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Bureau of Land Management

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Bowie Coal Lease Modification Application

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U.S. Department of the Interior
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ENVIRONMENTAL ASSESSMENT

NUMBER: DOI-BLM-CO-SO50- 2012-0001

CASEFILE/PROJECT NUMBER: COC-37210 and COC-61209

PROJECT NAME: Bowie Coal Lease Modification

LEGAL DESCRIPTION:

COC-61209 Modification
Township 13 South, Range 91 West, 6th P.M.
Section 5: SWNW, NWSW, SWSW, NESW, S/2NESENW, S/2SENW, S/2NWSENW, SWSWNE, S/2NWSWNE, W/2NWSE;
Section 6: SENE; containing approximately 265.00 acres.

COC-37210 Modification
Township 13 South, Range 92 West, 6th P.M.
Section 1: S/2NE, S/2NW, Lots 9 – 12; containing approximately 237.43 acres.

APPLICANT: Bowie Resources, LLC

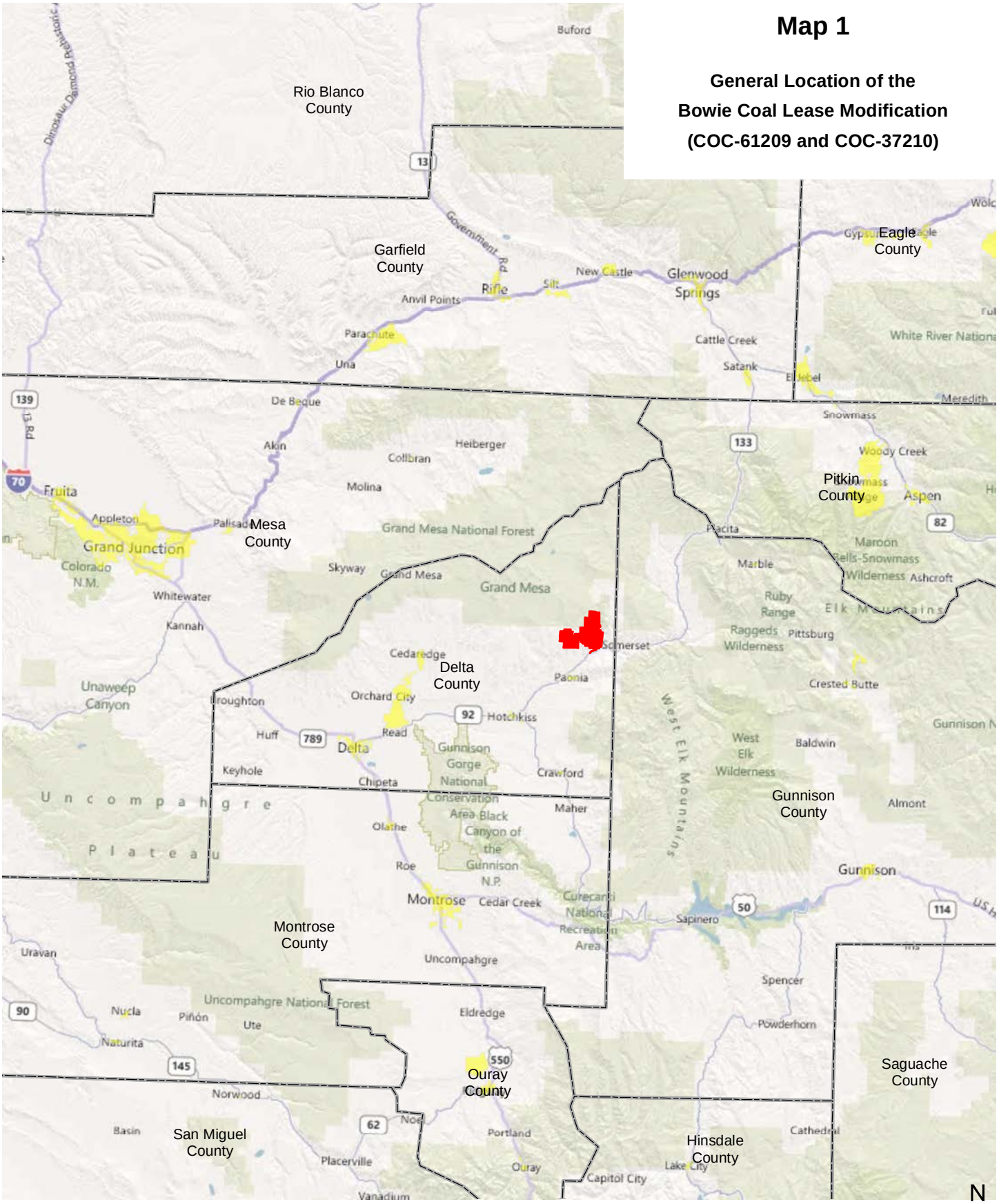
BACKGROUND/INTRODUCTION

Currently, Bowie Resources, LLC (Bowie) operates the Bowie No. 2 mine which is an underground longwall coal mine located about 5 miles northeast of Paonia in Delta County, Colorado (see Map 1). Coal mining has been conducted in the North Fork Valley for more than 100 years. The Bowie No. 2 Mine has been in operation since November 1997 and is capable of producing approximately 5,000,000 tons of coal annually. The lease modifications would provide the opportunity for a logical extension of the Bowie B-Seam workings beyond the current mine plan.

The proposed lease modifications would add approximately 265 acres to lease COC-61209, and 237.43 acres to lease COC-37210, for a total of approximately 502.43 acres. Bowie applied for the two coal lease modifications, which are immediately adjacent to their existing federal coal leases at the Bowie No. 2 mine, so that they can continue to mine and sell compliant and super-compliant coal. Bowie holds approximately 11,228 federal lease acres and approximately 1,696 acres of fee coal that are covered by approximately 14,543 acres in the combined permits of the Bowie No. 1 and No. 2 Mines accessed by the Bowie No. 2 mine. The lease modifications are located on lands in which the Bureau of Land Management (BLM) manages a portion of the surface (174 acres on COC-61209), and all of the mineral estate (COC-37210 and COC-61209).

Map 1

General Location of the
Bowie Coal Lease Modification
(COC-61209 and COC-37210)



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The BLM is required, by law, to consider leasing federally-owned minerals for economic recovery. Although the decision to lease these lands is a necessary requisite for mining, that decision is not the enabling action that will allow mining. On-going management of the existing leases, permitting of associated mining and surface activities follows the Surface Mining Control and Reclamation Act of 1977 (SMCRA) implementing regulations at 43 C.F.R. § 3400, and 30 C.F.R. § 700 (respectively), and the State of Colorado Coal regulations. Leasing conveys rights to the mineral resource; however, leasing does not authorize coal mining. Subsequent permitting actions would be required to allow mining and/or change the approved mine permit boundary to include the modification area. These permitting actions fall with the purview of the State of Colorado, Division of Reclamation Mining and Safety (DRMS) under procedures set forth in 30 C.F.R. § 700, et. seq. and the regulations of the Colorado Mined Land Reclamation Board for Coal Mining. These changes may also require approval from the U.S. Department of the Interior (USDI) through the Office of Surface Mining Reclamation and Enforcement (OSM).

The OSM has agreed to cooperate in preparing this EA. In addition, OSM has jurisdiction in recommending approval or disapproval of any mining plan that might result from BLM's leasing decision. The BLM, though, must concur with the OSM recommendation to the Assistant Secretary concerning the mining plan submitted to OSM by a successful bidder (lessee).

Federal coal lease holders in Colorado must submit a permit revision application to DRMS for proposed expansions of existing mines that covers mining and reclamation on federal lands. DRMS reviews the package to ensure that the permit application complies with the permitting requirements and that the coal mining operation would meet the State's performance standards. OSM, BLM, and other federal agencies also review the application to ensure it contains the necessary information for compliance with the coal lease, the Mineral Leasing Act (MLA), the National Environmental Policy Act (NEPA) and other applicable federal laws and regulations. If the application complies, DRMS issues a permit to conduct coal mining operations. When needed, OSM recommends approval, approval with conditions, or disapproval of the mining plan to the Assistant Secretary of the Interior, Land and Mineral Management. Prior to mining plan approval, OSM obtains input from BLM (for the mineral estate) and the federal land management agency.

The extraction of the coal resources is established by the MLA of 1920, as amended by the Federal Coal Leasing Amendments Act (FCLAA) of 1976 and the Federal Land Policy and Management Act (FLPMA) of 1976. Modifying the leases would let Bowie lengthen three longwall panels, which would allow the coal to be mined. Should the leases not be modified and the longwall panels not be lengthened, it would become economically unviable and technically infeasible to mine the federal coal within the lease modification areas in the future resulting in a bypass of the federal coal resource.

PURPOSE AND NEED FOR THE PROPOSED ACTION

Bowie submitted a request on July 11, 2011 seeking to modify two existing federal coal leases for BLM mineral estate located adjacent to the currently operating Bowie No. 2 Mine.

The BLM purpose is to decide whether to accept the coal lease modification proposals as applied for by Bowie, reject the applications, or modify the proposed lease modifications.

The BLM need is to respond to a request to modify an existing lease in accordance with the NEPA, the MLA, as amended by the FCLAA of 1976, and the FLPMA of 1976.

PROPOSED ACTION AND ALTERNATIVES

The Proposed Action is to issue two federal coal lease modifications. The proposed lease modifications would add approximately 502.43 acres to existing coal leases COC-37210 (237.43 acres) and COC-61209 (265 acres) under the direction of the Energy Policy Act of 2005. The lease modifications would allow Bowie to continue operations by providing a logical extension to the mine's current B-Seam workings. Bowie is currently mining the first of nine longwall panels west of Terror Creek (see Map 2). The longwall panels run in a north-south direction. Following the nine longwall panels, Bowie plans to mine four longwall panels, which run in an east-west direction. The four east-west panels are located north of the nine north-south panels. The lease modifications would allow three of the four east-west longwall panels to be lengthened by a total of nearly 8,000 feet. Without the lease modifications, approximately 8,000 feet of longwall coal would be permanently by-passed. Therefore, the modifications avoid bypassing approximately 3.25 million enhanced recoverable tons (1.20 million on existing leases and 2.05 million on the modification tracts (see Appendix C, GER/MER)). The lease modifications would not generate any additional exploration activities.

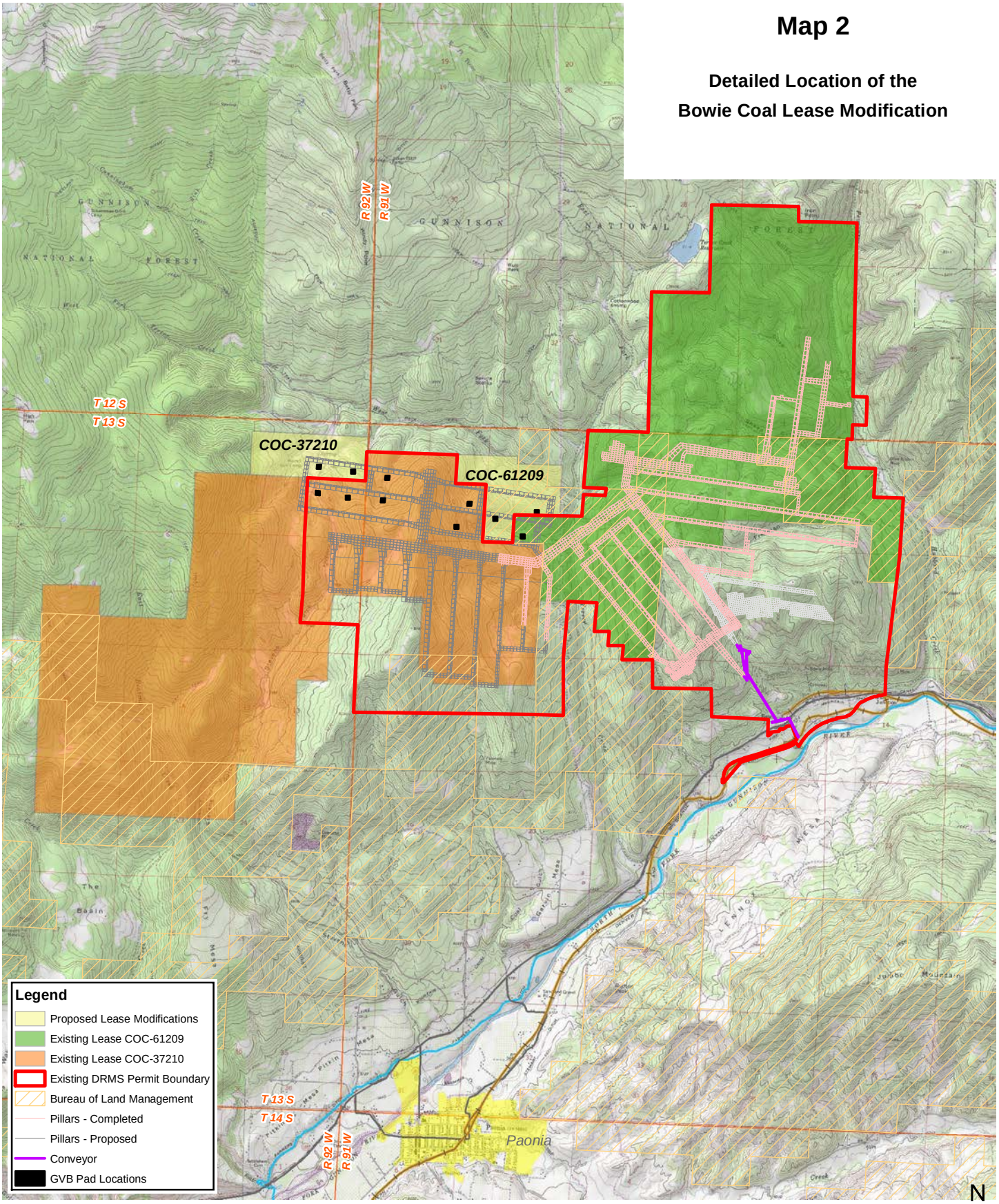
Under the Proposed Action, the life of the current mine would be extended by approximately one year. Pillars would be left in place in gateroads and bleeders and full extraction of coal would occur in the longwall block. A typical belt conveyor would be used for transportation of the coal to the surface.

Gob vent boreholes (GVBs) would be located on the modification tracts. GVBs would ventilate potentially explosive gases from the mine in order to provide a safe environment for miners working underground. Venting of the potentially explosive gases for the safety of the miners is the overriding consideration. Under the Proposed Action, no measures for capture and use or conversion of the Coal Mine Methane (CMM) have been identified (see discussion *infra*, Alternatives Considered but Eliminated from Detailed Analysis).

If BLM issues the federal coal lease modifications, Bowie would need to construct pads and roads to four GVB sites (see Map 3) on the proposed lease modification tracts. One pad would have a second directional hole drilled from it to avoid construction of an additional pad thus resulting in four pads and five holes. A single GVB pad and hole (GVB-B19A) on existing lease COC-61209 would also be required as a result of Bowie obtaining the lease modification tracts; therefore, requirements for GVBs on the modification tracts come to a total of five pads and six holes. Any and all of the proposed GVB pads and holes would be submitted by Bowie as part of mine plan revisions in the future and would receive site-specific agency review and would be approved as part of mine plan revisions.

Map 2

Detailed Location of the Bowie Coal Lease Modification



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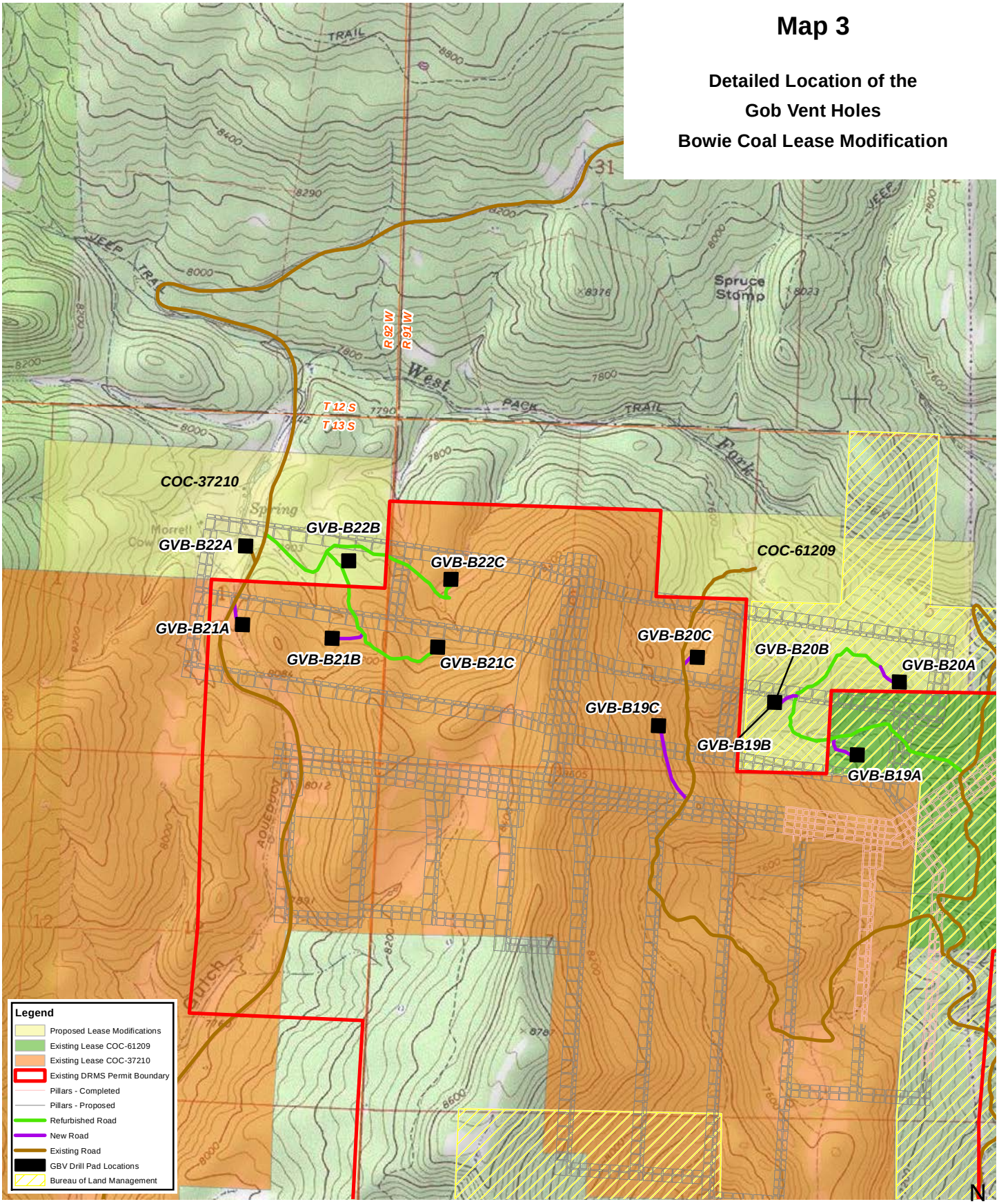
6,000 0 6,000 Feet

Map 3

Detailed Location of the
Gob Vent Holes
Bowie Coal Lease Modification



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2,000 0 2,000
Feet

GVBs are utilized as a mine methane drainage technique. Prior to mining, vertical and directional holes are drilled from the surface to within a short distance above a longwall panel. Typically, the GVBs do not produce methane gas in any quantity until after the longwall face has mined past the boreholes and the overburden has collapsed to form highly fractured rocky material, or gob. The GVBs become conduits through which methane released into the gob exhausts to the surface before it can inundate the essential ventilation air courses in the mine. Surface disturbance would be temporary and would be approximately 16.6 acres for GVBs, associated temporary drill pads, and light-use roads (see Table 1).

Table 1
Proposed Surface Disturbance

Gob Vent Bore Hole No.	Surface Ownership/ Existing Lease or Lease Modification	Improved Existing Road (Feet)	New Road (Feet)	Drill Pad (Acres) [2]
GVB-B19A	BLM / Existing	2,265	415	0.92
GVB-B19B and GVB-B20B (Directional)	BLM / Modification	1,245	260	0.92
GVB- B19C	Private / Existing	0	1,095	0.92
GVB-B20A	BLM / Modification	1,720	300	0.92
GVB–B20C	Private / Existing	0	155	0.92
GVB-B21A [1]	Private / Existing	0	230	0.92
GVB-B21B [1]	Private / Existing	1,075	405	0.92
GVB-B21C [1]	Private / Existing	1,267	0	0.92
GVB-B22A [1]	Private / Modification	0	0 [3]	0.92
GVB-B22B [1]	Private / Modification	1,665	0	0.92
GVB-B22C [1]	Private / Existing	2,405	0	0.92
	Total	**11,642 3.2 acres**	**2,860 3.3 acres**	**10.1**

[1] Water for drilling would be hauled using the Stevens Gulch road maintained by Delta County, which is approximately 15,000 feet long. No improvements are planned.
[2] Following construction, mud pits would be reclaimed shortly after drilling.
[3] There is an existing 160-foot road to GVB-B22A, which would not need to be upgraded.

Access to the GVBs would be from improved jeep trails or new roads. The work required to improve the roads would include widening, smoothing the surface, and in some cases reducing steep grades. GVB-B22A is on the edge of the private property owner's access road. The short stretch of access road (160 feet) would not need to be reconditioned. It is assumed there would

be a 12-foot wide incremental disturbance to improve existing roads (i.e., jeep trails). The total additional disturbance for the improved existing roads would be 3.2 acres.

New roads would be constructed to handle drill rigs, crews, and support equipment. Because of the potential for cut and fill slopes, it is assumed there would be a 50-foot wide disturbance for new roads. The total disturbance from new roads would be approximately 3.3 acres. The drill rig would be a truck mounted DR24 type capable of both rotary and core drilling. Supporting that rig would be a flatbed supply truck, a 3,000-gallon water truck, when needed, two crew trucks for transportation, and an E-log truck which would run digital logs for each hole.
The following design and reclamation features would apply to access roads:

- New roads and other linear facilities would be located and constructed to follow the contour of the landform or to mimic lines in the vegetation (avoiding straight roads and steep slopes).
- Road beds would be a maximum of 12 feet wide.
- Cutting and filling, and crowning and ditching, of temporary roads would be kept to the minimum necessary.
- Interim reclamation would include seeding the disturbed surface of the roads with the approved seed mixture or cover crop approved by BLM in order to reduce the amount of bare ground created during construction and drilling activities.
- After there is no longer a need for mine ventilation (1 to 3 years from the time construction is completed), the new road segments would be reclaimed to their original contour and rough texture in order to match the "texture" of the surrounding landscape, and revegetated in accordance with BLM direction using a BLM-approved seed mix (see Table 2).

Table 2
Approved Seed Mixture for Use on BLM-Managed Public Lands

Name (Variety)	**Species**	**Pounds per acre**
Western Wheatgrass (Arriba)	*Pascopyrum smithii*	0.96
Slender Wheatgrass (San Luis)	*Elymus trachycaulum*	0.66
Mountain Brome (Bromar)	*Bromus marginatus*	1.50
Big Bluegrass (Sherman)	*Poa ampla*	0.18
Bottlebrush Squirreltail	*Elymus elymoides*	0.96
Canada Wildrye	*Elymus canadensis*	0.94
American Vetch	*Vicia Americana*	0.60
Rocky Mountain Penstemon	*Penstemon strictus*	0.09
Western Yarrow	*Achillea lanulosa*	0.06
	Total	**5.95 (double rate for broadcasting)**

The following design features would apply to drill pads:

- Drill pads would be approximately 0.92 acre in size (200 feet by 200 feet).
- Construction of each pad would proceed by first selectively clearing brush/vegetation, removing the topsoil and stockpiling it for use in later reclamation, and leveling the subsoil to form a flat pad.
- Drill pads would be designed to prevent or diminish overland flow from entering the site during precipitation events. Pad sites would have berms on all downslope portions and pads would be sloped to drain all spills and site precipitation into the mud pits.
- Impermeable ground cloths would be used under the drill rigs and petroleum product containers to contain minor petroleum leaks. Refueling of equipment would not occur within 100 feet of waterbodies. In the unlikely event of a petroleum spill, it would be contained and cleaned up using standard hazmat procedures. The spill would also be reported to the BLM authorized hazardous material coordinator.
- Light shields would be installed to minimize fugitive light and ensure a dark sky condition during nighttime drilling activities.
- Reserve (mud) pits would be constructed on the prepared pads and lined with a plastic liner. The mud pits would be small, generally 10 feet wide by 40 feet long by 10 feet deep. Biodegradable synthetic polymer drilling fluids or bentonite would be used and would be contained in the reserve pits until dry. If necessary, pits would be pumped out to reduce their content and insure that overflow does not occur. Pumped fluids would be hauled to a State-approved facility for disposal. Once the pits are dry, the pit liner would be removed (as much as possible) and disposed in the trash. The pit would then be filled with reserved soil.
-

The following would apply to water delivery to drill pads:

- Water would be hauled to GVB-B21A, B21B, B21C, B22A, B22B, and B22C, using the Stevens Gulch Road, which is an existing road.
- Water would be pumped to GVB-B19A, B19B, B20A, and B20B from a point just upstream of the confluence of East and West Terror Creeks. A self-contained pump would be placed in a sheet metal trough capable of containing the full volume of the engine oil and fuel supply used for the pump in case of a leak. Two- to three-inch high-pressure pipelines would be laid alongside the existing, upgraded and new roads. This would reduce the use of water trucks, and, therefore, potential sediment caused by fugitive dust and increased road maintenance requirements.
- Pumping would occur as outlined in the February 21, 2012 informal section 7 consultation for the Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities. Conservation measures 2-5 contained in Appendix A to the consultation provide specific direction on pumping-related activities. This consultation can be found in Appendix B to this EA.
- Cofferdams made of heavy duty plastic would be used to pool water where pump intakes would be located. The cofferdams and pump intakes would be screened using ¼ inch or finer mesh to preclude fish from passing through. Further, the low pumping rate would reduce the chances that any fish would be held against the screen while a pump is operating.

- As water is required for drilling activities, a call on Bowie's water rights would be made and water would be continually released into East Terror Creek at a rate equal to or greater than the amount of water being consumed.

All of the GVBs would be drilled at approximately the same time over a period of a few weeks before mining each longwall panel. During the time the longwall panel beneath the GVBs is being mined, and for approximately 1 year after the completion of mining, the GVB pump would require weekly inspection and maintenance. Figure 1 provides a photo of a typical methane pump.

Figure 1
Typical Methane Pump

The operating size of each pad would be approximately 0.92 acre. The following design features apply to the GVB pads:

- Generally level areas would be chosen for pad locations in order to minimize the need for cutting and filling.
- Natural or artificial features, such as topography, vegetation, or artificial berms, would be used in order to help screen drill pads.
- Topsoil and soil from the pad site would be stockpiled for reclamation. Topsoil would be stockpiled separately from other soil horizons.
- Pads would be totally reclaimed after underground mining activities are completed,

longwall panels are sealed, and there is no longer a need for mine ventilation (1 to 3 years from the time construction is completed).

- During reclamation, drill pads would be recontoured back to their original contours and rough texture or to a natural looking contour that blends with the surrounding topography.
- Topsoil that was stockpiled would be spread over the surface of the reclamation area, and any areas of compacted surface would be mechanically ripped in order to loosen the soil.
- A BLM-approved seed mix (see Table 2) would be used for reclamation of BLM-managed lands.
- Reclaimed areas would be monitored annually until they are considered successful. (Reclamation would be considered "successful" when evidence of surface erosion is no greater than in adjacent undisturbed areas, and when natural, perennial plant cover has achieved a density of 75 percent of the pre-disturbance canopy cover.)

GVB abandonment would follow BLM and state guidelines. Holes would be sealed using cement or other approved sealant from the bottom of the hole to within three feet of the surface. Drill cuttings may be mixed with the sealant. The surface casing would be cut off below the ground surface. That portion of the hole between the seal and the reclaimed ground surface would be filled with dirt, drill cuttings, or both to minimize hazards to animals or humans. Hole locations would be marked with a four-foot (minimum) steel roof bolt or a T-shaped fence post.
The mining on the existing leases and proposed lease modification tracts would be short term, lasting approximately 3 years. Due to the economic limitations of this short-term operation, the Proposed Action would include venting methane gas directly into the atmosphere via GVBs and the mine ventilation system (see discussion *infra*, Alternatives Considered but Eliminated from Detailed Analysis).

No Action Alternative

In accordance with NEPA and the Council of Environmental Quality (CEQ) regulations, which require that a No Action Alternative be presented in all environmental analyses in order to serve as a "baseline" or "benchmark" from which to compare all proposed "action" alternatives, this EA analyzes a No Action Alternative.

Under the No Action Alternative, the two coal lease modifications would not be approved. As a result, federal coal reserves within the applied for tracts would not be recovered and would, therefore, be bypassed. Production at the Bowie No. 2 Mine would eventually cease once coal reserves under existing leases were mined. Under the No Action Alternative, there would be no surface disturbance, ventilation of explosive gases, removal of coal, or any other impacts associated with the activities described under the Proposed Action within the two proposed coal lease modification areas.

Alternatives Considered but Eliminated from Detailed Analysis

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

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

Alternatives specific to this EA that were considered, but that will not be analyzed in detail, are discussed below.

Coal Mine Methane (CMM) and Gob Vent Gas (GVG) Capture

An alternative analyzing the capture of CMM and GVG was considered; however, the alternative was not carried through the entire analysis process. The alternative was eliminated from detailed analysis due to the environmental impacts associated with methane capture as well as the economic infeasibility associated with the infrastructure required.
On November 28, 2011, Bowie provided BLM with a report (Vessels Coal Gas Inc., 2011) evaluating the technical and economic feasibility to capture CMM and GVG. Vessels Coal Gas, Inc. (VCG), working for Bowie, evaluated the technical capability and potential for uses of methane recovered from the Bowie No. 2 Mine. VCG is a Denver based company, developing and operating coal mine methane producing properties in the Rocky Mountain and Appalachian coal basins. VCG currently operates a coal mine methane recovery property in Cambria County, Pennsylvania that came on production in May of 2008. VCG installed an electrical generation unit on the same plant site. VCG is also currently developing a similar project in Colorado on the Sanborn Creek Mine in Gunnison County, Colorado. The Sanborn Creek property will initially utilize the coal mine methane as a fuel for electrical generation. This electrical generation and methane destruction facility will also use methane from the active Elk Creek Mine. In the November 2011 report, VGC concluded that the current conditions at the Bowie No. 2 mine make methane capture technologies economically unfeasible.

Methane released to the atmosphere from the Bowie No. 2 Mine activity has two principal avenues:

- High volume circulation of ventilation air through the underground mining access corridors that is subsequently exhausted to atmosphere; and
- GVBs drilled from surface to locations immediately above the longwall panels that are used to remove methane released during the mining of longwall panels for the safety of the mine workers.

The following is a discussion of the options related to CMM and GVG capture for the Bowie No. 2 Mine.

- **Ventilation Air Methane (VAM**). This is the methane gathered in the mine ventilation air in substantially diluted amounts as the air is circulated in high volumes throughout the underground mine then exhausted to the atmosphere using large fans. The expulsion of the diluted methane helps ensure a safe working condition for the miners. The VAM may be released at one or more locations for mine air exhaust.

- **Gob Vent Gas -** Prior to mining, vertical and directional holes (GVBs) are drilled from the surface to within a short distance above a longwall panel. Typically, the GVBs do not produce GVG in any quantity until after the longwall face has mined past the boreholes and the overburden has collapsed to form highly fractured rocky material, or gob. The GVBs become conduits through which methane exhausts to the surface before it can inundate the essential ventilation air courses in the mine.

    - Gases exhausted from GVBs, have a higher concentration of methane than that contained in VAM, which presents the opportunity for conversion of the energy from the methane to fire engines and flares using conventional combustion process technology.
    - To the extent that electric and or process heat loads are available, relatively low capital cost equipment, as compared to that required for energy capture from VAM, can be utilized.
        - The geographic location of the proposed new longwall panels are too far from the existing Bowie surface facilities to provide ready access for GVG to be made available for either electric or natural gas markets or to utilize process heat loads. The following were noted in Exhibit E to the report:

While the BLM does not analyze methane capture in the alternatives carried forward in this EA, nothing in this document prevents Bowie from voluntarily implementing a methane capture project in the future if it is determined to be feasible and all needed permits are acquired.

Reduce Potential Greenhouse Gas Emissions through Methane Flaring

An alternative analyzing the flaring of CMM was also considered and eliminated from detailed analysis. Any proposed flaring system intended for use at a coal mine in the United States would need to be approved by the Mine Safety and Health Administration (MSHA). MSHA has a process in place to analyze the safety aspects of a proposed design and would conduct a thorough review of the proposed flaring system in order to establish the requirements for the system. It is not likely that a thorough review and approval would occur prior to the development and operation of the mine expansion. To date, MSHA has not approved a flaring system for a coal mine in the Western U.S. MSHA has authorized a flaring system for Solvay's underground trona mine near Green River, Wyoming. This degasification system was commissioned in August 2010 and is currently in operation. Trona mines have similar characteristics to underground coal mines in terms of their methane gas production and mining techniques. However, trona is a non-combustible ore, while coal is highly combustible. Because of the

combustibility of coal, and associated concerns for miner safety, the flaring system in use at Solvay cannot be considered for an underground coal mine.

Additionally, flaring of methane can result in the release of other air pollutants, including NO_2 and carbon monoxide, which are criteria pollutants. The following was considered related to methane flaring:

- To reduce methane emissions from the GVG conventional flaring technology could be used to destroy the methane.
  - Production of methane for flaring would only be approximately 80% of the time for 5 to 6 months. Exhibit B to the report provides a summary of GVB flow and methane concentration data.
- The report concludes that based on current GVG volumes that a gathering system and flare project would not be economical to pursue and that in order to approach a return on investment, the GVG volumes would need to increase by an approximate 7 times factor. Gathering system costs would then increase with higher volumes as larger pipe sizes would be required and a larger enclosed flare would be required.

Due to the VGC finding that methane flaring would not be economically feasible, and the increased potential for environmental impacts, the methane flaring alternative was not considered a viable alternative for Bowie, and was eliminated from detailed analysis. While the BLM does not analyze methane flaring in the alternatives carried forward in this EA, nothing in this document prevents Bowie from voluntarily implementing a methane flaring project in the future if it is determined to be feasible and all needed permits are acquired.

SCOPING AND IDENTIFIED ISSUES

Public comments were solicited via a letter, dated October 3, 2011, that was mailed to the appropriate agencies, specific interested parties, and to the general public. The scoping notice was also posted on the BLM Uncompahgre Field Office (UFO) website. Public comments were received through November 7, 2011. All comment letters were reviewed and considered in the development of the EA.

A total of 47 comment letters were received during the public comment period. The following is a summary of those comments and responses:

- *39 of the comments were in support of the project based upon: 1) benefit to the local economy; 2) the national need for energy; 3) current lease expansion guidelines and enhanced coal recovery; and 4) no anticipated significant impacts to wildlife populations.* These items are discussed as appropriate in the EA.
- *One comment asked that the BLM demonstrate that there is no competitive interest in the lands or coal deposits*. BLM processes lease modifications per appropriate regulations. The proposed modifications are non-competitive by regulation.
- *Some comments raised the issue of methane release from the GVBs. These comments asked that the impacts to global climate change resulting from the release of methane from mine ventilation systems and GVBs be analyzed in the environmental analysis*

process. These comments also asked that methane recovery or flaring systems be employed in order to mitigate the potential impacts of methane release to global climate change. The EA analyzes impacts related to methane releases, climate change, and appropriate mitigation to identified impacts.

- *One comment suggested that the magnitude of potential impacts warranted the production of an EIS, rather than an EA.* The BLM has followed appropriate NEPA regulations, policy, and manuals in the development of a NEPA document in response to the lease modifications. The BLM concluded that an EA rather than an EIS is the appropriate type of NEPA review for these lease modifications.
- *The Fish and Wildlife service addressed special status species and their habitats in the project area, recommending avoidance of impacts, and raised special concern regarding impacts to greenback and cutthroat trout. A Section 7 Consultation was recommended. Additionally, a recommendation was made to minimize impacts to migratory birds, including nesting raptors.* BLM has followed appropriate agency procedures to consult with the U.S. Fish and Wildlife Service to address special status species and their habitats in the development of the EA.
- *The Office of Surface Mining made one comment requesting to be listed as a cooperating agency.* OSM is now a cooperating agency on this EA.
- *One comment asked the BLM to address cumulative impacts to the endangered Colorado pikeminnow and razorback sucker in the Gunnison River.* The EA addresses the species.
- *One comment stated that impacts to waters and wetlands could require a permit from the U.S. Army Corps of Engineers.* BLM would follow agency procedures related to waters of the United States and wetlands. No impacts to surface waters or wetlands are proposed for the lease modification areas.

PLAN CONFORMANCE REVIEW

The Proposed Action is subject to, and has been reviewed for, conformance with the BLM Unsuitability Criteria for coal leasing (see Appendix A), and with the following RMP (43 CFR 1610.5-3, 1617.3):

Name of Plan: Uncompahgre Basin RMP
Date Approved: July 26, 1989, as amended

Decision Number/Page: Management Unit 7, pg. 21, and Management Unit 9, pg. 22.

Decision Language: Management Unit 7: "The management unit will be managed for both existing and potential coal development. Development of existing coal leases will continue and non-leased federal coal will be identified as acceptable for further coal leasing consideration with a minimum of multiple-use restrictions. Activities and land uses that are consistent with maintaining existing coal operations and the potential for coal development will be permitted."

Management Unit 9: "The management unit will be managed to restore and enhance riparian vegetation along 48 miles of streams." "Coal development will be considered on a site-specific basis after consultation with affected entities and formulation of mitigating measures." The Proposed Action is consistent with current land management planning.

Other Related NEPA Documents:

This EA tiers to the 2000, USDA FS and BLM. Environmental Impact Statement for the Iron Point Exploration License, the Iron Point Coal Lease Tract and the Elk Creek Coal Lease Tract (North Fork Coal EIS, FS and BLM, 2000). The 2000 North Fork Coal EIS analyzed the issuance of lease COC-61209, and referenced the existing lease COC-37210 in its analysis. The air quality modeling and analysis included in the 2000 North Fork Coal EIS (pages 3-3 to 3-17 and Appendix M) are used in the air quality analysis in this EA.

Standards for Public Land Health

In January of 1997, the Colorado BLM approved the Standards for Public Land Health (see Table 3). These standards describe conditions needed in order to sustain public land health in relation to all uses of public lands. A finding for each Standard has been made in the Affected Environment, Environmental Consequences, and Mitigation Measures section of this EA.

Table 3
Standards for Public Land Health

Standard	Definition/Statement
Standard 1 Upland Soils	Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form, and geologic processes. Adequate soil infiltration and permeability allows for the accumulation of soil moisture necessary for optimal plant growth and vigor, and minimizes surface run-off.
Standard 2 Riparian Systems	Riparian systems associated with both running and standing water function properly and have the ability to recover from major surface disturbance, such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment, and provides forage, habitat, and bio-diversity. Water quality is improved or maintained. Stable soils store and release water slowly.
Standard 3 Plant and Animal Communities	Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations, and ecological processes.
Standard 4 Threatened and Endangered Species	Special status, threatened and endangered species (federal and state), and other plants and animals, and their habitats, officially designated by the BLM, are maintained or enhanced by sustaining healthy, native plant and animal communities.
Standard 5 Water Quality	The water quality of all water bodies, including groundwater where applicable, located on or influenced by BLM-managed public lands will achieve or exceed the Water Quality Standards established by the State of Colorado. Water Quality Standards for surface and ground waters include the designated beneficial uses, numeric criteria, narrative criteria, and anti-degradation requirements set forth under state law as found in (5 CCR 1002-8), as required by Section 303I of the Clean Water Act.

AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION MEASURES

This section describes the human and natural environmental resources that could be affected by the Proposed Action and presents comparative analyses of the direct and indirect effects on the

environment. A description of the past, present, and reasonably foreseeable actions is at the end of this section, including the cumulative impacts analysis of each element.

Environmental Impact Analysis

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

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

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

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

Elements specified by statue, regulation, executive order, other resources, or the Standards for Public Land Health are described and analyzed in this section. Table 4 lists the elements considered in this section; those that could be impacted are brought forward for analysis. Any element not affected by the Proposed Action or no action alternative will not be analyzed in this document; the reasons for no impact will be stated. Environmental impact analysis was based upon available data and literature from state and federal agencies, peer-review scientific literature, and resource studies conducted in the proposed lease modification areas.

There are no Areas of Critical Environmental Concern (ACECs), Wilderness Areas, Lands with Wilderness Characteristics, Prime or Unique Farmlands, Native American Religious Concerns, or Floodplains within the lease modification areas. In addition, other resources that are present, but would not be impacted, and, therefore, not brought forward for analysis include: Range Management and Forest Management. In terms of Range Management, there are no managed grazing leases within the proposed lease modification areas. In terms of Forest Management, the area is not managed as forest.

Table 4
Environmental Assessment Resource Areas

Element	Not Applicable or Not Present	Present, but No Impact	Applicable and Present; Brought Forward for Analysis
Air Quality			X
ACEC	X		
Wilderness	X		
Lands with Wilderness Characteristics	X		
Wild and Scenic Rivers			X
Cultural Resources			X
Native American Religious Concerns	X		
Farmlands, Prime/Unique	X		
Soils			X
Vegetation			X
Invasive, Non-native Species			X
Threatened and Endangered Species			X
Migratory Birds			X
Wildlife, Terrestrial			X
Wildlife, Aquatic			X
Wetlands and Riparian Zones			X
Floodplains	X		
Water Quality, Surface and Ground			X
Wastes, Hazardous or Solid			X
Environmental Justice		X	
Access			X
Transportation			X
Cadastral Survey	X		
Realty Authorizations			X
Range Management		X	
Forest Management		X	
Wildfire			X
Hydrology/Water Rights			X
Noise			X
Recreation			X
Visual Resources			X
Geology and Minerals			X
Paleontology			X
Law Enforcement	X		
Socio-Economics			X

AIR QUALITY

Affected Environment

Paonia, Colorado is located in the North Fork Gunnison River Valley and rests at approximately 5,682 feet above MSL. The area is rural with mountainous terrain. The normal temperatures (min and max) for the area range from 14.4 to 38.6 ˚F in January to 53.4 to 88.9 ˚F in July. The average annual precipitation amounts to approximately 14.02 inches, which according to historical records is relatively evenly distributed throughout the year. Average annual wind resultants are generally from the southeast at a speed of approximately 7.1 mph. The area enjoys sunshine for approximately 70 percent of the time and has an annual average sky cover of around 52 percent (Western Regional Climate Center, 2012).

Implementation of the Proposed Action would result in emissions of criteria pollutants, hazardous air pollutants (HAPs), and greenhouse gases (GHGs). Fugitive particulate matter would be emitted when drill rigs and other vehicles associated with the mining activities travel on existing dirt roads or overland access routes to GVB drilling locations. Emissions of particulate matter would be generated from processing equipment, material handling transfer points, storage piles, rail load-out locations, and mine ventilation shafts. Air quality would also continue to be impacted by fuel combustion sources, such as the engine exhaust emissions from locomotives, mobile material handling equipment, personnel transport equipment, and stationary internal combustion engines.

Air quality in the region, which is generally made up of smaller towns, usually located in fairly broad river valleys, is affected by multiple activities currently conducted within the area. The facility is located near the boundaries of Delta and Gunnison Counties, and so it is reasonable to conclude that indirect and cumulative effects for the area would be influenced in the near field by sources of emissions within each county's respective emissions inventory. Activities occurring within the region that affect air quality include stationary 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, etc. Portable source examples include facilities such as gravel crushers, associated processing equipment, and asphalt plants. Mobile sources of emissions within the region would include highway or on-road vehicles, and off-road vehicles such as construction-related equipment (dozers, loaders, backhoes, etc.) and recreational vehicles (snowmobiles, ATVs, and dirt bikes). Smoke from grass and forest fires represent area source emissions that can have an impact on air quality.

Regulatory Framework

The Clean Air Act (CAA), which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for criteria pollutants. Criteria pollutants are air contaminants that are commonly emitted from the majority of emissions sources and include carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), particulate matter smaller than 10 & 2.5 microns (PM_{10} & $PM_{2.5}$), ozone (O_3), and nitrogen dioxide (NO_2).

The CAA established 2 types of NAAQS:

Primary standards: – Primary standards set limits in order to protect public health, including the health of "sensitive" populations (such as asthmatics, children, and the elderly).

Secondary standards: – Secondary standards set limits in order to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The EPA regularly reviews the NAAQS (every five years) to ensure that the latest science on health effects, risk assessment, and observable data such as incidence rates are evaluated in order to re-propose any NAAQS to a lower limit if the data supports the finding.

The Colorado Air Pollution Control Commission, by means of an approved State Implementation Plan (SIP) and/or delegation by EPA, can establish state ambient air quality

standards for any criteria pollutant that is at least as stringent as, or more so, than the federal standards. Ambient air quality standards must not be exceeded in areas where the general public has access. Table 5 lists the federal and state ambient air quality standards.

Table 5
Ambient Air Quality Standards [1]

Pollutant [final rule cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead [73 FR 66964, Nov 12, 2008]		Primary and Secondary	Rolling 3-month average	0.15 μg/m^3 (2)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		Primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		Primary and Secondary	Annual	53 ppb (3)	Annual Mean
Ozone [73 FR 16436, Mar 27, 2008]		Primary and Secondary	8-hour	0.075 ppm (4)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution [71 FR 61144, Oct. 17, 2006]	$PM_{2.5}$	Primary and Secondary	Annual	15 μg/m^3	Annual mean, averaged over 3 years
			24-hour	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 μg/m^3	Not to be exceeded more than once per year on average over years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sep 14, 1973]		Primary	1-hour	75 ppb (5)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary	Annual	0.03 ppm (6)	Arithmetic Average
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(1) National Ambient Air Quality Standards (http://www.epa.gov/air/criteria.html)
(2) Final rule signed October 15, 2008. The 1978 lead standard (1.5 μg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
(3) The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
(4) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.
(5) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved. (b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard. (c) EPA is in the process of reconsidering these standards (set in March 2008).
(6) Colorado Primary Standard
NOTE: Air quality in the Delta and Gunnison County Air Sheds currently meets all NAAQS & CAAQS.

Emissions Source Classifications and Regulatory Authority.
Emissions sources are generally regulated according to their type and classification. Essentially all emissions sources fall into two broad categories, stationary and mobile. Stationary sources are generally non-moving, fixed-site producers of pollution such as power plants, chemical plants, oil refineries, manufacturing facilities, and other industrial facilities. This source class

can also cover certain types of portable sources. Stationary facilities emit air pollutants via process vents or stacks (point sources) or by fugitive releases (emissions that do not pass through a process vent or stack). Stationary sources are also classified as major and minor. A major source is one that emits, or has the potential to emit, a regulated air pollutant in quantities above a defined threshold. Stationary sources that are not major are considered minor or area sources. A stationary source that takes federally-enforceable limits on production, consumptions rates, or emissions to avoid major source status are called synthetic minors. The Colorado Department of Health and Environment (CDPHE), Air Pollution Control Division (APCD) has authority under their approved SIP, or by EPA delegation, to regulate and issue Air Permits for stationary sources of pollution in Colorado.

Mobile sources include any air pollution that is emitted by motor vehicles, engines, and equipment that can be moved from one location to another (typically under their own power). Due to the large number of sources, which includes cars, trucks, buses, construction equipment, lawn and garden equipment, aircraft, watercraft, motorcycles, etc., and their ability to move from one location to another, mobile sources are regulated differently than stationary sources. In general EPA and other federal entities retain authority to set emissions standards for these sources depending on their type (on-road or off-road) and class (light duty, heavy duty, horse power rating, weight, fuel types, etc.). Mobile sources are not regulated by the state (an exception being California) unless they are covered under an applicable SIP specific to a non-attainment or maintenance area.

Criteria Pollutants.

Of all the criteria pollutants, only ground level ozone and secondary formation $PM_{2.5}$, also known as condensable particulate matter, are not directly emitted by emissions sources. Ozone is chemically formed in the atmosphere via interactions of oxides of nitrogen (NO_X) and volatile organic compounds (VOCs) in the presence of sunlight and under certain meteorological conditions (NO_X and VOCs are Ozone precursors). Ozone formation and prediction is complex, generally results from a combination of significant quantities of VOCs and NO_X emissions from various sources within a region, and has the potential to be transported across long ranges. Therefore, it is typically not appropriate to assess potential ozone impacts of a single project on potential regional ozone formation and transport. However, the State assesses potential ozone impacts from its authorizing activities on a regional basis when an adequate amount of data is available and where such analysis has been deemed appropriate. For this reason (inappropriate scale of analysis), ozone will not be further addressed in this document beyond the related precursor discussions.

The EPA defines $PM_{2.5}$ as particulate matter with an aerodynamic diameter less than or equal to 2.5 microns in size. According to the EPA, the chemical composition of $PM_{2.5}$ is characterized in terms of five major components that comprise the mass of pollutant. In the West, organic carbon (OC) is generally the largest estimated component of $PM_{2.5}$ by mass. Primary emissions of $PM_{2.5}$ are generally from combustion processes with fireplaces and woodstoves being important contributors to OC. A minority component of $PM_{2.5}$ is made up of crustal elements (i.e., fugitive dust). Secondary $PM_{2.5}$ will not be addressed in more detail than a general discussion of particulates due to the current lack of available technical methods and facility data

to apply such analysis (see EPA's March 23, 2010 guidance memorandum "Modeling Procedures for Demonstrating compliance with $PM_{2.5}$ NAAQS").

Hazardous Air Pollutants.
Toxic air pollutants, also known as hazardous air pollutants (HAPs), are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. The majority of HAPs originate from stationary sources (factories, refineries, power plants) and mobile sources (e.g., cars, trucks, buses), as well as indoor sources (building materials and cleaning solvents). No ambient air quality standards exist for HAPs, instead emissions of these pollutants are regulated by a variety of laws that target the specific source class and industrial sectors for stationary, mobile, and product use/formulations. The majority of HAPs emitted from Bowie's operations are the result of the on-road and non-road vehicle use.

Green House Gases. Gases that trap heat in the atmosphere are often called greenhouse gases, and include carbon dioxide (CO_2), methane (CH4), nitrous oxide (N2O), and several fluorinated species of gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Carbon dioxide is emitted from the combustion of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). Methane is emitted during the production and transport of coal, natural gas, and oil. Methane also results from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases are powerful greenhouse gases that are emitted from a variety of industrial processes and are often used as substitutes for ozone-depleting substances (i.e., CFCs, HCFCs, and halons).
All of the different gases all have various capacities to trap heat in the atmosphere, which are known as global warming potentials (GWPs). Carbon dioxide has a GWP of 1, and so for the purposes of analysis a GHGs GWP is generally standardized to a carbon dioxide equivalent (CO_2e), or the equivalent amount of CO_2 mass the GHG would represent.

As with the HAPs, ambient air quality standards do not exist for GHGs. In its Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, the EPA determined that GHGs are air pollutants subject to regulation under the CAA. The most recent rules promulgated to regulate the emissions and the industries responsible are the Mandatory Reporting Rule (74 FR 56260) and the Tailoring Rule (70 FR 31514). Under EPA GHG Mandatory Reporting Rule, Underground Coal Mines subject to the rule are required to report emissions in accordance with the requirements of Subpart FF. Under the provisions of the Tailoring Rule (step 2 – July 2011) a facility would be subject to Prevention of Significant Deterioration (PSD) permitting if it has the potential to emit GHGs in excess of 100,000 tpy of CO_2e equivalent and 100/250 tpy of GHGs on a mass basis. For existing facilities this review would take place during any subsequent modifications to the facility (CDPHE's anticipated implementation strategy).

The EPA is also planning to develop stationary source GHG emissions reduction rules (New Source Performance Standards) that could mandate substantial reductions in U.S. greenhouse gas emissions. Alternatively, Congress may develop cap-and-trade legislation as another means to

reduce GHG emissions. Consequently, a GHG emissions calculation for coal burned at a power plant is likely to be increasingly regulated in the near future. The first EPA regulation to limit emissions of GHGs imposed carbon dioxide emission standards on light-duty vehicles, including passenger cars and light trucks. As of February 2011, the EPA had not set GHG emission standards for stationary sources (such as compressor stations); however, the EPA is gathering detailed GHG emission data from thousands of facilities throughout the U.S., and will use the data in order to develop an improved national GHG inventory, as well as to establish future GHG emission control regulations.

Black Carbon. Black carbon is a by-product of incomplete combustion of fossil fuels, biofuels, and biomass. It can be emitted when coal is burned, as well as through tailpipe emissions from engines that use diesel fuel (such as diesel trucks and locomotives). Black carbon, therefore, is a likely by-product that will be emitted from haul trucks used during coal mining operations. Black carbon emissions from diesel tailpipe emissions are largely dependent upon the composition of the diesel fuel, and not upon the type of engine used. Black carbon is an unregulated pollutant; however, the EPA does regulate diesel fuel quality, such that, in recent years diesel fuel quality has been improved.

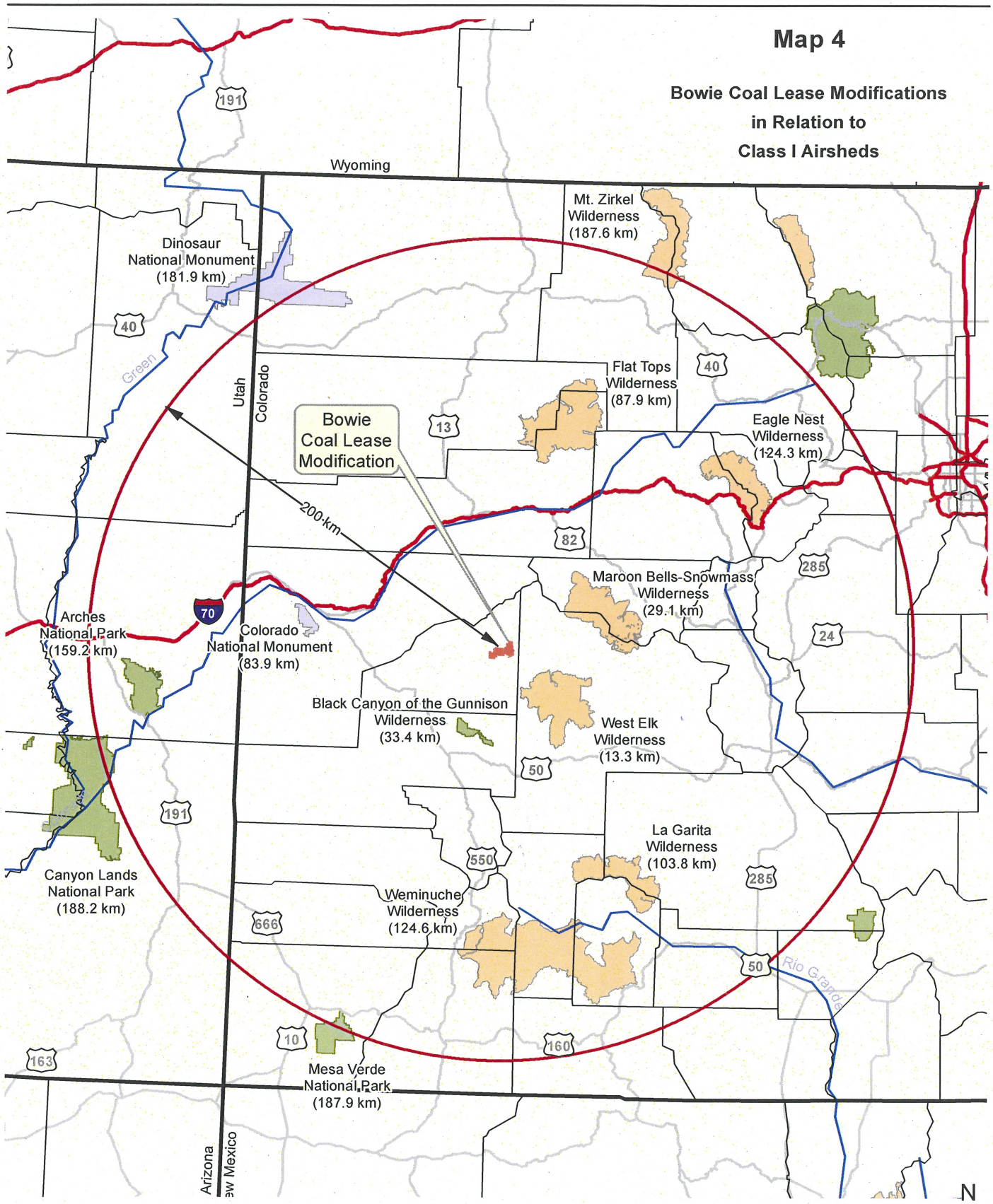
Black carbon is not emitted from the coal when it is being mined, but is likely to occur when the coal is combusted. Black carbon emissions associated with coal combustion occur at the facility where the coal is being burned, not where it is being mined. It is a component of the anthropogenic global warming phenomenon, and acts to warm the earth's atmosphere by reducing the ability to reflect sunlight (albedo). It is the second highest contributor to global warming however; it is very short-lived, staying in the atmosphere only a few days to a few weeks. This analysis did not quantify indirect emissions of black carbon associated with the coal's combustion because: the BLM does not have information regarding the facilities that may burn the coal (in order to produce electricity); and since power plant facilities have vast variations in structure and emission-control devices (which would, in turn, greatly affect the emissions associated with burning the coal); it is beyond the scope of the analysis; and most coal-fired power plants contain emission control devices (such as baghouses and cyclone separators) that would greatly reduce black carbon emissions; therefore it is highly unlikely that black carbon emissions from coal-fired power plants would be a significant issue, as those emissions would likely be deminimis (in accordance with the Clean Air Act).

The assumption is that as existing coal fired electric generators operate in accordance with regulatory and cost factors in effect in the future, they would continue to acquire coal supplies from national and international coal markets. Examining the options available to reduce GHG releases from burning coal is best applied at the place where the coal is consumed rather than at the sources of supply.

Classes of Airsheds. Classes of airsheds (any geographical area that defines the class boundary) are categorized as either Attainment, an area where the air does not exceed NAAQS specified concentrations of a criteria pollutant, or Nonattainment, an area where the air does exceed NAAQS specified concentrations of a criteria pollutant. Two additional subset categories of attainment exist for those areas where a formal designation has not been made, i.e., Attainment/Unclassifiable (generally rural, or natural areas), and for areas where previous

violations of the NAAQS have been documented, but pollution concentrations no longer exceed NAAQS concentrations, i.e., Attainment/Maintenance areas. Further, all geographical regions are assigned a priority Class (1, 2, or 3) which describes how much degradation to the existing air quality is allowed to occur within the area under the PSD permitting rules. Class I areas are areas of special national or regional natural, scenic, recreational, or historic value, and essentially allow very little degradation in air quality, while Class 2 areas allow for reasonable industrial/economic expansion. There are currently no Class 3 areas defined in Colorado. The closest Federal/State mandatory Class I areas located near the Proposed Action is the West Elk Wilderness Area (approximately 8 miles southeast), Maroon Bells-Snowmass (approximately 18 miles northeast), and the Black Canyon of the Gunnison National Park (approximately 21 miles south-southwest). Map 4 illustrates the location of these and other regional PSD Class I areas relative to the Bowie No. 2 Mine.

For an area that is in attainment for the NAAQS and CAAQS, the CAA provides specific criteria for stationary sources to allow for economic growth under the PSD permitting rules (40 CFR 52.21 or 40 CFR 51.166 for SIP approved Rules). Major PSD sources are required to provide an analysis to ensure their emissions in conjunction with other applicable emissions increases and decreases will not cause or contribute to a violation of any applicable NAAQS or PSD increment. A PSD increment is the amount of pollution an area is allowed to increase while preventing air quality in the airshed from deteriorating to the level set by the NAAQS. The NAAQS is a maximum allowable concentration "ceiling," while a PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The baseline concentration is defined for each pollutant and, in general, is defined as the ambient concentration existing at the time that the first complete PSD permit application affecting the area is submitted. Significant deterioration is said to occur when the amount of new pollution would exceed the applicable PSD increment. Under no circumstance can the air quality of the airshed deteriorate beyond the concentration allowed by the applicable NAAQS. In addition, the analysis required for permitting must include impacts to surface waters, soils, vegetation, and visibility (also known as air quality related values (AQRVs)) caused by any increase in emissions, and from associated growth. Associated growth is industrial, commercial, and residential growth that will occur in the area due to the source. Where a PSD source is located near a Class 1 airshed (within 50km) the AQRVs thresholds set by the applicable Class 1 controlling agency (Federal Land Manager) must be assessed to determine if an adverse impact on the area is likely to occur.



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

If a nonattainment designation takes effect for any criteria pollutant, the state will have three years to develop implementation plans outlining how areas will attain and maintain the NAAQS by reducing air pollutant emissions contributing to the violation. Further, any new major stationary source or major modification to a stationary source that emits a nonattainment pollutant in the designated area would be required to offset new or modified emissions sources in a ratio of greater than 1:1. Offset emission or emissions credits would be required to be obtained from within the designated nonattainment area.

Environmental Consequences/Mitigation Measures

Proposed Action

Emissions Inventory

The Proposed Action will produce direct and indirect emissions of the above-identified pollutants from both stationary and mobile sources at the facility. Production rates would not increase under the Proposed Action and therefore production emissions can reasonably be expected to be the same. No reasonably foreseeable increases in permitted emissions authorizations are anticipated by the implementation of the Proposed Action. As described in above, however, there will be four additional GVB pads constructed and five GVBs drilled as a direct result of the lease modifications. These are construction activities and not permitted by CDPHE, but their development will be a source of air emissions, and those emissions are quantified herein.

Direct Emissions.

With the exception of particulate matter (TSP & PM_{10}) all of the directly emitted criteria pollutants originating from the mine's operations are from fuel combustion sources, such as mobile mining equipment and stationary emergency generators. HAPs and GHGs are also emitted from fuel combustion sources, albeit in de minimis amounts. The overwhelming majority of the site's GHG emissions are the result of methane drainage systems that are installed to reduce the combustion potential of the mines underground atmosphere. The systems at the Bowie mine consist of ventilation air methane (VAM) and gob vent borehole (GVB) methane.

The majority of PM_{10} emissions in the area are from miscellaneous sources, which are mainly fugitive dust sources rather than stack emissions or internal engine combustion sources. Fugitive emissions are those not caught by a capture system and are often due to equipment leaks, earth moving/quarrying, equipment and vehicles traveling on paved and unpaved roads, and windblown disturbances.

Stationary sources (including fugitive emissions) at the Bowie No. 2 mine are regulated by CDPHE and are authorized by multiple APCD permits. The permits establish limits for stationary and other regulated emissions sources which maintain emission rates below certain applicability thresholds, allowing the mine to be classified as a synthetic minor source under New Source Review and the Title V Operating Permit program, as well as a PSD minor source not subject to PSD permit requirements. Some stationary equipment at the site is covered by New Source Performance Standard (NSPS) subpart Y, which specifies emissions standards for coal preparation plants. Under the SIP PSD rules the site is covered under one of the 28 named source categories (AQCR 3, Part D, Section II.A.24.e) which requires inclusion of any fugitive

emissions related to the coal process operations in the site's potential to emit calculations for major source determination. The latest revisions made to the permit were issued prior to the implementation of the SIP rules for GHG permitting, and therefore the permit does not cover GHG emissions (including methane) from the mine. Stationary sources of direct emissions at the Bowie No. 2 Mine and within the lease area include the following:

- Material Processing Screens
- Material Processing Crushers
- Material Handling Conveyors
- Mine Ventilation
- Surface Operations (material handling, stockpiles)
- Coal Preparation
- Train Loading
- GVB Releases

Criteria pollutant emission rates, as permitted in CDPHE-APCD air quality permits 96DL103-1, 96DL103-6, 96DL103-7F, 98DL0726, 01DL0685, 03DL0099F, 03DL0596, 03DL0923F, 04DL0560, and 06DL1082F to which the Bowie No. 2 Mine is currently subject, are provided in Table 7.

HAP emissions from stationary sources are considered de minimis, and there are no permitted sources of HAPs. HAP emissions are primarily emitted from on-road and nonroad mobile sources.

Mobile sources at the facility include underground mining equipment, listed under source classification code (SCC) 2270009010, and aboveground construction equipment identified under SCC 2270002000, as well as light duty gasoline trucks. The underground mining mobile sources are specialized, industry specific equipment designed to function in the unique environment of an underground mine, while the aboveground sources would be heavy construction equipment used for material handling, stockpile management, and drilling.

With respect to generating an emissions inventory for the mobile sources at the site, insufficient data was available to develop equipment specific, or fleet based emissions that would correspond to the authorized production rates. A detailed analysis for each mobile source would have to be developed to include equipment specifications such as age, horse power, and the type of equipment, as well as operational parameters such as the hours per year each piece of equipment was used, or the exact amount of fuel the source consumed, the average loading factor, average work cycles per hour, vehicle miles travelled, etc. The level of detail required to provide a speciated source specific emissions inventory for each mobile source at the Bowie No. 2 Mine is beyond the scope of the analysis required for this EA.

Table 6
Direct Criteria and GHG Emissions from Stationary and Mobile Sources (tpy)

Stationary Sources	**CDPHE-APDC Permit**	**Stationary PM_{10}**	**Fugitive PM_{10}**	**$PM_{2.5}$**	**NMOG**	**CO**	**NO_X**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Screen	96DL103-1	6.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Crusher	96DL103-6	6.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conveyor Transfer, Haul, Stockpiles	96DL103-7F	4.2	161.2	NA	NA	NA	NA	NA	NA	NA	NA
Ventilation Shaft	98DL0726	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
Train Loading	01DL0685	8.76	NA	NA	NA	NA	NA	NA	NA	NA	NA
Portal Development	03DL0099F	NA	39.7	NA	NA	NA	NA	NA	NA	NA	NA
Coal Prep/Wash Plant	03DL0596	8.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
GOB Handling	03DL0923F	NA	40	NA	NA	NA	NA	NA	NA	NA	NA
Underground Conveyor	04DL0560	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA
GOB Pile Operations	06DL1082F	2.1	55	NA	NA	NA	NA	NA	NA	NA	NA
Methane Sources	None	NA	NA	NA	NA	NA	NA	NA	ND	24,905[3]	NA
Mobile Sources[2]	**SCC**		**PM_{10}**	**$PM_{2.5}$**	**NMOG**	**CO**	**NO_X**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Underground Mining Equipment	2270009000		6.82	6.62	10.46	40.38	47.97	0.65	3031.54	0.16	0.02
Surface Mining Equipment	2270002036 2270002051 2270002060 2270002069 2270002033		1.79	1.73	2.18	11.55	24.68	0.39	1795.79	0.03	0.02
Gasoline Trucks	LDGT		0.03	0.03	0.05	0.73	0.08	0.02	107.64	NA	NA
Total Direct Emissions (tons)		**50.2**	**304.54**	**8.38**	**12.69**	**52.66**	**72.73**	**1.06**	**4934.97**	**24905.2**	**0.04**

[1] All PM10 assumed to be PM2.5, site specific data is not known.
[2] Mobile sources emissions are for exhaust only.
[3] Reported in short tons. The CO_2e of the methane gas is approximately 474,464 metric tons.

To provide acceptable emissions estimates and to fully disclose expected direct emissions from the facilities mobile sources, BLM used the EPA's Nonroad model (2008a) to generate SCC specific emissions factors (grams per horsepower-hour) for the Delta and Gunnison County based equipment inventories for the year 2000. The year 2000 inventory was chosen to be reasonably conservative, with respect to the fleets overall state of control technology integration that would be expected to increase as the inventory equipment ages and is replaced with newer and better controlled sources. To estimate emissions from the sources, the analysis had to determine a reasonable thermal efficiency (TE) for the SCC groups in order to estimate the total horsepower-hours the annual fuel use would provide to the equipment. This was necessary because the emissions factors derived from the nonroad model already account for the overall TE of the equipment, as well as some of the other variables, such as deterioration factors, loading factors, etc. The CO_2 emission factor was used to estimate the TE because the model does not rely on a particular control technology, engine class, or equipment type for derivation, and instead calculates the CO_2 emissions rates based on the in-use brake specific fuel consumption (BSFC - reported as pounds of fuel per horsepower-hour), which is essentially static across all horsepower classes for all model years. Example TE and total horsepower-hour calculations and applicable references are provided in Appendix D along with the emissions estimate calculations for the data provided in Table 6.

For the light duty gasoline trucks (LDGT) the analysis used the corporate average fuel efficiency (CAFE) mileage standards for the model year (MY) 2004 to estimate total vehicle miles travelled (VMT) from the fuel use data that was provided by the mine. The VMT data was then multiplied by the pollutant specific emissions factors for MY 2004 LDGT to derive emissions. The 2004 factor was chosen to be conservative and to reflect the fact that gasoline engines do not last as long as typical diesel powered equipment used at similar rates. Example emissions estimates and applicable references are provided in Appendix D. Emissions estimates are provided in Table 6.

Indirect Emissions.

Electrical energy consumed at the site can reasonably be expected to produce emissions from the supplying source, unless that source is some form of renewable energy. It is possible to provide rough estimates of emissions from mine electricity consumption if the annual energy consumption and supplier data is known, however the consumption information is not available to the BLM at this time.

Train emissions from hauling the mined and processed coal were accurately quantified in the original EIS prepared for the mine and are discussed further below. The analysis tiers to the referenced EIS in support of the rail emissions discussion. Rail hauling emissions would continue under the Proposed Action.

Combustion of the mined and processed coal will produce all of the emissions outlined above. According to the U.S. Energy Information Administration (2009), nearly 94 percent of all coal consumed in the U.S. during 2009 was used in the generation of electric power. Bowie ships 95-98% of their coal to electric utilities with the remainder going to various manufacturing plants such as Coke and Cement. It would be possible to provide a quantification of criteria, GHG, and HAP emissions associated with the burning of the mined coal at a specific facility; however, the

types and location of the facilities the coal might be processed and consumed in is speculative and not foreseeable. The contractual agreements between the coal fired power plant and the coal supply company are outside the scope of this analysis, and the BLM does not determine at which facilities the coal is used. Different emissions control devices on a power plant could greatly affect the amount of criteria, HAP and GHG emissions that are released into the atmosphere. For example, a power plant that is equipped with selective catalytic reduction or practices CO_2 capture would ultimately release much smaller quantities of NO_X and CO_2 than a power plant lacking such controls.

Even though the BLM cannot reasonably say where the coal is ultimately going to be burned, it is still possible to do emissions calculations to estimate the associated CO_2 emissions from the combustion of the coal. The specific information required, i.e., the number of tons of coal produced per year from the mine, and the heat content or carbon content of that coal in BTUs or % weight per ton, is known for the proposed lease modifications. However since the type of facility the coal might be processed in (i.e., the control efficiency of the facility) is speculative; calculations were made using average numbers for U.S. facilities. Therefore, the emissions calculation does not represent an accurate estimate of potential GHG emissions from this specific project. Assuming the Proposed Action would generate 5.0 million tons of high-quality low-sulfur supercompliant bituminous coal per year, with an average heat content of 24.2 million British thermal units (BTUs) per ton, nearly 12.12 million metric tons of carbon dioxide equivalent (CO2e) would be emitted. This amount represents 10.14 percent of all CO2e emissions in Colorado during 2007, 0.18 percent of all CO2e emissions in the U.S. during 2007, and 0.05 percent of global CO2 emissions during 2007 (CAIT-US, 2011). These calculations are based upon default emission factors for stationary combustion in the Energy Industries (IPCC, 2006), assuming no other use of the coal and complete total combustion, and therefore represent a highly conservative overestimate of potential GHG emissions.

Ultimately, any near or far field impacts associated with most of the indirect emissions sources identified above will ultimately receive analysis (and most likely permitting) from their respective regulatory agencies, so this action should not cause or contribute to the likeliness, frequency, or severity of any detrimental impacts at the respective sources.

Air Quality Impacts

The airshed in the Proposed Action area (Western Counties) is currently designated as attainment for all criteria pollutants. The attainment status for pollutants in the project area is determined by monitoring levels of criteria pollutants for which NAAQS and CAAQS apply. The attainment designation means that no violations of any ambient air quality standard have been documented in the area. The airshed around the Proposed Action area is also identified as a Class 2 airshed, which allows for reasonable economic growth. Table 7 below provides a listing of the most recently available air pollutant emissions inventory compiled by CDPHE for the Delta and Gunnison County emissions sources. Table 8 below provides air pollutant emissions totals from the greater-populated Mesa County as a regional comparison.

Table 7
Delta and Gunnison County Emissions Inventory (CDPHE, 2008)

Source Type	Inventory Pollutants											
	CO		NO_2		SO_2		PM_{10}		VOC		BEN	
	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta	Gunnison	Delta
Vehicles:	3,830.83	5,027.39	537.35	745.32	3.95	5.80	21.50	30.95	365.69	461.62	11.49	14.53
Road Dust:	ND	ND	ND	ND	ND	ND	1,229.75	961.00	ND	ND	ND	ND
Non-Road:	2,097.71	1,206.47	275.42	248.62	0.84	0.77	39.32	27.57	664.81	270.94	16.57	7.22
Wood burning:	1,115.69	2,254.55	15.09	30.50	2.34	4.73	154.58	312.36	215.74	435.96	9.17	18.52
Point Source:	38.06	0.86	36.05	6.09	0.92	0.19	215.46	378.17	60.71	17.27	1.10	0.13
Railroad:	8.22	22.14	83.43	224.75	4.75	12.80	2.07	5.58	3.11	8.37	0.01	0.02
Aircraft:	121.58	288.03	4.17	1.56	0.48	0.24	2.33	5.67	9.39	27.07	0.22	0.65
Forest/Ag. Fires:	3,389.85	1,051.06	89.51	34.90	28.64	7.88	469.02	130.29	218.40	61.39	16.42	4.62
Solvents:	ND	ND	ND	ND	ND	ND	ND	ND	57.25	116.38	ND	ND
Agricultural Tilling:	ND	ND	ND	ND	ND	ND	0.79	270.88	ND	ND	ND	ND
Structure Fires:	0.93	1.91	0.02	0.04	ND	ND	0.17	0.34	0.17	0.35	ND	ND
Surface Coating:	ND	ND	ND	ND	ND	ND	ND	ND	52.22	89.46	ND	ND
Restaurants:	1.44	2.94	0.01	0.02	0.01	0.02	3.88	7.93	3.59	7.33	0.06	0.13
Biogenic:	2,681.08	2,040.81	192.99	232.53	ND	ND	ND	ND	20,474.30	16,546.90	ND	ND
Oil Gas Point:	131.56	ND	147.24	ND	0.07	ND	0.97	ND	84.79	ND	2.81	ND
Oil Gas Area:	23.23	4.97	20.36	0.11	0.44	ND	2.21	367.98	54.92	0.57	ND	ND
Combustion:	29.73	231.14	19.55	47.37	1.82	15.18	0.62	0.00	1.81	9.91	0.00	0.00
Tank Trucks:	ND	ND	ND	ND	ND	ND	ND	ND	0.29	0.33	0.00	0.00
Refueling:	ND	ND	ND	ND	ND	ND	ND	ND	10.77	14.55	0.11	0.15
Portables:	ND	ND	ND	ND	ND	ND	ND	ND	15.03	10.49	0.05	0.03
Construction:	ND	ND	ND	ND	ND	ND	400.97	ND	ND	ND	ND	ND
Pesticides:	ND	ND	ND	ND	ND	ND	ND	ND	13.48	27.52	ND	ND
Totals (tons):	**13,469.91**	**12,132.27**	**1,421.20**	**1,571.84**	**44.28**	**47.61**	**2,543.65**	**2,498.73**	**22,306.46**	**18,106.41**	**58.01**	**46.00**

ND = No Data

Table 8
Mesa County Emissions Inventory (tons), Total Emissions (CDPHE, 2008)[1]

CO	NO_2	SO_2	PM_{10}	VOC	BEN
40,688	9,048	2,879	8,050	39,828	161

[1] Provided for illustration purposes only.

Pollutant Monitoring.

Grand Junction is the only large city in the area, and the only location that monitors for CO and air toxics on the western slope. In 2008, Rifle, Palisade, and Cortez began monitoring for ozone. The other Western County locations monitor only for particulates. They are located in Delta, Durango, Parachute, and Telluride. Currently, there are four gaseous pollutant monitors and 11 particulate monitors in the Western Counties area (see Tables 9 and 10). There are one CO, three O_3, eight PM_{10}, and three $PM_{2.5}$ monitoring sites. PM_{10} data have been collected in Colorado since 1985, however the samplers were modified in 1987 to conform to the requirements of the new standard. Therefore, available trend data is only valid back to 1987. Since 1988, the state has had at least one monitor exceed the level of the 24-hour PM_{10} standard (150 µg/m) every year except 2004. Monitoring for $PM_{2.5}$ in Colorado began with the establishment of sites in Denver, Grand Junction, Steamboat Springs, Colorado Springs, Greeley, Fort Collins, Platteville, Boulder, Longmont, and Elbert County in 1999. Additional sites were established nearly every month until full implementation of the base network was achieved in July of 1999. In 2004, there were 20 $PM_{2.5}$ monitoring sites in Colorado. Thirteen of the 20 sites were selected based on the population of the metropolitan statistical areas. This is a federal selection criterion that was developed to protect the public health in the highest population centers. In addition, there were seven special-purpose monitoring (SPM) sites. These sites were selected due to historically elevated concentrations of PM_{10} or because citizens or local governments had concerns of possible high $PM_{2.5}$ concentrations in their communities. All SPM sites were removed as of December 31, 2006 due to the low concentrations of $PM_{2.5}$ measured and a lack of funding.

Table 9
Western County Gaseous, Particulate, and Meteorological Monitors in Operation for 2010

County	Location	CO	SO_2	NO_X	O_3	PM_{10}	$PM_{2.5}$	Met
Delta	Delta - Health Dept 560 Dodge St.					X3		
Garfield	Rifle - Health Dept 195 W. 14th Ave.				X			
	Rifle - Henry Building 144 E. 3					X3 / H	H	
	Parachute - Elem. School 100 E. 2					X3		
La Plata	Durango - River City Hall 1235 Camino del Rio					X3		
Mesa	Grand Junction - Pitkin 645¼ Pitkin Ave.	X				H		X
	Grand Junction - Powell 650 South Ave.					X3	X3 / H	
	Palisade Water Treatment 865 Rapid Creek Rd.				X			X
	Clifton - Hwy. 141 & D Rd.					X3		
Montezuma	Cortez - Health Dept 106 W. North Ave.				X		X6	
San Miguel	Telluride - 333 W. Colorado Ave.					X3		
(Xn) – Filter Sample Continued; n=frequency in days, (H) – Hourly particulate								

Table 10
Western County Monitored Particulate Matter Values for NAAQS

County	Location	PM_{10}			$PM_{2.5}$	
		Annual[1]	24 Hour	3 Yr. Ave. Ex.	Annual	24 Hour
Delta	Delta - Health Dept 560 Dodge St.	23.4	125	0		
Garfield	Rifle - Henry Building 144 E. 3	25.5	59	0	< 3 yrs Data	< 3 yrs Data
	Parachute - Elem. School 100 E. 2	22.5	125	0		
La Plata	Durango - River City Hall 1235 Camino del Rio	24.8	320	6.1		
Mesa	Grand Junction - Pitkin 645¼ Pitkin Ave.	26.8	171	1		
	Grand Junction - Powell 650 South Ave.	22.9	155	0	9.3	34.5
	Clifton - Hwy. 141 & D Rd.	23	189	3		
Montezuma	Cortez - Health Dept 106 W. North Ave.				< 3 yrs Data	< 3 yrs Data
San Miguel	Telluride - 333 W. Colorado Ave.	19.9	354	3.1		

[1] Annual standard rescinded

Because the Bowie No. 2 Mine is primarily a source of PM_{10} emissions, only the recent monitoring data for particulate matter is shown below. The regional monitoring data for both ozone and carbon monoxide suggests the air quality at the monitored locations is easily attaining the national standards, and therefore was not included in the values table. More so than other pollutants, PM_{10} is a localized pollutant where concentrations vary considerably. Thus, local averages and maximum concentrations of PM_{10} are more meaningful than averages covering large regions or the entire state. The data below is presented for qualitative purposes only.

With respect to $PM_{2.5}$ the available monitoring data for the region suggests continued attainment of the standard. Because of the limited $PM_{2.5}$ emissions from the site, actual crustal element fractions verses assumed PM_{10} equivalency, $PM_{2.5}$ emissions are not expected to pose any significant impacts to area air quality.

Potential Impacts Analysis for Criteria Pollutants.
A detailed air quality assessment, including modeling, of the Bowie No. 2 mine was conducted as part of the environmental analysis for the Iron Point Coal Lease Tract in 2000. (See North Fork Coal EIS, FS and BLM, 2000) In this Final EIS (FEIS), an air quality assessment was completed for the Bowie No. 2 mine, which is permitted by the State to produce up to 5.0 million tons of coal and coal-refuse annually. The Proposed Action analyzed in this EA is an expansion of the Bowie No. 2 mine. As stated previously, the Proposed Action is to continue mining operations into additional lease modification areas. That is, the action would not constitute adding additional production to previously authorized limits or increasing mining intensity.

The air quality analysis conducted for the 2000 North Fork Coal EIS included an emissions inventory and modeling analysis that covered all three active coal mines in the North Fork Valley (Bowie No. 2, Elk Creek, and West Elk) and other related emission sources. That emissions inventory quantified PM_{10}, NO_X, and SO_2 emissions. The modeling analysis also included a visibility impacts assessment in the West Elk Wilderness Area as well as an atmospheric deposition impacts assessment. Emissions that were calculated and modeled included tailpipe emissions from mining equipment, haul trucks, and locomotives (railway

emissions). The results of that detailed impact assessment predicted no significant impacts to air quality as a result of authorizing the mine.

The equipment used for the mine expansion will be the same equipment that is being used in the current mining operations. Therefore, the air quality impacts associated with the proposed mine expansion can be presumed to be equal to, or less than, impacts predicted in the original air quality impact assessment. The air quality assessment for this EA tiers to that original assessment. Additionally, given the age of the original assessment, and the useful life of most of the equipment, it can be reasonably expected that some of the equipment has been replaced by newer models, which would have the effect of reducing equipment emissions based on the regulatory requirements placed on newer nonroad engines.

As related to railway emissions, due to more stringent regulations since the North Fork Coal EIS was written, the EPA predicted that, on a nationwide average, NO_X emissions from locomotives in the year 2010 would be about 40 percent less than emissions compared to 1999 levels (North Fork Coal EIS, page 3-7). The North Fork Coal EIS air quality impact analysis, which relied on emissions factors for 1999, determined NO_X emissions to be insignificant; therefore, it can be presumed that NO_X emissions associated with current use of trains is actually lower than previously modeled levels.

With respect to potential ozone formation, the county level analysis of the emissions inventory suggests the region is potentially NO_X limited. Therefore, to effectively limit any potential for ozone formation due to area emissions, controls should focus on controlling NO_X emissions. By continuing to limit the minor reaction species, ozone formation potential from area emissions should remain small. The Bowie No. 2 Mine is not a significant source of VOC emissions [the photochemical reactivity potential of methane in the troposphere is considered negligible (40CFR51.100 (s)] and therefore operations at the mine are not expected to contribute to any regional ozone formation potential.

With respect to the facilities emissions in the regional context, emissions of criteria pollutants from the Bowie No. 2 Mine are not considered regionally significant, should not increase above current levels, and therefore should not result in any additional impacts on existing ambient air quality in the area.

Potential Impacts Analysis for Greenhouse Gas Pollutants.
According to the U.S. Global Change Research Program (2009), global warming is unequivocal, and the global warming that has occurred over the past 50 years is primarily human-caused. Standardized protocols designed to measure factors that may contribute to climate change, and to quantify climatic impacts, are presently unavailable. As a consequence, impact assessment of specific impacts related to anthropogenic activities on global climate change cannot be accurately estimated. Moreover, specific levels of significance have not yet been established by regulatory agencies. Therefore, climate change analysis for the purpose of this environmental assessment within this air quality section is limited to accounting for GHG emissions changes that would contribute incrementally to climate change.

Methane associated with coal seams and the surrounding rock would be liberated during the mining process, as well as during the subsequent fracturing of the overburden, which occurs as the gob area (the portion of coal panels that have already been mined) is allowed to collapse. In order to protect the health and safety of miners working underground, explosive gases would be removed from the mine via a ventilation system as well as through GVBs drilled into the gob area. GVBs would be drilled to about 10 to 50 feet above the target coal seam about 1 year before mining operations begin. As the longwall mining passes under the GVB, the strata around the GVB would fracture and liberate methane. GVBs would actively pump mine atmosphere (including methane) to the surface. The GVB pumps are fueled by methane from the gob. The process of fracturing and liberation of methane would continue as the mined area collapses behind the mining operation, and the GVBs continue to pump methane from the gob. Both the ventilation system and the GVBs would release methane directly into the atmosphere. This would result in varying levels of methane release, based upon the relative concentration of methane in the mine air and overburden. Because methane emission rates are roughly correlated with coal production rates, and because coal production from the Bowie No. 2 Mine is expected to be consistent with current production rates, the rate of methane emission is not expected to differ greatly from current emission rates.

Bowie has provided methane emissions estimates for releases through mine ventilation and from the GVBs. Mine ventilation currently liberates 2,710,000 cubic feet per day based on mine exhaust monitoring. GVBs are estimated to release a total of 504,000 cubic feet of methane per day. Based upon the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2008 (EPA Publication 430-R-10-006), April 15, 2010, total coal mining related methane emissions in 2008 were 6.76 tg (teragrams=one million metric tons), and total GHG emissions were 6,956.8 tg CO_2 equivalent. At the Bowie No. 2 Mine, the total release of (2,710,000 + 504,000=) 3,214,000 cubic feet CH_4 per day is the equivalent of 474,464 metric tons per year or 0.0068 percent of the total calculated CO2 equivalent emissions (0.47 to 6,957) for the U.S. in 2008. Based upon this analysis of mine-vented methane emissions, the calculated GHG emissions associated with the Proposed Action are negligible relative to any potential impacts on the global scale. If the calculated GHG emissions were compared with the global figures (2005 CO2 equivalent emissions of 26,544 tg, World Development Report 2010: Development and Climate Change, World Bank, 2010), the relative significance of the impact to the global climate would further decrease.

The implementation of the Proposed Action is estimated to contribute 0.474 mm metric tons of GHG equivalent annually, with that being about 0.0068 percent of total U.S. contribution. Predicting the degree of impact any single emitter of GHGs may have on global climate change, or on the changes to biotic and abiotic systems that accompany climate change, is not possible at this time. As such, the controversy is to what extent GHG emissions resulting from continued mining may contribute to global climate change, as well as the accompanying changes to natural systems cannot be quantified or predicted. The degree to which any observable changes can, or would, be attributable to the Proposed Action cannot be reasonably predicted at this time.

Mitigation Measures

Criteria Pollutant Emissions

To reduce particulate matter/fugitive dust emissions during construction and ongoing production activities, the following mitigation measure will be implemented:

- Fugitive emissions from all vehicles traveling on regularly-used non-paved surfaces during all project phases will be controlled utilizing a variety of suppression techniques applied to the non-paved roads.
- Storage piles will be watered or covered as necessary to limit wind erosion potential and reduce fugitive emissions.
- Most coal transfer points and processing activities during coal production have been enclosed and, therefore, limit fugitive particulate matter emissions.
- The mine will continue to comply with their APCD-issued air emissions permit provisions, and any other regulatory requirements the facility is subject to now or in the future.

Greenhouse Gas Emissions

With regard to production activities at the mine, methane liberation from the mine may be reduced through mine planning, sealing previously mined areas, and degasification efforts. Methane drainage systems, consisting of vertical and horizontal boreholes, could reduce methane gas emissions from the un-mined reserve. This can reduce mine ventilation emissions when the coal is mined. Degasification procedures can only be developed as experience is gained during future mining.

No Action Alternative

Under the No Action Alternative, mining of the two coal lease modification tracts would not be permitted. Current levels of methane liberation and emissions associated with the existing mine plan would continue until mining is completed. The facility would continue to comply with their APCD issued air emissions permit provisions and any other regulatory requirements the facility is subject to now or in the near future. Methane emissions associated with proposed mining of the Bowie lease tract modifications would not occur.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

The BLM uses the ACEC designation to highlight areas of public lands where special management attention is required in order to protect and prevent irreparable damage to important historical, cultural, and scenic values; fish or wildlife resources; or other natural systems or processes. The ACEC designation may also be used in order to protect human life and safety from natural hazards. The BLM identifies, evaluates, and designates ACECs through its resource management planning process. There are no ACECs in the vicinity of the proposed project. The closest ACEC to the proposed lease is the Needle Rock ACEC, which is located over 15 miles to the southwest; therefore, ACECs will not be evaluated further.

WILDERNESS

National Wilderness Areas, designated by Congress, are defined by the Wilderness Act of 1964 as places “where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.” Designation is aimed at ensuring that these lands are

preserved and protected in their natural condition. Wilderness Areas, which are generally 5,000 acres or more in size, offer outstanding opportunities for solitude or a primitive and unconfined type of recreation. These areas may also contain ecological, geological, or other features that have scientific, scenic, or historical value.

Through FLPMA (Sec. 201 and 202) of 1976, Congress directed the BLM to maintain an inventory of the lands under its jurisdiction that possess "wilderness characteristics." Each BLM office maintains an inventory of lands with wilderness characteristics, updating it as necessary. The characteristics are:

A. Size – generally 5,000 acres or greater that do not have mechanically constructed and maintained roads. Smaller areas that share a boundary with existing wilderness or wilderness study areas of 5,000 acres or greater may also be considered to have adequate size.

B. Naturalness – lands must appear to have been affected primarily by the forces of nature, and people's work must be substantially unnoticeable.

C. Outstanding opportunities for solitude, or primitive and unconfined type of recreation:

- Solitude – visitors can feel alone, secluded and isolated from the sights and sounds of other people.
- Primitive and unconfined recreation – the use of the area is primarily through non-motorized or non-mechanical means with no or minimal recreation facilities.

D. Supplemental values – the area contains ecological, geological, or other features of scientific, educational, scenic, or historical value.

For an area to possess wilderness characteristics it must meet A, B and C; D is optional.

BLM surface ownership lands within the UFO were inventoried for wilderness characteristics in 2010-2011. No lands possessing wilderness characteristics were found on BLM-managed lands within, or adjacent to, the area of this proposed project.

There are no designated Wilderness Areas within, or adjacent to, the proposed lease modifications. The closest Wilderness Area is the West Elk Wilderness, which is located over 7 miles to the south-southeast of the proposed lease modifications. The Raggeds, Maroon Bells-Snowmass, Hunter Fryingpan, Holy Cross, Eagles Nest, and Flattop Wilderness Areas are within 30 miles, to the north. The Great Sand Dunes National Park, La Garita, Powderhorn, Uncompahgre, and Weminuche Wilderness Areas are to the south and east.

WILD AND SCENIC RIVERS

Affected Environment

BLM inventoried area streams and rivers in 2006 as part of the evaluation of Wild and Scenic Rivers in the UFO. A 1.21-mile segment of the West Fork of Terror Creek has Outstandingly Remarkable Values and is potentially suitable for inclusion into the National Wild and Scenic River System. This segment flows through the proposed lease modification for lease COC-61209. The following portions of the lease modification for COC-61209 are within ¼ mile of the stream segment –

> Township 13 South, Range 91 West, 6th P.M., Section 5: SWNW, S/2NESENW, S/2SENW, S/2NWSENW, SWSWNE, S/2NWSWNE, W/2NWSE – approximately 105 acres

The revised UFO RMP will make recommended decisions concerning this section and ultimately Congress will have the final decision under the Wild and Scenic Rivers Act. BLM policy is to protect the resource values found in the segments pending decisions by Congress on the eligibility of the various river segments.

Environmental Consequences/Mitigation Measures

Proposed Action

Current plans for mining do not include the lands under the West Fork of Terror Creek (see Map 2). Subsidence associated with the Proposed Action is expected to be minimal to negligible and would generally affect the area immediately overlying those areas that are mined (see Geology and Minerals); therefore, there are likely no impacts to the West Fork of Terror Creek resources resulting from subsidence.

Mitigation

State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw [angle between a vertical line drawn upward to the surface from the edge of the underground opening and a line drawn from the edge of the opening to the point of zero surface subsidence], etc.) would be used to control subsidence.

- No mining related surface disturbance would occur within 100 feet of the stream channel for the West Fork of Terror Creek without a written finding from the Authorized Officer (AO). These techniques would provide for maximum coal removal while protecting the values associated with the inventoried Wild and Scenic River segment.

No Action Alternative

Under the No Action Alternative, there would be no impacts to the West Fork of Terror Creek from leasing of the coal tracts as leases would not be issued.

CULTURAL RESOURCES

Affected Environment

A Class III Cultural Resource Inventory was conducted for a block clearance area (which included the proposed lease modifications) in order to identify any cultural resources present.

The Cultural Resource Inventory included a file search and field visits to the area, as well as a search for relevant traditional cultural properties (Grand River Institute [GRI] 2011).
The Cultural Resources Inventory identified and documented one previously recorded site within the study area, three new sites, and a new segment of a previously recorded aqueduct. No traditional cultural properties were found within the proposed lease modification areas (GRI, 2011). None of the identified sites was evaluated as being eligible for the National Register of Historic Places.

Environmental Consequences/Mitigation Measures

Proposed Action

With mitigation, as discussed below, activities associated with the Proposed Action would result in no impacts to cultural resources. Subsidence associated with the Proposed Action is expected to be minimal to negligible and would generally affect the area immediately overlying those areas that are mined (see Geology and Minerals); therefore, there would be no impacts to cultural resources resulting from subsidence.

Mitigation

Roads and drill pads associated with GVB drilling would avoid areas where cultural resources have been identified. In addition, if any cultural resources are discovered during construction of the pads or roads, construction would stop and the BLM would be notified immediately.

No Action Alternative

Under the No Action Alternative, there would be no impacts to cultural resources in the proposed lease tracts as leasing would not occur.

NATIVE AMERICAN RELIGIOUS CONCERNS

Native American religious concerns are associated with cultural practices or beliefs of a living community rooted in the history or religion of that community and are important in maintaining the continuing cultural or religious identity of the community. The Class III Cultural Resource Inventory conducted by GRI (2011) did not identify any Native American religious concerns or potential traditional cultural properties within the proposed lease modification areas; therefore, Native American religious concerns will not be evaluated further.

FARMLANDS, PRIME AND UNIQUE

Prime Farmland, as defined by the Natural Resource Conservation Service (NRCS), is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Prime Farmland is also available for such uses as: cropland, pastureland, rangeland, forest land, or other land development. Unique Farmland is land other than Prime Farmland that is used for the production of specific high-value food and fiber crops. No Prime or Unique Farmlands have been identified within the proposed lease modification areas (NRCS, 2008); therefore, Prime or Unique Farmlands will not be evaluated further.

It is noted that approximately 71.5 acres (14.1 percent) in the proposed lease modification for COC-37210 are considered farmland of statewide importance and the associated soils are Soil Mapping Unit 32 - Delson loam, 3 to 12 percent slopes. In some areas, land that does not meet the criteria for prime or unique farmland is considered to be “farmland of statewide importance”

for the production of food, feed, fiber, forage, and oilseed crops. The criteria for delineating farmland of statewide importance are determined by the appropriate state agency. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. In Colorado, all agricultural lands that are irrigated, regardless of other soil characteristics, are considered farmlands of statewide importance (NRCS, 2011a).

SOILS

Affected Environment

Data regarding soils within the proposed lease modification areas were obtained from a custom Soil Resource Report generated using the NRCS Web Soil Survey and the Soil Survey of Paonia area which was based upon soil survey data compiled in 1981 (NRCS, 2011b; USDA, 1981). This information is consistent with the discussion in the North Fork Land Health Assessment (LHA) (BLM, 2007). The North Fork LHA evaluated the general area as meeting Standard 1 for soils. Some potential soil protection issues related to high bare ground and low plant basal cover were noted; however, soil loss and runoff damage problems were not identified.

There are six soil mapping units (MUs) present within the proposed lease modification areas. Four of these mapping units would be disturbed by surface activities associated with installation of roads and GVBs. Each of the soils is described below. The soils, medium to fine grained silt and clays, are generally similarly classified based on particle size and use as construction material. None of the soils has saline or sodic characteristics. Table 12 provides the acres of each soil mapping unit within the proposed lease modification areas.

The Beenon-Absarokee loams (MU 12) are well drained soils derived from weathered sandstone and interbedded shale. The mapping unit slopes range between 5 to 20 percent. The Beenon component is shallow and overlies bedrock at a depth of 10 to 20 inches and contains up to 25 percent large stones. The effective rooting depth is approximately 14 inches. The Absarokee loam is moderately deep, overlies bedrock at a depth of 20 to 40 inches and contains up to 15 percent large stones. The effective rooting depth is approximately 30 inches. Water erosion for this complex is moderate to high. Limiting characteristics of the mapping unit include high clay content, depth to bedrock, low organic content, and low available water content.

The Cochetopa stoney loam (MU 25) is a deep, well drained soil derived from alluvium and or complex landslide deposits and has slopes that range between 10 and 40 percent. The hazard from water erosion is moderate to high, and the effective rooting depth is greater than 60 inches. The stone content varies from areas free of stones to small areas with stone contents up to 45 percent. This mapping unit has inclusions in depressions that are considered hydric. The main limitations for construction within this soil unit are the presence of large stones, shrink-swell potential, low strength, and slope.

The Delson loams (MU32, MU33, MU34) are deep, well drained soils formed in stony outwash alluvium from igneous origin. Slopes within these three mapping units range from 0 to 60 percent, and the stone content ranges from 0 to 70 percent. MU32 is rated farmland of statewide importance in areas used for crops or designated for agriculture by the State. The main

limitations for construction within these soil units are stones, low strength, and shrink-swell potential because of the high clay content and the slopes in MU34.

The Fughes loam (MU 39) is a deep, well drained soil formed in old alluvial fan and/or complex landslide deposits. Surface runoff is rapid to very rapid and the hazard from water erosion is high. The main limitations for construction within this soil unit are high clay content, low strength, shrink-swell potential, and slope. The soil limitations within these soil mapping units could be overcome through proper engineering designs and application of appropriate reclamation procedures.

Table 12
Summary of Soil Resources within the Proposed Lease Modification Areas and Affected by Proposed Lease Modification Activities

Soil Mapping Unit	Acres in the Proposed Leases	Percent of the Proposed Leases	Acres Affected by Construction of Roads	Acres Affected by Construction of GVB Pads	Hazard of Erosion	Rutting Hazard [1]
Beenon-Absarokee loams (MU12) 5 to 20 percent slope	12.2	2.4	0.0	0.00	Moderate to severe – slope erodibility	Severe – low strength
Cochetopa stony loam (MU 25) 10 to 40 percent slope	98.9	19.6	0.0	0.00	Moderate – slope erodibility	Moderate – low strength
Delson loam (MU 32) 3 to 12 percent slope	71.5	14.1	0.5	1.8	Moderate – slope erodibility	Severe – low strength
Delson stony loam (MU33) 3 to 20 percent slope	0.6	0.1	0.0	0.02	Moderate – slope erodibility	Severe – low strength
Delson very stony loam (MU34) 20 to 60 percent slope	106.0	21.0	3.6	2.8	Severe – slope erodibility	Moderate – low strength
Fughes loam (MU39) 25 to 65 percent slope	215.9	42.9	2.4	5.5	Severe – slope erodibility	Severe – low strength
Total	**505.1**	**100**	**6.5**	**10.1**		

[1] Soils also have AASHTO soil classification system ratings that are considered fair to poor as road subgrade materials.

Environmental Consequences/Mitigation Measures

Proposed Action

Approximately 16.6 acres of soil would be affected by the lease modification activities: 6.5 acres for road construction and 10.1 acres for construction of the GVB pads. Table 12 shows the acres of each soil type within the proposed lease modification areas as well as the potential hazard for roads and rutting.

Drilling and partial reclamation would occur over a period of several years. Topsoil from the portions of GVB drill pads to be reclaimed would be stockpiled separately from other soil horizons and used to reclaim portions of the drill pads. (Topsoil salvage helps to retain microbial communities that can accelerate revegetation of disturbed areas.)

The potential direct impacts resulting from GVB drilling would be:

- physical removal, mixing, or burying of surface soils;
- damage including compaction or destruction of soil properties in place;
- mixing of drilling wastes into the pad subsoil materials; and
- localized losses or decreases in vegetation cover and plant litter.

The immediate short-term direct impacts of the drilling would be the removal of vegetation and topsoil over a 200 by 200 foot area (0.92 acre for each pad). This area would be partially reclaimed after drilling, and completely reclaimed after the GVBs are no longer needed (1 to 3 years).

Project activities have the potential to result in short-term indirect impacts to soil through increased water and wind erosion. This could result in a loss of surface soil, potentially impacting the viability of vegetation communities. Soil loss during project activities would be mitigated by seeding the soil stockpiles.

Roads would be reclaimed after mining is complete and ventilation is no longer needed. The period of active use of the roads for drilling would be from a few days to a few weeks, depending upon the number of drill pads a road would access. Reclamation would include returning disturbed areas to original contours and revegetating the disturbed areas using a BLM-approved native seed mix. Reclamation of the disturbed areas would be monitored annually until considered successful. Reclamation would be considered "successful" when evidence of surface erosion is no greater than in adjacent undisturbed areas and when natural, perennial plant cover has achieved a density of 75 percent of the pre-disturbance plant cover.

Some subsidence is expected to occur as a result of underground activities. Some fracturing or loosening of the soil profile may occur in areas where the surface shows tensile subsidence fractures from the irregular pattern of subsidence and, to a lesser degree, some compression may result in, and near, the areas of maximum subsidence. These modifications to the soil profile could result in increased percolation of water in areas that are fractured and reduced percolation in areas that are compressed. These slight modifications to the soil profile are not expected to result in appreciable changes to the characteristics or properties of the soils.

Mitigation

Topsoil stockpiles would be stabilized with erosion control fencing/berms and seeded with a BLM-approved seed mix (see Table 2).

Finding on the Public Land Health Standard for Upland Soils

The existing soil conditions meet the criteria established in the Public Land Health Standard for upland soils. As appraised in the North Fork LHA (BLM, 2007), the proposed lease modification areas meets LHA Standard 1 for soils; however, there are some sites noted with high bare ground and low plant basal cover in the general area. Yet, these sites had adequate litter cover and showed no soil loss or runoff drainage problems.

Currently, there are no identified serious problems with poorly located and maintained roads; however, care needs to be taken in order to maintain this situation in this steep terrain. Based upon the limited disturbance and required site reclamation, the Proposed Action would not change the existing conditions for upland soils in the proposed lease modification areas, and natural soil functions would be maintained with the applied mitigation measures.

No Action Alternative

Under the No Action Alternative, there would be no impacts to soils within the proposed lease modification areas.

VEGETATION

Affected Environment

The vegetation types within the proposed leases were characterized using data from the Colorado Vegetation Classification Project (CVCP) for the North Fork Gunnison River Basin (Colorado Parks and Wildlife [CPW] et al, 2003). Similar vegetation types mapped in the CVCP dataset were grouped together in this analysis because several of the minor vegetation types have similar community compositions, blend into one another at ecotones, and serve similar ecological roles as habitat for wildlife. The dominant vegetative cover-type across the proposed lease areas is a mesic mountain shrub mix codominated by Gambel oak (*Quercus gambelii*), serviceberry (*Amelanchier arborea*), and mountain mahogany (*Cercocarpus montanus*) mixed with sagebrush (*Artemesia* spp.), snowberry (*Symphoricarpos albus*), or chokecherry (*Prunus virginiana*). In some dispersed areas, sagebrush or a sagebrush and grassland mix is more dominant. The mesic mountain shrub/sagebrush mix is interspersed with stands of quaking aspen (*Populus tremuloides*) primarily on proposed lease COC-37210, and stands of Douglas-fir (*Pseudotsuga menzesii*) and pinyon-juniper (*Pinus edulis* and *Juniperus* spp.) within proposed lease COC-61209 (see Table 13). Vegetation present within adjacent, existing leases where seven (7) GVBs would be drilled is similar in composition to vegetation within the proposed lease modification areas described above and included in Table 13.

Table 13
Vegetative Cover-types Present within Proposed Leases COC-37210 and COC-61209

Vegetative Cover-types	Total Acres	Percent of Proposed Lease Area
Proposed Lease COC-37210		
Mesic Shrub/Sagebrush Mix	217.9	90.6
Quaking Aspen	19.5	8.2
Agriculture	1.9	0.8
Unvegetated (Rock Outcrop, Bareground)	0.8	0.3
Riparian	0.02	<0.1
COC-37210 TOTAL	***240.1***	
Proposed Lease COC-61209		
Mesic Shrub/Sagebrush Mix	249.8	94.3
Pinyon-Juniper	6.1	2.3
Douglas-fir/Other Coniferous Forest	6.0	2.2
Quaking Aspen	2.8	1.1
Riparian	0.3	0.1
COC-61209 TOTAL	***265***	
OVERALL TOTAL	**505.1**	
Source: CDOW et al., 2003		

Environmental Consequences/Mitigation Measures

Proposed Action

Approximately 16.6 acres of vegetation would be disturbed by project activities, of which mesic shrub/sagebrush mix is the vegetation type most affected (92.7 percent). Localized, short-term disturbance to vegetation would result from the construction and use of light-use roads, as well as activities associated with the drilling of 6 GVBs (5 drill pads). Plants would be disturbed, crushed, or removed during the construction and use of the routes, as well as during drilling. Indirect impacts to vegetation include increased dust deposition and effects to native plant community from the introduction of weeds and weedy species, which would not all be controlled. Some low level disturbance to vegetation may occur due to future subsidence.

Interim reclamation would occur after construction and drilling activities are complete to reduce the amount of bare ground associated with construction of roads. After mine ventilation is no longer required (approximately 1 to 3 years after construction is completed), drill pads and new or reopened light-use roads would be reclaimed, recontoured, and revegetated with native vegetation using BLM-approved seed mixes (see Table 2). Some impacts may occur from the introduction of new genetics from the seeding, since the seeds are not going to be from local genotypes. This would be mitigated by applying a diverse seed mix made up of native species, and minimization of new disturbance through use of existing roads, etc. Revegetation of areas where trees or shrubs would be disturbed would take longer (30-50 years) than areas where only grasses and forbs would be disturbed (10 + years) and is not always successful,

Although there would be a short-term shift in species composition until native trees and shrubs become reestablished, all areas of disturbance would be reclaimed, and there would be no permanent impacts. Overall impacts are expected to be: very slight degradation of the vegetation

in the area, not significant at landscape level, and vegetation already somewhat degraded due to previous disturbance.

Underground activities are not expected to impact vegetation within the proposed lease modification areas. There would be no permanent loss of vegetation as a result of the Proposed Action.

Mitigation

None.

Finding on the Public Land Health Standard for Plant and Animal Communities (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Invasive, Non-native Species)

The North Fork LHA (BLM, 2007) found that the project area was generally in good condition, with a few areas with low ground cover and less plant litter than expected. Cheatgrass (*Bromus tectorum*) is present throughout the LHA Area. The problems were not identified as serious. Vegetation communities on BLM-managed lands in the lease modification areas and within the existing lease areas would continue to meet Public Health Standard 3.

No Action Alternative

Under the No Action Alternative, there would be no additional surface disturbance and, consequently, no additional impacts to vegetation within the proposed lease modification areas.

INVASIVE, NON-NATIVE SPECIES

Affected Environment

The State of Colorado maintains a list of plants that are considered to be noxious weeds and are given one of three categories that should be managed according to the Colorado Noxious Weed Act: Category A species are not known to occur in Colorado or are very limited and should be eradicated; Category B species have varying distributions and densities and weed management plans should be designed to stop the continued spread of these species; and Category C species are widespread and common in Colorado but may be required to be controlled (Colorado Department of Agriculture, 2011). In the BLM North Fork LHA (2007), the BLM-managed lands in this area were described as having minimal exotic plant problems but with trace amounts of cheatgrass (Category C). However, since the completion of the LHA, there have been some additions to the list that occur specifically in the project area, all of which occur on the Category B list: scentless chamomile (*Matricaria perforate*), oxeye daisy (*Chrysanthemum leucanthemum*), Russian knapweed (*Acroptilon repens*), and Canada thistle (*Cirsium arvense*). Potential invaders that are adjacent to the project area include one Category A species – yellow starthistle (*Centaurea solstitialis*), and three other Category B species – musk thistle (*Carduus nutans*), yellow toadflax (*Linaria vulgaris*), and sulfur cinquefoil (*potentilla recta*) (Rogers, 2010). Because roads are typically vectors for weed seeds, noxious or invasive weed species are likely to be present on or adjacent to the areas that would be disturbed by drilling equipment.

Environmental Consequences/Mitigation Measures

Proposed Action

Under the Proposed Action, light-use roads and drill pads associated with GVB drilling would cause surface disturbance. Access routes would involve scratch-grading or surface preparation that could result in surface disturbance and expose areas to the establishment of noxious weeds. Where soils are disturbed and native vegetation is lost, there is a potential for invasive and non-native plant species to establish. Once established, invasive and exotic species can dominate the sites and prevent effective recovery of native species.

Reclamation of roads, as well as of each drill pad site, would include grading, scarifying, and seeding using a BLM-approved seed mixture and application rate (see Table 2). Seeding would occur both as an interim control measure after construction activities are completed and as part of final reclamation, and would occur at a time when opportunities are greatest for establishment (including late summer, fall, or early spring) in order to improve germination rates. With the proposed mitigation, the risks of long-term noxious weed problems on the roads and GVB pads are expected to be low.

Mitigation

Noxious weed control would be required under the Proposed Action along access routes and at drill sites, in accordance with the Colorado Noxious Weed Act. Mitigation measures would include both preventive measures designed to avoid the introduction of noxious weeds and control measures if invasive species are identified in, or directly adjacent to, the proposed lease modification areas. Mitigation measures would include:

- Complete an inventory for noxious weeds within the proposed lease modification areas before construction begins in order to determine whether there is a need for pre-treatments (with results of the inventory shared with the BLM-UFO weed specialist).
- As a safeguard to avoid the introduction of noxious weeds, drill rigs and vehicles would be required to have all dirt and debris that could contain weed seeds removed; vehicles would also be washed prior to entering the proposed lease modifications in areas where wash-out material can be contained. Inspection of vehicles would be required or proof of cleaning vehicles could be remitted.
- If the drill rigs or other vehicles are used within areas infested with noxious weeds, each vehicle would be cleaned with high-pressure water spray equipment before moving to another area in order to reduce the likelihood of spreading noxious weed seeds.
- Appropriate herbicides and non-ionic surfactants would be applied to disturbed areas, topsoil stockpiles, and reclaimed areas in order to prevent invasion by noxious weeds. Care would be taken to avoid drift onto desirable species.
- Other mechanical or biological means of weed control (such as disking, shoveling, or insects) may also be employed on disturbed areas where appropriate, and where prior consultation with the BLM has occurred.
- Bowie would maintain records of location, type, and date of all weed control, and a Pesticide Use Proposal (PUP) number would be obtained from the BLM prior to any herbicide application. A Pesticide Application Record would be turned into the BLM within 15 days after application.
- If outbreaks of noxious weeds were identified within the proposed lease modification

areas, control measures would be implemented in consultation with the BLM.

- All GVB pads and new and upgraded roads within the proposed lease modifications would be monitored for noxious weeds by a qualified contractor or trained Bowie employee. Bowie would be responsible for treating all noxious weeds in areas of project disturbance and would not be responsible for existing roads that have not been modified for the project. A monitoring report would be required by the BLM once a year, in early summer, while the mine is active and/or until BLM releases Bowie from this requirement.
- All herbicide application would be done in accordance with the label, at the appropriate time of year, with the appropriate chemical for the targeted noxious weed species, and would be applied by a certified applicator.

The DRMS mining permit also contains a requirement for a noxious weed control plan.

Finding on the Public Land Health Standard for Plant and Animal Communities (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Vegetation)

The proposed lease modification areas meet Public Land Health Standard 3 for healthy native communities; however, some exotic invasive plant species are known to exist within the area. Precautions need to be maintained in order to minimize the spread and/or introduction of invasive, non-native species within the project area. The project would not impact the viability of plant populations or communities. Vegetation communities within the proposed leases would continue to meet the Standard after implementation of the Proposed Action, including mitigation to prevent or minimize invasive, non-native species, listed above.

No Action Alternative

Under the No Action Alternative, there would be no increase in the current establishment and occurrence of noxious or invasive weeds within the proposed lease modification areas.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Affected Environment

On February 21, 2012, an informal section 7 consultation for Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities was completed by USFWS, Western Colorado Ecological Services Field Office, and is contained in Appendix B to this EA. The informal consultation is programmatic in nature and addresses Bowie's mining-related surface developments and provides information about the potential effects of Bowie's action on federally-listed species included below. Appendix A to the consultation document contains the BLM-required conservation measures that will be used in future approvals related to Bowie's developments. The scope of this project is consistent with sufficient progress thresholds of the BLM Programmatic Biological Assessment addressing surface disturbance associated with underground mining based on Reasonably Foreseeable Development projections for Bowie activities.

USFWS (2010a) identified 12 species as endangered, threatened, or candidate under the Endangered Species Act (ESA) that may occur in Delta County (see Table 14). In addition to

federally-listed species, the BLM (2009) identified 39 other species as sensitive with the potential to occur within the BLM UFO and the general area of the proposed lease modification areas (see Table 15). Those species known to occur or suspected near the proposed lease modifications were surveyed for during block clearance surveys conducted for the proposed lease modifications and surrounding area. Only species that are known or have potential to be within the proposed lease modification areas or affected by the project area are discussed below (see Tables 14 and 15).

Table 14
Federal Threatened, Endangered, or Candidate Species in Delta County

Common Name/ Scientific Name	**Status[1]**	**Habitat[2]**	**Potential Occurrence in the Analysis Area [3]**	**Discussed in EA**
Mammals				
Black-footed ferret *Mustela nigripes*	E, SE	Requires large prairie dog colonies in open habitat such as grasslands, steppe, and shrub steppe.	None	No
Canada lynx *Lynx canadensis*	T, SE	Coniferous forests interspersed with thickets of trees and shrubs, rocky outcrops, large woody debris; closely associated with snowshoe hares. Present on Grand Mesa.	Possible	Yes
North American wolverine *Gulo gulo lucus*	C, SE	High elevation boreal and alpine habitats.	None	No
Birds				
Gunnison sage-grouse *Centrocercus minimus*	C, SC	Expansive sagebrush with grasses, forbs, and healthy riparian ecosystems; project outside of expected range.	None	No
(Western) Yellow-billed cuckoo [4] *Coccyzus americanus*	C, SC	Riparian forested habitats dominated by cottonwoods. Observed on North Fork of Gunnison River (Beason, 2009).	None	No
Fish				
Bonytail *Gila elegans*	E, SE	Eddies, pools, and backwaters near swift current in large rivers of the Colorado River system	Possible	Yes
Colorado pikeminnow *Ptychocheilus lucius*	E, SE	Fast, deep, white-water rivers with backwater areas and eddy habitats 2 to 3 feet deep that support aquatic insects, small fish as prey species.	Possible	Yes
Humpback chub *Gila cypha*	E, SE	Adults, in habitats ranging from deep turbid rapids often associated with large boulders and steep cliffs to flooded lowlands; young, in slow-moving backwaters.	Possible	Yes
Greenback cutthroat trout *Oncorhynchus clarki stomias*	E, ST	Cold, clear, gravely headwater streams and mountain lakes with abundant insects; originally in the Arkansas and South Platte river drainages of Colorado and Wyoming. Recent genetic testing indicates populations exist in the	Possible	Yes

Common Name/ Scientific Name	Status[1]	Habitat[2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
		Colorado River drainage.		
Razorback sucker *Xyrauchen texanus*	E, ST	Slow backwater habitats or large rivers and impoundments, not small tributaries or headwaters, with mud, sand or gravel substrate.	Possible	Yes
Plants				
Clay-loving wild buckwheat *Eriogonum pelinophilum*	E, SE	Restricted to the badlands/Adobe Hills east of Delta and Montrose, CO.	None	No
Colorado hookless cactus *Sclerocactus glaucus*	E, SE	Rocky hills, alluvial benches, and lower mesa slopes in desert shrub communities from 4,500 to 6,000 feet	None	No

[1] Status: T – Federal Threatened; E – Federal Endangered; C – Federal Candidate; SE – Colorado Endangered; ST – Colorado Threatened; SC – Colorado Candidate
[2] Source: CDOW, 2009; CNHP, 2009.
[3] Potential Occurrence based on habitat associations and known distributions:
None: May occur in Delta County but restricted distributions are distant and/or habitat is not present in the project area.
Unlikely: May occur in Delta County and marginally suitable habitat present in the project area.
Possible: Occurs in Delta County, suitable habitat is present, but not observed in the project area.
Present: Observed in the project area and/or occupied habitat includes the project area.
[4] Also considered a BLM Sensitive Species within the Uncompahgre Field Office management area.

Table 15
BLM Sensitive Species that May Be Present in or near the Proposed Lease Modification Areas

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
Invertebrates				
Great Basin silverspot butterfly *Speyeria okomis nokomis*		Spring-fed meadows, seeps, marshes, boggy streamside meadows with flowing water.	None	No
Amphibians				
Northern leopard frog *Rana pipiens*	SC	Margins, banks of marshes, ponds, streams, other permanent water.	Present	Yes
Boreal toad *Anaxyrus boreas boreas*	SE	Pond margins, marshes, wet meadows, riparian areas in subalpine elevations. Present on Grand Mesa.	None	No
Canyon treefrog *Hyla arenicolor*		Intermittent streams in deep rocky canyons with pinyon-juniper vegetation; project outside of expected range.	None	No
Reptiles				
Longnose leopard lizard *Gambelia wislizenii*	SC	Flat or gently sloping, open shrublands; project outside of expected range.	None	No
Milk snake *Lampropeltis trianguium*		Grasslands, sandhills, canyons, open woodlands	Possible	Yes

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
taylori		ponderosa, pinyon-juniper; known along the North Fork of the Gunnison River.		
Midget faded rattlesnake *Crotalus viridis concolor*	SC	Most terrestrial habitats in west-central Colorado including grasslands, shrublands, pinyon-juniper woodlands, coniferous forests.	Possible	Yes
Fish				
Roundtail chub *Gila robusta*		Colorado River drainage, mostly large rivers, also streams and lakes; not documented in Terror Creek.	Possible	Yes
Bluehead sucker *Catostomus discobolus*		Headwater streams to large rivers with moderate velocity; not documented in Terror Creek.	Possible	Yes
Sucker, flannelmouth *Catostomas latipinnis*		Larger streams and rivers with riffles, eddies, backwaters; not documented in Terror Creek.	None	No
Colorado River cutthroat trout *Oncorhynchus clarki pleuriticus*	SC	Clear, headwater streams in the Colorado River drainage, clear mountain streams; no known populations of pure strain cutthroats on public lands managed by UFO.	Possible	Yes
Birds				
Long-billed curlew *Numenius americanus*	SC	Short-grass grasslands, wheat fields, dry land agriculture near water.	None	No
American peregrine falcon *Falco peregrinus anatum*	SC	Open conifer forests, riparian forests, and cliffs; migrant in western Colorado.	Present	Yes
Bald eagle *Haliaeetus leucocephalus*	SC	Reservoirs, rivers, wintering in semidesert and grasslands.	Possible	Yes
Brewer's sparrow *Spizella berweri*		Mostly in sagebrush shrubland but also in mountain mahogany and rabbitbrush, mesas and foothills.	Possible	Yes
American white pelican *Pelecanus erythrorhynchos*		Larger reservoirs, breeding on islands in eastern Colorado.	None	No
Columbian sharp-tailed grouse	SC	High elevation grassland areas interspersed with	Unlikely	No

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
Tympanuchus phasianellus columbianus		serviceberry, chokecherry, oakbrush, sagebrush, snowberry, and aspen; cultivated crops in spring/summer.		
Northern goshawk *Accipiter gentilis*		Forests of aspen, ponderosa pine, lodgepole pine; larger trees for nesting.	Possible	Yes
Ferruginous hawk *Buteo regalis*	SC	Grassland, semidesert shrublands, rare in pinyon-juniper; nest on isolated structures.	Possible	Yes
White-faced ibis *Plegadis chihi*		Marsh edges, wet meadows, reservoir shorelines.	None	No
Mammals				
Allen's (Mexican) big-eared bat *Idionycteris phyllotis*		Oak-juniper woodland and ponderosa pine forest; project outside of expected range.	None	No
Big free-tailed bat *Nyctinomops macrotis*		Rocky slopes, canyon lands, roosts in crevices.	None	No
Spotted bat *Euderma maculatum*		Ponderosa pine in montane forest, pinyon-juniper woodlands, aspen, semi-desert shrublands.	Possible	Yes
Townsend's big-eared bat *Corynorhinus townsendii*	SC	Montane forests, pinyon-juniper woodlands, semi-desert shrublands.	Possible	Yes
Fringed myotis *Myotis thysanodes*		Ponderosa pine, greasewood, oakbrush, saltbush shrublands.	Possible	Yes
Gunnison prairie dog *Cynomys gunnisoni*		Grasslands and high desert scrub; project outside the current, expected range.	None	No
White-tailed prairie dog *Cynomys leucurus*		Open shrublands, arid grass-shrub, and mountain valleys mostly in semidesert shrublands, also agriculture/pasture.	None	No
Kit fox *Vulpes macrotis*	SE	Semidesert shrubland and margins of pinyon-juniper woodlands; saltbush, sagebrush, greasewood.	None	No
Desert bighorn sheep *Ovis canadensis nelsoni*		Steep inaccessible cliffs, areas dominated by grasses.	None	No
Plants				
Grand Junction milkvetch *Astragalus linifolius*		Pinyon-juniper, sagebrush on Chinle, Morrison Formation; project	None	No

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
		outside of expected range.		
Naturita milkvetch *Astragalus naturitensis*		Pinyon-juniper, sandstone mesas, ledges, crevices; project outside of expected range.	None	No
San Rafael milkvetch *Astragalus rafaelensis*		Gullied hills, washes, tallus, seleniferous clay, silt, sand; project outside of expected range.	None	No
Sandstone milkvetch *Astragalus sesquiflorus*		Sandstone rock ledges, fissures of domed slickrock, talus under cliffs, sandy washes; project outside of expected range.	None	No
Fragile rockbrake *Cryptogramma stelleri*		Moist, shaded limestone cliffs and ledges.	None	No
Uncompahgre bladderpod *Lesquerella vicina*		Grows on Mancos shale at the ecotone between pinyon-juniper and salt desert scrub; 6,000 to 7,200 feet; project outside of expected range.	None	No
Adobe desertparsley *Lomatium concinnum*		Barren adobe soils derived from Mancos shale formation in shrub-dominated communities; project outside of expected range.	None	No
Paradox lupine *Lupinus crassus*		Grows on Mancos shale in pinyon-juniper woodlands; project outside of expected range.	None	No
Eastwood monkey-flower *Mimulus eastwoodiae*		Shallow caves, seeps, in canyon walls. No habitat present.	None	No
Aromatic Indian breadroot *Pediomelum aromaticum*		Sandy soils, barren hills, in sagebrush, pinyon-juniper; project outside of expected range.	None	No

[1] Status: T – Federal Threatened; E – Federal Endangered; C – Federal Candidate; SE – Colorado Endangered; ST – Colorado Threatened; SC – Colorado Candidate

[2] Sources: CNHP, 2009; CDOW, 2009; Weber and Wittmann, 1987; Andrews and Righter, 1992; Hammerson, 1986; Woodling, 1985; Fitzgerald et al., 1994.

[3] Potential Occurrence based on habitat associations and known distributions:

None: May occur in Delta County but restricted distributions are distant and/or habitat is not present in the project area.
Unlikely: May occur in Delta County and marginally suitable habitat present in the project area.
Possible: Occurs in Delta County, suitable habitat is present, but not observed in the project area.
Present: Observed in the project area and/or occupied habitat includes the project area.

Federally-Listed Species

Canada Lynx. Canada lynx (*Lynx canadensis*) are known to be present on Grand Mesa, and at this time, all suitable habitats are considered to be occupied by this species (USFWS, 2010b). There are no habitats currently mapped as suitable for lynx on public lands in the lease modification areas, and no critical habitat has been designated in Colorado (USFWS, 2009a). The lease modification areas also fall outside a BLM mapped lynx analysis unit (LAU) (BLM, 2002). There is little to no denning, wintering, or dispersal habitat (spruce/fir) within the proposed leases.

Colorado River Endangered Fishes. The federally endangered bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) are not present on the proposed lease modification areas but are found 30 miles downstream (USFWS, 1994) of the lease modification areas in portions of the Colorado River system. No suitable habitat for these species is found within the proposed lease modification areas.

Greenback Cutthroat Trout (GBCT). CPW considers the main stem of Terror Creek, from the confluence of the East and West Forks to the confluence with the North Fork, as occupied habitat for federally-endangered greenback cutthroat trout (*Oncorhynchus clarki stomias*) (Kowalski, 2010). Recent surveys documented GBCT in the West Fork of Terror Creek, the East Fork of Terror Creek, and the upstream portion of Terror Creek. There are an estimated 151 to 400 GBCT per mile within the reaches sampled by the U.S. Forest Service (Carrillo, 2010). There is no designated critical habitat for this species.

BLM Sensitive Species

Mammals. Three species of bats included in Table 15 could occur in the vicinity of the proposed lease modification areas. Townsend's big eared bats (*Corynorhinus townsendii*) roost in caves, tunnels, mines, and buildings and can be found in lower elevation pinyon-juniper woodlands (Culver et al., 2008). Fringed myotis (*Myotis thysanodes*) commonly occupy oak and pinyon woodlands, as well as Douglas-fir and ponderosa pine forests, mines, caves, and buildings (Adams, 2003). Spotted bats (*Euderma maculatum*) occur in ponderosa pine woodlands, pinyon-juniper woodlands, and open semi-desert shrublands (CDOW, 2009). Much of the roosting habitat within the North Fork River LHA area is in cracks and crevices in rock/cliff faces (BLM, 2007). These species are more likely to occur in the proposed lease modification areas during foraging activities.

Birds. There are nine species of birds in Table 15 that are identified as sensitive within the BLM UFO. Based on habitat present and range of the species, five of those species are known or could occur in the proposed lease modification areas. Brewer's sparrows (*Spizella berweri*) are a sagebrush-obligate species, occupying sagebrush steppe (Knick and Rotenberry, 2001) and may nest in suitable habitat. It is possible that northern goshawks (*Accipiter gentilis*) may nest within or adjacent to the proposed lease modification areas in larger trees. There is no suitable nesting habitat for bald eagles (*Haliaeetus leucocephalus*), ferruginous hawks (*Buteo regalis*), or peregrine falcons (*Falco peregrinus anatum*) within the proposed lease modification areas,

although the lease modification areas may be used for foraging. Peregrine falcons were observed in the proposed lease modification areas.

Herpetofauna. Sensitive BLM species of reptiles and amphibians likely or possibly to be present within the proposed lease modification areas, based on known distributions and habitat affinities include the northern leopard frog (*Rana pipiens*), milk snake (*Lampropeltis trianguium taylori*), and midget faded rattlesnake (*Crotalus viridis concolor*). The northern leopard frog is usually found in permanent water with rooted aquatic vegetation, and in the summer it will inhabit wet meadows and fields (NDIS, 2011). The northern leopard frog is known to be present in the general project area. The midget faded rattlesnake occurs in Delta County and is found in most habitats (NDIS, 2011). Milk snakes occur in a variety of habitats including shrubby hillsides, canyons, and open stands of ponderosa pine with Gambel oak, pinyon-juniper woodlands, and river valleys (NDIS, 2011). Milk snakes have been documented along the North Fork of the Gunnison River and could be present within the proposed lease modification areas.

Fish. Two BLM-sensitive fish species, the roundtail chub (*Gila robusta*) and bluehead sucker (*Catostomus discobolus*), may be present in Terror Creek or its tributaries based on habitat preferences, although neither species has been documented.

Environmental Consequences/Mitigation Measures

Proposed Action

<u>Federally-Listed Species</u>

Canada Lynx. The proposed GVB drilling activities would not directly affect lynx denning habitat, wintering, or dispersal habitat. In addition, surface-disturbing activities would be limited in extent and not occur during winter months; would not affect local habitat components or stands equivalent to areas of lynx habitat; and would not cause lynx to avoid using the area. The Proposed Action would not affect lynx or suitable lynx habitat.

Colorado River Endangered Fishes. No direct effects to endangered Colorado River fish are expected; however, water depletions (0.15 acre-feet/year) associated with proposed activities could cause off-site effects to the endangered fish and their critical habitat (Colorado pikeminnow and razorback sucker) in the lower Gunnison River and Colorado River (USFWS, 1994). Water depletions from the Upper Colorado River basin are likely to adversely affect the four federally-listed Colorado River fishes and likely to adversely modify their designated critical habitats. Water depletions were previously addressed with the FWS Programmatic Biological Opinion (PBO) (ES/GJ-6-CO-08-F-0010) for water depletions associated with BLM projects authorized by BLM within the Upper Colorado River Basin in Colorado on February 25, 2009 (USFWS, 2009b). The PBO includes reasonable and prudent alternatives developed by USFWS, which allow BLM to authorize water depletions while avoiding the likelihood of jeopardy to the endangered fishes and avoiding destruction or adverse modification of their critical habitat. The PBO requires the BLM State Office to track all projects that result in water depletions from the Upper Colorado River Basin and provide an annual report to the Service.

The UFO would include the water depletions associated with the subject project in their annual report to the BLM State Office.

To comply with the above PBO, Bowie would be required to report their annual water depletions to the BLM UFO by September 30 each calendar year. This includes depletions that result from any coal mining-related actions within the project area, regardless of surface or mineral ownership. Depletion fees would be paid by BLM as required in the above-mentioned PBO.

Greenback Cutthroat Trout. Water for drilling would be pumped from a point just upstream of the confluence of East and West Terror Creeks, where GBCT could be entrained or impinged during water withdrawal.
Potential effects to GBCT in Terror Creek and West Fork of Terror Creek could also occur from sediment entering the creeks as a result of soil disturbance during construction and/or improvement of access roads.

The February 2012 informal consultation with USFWS contains a suite of conservation measures designed to protect GBCT that BLM will apply as part of the proposed action, including project setbacks from occupied streams, reclamation standards, erosion/ sediment control measures and implementation monitoring, and measures to avoid take, entrapment, and entrainment of fish during water pumping activities. In particular, no new surface disturbance will occur within 200 feet of GBCT occupied habitat, as measured from the normal high water mark, and maintenance of roads or other existing features within this zone will be limited to the existing road prism or footprints. FWS noted that their understanding of *surface disturbance* to be any project-related disturbance resulting in direct and pronounced alteration, damage, removal, displacement, or mortality of vegetation, soil, or substrates, or similar effects. Also, BLM has committed to ensuring that adequate and proper erosion control measures are implemented and effective, such that adverse effects do not occur to GBCT and its habitat. Based on this information, FWS concurred with BLM's determination that the proposed action may affect, but is not likely to adversely affect greenback cutthroat trout, due to discountable and insignificant effects.

Removal of water from the Terror Creek system could also potentially affect GBCT. To minimize potential effects from water removal from Terror Creek, Bowie would make a call on their water rights and release water into East Terror Creek from Terror Creek Reservoir at a rate equal to or greater than the amount of water being removed.

Terror Creek is approximately 490 feet from the closest longwall mining that would occur if the lease modification were approved. Given a worst-case overburden depth of 600 feet, with an angle of draw of 25 degrees, the effects of surface subsidence are projected to extend approximately 250 feet from the longwall panel (BLM, 2000). Therefore, there would be no subsidence related disturbance to the flows in Terror Creek, and no impacts to Endangered, Threatened, or Sensitive fish species or their habitat.

BLM Sensitive Species

Mammals. The habitats within the proposed lease modification areas may provide roosting, nursery, and/or foraging habitat for bats. Given the existing activity in the area, the short

duration of drilling activity, and the small additional surface disturbance, adverse effects to sensitive bats are not expected.

Birds. Potential foraging habitat for peregrine falcons, bald eagles, northern goshawk, and ferruginous hawk is present within the lease modifications; however the small amount of potential habitat removed versus available habitat within the lease modification areas is not expected to affect these species. No nesting substrate would be removed by the project for these four species and no nests were observed during surveys.
Brewer's sparrows were not documented within the project area during surveys; however potential nesting habitat is present. Removal of sagebrush vegetation during nesting (May 15 through August 1) could risk mortality of birds, eggs, and/or nestlings (see Migratory and Other Birds of Conservation Concern section for mitigation).

Herpetofauna. There is no known habitat at the proposed lease modifications for northern leopard frogs, and there are no GVB pads or access roads proposed within wetland, pond, or reservoir habitats. Drilling activities, as currently proposed, would not result in habitat losses for milk snakes. Because midget faded rattlesnakes are found in most habitats within the proposed lease modifications, they would be the most likely affected of the three species. The small amount of potential habitat removed versus available habitat within the lease modifications areas is not expected to affect these species. As would be the case with any terrestrial wildlife species with a small home range, some direct mortality from machinery and human behavior may result in minor short-term effects to local populations.

Fish. Although potentially suitable habitat for roundtail chub and bluehead sucker occurs within the project area in Terror Creek and its forks, these species have not been documented. Effects described above for endangered fish are not expected; however, protective measures implemented for endangered fish, above, would also reduce potential effects to BLM sensitive fish species, if present.

Mitigation

BLM would require the following mitigation measures:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining-related surface disturbance would occur within 200 feet of greenback cutthroat trout occupied habitat, as measured from the normal high water mark, without a written finding from the Authorized Officer. These techniques would provide for maximum coal removal while protecting the values associated with the threatened greenback cutthroat trout habitat.
- Sediment control measures, such as silt fences or straw wattles, would be placed down slope from the pads and access roads to prevent potential sedimentation effects to Terror Creek.
- In order to insure that Best Management Practices (BMPs) relating to the control of sediment from disturbed sites are in place, and functional, Bowie shall, on a monthly basis from May through August, use an independent contractor to inspect Bowie's well pad sites and access roads within the Terror Creek watershed. The independent

contractor shall contact Bowie and the BLM UFO (970-240-5300), within two business days of discovering sediment control measures that are missing or non-functional. Bowie will have three business days to correct the problem. Ineffective measures would be redesigned and replaced after consultation with BLM. For each year that Bowie operates under this BA, Bowie shall submit the compiled monthly inspection reports to BLM UFO by September 30. In the event new sediment control methods are identified or current practices are not working as intended, adaptive management will be used to implement methods that are effective at eliminating offsite movement of soils and sedimentation into resident streams.

- At any time during drilling activities, until successful reclamation or continuing into the future, the point of access to temporary roads shall be blocked with gates, rock barriers, or concrete barriers to prevent vehicles, including Off-Highway Vehicles (OHVs), from using them. Signs identifying the road closure shall be placed at the barricades.
- In order to prevent increased risk of sediment being generated as a result of pumping related disturbance, pumping from East Terror Creek would not take place until after the April and May peak runoff period has past. Therefore, pumping from East Terror Creek would not begin until June. The AO may grant an exception that would allow pumping in May if runoff flows have dropped to the normal mean monthly levels for June (6.9 cfs) and USFWS has concurred via informal consultation.

- To prevent mortality of GBCT due to pumping from the East Fork of Terror Creek, the conservation measures are defined as: pumping during the June and July period would require the use of a screened pump intake, with a maximum ¼ inch size mesh. For the August through September period, when GBCT fry would be present in the stream, pump intakes would be screened with no larger than 1/16th mesh screen. The screen would not be confined to just the pump intake, but must cover a larger area, such as a cylinder or box design which has at least 5 times the surface area of the pump intake. Bowie must submit the final design for this screening fixture to the BLM Western Slope fisheries biologist, Tom Fresques (970-876-9078; t1fresqu@blm.gov), for his approval.

- During the June through September period, if the flows in East Terror Creek drop below the ten year mean monthly flow for October (1.0 cfs), Bowie will not pump water from the East Fork of Terror Creek.

- To prevent impacts to GBCT fry and fingerlings, pumping would not take place during the base flow (low flow) periods of the year; October through March.

- If there are existing roads or disturbance features within the 200-foot buffer along GBCT habitat streams, then no additional surface disturbance will be permitted within those areas. Maintenance of roads or other existing features must remain within the existing road prism or footprint of the feature being maintained.

- The operator shall not store equipment, machinery, or construction materials in any locations that are 200 feet or less from the riparian zones of the streams within the Terror Creek watershed.

- No overstory or understory vegetation will be removed from the riparian zone of the streams in the Terror Creek watershed.
- During construction or maintenance activities in proximity to the 200-foot riparian buffer zone, the edge of the buffer zone shall be marked for avoidance by construction equipment and activities.
- Within the Terror Creek watershed only fresh water, free of chemicals or other contaminants, may be used for dust abatement activities.
- Within the Terror Creek watershed, additional crossings of perennial streams will not be constructed
- The BLM UFO hydrologist must approve, in advance, the size and composition of riprap material to be used in the East Fork of Terror Creek.
- Bowie must report their annual water depletions to the BLM UFO by September 30 each calendar year. This includes depletions that result from surface activities associated with coal mining related activities within the Action Area, regardless of surface ownership.
- No additional disturbance, such as road widening or upgrading would occur within 200 feet of GBCT occupied habitat, as measured from the normal high water mark, to protect and maintain riparian vegetation and eliminate potential effects to the greenback cutthroat trout, unless exceptions were approved by the Authorized Officer.
- Site-specific surveys for sensitive plants would be conducted onsite prior to the development of any surface facilities or to other soil-disturbance activities.
- There would be no surface occupancy or soil-disturbing activities within a 100-foot radius of sensitive plant locations unless exceptions were approved by the Authorized Officer.
- Application of herbicides, surfactants, and other weed control measures would avoid overspray or drift onto desirable species or sensitive plants.

Finding on the Public Land Health Standard for Threatened and Endangered Species

The LHA (BLM, 2007) identified this area as meeting Public Land Health Standard 4 for special status species, including threatened and endangered species, but with problems, mainly as a result of weed infestations affecting the quality of available habitat. Fish habitat within the project area is in good condition with adequate riparian vegetation and water quality. The proposed project with implementation of BMPs and mitigation measures should not further degrade the quality of special status species populations and communities within the project area. The Standard with regard to threatened and endangered species, therefore, would be met.

No Action Alternative

The No Action Alternative would have no impacts to threatened, endangered, or sensitive species within the lease modification areas.

MIGRATORY AND OTHER BIRDS OF CONSERVATION CONCERN

Affected Environment

The Migratory Bird Treaty Act (916 U.S.C. 703-711) identifies numerous bird species of the southwestern U.S. that are assigned a migratory status. BLM signed a Memorandum of Understanding (MOU) with the USFWS in April 2010, which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. The focus of BLM's conservation efforts is on migratory species and some non-migratory game bird species that are listed as Birds of Conservation Concern (BCC). BCC have been identified by the USFWS (2008) for different Bird Conservation Regions (BCR) in the United States to identify those species in the greatest need of conservation action, outside of those species already listed by the USFWS as threatened or endangered. The entire project area is in BCR 16, the Southern Rockies/Colorado Plateau region. The USFWS lists 27 species (see Table 16) that are BCC in BCR 16 (USFWS, 2008). Table 16 also shows the status for each species within the UFO management area and probable presence within the project area (Kingery, 1998; CDOW, 2011). Several of the species in Table 16 were also included in the Endangered, Threatened, and Sensitive Species section.

Based on species' known distributions and habitat associations in western Colorado, nine species are known or have potential to occur in the project area: bald eagle, golden eagle (*Aquila chrysaetos*), peregrine falcon, prairie falcon (*Falco mexicanus*), Lewis's woodpecker (*Melanerpes lewis*), pinyon jay (*Gymnorhinus cyanocephalus*), Grace's warbler (*Dendroica graciae*), Brewer's sparrow, and Cassin's finch (*Carpodacus cassinii*). Two of these species were observed on-site during surveys: peregrine falcon and golden eagle.

An active peregrine falcon nest is located in the upper end of Dove Gulch. This is the only active peregrine nest known to occur in this general area. The nest is located over a high ridge and more than two miles from any activity associated with road and pad construction, and drilling activity. It is not expected to be affected by the activities associated with the proposed lease modifications.

The bald eagle is present as a winter resident along the North Fork of the Gunnison River. The river and adjacent habitats are designated as Bald Eagle Winter Forage Range by CDOW (2011), of which a small portion of the designated range overlaps proposed lease COC-61209, including GVB-B19A and access roads. Biological surveys indicate that bald eagle activity has been observed along the North Fork Valley, but that no bald eagles have been sighted in the mine area, or in areas near the mine, for several years.

Table 16
Birds of Conservation Concern within BCR 16

Common Name **Scientific Name**	**Habitat** [1]	**Status Within UFO**	**Presence in Project Area**
Gunnison sage-grouse *Centrocercus minimus*	Expansive sagebrush with grasses, forbs, and healthy riparian; project outside of expected range.	Resident	No
American bittern *Botaurus lentiginosus*	Dense freshwater marshes and extensive wet meadows.	Migrant	No
Bald eagle *Haliaeetus leucocehpalus*	Nests, roosts in large cottonwoods along rivers; near prey or carrion during winter.	Migrant/Winter	Yes
Ferruginous hawk *Buteo regalis*	Nests in isolated trees, rock outcrops, artificial structures, ground near prey base.	Migrant	No
Golden eagle *Aquila chrysaetos*	Nest on open cliffs and in canyons or in tall trees (cottonwoods) in open country and riparian zones.	Resident	Yes
Peregrine falcon *Falco peregrinus*	Nests on high cliff faces, often near water; forages in adjacent habitats.	Resident	Yes
Prairie falcon *Falco mexicanus*	Nests in cavities on cliffs, rock outcrops adjacent to open grassland, shrublands.	Resident	Yes
Snowy plover *Charadrius alexandrinus*	Barren or sparsely vegetated alkaline flats and river bars.	Migrant	No
Mountain plover *Charadrius montanus*	Short-grass prairie and shrub-steppe landscapes, ryland and cultivated farms, and prairie dog towns.	Migrant	No
Long-billed curlew *Numenius americanus*	Short-grass grasslands, wheat fields, dry land agriculture near water.	Migrant	No
Yellow-billed cuckoo *Coccyzus americanus*	Riparian forested habitats dominated by cottonwoods.	Breeding	No
Flammulated owl *Otus flammeolus*	Nests in forest of ponderosa pine and Douglas-fir with aspen, and in aspen stands.	Breeding	No
Burrowing owl *Athene cunicularia*	Nests in burrows, especially prairie dog / badger burrows in grasslands, desert shrub.	Breeding	No
Lewis's woodpecker *Melanerpes lewis*	Nests in open stands of cottonwood riparian or urban stands, also in aspen, oak shrub.	Resident	Yes
Willow flycatcher *Empidonax traillii*	Dense riparian habitats along rivers, streams, or other wetlands.	Breeding	No
Gray vireo *Vireo vicinior*	Nests in open pinyon-juniper stands with mountain mahogany, deciduous shrub interspersed.	Breeding	No
Pinyon jay *Gymnorhinus cyanocephalus*	Nest in pinyon and/or juniper woodlands, feed/cache pinyon nuts, juniper berries.	Resident	Yes
Juniper titmouse *Baeolophus griseus*	Nests in pinyon and/or juniper open or dense woodlands, often intermixed with Gambel oak.	Breeding	No
Veery *Catharus fuscescens*	Damp deciduous/mixed woodlands with dense understory, wood swaps/lowlands, and damp ravines.	Not present	No

Common Name Scientific Name	Habitat [1]	Status Within UFO	Presence in Project Area
Bendire's thrasher *Toxostoma bendirei*	Open farmlands, grasslands, and brushy arid to semi-arid deserts; breeds mainly in grasslands, shrublands or woodlands.	Not present	No
Grace's warbler *Dendroica graciae*	Open montane forests, especially oaks, junipers, firs, and pines..	Breeding	Yes
Brewer's sparrow *Spizella breweri*	Nests in sagebrush, occasionally greasewood, rabbitbrush in desert valleys.	Breeding	Yes
Grasshopper sparrow *Ammodramus savannarum*	Grasslands with few scattered shrubs.	Not present	No
Chestnut-collared longspur *Calcarius ornatus*	Shortgrass or mixed-grass habitats heavily grazed or recently burned.	Not present	No
Black rosy-finch *Leucosticte atrata*	Alpine areas usually near rock piles and cliffs; winters in mountain meadows, high deserts, valleys, and plains.	Winter	No
Brown-capped rosy-finch *Leucosticte australis*	Nests on cliffs or in caves, rock slides or old buildings above timberline.	Winter	No
Cassin's finch *Carpodacus cassinii*	Nests in montane forests with spruce/fir and aspen; also in lower pinyon-juniper woodlands.	Breeding	Yes

[1] Based on Righter et al., 2004.

Environmental Consequences/Mitigation Measures

Proposed Action

Underground activities would have no impacts on migratory bird and/or raptor populations. There is potential for disturbance to migratory birds during drilling, access, and site reclamation activities associated with GVB drilling where vegetation would be disturbed. This includes direct impacts to unidentified active nests, potential mortalities and injuries to birds and eggs in unidentified nests, and disturbance to suitable nesting habitat potentially resulting in incidental "take" of migratory birds. To minimize or avoid effects to nesting migratory birds, where practicable, Bowie would avoid vegetation removal during the migratory bird nesting period (May 15 to August 1).

Raptors nesting in the project area could abandon nests because of noise and human presence during the breeding period, which varies by species. Recent surveys within the proposed lease modification areas did not observe raptor nests within woodland habitat 0.25 mile from the project or within cliffs 0.5 mile from the project. It is not expected that construction of the project would affect nesting raptors.

Mitigation

BLM would require the following mitigation measures:

- A qualified biologist would conduct pre-construction breeding bird and raptor surveys during the breeding period within 0.5 mile of the general disturbance area (drill pads and access roads) if activities would occur during the breeding season (generally May 15 to

August 1, but varies by species). Surveys would document active nests. If no active nests are found and a survey report is submitted to and approved by the BLM Biologist, activities may begin within the cleared areas. If active nests are found, development timing would be restricted during the breeding season, as per the BLM authorized officer.

- Where practicable, surface disturbing activities should not occur during the migratory bird nesting period (May 15 through August 1) to prevent potential take of migratory birds and/or eggs, unless vegetation is removed prior to May 15. Nesting surveys conducted within 2 weeks of surface-disturbing activities that indicate no migratory bird species are nesting or otherwise present within the area to be disturbed may also be considered; however, consultation and approval by BLM would be required.
- If active nests were identified during project implementation, appropriate measures would be taken in order to reduce impacts to these species, including relocating overland access routes and drill-hole locations, and implementing disturbance-free buffer zones and timing limitations for active nests as recommended by the BLM UFO.
- All unavoidable surface disturbance would require approval of the BLM Authorized Officer. The BLM would coordinate with USFWS and CPW to determine the type and extent of allowable variances. A site-specific analysis would determine if this stipulation would apply.

Finding on the Public Land Health Standard for Threatened and Endangered Species

The LHA (BLM, 2007) identified this area as meeting Public Land Health Standard 4 for special status species, including threatened and endangered species and migratory birds. However, increased weed infestations have negatively affected the quality of available habitat. The project area was mapped as being at the margins of bald eagle winter range and populations of wintering bald eagles have increased in the North Fork LHA area. The project, as proposed, should not adversely affect migratory birds or their habitat, and should maintain this Standard over the life of mine.

No Action Alternative

Under the No Action Alternative, there would be no impacts to migratory birds within the proposed lease modification areas.

WILDLIFE, TERRESTRIAL

Affected Environment

The proposed lease modification areas occurs within the CPW Game Management Unit (GMU) 521, of which mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), moose (*Alces alces*), black bear (*Ursus americanus*), and cougar (*Puma concolor*) are all big game species harvested in GMU 521. CPW has mapped seasonal ranges utilized by game species (CPW, 2010), and all portions of the project area are classified as overall range for those big game species, as well as for turkey (*Meleagris gallopavo*) (game bird). Although CPW identifies the area as part of the overall range for moose on Grand Mesa, the plant communities on the lease modification area are marginally suitable for moose, and except for rare occasions, they are not expected to be present. Elk winter range and mule deer summer range have also been classified within the project area. A portion of the lease modification tracts have been identified as mule deer winter

range and black bear fall concentration area. Turkey and elk populations within the area are doing well (BLM, 2007). Mountain shrub habitat is widespread on the lower slopes of Grand Mesa, and other terrestrial wildlife associated with this habitat type in this area includes species such as coyote (*Canis latrans*), bobcat (*Lynx rufus*), porcupine (*Erethizon dorsatum*), eagles, hawks, blue grouse (*Dendragapus obscurus*), numerous migratory bird species, small mammals, amphibians, and reptiles (BLM, 2007). Wildlife habitat conditions in the area are generally good, with some areas that are heavily utilized by mule deer and elk, usually as a result of use constraints imposed by winter weather.

Environmental Consequences/Mitigation Measures

Proposed Action

Activities associated with drilling GVBs may result in some temporary disturbance and in the displacement of local wildlife species from habitats near surface activities, in response to increased human presence and activity (noise). The disturbance and displacement would result in short-term impacts to individuals; however, due to the limited duration of activities and the availability of other unaffected suitable habitats in the vicinity of the proposed lease, these impacts would not be detrimental to population status and health. Presence of garbage during GVB construction activities could attract bears that could develop as a conflict and risk to bears.
There would be a short-term loss of approximately 16.6 acres of wildlife habitat resulting from the construction of drill pads and new access roads associated with the GVBs. These impacts would not be long-term because the drill pads and access roads would be reclaimed after mining. In the long-term, reclamation would return the habitat to its pre-mining condition. Underground activities would not have an impact on terrestrial wildlife.

Mitigation

BLM would require the following mitigation measures:

- Facility construction and major scheduled maintenance would not be authorized within these crucial winter ranges from December 1 through April 30. All unavoidable surface disturbances within these crucial winter ranges during these times would require approval of the BLM Authorized Officer.

- Bear-proof containers would be used and refuse collected frequently to minimize potential for human-bear conflicts at construction sites. Employee training would include information to reduce bear-human conflicts including not feeding bears.

- Noise reduction mitigation would be utilized on the individual GVB pumps to reduce impacts from their operation.

Finding on the Public Land Health Standard for Plant and Animal Communities (partial, see also Vegetation; Invasive, Non-native Species; and Wildlife, Aquatic)

The area of the proposed lease modifications meets Public Land Health Standard 3 for healthy native communities (BLM, 2007). The abundance and amount of exotic and noxious vegetative species is increasing and that could decrease the habitat value for wildlife. Under the Proposed Action and with implementation of the mitigation measures listed within the invasive, non-native

species section and other BMPs, viable wildlife populations and communities would be maintained. The public lands within the proposed lease modification areas would continue to meet the standards for healthy plant and animal communities after implementation of the Proposed Action.

No Action Alternative

There would be no impacts to terrestrial wildlife as a result of the coal lease modifications and subsequent coal extraction.

WILDLIFE, AQUATIC

Affected Environment

Aquatic habitat is present in Terror Creek and its tributaries. Greenback cutthroat trout are known to be present in the East and West Forks of Terror Creek and are believed to be present in Terror Creek (Speas, 2010; Carrillo, 2010). This species is discussed in the Endangered Species section of this document. Additional species known to be present in this stream system include speckled dace (*Rhinichthys osculus*) and mottled sculpin (*Cottus bairdi*) (Carrillo, 2010). It is likely that additional species are present. Aquatic habitat in Terror Creek is believed to be in good condition, well shaded by riparian vegetation, with stable banks, and a stable substrate. Approximately 3,106 linear feet of the West Fork of Terror Creek is contained with the proposed lease modification for COC-61209. Current mine plans do not propose surface or subsurface disturbance under the West Fork of Terror Creek. The closest longwall unit is approximately 490 feet from the creek.

The BLM North Fork Coal EIS, FS and BLM, 2000 noted that six monitoring stations in the vicinity of the Iron Point Coal Lease Tract measured ephemeral streams that are directly tributary to the North Fork of the Gunnison River. Upper and Lower Stevens Draw, A Gulch, B Gulch, C Gulch, and D Gulch are located within the permit boundary of the Bowie No. 2 Mine. These stations were monitored from February 1995 through December 1998. These streams are dry for much of the year. Flow events were captured only in the Lower B and C gulches. These flow measurements are less than 0.01 cfs, and there is no seasonal pattern.

Environmental Consequences/Mitigation Measures

Proposed Action

Some short-term increases in sediment production associated with GVB drilling may occur, especially during high intensity storm events. The topography is steeper for both proposed lease modification areas, which slope to the West Fork of Terror Creek on the north and east side, and Stevens Gulch on the west. The lease modifications proposed by Bowie, along with the mitigation resulting from this EA, should result in minimal impacts to aquatic habitat or aquatic life (see also the Endangered Species section of this document). There would be no impact on Terror Creek stream flows from subsidence related to coal extraction in the current mine plan.

Mitigation

In addition to the mitigation measures provided in the Proposed Action, Wild and Scenic Rivers, and Endangered Species sections of this document, BLM would require Bowie to:

- Disinfect heavy equipment, hand tools, boots, and any other equipment that was previously used in a river, stream, lake, pond, or wetland prior to moving equipment to another waterbody to avoid spreading aquatic nuisance species or other undesirable biota (fish pathogens or parasites).

Finding on the Public Land Health Standard for Plant and Animal Communities

The riparian areas, including riparian vegetation along Terror Creek within the project area and Stevens Gulch downstream of the project area meet Standard 2 (BLM, 2007). These streams have no evident problems with hydrology, vegetation, or excessive erosion and deposition from either the stream channel or watershed, with the exception of weed problems. With the implementation of BMPs and mitigation measures described, the aquatic habitats in the lease modification areas would continue to meet public land health standards.

No Action Alternative

There would be no impacts to aquatic species or habitat as a consequence of mining activities associated with the lease modifications.

WETLANDS AND RIPARIAN ZONES

Affected Environment

No wetlands, as defined in Section 404 of the Clean Water Act, have been identified within the proposed lease modification areas. Approximately 0.27 acre of riparian habitat has been delineated along the West Fork of Terror Creek. This riparian habitat contains limited populations of cottonwood and willow. During field surveys conducted in 2005, very little regeneration of either of these species was observed.

Environmental Consequences/Mitigation Measures

Proposed Action

Surface-disturbing activities associated with the GVBs would be located so as to avoid impacts to riparian zones and Waters of the U.S., including any wetland/riparian areas associated with Terror Creek (0.27 acre). There would be no impacts to Waters of the U.S. or wetlands under the Proposed Action; therefore, no permit from the U.S. Army Corps of Engineers would be required.

The nearest road construction activities to creeks within the proposed lease modification areas would be those associated with the reopening of previously reclaimed roads and would take place approximately 0.4 mile from Terror Creek (see Map 3). The existing road along Terror Creek and Stevens Gulch would not be modified. Installation of proper sediment controls (see Mitigation Measures below) during road construction, combined with the distance of operations from streams would prevent sedimentation to area streams. Three of the GVB drill pads would be located on the high flats above Terror Creek and would be accessed from the existing road that follows Terror Creek. Two GVB drill pads would be accessed from the Stevens Gulch Road

with two of the pads immediately adjacent to the road and the other four pads accessed from an existing upgraded road.

Existing roads through the proposed lease modification areas that would be used for GVB construction and operation occur immediately adjacent to both Terror Creek and Stevens Gulch. The operation of vehicles on these roads may slightly increase the rate of sedimentation into the stretches of streams closest to the roads. With the mitigation measures, shown below, the amount of sedimentation from these activities is expected to be minimal and short-term.

Mitigation Measures

The Proposed Action includes the following measures for protecting wetlands and riparian areas. Additional mitigation measures are also contained in the Threatened, Endangered and Sensitive Species section related to wetlands and riparian area:

- Ground disturbance would be located at least 200 feet away from drainages and wetlands to the extent possible (see mitigation for Threatened, Endangered and Sensitive Species).
- Dust control measures, such as wetting and surfactants, would be applied to exposed surfaces and soil stockpiles except within the Terror Creek watershed where only fresh water, free of chemicals or other contaminants, may be used for dust abatement activities.
- Proper sediment controls would be used during drill pad and road preparation. These would include sediment barriers, such as silt fences or straw bale sediment barriers, equipment matting, prompt revegetation, etc.
- The drill pads, along with any associated disturbance, would be located at least 200 feet from any delineated wetlands or riparian areas.
- No new surface disturbance off the existing road prism or footprint of the feature being maintained would occur in wetlands or riparian areas.

Finding on the Public Land Health Standard for Riparian Systems

The proposed lease modifications are identified as meeting Public Land Health Standard 5 for water quality (BLM, 2007). Terror Creek has 0.27 acre of riparian habitat. Based upon the lack of disturbance to wetlands and riparian zones within the proposed lease modifications, the criteria for this Standard would be met.

No Action Alternative

Under the No Action Alternative, there would be no impacts to wetlands and riparian zones in the proposed lease modification areas.

FLOODPLAINS

A 100-year floodplain is defined by the Federal Emergency Management Agency (FEMA) as the area adjacent to a watercourse that has a 1 percent chance of becoming wet in any single year (FEMA, 1989). Floodplain maps have been prepared by FEMA that cover the proposed leases; no floodplains have been mapped within the proposed lease modification boundaries (FEMA, 1989). Terror Creek is too small to be depicted at the scale of FEMA floodplain maps. However, these streams do not have any significant reaches that are likely to be regularly inundated by

flows that overtop their channel banks to the extent that they would leave areas of overbank deposition. Potential subsidence from coal extraction beneath these creeks could result in minor local shifts in channel morphology and gradient; however, these would not be considered floodplain alterations. There are not any mapped or identified floodplains within the proposed lease area; there would be no project-related disturbance within or near mapped floodplains.

WATER QUALITY, SURFACE AND GROUND (includes a finding on Standard 5)

Affected Environment

Surface Water. The lease modification tracts are located in the Terror Creek watershed. Terror Creek has a drainage basin of approximately 18,826 acres. The lease modification for COC-37210 contains approximately 1.26 % of the Terror Creek watershed and lease COC-61209 contains approximately 1.43 %, for a total of 2.69% (502 acres). The West Fork of Terror Creek is a perennial stream located on the lease modification tract for lease COC-61209.

CDPHE-Water Quality Control Commission (WQCC) (CDPHE, 2010b) classifies beneficial uses for the waters of the Terror Creek drainage on BLM-managed lands as Aquatic Life Cold 1, Recreation P, Water Supply, and Agricultural (CDPHE, 2010b). The Clean Water Act requires states to compile a list of waterbodies, known as the 303(d) list, that do not fully support their beneficial uses. Terror Creek is not identified on the 303(d) list or 305(b) report that the CDPHE provides to EPA under the Clean Water Act. Those documents identify impaired streams, i.e. those that do not meet water quality standards for the designated uses. However, Terror Creek drainage is tributary to the North Fork of the Gunnison River, which is listed on the 2010 303(d) list for selenium (CDPHE, 2010c). According to the most recent update to the Colorado 305(b) report, the leading cause of impairment in Colorado rivers is metals and specifically selenium derived from marine shales (CDPHE, 2010d).
The North Fork Coal EIS, FS and BLM, 2000 noted that surface water quality in streams that drain the Iron Point Coal Lease Tract area is relatively consistent, with only a few exceptions. Generally, flows in Hubbard and Terror creeks, and the North Fork of the Gunnison River, are calcium bicarbonate type water. Four stations: Iron Point Gulch (D34-12), Dove Gulch (D34-15), Lower Freeman Gulch (Free-low), and Lower Stevens Gulch (Steph-low) are calcium/sodium bicarbonate type with high concentrations of TDS. Metals concentrations at these four stations were below detection limits or within the state standards for total iron, manganese, and selenium with one exception; the Dove Gulch station had a concentration of total iron that slightly exceeded the standard in July 1998.

Regional water resources are also summarized in the LHA for the North Fork Area which describes the water sources in the lease modification areas as meeting Land Health Standard 5 (BLM, 2007).

Groundwater. Groundwater resources within the area are primarily associated with alluvial deposits, and the direction of flow follows local topography. Generally, this groundwater resource is of good quality, and is used for both human consumption and agricultural purposes. There are no groundwater wells within the proposed lease modification areas (CDNR, 2011).

There is some groundwater associated with bedrock formations; specifically, Mancos and Mesa Verde Formations. This analysis focuses on the Mesa Verde Formation because this is the formation in which mining activity would occur. Groundwater resources associated with this formation are minimal to moderate and are primarily associated with sandstone members of the formation. Groundwater flow typically follows the dip (5 degrees) of the bed, which trends to the northeast. Groundwater quantities are higher down-bed and lower near outcrops.

Historically, the Bowie No. 2 Mine has encountered very little water in its B-Seam workings (the area where mining is currently taking place). This is due, in part, to the mine's proximity to the formation's outcrop. Groundwater that has been encountered has been within perched water bearing zones associated with sandstones, and has been of limited extent. All groundwater intercepted during mining activities either by removing the coal or subsidence is currently being pumped into mined out portions of the mine, a practice that would continue to occur if mining of the lease modification tracts takes place.

Environmental Consequences/Mitigation Measures

Proposed Action

Surface-disturbing activities associated with the drilling of GVBs would result in no direct impacts to surface waters; however, activities could indirectly result in increased amounts of sediment being deposited into surface waters due to increased erosion resulting from clearing and grading of GVB pads and the construction and use of access roads. These impacts would be mitigated by BMPs employed during construction of pads and roads (such as sediment control barriers and dust abatement). Impacts would be mainly short-term, as roads and pads would be reclaimed after construction.

No impacts to local perennial streams or aquatic wildlife are expected as a result of the implementation of the Proposed Action. The depletions of surface flows discussed in the Threatened, Endangered, and Sensitive Species section would impact the North Fork of the Gunnison River.

Terror Creek is approximately 490 feet from the closest longwall mining that would occur if the lease modifications were approved. Given a worst-case overburden depth of 600 feet, with an angle of draw of 25 degrees, the effects of surface subsidence are projected to extend approximately 250 feet from the longwall panel (BLM, 2000). In 2003, the U.S. Geological Survey completed a study of the streamflow gain-loss in a reach of Terror Creek, in the vicinity of the current and future mining. The study utilized tracer techniques and also incorporated other streamflow gauges, etc. in the study area. The study did not note any significant gains or losses of streamflow in the study reach. Through personnel communication with Art Etter, project engineer for Bowie, as Bowie constructed the entry mains under Terror Creek and began to mine west of the creek they found that the B seam is essentially dry (Etter 2012). Therefore, it is unlikely there would be any subsidence-related disturbance to the flows in Terror Creek, and no impacts to surface water, Endangered, Threatened, or Sensitive fish species or their habitat.

Subsidence would occur in areas above and adjacent to longwall mining. The amount of subsidence would depend upon many factors, including mine plans, coal seam thickness,

geologic strata, and overburden depth. Within the lease modification areas, overburden depth is greater than 1,000 feet, but less than 2,300 feet, and the maximum subsidence would be expected to be about 6 feet (see Geology and Minerals). Subsidence would be most noticeable on ridges and steeper slopes. Tension cracks may appear in bedrock outcrops, on steep slopes, and at the edges of subsidence. These cracks would result from shifts in the relative position of surface materials, and would have no connection to the fracture zone above the gob. Tension cracks could be comparatively deep and conspicuous in bedrock; however, they would not extend deeply below the surface. Tension cracks would not result in any potential drainage of surface water to the gob or contamination of surface water.

Subsidence from mining could alter surface water hydrology by altering surface water drainage patterns. As discussed above, there is little connection between groundwater flow regimes and surface water hydrology within this area, and no indirect impacts are anticipated. Subsidence under surface-water drainages could result in minor changes in channel morphology and gradient, thereby temporarily impacting water quality by inducing minor cutting, pooling, soil erosion, and sedimentation. Surface-tension cracks have the potential to develop within the surrounding surface drainages, which would result in an initial period of erosion and sedimentation after initial periods of run-off after subsidence occurs. Surface-tension cracks would be small and discontinuous, and would not result in any extensive rechanneling or draining of the stream channels. The potential for larger surface fractures to develop in drainages where unconsolidated materials occur would be partially mitigated by the ductile nature of the unconsolidated alluvium and colluvium. Settling and tension cracking of the surface would not impact surface water quantity, and would result in only local and short-term impacts to water quality.

Water discharge from the mine into 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 total dissolved solids (TDS), iron, manganese, and sulfate could be constituents likely to increase. All groundwater intercepted during mining activities either by removing the coal or subsidence is currently being pumped into mined out portions of the mine, a practice that would continue to occur if mining of the lease modification tracts takes place.

The GVB drilling activity is not expected to cause impacts to either surface or groundwater in the project area. Mitigation measures associated with soils, hazardous materials, and the Threatened greenback cutthroat trout would be sufficient to protect the water quality in the West Fork of Terror Creek. The potential effects on groundwater as a result of coal mining that is already authorized, or occurring, on the adjacent leases would not be expected to change as a consequence of mining the sections of longwall proposed for the lease modification tracts.

Mitigation

See Threatened, Endangered, and Sensitive Species- Greenback Cutthroat Trout section.

Finding on the Public Land Health Standard for Water Quality

The proposed lease modifications are identified as meeting Public Land Health Standard 5 for water quality (BLM, 2007). Aquatic habitat is present in Terror Creek and its tributaries. Greenback cutthroat trout are known to be present in the East and West Forks of Terror Creek and are believed to be present in Terror Creek. This species is discussed in the Endangered Species section of this document. It is likely that additional species are present. Aquatic habitat in Terror Creek is believed to be in good condition, well shaded by riparian vegetation, with stable banks, and a stable substrate. Approximately 3,106 linear feet of the West Fork of Terror Creek is contained within the proposed lease modification for COC-61209. Current mine plans do not contain surface or subsurface disturbance under the West Fork of Terror Creek. Final locations for the drill pads have not been identified, but would be at least 200 feet from any delineated wetland or riparian area. The public lands within the proposed lease modification areas would continue to meet the Standards for healthy aquatic plant and animal communities after implementation of the Proposed Action.

No Action Alternative

No surface or groundwater quality impacts would occur as a result of coal mining on the lease modification tracts. However, water intercepted during mining activities would continue to be pumped into mined-out portions of the mine.

WASTES, HAZARDOUS OR SOLID

Affected Environment

The equipment and materials needed under the Proposed Action have low potential for accidental spill of regulated or hazardous waste substance release. These materials include motor fuel and drilling fluids (bentonite and benign soaps). Bowie would maintain all of the appropriate Material Safety Data Sheets (MSDS) for all chemicals, compounds, and substances to be used during project activities.

Environmental Consequences/Mitigation Measures

Proposed Action

Impacts to the environment resulting from the release of hazardous or solid waste are not expected. The potential for impacts resulting from substance release would depend upon the responsible use of chemicals, and the immediate containment and adequate clean-up in the event of unintentional releases. The potential for exposure to hazardous or solid wastes would be low and short-term during drilling activities. Spill kits would be located onsite, which would be used in the case of an accidental spill in order to assist in rapid clean-up. Additionally, appropriate secondary containment would be utilized for all hazardous chemicals.

Mitigation

None.

No Action Alternative

Under the No Action Alternative, there would be no impacts associated with hazardous or solid wastes from the proposed lease modification tracts.

ENVIRONMENTAL JUSTICE

Affected Environment

Executive Order No. 12898 on Environmental Justice, regarding how federal actions may impact minority and low-income populations, was issued on February 11, 1994. The purpose of the order is to identify and address, as appropriate, disproportionately high and adverse human health and environmental impacts resulting from programs, policies, or activities on minority or low-income populations. U.S. Census Bureau summary data for Gunnison and Delta Counties (U.S. Census Bureau, 2008a and 2008b), and 2000 Census data for Census Tract 9639 in Gunnison County (U.S. Census Bureau, 2009), do not indicate that there are ethnic groups or communities or low-income populations within the upper drainage of the North Fork of the Gunnison River area, or in adjacent portions of Delta County that may be impacted by changes in employment at the mine. There are no low-income or minority populations that could be disproportionately impacted by the Proposed Action.

Environmental Consequences/Mitigation Measures

Proposed Action

There are no environmental consequences associated with Environmental Justice under the Proposed Action, as operations in the lease modification areas would be continued as currently being conducted at the Bowie No. 2 Mine.

Mitigation

None.

No Action Alternative

Under the No Action Alternative, there would be no disproportionate negative impacts to minority and low-income populations.

ACCESS AND TRANSPORTATION

Affected Environment

The surface facilities of the Bowie No. 2 operation are accessed from old State Highway 133, approximately 1 mile from a junction between old State Highway 133 and the relocated section of State Highway 133. This junction is approximately 3 miles east of the community of Paonia.

Access to the proposed lease modifications is by two roads. The Terror Creek road is an unsurfaced road that takes off from Colorado highway 133 on private land, proceeds up Terror Creek on to BLM land, and continues on to USFS lands. The Terror Creek road does not enter the proposed lease tract COC-61209 but would provide access to the GVBs associated with that tract. Bowie has acquired a BLM right-of-way (see Realty Authorizations section) for that

portion of the road on BLM lands. This is not a public road and has limited access due to locked gates.

The Bowie No. 1 Mine and proposed lease tract COC-37210 is accessed from Paonia by the Stevens Gulch public road, which is initially a Delta County road, and is an asphalt all-weather, two-lane road to the entrances of the Bowie No. 1 Mine (approximately 2.5 miles). Beyond the turnoff to the mine, the Stevens Gulch public road is no longer a county road but is an unpaved gravel road (FS road # 701) leading to the Gunnison National Forest (GNF). Delta County maintains the road under agreement with the GNF. The GNF has acquired easements through the private land for the public to access the National Forest. The road is not maintained through the National Forest in the winter but is used for snowmobile and other winter access. The overall condition of the Stevens Gulch public road should be considered as fair, and it requires routine maintenance. The road continues through the proposed lease tract and continues onto the Gunnison National Forest.

Several other roads have been constructed for past coal exploration activities within the proposed lease modifications. These roads have been reclaimed and do not currently serve as access routes into the proposed lease modifications, but would be re-opened to serve the project as access to GVBs sites. Gates would be placed on these temporary roads to prevent public access, and reclamation would be accomplished when the GVBs sites are no longer needed.
Transportation of mined coal would occur entirely underground on the proposed lease modification areas. As underground mining advances, conveyor belt lines would be extended to the working faces serving as an extension of the existing coal conveyance system. The coal would arrive at the surface to be handled by the existing coal handling facilities at the Bowie No. 2 Mine and loaded primarily on trains for delivery.

A very small quantity of coal would be hauled by truck locally in the North Fork Valley. The North Fork Coal EIS, FS and BLM, 2000 did a comprehensive analysis of the truck and train transportation in association with the operations of the mining activities. Transportation of the coal to the rail system is by a conveyor system. This EA is tiered to the analysis in the North Fork Coal EIS, FS and BLM, 2000.

Environmental Consequences/Mitigation Measures

Proposed Action
The Proposed Action is expected to result in only a minor and temporary impact on access to the proposed lease modification areas. GVB activities would result in the reopening of approximately 1 mile of reclaimed access roads and the construction of approximately 0.2 mile of new access roads on BLM-managed lands. These roads would remain open during the mining operations for access by light-duty trucks for regular inspections and maintenance of the GVBs. Both the new access roads and the reopened roads would be reclaimed after mining activities are completed. Roads constructed or reopened for GVB drilling would be kept closed to the public during GVB drilling and operation and appropriate signage would be used. Activities associated with the Proposed Action would not impact current public access to the proposed lease modification tracts.

Two longwall units are proposed under the Stevens Gulch public road. Longwall units B21 and B22 both pass under the Stevens Gulch public road. The overburden range for the panels is from 1,750 feet to 2,150 feet. At that depth there would be measurable subsidence but no visible surface cracking (see Geology and Minerals). Therefore, it is expected that there would be no subsidence-related disturbance to the public road in Stevens Gulch. Mitigation may be appropriate to ensure that impacts do not occur to the road.

The Proposed Action impacts from train transportation in association with the operations of the mining activities are expected to be within the impacts evaluated in the North Fork Coal EIS, FS and BLM, 2000. This evaluation concluded that the Proposed Action would not result in significant effects beyond the range of effects already analyzed. The proposed transportation of the coal product was analyzed within the North Fork Coal EIS (BLM, 2000) and presents no significant change to the federal action within that analysis.

Mitigation

Stevens Gulch public road would be protected from surface disturbance and subsidence due to mining by the following lease stipulation:

- No mining related disturbance would occur within 100 feet of the outside line of the right-of-way of Stevens Gulch public road. The angle of draw used to protect the road from subsidence would be dictated by the approved Colorado DMG Mining and Reclamation Plan (the estimated angle of draw is conservatively estimated to be 25 degrees). However, mining-related disturbance may occur if, after public notice and the 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 would be protected.

No Action Alternative

Under the No Action Alternative, there would be no new road construction and no reopening of existing reclaimed roads associated with the lease modification areas; therefore, there would be no impacts on access and transportation within the proposed lease modification areas.

REALTY AUTHORIZATIONS

Affected Environment

There are three existing rights-of-way on public lands within the lease modification area for tract COC-61209 (BLM, 2011).

- Right-of-way COC-66873 is an access road to Bowie Resources LLC for their mining operations.
- Right-of-way COC-22713, held by the WAPA, is a 125-foot wide right-of-way for an electrical transmission line with a capacity up to 345 kV.
- The third right-of-way, COC-44585, is for a stream gage monitoring station to Bowie Resources.

An additional public use, located on private land, includes the Pitkin Mesa Pipeline which is west of the Stevens Gulch road. The pipeline crosses approximately 410 feet of the proposed lease modification for COC-37210. The original pipeline was built in 1938 and it collects water

from a series of springs located north of the proposed lease tracts on the National Forest. During various times the original pipeline (4-inch diameter steel) has been replaced by a 6-inch diameter PVC pipeline. The pipeline services approximately 160 domestic water taps on Pitkin Mesa.

Environmental Consequences/Mitigation Measures

Proposed Action

Subsidence effects on the 230/345 kV WAPA transmission line is unlikely. The worst-case angle of draw for subsidence effects from longwall mining would be 25 degrees (BLM, 2000). Table 17 provides specific details on the potential subsidence effects to the three WAPA towers. Given the distance of the three towers from the possible subsidence, no impacts are anticipated. There is a potential for impacts to the 230/345 kV WAPA transmission line as a consequence of drilling equipment interference with overhead transmission lines or right-of-way access roads from surface drilling operations. There is minimal potential for any impact on future realty actions on BLM-managed lands.

Table 17
Potential Subsidence Effects to WAPA Towers

WAPA 230 KV Electrical Tower (north to south)	Depth of overburden for longwall B 20 nearest the tower (feet)	Surface expression of subsidence (using worst-case 25^0 angle of draw) (feet)	Distance between tower and surface expression of subsidence (feet)
4	1,060	447	170
5	1,160	461	135
6	1,140	452	371

Mitigation

BLM would require Bowie to implement the following mitigation measures:

- Electrical safety clearances addressed in the Code of Federal Regulations, 29 CFR 1910.333(c) (3) must be maintained at all times.
- All vehicles, equipment, and/or machinery or other materials near the Right-of-Way must be properly grounded. In order to avoid static or induced electrical hazards no materials may be stored in the transmission line Right-of-Way.
- If future longwall mining would come within 100 feet of any transmission line tower foundation, a structural review and acceptance by WAPA would be required.
- Any drilling activities within WAPA's right-of-way must be approved by WAPA in advance. Safety provisions would be provided to ensure there are no conflicts with WAPA's transmission line or access.
- Bowie is required to coordinate with WAPA's operations center located in Western Rocky Mountain Region Office in Loveland, Colorado at least two weeks prior to commencement of any work beneath or adjacent to the transmission line.
- Roads used to provide personnel and equipment access to WAPA's facilities cannot be restricted or impaired in a way that denies access. Alternate access must be provided if an access road is blocked or damaged. Damage to WAPA's access roads must be repaired by Bowie or Bowie's contractor.
- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and

extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining related surface disturbance would occur within 100 feet of the outside line of the power line right-of-way without a written finding from the Authorized Officer and consultation with the right-of-way holder. These techniques would provide for maximum coal removal while insuring that sufficient coal is left in place to prevent subsidence.

- The applicant plans to mitigate the risk of damage to the Pitkin Mesa pipeline by installing a 6-inch diameter heat fusible high density polyethylene pipe (HDPE) on the surface above the existing buried PVC pipe through the projected zone of subsidence. The new HDPE pipe would be joined to the existing PVC pipe outside the projected zone of subsidence. Two years after mining the HDPE pipe would be buried adjacent to the existing PVC pipe.

No Action Alternative

There would be no impacts to current or future realty authorizations in the project area.

WILDFIRE

Affected Environment

Warm, dry summers experienced in the proposed lease modification areas contribute to a moderate to high risk of wildfire, depending upon specific meteorological conditions. There are no known recent wildfires within the proposed lease modification areas or immediate vicinity.

Environmental Consequences/Mitigation Measures

Proposed Action

Potential wildfire hazards resulting from the implementation of the Proposed Action would be low to moderate. Drilling crews would be equipped with appropriate fire-suppression devices designed to respond to project-related fire starts. Equipment would only be operated on roads and drill pads, which would reduce the risk of fire ignition resulting from vehicle use. Drilling crews would have access to telephones to facilitate calls to Montrose Fire Dispatch in order to report naturally occurring wildfires.

Mitigation

None.

No Action Alternative

Under the No Action Alternative, there would be no project-related impacts to the risk of wildfire.

HYDROLOGY/WATER RIGHTS

Affected Environment

Table 18 provides a description of the water rights associated with the two lease modification tracts.

Table 18
Water Rights Associated with the Project

Location	Qtr/Qtr	Water Source	Water Right Name	Water Right ID	Structure	Uses
Proposed Lease modification COC-37210 - 6 surface water rights						
13S 92W Section 1	NWSW	N Fork Gunnison River	BM Spring	2677	Spring	Stock
	NWSW	N Fork Gunnison River	D M Spring	2678	Spring	Stock
	NWSW	N Fork Gunnison River	J M Spring	2676	Spring	Stock
	NW	Terror Creek	Pitkin Mesa Pipeline	2737	Spring, Pipeline	Domestic
	NW	Terror Creek	Pitkin Mesa Pipeline	1191	Spring, Pipeline	Irrigation, Stock, Domestic
	NWSW	Terror Creek	Stratton Springs 1, 2, 3 Pond	1782	Ditch, Spring	Stock, Domestic, Recreation
Proposed lease modification COC-61209 - 3 surface water rights						
13S 91W Section 5	SWSW	Terror Creek	Borrow Spring Pipeline	1547	Pipeline	Domestic, Recreation, Stock
	NWNW	Terror Creek	Hughes Family Pipeline & Spring	6241	Spring, Pipeline	Domestic, Stock, Wildlife
	NWNE	N Fork Gunnison River	Reds Spring and Pipeline	6222	Pipeline	Domestic, Stock, Wildlife
Source: CDNR, 2011.						

Environmental Consequences/Mitigation Measures

Proposed Action

Longwall units B21 and B22 pass under three springs and ponds in lease tract COC-37210. The overburden range for the panels is from 1,750 feet to 2,150 feet. At that depth there would be measurable subsidence but no visible surface cracking (see Geology and Minerals). Therefore, there would be no subsidence related disturbance to the springs and ponds.

Mitigation Measures

Mitigation measures for water rights are normally addressed as part of the DRMS mine plan review process.

No Action Alternative

Under the No Action Alternative, there would be no project-related impacts to water rights or hydrologic resources.

NOISE

Affected Environment

Noise has 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.

The secondary impact associated with noise is the nuisance effects of noise that include interference with speech, unsettling environment at home, work, recreation and other natural environment disruptions. Background noise levels vary greatly due to location and distance from working equipment. 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 some cases relatively a small increase in noise levels caused by mechanical equipment would be noticeable.

Environmental Consequences/Mitigation Measures

Proposed Action

From the surface, the mining of the coal does not create any noise disturbance. However, the noise generated from construction and drilling equipment in adjacent areas would be noticeable. Typically, the noise emissions as a result of adjacent surface facilities for the underground mines are not expected to be a general nuisance to nearby towns and residents or on the lease modification areas. The Bowie No. 2 surface facilities are located three miles from the community of Paonia, and noise control measures include maintenance of existing equipment and screening to contain, or deflect, noise. Impacts would occur locally associated with GVB well pump operations on the lease modification areas. It is possible that under certain meteorological conditions with quiet background, that noise from the surface facilities of the mine could be audible approximately 2 miles away (USFS, 2011). Most of the noise from the surface facilities at the mine would be blocked by topographic features.

Mitigation

Noise reduction mitigation would be utilized on the individual GVB pumps to reduce impacts from their operation and comply with state and Federal standards.

No Action Alternative

There would be no additional noise impacts in the project area from activities associated with the lease modifications if they are not issued.

RECREATION

Affected Environment

The vicinity of the proposed lease modifications provides dispersed, unstructured recreational use and opportunities. There are no developed recreational facilities (such as campgrounds) in the vicinity. The BLM allows year-round motorized and non-motorized recreational activities.

Primary recreational activities available to the public within the proposed lease modification areas include big game hunting, camping, and other dispersed recreation. Big game and mountain lion hunting is a seasonal activity, with calendar-specific hunting periods for mountain lion, deer, elk, and bear.

Environmental Consequences/Mitigation Measures

Proposed Action

Under the Proposed Action, dispersed recreation activities would likely be impacted during the proposed construction period. The general disturbance of the proposed lease modifications would likely temporarily lessen the potential for recreational use within the proposed lease modification areas and the immediate surroundings. Recreational use of lands within active operational portions of the proposed lease modifications would temporarily be displaced until completion of activities.

Adverse indirect impacts on the recreational experience near the proposed lease modifications, including hunting, hiking, camping, biking, and birding, would possibly be caused by elevated noise levels and a general increase in human activity and traffic stemming from construction activity. Elevated noise levels during construction would be temporary and would diminish with distance from the construction sites. As a whole, impacts to recreation would be localized and short-term.

Mitigation

None.

No Action Alternative

Under the No Action Alternative, there would be no project-related impacts to recreation resources if the lease modifications were not issued.

VISUAL RESOURCE MANAGEMENT

Affected Environment

The characteristic landscape consists of low rolling hills and steep-sided creek drainages vegetated with low-growing piñon, juniper, oak brush, sagebrush, and grasses. Most of the landscape within the proposed lease appears natural and undeveloped in character, and is composed primarily of scenery that is common for the region. The only visible existing mine facilities within, or near, the proposed lease are located 3 miles east of Paonia, and consist of the rail loadout and other surface facilities. These are readily visible within foreground views (less than 3 miles from viewpoint) of residents and motorists on State Highway 133.

The primary sensitive viewing area is State Highway 133 and the community of Paonia. Some motorists exposed to the landscapes would have a concern for scenic quality, and would be sensitive to modifications to the landscape. With the exception of dispersed recreation activities (primarily hunting and camping), the public does not visit other areas within, or near, the proposed leases. Most of the tracts are on upper slopes and relatively level terraces that are more

than 1,000 feet higher in elevation than Paonia and the highway, and are not within the viewsheds.

The BLM has inventoried visual resources within the area with the Visual Resource Management (VRM) system. The BLM recently conducted an updated visual resource management inventory. The proposed affected area falls within a Class III objective in the inventory. Class III objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. In the Uncompahgre RMP, the proposed lease tracts are in BLM's Management Area 7. The RMP does not provide management direction for Management Area 7, which is managed primarily for coal development.

Environmental Consequences/Mitigation Measures

Proposed Action

Short-term impacts to the visual character of the landscape would result from drill pad construction, GVB drilling, and associated construction of ancillary facilities (such as access roads). These impacts would be temporary, and would not occur within the viewshed of sensitive viewpoints. The dust from construction activities, and the sight of vehicles on access roads used for the transport of equipment and workers, would be visible until construction activities are completed.

Long-term impacts associated with the implementation of the Proposed Action would result from the addition of temporary wellhead structures to the landscape and from the operation of ventilation pumps. The surface disturbance and aboveground facilities associated with the project would be located on flat terraces or on drainage slopes that do not face towards the highway or toward Paonia. All surface facilities would be higher in elevation than the viewpoints, with a very low profile that would not intrude into viewsheds. Access to most of the drill pads would be on existing access roads. The new access road would not be visible from any viewpoint. It is anticipated that there would be minimal to no cut-and-fill slopes at drill pads that would face towards sensitive viewing areas.

Mitigation

All aboveground long-term facilities shall be painted with a BLM-approved standard environmental color.

No Action Alternative

Under the No Action Alternative, there would be no project-related impacts to visual resources.

GEOLOGY AND MINERALS

Affected Environment

General Geology. The proposed lease modification area is located on the lower southern slopes of the Grand Mesa, in the Paonia-Somerset coal field which contains medium to high coal development potential deposits (BLM, 2000). The modification area resides on Quaternary Alluvium (Holocene Soil-creep deposits and Holocene-Pleistocene colluvial deposits) and the Cretaceous Mesa Verde Formation (Junge, 1978a). The Mesa Verde Formation consists of sandstone interbedded with dark gray shales, where coal beds are found in the two major members (Bowie Shale Member, Paonia Shale Member) (Stewart et al., 2006).

Table 19 provides a description of the geologic resources within the proposed lease modification areas. In addition to the geologic units described below, isolated igneous intrusions, which compromise the quality of adjacent coals, are present in the vicinity of the proposed lease modification areas (USFS and BLM, 2000). No faults are known within the proposed lease areas but they could be present.

Table 19
Stratigraphy of Proposed Leases

Geologic Unit		Geologic Period	Description
Alluvium and Colluvium		Quaternary	Unconsolidated soil and rock formed by mass wasting processes or by weathering of intact bedrock.
Wasatch Formation		Tertiary	Red and buff sandstones, and mudstones deposited in alluvial floodplains and stream channels (this formation contains abundant vertebrate fossils and outcrops commonly found throughout the region).
Mesa Verde Group	Ohio Creek Member	Cretaceous	Fluvial conglomerate often used as a local stratigraphic datum.
	Barren Member		Up to 2,300 feet of interbedded sandstones, shales, siltstones, and coals deposited during the final regression of the Western Interior Seaway. Mesa Verde sandstones are common natural gas reservoirs targeted for production to the northwest in Mesa and Garfield Counties. Coal Seams A, B, and C are found near the base of the Lower Coal Member; the D- and E-Seams are found in the base of the Upper Coal Member; the F-Seam is located at the top of the Upper Coal Member. Portions of the Mesa Verde Formation, including coal seams, do outcrop within the Proposed lease.
	Upper Coal Member		
	Lower Coal Member		
	Rollins Sandstone		
Mancos Formation			Up to 4,000 feet of marine shales (this formation does not outcrop within the Proposed lease, but is exposed west of Somerset along the North Fork of the Gunnison River).

The surface geology in the area of proposed leasing is Mesa Verde on the northern tip, grading to Holocene Soil-creep deposits. The Soil-creep deposits are mixtures of sand, silt, and clay with rock fragments. These deposits are characterized by a series of small swales and ridges, and are generally a sign of unstable slopes.

The Cretaceous Mesa Verde Formation is the surface unit in part, and lies below the alluvium in

part of the proposed leasing area. The Mesa Verde is the coal bearing formation in the general region and the target of mining in the project area. The top of the Mesa Verde is approximately 0-400 feet below surface. Extensive burn zones exist in the Mesa Verde (Stewart et al., 2006). This is evidenced in the region where the Mesa Verde outcrops as red colored shale and can be seen along Highway 133, which gives access to Terror Creek Road (Chronic and Williams, 2002). The Mesa Verde is above the Mancos Shale which is a regionally extensive bed of marine shales ranging up to 4,000 feet in thickness (Tweto, 1979). The regional geology was described in detail in the North Fork Coal EIS, FS and BLM, 2000.

Geologic hazards are defined in the lease modification areas as potentially unstable and unstable slopes, and rockfall areas. The area of proposed leasing rests upon potentially unstable slopes, which means that past or present mass movement is not apparent (Junge, 1978b).

A portion of federal oil and gas lease (serial number COC64766) held by Gunnison Energy Corp. overlaps the coal lease modification tract COC37210 in T.13 S., R. 92 W., Section 1: SWNW, lots 8 and 9, 6th PM. This lease expires on 04/19/2013.

According to the Colorado Oil and Gas Conservation Commission, there have been no oil and gas wells drilled and/or abandoned in the proposed lease development area.

Past oil and gas activity within the region has included coal-bed methane wells, shale wells, and coal mine methane wells. The wells within approximately 20 miles of the lease modification areas include;

- 56 total wells drilled on private surface (25), split-estate wells (11), Forest Service (20), and no BLM wells.
- 20 wells are producing and 31 are shut-in.
- Total disturbance includes:
  - Well pads - approximately 127.5 acres.
  - Pipelines - approximately 76.4 acres.
  - Roads - approximately 129.6 acres
  - Facilities – approximately 48.11 acres
  - Total disturbance – 381.61 acres (average disturbance per well – 6.8 acres)

Environmental Consequences/Mitigation Measures

Proposed Action

The Proposed Action could result in the production of approximately 3.25 million recoverable tons of coal that would otherwise be bypassed. There is the possibility of subsidence issues during mining by longwall techniques. Subsidence is the gradual lowering of the surface after the large rectangular blocks of coal are removed from the longwall mining panels. It is common that after coal recovery, the overburden could be altered due to subsidence. Shallow overburden results in greater vertical lowering of the surface over longwall mining areas. Data from the Bowie No. 1 Mine and field measurements of subsidence cracks in the Mesaverde Formation by Dunrud (1976) indicate subsidence cracks may develop through overburden thicknesses of up to 800 feet under unfavorable conditions. While unfavorable conditions cannot be defined exactly, they may include zones of weathered coal and overburden. Overburden thicknesses over 800

feet have been classified as having a negligible risk of surface fracturing developing. This is a conservative upper limit under normal conditions.

This analysis of subsidence is tiered to the North Fork Coal EIS, FS and BLM, 2000 in Appendix K "Subsidence Evaluation," and in Chapter 3.2 under the analysis of Topography/Physiography. That EIS document addresses the west tract which is known as the Iron Point Coal Tract and assigned tract serial number COC-61209. That EIS also provides guidance in assessing potential subsidence in the proposed leases. The longwall panel design, and yield and gate road pillar design and configuration are similar to those used in the Iron Point Coal Tract. None of the underlying coal seams has been mined within the proposed lease modification areas; therefore, subsidence amounts are reported for mining in undisturbed ground.

Roof rocks primarily consisting of strong, thick sandstones of the Mesa Verde Group would cave into the mine in larger blocks than would shale roof rocks, and would reduce the height of caving above the mine workings. These sandstones would generally reduce the amount of subsidence compared to shale. Sandstones at the surface would have larger displacements, and may form cracks up to 1 foot wide and 25 to 50 feet deep on steep slopes. Formation of joints and fractures on steep slopes may contribute to slope instability and susceptibility to landslides and rockfalls.
At overburden depths greater than 1,000 to 1,500 feet, gate road pillars would yield to the level of recompacted, caved, and broken rock in the longwall panel. This range of depths would be common within the proposed lease modification areas.

The values reported in Table 20 are calculated for undisturbed areas and an average D-Seam mining thickness of 12 feet and a panel width of 800 feet. On average, the maximum amount of subsidence is projected to be approximately 0.6 times the mining thickness.

Table 20
Anticipated Subsidence Values within the Proposed Leases

Maximum Subsidence Parameters				
Overburden Depth (feet)	**Vertical Displacement (feet)**	**Maximum Tilt (percent)**	**Horizontal Tensile Strain (percent)**	**Horizontal Compressive Strain (percent)**
100-250	7.2	21.6 – 8.6	7.2 – 2.9	7.2 – 2.9
250-500	7.2	8.6 – 4.3	2.9 – 1.4	2.6 – 1.3
500-1,000	7.2 – 6.0	4.3 – 1.8	1.4 – 0.6	1.3 – 0.7
1,000-1,500	6.0 – 4.1	1.8 – 0.8	0.6 – 0.3	0.7 – 0.5
1,500-2,000	4.1 – 2.4	0.8 – 0.4	0.3 – 0.15	0.5 – 0.3
2,000-2,500	2.4 – 1.6	0.4 – 0.2	0.15 – 0.1	0.3 – 0.15
Note: Modified from USFS and BLM, 2000.				

In the DRMS permit area, Bowie has segregated the mine area into three zones of expected subsidence impact. The zone of greatest subsidence impact is in areas where the overburden is between 110 and 500 feet. The zone of intermediate subsidence impact is in areas where the overburden is between 500 and 1,000 feet. The zone of minor subsidence impact is in areas where the overburden is over 1,000 feet. Under normal conditions, subsidence cracks do not appear likely to propagate through more than 500 feet of overburden.

The overburden range for both lease modification areas is from 1,000 feet to 2,150 feet. The east side of the COC-61209 lease modification has the shallower 1,000 feet of overburden but gains overburden rather quickly, climbing out of the drainages. At that depth there would be measurable subsidence but no visible surface cracking (Bowie, 2011). Assuming a coal seam thickness of 12 feet, surface lowering after longwall mining could vary from 6 to 8 feet (BLM, 2000). Based on the information contained in the North Fork Coal EIS, FS and BLM, 2000, the mining is unlikely to result in detectable surface subsidence impacts.

Geologic Hazards. Generally, potential geologic hazards include landslides, frost heaves, and seismic activity related to known or suspected active faults. Landslides and rockfall represent the geologic hazards within the proposed lease modification areas. Some landslides have occurred within the proposed lease modification areas during the past 30 years (mainly as a result of higher-than-average precipitation during the 1980's). Some of these landslides occurred as reactivations of previously disturbed slopes, and some were new movements. Rockfall-prone areas occur in the western portion of the study area, as do less-extensive areas of unstable slopes.

Other Geologic Resources. Other mineral resources in the area include oil and gas leasing and perhaps interest in coal bed methane. Impacts to the oil and gas resources are not expected to occur as result of the Proposed Action.

Mitigation

The Colorado DRMS 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 (DRMS, 2010). These regulations have been in force for Colorado since 1980 and would serve as mitigation for future mining on the proposed lease modification areas.

As required by DRMS, a subsidence monitoring survey network was established in May 1999 (Cragg Surveying, 2010), and new monitoring points may be added to the lease modification areas if mined. The subsidence monitoring of these points and others should help to mitigate subsidence during mining.

No Action Alternative

Under the No Action Alternative, there would be no project-related impacts to the geology of the area from subsidence, and the coal in the lease modification areas would remain in place.

PALEONTOLOGY

Affected Environment

Exposed bedrock within the proposed lease consists predominantly of the Cretaceous Mesa Verde Group. Residuum and colluvium of the Tertiary-age Wasatch Formation is also present. Both of these formations are ranked as Class 5 formations (very high potential to yield scientifically significant fossils) under the BLM's Potential Fossil Yield Classification (PFYC) System (DOE and BLM, 2008). Mammalian taxa are most common in the Wasatch Formation of the southern Piceance Basin, and include representatives of the following fossil orders: Pantodonta, Condylarthra, Primata, Taeniodontia, Multituberculata, Rodentia, Tillodontia, and

Perissodactyla (Lucas, 1998). Reptiles, amphibians, invertebrate, and plant fossils are also found in the Wasatch Formation. The Mesa Verde Group contains dinosaur, mammal, reptile, crocodile, turtle, invertebrate, and plant fossils (BLM, 2005).

Environmental Consequences/Mitigation Measures

Proposed Action

Under the Proposed Action, scientifically important paleontological resources could be destroyed during road and pad construction, as well as during GVB drilling. Coal, although the remains of ancient vegetation, is not considered a scientifically important fossil.

Mitigation

Mitigation measures for paleontological resources would include:

- If any paleontological resources are located during construction of the pads or roads, construction would stop and the BLM would be notified immediately.

No Action Alternative

There would be no impacts to paleontology resources in the project area.

SOCIOECONOMICS

Affected Environment

The area of influence for the social and economic elements of this EA includes Delta County in west central Colorado. Delta County is the area of influence for the population and demographic component because the majority of employees at the coal mining facilities and their families live within the communities in its jurisdiction.

The cumulative impact area would include Delta County. Baseline data for Delta County in the area of influence includes population and demographic data as well as current business and economic statistics information. The information in this section was obtained from the US Bureau of the Census based on the 2000 census and 2009 Census Bureau data (www.census.gov). Additional information was obtained from the Colorado Department of Local Affairs (CDOLA) State Demography Office (www.colorado.gov/cs/Satellite/DOLA-Main/).

Population. Table 21 presents basic population and demographic information for Delta County and the State of Colorado.

Table 21
Population by Category, 2000 and 2009, Delta County and the State of Colorado

Population	Delta County	Colorado
2000 2009 % Change	27,834 31,322 12.5%	4,302,015 5,024,748 16.8%
Male (2008)	49.8%	50.4%
Female (2008)	50.2%	49.6%
Under 5 years	5.8%	7.3%
Under 18 years	21.4%	24.4%
65 years and over	19.9%	10.3%
% Minority (2008)	16.4%	29%
% Below poverty (2008)	12.1%	11.2%
Source: US Census Bureau, 2008a.		

Delta County comprises 1,142 square miles with 24.4 people per square mile and a total population of 31,322 people in 2009. Delta County grew by almost 12.5% between 2000 and 2009. According to CDOLA, Delta County grew slower than the state but faster than the nation between 1970 and 2000, with an annual average growth rate of 2.7%. The median age in Delta County is 42.3 years with 21.4% of the population being under the age of 18 and almost 20% being 65 years or older. According to census data, over 80% of the people age 25 and older in Delta County have graduated from high school and just over 17% have graduated from college.

The Town of Delta is the largest town in Delta County with a 2000 population of 6,400, an increase of 75% since 1990. Other communities in the county include Cedaredge (2000 population of 1,854), Crawford (2000 population of 366), Hotchkiss (2000 population of 968), Orchard City (2000 population of 2,880), and Paonia (2000 population of 1,497). The 2009 US Census reports that there were 13,391 housing units in Delta County that housed 11,058 households, indicating a vacancy rate of approximately 17%. Only 3.7% of the vacant houses are classified as seasonal, recreational, or for occasional use. Approximately 8% of rental units were classified as vacant. There were 2.43 persons per household. Delta County had a home ownership rate of 77.5% in 2000, well above the state average of 67%. The median value of an owner occupied housing unit was $115,500, well below the state average of $166,600.

Economic Resources. Coal mining employment in Delta County in 2009 is estimated at approximately 1,000 employees (US Department of Commerce, 2012). The unemployment rate in Delta County in 2009 was 7%, much lower than the statewide average of 8.4% for the same period (http://www.bls.gov/lau/laucntycur14.txt).
In 2009, the Bowie No. 2 Mine employed an average of 305 full and part time workers with an annual payroll of approximately $28.3 million. Average mining wages in 2009 were more than twice the average wage for other employment sectors in the project area ($23,254) (Region 10 Review, 2003). The Bowie No. 2 Mine spends many dollars locally for materials, supplies, and services. In addition, the Bowie No. 2 contributes royalty and tax payments to the local and national economy.

Environmental Consequences/Mitigation Measures

Proposed Action
Assuming that the lease modifications are approved and the existing Bowie No. 2 Mine operations and facilities used, there would be no new or added employment at the Bowie No. 2 Mine. Mining the coal reserves in the lease modifications would increase the life of the mine. No additional demand for housing or municipal services would be anticipated. Mining operations would be extended throughout the period required to mine recoverable coal reserves. This extension of mining operations would also extend the annual payroll, local expenditures, and taxes and royalty payments for approximately one year. The federal government receives annual payments from coal lease holders based on rents at not less than $3.00 per acre. The rental rates are specified in the lease. Royalty payments are 8% of the value of the coal removed from an underground mine (43 C.F.R. § 3473). Royalties from the federal coal are distributed in the following way: 50% returns to the federal treasury in the general fund. The other 50% 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 CDOLA 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.

No Action Alternative
If the lease modifications were not approved and not offered for sale, coal mining at the Bowie No. 2 Mine would continue at existing rates until existing reserves are depleted. At that point, the mining employment sector would be terminated. An estimated 3.25 million recoverable tons of federal coal would be permanently bypassed. Reductions in jobs and associated salaries, local expenditures, royalty and tax payments would occur after the reserves are depleted. The federal government (US Treasury) would not receive the rents and royalties associated with mining the coal in the lease modifications.

CUMULATIVE IMPACTS

Cumulative impacts are the environmental impacts that could result from the implementation of the Proposed Action, when added to the impacts from all other past, present, and reasonably foreseeable activities, regardless of who is conducting such activities. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The cumulative effects analysis considers the geographic scope of the cumulative effects and past, present, and reasonably foreseeable actions. Geographic scope may vary by resource and will be described within that cumulative impacts section for that specific resource if different than that described below.
For this project that geographic scope is focused upon the expanded watershed area from east of the town of Delta, north to the Mesa/Delta County line, east to the Pitkin County boundary, then south and west along the watershed for the North Fork of the Gunnison River back towards the town of Delta. This area is approximately 566,700 acres in total with National Forest being 57% (322,400 acres), BLM 11% (61,150 acres), and private land 32% (182,150 acres). A portion of the private land has the mineral estate reserved to the United States in the patents.

Past Actions. The primary existing (past) disturbances within the proposed lease are associated

with mining, oil and gas, livestock grazing, and residential/agricultural development.

Historic mining activities over the past century include the following:

- Hawks Nest Mine;
- Oliver Mine No. 1 and No. 2;
- Bear Mine No. 1, No. 2, and No. 3;
- Edwards Mine;
- USS Steel Mine;
- Blue Ribbon Mine;
- King Mine;
- Farmers Mine;
- Oxbow Sanborn Creek; and
- Bowie No. 1 Mine (a.k.a. Orchard Valley Mine).

Past oil and gas activity within the region has included coal-bed methane wells and conventional gas wells. The wells within approximately 20 miles of the lease modification areas include:

- 56 total wells drilled. 25 are on private surface/private minerals; 11 are split-estate wells (private surface, federal minerals); 20 are on U.S. Forest Service surface; and no wells are on BLM surface.
- 20 wells are producing, 31 are capable of producing but are shut-in, and 5 are temporarily abandoned.
- Total disturbance includes:
  - Well pads – approximately 127.5 acres.
  - Pipelines – approximately 76.4 acres.
  - Roads – approximately 129.6 acres.
  - Facilities – approximately 48.1 acres.
  - Total disturbance – 381.6 acres (average disturbance per well – 6.8 acres).

Over the last century, there has been noticeable subsidence in a number of areas above the historic mines. However, there has been no known damage to overlying resources or to structures attributable to this subsidence. Subsidence may have aggravated or contributed to some landslide movements, but this is difficult to identify given the pre-mining instability of many areas of the valley.

Present Actions. Present actions are focused on mining, oil and gas, livestock grazing, and residential/ agricultural development.

<u>Mining</u>

The following table contains recent production data for the three coal mines in the North Fork Valley.

Raw Coal Production - North Fork Valley (NF) - BLM-UFO
1-Year Averages

Average based on:	Bowie No. 2	Elk Creek	West Elk	Totals (NF)
5 Year	2,808,556	4,378,814	5,721,944	12,909,314
1 Year	1,873,357	3,495,575	6,499,048	11,867,980
Periods end Sept. 30, 2011				

NOTE: The total yearly production for the NF is expected to remain about the same -- between 12 and 13 million tons. Each of these mining operations control coal reserves with a mix of Federal and fee coal; however, 90 percent or more of local production is Federal. As mining progresses, only Federal coal will be available in the reserve base.

- Bowie No. 2 was opened in 1997 as a room-and-pillar mine but converted to a longwall system in late 1999. It is located northeast of Paonia and is operated by Bowie Resources, LLC with a loadout northeast of Paonia.
- The Elk Creek Mine is a longwall operation north of Somerset, operated by Oxbow Mining, LLC, with a loadout immediately north of Somerset. There are 13,429 acres permitted.
- The West Elk Mine is a longwall operation located south and east of Somerset and is operated by Mountain Coal Company with a loadout about 1 mile east of Somerset. There are 17,155 acres permitted and the mine is about the 7th largest underground longwall coal mine in the U.S.

The North Fork Branch of the Union Pacific Railroad operates exclusively to serve these coal mines. This line branches from the main line in Grand Junction and passes through Delta, Hotchkiss, Paonia, and Somerset.

Oil and Gas Leasing

There are approximately 418,469 total acres of federal oil and gas mineral estate within the cumulative impacts area. Overall, there are 173,646 acres currently leased. This includes 54,580 acres of inventoried roadless areas which were leased prior to implementation of the 2001 USFS roadless rule. If these pre-2001 leases expire and are subsequently leased again, they will have surface use restrictions for whatever roadless rule may be in place. Approximately 124,192 unleased acres are within inventoried roadless areas which, due to on-going litigation, may have surface use restrictions related to road building if ever nominated for leasing. Approximately 120,631 acres of Federal oil and gas mineral estate remains available for nomination to be leased at this time.

Other

Historically, fruit orchards along the valley floor and low mesas have been important to the local Paonia economy. More recently, vineyards have replaced some orchards in the area.

- Sheep and cattle are grazed in pastureland around Paonia and also at higher elevations near the mining operations during the summer.
- There are a number of water storage reservoirs and canals around the North Fork Valley to serve agriculture and domestic uses.
- WAPA operates the Curecanti-Rifle 230/345 kV transmission line that parallels Terror Creek.
- Residential developments in the area around the communities of Paonia, Hotchkiss, Crawford, and Delta have been growing in population, with many new houses being built. Most of this development has been down-valley from the coal mines in broader portions of the North Fork Valley. This development has increased the traffic load and demand for maintenance on State Highway 133.
- There is little developed recreation in the area; however, the area is widely used for dispersed recreational activities, such as hunting, four-wheeling, hiking, picnicking,

horseback riding, snowmobiling, mountain biking and sight-seeing.
- Forest treatments timber sales have been limited in the area.

Reasonably Foreseeable Future Actions. Underground coal mining would continue in the North Fork Valley. In addition to existing coal leasing and exploration activities, the following are reasonably foreseeable future actions:

- Oxbow Mining, LLC (Elk Creek Mine) was granted a 786-acre lease by application with surface disturbance of approximately 5.63 acres on public lands and a 157-acre coal lease modification with no surface disturbance on the GMUG.
- Mountain Coal Company (West Elk Mine) applied to construct, operate, and reclaim up to 159 E Seam methane drainage well (MDWs) sites that would support 171 individual MDWs, and use or construction of approximately 26.1 miles of roads within the GMUG are in the final process of approval. Also, on August 2, 2012, the GMUG issued a Record of Decision on its FEIS and consented to BLM to issue two lease modifications adjacent to each other and to current leases to the south within the GMUG. BLM's decision is pending. It would add approximately 1,700 acres to the West Elk Mine, of which an estimated 73 acres will be actively disturbed for the remaining life of the mine.
- Oxbow Mining, LLC (Oak Mesa Project – coal exploration license) - a proposal to drill 43 exploration drill holes on private and federal lands into federal subsurface holdings. The entire exploration area covers about 13,873 acres, and temporary surface disturbances from road and pad construction would occur on about 32.86 acres.
- Bowie Resources, LLC (Bowie No. 2 Mine) applied for two lease modifications adjacent to current leases to the north under private and public lands and are in the first stages of NEPA analysis (i.e., the Proposed Action herein). They would add approximately 502 acres, and temporary surface disturbances from road and pad construction would occur on about 16.6 acres.

Additional actions including coal lease modifications and new coal lease applications could be expected in the North Fork Valley. These factors may affect how long mining would continue in this area; however, it is likely that mining would continue for another decade, if not more.

Pending oil and gas activity includes 22 total permits.
- 9 shale well permits;
- 8 coal-bed methane wells; and
- 5 coal mine methane wells.
- Total estimated disturbance based on current permits – approximately 150 acres (based on 6.8 acres of disturbance per well).

It is difficult to forecast future oil and gas development within the cumulative impact assessment region. The area is seeing an increase in development which exceeds the past average. Activity increases are due to changes in technology for the drilling and development of the conventional mancos shale wells and wells used to capture methane from coal mines. It is estimated that the area will average 20 new wells per year (assumes at least 2 wells per pad – 10 new pads per year). This will then create approximately 68 acres of new disturbance per year from oil and gas development.

SG Interests I, Ltd (SG) has proposed a 150 gas well Master Development Plan to develop mineral leases they hold within the Bull Mountain Unit located in Gunnison County, Colorado. SG is proposing to drill and produce 150 wells from approximately 41 individual well pads and associated infrastructure. Approximately 50% of the wells are targeting coalbed methane production and the other 50% will be exploring other potentially productive natural gas zones encountered by drilling into other geologic zones in the area of the Bull Mountain Unit.

2012 Oil and Gas lease nomination: The BLM is currently developing an environmental analysis regarding a nomination to lease nearly 30,000 acres of federal oil and gas mineral estate. 22,000 acres of the proposed nominations lie within the cumulative impacts assessment area of this EA.

Cumulative Impacts. Cumulatively, impacts from the proposed coal lease modifications could include small increases in deposition of sediment or pollutants into surface waters, increased subsidence within the North Fork Valley, low increase in cumulative emission of GHGs from mine ventilation, and a slight increase in water withdrawal from the Colorado River system that may potentially impact several federally-listed species of fish in downstream portions of the North Fork and Gunnison Rivers. None of these impacts is expected to be major as analyzed in the specific resource sections. Impacts resulting from the proposed lease modifications could add incrementally to impacts from the other activities discussed above, resulting in a low-level increase in noise, human presence, soil erosion, invasive weeds, wildlife habitat loss, and vegetation loss or conversion. These impacts are discussed in the sections below. Cumulative impacts associated with coal mining activities in the area were analyzed in greater detail in the Uncompahgre Basin RMP Environmental Impact Statement (BLM, 1988), as well as in the North Fork Coal EIS, FS and BLM, 2000.

Air Quality. The cumulative impacts to air quality in the area would primarily result in emissions of particulate matter, NO_X, and SO_2 from current and future mining of coal. Mining activities related to air emissions are permitted by the Air Pollution Control Division of the CDPHE. The State imposes permitting limits and control measures in order to limit emissions of NAAQS pollutants. The State develops air quality attainment and maintenance plans in order to keep Colorado in compliance with the Federal NAAQS. Therefore, cumulative impacts are not anticipated to exceed NAAQS, or to push the region into non-attainment for any NAAQS, and would result in no net change.

Furthermore, a detailed air quality assessment, including modeling, of the original mine was conducted as part of the environmental analysis for the Iron Point Coal Lease Tract in 2000 (See North Fork Coal EIS, FS and BLM, 2000). The APCD also ensures limits are consistent with the NAAQS by requiring air quality modeling where appropriate.

The air quality analysis conducted for the original mine included an emissions inventory and modeling analysis. That emissions inventory quantifies PM_{10}, NO_X, and SO_2 emissions. The modeling analysis also includes a visibility impacts assessment in the West Elk Wilderness Area as well as an atmospheric deposition impacts assessment. Emissions that were calculated and modeled included tailpipe emissions from mining equipment, haul trucks, and locomotives

(railway emissions). The results of that detailed impact assessment predicted no significant impacts to air quality as a result of Bowie Mine operations.

The proposed expanded lease area would retain the current coal production rate of 5.0 million tons, and the emissions generating equipment used is assumed to be slightly newer than equipment analyzed for the operation in 2000. Therefore, the air quality impacts associated with the proposed mine expansion can be presumed to be equal to, or less than, impacts predicted in the original air quality impact assessment.

The BLM estimated the amount of GHG emissions that could be attributed to coal production as a result of the proposed lease modifications, as well as from the forecast coal production from all three coal mines in the North Fork Valley.

Coal production for the operating mines in the North Fork Valley are reported to produce the following emissions of CO2e:

- Coal production and Methane Liberation at the Bowie No. 2 Mine 474,464 metric tons of CO2 equivalent released per year based on on-going mine activities.
- Coal Production and Methane Liberation at the Elk Creek Mine (Oxbow) 1,200,000 tons of CO2 equivalent released per year based on on-going mine activities.
- Coal Production and Methane Liberation from the West Elk Mine 1,230,000 tons of CO2 equivalent released per year based on on-going mine activities.

The BLM assumed that the majority of the coal was used for coal fired electric generation as part of the total U.S. use of coal for electric generation. Policies regulating specific levels of significance have not yet been established for GHG emissions. Given the state of the science, it is not possible to associate specific actions with the specific global impacts such as potential climate effects. Since there are no tools available to quantify incremental climate changes associated with these GHG emissions, the analysis cannot reach conclusions as to the extent or significance of the emissions on global climate. The potential impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions.

Climate Change. Continued mining, operation of mine surface facilities, and associated vehicle traffic, would result in minor cumulative contributions to the release of GHGs into the atmosphere. The mining, processing, and shipping of coal from the Bowie No. 2 Mine, and from other mines in the area, would contribute to GHG emissions through carbon fuels used in mining (including fuel consumed by heavy equipment and stationary machinery), electricity used on site, methane released from mined coal, and rail transport of the coal. The use of the coal after it is mined has not been determined at this time; however, almost all of the coal that would be mined from the Bowie No. 2 Mine would be used by coal-fired power plants in order to generate electricity. This also results in the production of GHGs. The proposed lease modifications would make an additional area of the coal seam that is being mined available for mining, and would extend the life of mine by approximately 1 year. Coal production would be consistent with current production rates. Release of GHGs would remain about the same as current rates.

Wild and Scenic Rivers. Cumulative impacts to the inventoried segment of the West Fork of Terror Creek should be limited with possible effects from livestock grazing, recreation use, and

other mineral related activity such as oil and gas development. Private lands in the area around the inventoried segment could be developed in the future and affect the segment.

Cultural Resources. Few cultural resources have been documented within the Bowie No. 2 Mine area. Cultural resources on steep slopes, and in areas of rock outcrops, could be impacted by subsidence resulting from underground mining. Dispersed residential and other development activities could also impact cultural resources. Currently, there is no requirement for systematic cultural resource surveys for other developments within the proposed lease.

Native American Religious Concerns. There would be no cumulative Native American religious impacts resulting from continued mining and other rural development in the Bowie No. 2 Mine area.

Soils. The cumulative impacts of continued underground mining to soils in the Bowie No. 2 Mine area would primarily be the disturbance effects of GVB surface facilities. In addition, the land over the mined areas would subside in place and remain largely intact. There could be local areas of erosion; however, the overall impacts to soils would be minor. Oil and gas development, dispersed residential, recreation use, ATV use, and other developments would result in localized impacts to soils; however, the overall cumulative impacts of these developments would be minor.

Vegetation. Other than minor subsidence impacts and disturbance from GVB development, continuing mining operations in the Bowie No. 2 Mine area would not greatly impact vegetation communities. Sustainable grazing is anticipated to continue, as practiced, and vegetation communities are not expected to be altered by this practice. There may be local displacement of vegetation communities as a result of continued dispersed residential and forest management activities. Sustainable grazing is anticipated to continue, as practiced, and vegetation communities are not expected to be altered by this practice. There may be local displacement of vegetation communities as a result of continued oil and gas development, dispersed residential and forest management activities, and recreation and ATV use. Overall, cumulative impacts to vegetation are expected to be minor, and mining operations would negligibly contribute to these impacts.

Invasive, Non-Native Species. Other than minor subsidence impacts and disturbance from GVB development, continuing mining operations in the Bowie No. 2 Mine area would not greatly impact vegetation communities' health and create opportunities for invasive species. Mitigation required to control invasive species should limit the impacts from invasive species.

Threatened, Endangered, and Special Status Species. There would be negligible cumulative impacts to identified threatened, endangered or special status species or habitats from continued mining and other development activities in the Bowie No. 2 Mine area. Residential or other development would also result in minimal surface disturbance on habitats in the area.

Migratory and other Birds of Conservation Concern. Prolonged mining would result in negligible impacts to migratory and other birds of conservation concern habitat and population dynamics. Dispersed residential development is expected to continue in the area. This

development could cause birds sensitive to human activity to seek habitat outside the area of development. The increased presence of houses, other buildings, fences, roads, and traffic would also alter the movement of the birds and increase losses due to human and other introduced species contact. Migratory and other birds of conservation concern and their habitats would still be present in the area; however, but they would likely be altered or reduced.

Wildlife, Terrestrial. Other than what has already been analyzed, prolonged mining would result in negligible impacts to wildlife habitat and population dynamics. Dispersed residential development is expected to continue in the area. This development could cause wildlife sensitive to human activity to seek habitat outside the area of development. The increased presence of houses, other buildings, fences, roads, and traffic would also alter the movement of big game animals, and would restrict hunting and other recreational opportunities. Wildlife and their habitats would still be present in the area; however, but they would likely be altered or reduced.

Wildlife, Aquatic. Disturbance of aquatic species in the Terror Creek watershed would continue to take place as a result of coal mining, livestock grazing, recreation, timber sales, and other human activities. Due to the short-term nature, and small acreage that would be impacted by actions associated with this lease modification, it is unlikely that they would contribute to a detectable increase in cumulative impacts on aquatic species in the Terror Creek watershed.

Wetlands and Riparian. The cumulative impacts of continued mining to wetlands in the Bowie No. 2 Mine area would be minimal, due to subsidence in the mine area. Dispersed residential development is expected to continue in the mine area. This development could remove or alter local wetlands, and their present vegetation communities, in the area. Federal regulations under Section 404 of the Clean Water Act, as well as regulations set by the U.S. Army Corp of Engineers over jurisdictional waters, would reduce the potential for developments to remove or impact wetlands in the area.

Water Resources. There would be minor cumulative impacts to identified water resources from continued mining, GVB development, and from other rural development in the Bowie No. 2 Mine area. Underground mines would result in limited disturbance on the surface; however, the subsidence-related impacts to water resources would be additive for other areas of development. Permit requirements would mitigate these potential impacts. Residential and other developments would also have additive impacts due to surface disturbance and use of groundwater for domestic purposes. Uses of water from mining and other developments could impact the quantity and quality available to downstream users in the primary downstream drainages.

Wastes, Hazardous or Solid. Continued mining would produce additional quantities of hazardous and solid waste. These materials would continue to be managed and controlled under current regulations and BMPs. Cumulative impacts would be kept within state and federal guidelines, and would be minor. Development of residential and other activities would also generate hazardous and solid wastes. It is expected that the private landowners would contract with private waste management specialists, and the cumulative impacts would be minor.

Environmental Justice. There would be no cumulative environmental justice impacts resulting from continued mining and other rural development in the Bowie No. 2 Mine area.

Transportation Facilities and Access. Future mining operations and other development activities would maintain and, potentially, open new related infrastructure for traffic access. Potential oil and gas development, residential development on private land and other activities may increase access and road infrastructure in the area. The tax revenue generated from mining and other development would contribute to the maintenance of public roads. The railroad traffic related to mining would not impact other traffic with the continuation of mining activities.

Water Rights. Mining activity in the Terror Creek watershed and Bowie's adjacent leases would continue, and groundwater would continue to be intercepted with minimal expected impacts. Other activities associated with residential development, oil and gas activities, and recreation use may put additional demands on water resources within the area and especially groundwater used for development.

Noise. The principal noise sources related to the continued mining operation of the surface facilities include the ventilation fans, GVB pumps, trucks, conveyors, loadout equipment, and trains in the area. The dispersed residential development, oil and gas activities, and other recreation activities would also impact background noise levels, due to the increased human presence in the area.

Recreation. The mining activities are unlikely to result in a detectable change in recreation activities within the lease modification or surrounding areas of the Terror Creek watershed. Recreational use is expected to continue and/or increase in the future with residential development, ATV use, and hunting activities.

Visual Resources. Dispersed residential, oil and gas development and other utility development activities would impact visual resources. The houses, roads, and utility infrastructure would alter the visual character of the landscape. These developments are not regulated in terms of visual impacts.

Geology, Mineral Resources, and Paleontology. The cumulative impacts resulting from the continued underground mining in the Bowie No. 2 Mine Area would primarily be due to the removal of large amounts of coal. Other geologic features, mineral resources, and paleontology in the overburden of the coal would subside in place and remain largely intact. Subsidence would be expected to be relatively uniform over large areas. The impacts of subsidence may include lowering elevations over subsided areas. There may be small areas that would require mitigation measures in order to restore surface drainage patterns; however, the overall impacts of subsidence would be minor. Dispersed residential and other development activities would result in only localized impacts to geology, mineral resources, and paleontology. The overall cumulative impacts of these developments would be minor.

Socioeconomics. The cumulative socioeconomic effects of continued mining would include a constant level of employment and tax revenues during the operation of the mine and the removal of that source of income when the mine is closed. Residential and other development activities would increase the local population and infrastructure in the area. 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 extend the mining employment sector proportionately to the length of the remaining reserves.

PERSONS / AGENCIES CONSULTED

The following agencies were contacted for input in the development of this EA. Issues raised during scoping are addressed in more detail in the Scoping and Identified Issues section.

- USFS, Delta and Paonia Offices, Colorado
- USFWS, Grand Junction, Colorado
- Western Area Power Administration
- Colorado Parks and Wildlife
- Office of Surface Mining
- U.S. Army Corp of Engineers
- Delta County Planning Department

INTERDISCIPLINARY REVIEW

The following BLM personnel have contributed to and have reviewed this EA:

Name	**Title**	**Area of Responsibility**
Amanda Clements	Ecologist	Wetland and Riparian
Desty Dyer	Mining Engineer	Solid Mineral Leasing
Glade Hadden	Archaeologist	Cultural Resources, Paleontology
Ken Holsinger	Fuels Specialist	Fire
Julie Jackson	Outdoor Recreation Planner	VRM, Recreation, Wilderness, Transportation
Alan Kraus	Hazmat Specialist	Solid and Hazardous Wastes
Bruce Krickbaum	NEPA Coordinator	EA/NEPA Review and Compliance
Teresa Pfifer	Land and Minerals Supervisor	Lands and Minerals
Lynae Rogers	Range Specialist	Invasive Species, Range, Vegetation
Melissa Siders	Wildlife Biologist	Migratory Birds, Threatened, Endangered and Sensitive Species, Terrestrial and Aquatic Wildlife
Dave Kauffman	Biological Staff Supervisor	Biological Resources
Jedd Sondergard	Hydrologist	Soil, Water
Thane Stranathan	Natural Resources Specialist	Oil and Gas, GIS data
Chad Meister	Air Quality Specialist	Air Quality, Climate
David Epstein	Socioeconomics Specialist	Socioeconomics

List of Acronyms and Abbreviations

ACEC	Areas of Critical Environmental Concern
AO	Authorized Officer
AQRVs	Air Quality-Related Values
APCD	Air Pollution Control Division
APEN	Air Pollution Emission Notice
BA	Biological Assessment
BCC	Birds of Conservation Concern
BLM	Bureau of Land Management
BMPs	Best Management Practices
Bowie	Bowie Resources, LLC
CAA	Clean Air Act
CAAQS	Colorado Ambient Air Quality Standards
CASTNET	Clean Air Status and Trends Network
CDOLA	Colorado Department of Local Affairs
CDOW	Colorado Division of Wildlife now known as CPW
CDPHE	Colorado Department of Public Health and Environment
CDWR	Colorado Division of Water Resources
CEQ	Council of Environmental Quality
CFC	chlorofluorocarbon
cfm	cubic feet minute
CFR	Code of Federal Regulations
CH4	methane
CMM	Coal Mine Methane
COS	Carbon Offsets
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
CPW	Colorado Parks and Wildlife formerly known as CDOW
CVCP	Colorado Vegetation Classification Project
DOE	Department of Energy
DRMS	Division of Reclamation Mining and Safety
EA	Environmental Assessment
EPA	Environmental Protection Agency
EO	Executive Order
ESA	Endangered Species Act
FCLAA	Federal Coal Leasing Amendments Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
GBCT	Greenback Cutthroat Trout
GHG	greenhouse gas emissions
GMU	Game Management Unit
GNF	Gunnison National Forest
GRI	Grand River Institute
GVBs	gob vent boreholes
GVG	gob vent gas
GWP	global warming potential
HAP	hazardous air pollutants

HDPE	high density polyethylene pipe
HCFC	hydrochloroflurocarbon
IMPROVE	Interagency Monitoring of Protected Visual Environments
IBR	Incorporate by Reference
LAU	lynx analysis unit
LDGT	light duty gasoline truck
LHA	Land Health Assessment
MLA	Mineral Leasing Act
MDWs	methane drainage well
MOU	Memorandum of Understanding
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration
MU	mapping unit
MY	model year
N2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NF	North Fork Valley
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NRCS	Natural Resource Conservation Service
NSPS	New Source Performance Standard
O_3	ozone
OSMRE	Office of Surface Mining Reclamation and Enforcement
Pb	lead
PBO	Programmatic Biological Opinion
$PM_{2.5}$	particulate matter less than 2.5 microns in effective diameter
PM_{10}	particulate matter less than 10 microns in effective diameter
PUP	Pesticide Use Proposal
PSD	Prevention of Significant Deterioration
RMP	Resource Management Plan
RTO	Regenerative thermal oxidation
SIP	State Implementation Plan
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO_2	sulfur dioxide
SPM	special-purpose monitoring
SVR	standard visual range
TDS	total dissolved solids
TE	thermal efficiency
TSP	total suspended particulate
UFO	Uncompahgre Field Office
USDI	U.S. Department of the Interior
VAM	Ventilation Air Methane
VCG	Vessels Coal Gas, Inc.
VOCs	volatile organic compounds
WAPA	Western Area Power Administration
WQCC	Water Quality Control Commission
WSA	Wilderness Study Area
WSR	Wild and Scenic River
WUS	Waters of the U.S.

REFERENCES

Adams, R.A. 2003. Bats of the Rocky Mountain West. University of Colorado Press, Boulder, Colorado.

Andrews, R. and R. Righter. 1992. Colorado Birds: a Reference to their Distribution and Habitat. Denver Museum of Natural History. Denver, Colorado.

Beason, J.P. 2009. Yellow-billed Cuckoos in Western Colorado. Tech Rep. R-YBCUCPW & USFWS-08-1. Rocky Mountain Bird Observatory, Brighton, Colorado, 27 pp. Accessed online at : http://rmbo.org/public/monitoring/PDF_Reports/CPW_USFWS_YBCU_REPORT_26JAN09v3.pdf.

Bureau of Land Management. 1988. Uncompahgre Basin Proposed Resource Management Plan and Final Environmental Impact Statement, September 1988. 196 pages.

Bureau of Land Management. 1989. Uncompahgre Basin Resource Management Plan and Record of Decision (amended, 1992, 1994, 1997, 2001). Uncompahgre Field Office. Montrose, Colorado.

Bureau of Land Management. 2000. North Fork Coal EIS and Record of Decision. Uncompahgre Field Office, Montrose, Colorado.

Bureau of Land Management. 2002. Canada Lynx Habitat Mapping, GIS data. Uncompahgre Field Office, Montrose, Colorado.

Bureau of Land Management. 2005. Little Snake Resource Management Plan, Analysis of the Management Situation. April 2005.

Bureau of Land Management. 2007. North Fork Land Health Assessment, 2006-2007. Bureau of Land Management, Uncompahgre Field Office, Montrose, Colorado. 110 pages.

Bureau of Land Management. 2009. BLM Colorado State Director's Sensitive Species List. Available online: BowieEA12-08-11.dochttp://www.blm.gov/pgdata/etc/medialib/blm/co/programs/botany.Par.8609.File.dat/BLM%20CO%20SD%20Sensitive%20Spec.%20List.pdf. November.

Bureau of Land Management. 2010. Final Wild and Scenic River Eligibility Report for the BLM Uncompahgre Planning Area. June 2010.

Bureau of Land Management. 2011. BLM's Land and Mineral Legacy Rehost 2000 System-LR2000. Available online at: http://www.blm.gov/lr2000/.

Bowie Resources. 2011. Personal Communication with Art Etter. Map providing overburden contours.

Carrillo, Michael. 2010. Fish Species in the Terror Creek System. E-mail with WestWater Engineering. March 30, 2010.

Chronic, Halka, and Felicie Williams. 2002. Roadside Geology of Colorado. Second Edition. Mountain Press Publishing Company, Missoula, Montana.

Climate Analysis Indicators Tool (CAIT-US). 2011. Version 4.0. World Resources Institute, Washington, DC. Accessed on March 28, 2011 from < http://cait.wri.org/>.

Colorado Department of Agriculture. 2011. Colorado Noxious Weed List. Noxious Weed Management Program. Last accessed online at: http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733. September.

Colorado Department of Natural Resources. 2011. Colorado Decision Support Systems, Water Rights Database. Colorado Department of Natural Resources, Division of Water Resources, Denver. Available online at: http://cdss.state.co.us/onlineTools/Pages/WaterRights.aspx.

Colorado Department of Public Health and Environment (CDPHE). 2008. Colorado Air Quality Control Commission Report to the Public 2007-2008. 60 pages.

Colorado Department of Public Health and Environment. 2010a. Colorado 2009 Air Quality Data Report. Colorado Department of Public Health and Environment, Air Pollution Control Division, Denver. August 2010.

Colorado Department of Public Health and Environment. 2010b. State of Colorado Integrated Water Quality Monitoring and Assessment Report Prepared Pursuant to Section 303(d) and Section 305(b) of the Clean Water Act. Colorado Department of Public Health and Environment, Water Quality Control Commission, Denver. Available online at: http://www.cdphe.state.co.us/op/wqcc/Resources/waterstatus_305_b/305bRept2010.pdf

Colorado Department of Public Health and Environment. 2010c. Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation No. 93, effective April 30, 2010. Colorado Department of Public Health and Environment, Water Quality Control Commission, Denver. Available online at: http://www.cdphe.state.co.us/regulations/wqccregs/100293wqlimitedsegtmdlsnew.pdf

Colorado Department of Public Health and Environment. 2010d. Integrated Water Quality Monitoring and Assessment Report, 2010 Update to the 2008 305(b) Report. Colorado Department of Public Health and Environment, Water Quality Control Division, Denver.

Colorado Department of Public Health and Environment. 2011. Letter from Nancy Chick to Ralph Morris, Environ Corporation, Summary of rural area background concentration estimates for the BLM Grand Junction and Uncompahgre Field Office Resource Management Plans. Colorado Department of Public Health and Environment, Air Pollution Control Division, Denver. June 6 2011.

Colorado Division of Wildlife, Bureau of Land Management, and U.S. Forest Service. 2003. Colorado Vegetation Classification Project. Available online at: .

Colorado Division of Wildlife. 2009. Natural Diversity Information Source. Colorado State University. Available at: http://ndis.nrel.colostate.edu/.

Colorado Division of Wildlife. 2010. Threatened and Endangered Species List. Colorado Division of Wildlife. Denver, CO. Available online at: http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/ThreatenedEndangeredList/ListOfThreatenedAndEndangeredSpecies.htm

Colorado Division of Wildlife. 2011. Colorado's Biological Map and Data Resource. Natural Diversity Information Source , Colorado Division of Wildlife. Available Online: http://ndis.nrel.colostate.edu/

Colorado Division of Wildlife, Bureau of Land Management, and U.S. Forest Service. 2003. Colorado Vegetation Classification Project. Available online at: http://ndis.nrel.colostate.edu/coveg/.

Colorado Natural Heritage Program. 2009. Rare Plant Guide. Colorado State University. Available at: http://www.cnhp.colostate.edu/.

Cragg Surveying. 2010. Bowie No. 2 and 3 Mines, Subsidence Surveys. May 17th to June 18th, 2010, Paonia, Colorado.

Culver, D.R., P. Lyon, and J. Huggins. 2008. Survey of Critical Biological Resources, Rio Blanco County, Colorado. Prepared for Rio Blanco County, Meeker, CO, U.S. Environmental Protection Agency, Region 8, Denver CO, and Colorado Department of Natural Resources, Division Wildlife, Wetlands Program, Denver, Colorado.

Division of Reclamation Mining and Safety. 2010. Regulations of the Colorado Mined Land Reclamation Board for Coal Mining, (Section 2.05.6(6)). Available online at: http://mining.state.co.us/

Dunrud, C.R. 1976. Some engineering geologic factors controlling coal mine subsidence in Utah and Colorado: U.S. Geological Survey Professional Paper 969, 39p.

Environmental Protection Agency. 2008 "Identifying Opportunities for Methane Recovery at U.S. Coal Mines: Profiles of Selected Gassy Underground Coal Mines 2002 – 2006" revised January 2009.

Environmental Protection Agency. 2010. "Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2008," EPA Publication 430-R-10-006. April 15,2010.

Environmental Protection Agency. 2011. Clean Air Status and Trends Network (CASTNET). Online at: http://epa.gov/castnet/javaweb/index.html. Accessed December 2011.

Federal Emergency Management Agency. 1989. Flood Insurance Rate Map, Gunnison County, Colorado (Unincorporated Areas). Community Panel Numbers 080078 275 B, 080078 125 B, and 080078 235 B. September 29, 2008.

Etter, Art. 2012. Personal Email Communication with Jim Ferguson. WestWater Engineering. January 10, 2012.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. Niwot, Colorado.

Grand River Institute. 2011. Class III Cultural Resources Inventory and Paleontological Assessment of Two Proposed Lease Modification Block Areas (MOD COC-37210 and MOD COC-61209) in Delta County, Colorado for Bowie Resources, LLC. GRI Project No. 2011-86. September 30, 2011.

Hammerson, G.A. 1986. Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver, Colorado.

Interagency Working Group on Social Cost of Carbon, United States Government. 2010. Social Cost of Carbon for Regulatory Impact Analysis. Online at: http://www.epa.gov/otaq/climate/regulations/scc-tsd.pdf.

Intergovernmental Panel on Climate Change (IPCC). 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 – Energy. Table 2.2 Default Emission Factors for Stationary Combustion in the Energy Industries. ISBN 4-88788-032-4. Accessed on March 28, 2011 from < http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Junge, Walter R. 1978a. Surficial Geology of the Bowie Quadrangle. Colorado Geological Survey. Plate 2 of 7. Surficial geology, Hotchkiss-Paonia Reservoir area, Delta and Gunnison Counties, Colorado, Denver.

Junge, Walter R. 1978b. Geologic Hazards Map of the Bowie Quadrangle, Plate 2 of 7, Hotchkiss-Paonia Reservoir area, Delta and Gunnison Counties, Colorado. Denver, Colorado.

Kingery, Hugh E., ed. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver. 636 pages.

Knick, S.T., and J.T. Rotenberry. 2001. Effects of Habitat Fragmentation on Passerine Birds Breeding in Intermountain Shrubsteppe. Studies in Avian Biology No. 25:130-140.

Kowalski, D. 2010. Greenback Cutthroat Trout in Terror Creek. Personal Communication with WestWater Engineering, December 9, 2010.

Lucas, S.G. 1998. Fossil Mammals and the Paleocene/Eocene Series Boundary in Europe, North America, and Asia. *In* Late Paleocene-Early Eocene Climatic and Biotic Events in the Marine and Terrestrial Records, Marie-Pierre Aubry, M-P., Lucas, S.G., and Berggren, W.A., (eds.). Columbia University Press, New York.

Marten, Alex L. and Newbold, Stephen C. 2011. Estimating the Social Cost of Non-CO2 GHG Emissions: Methane and Nitrous Oxide. US EPA, National Center for Environmental Economics, Working Paper #11-01.

Monarch & Associates and Michael Ward Outdoors. 2005. Oxbow Mining, LLC, Elk Creek Mine Block Clearance Project. August, 2005. 38 pages.

Monarch & Associates and Michael Ward Outdoors. 2006. Oxbow Mining, LLC, Elk Creek Mine Habitat and wildlife Studies. June, 2006.

Monarch & Associates and Michael Ward Outdoors. 2008. Oxbow Mining, LLC, Elk Creek Mine 2008 Exploration Project Habitat and Wildlife Studies. June, 2008. 22 pages.

Monarch & Associates. 2011. Habitat and Wildlife Surveys for 2011 Proposed Exploration and GVB Drill Sites and Access Roads. June.

Natural Diversity Information Source. 2011. Colorado's Biological Map and Data Resource. Colorado Division of Wildlife. Available Online: http://ndis.nrel.colostate.edu/.

Natural Resources Conservation Service. 2008. Custom Soil Resource Report for Paonia Area, Colorado, Parts of Delta, Gunnison and Montrose Counties: Oxbow ECET EA. Accessed from NRCS Web Soil Survey on December 11, 2008. Available at http://websoilsurvey.nrcs.usda.gov.

Natural Resources Conservation Service. 2011b. NRCS Farm and Ranch Lands Protection Program (FRPP), Colorado. Colorado FRPP Scoring System document. Accessed at http://www.co.nrcs.usda.gov/programs/frpp/2011/2011frpp.htm. September.

Natural Resources Conservation Service. 2011b. Web Soil Survey Geographic (SSURGO) Database. U.S. Department of Agriculture, Natural Resources Conservation Service. Available online at: http://soils.usda.gov/survey/geography/ssurgo/.

Righter, R., R. Levad, Coen Dexter, and K. Potter. 2004. Birds of Western Colorado Plateau and Mesa County. Grand Valley Audubon Society, Grand Junction, Colorado Rogers, Lynae. 2010. Personal Communication, via e-mail with WestWater Engineering, regarding weed information for Bureau of Land Management lands. Bureau of Land Management, Uncompahgre Field Office, Montrose, CO.

Rogers, Lynae. 2010. Personal Communication, via e-mail, regarding weed information for Bureau of Land Management lands. Bureau of Land Management, Uncompahgre Field Office, Montrose, CO.

Speas, Clay. 2010. Programmatic Water Depletion BO for Grand Mesa, Uncompahgre Gunnison National Forest. E-mail communication, March 29.

Stewart, Collin, Greg Hunt and Christopher Mark. 2006. Geology, Ground Control and Mine Planning at Bowie Resources, Paonia, Colorado. 25th International Conference on Ground Control in Mining, July 2006, Morgan Town, West Virginia.

Tweto, Ogden, 1979. USGS geologic map of Colorado. 1:500,000 scale. Available online at: http://geology.about.com/library/bl/maps/blcoloradomap.htm.

U.S. Census Bureau. 2008a. Fact Sheet: Delta County, Colorado. Available online at: http://factfinder.census.gov/servlet/ACSSAFFFacts?_event=Search&geo_id=05000US08029&_geoContext=01000US%7C04000US08%7C05000US08029&_street=&_county=delta+county&_cityTown=delta+county&_state=04000US08&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=050&_submenuId=factsheet_1&ds_name=ACS_2007_3YR_SAFF&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry= Last accessed: 1/27/2009.

U.S. Census Bureau. 2008b. Fact Sheet: Gunnison County, Colorado. Available online at: http://factfinder.census.gov/servlet/SAFFFacts?_event=Search&geo_id=05000US08029&_geoContext=01000US%7C04000US08%7C05000US08029&_street=&_county=gunnison+county&_cityTown=gunnison+county&_state=04000US08&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=050&_submenuId=factsheet_1&ds_name=ACS_2007_3YR_SAFF&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=&show_2003_tab=&redirect=Y Last accessed: 1/27/2009.

U.S. Census Bureau. 2009. U.S. Census Bureau American Fact Finder Web Site, Data Sets, Quick Tables, Census Tract 9639, Gunnison County, Colorado. Available online at: http://factfinder.census.gov. Accessed April 9, 2009.

U.S. Department of Agriculture. 1981. Soil Survey. Paonia Area, Parts of Delta, Gunnison and Montrose Counties.

U.S. Department of Commerce. 2012. Census Bureau, American Community Survey Office, Washington, D.C.

U.S. Department of Energy and BLM. 2008. Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/EIS-0386). Appendix N: Potential Fossil Yield Classifications (PFYC) for Geologic Formations Intersecting Proposed Corridors under the Proposed Action by State. November 2008.

U.S. Energy Information Administration. 2009. Annual Energy Review 2009. Table 7.3 Coal Consumption by Sector, Selected Years, 1949-2009. DOE/EIA-0384(2009). August 2009. Accessed on March 28, 2011 from < http://www.eia.doe.gov/aer/>.

U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Colorado River Endangered Fishes: Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub. Federal Register 59(54): 13374–13400.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. Division of Migratory Bird Management, Arlington, Virginia. 87 pages. [Online version available at http://www.fws.gov/migratorybirds/reports/BCC2008/BCC2008m.pdf; accessed].

U.S. Fish and Wildlife Service. 2009 Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx.

U.S. Fish and Wildlife Service. 2009. Consultation Guidance for DeMinimis Water Depletions in the Upper Colorado River Basin. U.S. Fish and Wildlife Service. Ecological Services. Lakewood, Colorado.

U.S. Fish and Wildlife Service. 2010a. Threatened, Endangered, Candidate, and Proposed Species by County. July 2010. USDI-Fish and Wildlife Service, Ecological Services, Colorado Field Offices. Grand Junction, Colorado.

U.S. Fish and Wildlife Service. 2010b. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the North American Wolverine as Endangered or Threatened. Federal Register 75 (239): 78030-78061.

U.S. Forest Service. 2011. Environmental Assessment for Federal Coal Lease Modification COC-61357. Paonia Ranger District (Grand Mesa, Uncompahgre, and Gunnison National Forests). August 2011.

U.S. Forest Service and Bureau of Land Management. 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.

U.S Geological Survey (USGS). 2003 Using Tracers to Evaluate Streamflow Gain-Loss Characteristics of Terror Creek, in the Vicinity of a Mine-Permit Area, Delta County, Colorado, Water Year 2003.

U.S. Global Change Research Program. 2009. Reports and Assessments, USGCRP Scientific Assessments, Key Findings. [Web Page] located at: http://globalchange.gov/publications/reports/scientific-assessments/us-impacts/key-findings. Accessed 6/22/2009.

Vessels Coal Gas, Inc. 2011. Methane Recovery Evaluation – Bowie Resources, LLC-Bowie No. 2 Mine. November 4, 2011.

VIEWS. 2011. Visibility Information Exchange Web System. Regional Haze Summary Data. Means for Best, Middle, and Worst 20% Visibility Days. Online at http://views.cira.colostate.edu/web/Trends/. Accessed December 2011.

Weber, W.A., and R.C. Wittmann. 1987. Colorado Flora, Western Slope. University Press of Colorado. Niwot, Colorado.

Western Regional Climate Center, 2012. General Climate Summary Data for Paonia, Colorado. http//www.wrcc.dri.edu.

Woodling, J. 1985. Colorado's Little Fish – A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado. Colorado Division of Wildlife. Denver, Colorado.

APPENDIX A

Unsuitability Criteria

APPENDIX A

COAL UNSUITABILITY CRITERIA

DESCRIPTION OF THE FEDERAL LANDS INVOLVED

This unsuitability analysis has been prepared for the proposed modification of existing coal leases COC-37210 and COC-61209.

LEGAL DESCRIPTION:

COC-61209 Modification

Township 13 South, Range 91 West, 6th P.M.

Section 5: SWNW, NWSW, SWSW, NESW, S/2NESENW, S/2SENW, S/2NWSENW, SWSWNE, S/2NWSWNE, W/2NWSE

Section 6: SENE

containing approximately 265 acres.

COC-37210 Modification

Township 13 South, Range 92 West, 6th P.M.

Section 1: S/2NE, S/2NW, S/2 Lot 1, S/2 Lot 2, S/2 Lot 3, S/2 Lot 4

containing approximately 237.43 acres.

The tracts were identified as a result of a coal lease modification application submitted by Bowie Resources, LLC (Bowie) on July 11, 2011. The tracts lie approximately 4 miles northeast of the town of Paonia in Delta County, Colorado. The existing leases are part of a Logical Mining Unit held by Bowie, which would be mined from the Bowie No. 2 Mine near Paonia in Delta County, Colorado. The lease modifications are located on lands in which BLM manages a portion of the surface (174 acres on COC-61209) and all of the mineral estate (COC-37210 and COC-61209).

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. All of the areas on which surface facilities associated with the proposed operation were to be located and all the areas identified as likely to be affected by subsidence were delineated as having surface effects.

The unsuitability criteria were then applied individually to the areas identified as having surface effects. Then after all criteria had been applied, the exceptions of each criterion found to be applicable were then examined to determine if the exceptions were also applicable.

ANALYSIS OF THE UNSUITABILITY CRITERIA

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 with Wilderness Characteristics, lands acquired with money derived from the Land and Water Conservation Fund, National Forests, and federal lands in incorporated cities, towns, and villages.

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 100th 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.

The application of this criterion to lands within the listed land systems and categories is subject to valid existing rights, and does not apply to surface coal mining operations existing on August 3, 1977.

Analysis - BLM inventoried area streams and rivers in 2006 as part of the evaluation of Wild and Scenic Rivers (WSR) in the UFO. A 1.21-mile segment of the West Fork of Terror Creek has Outstandingly Remarkable Values and is potentially suitable for inclusion into the National Wild and Scenic River System. This segment flows through the proposed lease modification for lease COC-61209. The following portions of the lease modification for COC-61209 are within ¼ mile of the stream segment;

> Township 13 South, Range 91 West, 6th P.M., Section 5: SWNW, S/2NESENW, S/2SENW, S/2NWSENW, SWSWNE, S/2NWSWNE, W/2NWSE – approximately 105 acres.

In early 2011 the Gunnison Basin stakeholder group concluded public meetings and submitted their suitability recommendations for eligible segments in the Gunnison river basin to the BLM UFO. These recommendations, as well as other public comment, are being considered during formulation of the preferred alternative for the Uncompahgre Resource Management Plan, which is currently under development.

The RMP will make recommended decisions concerning this section and ultimately Congress will have the final decision under the Wild and Scenic Rivers Act. BLM policy is to protect the resource values found in the segments pending decisions by Congress on the eligibility of the various river segments.

Current plans for mining do not include the lands under the West Fork of Terror Creek. Subsidence associated with the Proposed Action is expected to be minimal to negligible, and would generally affect the area immediately overlying those areas that are mined; therefore, there are likely no impacts to the West Fork of Terror Creek resources resulting from subsidence. Lands inventories are suitable for coal leasing after applying the exceptions to the criteria. In order to protect the West Fork of Terror Creek inventoried segment of the Wild and Scenic River, the following lease stipulation would be required for lease COC-61209:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining related surface disturbance would occur within 200 feet of the stream channel for the West Fork of Terror Creek without a written finding from the Authorized Officer. These techniques would provide for maximum coal removal while protecting the values associated with the inventoried Wild and Scenic River segment.

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.

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 one right-of-way located on the application lands managed by the BLM: a power transmission line (COC-22713). Subsidence effects on the 230/345 kV WAPA transmission line is unlikely. The worst-case angle of draw for subsidence effects from longwall mining would be 25 degrees (BLM, 2000). Table A-1 provides specific details on the potential subsidence effects to the three WAPA towers. Given the distance from the possible subsidence, no impacts are anticipated.

Table A-1
Potential Subsidence Effects to WAPA Towers

WAPA 230 KV Electrical Tower (north to south)	Depth of overburden for longwall B 20 nearest the tower (feet)	Surface expression of subsidence (using worst-case 25^0 angle of draw) (feet)	Distance between tower and surface expression of subsidence (feet)
4	1,060	447	170
5	1,160	461	135
6	1,140	452	371

Lands involved in these rights-of-way are suitable for coal leasing after applying the exceptions to the criteria. The power line would be protected by exception (v) above. The power line right-of-way is 125 feet in width and includes access roads (BLM, 2011). In order to protect the power line, the following lease stipulation would be required for Lease COC-61209:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining related surface disturbance would occur within 100 feet of the outside line of the power line right-of-way without a written finding from the Authorized Officer and consultation with the right-of-way holder. These techniques would provide for maximum coal removal while insuring that sufficient coal is left in place to prevent subsidence.

There is a General Land Office Order, 6/1/1910, which classifies the lands within the application area for coal. The lands are also within the Paonia-Somerset Known Recoverable Resource Area, COC-20093. No other easements or surface leases for residential, commercial, industrial, or other public purposes are determined to exist within the lease modification 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.

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 AO 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 - The Bowie No. 1 Mine and proposed lease tract COC-37210 is accessed from Paonia by the Stevens Gulch public road, which is initially a Delta County road and is asphalt, all-

weather, two-lane road to the entrances of the Bowie No. 1 Mine (approximately 2.5 miles). Beyond the turnoff to the mine, the Stevens Gulch public road is no longer a county road but is an unpaved gravel road (FS road # 701) leading to the Gunnison National Forest (GNF). Delta County maintains the road under agreement with the GNF. The GNF has acquired easements through the private land for the public to access the NF. The road is not maintained through the National Forest in the winter but is used for snowmobile and other winter access. The overall condition of the Stevens Gulch public road should be considered as fair, and it requires routine maintenance. The road continues through the proposed lease tract and onto the Gunnison National Forest.

Two longwall units are proposed under the Stevens Gulch public road. Longwall unit B21 and B22 both pass under the Stevens Gulch public road. The overburden range for the panels is from 1,750 feet to 2,150 feet. At that depth there would be measurable subsidence but no visible surface cracking (see Geology and Minerals). Therefore, it is expected that there would be no subsidence related disturbance to the road in Stevens Gulch. The Stevens Gulch public road is suitable for coal leasing after applying the exceptions (iii) to the criteria. In order to protect the road, the following lease stipulation would be required for Lease COC-37210:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining related surface disturbance would occur within 100 feet of the outside line of the road right-of-way without a written finding from the Authorized Officer and consultation with appropriate agencies. These techniques would provide for maximum coal removal while insuring that sufficient coal is left in place to prevent subsidence.

No occupied dwellings, public buildings, schools, churches, community, or institutional buildings exist within this area.

All of the lands affected by this criterion are suitable for coal leasing with application of the exceptions.

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 or Lands with Wilderness Characteristics. 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 or Lands with 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 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.

Exceptions - A lease may be issued and mining operations approved if, after consultation with the Fish and Wildlife Service, the Fish and Wildlife Service determines that the proposed activity is not likely to jeopardize the continued existence of the listed species and/or its Critical Habitat.

Analysis - USFWS (2010a) identified 12 species as endangered, threatened, or candidate under the Endangered Species Act (ESA) that may occur in Delta County (see Table A-2). In addition to federally-listed species, the BLM (2009) identified 39 other species as sensitive with the potential to occur within the BLM Uncompahgre Field Office and the general area of the proposed lease modification areas (see Table A-3). Those species known to occur or suspected near the proposed lease modifications were surveyed for during block clearance surveys conducted for the proposed lease modifications and surrounding area.

Table A-2
Federal Threatened, Endangered, or Candidate Species in Delta County

Common Name/ Scientific Name	Status[1]	Habitat[2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
Mammals				
Black-footed ferret *Mustela nigripes*	E, SE	Requires large prairie dog colonies in open habitat such as grasslands, steppe, and shrub steppe.	None	No
Canada lynx *Lynx canadensis*	T, SE	Coniferous forests interspersed with thickets of trees and shrubs, rocky outcrops, large woody debris; closely associated with snowshoe hares. Present on Grand Mesa.	Possible	Yes
North American wolverine *Gulo gulo lucus*	C, SE	High elevation boreal and alpine habitats.	None	No
Birds				
Gunnison sage-grouse *Centrocercus minimus*	C, SC	Expansive sagebrush with grasses, forbs, and healthy riparian ecosystems; project outside of expected range.	None	No
(Western) Yellow-billed cuckoo [4] *Coccyzus americanus*	C, SC	Riparian forested habitats dominated by cottonwoods. Observed on North Fork of Gunnison River (Beason, 2009).	None	No
Fish				

Common Name/ Scientific Name	Status[1]	Habitat[2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
Bonytail *Gila elegans*	E, SE	Eddies, pools, and backwaters near swift current in large rivers of the Colorado River system	Possible	Yes
Colorado pikeminnow *Ptychocheilus lucius*	E, SE	Fast, deep, white-water rivers with backwater areas and eddy habitats 2 to 3 feet deep that support aquatic insects, small fish as prey species.	Possible	Yes
Humpback chub *Gila cypha*	E, SE	Adults, in habitats ranging from deep turbid rapids often associated with large boulders and steep cliffs to flooded lowlands; young, in slow-moving backwaters.	Possible	Yes
Greenback cutthroat trout *Oncorhynchus clarki stomias*	E, ST	Cold, clear, gravely headwater streams and mountain lakes with abundant insects; originally in the Arkansas and South Platte river drainages of Colorado and Wyoming. Recent genetic testing indicates populations exist in the Colorado River drainage.	Possible	Yes
Razorback sucker *Xyrauchen texanus*	E, ST	Slow backwater habitats or large rivers and impoundments, not small tributaries or headwaters, with mud, sand or gravel substrate.	Possible	Yes
Plants				
Clay-loving wild buckwheat *Eriogonum pelinophilum*	E, SE	Restricted to the badlands/Adobe Hills east of Delta and Montrose, CO.	None	No
Colorado hookless cactus *Sclerocactus glaucus*	E, SE	Rocky hills, alluvial benches, and lower mesa slopes in desert shrub communities from 4,500 to 6,000 feet	None	No

[1] Status: T – Federal Threatened; E – Federal Endangered; C – Federal Candidate; SE – Colorado Endangered; ST – Colorado Threatened; SC – Colorado Candidate

[2] Source: CPW, 2009; CNHP, 2009.

[3] Potential Occurrence based on habitat associations and known distributions:

None: May occur in Delta County but restricted distributions are distant and/or habitat is not present in the project area.

Unlikely: May occur in Delta County and marginally suitable habitat present in the project area.

Possible: Occurs in Delta County, suitable habitat is present, but not observed in the project area.

Present: Observed in the project area and/or occupied habitat includes the project area.

[4] Also considered a BLM Sensitive Species within the Uncompahgre Field Office management area.

Table A-3
BLM Sensitive Species that May Be Present in or near the Proposed Lease Modifications

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
Invertebrates				
Great Basin silverspot butterfly *Speyeria okomis nokomis*		Spring-fed meadows, seeps, marshes, boggy streamside meadows with flowing water.	None	No
Amphibians				
Northern leopard frog *Rana pipiens*	SC	Margins, banks of marshes, ponds, streams, other permanent water.	Present	Yes
Boreal toad *Anaxyrus boreas boreas*	SE	Pond margins, marshes, wet meadows, riparian areas in subalpine elevations. Present on Grand Mesa.	None	No
Canyon treefrog *Hyla arenicolor*		Intermittent streams in deep rocky canyons with pinyon-juniper vegetation; project outside of expected range.	None	No
Reptiles				
Longnose leopard lizard *Gambelia wislizenii*	SC	Flat or gently sloping, open shrublands; project outside of expected range.	None	No
Milk snake *Lampropeltis trianguium taylori*		Grasslands, sandhills, canyons, open woodlands ponderosa, pinyon-juniper; known along the North Fork of the Gunnison River.	Possible	Yes
Midget faded rattlesnake *Crotalus viridis concolor*	SC	Most terrestrial habitats in west-central Colorado including grasslands, shrublands, pinyon-juniper woodlands, coniferous forests.	Possible	Yes
Fish				
Roundtail chub *Gila robusta*		Colorado River drainage, mostly large rivers, also streams and lakes; not documented in Terror Creek.	Possible	Yes
Bluehead sucker *Catostomus discobolus*		Headwater streams to large rivers with moderate velocity; not documented in Terror Creek.	Possible	Yes
Sucker, flannelmouth *Catostomas latipinnis*		Larger streams and rivers with riffles, eddies, backwaters; not documented in Terror Creek.	None	No

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
Colorado River cutthroat trout *Oncorhynchus clarki pleuriticus*	SC	Clear, headwater streams in the Colorado River drainage, clear mountain streams; no known populations of pure strain cutthroats on public lands managed by UFO.	Possible	Yes
Birds				
Long-billed curlew *Numenius americanus*	SC	Short-grass grasslands, wheat fields, dry land agriculture near water.	None	No
American peregrine falcon *Falco peregrinus anatum*	SC	Open conifer forests, riparian forests, and cliffs; migrant in western Colorado.	Present	Yes
Bald eagle *Haliaeetus leucocephalus*	SC	Reservoirs, rivers, wintering in semidesert and grasslands.	Possible	Yes
Brewer's sparrow *Spizella berweri*		Mostly in sagebrush shrubland but also in mountain mahogany and rabbitbrush, mesas and foothills.	Possible	Yes
American white pelican *Pelecanus erythrorhynchos*		Larger reservoirs, breeding on islands in eastern Colorado.	None	No
Columbian sharp-tailed grouse *Tympanuchus phasianellus columbianus*	SC	High elevation grassland areas interspersed with serviceberry, chokecherry, oakbrush, sagebrush, snowberry, and aspen; cultivated crops in spring/summer.	Unlikely	No
Northern goshawk *Accipiter gentilis*		Forests of aspen, ponderosa pine, lodgepole pine; larger trees for nesting.	Possible	Yes
Ferruginous hawk *Buteo regalis*	SC	Grassland, semidesert shrublands, rare in pinyon-juniper; nest on isolated structures.	Possible	Yes
White-faced ibis *Plegadis chihi*		Marsh edges, wet meadows, reservoir shorelines.	None	No
Mammals				
Allen's (Mexican) big-eared bat *Idionycteris phyllotis*		Oak-juniper woodland and ponderosa pine forest; project outside of expected range.	None	No
Big free-tailed bat *Nyctinomops macrotis*		Rocky slopes, canyon lands, roosts in crevices.	None	No
Spotted bat *Euderma maculatum*		Ponderosa pine in montane forest, pinyon-	Possible	Yes

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
		juniper woodlands, aspen, semi-desert shrublands.		
Townsend's big-eared bat *Corynorhinus townsendii*	SC	Montane forests, pinyon-juniper woodlands, semi-desert shrublands.	Possible	Yes
Fringed myotis *Myotis thysanodes*		Ponderosa pine, greasewood, oakbrush, saltbush shrublands.	Possible	Yes
Gunnison prairie dog *Cynomys gunnisoni*		Grasslands and high desert scrub; project outside the current, expected range.	None	No
White-tailed prairie dog *Cynomys leucurus*		Open shrublands, arid grass-shrub, and mountain valleys mostly in semidesert shrublands, also agriculture/pasture.	None	No
Kit fox *Vulpes macrotis*	SE	Semidesert shrubland and margins of pinyon-juniper woodlands; saltbush, sagebrush, greasewood.	None	No
Desert bighorn sheep *Ovis canadensis nelsoni*		Steep inaccessible cliffs, areas dominated by grasses.	None	No
Plants				
Grand Junction milkvetch *Astragalus linifolius*		Pinyon-juniper, sagebrush on Chinle, Morrison Formation; project outside of expected range.	None	No
Naturita milkvetch *Astragalus naturitensis*		Pinyon-juniper, sandstone mesas, ledges, crevices; project outside of expected range.	None	No
San Rafael milkvetch *Astragalus rafaelensis*		Gullied hills, washes, tallus, seleniferous clay, silt, sand; project outside of expected range.	None	No
Sandstone milkvetch *Astragalus sesquiflorus*		Sandstone rock ledges, fissures of domed slickrock, talus under cliffs, sandy washes; project outside of expected range.	None	No
Fragile rockbrake *Cryptogramma stelleri*		Moist, shaded limestone cliffs and ledges.	None	No
Uncompaghre bladderpod *Lesquerella vicina*		Grows on Mancos shale at the ecotone between pinyon-juniper and salt desert scrub; 6,000 to 7,200 feet; project outside of expected range.	None	No
Adobe desertparsley *Lomatium concinnum*		Barren adobe soils derived from Mancos	None	No

Common Name/ Scientific Name	Status [1]	Habitat [2]	Potential Occurrence in the Analysis Area [3]	Discussed in EA
		shale formation in shrub-dominated communities; project outside of expected range.		
Paradox lupine *Lupinus crassus*		Grows on Mancos shale in pinyon-juniper woodlands; project outside of expected range.	None	No
Eastwood monkey-flower *Mimulus eastwoodiae*		Shallow caves, seeps, in canyon walls. No habitat present.	None	No
Aromatic Indian breadroot *Pediomelum aromaticum*		Sandy soils, barren hills, in sagebrush, pinyon-juniper; project outside of expected range.	None	No

[1] Status: SE – Colorado Endangered; ST – Colorado Threatened; SC – Colorado Candidate
[2] Sources: CNHP, 2009; CPW, 2009; Weber and Wittmann, 1987; Andrews and Righter, 1992; Hammerson, 1986; Woodling, 1985; Fitzgerald et al., 1994.
[3] Potential Occurrence based on habitat associations and known distributions:
None: May occur in Delta County but restricted distributions are distant and/or habitat is not present in the project area.
Unlikely: May occur in Delta County and marginally suitable habitat present in the project area.
Possible: Occurs in Delta County, suitable habitat is present, but not observed in the project area.
Present: Observed in the project area and/or occupied habitat includes the project area.

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. However, Critical Habitat for the Colorado squawfish, Razorback sucker, Humpback chub, and Bonytail chub does exist off-site in the Colorado River drainage which potentially could be affected by water depletion from this action (USFWS, 1994). The Fish and Wildlife Service has concluded that any water depletion in the upper Colorado River Basin "may affect" these Endangered fish species and their Critical Habitat.

A segment of the West Fork of Terror Creek proposed lease modification tract, is occupied habitat for the Threatened greenback cutthroat trout. The following portions of the lease modification for COC-61209 are within ¼ mile of the stream segment -

> Township 13 South, Range 91 West, 6th P.M., Section 5: SWNW, S/2NESENW, S/2SENW, S/2NWSENW, SWSWNE, S/2NWSWNE, W/2NWSE – approximately 105 acres.

Current plans for mining do not include the lands under the West Fork of Terror Creek. The West Fork of Terror Creek is nearly 490 ft. from the closest longwall mining that would occur if the lease modifications are approved. Given a worst-case overburden depth of 600 feet, with an angle of draw of 25 degrees, the effects of surface subsidence are projected to extend approximately 250 feet from the easternmost longwall panel (BLM, 2000). Therefore, no subsidence related disturbance to the flows in Terror Creek or to Threatened greenback cutthroat trout are predicted as a result of proposed mining on the lease modification tracts. Lands are suitable for coal leasing after applying the exceptions to the criteria. In order to protect the West

Fork of Terror Creek and related habitat for the Threatened greenback cutthroat trout, the following lease stipulations would be required for Lease COC-61209:

- State-of-the-art mining techniques (pillar and panel widths, rate of coal development and extraction, mine method, determining angle of draw, etc.) would be used to control subsidence. No mining-related surface disturbance would occur within 200 feet of GBCT occupied habitat, as measured from the normal high water mark, without a written finding from the Authorized Officer. These techniques would provide for maximum coal removal while protecting the values associated with the threatened greenback cutthroat trout habitat.
- Sediment control measures, such as silt fences or straw wattles, would be placed down slope from the pads and access roads to prevent potential sedimentation effects to Terror Creek.
- In order to insure that BMPs relating to the control of sediment from disturbed sites are in place, and functional, Bowie shall, on a monthly basis from May through August, use an independent contractor to inspect Bowie's well pad sites and access roads within the Terror Creek watershed. The independent contractor shall contact Bowie and the BLM Uncompahgre Field Office (970-240-5300), within two business days of discovering sediment control measures that are missing or non-functional. Bowie will have three business days to correct the problem. Ineffective measures would be redesigned and replaced after consultation with BLM. For each year that Bowie operates under this BA, Bowie shall submit the compiled monthly inspection reports to BLM Uncompahgre Field Office by September 30. In the event new sediment control methods are identified or current practices are not working as intended, adaptive management will be used to implement methods that are effective at eliminating offsite movement of soils and sedimentation into resident streams.

- At any time during drilling activities, until successful reclamation or continuing into the future, the point of access to temporary roads shall be blocked with gates, rock barriers, or concrete barriers to prevent vehicles, including Off-Highway Vehicles (OHVs), from using them. Signs identifying the road closure shall be placed at the barricades.
- In order to prevent increased risk of sediment being generated as a result of pumping related disturbance, pumping from East Terror Creek would not take place until after the April and May peak runoff period has past. Therefore, pumping from East Terror Creek would not begin until June. The AO may grant an exception that would allow pumping in May if runoff flows have dropped to the normal mean monthly levels for June (6.9 cfs) and USFWS has concurred via informal consultation.

- To prevent mortality of GBCT due to pumping from the East Fork of Terror Creek, the conservation measures are defined as: pumping during the June and July period would require the use of a screened pump intake, with a maximum ¼ inch size mesh. For the August through September period, when GBCT fry would be present in the stream, pump intakes would be screened with no larger than 1/16th mesh screen. The screen would not be confined to just the pump intake, but must cover a larger area, such as a cylinder or box design which has at least 5 times the surface area of the pump intake. Bowie must submit the final design for this screening fixture to the BLM Western Slope fisheries biologist, Tom Fresques (970-876-9078; t1fresqu@blm.gov), for his approval.

- During the June through September period, if the flows in East Terror Creek drop below the ten year mean monthly flow for October (1.0 cfs), Bowie will not pump water from the East Fork of Terror Creek.
- To prevent impacts to GBCT fry and fingerlings, pumping would not take place during the base flow (low flow) periods of the year; October through March.
- If there are existing roads or disturbance features within the 200-foot buffer along GBCT habitat streams, then no additional surface disturbance will be permitted within those areas. Maintenance of roads or other existing features must remain within the existing road prism or footprint of the feature being maintained.
- The operator shall not store equipment, machinery, or construction materials in any locations that are 200 feet or less from the riparian zones of the streams within the Terror Creek watershed.
- No overstory or understory vegetation will be removed from the riparian zone of the streams in the Terror Creek watershed.
- During construction or maintenance activities in proximity to the 200-foot riparian buffer zone, the edge of the buffer zone shall be marked for avoidance by construction equipment and activities.
- Within the Terror Creek watershed only fresh water, free of chemicals or other contaminants, may be used for dust abatement activities.
- Within the Terror Creek watershed, additional crossings of perennial streams will not be constructed
- The BLM Uncompahgre Field Office hydrologist must approve, in advance, the size and composition of riprap material to be used in the East Fork of Terror Creek.
- Bowie must report their annual water depletions to the BLM Uncompahgre Field Office by September 30 each calendar year. This includes depletions that result from surface activities associated with coal mining related activities within the Action Area, regardless of surface ownership.
- No additional disturbance, such as road widening or upgrading would occur within 200 feet of GBCT occupied habitat, as measured from the normal high water mark, to protect and maintain riparian vegetation and eliminate potential effects to the greenback cutthroat trout, unless exceptions were approved by the Authorized Officer.
- Site-specific surveys for sensitive plants would be conducted onsite prior to the development of any surface facilities or other soil-disturbing activities.
- There would be no surface occupancy or soil-disturbing activities within a 100-foot radius of sensitive plant locations unless exceptions are approved by the Authorized Officer.
- Application of herbicides, surfactants, and other weed control measures would avoid overspray or drift onto desirable species or sensitive plants.

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.

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 - No lands within the review area, or off-site that would be affected by this action, have been determined by the state of Colorado as critical or essential habitat for any state-listed Endangered or Threatened animal species. No plant species are listed by the state of Colorado as Threatened or Endangered. Of the Colorado State-listed species shown in the table for Criterion 9, only the greenback cutthroat trout occurs in the proposed lease modification tract for COC-61209. This species is known to occur in the West Fork of Terror Creek, which flows through the lease modification tract boundary, and approximately 490 ft. from any proposed longwall mining. No direct impacts to West Fork of Terror Creek would occur from mining of the proposed lease modification tracts (see Criterion #9).

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.

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 - Presently, no bald or golden eagle nest sites exist on federal lands within the review area. A buffer zone of one-quarter mile radius around bald and golden eagle nest sites is considered adequate protection. Underground coal mining and nesting bald or golden eagles are compatible on the same tract of land unless surface facilities or surface disturbance cause nest-site abandonment. Lands are suitable for coal leasing after applying the exceptions to the criteria. With respect to bald or golden eagle nests that may be established on the review area during the life of the project, the following special stipulations would apply:

1. No new permanent surface facilities or disturbance except subsidence would be located within a one-quarter mile radius buffer zone around each bald or golden eagle nest site.

2. No surface activities would be allowed within a one-half mile radius buffer zone around each active eagle nest site from November 15 to July 30 for bald eagles and February 1 to July 15 for golden eagles.

3. Any proposed surface facilities, disturbance, or activities (as noted above) in or adjacent to these buffer zones would require approval from the surface management agency on a site-specific basis, after consultation with the U.S. Fish and Wildlife Service.

Criterion 12

Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering shall be considered unsuitable.

Analysis - The bald eagle is present as a winter resident along the North Fork of the Gunnison River. The river and adjacent habitats are designated as Bald Eagle Winter Forage Range by CPW (2011), of which a small portion of the designated range overlaps proposed lease COC-61209, including GVB-B19A and access roads. Biological surveys indicate that bald eagle activity has been observed along the North Fork Valley, but that no bald eagles have been sighted in the mine area, or in areas near the mine, for several years. Lands are suitable for coal leasing after applying the exceptions to the criteria.

With respect to bald or golden eagle roost sites or concentration areas which may be established on the review area during the life of the project, the following special stipulation would be applied:

- No surface activity except subsidence would occur within a one-quarter 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, activity would be restricted to the hours of 10:00 a.m. and 2:00 p.m. from November 15 through March 15.

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.

Exceptions - 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 - An active peregrine falcon nest is located in the upper end of Dove Gulch. This is the only active peregrine nest known to occur in this general area. The nest is located over a high

ridge and more than two miles from any activity associated with road and pad construction and drilling activity. It is not expected to be affected by the activities associated with the proposed lease modifications. Lands are suitable for coal leasing after applying the exceptions to the criteria.
With respect to peregrine falcon nests which may be established in the review area during the life of the project, the following special stipulations would be applied (also see Criterion 14 for additional conditions):

1. No new permanent surface facilities or disturbance would be located within a one-quarter mile radius buffer zone around each peregrine falcon nest site.
2. No aboveground activities would be allowed within a one-half mile radius buffer zone around each active peregrine falcon nest site from February 1 to July 15.
3. Any proposed surface facilities, disturbance, or activities in, or adjacent to, these buffer zones would require approval from the BLM on a site-specific basis, after consultation with the U.S. Fish and Wildlife Service.

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.

Exceptions - 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 habitant during the periods when such habitat is used by the species.

Analysis – The Migratory Bird Treaty Act (916 U.S.C. 703-711) identifies numerous bird species of the southwestern U.S. that are assigned a migratory status. BLM signed a Memorandum of Understanding (MOU) with the USFWS in April 2010, which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. The focus of BLM's conservation efforts is on migratory species and some non-migratory game bird species that are listed as Birds of Conservation Concern (BCC). BCC have been identified by the USFWS (2008) for different Bird Conservation Regions (BCR) in the United States to identify those species in the greatest need of conservation action, outside of those species already listed by the USFWS as threatened or endangered. The entire project area is in BCR 16, the Southern Rockies/Colorado Plateau region. The USFWS lists 27 species (see Table A-4) that are BCC in BCR 16 (USFWS, 2008). Table A-4 also shows the status for each species within the UFO management area and probable presence within the project area (Kingery, 1998; CPW, 2011). Several of the species in Table A-4 were also included in the Endangered, Threatened, and Sensitive Species section.

Based on species' known distributions and habitat associations in western Colorado, nine species are known or have potential to occur in the project area: bald eagle, golden eagle (*Aquila chrysaetos*), peregrine falcon, prairie falcon (*Falco mexicanus*), Lewis's woodpecker

(*Melanerpes lewis*), pinyon jay (*Gymnorhinus cyanocephalus*), Grace's warbler (*Dendroica graciae*), Brewer's sparrow, and Cassin's finch (*Carpodacus cassinii*). Two of these species were observed on-site during surveys: peregrine falcon and golden eagle.

An active peregrine falcon nest is located in the upper end of Dove Gulch. This is the only active peregrine nest known to occur in this general area. The nest is located over a high ridge and more than two miles from any activity associated with road and pad construction, and drilling activity. It is not expected to be affected by the activities associated with the proposed lease modifications.

The bald eagle is present as a winter resident along the North Fork of the Gunnison River. The river and adjacent habitats are designated as Bald Eagle Winter Forage Range by CPW (2011), of which a small portion of the designated range overlaps proposed lease COC-61209, including GVB-B19A and access roads. Biological surveys indicate that bald eagle activity has been observed along the North Fork Valley, but that no bald eagles have been sighted in the mine area, or in areas near the mine, for several years.

Table A-4
Birds of Conservation Concern within BCR 16

Common Name **Scientific Name**	**Habitat** [1]	**Status Within UFO**	**Presence in Project Area**
Gunnison sage-grouse *Centrocercus minimus*	Expansive sagebrush with grasses, forbs, and healthy riparian; project outside of expected range.	Resident	No
American bittern *Botaurus lentiginosus*	Dense freshwater marshes and extensive wet meadows.	Migrant	No
Bald eagle *Haliaeetus leucocehpalus*	Nests, roosts in large cottonwoods along rivers; near prey or carrion during winter.	Migrant/Winter	Yes
Ferruginous hawk *Buteo regalis*	Nests in isolated trees, rock outcrops, artificial structures, ground near prey base.	Migrant	No
Golden eagle *Aquila chrysaetos*	Nest on open cliffs and in canyons or in tall trees (cottonwoods) in open country and riparian zones.	Resident	Yes
Peregrine falcon *Falco peregrinus*	Nests on high cliff faces, often near water; forages in adjacent habitats.	Resident	Yes
Prairie falcon *Falco mexicanus*	Nests in cavities on cliffs, rock outcrops adjacent to open grassland, shrublands.	Resident	Yes
Snowy plover *Charadrius alexandrinus*	Barren or sparsely vegetated alkaline flats and river bars.	Migrant	No
Mountain plover *Charadrius montanus*	Short-grass prairie and shrub-steppe landscapes, ryland and cultivated farms, and prairie dog towns.	Migrant	No
Long-billed curlew *Numenius americanus*	Short-grass grasslands, wheat fields, dry land agriculture near water.	Migrant	No
Yellow-billed cuckoo *Coccyzus americanus*	Riparian forested habitats dominated by cottonwoods.	Breeding	No
Flammulated owl *Otus flammeolus*	Nests in forest of ponderosa pine and Douglas-fir with aspen, and in aspen stands.	Breeding	No
Burrowing owl	Nests in burrows, especially prairie dog /	Breeding	No

Common Name Scientific Name	Habitat [1]	Status Within UFO	Presence in Project Area
Athene cunicularia	badger burrows in grasslands, desert shrub.		
Lewis's woodpecker *Melanerpes lewis*	Nests in open stands of cottonwood riparian or urban stands, also in aspen, oak shrub.	Resident	Yes
Willow flycatcher *Empidonax traillii*	Dense riparian habitats along rivers, streams, or other wetlands.	Breeding	No
Gray vireo *Vireo vicinior*	Nests in open pinyon-juniper stands with mountain mahogany, deciduous shrub interspersed.	Breeding	No
Pinyon jay *Gymnorhinus cyanocephalus*	Nest in pinyon and/or juniper woodlands, feed/cache pinyon nuts, juniper berries.	Resident	Yes
Juniper titmouse *Baeolophus griseus*	Nests in pinyon and/or juniper open or dense woodlands, often intermixed with Gambel oak.	Breeding	No
Veery *Catharus fuscescens*	Damp deciduous/mixed woodlands with dense understory, wood swaps/lowlands, and damp ravines.	Not present	No
Bendire's thrasher *Toxostoma bendirei*	Open farmlands, grasslands, and brushy arid to semi-arid deserts; breeds mainly in grasslands, shrublands or woodlands.	Not present	No
Grace's warbler *Dendroica graciae*	Open montane forests, especially oaks, junipers, firs, and pines..	Breeding	Yes
Brewer's sparrow *Spizella breweri*	Nests in sagebrush, occasionally greasewood, rabbitbrush in desert valleys.	Breeding	Yes
Grasshopper sparrow *Ammodramus savannarum*	Grasslands with few scattered shrubs.	Not present	No
Chestnut-collared longspur *Calcarius ornatus*	Shortgrass or mixed-grass habitats heavily grazed or recently burned.	Not present	No
Black rosy-finch *Leucosticte atrata*	Alpine areas usually near rock piles and cliffs; winters in mountain meadows, high deserts, valleys, and plains.	Winter	No
Brown-capped rosy-finch *Leucosticte australis*	Nests on cliffs or in caves, rock slides or old buildings above timberline.	Winter	No
Cassin's finch *Carpodacus cassinii*	Nests in montane forests with spruce/fir and aspen; also in lower pinyon-juniper woodlands.	Breeding	Yes

[1] Based on Righter et al. 2004.

Underground activities would have no impacts on migratory bird and/or raptor populations. There is potential for disturbance to migratory birds during drilling, access, and site reclamation activities associated with GVB drilling where vegetation would be disturbed. This includes direct impacts to unidentified active nests, potential mortalities and injuries to birds and eggs in unidentified nests and disturbance to suitable nesting habitat potentially resulting in incidental "take" of migratory birds. To minimize or avoid effects to nesting migratory birds, Bowie would avoid vegetation removal during the migratory bird nesting period (May 15 to August 1).

Raptors nesting in the project area could abandon nests because of noise and human presence during the breeding period, which varies by species. Recent surveys within the proposed lease modification areas did not observe raptor nests within woodland habitat 0.25 mile from the project or within cliffs 0.5 mile of the project. It is not expected that construction of the project would affect nesting raptors.

1. A qualified biologist would conduct pre-construction breeding bird and raptor surveys during the breeding period within 0.5 mile of the general disturbance area (drill pads and access roads) if activities would occur during the breeding season (generally May 15 to August 1, but varies by species). Surveys would document active nests. If no active nests are found and a survey report is submitted to and approved by the BLM Biologist, activities may begin within the cleared areas. If active nests are found, development timing would be restricted during the breeding season, as recommended by the BLM UFO.
2. Surface disturbing activities would not occur during the migratory bird nesting period (May 15 through August 1) to prevent potential taking of migratory birds and/or eggs, unless vegetation is removed prior to May 15. Nesting surveys conducted within 2 weeks of surface-disturbing activities that indicate no migratory bird species are nesting or otherwise present within the area to be disturbed may also be considered; however, consultation and approval by BLM would be required.
3. If active nests are identified during project implementation, appropriate measures would be taken in order to reduce impacts to these species, including relocating overland access routes and drill hole locations, and implementing disturbance-free buffer zones and timing limitations for active nests as recommended by the BLM UFO.
4. All unavoidable surface disturbances would require approval of the BLM AO. The BLM would coordinate with USFWS and CPW to determine the type and extent of allowable variances. A site-specific analysis would determine if this stipulation would apply.

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.

Exceptions - 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 - According to CPW's current mapping of seasonal ranges, elk winter range and mule deer summer range are classified within the project area. A portion of the lease modification tracts have been identified as mule deer winter range and black bear fall concentration area. Surface disturbing activities in this area caused by underground coal mining would impact elk

and mule deer winter ranges and fall black bear use. Lands are suitable for coal leasing after applying the exceptions to the criteria. The review area is suitable for coal leasing with inclusion of the following special protective stipulations on those areas that are currently, or may be, designated as crucial winter range and fall black bear concentration during the life of the project:

1. Facility construction, and major scheduled maintenance would not be authorized within these crucial winter ranges from December 1 through April 30. All unavoidable surface disturbance within these crucial winter ranges during these times would require approval of the authorized official.

2. Bear-proof containers would be used and refuse collected frequently to minimize potential for human-bear conflicts at construction sites. Employee training would include information to reduce bear-human conflicts including to not feed bears.

No other federal lands within the review area, or off-site that would be affected by the Proposed Action are considered critical or essential habitat for resident species of fish, wildlife or plants of high interest to the state of Colorado.

Criterion 16

Federal lands in riverine, coastal, and special floodplains (100-year recurrent 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 tracts is 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 one-quarter mile from the outer edge of the far banks of the water, shall be unsuitable.

Analysis - None of the lands in the proposed lease tracts is identified as 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 of the Gunnison River, along which both surface irrigated and potentially irrigable sites exist. However, material damage to the quality and quantity of water arising on or flowing over the proposed lease tracts is not anticipated.

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.

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 the Interior
Fish and Wildlife Service
Western Colorado Supervisor
Ecological Services
764 Horizon Drive, Building B
Grand Junction, CO 81505-3946

U.S. Department of the Interior
Office of Surface Mining
Reclamation and Enforcement – Western Region
1999 Broadway, Suite 3320
Denver, CO 80202

U.S. Department of Energy

Western Area Power Administration
P.O. Box 3700
Loveland, CO 80539-3700

Appendix B

Informal Section 7 Consultation for Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:
ES/CO:BLM/UFO/Bowie
TAILS 65413-2011-I-0102

February 21, 2012

Memorandum

To: Field Manager, Bureau of Land Management, Uncompahgre Field Office, Montrose, Colorado

From: Acting Western Colorado Supervisor, Fish and Wildlife Service, Ecological Services, Grand Junction, Colorado

Subject: Informal section 7 consultation for Bowie Resources Underground Coal Mining Associated Surface Activities and Facilities

The U.S. Fish and Wildlife Service (Service) received your November 30, 2011, request for informal section 7 consultation under the Endangered Species Act. The consultation concerns the Bowie Resources (Bowie), LLC, Underground Coal Mining Associated Surface Activities and Facilities potential effects on greenback cutthroat trout(*Oncorhynchus clarkii stomias*) lineage (GBCT), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), razorback sucker (*Xyrauchen texanus*), Canada lynx (*Lynx canadensis*), wolverine (*Gulo gulo luscus*), and yellow-billed cuckoo (*Coccyzus americanus*). Beginning on June 6, 2011, we provided comments on several drafts of the BLM's Programmatic Biological Assessment (PBA) for this project. On December 12, 2011, we requested additional information to support the BLM's "may affect, not likely to adversely affect" determination for GBCT. This information was received by our office via email on February 2, 2012, and via letter on February 7, 2012, and hereby amends the PBA.

Proposed Action

The proposed action includes surface disturbance associated with underground mining based on Reasonably Foreseeable Development projections for Bowie activities. Surface disturbance would result from the installation of gob vent boreholes, drilling of exploration holes for baseline geologic data, installation of deep bedrock water monitoring wells, construction of future ventilation shafts, and construction or restoration of roads to access these facilities. Proposed activities would take place in a 19,385-acre area (action area) located in Delta County, Colorado, approximately 8 air miles north of Paonia, Colorado. The activities would occur in the watersheds of Terror Creek, Stevens Gulch, Hubbard Creek, Roatcap Creek, and one small

unnamed watershed, all of which are tributaries of the North Fork of the Gunnison River. Lands involved are managed by the Paonia Ranger District of the Grand Mesa, Uncompahgre, and Gunnison National Forest, the Uncompahgre Field Office of the BLM, and private landowners, including Bowie. Within the action area, the Federal government retains rights for all minerals on approximately 17,075 acres; the mineral rights for oil, gas and coal on 476 acres; and the mineral rights for coal on 1,522 acres. There are approximately 312 acres of private surface with private (fee) minerals. Additional details of the proposed action are provided in the PBA (BLM 2011) for this project.

BLM (2011) addresses Bowie's mining-related surface activities and facilities through December 31, 2021, with a maximum of 71.4 acres of new surface disturbance within the Terror Creek watershed over the life of the PBA. An average total of 31.5 acres of disturbance would exist at any one time, with an estimated 18.6 acres of long-term disturbance in the Terror Creek watershed. By September 30 each year, Bowie will submit an annual report that describes site-specific activities or projects covered under the umbrella of this consultation. BLM will determine whether a project falls under the umbrella of the consultation and will coordinate with the Service if there are uncertainties. Reports will contain a brief description of the project, project location, and total acres of disturbance. The BLM will provide annual reports to the Service and will track disturbance to ensure activities do not exceed the 71.4-acre threshold. If disturbance differs from that evaluated in the PBA, or if the 71.4-acre threshold would be exceeded as a result of a planned activity, BLM will reinitiate consultation with the Service. Actions that do not fall under the umbrella of the consultation and the proposed action description will require separate consultation.

Effects Determinations and Concurrence

[Note: This letter and our concurrence are based on the information provided in the PBA (BLM 2011). Your letter dated November 30, 2011, requesting informal section 7 consultation provided effects determinations and rationale different than that of the PBA.]

You determined that the proposed action would have no effect on yellow-billed cuckoo or North American wolverine. Therefore, Section 7 consultation and concurrence are not necessary for these species.

BLM (2011) estimates that .15 acre-feet of water would be depleted annually, and 1.6 acre-feet total over the ten-year period, as a result of proposed activities. The Service has determined that water depletions adversely affect the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail and their critical habitats. Small water depletions associated with the project would be addressed and reported under the Programmatic Biological Opinion (PBO) for *Water Depletions Associated with BLM Projects (Excluding Fluid Mineral Development)* (ES/GJ-6-CO-08-F-0010) within the Upper Colorado River Basin in Colorado. All other water depletions not meeting the requirements and conditions of the PBO would need to be addressed under separate section 7 consultation.

Avoidance of direct disturbance of suitable habitat would minimize project impacts on Canada lynx, and disturbance or displacement of animals would be extremely unlikely to occur.

Therefore, we concur with your determination that the proposed action may affect, but is not likely to adversely affect Canada lynx, due to discountable effects.

A suite of conservation measures designed to protect GBCT will be applied as part of the proposed action, including project setbacks from occupied streams, reclamation standards, erosion/ sediment control measures and implementation monitoring, and measures to avoid take, entrapment, and entrainment of fish during water pumping activities (Appendix A). In particular, no new surface disturbance will occur within 200 feet of GBCT occupied habitat, as measured from the normal high water mark, and maintenance of roads or other existing features within this zone will be limited to the existing road prism or footprints. To clarify, we understand *surface disturbance* to be any project-related disturbance resulting in direct and pronounced alteration, damage, removal, displacement, or mortality of vegetation, soil, or substrates, or similar effects. Also, BLM has committed to ensuring that adequate and proper erosion control measures are implemented and effective, such that adverse effects do not occur to GBCT and its habitat. An a*dverse effect* is an effect occurring as a direct or indirect result of the proposed action or its interrelated or interdependent actions, where the effect is not discountable, insignificant, or wholly beneficial. Based on this information, we concur with your determination that the proposed action may affect, but is not likely to adversely affect greenback cutthroat trout, due to discountable and insignificant effects.

Conclusion

This concludes section 7 consultation for the Bowie Resources (Bowie), LLC, Underground Coal Mining Associated Surface Activities and Facilities. As provided in 50 CFR §402.16, re-initiation of consultation is required if: 1) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not previously considered, 2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered, or 3) a new species is listed or critical habitat designated that may be affected by the action. In addition, the Proposed Action section of this letter provides specific requirements for reinitiation of consultation, per the programmatic terms.

Thank you for your interest in conserving threatened and endangered species. If we can be of further assistance, please contact Charlie Sharp at (970) 243-2778, extension 18.

Literature Cited

Bureau of Land Management (BLM). 2011. Biological assessment: Bowie Resources, LLC, underground coal mining associated surface activities and facilities (November draft). Prepared for the BLM Uncompahgre Field Office, Montrose, Colorado, by WestWater Engineering, Grand Junction, Colorado.

Appendix A

BLM Required Conservation Measures:

- In order to insure that BMPs relating to the control of sediment from disturbed sites are in place, and functional, Bowie will, on a monthly basis from May through August, use an independent contractor to inspect Bowie's well pad sites and access roads within the Terror Creek watershed. The independent contractor will contact Bowie and the BLM Uncompahgre Field Office (970-240-5300), within two business days of discovering sediment control measures that are missing or non-functional. Bowie will have three business days to correct the problem. Ineffective measures would be redesigned and replaced after consultation with BLM. For each year that Bowie operates under this BA, Bowie shall submit the compiled monthly inspection reports to BLM Uncompahgre Field Office by September 30. In the event new sediment control methods are identified or current practices are not working as intended, adaptive management will be used to implement methods that are effective at eliminating offsite movement of soils and sedimentation into resident streams.

- In order to prevent increased risk of sediment being generated as a result of pumping related disturbance, pumping from East Terror Creek would not take place until after the April and May peak runoff period has past. Therefore, pumping from East Terror Creek would not begin until June. The AO may grant an exception that would allow pumping in May if runoff flows have dropped to the normal mean monthly levels for June (6.9 cfs) and USFWS has concurred via informal consultation.

- To prevent mortality of GBCT due to pumping from the East Fork of Terror Creek, the conservation measures are defined as: pumping during the June and July period would require the use of a screened pump intake, with a maximum ¼ inch size mesh. For the August through September period, when GBCT fry would be present in the stream, pump intakes would be screened with no larger than 1/16th mesh screen. The screen would not be confined to just the pump intake, but must cover a larger area, such as a cylinder or box design which has at least 5 times the surface area of the pump intake. Bowie must submit the final design for this screening fixture to the BLM Western Slope fisheries biologist, Tom Fresques (970-876-9078; t1fresqu@blm.gov), for his approval.

- During the June through September period, if the flows in East Terror Creek drop below the ten year mean monthly flow for October (1.0 cfs), Bowie will not pump water from the East Fork of Terror Creek.

- To prevent impacts to GBCT fry and fingerlings, pumping would not take place during the base flow (low flow) periods of the year; October through March.

- There will be no new surface disturbing activities within 200 feet of any occupied greenback cutthroat trout habitat, as measured from the normal high water mark.

- If there are existing roads or disturbance features within the 200-foot buffer along GBCT habitat streams, then no additional surface disturbance will be permitted within those areas. Maintenance of roads or other existing features must remain within the existing road prism or footprint of the feature being maintained.

- The operator shall not store equipment, machinery, or construction materials in any locations that are 200 feet or less from the riparian zones of the streams within the Terror Creek watershed.

- No overstory or understory vegetation will be removed from the riparian zone of the streams in the Terror Creek watershed.

- During construction or maintenance activities in proximity to the 200-foot riparian buffer zone, the edge of the buffer zone shall be marked for avoidance by construction equipment and activities.

- Within the Terror Creek watershed only fresh water, free of chemicals or other contaminants, may be used for dust abatement activities.

- Within the Terror Creek watershed, additional crossings of perennial streams will not be constructed

- The BLM Uncompahgre Field Office hydrologist must approve, in advance, the size and composition of riprap material to be used in the East Fork of Terror Creek.

- Bowie must report their annual water depletions to the BLM Uncompahgre Field Office by September 30 each calendar year. This includes depletions that result from surface activities associated with coal mining related activities within the Action Area, regardless of surface ownership.

- Conditions which will trigger re-initiation of consultation with the USFWS are:

  1. The types of impacts associated with the proposed actions differ from, or exceed those evaluated in this BA.

  2. In the future, species that could be impacted by Bowie's activities in the Action Area are added to the list of Threatened or Endangered species.

  3. Surface disturbance within the Terror Creek watershed exceeds 71.4 acres.

  4. Bowie submits to BLM requests for exceptions to the conservation measures of this BA.

  5. If future genetic information results in a change in GBCT's status as Threatened under the ESA, the conservation measures contained in this BA will be reviewed and updated as appropriate.

- Bowie Best Management Practices (Appendix A of BLM (2011)), including erosion/ sedimentation control measures, will be applied to project activities.

Appendix C

Combined Geologic and Engineering
And
Maximum Economic Recovery Report

Combined
Geologic and Engineering Report (GER)

and

Maximum Economic Recovery Report (MER)

for

Coal Lease Modifications
To Federal Coal Leases
COC61209
COC37210

applied for by

Bowie Resources, LLC (BRL) July 11, 2011

T.13S., R.91W. 6th Principal Meridian and
T.13S., R.92W. 6th Principal Meridian

by
Desty Dyer
Mining Engineer
March 2012

LEGAL DESCRIPTION

The legal descriptions for the two separate modification tracts are as follows:

COC-61209 Modification

Township 13 South, Range 91 West, 6th P.M.
Section 5: SWNW, NWSW, SWSW, NESW, S/2NESENW, S/2SENW, S/2NWSENW, SWSWNE, S/2NWSWNE, W/2NWSE
Section 6: SENE
containing approximately 265.00 acres.

COC-37210 Modification

Township 13 South, Range 92 West, 6th P.M.
Section 1: S/2NE, S/2NW, Lots 9 – 12.
containing approximately 237.43 acres.

Note: The lease modifications are located on lands in which BLM manages a portion of the surface (174 acres on COC-61209) and all of the mineral estate (COC-37210 and COC-61209). The lease modification tracts will be referred to hereafter as the MODS.

LOCATION

The Bowie No. 2 Mine is located in Delta County, Colorado, 5 miles north-northeast of Paonia off of highway 133. The mine accesses federal coal reserves through coal lease COC61209 while mining from leases COC37210, COC27432, and COC036955 within LMU COC57202 all held by BRL.

LEASE STATUS

Lease status is as follows:

- **COC-57202 –** Logical Mining Unit (LMU) approximately 6,802 acres – comprised of Federal leases COD036955, COC25079, COC27432, and COC37210.

- **COD036955 –** In LMU approximately 440 acres – Original lease – A small portion near the north boundary projected to be mined in 2012 will result in it being mined out. The lease is bounded by coal outcrop, and Federal leases; therefore, it is not a candidate for modification.

- **COC25079 –** In LMU approximately 311 acres – Is mined out, and is bounded by coal outcrop and Federal leases; therefore, it is not a candidate for modification.

- **COC27432 –** In LMU approximately 1,014 acres – A small portion near the north boundary projected to be mined in 2012 will result in it being mined out. It is bounded by coal outcrop and Federal leases; therefore, it is not a candidate for modification.

- **COC37210 –** In LMU approximately 5,037 acres – Actively producing and holds nearly all remaining mineable reserves – Borders COD036955 and COC27432, on their north, COC53356 on it's south and east, and COC62109 on it's west. Unleased and unmined Federal reserves bound it on the north and west that could be modified into the lease.

- **COC53356 –** Approximately 522 acres – considered mined out and would have no mineable reserves unless modified or economics change to make the remaining in-place coal mineable. Borders COC37210 on the northwest.

- **COC61209 –** Approximately 3,904 acres – considered mined out and would have no mineable reserves unless modified or economics change to make the remaining in-place coal mineable. Borders COC37210 on the east. Unleased and unmined Federal coal reserves bound it on the north and northwest which could be modified into the lease.

STRATIGRAPHY & GEOLOGY

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 Uncompaghre 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 MODS, the B-Seam is split into the upper and lower seams and only the lower B-Seam is of mineable thickness and quality. The A and C seams are not of mineable thickness, the D-Seam is split into three thin seams. The E and F-Seams are not of mineable thickness.

COAL QUALITY - The B-Seam coal "as received" analysis for the moisture, ash, sulphur, and BTU content based on drill hole samples is expected to be approximately:

Moisture 7.68 % Ash 5.74% Sulphur 0.49% BTU 12,324

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 MODS, and economic constraints and equipment availability for the applicant dictate that the underground longwall mining method be employed to extract the coal from the MODS. The amount of overburden above the mineable seam on the MODS varies from just under 1,000 ft. on the east to 1,600 ft. on the west with 2,000 ft. on existing lease COC37210 between the two MODS. The purpose of the MODS is to offer an extended area within the federal coal reserve for gateroad development and longwall mining east and west from existing lease COC37210. Both gateroad development and longwall mining will take place on the MODS.

PRODUCTION FACTORS

CURRENT	PROJECTED with MODS
Short Term Schedule - Production to meet the market demand is supplied by two active development sections and one longwall block. The permitted mining projections include west mains with longwall panels extended south from those mains. Production rates could vary but are expected to be at 4 million tons per year. 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 1000 operating shifts per year.	Short Term Schedule - BRL management would continue to develop and longwall mine at about a 4 million ton per year rate. The MODS would provide opportunity for a logical extension of the Bowie No. 2 Mine B-Seam workings beyond the current mine plan. Mains would be developed north from existing west Mains and from the north Mains gateroads would be developed to facilitate two longwall blocks to the east and two longwall blocks to the west. Three of the four longwall blocks would overlap both the MODS and existing lease COC37210. Development of the north Mains could begin by mid-2012 and gateroad development could cross onto the MODS by mid-2013.
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 two to six months. Recovery overall is about 65% with a rate of mining at about 1 million tons per year on development going up to 4 million tons per year with added longwall production. BRL could sustain a production rate of 5 million tons per year in a 3 or 4 month period but not likely in any given 12 month period.	Production Data - The operation would extract coal from the B-Seam with no change in the production data except that the MODS would add recoverable reserves.
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)	Mining Equipment - There would be no change.

CURRENT	PROJECTED with MODS
Life of Mine - The B-Seam (combined upper and lower) recoverable reserves estimated to remain after January 2012 available to the Bowie No. 2 Mine operation on the current West Mine permit within the LMU total about 8.57 million tons of federal coal. Additional mining could be permitted to the north on the LMU which would add an estimated 4.61 million tons of federal coal to those recoverable reserves bringing the total available in the LMU to 13.18 million tons. (SEE TABLE UNDER ESTIMATED RECOVERY BELOW). At the projected mining rate of 4 million tons per year, the life of mine would be about 3.3 years **without the MODS**. There are also potential recoverable reserves on unleased federal coal to the north that could be explored in the future.	Life of Mine - The existing combined federal holdings represent about 3.3 years of mine life. The MODS would add about 2.05 million tons and allow an additional 1.20 million tons to be mined on the adjacent existing LMU, bringing the total to about 3.25 million tons thus increase the life of mine from 3.3 to 4.1 years. (SEE TABLE UNDER ESTIMATED RECOVERY BELOW). The result is that about 10 months would be added to the life-of-mine, and a bypass of available federal coal reserves would be avoided. Actual years of operations on the MODS could last over an extended time since coal production from the adjacent federal coal leases could be realized in conjunction with production from the MODS. Mining in the MODS and in the adjacent LMU could take 4.1 years, and it is likely that the MODS would be mined near the end of the life of mine.
Manpower - The current manpower level averages about 295.	Manpower - The manpower requirements would not change.

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 MODS 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 MODS. 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 MODS.

ESTIMATED RECOVERY

Estimated Recoverable B-Seam Tons - Bowie No. 2 Mine - As of End of January 2012				
Area Name	Mineable Area (Acres)	Mineable Recovery Factor	Average Excavation Ht. (ft.)	Recoverable Tons
West Mine LMU 57202	735.22	63%	10	**8,570,000**
North COC37210	411.45	61%	10	**4,610,000**
COC37210 MOD	54.44	65%	10	**653,000**
COC61209 MOD	107.12	71%	10	**1,397,000**
LMU added due to MODS	78.41	83%	10	**1,200,000**
TOTALS:	1386.64	64%	10	**16,430,000**
Notes:	Excavation Ht. --> 10.2' LW and 9.5' Development Averages about 10'			
	Product Density = 1840 tons/acre-ft.			
	Recovery approximates 100% LW and 31% Development - with higher LW to Development ratio on MODS			

The B-Seam recovery within the MODS should be that for underground development calculated to be 31% in development and 100% in the longwall block, and includes chain pillars in gateroads. The orientation of Mains

on the existing LMU at about 2,000' overburden with gateroads development toward lower cover on the MODS makes it reasonable to expect that B-Seam recovery will be enhanced on both federal coal leases COC37210 and COC61209 with the addition of the MODS by facilitating extended longwall blocks. If the blocks were shortened as a result of the mine layout without the MODS, BLM calculates the total recovery of the B-Seam coal from the combination of both federal coal leases would be diminished by about 1,200,000 tons. Therefore; with those reserves realized plus the **653,000 from the COC37210 Mod and 1,397,000 tons from the COC61209 MOD** the total recovery with the MODS as noted above would be 3,250,000 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

BRL applied for the MODS having determined the availability of mineable coal (constrained by projected quality, seam thickness, 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 MODS. It is not possible that a third party would deem the coal resource in the MODS 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 MODS federal lease application can be achieved by underground mining using the longwall method of mining as described above.

There is no logical competitive interest based upon utilization of the lands or mining of the deposits due to the following:

- The applicant is the lessee of record holding the Federal leases adjacent to the modification area.
- This lease modification would allow a continuum of an existing mining block and would not represent an economic venture based on a stand-alone development of the property.
- The adjacent lands are in private ownership or managed by BLM and the impacts associated with developing a new mine portal would be significant.
- The economic investment required in order to mine the modification areas independent of the current leases held by BRL would be unreasonable.
- The only logical access is from the applicant's existing adjacent leases and underground mine with its' associated coal handling surface facilities.

Appendix D

Example Calculations

Example Calculations

1.) Horsepower-hour Calculations for Underground Mobile Sources

Known Parameters:

1.) Bowie annual diesel fuel use 461,000 (270,000 Under, 191,000 Surf) gal *source: Bowie Resources
2.) The average density of the diesel fuel is 7.11 lb/gal *source: LSD MSDS
3.) The LHV based energy density of the diesel fuel is 18,500 btu/gal *source: Ave. of literature
4.) Conversion: btu/hp-hr = 2,544.43 *source: Common conversion
5.) CO_2 EF = 642.323 g CO_2/hp-hr *source: EPA Nonroad (2008a)
6.) Carbon content of diesel fuel = 2,778 g C/gal *source: 40 CFR 600.113
7.) CO_2 : C Molecular Weight Ratio = 44/12 = 3.667 (unit less) *source: Periodic Table

Calculate Parameters (Underground Equipment Example)**:**

1.) Total Available Energy of fuel =
270,000 gal x 7.1 lb/gal x 18,500 btu/lb = 35,464.5 MMbtu

2.) Energy Converter to HP (Energy IN) =
35,464,500,000 btu / 2544.43 btu/hp-hr = 13,938,092.23 hp-hr

3.) Convert CO_2 EF of Diesel Fuel to C EF =
642.323 g CO_2/hp-hr x 3.667^{-1} = 175.179 g C/hp-hr

4.) Derived hp-hr/gal of fuel from known Carbon Content of fuel =
2,778 g C/gal / 175.179 g C/hp-hr = 15.858 hp-hr/gal

5.) Derived hp-hr from fuel use (Energy Out) =
15.858 hp-hr/gal x 270,000 gal = 4,281,660.0 hp-hr

6.) TE = Energy Out / Energy IN x 100% =
4,281,660.0 hp-hr / 13,938,092.23 hp-hr x 100% = **30.72%**

Conclusions:

The Thermal Efficiency of the underground equipment is approximately 30.72% based on the EPA Model data for CO_2. Although low for typical diesel engines based on the literature, it is realistic for working engines where hp is developed at various RMPs (based on loading and work cycles). Further the EPA Model takes this into account when developing the EFs (see Nonroad Technical Document NR009d "Exhaust and Crankcase Emission factors for Nonroad Engine Modeling – Compression-Ignition"). All emissions estimates are based on the EPA Nonroad Model emissions factors and the total hp-hrs derived in calculated parameter 5 for each equipment class, i.e. underground or surface.

2.) Example Emissions Calculations for Diesel Mobile Sources

General Equation for all Emissions:

Emissions (tons) = Total hp-hr (Energy Out[1]) x NR EF_E g/hp-hr x 453.6^{-1} g/lb x 2000^{-1} lb/ton

Where:

EF_E = Either the Underground or Surface Equipment Emissions Factor

[1] For N2O, substitute (Energy In). EF based on fuel use only.

A.) For N_2O (surface)

3,028,878.0 hp-hr x 0.005 g/hp-hr x 453.6^{-1} g/lb x 2000^{-1} lb/ton = 0.016 tons

B.) NO_X (underground)

4,281,660.0 hp-hr x 10.163 g/hp-hr x 453.6^{-1} g/lb x 2000^{-1} lb/ton = 47.97 tons

3.) Example Emissions Calculations for Gasoline Mobile Sources

Known Parameters:

1.) OMLLC annual unleaded fuel use 11,000 gal *source: Bowie Resources
2.) 2004 CAFE for LDGT = 20.7 miles per gallon (mpg) *source: NHTSA (2004)
3.) Emissions Factors (grams per vehicle mile traveled (g/VMT) are from 2003 IERA Mobile Source Emissions Tables 4.5, 4.6, 4.7, & 4.50
4.) Gasoline carbon content per gallon = 2,421 g C/gal *source: EPA 420-F-05-001, 2005
5.) CO_2 : C Molecular Weight Ratio = 44/12 = 3.667 (unit less) *source: Periodic Table

Calculate Parameters:

1.) Total Vehicle Miles Traveled (theoretical) =
11,000 gal x 20.7 mpg = 227,700 miles

2.) CO_2 Emissions Factor =
11,000 gal x 2,421 g C/gal x 3.667 x $348{,}257^{-1}$ miles = 280.41 g/VMT

General Equation for all Emissions:

Emissions (tons) = Total Annual Fuel Use (gal) x CAFE (mi/gal) x EF g/mi x 453.6^{-1} g/lb x 2000^{-1} lb/ton

A.) CO

11,000 gal x 20.7 mi/gal x 2.9 g/mi x 453.6^{-1} g/lb x 2000^{-1} lb/ton = 0.73 tons

B.) CO_2

11,000 gal x 20.7 mi/gal x 428.84 g/mi x 453.6^{-1} g/lb x 2000^{-1} lb/ton = 107.64 tons

Table D-1
EPA Nonroad Emissions Factors (g/hp-hr)

Equipment Type	SCC	PM	PM_{10}	$PM_{2.5}$	NMOG[2]	CO	NO_X	SO_2	CO_2	CH_4[3]	N_2O[4]
Underground Mining Equipment	2270009000	1.446	1.446	1.403	2.216	8.555	10.163	0.138	642.323	0.034	0.005
Surface Mining Equipment[1]	2270002036 2270002051 2270002060 2270002069 2270002033	0.535	0.535	0.519	0.652	3.458	7.393	0.116	537.869	0.010	0.005
Passenger Vehicles[5]	LDGT	0.13	0.13	0.12	0.20	2.90	0.30	0.096	428.84	ND	ND

[1] Emissions factors from listed SCC equipment was averaged together to produce a composite emissions factor to represent likely equipment present at the facility. The individual equipment emissions did not statistically vary significantly, with the exception of the bore/drill rigs, within the model results. However, the drilling and boring equipment is not expected to be as heavily used as the other surface equipment, and therefore a straight average of all the emissions factors was used to develop the composite factor (conservative) vs. a weighted average which would have considered area equipment population data. Data was not available for site fleet data to produce a facility specific weighted average.

[2] NMOG (Non-Methane Organic Gases) used to represent potentially reactive VOC species that may participate in ground level Ozone formation. NMOG is the sum of crankcase and exhaust emissions.

[3] CH4 is represented from TOG (Total Organic Gases) – NMOG. CH4 is the sum of crankcase and exhaust emissions.

[4] N2O factor derived from EPA Climate Leaders GHG Inventory Protocol (EPA430-K-08-004) Direct Emissions from Mobile Combustion Sources, Appendix A, Table A-6. N2O factor reported as 0.08 g/kg of fuel combusted. Factor was converted to g/hp-hr based on calculated hp-hr from total annual fuel use (Appendix XX, Example TE Calculation).

[5] Passenger vehicle emissions factors are in grams per vehicle mile traveled (g/VMT).