United States Department of the Interior
Bureau of Land Management

Decision Record, Finding of No Significant Impact, and Final Environmental Assessment for the
Whirlwind Mine Uranium Mining Project

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

and

Moab Field Office
82 East Dogwood
Moab, Utah 84532

September 2008
INTRODUCTION

Energy Fuels proposes to reopen the Urantah Decline and Packrat Mine as a single combined underground uranium-vanadium mine operation called the Whirlwind Mine (Proposed Action). Exploration and bulk sampling activities are currently ongoing in both the Urantah Decline (also known as the Whirlwind Portal) and the Packrat Portal under a BLM Notice of Intent. This Decision Record incorporates and supersedes existing BLM permits and or approvals for exploration and sampling at the Whirlwind Mine.

The Whirlwind Mine property straddles the Colorado/Utah state line and consists of 206 unpatented claims, totaling 4,890 acres in the Beaver Mesa Mining District of the Uravan Mineral Belt. The mine claims are located on public lands administered by the BLM. The Whirlwind Mine is located approximately 5 miles southwest of Gateway, Colorado and about 45 miles southwest of Grand Junction, Colorado in Mesa County. The mine is accessed from Colorado State Highway 141, Mesa County Road 4 4/10 (John Brown Road), and Mesa County Road 5/10. The Whirlwind Mine portals are located in Mesa County, Colorado in Section 36, T. 51 N., R. 20 W., New Mexico Principal Meridian at an elevation of about 7,000 feet. The mine vent shafts would be located in Colorado in Section 35, T. 51 N., R. 20 W. and Section 2, T. 50 N., R. 20 W., NMPM and in Grand County, Utah in Section 9, T. 26 S., R. 26 E., Salt Lake Base Meridian.

Total surface disturbance required for operation of the Whirlwind Mine is 23.98 acres. Approximately 7.69 acres of the proposed disturbance will occur in previously disturbed and reclaimed areas. Project components include the Whirlwind Portal Area, the Packrat Portal Area, vent shafts and power drops in Colorado, and vent shafts in Utah.

The Whirlwind Mine has an expected life of 10 years based on known and inferred resources. Mine startup is scheduled for fourth quarter 2008 which would allow the mine to reach a production level of 100 tons per day by the first quarter of 2009 and full production of 200 tons per day by the first quarter of 2010. At full production, Energy Fuels will employ up to 24 workers at the Whirlwind Mine.

Energy Fuels plans to haul the ore to the White Mesa Mill in Blanding, Utah for processing. The primary and only all-weather haul route is from Mesa County Road 5/10 to John Brown Road, Colorado State Highway 141, Colorado State Highway 90/Utah State Highway 46 and south on U.S. Highway 191 to Blanding.

Upon completion of mining, all disturbed areas would be reclaimed to dry rangeland for wildlife habitat which is the primary pre-mining land use. Reclamation procedures are described in Chapter 2 Section 2.2.2.10 in the Environmental Assessment (EA).
PLAN CONFORMANCE AND CONSISTENCY

The Proposed Action and alternatives have been reviewed and found to be in conformance with the Grand Junction Resource Area (now referred to as the Grand Junction Field Office) Resource Management Plan (RMP) and Record of Decision (ROD) dated January 1987 and the BLM Moab Field Office Grand Resource Area RMP and ROD, dated June 1985.

The Grand Junction Field Office RMP states (page 2-5) that existing withdrawals from mineral locations on 124,443 acres would continue, and recognizes the development of minerals as important to local economies and national interests. An objective of the RMP for minerals management (page 2-5) calls for “making public lands available to exploration and development under the general mining laws” unless the lands are otherwise withdrawn to protect other resources. No lands in the proposed project area are classified as withdrawn from minerals management.

The Moab Field Office RMP, under its Goals and Objectives section (page 15), calls for land managers “to keep public lands open for exploration and development of mineral resources while protecting areas with sensitive resource values”. In part, the Minerals section states (page 22): “leave the entire Grand Resource Area (1.8 million acres) open to mining claims for locatable minerals under the General Mining Laws, with exception of 1,850 acres of widely scattered campgrounds and scenic sights under existing mineral withdrawals”. The proposed project area is not within the 1,850 acres under existing mineral withdrawals.

FINDING OF NO SIGNIFICANT IMPACT

Based upon review of the EA, I have determined that the Proposed Action will not significantly affect the quality of the human environment, individually or cumulatively with other actions in the area. There are no effects described in the EA that meet the definition of significance in context or intensity as defined in 40 CR 1508.27. Therefore, an environmental impact statement is not needed. This finding is based on the context and intensity of the project as described in the Finding of No Significant Impact (FONSI) for the project.

DECISION

It is my decision to authorize Energy Fuels’ Plan of Operations for the Whirlwind Mine. This decision is contingent upon meeting all protective mitigation measures described in Attachment A and meeting all the sampling, monitoring, and reporting requirements described in Attachment B.

Conditions of Approval

Several protective/mitigation measures were described in Chapter 4 of the EA. Many of the measures are requirements, stipulations, and conditions included in other permits and/or approvals issued by the Colorado Division of Mine Reclamation and Safety, Mesa County Department of Planning and Economic Development, and the Colorado Department of Health and Environment. A list of authorizing actions is provided in Chapter 1 of the EA. All stipulations and conditions included in other permits and approvals are not necessarily repeated here in this Decision. The Conditions of Approval that BLM has chosen to include in this Decision are included as Attachment A.
Compliance, Monitoring, and Reporting

The EA describes compliance, monitoring, and reporting requirements that are required to ensure that areas with sensitive resource values are protected. These requirements are provided in Attachment B.

Alternatives Considered

The EA considered two alternatives: the No Action Alternative and the Proposed Action. BLM has selected the Proposed Action Alternative.

The No Action Alternative was not selected because the No Action Alternative does not meet the purpose and need of this project and selecting the No Action Alternative would not preclude continued development of the Whirlwind Mine. According to 43 CFR 3809.411(d)(3), the proponent has a valid and existing right to develop the uranium resource if done so in an environmentally responsible manner. The analysis shows that development with BLM required conditions of approval and compliance, monitoring, and reporting requirements can be achieved without unnecessary or undue degradation excluding the need to select the No Action Alternative.

Rationale for Decision

The decision to authorize Energy Fuels’ Plan of Operation has been made in consideration of the environmental impacts of the Proposed Action. The action is in conformance with the RMPs for the Grand Junction and Moab field offices. Energy Fuels has obtained a Conditional Use Permit from Mesa County Department of Planning and Economic Development, a Mine Permit from Colorado Division of Reclamation Mining and Safety, a Small Mine Permit from the Utah Division of Oil, Gas and Mining, and permits from the Colorado Department of Public Health and Environment.

In May 1994, the BLM prepared a Programmatic Biological Assessment that addresses water depleting activities in the Colorado River Basin that would impact the endangered Colorado River fish. In response to BLM’s Programmatic Biological Assessment, the U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (#ES/GJ-6-CO-94-F-017) on June 13, 1994, which determined that water depletions from the Colorado River Basin are likely to jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker, and result in the destruction or adverse modification of their critical habitat. The Biological Opinion included reasonable and prudent alternatives developed by the USFWS to allow BLM to authorize individual projects, such as the Proposed Action, which will result in water depletions of less than 125 acre-feet per year. Therefore, further consultation with the USFWS is not required. Energy Fuels is required to make a one-time payment of $434.08 to the National Fish and Wildlife Foundation. A discussion of potential impacts to the Colorado River Fish as a result of changes in water quality in the Dolores River was added to the Final EA as a result of public comment. It was determined that the potential for impact is immeasurable and therefore, would result in no effect to the endangered fish or their designated critical habitat.

Several public comments focused on the potential use of an alternate haul route through Castle Valley and Moab (Route B in the EA). A discussion was added to the EA stating that this route would not be able to be used by haul trucks due to weight limitations on Utah State Highway 128. This route would only be used if the primary route and other alternate routes are
unavailable and only after Energy Fuels obtains all applicable permits and approvals or variances from appropriate governments.

The Preliminary EA was available for public review and comment for 30 days. Responses to other substantial comments on the Preliminary EA have been addressed in Appendix A of the Final EA.

**Appeals Language**

This decision may be appealed to the State Director or the Office of Hearing and Appeals, in accordance with 43 CFR 3809.800. The appeal must be submitted in writing within 30 calendar days from the date of receipt of the decision, to the Colorado State Director, 2850 Youngfield Street, Lakewood Colorado 80215. The original decision or the decision of the State Director may also be appealed to the Office of Hearings and Appeals.
SIGNATURE OF AUTHORIZED OFFICIAL

DATE SIGNED: 9/10/08

Catherine Roluhn
GRAND JUNCTION, Field Manager
SIGNATURE OF AUTHORIZED OFFICIAL

DATE SIGNED: 9/10/08
ATTACHMENT A

Conditions of Approval
Whirlwind Mine Uranium Mining Project EA

1. Energy Fuels shall implement dust suppression measures including tarping of truck beds on ore haul trucks prior to leaving the mine and application of water and/or magnesium chloride on the mine haulage roads and other areas of the mine.

2. Noise reduction measures shall be implemented as necessary to meet the criteria of the 50 dB boundary outside the Whirlwind and Packrat portal areas.

3. If noise levels or freezing during the winter become concerns, generators shall be placed in insulated enclosures.

4. The primary ore haul route described in the Proposed Action is the primary haul route. An alternate route may only be used after all permits and approvals from appropriate governments are obtained.

5. Ore haul trucks shall travel to and from the site during three time intervals (i.e., early morning, mid-day, and late afternoon) and are limited to 5 days a week, Monday through Friday. The times shall be posted on the road and in the Town of Gateway. Truck traffic shall be limited to weekdays from April 15 through December 15.

6. The ore haulage contractors shall obtain all necessary permits and clearances, following U.S. Department of Transportation, Colorado Department of Transportation, and Utah Department of Transportation regulations including establishment of an Emergency Response Plan.

7. Energy Fuels shall consult with Mesa County, the BLM, and the U.S. Army Corps of Engineers, as appropriate, in the event that additional road upgrades or culvert installations are necessary. Improvements shall be designed according to Mesa County and BLM’s standard design practices (i.e., # 17, 18, 19 and 20 of Appendix B in the Grand Junction Resource Area RMP) to minimize impacts to streams.

8. Energy Fuels shall provide a 4-wheel-drive company van for the employees to minimize light-vehicle traffic.

9. Outdoor lighting shall be of the full cut-off type, in accordance with Mesa County requirements.

10. Buildings, other structures, and permanent equipment such as vent shaft fans and generator sound mitigation covers shall be painted a BLM-approved color, as per BLM Visual Resource Management BMPs (BLM, 2005a), using color(s) from either the chart of Standard Environmental Colors or the chart of Supplemental Environmental Colors.

11. Mitigation of potential impacts to cultural resources shall be accomplished through mandated avoidance of historic properties by mine personnel.
12. The proposed vent shafts have been located away from the existing cultural sites. The five sites found to be eligible for nomination to the NRHP (42GR2095, 42GR2777, 42GR2778, 42GR3188, and 5ME15765) shall be protected from indirect impacts by limiting vehicular access to the site vicinity.

13. Energy Fuels shall inform all persons who are associated with the project operations that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts.

14. Energy Fuels and all of their subcontractors shall strictly adhere to the confidentiality of information concerning the nature and location of archaeological resources.

15. If a dinosaur fossil is encountered during mining operations, Energy Fuels shall immediately cease work in that area of the mine and notify the BLM Authorized Office (AO) of the discovery.

16. All chemicals and hydrocarbon products (including used oil) shall be contained and controlled in accordance with the Materials Containment Plan and SPCC Plan, respectively.

17. Energy Fuels shall conduct a Hydrogeologic Study to further characterize the upgradient and downgradient aquifers, the groundwater flowing into the mine, connections between the mine and area springs, the water flowing out of the mine, the eventual fate of the water flowing from the mine, and any groundwater impacts from mining operations. The report will provide additional groundwater information that could be used for closure planning by Energy Fuels, the BLM, and the DRMS. This study shall be completed and submitted to the BLM within 2 years of signing this Decision.

18. The BLM Hazardous Material Coordinator shall be notified soon as possible if a spill occurs during ore transport.

19. The ore stockpile shall consist of a geosynthetic liner as described in Chapter 2 Section 2.2.2.3 of the EA.

20. Energy Fuels shall install a groundwater monitoring well built to comply with EPA and USGS standards down-gradient from the ore stockpile pad and the Whirlwind Portal.

21. During vegetation clearing and topsoil salvaging, all clearing work shall be completed when soils are not saturated and shall occur without the mixing of soil and vegetation.

22. The waste rock storage area shall be incrementally expanded minimizing site disturbance in the short-term and minimizing exposure of soils to potential wind and water erosion.

23. Salvaged topsoil shall be contemporaneously used for final reclamation minimizing topsoil storage and the potential for soil degradation from long-term stockpile storage.

24. Energy Fuels shall conduct incremental and interim reclamation of various parts of the project site as described in Chapter 2 Section 2.2.2.3 in the EA.
25. The BLM’s Standard Design Practices item #16 (Grand Junction Resource Area RMP) shall be applied during restoration efforts, this standard requires that a seedbed be prepared by contour cultivating 4 to 6 inches deep where possible and drilling seed ¼- to ½-inch deep. In areas that cannot be drill seeded, broadcast seeding will be used with one and one-half times the recommended drilling rate and would be covered ¼- to ½-inch deep using a harrow, drag bar, or chain. Seeding will be completed after August 15 and prior to October 1.

26. As specified in the BLM’s Standard Design Practices items #32 (Grand Junction Resource Area RMP) where woodland or forest vegetation is present prior to disturbance, tree species shall be reestablished by including piñon and juniper in the seed mixture. Where ponderosa pine is disturbed, seedlings shall be planted if directed by the BLM AO.

27. All topsoil shall be salvaged from disturbed areas and stockpiled prior to surface disturbing activities.

28. Woody vegetation shall be salvaged prior to topsoil stripping and shall be mulched and placed on top of the reclaimed surfaces along with whole pieces of woody material.

29. The soil stockpiles shall be seeded with the seed mix specified in Chapter 2 Section 2.2.2.10 in the EA.

30. The Proposed Action shall avoid disturbing existing reclaimed areas around the Packrat Portal area that are rugged and steeply sloping (i.e., > 40 percent).

31. The waste rock storage area shall be contemporaneously reclaimed during the mining process.

32. The waste rock pile and reclaimed area shall be fenced to exclude livestock for a minimum of 3 years after reclamation.

33. Energy Fuels’ Weed Control Plan shall be implemented throughout the life of the mining operation and during reclamation.

34. If necessary, Energy Fuels shall consult with the BLM and county weed control staff regarding problematic weed infestation areas and appropriate control measures would be agreed upon prior to initiation.

35. All weed infested areas shall be marked and avoided.

36. All tracked equipment and mine-related vehicles that come in contact with identified areas of noxious and invasive weeds shall be washed/rinsed.

37. All noxious weeds shall be sprayed. The herbicides to be used shall be approved by BLM and county weed control staff.

38. State, county, and BLM listed species scheduled for eradication that are found in the project area shall be eradicated and reported to the county weed inspector.
39. The swinging metal gates on the roads to the Whirlwind and Packrat portals shall be locked during weekends, holidays, and other down times.

40. Energy Fuels shall engage in ongoing communication with the BLM rangeland managers and/or the two grazing leaseholders during the summer season.

41. To be covered by the BLM Programmatic Consultation for the endangered Colorado River fish species, Energy Fuels shall make a one-time payment in the amount of $434.08 to the National Fish and Wildlife Foundation, the USFWS’ designated agent.

42. Energy Fuels shall install bat gates at the main Packrat Portal and the Whirlwind Portal during reclamation.

43. Reopening of portals shall occur sometime during the months of April to September in order to avoid direct impacts to bat species.

44. Construction shall be avoided between pre-nesting and chick fledgling. If construction occurs between these times, additional nesting surveys shall be performed and a 300-foot radius buffer would be placed around active nests.

45. One pre-treatment pond and two on-site water post-treatment settling tanks shall be available for birds to use as a safe water source. The tanks shall be equipped with escape structures based on proven methods (Taylor and Tuttle, 2007) and must be maintained so that they are functioning at all times.

46. The sediment pond shall be constructed in such a way as to provide easy exit by wildlife. The sediment pond shall not be netted or fenced.

47. Haul drivers, miners, and other contractors shall be briefed in regularly scheduled safety meetings on the potential impacts to big game winter range and bear fall concentration.

48. In accordance with 29 CRF 1910.1200(g), Energy Fuels shall maintain a file containing Material Safety Data Sheets (MSDS) for all chemicals, compounds, and/or substances which are utilized during the course of construction, mining, and reclamation operations of this project. This file shall be available for reference and inspection at all times at the site.

49. A roll-off bear-proof container for disposal of trash shall be located on-site. A second roll-off may be placed on the Whirlwind pad if needed. No landfills shall be constructed on-site. Recycling of applicable materials (batteries, scrap metal) shall take place during mine operations.

50. Ore haul trucks shall be checked for radiation levels prior to leaving the mine site and the mill site on the return leg. If gamma readings are found to be elevated, the ore truck shall be cleaned using a power wash or other method to meet appropriate radiation standards.
52. Diesel fuel and various oils for use in mobile and on-site equipment shall be stored and used on-site. Secondary containment shall be provided for all petroleum products. As described in detail in Section 2.2.2.9, a SPCC Plan consistent with federal regulation 40 CFR 112 shall be prepared and implemented for storing and using petroleum products on the site.

53. Spills shall be immediately reported to the BLM authorized officer, characterized, and remediated. Spill reporting and containment shall occur immediately and material shall be moved to the nearest approved landfill or disposal facility as necessary.

54. Portable sanitation facilities shall be provided during exploration and the initial phases of mining. The waste shall be taken off-site for treatment at an approved facility. A leach field shall be constructed to dispose of wastewater when the surface facilities are constructed.

55. Sludge collected from the treated water settling tank shall be analyzed to determine the disposal method. Then it shall be 1) mixed into a cement grout on-site and disposed of in the mine in a designated area, or 2) taken to the uranium mill with ore to be processed, or 3) taken to a landfill.

56. Solid waste shall be containerized and hauled to a landfill in accordance with state and local regulations.

57. Used oil and antifreeze from the maintenance shop shall be containerized and hauled to a recycling facility. Scrap metal, batteries, and tires shall also be recycled.

58. If a solvent station is installed to clean parts, it shall consist of a sink mounted on a small drum of solvent. The solvent shall be recycled to the drum after each use.

59. The mine shall operate in accordance with federal regulations that are designed to protect the mine workers and the general public from radiation exposure.

60. The miners shall be protected through establishment of adequate ventilation and monitoring of radiation levels in the underground work areas in accordance with MSHA regulations.

61. The Whirlwind Mine shall maintain a minimum of 20,000 cubic feet per minute of air flow at the working area. A radon-daughter monitoring program shall be established in accordance with 57 CFR §5037 in which exposure levels would be monitored and recorded. If radiation levels in a working area are found to be in excess of MSHA standards, the ventilation shall be corrected immediately and more frequent monitoring shall be implemented to verify compliance.

62. All scrap metal and other recyclables shall be checked with a gamma meter prior to leaving the mine site. If gamma readings are found to be elevated, the material shall be cleaned using a power wash or other methods to meet appropriate radiation standards.

63. Energy Fuels shall not build the ventilation shafts in Utah or conduct any surface disturbing activities in Utah until the BLM Moab Field Office has completed Native American notification/consultation.
ATTACHMENT B

Compliance and Monitoring
Whirlwind Mine Uranium Mining Project EA

1. Personal monitoring and active ventilation for radon emissions in the mine workings shall be implemented as required by MSHA safety provisions.

2. Energy Fuels shall calculate emissions on a monthly basis to ensure that none of the emission sources is exceeding the permit limits.

3. Energy Fuels shall conduct sampling and analysis of the treated water prior to discharge as required by the CDPS permit and provide copies of the reports to the BLM.

4. Energy Fuels shall sample and test material containing elevated radionuclide levels such as water treatment sludge and residual ore pad material. The BLM will dictate disposal method and location based on test results.

5. Energy Fuels shall conduct quarterly sampling of sediment pond water and implement mitigation, if necessary. These data and a summary report shall be provided to the BLM.

6. Energy Fuels shall conduct an annual survey of the project area each summer to check for new water seeps and springs and report the results to the BLM.

7. Flow rates shall be measured for DP and PR springs and water quality shall be sampled and analyzed for PR Spring on a quarterly basis. These data and a summary report shall be provided to the BLM.

8. Composite samples shall be made from quarterly waste rock grab samples and analyzed once per year to ensure that the waste rock in the storage area is still considered inert. These data and a summary report shall be provided to the BLM. If results indicate the waste rock is not inert, a groundwater monitoring well shall be constructed down gradient of the waste rock storage area and built to comply with EPA and USGS standards.

9. Energy Fuels shall provide quarterly estimates of groundwater flow in the underground workings and conduct water quality sampling. These data and a summary report shall be provided to the BLM.

10. Prior to final reclamation of the Packrat Portal and road, soil samples from the berm shall be sampled and analyzed for recommended nutrient amendments. Analysis shall include standard agronomic nutrients: nitrogen, phosphorus, and potassium in addition to pH for fertilizer recommendations that consider the species being planted.

11. During mining operations, weed surveys for plants listed in Chapter 3 Table 3.21-1 in the EA, and BLM- and county-approved weed control measures shall be implemented along Mesa County Road 5\(^5\)/10\(^10\) from its intersection with John Brown Road to the project area.

12. A weed survey shall be conducted at the mine area and Mesa County Road 5\(^5\)/10\(^10\) in the spring (April or May) and in the fall (September or October).
13. Energy Fuels shall provide an annual report of weed survey results to the BLM and the respective counties. It shall include weed control measures and practices implemented including pesticide application records.

14. Energy Fuels shall measure for radon levels and flow rates in accordance with EPA regulations. This data would then be input into an EPA air modeling program to predict radiation levels at the nearest residence. The collected data and modeling results would be reported annually to the CDPHE. Energy Fuels shall provide copies of these reports to the BLM.

15. Groundwater samples will be taken and analyzed quarterly from the monitoring well down-gradient from the ore stockpile pad and the Whirlwind Portal. Analysis shall be conducted for selenium, arsenic, uranium, manganese, zinc, radionuclides, Eh, pH, sulfate, and iron. These data and a summary report shall be provided to the BLM.

16. To ensure selenium levels in the Dolores River are not increasing due to the Proposed Action, Energy Fuels shall monitor the Dolores River for selenium upstream and downstream from the confluence with Lumsden Creek when discharge is occurring under the CDPS permit and there is continuous flow from the middle tributary of Lumsden Creek to the Dolores River. Results of the monitoring shall be reported to the BLM. If the CDPS Permit effluent limit for selenium is met for two years, monitoring of selenium in the Dolores River can be discontinued. If at any time there is an exceedance in the effluent limit for selenium under the CDPS Permit, monitoring of selenium in the Dolores River shall be reinitiated until the effluent limit is met for two years.

17. Any birds or bats that are found dead or apparently ill in or near the ponds shall be reported to the BLM within 3 days of discovery to allow measures to be drafted to prevent further losses.

18. Any vehicle collisions with wildlife by mine personnel shall be reported to the BLM within 3 days of the collision.

19. Prior to reclamation, testing of the potential waste rock root zone material shall be conducted using appropriate testing procedures that extract available plant nutrients. Analysis shall be conducted for pH; conductivity; saturation; texture; soluble calcium, magnesium, and sodium; sodium adsorption ratio; carbonates; arsenic; boron; and selenium. The data and a summary report shall be provided to the BLM.

20. All data collected for groundwater and surface water sampling and analysis and a summary report shall be provided to the BLM.
FINDING OF NO SIGNIFICANT IMPACT
FOR
WHIRLWIND MINE URANIUM MINING PROJECT
CO-130-2008-024-EA
BLM Grand Junction Field Office
BLM Moab Field Office

The Environmental Assessment and analysis of the direct, indirect, and cumulative effects of the Proposed Action have been reviewed. BLM believes that implementation of the mitigation/protective measures described in the EA result in a Finding of No Significant Impact on the human environment. Therefore, an environmental impact statement is not necessary to further analyze the environmental effects of the Proposed Action.

Context
The Whirlwind Uranium Mine is a site-specific action directly involving disturbance of approximately 24 acres of BLM administered public land that does not in and of itself have international, nation, regional, or state-wide importance. Energy Fuels has submitted a Plan of Operations for construction and operation of the Uranium Mine.

Intensity
For some resources, the impact is zero or no impact. In other cases, there is some impact and it is necessary to consider the intensity (how much) of the impact when determining significance. The BLM NEPA Handbook H-1790-1 (revised January 2008) states that CEQ regulations include the following Ten Significance Criteria described in 40 CFR 1508.27 for evaluating intensity:

1. **Impacts that may be both beneficial and adverse.** The proposed action would impact resources as described in the EA. Protective/mitigation measures to reduce impacts to these resources were also provided in the EA. None of the environmental effects described in the EA are considered significant. There would be no environmental effect for the following resources as discussed in the EA: Environmental Justice, Wild and Scenic Rivers, Wilderness Areas, Native American Religious Concerns, Farmlands – Prime/Unique, and Areas of Critical Environmental Concern. Potential adverse impacts were identified for the following resources: Air Quality, Noise, Land Use and Residential Areas, Transportation, Recreation, Visual Resources, Cultural and Historic Properties, Geologic Resources, Paleontological Resources, Surface Water, Groundwater, Wetlands, Riparian Areas, and Floodplains, Soil Resources, Vegetation Resources, Invasive Species and Noxious Weeds, Grazing Resources, Threatened, Endangered and Special Status Species, Wildlife and Aquatic Resources, and Human Health. The potential effects to these resources are either considered minimal, short-term, or temporary resulting in no significant impact or have been mitigated to a non-significance level.
Beneficial impacts may result from increased jobs, increased activity for local businesses, and increased tax revenue as described in Chapter 4 of the EA. Beneficial impacts may also result from water source control measures which would be implemented as described in Chapter 2 Section 2.2.2.9 of the EA.

Comments received during public scoping on the Preliminary EA are summarized in Appendix A of the Final EA. Responses are provided to comments and where appropriate, changes were made between the Preliminary EA and the Final EA based on public comment.

2. **Public health and safety.** Public health and safety concerns have been evaluated directly under “Human Health” and indirectly under “Air Quality”. Impact to public health is expected to be minimal and therefore not significant based on the protective measures described in the EA.

3. **Unique characteristics of the geographic area.** Cultural and historic resources are considered to be unique characteristics of the geographic area; however, there would be no direct impact to these resources as a result of the Proposed Action. Indirect impacts to these resources would be mitigated through protective measures described in the EA resulting in no significant impact. Other unique characteristics of a geographic area may include wild and scenic rivers, wilderness areas, Native American religious concerns, prime and unique farmlands and areas of critical environmental concern. None of these exist in the Whirlwind Project Area and therefore, there is no effect to these resources.

4. **Degree to which effects are likely to be highly controversial.** Although there has been an expression of opposition to the Proposed Action in public comments on the Preliminary EA, there is no identified substantial dispute within the scientific community about the effects of the Proposed Action.

5. **Degree to which effects are highly uncertain or involve unique or unknown risks.** Effects described in the EA are not identified as unique, unknown, or highly uncertain. Uranium mining has occurred previously in the project area and this knowledge allows for anticipation of effects with a high degree of certainty.

6. **Consideration of whether the action may establish a precedent for future actions with significant impacts.** The Proposed Action does not establish a precedent for future BLM actions with significant effects. All future actions would require further NEPA analysis.

7. **Consideration of whether the action is related to other actions with cumulatively significant impacts – which include connected actions regardless of land ownership.** No individually or cumulative significant impacts were identified for the Proposed Action. Cumulative effects are identified in Chapter 5 of the EA.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.** The project will not adversely affect districts, sites,
highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places, nor will it cause loss or destruction of significant scientific, cultural, or historical resources. A Class I information review and Class III pedestrian survey of the Area of Potential Affect were conducted. Five sites were found to be eligible for nomination to the National Register of Historic Places; however these sites would not be directly impacted by the Proposed Action because they do not occur in areas of proposed disturbance. Indirect impacts to cultural resources that could occur through increased opportunity for vandalism or casual collecting of artifacts due to increased access to sites are not likely because no new roads would be built. Protective/mitigation measures as described in the EA would apply to any newly discovered cultural resources.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973, or the degree to which the action may adversely affect: 1) a proposed to be listed endangered or threatened species or its habitat, or 2) a species on BLM's sensitive species list. Four Colorado River fish, listed as endangered under the Endangered Species Act, could be impacted by the project. BLM has determined that the Proposed Action is "likely to adversely affect" the four species based on proposed water depletions. However, the impact would be offset through a mitigation payment to the U.S. Fish and Wildlife Service under a Programmatic Biological Opinion resulting in no significant impact to the Colorado River Endangered Fish. Impacts to BLM sensitive species, as described in Chapter 4 of the EA, would not be significant.

10. Any effects that threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. The project does not violate any known federal, state, local or tribal law or requirement imposed for the protection of the environment.
SIGNATURE OF AUTHORIZED OFFICIAL

DATE SIGNED: 9/10/08

GRAND JUNCTION, Field Manager
SIGNATURE OF AUTHORIZED OFFICIAL

DATE SIGNED: 9-10-08

MOAB, Field Manager (Acting)
United States Department of the Interior
Bureau of Land Management

Final Environmental Assessment
for the
Whirlwind Mine Uranium Mining Project

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

and

Moab Field Office
82 East Dogwood
Moab, Utah 84532

September 2008
Chapter 4 – Environmental Consequences

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Abbreviations and Acronyms

AADT  average annual daily traffic
AO  Authorized Officer
APCD  Air Pollution Control Division
APEN  Air Pollutant Emission Notice
APE  Area of Potential Effect
AUM  animal unit month
BA  Biological Assessment
BBS  North American Breeding Bird Survey
BCC  Birds of Conservation Concern
BGEPA  Bald and Golden Eagle Protection Act
BLM  Bureau of Land Management
BMPs  Best Management Practices
BO  Biological Opinion
Ca  calcium
CDD  Census Division District
CDOT  Colorado Department of Transportation
CDOW  Colorado Division of Wildlife
CDPHE  Colorado Department of Public Health and Environment
CDPS  Colorado Discharge Permit System
CDWR  Colorado Division of Water Resources
CEQ  Council on Environmental Quality
CFR  code of federal regulations
cfs  cubic feet per second
CGAP  Colorado Gap Analysis Project
cl  chloride
cm/sec  centimeters per second
CNHP  Colorado Natural Heritage Program
COD  chemical oxygen demand
COE  U.S. Army Corps of Engineers
dB  decibel
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOGM</td>
<td>Utah Division of Oil, Gas and Mining</td>
</tr>
<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
</tr>
<tr>
<td>DP</td>
<td>Dolores Point</td>
</tr>
<tr>
<td>DRMS</td>
<td>Division of Reclamation Mining and Safety</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EC</td>
<td>electrical conductivity</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>ERMA</td>
<td>Extensive Recreation Management Area</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
</tr>
<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>°F</td>
<td>degrees farenheit</td>
</tr>
<tr>
<td>Ft</td>
<td>feet/foot</td>
</tr>
<tr>
<td>FR</td>
<td>Federal Register</td>
</tr>
<tr>
<td>GJFO</td>
<td>Grand Junction Field Office</td>
</tr>
<tr>
<td>GMU</td>
<td>Game Management Unit</td>
</tr>
<tr>
<td>gpd</td>
<td>gallons per day</td>
</tr>
<tr>
<td>gpm</td>
<td>gallons per minute</td>
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<tr>
<td>HCO₃</td>
<td>bicarbonate</td>
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<td>HDPE</td>
<td>high density polyethylene</td>
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<tr>
<td>K</td>
<td>potassium</td>
</tr>
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<td>MBTA</td>
<td>Migratory Bird Treaty Act</td>
</tr>
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<td>Moab Field Office</td>
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<td>magnesium</td>
</tr>
<tr>
<td>mg/L</td>
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</tr>
<tr>
<td>Mmhos/cm</td>
<td>millimhos per centimeter</td>
</tr>
<tr>
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<td>miles per hour</td>
</tr>
<tr>
<td>mrem/yr</td>
<td>millirem per year</td>
</tr>
<tr>
<td>MSDS</td>
<td>Material Safety Data Sheet</td>
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<tr>
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<td>Mine Safety and Health Administration</td>
</tr>
<tr>
<td>Na</td>
<td>sodium</td>
</tr>
<tr>
<td>NAGPRA</td>
<td>Native American Graves Protection and Repatriation Act</td>
</tr>
<tr>
<td>NCRP</td>
<td>National Council on Radiation Protection</td>
</tr>
<tr>
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<td>Natural Diversity Information Source</td>
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<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<tr>
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<td>National Emission Standards for Hazardous Air Pollutants</td>
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<td>National Historic Preservation Act</td>
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<td>NOI</td>
<td>Notice of Intent</td>
</tr>
<tr>
<td>NOₓ</td>
<td>nitrogen oxides</td>
</tr>
<tr>
<td>NRC</td>
<td>Nuclear Regulatory Commission</td>
</tr>
<tr>
<td>NRCS</td>
<td>Natural Resources Conservation Service</td>
</tr>
<tr>
<td>NRHP</td>
<td>National Register of Historic Places</td>
</tr>
<tr>
<td>NSPS</td>
<td>New Source Performance Standards</td>
</tr>
<tr>
<td>NTUs</td>
<td>nephelometric units</td>
</tr>
<tr>
<td>OHV</td>
<td>off-highway vehicle</td>
</tr>
<tr>
<td>OHWM</td>
<td>ordinary high water mark</td>
</tr>
<tr>
<td>PB</td>
<td>Protracted Block</td>
</tr>
<tr>
<td>pCi/g</td>
<td>pico curies per gram</td>
</tr>
<tr>
<td>pCi/L</td>
<td>pico curies per liter</td>
</tr>
<tr>
<td>PFYC</td>
<td>Probably Fossil Yield Classification</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>particulate matter less than 10 microns in diameter</td>
</tr>
<tr>
<td>PR</td>
<td>Packrat</td>
</tr>
<tr>
<td>PSD</td>
<td>Prevention of Significant Deterioration</td>
</tr>
<tr>
<td>Ra-226</td>
<td>radium-226</td>
</tr>
<tr>
<td>Ra-228</td>
<td>radium-228</td>
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<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>RESRAD</td>
<td>Residual Radioactive Material Guideline Implementation</td>
</tr>
<tr>
<td>RIP</td>
<td>Recovery and Implementation Program</td>
</tr>
<tr>
<td>RMP</td>
<td>Resource Management Plan</td>
</tr>
<tr>
<td>RMZ</td>
<td>Recreation Management Zone</td>
</tr>
<tr>
<td>ROD</td>
<td>Record of Decision</td>
</tr>
<tr>
<td>SAR</td>
<td>sodium adsorption ratio</td>
</tr>
<tr>
<td>SHPO</td>
<td>State Historic Preservation Officer</td>
</tr>
<tr>
<td>SLBM</td>
<td>Salt Lake Base Meridian</td>
</tr>
<tr>
<td>SO4</td>
<td>sulphate</td>
</tr>
<tr>
<td>SPCC</td>
<td>Spill Prevention, Control and Countermeasures</td>
</tr>
<tr>
<td>SPLP</td>
<td>Synthetic Precipitation Leaching Procedure</td>
</tr>
<tr>
<td>SRMA</td>
<td>Special Recreation Management Area</td>
</tr>
<tr>
<td>SWMP</td>
<td>Stormwater Management Plan</td>
</tr>
<tr>
<td>TDS</td>
<td>total dissolved solids</td>
</tr>
<tr>
<td>TENORM</td>
<td>technologically-enhanced naturally occurring radioactive materials</td>
</tr>
<tr>
<td>TMDL</td>
<td>total maximum daily load</td>
</tr>
<tr>
<td>tpd</td>
<td>tons per day</td>
</tr>
<tr>
<td>TDS</td>
<td>total dissolved solids</td>
</tr>
<tr>
<td>TSS</td>
<td>total suspended solids</td>
</tr>
<tr>
<td>U₃O₈</td>
<td>triuranium octaoxide</td>
</tr>
<tr>
<td>UCDC</td>
<td>Utah Conservation Data Center</td>
</tr>
<tr>
<td>UDNR</td>
<td>Utah Department of Natural Resources</td>
</tr>
<tr>
<td>UDOT</td>
<td>Utah Department of Transportation</td>
</tr>
<tr>
<td>UDWR</td>
<td>Utah Division of Wildlife Resources</td>
</tr>
<tr>
<td>ug/l</td>
<td>microgram per liter</td>
</tr>
<tr>
<td>UNHP</td>
<td>Utah Natural Heritage Program</td>
</tr>
<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>USDOI</td>
<td>U.S. Department of the Interior</td>
</tr>
<tr>
<td>USDOT</td>
<td>U.S. Department of Transportation</td>
</tr>
<tr>
<td>V₂O₅</td>
<td>vanadium pentoxide</td>
</tr>
<tr>
<td>VRM</td>
<td>Visual Resource Management</td>
</tr>
<tr>
<td>WET</td>
<td>whole effluent toxicity</td>
</tr>
<tr>
<td>WQCC</td>
<td>Water Quality Control Commission</td>
</tr>
<tr>
<td>WQCD</td>
<td>Water Quality Control Division</td>
</tr>
<tr>
<td>WSA</td>
<td>Wilderness Study Area</td>
</tr>
<tr>
<td>WSRA</td>
<td>Wild and Scenic Rivers Act of 1968</td>
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</table>
Chapter 1
Introduction

1.1 INTRODUCTION

Energy Fuels Resources Corporation (Energy Fuels) proposes to reopen the Urantah Decline and Packrat Mine as a single combined underground uranium-vanadium mine operation called the Whirlwind Mine (Proposed Action). In support of the proposal, Energy Fuels submitted a detailed Whirlwind Mine Plan of Operations (Plan – Energy Fuels, 2007a) to the U.S. Department of the Interior (USDOI) Bureau of Land Management (BLM) in July 2007. In compliance with the National Environmental Policy Act (NEPA), this Environmental Assessment (EA) analyzes the potential impacts to the human and natural environment that could result from implementation of the Proposed Action and Alternatives. The BLM Grand Junction Field Office (GJFO) and the BLM Moab Field Office (MFO) are co-lead agencies for preparation of this EA.

1.2 PROJECT LOCATION

The Whirlwind Mine property straddles the Colorado/Utah state line and consists of 206 unpatented claims, totaling 4,890 acres in the Beaver Mesa Mining District of the Uravan Mineral Belt. The mine claims are located on public lands administered by the BLM. The Whirlwind Mine is located approximately 5 miles southwest of Gateway, Colorado and about 45 miles southwest of Grand Junction, Colorado in Mesa County (see Map 1.2-1). The mine is accessed from Colorado State Highway 141 and Mesa County Road 4 4/10 (John Brown Road). The Whirlwind Mine portals are located in Mesa County, Colorado in Section 36, T. 51 N., R. 20 W., New Mexico Principal Meridian (NMPM) at an elevation of about 7,000 feet. The mine vent shafts would be located in Colorado in Section 35, T. 51 N., R. 20 W. and Section 2, T. 50 N., R. 20 W., NMPM and in Grand County, Utah in Section 9, T. 26 S., R. 26 E., Salt Lake Base Meridian (SLBM).

The region surrounding the project area is characterized by piñon-juniper mesas cut by deep canyons. There are narrow benches on the mesa shoulders in some areas and near-vertical, 500-foot cliffs in other areas. Elevations within the project area range from 6,800 feet near the canyon rim in the northeast part to 7,800 feet in the southwestern part. The area is semiarid with stands of piñon-juniper in rocky soils along with sage and other brush, forbs, and grasses. The northern portion of the mesa where the mine is located drains into Lumsden Creek, an intermittent drainage that flows in response to precipitation events.

1.3 PURPOSE AND NEED

The purpose and need for Energy Fuels’ proposal is to develop the uranium resource in support of the Energy Policy Act of 2005 (Public Law 109-58), which emphasizes the reestablishment of nuclear power (Sections 601 through 657). Implementation of the proposal would contribute toward meeting the world demand for uranium which is projected to grow from approximately 60,000 tons in 2007 to 120,000 tons by 2025 (Uranium Information Centre Ltd, 2008). The Proposed Action is consistent with the following:
Map 1.2-1
General Location of the Whirlwind Mine Project Area

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.
• The Domestic Minerals Program Extension Act of 1953 - stipulates that each department and agency of the federal government charged with responsibilities concerning the discovery, development, production, and acquisition of strategic or critical minerals and metals shall undertake to decrease further, and to eliminate where possible, the dependency of the United States on overseas sources of supply of each such material.

• The Mining and Minerals Policy Act of 1970 - declares that it is the continuing policy of the federal government to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources. This act includes all minerals, including sand and gravel, geothermal, coal, and oil and gas.

• The Federal Land Policy and Management Act of 1976 - reiterates that the 1970 Mining and Minerals Policy Act shall be implemented and directs that public lands be managed in a manner which recognizes the need for domestic sources of minerals and other resources.

• The National Materials and Minerals Policy, Research and Development Act of 1980 - requires the Secretary of the Interior to improve the quality of minerals data in federal land use decision-making.

• The Energy Policy Act of 2005 (Public Law 109-58) - encourages energy efficiency and conservation; promotes alternative and renewable energy sources; reduces dependence on foreign sources of energy; increases domestic production; modernizes the electrical grid; and encourages the expansion of nuclear energy.

The responsibility of the BLM is to act upon Energy Fuels’ proposal to construct and operate the Whirlwind Mine while ensuring that areas with sensitive resource values are protected and that adequate monitoring is in place.

1.4 BLM RESPONSIBILITIES AND RELATIONSHIP TO PLANNING

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

1.5 CONFORMANCE WITH BLM’S EXISTING RESOURCE MANAGEMENT PLANS

Policies for development and land use decisions are currently contained in the Grand Junction Resource Area (now referred to as the GJFO) Resource Management Plan (RMP) and Record of Decision (ROD), dated January 1987 (BLM, 1987), and the BLM MFO Grand Resource Area RMP and ROD, dated June 1985 (BLM, 1985a). Management activities and development projects selected and approved must be in conformance with the RMPs. According to the details summarized below, the BLM has determined that the Energy Fuels’ Plan (2007a) for the Whirlwind Mine would comply with management objectives in the two BLM field offices.

GJFO RMP. The GJFO RMP states that existing withdrawals from mineral locations on 124,443 acres would continue, and recognizes the development of minerals as important to local economies and national interests (BLM, 1987). An objective of the RMP for minerals
management calls for “making public lands available to exploration and development under the general mining laws” unless the lands are otherwise withdrawn to protect other resources (BLM, 1987). No lands in the proposed project area are classified as withdrawn from minerals management.

MFO RMP. The MFO RMP, under its Goals and Objectives section, calls for land managers “to keep public lands open for exploration and development of mineral resources while protecting areas with sensitive resource values” (BLM, 1985a). In part, the Minerals section states: “leave the entire Grand Resource Area (1.8 million acres) open to mining claims for locatable minerals under the General Mining Laws, with exception of 1,850 acres of widely scattered campgrounds and scenic sights under existing mineral withdrawals” (BLM, 1985a). The proposed project area is not within the 1,850 acres under existing mineral withdrawals.

1.6 PUBLIC PARTICIPATION

1.6.1 Scoping, Consultation and Coordination

NEPA regulations (40 CFR §1500-1508) require that the BLM use a scoping process to identify potential significant issues in preparation for impact analysis. The principal goals of scoping are to allow public participation to identify issues, concerns, and potential impacts that require detailed analysis. Scoping was the primary mechanism used by the BLM to initially identify issues regarding Energy Fuels’ Plan (2007a) for the Whirlwind Mine.

On August 27, 2007, BLM mailed a scoping notice to interested parties (media, governmental agencies, environmental organizations, industry representatives, and individuals) explaining the general nature of the proposal and requested comments. A public scoping meeting was held on September 28, 2007 in Gateway, Colorado. The public comment period ended October 14, 2007. Comments received during scoping were incorporated into the analysis in this EA and are available for inspection in BLM’s GJFO and MFO. On May 15, 2008, BLM released a Preliminary EA for public review and comment through June 20, 2008.

1.6.2 Summary of Issues

Following the August 2007 scoping, BLM received a total of 14 written comments. Thirteen from individuals and one joint comment letter from seven different environmental organizations. Comments received during scoping were incorporated into the analysis in the EA.

Issues introduced by the public, industry, interested groups and other agencies are summarized below:

- The project would provide jobs - economic stimulation and growth;
- The U.S. should be independent of foreign governments for uranium and its by-products;
- Renewable energy should be used;
- Multi-use should be maintained on federal lands;
- Mine permitting should be expedited;
- Mine safety should be ensured (mixture of radiation and diesel);
- Ensure compliance with state water laws;
- A hydrologic study should be conducted;
- Cumulative impacts should be comprehensively analyzed including transportation, endangered species, storage and disposal facilities throughout uranium’s life cycle, water resources, air quality, visual resources, and noise;
• Milling facilities and transportation routes to mill sites should be identified; and
• Adequate bond should be required and the bond should be subject to the public process.

Following the May 15, 2008 Preliminary EA, BLM received a total of 89 written comments. Of these, 54 were general letters of support, 24 were received from individuals with concerns, 6 were received from environmental groups, 2 were from agencies, and 3 were from businesses. A detailed summary of the comments and BLM’s responses to the comments are provided in Appendix A. This Final EA has been prepared in response to the comments that were received on the Preliminary EA.

1.7 AUTHORIZING ACTIONS, RELATIONSHIP TO STATUTES, AND REGULATIONS

BLM is not the only agency that must issue approvals for the Proposed Action. A list of permits, approvals, and authorizing actions necessary to construct, operate, maintain, and abandon the Proposed Action is provided in Table 1.7-1.

1.8 DECISIONS TO BE MADE BASED ON THIS NEPA ANALYSIS

BLM decision-makers will decide, based on the analysis contained in this EA, whether or not to authorize the Proposed Action. BLM’s options when responding to the Plan (Energy Fuels, 2007a) would include: a) accept the Plan as proposed, b) accept with modifications, or c) modify the Plan by incorporating reasonable alternatives. The Decision Record associated with this EA may not constitute the final approval for all actions associated with the Proposed Action. It does; however, provide the BLM’s Authorized Officer (AO) with an analysis from which to base the final approval for individual project components.
### Table 1.7-1
Permits, Approvals, and Authorizing Actions Necessary for Construction, Operation, Maintenance, and Abandonment of the Proposed Action

<table>
<thead>
<tr>
<th>Issuing Agency</th>
<th>Permit Name or Approval</th>
<th>Nature of Permit/Approval</th>
<th>Authority</th>
<th>Permit Number (if obtained)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Antiquities, Cultural, and Historic Resource Permits</td>
<td>Issue antiquities and cultural resources use permits to inventory, excavate, or remove cultural or historic resources from federal lands</td>
<td>Antiquities Act of 1906; Archaeological Resources Public Protection Act of 1979; 43 CFR §3; Section 106 of the National Historic Preservation Act</td>
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<td>U.S. Fish and Wildlife Service</td>
<td>Consultation Process, Endangered and Threatened Species</td>
<td>Biological Assessment/Biological Opinion</td>
<td>Section 7 of the Endangered Species Act of 1973, as amended</td>
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<tr>
<td>Colorado State Historic Preservation Office</td>
<td>Concurrence</td>
<td>Cultural resource protection</td>
<td>Section 106 of National Historic Preservation Act and Advisory Council Regulations (36 CFR §800)</td>
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<tr>
<td>Colorado Water Quality Control Division</td>
<td>General Stormwater Construction/Operation NPDES Permit</td>
<td>Controls off-site stormwater runoff from construction activities resulting in 1 acre or more of disturbance</td>
<td>Section 402 of the Clean Water Act</td>
<td>COR-040227</td>
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<td>Water Discharge Permit</td>
<td>Discharge of water</td>
<td>Section 402 of the Clean Water Act</td>
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<td>Colorado Division of Water Resources</td>
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<td>Consumption and diversion of groundwater</td>
<td>Colorado Water Law</td>
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<td>Well Permit</td>
<td>Collection of groundwater from mine sump</td>
<td>Water Well Construction Rules (2 CCR 402-2)</td>
<td>66419</td>
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<tr>
<td>Colorado Air Pollution Control Division</td>
<td>Air Pollution Emission Notice</td>
<td>Fugitive emissions, Ventilation emissions, Internal combustion engine (generator emissions)</td>
<td>Clean Air Act</td>
<td>07ME1051F 07ME1052 07ME1053</td>
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<td>Prospecting Operations, Mining Operations</td>
<td>Colorado Mined Land Reclamation Act</td>
<td>2005-008 (Mod-01 and 02) 2007-003 M-2007-044</td>
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<td>Issuing Agency</td>
<td>Permit Name or Approval</td>
<td>Nature of Permit/Approval</td>
<td>Authority</td>
<td>Permit Number (if obtained)</td>
</tr>
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<td>---------------------------------</td>
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<td>Surface Alteration Permit</td>
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<td>S07-018</td>
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<td></td>
<td>John Brown Road</td>
<td></td>
<td>S07-019</td>
</tr>
<tr>
<td></td>
<td>Access Permit (Dept. of Planning and Development)</td>
<td>Proper Construction</td>
<td>Property development and health regulations</td>
<td>2005-368</td>
</tr>
<tr>
<td></td>
<td>Access Permit (Regional Transportation Planning Office)</td>
<td>Proper construction</td>
<td></td>
<td>07-24</td>
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<tr>
<td></td>
<td>Septic System Permit</td>
<td>Proper construction</td>
<td></td>
<td>013242</td>
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<td></td>
<td>Building Permit</td>
<td>Proper construction</td>
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<td></td>
</tr>
<tr>
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<td>Small Mine Permit</td>
<td>Mining Operations</td>
<td>Utah Mined Land Reclamation Act</td>
<td>S/019/0065</td>
</tr>
</tbody>
</table>

1 This list is intended to provide an overview of key regulatory requirements that would govern project implementation. Additional approvals, permits, and authorizing actions could be necessary.
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Chapter 2
Alternatives

2.1 INTRODUCTION

The purpose of this chapter is to provide information on the Proposed Action Alternative and the No Action Alternative. Alternatives considered but not analyzed in detail are also discussed.

2.2 ALTERNATIVES ANALYZED IN DETAIL

2.2.1 No Action Alternative

Under this Alternative, BLM would deny the Plan (Energy Fuels, 2007a) for the Whirlwind Mine. Energy Fuels would be allowed to continue exploration and bulk sampling of up to a total of 999 tons of ore; however, expansion of the mine facilities and operations would not be allowed. There would be no additional surface disturbance. Direct precipitation would continue to be fully contained in berms and no additional stormwater runoff controls would be implemented.

After sampling 999 tons of ore, the existing surface disturbance of about 4 acres would be reclaimed in accordance with approved existing permits. There are reclamation bonds in place for both the Whirlwind and Packrat sites. Reclamation of the 2.6 acres associated with the Whirlwind Mine would include removal of all trailers, tanks, materials, etc. from the site, recovery of the concrete pad and regrading of disturbed areas to be free-draining, placement of salvaged topsoil, and seeding. The bat gate would be repaired and locked in place. The Packrat area (1.4 acres) would be returned to its former reclaimed state.

2.2.2 Proposed Action Alternative

2.2.2.1 History and Existing Activities

Energy Fuels proposes to reopen the Urantah Decline and Packrat Mine as a single combined underground uranium-vanadium mine operation called the Whirlwind Mine (Proposed Action). Exploration activities are currently ongoing in both the Urantah Decline (also known as the Whirlwind Portal) and the Packrat Portal. Surface disturbance associated with exploration activities is included in this EA. The Decision Record for this EA would incorporate and supersede existing BLM permits and or approvals for exploration and sampling.

The Whirlwind property, which straddles the Colorado/Utah state line, consists of 206 unpatented claims in the Beaver Mesa Mining District of the Uravan Mineral Belt (Map 2.2-1). The claim block boundary is shown on Map 2.2-1 and encompasses approximately 4,890 acres. The unpatented claims are on BLM-administered public lands. The mineral rights are controlled by Energy Fuels through long-term lease agreements with the claim owners. There are two areas within the project boundary which are not part of the claims boundary as shown on Map 2.2-1. These areas consist of approximately 294 acres of state land in Utah (Section 16, T. 25 S., R. 26 E.) and 59 acres of private land in Colorado (Section 35, T. 51 N., R. 20 W.).

In Mesa County, Colorado, the claims lie in: Protracted Block (PB) 52 (Section 31), T. 51 N., R. 19 W.; Section 6, T. 50 N., R. 19 W.; Section 35, PB 41 (Section 25), PB 42 (Section 26), and PB 43 (Section 36) of T. 51 N., R. 20 W.; and Sections 1, 2, 11, and 12 of T. 50 N., R. 20 W., NMPM. In Grand County, Utah, the claims lie in: Sections 17, 18, 19, 20, and 21; and PB 37 (Section 4), PB 38 (Section 5), PB 40 (Section 7), PB 41 (Section 8), and PB 42 (Section 9) of T. 25 S., R. 26 E., SLBM.
Map 2.2-1
Claims, Project Boundary and Vent Shaft Locations

Legend
- Roads
- Permit Area
- Private Land (Not In Claims Boundary)
- State Land (Not In Claims Boundary)
- Project Boundary (Limits of Underground Mining)
- Claims Boundary

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM
Urantah Decline. The Urantah Mine was started by Pioneer Uravan in September 1979. The Urantah Mine consists of a 3,200-foot long, single-entry decline that accesses the ore body at a 6 percent grade and approximately 700 feet of drift in the Salt Wash Member of the Morrison Formation. The decline is supported by steel sets through the Brushy Basin Member of the Morrison Formation, which consists predominantly of shales and mudstones. Both the decline and drifts are about 9-feet high by 12-feet wide. Approximately 2,800 tons of ore had been mined when the mine was closed in September 1981 due to declining uranium prices. The mine was later acquired by Cotter Corporation, but remained idle until it was reclaimed in the fall of 2002.

Little Maverick Mining Company reopened the mine under a Colorado Division of Reclamation Mining and Safety (DRMS) prospect permit and a BLM Notice of Intent (NOI) in 2005. These permits were transferred to Energy Fuels in 2007. Surface disturbance associated with exploration activities included opening up an access road, uncovering a buried concrete pad and erecting a temporary shop, building a working pad on top of the reclaimed waste pile, and installing a portable water treatment system with fabricated water tanks. The mine portal was secured with a bat gate; therefore, no excavation was required to access the old workings.

Underground exploration activities include rehabilitation of the existing workings to gain safe access to the ore body, pumping and treating mine water, and geological and environmental sampling. This area is referred to as the “Whirlwind Portal.”

Packrat Mine. The Packrat Mine is an older mine that probably was first developed in the 1950’s and consists of several miles of drifts with numerous stopes or rooms mined off of each drift. The three Packrat Mine portals are located approximately 0.5 mile north of the Whirlwind Portal and are almost 300 feet lower in elevation.

The mine workings extend in a southwesterly direction through the Salt Wash Member of the Morrison Formation, which is relatively flat-lying. Early miners used track methods to mine most drifts. The drifts in the south part of the mine are still relatively small with a width of about 6 feet. The northern drifts were later widened and extended to accommodate rubber-tired equipment and are typically 9-feet high by 12-feet wide. The Packrat Mine had two ventilation shafts: a 60-inch diameter shaft near the end of the northern workings that was subsequently reclaimed, and an existing, intact 36-inch shaft, called 10-Straight, near the end of the southern workings.

The Packrat Mine operated until 1990 when the mine was placed on standby in response to depressed uranium prices. Umetco reclaimed the mine surface area in 2002. Energy Fuels reopened the mine in early 2007 under a DRMS Prospect Permit and a BLM NOI. The road and the main portal were reopened and a pad area was established in front of the portal. Energy Fuels is currently establishing ventilation and rehabilitating portions of the Packrat Mine so that exploration activities can be safely conducted. This area is referred to as the “Packrat Portal”.

The Whirlwind and Packrat portal areas were reclaimed by previous mine operators prior to Energy Fuels initiating bulk sampling operations. The BLM and DRMS inspected the final reclamation and approved liability releases in 2004 based on the success of reclamation efforts. In addition to the liability releases, DRMS presented an award to the previous mine operators for successful reclamation.

2.2.2.2 Mine Design and Mine Plan

Based on existing exploration data, the mine would be initially expanded to the west and south in the direction of the proposed vent shafts shown on Map 2.2-1. The thin and irregular nature of the ore body makes it difficult to define the exact location and extent of future mining. Exploration drilling from the surface and long-hole drilling from existing underground workings would ultimately determine the optimum location of future drifts and production stopes.
Future underground mining operations may connect with adjacent mines in the area such as the Lumsden No. 2 and Rajah 49. This would be done primarily for mine ventilation purposes although some older stopes could also be mined. No additional surface disturbance is anticipated at the adjacent mines because ventilation fans would be installed underground and ore and waste would be hauled out through the Whirlwind Portal. Energy Fuels would be required to consult with BLM prior to any connection with adjacent mines and further NEPA analysis may be required.

Nine-foot high by 12-foot wide drifts would be driven through known ore-bearing zones to provide access for production mining. The drifts also provide access for geologic mapping, long-hole drilling, rib scanning, and sample collection. This geologic data would be used to develop detailed mine planning and stope development for each drift.

The ore would be mined using a modified room-and-pillar system. This is a common method for mining in uranium-bearing sandstone and is designed to follow the irregular configuration of the individual ore bodies. The ore seams vary in height with an average seam thickness of approximately 3 feet. The waste-to-ore ratio also varies depending on the thickness of the ore and splits within the ore seams. Mines in the area have typically averaged 2 to 3.5 tons of waste per 1 ton of ore.

Energy Fuels is proposing to operate the Whirlwind Mine under Mesa County Conditional Use Permit 2007-299 and DRMS Mine Permit M-2007-044, which were approved on December 18, 2007 and February 21, 2008, respectively. The proposed permitted area in Colorado includes 31.4 acres (Colorado permit area) and is shown on Map 2.2-1. The proposed surface disturbance within the Colorado permit area is 22.6 acres. An additional 1.38 acres of surface disturbance is proposed in Utah for construction of six ventilation shafts (Utah permit area). These ventilation shafts were approved by the Utah Division of Oil, Gas and Mining (DOGM) under Small Mine Permit S/019/0065 on February 13, 2008.

2.2.2.3 Surface Support Facilities

The proposed surface facilities for the Whirlwind Portal area are shown on Map 2.2-2. Detail of the Packrat Portal area is shown on Map 2.2-3. The proposed ventilation shafts and power drop areas for the Whirlwind Mine are shown on Map 2.2-1. Minor changes may be made to the proposed layouts during construction; however, construction activities would be confined to permitted areas and would be located outside of surface drainages. The majority of the ore and waste rock (i.e., over 90 percent) would be brought to the surface from the Whirlwind Portal. Ore and waste rock brought through the Packrat Portal would be transferred to bins where the waste rock would be loaded into highway haul trucks for transfer to the Whirlwind Portal area or the ore would be hauled directly to the mill in trucks that would be tarped. There would be no processing activities on-site. The ore would be transported to the White Mesa Mill near Blanding, Utah. Other potential processing mills that may be used in the future include the Cañon City Mill in Cañon City, Colorado, the Shootaring Mill in Ticaboo, Utah, and the proposed Piñon Ridge Mill in Bedrock, Colorado.

Surface Disturbance. It is estimated that total surface disturbance required for operation of the Whirlwind Mine would be 23.98 acres. Approximately 7.69 acres of the proposed disturbance would occur in previously disturbed and reclaimed areas. Table 2.2-1 lists the proposed surface disturbance by project component for the Whirlwind Portal Area, the Packrat Portal Area, the vent shafts and power drop areas in Colorado, and the vent shafts in Utah.
Table 2.2-1
Total Surface Disturbance Associated with the Whirlwind Mine

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Proposed Disturbance in Previously Disturbed and Reclaimed Areas (acres)</th>
<th>Proposed New Disturbance (acres)</th>
<th>Total Surface Disturbance (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whirlwind Portal Area</td>
<td>5.07</td>
<td>14.68</td>
<td>19.75</td>
</tr>
<tr>
<td>Packrat Portal Area</td>
<td>1.75</td>
<td>0.00</td>
<td>1.75</td>
</tr>
<tr>
<td>Vent Shafts and Power Drops</td>
<td>0.87</td>
<td>0.23</td>
<td>1.10</td>
</tr>
<tr>
<td><strong>Total (Colorado)</strong></td>
<td><strong>7.69</strong></td>
<td><strong>14.91</strong></td>
<td><strong>22.60</strong></td>
</tr>
<tr>
<td>Vent Shafts (Utah)</td>
<td>0.00</td>
<td>1.38</td>
<td>1.38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.69</strong></td>
<td><strong>16.29</strong></td>
<td><strong>23.98</strong></td>
</tr>
</tbody>
</table>

\* Of the 7.69 acres, approximately 4 acres have been disturbed under the approved exploration permits.

Whirlwind Portal Area

The total proposed surface disturbance associated with the Whirlwind Portal area would be 19.75 acres of which 5.07 acres is on previously disturbed and reclaimed areas and is described below.

Ore Stockpile Area. Ore would be end-dumped directly onto an ore stockpile pad located north of the Whirlwind Portal (Map 2.2-2). The ore stockpile pad has been sized to contain up to 15,000 tons of ore, which represents 3 to 4 months of full production. The ore would be stored temporarily on-site to accommodate transportation scheduling needs. The ore pad would consist of a geosynthetic liner with very low permeability protected by 2.5 feet of cushion material (i.e., crushed mine waste rock) and 1 foot of run-of-mine waste rock. Meteoric water that contacts the pad would be directed to a sump equipped with an overflow that drains directly to the untreated-water tank that feeds into the water treatment plant.

Waste Rock Storage Area. The largest single surface disturbance is the waste rock storage area which would encompass approximately 10 acres and is designed for the life of the mine. Three to four acres are needed on the top of the Whirlwind waste rock pile to park equipment and store materials needed for underground mining. This facility would extend eastward from the Whirlwind Portal within the gently sloping area between Mesa County Road 5/10 to the north and the natural hillside to the south. The north facing side of the waste rock storage area would be graded, topsoiled, and revegetated contemporaneously as the pile expands to minimize visual impacts and sediment loading of surface water runoff. Air quality permits issued by the Colorado Department of Public Health and Environment (CDPHE) require that the mine use magnesium chloride and water sprays to control dust. The advancing face of the waste rock pile is limited to approximately 1 acre.

Topsoil Stockpile Areas. Topsoil would be salvaged from areas of potential disturbance prior to conducting mining or construction activities. These areas include previously reclaimed areas, previously disturbed and unreclaimed areas, and undisturbed areas. Based on soil samples taken in April 2007, the average topsoil thickness in the area is 14 inches. Calculations for earthwork and reclamation are based on this thickness. An estimated 15,000 cubic yards of material would be salvaged and stored for use during reclamation (Map 2.2-2). Additional soil would be stripped as the waste rock storage area is expanded and placed directly on the regraded north embankment as part of contemporaneous reclamation. Piñon-juniper, scrub oak, and other small trees would be removed from previously undisturbed areas prior to stripping the topsoil. These trees and other woody material would be placed in a separate pile. Downed trees and all other woody material would be placed on top of the topsoil during reclamation - either as mulch or in whole pieces.
**Water Treatment Plant and Tanks.** The existing portable water treatment plant and tanks installed for bulk sampling activities would be utilized to periodically treat and discharge excess mine water that cannot be used in mining operations. The treatment system consists of an untreated water tank (164,000 gallons), a trailer-mounted treatment system, and a settling tank and polish tank (7,500 gallons each).

**Fuel and Oil Storage Areas.** Diesel fuel and various oils for use in mobile equipment and generators would be stored and used on-site. Secondary containment would be provided for all petroleum products. The utility company would supply electrical power to the site; however, generators would likely be used initially to supply power to the main facilities, remote ventilation fans, and water treatment trailer. Once electrical power is available on-site, the generators would be removed and/or used for emergency backup.

A Spill Prevention, Control and Countermeasures (SPCC) Plan for storing and using petroleum products would be prepared and implemented for the site in accordance with federal and state regulations. This is required because the total aboveground storage of fuel and oil, in containers of 55 gallons or larger, would exceed 1,320 gallons.

**Mine Facilities.** A mobile trailer and a temporary prefabricated structure would be used initially as the warehouse and maintenance area, respectively, at the Whirlwind Portal area. As the mine develops, these structures would be replaced by a one-bay service area and warehouse constructed on top of the existing 6-inch thick, 43 feet x 60 feet concrete pad (Map 2.2-2). This structure would be a prefabricated metal building that is painted a BLM-approved color, as per BLM Visual Resource Management (VRM) Best Management Practices - BMPs (BLM, 2005a), using a color from either the chart of Standard Environmental Colors or the chart of Supplemental Environmental Colors, to blend in with the environment and surroundings. Maintenance activities would be limited to routine service and minor repairs. Waste products generated from maintenance activities would be disposed of in accordance with all federal, state, and local regulations.

A portable dry (change/shower facilities), approved under the prospect permit, would be used initially for changing and showering. The dry would be painted in accordance with BLM specifications to reduce visual impacts. As mine production increases, mine offices and a more permanent dry would be constructed on-site. A 4-inch thick concrete pad with nominal dimensions of 20 feet x 50 feet would be constructed immediately north of the warehouse and maintenance shop. A prefabricated metal building consisting of mine offices and the dry would be constructed on the concrete pad. The building would be adjacent to the shop and warehouse and would be painted the same color as the other buildings. This area would have a chain link fence and a gate to prevent unauthorized access when the mine is idle. Signs would be posted stating that visitors must check in at the mine administrative office (Map 2.2-2).

A portable watchman’s trailer would be located on-site. The trailer would be approximately 10 feet x 30 feet and could be used as sleeping quarters for a security person at night or when the mine is not operating. Water would be hauled to the site and a septic system would be installed for the shower and bathroom facilities as described under utilities below. A gravel parking area would be constructed for employees and visitors just north of and adjacent to the mine offices. A 1,000-gallon tank containing a dilute solution of magnesium chloride would be installed on top of the pad near the Whirlwind Portal.

**Packrat Portal Area**

Proposed surface disturbance associated with the Packrat Portal area is 1.75 acres (Map 2.2-3). The Packrat Portal area would be relatively small and would be terraced to provide two levels.
Waste Rock. Waste rock and ore hauled out of the Packrat Portal would be dumped into bins. The waste would be hauled to the Whirlwind waste rock storage area while the ore would be hauled to either the Whirlwind ore stockpile or directly to the mill.

Topsoil. Topsoil at the Packrat Portal area would be salvaged and used for safety berms at the Packrat Portal and the Packrat road. The safety berm would be stabilized by seeding with a BLM-approved seed mixture. During mine reclamation, the salvaged berm material would be re-used for reclamation of the Packrat Portal area.

Mine Facilities. A maintenance shop would be located underground in a shallow adit just north of the main Packrat Portal (Map 2.2-3). A small storage area would be available at the north end of the Packrat waste rock pad next to the maintenance shop.

Vent Shafts and Power Drops (Colorado)

Vent Shafts. As the mine expands, seven ventilation shafts would be added for a total of eight ventilation shafts (Map 2.2-1). One existing vent shaft (10-Straight) and one proposed vent shaft are in Colorado. The existing 10-Straight Vent Shaft that accesses the southern portion of the Packrat Mine would be rehabilitated and used for ventilation purposes. Rehabilitation would include grouting the lower portion of the casing to eliminate seepage of water from the lower Brushy Basin Member into the mining zone.

The location of the proposed vent shafts may change by several hundred feet depending on the ultimate location of the drift and ventilation needs. The ventilation shafts would typically be 72 inches in diameter and would be cased. The steel casing would be grouted where it passes through aquifers to prevent intermixing of waters between formations.

The vent shafts have been located adjacent to existing access roads. Surface disturbance at each vent shaft is estimated to be 0.23 acre consisting of a cleared earthen pad area (typically 100 feet x 100 feet) that would include a 15-foot wide, two-track access road. A small concrete pad (up to 200 square feet in size) would be constructed to provide a level platform for drilling equipment during installation. Once the shafts are completed and cased, a single-vane axial fan with a diffuser would be mounted on top of each hole. These units would typically be about 3- to 5-feet high and have metal grates on top. Silencers may be added to reduce noise levels; this may increase the overall height of these units by several feet. The diffusers would be painted a color from the charts of Standard or Supplemental Environmental Colors (BLM, 2005a) that blends with the surroundings to mitigate potential visual impacts.

The fans would be powered by electricity from nearby power poles and each unit would have locked breaker boxes at the power drop. Some additional poles and transformers would be needed to access some locations. Temporary generators may be used in some areas until the power is completely established. The vent shafts would be inspected periodically during operation (i.e., average of once per day) by mine personnel.

Power Drops. No new disturbance is proposed for power drop areas.

Vent Shafts (Utah)

There is no existing disturbance in Utah. Proposed new surface disturbance associated with vent shafts in Utah is 1.38 acres. Topsoil would be salvaged on-site at the proposed vent shaft areas as mining progresses over the life of the mine. Topsoil at the vent shafts would be stockpiled and stabilized (seeded) for use during final reclamation.

2.2.2.4 Schedule

The mine has a projected life of 10 years based on known and inferred resources. Current mine rehabilitation, exploration, and bulk sampling activities are expected to continue through third quarter 2008 with mine startup scheduled for fourth quarter 2008. This schedule would allow the
mine to reach a production level of 100 tons per day (tpd) by the first quarter 2009 and full production of 200 tpd by the first quarter 2010.

2.2.2.5 Workforce

The Whirlwind Mine would operate one to three shifts per day five days per week. Initially, 10 to 12 employees would mine approximately 100 tpd of ore. As the mine expands and more headings are opened up, up to 24 employees may work at the mine and ore production would increase to an average of 200 tpd.

2.2.2.6 Mine Access

Access to the Whirlwind Mine is from Colorado State Highway 141 near Gateway, Colorado to John Brown Road as shown on Maps 2.2-1 and 2.2-4. The route includes approximately 7.4 miles traveling southwest on John Brown Road to Mesa County Road $^5_{/10}$. Mesa County Road $^5_{/10}$ would be traveled for 3.2 miles to the west and north to reach the Whirlwind Mine. Access to the Packrat Portal would be via an existing mine road off of Mesa County Road $^5_{/10}$. The 10-Straight vent shaft, as well as the Whirlwind power drop area, would be accessed by an existing secondary road and two-track road off of Mesa County Road $^5_{/10}$ (Map 2.2-4). The proposed vent shafts are located next to existing secondary roads and the short access roads would be included within the proposed 100 feet x 100 feet (0.23 acre) pad area required for the vent shafts.

2.2.2.7 Traffic

Traffic to and from the Whirlwind Mine would consist of employees traveling to and from work and trucks hauling ore from the mine. Initially, there would be approximately six light-vehicle round trips (12 trips total) per day accessing the Whirlwind Mine including a 4-wheel-drive company van for the employees. With a peak workforce of 24 employees, there would be up to 12 light-vehicle round trips (24 trips total) per day. Additional light-vehicle and heavy-vehicle trips would be necessary to deliver supplies, parts, and equipment. Approximately two additional light-vehicle round trips (four trips total) per day and one heavy-vehicle round trip (two trips total) per day are estimated for delivery purposes at peak production.

Initial operations would require ore haulage (heavy-vehicle) from the mine at an average rate of four round trips (eight trips total) per day. As production increases to 200 tpd, ore truck (heavy-vehicle) traffic would increase to an average of eight round trips (16 trips total) per day.

2.2.2.8 Ore Haul Routes

Energy Fuels plans to haul the ore to the White Mesa Mill in Blanding, Utah for processing. The primary and only all-weather route by which the ore would be transported from the Whirlwind Mine to the processing mill would be from Mesa County Road $^5_{/10}$ to John Brown Road to Colorado State Highway 141. Ore trucks would travel on Colorado State Highway 141 in a southeasterly direction to Colorado State Highway 90 (which becomes Utah State Highway 46) where they would turn west to U.S. Highway 191 at La Sal Junction, Utah. The trucks would then turn south on U.S. Highway 191 and travel south to Blanding passing through Monticello, Utah (Route A on Map 2.2-5). If ore trucks are not able to travel on the primary and all-weather route, haul trucks may use other routes on a temporary basis. Three alternative haul routes were identified in the Plan (Energy Fuels, 2007a) including:

- West from the mine on Gateway Road to La Sal Mountain Loop Road – northwest on La Sal Mountain Loop Road to Utah State Highway 128 - southwest on Utah State Highway 128 to U.S. Highway 191 – south on U.S. Highway 191 through Moab and south to Blanding (Route B on Map 2.2-5);
Map 2.2-5
Whirlwind Mine
Alternative Haul Routes

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM
- West from the mine on Gateway Road and south through the Manti-La Sal National Forest to Utah State Highway 46 - west on Utah State Highway 46 to U.S Highway 191 then south to Blanding (Route C on Map 2.2-5); and

- West from the mine on Gateway Road to La Sal Mountain Loop Road – south on La Sal Mountain Loop Road to U.S. Highway 191 south of Moab then south on U.S. Highway 191 to Blanding (Route D on Map 2.2-5).

Permits and approvals from appropriate governments would be necessary before haul trucks could use the alternate routes. Travel routes to other potential mills that may be used in the future would be via Colorado and Utah state highways and U.S. highways.

### 2.2.2.9 Mine Operations

#### Equipment List

An exact equipment inventory is not known at this time, but Table 2.2-2 lists typical equipment needed for a mining operation of this type. When the mine is idle, underground equipment would be parked underground and surface equipment would be parked on the ready-lines near the Whirlwind and Packrat portals. Some of the surface equipment would likely be owned and operated by local contractors and would be stored off-site when not in use.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Number</th>
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</thead>
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<td><strong>Underground Equipment</strong></td>
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</tr>
<tr>
<td>Diesel Skid Steer Loaders, 2 yd³ capacity</td>
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</tr>
<tr>
<td>Diesel Trucks (Buggies), 5 and 10 ton capacity</td>
<td>8 to 10</td>
</tr>
<tr>
<td>Development Drill, Jumbo</td>
<td>1</td>
</tr>
<tr>
<td>Production Drills, Jacklegs</td>
<td>8 to 10</td>
</tr>
<tr>
<td>Exploration Drills, Longhole</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Diesel Boss Buggies and Utility Vehicles</td>
<td>2 to 4</td>
</tr>
<tr>
<td><strong>Surface Equipment</strong></td>
<td></td>
</tr>
<tr>
<td>Front End Loader, 2 to 3 yd³ capacity</td>
<td>1</td>
</tr>
<tr>
<td>Backhoe/Skid Loader or Excavator, 8 hp</td>
<td>1</td>
</tr>
<tr>
<td>Highway Haul Trucks, 22 to 24 ton capacity</td>
<td>2 to 3</td>
</tr>
<tr>
<td>Bulldozer, 200 hp</td>
<td>1</td>
</tr>
<tr>
<td>Motor Grader, 140 hp</td>
<td>1</td>
</tr>
<tr>
<td>Flat Bed Truck, 1 ton</td>
<td>1</td>
</tr>
<tr>
<td>Pickup Truck, ¾ ton (4 wheel drive)</td>
<td>2</td>
</tr>
<tr>
<td>Snow Plow</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Waste Rock Handling Plan

Waste material would be generated from above and below the ore-bearing material by blasting (i.e. split-shooting). The material would consist primarily of sandstone that tends to weather rapidly, lose its cementation, and become softer upon exposure to air and water. The blasted rock would be very poorly sorted, ranging in size from fine-grained sand particles to a maximum of 2 feet in diameter. As the waste rock is brought outside in the buggies (rubber-tired, low-profile trucks), it would be dumped into the expansion area. As the waste rock storage area is expanded to the east, the north embankment would be regraded to 3 horizontal to 1 vertical (3H:1V) and reclaimed contemporaneously. Waste rock that would be hauled out of the Packrat Portal would be dumped into bins on the lower bench at the Packrat truck unloading area and then hauled to the Whirlwind waste rock storage area using larger ore trucks.

The existing bench at the Whirlwind Portal would be expanded to provide storage space for waste rock produced from underground mining operations. The waste rock storage area would be expanded to the east and gradually raised in height. The waste rock would be hauled to the
storage area in buggies and dumped near the edge of the pile. A dozer would then level and push the material over the edge of the pile. The pile would have two levels; the lower level at the portal and an upper level to the east. Travel over the pile by the loaded buggies would compact the material which would encourage runoff and reduce infiltration of precipitation. The waste rock storage area would have a capacity of 900,000 tons, which would contain most of the waste rock generated during the projected 10-year life of the mine. The remaining waste rock would be disposed of underground in mined-out areas.

The area east of the existing waste rock storage area consists of piñon and sagebrush crisscrossed by historic drill roads and pads. This area is on relatively gentle slopes with an average topsoil thickness of about 1.8 feet. Prior to expansion of the waste rock storage area to the east, the vegetation would be stripped and the topsoil would be removed and stockpiled on the north side of Mesa County Road 5/10. Downed trees and other woody material would be salvaged and stored in a separate pile, and then placed on the topsoil surface during reclamation, either as mulch or in whole pieces. All woody material would remain on-site to improve reclamation. The areas around the Whirlwind and Packrat portals have been checked for springs and seeps. None exists within the area of the proposed waste rock storage area expansion.

Two 10-foot wide benches would be placed on the final slope of the waste rock storage area as it is constructed to prevent unbroken steep slopes with elevation changes of more than thirty vertical feet. In addition, a haul road with a 6 percent positive slope would be constructed as the waste rock storage area expands. This road would be treated with magnesium chloride to minimize the generation of fugitive dust. Waterbars would be placed on the haul road as necessary to control runoff and erosion. Water would be channeled away from the slope using a ditch on the inside of the road. The road and top of the waste rock storage area would have a 3-foot high berm constructed of waste rock as required by the Mine Safety and Health Administration (MSHA) for safety of the vehicle traffic on the road.

Expansion of the waste rock storage area would occur in increments of approximately 3 to 4 acres so that a large portion of the area is not disturbed at once. As permanent waste rock slopes are created, topsoil from new disturbed areas would be placed on the north regraded slope and seeded to allow for contemporaneous reclamation of a portion of the storage area. The reclaimed slope would be covered with a minimum of 12 inches of topsoil prior to seeding and mulching. Permanent diversions would keep stormwater runoff from entering the waste rock storage area from the uphill areas to the south.

Approved BMPs would be utilized to minimize stormwater contact with waste rock. Runoff from the waste rock storage area and other disturbed areas would be collected in ditches that would channel the water to the sediment pond. The steeper portions of these collection ditches would be riprapped to minimize erosion. The sediment pond is designed to allow suspended solids to settle out of solution before the water enters the natural drainage. The sediment pond is designed to fully contain a 10-year, 24-hour precipitation event for the site. It is also designed to safely pass a 100-year, 24-hour storm event through the principal spillway pipe. Larger flows would be routed through an emergency spillway.

Power Supply and Utilities

The long-range mine plan anticipates that the local power company would supply electricity to the site using the existing power poles and lines in the area. Historically, electric power was provided by San Miguel Power using Utah Power and Light’s (now Rocky Mountain Power’s) infrastructure. Assuming that a similar arrangement could be developed using the existing distribution system, additional poles and transformers would be needed at the point of use. Until such an arrangement could be brokered, Energy Fuels would use temporary generators to supply power to the mine and ventilation shafts. These generators would be newer models that
would be relatively quiet and meet EPA's current emission standards. The generators would be placed in insulated enclosures should noise levels or freezing during the winter become issues of concern.

Regardless of the power source (i.e., line power or generators), power drops to the Whirlwind and Packrat portal areas, Whirlwind and Packrat underground workings, and vent shafts would be installed. The approximate locations of the two pad areas for the power drops to the Packrat and Whirlwind underground workings are shown on Map 2.2-1. The proposed power drop for the Whirlwind is a cased drill hole that was installed in 2005 by Little Maverick Mining Company as part of their exploration and prospecting activities. It is located about 3,500-feet southwest of the Whirlwind Portal and about 800 feet south-southeast of the 10-Straight vent shaft. This power drop would be about the size of a vent shaft pad (i.e., 0.23 acre). The proposed Packrat power drop would be located on a previously disturbed pad (0.41 acre) that was used for this same purpose by Umetco.

Initially, generators would be installed near the mine portals and ventilation shafts to supply power to the surface facilities and fans. Once line power is reestablished in the area, the generators would be replaced with transformers. The exact number of new power poles and the length of connecting powerline required for each installation would be determined by the power company in consultation with the BLM. Approximately five to six poles would likely be needed to bring the power from the Cherokee Shaft area to the Whirlwind Portal area. The poles would be installed in the same powerline corridor as was used previously. The power could, alternately, be brought to the Whirlwind Portal from the Packrat power drop area. This would require the installation of approximately three additional poles and removal or trimming of some trees. There are several existing powerlines on top of the mesa, and each of the ventilation shafts and the Whirlwind power drop could be accessed with an average of two additional poles. Power poles are present at the Packrat power drop area; however, one additional pole may be needed near the cased hole that accesses the underground workings. Power to the Packrat Portal area would probably be supplied by underground lines originating at the Packrat power drop. If surface lines are needed, approximately five to six poles would be required to support a new line from the Packrat power drop area to the Packrat Portal area. The power poles would be installed next to the existing road that accesses the Hubbard Mine Portal, which is located north of the Packrat Portal.

Water for bathrooms, showers, and other general uses would be hauled to the site from nearby, privately-owned springs or wells under a purchase agreement. The mine would supply bottled water for drinking purposes. A septic system would be installed in accordance with state and county requirements near the mine offices and dry change facilities.

The main buildings, which include the maintenance shop, warehouse, mine offices, and dry change facilities, would be heated using propane. The propane tank would be located near the main buildings. The water treatment trailer would be equipped with an electrical heater for use during the colder months. A portable propane heating system would be used at the Packrat maintenance shop during the winter.

**Solid Waste Storage and Disposal**

Solid waste generated at the site would include paper, cardboard, wood, metal bands, and other packing materials in addition to organic waste from the lunchroom areas. This waste would be containerized and hauled to a landfill. Used oil and antifreeze from the maintenance shop would be containerized and hauled to a recycling facility. Scrap metal, batteries, and tires would be recycled. If a solvent station is installed to clean parts, it would consist of a sink mounted on a small drum of solvent. The solvent would be recycled to the drum after each use. Periodically, the solvent drum would be exchanged with the vendor for a new drum with the old solvent being recycled. The only waste material that would be buried on-site would consist of inert
construction material such as broken concrete and brick. Waste containers with organic material in them (from lunchroom, etc.) would be located within the chain link fence.

Surface Water Management

Surface drainage controls would consist of: 1) diversion of potential run-on stormwater around the portal areas utilizing ditches and culverts; 2) collection of surface runoff from the waste rock storage area and other facilities in ditches and culverts that would flow into a sediment pond; and 3) treatment and discharge of post-contact stormwater from the ore stockpile and pad.

Diversion ditches would be installed around both the Whirlwind and Packrat surface facilities to route stormwater runoff from undisturbed areas above and around the mining area. These ditches have been designed for a 100-year storm event.

Collection ditches and culverts would be installed in the Whirlwind mining area to route water to a sediment pond where suspended solids would settle out of solution. Similarly, ditches and culverts within the Packrat Portal area would convey stormwater to a collection sump. The collection ditches and culverts are designed for a 10-year storm event, as they are temporary structures that would be maintained by the mine. Structural BMPs (e.g., riprap, silt fence, straw-bale barriers, seeding of disturbed areas) would be implemented as needed to reduce erosion.

Energy Fuels proposes to utilize the existing water treatment system that was installed to dewater the mine for bulk sampling. Excess water from the underground workings would be pumped into the untreated-water tank through a buried high density polyethylene (HDPE) pipe. Surface drainage overflow from the ore stockpile area would be directed to this tank through a buried 6-inch HDPE line. The untreated water tank is equipped with two synthetic liners and a leak detection system. A portable, trailer-mounted water treatment plant has been installed immediately southwest of the untreated-water tank. The plant would pump water from the tank and treat the water with barium chloride and ferric sulfate to precipitate out radium and uranium, and reduce selenium concentrations. Sulfuric acid may also be added in small quantities to lower the pH to approximately 6.5 to 7 standard units if selenium concentrations are elevated. Selenium, unlike other metals, precipitates out of solution at lower pH levels.

The treated water would be routed into two synthetically lined tanks located immediately northwest of the treatment plant. Precipitated metals and radionuclides would settle out in the first tank (i.e., settling tank) and the second tank (i.e., polishing tank) would collect the treated water prior to gravity discharge into the middle tributary of Lumsden Creek immediately west of the tanks. The discharge is permitted under a Colorado Discharge Permit System (CDPS) Permit (CO-0047562) by the CDPHE Colorado Water Quality Control Division (WQCD). The settling and polish tanks are, like the untreated-water tank, double lined with leak detection systems. The treatment plant and tanks are fenced and equipped with a locked gate to prevent unauthorized access.

Groundwater Controls

The uranium ore would be mined from the Upper Rim sandstones of the Salt Wash Member, which do not naturally contain groundwater in the Lumsden Canyon area. However, groundwater has entered the mining zone from above through historic mine features such as unplugged drill holes, ungrouted shafts, and the Whirlwind (i.e., Urantah) decline. Natural features such as fractures or faulting could also contribute to groundwater inflows in some of the Lumsden Canyon mines. Most of the water entering the mine workings originates from perched water zones in the lenticular channel sandstones that are found within the massive (about 400-feet thick) mudstones and shales of the overlying Brushy Basin Member. The inflows into the Whirlwind/Packrat workings are relatively small, typically 1 to 3 gallons per minute (gpm) with a combined estimated inflow of about 7 gpm. Because of the low inflow rate, the water does not discharge from the downdip portals, but rather, gradually seeps into the mine floor.
Most of the water inflow during mining operations would be used to support drilling and ventilation. Energy Fuels has obtained a water well permit (Permit # 66419) and a Conditional Water Right (Case #07CW69) from the Colorado Division of Water Resources (CDWR) to use this water. Excess water would be pumped to the surface and treated prior to discharge to the middle tributary of Lumsden Creek under the CDPS discharge permit. The treated groundwater could also be used for mining-operations support such as, but not limited to, cleaning equipment, drilling, and dust suppression.

**Spill Prevention, Material Containment, and Emergency Response**

In addition to an SPCC Plan, Energy Fuels has prepared and would implement a Material Containment Plan and Surface Facility Emergency Response Plan (Appendix B) in accordance with local, state, and federal regulations. A copy of these plans would be maintained in the mine office and mine employees would receive emergency and spill response training at the time of hire and at least annually thereafter.

The SPCC Plan would be prepared in conformance with the U.S. Environmental Protection Agency’s (EPA’s) regulations for aboveground storage of more than 1,320 gallons of petroleum products. This plan would provide measures for properly storing and handling petroleum products and responding to, and reporting, spills. Secondary containment would be provided for the diesel fuel tanks and the various oils used in mobile equipment and generators.

A Material Containment Plan has been developed for the water treatment system in accordance with the CDPS discharge permit. This plan provides guidance on the proper handling, use, and disposal of the water treatment chemicals. It also provides Material Safety Data Sheets (MSDS) and additional information on how to respond to, and clean up, a dry chemical or solution spill. The existing Material Containment Plan would be updated as the treatment system methods or reagents are modified.

A Surface Facility Emergency Response Plan has been developed and as required by the Mesa County Conditional Use Permit, has been provided to Mesa County and the local Gateway Fire District. The Surface Facility Emergency Response Plan is provided in Appendix B. The plan provides training information and response procedures in the event of a fire, explosion, or other emergency at the site.

The ore hauling contractor is required to comply with the U.S. Department of Transportation’s (USDOT’s) regulations for transport of radioactive materials found in Title 49 of the Code of Federal Regulations which includes preparation and implementation of an Emergency Response Plan. Energy Fuels’ Ore Transportation Plan (Appendix C) identifies emergency response procedures that would be part of the Emergency Response Plan which will not be prepared until the hauling contractor is selected.

**Monitoring**

Statutes and permit conditions require Energy Fuels to monitor the performance of a number of on-site components including the following:

- Groundwater;
- Stormwater control and/or erosion;
- Sediment pond stability;
- Revegetation;
- Noxious weeds/weed control success;
- Air quality control measures; and
- Water treatment facilities.

The monitoring programs are discussed in more detail in Chapter 4.
2.2.2.10 Reclamation

Upon completion of mining, all disturbed areas would be reclaimed to dry rangeland for wildlife habitat, which is the primary pre-mining land use. Bat gates would be provided at the main Packrat Portal to enhance bat habitat. Current plans are to backfill the Whirlwind Portal during reclamation, however, a bat gate could also be installed if requested by BLM. As part of the Plan (Energy Fuels, 2007a), the site would be partially reclaimed as the waste is accumulated and the waste rock storage area is constructed. Initially, the outer slope of the existing waste pile would be reclaimed, after it is expanded to its northern limit. As the waste rock storage area expands to the east, the north face would be reclaimed contemporaneously. Topsoil would be replaced by dozers spreading the material over the slope, followed by seeding in the fall planting season. Table 2.2-3 provides the proposed seed mixture that would be used to stabilize disturbed areas and to facilitate restoration to pre-mining land use (grazing and wildlife habitat).

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Scientific Name</th>
<th>Lbs/ac pure live seed (PLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasses (variety)</td>
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<td></td>
</tr>
<tr>
<td>Western Wheatgrass (Arriba)</td>
<td><em>Pascopyrum smithii</em></td>
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<tr>
<td>Slender Wheatgrass (Primar)</td>
<td><em>Elymus trachycaulus</em></td>
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<td>Pubescent Wheatgrass (Luna)</td>
<td><em>Agropyron trichophorum</em></td>
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<tr>
<td>Crested Wheatgrass (Nordan)</td>
<td><em>Agropyron cristatum</em></td>
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</tr>
<tr>
<td>Indian Ricegrass (Paloma)</td>
<td><em>Oryzopsis hymenoides</em></td>
<td>1.4</td>
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<tr>
<td>Needle and Threadgrass</td>
<td><em>Stipa comata</em></td>
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<tr>
<td>Blue Grama (Hachita)</td>
<td><em>Bouteloua gracilis</em></td>
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</tr>
<tr>
<td>Forbs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lewis flax</td>
<td><em>Linum lewisii</em></td>
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<tr>
<td>Palmer Penstemon (Cedar)</td>
<td><em>Penstemon palmeri</em></td>
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</tr>
<tr>
<td>Cicer Milkvetch (Lutana)</td>
<td><em>Astragalus cicer</em></td>
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</tr>
<tr>
<td>Shrubs</td>
<td></td>
<td></td>
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<tr>
<td>Four Wind Saltbush (Rincon or Native)</td>
<td><em>Atriplex canescens</em></td>
<td>2.0</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>12.2</strong></td>
</tr>
</tbody>
</table>

* Proposed rate is for drill seeding. For areas that cannot be drilled, broadcast seeding would be used with one and one-half times the drill seeding rate.

Final reclamation would commence at the end of the mine life followed by monitoring for revegetation success. The reclamation steps are listed below:

**Seal Whirlwind Portal.** The Whirlwind Portal would require a bulkhead seal placed in the decline to ensure that the water seeping into the decline does not enter into the mine. The bulkhead would be constructed near the base of the decline in a competent sandstone of low hydraulic conductivity. It would require an estimated 6 to 9 months for the water to stabilize above the seal within the shales and mudstones of the Brushy Basin Member. This water pool would be monitored and sampled to verify its extent and quality prior to backfilling the portal.

**Placement of Treatment Sludge in Mine.** The sludge collected in the Treated Water Settling and Polish Tanks would be disposed of in one of two ways: 1) mixed into a cement grout on-site and disposed of in a dry portion of the decline above the water zone, or 2) taken to the uranium mill with the ore to be processed. The latter option would be preferred, because it would allow for recovery of the uranium resource. Sediment collected in the untreated-water tank would be sampled and analyzed prior to removal. It is expected that this material is similar in composition to the waste rock and could be placed on the waste rock storage area. If metals or radionuclides were found to be elevated, it would be treated in the same manner as the treatment sludge.
Reclamation of Ore Stockpile Area: The cushion material and liner from the ore pad would be excavated and placed in a dry portion of the decline above the water zone.

Reclamation of Ventilation Shafts and Power Drops. All new shafts would be grouted during installation at locations where they intercept aquifers so that they do not provide a conduit for groundwater flow. During reclamation, vent casings would be cut below ground surface with a steel plate welded over the opening. A steel-reinforced concrete cap would be installed over the top of the steel plate. Soil would then be placed over the hole and reseeded. The two cased holes used as power drops would have the power cable removed and the casing would be cut below ground surface. The holes would then be plugged, backfilled, and seeded.

Dismantling of Buildings and Structures at Both Portal Areas. All buildings and structures at the portal areas would be removed.

Removal of Foundations at Whirlwind and Packrat Portals. All foundations at each portal site would be removed using heavy equipment and would be hauled underground or off-site.

Installation of Bat Gate or Backfill Packrat Portal and Seal Shop Area. A steel bat gate would be welded into place at the main Packrat Portal and a block wall would be constructed at the entrance to the shop area.

Removal of Water Treatment Trailer and Tanks and Backfill Collection Ditches. The treatment trailer and fabricated tanks would be hauled from the site and the collection ditches would be backfilled, reseeded, and monitored for revegetation success. Reclamation of the sediment pond would not occur until the mine site is adequately revegetated.

Backfilling and Grading at Whirlwind and Packrat Portal Areas. At the Whirlwind Portal, material would be pushed from the portal pad into the mine opening for a distance of 20 feet. Additional material would then be backfilled to a height of 10 feet above the top of the portal opening to the existing bench at a slope of 3H:1V. Final grading of the waste rock storage area would include grading the remaining angle of repose slopes to 3H:1V or less steep to allow for proper drainage. The Packrat Portal would require grading to 3H:1V or less after removal of the retaining wall.

Topsoiling Packrat Portal Area with MSHA Berm. Sequestered topsoil (retained in the form of the perimeter berm to the Packrat pad and road) would be removed and placed on the regraded Packrat Portal area surface.

Pocking, Reseeding, and Mulching of the Packrat Portal Area. Once topsoil placement is complete, the area would be pocked using a hydraulic excavator, broadcast seeded, and mulched.

Partial Backfilling and Grading of Packrat Road. Reclamation would include partial backfilling and re-contouring of the historic road cut so that the reclaimed surface blends with the surrounding area. The backfill and topsoil material would come from the MSHA berms and the material pushed down the side of the hill during original road construction.

Seeding, Mulching, and Blocking of Packrat Road. The backfilled surface would be seeded and mulched as segments of the road are reclaimed because there would be no future vehicle access. The former entrance would be blocked with boulders to preclude vehicle access.

Ripping of Compacted Traffic Areas Prior to Topsoil Placement. The Whirlwind portal bench, access roads, facility areas, and top of waste rock storage area would be ripped prior to topsoil placement to relieve compaction from vehicle traffic.
Replacement of Topsoil on Remaining Areas. Topsoil would be placed on the remaining areas within the mine facility.

Harrowing of Topsoil at the Whirlwind Portal Area. Topsoil would be harrowed on contour using a tractor and disc.

Seeding, Mulching, and Blocking the Whirlwind Portal Area. Approximately 9.89 acres of area would be seeded and mulched with the stockpiled vegetative matter. The entrance to the area would be blocked with boulders to prevent vehicle access.

Post-reclamation site drainage (restore natural drainage). The reclaimed Whirlwind and Packrat areas would be designed to drain to the large ephemeral drainage located immediately west of the Whirlwind Portal and east of the Packrat Portal. The sediment pond below the Whirlwind Portal would be backfilled, recontoured, and seeded once vegetation is adequately established on the reclaimed areas.

Weed Control. Weed surveys would be conducted of the mine disturbed areas including soil stockpiles in the spring (April or May) and fall (September or October) each year. If noxious weeds are identified, they would be sprayed with a herbicide approved by the BLM and Mesa County. These measures are designed to reduce the occurrence of weeds, both during mining operations and subsequent reclamation.

Monitoring Reclamation Success. The pre-disturbed mine site consists of an overstory of piñon-juniper with an understory of grasses and forbs. Disturbed areas would be considered satisfactorily revegetated when the percent vegetative cover at least equals the cover present prior to disturbance and the plant species composition is at least as desirable as that present prior to disturbance (BLM, 1987).

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Two alternatives for access to the ore body were considered but not analyzed in detail for the reasons described below.

2.3.1 Plateau Located Vertical Access Shaft

This Alternative consists of constructing a vertical production and ventilation shaft in the vicinity of the proposed vent shafts in Utah and using the Whirlwind decline and Packrat drifts for ventilation only. Both waste and ore would be removed from the mine using a hoist system. This Alternative was not analyzed in detail because access to the ore body through a new vertical shaft would result in all new surface disturbance for mine facilities, including waste rock disposal. The mine road to the new facilities would extend an additional 3 miles beyond the Whirlwind Portal and would pass immediately adjacent to several private landowners. This Alternative did not provide any advantage over the Proposed Action while adding additional surface disturbance in the form of new mine facilities and new and upgraded roads.

2.3.2 Primary Canyon Wall Access

Primary access to the deposit from the existing Packrat, Lumsden, and Rajah 49 Mines was also considered; however, this approach would create a situation where placement of waste rock storage areas, ore stockpile areas, and mine structures would be problematic. These portals are located along canyon faces and lack sufficient surface area from which to work or store ore and waste rock. Under this Alternative, stored materials would likely be placed within steep drainage settings thereby creating stability, stormwater runoff, and other environmental problems that would most likely be insurmountable. In the Proposed Action, the Packrat Mine was selected for secondary access (e.g., ventilation, emergency escape, limited haulage) due to its proximity to the Urantah decline; however, the pad area would be small and storage of ore or waste rock would be temporary and limited to several small bins.
Chapter 3
Affected Environment

3.1 INTRODUCTION

This chapter provides a description of the human and natural environmental resources that could be affected by the Proposed Action and Alternatives. This EA draws upon information compiled in the Grand Junction Resource Area RMP (BLM, 1987) and the Grand Resource Area RMP (BLM, 1985a). Each of the following elements is addressed in a level of detail commensurate with the degree of impact to the element or resource:

- air quality, climate, and noise;
- environmental justice;
- socioeconomics; Areas of Critical Environmental Concern;
- land use and residential areas;
- transportation;
- visual resources;
- recreation resources;
- wild and scenic rivers; wilderness areas;
- cultural and historic resources;
- Native American religious concerns;
- geological resources;
- paleontological resources;
- surface water resources;
- groundwater resources;
- wetlands, riparian resources, and floodplains;
- soil resources;
- farmland – prime/unique;
- vegetation resources;
- invasive species and noxious weeds;
- grazing resources;
- threatened and endangered and special status species;
- wildlife and aquatic resources;
- hazardous materials;
- human health; and
- areas of critical environmental concern.

3.2 AIR QUALITY, CLIMATE, AND NOISE

3.2.1 Air Quality

The Colorado permit area for the Whirlwind Mine is within Mesa County and the Western Slope Region for air quality planning (Colorado Department of Public Health and Environment - CDPHE, 2006). The Western Slope Region includes all counties lying west of the Continental Divide. Air quality concerns in this region are primarily from impacts related to recent activities associated with energy development. Prior to the most recent energy development boom, primary air-pollution sources such as woodstoves, unpaved roads, and street sanding have largely been addressed and are no longer a substantial source of air pollutants; however, controlled and uncontrolled burns continue to be a major source of air pollution in the region.
Under Prevention of Significant Deterioration (PSD) regulations, EPA has adopted three standards/classifications for ambient air quality. Class I standards are intended to preserve the quality of areas with pristine air quality (most restrictive), Class II permits moderate air quality deterioration, and Class III (the least restrictive) sets an absolute limit beyond which degradation is not allowed and is designed to set standards that are protective of human health. The project area and all of Mesa County is designated as PSD Class II attainment areas by EPA and the State of Colorado meaning that the baseline ambient air quality meets all federal ambient air quality standards (U.S. Department of Energy – DOE, 2007).

3.2.2 Climate
The closest weather station in the vicinity of the Whirlwind Mine is the Gateway Station located in Gateway, Colorado (CO53246) about 4.8 miles southeast of the Whirlwind Portal area. The Gateway Station has a period of record of more than 50 years (1948 through 2005) and is at an elevation of about 4,600 feet, which is about 2,400 feet lower than the elevation of the Whirlwind Mine (7,000 feet). The total average yearly precipitation at the Gateway Station is 11.29 inches with an average total snowfall of 15.5 inches. Most snow falls in December and January while precipitation as rainfall is typical throughout the year but is primarily associated with summer thunder showers. August has the highest total average monthly precipitation (1.32 inches) and June typically receives the least average monthly precipitation (0.55 inches). Because the Whirlwind Mine is located about 2,400 feet higher in elevation than the Gateway Station, average precipitation at the mine is expected to be higher - with an the average annual precipitation estimated to be about 16 to 20 inches (Prism Group, 2008). The BLM recorded average annual and monthly precipitation data since 1981 from their Cave Canyon gage located in Section 4, T. 50 N., R. 19 W. The Cave Canyon rain gage is located approximately 3.5 miles to the east and at a similar elevation and topographic setting as the Whirlwind Mine. Average annual precipitation recorded at the Cave Canyon gage is reported as 16.54 inches with the highest average monthly precipitation received in August and September (1.78 and 1.74 inches, respectively). June receives the lowest average monthly precipitation (0.71 inches).

The average maximum temperature at the Gateway Station is 68.2 degrees farenheit (°F) with the highest maximum average temperature being 92.8 °F and 90.3 °F in July and August, respectively. The average minimum temperature is 39.5 °F with the lowest average minimum monthly temperatures occurring in December and January (20.0 °F and 18.1 °F, respectively) (Western Regional Climate Center, 2008a). Mean annual pan evaporation in the project area is around 60 inches per year (National Oceanic and Atmospheric Administration and National Climatic Data Center, 1983). Because of the higher elevations at the mine, average maximum and minimum temperatures are expected to be lower than those recorded at the Gateway Station. The closest wind monitoring station to the Whirlwind Mine is located in Grand Junction, Colorado reporting an average annual wind speed of 7.8 miles per hour (mph) with an average prevailing wind direction from the east-southeast (Western Regional Climate Center, 2008b).

3.2.3 Noise
Currently, noise in the project area is generally attributable to local traffic. Noise levels and the distance that sound travels fluctuate with temperature, humidity, and wind. The local topography creates a natural barrier, attenuating noise that might emanate from the Whirlwind Mine and minimizing noise-related impacts in areas outside of the project area. The project area is located on public lands, managed for multiple-use, with one mobile camp trailer in the vicinity.
3.3 ENVIRONMENTAL JUSTICE

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level).

The Whirlwind Mine is located in the Glade Park-Gateway Census Division District (CDD). According to the 2000 Census (U.S. Census Bureau, 2000), which is the most recent year for which population data by race are available, minorities comprise 24.3 percent of the population in the State of Colorado, 12 percent of the population in Mesa County, and 6 percent of the population in the Glade Park-Gateway CDD (see Table 3.3-1).

<table>
<thead>
<tr>
<th>Race</th>
<th>Colorado (percent)</th>
<th>Mesa County (percent)</th>
<th>Glade Park-Gateway CDD (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>3.8</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>American Indian</td>
<td>1.0</td>
<td>0.9</td>
<td>0.2</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>2.3</td>
<td>0.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Hispanic, any race</td>
<td>17.1</td>
<td>10.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Total minority</td>
<td>24.2</td>
<td>12.0</td>
<td>6.1</td>
</tr>
</tbody>
</table>

1 Source: U.S. Census Bureau, 2000.

According to the 2000 Census (U.S. Census Bureau, 2000), persons in poverty comprise 9.3 percent of the population in Colorado, 10.2 percent of the population in Mesa County, and 8.5 percent of the population in the Glade Park-Gateway CDD (see Table 3.3-2).

<table>
<thead>
<tr>
<th>Income Variable</th>
<th>Colorado</th>
<th>Mesa County</th>
<th>Glade Park-Gateway CDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Household Income</td>
<td>$47,230</td>
<td>$35,864</td>
<td>$48,088</td>
</tr>
<tr>
<td>Income Below Poverty Level</td>
<td>9.3%</td>
<td>10.2%</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

1 Source: U.S. Census Bureau, 2000.

3.4 SOCIOECONOMICS

3.4.1 Socioeconomics

Mesa County is the largest population and economic center in western Colorado. According to the Colorado Department of Local Affairs (2008), 38 percent of the county’s residents live in Grand Junction, the county seat as well as the region’s largest city and employment hub for surrounding towns and counties. Mesa County reflects western Colorado’s rural character, with more than half of the county’s population living in unincorporated areas (U.S. Census Bureau, 2000).

The Whirlwind Mine lies 5 miles southwest of the unincorporated community of Gateway in Mesa County. Gateway, which is located 40 miles southwest of Grand Junction, was originally homesteaded in the 1880s and became a community based around cattle ranching, farming, and lumber milling by the early 1900s. Uranium mining was Gateway’s economic driver throughout most of the second half of the century. Falling uranium prices in the mid-1990s led to the closure of nearly all vanadium and uranium mines in the area, which resulted in business closures and population losses in Gateway. In recent years, Gateway’s economy has begun to
recover with tourism-related development. Rising uranium prices have also led to renewed mining activity in the area.

3.4.1.1 Population

Mesa County is Colorado’s 11th largest county in terms of population. The 24.8 percent change in population between 1990 and 2000 did not match Colorado’s overall growth of 30.6 percent; however, since 2000, Mesa County has grown at a faster rate than Colorado as a whole (Table 3.4-1). The Colorado Department of Local Affairs (2008) projects that population growth in Mesa County will continue to exceed the statewide average through 2020.

<table>
<thead>
<tr>
<th>Year</th>
<th>Colorado</th>
<th>Mesa County</th>
<th>Colorado (percent)</th>
<th>Mesa County (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>3,294,473</td>
<td>93,145</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2000</td>
<td>4,301,261</td>
<td>116,255</td>
<td>30.6</td>
<td>24.8</td>
</tr>
<tr>
<td>2006</td>
<td>4,813,536</td>
<td>135,488</td>
<td>11.9</td>
<td>16.5</td>
</tr>
<tr>
<td>2010</td>
<td>5,207,801</td>
<td>150,504</td>
<td>8.2</td>
<td>11.1</td>
</tr>
<tr>
<td>2020</td>
<td>6,285,135</td>
<td>190,019</td>
<td>20.7</td>
<td>26.3</td>
</tr>
</tbody>
</table>

The area surrounding the Whirlwind Mine is sparsely populated. As of 2007, approximately 200 people lived in the community of Gateway (Denver Post, 2007). To the south, the nearest communities are the towns of Naturita and Nucla, in Montrose County. The Nucla-Naturita area is approximately 1 hour south of the Whirlwind Mine. In 2006, Naturita had a population of 675 and Nucla had a population of 753 (Colorado Department of Local Affairs, 2008).

3.4.1.2 Employment and Income

As of 2006, service industries were Mesa County’s largest source of employment, accounting for 48.1 percent of all wage jobs in the county (Table 3.4-2). Between 2001 and 2006, the greatest employment gains occurred in the Mining sector (410.7 percent), followed by Arts, Entertainment, and Recreation (63.5 percent). In 2006, the highest average wages were paid in the Mining sector ($63,453) (Colorado Department of Labor and Employment, 2007a).

<table>
<thead>
<tr>
<th>Sector</th>
<th>2001 Employment</th>
<th>Average wages</th>
<th>2006 Employment</th>
<th>Average wages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>50,914</td>
<td>$27,425</td>
<td>57,970</td>
<td>$33,729</td>
</tr>
<tr>
<td>Agriculture, Fishing, and Hunting</td>
<td>458</td>
<td>$17,974</td>
<td>530</td>
<td>$25,158</td>
</tr>
<tr>
<td>Mining</td>
<td>364</td>
<td>$47,437</td>
<td>1,859</td>
<td>$63,453</td>
</tr>
<tr>
<td>Utilities</td>
<td>222</td>
<td>$51,871</td>
<td>217</td>
<td>$58,992</td>
</tr>
<tr>
<td>Construction</td>
<td>4,207</td>
<td>$32,066</td>
<td>5,383</td>
<td>$36,252</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3,773</td>
<td>$31,242</td>
<td>3,318</td>
<td>$37,786</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1,968</td>
<td>$33,528</td>
<td>2,150</td>
<td>$41,964</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>7,535</td>
<td>$21,791</td>
<td>8,112</td>
<td>$25,161</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>1,797</td>
<td>$27,905</td>
<td>2,071</td>
<td>$38,469</td>
</tr>
<tr>
<td>Information</td>
<td>958</td>
<td>$32,873</td>
<td>926</td>
<td>$36,184</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1,808</td>
<td>$38,608</td>
<td>2,123</td>
<td>$44,714</td>
</tr>
<tr>
<td>Real Estate, Rental, and Leasing</td>
<td>992</td>
<td>$23,269</td>
<td>1,131</td>
<td>$29,906</td>
</tr>
<tr>
<td>Professional and Technical Services</td>
<td>1,645</td>
<td>$36,236</td>
<td>2,129</td>
<td>$42,453</td>
</tr>
<tr>
<td>Mgmt of Companies and Enterprises</td>
<td>119</td>
<td>$59,271</td>
<td>93</td>
<td>$79,546</td>
</tr>
<tr>
<td>Administrative and Waste Services</td>
<td>3,140</td>
<td>$18,385</td>
<td>3,055</td>
<td>$23,212</td>
</tr>
<tr>
<td>Educational Services</td>
<td>206</td>
<td>$11,670</td>
<td>228</td>
<td>$18,502</td>
</tr>
</tbody>
</table>
Table 3.4-3

United States, Colorado, and Mesa County Unemployment Rates

<table>
<thead>
<tr>
<th>Area</th>
<th>1990 (percent)</th>
<th>2000 (percent)</th>
<th>2005 (percent)</th>
<th>2006 (percent)</th>
<th>2007 (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>5.6</td>
<td>4.0</td>
<td>5.1</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td>Colorado</td>
<td>5.0</td>
<td>2.7</td>
<td>5.1</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>Mesa County</td>
<td>5.9</td>
<td>3.3</td>
<td>5.0</td>
<td>3.9</td>
<td>3.2</td>
</tr>
</tbody>
</table>


In 1990, the unemployment rate in Mesa County was higher than the national and state averages (see Table 3.4-3). By 2000, the county’s unemployment rate (3.3 percent) fell below the national average (4.0 percent), but remained above the state average (2.7 percent). Since 2005, Mesa County’s unemployment rate has been lower than the national and state averages (Colorado Department of Labor and Employment, 2007b and U.S. Bureau of Labor Statistics, 2008).

In 2007, the median family income in Mesa County was $49,800 (U.S. Department of Housing and Urban Development, 2007). In Mesa County, work earnings account for the majority of residents’ personal income. Earnings in 2007 accounted for 65 percent of personal income, followed by 17.9 percent for dividends, interest, and rent, and 17.1 percent for transfer receipts (e.g. pension and retirement benefits, social security payments) (U.S. Bureau of Economic Analysis, 2007).

Recent economic activity in the Gateway area has focused on promoting recreation and tourism. The John Hendricks family has plans to develop lodging, dining, retail, and recreation properties in Gateway (Western Sky Investments, 2006). By the end of 2007, this development included Gateway Canyons, a multi-facility resort, a restaurant, a service station, and an auto museum. Gateway Canyons is Gateway’s largest employer, with a service staff of approximately 90 workers, as well as numerous construction workers.

### 3.4.1.3 Housing

Most of the dwelling units in Mesa County are owner-occupied single-family homes. In 2000, the latest year for which housing data by tenure are currently available, owners lived in 86.3 percent of all detached single-family units and 81.5 percent of all mobile homes (U.S. Census Bureau, 2000). At year-end 2007, the median residential sale price in Mesa County was $212,836, a 9.6 percent increase from the previous year (Grand Junction Daily Sentinel, 2008).

Rents are also increasing in Mesa County. Most of the county’s rental housing units are in Grand Junction. According to the Colorado Department of Local Affairs (2008), the average rent level in Mesa County increased 12.7 percent between the 3rd quarters of 2005 and 2006 (from $494 to $566), and 7.7 percent between 3rd quarters of 2006 and 2007 (from $566 to $610) (Von Stroh, 2007).
Consistent with development patterns in other unincorporated areas of Mesa County, most dwelling units in Gateway are single-family or mobile homes on large acreage parcels. Housing is sparse, with most homes located along Colorado State Highway 141 through the Unaweep Canyon. A multi-family residential project consisting of 60 two- and three-bedroom housing units is being developed near the Gateway Post Office. By 2006, 20 of these units had been completed (Western Sky Investments, 2006). Additional land along the Dolores River is being prepared for a high-end residential community (Fleenor, 2008).

Housing prices in Gateway are increasing and the few rental homes in the area are fully occupied. Because of the limited local supply of housing, several workers employed by Western Sky Investments currently live in Grand Junction and commute to Gateway on vans and busses.

### 3.4.1.4 Infrastructure and Community Services

Most of Mesa County’s public service facilities and retail opportunities are located in Grand Junction. Grand Junction has two hospitals: St. Mary’s Hospital and Community Hospital; two higher education institutions: Western Colorado Community College and Mesa State College; and the Grand Junction Regional Airport. As the county seat, Grand Junction is the center of governmental activity in Mesa County.

The community of Gateway has limited community services. The Mesa County Sheriff’s Office provides public safety services in Gateway through its Rural Area Deputy Program. The Gateway/Unaweep Fire Department provides fire fighting, emergency medical and first response services to area residents. The volunteer fire department has nine response vehicles, including two ambulances. The Gateway School provides K-12 classes to local students. A community center houses the fire station, post office, a branch of the county library, and a large meeting room. A park with tennis courts and a volleyball court are located on the community center grounds.

Individual wells provide water for residential and domestic use. The Gateway Sewer Plant began operating in Gateway in late 2005. The plant has a 13,750 gallons per day (gpd) capacity with the ability to expand to 25,000 gpd.

### 3.4.1.5 Fiscal Conditions

The largest sources of revenue for Mesa County government are property taxes, sales and use taxes, and intergovernmental transfers (see Table 3.4-4). Between 2003 and 2007, property taxes accounted for 16 to 17 percent of Mesa County’s budgeted revenues, while sales and use taxes, which are paid on goods purchased and/or used in the county, comprised 17 to 23 percent of the county’s revenues. Intergovernmental transfers, which include distributions of severance tax and federal mineral leases paid on mineral extraction, comprised 20 to 27 percent of Mesa County’s revenues during this period (Mesa County Assessors Office, 2007).

<table>
<thead>
<tr>
<th>Revenue Source</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Taxes</td>
<td>$20.5</td>
<td>$22.3</td>
<td>$22.6</td>
<td>$23.6</td>
<td>$24.9</td>
</tr>
<tr>
<td>Sales and Use Tax</td>
<td>$22.9</td>
<td>$24.1</td>
<td>$27.1</td>
<td>$31.2</td>
<td>$34.5</td>
</tr>
<tr>
<td>Intergovernmental Transfers</td>
<td>$25.5</td>
<td>$27.6</td>
<td>$30.4</td>
<td>$34.5</td>
<td>$39.6</td>
</tr>
<tr>
<td>All Revenue Sources</td>
<td>$122.9</td>
<td>$138.5</td>
<td>$133.9</td>
<td>$136.3</td>
<td>$147.2</td>
</tr>
</tbody>
</table>

Table 3.4-4
Mesa County Budget Revenue Sources, 2003 through 2006 (million $s)\(^1\)

Mineral extraction affects the county’s fiscal status largely through the extracting activity's impact on the property, or ad valorem, tax base. Mesa County’s property tax base has been
increasing for the past several years. Total assessed valuation on taxable property in Mesa County grew 64.7 percent between 2000 and 2006; from $807.1 million to $1.3 billion (Table 3.4-5).

<table>
<thead>
<tr>
<th>Year</th>
<th>Assessed Value (million $s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>$807.1</td>
</tr>
<tr>
<td>2001</td>
<td>$907.4</td>
</tr>
<tr>
<td>2002</td>
<td>$955.7</td>
</tr>
<tr>
<td>2003</td>
<td>$1,012.6</td>
</tr>
<tr>
<td>2004</td>
<td>$1,054.2</td>
</tr>
<tr>
<td>2005</td>
<td>$1,243.5</td>
</tr>
<tr>
<td>2006</td>
<td>$1,329.3</td>
</tr>
</tbody>
</table>

Table 3.4-5
Mesa County Assessed Valuation, 2000 – 2006 (million $s)¹

Residential property accounts for nearly half of Mesa County’s assessed valuation (Table 3.4-6). Natural resources, which include coal, gravel/stone, minerals, and oil and gas, account for 4.7 percent of Mesa County’s assessed valuation. Oil and gas production and equipment account for 97 percent of the total assessed valuation for natural resources (Mesa County Assessor’s Office, 2007).

<table>
<thead>
<tr>
<th>Class of Property</th>
<th>Assessed Valuation</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacant</td>
<td>$80.9</td>
<td>6.1</td>
</tr>
<tr>
<td>Residential</td>
<td>$646.2</td>
<td>48.6</td>
</tr>
<tr>
<td>Commercial</td>
<td>$372.9</td>
<td>28.1</td>
</tr>
<tr>
<td>Industrial</td>
<td>$58.2</td>
<td>4.4</td>
</tr>
<tr>
<td>Agricultural</td>
<td>$20.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>$62.5</td>
<td>4.7</td>
</tr>
<tr>
<td>State Assessed</td>
<td>$88.1</td>
<td>6.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,329.3</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 3.4-6
Mesa County Assessed Valuation by Property Class, 2006 (million $s)¹

³ Source: Mesa County Assessor’s Office, 2007.

3.5 LAND USE AND RESIDENTIAL AREAS

The dominant land uses in the Whirlwind Mine project area include mining, grazing, and wildlife habitat. The Beaver Mesa Mining District, where the Whirlwind Mine is located, has seen production of radium, vanadium, and uranium ores since early in the 20th century. Grazing on BLM-administered public lands has occurred within two livestock grazing allotments (06429 Dolores Point and 06419 Hubbard). Dispersed recreational opportunities are available in the area, and are expected to increase with the development of the Gateway Canyons Resort in Gateway, Colorado and development of the Lumsden Canyon Trail System and Gateway Special Recreation Management Area (SRMA).

There are no permanent residences in the area. However, recently one of the private landowners, approximately 1,800 feet northwest of the Whirlwind Portal, installed a driveway and a mobile camper trailer.

3.6 TRANSPORTATION

3.6.1 Mine Access Roads

The main access to the Whirlwind Mine is from Colorado State Highway 141 which is a paved two-lane road and is the major arterial road through Gateway. Colorado State Highway 141 is also known as the Unaweep/Tabeguache Scenic and Historic Byway. From Colorado State Highway 141, access to the mine would be via John Brown Road which is an improved dirt road with short graveled sections. This road is maintained by the Mesa County Highway Department; however, there is no winter maintenance provided by Mesa County. Winter maintenance is
accomplished (through coordination with Mesa County) by either ranch owners or by a subcontractor of the Whirlwind Mine. Mesa County Road $^{5/10}$, which is a graded improved dirt roadway, leads to the Whirlwind Mine, and is currently maintained by the mine. Within the mine facilities, there are two short access roads, a previously reclaimed mine access road leading to the Packrat Portal area and an existing secondary and two-track road leading to the 10-Straight vent shaft. These roads are primarily graded dirt with short graveled sections and are maintained by the mine.

3.6.2 Ore Transportation Routes

The primary ore transportation route would be John Brown Road to Colorado State Highway 141, southeast on Colorado State Highway 141 to Colorado State Highway 90, west on Colorado State Highway 90 and Utah State Highway 46 to La Sal Junction, Utah and south on U.S. Highway 191 to Blanding, Utah.

**Colorado State Highways.** Colorado State Highway 141 from the junction with John Brown Road to the junction with Colorado State Highway 90 (a 49-mile segment) and Colorado State Highway 90 from the junction with Colorado State Highway 141 to the Utah state line (a 34-mile segment) have been studied by the Colorado Department of Transportation (CDOT).

The Colorado State Highway 141 segment is functionally classified as minor arterial/rural (CDOT, 2007). CDOT monitoring indicated average daily traffic counts (composite north/south) of 825 for the September 28-29, 2004 sample period (most recent available), with current volumes likely to be higher due to subsequent real estate development at Gateway. CDOT estimates a background annual average growth rate of 3.85 percent for daily volume on Colorado State Highway 141 (TurnKey Consulting LLC, 2007), resulting in a 2008 forecast traffic volume of 965 vehicles per day, and a 2015 forecast volume of 1,250 vehicles per day.

The Colorado State Highway 90 segment is functionally classified as major collector/rural. CDOT monitoring indicates average daily traffic counts of 222 (east) and 218 (west) for the September 28-29, 2004 sample period. A more recent CDOT survey (TurnKey Consulting LLC, 2007) indicates a similar estimate of 400 vehicles per day in 2006 for Colorado State Highway 90 west of the Colorado State Highway 141 intersection. CDOT estimated a background annual average growth rate of 3.40 percent for daily volume on Colorado State Highway 90, resulting in a 2008 forecast traffic volume of 430 vehicles per day, and a 2015 forecast volume of 660 vehicles per day.

Both of these state highway segments are located on primarily uninhabited public lands. These highway segments have been used historically for hauling uranium ore. There are currently no truck restrictions on either highway segment. The highways parallel or cross perennial water resources along the primary haul route. Colorado State Highway 141 parallels the Dolores River for several miles from Gateway to Uravan and the San Miguel River from Uravan to Naturita. Colorado State Highway 90 crosses the Dolores River at Bedrock, Colorado (DOE, 2007).

CDOT highway statistics for calendar year 2000 report fatality and injury rates from accidents along all state highways of 0.015 fatality per million vehicle miles and 0.63 injury per million vehicle miles. For total rural state highways, the comparative rates were 0.018 fatalities and 0.36 injuries per million vehicle miles (DOE, 2007). State highways 141 and 90 were not characterized as having fatality or injury rates higher than state averages. Information from CDOT and Utah Department of Transportation (UDOT) indicate that the majority of accidents occur at intersections and on curved sections of the highways.

**Utah State Highways.** Utah State Highway 46 is a functional class 7, major collector road. The UDOT 2006 monitoring data reports an annual average daily traffic (AADT) of 235 vehicles from the Colorado state line to La Sal and 590 vehicles from La Sal to the junction with U.S. Highway
191. For both segments of Utah State Highway 46, approximately 13 percent of the daily total traffic is trucks (UDOT, 2008a).

For the 2005 calendar year, the UDOT crash database lists five property damage only crashes and two injury crashes on Utah State Highway 46 between the junction with U.S. Highway 191 (MP 21.59) and the Colorado state line (MP 0). No fatalities were reported. Additionally, the crash database lists 60 property damage only crashes and 20 injury crashes on U.S. Highway 191 between MP 51.95 at the north city limits of Blanding and MP 103.44 at the junction with Utah State Highway 46. Two fatalities were reported for this section of highway (UDOT, 2008b). Crash data for 2006 and 2007 is not available.

**U.S. Highways.** U.S. Highway 191 is a functional class 2, principal arterial. UDOT reports 2006 AADT along U.S. Highway 191 at the junction with Utah State Highway 211 (approximately 15 miles south of La Sal) at 3,655 with trucks making up 31 percent of the total. Further south at the junction with U.S. Highway 666 (recently renamed U.S. Highway 491) in Monticello, AADT is reported at 3,095. AADT reported at Verdure (approximately 12 miles north of Blanding) is 2,465 with trucks making up 39 percent. AADT at East Blanding is reported at 2,125 with 35 percent trucks (UDOT, 2008a).

As of December 2007, Utah had 95 automatic traffic recorder stations located throughout the state. One counter is located along the ore transportation route on U.S. Highway 191, 6 miles north of State Route 492 near Monticello. Data from this location, from December 2007, indicate a 3.3 percent increase in AADT compared to the corresponding period in 2006 (UDOT, 2007).

### 3.7 RECREATION RESOURCES

The proposed Whirlwind Mine project area is mostly on BLM-administered public lands in Colorado and Utah. The site is situated in piñon-juniper dominated uplands above important recreational canyon complexes southwest of the Dolores River in Colorado and southeast of the Cottonwood River in Utah.

For several decades, big game hunting has been the primary recreational use in the vicinity of the project area (BLM, 1985b and Stevens, 2008). The proposed project area is in Game Management Unit (GMU) 60 in Colorado and GMU 13a, the La Sal Mountains Unit in Utah. In addition to a bear hunt season in Utah, there is a specific season for recreational black bear pursuit and this can occur in the vicinity of the project area (Utah Division of Wildlife Resources - UDWR, 2008a). Table 3.7-1 summarizes big game and black bear hunting harvest data for the GMUs in the vicinity of the proposed project area. More recently, the region has also become an important recreation destination for hikers, mountain bikers, boaters, campers, and off-highway vehicle (OHV) enthusiasts (BLM, 2007a).

<table>
<thead>
<tr>
<th>Year</th>
<th>Big Game Species</th>
<th>Colorado Game Management Unit 60</th>
<th>Utah La Sal Game Management Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Harvest</td>
<td>Total Hunters</td>
</tr>
<tr>
<td>2006</td>
<td>Deer</td>
<td>119</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>Elk</td>
<td>100</td>
<td>426</td>
</tr>
<tr>
<td></td>
<td>Black Bear</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>2005</td>
<td>Deer</td>
<td>85</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>Elk</td>
<td>80</td>
<td>366</td>
</tr>
<tr>
<td></td>
<td>Black Bear</td>
<td>2</td>
<td>N/A</td>
</tr>
</tbody>
</table>
3.7.1 Gateway, Colorado Area

Under the current BLM GJFO RMP, the Gateway area is currently managed as the Gateway Intensive Recreation Area, which was primarily established to protect high value recreation sites (BLM, 1987). The Dolores River corridor is managed to protect recreational opportunities in and along the river (BLM, 1987).

Recently, an overall boost and gradual change in the types of recreational uses in the Gateway region are products of both the increasing popularity of various dispersed recreational pursuits, and the construction of Gateway Canyons Resort (BLM, 2007a). Although Gateway and surrounding communities historically have been considered mining towns, the Gateway Canyons Resort and increasing recreational use are steadily changing the dynamics of the area (Anderson, 2008). The resort is located on Colorado State Highway 141, also known as the Unaweep/Tabeguache Scenic and Historic Byway.

The Gateway Canyons Resort includes lodging, food and beverage services, an outfitter, bicycle rentals, jeep rentals, grocery store, gas station, an automotive museum, and convention facilities. In the southwest portion of Mesa County, additional private lands are being developed by the Gateway Canyons Resort within the boundary of the BLM GJFO. Future plans include 200 units of overnight accommodations, five restaurants, and a conference center. There are plans to host guests for a variety of activities and events in several adjacent ranches owned by the same management group (BLM, 2007a).

While recreational use of the Gateway area would likely increase independent of Gateway Canyons Resort, its presence is an important factor in promoting recreational activities in the area. As it continues to develop, the Gateway Canyons Resort is expected to attract an increasing number of visitors who would be drawn to the dramatic desert landscape and opportunities for exercise and exposure to local cultural sites available on adjoining public lands. Heritage tourism is also a cornerstone of the resort, and many visitors are interested in the history and prehistory of the area (BLM, 2007a).

In December 2007 (USDOI, 2007), the BLM GJFO announced a recreation planning effort for the Gateway SRMA, which would include a recreation area management plan for the region surrounding the proposed Whirlwind Mine. In part, this plan could eventually result in ten recreation management zones (RMZs), supply guidance for resource protection and community enhancement, and help provide quality recreation opportunities for a variety of user groups (BLM, 2007b). Under the current draft plan, the Whirlwind Mine project area would be located in RMZ 7 and the haul routes could pass through RMZs 1, 2, and 8.

<table>
<thead>
<tr>
<th>Year</th>
<th>Big Game Species</th>
<th>Colorado Game Management Unit 60</th>
<th>Utah La Sal Game Management Unit2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Harvest</td>
<td>Total Hunters</td>
<td>Total Rec Days</td>
</tr>
<tr>
<td>2004</td>
<td>Deer 82</td>
<td>195</td>
<td>1019</td>
</tr>
<tr>
<td></td>
<td>Elk 89</td>
<td>416</td>
<td>2322</td>
</tr>
<tr>
<td>2003</td>
<td>Deer 61</td>
<td>180</td>
<td>1015</td>
</tr>
<tr>
<td></td>
<td>Elk 67</td>
<td>277</td>
<td>1356</td>
</tr>
<tr>
<td>2002</td>
<td>Deer 65</td>
<td>178</td>
<td>798</td>
</tr>
<tr>
<td></td>
<td>Elk 59</td>
<td>274</td>
<td>1309</td>
</tr>
</tbody>
</table>

1 Sources: Colorado Division of Wildlife – CDOW, 2008a and 2008b; UDWR, 2008a and 2008b.
2 Black bear statistics include areas 13a (La Sal/La Sal Mountains) and 13b (Dolores Triangle).
RMZ 7, Cone Mountain/Dolores Point, is currently characterized by historic and modern uranium mining activity and is valued for big game hunting and dispersed OHV and non-motorized recreation. The Gateway RMZ (RMZ 1) includes lands adjacent to the Town of Gateway and Gateway Canyons Resort. It represents lands that would be most immediately impacted by the development of the resort. The zone is valued for its scenic red rock landscape and accessibility. RMZ 2, Dolores River, is two discontinuous units containing the Dolores River and West Creek. It includes the Unaweep/Tabeguache Scenic and Historic Byway and is valued for its scenic red rock canyons, river boating, and canyon hiking. John Brown Canyon, RMZ 8, includes John Brown Road, the primary access route west of Gateway to the Whirlwind Mine. It connects the Gateway area with the La Sal Mountains, BLM-administered public lands to the west, and Moab in Grand County, Utah. The zone is valued as a transportation corridor for motorized and non-motorized recreation and its highly diverse and scenic character (BLM, 2007c).

### 3.7.2 Grand County, Utah

In Utah, some lands managed by the BLM MFO are considered internationally recognized recreation destinations (BLM, 2007d). Busy seasons include spring, summer, and fall, with spring bringing the most visitors to the area. Spring and fall visitors engage in the full range of recreation activities, including scenic driving, camping, hiking, jeeping, mountain biking, canoeing and rafting, rock climbing, OHV and dirt bike riding, hunting, and horseback riding. Summer visitation is mainly associated with touring the nearby Arches and Canyonlands National Parks and with river-related activities. The summer season brings large numbers of visitors who engage in sightseeing activities such as driving through the public lands and viewing the landscape from scenic overlooks, and some hiking and biking (BLM, 2007d).

The current RMP for the MFO, the Grand Resource Area RMP, was released in 1985, prior to rapid expansion of recreational use on public lands (BLM, 2007d). The Grand Resource Area RMP contains very limited recreation management direction, and none specific to the Whirlwind Mine project area. There, recreation lands in Utah have historically been important to hunters and back-country drivers (Stevens, 2008). This relatively remote area is included in the proposed Extensive Recreation Management Area (ERMA) under the BLM MFO Draft RMP (2007d). The ERMAs are areas where usually very little recreation occurs, and dispersed recreation is encouraged under minimal regulatory constraints (BLM, 2007d).

### 3.8 VISUAL RESOURCES

Visual resources are the visible physical features of a landscape that convey scenic value. Visual resources are often the dominant resource value involved in providing high quality outdoor recreational opportunities. BLM has described the areas surrounding the Whirlwind Mine as having diverse and very scenic qualities (BLM, 1985a; Cooper, 2008). In general, they are characterized by the Dolores River valley, steep canyons, vertical cliffs, mesas, rolling parks, and ridges.

On some BLM-administered public lands in the vicinity of the project area, visual resources have been classified according to VRM analysis criteria. Visual quality, sensitivity, and public visibility are considered, resulting in a VRM classification of I, II, III, or IV. There are VRM Class I, II, and III areas in the region of the proposed Whirlwind Mine. Class I areas, the most scenic and highly restrictive VRM class, cover the Palisade Wilderness Study Area (WSA) northeast of the project area. Class II areas are usually sensitive, unique, or scenic areas and any changes to the landscape should have a low visual impact. In Class III areas, changes to the visual landscape from new activities should, at a minimum, partially retain the existing character of the landscape.
Under both the current Grand Junction Resource Area and Grand Resource Area RMPs (BLM, 1987 and BLM, 1985a), the proposed Whirlwind Mine is sited in an area that is unclassified under VRM criteria. Currently, none of the management directions for activities in VRM areas apply to the project area. Further, the project area and access roads are largely screened by the natural topography and existing vegetation, and are not visible from primary transportation corridors, which include the Unaweep/Tabeguache Scenic and Historic Byway (Colorado State Highway 141) and John Brown Road. The proposed mine is located in an area with a history of mining activity and currently shows evidence of past surface disturbance.

3.9 WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968 (WSRA) established legislation for a National Wild and Scenic Rivers System to protect and preserve designated rivers in their free-flowing condition and to protect and preserve their immediate environments. There are currently no WSRA-designated wild and scenic rivers in the vicinity of the project area. However, both the BLM GJFO and MFO have determined that the Dolores River from Gateway, Colorado to its confluence with the Colorado River is eligible for protection based on its wild and scenic qualities (BLM, 2005b).

3.10 WILDERNESS AREAS

Congress passed the Wilderness Act in 1964, establishing a national system of lands for the purpose of preserving ecosystems in their natural condition for benefit of future generations. With the passage of the Federal Land Policy and Management Act in 1976, Congress directed the BLM to inventory, study, and recommend which public lands under its administration should be designated wilderness. There are no congressionally-designated wilderness areas in the vicinity of the proposed Whirlwind Mine. The nearest WSA is the Palisade in Colorado, on the north side of the Dolores River and about 4.5 miles northeast of the Whirlwind Mine (BLM, 1985b and 2007a).

3.11 CULTURAL AND HISTORIC RESOURCES

A records search of the general project area, and a Class III inventory of the Area of Potential Effect (APE), as defined in the National Historic Preservation Act (NHPA), was completed (GJFO CRIR #8307-02 and Utah State Project Number U-07-A1-0493b). Conditions of the existing cultural environment are incorporated by this reference but the following section briefly summarizes cultural resources in the APE.

A Class I information review and Class III pedestrian survey of the APE were conducted by Alpine Archaeological Consultants, Inc. One previously unrecorded site was identified in Colorado during the survey (5ME15765). Four previously unrecorded isolated finds were identified in Colorado, and one isolated find was recorded in Utah. Additionally, field archaeologists reevaluated five previously recorded sites (42GR2095, 42GR2776, 42GR2777, 42GR2778, and 42GR3188) in Utah in order to make project-specific management recommendations. Field personnel relocated and re-recorded three previously recorded sites (5ME5116, 5ME5117, and 5ME5119) within the APE in Colorado. Site 5ME5119 was originally recorded as an isolated find, consisting of a single lithic flake and a hearth of indeterminate age; the other two sites were originally recorded as archaeological sites. For the purposes of the inventory, all three properties were treated as archaeological sites. Site 5ME7025 was located and recorded in 1993 as the Packrat Mine. In 1993, the site was officially determined eligible; however, in 1999, the BLM contracted the reevaluation of the site and an update of this
information has been presented to the State Historic Preservation Office (SHPO) as part of the current project recommending that the site is not eligible.

Site numbers 42GR2095, 42GR2777, 42GR2778, and 42GR3188 have previously been determined eligible for nomination to the National Register of Historic Places (NRHP). Newly recorded site number 5ME15765 is recommended as eligible for NRHP listing. The project inventory and evaluation is in compliance with the NHPA, the Colorado State Protocol Agreement, and other federal law, regulation, policy, and guidelines regarding the documentation of cultural resources.

3.12 NATIVE AMERICAN RELIGIOUS CONCERNS

The cultural resource investigations performed by Alpine Archaeological Consultants, Inc. and the literature reviews conducted by the BLM revealed no information that suggests that the project area holds special significance for Native Americans for traditional or religious purposes. Consultation with the Ute Indian Tribe of the Uintah and Ouray Reservation, Southern Ute Indian Tribe, and the Ute Mountain Ute Tribe consisted of information letters and maps sent to the Councils and their cultural departments. A follow-up phone call offering an invitation to consult further was met with no comments from these tribes. Additionally, no evidence suggests that the project would alter or limit any access if there were traditional uses that are not known to the agency.

3.13 GEOLOGICAL RESOURCES

A geologic cross section of the Whirlwind Mine project area is shown in Figure 3.13-1. The cross section is oriented from southwest to northeast along the Urankah Decline drift. The geologic units lay almost flat with only a slight dip of 1 to 4 degrees to the northeast. Each of the units is described below starting with the formation at the top of the geologic sequence.

Erosional remnants of the Dakota Formation cover about 10 percent of the top of Beaver Mesa in the vicinity of the Whirlwind Mine and are only a few tens of feet thick. The Burro Canyon Formation is the primary surface outcrop on top of Beaver Mesa and is approximately 100 to 210 feet thick. The lithology of the Burro Canyon Formation includes fluvial sandstone and conglomerate, interbedded with lacustrine siltstone, shale, and mudstone and thin impure limestone beds. The sandstone and conglomerate occur in lenticular, very thick beds that display cross bedding.

Underlying the Burro Canyon Formation is the Brushy Basin Member of the Morrison Formation. The lithology of the Brushy Basin Member includes mudstone, claystone, and siltstone composed of bentonitic clays derived from detrital glassy volcanic debris and settled on a large floodplain, interbedded with a few channels of sandstone and conglomerate. The Brushy Basin Member, estimated from several exploration boreholes, is 370 to 410 feet thick.

Underlying the Brushy Basin Member is the Salt Wash Member of the Morrison Formation. The lithology of the Salt Wash Member includes mudstone, claystone, and siltstone composed of bentonitic clays derived from detrital glassy volcanic debris and settled on a large floodplain, interbedded with a few channels of sandstone and conglomerate. The Salt Wash Member is greater than 300 feet thick in the Whirlwind Mine area. The uranium ore would be mined from the upper sandstone units of the Salt Wash Member and consist of lenticular and cross bedded sandstone, and lesser amounts of mudstone and shale. In the upper part of the Salt Wash Member, the numerous channel sandstones have coalesced into a relatively thick unit referred to as the Top Rim. The uranium and vanadium mineralization occurs in bands that range in thickness from a few inches to in excess of 8 feet. The average ore thickness is 2.7 to 3.0 feet. The ore body is located below approximately 500 to 750 feet of cover and can be accessed through adits located on the side of canyon walls and declines and shafts.
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Figure 3.13-1
Schematic Hydrogeologic Cross Section
Along Urantah Decline

Legend
- Burro Canyon Formation - Interbedded Sandstone and Conglomerate
- Burro Canyon Formation - Interbedded Mudstone
- Brushy Basin Member Morrison Formation - Mudstone
- Brushy Basin Member Morrison Formation Sandstone
- Salt Wash Member Morrison Formation - Sandstone
- Salt Wash Member Morrison Formation - Interbedded Mudstone
- Salt Wash Member Morrison Formation - Mineralized Sandstone Horizon
- Salt Wash Member Morrison Formation - Mudstone
- Salt Wash Member Morrison Formation - Interbedded Sandstone
- Waste Rock Pile
- Precipitation
- Subsurface Recharge

Horizontal Scale: 1-inch = Approx. 200 feet
Vertical Scale: 1-inch = Approx. 100 feet
Vertical Exaggeration = 2x

NOTE:
See figure 3.15-1 for location of cross section.
The majority of the ore is formed in tabular sandstone bodies ranging in size from several tons to millions of tons. The deposits were formed when uranium and vanadium enriched groundwater flowed through reducing environments. The reducing environment resulted in precipitation of the uranium and vanadium minerals. Grades of the deposits in the Uravan Mineral Belt range from 0.16 percent to 0.25 percent triuranium octaoxide (U₃O₈) – the most stable compound of uranium and the form that is most commonly found in nature. Vanadium is also associated with these deposits with a ratio of vanadium to uranium of approximately 4:1.

The Lumsden Fault is located approximately 0.25 mile north of the Packrat Portal and 0.5 mile north of the Whirlwind Portal. It is the only major fault identified in the area and trends N 70 degrees E through the center of Lumsden Canyon. The displacement is estimated to be between 65 and 100 feet.

3.14 PALEONTOLOGICAL RESOURCES

According to the BLM (1985b), fossils occur in many of the geologic formations in the area. These formations have been classified to indicate the likelihood of significant fossil occurrence (usually vertebrate fossils of scientific interest). The Potential Fossil Yield Classification System (PFYC) for Paleontological Resources on Public Lands (BLM, 2007e) is as follows:

Class 1 – Very Low. Geologic units that are not likely to contain recognizable fossil remains.

- Units that are igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age or older.
  (1) Management concern for paleontological resources in Class 1 units is usually negligible or not applicable.
  (2) Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances. The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is non-existent or extremely rare.

Class 2 – Low. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.
- Recent aeolian deposits.
- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration).
  (1) Management concern for paleontological resources is generally low.
  (2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.

The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be rare and would not influence the classification. These important localities would be managed on a case-by-case basis.
Class 3 – Moderate or Unknown. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

- Often marine in origin with sporadic known occurrences of vertebrate fossils.
- Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.

(or)

- Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.

Class 3a – Moderate Potential. Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but is somewhat higher for common fossils.

Class 3b – Unknown Potential. Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions.

1. Management concern for paleontological resources is moderate; or cannot be determined from existing data.

2. Surface-disturbing activities may require field assessment to determine appropriate course of action. This classification includes a broad range of paleontological potential. It includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils. Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources. These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources.

Class 4 – High. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.

Class 4a – Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.

Class 4b – These are areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil,
thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

1. Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action.
2. A field survey by a qualified paleontologist is often needed to assess local conditions.
3. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.
4. Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application. The probability for impacting significant paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities.

Class 5 – Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

Class 5a – Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities.

Class 5b – These are areas underlain by geologic units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
• Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

(1) Management concern for paleontological resources in Class 5 areas is high to very high.

(2) A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions.

(3) Official designation of areas of avoidance, special interest, and concern may be appropriate. The probability for impacting significant fossils is high. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. On-site monitoring may be necessary during construction activities.

These classifications determine the procedures to be followed prior to the granting of a paleontological clearance to proceed with a project. Mitigation measures are taken to protect any significant fossil found in any formation.

Historically, the Morrison Formation is the most important dinosaur fossil-bearing formation in the United States. Therefore, it is possible that dinosaur fossils may be encountered in the Whirlwind underground mine workings or on the surface of the project area. Dinosaur fossils are mostly contained in the shales and mudstones of the Brushy Basin Member of the Morrison Formation in this part of the western United States; however, dinosaur fossils have also been discovered in the Salt Wash Member of the Morrison Formation. The Grand Junction Resource Area RMP (BLM, 1987) classified all formations in the resource area as the likelihood of significant fossil occurrence (usually vertebrate fossils of scientific interest). The BLM GJFO has classified the entire Morrison Formation as Class 4-5 paleontology category, which indicates the formation is known or is likely to produce vertebrate and/or scientifically important fossils.

### 3.15 SURFACE WATER RESOURCES

#### 3.15.1 Surface Water and Springs

The Colorado permit area for the Whirlwind Mine is located within the Lumsden Creek drainage basin, also known as Lumsden Canyon. Lumsden Creek is an ephemeral/intermittent stream, and streamflow occurs primarily in the spring and after major storm events in direct response to precipitation and snowmelt runoff. Its flow is primarily subsurface, is strongly groundwater influenced, and supports riparian vegetation. The creek generally follows the Lumsden Fault, and flows from the southwest at the drainage basin headwaters on Beaver Mesa to the northeast (Map 3.15-1). Lumsden Creek reaches the confluence with the Dolores River about 0.7 mile west of Gateway, Colorado which is about 5 miles from the Whirlwind Mine. The change in elevation of Lumsden Creek from the Whirlwind Mine project area to the Dolores River is about 2,550 feet.

Lumsden Creek is fed by three springs: Dolores Point (DP) Spring, Packrat (PR) Spring, and Lumsden Canyon Spring. Based on past observations, the springs discharge into the creek bed and the water infiltrates into the dry streambed within a short distance of 0.25 mile or less, depending on the season. All three springs appear to be fault related. Groundwater flow from DP, PR, and Lumsden Canyon springs is in the general vicinity of and along this displacement.

DP Spring and PR Spring are located in the upper portion of the canyon near the Whirlwind Mine project area. Both areas are densely vegetated with riparian vegetation and, in each case, plastic pipe channels water from the seep area into a livestock tank. These tanks then overflow
Map 3.15-1
Hydrogeologic Features

Legend
- Surface Water
- A - A' Hydrogeologic Cross Section Location
- Vent Shaft
- Roads
- Permit Area
- Project Boundary (Limits of Underground Mining)
- Claims Boundary

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

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into the ephemeral tributary drainages below. The pipes capture only a portion of the spring water, probably about one-third of the available water. The remaining seepage saturates the soils in the immediate area and supports the relatively abundant vegetation around the spring areas. Both DP Spring and PR Spring exhibit seasonal variations in water flow into the tanks with late spring having the highest flow rate. This is attributable to augmentation by spring snowmelt in the spring and higher water uptake rates by vegetation during the summer growing season when flow rates are at their lowest.

Lumsden Canyon Spring is located about midway between the Whirlwind Mine project area and the Dolores River within the streambed of Lumsden Creek. It is in a relatively remote location where cottonwood trees grow and is readily visible from the Dolores River. There are no man-made improvements at the Lumsden Canyon Spring.

John Brown Canyon Creek is perennial with riparian vegetation and was classified as properly functioning in 1993 by the BLM (2007a). The primary access to the mine is on John Brown Road, which parallels John Brown Canyon Creek for about 4.1 miles. The longest portion of the ore transportation route is on Colorado State Highway 141 and runs parallel to the Dolores River and associated riparian areas. The ore trucks would cross the Dolores River on Colorado State Highway 90 at Bedrock.

**Surface Water Quantity and Water Rights.** There is no known historical record of streamflow for Lumsden Creek. The only recorded samples of the creek were collected by BLM in 1996 and 1997 at the mouth of Lumsden Canyon, about 1.5 miles upstream of the Dolores River (Fowler, 2001). There are no known water rights associated with Lumsden Creek.

DP Spring (also known as Hubbard Homestead Spring) is located 3,150 feet northwest of, and topographically above, the Whirlwind Portal. It is the highest producing spring of the three springs, with a mean flow of about 11 gpm (Wright Water Engineers, 1999). The rate of flow from DP Spring, as recorded from the pipe that flows into a stock tank, has been reported to fluctuate seasonally, with a range of 4 to 14 gpm.

The high flow rate from DP Spring (relative to the other two springs) is probably attributable to its location on the Lumsden Fault trace in Lumsden Canyon. DP Spring originates from a Burro Canyon Formation sandstone aquifer that, due to vertical displacement of the fault, abuts the less permeable Brushy Basin Member of the Morrison Formation mudstones at the fault interface. DP Spring has an adjudicated, absolute decreed water right for 0.033 cfs (15 gpm) and a conditional decree for 0.22 cfs (100 gpm), with appropriation dates in 1920, 1985, and 1999 for various uses (Colorado Water Court Case No. 02CW221).

PR Spring originates from the base of the Top Rim sandstone in the Salt Wash Member of the Morrison Formation, below the uranium production zone. It is located 400 feet north of and approximately 44 feet lower in elevation than the Packrat Portal and about 800 feet south of the Lumsden Fault. The flow from PR Spring ranges from 4 to 10 gpm, as recorded from the pipe discharging into a stock tank. Similar to the flow from DP Spring, flows are seasonally dependant. The BLM is in the process of filing for a water right for PR Spring to protect wildlife use of the water. The tank was installed for wildlife use (bats, etc.) years ago.

The Lumsden Canyon Spring is located about 3 miles downstream from the Whirlwind Mine in the Lumsden Canyon. The spring appears to flow from either the lower Chinle Formation or the upper Moenkopi Formation. This spring, which reportedly flows at about 4 to 7 gpm, has no apparent hydraulic connection to the uranium-producing zone in the Salt Wash Member of the Morrison Formation. The Lumsden Canyon Spring has an absolute water right decree for 0.02 cfs (9 gpm) with an appropriation date of April 1, 1974 (Colorado Water Court Case No. 81CW68).
Records for monthly mean discharge (cubic feet/second, cfs) in the Dolores River at Bedrock, Colorado (USGS Gauge 09169500), downstream from the Whirlwind Mine, indicate highest flows during April and May and lowest flows in December and January. However, mean monthly flows are highly variable from year to year. During the period from October 1984 through September 2007, the highest mean discharge during May was 3,243 cfs in 1993 while the lowest flow during May was 18 cfs in 2002 (Figure 3.15-1). The lowest mean monthly flow during the period was 2.2 cfs recorded in August 2002. Instream flows in the lower Dolores River are influenced by releases from McPhee Reservoir, upstream in Montezuma County.

Figure 3.15-1
Monthly Discharge (with Monthly Maxima and Minima) in the Dolores River at Bedrock, CO (USGS Gauge 09169500) Averaged for Wateryears 1985 through 2007

Surface Water Quality. Factors affecting surface water quality in Lumsden Creek are primarily soil conditions, geologic formations, erosion, spring flow, rate of runoff, and stormwater runoff from existing roads and historic mining areas. Some of the existing mine portals have been documented to historically discharge to Lumsden Creek.

Elevated levels of radium, uranium, and other metals are believed to be naturally present in Lumsden Creek because the canyon cuts through 300 feet of the Salt Wash Member, which is highly mineralized and easily eroded. Waste rock and mining debris are present in the upper portion of the canyon immediately below the Lost Dutchman and Bonanza historic mine dumps where historical mining activities have impacted the creek. Limited monitoring data indicates that the water quality is good when flow rates are high, but that water quality deteriorates when flows are low and the contact time between the flowing water and streambed are longer.

The analytical results from the stormwater samples collected in 1996 indicate that radium-226 (Ra-226) and uranium were present in the water, but at levels well below surface water standards for the Dolores River (CDPHE, 2005, 2007a, and 2007b). The analytical results showed that Ra-226 and uranium were present (2 picoCurries per liter - pCi/L and 0.025 milligram per liter - mg/L, respectively) in the water but at levels below regulatory standards. Three grab samples were collected in 1997 when the creek flow was reported as intermittent or as a seep. These samples contained higher levels of Ra-226 (5.2 to 6.0 pCi/L), uranium (0.185 to 0.448 mg/L), and total dissolved solids with Ra-226 activity levels close to the Dolores River surface water standards.
Lumsden Creek is tributary to the Dolores River. As an ephemeral/intermittent drainage, the standard most applicable to the Lumsden Canyon setting would be to achieve the defined-use-narrative criteria at the point of tributary discharge into the Dolores River. Lumsden Creek is part of Stream Segment 3a of the Lower Dolores River Basin, which is defined by CDPHE - Water Quality Control Commission (WQCC) as “all tributaries to the Dolores River from the bridge at Bradfield Ranch to the Colorado/Utah border....” The stream-use designations or beneficial uses classified for this stream segment include (CDPHE, 2007a and 2007b):

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

- **Recreation E - Existing Primary Contact Use**: These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975 (CDPHE, 2007b).

- **Agriculture**: These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock (CDPHE, 2007a).

The Dolores River is a perennial stream that supports aquatic life, including warm-water fisheries. The stream-use designations for the Dolores River have specifically defined numeric and narrative standards that protect these uses. There are no "outstanding waters" or "protected uses" defined within the Lumsden Creek drainage basin.

The Dolores River is listed on the 2006 CDPHE section 303(d) list of water quality limited streams requiring Total Maximum Daily Load (TMDLs) for total recovered iron. The 24-mile stream segment begins at the Little Gypsum Bridge near the Montrose-San Miguel County border (upstream from the Whirlwind Mine project area) and ends at the Colorado-Utah border (downstream from the Whirlwind Mine project area). A water sample was collected from the Dolores River on September 1, 1994 below where Lumsden Creek outlets in the river. The sample was collected just below the gaging station when the river was flowing at 113 cfs. The water was very hard (460 mg/L CaCO₃) and had a high sediment load as evidenced by a turbidity of 150 nephelometric turbidity units (NTUs); otherwise, the water chemistry appeared normal. Neither radium nor uranium was detected in the water sample from the river. The Dolores River crosses the Utah-Colorado border and flows into the Colorado River approximately 20 miles from Gateway. The Dolores and Colorado River sections downstream of the Whirlwind Mine project area are not listed on the Utah Department of Environmental Quality 2006 section 303(d) list.

The water quality of DP Spring is good, with no reported exceedance of State of Colorado Water Quality Standards (CDPHE, 2005, 2007a, and 2007b). The water from DP Spring is a calcium-bicarbonate type, which is typical of waters from the Burro Canyon Formation aquifer system (Energy Fuels, 2007a).

Water quality data from PR Spring indicates elevated levels of radium, uranium, arsenic, and selenium. The quality of this spring is attributable to the mineralized nature of the Salt Wash Member; however, there is some concern that water from the Packrat Portal may be impacting the spring.

The water at Lumsden Canyon Spring also contains elevated levels of radium, uranium, arsenic, and selenium, with the concentration of uranium ranging from 33 to 145 pCi/L. The levels of these constituents are generally lower than those observed in PR Spring.
3.16 GROUNDWATER RESOURCES

Locally, alluvial groundwater associated with perennial river systems is used for domestic, stock, and irrigation purposes (Topper, et al., 2003). No other substantial groundwater resources are known or expected to occur in the area. The closest alluvial system to the Whirlwind Mine project area is 4 to 5 miles away, where Lumsden Creek flows into the Dolores River. Non-alluvial groundwater systems with lower yielding capacity are present in the Whirlwind Mine project area and are utilized by ranchers on a limited basis for seasonal livestock grazing.

**Groundwater Occurrence.** Information on groundwater occurrence in the Whirlwind Mine project area and vicinity was obtained from nearby water wells, the Urantah Decline, exploration drill holes, and subsurface packer tests conducted by Umetco for borehole BM00-1 (U.S. Environmental Services, Inc., 2000). This information is summarized in the Plan (Energy Fuels, 2007a).

Groundwater is known to exist in the Burro Canyon Formation, particularly at the base of the formation and along the Lumsden Fault. The Dolores Point Well (also known as the BLM well or the Burro Canyon well) is located in this zone and DP Spring flows from the base of the Burro Canyon Formation.

The Brushy Basin Member, which is about 400 feet thick and predominantly mudstone, forms an aquiclude between the Burro Canyon Formation aquifer and the Salt Wash Member. An aquiclude is “a low permeability unit that forms either the upper or lower boundary of a groundwater system” (Fetter, 1994). The Brushy Basin Member is also described as a “Morrison confining unit” by Robson and Banta (1995). Topper et al. (2003) describes the aquifer-yield characteristics as “none.”

Although the Brushy Basin Member as a whole is an aquiclude, it does contain groundwater within thin, 10 to 40-foot thick, lenticular and discontinuous channel sandstone units. These channel sandstones were formed by ancient meandering river streams. They are irregular in configuration and tend to be discontinuous over larger areas. A packer test conducted by Umetco (U.S. Environmental Services, Inc., 2000) in the immediate vicinity of the Urantah Decline and Packrat Portal identified three water-bearing channel sandstones within the Brushy Basin Member. The upper zone is at the very top of the Brushy Basin Member and is separated by only a thin mudstone layer from the lower Burro Canyon Formation sandstone unit. The other two water-bearing zones are located near the center and near the base of the Brushy Basin Member (Figure 3.13-1). Based on exploration drilling and prospecting activities conducted in the area, the groundwater in these channel sandstones is known to be perched (i.e., of limited quantity with no confining pressure).

Based on the Umetco packer test study (U.S. Environmental Services, Inc., 2000) and historical observations, groundwater is generally not encountered in substantial quantities in the sandstone comprising the Top Rim of the Salt Wash Member. Topper et al. (2003) describes the aquifer-yield characteristics of the Salt Wash Member as, “Yields small quantities, stock and domestic.” This assessment has been validated by water well drilling and tests in the area, which have yielded only small quantities or no water, and no yields that would be reliable for long-term use. The presence of PR Spring at the base of the Top Rim; however, indicates that groundwater does exist within the lower part of the Top Rim sandstone.

**Groundwater Flow.** Recharge in the Burro Canyon Formation is from precipitation and storm events in the spring, summer, and fall and snowmelt in the spring. In semiarid regions, most recharge will occur in the spring during the spring snowmelt runoff. Groundwater recharge is limited in the summer or fall when evapotranspiration and overland runoff account for over 90
percent of the precipitation that hits the ground surface. The Dakota Formation overlies the Burro Canyon Formation; however, only about 10 percent of the Dakota Formation is remaining at the top of Beaver Mesa. The Dakota Formation and the Burro Canyon Formation together are called the “Dakota Aquifer.” Because the Dakota Aquifer lies directly at the top of Beaver Mesa and the soils there are, for the most part, derived from the weathering of the Dakota Sandstone and Burro Canyon Formation, precipitation that infiltrates into and saturates the soils will recharge the aquifer, particularly in the spring. The Dakota Aquifer is not a homogenous aquifer, but rather, an interbedded mix of sandstone, conglomerate, and mudstone with widely varying permeability based on the depositional environment and capability to transmit water.

The flow pathway for groundwater recharge through the Burro Canyon Formation is in the general vertical direction downward toward the bottom of the aquifer to the contact with the Brushy Basin Member mudstone, as well as down-dip toward the outcrop (Figure 3.13-1). Because the primary flow direction in the aquifer is vertical (downward), the groundwater tends to flow vertically faster than it does horizontally and the groundwater recharge is at the base of the aquifer before it flows horizontally. Based on the flow path, dip, and the proximity to an outcrop at the contact, groundwater could potentially discharge at the outcrop. The DP Spring is a good example of the groundwater flow in the Burro Canyon Formation of the Dakota Aquifer resulting in a spring at the outcrop.

As shown on Figure 3.13-1, when groundwater flow reaches the top of the Brushy Basin Member aquiclude, downward flow is impeded by the thick and predominantly low permeability mudstone and shale. The vertical permeability values of mudstone are in the range of $1 \times 10^{-7}$ to $10^{-11}$ centimeters per second (cm/sec), based on Freeze and Cherry (1979).

Natural features such as fractures or faulting could also contribute to vertical groundwater recharge, but the Brushy Basin Member is primarily a mudstone approaching 400 feet thick, thus prohibiting significant recharge from surface infiltration. The channel sandstones within the Brushy Basin Member receive very little recharge because of the overlying massive mudstones. Some recharge from precipitation and snowmelt occur on the southwest (i.e., updip) side of Beaver Mesa where the unit outcrops and within both Lumsden Canyon and John Brown Canyon where fracture zones may intersect the Brushy Basin Member; however, the volume of recharge received would be expected to be very small in comparison to that received by the Burro Canyon Formation.

The limited recharge of the lenticular and discontinuous channel sandstones is apparent within the Urantah Decline. The decline diagonally traverses the Brushy Basin Member for approximately 3,000 feet, cutting across approximately the bottom third of the stratigraphic section of the member. Over this length, groundwater is seeping into the 9 foot by 12 foot tunnel over a length of about 100 feet near the base of the decline. The groundwater inflow into the Whirlwind workings is relatively limited, with an estimated inflow ranging from 5 to 7 gpm prior to initiating dewatering activities. The current inflow rate is estimated to be about 1.5 gpm. This inflow rate is considerably less than that previously reported by Pioneer Uravan during mine development in the early 1980s. The groundwater is seeping from the bottom of the lower lenticular and discontinuous channel sandstone, which indicates that this water is perched and not under confining pressure. The reduction in inflow from 1982 to the present time indicates that this water-bearing zone is being depleted and that recharge, if present at all, is very limited.

The Salt Wash Member of the Morrison Formation consists of lenticular and cross bedded sandstone and lesser amounts of mudstone and shale. Previous miners in Lumsden Canyon reported that the ore zone at the top of the Top Rim was dry except for water inflow from above through uncased drill holes and vent shafts (Energy Fuels, 2007a). Groundwater can flow in the sandstone, if saturated, of the Top Rim of the Salt Wash Member; however, it is very fine-grained with a tested hydraulic conductivity of $1 \times 10^{-5}$ cm/sec. Based on a review of literature
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(Freeze and Cherry, 1979), this value is in the mid-range for sandstone units. A packer test conducted in a borehole located between 0.75 and 1.0 mile southwest of the Whirlwind Mine project area was conducted in the 510- to 555-foot below ground surface interval of the Top Rim sandstone. After 40 minutes of pumping, the unit was depleted. This result indicates that the upper portion of the Salt Wash Member is very tight with limited recharge, and could retard groundwater flow locally.

There are historical exploration drill holes and vent shafts on Beaver Mesa above the underground mine workings that penetrate the Top Rim of the Salt Wash Member. Many of the borings were not sealed properly, and the holes create a man-made conduit enhancing groundwater recharge to the underlying units. These historical activities resulted in cross connection between water-bearing zones and are common phenomena throughout the mining area. Improperly sealed exploration drill holes and shafts are believed to be a source of groundwater recharge to the Top Rim of the Salt Wash Member, and to a lesser extent, the lenticular sandstone units of the Brushy Basin Member. Natural fractures in the Morrison Formation may also enhance groundwater flow down through the formations; however, the predominance of mudstone and shale in the Brushy Basin Member impede recharge to, and groundwater flow, in these sandstone units.

No discharge from the Whirlwind Portal has been reported. The Urantah Decline is at a 6 percent grade and observations prior to dewatering indicated that groundwater stabilized at an elevation of approximately 6,950 feet, where saturated lenses of sandstone were first encountered in the Brushy Basin Member.

Data collected between 1993 and 1997 by Umetco and the BLM show that discharge from the Packrat Portal was approximately 1 gpm until the end of 1995 when the discharge ceased (Energy Fuels, 2007a). Discharge of a similar magnitude had been reported from the Lumsden No. 2 and Rajah 49 portals, which has also ceased. This cessation of flow from the portals was most likely due to decreasing groundwater inflow into the mine workings as a result of aquifer depletion and implementation of source control measures by Umetco (Energy Fuels, 2007a).

Recent data are limited in the Packrat mine workings, due to access safety restrictions. Data collected by Umetco in the mid-1990s indicate that there are areas of standing water in the Packrat Mine, similar to that observed in the lower portion of the Urantah Decline workings. This groundwater could originate from the historic 10-Straight Vent Shaft and uncased exploration drill holes which then seeps into the mine floor. Based on historical data, the groundwater flow rates into the Packrat Mine are expected to be small (5 gpm or less).

**Groundwater Quality.** The groundwater quality is closely linked to the quality of the spring water, which is to be expected given that the spring water originates from the water-bearing formations where they intersect the Lumsden Fault zone. Sampling and analyses of water from local wells, springs, mine discharge, and packer tests conducted in a test boring by Umetco in the Brushy Basin Member provide groundwater quality data in the area.

The Burro Canyon Formation groundwater is a calcium bicarbonate water of good quality that is utilized locally for watering of domestic livestock during the summer. DP Spring originates from this formation and displays similar water quality characteristics. The water quality of the Burro Canyon Formation can also be represented by data collected from the Dolores Point Well (BLM well or Burro Canyon well).

The lenticular sandstone units within the Brushy Basin Member of the Morrison Formation change in quality with depth. The lenses near the top of the Brushy Basin Member are similar in quality and chemistry to the Burro Canyon Formation. Sampling of the deeper units indicates that sodium gradually replaces calcium and the level of radionuclides and metals increase with depth. This finding is not surprising given that the uranium, vanadium, and other metals found in
the underlying Salt Wash Member are thought to have originated from leaching of the Brushy Basin Member volcanics that were deposited in the late Jurassic. The groundwater in the lowest Brushy Basin Member sandstone unit is a sodium bicarbonate water with Ra-226 levels above surface water discharge standards. There are no known seeps or springs associated with these sandstone units.

The analytical results of two samples collected from the Urantah Decline in early May 2007 are presented in the Plan (Energy Fuels, 2007a). The results are similar to the findings from the Umetco packer tests for the lower water-bearing zone of the Brushy Basin Member, with elevated levels of selenium, uranium, and radium above CDPHE-WQCC groundwater quality standards.

The upper portion of the Top Rim Member sandstone contains little if any groundwater except for water seeping into the unit from above through historic drill holes and vent shafts. Sampling of historic mine water discharge and the standing water found within the Whirlwind and Packrat mines indicate that this water, which originates primarily from seepage from the Brushy Basin Member sandstones, deteriorates further in quality due to contact with the mineralized ore zone. The major ion chemistry remains the same but levels of Ra-226, uranium, arsenic, and selenium increase. The groundwater has a relatively high pH of about 8.5 standard units, which is responsible for the dissolution of arsenic and selenium. Unlike most metals, these can preferentially enter into solution at higher pH levels.

PR Spring is located at the base of the Top Rim of the Salt Wash sandstone, which is about 40 feet below the Packrat portal. Because of its proximity to the portal and its relatively poor quality, the possibility exists that there is a connection between the mine water and the spring. However, the spring is known to have existed historically prior to the start of the Packrat Mine and the major ion chemistry of the spring water is higher in calcium and sulfate than the mine water (U.S. Environmental Services, Inc., 2001). At this time, it is unknown whether the mine water is interconnected with PR Spring.

Recent data are limited in the Packrat Mine workings, due to access safety restrictions. Historical data were collected by Umetco, BLM, and Energy Fuels and analyses are presented in the Plan (Energy Fuels, 2007a). The data indicate that the Packrat Mine water is a sodium-bicarbonate type, with the total dissolved solids (TDS) concentration ranging from 426 to 759 milligrams per liter (mg/L). Based on a study of the Packrat Mine water and the PR Spring discharge (U.S. Environmental Services, Inc., 2001), the water quality of the mine workings, as represented by the concentration of sulfate and calcium, are significantly lower in the Packrat Mine water than in PR Spring. Analysis of water from the Packrat Portal discharge indicated a substantially greater concentration of arsenic and total Ra-226 than from PR Spring. In addition, PR Spring water had a higher concentration of uranium than the mine water.

Water samples collected in the Packrat Mine workings indicate water quality is substantially different from that in PR Spring, with similar ions to the Whirlwind sump water, originating from the Brushy Basin Member (U.S. Environmental Services, Inc., 2001). Analytical results from samples collected from the mine workings in October 2006, and January and April 2007, indicate the concentrations of uranium, vanadium, radium, arsenic, and selenium are substantially higher than the historical analytical results from PR Spring. The first sample, called the Whirlwind Seep, had levels of selenium (0.023 mg/L), uranium (0.0814 mg/L), and Ra-226 (6.5 pCi/L) above some regulatory standards in addition to an elevated arsenic concentration (0.024 mg/L). The second sample from the Upper Whirlwind Sump in the Brushy Basin Member had similar concentrations of selenium (0.038 mg/L), uranium (0.0993 mg/L), and arsenic (0.029 mg/L). Ra-226 was not tested in this sample. These analytical results confirm the previous findings that the water in the mine workings is of poor quality due to interaction with the mineralized zone.
**Groundwater Wells and Water Rights.** The closest water wells to the Whirlwind Mine project area are the Shallow and Deep Cherokee Wells (40 and 110 feet deep, respectively) located about 2,000 feet east to southeast of the Whirlwind Portal. These wells, which were used historically by the Cherokee Mine Camp, are currently capped and are not in use. They produce only small amounts of water from the upper Brushy Basin Member channel sandstones and are not listed as permitted wells by CDWR; however, CDWR did not require permitting of wells until the early 1990s.

The Dolores Point Well was developed for agricultural uses and is located on top of Beaver Mesa, approximately 1 mile due west of the Whirlwind Portal near the Lumsden Fault in Utah (Map 3.15-1). This well was completed in the Burro Canyon Formation in 1981 and provides water to a series of stock ponds and tanks in the spring and fall when cattle are grazed on this BLM allotment. The well is screened at the base of the formation from 70 to 120 feet below the ground surface and produces between 12 and 15 gpm. Recharge to support water use is primarily from surface-water infiltration, particularly during snowmelt in the spring. The well was sampled on April 26, 2007 and results are presented in the Plan (Energy Fuels, 2007a). The results of sampling indicate the water quality is a calcium-bicarbonate type.

Energy Fuels obtained a water well permit (Permit # 66419) and an underground water right (Case #07CW69) from CDWR to use the water from the Whirlwind Mine sump. The sump is fed by water seeping from the lower Brushy Basin Member channel sandstones that are intersected by the Urantah Decline. The sump is located in the southwest quarter of Section 35, T. 51 N., R. 20 W., adjacent to the Utah/Colorado state line and about 1.25 miles southwest of the Whirlwind Portal area. The amount claimed for the Whirlwind Mine well is 24.4 acre-feet per year (average annual amount) which would be pumped or otherwise removed from the underground mine workings at a maximum rate of 0.178 cfs (80 gpm).

### 3.17 WETLANDS, RIPARIAN RESOURCES, AND FLOODPLAINS

Under Section 404 of the Clean Water Act, waters of the United States include wetlands and drainage courses (streams, ephemeral drainages that connect to streams via surface flow or subsurface connection), ponds, lakes, and springs. The U.S. Army Corp of Engineers’ (COE’s) jurisdiction in ephemeral drainages is considered to be areas below the Ordinary High Water Mark (OHWM) as indicated by evidence of flow. In general, evidence of flow (erosional features including bed and bank, detritus accumulation, and lack of vegetation) may be considered jurisdictional by COE.

According to WestWater Engineering (2007), areas of potential COE jurisdiction under Section 404 of the Clean Water Act in the vicinity of the Whirlwind Mine include: two springs (PR Spring and DP Spring) and their related drainages (see Section 3.15), and two ephemeral washes called COE 1 and COE 2. Locations of these hydrogeologic features are shown on Map 3.15-1.

The ephemeral washes in the Whirlwind Mine project area originate on top of the mesa in the vicinity of the proposed vent shafts and drain into Lumsden Canyon. COE 1 is crossed by a two-track trail that provides access to vent shafts U1 and U2 in Utah. The OHWM of this wash is estimated to be 18 inches wide and 2 inches deep and has exposed shallow sandstone bedrock north of the two track crossing (WestWater Engineering, 2007). The other wash, COE 2, is crossed by a two-track trail that provides access to vent shaft C1 in Colorado. The OHWM of this wash is estimated to be 12 inches wide and 2 inches deep (WestWater Engineering, 2007).

Another ephemeral wash, not verified by WestWater Engineering (2007), because it is outside of the survey area, is depicted as an unlabeled hydrologic feature on Map 3.15-1 east of Vent Shaft C1 and east of the Whirlwind Portal area.
The Whirlwind mine operation could impact Lumsden and John Brown canyons which are tributary to the Dolores River. The drainage in Lumsden Canyon is an ephemeral wash which has a few large cottonwoods along the stream course. The drainage in John Brown Canyon is a perennial stream (John Brown Creek) with a well developed riparian community consisting of Fremont cottonwoods, coyote willow, skunkbush sumac, cattails, sedges, and rushes. John Brown Creek is confined on the north side by the Mesa County Road 5/10 which is the access road to the Whirlwind mine. John Brown Canyon has an overly large watershed which contributes to excessive flash flood events. The larger trees contain debris from these flood events and many of the smaller trees have been snapped off. Given the difficulties of maintaining riparian vegetation in this stream and the quality of habitat present, John Brown Canyon is considered as “properly functioning”. The Dolores River is below John Brown and Lumsden canyons, and is also along the transportation route for the ore. The riparian community along the Dolores River consists of Fremont cottonwood galleries, coyote willow, skunkbush sumac, cattails, sedges, and rushes. The riparian habitat is rated as functioning, and is stable but flow regulation and highway encroachment are concerns to riparian stability.

There are no floodplains within either the Colorado or Utah permit areas according to the Federal Emergency Management Agency website (FEMA, 2008). Floodplains that are not identified by FEMA could exist along stream courses in the area, adjacent to the active channel including the Dolores River.

3.18 SOIL RESOURCES

3.18.1 Soil Descriptions

The Whirlwind Portal, Packrat Portal, power drops, and proposed vent shafts lie within six soil mapping unit boundaries (Natural Resources Conservation Service - NRCS, 2007). There are two naturally occurring soil mapping units in the Whirlwind Portal area and the Packrat Portal area. The Whirlwind Portal coincides with mapping unit 66-Bodot-Sili-Rock outcrop complex and the Packrat Portal coincides with mapping unit 6-Rock Outcrop Sedgran. The areas of the Whirlwind and Packrat portals that were previously reclaimed are covered with a combination of sub-soils, sandy waste, salvaged topsoil, and imported alluvial soils from the lower portion of John Brown Canyon. The proposed surface disturbance at the Packrat Portal would occur entirely on previously disturbed and reclaimed lands. The Packrat and Whirlwind power drop areas are located on previously disturbed and unreclaimed areas within soil mapping units 6 and 66, respectively. Two vent shafts in Colorado (an existing vent shaft and one proposed vent shaft) are located on Soil Mapping Unit 111-Maudlin-Bege complex. The Whirlwind Power Drop is located on Soil Mapping Unit 110. Six proposed vent shafts, in Utah, are located on two mapping units: 15-Bond-Windwhistle complex and 102-Waas very fine sandy loam. Soil mapping unit characteristics are provided in Table 3.18-1.

The soil descriptions below were obtained from the NRCS (2007):

*Mapping Unit 6–Rock outcrop-Sedgran, 40 to 99 percent slopes, very stony.* The Packrat Portal area is located within this mapping unit; however, native soil conditions do not exist in the area, because historic mining activities disturbed this area and subsequent reclamation activities in 2002 utilized available materials on-site for backfill and substitute topsoil. Typically in undisturbed areas the mapping unit is composed of 60 percent Rock outcrops and 25 percent Sedgran soils. The Sedgran soil series typically has slopes of 40 to 60 percent and is on mesas. Parent material consists of colluviums over residuum weathered from sandstone. Soil textures are generally fine sandy loam to loamy fine sands with coarse fragments in the subsurface. Bedrock is typically contacted
<table>
<thead>
<tr>
<th>Soil Mapping Unit</th>
<th>Project Component</th>
<th>USDA Texture</th>
<th>Depth to Restrictive Layer</th>
<th>pH</th>
<th>Salinity</th>
<th>Sodium Adsorption Ratio (SAR)</th>
<th>Organic matter</th>
<th>Prime Farmland Class</th>
</tr>
</thead>
</table>
| Prime Farmland Class  
<p>| 60 % - Rock outcrop | Packrat Portal Area | 0-60 | uwb | -- | -- | -- | -- | -- |
| 25% - Sedran | 0-9 | fsl | 7.4-7.8 | 0.0 to 2.0 | 0.0 | 0.5-1.0 | None |
| 9-12 | chls | 7.4-7.8 | 0.0 to 2.0 | 0.0 | 0.0-0.5 | None |
| 12-19 | vchls | 7.4-7.8 | 0.0 to 2.0 | 0.0 | 0.0 | 0.0 | None |
| 19-23 | uwb | -- | -- | -- | -- | -- | None |
| 20 to 40 inches to bedrock | 7.9-8.4 | 0.0 | 0.0 to 2.0 | 0.0-2.0 | 0.5-1.0 | 0.0-0.5 | None |
| 45 % - Bodot | 0-5 | cl | 7.4-7.8 | None | 0.0 | 0.5-1.0 | None |
| 5-32 | c | 7.4-7.8 | 0.0 | 0.0-2.0 | 0.5-1.0 | 0.0-0.5 | None |
| 32-36 | uwb | 7.4-7.8 | 0.0 to 2.0 | 0.0-2.0 | 0.5-1.0 | 0.0-0.5 | None |
| 25 % - Sili | 0-3 | cl | 7.4-7.8 | None | 0.0 | 0.5-1.0 | None |
| 3-9 | gcl | 7.4-7.8 | 0.0 | 0.0-2.0 | 0.5-1.0 | 0.0-0.5 | None |
| 9-15 | cl | 7.4-7.8 | 0.0 | 0.0-2.0 | 0.5-1.0 | 0.0-0.5 | None |
| 15-39 | c | 9.1-9.6 | 0.0 to 2.0 | 10-20 | 0.0-2.0 | None |
| 39-60 | c | 7.4-7.8 | 0.0 to 2.0 | 0.0-2.0 | 0.5-1.0 | 0.0-0.5 | None |
| Energy Fuels Sample within Map Unit 66 | Whirlwind Portal Area and Packrat Power Drop | Composite of samples 1-7 | CL | N/A | 7.4 | 0.4 | N/A | 2.4 | N/A |
| Whirlwind Power Drop | Clod sample | CL | N/A | 7.5 | 1.1 | N/A | 1.1 | N/A |
| 50% Tragmon | 0-3 | L | 6.6-7.3 | 0.0 | 0.0-0.5 | None |
| 3-13 | L | 6.6-7.3 | 0.0 | 0.0-0.5 | None |
| 13-31 | CL | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 31-45 | CL | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 45-55 | CL | 7.9-8.4 | 0.0 | 0.0-0.5 | None |
| 55-60 | CL | 7.9-8.4 | 0.0 | 0.0-0.5 | None |
| Whirlwind Power Drop | 40 to 60 inches to bedrock | L | 6.6-7.3 | 0.0 | 0.0-0.5 | None |
| 0-2 | SCL | 6.6-7.3 | 0.0 | 0.0-0.5 | None |
| 3-10 | L | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 10-18 | L | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 18-28 | L | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 28-36 | SCL | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 36-48 | CL | 7.9-8.4 | 0.0 | 0.0-0.5 | None |
| 48-60 | UWB | 7.9-8.4 | 0.0 | 0.0-0.5 | None |
| 110 – Tragmon-Detra complex, 3 to 12 percent | Whirlwind Power Drop | 60-70 inches to bedrock | L | 6.6-7.3 | 0.0 | 2.0-0.5 | None |
| 0-2 | SCL | 6.6-7.3 | 0.0 | 0.0-0.5 | None |
| 3-10 | L | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 10-18 | L | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 18-28 | L | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 28-36 | SCL | 7.4-7.8 | 0.0 | 0.0-0.5 | None |
| 36-48 | CL | 7.9-8.4 | 0.0 | 0.0-0.5 | None |</p>
<table>
<thead>
<tr>
<th>Soil Mapping Unit</th>
<th>Project Component</th>
<th>Mapping Unit Composition</th>
<th>USDA Texture $^4$</th>
<th>Depth to Restrictive Layer $^5$</th>
<th>pH</th>
<th>Salinity $^6$ (mmhos/cm)</th>
<th>Sodium Adsorption Ratio (SAR) $^7$</th>
<th>Organic matter (Pct) $^8$</th>
<th>Prime Farmland Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>111 - Maudlin-Bege complex, 3 to 12 percent slopes</td>
<td>Existing Vent Shaft (10-Straight) (VS) and VS-1</td>
<td>50% - Maudlin</td>
<td>fsl</td>
<td>0-8 inches to bedrock</td>
<td>6.6-7.3</td>
<td>0.0 to 2.0</td>
<td>2.0-3.0</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8-24</td>
<td></td>
<td>6.6-7.8</td>
<td>0.0</td>
<td>0.5-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24-28</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>scl</td>
<td>10 to 20 inches to bedrock</td>
<td>6.6-7.8</td>
<td>0.0</td>
<td>0.5-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>uwb</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35% - Bege</td>
<td></td>
<td>0-7</td>
<td>fsl</td>
<td>0-8 inches to bedrock</td>
<td>6.6-7.3</td>
<td>0.0</td>
<td>0.5-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7-17</td>
<td>scl</td>
<td></td>
<td>6.6-7.8</td>
<td>0.0</td>
<td>0.5-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>17-21</td>
<td>uwb</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canyonlands Area, Utah – Parts of Grand and San Juan Counties (UT633)</td>
<td>VS-1, VS-2, VS-5 and VS-U6 $^1$</td>
<td>45% - Bond</td>
<td>l</td>
<td>10-20 inches to bedrock</td>
<td>7.4-8.4</td>
<td>0.0 to 2.0</td>
<td>1.0-3.0</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>scl/l</td>
<td></td>
<td>7.4-8.4</td>
<td>0.0 to 2.0</td>
<td>0.0-0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>uwb</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>35% - Windwhistle</td>
<td>vsf/l</td>
<td>20 to 40 inches to bedrock</td>
<td>7.4-8.4</td>
<td>0.0 to 2.0</td>
<td>0.0-0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>vsf/l</td>
<td></td>
<td>7.4-9.0</td>
<td>0.0 to 2.0</td>
<td>0.5-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>lvfs</td>
<td></td>
<td>7.9-9.0</td>
<td>0.0 to 2.0</td>
<td>0.0-0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>uwb</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - Bond-Windwhistle complex, 2-15 percent slopes</td>
<td>VS-1, VS-2, VS-5 and VS-U6 $^1$</td>
<td>72% - Waas</td>
<td>vsf/l</td>
<td>None</td>
<td>6.6-7.8</td>
<td>0.0 to 2.0</td>
<td>3.0-5.0</td>
<td>All Areas are Prime farmlands</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>uwb</td>
<td></td>
<td>6.6-8.4</td>
<td>0.0 to 2.0</td>
<td>1.0-2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 – Waas very fine sandy loam, 2 to 8 percent slopes</td>
<td>VS-1, VS-3 and VS-4</td>
<td>0-5</td>
<td>l</td>
<td></td>
<td>6.6-7.8</td>
<td>0.0 to 2.0</td>
<td>3.0-5.0</td>
<td>All Areas are Prime farmlands</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-13</td>
<td>scl</td>
<td></td>
<td>6.6-8.4</td>
<td>0.0 to 2.0</td>
<td>1.0-2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13-17</td>
<td>uwb</td>
<td></td>
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<td>--</td>
<td>--</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>0-2</td>
<td>vsf/l</td>
<td></td>
<td>6.6-7.8</td>
<td>0.0 to 2.0</td>
<td>3.0-5.0</td>
<td>All Areas are Prime farmlands</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-25</td>
<td>vsf/l</td>
<td></td>
<td>6.6-8.4</td>
<td>0.0 to 2.0</td>
<td>1.0-2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25-38</td>
<td>lvfs</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>38-42</td>
<td>uwb</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Undisturbed soils are not present in the Packrat Portal area. This area was previously disturbed during historic mining operations and topsoil was not salvaged. The area was reclaimed in 2007 using existing on-site materials and imported alluvium.
3. Mapping unit composition is of the dominant soils – other minor mapping unit inclusions comprise the remainder of the mapping unit.
5. Restrictive layer is defined by the depth of root penetration which is restricted by bedrock or a hardened or cemented soil horizon. The type of restrictive layer is listed for each soil mapping unit where present.
6. Salinity is a measure of soluble salts in the soil at saturation and is expressed as the electrical conductivity (EC) of the saturated extract in millimhos per centimeter (mmhos/cm). Soils with EC’s of > 4 mmhos/cm are generally considered saline.
7. Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.
9. Energy Fuels sampled seven topsoil locations in May of 2007, to a depth between 0.5 and 2.3 feet, within the proposed disturbance boundary of the Whirlwind Portal area and the proposed waste rock storage area. These seven samples were composited and analyzed for the various parameters listed as well as nutrients. Soil attributes noted as N/A (i.e., Soil Restrictive Layer, Prime farmland) were not determined or analyzed. A grab sample of clay subsoil, “clod sample” was also collected and analyzed.
between 10 to 20 inches. The soils are well-drained, and have low available water because of their shallow depths.

**Mapping Unit 66-Bodot-Sili-Rock outcrop complex, 5 to 25 percent slopes, very bouldery.** The Whirlwind Portal and Packrat Power Drop areas lie within this soil mapping unit. Bodot clay loam comprises 45 percent of this unit. It has clay subsurface textures; is well-drained; has high or very high runoff; slow or very slow permeability; and is moderately deep to clayey shale bedrock (20 to 40 inches). Sili clay loam comprises 25 percent of this unit. It has clay subsurface textures; is well-drained; has moderate runoff; has moderately slow permeability; and is deep to clayey shale bedrock (greater than 80 inches). Subsoils, typically between 15 to 39 inches below the surface, may be sodic with sodium adsorption ratios (SARs) between 10 and 20. Rock outcrop comprises 20 percent of this unit and other inclusions make up the remainder. Stones and boulders cover 1.5 percent of the surface.

**Mapping Unit 110-Tragmon-Detra complex, 3 to 12 percent slopes.** The existing Whirlwind Power Drop is located on this mapping unit. The mapping unit is on mesas and typically is composed of 50 percent Tragmon and 35 percent Detra soils with other inclusions making up the remainder of the unit. Parent material of the Tragmon component consists of eolian deposits over alluvium derived from sandstone and shale. This deep soil is well-drained and has a high available water content. Parent material of the Detra soil consists of alluvium derived from sandstone and shale over residuum weathered from sandstone and/or colluvium derived from sandstone and shale.

**Mapping Unit 111-Maudlin-Beje complex, 3 to 12 percent slopes.** The existing and proposed vent shaft in Colorado (VS-C1) lies in this soil mapping unit. Maudlin fine sandy loam comprises 50 percent of this unit. It has sandy clay loam subsurface textures; is well-drained; has low runoff; has moderate permeability; and is moderately deep to sandstone bedrock (20 to 40 inches). Beje fine sandy loam comprises 35 percent of this unit. It has sandy clay loam subsurface textures; is well-drained; has low to high runoff; has moderate or moderately rapid permeability; and is shallow to bedrock (10 to 20 inches). Other inclusions make up the remainder of this unit.

**Mapping Unit 15-Bond-Windwhistle complex, 2 to15 percent slopes.** Four proposed vent shafts in Utah (VS-U1 VS-U2, VS-U3 and VS-U6) lie in, or partially within, this complex. Bond loam comprises 45 percent of this unit. It has loam to sandy clay loam subsurface textures; is well-drained; medium runoff; moderately permeable; and shallow to sandstone bedrock (10 to 20 inches). Windwhistle very fine sandy loam comprises 35 percent of this unit. It has very fine sandy loam or loamy very fine sand subsurface textures; is well-drained; has slow runoff; has moderately rapid permeability; and is moderately deep to sandstone bedrock (20 to 40 inches). Various inclusions make up the remainder of this unit.

**Mapping Unit 102-Waas very fine sandy loam, 2 to 8 percent slopes.** Four proposed vent shafts in Utah (VS-U1, VS-U2, VS-U4, VS-U5) are in, or partially within, this soil mapping unit. Waas very fine sandy loam comprises 72 percent of this unit. It has loam subsurface texture; is well-drained; has slow runoff; has moderate permeability; and is deep to bedrock (greater than 80 inches). Various inclusions make up the remainder of this unit.

Available soil chemical and physical data from the NRCS (2007) and Energy Fuels (2007a) indicate that the topsoil materials in the Whirlwind Mine project area are suitable as a plant growth medium. Nutrient analyses of soil samples indicate that available nitrogen, phosphorous, and zinc are low according to agronomic standards (Soltanpour and Follett, 1999).
3.18.2 Available Topsoil

Topsoil from the original Packrat Portal area was not salvaged during historic mining operations. Alluvial material that was previously transported to the site as haul truck ballast was utilized as substitute topsoil during reclamation efforts when the Packrat Mine was reclaimed in 2002. This material was redistributed over the reclaimed areas to a depth of 4 to 6 inches. Since reclamation in 2002, revegetation has established on this material type, especially within the subtle microclimates provided by the roughed/pocked reclaimed surfaces where moisture collects.

Seven topsoil borings were completed in Soil Mapping Unit 66 within the Whirlwind Mine project area by Energy Fuels in May 2007. One of the borings occurred in the Whirlwind Portal area that had been previously reclaimed, and six borings occurred in undisturbed areas associated with the proposed waste rock storage area within Soil Mapping Unit 66-Bodot-Sili-Rock outcrop, 5 to 25 percent slopes. The topsoil boring samples were analyzed by Colorado State University and the results are presented in Table 3.18-1. Topsoil descriptions and estimated volumes are presented in Table 3.18-2. The areas of topsoil salvage and sampling are described below. Topsoil volumes assume no adjustment for large coarse fragments that might be present in the topsoil.

<table>
<thead>
<tr>
<th>Area</th>
<th>Samples</th>
<th>Topsoil Depth (ft)</th>
<th>Topsoil Soil Description</th>
<th>Subsoil Description</th>
<th>Estimated Topsoil Volume(^2) (cubic yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.5</td>
<td>Dark brown clay loam</td>
<td>clay</td>
<td>1,300</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1.8</td>
<td>Dark brown clay loam</td>
<td>Tannish green clay</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1.7</td>
<td>Dark brown clay loam</td>
<td>Brown grey clay loam</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>1.8</td>
<td>Dark brown clay loam</td>
<td>Dark brown clay</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>1.3</td>
<td>Dark brown clay loam</td>
<td>Brown clay with red sand</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>2.3</td>
<td>Dark brown clay loam</td>
<td>Brown clay</td>
<td></td>
</tr>
<tr>
<td>Area 1 size: 1.6 acres</td>
<td>Average topsoil depth: 0.5 feet</td>
<td></td>
<td></td>
<td>(\text{Total} = 1,300)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>1.2</td>
<td>Dark brown clay loam</td>
<td>Tan clay with white streaks</td>
<td></td>
</tr>
<tr>
<td>Area 3 size: 2.36 acres</td>
<td>Average topsoil depth: 1.2 feet</td>
<td></td>
<td></td>
<td>(\text{Total} = 3,000)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td>Assumed to be similar to Area 2</td>
<td></td>
</tr>
<tr>
<td>Area 4 size: 1.71 acres</td>
<td>Average topsoil depth: 1.6 feet</td>
<td></td>
<td></td>
<td>(\text{Total} = 4,400)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(\text{Total} = 30,400)</td>
</tr>
</tbody>
</table>

\(^1\) Collected May 2007.
\(^2\) Topsoil volumes assume no adjustment for large coarse fragments that might be present in the topsoil.

**Area 1**: Area 1 includes the existing slopes of the Whirlwind Portal bench, which were previously reclaimed with original topsoil to an approximate depth of 0.5 feet. This material would be stripped and re-used in reclamation. This area is 1.6 acres in size, therefore, the topsoil volume available for stripping is approximately 1,300 cubic yards.

**Area 2**: The waste rock storage area would be located on relatively gentle slopes within Soil Mapping Unit 66-Bodot-Sili-Rock outcrop, 5 to 25 percent slopes, very bouldery. Most of the soil borings (i.e., Samples 2-6) were completed in this area, where topsoil ranges from 1.2 feet to
2.3 feet in depth. There are a number of rock outcrops in the area where no topsoil is available. From Table 3.18-2, it is estimated that the average topsoil depth of approximately 1.78 feet is available from this area. When the rock outcrops are subtracted, the average thickness is estimated to be 1.6 feet. The area is 8.4 acres in size, and therefore, the estimated topsoil volume available for salvage is approximately 21,700 cubic yards.

**Area 3:** Area 3 comprises the steeper slopes along the south portion of the waste rock storage area. This area has less topsoil available for stripping. Boring 5, which was completed at the base of this area, contained only 1.2 feet of topsoil. An average thickness of approximately 0.8 feet is assumed for this area because the topsoil depths are expected to thin progressively upslope. The area is 2.36 acres and, therefore, the topsoil volume available for stripping is estimated to be 3,000 cubic yards.

**Area 4:** This area is north of Mesa County Road \(\frac{5}{10}\) and would contain the treatment plant and various ponds. No borings occur in this area, but visual inspections and the similarities to Area 2 suggest that the topsoil thickness is similar to Area 2. Assuming a soil depth of 1.6 feet over an area of 1.71 acres, the salvage volume is estimated to be 4,400 cubic yards.

The total estimated volume of topsoil available from the four areas is approximately 30,400 cubic yards. Energy Fuels estimates that this calculated volume is accurate to plus or minus 20 percent. Reclamation calculations are based on 30,400 cubic yards of salvageable topsoil. This quantity of salvaged topsoil would equate to an average topsoil depth of 12 inches uniformly redistributed over the approximate 19.75 acres area associated with the Whirlwind Portal area.

### 3.19 FARMLANDS - PRIME/UNIQUE

Prime farmland soils are designated by the United States Department of Agriculture (USDA) and are soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and are also available for these uses. There are no prime or unique farmlands within the Whirlwind Mine project area in Colorado (Soil Conservation Service and Colorado State University, 1979). In Utah, vent shafts 1, 2, 3, and 4 are located on Soil Mapping Unit 102-Waas very fine sandy loam which is designated as a prime farmland in all areas according to the NRCS (2007) (see Table 3.18-1). However, none of the areas, including the vent shafts, within Soil Mapping Unit 102 are currently farmed nor have they been farmed in the past. All of these areas are managed by the BLM for multiple use including grazing.

### 3.20 VEGETATION RESOURCES

The vegetation in the Whirlwind Mine project area varies depending on slope, aspect, elevation, and soils. Generally, the composition of vegetation is piñon pine (Pinus edulis) woodlands, mixed bunch grass, sagebrush shrublands, and oakbrush communities. The vegetation surrounding the location of the proposed vent shafts is primarily piñon pine woodlands and sagebrush shrublands. The piñon understory includes needle and thread grass, sandberg bluegrass, sand dropseed, Indian ricegrass, and western wheatgrass. The sagebrush understory includes the above-mentioned species as well as scarlet globemallow, arrowleaf balsamroot, and junegrass. The vegetation surrounding the Whirlwind Portal area is slightly more complex as a result of varying terrain and moisture conditions. Gambel oak dominates the north-facing slopes with intermixed Utah serviceberry and mountain mahogany. Included in the area to the south and east of the Whirlwind Portal are a few open stands of Ponderosa Pine. The south fork of Lumsden Creek to the east of the Whirlwind Portal includes small moist
pockets supporting rocky mountain maple and western poison ivy. A complete list of common vegetation observed in the Whirlwind Mine project area is listed below in Table 3.20-1.

Table 3.20-1
Common Plant Species Observed in the Project Area¹

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piñon pine</td>
<td>Pinus edulis</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>Pinus ponderosa</td>
</tr>
<tr>
<td>Utah juniper</td>
<td>Juniperus osteosperma</td>
</tr>
<tr>
<td>mountain mahogany</td>
<td>Cercocarpus montanus</td>
</tr>
<tr>
<td>Gambel oak</td>
<td>Quercus gambeli</td>
</tr>
<tr>
<td>Utah serviceberry</td>
<td>Amelanchier utahensis</td>
</tr>
<tr>
<td>Wyoming sagebrush</td>
<td>Artemisia tridentata wyomingensis</td>
</tr>
<tr>
<td>Arrowleaf balsamroot</td>
<td>Balsamorhiza sagittata</td>
</tr>
<tr>
<td>Rubber rabbitbrush</td>
<td>Chrysothamnus nauseosus</td>
</tr>
<tr>
<td>Wild Onion</td>
<td>Allium spp.</td>
</tr>
<tr>
<td>Prickleypear cactus</td>
<td>Opuntia spp.</td>
</tr>
<tr>
<td>Tracy's thistle</td>
<td>Cirsium undulatum var. tracyi</td>
</tr>
<tr>
<td>Bottlebrush squirrel</td>
<td>Sitanion hystrix</td>
</tr>
<tr>
<td>Crested wheatgrass</td>
<td>Agopyron cristatum</td>
</tr>
<tr>
<td>Needle and thread grass</td>
<td>Stipa Comata</td>
</tr>
<tr>
<td>Indian rice grass</td>
<td>Oryzopsis hymenoides</td>
</tr>
<tr>
<td>Junegrass</td>
<td>Koeleria macrantha</td>
</tr>
<tr>
<td>Western wheatgrass</td>
<td>Pascopyrum smithii</td>
</tr>
</tbody>
</table>


3.21 INVASIVE SPECIES AND NOXIOUS WEEDS

Many invasive plant species are classified as noxious weeds, are aggressive, and have the ability to dominate sites with dramatic impacts to native plant communities. Wildlife habitat deteriorates, erosion increases, water quality diminishes, nutrient cycling and infiltration are altered, and recreational values are degraded (BLM, 2005c). They often establish following surface disturbances and can be exotic species that do not have naturally-occurring local predators (BLM, 2007a). As of 2000, Utah had the largest weed infestation on public lands in the United States (BLM, 2005c).

The Whirlwind Mine project area is not currently affected by a wide variety of invasive or noxious species. Most occurrences are in the immediate vicinity of the Whirlwind Portal and the Packrat Power Drop area. Invasive species and noxious weeds found during biological surveys (WestWater Engineering, 2007) include: Common Burdock, Field Bindweed, Hoary Cress, Russian Knapweed, and Downy Brome (cheatgrass). Of the species identified, only cheatgrass is noted throughout the entire survey area. Table 3.21-1 shows state and county designated noxious weeds occurring in Mesa and Grand counties, BLM species of management concern, and those located recently in the Whirlwind Mine project area by WestWater Engineering (2007). Designated weeds are subject to various methods of control and containment depending on their state and county status under the relative noxious weed statutes.

Table 3.21-1
Designated Noxious Weeds Found in Mesa and Grand Counties ¹

<table>
<thead>
<tr>
<th>Common Name Scientific Name</th>
<th>Colorado/Utah Noxious Weed</th>
<th>Mesa/Grand County Noxious Weed</th>
<th>BLM Species of Concern¹</th>
<th>Present in the Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermudagrass Cynodon dactylon</td>
<td>UT</td>
<td>G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bindweed (Wild Morning-glory) Convolvulus spp.</td>
<td>UT</td>
<td>G</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Name Scientific Name</th>
<th>Colorado/Utah Noxious Weed</th>
<th>Mesa/Grand County Noxious Weed</th>
<th>BLM Species of Concern</th>
<th>Present in the Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad-leaved Peppergrass <em>Lepidium latjfolium</em></td>
<td>UT</td>
<td>G</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bull Thistle <em>Cirsium vulgare</em></td>
<td>CO</td>
<td>M</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Canada thistle <em>Cirsium arvense</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Common Burdock <em>Arctium minus</em></td>
<td>CO</td>
<td>–</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Diffuse Knapweed <em>Centaurea diffusa</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Dalmatian toadflax <em>Linaria dalmatica</em></td>
<td>CO</td>
<td>M</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Downy Brome <em>Bromus tectorum</em></td>
<td>CO</td>
<td>–</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Dyer’s Woad <em>Isatis tinctoria</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Field bindweed <em>Convolvulus arvensis</em></td>
<td>CO, UT</td>
<td>–</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hoary cress (whitetop) <em>Cardaria draba</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Houndstongue <em>Cynoglossum officinale</em></td>
<td>CO</td>
<td>M</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Leafy spurge <em>Euphorbia esula</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Medusahead <em>Taeniatherum caput-medusae</em></td>
<td>CO, UT</td>
<td>G</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Musk thistle <em>Carduus nutans</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Oxeye daisy <em>Chrysanthemum leucanthemum</em></td>
<td>CO</td>
<td>M</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Perennial Sorghum <em>Sorghum almum, S. halepense</em></td>
<td>CO, UT</td>
<td>G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Plumeless thistle <em>Carduus acanthoides</em></td>
<td>CO</td>
<td>M</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Purple loosestrife <em>Lythrum salicaria</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Quackgrass <em>Agropyron repens</em></td>
<td>CO, UT</td>
<td>G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Russian knapweed <em>Centaurea repens</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Saltcedar/Tamarisk <em>Tamarix spp.</em></td>
<td>CO</td>
<td>M</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Scotch thistle <em>Onopordum acanthium</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Spotted knapweed <em>Centaurea maculosa</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Squarrose knapweed <em>Centaurea squarrosa</em></td>
<td>CO, UT</td>
<td>G</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yellow Starthistle <em>Centaurea solstitialis</em></td>
<td>CO, UT</td>
<td>M, G</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Yellow toadflax <em>Linaria vulgaris</em></td>
<td>CO</td>
<td>M</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Sources: BLM, 2007a; Colorado Department of Agriculture, 2008; Division of Pest Management, 2001; Grand County Utah, 2008; Utah Department of Natural Resources, 2008a; WestWater Engineering, 2007.
3.22 GRAZING RESOURCES

The Whirlwind Mine project area is located within two BLM livestock grazing allotments (06429 Dolores Point and 06419 Hubbard) that straddle the Colorado/Utah border. These cattle allotments are managed by the BLM GJFO. The Dolores Point allotment is authorized for cattle grazing from May 1 to June 20 as well as mid-October to December 31. There is one lease with 822 active Animal Unit Months (AUMs) in the Dolores Point allotment. The majority of the Whirlwind Mine project area is within the Cottonwood pasture of the Hubbard allotment which is authorized for cattle grazing from April 1 to April 21 and November 1 to January 1. There are 230 AUM’s associated with this pasture. The entire Hubbard allotment contains one lease with 548 AUMs (Dollerschell, 2008).

3.23 THREATENED AND ENDANGERED SPECIES AND SPECIAL STATUS SPECIES

3.23.1 Federally Listed and Candidate Species

Currently, there are several fish and wildlife species and two plant species listed under the Endangered Species Act (ESA) occurring in the region of the Whirlwind Mine (BLM, 2007d). Each of these species are described below and summarized in Table 3.23-1. The black-footed ferret and southwestern willow flycatcher are both listed as endangered wildlife. Four species of Colorado River Basin fish, the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker, are listed as endangered and their critical habitats occur in the region of the Whirlwind Mine. The Canada lynx, Mexican spotted owl, Jones cycladenia, and Uinta Basin hookless cactus are currently listed as threatened. The western yellow-billed cuckoo, Debeque phacelia, and Parachute beardtongue are candidates for listing under the ESA (Colorado Natural Heritage Program - CNHP, 2007 and U.S. Fish and Wildlife Service - USFWS, 2007a). In August 2007, the bald eagle was removed from the threatened species list (USFWS, 2007b) and it is discussed below in Section 3.23.2.

Table 3.23-1
Species Potentially Occurring in the Vicinity of the Whirlwind Mine

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Area of Known or Potential Occurrence</th>
<th>ESA Status²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonytail</td>
<td>Gila elegans</td>
<td>Eddies, pools, and backwaters near swift current in large rivers</td>
<td>Main branches of the Green and Colorado rivers</td>
<td>Endangered</td>
</tr>
<tr>
<td>Colorado pikeminnow</td>
<td>Ptychocheilus lucius</td>
<td>Adults, in habitats ranging from deep turbid rapids to flooded lowlands; young, in slow-moving backwaters</td>
<td>Main branches of the Green and Colorado rivers</td>
<td>Endangered</td>
</tr>
<tr>
<td>Humpback chub</td>
<td>Gila cypha</td>
<td>Fast, deep, white-water areas</td>
<td>Main branches of the Green and Colorado rivers</td>
<td>Endangered</td>
</tr>
<tr>
<td>Razorback sucker</td>
<td>Xyrauchen texanus</td>
<td>Slow backwater habitats and impoundments</td>
<td>Main branches of the Green and Colorado rivers</td>
<td>Endangered</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black-footed ferret</td>
<td>Mustela nigripes</td>
<td>Prairie dog towns associated with open grassland and prairies</td>
<td>No live animals have been found in Colorado; unconfirmed sightings in eastern Utah</td>
<td>Endangered</td>
</tr>
</tbody>
</table>

1 Species potentially occurring in the vicinity of the Whirlwind Mine.

2 ESA Status: Endangered, Threatened, or Candidate for listing.
### Common Name

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Area of Known or Potential Occurrence</th>
<th>ESA Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada lynx</td>
<td>Coniferous forests interspersed with thicketts of trees and shrubs, rocky outcrops, large woody debris; closely associated with snowshoe hare</td>
<td>Introduced lynx have dispersed into or through Mesa County</td>
<td>Threatened</td>
</tr>
<tr>
<td>Lynx canadensis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Birds

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Area of Known or Potential Occurrence</th>
<th>ESA Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southwestern willow flycatcher</td>
<td>Empidonax trailli extimus</td>
<td>Foothill and montane riparian thicketts, usually distant from trees</td>
<td>Throughout western Colorado and southern Utah</td>
<td>Endangered</td>
</tr>
<tr>
<td>Mexican spotted owl</td>
<td>Strix occidentalis lucida</td>
<td>Steep rocky canyons</td>
<td>Throughout Utah and Colorado</td>
<td>Threatened</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo</td>
<td>Coccyzus americanus occidentalis</td>
<td>Uncommon in summer in lowland riparian habitats</td>
<td>Mesa County, CO and throughout Utah</td>
<td>Candidate</td>
</tr>
</tbody>
</table>

### Plants

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Area of Known or Potential Occurrence</th>
<th>ESA Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones cycladenia</td>
<td>Cycladenia humilis var. jonesii</td>
<td>Mixed desert shrub and the lower edge of the piñon pine and juniper communities at 4,400 to 6,000 feet in sparsely vegetated hills</td>
<td>Grand County, Utah</td>
<td>Threatened</td>
</tr>
<tr>
<td>Uinta Basin hookless cactus</td>
<td>Sclerocactus glaucus</td>
<td>Rocky hills, alluvial benches, and lower mesa slopes in desert shrub communities at 4,500 to 6,000 feet</td>
<td>Mesa County, CO</td>
<td>Threatened</td>
</tr>
<tr>
<td>DeBeque phacelia</td>
<td>Phacelia submutica</td>
<td>Restricted to barren and semi-barren hill-sides of the Wasatch geological formation</td>
<td>Mesa County, CO</td>
<td>Candidate</td>
</tr>
<tr>
<td>Parachute beardtongue</td>
<td>Penstemon debilis</td>
<td>Endemic to south facing white shale talus outcrops of the Green River Formation on the Roan Plateau at 8,000 to 9,000 feet</td>
<td>Roan Plateau, Garfield County, CO</td>
<td>Candidate</td>
</tr>
</tbody>
</table>

2. ESA Status = Endangered Species Act Status.

**Colorado River Fish.** The bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker are a group of endangered fish that may inhabit the Colorado River system downstream from the Whirlwind Mine. These fish have been found mainly in the Colorado, Gunnison, and Green rivers, with the Colorado pikeminnow also thought to occur in the San Juan, Yampa, White, and Dolores rivers (Woodling, 1985; BLM 2007d).

**Bonytail chub.** The bonytail chub was listed as endangered by the USFWS in April 1980 because it has been nearly extirpated from its historical range by physical alterations (impoundments and diversions) and chemical changes to habitats and introductions of non-native fish (USFWS, 1980). In addition, there have been adverse effects to bonytails and other fish native to the Colorado River Basin by changes in river flow regimes, migratory barriers, changes in water temperature, competition and predation by exotic fish species, parasites, and altered food base (USFWS, 1987). The bonytail is an exceedingly rare minnow originally native to the Colorado River system of the western United States and northern Mexico (UDWR, 2008c). The fish are considered big or mainstream river species, preferring pools and eddies of warm, often heavily silted, swift moving rivers; however, they do occur in reservoir habitats as well (USFWS, 2008a).

Viable populations are extremely rare within the Green River drainage in Utah and are not known in the State of Colorado (USFWS, 2002a; Colorado Division of Wildlife - CDOW, 2007a; UDWR, 2008c). Currently there are no self sustaining populations of bonytails in the Colorado River Basin. During the 1960s through the early 1980s, adult bonytail were captured in the Upper Colorado River Basin including the Yampa River, Green River, and Colorado River...
mainstem (USFWS, 2002a). Most recently, wild bonytails were captured in Lake Mohave, Nevada (2002) and Lake Havasu, Arizona (1990). Natural reproduction was last documented in the 1960s in the Green River within Dinosaur National Monument; spawning appear to occur during June and July (USFWS, 2002a). Water temperatures between 68°F and 70°F appear to be optimal for reproduction, incubation, and survival of eggs and newly hatched fry (USFWS, 2002a). Water temperatures have decreased due to impoundments within the Colorado River Basin because colder water from the bottom is released downstream (USFWS, 2002a).

The USFWS has designated critical habitat for the bonytail chub in river channels and flooded, ponded, or inundated riverine habitats that would be suitable for adults and young. Critical habitat within Colorado has been designated for approximately 59 miles of the Green River and Yampa River within Moffat County (USFWS, 1994a). Designated critical habitat in Utah is found on the Green River between the Yampa River and the Colorado River, as well as between the Desolation and Gray canyons areas (BLM, 2007d). Designation of critical habitats for all listed fish in the Colorado River Basin, including the bonytail, was based on presence of primary constituent elements – physical and biological features – needed for species’ continued survival. Briefly, primary constituent elements for the four species include (USFWS, 1994a):

1. Sufficient quantity and quality of water delivered to a location with appropriate hydrologic regime necessary for a stage of the species’ life cycles;
2. Physical habitat in the Colorado River system inhabited or potentially inhabited by species and providing life functions including spawning, nursery, feeding, rearing, and passage for access between those areas; and
3. Biological environment including food supplies, predation, and competition during each life stage for the different species. In particular, species have been adversely affected by predation and competition from introduced non-native fish species.

**Colorado pikeminnow.** Historically, the Colorado pikeminnow occurred in great numbers throughout the Colorado River system from Green River, Wyoming to the Gulf of California in Mexico. The species was included on the 1967 list of native fish and wildlife threatened with extinction under the Endangered Species Preservation Act of 1966 (see USFWS, 1967) and included in Appendix D, the “United States List of Endangered Native Fish and Wildlife” (USFWS, 1970) prior to enactment of the ESA of 1973. Colorado pikeminnows are endangered under the ESA.

Currently, wild populations are found only in the upper Colorado River Basin. In Colorado, they are found in the Green, Yampa, Little Snake, White, Colorado, Gunnison, San Juan and Dolores rivers (Woodling, 1985; USFWS, 2002b). Historically, Colorado pikeminnows occurred on the Dolores River from the Paradox Valley near Bedrock downstream to the confluence with the Colorado River mainstem (USFWS, 2002b). They are currently limited to the lower 1.25 miles of the Dolores River in Utah though they apparently do not spawn in the river (USFWS, 2002b). Although streamflow in the Dolores River has been altered, there are no apparent barriers to pikeminnows occupying historic habitat (USFWS, 2002b). On the Utah side of the project area, the mainstem of the Colorado River from the Colorado border to Lake Powell contains known distribution of the fish (BLM, 2007d; UDWR, 2008d).

Adult Colorado pikeminnows can be found in big, deep water (i.e., eddies, pools, and other areas adjacent to the main current flows), whereas young pikeminnow inhabit shallow, quiet backwaters (Woodling, 1985). Spawning occurs after high spring runoff flows with water temperatures ranging from 64°F to 73°F (USFWS, 2002b). After hatching, pikeminnow larvae drift downstream from spawning substrates and typically inhabit in-channel backwater sites, characterized by warm, deep and turbid water, that historically formed after spring peak runoff (USFWS, 2002b), generally during June, July, and August (USFWS, 1994a).
The USFWS designated critical habitat in Utah is found on the Green River between the Yampa River and the Colorado River; between the Desolation and Gray canyons areas; the Dolores River at about 1.25 miles from the Colorado River confluence in Utah; the Colorado River from Interstate 70 to the boundary with the BLM Monticello Field Office; and the Colorado River south from the Westwater Canyon Area (BLM, 2007d). There is no critical habitat on the Dolores River in Colorado. Designation of critical habitats for all listed fish in the Colorado River Basin, including the Colorado pikeminnow, was based on presence of primary constituent elements – physical and biological features – needed for species’ continued survival and identified above for the bonytail (USFWS, 1994a).

Humpback chub. The humpback chub was included on the 1967 list of native fish and wildlife threatened with extinction under the Endangered Species Preservation Act of 1966 (USFWS, 1967) and included in Appendix D, the “United States List of Endangered Native Fish and Wildlife” (USFWS, 1970) prior to enactment of the ESA of 1973. Humpback chubs are endangered under the ESA. Similar to other endangered species such as the bonytail, humpback chubs have been adversely affected by stream alteration (dams, irrigation, dewatering, and channelization); competition with and predation by introduced, nonnative fish species; and hybridization with other species of the genus Gila (USFWS, 1990a). Reduced water flows have also affected humpback chubs (Woodling, 1985; USFWS, 1990a; USFWS, 1994a).

The known historic distribution includes portions of the mainstem Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado (USFWS, 2002c and 2008b). Presently, there is some discrepancy on the fish’s current range. The USFWS limits the humpback chub as being found only in the Little Colorado River and adjacent portions of the Colorado River (USFWS, 2008b). Whereas, the UDWR estimates the chub are now confined to a few whitewater areas in the Colorado, Green, and White rivers (UDWR, 2008e). Apparently, humpback chubs were not found in the Dolores River historically and were not present in 1990 (USFWS, 1990a).

The humpback chub prefers waters that are deep, fast-moving, and turbid (Woodling, 1985) and are often associated with large boulders and steep cliffs (CDOW, 2007b). However, they have been found in relatively quiet waters as well and they may use diverse habitats (USFWS, 1990a). Evidence suggests that humpback chubs may spawn from April to June with water temperatures between 61°F to 68°F (USFWS, 1990a). Optimal temperature for egg hatch is in warmer (68°F) water. Similar to other species of Gila, humpback chubs feed on benthic invertebrates but will also feed on insects floating on the surface (USFWS, 1990a).

The USFWS has designated the same critical habitat for the humpback chub as the bonytail chub within Colorado, approximately 59 miles of the Green River and Yampa River within Moffat County (USFWS, 1994a). The designated critical habitat in Utah is found on the Green River between the Desolation and Gray canyons areas, and the Colorado River south from Westwater Canyon Area (BLM, 2007d). There is no critical habitat designated on the Dolores River in Utah or Colorado. Designation of critical habitats for all listed fish in the Colorado River Basin, including the humpback chub, was based on presence of primary constituent elements – physical and biological features – needed for species’ continued survival and identified above for the bonytail (USFWS, 1994a).

Razorback sucker. The razorback sucker was listed as endangered by the USFWS because of limited numbers found throughout the Colorado River Basin and minimal evidence of natural recruitment (USFWS, 1991). This species was once abundant through the Colorado River basin, primarily in the mainstream and major tributaries and now is known within the Upper Colorado River Basin including the lower Yampa and Green Rivers, mainstream Colorado
River, and lower San Juan River (USFWS, 2002d). Within the Upper Colorado River Basin, naturally reproducing populations are only found in the middle Green River in Utah and in an off-channel pond in the Colorado River near Grand Junction (USFWS, 2002d).

The razorback is most often found in quiet, muddy backwaters along the river (USFWS, 1994a; CDOW, 2007c). Spawning extends from April through June; spawning occurs in river bars with cobble, gravel, and sand substrates during high flows from spring runoff, when water temperatures are greater than 57°F (USFWS, 2002d). Juvenile rearing habitats are in quiet, warm, shallow water associated with various river and floodplain features (USFWS, 2002d). Reproduction has been adversely affected by lower water temperatures due to impoundments within the Colorado River Basin because colder water from the bottom is released downstream (USFWS, 2002d).

The USFWS has designated 1,124 miles (49 percent of its historical range) of critical habitat in the entire Colorado River Basin for the razorback sucker, which includes the Colorado River and its 100-year floodplain from Colorado River Bridge at exit 90 north of Interstate 70 to Westwater Canyon including the Gunnison River and its 100-year floodplain from the Redlands Diversion Dam to the confluence with the Colorado River (USFWS, 1994a). There is no critical habitat designated on the Dolores River in Utah or Colorado. Designation of critical habitats for all listed fish in the Colorado River Basin, including the razorback sucker, was based on presence of primary constituent elements – physical and biological features – needed for species’ continued survival and identified above for the bonytail (USFWS, 1994a). In addition, designation of critical habitat for the razorback sucker included specific habitats required for reproduction and recruitment because a recovery plan for the species had not been prepared at the time critical habitat was finalized (USFWS, 1994a).

Black-footed Ferret. The black-footed ferret was included on the 1967 list of native fish and wildlife threatened with extinction under the Endangered Species Preservation Act of 1966 (USFWS, 1967) and included in Appendix D, the “United States List of Endangered Native Fish and Wildlife” (USFWS, 1970) prior to enactment of the ESA of 1973. Black-footed ferrets are endangered under the ESA. This rare mammal was believed to be extinct until a wild population was discovered near Meeteetse, Wyoming in the early 1980s. Descendants of those individuals have been released at several sites in the western United States, including Utah and Colorado. The re-introduced populations have been classified as "nonessential-experimental" (UDWR, 2008f). The nocturnal ferrets are closely associated with prairie dog colonies.

In addition to Utah’s re-introduced black-footed ferret population, unconfirmed sightings of naturally occurring ferrets persist throughout eastern Utah (UDWR, 2008f). In the vicinity of the Whirlwind Mine project area, there are no known populations of black-footed ferrets or prairie dogs. In Northwestern Colorado, efforts are underway to restore the ferret to their native range, which includes remote scrubland in Rio Blanco and Moffat counties (CDOW, 2007d), over 100 miles north of the Whirlwind Mine.

Canada Lynx. Canada lynx within the contiguous United States were listed as threatened on March 24, 2000 (USFWS, 2000). The listing includes lynx within Colorado. In 2000, the USFWS (2000) identified significant threats to the lynx including threats by destruction, modification, or curtailment of the species’ habitat or range within the Northern Rockies/Cascades and Southern Rockies. Lynx habitats have been adversely affected by timber harvest, mostly within western boreal forests (subalpine fir/spruce forest). However, timber harvest levels on federal lands in the West have declined since the 1990’s and reduction of early successional habitats with concomitant reductions of snowshoe hare habitats may have affected lynx in some areas (USFWS, 2000).
USFWS (2000) concluded that lynx populations in the contiguous United States occur at naturally low densities, generally maintained by limited abundance of primary prey (snowshoe hare) which in turn results from patchy distribution of transitional boreal forest habitat. While lynx have been trapped, legally or otherwise, USFWS (2000) recognized that overharvest (overutilization) of the species is not a factor that threatens lynx, especially since the 1980’s when legal trapping became considerably restricted or eliminated by states.

Lynx inhabit coniferous forests interspersed with thickets of trees and shrubs, rocky outcrops, and large woody debris that are often used for den sites. Canada lynx are specialized predators that are highly dependent on snowshoe hare, although they may also prey opportunistically on squirrels, mice, beaver, muskrat, birds, young ungulates, and some carrion when hare populations decline. Breeding populations are not possible without an adequate snowshoe hare population (USFWS, 2003). They are highly mobile, and often explore outside their home ranges (USFWS, 2003).

Historically, lynx occurred in the mountains of Colorado. Records indicate they were present in the Park, Gore, San Juan, and La Plata mountains as well as the White River Plateau; their distribution included Rio Blanco and Garfield counties, north of Mesa County but did not include Mesa County (Fitzgerald et al., 1994).

Between 1999 and 2004, the CDOW reintroduced 166 Canada lynx to the San Juan Mountains in southwestern Colorado (Shenk, 2005). These animals are not designated as experimental under Section 10(j) of the ESA. USFWS (2006a) recognized the reintroduction as important though not essential for recovery of lynx; the reintroduction program has been included in the recovery plan, but not the critical habitat designation (USFWS, 2006a). Since their release, lynx have been located within Mesa County on the Uncompahgre Plateau within the Uncompahgre National Forest (Shenk, 2005), east of the Whirlwind Mine.

The USFWS 2005 Recovery Outline for the Canada lynx (USFWS, 2005a) categorized lynx habitat within the contiguous United States as either 1) core areas (recent/long-term evidence of lynx and reproduction, and high quality, intact boreal habitat); 2) secondary areas (more sporadic evidence of lynx, no reproduction documented, and quality of habitat is unknown); or 3) peripheral areas (few historical or recent records of lynx and marginal habitat for lynx and/or snowshoe hare). None of the recovery goals or recovery actions were identified for implementation within Colorado. Critical habitat was designated for Canada lynx but no critical habitat was designated in Colorado (USFWS, 2006a).

**Southwestern Willow Flycatcher.** The southwestern willow flycatcher was listed as endangered under the ESA in 1995 (USFWS, 1995a) and critical habitat was designated 10 years later (USFWS, 2005b). This bird is one of five subspecies of the willow flycatcher and is found most frequently in riparian habitats, especially in areas of dense willow. It is known to nest primarily in willows, buttonbush, and coyote brush, with a scattered overstory of cottonwood (UDWR, 2007; USFWS, 2005b). The southwestern willow flycatcher does not occur in the vicinity of the Whirlwind Mine; however, it could utilize habitat along the Dolores River and migration occurrences have been documented along the Dolores River directly south of the Whirlwind Mine and potentially along the ore haul route (Riddle, 2008).

**Mexican Spotted Owl.** The Mexican spotted owl was listed as a threatened species in 1993 (USFWS, 1993). The USFWS (2004) designated over 8.6 million acres of critical habitat for the Mexican spotted owl over four western states, including Utah and Colorado. The owl occurs in disjunct localities that correspond to isolated mountain systems and canyons. The owl is frequently associated with large, steep canyons with exposed cliffs and dense, mature mixed-conifer, pine-oak; and canyons in piñon-juniper areas with small and widely scattered patches of old Douglas-fir (Andrews and Righter, 1992; BLM, 2007d). The owl exists in small isolated...
subpopulations and is threatened by habitat loss and disturbance from recreation, overgrazing, road development, catastrophic fire, timber harvest, and mineral development (USFWS, 1993).

The closest designated critical habitat unit (CP-14) encompasses the Dark Canyon Primitive Area and Canyonlands National Park in Utah, over 25 miles from the Whirlwind Mine (USFWS, 2004). CDOW’s Natural Diversity Information Source (NDIS) lists the Mexican spotted owl as known to occur in Montrose County, south of Mesa County and the Whirlwind Mine (CDOW, 2008c). The Colorado Gap Analysis Project indicates that the owl is likely to occur in areas near the Whirlwind Mine based on modeled habitat types (Colorado Gap Analysis Project-CGAP, 1999). Surveys for Mexican spotted owls were not conducted; however, Westwater Engineering (2007) determined that no habitats for any federally-listed species occur in the Whirlwind Mine project area. There are ponderosa pine and piñon-juniper habitats in the project vicinity which could potentially be utilized by Mexican spotted owls. Limited areas of ponderosa and piñon-juniper would be removed for the long-term by the Proposed Action, but removal of these vegetation types would not be in physical settings (steep canyons) likely to be inhabited by the owls. No designated critical habitat for the Mexican Spotted Owl occurs in the project area and the closest protected activity center is approximately 50 miles south of the project area.

**Jones Cycladenia.** The USFWS listed this rare plant as threatened in 1986 (USFWS, 1986). Jones cycladenia is endemic to Utah and Arizona, and has been identified as occurring in Grand County, Utah, near lower Castle Valley. Jones cycladenia is a rosy flowered herbaceous perennial that grows on canyonland barren slopes of the Chinle, Cutler, and Summerville formations in gyspiferous, saline soils (USFWS, 1986; BLM, 2007d). This species occurs in cool desert shrub and juniper communities at elevations ranging from 4,400 to 6,000 feet. Blooming takes place from mid-May through June (BLM, 2007d; Spence, 1994). Off-road vehicle activity and the presence of mining claims and oil and gas leases on or immediately adjacent to known sites are the biggest threats to this species (UDWR, 2008g; Sipes et al., 1994). A population is found in Grand County, Utah on the western side of the La Sal Mountains several miles from the Whirlwind Mine (UDNR, 2005).

**Uinta Basin Hookless Cactus.** Uinta Basin hookless cactus is a federally-listed threatened plant (USFWS, 1979) that occurs on river benches, valley slopes, and rolling hills in Duchesne and Uintah counties, Utah, and in Delta, Garfield, Mesa, and Montrose counties, Colorado (UDWR, 2008h). A member of the cactus family, this species is a perennial herb that produces pink flowers from April to late May. Uinta Basin hookless cactus is found on the Duchesne River, Green River, and Mancos formations. It is found in xeric, fine-textured soils overlain with cobbles and pebbles, growing in salt desert shrub and piñon-juniper communities, at elevations ranging from 4,500 to 6,000 feet (CNHP, 1999; UDWR, 2008h). The distribution map located in the Colorado Rare Plant Guide shows several populations occurring over 20 miles to the north and east of the Whirlwind Mine (CNHP, 1999).

**Western Yellow-billed Cuckoo.** The yellow-billed cuckoo is a federal candidate species that is being considered for listing due to loss of riparian habitat from agricultural use, water use, road development, and urban development (UDWR, 2008i). Its historic range includes all states west of the Rocky Mountains and extends into southern British Columbia at the northern extent and into the northwestern states of Mexico at the southern limit (UDWR, 2008i). Currently, the range of the cuckoo is limited to disjunct fragments of riparian habitats from northern Utah, western Colorado, southwestern Wyoming, and southeastern Idaho southward into northwestern Mexico and westward into southern Nevada and California (UDWR, 2008i). North American populations of this species are declining (Andrews and Righter, 1992).

The birds inhabit lowland riparian forests and urban areas with tall trees. Yellow-billed cuckoos are considered a riparian obligate and are usually found in large tracts of cottonwood/willow
habitats with dense sub-canopies. The bird is an uncommon local summer resident in western valleys, primarily from Mesa County southward. Numbers of this species fluctuate widely from year to year (CDOW, 2008d; Andrews and Righter, 1992). No known population of this species exists at present within the BLM Moab Planning Area (BLM, 2007d), or the BLM Grand Junction Planning area.

DeBeque Phacelia. This rare plant became a candidate for listing under the Endangered Species Act in 1990 (USFWS, 2007c). The species is ranked S2 (imperiled in the state, at high risk of extinction) in Colorado, CNHP (2008). This annual species is endemic to Colorado in Garfield and Mesa counties and it can be found exclusively on sparsely vegetated, steep slopes in brown or gray clay on Atwell Gulch and Shire members of the Wasatch Formation, within a 20-mile radius of DeBeque, Colorado. Soils often have large cracks because of the high shrink-swell potential of the clays at elevations from 4,700 to 6,200 feet (CNHP, 1999; Decker et al., 2005).

DeBeque phacelia does not necessarily appear every year and this makes it difficult to confirm presence or absence in a single observation. A survey in an unfavorable year or at the incorrect time of year cannot rule out the possibility that it is actually present at the site in the seed bank (Decker et al., 2005). Decker et al. (2005) conclude there is a high likelihood for potential distribution on the southwestern flanks of the Uncompahgre Plateau near Gateway about 10 miles from the Whirlwind Mine. The only known populations of DeBeque phacelia occur in the Piceance Basin of Colorado, straddling the borders of Mesa and Garfield counties (CNHP, 1999; USFWS, 2007c).

Parachute Beardtongue. This species of beardtongue (penstemon) became a candidate for listing under the Endangered Species Act in 1990 and changed in listing priority from 5 up to 2 in 2005 due to increased energy exploration and development along the Roan Plateau in Garfield County, Colorado (USFWS, 2005c). Approximately 90 percent of the known plants occur on private lands owned by Occidental Petroleum (c). The plant flowers from mid-June to mid-July and is found in isolated populations on white shale talus of the Parachute Creek Member of the Green River Formation at elevations from 8,000 to 9,000 feet (CNHP, 1999).

3.23.2 BLM Sensitive and State Sensitive Species

In addition to species listed as threatened or endangered under the ESA and candidate species, the BLM and the states of Colorado and Utah have identified sensitive species. Species lists developed by Colorado and Utah (UDWR, 2007; CNHP, 2008) were used to determine both the BLM (GJFO and MFO) and state agencies’ sensitive species for animals that may occur in Mesa County, Colorado and Grand County, Utah. Additionally, the Draft RMP for the BLM MFO (BLM, 2007d) and the RMP for the BLM GJFO (1985b) were consulted for BLM sensitive species. State wildlife agencies in Colorado and Utah manage sensitive wildlife species in their respective states. Tables 3.23-2 and 3.23-3 list sensitive species identified by Colorado, Utah, and the BLM that might occur near the Whirlwind Mine project area.

CDOW does not list or protect rare plants, and plants’ status is only advisory; however, the CNHP tracks and ranks both plant and wildlife species using a standardized method for evaluating imperilment (CNHP, 2005). In general, state ranks are based on the assessed risk of extinction within Colorado. Species given a state rank of S1 are deemed critically imperiled because of their extreme rarity (less than 5 occurrences statewide) and are considered critically endangered. A species with a state rank of S2 is considered imperiled (endangered or threatened) in Colorado because of its rarity (6 to 20 occurrences), or other biological factors make it rare and extremely vulnerable to extirpation within the state. A species given a state rank of S3 is considered vulnerable (20 to 100 occurrences statewide) (CNHP, 2005). Table
3.23-4 details Colorado and BLM sensitive plant species that may occur within the Whirlwind Mine project area based on listings for Mesa County.

Utah does not officially designate plant species, but Utah’s Natural Heritage Program (UNHP), a branch of the Division of Wildlife and the Utah Conservation Data Center (UCDC), periodically reports on imperiled plants species (UCDC, 2008; UDNR, 2005). UCDC compiles the state’s wildlife and plant lists of species for which there is credible scientific evidence to substantiate a threat to continued population viability (UDWR, 2007). For wildlife, the list is comprised of wildlife species of concern, species receiving special management under a conservation agreement in order to preclude federal listing, and those that are federally-listed or candidates for federal listing under the ESA (UDWR, 2007). Table 3.23-5 summarizes BLM-sensitive plant species in Utah that may occur near the Whirlwind Mine based on the species listing for Grand County.

Table 3.23-2

<table>
<thead>
<tr>
<th>Common Name Scientific Name</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
<th>Federal Sensitive</th>
<th>State Status</th>
<th>State Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibians</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boreal Toad</td>
<td>Bufo boreas pop. 1</td>
<td>Pond margins, wet meadows, riparian areas</td>
<td>highly unlikely</td>
<td>-</td>
<td>SE</td>
</tr>
<tr>
<td>Canyon Treefrog</td>
<td>Hyla arenicolor</td>
<td>Occurs along intermittent streams in deep, rocky canyons</td>
<td>possible</td>
<td>BLM</td>
<td>-</td>
</tr>
<tr>
<td>Great Basin Spadefoot</td>
<td>Spea intermontana</td>
<td>Spring seeps, permanent and temporary waters</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>-</td>
</tr>
<tr>
<td>Birds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Accipiter gentilis</td>
<td>Common in aspen-conifer forests, potentially piñon-juniper woodlands</td>
<td>possible</td>
<td>BLM</td>
<td>-</td>
</tr>
<tr>
<td>Ferruginous Hawk</td>
<td>Buteo regalis</td>
<td>Flat and rolling terrain in grassland or shrub steppe; nests on elevated cliffs, buttes, or creek banks</td>
<td>unlikely</td>
<td>BLM</td>
<td>SC</td>
</tr>
<tr>
<td>Gunnison Sage Grouse</td>
<td>Centrocercus minimus</td>
<td>Expansive sagebrush and sagebrush/grassland habitats</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>SC</td>
</tr>
<tr>
<td>Mountain Plover</td>
<td>Charadrius montanus</td>
<td>Common resident in foothills and mountains. In fall and winter, there is altitudinal movement, as many birds withdraw from the highest parts of the breeding range and the numbers in the foothills increases</td>
<td>possible</td>
<td>BLM</td>
<td>SC</td>
</tr>
<tr>
<td>American Peregrine Falcon</td>
<td>Falco peregrinus anatum</td>
<td>Open conifer forests, rock outcrops, and cliffs</td>
<td>likely</td>
<td>-</td>
<td>SC</td>
</tr>
<tr>
<td>Greater Sandhill Crane</td>
<td>Grus canadensis tabida</td>
<td>Migrants occur on mudflats around reservoirs, in moist meadows, and in agricultural areas. Breeding birds are found in parks with grassy hummocks and watercourses, beaver ponds, and natural ponds lined with willows or aspens</td>
<td>highly unlikely</td>
<td>-</td>
<td>SC</td>
</tr>
<tr>
<td>Long-billed Curlew</td>
<td>Numenius americanus</td>
<td>Grasslands, plains, foothills, wet meadows</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>SC</td>
</tr>
</tbody>
</table>
### Utah and BLM Sensitive Wildlife Species Not Listed under the ESA that Could Potentially Occur in the Vicinity of the Whirlwind Mine

<table>
<thead>
<tr>
<th>Common Name Scientific Name</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
<th>Federal Sensitive</th>
<th>State Status (^2)</th>
<th>State Rank (^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American White Pelican</td>
<td>Along lakes, ponds, creeks, and rivers</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>SPC</td>
<td></td>
</tr>
<tr>
<td>Pelecanus erythrorhynchos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bobolink</td>
<td>Riparian or wetland areas</td>
<td>highly unlikely</td>
<td>BLM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolichonyx oryzivorus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burrowing Owl</td>
<td>Open grassland and prairies</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>SPC</td>
<td></td>
</tr>
<tr>
<td>Athene cunicularia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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2 State Status: SC= Species of Special Concern, SE= State Endangered

3 State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, ranks with “B” indicate status of breeding occurrences.
<table>
<thead>
<tr>
<th>Common Name Scientific Name</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
<th>Federal Sensitive</th>
<th>State Status(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-eared owl <em>Asio flammeus</em></td>
<td>Grasslands, shrublands, and other open habitats</td>
<td>unlikely</td>
<td>BLM</td>
<td></td>
</tr>
<tr>
<td>Ferruginous Hawk <em>Buteo regalis</em></td>
<td>Flat and rolling terrain in grassland or shrub steppe; nests on elevated cliffs, buttes, or creek banks</td>
<td>possible</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Northern Goshawk <em>Accipiter gentilis</em></td>
<td>Mature mountain forest and riparian zone habitats</td>
<td>possible</td>
<td>BLM</td>
<td>CS</td>
</tr>
<tr>
<td>Greater Sage-Grouse <em>Centrocercus urophasianus</em></td>
<td>Sagebrush plains, foothills, and mountain valleys</td>
<td>unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Gunnison sage-grouse <em>Centrocercus minimus</em></td>
<td>Sagebrush and sagebrush/grassland habitats</td>
<td>unlikely</td>
<td>BLM</td>
<td></td>
</tr>
<tr>
<td>Lewis's Woodpecker <em>Melanerpes lewis</em></td>
<td>Mixed conifer, piñon-juniper, riparian, and oak woodlands, also found on fringes of pine and juniper stands, and deciduous forests, especially riparian cottonwoods</td>
<td>possible</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Three-toed Woodpecker <em>Picoides tridactylus</em></td>
<td>Engelmann spruce, sub-alpine fir, Douglas fir, grand fir, ponderosa pine, tamarack, aspen, and lodgepole pine forests</td>
<td>unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bluehead Sucker <em>Catostomus discobolus</em></td>
<td>Fast flowing water in high gradient reaches of mountain rivers</td>
<td>highly unlikely</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>Colorado River cutthroat trout <em>Oncorhynchus clarki pleuriticus</em></td>
<td>Cool clear water, high-elevation streams and lakes</td>
<td>highly unlikely</td>
<td>Conservation Agreement Species</td>
<td></td>
</tr>
<tr>
<td>Flannelmouth Sucker <em>Catostomus latipinnis</em></td>
<td>Large rivers, where they are often found in deep pools of slow-flowing, low gradient reaches</td>
<td>highly unlikely</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>Roundtail Chub <em>Gila robusta</em></td>
<td>Large rivers, and is most often found in murky pools near strong currents</td>
<td>highly unlikely</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allen's Big-Eared Bat <em>Idionycteris phyllotis</em></td>
<td>Wide range in rocky and riparian areas, in piñon-juniper woodland and scrubland regions, roosts in caves or rock crevices</td>
<td>unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Big Free-Tailed Bat <em>Nyctinomops Macrotis</em></td>
<td>Rocky and woodland habitats, roosts in caves, mines, old buildings, and rock crevices</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Spotted Bat <em>Euderma maculatum</em></td>
<td>Found in a variety of habitats, ranging from deserts to forested mountains; roost and hibernate in caves and rock crevices</td>
<td>highly unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Townsend's Big-Eared Bat <em>Corynorhinus townsendii</em></td>
<td>Occur in many types of habitat, but is often found near forested areas; roosts and hibernate in caves and rock crevices</td>
<td>highly likely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Fringed Myotis <em>Myotis thysanodes</em></td>
<td>Desert and woodland areas, roosts in caves, mines, and buildings</td>
<td>likely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Gunnison's Prairie-Dog <em>Cynomys gunnisoni</em></td>
<td>Grasslands, semidesert and montane shrublands</td>
<td>unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>Kit Fox <em>Vulpes macrotis</em></td>
<td>Semi desert grasslands and open shrublands</td>
<td>unlikely</td>
<td>BLM</td>
<td>SPC</td>
</tr>
<tr>
<td>White-tailed Prairie-dog <em>Cynomys leucurus</em></td>
<td>Semi desert grasslands and open shrublands</td>
<td>unlikely</td>
<td>BLM</td>
<td></td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Habitat</td>
<td>Potential Occurrence</td>
<td>Federal Sensitive</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Mollusks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eureka Mountainsnail</td>
<td>Oreohelix eurekensis</td>
<td>Forested areas</td>
<td>highly unlikely</td>
<td>Federal Sensitive</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cornsnake</td>
<td>Elaphe guttata</td>
<td>Near streams, or in rocky or forest habitats</td>
<td>unlikely</td>
<td></td>
</tr>
<tr>
<td>Smooth Greensnake</td>
<td>Opheodrys vernalis</td>
<td>meadows, grassy marshes, moist grassy fields at forest edges, mountain shrublands, stream borders, bogs, open moist woodland</td>
<td>likely</td>
<td></td>
</tr>
</tbody>
</table>

2 State Status: CS = Species receiving special management under a conservation agreement. SPC = Species of Concern.
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
<th>Federal Sensitive</th>
<th>State Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piceance bladderpod</td>
<td><em>Lesquerella parviflora</em></td>
<td>Shale outcrops of Green River Formation, on ledges and slopes of canyons in open areas at 6,200 to 8,600 feet</td>
<td>highly unlikely</td>
<td>BLM S2</td>
<td></td>
</tr>
<tr>
<td>Dolores River skeletonplant</td>
<td><em>Lygodesmia doloresensis</em></td>
<td>Reddish purple, sandy alluvium and colluvium of the Cutler Formation between the canyon walls and the river in juniper, shadscale, and sagebrush communities at 4,000 to 5,500 feet</td>
<td>highly unlikely</td>
<td>BLM S1</td>
<td></td>
</tr>
<tr>
<td>Arapian Stickleaf</td>
<td><em>Mentzelia argillosa</em></td>
<td>Steep eroding talus slopes of shale. Green River Formation at 4,700 to 5,800 feet</td>
<td>unlikely</td>
<td>BLM S2</td>
<td></td>
</tr>
<tr>
<td>Eastwood monkey-flower</td>
<td><em>Mimulus eastwoodiae</em></td>
<td>Shallow caves and seeps on steep canyon walls at 4,700 to 5,800 feet</td>
<td>unlikely</td>
<td>BLM S1</td>
<td></td>
</tr>
<tr>
<td>Osterhout cat's-eye</td>
<td><em>Cryptantha osterhoutii</em></td>
<td>Dry, barren sites, in reddish-purple decomposed sandstone at 4,500 to 6,100 feet</td>
<td>unlikely</td>
<td>BLM S2</td>
<td></td>
</tr>
<tr>
<td>Paradox breadroot</td>
<td><em>Pediomelum aromaticum</em></td>
<td>Open piñon-juniper woodlands, in sandy soils or adobe hills at 4,00 to 5,700 feet</td>
<td>unlikely</td>
<td>BLM S2</td>
<td></td>
</tr>
</tbody>
</table>

1. Sources: CNHP, 1999 and 2007
2. State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, S2S3=indicates range of uncertainty.

**Table 3.23-5**

BLM Sensitive Plant Species in Grand County, Utah Not Listed under the ESA that Could Potentially Occur in the Vicinity of the Whirlwind Mine

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular Plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peabody milkvetch</td>
<td><em>Astragalus pubentissimus</em> var. peabodianus</td>
<td>Entrenched channels of escarpments draining south and west flanks of Tavaputs Plateaus; Piñon-Juniper and mixed desert shrub at 4,300 to 5,800 feet</td>
<td>highly unlikely</td>
</tr>
<tr>
<td>Cisco milkvetch</td>
<td><em>Astragalus sabulous</em> var. sabulous</td>
<td>Salt desert shrub in Mancos Shale Formation in Grand River Valley (Cisco desert); Selenophyte at 4,260 to 5,250 feet</td>
<td>highly unlikely</td>
</tr>
<tr>
<td>Stage-station milkvetch</td>
<td><em>Astragalus sabulous</em> var. vehiculus</td>
<td>Salt desert shrub in Morrison Formation; Selenophyte; Blooms April to May at 4,500 to 4,800 feet. Considered geographically isolated from var. sabulous.</td>
<td>unlikely</td>
</tr>
<tr>
<td>Cataract Canyon gilia</td>
<td><em>Gilia latifolia</em> var. <em>imperialis</em></td>
<td>Shadscale and other mixed desert shrub communities, esp. wash bottoms and ledges at 3,800 to 5,215 feet. Blooms June to October</td>
<td>highly unlikely</td>
</tr>
<tr>
<td>Alcove bog orchid</td>
<td><em>Habenaria zothecina</em> (syn. <em>Platanthera zothecina</em>)</td>
<td>Moist streambanks, seeps, hanging gardens, in mixed desert shrub, piñon-juniper, and oakbrush, associated with cottonwood and willow. Blooms mid June to August at 4,360 to 8,690 feet</td>
<td>unlikely</td>
</tr>
<tr>
<td>Canyonlands lomatium</td>
<td>(biscuitroot, or desert-parsley)</td>
<td>Sandy soil or crevices in Entrada sandstone. Slot canyons. Prefers the sheltered, cool habitat on all slopes and aspects at 4,800 to 6,855 feet. Blooms April to June</td>
<td>highly unlikely</td>
</tr>
<tr>
<td>Dolores rushpink</td>
<td><em>Lygodesmia grandiflora</em> var. doloresensis</td>
<td>Reddish alluvial soil, juniper-grassland, sagebrush at 4,500 to 4,700 feet. Blooms in June</td>
<td>unlikely</td>
</tr>
<tr>
<td>Entrada rushpink (or skeletonweed)</td>
<td><em>Lygodesmia grandiflora</em> var. entrada</td>
<td>Juniper, mixed desert shrub communities at 4,400 to 4,800 feet; Blooms in June</td>
<td>unlikely</td>
</tr>
<tr>
<td>Common Name (Scientific Name)</td>
<td>Habitat</td>
<td>Potential Occurrence</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>Shultz’ stickleaf (or blazing star) <em>Mentzelia shultziorum</em></td>
<td>Shadscale, eriogonum, ephedra communities in Cutler Formation. Moderate to very steep slopes of Paradox and Moenkopi Formations. Silty clay loam or silty loam at 4,200 to 6,000 feet; Blooms from mid-June to September</td>
<td>unlikely</td>
<td></td>
</tr>
<tr>
<td>Trotter’s oreoxis (spring parsley) <em>Oreoxis trotteri</em></td>
<td>Mixed juniper and warm desert shrub. Slickrock or Main Body Entrada sandstone on eastern slope of Courthouse Rock and Navajo sandstone below on flats. Most abundant on Moab Tongue white sandstone of Entrada. Blooms late April to mid-June at 4,750 to 5,000 feet</td>
<td>unlikely</td>
<td></td>
</tr>
<tr>
<td>Alcove rock-daisy <em>Perityle specuciola</em></td>
<td>Drier crevices in seasonally wet hanging gardens, and alcove communities. Navajo and Windgate sandstone and Rico Formation, but not substrate specific. Blooms mid-July to late September at 3,690 to 4,000 feet</td>
<td>highly unlikely</td>
<td></td>
</tr>
<tr>
<td>Jane’s Globemallow <em>Sphaeralcea janeae</em> (or S. leptophylla var. janeae)</td>
<td>Sandy soils of weathered white rim and Organ Rock members of Cutler Formation. Warm and salt desert shrub at 4,000 to 4,600 feet; blooms May to June</td>
<td>highly unlikely</td>
<td></td>
</tr>
<tr>
<td>San Rafael globemallow <em>Sphaeralcea psoraloides</em></td>
<td>Eastern and southeastern footslopes of the Swell. Saline and gypsiferous substrates; Zuckin-ephedra communities of Entrada siltstone at 4,000 to 6,000 feet; blooms mid-May to June</td>
<td>highly unlikely</td>
<td></td>
</tr>
</tbody>
</table>

Sources: BLM, 2005b and 2007d; Shultz et al., 2006.

**Mammals.** Mining activity in the western United States has historically provided roosting and nesting habitat for bats, albeit unintentionally. Over 60 percent of species in the country are known to use underground mines (Adams, 2003). Navo and Ingersoll, (2000) identified the Lumsden Canyon mine complex as a hibernaculum for Townsend’s big-eared bat, and most likely other bat species. Known as the Lumsden Canyon Project, the study consisted of a survey of several mines in and near John Brown, Gateway, and Lumsden canyons, including what is now known as the Packrat Mine and Urantah Decline. Both the Packrat Mine portal and Urantah Decline would be utilized as part of the Whirlwind Mine. The potential mining area is shown on Map 2.2-1 and includes the existing Lumsden Canyon mines. It is suspected that the BLM-sensitive and state-sensitive Townsend’s big-eared bat and other species occur in large numbers in many of the various scattered mine portals. If so, the features may be important to populations in a much larger area than Lumsden Canyon (Navo and Ingersoll, 2000). There is also potential for the fringed myotis, another BLM- and state-sensitive species, to occur in the area mines. The mine complex, because of its size and species documentation, is considered to be an important bat conservation area and “worthy of protection” (Navo and Ingersoll, 2000).

Specific to the Whirlwind Mine, Navo et al. (2001) identified the Packrat Mine (part of what they call the Hubbard/Pack Rat/La Sal system and what would be included as part of Energy Fuels’ Whirlwind Mine claim block) as an important roosting and micro-habitat area (WestWater Engineering, 2007). An incomplete survey was conducted in 2001 of the Urantah mine (identified by Navo and Ingersoll in 2000 as Cherokee Adit, and now considered under the Proposed Action as the Whirlwind Portal) that resulted in no documentation of bats (Navo et al., 2001). The mine survey, while incomplete, documented ceiling temperatures near the portal at 56°F to 33°F, where the survey was abandoned (Navo et al., 2001). These temperatures are considered to be inhospitable for roosting during the summer. While the mine was considered potentially suitable for hibernation, surveys in March of 2000 found no hibernating bats, and the conclusion was drawn that it appears the mine is too cold for hibernation conditions (Navo et al., 2001). However, in summer 2000, a western small-footed myotis was documented as using the mine (Navo et al., 2001).
**Birds.** As of August 2007, the bald eagle is no longer listed under the ESA (USFWS, 2007b). Colorado has determined that bald eagles are threatened in the state and Utah considers the bird as a sensitive species (CDOW, 2008d and UDWR, 2007). Although no longer listed as threatened under the ESA, bald eagles remain protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d) and the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). The BGEPA prohibits “take” of bald and golden eagles, which includes disturbances. The USFWS defines “disturb” as “to agitate or bother a bald or golden eagle to the degree that it interferes with or interrupts normal breeding, feeding, or sheltering habits, causing injury, death, or nest abandonment” (USFWS, 2006b).

Bald eagles nest in trees, including cottonwoods, and in riparian zones associated with large lakes and streams (Andrews and Righter, 1992). The birds are fairly common winter and summer residents in the northwestern valleys of Colorado and nesting, roosting, and wintering areas are known to occur along the White and Colorado rivers approximately 200 and 30 miles north of the project area, respectively (Andrews and Righter, 1992 and CDOW, 2008d). According to the CDOW NDIS (CDOW, 2008d), two bald eagle roost sites occur on Dolores River bottom lands near Gateway, which could be along the ore trucking route for the mine. No known nest sites, communal roosts, or wintering and summering activities occur in the direct vicinity of the Whirlwind Mine.

The northern goshawk, mountain plover, ferruginous hawk, peregrine falcon, and Lewis's Woodpecker are also sensitive bird species that could potentially occur in the project area based on habitat preferences. None of these birds were observed during field surveys (WestWater Engineering, 2007). The project area does not contain habitat for the Gunnison or greater sage-grouse. The nearest occurrence of the state-sensitive Gunnison sage grouse, the Piñon Mesa population, is approximately 10 miles to the north of the Whirlwind Mine project area.

**Plants.** Project area biological surveys conducted by WestWater Engineering in 2007 determined that sensitive plants (Montrose bladder pod and Grand Junction milkvetch) could possibly have potential habitat in the area, though neither plant was found. Surveyors found a small amount of suitable habitat for Naturita milkvetch, but the plant was not observed (WestWater Engineering, 2007).

**Herpetiles.** There are known occurrences of the BLM-sensitive and state-sensitive long-nose leopard lizards and canyon tree frogs in the Whirlwind Mine project area. The leopard lizard is found in stands of sagebrush in deep, sandy soils and broad canyon outwash plains and has been spotted in the Gateway area (Hammerson, 1986). The canyon tree frog occurs along intermittent streams in deep rocky canyons. John Brown Canyon is one of its few known habitats (Hammerson, 1986).

### 3.24 WILDLIFE AND AQUATIC RESOURCES

Wildlife and aquatic species found in the vicinity of the Whirlwind Mine are common to piñon-juniper, scattered ponderosa pine, sagebrush, and oakbrush vegetation communities in western Colorado and eastern Utah. Vegetation and habitat types are based on Colorado’s NDIS mapping, ground surveys, and aerial photo coverage. During field surveys conducted by WestWater Engineering (2007), evidence indicated the following mammal species utilize the area: elk, mule deer, coyote, gray fox, black bear, and desert cottontail. This evidence represents a small percentage of the wildlife species that may be present in the vicinity of the Whirlwind Mine. Table 3.24-1 illustrates the variety of wildlife common to the habitats in the vicinity of the Whirlwind Mine and lists the likelihood of their occurrences.
Table 3.24-1
Numbers of Wildlife Species Potentially in the Different Habitat Types in the Whirlwind Mine Project Area

<table>
<thead>
<tr>
<th>Habitat Category</th>
<th>Expected Occurrence</th>
<th>Herpetile Species Numbers</th>
<th>Bird Species Numbers</th>
<th>Mammal Species Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unique to Habitat Type</td>
<td>In Multiple Habitat Types</td>
<td>Unique to Habitat Type</td>
</tr>
<tr>
<td>Piñon Pine Complex</td>
<td>Common</td>
<td>1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Potential</td>
<td>2</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>Common</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Potential</td>
<td>0</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Oakbrush</td>
<td>Common</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Potential</td>
<td>0</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sagebrush Complex</td>
<td>Common</td>
<td>0</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Potential</td>
<td>0</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

1 Sources: Hammerson, 1986; Andrews and Righter, 1992; Sauer et. al., 2007; WestWater Engineering, 2007.

3.24.1 Big Game

According to the UCDC, the Whirlwind Mine project area falls within winter range for both deer and elk (UDNR, 2008b) and is also winter range for deer and elk in Colorado (CDOW, 2008a). John Brown Road, the primary Whirlwind Mine access road, travels through approximately 4 miles of severe winter range for mule deer from Colorado State Highway 141 into John Brown Canyon. While the road does not coincide with severe winter range for elk, it does come within 1 mile of an area of wintering elk concentration near Cave Canyon. In Colorado, the Whirlwind Mine project area falls into GMU 60 for deer and elk (CDOW, 2008a). In Utah, the site overlaps with GMU 13A, the La Sal Mountains Unit.

Black bears are also known residents of the area. The CDOW lists black bear as a big game species, while UDNR registers black bear in its own category as black bear (CDOW, 2008b; UDNR, 2006). John Brown Road is in a black bear fall concentration area in Colorado. The fall concentration area does not overlap with the Whirlwind Mine, but is within 1 mile of the primary mine opening (CDOW, 2008a).

3.24.2 Upland Birds

Wild turkeys can be found in the vicinity of the Whirlwind Mine project area. They are found in nearly all types of habitat present in the project area (Andrews and Righter, 1992). Ponderosa pine with an understory of Gambel oak is a primary habitat. The birds have winter range overlapping the John Brown Road and the mine area. The road and mine site are listed as wild turkey winter concentration areas (CDOW, 2008a). Winter range is a part of the overall range where 90 percent of individuals in the area are located from approximately November 1 to April 1 during the average five winters out of ten. Winter concentration is the part of the winter range where densities are at least 200 percent greater than the surrounding winter range density. The wild turkey winter concentration extends from the upper half of John Brown Canyon northwest to upper Lumsden Canyon and encompasses virtually all of the mine operations (CDOW, 2008a).

Chukar are also present in the area and are an introduced species that has been able to keep self-sustaining populations in the general three-county region surrounding the project area, where it is rare (Andrews and Righter, 1992). The bird prefers steep, rocky, dry canyons with cheatgrass.
3.24.3 Migratory Birds

Migratory birds that occur in the vicinity of the Whirlwind Mine include a variety of raptors and neo-tropical migrants. Potential occurrence of bird species in the vicinity of the Whirlwind Mine was evaluated from data collected on two nearby North American Breeding Bird Survey (BBS) routes (Sauer et al., 2007). The BBS routes closest to the mine are Uncompahgre (route 17045) in Colorado and Westwater (route 85313) in Utah. The Uncompahgre route is approximately 13 miles southeast of the Whirlwind Mine project area, and the Westwater survey route is about 24 miles to the northwest. Data compiled reveal that 105 bird species have been observed on these routes since 1988. There are potential suitable habitats within the Whirlwind Mine project area for 83 of the bird species, many of which are protected under the MBTA. Table 3.24-2 details observed bird species monitored on the Uncompahgre and Westwater routes in correlation with habitat associations relative to the Whirlwind Mine project area.

<table>
<thead>
<tr>
<th>Bird Species</th>
<th>Possible Occurrence of Species Associated with Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Piñon Pine Complex</td>
</tr>
<tr>
<td>Blue Grouse</td>
<td>Rare</td>
</tr>
<tr>
<td>Chukar</td>
<td>Potential</td>
</tr>
<tr>
<td>Turkey Vulture</td>
<td></td>
</tr>
<tr>
<td>Northern Harrier</td>
<td></td>
</tr>
<tr>
<td>Northern Goshawk</td>
<td></td>
</tr>
<tr>
<td>Swainson's Hawk</td>
<td>potential</td>
</tr>
<tr>
<td>Red-tailed Hawk</td>
<td>potential</td>
</tr>
<tr>
<td>Ferruginous Hawk</td>
<td>Rare</td>
</tr>
<tr>
<td>Golden Eagle</td>
<td>Common</td>
</tr>
<tr>
<td>American Kestrel</td>
<td>Potential</td>
</tr>
<tr>
<td>Prairie Falcon</td>
<td></td>
</tr>
<tr>
<td>Peregrine Falcon</td>
<td>Rare</td>
</tr>
<tr>
<td>Band-tailed Pigeon</td>
<td>common</td>
</tr>
<tr>
<td>Mourning Dove</td>
<td>common</td>
</tr>
<tr>
<td>Great Horned Owl</td>
<td></td>
</tr>
<tr>
<td>Common Nighthawk</td>
<td>Common</td>
</tr>
<tr>
<td>Common Poorwill</td>
<td>Common</td>
</tr>
<tr>
<td>White-throated Swift</td>
<td></td>
</tr>
<tr>
<td>Black-chinned Hummingbird</td>
<td>Common</td>
</tr>
<tr>
<td>Broad-tailed Hummingbird</td>
<td>Potential</td>
</tr>
<tr>
<td>Lewis's Woodpecker</td>
<td>Rare</td>
</tr>
<tr>
<td>Williamson's Sapsucker</td>
<td>Rare</td>
</tr>
<tr>
<td>Downy Woodpecker</td>
<td>Rare</td>
</tr>
<tr>
<td>Hairy Woodpecker</td>
<td>Common</td>
</tr>
<tr>
<td>Western Wood-Pewee</td>
<td>Potential</td>
</tr>
<tr>
<td>Hammond's Flycatcher</td>
<td>Potential</td>
</tr>
<tr>
<td>Dusky Flycatcher</td>
<td>Common</td>
</tr>
<tr>
<td>Say's Phoebe</td>
<td></td>
</tr>
<tr>
<td>Ash-throated Flycatcher</td>
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</tr>
<tr>
<td>Western Kingbird</td>
<td>Potential</td>
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<tr>
<td>Horned Lark</td>
<td></td>
</tr>
<tr>
<td>Tree Swallow</td>
<td></td>
</tr>
<tr>
<td>Violet-green Swallow</td>
<td></td>
</tr>
<tr>
<td>Steller's Jay</td>
<td>Common</td>
</tr>
<tr>
<td>Western Scrub-Jay</td>
<td>Common</td>
</tr>
<tr>
<td>Piñon Jay</td>
<td>Common</td>
</tr>
</tbody>
</table>
### Possible Occurrence of Species Associated with Habitat

<table>
<thead>
<tr>
<th>Bird Species</th>
<th>Pinon Pine Complex</th>
<th>Ponderosa Pine</th>
<th>Oakbrush</th>
<th>Sagebrush Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark's Nutcracker</td>
<td>Potential</td>
<td>potential</td>
<td>potential</td>
<td></td>
</tr>
<tr>
<td>Black-billed Magpie</td>
<td>Common</td>
<td>common</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Crow</td>
<td>potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Raven</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black-capped Chickadee</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mountain Chickadee</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Red-breasted Nuthatch</td>
<td></td>
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</tr>
<tr>
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<tr>
<td>Pygmy Nuthatch</td>
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<td></td>
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<tr>
<td>Rock Wren</td>
<td></td>
<td></td>
<td>rare</td>
<td></td>
</tr>
<tr>
<td>Bewick's Wren</td>
<td>Common</td>
<td></td>
<td></td>
<td>potential</td>
</tr>
<tr>
<td>House Wren</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruby-crowned Kinglet</td>
<td>Potential</td>
<td>potential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue-gray Gnatcatcher</td>
<td>Common</td>
<td>common</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Bluebird</td>
<td>Potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain Bluebird</td>
<td>Common</td>
<td>common</td>
<td>common</td>
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</tr>
<tr>
<td>Townsend's Solitaire</td>
<td>Common</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hermit Thrush</td>
<td>Rare</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Robin</td>
<td>Common</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Mockingbird</td>
<td>Common</td>
<td></td>
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</tr>
<tr>
<td>Sage Thrasher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loggerhead Shrike</td>
<td>Potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange-crowned Warbler</td>
<td>Common</td>
<td></td>
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<td>potential</td>
</tr>
<tr>
<td>Virginia's Warbler</td>
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<td>common</td>
</tr>
<tr>
<td>Audubon's Warbler</td>
<td></td>
<td></td>
<td></td>
<td>potential</td>
</tr>
<tr>
<td>Grace's Warbler</td>
<td></td>
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<td>potential</td>
</tr>
<tr>
<td>MacGillivray's Warbler</td>
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<td>potential</td>
</tr>
<tr>
<td>Western Tanager</td>
<td>Common</td>
<td>common</td>
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<td></td>
</tr>
<tr>
<td>Black-headed Grosbeak</td>
<td>Common</td>
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<td>common</td>
<td></td>
</tr>
<tr>
<td>Blue Grosbeak</td>
<td>Rare</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lazuli Bunting</td>
<td>Common</td>
<td></td>
<td>common</td>
<td>common</td>
</tr>
<tr>
<td>Green-tailed Towhee</td>
<td>Common</td>
<td></td>
<td>common</td>
<td>common</td>
</tr>
<tr>
<td>Spotted Towhee</td>
<td>Common</td>
<td></td>
<td>common</td>
<td></td>
</tr>
<tr>
<td>Chipping Sparrow</td>
<td>Common</td>
<td></td>
<td>common</td>
<td>common</td>
</tr>
<tr>
<td>Vesper Sparrow</td>
<td>Common</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lark Sparrow</td>
<td>Potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black-throated Sparrow</td>
<td>Potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sage Sparrow</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray-headed Junco</td>
<td>Common</td>
<td></td>
<td>common</td>
<td></td>
</tr>
<tr>
<td>Western Meadowlark</td>
<td></td>
<td></td>
<td></td>
<td>rare</td>
</tr>
<tr>
<td>Brewer's Blackbird</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown-headed Cowbird</td>
<td>Potential</td>
<td>common</td>
<td>potential</td>
<td></td>
</tr>
<tr>
<td>Scott's Oriole</td>
<td>Potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassin's Finch</td>
<td>Common</td>
<td></td>
<td>common</td>
<td></td>
</tr>
<tr>
<td>House Finch</td>
<td>Potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Crossbill</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine Siskin</td>
<td></td>
<td></td>
<td></td>
<td>potential</td>
</tr>
</tbody>
</table>

In this portion of the Colorado Plateau, the raptor nesting season is generally considered to occur between mid-February and mid-August. Usually, by mid-August young birds have fledged and left the nest (WestWater Engineering, 2007). Suitable raptor nesting habitat occurs in much of the Whirlwind Mine project area but no active or inactive nests were found during the raptor survey WestWater Engineering (2007). During the two days of the survey, one red-tailed hawk was seen soaring briefly over the Whirlwind Portal area. One Cooper’s hawk was flushed from a piñon pine on Beaver Mesa. Neither bird was seen again and no evidence of nesting was found. In addition, one feather, presumably from a great horned owl, was found on Beaver Mesa, in the project area (WestWater Engineering, 2007).

Table 3.24-3 lists USFWS Birds of Conservation Concern (BCC) species that have been observed in the region and habitat types near the Whirlwind Mine. Two BCC listed birds were observed during the WestWater Engineering (2007) biological survey. Black-throated gray warblers were found throughout the project area but were most often encountered above the mining area on Beaver Mesa. In one instance, a black-throated gray warbler exhibited territorial behavior, but a subsequent nest search produced no results. Virginia’s warblers were also found throughout the survey area but were most commonly heard on the brushy slopes to the south of the Whirlwind Portal. Visual sightings of Virginia’s warblers were difficult because of the dense brush, but some males did respond to a recorded call of the species (WestWater Engineering, 2007).

<table>
<thead>
<tr>
<th>Bird Species</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Harrier</td>
<td>Open habitats such as marshes, fields, and grasslands</td>
<td>unlikely</td>
</tr>
<tr>
<td>Swainson's Hawk</td>
<td>Grasslands, agricultural areas, shrublands, and riparian forests</td>
<td>possible</td>
</tr>
<tr>
<td>Ferruginous Hawk</td>
<td>Flat and rolling terrain in grassland or shrub steppe; nests on elevated cliffs, buttes, or creek banks</td>
<td>possible</td>
</tr>
<tr>
<td>Golden Eagle</td>
<td>Grasslands, shrublands, piñon-juniper woodlands, and ponderosa pine forests</td>
<td>likely</td>
</tr>
<tr>
<td>Prairie Falcon</td>
<td>Cliffs or bluffs in open areas, and range widely over surrounding grasslands, shrublands, and alpine tundra</td>
<td>possible</td>
</tr>
<tr>
<td>Peregrine Falcon</td>
<td>Coniferous and riparian forests</td>
<td>unlikely</td>
</tr>
<tr>
<td>Lewis's Woodpecker</td>
<td>Mixed conifer, piñon-juniper, riparian, and oak woodlands, also found on fringes of pine and juniper stands, and deciduous forests, especially riparian cottonwoods</td>
<td>possible</td>
</tr>
<tr>
<td>Piñon Jay</td>
<td>Piñon-juniper woodlands. Wandering birds occur in riparian areas, grasslands, shrublands, coniferous forests, isolated aspen stands</td>
<td>likely</td>
</tr>
<tr>
<td>Virginia's Warbler</td>
<td>Dense hillside shrublands, especially Gambel oak</td>
<td>present</td>
</tr>
</tbody>
</table>
### Bird Species and Habitat

<table>
<thead>
<tr>
<th>Bird Species</th>
<th>Habitat</th>
<th>Potential Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grace’s Warbler</td>
<td>Breeds in ponderosa pine forests. In migration, occasionally found in lowland riparian forests or other wooded areas</td>
<td>possible</td>
</tr>
<tr>
<td>Black-throated Gray Warbler</td>
<td>Pinon-juniper woodlands, but occasionally occurs in shrublands</td>
<td>present</td>
</tr>
<tr>
<td>Sage Sparrow</td>
<td>Sagebrush shrublands, grasslands</td>
<td>possible</td>
</tr>
</tbody>
</table>

1 Sources: Andrews and Righter, 1992; USFWS, 2002c; Sauer et. al., 2007; WestWater Engineering, 2007.
2 Species that may occur in the Whirlwind Mine project area as listed in USFWS Bird Conservation Region 16 (Southern Rockies/Colorado Plateau), BCC 2002 list.

### Aquatic Resources

Potential aquatic habitat in or near the Whirlwind Mine project area is limited to three springs in Lumsden Canyon. The springs and areas downstream to the point where the stream bed dries up (variable by season) probably support some amphibians and aquatic invertebrates, and can provide water sources for birds, bats, and other mammals. At the canyon’s end, the Dolores River flows north and is a major tributary to the Colorado River. This warm-water fishery could support Eurasian carp, channel catfish, green sunfish, roundtail chub, and flannelmouth sucker (BLM, 1985b). More than 40 non-native fish species have been introduced to the Colorado River Basin since the late 1800’s. Some, such as carp, green sunfish, red shiner, channel catfish, fathead minnows and northern pike are predators of young or eggs of endangered native species, discussed above. Largemouth bass preferentially prey on Colorado pikeminnows. Native non-game fish likely to be present in the lower Dolores River include the speckled dace, roundtail chub, redside shiner, bluehead sucker, flannelmouth sucker, and mottled sculpin (Woodling, 1985).

### Wild Horses

Feral horse are associated with a variety of arid grasslands and shrublands in western North America. Congress enacted the Wild and Free-roaming Horse and Burro Protection Act in 1971 in part to claim federal ownership of feral horses on public lands (BLM, 2008b). The Little Book Cliffs Wild Horse Range contains the feral horse population that is closest to the Whirlwind Mine project area (Fitzgerald et al., 1994). The range is 10 miles northeast of Grand Junction, Colorado.

### HAZARDOUS MATERIALS

Some potentially hazardous materials would be used during mining. Solid waste would be generated during the construction and mining activities. Hazardous materials that could be found at the site include explosives and flammable or combustible motor fuels. The following is a list of the hazardous materials that may be used during mining operations which are regulated by the USDOT:

- Ammonium nitrate-fuel oil mixture containing only prilled ammonium nitrate and fuel oil
- Propane
- Gasoline
- Diesel fuel
- Radioactive material, low specific activity (LSA-I) non fissile or fissile-excepted
- Oxygen, compressed
- Acetylene, dissolved
• Sulfuric acid with more than 51 percent acid
• Barium compounds, n.o.s.

Ferric sulfate, coolant (ethylene glycol), sodium metabisulfite, and new/used oil are not regulated under USDOT but may also be used during mining operations.

Appendix A of the Plan (Energy Fuels, 2007a) provides Synthetic Precipitation Leaching Procedures (SPLP) test results of ore and waste rock samples that were selected to represent the varying ore and waste rock materials that would be expected during mine operations. SPLP testing is a leachability test that is designed to simulate leaching by acid rains and is an accepted EPA method for testing mine wastes. Baseline results of three ore samples indicated that the ore has the potential to generate levels of uranium, radium, and trace metals, including antimony, arsenic, nickel, selenium, and vanadium, above state water quality standards. However, the ore would be temporarily stored on site (on the ore pad) prior to being hauled to a processing mill. Based on the test results of three waste rock samples, leachate was not produced that exceeded state water quality standards; however, pH was elevated. The Colorado DRMS reviewed the testing results and based on waste rock geochemical analysis as required under Rule 6.4.20(14) concluded that the waste material from the Whirlwind Mine is inert (Colorado DRMS, 2008).

### 3.26 HUMAN HEALTH

As discussed in the Uranium Leasing Program Final Programmatic EA (DOE, 2007), rocks and soils in the vicinity of the Whirlwind Mine project area contain naturally-occurring radioactive material. Most of the natural radioactivity is derived from the uranium-238 and uranium-235 decay chains. One of the products in the uranium-238 decay chain is Ra-226, which is the principal radionuclide of concern for characterizing the distribution of radioactivity in the environment.

Background levels of Ra-226 are normally present in soil in trace concentrations of about 1 picoCurie per gram (pCi/g); however, background concentrations within ore-bearing formations may be as high as hundreds of thousands of pCi/g. Background concentrations of Ra-226 in mine-waste rock piles average 23.7 pCi/g (EPA, 1991). In underground mines, the primary Ra-226 source is the ore-bearing Salt Wash Member.

Nationwide, people are exposed to an average of about 300 millirems per year (mrem/yr) of natural background radiation (National Council on Radiation Protection and Measurements - NCRP, 1987). Table 3.26-1 presents a summary of radiation doses from natural background for the nation and representative doses for the region of the Whirlwind Mine project area.

<table>
<thead>
<tr>
<th>Source</th>
<th>U.S. Average Natural Background Radiation Dose (millirem/yr)</th>
<th>Whirlwind Mine Project Area Regional Natural Background Radiation Dose (millirem/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmic and cosmogenic radioactivity</td>
<td>28</td>
<td>68</td>
</tr>
<tr>
<td>Terrestrial radioactivity</td>
<td>28</td>
<td>74</td>
</tr>
<tr>
<td>Internal radioactivity</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Inhaled radioactivity</td>
<td>200</td>
<td>260</td>
</tr>
<tr>
<td>Rounded Total</td>
<td>300</td>
<td>440</td>
</tr>
</tbody>
</table>

1 Source: DOE, 2007.
The largest natural source is inhaled radioactivity, mostly from radon-222 and its radioactive decay products in homes and buildings, which accounts for about 200 mrem/yr. Radon gas is an invisible, odorless gas that is formed from the disintegration of Ra-226. Additional natural sources include radioactive material in soils (primarily external radiation from the uranium and thorium decay series), radioactive material in the body (primarily potassium-40), and cosmic rays from space filtered by the atmosphere.

Laboratory analyses of three ore and three waste rock samples collected from the Whirlwind Mine provide an indication of the Ra-226 levels that would be present during mining operations. These analyses are found in Appendix A of the Plan (Energy Fuels, 2007a). Ra-226 levels in the waste rock ranged from 2.8 to 4.2 pCi/g while Ra-226 levels in the ore ranged from 113 to 1,170 pCi/g. Because some intermixing of ore and waste would occur during mining, Energy Fuels projects that the ore transported to the mill would average about 400 pCi/g of Ra-226 (equivalent to an ore grade of 0.25 percent U₃O₈) and the waste rock disposed of at the surface would have radium levels similar to the average reported by the EPA (i.e., 23.7 pCi/g). Because radon gas dissipates rapidly in the outdoors, the primary health concern would be associated with working in underground areas that are not adequately ventilated.

### 3.27 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

There are no Areas of Critical Environmental Concern near the Whirlwind Mine project area or along the ore transportation routes.
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Chapter 4  
Environmental Consequences

4.1 INTRODUCTION

This chapter evaluates the environmental impacts of implementing each Alternative discussed in Chapter 2.

4.2 AIR QUALITY AND NOISE

4.2.1 Air Quality

4.2.1.1 No Action Alternative

Under the No Action Alternative, Whirlwind Mine operations would not be expanded and there would not be increased emissions of nitrogen oxides (NOx) and particulates. Radon emissions through the existing mine openings would continue unmonitored. Traffic through the project area, on John Brown Road and Colorado State Highway 141, would not be increased due to expanded mine operations. Dust suppression measures on unpaved roads would not be needed upon completion of bulk sampling under existing permits.

4.2.1.2 Proposed Action Alternative

Energy Fuels has submitted Air Pollutant Emission Notices (APENs) to the CDPHE Air Pollution Control Division (APCD) for fugitive emissions associated with mining activities, mine ventilation, and internal combustion engines (generators). Preliminary Construction Permits have been issued for each APEN. Final permits would be approved following the self-certification process, to be conducted within 180 days of the start of mining activities. The issued permit numbers are 07ME1051F (mining activities), 07ME1052 (ventilation), and 07ME1053 (generators). As a condition of these permits, Energy Fuels would calculate emissions on a monthly basis to ensure that none of the above sources is exceeding the permit limits.

Mitigation measures would be implemented to reduce impacts to air quality. Operation of the Whirlwind Mine would not result in an exceedance of the ambient air quality standards. Impacts to air quality as a result of mine operations and ore transportation would be minimal.

Mine Ventilation. Particulate emissions from mine ventilation were calculated based on the maximum allowable in-mine level of PM10. Based on this level and conservatively estimated maximum emission levels, PM10 emissions from mine ventilation are minimal. The Whirlwind Mine ventilation emissions are considered a minor source. APEN 07ME1052 stipulates that annual particulate emissions from ventilation cannot exceed 4.1 tpy; annual PM10 emissions cannot exceed 4.1 tpy; and visible emissions cannot exceed 20 percent opacity.

Radon emissions from existing and proposed vent shafts, portals, and the power drop shaft could result in potential minor air quality concerns. In the open air, the amount of radon gas is very small and does not pose a health risk (Health Canada, 2007). Radon is primarily a health concern only in confined spaces due to its concentration and accumulation. As a result of radon’s propensity to dissipate very quickly in open air, radon should not be an air quality concern in open air spaces such as those in the vicinity of the top of a vent shaft, power drop shaft, or portals. Radon exposure could be a concern in these locations only if there is a structure present near the top of the vent shaft or power drop shaft that can trap the radon gas.
Potential radon exposure would be in the confined space of the underground mine workings infrastructure, not in the open air outside of the workings. Because radon is the heaviest noble gas, it would tend to sink to the bottom of the shaft rather than move to the top. Under MSHA safety requirements, the mine would be adequately ventilated at all times during human occupancy. A vent fan on the vent shaft and the natural direction of air flow through the mine would positively influence radon gas movement. Radon gas accumulation in confined spaces is reduced or eliminated by the circulation and venting of the air in the mine workings and shafts. Exposure risks would be reduced by using active fan ventilation systems to vent mine air.

Energy Fuels would monitor and model the radon emissions from the vent shafts and portals. This information would be collected and presented annually to the EPA. The monitoring would be performed with radon canisters and air velocity meters while the modeling is completed using EPA-approved air pollutant concentration models. The maximum radon dose permitted at the closest receptor under the National Emission Standards for Hazardous Air Pollutants (NESHAPs) is 10 mrem/yr. This maximum dose rate is equivalent to a calculated increased lifetime cancer risk of about 2 in 10,000.

At the present time, the nearest receptor is at a trailer that is occupied by Zabronsky. The trailer is located about 1,800 feet northwest of the Whirlwind Portal area. The predominant wind direction, as reported by the Western Regional Climate Center (2008b), is from the east-southeast and, based on the distance and propensity to disperse, existing and potential future radon emissions from shafts and portals would not affect nearby residents.

**Generator.** Emissions of criteria pollutants and hazardous air pollutants from generators are considered a minor source. Generator emissions are comprised primarily of nitrogen oxides. The generators would meet strict New Source Performance Standards (NSPS). The generators incorporate modern, best available control technology to limit emissions. APEN 07ME1053 stipulates that annual NOx emissions from the generators cannot exceed 12.3 tpy and visible emissions cannot exceed 20 percent opacity.

**Surface Facilities.** Potential sources of fugitive particulate emissions associated with surface facilities in support of underground mining at the Whirlwind Mine include:

- topsoil stripping;
- topsoil and ore stockpiles and waste rock storage area;
- waste rock and ore handling; and
- haulage roads throughout the mine site.

APEN 07ME1051F stipulates that annual particulate emissions resulting from surface facilities supporting underground mining cannot exceed 27.85 tpy and annual PM10 emissions cannot exceed 8.21 tpy. Energy Fuels would be required to track the emissions. Emissions associated with surface facilities in support of underground mining are considered a minor source. The APEN stipulates process rate limits for production of uranium/vanadium ore of 6,200 tons per month or 50,000 tpy.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to mitigate impacts to air quality under the Proposed Action:

- Diesel generators would only be used during hours of operation. The generators would meet current EPA emission standards.
- Energy Fuels would use very low sulfur content diesel fuel, containing less than 15 parts per million of sulfur, in the generators and other equipment.
• Monitoring and modeling of the radon emissions from the vent shafts is required by permit. This information is collected and presented annually to the CDPHE and EPA.

• Personal monitoring and active ventilation for radon emissions in the mine workings would be implemented as required by MSHA safety provisions.

• The ore loading area would be treated with magnesium chloride to seal the loading area surface. Sprayed water would be used for dust suppression on the waste rock storage area and other disturbed areas.

• As a condition of the Conditional Use Permit issued by Mesa County, Energy Fuels would be responsible for application of magnesium chloride on Mesa County Road 5/10 from John Brown Road to the mine in the spring and up to two additional applications annually. Water would be sprayed for dust suppression on the mine access roads.

• Dust resulting from topsoil salvaging and stockpiling would be kept to a minimum by incrementally stripping topsoil from small (3 to 4 acre) segments as needed rather than stripping the entire area at once. Soil stockpiles would be seeded as soon as possible to achieve vegetative cover, thereby containing fugitive dust and preventing erosion.

• The waste rock storage area would be constructed sequentially and the north embankment would be topsoiled and reclaimed contemporaneously to contain fugitive dust and to prevent erosion.

• Ore haul trucks would be securely tarped prior to leaving the mine site to prevent release of fugitive dust along haul routes.

4.2.2 Noise

4.2.2.1 No Action Alternative

Under the No Action Alternative, the mine would not be developed and no additional noise would be generated due to construction and operation. There would be no additional risk of noise annoyance to the part-time resident within the project vicinity.

4.2.2.2 Proposed Action Alternative

Noise would occur as a result of various mine operations. Underground operation-related noise would be suppressed. Blasting operations would be conducted in accordance with MSHA regulations (30 CFR Parts 56 and 57). Miners would be required to wear company-supplied earplugs or other hearing protection when working in the vicinity of loud equipment.

Noise sources on the surface would include ventilation fans and surface equipment including diesel powered haul trucks, diesel generators, front-end loader, backhoe/skid loader or excavator, bulldozer, motor grader, flatbed truck, and pickup trucks. The ventilation shafts, once completed, would contain a single-vane axial fan with a diffuser. Taller diffusers for improved noise abatement would be installed if additional noise reduction is required.

The use of fans on the Utah side of the project area has been given a categorical exemption due to ‘heat and radon gas’ intensity. Given the remote location of the project area in relation to populated centers, it is unlikely that the amount of noise generated would create a concern to the public. Energy Fuels has taken steps to address noise concerns expressed by the part-time resident within the area. Silencers have been added to the ventilation fans and an older, noisier mobile generator was replaced with a newer, quieter unit. Increases in traffic due to the haul trucks would only occur three times per day (early morning, mid-day, and evening). Noise-related impacts would be minimal as a result of construction and operation of the Whirlwind Mine.
Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to mitigate noise-related impacts under the Proposed Action:

- Energy Fuels has agreed to a noise boundary outside the Whirlwind and Packrat portal areas beyond which noise levels would not exceed 50 decibels (dB). Energy Fuels would take whatever noise reduction measures are necessary to meet the criteria of the 50 dB boundary.

- Generators would be placed in insulated enclosures should noise levels or freezing during the winter become issues of concern.

4.3 ENVIRONMENTAL JUSTICE

4.3.1 No Action Alternative
As described below for the Proposed Action Alternative, the No Action Alternative would not result in a disproportionately high and adverse human health or environmental impact on minority populations, low-income populations, or Indian Tribes.

4.3.2 Proposed Action Alternative
EPA provides a framework for the identification and assessment of significance of environmental justice concerns. A two-step process defines significance criteria for concerns, either of which, if unmet, indicates that environmental justice effects are not likely to be present:

- Does the potentially affected community include minority and/or low-income populations?

- Are the environmental effects likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resources?

Table 3.3-1 in Chapter 3 shows that the racial composition of the population nearest the Whirlwind Mine project area (Glade Park-Gateway CDD) contains a lower portion of minority populations and Indian Tribes than Mesa County or Colorado as a whole. Overall, the percent of minorities in the Glade Park-Gateway CDD is 75 percent lower than the state average and 50 percent lower than the Mesa County average.

Similarly, Table 3.3-2 in Chapter 3 shows that the Glade Park-Gateway CDD contains a lower portion of persons in poverty than Mesa County or Colorado as a whole. The percent of persons living in poverty in the Glade Park-Gateway is 8 percent lower than the state average and 17 percent lower than the county average.

Therefore, the Proposed Action would not result in a disproportionately high and adverse human health or environmental impact on minority populations, low-income populations or Indian Tribes.

Protective/Mitigation Measures. There are no protective/mitigation measures identified for Environmental Justice.

4.4 SOCIOECONOMIC RESOURCES

4.4.1 No Action Alternative
Under the No Action Alternative, activities at the Whirlwind Mine conducted under the prospecting and bulk sampling permits would continue; however, there would not be an increase in workforce, population, and increased benefits to local businesses.
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4.4.2 Proposed Action Alternative
Most socioeconomic impacts, including population, employment, housing, infrastructure and community services, and fiscal impacts result from the size of the Whirlwind Project’s workforce and the duration of the mine’s production. At year-end 2007, four miners were employed on rehabilitation activities at the Whirlwind Portal area. Another three miners were scheduled to join the workforce during the first quarter 2008. The mining workforce is expected to employ between 10 and 12 workers during initial operations and grow to a maximum of 24 workers at peak production. The mining workforce includes a core of experienced miners supported by newly-trained workers who are employed on a year-round basis. Based on proven and inferred ore zones, the Whirlwind Mine has an estimated life of 10 years.

4.4.2.1 Population impacts
Given the small size of the Whirlwind Mine workforce, the Proposed Action would have little impact on the population of Mesa County. New mine workers are expected to be hired from within the region and are not likely to cause substantial shifts in regional population distribution. Depending on their preference for a rural lifestyle, some miners may choose to relocate to Gateway.

4.4.2.2 Employment and Income
Direct employment benefits of the Proposed Action include 10 to 24 year-round mining jobs. The average miner’s salary is expected to be between $40,000 and $50,000 per year, which is above the Mesa County average wage level of $33,700 (see Table 3.4-2).

The Proposed Action would have additional indirect benefits to local and regional businesses through the mine’s purchase of goods and services, such as power, fuel, equipment and parts, and facility construction services. Most of these regional benefits are likely to occur in the towns of Grand Junction, Naturita, and Nucla where most mining service businesses are located.

Businesses providing consumer goods and services would benefit from the increased demand due to the purchasing power of the mine workers. The demand for goods and services would be further stimulated by the demand from people employed by businesses that support the mine and its workers.

4.4.2.3 Housing Impacts
The Proposed Action is not expected to have a measurable impact on Mesa County’s housing market. The influx of new miners and their families into the region is likely to be minimal, and within the absorptive capacity of regional communities such as Grand Junction, Naturita, and Nucla.

The availability of housing in the Gateway area would influence the number of workers who move to the area. Although the housing supply is currently limited and vacancy rates are low, new housing opportunities are emerging in Gateway as land is being prepared for residential development and new housing units are scheduled to be built.

4.4.2.4 Infrastructure and Community Services Impacts
The Proposed Action is not expected to have a substantial impact on infrastructure and community services in Gateway or surrounding communities.

4.4.2.5 Fiscal Impacts
The Proposed Action would generate public sector revenues primarily through ad valorem (property) taxes and sales and use receipts. Property taxes directly related to the Whirlwind Mine are based on production revenues. The Whirlwind Mine is expected to produce 50,000
tons of ore per year with an average grade of 0.25 percent U₃O₈. At the current long-term market price of uranium of $95 per pound, this production level is expected to generate revenues of $23.75 million per year (Energy Fuels, 2008a). The property taxes associated with this level of production are approximately $480,000. Estimated property taxes from production were calculated by multiplying the value of production ($23.75 million) by Colorado’s minerals assessment percentage (29 percent) by the estimated tax rate (69.342 mills or 6.93 percent). This tax rate was estimated using the County Assessor’s summary of 2006 mill levies for taxing districts in Mesa County (Mesa County Assessor’s Office, 2007). The property taxes would benefit a wide range of local service providers, including Mesa County School District #51, the Gateway-Unaweep Fire Protection District, and the Southwest Rural Public Improvement District.

Increased property taxes indirectly related to the Whirlwind Mine could also result from an increase in Mesa County’s property tax base due to additional residential and commercial development, as well as higher values for existing development due to increased demand.

Sales and use taxes on taxable purchases of goods in Mesa County, or purchased elsewhere and imported into the county, are the other major category of public sector revenues associated with the Whirlwind Mine. Direct purchases of goods used at the mine would account for some of these expenditures, but retail expenditures by the company’s employees, contractors, and persons whose jobs are supported indirectly by the mine would account for most of the total sales and taxes. These expenditures and taxes would accrue to several communities in the area, including Gateway, Grand Junction, Naturita, and Nucla, as well as other commercial centers across the region.

**Protective/Mitigation Measures.** There are no protective/mitigation measures identified for Socioeconomic impacts.

### 4.5 LAND USE AND RESIDENTIAL AREAS

#### 4.5.1 No Action Alternative

Implementation of the No Action Alternative would prevent mineral claims from being mined where known resources occur and where past mining operations have occurred. Under the No Action Alternative, other land uses would continue to occur within the project area as they currently are allowed on BLM-administered public lands.

#### 4.5.2 Proposed Action Alternative

Implementation of the Proposed Action would not change the existing land uses within the Whirlwind Mine project area. Grazing would continue and mine operations would not preclude recreational use. Habitat would still be available to wildlife in the Whirlwind Mine project area. There could be some impact from noise and light pollution to the private landowner to the northwest. Overall, impacts to land use and residential areas would be minimal.

**Protective/Mitigation Mitigation.** Protective/mitigation measures have not been identified for impacts to Land Use. Measures identified for mitigation of noise and visual impacts to the residence are discussed in the noise and visual sections of this chapter.

### 4.6 TRANSPORTATION

#### 4.6.1 No Action Alternative

Under the No Action Alternative, mine operations under the prospecting and bulk sampling permits would continue but mine operations would not be expanded. There would be no
increased traffic on John Brown Road as a result of expansion of the Whirlwind Mine, and the Whirlwind Mine would not apply dust suppressants on John Brown Road and Mesa County Road \( \frac{5}{10} \) upon completion of the bulk sampling project.

### 4.6.2 Proposed Action Alternative

Transportation impacts could result from increased traffic on John Brown Road, Colorado and Utah state highways, and U.S. Highways. Impacts could also occur to roads which would require increased maintenance. Ore haul trucks could cause impacts due to the sensitivity of the material being hauled.

**Traffic.** Traffic-related impacts could occur from increased traffic. Mine workers would most likely travel on Colorado State Highway 141, John Brown Road, and Mesa County Road \( \frac{5}{10} \). Ore haul trucks would cause increased traffic on Mesa County Road \( \frac{5}{10} \), John Brown Road, Colorado State Highway 141, Colorado State Highway 90, Utah State Highway 46, and U.S. Highway 191.

The ore haul route described above has been identified as the only all-weather and primary route for ore haul trucks. The Plan (Energy Fuels, 2007a) also identifies three other potential haul routes and additional permits and approvals would be required before these routes could be used (Map 2.2-5 in Chapter 2). Route B identified in the Plan is via the La Sal Mountain Loop Road to Utah State Highway 128 through Castle Valley. UDOT has placed a 55,000 pound load limit on Utah State Highway 128 to minimize through traffic because the road is narrow and there is a lot of tourist traffic (Stapely, 2008). Energy Fuels would be required to obtain a variance from UDOT to use this route. The route identified as Route C in the Plan (Energy Fuels, 2007a) travels through the Manti-La Sal National Forest. The Forest Service would limit hauling to daylight hours due to the high likelihood of haul trucks colliding with deer crossing the highway in the La Sal and Devils Canyon Areas (Nowak, 2007). Route D identified in the Plan (Energy Fuels, 2007a) turns south at La Sal Mountain Loop Road and connects with U.S. Highway 191 south of Moab. San Juan County currently has no weight restrictions on this road; however, there may be a weight restriction in the future (Laws, 2008).

Traffic increases resulting from peak worker traffic would be 12 light-vehicle round trips (24 trips total) per day. An additional two light-vehicle round trips (4 trips total) and one heavy-vehicle round trip (two trips total) would be necessary for delivery of supplies, parts, and equipment. Production of 200 tons of ore per day would require eight round trips (16 trips total) per day for ore haul trucks. This traffic results in a total of 14 light-vehicle round trips (28 trips total) and nine heavy-vehicle round trips (18 trips total) per day at peak production.

A level I Traffic Engineering Evaluation is required for all projects in Mesa County that generate less than 10 trips during the peak hour and is intended to document the project trip generation and determine if auxiliary turn lanes are required at the proposed access point. An evaluation was conducted by an independent consulting firm (Kimley Horn, 2007). Based on CDOT traffic counts and forecast rates of increase, an estimate of 16 round trips (32 trips total) per day associated with Whirlwind Mine ore transportation would result in an incremental increase of between 1.9 percent (in 2008) and 1.3 percent to average traffic volume on Colorado State Highway 141. This traffic estimate is almost twice the heavy-vehicle traffic projected for peak production of 200 tons of ore per day. The evaluation concluded that based on Mesa County guidelines, construction of auxiliary turn lanes at the junction of John Brown Road and Colorado State Highway 141 is not required (Kimley-Horn, 2007).

Based on CDOT traffic counts and forecast rates of increase, 16 round trips per day from the Whirlwind Mine (twice the ore haulage traffic associated with peak production of 200 tons per day) would result in an incremental increase of 3.7 percent on Colorado State Highway 90 in
2008. Forecast volumes for Utah highways are unknown for 2008. However, based upon UDOT 2006 data alone, AADT would increase 6.8 percent on Utah State Highway 46 from the Colorado state line to La Sal; and from La Sal to the junction with U.S. Highway 191, AADT would increase 2.7 percent. Ore transportation along U.S. Highway 191 would result in an increase of 0.40 percent to 0.75 percent between La Sal and Blanding.

**Maintenance.** The Whirlwind Mine would be responsible for maintaining all mine roads and Mesa County Road 5/10 from John Brown Road to the mine. Energy Fuels has been issued Surface Alteration Permits from Mesa County for Mesa County Road 5/10 and John Brown Road. They set forth conditions that the Whirlwind Mine must follow. The permit for Mesa County Road 5/10 requires installation of additional culverts, road improvements (addition of sub-base and gravel), periodic grading, application of magnesium chloride for dust suppression, and winter snow removal. Biannual weed surveys and spraying are also required by Mesa County along Mesa County Road 5/10. The permit for John Brown Road is limited to snow removal and road maintenance during the winter months. John Brown Road is maintained by Mesa County through the winter to just beyond the intersection with Mesa County Road 5/10. Snow and ice create hazardous driving conditions which would be minimized by increased winter maintenance of the roads.

The access roads to the portal areas would be dirt and/or gravel and bermed in accordance with MSHA regulations. The roads into the Whirlwind and Packrat portal areas would have swinging/locking metal gates. Gates would be locked during weekends, holidays, and other down times. The short access roads to ventilation shafts and power drops would typically be two-track overland roads that would only be used for periodic inspections and maintenance.

**Haul Trucks.** Ore would be transported from the mine to the White Mesa Mill in Blanding, Utah. Ore haulage would be contracted to one or more trucking companies, which would be responsible for developing and implementing an Emergency Response Plan in the event of an accident, obtaining required road use permits, and obeying all traffic rules. Road use constraints mandated by the counties or the BLM would be incorporated into the Whirlwind Mine third party haulage contracts. Emergency response and remediation services in the event of an accident may be supported by the Whirlwind Mine, provided that the ore haulage contractor requests this service as part of the contractual arrangement.

All ore shipments would be conducted in accordance with applicable CDOT and UDOT regulations which require that specific shipping documents be prepared for each shipment and then accompany the shipment to the mill. Ore haul trucks would be dedicated to uranium ore transportation and would be cleaned at the mill prior to returning to the Whirlwind Mine. The regulations also mandate that all shipments be tarped to reduce the potential for accidental spillage and fugitive dust. The Ore Transportation Plan in the Plan (Energy Fuels, 2007a) identifies emergency response procedures that would be part of the Emergency Response Plan and is included as Appendix C to this document.

The Mesa County Conditional Use Permit requires that truck hauling of ore to the mill be limited to 5 days a week, Monday through Friday, from April 15 through December 15 of each year. It requires that the ore be transported on a fixed schedule not to exceed three periods per day that would be clearly posted on the road and within the Town of Gateway.

Based on the permit requirements, limitations on ore transportation, road improvements, road maintenance requirements, and the results of the traffic study (Kimley-Horn, 2007), impacts to transportation resources would be minimal.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to mitigate transportation impacts under the Proposed Action:
To minimize impacts to recreational users of John Brown Road, the ore haul trucks would only travel to and from the site during three time intervals (i.e., early morning, midday, and late afternoon) and would be limited to 5 days a week, Monday through Friday. The times would be posted on the road and in the Town of Gateway. Truck traffic would be limited to weekdays from April 15 through December 15 to reduce weekend traffic levels during the warmer times of the year when recreational use is greater. The trucks would be convoyed using an escort vehicle, if needed, when haulage rates increase.

- Dust suppression measures would be implemented including tarping of truck beds prior to leaving the mine, spraying water, and application of magnesium chloride (up to three times a year) on the mine haulage roads, as necessary, to control dust during the summer months.

- Ore haulage would be performed by contractors who would be required to obtain all necessary permits and clearances, following CDOT and UDOT regulations including establishment of an Emergency Response Plan. Ore transportation, materials transportation, and personnel vehicular use would be in compliance with all applicable laws and regulations.

- Energy Fuels would consult with Mesa County, the BLM, and the COE, as appropriate, in the event that additional road upgrades or culvert installations are necessary. Improvements would be designed according to Mesa County and BLM’s standard design practices (i.e., # 17, 18, 19 and 20 of Appendix B in BLM, 1987) to minimize impacts to streams.

- The Whirlwind Mine would provide a 4-wheel-drive company van for the employees to minimize light-vehicle traffic.

### 4.7 RECREATION RESOURCES

#### 4.7.1 No Action Alternative
Under this Alternative, there would be no additional impacts to recreation resources. Current activities being conducted at the Whirlwind Mine under existing prospecting and bulk sampling permits would continue up to a total of 999 tons.

#### 4.7.2 Proposed Action Alternative
Impacts to recreational resources in the project area or within the greater region of Gateway and remote central-east Utah would be minimal. The Proposed Action is consistent with BLM GJFO’s management objective (BLM, 1987) to protect high value recreation sites in the Gateway Intensive Recreation Management Area. Implementation of the Proposed Action would not prevent achievement of the recreation resource objectives to ensure the continued availability of outdoor recreation opportunities and to protect resources and meet the legal requirement for visitor health and safety (BLM, 1987). Lands managed under the BLM MFO Grand Resource RMP (BLM, 1985a), while important to hunters and other backcountry recreationists, would not be affected by the minor 1.38 acres of disturbance associated with the six vent shafts that would be installed over the expected 10-year life of the mine.

Seasonal big game hunting opportunities in the area would not be impacted because there would be no access restrictions on road or public lands resulting from mine operations and ore transportation. No declining trends in elk, deer, or black bear harvest and hunting recreation days are expected as a result of mining operations and subsequent reclamation.
There would be minimal impacts to hiking and mountain biking in the Whirlwind Mine project area and vicinity because most of these uses would occur away from roads and surface areas affected by mine operations. However, there could be some impacts to recreational user access to trailheads due to the potential for encountering ore haul trucks on John Brown Road. Temporary delays in arriving at trailheads could occur, but access would not be blocked. Additionally, John Brown Road is used by permitted and casual visitors who mountain bike and motorcycle to the Moab area recreation opportunities. This activity takes place over an 8 to 9 month period every year, depending on weather. The forecasted increase in recreational visitors attracted by the Gateway Canyons Resort would likely accelerate the rate of increased recreational traffic of all kinds in the area. With the increase in ore haul trucks on John Brown Road, there is increased potential for accidents between bicyclists or motorcyclists and the ore haul trucks.

**Protective/Mitigation Measures.** Impacts to recreational users would be minimized by implementation of several mitigation measures associated with traffic (see Section 4.6). There are no additional protective measures or mitigation defined for Recreation Resources above and beyond those listed for Transportation.

### 4.8 VISUAL RESOURCES

#### 4.8.1 No Action Alternative

Under this Alternative, there would be temporary impacts to visual resources. The approximate 4 acres of surface disturbance and associated structures allowed under the existing exploration and bulk sampling permits would temporarily impact scenic qualities of the surrounding landscape until 999 tons have been sampled.

#### 4.8.2 Proposed Action Alternative

The impacts to visual resources associated with the Proposed Action are expected to be low because of the relative small size of proposed surface disturbances and the topographic screening of most of the project area. The BLM VRM objective to protect the quality of the scenic values on public land would not be compromised by the proposed Whirlwind Mine (BLM, 1987). The mine area cannot be seen from Gateway, the Dolores River Canyon, or John Brown Canyon. Roads leading to the mine wind through various topographic and vegetative screens, and the mine site and operations cannot be seen upon approach until viewers reach the immediate vicinity. There is potential for the mine site to be seen from far away points of interest such as the Palisade WSA and the La Sal mountains and foothills, especially as the waste rock storage area expands. The overall landscape from these limited and distant viewpoints would not be substantially altered and the mine activity would not dominate the view of the casual observer.

A portion of the haul route coincides with the Unaweep/Tabeguache Scenic and Historic Byway. The increase in haul truck traffic, for most travelers, would not affect visual resources along the byway. Truck traffic on state and federal highways is an everyday occurrence, and travelers do not tend to notice expected and usual events, especially if their focus is on surrounding scenic landscapes. Residents that live along the scenic byways, particularly in remote areas, would likely notice the increase in truck traffic. For these people, the trucks would adversely affect their views of the landscape during the brief moment that the truck passes the residence (DOE, 2007).

Over the life of mine operations, there would be changes to local views due to the presence of mine surface facilities and incremental expansion of topsoil stockpiles and the waste rock
storage area. Upon reclamation completion, surface facilities would be removed and disturbed areas revegetated, resulting in minimal to non-existent long-term effects to visual resources.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to mitigate impacts to visual resources under the Proposed Action:

- There would be incremental and interim reclamation of various parts of the project site. Examples would include:
  - Seeding of topsoil stockpiles with native vegetation to prevent erosion and weed propagation, provide a native plant seed base when the topsoil is used for final reclamation and to help the stockpiles blend visually into the surrounding background colors and landscape.
  - Contemporaneous seeding and reclamation of the north embankment of the waste rock storage area as it is built to the east of the Whirlwind Portal.
  - Incremental opening of new areas for the expanding waste rock storage area as needed to the east to keep the newly disturbed and unreclaimed areas associated with the waste rock storage area as small as possible.
  - Reclamation and seeding of unneeded disturbed areas around the vent shafts and power drop shafts to minimize the size of these small, disturbed areas.
  - Weed control in all areas of the project. This would prevent noticeable visual contrasts often associated with weed infestations.

- Outdoor lighting would be of the full cut-off type, in accordance with Mesa County requirements, to reduce visibility from the Gateway area.

- Buildings, other structures, and permanent equipment such as vent shaft fans and generator sound mitigation covers would be painted a BLM-approved color, as per BLM VRM BMPs (BLM, 2005a), using color(s) from either the chart of Standard Environmental Colors or the chart of Supplemental Environmental Colors, to blend in with the environment and surroundings. Structures currently on the mine site provide a good example of this fabricated visual screening method and continuation of this practice would minimize visual impacts in the near-, medium-, and long-distance viewsheds.

### 4.9 WILD AND SCENIC RIVERS

#### 4.9.1 No Action Alternative

Under the No Action Alternative, there would be no impact to any designated rivers under the WSRA.

#### 4.9.2 Proposed Action Alternative

Under the Proposed Action, there would be no impact to any designated rivers under the WSRA.

### 4.10 WILDERNESS AREAS

#### 4.10.1 No Action Alternative

Under the No Action Alternative, there would be no impact to any designated wilderness areas or WSAs.
4.10.2 Proposed Action Alternative
Under the Proposed Action, there would be no impact to any designated wilderness areas or WSAs.

4.11 CULTURAL AND HISTORIC RESOURCES

4.11.1 No Action Alternative
Under the No Action Alternative, there would be no additional disturbance in the Whirlwind Mine project area and, therefore, there would be no impact to cultural resources.

4.11.2 Proposed Action Alternative
Based on the findings, no historic properties (sites that are either listed, or are eligible for listing on the National Register of Historic Places (NRHP)) occur in areas proposed for disturbance. The five sites found to be eligible for nomination to the NRHP, described in Section 3.11, would not be directly impacted by the Proposed Action. Therefore, there would be no direct impacts to historic properties as a result of construction and operation of the Whirlwind Mine.

Potential direct impacts to cultural resources of the types documented in the APE could result from ground-disturbing activities that might destroy archaeological remains or alter the integrity of the site. Potential indirect impacts might occur in the form of increased accessibility and pedestrian traffic in the area resulting in increased opportunities for vandalism or casual collecting of artifacts. This is highly unlikely because existing roads would be used for mine access that do not require improvement. Potential for unauthorized access would not be increased because no new roads would be built.

The NHPA, as amended, requires that if newly discovered historic or archaeological materials or other cultural resources are identified during the Proposed Action implementation, work in that area must stop and the BLM AO must be notified immediately. Within five working days the AO would inform the operator as to the mitigation measures the operator would likely have to undertake before the site can be used (assuming in place preservation is not necessary) (36 CFR 800.13).

The Native American Graves Protection and Repatriation Act (NAGPRA) requires that if inadvertent discovery of Native American Remains or Objects occurs, any activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice be made to the BLM AO, as well as the appropriate Native American group(s). Notice may be followed by a 30-day delay (NAGPRA Section 3(d)).

Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to mitigate impacts to cultural resources under the Proposed Action:

- Mitigation of potential impacts to cultural resources would be accomplished through mandated avoidance of historic properties by mine personnel.
- The proposed vent shafts have been located away from the existing cultural sites. The five sites found to be eligible for nomination to the NRHP (42GR2095, 42GR2777, 42GR2778, 42GR3188, and 5ME15765) would be protected from indirect impacts by limiting vehicular access to the site vicinity.
- Energy Fuels is responsible for informing all persons who are associated with the project operations that they would be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts.
• Strict adherence to the confidentiality of information concerning the nature and location of archeological resources would be required of Energy Fuels and all of their subcontractors (Archaeological Resource Protection Act, 16 U.S.C. 470hh).

4.12 NATIVE AMERICAN RELIGIOUS CONCERNS

4.12.1 No Action Alternative
Under the No Action Alternative, there would be no additional disturbance in the Whirlwind Mine project area and, therefore, there would be no additional Native American religious concerns.

4.12.2 Proposed Action Alternative
Based on the information available to-date, no impacts to Native American Religious Concerns would result from the BLM’s approval of the Plan (Energy Fuels, 2007a). The BLM GJFO has consulted with Tribal representatives on previous projects in this area and provided instructions for the protection of culturally sensitive sites, should any be discovered during construction.

Protective/Mitigation Measures. The following protective/mitigation measure would be implemented to mitigate impacts to Native American Religious Concerns under the Proposed Action:
• In addition to the stipulations for the protection of Cultural Resources, if new information is brought forward, any site-specific Native American mitigation measures suggested during previous notification/consultation would be considered during the implementation of the Proposed Action. If new information is provided by Native Americans during the EA process, additional or edited terms and conditions for mitigation may be negotiated or enforced to protect resource values.

4.13 GEOLOGICAL RESOURCES

4.13.1 No Action Alternative
There would be no additional impacts to geologic resources under the No Action Alternative. Impacts to geologic resources associated with prospecting and bulk sampling of up to 999 tons would continue.

4.13.2 Proposed Action Alternative
The Proposed Action would mine a residual ore body within the Urantah decline and Packrat mine areas. The mining would produce (at maximum capacity) up to 200 tpd (White, 2007). The mining would result in waste rock and ore being transported to the surface and placed outside the Whirlwind Portal. The ore would be hauled to the mill for processing while the waste rock storage area would remain on-site. Subsidence into mine workings is unlikely given the structural integrity of the host rock formation, the depth below the surface, and the proposed mining methods (modified room and pillar).

Protective/Mitigation Measures. There are no protective measures or mitigation for geologic resources.

4.14 PALEONTOLOGICAL RESOURCES

4.14.1 No Action Alternative
Under the No Action Alternative, there would be no additional disturbance in the Whirlwind Mine project area and, therefore, there would be no impact to paleontological resources.
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4.14.2 Proposed Action Alternative
The Morrison Formation is known to produce scientifically important fossils and they could be encountered during surface disturbing activities and in the underground workings. Strict adherence to mitigation measures described below would ensure that there are not substantial impacts to paleontological resources.

Protective Measures/Mitigation. The following protective/mitigation measure would be implemented to mitigate impacts to Paleontological Resources under the Proposed Action:

- If a dinosaur fossil is encountered during mining operations, work in that area of the mine would cease immediately and Energy Fuels staff would notify the BLM AO at the GJFO of the discovery. The BLM would notify appropriate personnel and arrange a timely inspection of the fossil. A decision would be made as to whether mining could continue or not depending on the discovery requiring excavation or further documentation. In any case, decisions and paleontological work would be completed in a reasonably short timeframe to avoid unreasonable delays in mining progress. Mining operations could continue in other parts of the mine while the paleontology issue is being resolved.

4.15 SURFACE WATER

4.15.1 No Action Alternative
The existing bulk sampling facilities would remain in place and no additional surface disturbance would occur under this Alternative. At the conclusion of bulk sampling, the existing surface disturbance of about 4 acres would be reclaimed in accordance with the approved DRMS and BLM permits and subsurface water pumping and treating would cease. The Packrat Mine waste rock pile reclamation would essentially remain unchanged. Rather than a sediment pond below the mine to settle out suspended solids from runoff as detailed in the Plan (Energy Fuels, 2007a), the exploration plan calls for berms to fully contain direct precipitation on site. Flow in Lumsden Creek would continue to be in response to precipitation runoff and snowmelt runoff.

4.15.2 Proposed Action Alternative
Potential surface water impacts from mining operations include water quality degradation and changes to surface water flow (hydrology) in Lumsden Creek. These potential impacts and mitigation are described in detail below.

Water Quality
Water quality impacts could occur from vegetation removal and land clearing, mine water discharge, ore stockpiling, waste rock storage, ore transport, road maintenance, motorized vehicle and equipment cleaning and fueling, oil and chemical spills, and other mining-related support activities. Accelerated sediment erosion could occur from increased soil compaction and reduced infiltration as a result of vegetation removal, resulting in sediment transport and deposition in Lumsden Creek and eventually the Dolores River. Mine water containing elevated pollutant levels would be pumped from within the mine; this would be treated prior to discharge to the middle tributary of Lumsden Creek as described below. Precipitation falling on the ore stockpile, waste rock pile, and any other contaminated areas within the mine project site could pick up pollutants and become stormwater. Ore transport on John Brown Road and State Highway 141 would be adjacent to John Brown Creek and the Dolores River, respectively, both perennial waters. Spills could introduce ore containing elevated concentrations of many chemical and radioactive constituents to these waterbodies. Road maintenance including blading and the addition of magnesium chloride and sand to road surfaces could introduce
additional sediments and chemical pollutants to John Brown and Lumsden creeks. Vehicle and equipment cleaning, fueling, and oil and chemical spills could introduce hydrocarbons, solvents, and other chemicals to soils and surface waters.

The potential water quality impacts described above would be minimal or negligible due to proper implementation of BMPs stated in the Plan (Energy Fuels, 2007a) and/or required by the BLM, DRMS, CDPHE-WQCD, and other federal, state, and local agencies.

To prevent contamination of surface waters, water originating outside of the mine project area would be routed around the mine materials and facilities. Stormwater from the ore stockpile area would be conveyed to the water treatment pond for sediment settling and on-site water treatment. Potential impacts to groundwater quality resulting from the ore stockpile pad are described in Section 4.16 – Groundwater. Stormwater outside of the ore stockpile area but within the waste rock storage area and mine facilities would be collected in the sediment pond. Chemicals used on-site would be properly stored to prevent exposure to surface water. Secondary containment would be required for appropriate chemicals. Plans (i.e., Materials Containment Plan and SPCC Plan) for management of petroleum hydrocarbon compounds would be implemented to control incidental spills and to contain contaminants on-site.

The intent is that all water leaving the site would be discharged either from the water treatment plant under the CDPS discharge permit (CO-0047562) or from the sediment pond emergency spillway. Prior to the treated water discharge, water would be sampled and analyzed on a weekly and monthly basis during active discharge operations to verify that the discharge meets permit conditions. The permit limits for each constituent are based on the state water quality standards for the Dolores River at Gateway (Stream Segment 3a). A quarterly report of the discharge dates and sampling results would be provided to the DRMS and BLM. Certain parameters have exceeded permit levels in the treated discharge water from Energy Fuels’ bulk sampling phase; these have been reported to CDPHE and BLM and Energy Fuels has been modifying the water treatment system to address the exceedances which include the 30-day average and daily maximum effluent limitations for selenium, dissolved Ra-226 and total Ra-226 + radium-228 (Ra-226+Ra-228), pH, and total suspended solids (TSS). Seventeen other parameters were analyzed and found to be in compliance with provisions in the discharge permit. These parameters include flow, chemical oxygen demand (COD), oil and grease, TDS, whole effluent toxicity (WET), arsenic, boron, beryllium, cadmium, trivalent chromium, lead, manganese, nickel, vanadium, zinc, uranium, and weak dissociable cyanide. The Whirlwind Water Treatment Compliance Summary is included as Appendix D in this EA.

The water collected in the sediment pond would be sampled and analyzed on a quarterly basis for a full suite of DRMS water quality parameters including Ra-226 and uranium. In the event that a sediment pond sample fails to meet state standards, Energy Fuels would conduct visual reconnaissance, sample soil materials, and conduct follow-up sampling and analysis of subsequent surface water runoff events. A report of exceedances and corrective action taken would be provided in the quarterly report to the DRMS and BLM. If the water from the emergency overflow should continue to exceed state standards, additional mitigation measures would be adopted in consultation with the DRMS and the BLM. This could include diverting the sediment pond water to the water treatment system for treatment prior to discharge under the CDPS discharge permit.

The ore would be transported to a mill over existing county roads, and state and U.S highways. Ore haul truck crashes that result in the loss of ore during transportation would be remediated under the Emergency Response Plan. The BLM hazardous materials coordinator would be notified as soon as possible. Impacts to other streams and drainages outside of the permit boundary and Lumsden Creek drainage basin could occur because of a haulage accident;
however, such accidents would rarely occur. With rapid cleanup and containment, there would not be a resulting long-term environmental impact to a stream or drainage.

Potential consequences of an accidental spill of uranium ore into surface water were discussed in the Uranium Leasing Program Final Programmatic EA in which the following was concluded (DOE, 2007, page 5-13):

“If an accident occurred where the uranium ore was dumped into a surface water source, it is unlikely that any adverse impacts to biota would occur because of the relatively low toxicity and low concentrations of the hazardous constituents of uranium ore. If the ore were spilled into a shallow surface water source, it would be removed before water quality could be adversely affected. Most ore would be in large enough sizes (e.g., cobbles) that it would be recovered easily from the water source. The finer particles would be dispersed by stream flow and would not create a radiological hazard to aquatic life. The primary impact to water quality from a spill would be a short-term increase in turbidity and total suspended solids.”

Reclamation would result in the mine area being returned to a stable, vegetated condition consistent with the surrounding undisturbed areas. The waste rock storage area would be contemproaneously developed and reclaimed during mining to minimize sediment loading of the sediment pond. The waste rock storage area would be covered with topsoil, stabilized with vegetation, and stored on-site permanently. The reclaimed area would be maintained until the reclamation bond is released by the DRMS and the BLM. To control sediment during the reclamation phase, the sediment pond would not be backfilled until vegetation is adequate to control erosion from the site. To prevent contamination of surface water during and after reclamation, material containing elevated radionuclide levels such as water treatment sludge and residual ore pad material would be tested. The BLM would dictate the disposal method and location based on test results.

**Water Quantity**

Potential impacts to water quantity include flow changes to Lumsden Creek, the Dolores River, and (DP, PR, and Lumsden Canyon springs). Flow upstream of and within the mine project area would be modified under the stormwater management system, which would be implemented to direct stormwater flow to minimize stormwater pollution. Impacts and mitigation are described below.

Potential impacts to flow in Lumsden Creek include increased flow as a result of the CDPS permitted discharge and a decrease in flow as a result of removal of runoff area associated with the mine facilities. Based on observations of the nearby springs and the steep and rugged topography of Lumsden Creek, the discharge would be expected to infiltrate into the streambed within a short distance from the mine permit area when the creek is not flowing. However, an observation by BLM staff in the spring of 2008 during a treated water discharge event indicated that the water traveled approximately 1 mile down Lumsden Creek. This suggests that the flow distance before infiltration varies seasonally; it may flow a mile or more before becoming subsurface flow during the winter and spring months. The treated water is also discharged at a much higher rate than from any of the nearby springs, giving it the ability to flow farther downstream. When the creek is flowing, the discharge could be transported downstream and could eventually reach the Dolores River. With adherence to the Stormwater Management Plan (SWMP) and the requirements of the CDPS discharge permit, the only potential increase in flow as a result of mining operations would be from the CDPS permitted discharge or from the emergency overflow in the sediment pond. There would be approximately 24 acres of potential runoff area removed from the creek during mining operations. Compared to the Lumsden Creek drainage basin area (6,593 acres), the reduction in surface water flow would be negligible.
Therefore, an increase or decrease in flow as a result of mine operations would not result in a measurable or permanent impact to the hydrology of Lumsden Creek.

The area around DP Spring, PR Spring, and Lumsden Canyon Spring would not be directly impacted as a result of mining activities. Surface water from the Whirlwind Portal area facilities from either the permitted discharge or the emergency overflow from the sediment pond would not flow directly to any of the springs (see Map 3.15-1). A discussion of the potential impact to the springs from underground mine workings is provided in Section 4.16. – Groundwater.

To monitor the springs for potential flow and water quality impacts, flow rates would be measured for DP and PR springs and water quality would be sampled and analyzed for PR Spring on a quarterly basis. An annual survey of the project area would also be conducted each summer to check for new water seeps and springs. A notification to the BLM, DRMS and cooperating regulatory authorities would be provided if the flow rate or water quality changes over time.

**Stormwater.** Energy Fuels has obtained a General Stormwater NPDES Permit (COR-040227) from the CDPHE-WQCD. As part of the permit requirements, Energy Fuels prepared the SWMP which would be implemented to manage runoff and surface water quality. The SWMP addresses both permanent and temporary BMPs as well as stormwater monitoring. The nearest aquatic habitat to the mine is the Dolores River, which is about 5 miles away. The only manner in which any discharge could reach the river is during storm events and spring snowmelt when the treated water mixes with and is strongly diluted by natural flows within the drainage.

As described in Chapter 2, surface drainage controls would consist of 1) diversion of potential run-on stormwater around the portal areas utilizing ditches and culverts; 2) collection of surface runoff from the waste rock storage area and other facilities in ditches and culverts that would flow into a sediment pond prior to discharge; and 3) treatment and discharge of post-contact stormwater from the ore stockpile pad.

The Whirlwind Mine facility has been designed to focus disturbance at the Whirlwind Portal area where the topography is relatively gentle and surface water may be controlled to minimize erosion (see Section 2.2.2.3 in Chapter 2). To prevent run-on to the facilities from undisturbed areas, all undisturbed runoff would be diverted away from the project area for a 100-year storm event and would be collected through a series of diversion ditches and culverts. Diversion ditches would be seeded to provide stable vegetation, except in areas where the flow velocity would exceed 5 feet per second, as defined in the SWMP. These steeper areas would be lined with riprap. The diversion ditches are temporary structures that would be maintained for the life of the mine; however, the diversions around the waste rock storage area would be permanent.

All runoff from the surface facilities at the Whirlwind Portal area (except for runoff associated with the ore stockpile area) would be collected and directed to the sediment pond. It is expected that at most times of the year the sediment pond would be dry. Excess water that accumulates in the sediment pond would be used for mine operations and dust suppression. The sediment pond is designed to contain all the runoff from the 10-year 24-hour storm event. Storm events larger than this size would be released through the pond’s emergency overflow. In the event of an overflow, the water would be directed to the middle tributary of Lumsden Creek.

Excess water from the underground workings and stormwater runoff that is collected in a sump from the ore stockpile pad area would be treated and discharged. The water would be discharged under the CPDS discharge permit to the middle tributary of Lumsden Creek; however, the discharge of water would be infrequent because the mine would use a substantial portion of the treated mine water for mine operations and fugitive dust control. In accordance with the requirements of the CDPS discharge permit and EPA’s oil storage regulations, Energy
Fuels has prepared a Materials Containment Plan and an SPCC Plan for management of petroleum hydrocarbon compounds. These plans provide measures for storage and use of chemicals (e.g., water treatment chemicals, solvents, antifreeze) and petroleum products, respectively, and for cleaning up and reporting spills or releases of these materials. Secondary containment would be provided for storage of chemicals and petroleum products. In the unlikely event of a spill or release outside of the secondary containment, all runoff from the Whirlwind Mine facilities area (except for runoff associated with the ore stockpile pad area) would be captured in the sediment pond located at the lower end of the site providing tertiary containment.

Like the Whirlwind Portal area, stormwater run-on to the Packrat Portal area would be permanently diverted around the site to prevent contact with waste rock and other materials. Stormwater runoff at the Packrat Portal area would be diverted into a sump designed for the 100-year precipitation event with no discharge. Ore and waste rock would be placed in bins (30 ton) located on the pad and transported to the Whirlwind ore pad and waste rock storage area, respectively, thus eliminating contact with stormwater runoff at the Packrat Portal area. Water collected in the bins would be transported to the Whirlwind ore pad and waste rock storage area with the ore and waste rock. Packrat Portal area disturbance would be limited to 1 acre and there would be no re-disturbance of the steep sides of the waste rock pile that were previously reclaimed (including the pocking).

Other areas of the mine site are limited to small vent shaft and power drop pads that are typically about 100 feet by 100 feet in size and located outside of surface drainage areas. The small pad areas associated with vent shafts and power drops would be either reseeded after initial clearing and/or bermed to prevent surface water run-on and runoff.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to reduce impacts to surface water resources under the Proposed Action:

- Surface drainage from undisturbed uphill areas would be permanently diverted around mine workings and into ditches and culverts that drain into natural drainages.
- Surface drainage from the Whirlwind Portal area surface facilities (except for the ore stockpile pad) would be diverted through ditches and culverts to the sediment pond.
- Excess mine water and stormwater runoff from the ore stockpile pad would be isolated and treated prior to discharge under the CDPS discharge permit.
- Energy Fuels would conduct sampling and analysis of the treated water prior to discharge as required by the CDPS permit.
- Energy Fuels would sample and test material containing elevated radionuclide levels such as water treatment sludge and residual ore pad material. The BLM would dictate disposal method and location based on test results.
- Energy Fuels would conduct quarterly sampling of sediment pond water and implement mitigation, if necessary.
- Chemicals and hydrocarbon products (including used oil) would be contained and controlled under the Materials Containment Plan and SPCC Plan, respectively.
- Flow rates would be measured for DP and PR springs and water quality would be sampled and analyzed for PR Spring on a quarterly basis.
- An annual survey of the project area would also be conducted each summer to check for new water seeps and springs.
• Spills that may occur during ore transport would be cleaned up under the Emergency Response Plan. The BLM hazardous materials coordinator would be notified as soon as possible.

• Energy Fuels is conducting a hydrogeologic study to better define the connectivity of area springs and groundwater, and provide additional information for mine closure planning. The study includes examination of the fault system in the Lumsden drainage and Lumsden Canyon Spring to determine source waters of the spring. Determination of connection between PR Spring and the Packrat Portal cannot be determined until there is safe access to the underground workings of the Packrat Mine.

4.16 GROUNDWATER RESOURCES

4.16.1 No Action Alternative
Under the No Action Alternative, the existing bulk sampling facilities would remain in place, but no additional surface disturbance would occur, the underground mine workings would not be developed further, and the vent shafts/power drops would not be installed. At the conclusion of bulk sampling, the existing surface disturbance of about 4 acres would be reclaimed in accordance with the approved DRMS and BLM permits. Groundwater would continue to be treated on a limited basis during on-going bulk sampling activities after which, the mine openings would be sealed. Under the No Action Alternative, existing groundwater conditions (quality and quantity) would remain unchanged.

4.16.2 Proposed Action Alternative
Mining activities, such as the installation of vent shafts and exploration drill holes and development of underground mine workings that intersect and link aquifers without control measures (sealing, packing, or grouting) have the potential to affect groundwater quantity by acting as conduits that can cause depletion or diversion of aquifers into mine workings or other aquifers. Groundwater quality can be affected by cross linking or comingling aquifers with differing qualities or with mine water which has been exposed to mineralized ores or materials. These activities can also affect groundwater quantity and quality in area wells and springs. Groundwater quality could be impacted by leaching of contaminant from the storage of ore and waste rock. Groundwater quality impacts can also occur from spills of fuel, hydraulic fluids, lubricating oils, or other chemicals that are required for mining.

Construction, operation, and reclamation at the Whirlwind Mine would be implemented using BMPs to reduce or avoid potential groundwater effects as specified in the Plan (Energy Fuels, 2007a) and the DRMS Permit.

Groundwater Quantity
In the project area, the ore zone in the Top Rim of the Salt Wash Member does not naturally contain a substantial source of groundwater; however, groundwater is seeping into the mine from water-bearing zones above the workings. These water zones include the small sandstone unit at the base of the Burro Canyon Formation and perched water in lenticular sandstone lenses within the Brushy Basin Member. Seepage is known to be entering the mine workings from the Brushy Basin Member through an ungrouted vent shaft, a sandstone lens within the lower part of the Urantah Decline, and unplugged exploration drill holes (see Figure 3.13-1).

Groundwater source control and monitoring would be implemented during mine operations and during mine closure and reclamation. Source control measures include packing and grouting of open exploration drill holes and vent shafts by plugging historical exploration drill holes and sealing around the casing of the 10-Straight Vent Shaft. The measures are designed to reduce
the volume of water entering the mine, creating pools that could produce a seep or spring on the surrounding hillslope or at the portals, reduce the intermingling of groundwater from different zones, and minimize depletion of water resources from overlying aquifers.

During mining operations, most of the water inflow into the mine workings would be used to support underground drilling and dust suppression activities. Excess water would be pumped to the surface and treated prior to discharge. Some of the water would ultimately leave the mine in the ventilation system and in the moist to wet ore and waste rock removed from the mine. Energy Fuels obtained a water well permit (Permit # 66419) and a conditional water right (Case #07CW69) from CDWR to use the water from the Whirlwind Mine sump. The consumptive use would increase over time as additional working sections are added to the mine. Excess water that is not used would be pumped from the mine and treated prior to discharge under the CDPS discharge permit. The conditional water right is for 24.4 acre-feet per year. This quantity of water is higher than what is produced in the mine which is estimated to be 8 to 16 acre-feet per year. Consumption at full production is estimated to be about 15,000 gallons per day which is equivalent to 11.5 acre-feet per year (based on a 250-day work year).

As indicated in Section 3.16 and on Figure 3.13-1, improperly sealed exploration drill holes and shafts are believed to be a source of groundwater seepage into the mine workings. Source control measures include packing and grouting of open exploration drill holes and vent shafts by plugging historical exploration drill holes and the 10 Straight Vent Shaft. Sealing these existing shafts and exploration drill holes as well as all new vent shafts and drill holes would reduce cross linking aquifers and seepage into the underground mine workings.

The mine water seeping into the Salt Wash Member has not resulted in the creation of a seep or spring in those downdip areas where the upper portion of the Top Rim sandstone is dissected by Lumsden Fault (See Map 3.15-1). However, the mine seepage may be interconnected with PR Spring and could be contributing water to this spring which emanates from the base of the Top Rim sandstone. A limited study by Umetco (U.S. Environmental Services, Inc., 2001) indicates that PR Spring and the mine workings may not be connected. Energy Fuels is conducting a hydrogeologic study to better define groundwater conditions within the mine and surrounding areas which would either confirm or refute existing data regarding the connection. The determination of a connection between PR Spring and the Packrat Portal cannot be determined until there is safe access to the underground workings of the Packrat Mine. The study is being conducted by a hydrogeologic consultant and will further characterize the upgradient and downgradient aquifers, the groundwater flowing into the mine, the water flowing out of the mine, the eventual fate of the water flowing from the mine, and any groundwater impacts from mining operations. The report will provide additional groundwater information that could be used for closure planning by Energy Fuels, the BLM, and the DRMS.

At the time of mine closure, bulkheads, backfilling, grouting, and other measures would be used to seal off groundwater that could not be sealed during active operations. One bulkhead seal in the Urantah Decline would be constructed after mine closure to ensure that the water seeping into the decline from the Brushy Basin Member sandstone lens is sealed off from the lower mine workings. This would prevent intermingling of groundwater and reduce the volume of water exposed to the more mineralized Salt Wash Member. The proposed seal is near the bottom of the decline in the extreme upper portion of the Salt Wash Member sandstone unit, where the sandstone is fine-grained, non-mineralized, and of low hydraulic conductivity and high compressive strength. There are also no observed bedding planes or fractures in the sandstone that could serve as conduits for groundwater. The sealing operation and observations of groundwater inflow reductions would be documented and presented in quarterly reports to the BLM and the DRMS during mining operations. The report would include mapped inflow
locations, estimated rate of flow, inflow sources, and reduction measures implemented. The report would also include water quality analyses.

The cost for the Urantah Decline seal is included in the reclamation bond required by the DRMS Permit. Although the potential for encountering additional sources of groundwater is low, the reclamation bond includes provisions for a contingency bulkhead seal in the event that sealing off of another area of the mine is required. The most likely location of this contingency seal may be in the Packrat Mine workings. The location of the seal would be determined once the workings are inspected and the groundwater conditions in the Packrat Mine are determined.

Source control is expected to improve groundwater conditions above the mine in both the Burro Canyon Formation aquifer and the water-bearing zones within the Brushy Basin Member by eliminating conduits into the mine. It would also result in less depletion of the Burro Canyon Formation aquifer and the perched water zones within the Brushy Basin Member channel sandstones, while limiting the volume of water that would collect in the mine workings after closure.

Development of the mine workings within the Top Rim sandstone may have no affect on the hydrologic characteristics (quantity or quality) of DP Spring. The mine workings would be separated by the 400-foot thick Brushy Basin Member aquiclue which is predominately mudstones and shales having low permeability, as described in Section 3.16. The vertical permeability values of mudstone are in the range of $1 \times 10^{-7}$ to $1 \times 10^{-11}$ cm/sec, based on Freeze and Cherry (1979). Below the mine, PR Spring and possibly Lumsden Canyon Spring could be impacted, however, it is not yet known if these springs are connected to the mine. This will be examined and defined during the hydrogeologic study. A possible connection between PR Spring and the Packrat Portal cannot be determined until there is safe access to the underground workings of the Packrat Mine.

Implementation of the Proposed Action is not expected to affect Lumsden Canyon Spring which is located approximate 3 miles to the east and 2,000 feet in elevation below the mine (see Map 3.15-1). Because there is a fault system in Lumsden Canyon and treated waters are being discharged into Lumsden drainage, Lumsden Canyon Spring could be potentially impacted by mining activities. However, water chemistry from the Lower Brushy Basin Member, the Whirlwind Mine, Packrat Mine, DP Spring, and Lumsden Canyon Spring have been compared (Energy Fuels, 2008b) and based on this data this seems unlikely. Data provided in Appendix E of the Plan (Energy Fuels, 2007a) shows the balance of major ions dissolved in groundwater. The most abundant cations present in water are calcium ($\text{Ca}^{2+}$), magnesium ($\text{Mg}^{2+}$), sodium ($\text{Na}^+$), and potassium ($\text{K}^+$); the most abundant anions are bicarbonate ($\text{HCO}_3^-$), chloride ($\text{Cl}^-$), and sulfate ($\text{SO}_4^{2-}$). By measuring the concentrations of these ions in groundwater samples, the ionic composition of the water can be determined and the chemical quality of the water can be characterized and described (Bartos and Ogle, 2002). The dominant cation in Lumsden Canyon Spring water is $\text{Ca}^{2+}$ and the dominant anions are $\text{HCO}_3^-$ and $\text{SO}_4^{2-}$. While the dominant cations dissolved in water from the Lower Brushy Basin Member, Whirlwind Mine, and Packrat Mine are $\text{Na}^+$ and $\text{K}^+$ with the dominant anion being $\text{HCO}_3^-$. The water characteristics of Lumsden Canyon Spring are similar to DP Spring because the water in DP Spring is also $\text{Ca}^{2+}$ and $\text{HCO}_3^-$ dominant water. Lumsden Canyon Spring water has higher levels of sulfates than any of the compared waters.

Many natural factors can affect groundwater quality; however, the primary factors include the source and chemical composition of recharge water, the lithological and hydrological properties of the geologic unit, the various chemical processes occurring within the geologic unit, and the amount of time the water has remained in contact with the geologic unit (residence time). All of these factors can affect the type and quantities of dissolved constituents in groundwater (Bartos...
If the Lumsden Fault is potentially influencing the water quality of Lumsden Canyon Spring from strata in the area of the proposed mining activity, similar water quality characteristics of the Lower Brushy Basin Member, Whirlwind Mine, and Packrat Mine are expected to be similar with the Lumsden Canyon Spring water and have dominant Na⁺/K⁺ and HCO₃⁻ characteristics. However, this is not exhibited in the water quality testing results which suggest that the Lumsden Fault does not provide a conduit or pathway with groundwater at the Whirlwind Mine, Packrat Mine, Lower Brushy Basin Member, or PR Spring.

The Dolores Point Well is completed in the Burro Canyon Formation aquifer about 1,500 feet west of the existing Packrat mine workings near the Lumsden Fault. Implementation of source control measures at the 10-Straight Vent Shaft and at any open drill holes encountered in the area is expected to conserve the existing water within the aquifer and help maintain the productivity of this well. There are no other known wells within the immediate mining area that could be impacted.

Groundwater Quality

Groundwater quality can be affected by cross linking or comingling aquifers with differing qualities or with mine water which has been exposed to mineralized ores or materials. These activities can also affect groundwater quantity and quality in area wells and springs.

Groundwater quality could potentially be impacted by leaching of surface water that has contacted the ore stockpile pad. SPLP test results (Appendix A of the Plan - Energy Fuels, 2007a) of representative ore samples indicate that the ore has the potential to generate elevated levels of uranium, radium, and trace metals (antimony, arsenic, nickel, and selenium). To protect groundwater resources, the ore stockpile pad would be lined with an engineered liner system to prevent contaminant migration into the underlying undisturbed geology of the Brushy Basin Member of the Morrison Formation. Stormwater runoff from the ore stockpile pad would be diverted to the water treatment plant for treatment prior to being discharged under the CDPS permit. The ore pad would be sloped toward the sump and the ore pad would be surrounded by a berm that would direct all runoff from the ore pad to the sump. The engineered liner system would include a minimum of 1 foot of compacted ROM (run of mine) waste rock, a 2.5 foot thick cushion material, a geosynthetic clay liner material, and compacted subgrade.

During reclamation, the cover over the ore pad liner would be excavated and tested. If testing indicates it is nonhazardous material, the material and liner would be disposed of inside the mine in a dry area above the bulkhead seal to prevent contact with groundwater.

Stormwater that would contact the waste rock storage area would be diverted to the sediment pond. Test results of representative waste rock samples (Appendix A of the Plan - Energy Fuels, 2007a) did not produce leachate that exceeded state water quality standards; however, pH was elevated. The DRMS reviewed the testing results and based on waste rock geochemical analysis as required under Rule 6.4.20(14) concluded that the waste material from the Whirlwind Mine is inert (DRMS, 2008). Composite samples would be made from quarterly waste rock grab samples and analyzed once a year to ensure the waste rock in the storage area is still considered inert. The following BMPs for the on-site disposal of waste rock would minimize potential impacts to surface or groundwater resources.

- The waste rock storage area would have large-size rocks from 1 inch to 24 inches in diameter which would not leach as readily as the pulverized SPLP tested materials.

- The permeability of the waste rock (and susceptibility to leaching) would be reduced by the compaction that occurs as loaded haulage buggies and other equipment travel over the top of the waste rock storage area.
• Undisturbed runoff from the south hillside would be permanently diverted away from the waste rock storage area, utilizing diversion ditches.

• The waste rock storage area would be covered with a minimum of 12 inches of topsoil and planted with a stable mix of grasses and forbs well suited to this location. The vegetation would utilize most of the direct precipitation and surface water runoff that occurs on the reclaimed waste rock storage area. This would minimize the amount of water that can percolate into the reclaimed waste material.

• The gradual slopes and revegetated surface of the waste rock storage area would minimize erosion of topsoil and prevent exposure of the underlying waste rock.

• The waste rock storage area would be located on the Brushy Basin Member aquiclude consisting predominately of low permeability mudstone and shales which would minimize potential infiltration and groundwater contact.

• The spring and seep survey of the site revealed no springs or seeps in the vicinity of the waste rock storage area; therefore, there is no water that could enter the waste from below and potentially compromise the stability of the storage area.

Impacts to groundwater quality could also occur from inadvertent spills that could leach into the groundwater system. Energy Fuels has prepared and would follow a Materials Containment Plan and a SPCC Plan to minimize potential groundwater impacts from the inadvertent spills of hydrocarbons or other chemicals during mining activities.

A shallow septic system would be installed under an approved permit with Mesa County. The system would include a septic tank and overflow leach field. The septic system and absorption field would be appropriately designed based on the proposed use of the system and the limiting characteristics of the soils including infiltration/percolation rates, profile depth, and slope. The subsoil and geology immediately underlying the leach field is unsaturated and there would be no resulting impact to groundwater.

Reclamation of the surface facility areas, ore stockpile, and waste rock storage area are required to minimize impacts to groundwater after operations. Reclamation is designed to protect the closest underlying water-bearing zone, which is about 190 feet below the waste rock storage area in the Brushy Basin Member. During reclamation, the top 18 inches of the ore stockpile pad liner would be excavated and tested. If testing indicates it is nonhazardous material, it would be disposed of inside the mine in a dry area above the bulkhead seal to prevent contact with groundwater. Portals would be sealed and bat gates would be installed. The disturbed area would be regraded, topsoil would be replaced, and the area would be revegetated. The vent shafts and power drops would also be sealed at the surface to prevent surface water runoff from entering the mine workings.

**Groundwater Monitoring.** A monitoring well would be installed in the Lower Brushy Basin Member, downgradient from the ore stockpile pad area along Mesa County Road 5/10. The well is designed to intercept the first water-bearing zone underlying the surface facilities. This is the same water zone that is intercepted by the lower portion of the Uranthah Decline and would be monitored for eight sampling events for the first five quarters after completion to establish baseline conditions. Once baseline conditions are established, the well would continue to be monitored on a schedule approved by the DRMS and BLM.
Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to reduce impacts to Groundwater Resources under the Proposed Action:

- The ore stockpile pad would be lined.
- Composite samples will be made from quarterly waste rock grab samples and analyzed once per year to ensure that the waste rock in the storage area is still considered inert.
- Groundwater and runoff from the ore stockpile pad would be treated at the water treatment plant prior to discharge.
- Historical exploration drill holes and vent shafts would be sealed and plugged.
- New exploration drill holes and vent shafts would be properly sealed and plugged.
- A monitoring well (W-1) would be installed. The location of the well would be downgradient from the ore stockpile pad and the Whirlwind Portal.
- Energy Fuels would provide quarterly estimates of groundwater flow in the underground workings and conduct water quality sampling.
- Energy Fuels would conduct quarterly flow measurements of DP Spring and PR Spring and would sample water quality in PR Spring.
- Energy Fuels would sample and test material containing elevated radionuclide levels such as water treatment sludge and residual ore pad material. The BLM would dictate the disposal method and location based on test results.
- Energy Fuels would install a hydraulic seal in the Urantah Decline to prevent cross migration of groundwater and seeps along the hillslope.
- A contingency seal would be installed if necessary (possibly in the Packrat Mine workings).
- Energy Fuels is conducting a hydrogeologic study to better define the connectivity of area springs and groundwater, and provide additional information for mine closure planning. The study will include examination of the fault system in the Lumsden drainage and Lumsden Canyon Spring to determine source waters of the spring. Determination of connection between PR Spring and the Packrat Portal cannot be determined until there is safe access to the underground workings in the Packrat Portal.

4.17 WETLANDS, RIPARIAN RESOURCES, AND FLOODPLAINS

4.17.1 No Action Alternative

Under the No Action Alternative, transport of ore from or delivery of fuel or materials to the Whirlwind Mine would not increase over that currently occurring under the prospecting and bulk sampling activities. As such, potential impact to wetlands, riparian areas, and floodplains from inadvertent spills would not increase over existing conditions.

4.17.2 Proposed Action Alternative

Proposed surface disturbance and underground mine operations would not occur within 100 feet of DP Spring or PR spring. DP Spring is located topographically above the Urantah Decline and underground mine workings and would not be impacted by surface disturbance or surface water runoff. A study by Umetco indicates that the Brushy Basin Formation sandstone lenses intercepted by the Packrat Mine and PR Spring are not connected (U.S. Environmental Services, Inc., 2001). To date, the data indicate that the PR Spring and DP Spring would not be
impacted by proposed mining activities; however, Energy Fuels is conducting a hydrogeologic study to better define groundwater conditions within the mine and surrounding areas (see Section 4.15) which would either confirm or refute existing data.

The ephemeral drainages located in the project area would not be impacted by disturbance; however, they would be crossed by existing roads. The crossings of these ephemeral drainages along Mesa County Road 5/10 are culverted and, therefore, would not be disturbed by mine traffic. Further, Energy Fuels is improving the existing road drainage system on Mesa County Road 5/10 by installing additional culverts. This would better control road drainage preventing concentrated flow and diverting surface runoff through culverts to minimize erosion and sediment loading of adjacent drainages.

Mine water would be chemically treated in the water treatment plant and then discharged by gravity to the settling tank and polish tank where the radionuclides and trace metals in the water would precipitate out of solution. Prior to discharge, the water would be sampled in compliance with the CDPS discharge permit. This would insure that impacts to water quality would not occur as a result of the discharge. However, most mine water would be used consumptively during the underground mining process (i.e., dust control) which would limit the quantity of mine water being discharged to the surface.

Access to the vent shafts would require crossing of these drainages on existing roads during installation and mine operations. Impacts to these drainages from the Proposed Action would be minor because these drainages would be crossed on existing roads and traffic would be negligible especially because the vents shafts would be installed over time, as mining operations progress. Further, Energy Fuels would consult with the BLM and COE in the event road upgrades or culvert installation is necessary and would use the BLM’s standard design practices that are specific to culvert installation (i.e., # 17, 18, 19 and 20 of Appendix B in BLM, 1987 ) to install any necessary culverts to minimize impacts to these ephemeral washes.

The potential for an impact to the floodplain from an ore spill, or fuel or materials supply vehicle accident is possible. Numerous mitigation and environmental protection measures under USDOT protocols would be in place during ore transport and materials delivery to reduce the likelihood of spills and other accidents (see Section 4.23.2.1).

Under the Emergency Response Plan submitted to Mesa County and the local fire district, if there is a spill, ore would be removed and, if applicable, spill remediation would be implemented as soon as practical. Vehicles would be removed from the wetland/riparian zone/floodplain in a short timeframe by the State Highway Patrol. The BLM would be notified of any spills.

**Protective/Mitigation Measures.** Protective/mitigation measures to mitigate impacts to wetlands, riparian zones, and floodplains are those associated with protection of riparian zones along the ore transportation routes and springs in the Section 4.15 - Surface Water. These measures are also discussed in Section 4.6, Transportation.

### 4.18 SOIL RESOURCES

**4.18.1 No Action Alternative**

Under the No Action Alternative, additional impacts to soils would not occur. Reclamation of existing disturbance would occur under the prospecting and bulk sampling permits issued by the DRMS and the BLM.
4.18.2 Proposed Action Alternative

Soil impacts consist primarily of physical removal, mixing or burying of surface soils, damage or destruction of soil properties in place, elimination or destruction of organic matter in soil stockpiles, and the potential mixing of mineral soil, waste rock, and ore into the topsoil. Disturbance from mining activities could expose soils to wind and water erosion. This could indirectly cause accelerated wind and water erosion resulting in an undetermined loss of surface soils thereby reducing soil and vegetation productivity.

Impacts to soils would be minimized because components of the Proposed Action would be located in previously disturbed areas associated with past mining activities. Approximately one-third or approximately 7.5 acres (see Table 2.2-1) of the proposed surface disturbance (approximately 24 acres) would be located in previously disturbed and reclaimed areas (e.g. Whirlwind Portal area, Packrat Portal area, Whirlwind and Packrat power drop areas, and the 10-Straight Vent Shaft). Although these previously disturbed areas were mostly reclaimed, soil productivity is expected to be less than the native undisturbed soils in the project area. Energy Fuels would avoid disturbance to existing reclaimed areas around the Packrat Portal area that are rugged and steeply sloping (i.e., > 40 percent) minimizing disturbance in areas that are difficult to reclaim. Minimizing disturbance to slopes greater than 40 percent is a BLM Soil Management Objective (BLM, 1987).

Prior to surface disturbing activities, all available topsoil would be salvaged and stockpiled. This minimizes the loss of topsoil which is important to ensure successful revegetation and restoration of the pre-mining land use. Salvaging suitable topsoil is also a BLM Soil Management Objective. During vegetation clearing and topsoil salvaging, all clearing work would be conducted when soils are not saturated and would occur without the mixing of soil and vegetation. This is required in the BLM’s Standard Design Practices for all Projects (BLM, 1987). Stockpile stabilization activities (i.e., surface roughing, seeding, and mulching) would be implemented to minimize the loss of the topsoil from potential wind and water erosion over the life of the mine. A suitable vegetative cover would be established on the topsoil stockpiles for stabilization purposes to promote beneficial soil biological activity within the stockpile, aid in maintaining soil productivity in the long-term and would minimize weeds. There is approximately 30,400 cubic yards of topsoil material that is estimated to be salvageable from the proposed disturbance areas associated with the Whirlwind Portal area and waste rock storage area. This volume of topsoil represents a topsoil redistribution depth of about 12 inches uniformly redistributed over the approximate 20-acre Whirlwind Portal area during final reclamation (see Table 2.2-1). Although this topsoil redistribution depth does not account for large coarse fragments that may be screened out of the topsoil, it is expected that the final topsoil replacement depth would be adequate to meet final reclamation success standards.

Incremental expansion and contemporaneous reclamation of the waste rock storage area would minimize site disturbance in the short-term and minimize the exposure of soils to potential wind and water erosion. It would also allow for topsoil salvaged from these areas to be directly hauled to the waste rock storage area. Contemporaneous use of the salvaged topsoil for final reclamation would minimize topsoil storage and potential soil degradation from long-term stockpile storage. Direct hauling of the salvaged topsoil to areas for final reclamation would preserve the soil seed bank (the viable seed and soil propagules - tubers, rhizomes, stolons, etc.) reservoir present in the soil, which is expected to enhance reclamation success (Roberts, 1981; Baker, 1989; Simpson et al., 1989; and Ferris, et al., 1996). Some of the woody vegetation salvaged prior to topsoil stripping would be mulched and placed on top of reclaimed surfaces along with whole pieces of woody material to provide additional nutrients and improve soil moisture retention to increase vegetation growth. Placing the salvaged woody vegetation on reclaimed surfaces would help roughen the surface and minimize erosion.
Although the SPLP testing procedures indicate that the tested waste rock leachate did not exceed state water quality standards, the SPLP test did not provide potential rooting characteristics of the waste rock material, except by inference. Therefore, prior to topsoil application to the final graded waste rock storage area, the BLM AO will require testing of the top 1 to 2 feet of surface waste rock material that would likely represent the potential reclaimed root zone of the waste rock storage area. It is expected that the vegetation root zone would be greater than the 12-inch topsoil depth that has been estimated to be available for reclamation and that the plant roots would penetrate into the waste rock storage area. Testing of the potential waste rock root zone material would be conducted using appropriate testing procedures that extract available plant nutrients so that reclamation suitability of the waste rock can be documented. Suggested testing parameters include: pH, conductivity, saturation, texture, soluble calcium, magnesium and sodium, SAR, carbonates, arsenic, boron and selenium. Although Colorado DRMS does not have testing guidelines, Utah DOGM and Wyoming Department of Environmental Quality (1994) have established topsoil and overburden guidelines which include recommended testing procedures for the various parameters as well as guidelines to determine material suitability.

The substitute topsoil materials that were used to reclaim the Packrat Portal would be salvaged and stored in the safety berms at the portal and along the Packrat Road. This material should also be sufficient for final reclamation of these areas. The berms would be stabilized using an interim reclamation seed mixture approved by the BLM. The objective of the interim reclamation seed mixture would be to stabilize these soils and to enhance organic matter content and nutrients through the use of legumes. Prior to final reclamation of the Packrat Portal and road, soil samples from the berm should be sampled and analyzed for recommended nutrient amendments to ensure establishment of vegetation. Topsoil salvaged from the vent shafts would also be sufficient to reclaim these sites once mining has commenced and these sites are reclaimed.

The low nutrient levels in the native soils would not limit their topsoil suitability or hinder reclamation of the postmining land use to rangeland and wildlife habitat because the native soils currently support native vegetation communities (see Section 3.20) that have lower nutrient requirements than agronomic crops. Further, the salvaged topsoil would provide a superior plant growth medium during reclamation than other potential substitute materials. Available topsoil materials have suitable textures and organic matter contents, are not excessively alkaline, and are not saline or sodic. Topsoil availability in the project area in some mapping units is limited by shallow depths of bedrock, high coarse fragment (rock) volume, subsoil clay textures, low organic matter contents and sodic conditions (i.e., Mapping Unit 66-Sili soil 15-39 inches).

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to mitigate impacts to soil resources from the Proposed Action Alternative:

- The soil stockpiles would be seeded with the seed mix specified in Table 2.2-3 in Chapter 2 to minimize establishment of noxious weeds or non-native vegetation, weeds would be treated as specified in Section 4.21.
- The Proposed Action would avoid disturbing existing reclaimed areas around the Packrat Portal area that are rugged and steeply sloping (i.e., > 40 percent) to minimize disturbance to areas that would be difficult to reclaim.
- All available topsoil from the proposed disturbed areas would be salvaged and stockpiled prior to surface disturbing activities.
- During vegetation clearing and topsoil salvaging, all clearing work would be completed when soils are not saturated and would occur without the mixing of soil and vegetation.
The waste rock storage area would be incrementally expanded minimizing site disturbance in the short-term and minimizing exposure of soils to potential wind and water erosion.

Salvaged topsoil would be contemporaneously used for final reclamation minimizing topsoil storage and the potential for soil degradation from long-term stockpile storage.

Prior to final reclamation of the Packrat Portal and road, soil samples from the berm would be sampled and analyzed for recommended nutrient amendments to ensure establishment of vegetation. Analysis should include standard agronomic nutrients: nitrogen, phosphorus, and potassium in addition to pH for fertilizer recommendations that consider the species being planted.

Testing of the potential waste rock root zone material would be conducted using appropriate testing procedures that extract available plant nutrients so that reclamation suitability of the waste rock can be documented. Analysis should be conducted for pH; conductivity; saturation; texture; soluble calcium, magnesium, and sodium; sodium adsorption ratio; carbonates; arsenic; boron; and selenium.

4.19 FARMLANDS – PRIME/UNIQUE

4.19.1 No Action Alternative
Under the No Action Alternative, the vent shafts in Utah would not be constructed. There would be no impact to prime and unique farmlands.

4.19.2 Proposed Action Alternative
Vent shafts U1, U2, U3, and U4 in Utah are located on, or partially on, Soil Mapping Unit 102 (Waas very fine sandy loam) which is designated as a prime farmland soil. There are no current or past farming activities that have occurred in the vicinity of the proposed vent shafts and the minor disturbance associated with the vent shafts (less than 1 acre) would not limit the primary agricultural land use activity (grazing). Further, potential future farming activities in this area are not expected because it is BLM-administered public land for which they have multiple use objectives. Therefore, there are no anticipated impacts to prime and unique farmlands as a result of the Proposed Action Alternative.

Protective/Mitigation Measures. There are no protective/mitigation measures identified to mitigate impacts to prime and unique farmlands.

4.20 VEGETATION RESOURCES

4.20.1 No Action Alternative
Under the No Action Alternative, no new vegetation would be disturbed. After sampling 999 tons of ore, the existing surface disturbance of about 4 acres would be reclaimed in accordance with approved existing permits. There are reclamation bonds in place for both the Whirlwind and Packrat sites.

4.20.2 Proposed Action Alternative
Proposed disturbance associated with mining activities is approximately 24 acres. Of this total, about one-third would occur in areas that were previously disturbed by past mining activities. Table 4.20-1 summarizes acres of total surface disturbance by habitat type and project component. Most of the new disturbance would occur in piñon habitat (approximately new 11.04 acres) and would be associated with the waste rock storage area. This area would be built out
incrementally and vegetation would be removed in phases over time, as more space is needed to dispose of mine waste rock.

Sagebrush and oakbrush-related habitat would be other relatively large disturbed areas under the Proposed Action, with 5.48 and 3.30 acres impacted, respectively. However, much of the sagebrush complex habitat disturbance in the Whirlwind Portal area occurs on land that has been either previously reclaimed and is now forbs and grass dominant or is part of the existing disturbance under prospecting and bulk sampling.

<table>
<thead>
<tr>
<th>Table 4.20-1</th>
<th>Total Surface Disturbance Acreage by Vegetation Type</th>
<th>Affected by the Whirlwind Mine Project Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Component</td>
<td>Piñon Pine Complex</td>
<td>Ponderosa Pine</td>
</tr>
<tr>
<td>Whirlwind Portal Area</td>
<td>11.04</td>
<td>0.16</td>
</tr>
<tr>
<td>Packrat Portal Area</td>
<td>1.75</td>
<td>0.00</td>
</tr>
<tr>
<td>Vent Shafts</td>
<td>1.38</td>
<td>0.23</td>
</tr>
<tr>
<td>Power Drops</td>
<td>0.64</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>14.81</td>
<td>0.39</td>
</tr>
</tbody>
</table>

1 Sagebrush complex in the Whirlwind Portal area was historically sage-dominant and is now a mixture of currently used land and land reclaimed as forbs/grassland. Approximately 5.07 acres of the Whirlwind Portal area were previously disturbed and reclaimed from past mining activities.

2 Disturbance of the Packrat Portal area includes the access road and portal areas previously disturbed and reclaimed. The vegetation types correspond to the dominant vegetation types associated with these facilities.

3 Approximately 0.87 acre of proposed disturbance is associated with the Packrat and Whirlwind power drops and the 10-Straight vent shaft which were previously disturbed from past mining activities that were not reclaimed. These facilities are correlated to their corresponding dominant vegetation types.

Overall, the Proposed Action Alternative would not affect the continued existence of the vegetation communities within the Whirlwind Mine project area. The impact would be temporary in nature, during the life of the mine which is expected to be 10 years. Once mining activities are completed, all disturbed areas would be reclaimed and allowed to return to their pre-mining vegetation types.

Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to mitigate impacts to vegetation resources from the Proposed Action Alternative:

- Stockpiled stripped vegetative matter would be used during interim and final reclamation. Spreading stockpiled vegetative matter over reclaimed areas as an amendment to seeding provides excellent shade and moisture retention for seeds and aids in germination and reestablishment of native plant species. If the quantity of this salvaged material is not sufficient to provide adequate soil erosion protection, straw or hydromulch or other acceptable materials would be utilized to facilitate restoration efforts.

- The BLM’s Standard Design Practices item #16 (BLM, 1987) would be applied during restoration efforts, this standard requires that a seedbed be prepared by contour cultivating 4 to 6 inches deep where possible and drilling seed ¼- to ½-inch deep. In areas that cannot be drill seeded, broadcast seeding would be used with one and one-half times the recommended drilling rate and would be covered ¼- to ½-inch deep using a harrow, drag bar, or chain. Seeding would be completed after August 15 and prior to October 1.

- As specified in the BLM’s Standard Design Practices items #32 (BLM, 1987) where woodland or forest vegetation is present prior to disturbance, tree species would be
reestablished by including piñon and juniper in the seed mixture. Where ponderosa pine is disturbed, seedlings would be planted if directed by the BLM AO.

- All topsoil would be salvaged from disturbed areas and stockpiled prior to surface disturbing activities to ensure successful revegetation and restoration.
- The waste rock storage area would be contemporaneously reclaimed during the mining process to allow for earlier revegetation establishment on these areas. Reclamation methods and seed mixes would be tested in these areas to ensure success during final reclamation.
- The waste rock pile and reclaimed area would be fenced to exclude livestock for a minimum of 3 years after reclamation.

4.21 INVASIVE SPECIES AND NOXIOUS WEEDS

4.21.1 No Action Alternative
Under this Alternative, there would not be any impacts from invasive plants and noxious weeds beyond what currently exists in the area. Weed control measures required by BLM would continue during and after reclamation associated with prospecting and bulk sampling.

4.21.2 Proposed Action Alternative
Soil disturbance and potential weed distribution due to increased vehicle traffic, equipment placement and operation, foot traffic, and other activities associated with the Proposed Action may promote the spread of invasive plants and noxious weeds. Surface areas that would be impacted by mining include the Whirlwind Portal area and the waste rock storage area, the water treatment area, access roads to the Whirlwind and Packrat portals, the Packrat Portal area, topsoil stockpiles, the Packrat power drop pad area, the vent shaft pad areas, and any additional power drop or vent shaft pads constructed in the future. Statutes and permit stipulations require Energy Fuels to monitor noxious weeds and weed control success.

Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to mitigate impacts from invasive species and noxious weeds under the Proposed Action Alternative:

- Energy Fuels’ Weed Control Plan would be implemented throughout the life of the mining operation and during reclamation to minimize potential impacts from noxious weeds. Should it become necessary, the BLM and county weed control staff would be consulted regarding problematic weed infestation areas and appropriate control measures would be agreed upon prior to initiation.
- During mining operations, weed surveys for plants listed in Table 3.21-1, and BLM- and county-approved weed control measures would be implemented along Mesa County Road $^{5/10}_{10}$ from its intersection with John Brown Road to the project area. A weed survey would be conducted at the mine area and Mesa County Road $^{5/10}_{10}$ in the spring (April or May) and in the fall (September or October). Other measures that may be implemented to avoid impacts by noxious weeds include:
  - reseeding of disturbed areas would occur according to BLM’s Standard Design Practices item #16 (BLM, 1987) and would occur after August 15 and prior to October 1 so that native vegetation would reestablish inhibiting growth of noxious/invasive weeds;
marking of weed infested areas, if any, and avoidance of those areas by mine personnel to avoid spreading seeds;
- washing tracked equipment prior to mobilizing to the project area to help prevent importing weed seeds on equipment;
- washing/rinsing of mine-related vehicles that come in contact with identified areas of noxious and invasive weeds;
- spraying of noxious weeds. Large infestations would be sprayed by a licensed commercial contractor. Smaller weed occurrences would be sprayed by mine personnel using a backpack sprayer. The herbicides to be used would be approved by BLM and county weed control staff. State, county, and BLM listed species scheduled for eradication that are found in the project area would be eradicated and reported to the county weed inspector.

- Energy Fuels would provide an annual report of weed survey results to the BLM and the respective counties. It would include weed control measures and practices implemented including pesticide application records.

4.22 GRAZING RESOURCES

4.22.1 No Action Alternative
Under this Alternative, there would be no impacts to grazing resources. Although prospecting and bulk sampling would continue, disturbance would be limited to 4 acres, which is considered negligible.

4.22.2 Proposed Action Alternative
Under the Proposed Action Alternative, the loss of livestock forage due to vegetation disturbance would be minimal. There would be approximately 24 acres of total disturbance, much of which would not impact AUMs in either of the two grazing allotments in the Whirlwind Mine project area. If the disturbed areas are revegetated according to the mine reclamation plan, there would be no long-term impact to grazing resources.

Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to mitigate impacts to grazing resources under the Proposed Action:

- The proposed project area and access roads do not impact fence lines, therefore, no gates or cattle guards would be required. However, the roads into the Whirlwind and Packrat portals would have swinging metal gates. Gates would be locked during weekends, holidays, and other down times to prevent cattle from entering the mine area and nearby water treatment ponds.

- The short access roads to ventilation shafts and power drops would typically be two-track overland roads that would only be used for periodic inspections and maintenance. There would be no fencing or gates at these sites, unless required by the BLM.

- Energy Fuels would engage in ongoing communication with the BLM rangeland managers and/or the two grazing leaseholders during the summer season to ensure direct impacts to ranging cattle are avoided.
4.23 THREATENED AND ENDANGERED SPECIES AND SPECIAL STATUS SPECIES

4.23.1 No Action Alternative
Under this Alternative, BLM would deny Energy Fuels’ Plan (2007a) and further development beyond that allowed under the prospecting and bulk sampling permits would not occur. No potential impact to Threatened and Endangered Species and Special Status Species would occur.

4.23.2 Proposed Action Alternative
4.23.2.1 Federally-Listed and Candidate Species
Section 7(a) of the ESA requires the BLM to ensure that authorized or permit management activities are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of critical habitat for such species. Additionally, Section 7(a) requires that federal agencies consult on any actions that may affect listed species. Such action could result in “take” of a listed species. As defined in the ESA, “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. §1532(19)). This broad definition includes “harm,” a term subject to debate. The USFWS defined “harm” as an act which actually kills or injures wildlife. Such an act may include habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR. §17.3 (1994)).

Federally-Listed Species
Colorado River Fish. Four species of endangered fish (bonytail chub, humpback chub, Colorado pikeminnow, and razorback sucker) are adapted to large, deep, turbid, and swift-flowing rivers in the Colorado River drainage where they inhabit shaded pools and eddies (humpback chub and Colorado squawfish) or deep, swift-moving water in channels (bonytail chub and razorback sucker) in the middle and upper Colorado and Green rivers in Utah, Colorado, and Arizona (Joseph et al., 1977; Lee et al., 1980; Woodling, 1985). Currently, none of these species is known to inhabit the Dolores River except possibly for Colorado pikeminnow, though only within the first 1.2 miles upstream from the confluence with the Colorado River in Utah.

Primary threats to the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker are stream flow regulation and habitat modification, including coldwater dam releases, habitat loss, and blocked migration corridors, as well as competition from nonnative fish species, pesticides, and pollution (USFWS, 2002a, 2002b, 2002c, and 2002d). Flow recommendations have been developed for some waters in the Upper Colorado River Basin. The recommendations were designed to enhance habitat complexity (i.e., suitable spawning areas and inundation of floodplain areas), and to restore and maintain ecological processes (i.e., sediment transport and food production) that are believed to be important for the life history and subsequent recovery of the endangered Colorado pikeminnow (USFWS, 2002b).

Water Depletions
The Recovery and Implementation Program (RIP) for Endangered Fish Species in the Upper Colorado River Basin was established in 1988 to mitigate for water depletion impacts. Under the RIP, water depletions from tributary waters within the Colorado River Basin are considered to jeopardize the continued existence of these fish species. Adequate flows are necessary to provide for the various life-stage requirements of these native fishes. Reduced flows can reduce
the abundance and usability of important spawning and backwater habitats and result in lowered productivity and recruitment.

As described above in Section 4.16.2, groundwater seepage enters the mine workings from several sources. During mining operations, most of the water inflow into the mine workings would be used to support underground drilling and dust suppression activities. Excess water that is not used would be pumped from the mine and treated prior to discharge under the CDPS discharge permit. The conditional water right is for 24.4 acre-feet per year. This quantity of water is higher than what is produced in the mine which is estimated to be 8 to 16 acre-feet per year. Consumption at full production is estimated to be about 15,000 gallons per day which is equivalent to 11.5 acre-feet per year (based on a 250-day work year). Such consumption of groundwater would be withdrawn from the Colorado River Basin.

In May 1994, BLM prepared a Programmatic Biological Assessment (BA) that addressed water-depleting activities in the Colorado River Basin. In response to the Programmatic BA, the USFWS issued a Programmatic Biological Opinion - BO (USFWS, 1994b) on June 13, 1994, which determined that water depletions from the Colorado River Basin would jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker. Consequently, all water depletions from the Colorado River Basin, including the Proposed Action, result in a "may affect, likely to adversely affect" determination of effects to each of the listed species. The Programmatic BO includes reasonable and prudent alternatives developed by the USFWS to allow BLM to authorize individual projects, such as the Proposed Action, which result in water depletions of less than 125 acre-feet per year.

The Programmatic BO was written to remain in effect until a total depletion threshold of 2,900 acre-feet per year is reached. An amendment to the Programmatic BO in 2000 revised the threshold to 3,000 acre-feet per year. To date, BLM has authorized less than 3,000 acre-feet of depletions per year. BLM reports the per-year depletions and makes a mitigation payment to USFWS to offset the impacts. This agreement is currently being updated through a revised Programmatic BA/BO. In the meantime, the water depletion impacts associated with the Proposed Action (24.4 acre-feet) continue to be within the level anticipated and disclosed in the 2000 Programmatic BO update and hence can be covered by the BLM’s Programmatic BA and USFWS Programmatic BO.

To be covered by the BLM Programmatic Consultation, Energy Fuels would need to pay a one-time depletion fee in the amount of $434.08. The fee would need to be paid to the National Fish and Wildlife Foundation, USFWS’ designated agent, at the end of fiscal year 2008. Fifty percent of the funds would be used for acquisition of water rights to meet the instream flow needs of the endangered fishes (unless otherwise recommended by the Implementation Committee); the balance would be used to support other recovery activities for the Colorado River endangered fishes.

**Selenium**

In Regulation No. 35 (5 CCR 1002-35), the CDPHE-WQCC listed the effluent concentration standards for selenium as Acute=20 µg/L and Chronic=5 µg/L. The standards were updated to reflect the existing acute and chronic criteria for selenium listed in the Basic Standards as Acute=18.4 µg/L and Chronic=4.6 µg/L which was adopted in 2000 by CDPHE-WQCC. Both acute and chronic numbers adopted as stream standards are levels not to be exceeded more than once every 3 years on the average.

In 5 CCR 1002-35, the CDPHE-WQCC declared that water quality monitoring had demonstrated a severe selenium problem in the Lower Gunnison and Uncompahgre River Basins. Elevated selenium levels, whether in solution or in sediment deposits, have been demonstrated in some
tributaries to the Colorado River (Hamilton, 1998; Stephens and Waddell, 1998; Hamilton, 1999). Deleterious effects to fish species (Lemly, 1998) have been attributed to elevated selenium within aquatic environments, including the four listed Colorado River fish (Hamilton, 1998; Stephens and Waddell, 1998; Hamilton, 1999). Selenium, even though an essential element in some vertebrate enzymes, can be toxic when concentrations are too high (e.g. greater than 2-5 µg/L in water, greater than 4 micrograms per gram in sediment, see Hamilton, 2004) but selenium is subject to bioaccumulation through a variety of pathways, within aquatic food chains in particular (Hamilton, 2004; Muscatello et al., 2008). Adverse effects to listed fish species include decreased egg survival and decreased reproduction, overall (Hamilton, 1998).

Historically, only trace amounts of selenium were found in the Dolores River at Cisco, Utah and the relatively non-seleniferous water from the Dolores River probably diluted concentrations from other tributaries (Hamilton, 2004). In 1994, a USGS investigation found elevated levels of selenium (maximum of 12 µg/L) in tributaries to the Dolores River (Dove Creek), upstream from the Whirlwind Mine, and elevated selenium in aquatic invertebrates and aquatic bird eggs (Butler et al., 1997). The degree to which concentrations in tributaries affects selenium levels in the Dolores River was not reported but Butler et al. (1997) noted the selenium present was mobilized from irrigated soils. Selenium in irrigation return flows has become a widespread problem in the Colorado River Basin (Hamilton, 1999).

As discussed above in Section 4.15.2, Energy Fuels has been modifying the water treatment system to address exceedances of the 30-day average and daily maximum effluent limitations for selenium. A compliance summary of the Whirlwind Water Treatment System is included in Appendix D. The nearest aquatic habitat to the Whirlwind Mine is the Dolores River, about 5 miles away. The only manner in which the discharge can reach the river is during storm events and spring snowmelt when the treated water mixes with and is strongly diluted by natural flows within the drainage. Given the flow regime of the Dolores River (Figure 3.15-1), the highest flows occur during April, May, and June which would probably coincide with maximum likelihood of any of the discharge reaching the river. For these reasons, discharge of selenium by the Proposed Action is expected to have no effect on the listed fish species or designated critical habitat.

Turbidity

The bonytail chub, humpback chub, Colorado pikeminnow, and razorback sucker are adapted to large, deep, turbid, and swift-flowing rivers in the Colorado River (Joseph et al., 1977; Lee et al., 1980; Woodling, 1985). An accidental spill of uranium ore into the Dolores River would potentially increase turbidity but, as discussed earlier, a spill in shallow surface water would be removed before water quality could be adversely affected. Most ore would be in large enough sizes (e.g., cobbles) that it would be recovered easily from the water source. Finer particles would be dispersed by stream flow and would not create a radiological hazard to aquatic life (DOE, 2007, page 5-13). The primary impact to water quality from a spill would be a short-term increase in turbidity and TSS although levels of turbidity due to a spill are impossible to predict though downstream effects would be influenced by flows in the Dolores River at the time of a spill (see Figure 3.15-1). The downstream effects of turbidity caused by an accidental spill on one or more of the four listed Colorado River fish species would be discountable because detection or measurement of effects would not be possible. For these reasons, any potential increase in turbidity by the Proposed Action is expected to have no effect on the listed fish species or its critical habitat.

Other Contaminants

Discussed above in Section 4.15.2, all water leaving the site would be discharged either from the water treatment plant under the CDPS discharge permit (CO-0047562) or from the sediment
pond emergency spillway. The discharge permit limits for each constituent are based on the state water quality standards for the Dolores River at Gateway (Stream Segment 3a). Certain parameters, including the 30-day average and daily maximum effluent limitations for selenium, dissolved Ra-226 and total Ra-226 + Ra-228, pH, and TSS, have exceeded permit levels in the treated discharge water from Energy Fuels’ bulk sampling phase; these have been reported to CDPHE and BLM and Energy Fuels has been modifying the water treatment system to address the exceedances (Appendix D). Seventeen other parameters were analyzed and found to be in compliance with provisions in the discharge permit. These parameters include flow, COD, oil and grease, TDS, WET, arsenic, boron, beryllium, cadmium, trivalent chromium, lead, manganese, nickel, vanadium, zinc, uranium, and weak dissociable cyanide.

There is a remote possibility that Ra-226 and Ra-226+Ra-228, pH, and TSS from the Whirlwind Mine discharge could reach the river during storm events and spring snowmelt. However, the downstream effects of those constituents produced by the Proposed Action on one or more of the four listed Colorado River fish species would be discountable because detection or measurement of effects would not be possible.

In addition to turbidity discussed above, an accidental spill of uranium ore into the Dolores River would introduce carnotite, which, in addition to uranium, can also contain aluminum, arsenic, barium, copper, iron, lead, manganese, selenium, vanadium, and zinc, all of which are potentially toxic to aquatic species (DOE, 2007). Using uranium as an indicator metal with aquatic toxicity higher than other potential metal constituents, DOE (2007) estimated dissolved uranium concentrations from 2.95 to 4.80 mg/L from carnotite spilled into the Dolores River. Given conservative mixing during critical low-flow conditions in the river, DOE (2007) estimated uranium concentrations would increase by approximately 0.017 to 0.082 microgram per liter (µg/L) which, when added to background dissolved uranium concentrations of ≈1 µg/L, would not impair the river water quality and not harm aquatic life (DOE, 2007). Any potential increase of other contaminants by the Proposed Action would have no effect to the listed fish species or designated critical habitat.

Black-footed Ferret. Black-footed ferrets are closely associated with prairie dogs, particularly black-tailed prairie dogs (Cynomys ludovicianus) and to a lesser extent, white-tailed prairie dogs (C. leucurus). Black-footed ferrets declined as prairie dog habitat declined because 1) steady conversion of native prairie to cropland was unsuitable habitat for prairie dogs, 2) active control of prairie dogs through poisoning to reduce competition with livestock, and 3) introduction of exotic diseases, especially sylvatic plague, to which prairie dogs and ferrets are highly susceptible, and canine distemper (Lockhart et al., 2006). Similar threats to prairie dogs and ferrets are ongoing; however, black-footed ferrets have not occurred in the Whirlwind Mine project area and no suitable habitat (prairie dog colonies) exists. The Proposed Action would have no effect on black-footed ferrets.

Canada Lynx. USFWS (2000) identified significant threats to the lynx including threats by destruction, modification, or curtailment of the species’ habitat or range within the Northern Rockies/Cascades and Southern Rockies. Lynx habitats have been adversely affected by timber harvest, mostly within western boreal forests (subalpine fir/spruce forest). However, timber harvest levels on federal lands in the West have declined since the 1990’s and reduction of early successional habitats with concomitant reductions of snowshoe hare habitats may have affected lynx in some areas (USFWS, 2000).

USFWS (2000) concluded that lynx populations in the contiguous United States occur at naturally low densities, generally maintained by limited abundance of primary prey (snowshoe hare) which in turn results from patchy distribution of transitional boreal forest habitat. Lynx are adversely affected by high traffic volumes on roads that cross suitable lynx habitat and by
proliferating suburban/urbanization (USFWS, 2003) but the threat of these effects in the project area are low. Although the Whirlwind Mine does not support boreal forest habitat or habitats suitable for snowshoe hares, lynx released by CDOW have been located within Mesa County on the Uncompahgre Plateau within the Uncompahgre National Forest (Shenk, 2005), east of the Whirlwind Mine. A lynx could occur in the project area if a lynx were dispersing towards Utah; however, given the habitat type in the project area and the fact that this area is adjacent to the extreme northern end of the lynx habitat, this is an unlikely event. For these reasons, the Proposed Action is expected to have no effect on Canada lynx.

**Southwestern Willow Flycatcher.*** The distribution of this endangered species is restricted to dense riparian vegetation composed of willow, cottonwood, buttonbush, and other deciduous shrubs and trees which historically was rare but has become more rare (USFWS, 1995a). The southwestern willow flycatcher is endangered indirectly by extensive loss and fragmentation of habitat by construction of dams and reservoirs, diversions and groundwater withdrawal, channelization related to flood control, land uses including agriculture, livestock grazing, recreation, and urbanization (Marshall and Stoleson, 2000). The species’ survival and reproduction are also directly affected by fires that are enhanced by fuel accumulation and invasion by flammable species such as saltcedar (Marshall and Stoleson, 2000). In the draft Recovery Plan published in 2001, USFWS included the Dolores Management Unit within the Upper Colorado Recovery Unit, noting that the Dolores Unit was at the northern boundary of the species’ range. Subsequent information indicated that the breeding range of southwest willow flycatcher did not extend to the Dolores Management Unit and it was removed from the final Recovery Plan published in 2002 (USFWS, 2002e).

The Proposed Action will not affect occupied or potentially suitable habitat for southwestern willow flycatchers; there are no willows, buttonbush, or coyote brush associated with riparian zones found in the Whirlwind Mine project area although riparian vegetation is present along the Dolores River. The Dolores River appears to be outside the currently known range of the southwestern willow flycatcher (USFWS, 2002e). The Proposed Action will not affect this endangered species.

**Mexican Spotted Owl.*** The Mexican spotted owl is frequently associated with mature mixed-conifer, pine-oak, and deciduous riparian forests as well as patches of coniferous forested vegetation within canyon habitats (USFWS, 2004). Mexican spotted owls nest and roost primarily in closed-canopy forests or rocky canyons but in the northern portion of the range, including Colorado, most nests are in caves or on cliff ledges in steep-walled canyons (USFWS, 1995b). Timber harvest practices by the USDA Forest Service throughout the Southwest was cited as a source of significant loss or modification of the species’ habitat (conversion to even-aged stand conditions), including loss of lower and middle level riparian habitats (USFWS, 1995b). Habitat loss due to recreational developments, predation by great horned owls and other raptors enhanced by habitat fragmentation, wildfires, and possible competition with barred owls as their range expands (USFWS, 1995b) has led to increased risks for the species.

Although no Mexican spotted owls have been recently documented near the Whirlwind Mine project area, the CGAP indicates that the threatened species is likely to occur in the region of the Whirlwind Mine, based on modeled habitat types (CGAP, 1999). However, suitable Mexican spotted owl habitat, including steep canyons with exposed cliffs in dense, mature mixed-conifer, and pine-oak, and canyons in piñon-juniper areas (Andrews and Righter, 1992; BLM, 2007d) would not be affected by the Proposed Action. The nearby Beaver Creek area in Utah supports the best Mexican spotted owl habitat in the project vicinity and is currently being surveyed according to USFWS protocol. Mexican spotted owls have not been detected and, therefore, Mexican spotted owl disturbance concerns are minimal (Riddle, 2008). Due to the limited amount of new surface disturbance at the mine and the habitats associated with these
disturbances, there would be no effect to the Mexican spotted owl as a result of the Proposed Action.

**Jones Cycladenia.** When this species was listed as threatened in 1986, main threats included off-road vehicle use, both for recreation and for exploration for minerals including tar sands and oil and natural gas. Such surface disturbances degrade fragile soils (USFWS, 1986). The species range is limited to Arizona and Utah (USFWS, 1986) and has not been reported in Colorado (Weber and Wittmann, 1996). There are no suitable cool desert shrub and juniper communities at elevations ranging from 4,400 to 6,000 feet within the Whirlwind Mine project area. The nearest known population of Jones cycladenia is in Grand County, Utah on the western side of the La Sal Mountains, several miles from the Whirlwind Mine (UDNR, 2005). There would be no effect to this species as a result of the Proposed Action.

**Uinta Basin Hookless Cactus.** Anthropogenic threats to this species include collecting, mineral and energy developments, off-road vehicle and recreation effects, road construction, water developments, and pesticide use (USFWS, 1990b). Suitable habitat for this species consists of xeric, fine textured soils that are overlain with cobbles and pebbles associated with salt desert shrub and pinyon-juniper communities at elevations ranging from 4,500 to 6,000 feet. This habitat does not exist within the Whirlwind Mine project area. The species’ distribution includes a portion of Mesa County along the Gunnison River but does not include the project area vicinity (USFWS, 1990b; CHNP, 1999). There would be no effect to this species as a result of the Proposed Action.

**Candidate Species**

**Western Yellow-billed Cuckoo.** Western yellow-billed cuckoos occur along narrow and patchy riparian corridors which provide relatively suitable moist deciduous woodlands within otherwise unsuitable arid vegetation (USFWS, 2007a). Loss of limited habitat due to similar actions described for southwestern willow flycatchers has adversely affected western yellow-billed cuckoos. In 1998, 242 miles of lowland river riparian habitat along six rivers in west-central Colorado were surveyed for cuckoos but only one was found and assumed to be one of a nesting pair (USFWS, 2007a). No riparian habitats with large tracts of cottonwood/willow habitats with dense sub-canopies are present within the Whirlwind Mine project area. Because of the limited amount of new surface disturbance at the Whirlwind Mine, the habitats associated with these disturbances, and the unlikelihood that they would be present in the region, the Proposed Action would not impact the western yellow-billed cuckoos.

**DeBeque Phacelia.** Threats similar to those described above for Jones cycladenia and Uinta Basin hookless cactus also may affect DeBeque phacelia. The species’ habitat overlaps 100 percent with high quality oil and gas reserves that are being actively developed in the Piceance Basin (USFWS, 2007c) on the border of Mesa and Garfield counties (CNHP, 1999). No sparsely vegetated, steep slopes in brown or gray clay on Atwell Gulch and Shire members of the Wasatch Formation occur within the Whirlwind Mine project area. Because these known populations and areas of potential distribution are not in close proximity to the Whirlwind Mine project area, impacts to the plant are not anticipated.

**Parachute Beardstongue.** This rare plant is known to occur only on the Roan Plateau, over 60 miles northeast of the project area. No white shale talus habitats of the Green River Formation are found in the vicinity of the project area and, therefore, this species would not be impacted by the Proposed Action.

**4.23.2.2 Sensitive Species**

Impacts to sensitive species can be directly related to surface disturbance within particular habitats. Because of the relatively limited amount of new surface disturbance under the
Proposed Action, impacts to sensitive species would be minimal. Based on sensitive species habitat and occurrence assessments outlined in Chapter 3, most of the BLM-, Utah-, and Colorado-sensitive wildlife and plant species are not likely to occur in the Whirlwind Mine project area and thus are highly unlikely to be impacted under the Proposed Action. However, some species have been observed and others are likely to occur in areas near the Whirlwind Mine project area.

**Bats.** Townsend’s big-eared bat and fringed myotis are both BLM-sensitive species and have been identified in the nearby Packrat/Hubbard mine complex. Navo et al. (2001) identified the Packrat mine (part of what they call the Hubbard/Packrat/La Sal system) as an important roosting and micro-habitat area (WestWater Engineering, 2007). In addition, the Cherokee Adit of the Urantah Mine, now the Whirlwind Portal in the Proposed Action, is potential habitat. Although mine temperatures within the Whirlwind Portal were not suitable for roosting during summer (see Section 3.23.2), the portal was considered potentially suitable for hibernation though possibly too cold for even hibernating bats (Navo et al., 2001).

Disturbances during hibernation periods would cause bats to become active, potentially leading to starvation before food is available later in the spring (Navo, 2005). The closure of mine entrances could destroy potential habitat for bat species. Use of the Whirlwind Portal by the Proposed Action could be a temporary loss of habitat, though the suitability of the portal as hibernation or roosting habitat has not been demonstrated by field observations. Although the Packrat Portal is part of the Proposed Action, mine activity there is not expected to adversely impact bats. Initial exploration of the mine portals began in the fall of 2007 and timing was coordinated with the local biologist to ensure minimal impact to the bats.

**Birds.** Sensitive bird species such as the northern goshawk, mountain plover, ferruginous hawk, peregrine falcon, and Lewis’s Woodpecker that could potentially occur in the Whirlwind Mine project area based on their habitat associations were not observed during field surveys (WestWater Engineering, 2007). Foraging areas for these and other birds that might be present may be slightly reduced, but roosting and nesting sites are not likely to occur in the Whirlwind Mine project area. These species are also protected by the MBTA (16 U.S.C. §703-712), which prohibits the destruction of migratory birds and their nests. Of these species, peregrine falcons have been reported on the Uncompahgre BBS route (route 17045) in Colorado and ferruginous hawks have been observed on the Westwater BBS route (route 85313) in Utah. Peregrine falcons typically lay eggs from late March to mid-April with young fledging during June (Call, 1978). Ferruginous hawks begin nest building during mid-March and young fledge from early June through early July (Call, 1978). Disturbances by the Proposed Action during these time periods could affect the species if they are nesting in the project area. However, based on survey results, nesting by either raptor species is not likely.

Impacts to bird species that utilize riparian habitats could occur if contaminants (i.e., uranium ore, oil, or fuel) were spilled into the streams leading to the Dolores River. It is highly unlikely that this would occur from either operational activities or from a ore haul truck accident (see discussion above for Colorado River Fishes). Implementation of the Emergency Response Plan would address impact if a spill occurs.

**Plants.** Project area biological surveys conducted in 2007 (WestWater Engineering) determined that Montrose bladder pod and Grand Junction milkvetch could possibly have potential habitat in the area, though neither plant was found. Surveyors found a small amount of potential suitable habitat for Naturita milkvetch, but the plant was not observed (WestWater Engineering, 2007). Sensitive plants are not likely to be impacted under the Proposed Action, although it is possible that small portions of their potential habitats could be affected.
**Herpetiles.** Long-nose leopard lizards and canyon tree frogs occur in the Whirlwind Mine project area. The leopard lizard is found in stands of sagebrush in deep, sandy soils and broad canyon outwash plains and has been observed in the Gateway area (Hammerson, 1986). The canyon tree frog occurs along intermittent streams in deep rocky canyons. John Brown Canyon is one of its few known occupied habitats (Hammerson, 1986). The Proposed Action could directly affect leopard lizards by surface disturbing actions and could potentially affect habitats utilized by canyon tree frogs from increased traffic, fugitive dust, road runoff, and runoff from dust abatement methods along John Brown Road.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to mitigate impacts to threatened and endangered and sensitive species under the Proposed Action:

- Energy Fuels would reclaim the Packrat Portal area which includes backfilling the smaller Packrat Portal and installing a bat gate on the larger portal, allowing for improved bat access.
- One water pre-treatment pond and two water post-treatment settling tanks would be available for bats and other wildlife to use as a safe water source. In order to prevent bat and bird impacts and/or mortality from tank entrapment, the tanks would be equipped with escape structures based on proven methods (Taylor and Tuttle, 2007).
- The eventual long-term reclamation of the Whirlwind Mine project area after mining is completed could result in an overall increase in habitat for bat species (DOE, 2007).
- Efforts would be made to prevent over-watering of the haul road and minimize runoff. Trucks would be moving at a relatively slow speed (averaging 15 mph) and loads would be tarped to prevent excess fugitive dust.
- In order to avoid direct impacts to any bat species that may be present in the mines, reopening of portals would occur sometime during the months of April to September.
- To ensure there is no effect to the endangered Colorado River fish species, Energy Fuels would monitor the Dolores River for selenium upstream and downstream from the confluence with Lumsden Creek when discharge is occurring under the CDPS permit and there is flow in the middle tributary to Lumsden Creek.
- To be covered by the BLM Programmatic Consultation for the endangered Colorado River fish species, Energy Fuels would make a one-time depletion fee in the amount of $434.08 to the National Fish and Wildlife Foundation, the USFWS’ designated agent.

**4.24 WILDLIFE AND AQUATIC RESOURCES**

**4.24.1 No Action Alternative**
Under the No Action Alternative, prospecting and bulk sampling would continue for a limited time. Impacts to wildlife and aquatic resources through increased traffic, noise, light, human presence, and removal of habitat would not increase above that which is already occurring.

**4.24.2 Proposed Action Alternative**
Impacts to wildlife and aquatic resources are expected to occur from increased traffic, noise, light, human presence, and removal of habitat. Because of the relatively limited amount of new surface disturbance under the Proposed Action, impacts to wildlife and aquatic resources would be minimal. The Proposed Action would result in approximately 24 acres of disturbance (see Table 2.2-1 in Chapter 2).
Under the Proposed Action, potential impacts to wildlife and aquatic resources would mostly come from increased traffic and traffic-related disturbance in the area. A few animals with small home ranges in immediate vicinity of the Whirlwind Mine project area, such as rodents and reptiles, would likely be displaced, and some could be killed by vehicles and heavy equipment. It is expected that a small number of wildlife could be impacted through road kill. Overall, minimal new habitat disturbance, regulated traffic patterns, and adherence to agency BMPs would ensure that impacts to wildlife and aquatic resources and wildlife diversity, in general, would be minimal.

**Big Game.** Human activity and mine-related traffic would probably have some impacts on big game throughout the year. Specifically, mine-related traffic along John Brown Road would probably have some impact on big game in the winter months and potentially more so during extreme winter conditions with deep snow.

Human-related factors such as truck traffic or other events on winter ranges that cause mule deer to expend energy during winter, in addition to environmental factors (severe weather forcing migration, competition with conspecifics and/or other ungulates, predators) could increase over-winter mortality (Reeve, 1996). Fawns expend more energy than adult deer when moving through snow. Increased over-winter fawn mortality could be a consequence of increased energy expense during winter if deer are escaping from vehicular traffic and other activities within winter range (BLM, 1999). The function of winter ranges is to provide maximum over-winter survival.

Because of larger body size, elk fare better than deer moving through deep snows in winter ranges (Lindzey et al., 1997). Although deer are lighter and have proportionately less weight distributed on each hoof than elk, elk can maneuver through deeper snows better because of greater chest heights. Where deep snows can limit deer use of habitats and limit their movements within winter ranges, these same conditions are less detrimental to elk (Lindzey et al., 1997). Escape from mine activities through snow would be less detrimental to elk than to mule deer.

Truck haulage (heavy-vehicle) from the mine for initial operations would be at an average rate of four round trips (eight trips total) per day. As production increases, traffic would increase to an average of eight round trips (16 trips total) per day. To minimize impacts to other resources, and as required by the Mesa County Conditional Use Permit, ore haul trips would be scheduled for early morning, mid-day, and late afternoon. Trip speeds would rarely exceed 15 mph on county roads, in order to minimize chances of big game and vehicle collisions. Early morning and dusk are times when big game are usually most active.

Other effects to elk and mule deer in winter and fall ranges (and black bears, if present at other times) by other types of impacts under the Proposed Action could include:

- increased mortality from collisions with vehicles;
- impeded migration;
- increased chances of poaching or harassment; and
- bears foraging in construction sites and haul truck roadside trash, becoming “nuisance bears” subject to removal.

Employee briefings and other mitigation measures regarding the potential for impacts to big game would minimize impacts to these species (see mitigation section below).

**Upland Game Birds.** The wild turkey winter concentration area encompasses all the Whirlwind Mine project area. The primary habitat is ponderosa pine with an understory of Gambel oak
although they can be found in all types of habitat in the Whirlwind Mine project area. Impacts could occur as a result of habitat removal - approximately 0.39 acres of ponderosa pine-associated habitat would be removed under the Proposed Action, from vehicle collisions, and from poaching. The wild turkey is fairly common in southern Colorado (Andrews and Righter, 1992) and so overall impacts to the species are expected to be minimal.

Impacts to chukar could occur as a result of vehicle collisions and poaching; however, impacts are expected to be minimal. Because these birds prefer steep, rock, dry canyons, there are not expected to be present at the immediate Whirlwind Mine project area and impacts would be minimal.

**Migratory Birds.** Table 4.20-1 in Section 4.20.2 identifies impact by habitat type that could affect migratory birds and USFWS BCC. Most new disturbance would occur in piñon pine-associated habitat (approximately 14.81 acres total) as a result of the waste rock storage area. Sagebrush and oakbrush habitats would be other relatively large disturbed areas under the Proposed Action, with 5.48 and 3.30 acres impacted, respectively (Table 4.20-1). Much of the sagebrush complex habitat disturbance in the Whirlwind Portal area occurs on land that has either been previously reclaimed and is now forbs and grass dominant, or is part of the existing disturbance authorized under the prospecting and bulk sampling permits. Because the area of surface construction activities is relatively small, the Proposed Action is expected to have minimal to no impact on most migratory bird populations.

Two BCCs, black-throated gray warblers and Virginia’s warblers, were observed in the vicinity of the Whirlwind Mine project area. Black-throated gray warblers begin nesting in early May and chicks are fledged by early August, primarily among the piñon vegetation complex on Beaver Mesa (WestWater Engineering, 2007). Approximately 11.04 acres of piñon pine complex habitat (Table 4.20-1), potentially utilized by black-throated gray warblers would be removed by the Proposed Action. Virginia’s warblers prefer nesting in lower elevation oakbrush (WestWater Engineering, 2007). They begin nesting in June and chicks are fledged by mid-August (WestWater Engineering, 2007). Approximately 3.30 acres of oakbrush habitat, potential nesting habitat for Virginia’s warbler, would be removed near the Whirlwind Portal under the Proposed Action. Migratory birds other than these BCCs would also be potentially affected by habitat removal due to the Proposed Action. Surface disturbances and human presence due to the Proposed Action from early May through mid-August could affect black-throated gray warblers and Virginia’s warblers as well as other neotropical migratory species if they are nesting in the project area.

Raptor nesting season is generally considered to occur between mid-February (nest building great horned owls and golden eagles) and mid-August. Usually, by mid-August young birds have fledged and left the nest (WestWater Engineering, 2007). Suitable raptor nesting habitat occurs in much of the proposed project area but no active or inactive nests were found during the WestWater Engineering (2007) Raptor Survey and impact to nesting raptors is not expected, based on current knowledge.

**Aquatic Resources.** The Dolores River, seeps and springs in Lumsden Canyon, and the intermittent and perennial streams of the John Brown Canyon complex provide habitat for a variety of extraordinary species in the Whirlwind Mine project area. Implementation of the Proposed Action would not directly impact aquatic resources; however there is the potential for impact should an ore haul truck have an accidental spill to streams that are tributary to the Dolores River. The haul route coincides with the Dolores River and crosses the Dolores River. Potential effects on fish, including the bluehead sucker, flannelmouth sucker, and roundtail chub, due to discharge of contaminants from the Whirlwind Mine could occur if discharges reach the river during storm events and spring snowmelt; the river is approximately 5 miles from the
Whirlwind Mine. Such effects were discussed above in Section 4.23.2.1 along with potential effects to ESA-listed fish species by accidental spills of uranium ore into the Dolores River. These potential impacts are unlikely and effects to listed fish and other species are not expected to be substantial. Accidental spills of uranium ore would be addressed through implementation of an Emergency Response Plan.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to mitigate impacts to wildlife and aquatic resources under the Proposed Action:

- In order to minimize impacts to USFWS BCC, construction would be avoided between pre-nesting and chick fledgling. If construction occurs between these times, additional nesting surveys would be performed and a 300-foot radius buffer would be placed around active nests.

- One pre-treatment pond and two on-site water post-treatment settling tanks would be available for birds to use as a safe water source. In order to prevent impacts to birds by tank entrapment, the tanks would be equipped with escape structures based on proven methods (Taylor and Tuttle, 2007).

- The sediment pond would be constructed in such a way as to provide easy exit should wildlife enter the pond; however, it would not be netted.

- Haul drivers, miners, and other contractors would be briefed in regularly scheduled safety meetings on the potential impacts to big game winter range and bear fall concentration, in order to prevent extraneous harassment and nuisance to the animals.

- Mine site trash would be contained and exterior trash containers would bear-proofed.

- Energy Fuels would install bat gates at the Whirlwind and Packrat portals during reclamation.

## 4.25 HAZARDOUS MATERIALS

### 4.25.1 No Action Alternative

Under the No Action Alternative, there would be little to no risk of impacts from hazardous materials as exploration, bulk sampling procedures, and associated daily operations would continue for a limited time.

### 4.25.2 Proposed Action Alternative

Given the combination of waste management mitigation and controls to be utilized on-site, there should be no impacts associated with hazardous and solid wastes at the site. Impacts that may occur would be the result of incidental spills. Spill response measures are outlined in the Plan (Energy Fuels, 2007a) and therefore, the overall impact attributable to this source would be minimal. Protective measures for hazardous waste is also addressed in Section 4.15 – Surface Water.

The only hazardous waste that could be generated by the mine would be used solvent from a solvent cleaning station. Hazardous materials brought to the site would potentially include explosives, petroleum products, and some water treatment chemicals. Hazardous materials shipped from the site would include the ore and any treatment sludge shipped to the mill. Used oil and used antifreeze may also be shipped out. The only other waste (besides solid waste) that would be on-site is special waste such as batteries, tires, used oil, etc. which require disposal/recycling in accordance with state regulations and, in some cases, landfill-specific requirements. The only waste material that would be buried on-site would consist of inert
construction material such as broken concrete and brick. Waste containers that would have organic material in them (from lunchroom, etc.) would be located within the chain link fence.

Some of the waste material generated by the mine operation is subject to CDPHE rules for technologically-enhanced naturally occurring radioactive materials (TENORM). The waste rock produced by the operation contains natural radioactivity that is below TENORM thresholds and is exempt by definition (CDPHE, 2007). The uranium ore is considered “source material” and is also exempt by definition. The precipitated sludge that settles out in the water treatment tanks is subject to TENORM disposal regulations. This material will be tested for Ra-226 and Ra-228 and uranium activity levels prior to disposal. Depending on the activity levels of the precipitants, the material could be considered exempt or could be designated for disposal in an appropriate landfill facility. Processing of the precipitants at a licensed uranium mill for extraction of uranium is also acceptable and, generally preferred, because it allows for recovery of the resource.

**Protective Measures/Mitigation.** The following protective/mitigation measures would be implemented to proactively prevent problems that might otherwise be associated with hazardous materials associated with the mining operation.

- In accordance with 29 CRF 1910.1200(g), Energy Fuels would maintain a file containing Material Safety Data Sheets (MSDS) for all chemicals, compounds, and/or substances which are utilized during the course of construction, mining, and reclamation operations of this project. This file would be available for reference and inspection at all times at the site.

- A roll-off container for disposal of trash would be located on-site. A second roll-off may be placed on the Whirlwind pad if needed. No landfills would be constructed on-site. Recycling of applicable materials (batteries, scrap metal) would take place during mine operations.

- Diesel fuel and various oils for use in mobile and on-site equipment would be stored and used on-site. Secondary containment would be provided for all petroleum products. As described in detail in Section 2.2.2.9, a SPCC Plan consistent with federal regulation 40 CFR 112 would be prepared and implemented for storing and using petroleum products on the site. In most cases, secondary tank containment would consist of an oversized livestock water tank within which the fuel or oil tank would be placed.

- Any spills would be immediately reported to the BLM authorized officer, characterized and remediated. Spill reporting and containment would occur immediately and would remove material to the nearest approved landfill or disposal facility as necessary.

- Portable sanitation facilities would be provided during exploration and the initial phases of mining. The waste would be taken off-site for treatment at an approved facility. A leach field would be constructed to dispose of wastewater when the surface facilities are constructed.

- Sludge collected from the treated water settling tank would be disposed of in either one of two ways: 1) mixed into a cement grout on-site and disposed of in the mine in a designated area, or 2) taken to the uranium mill with ore to be processed.

- Solid waste would be containerized and hauled to a landfill in accordance with state and local regulations.

- Used oil and antifreeze from the maintenance shop would be containerized and hauled to a recycling facility. Scrap metal, batteries, and tires would also be recycled.
• If a solvent station is installed to clean parts, it would consist of a sink mounted on a small drum of solvent. The solvent would be recycled to the drum after each use. Periodically, the solvent drum would be exchanged with the vendor for a new drum with the old solvent being recycled.

4.26 HUMAN HEALTH

A significant number of uranium miners, that worked in the 1950s, later developed small-cell lung cancer. Many of the miners were Navajo because many of the uranium sources were located on Navajo reservations. In part, the 1990 Radiation Exposure Compensation Act was passed to provide compensation to uranium miners, millers, and ore transporters who contracted cancer or other specified diseases as a result of exposure to high levels of radon. As understanding of the health risks grew, so did the applicable regulations. Today, the governing laws have decreased the health risks to uranium miners by requiring adequate ventilation and prohibiting smoking, among other requirements.

Recent studies in the Montrose County and the Colorado plateau areas as well as the Karnes County, Texas area have been completed specifically to investigate mortality in relation to exposure to uranium and vanadium during mining and milling activities. Summaries are provided below:

• In the first study, researchers compared mortality rates between 1950 and 2000 in Montrose County to those in five similar counties. They concluded that there was no evidence that residents in Montrose County experienced an increased risk of dying of cancer or other diseases because of environmental exposures associated with uranium and vanadium milling and mining activities (Boice, et al., 2007).

• In the second study, researchers evaluated the mortality experiences of 1,484 men employed in seven uranium mills in the Colorado plateau for at least one year after January 1, 1940 (Pinkerton, et al., 2004). The study results stated that mortality from all causes and all cancers was less than expected based on U.S. mortality rates. The study found an excess in mortality from haematopoietic and lymphatic malignancies (other than leukemia), trachea, bronchus, and lung cancer, non-malignant respiratory disease, and chronic renal disease. For workers hired prior to 1955, mortality from lung cancer and emphysema was higher, presumably because their exposure to uranium, silica and vanadium was higher. However, mortality did not increase with employment duration. The researchers’ conclusion stated that based on the study’s limitations (i.e., small cohort size, inability to estimate individual exposure, lack of smoking data), that firm conclusions about the relation of increases in mortality and mill exposures were not possible.

• In the third study, the same researchers that conducted the first study, completed a mortality study for Karnes County, Texas in which they contrasted cancer rates in the county before, during and after uranium operations (Boice, et al., 2003). The study also compared nearby counties with similar demographic characteristics. In conclusion, the study found that those cancers which might be increased following high exposures to uranium and its decay products were not elevated. The researchers qualified their conclusions with a statement that the ecological nature of the study design tempered the strength of the conclusions.
4.26.1 No Action Alternative

Similar to the Uranium Leasing Program Final Programmatic EA (DOE, 2007), most of the Whirlwind Mine project area is accessible to members of the public. Although members of the public are not permitted to permanently or temporarily reside in the Whirlwind Mine project area, some visitors may camp for one or more days. Other activities that bring public visitors include hunting, hiking, and mountain biking. In general, a public visitor would not spend more than 2 weeks per year in the area. An individual may be exposed to radiation in the Whirlwind Mine project area through three primary pathways: (1) external exposure to gamma radiation, (2) inhalation and ingestion of resuspended radioactive particulates, and (3) inhalation of radon and radon daughter products.

For the No Action Alternative, Energy Fuels’ mining activities under the prospect and bulk sampling permit would be governed by MSHA, which establishes radon exposure limits for workers and is described in more detail in Section 4.26.2. These health and safety requirements are the same as those that would be implemented for the Proposed Action. Surface reclamation measures approved under the prospect and bulk sampling permit would be similar to those outlined in the Proposed Action; however, the amount of topsoil cover over the Whirlwind waste rock storage area would be less (i.e., approximately 6 inches versus a minimum of 12 inches for the Proposed Action). The topsoil cover thickness for prospecting and bulk sampling activities is based on the volume of salvageable topsoil available for reclamation.

4.26.2 Proposed Action Alternative

The short-lived decay products of radon-222 gas are the primary radioactive constituents of concern in a uranium mine. These “radon daughters” are also the same elements that can accumulate in a basement, resulting in elevated radiation levels and increased risk of cancer. As provided in the Uranium Leasing Program Final Programmatic EA (DOE, 2007), EPA evaluated exposures from radon emissions for individuals located near uranium mines (EPA, 1989). For underground uranium mines, radon concentrations for nearby individuals (within 0.33 to 33 miles) ranged from 2.0 \times 10^{-6} to 0.0031 working levels (EPA, 1989). Assuming that an individual was continuously exposed, this is equivalent to a probability of a latent cancer fatality of 5.5 \times 10^{-8} to 8.5 \times 10^{-5}, or about 5 chances in 100 million to 8 chances in 100,000. Over 10 years, the probability of a latent cancer fatality would range from 5.5 \times 10^{-7} to 8.5 \times 10^{-4}, or about 5 chances in 10 million to 8 chances in 10,000. For perspective, an individual has a lifetime probability of dying of cancer from all sources of about 220,000 in 1 million, or a risk of lung cancer of 60,000 in 1 million.

At the Whirlwind Mine, the radon ventilated from the mine would quickly disperse upon reaching exhaust shafts or portals. The air emissions would be measured for radon levels and flow rates in accordance with EPA regulations. This data would then be input into an EPA air modeling program to predict radiation levels at the nearest residence. The collected data and modeling results would be reported annually to the CDPHE. Because of its remote location (i.e., about one-third mile from the nearest potential resident), no impacts to the general public are predicted.

Workers are protected through MSHA regulations, which establish maximum exposure levels of radon and radon-daughter products. Over the period 1985 through 1989, the average occupational radiation dose for uranium miners in the United States was 350 mrem/yr (United Nations Committee on the Effects of Atomic Radiation - USCEAR, 2000). This radiation dose is equivalent to a probability of a latent cancer fatality of 2.1 \times 10^{-4}, or about 2 chances in 10,000. Over 10 years, the probability of a latent cancer fatality would be 2.1 \times 10^{-3}, or about 2 chances in 1,000.
The Whirlwind Mine would maintain a minimum of 20,000 cubic feet per minute of air flow at the working area. A radon-daughter monitoring program would be established in accordance with 57 CFR §5037 in which exposure levels would be monitored and recorded. If radiation levels in a working area are found to be in excess of MSHA standards, the ventilation would be corrected immediately and more frequent monitoring would be required to verify compliance.

Outside the mine during operations, the uranium ore and recycled materials such as scrap metal, batteries, and tires are the only radioactive materials that could leave the site and potentially affect the general public. USDOT regulations require that the ore trucks be tarped and checked for radiation levels prior to leaving the mine site and the mill site on the return leg. In the event of an accident resulting in an ore spill, the spilled material and surrounding area would be cleaned up to background levels. Cleanup levels would be verified using a gamma meter or similar instrument. Energy Fuels’ company policies require that all scrap metal and other recyclables be checked with a gamma meter prior to leaving the mine site. If gamma readings were found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards.

To determine the potential safety risks of the waste rock storage area to a casual visitor (i.e., camper) following completion of mining activities and reclamation, a radiological dose rate was projected (Golder, 2007). The modeling projections included a 12-inch topsoil cover using a clay loam texture which is characteristic of the native soils in the waste rock storage area that would be salvaged for reclamation purposes (see Section 3.18). Dose calculations were made using RESRAD v6.3, a dose calculation code developed jointly by the DOE and the U.S. Nuclear Regulatory Commission (NRC) for site-specific dose assessments of residual radioactivity. The model is capable of calculating the dose to an individual from a known source with a wide variety of radionuclides and from all direct exposure, biological and airborne pathways. The radiological content of the waste rock storage area was conservatively modeled by including 25 percent proto-ore (i.e., 0.0558 percent U\textsubscript{3}O\textsubscript{8}) with 75 percent waste rock. Normally, the lower grade ore material is blended with the higher grade ore and shipped to the mill. Energy Fuels has indicated that it is very unlikely that the waste rock storage area would contain this much uranium.

The resulting Ra-226 level used in the modeling effort was equal to 31 pCi/g, which is above the waste-rock pile average of 23.7 pCi/g reported by the EPA (EPA, 1991). Results of the modeling efforts indicated that the calculated dose for a camper who resides on the reclaimed waste rock storage area over a 7-day period (24 hours/day) would be about 0.2 mrem/yr. This dose represents only 2 percent of the EPA’s 10 mrem/yr guideline for radiation exposure. The BLM in Colorado has established a 14-day camping limit on public lands. This requires a camper to leave an area for a minimum of 7 days after a 14-day period. After 7 days the camper may return to the same area for another 14-day period. Therefore, the maximum number of days a camper could legally reside on the reclaimed waste rock storage area in one year would be 244 days, resulting in a dose of 6.8 mrem, which is below the EPA’s guideline. Therefore, potential health risks from the reclaimed waste rock storage area would be low.

**Protective/Mitigation Measures.** The following protective/mitigation measures would be implemented to proactively prevent risks to human health that may be caused by the mining operation.

- The mine would operate in accordance with federal regulations that are designed to protect the mine workers and the general public from radiation exposure.
- The miners would be protected through establishment of adequate ventilation and monitoring of radiation levels in the underground work areas in accordance with MSHA regulations.
• The general public would be protected by monitoring of radiation emissions from the mine using methods approved by the EPA and adhering to ore transportation regulations established by the USDOT.

• The Whirlwind Mine would maintain a minimum of 20,000 cubic feet per minute of airflow at the working area. A radon-daughter monitoring program would be established in accordance with 57 CFR §5037 in which exposure levels would be monitored and recorded. If radiation levels in a working area are found to be in excess of MSHA standards, the ventilation would be corrected immediately and more frequent monitoring would be implemented to verify compliance.

• The air emissions would be measured for radon levels and flow rates in accordance with EPA regulations. This data would then be input into an EPA air modeling program to predict radiation levels at the nearest residence. The collected data and modeling results would be reported annually to the CDPHE.

• Ore haul trucks would be tarped and checked for radiation levels prior to leaving the mine site and the mill site on the return leg. If gamma readings are found to be elevated, the ore truck would be cleaned using a power wash or other method to meet appropriate radiation standards.

• All scrap metal and other recyclables would be checked with a gamma meter prior to leaving the mine site. If gamma readings are found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards.

4.27 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

4.27.1 No Action Alternative
Under the No Action Alternative, there would be no impact to Areas of Critical Environmental Concern.

4.27.2 Proposed Action Alternative
Under the Proposed Alternative, there would be no impact to Areas of Critical Environmental Concern.
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Chapter 5
Cumulative Effects

5.1 INTRODUCTION

NEPA requires federal agencies to consider the cumulative effects of proposals under their review. Cumulative effects are defined in the Council on Environmental Quality (CEQ) regulations 40 CFR §1508.7 as “…the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency…or person undertakes such other actions." These actions include current and projected area development or management activities, and authorizations on public lands; land use trends; and applicable industrial/infrastructure components. Although the individual impacts of each separate project might not be significant, the additive effects of multiple projects could be.

The CEQ guidance states: “It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to affected parties” (CEQ, 1997).

The geographic and temporal limitations the BLM has placed on its analysis are consistent with CEQ’s guidance (CEQ, 1997) which states that “cumulative effects result from spatial (geographic) and temporal (time) crowding of environmental perturbations.” With regard to the spatial, or geographic limitations, the CEQ states that the “cumulative effects analyses should be conducted on the scale of human communities, landscapes, watersheds, or airsheds” using the concept of “project impact zone” or more simply put, the area that might be affected by the proposed action.

This chapter evaluates the cumulative effects of the Proposed Action with past, present, and reasonably foreseeable actions in the geographic setting of the Proposed Action (Map 5.1-1). The resources that may be cumulatively affected within each of the evaluated actions are discussed. In addition, because the DOE’s uranium leasing program analysis area is located south of the Whirlwind Mine, a summary of the cumulative analysis in the Uranium Leasing Program Final Programmatic EA (DOE, 2007) is provided (Map 5.1-2).

5.2 PAST ACTIONS IN THE VICINITY OF THE WHIRLWIND MINE

The Beaver Mesa Mining District, where the Whirlwind Mine is located, has seen production of radium, vanadium, and uranium ores since early in the 20th century. Numerous underground mines on the Whirlwind property and on surrounding land within 1 mile of the Whirlwind claim group perimeter have produced in excess of 7,000,000 pounds of $\text{U}_3\text{O}_8$ and nearly 24,000,000 pounds of vanadium pentoxide ($\text{V}_2\text{O}_5$). In addition to the Packrat Mine and Urantah Decline (i.e., Whirlwind Portal), the claim block includes all or portions of the following mines: Bonanza, Lost Dutchman, Hubbard, Lumsden #2, Rajah 49, Austin #4 and the Rajah 30 (Map 5.1-1). These mining operations typically accessed ore bodies through adits or tunnels driven from the side of the canyon walls. Most of the previous mining operations included the construction of haul roads and dumping of waste rock along the sides of the canyons. Past mining activities in the area also included multiple exploration roads and drill sites that crisscrossed the area to locate or better define underground ore deposits.
Map 5.1-1
Existing and Proposed Projects in the Vicinity of the Whirlwind Mine

Legend
- Permit Area
- Vent Shaft
- Claims Boundary

Previous Mine Workings
- Bonanza
- Lost Dutchman
- Hubard
- Lumsden #2
- Rajah 49
- Austin #4
- Rajah 30

Gateway Canyon Resort
Gateway
John Brown Road

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.
Map 5.1-2
Gateway SRMA and Existing and Proposed Uranium Mills and DOE Lease Tract Area

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.
5.3 PRESENT AND REASONABLY FORESEEABLE ACTIONS

To assess present and reasonably foreseeable actions that may occur within the Whirlwind Mine project area and that could potentially contribute to cumulative effects, a review of the BLM’s GJFO and MFO NEPA registers was completed. The proposed projects in these registers were reviewed based on their proximity to the project area and the potential resource impacts that might create cumulative effects when considering the resources impacted by the Proposed Action. Based on the review of these registers, it was determined that BLM’s Lumsden Canyon Trail Project (C0-130-2007-001) is the only project in the vicinity of the Proposed Action, which could potentially cause impacts that might be additive or cumulative with those associated with the Proposed Action. Other present and reasonably foreseeable actions, that were identified outside of the NEPA register review, which could cause impacts that might be additive or cumulative with those associated with the Proposed Action include BLM Management Activities (Gateway SRMA), Gateway Canyons Resort, and other future mining activities (Maps 5.1-1 and 5.1-2).

5.3.1 Lumsden Canyon Trail Project

The purpose of the Lumsden Canyon Trail Project is to create a trail system that would deliver multiple visitor benefits and foster resource protection in an area experiencing increasing recreational use (Map 5.1-1). Potential cumulative impacts/conflicts could occur with the development of the trail system. The trail would provide recreational opportunities while protecting natural and cultural resources by concentrating and managing visitor impacts.

Increased recreational traffic associated with the trail system and increased mine-related traffic utilizing John Brown Road as well as ore-truck traffic on Colorado State Highway 141 have the potential to increase cumulative impacts/conflicts in this immediate area. However, the BLM has determined that increased recreation use along the lower part of John Brown Road is not expected to impact ore haulage operations. Warning signs for approaching truck traffic would be posted along lower John Brown Road, which would help to mitigate safety concerns.

In accordance with Mesa County restrictions, to further minimize potential cumulative impacts or user conflicts associated with ore-truck traffic and recreation users of John Brown Road, the ore-trucks would only travel to and from the site during three time intervals (identified as early morning, mid-day, and late afternoon) and these times would be posted on the road. Truck traffic would also be limited to weekdays from April 15 through December 15 to reduce weekend traffic levels during the warmer times of the year when recreational use is greater.

Potential cumulative impacts to other resources from the Proposed Action and the Lumsden Canyon Trail System are not expected because of the minor extent of disturbance associated with trail development (i.e., 3-foot wide trail). Further, the trail system is expected to minimize overall resource impacts from increased recreational use in the area considering the potential abuse that could occur without a developed trail system.

5.3.2 BLM Management Activities - Gateway SRMA

In December 2007 (USDI), BLM Grand Junction announced a recreation planning effort for the Gateway SRMA, which would include a recreation area management plan for the region surrounding the Whirlwind Mine (Map 5.1-2). The planning area includes 198,000 acres of public land located near Gateway. The BLM will use an interdisciplinary approach to develop the plan amendment and EA in order to consider all identified resource issues and concerns. The planning process is anticipated to take about 12 months to complete. Recreation in the area is increasing and the planning process would provide for better resource protections and quality
recreational experiences in the future. In part, this plan could eventually result in ten RMZs; supply guidance for resource protection and community enhancement; and help provide quality recreation opportunities for a variety of user groups (BLM, 2007c). Under the current draft plan, the Whirlwind Mine project area would be located in RMZ 7 and the haul routes would coincide with RMZs 1, 2, and 8. RMZ 7, Cone Mountain/Dolores Point, is currently characterized by historic and modern uranium mining activity and is valued for big game hunting and dispersed OHV and non-motorized recreation. Completion of the Gateway SRMA is expected to reduce potential cumulative resource effects because a management plan would be in place that has been specifically developed to minimize resource impacts and resource-use conflicts from increased recreational use.

5.3.3 Gateway Canyons Resort
Other development activities in the region that are considered in this cumulative effects analysis include the planned expansions at the Gateway Canyons Resort (Map 5.1-1). The resort was developed in 2004 and is located in Gateway adjacent to John Brown Road and Colorado State Highway 141 on private lands. It includes lodging and food services, retail (grocery store and gas station), recreational services (including bicycle and jeep rentals as well as outfitters), and an auto museum. Future planned expansions at the resort include a 250-seat event center and additional restaurants. Three additional lodges are planned at the resort over the next 3 to 4 years. The Whirlwind Mine is located approximately 5 miles southwest of the resort.

Because of the proximity of the resort to John Brown Road and the recreational opportunities accessed by this road, cumulative traffic impacts to resources (i.e., transportation, wildlife, air quality – dust) from recreational users and mine-related traffic is anticipated. Energy Fuels has negotiated an ore-hauling schedule in accordance with Mesa County restrictions to minimize the potential for cumulative impacts or user conflicts associated with ore-truck traffic and recreation users of John Brown Road. According to this schedule, ore-trucks would only travel to and from the mine site during three time intervals (identified as early morning, mid-day, and late afternoon) and these times would be posted on the road and in the Town of Gateway. Truck traffic would be limited to weekdays from April 15 through December 15 to reduce weekend traffic levels during the warmer times of the year when recreational use is greater. The hauling schedule and warning signs for approaching truck traffic that would be posted along lower John Brown Road are expected to reduce the potential for collisions along this road. Increased traffic on John Brown Road as well as increased activities in the canyon could increase potential cumulative effects to various resources including air quality from increased fugitive dust and wildlife from potential crashes and human presence. Energy Fuels would mitigate these potential impacts through employee training to ensure haul truck traffic and mine traffic speed is maintained to ensure safety and control fugitive dust. Further, Energy Fuels would treat the road with magnesium chloride or a similar dust suppressant, as necessary, to minimize fugitive dust.

5.3.4 Other Potential Future Mining Activities
Description of Mining Activities
Other potential mining activities in the John Brown Canyon area were assessed by Energy Fuels (2007b) to determine if they could contribute to potential cumulative effects in the area (Map 5.1-1). Based on Energy Fuels’ assessment, there are two small mining areas south of the Whirlwind Mine and claim block that could foreseeably operate in the future. These two potential mines include the October Mine and the Cone Mountain property which combined, have identified a relatively small quantity of potential uranium ore (i.e., estimated at 60,000 tons of ore or less to date). These current estimated reserves provide only about 2 to 3 years of production, although this could change with additional exploration. At full production, both mines could
produce an average of about 50 tpd (or a combined total of 100 tpd) of ore. This production rate could add an additional 50 percent to ore production and haulage in the area when added to the estimated 200 tpd for the Whirlwind Mine (i.e., eight round trips per day).

Blue Rock Energy Corporation has begun work under an NOI for bulk sampling at the Cone Mountain property and has recently submitted a Plan of Operations to the BLM GJFO for an underground uranium mine. The NOI states that once sampling begins, one to three haul trucks per day (20 to 60 tpd of ore) would be utilizing John Brown Road. To fully develop the Cone Mountain property, it is estimated that 9 acres of new surface disturbance would be required.

Ore hauled from the October Mine would also be expected to use John Brown Road. It is estimated that it would take a few years before either of these potential mines could reach their peak production because they would need to be permitted, rehabilitated, and developed to access their respective ore bodies. The October Mine is a historic mine site with an existing low-grade ore stockpile (containing about 7,500 tons) and it is estimated that less than 1 acre of surface disturbance would be necessary to remove and haul the ore from the stockpile.

Most of the area north of John Brown Canyon is currently controlled by Energy Fuels under three long-term leases. The potential mining area is shown on Map 2.2-1 and includes all or portions of the existing Beaver Mesa mines (i.e., the Rajah 30, Austin #4, Rajah 49, Urantah Decline, Lumsden #2, Packrat, Hubbard, Lost Dutchman, and Bonanza). Energy Fuels’ claim block would be mined through the Whirlwind Portal. Energy Fuels would be required to consult with BLM prior to any connection with adjacent mines and further NEPA analysis may be required. The Energy Fuels claim block does not include the 60-acre private parcel in the north half of Section 35 or the Utah state section (see Map 2.2-1). The mineral rights under the private parcel are controlled by the Hubbard family, while the state section is controlled by Energy Metals, which was recently acquired by Uranium One Inc.

The Hubbard Mine is a drift mine off of Lumsden Canyon and shares a common portal with the Packrat Mine, which Energy Fuels controls. The Utah state section (Section 16) has not been previously developed; however, development at the Whirlwind Mine is expected to be in close proximity to this section. Neither of these two properties has sufficient ore reserves to justify the construction of a production shaft and mine facilities although both could be mined easily from the Whirlwind/Packrat complex if agreements with the owners were to be implemented. Energy Fuels has indicated that it is unlikely that mineral rights agreements with these properties would result in higher production levels in the Whirlwind Portal because there is a limited amount of ore and waste rock that could be hauled from the Whirlwind Mine in a 24-hour period. It is more likely that the additional reserves would extend the mine life at the projected maximum production rate of 200 tpd.

Cumulative Resource Effects

Potential cumulative resource effects are possible if the other mining activities in the area were to occur. Traffic would increase along John Brown Road from these other mining activities, the Proposed Action, and traffic associated with private property access and recreational uses on public land. The other mining activities would also increase ore-truck traffic on state highways in western Colorado and eastern Utah. All mining-related traffic would be required to obtain permits and approvals from Mesa County and comply with CDOT and UDOT regulations. Impacts from traffic to all resources would be minimized through speed control, dust control, appropriate signage, employee training, and scheduling (seasonal and daily).

Air emissions from other mining sites are possible, although the disturbed area for underground mining operations is typically limited, and the potential for fugitive dust and combustion emissions is low. Other mine developers would be required to secure air permits from Colorado
APCPC and potentially from the Utah Department of Environmental Quality–Division of Air Quality and would be subject to similar provisions and mitigation as the Whirlwind Mine which would minimize the potential for cumulative air quality impacts.

Dewatering operations in other mines could result in additional water discharge that would flow to the Dolores River. The area disturbed by underground mining activities is typically limited and the impacts to surface water would be controlled through discharge and stormwater permitting requirements. Control of surface water runoff from facilities and road systems would be required under the Colorado DRMS and WQCD and under the Utah DOGM and Water Quality Division permitting stipulations. Future mine sites would be reclaimed under the requirements of the DRMS and DOGM, reducing the impacts to John Brown Creek after mining has ceased. The classification and uses of the Dolores River and tributaries are not expected to be affected.

Groundwater occurrence in the area is limited (DOE, 2007) and the use of groundwater for future mine operations and dust suppression is anticipated. The Burro Canyon Formation water-bearing zone would not be affected by mining operations. Generally, stock watering and domestic wells for beneficial use are completed in the Burro Canyon Formation and along the Lumsden Creek Fault. Wells in this area would not be affected. Based on the geology of the area, the subsurface geology to be intersected by mining operations at the Whirlwind Mine is the Brushy Basin Member and the Salt Wash Member of the Morrison Formation. The canyon is deeply incised and provides at least a partial barrier, if not a full barrier, to groundwater migration. In addition, the water-bearing zones are lenticular and discontinuous; therefore, no measurable cumulative impacts to groundwater resources are anticipated.

With increased traffic would be an increase in the potential for an ore-truck or materials delivery truck to overturn in a floodplain. Based on the dispersed location of the floodplains in the area and the very low potential for ore spillage if there were an accident, the potential cumulative impact to a floodplain would be minor if not nonexistent.

Wildlife would potentially be impacted by the increase in human presence, surface disturbance, and traffic. Those cumulative impacts would be mitigated through the traffic controls listed above. Cumulative wildlife impacts would be mitigated through individual permit requirements containing species-specific conditions such as bat gates, escape ramps in water tanks, reclamation requirements, etc.

5.4 DOE URANIUM LEASING PROGRAM FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT CUMULATIVE ANALYSIS

The DOE uranium leasing program area is located south of Gateway, Colorado and the Whirlwind Mine project area. Within the cumulative analysis section of the DOE Uranium Leasing Program Final Programmatic EA (DOE, 2007), the DOE limited the project impact zone to the geographic boundary of the uranium leasing mining area (27,000 acres south of Gateway), which is a much larger area than the Whirlwind Mine project area. The timeframe was limited to 10 years. DOE acknowledged that the increasing price of uranium is generating interest in uranium mining, evidenced by the 4,800 valid uranium claims (not on DOE lease tracts) in Mesa, Montrose, and San Miguel counties, most of which were staked within the last 2 years. DOE stated that the operational status of these claims is market-dependent and the number of claims that could be put into production is too uncertain to estimate.

Based on historical mining activity levels on DOE lease tracts, DOE projected the range of potential impacts. If just 42 claims (approximately 0.9 percent of the existing 4,800 claims in the region) were developed in a manner comparable to the development anticipated on DOE’s lease tracts, then the impacts would likely be comparable to 570 workers, 150 haul-trucks/ore
shipments per day, and 420 acres of land committed to mining. At the extreme, if all claims were brought into production, several thousand new workers would be needed, thousands of haul trucks could be on the county roads and state highways, potentially increasing traffic volume, noise, dust, and accident rates, and the acres of land and habitat affected would also number in the thousands. Under this scenario, the capacity of the two existing mills would be exceeded and therefore, such an expansion may not be feasible.

DOE’s conservative cumulative analysis in estimating workforce, haul-traffic and land committed to mining is likely unrealistic considering the potential milling capacity in the foreseeable future. Table 5.5-1 provides conservative estimates for the expected milling capacities and the operational status for potential mills that have been announced, are in process of permitting, or are already permitted.

<table>
<thead>
<tr>
<th>Mill/Location</th>
<th>Owner</th>
<th>Estimated Milling Capacity (tpd)</th>
<th>Estimated Operational Status</th>
</tr>
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<tr>
<td>White Mesa Mill</td>
<td>Denison Mines (USA) Corp</td>
<td>2,000</td>
<td>May 2008</td>
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<tr>
<td>Cañon City Mill</td>
<td>Cotter Corporation</td>
<td>1,500</td>
<td>Inactive</td>
</tr>
<tr>
<td>Shootaring Mill</td>
<td>Uranium One Inc.</td>
<td>750</td>
<td>Inactive, in process of permitting</td>
</tr>
<tr>
<td>Piñon Ridge Mill</td>
<td>Energy Fuels Resources Corp</td>
<td>1,000</td>
<td>Conducting baseline studies</td>
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<tr>
<td>MRI Mill</td>
<td>Blue Rock Resources LTD.</td>
<td>1,200</td>
<td>Projected 2012 start date</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>6,450</strong></td>
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</table>

Based on the total daily milling capacity in Table 5.5-1, if all mills were operational and at full capacity, this would equate to an average of approximately 269 ore-truck round trips per day (538 trips total) based on 24 tons per shipment. A conservative estimate for potential surface disturbance would be 20 acres of disturbance for every 100 tpd of production (Energy Fuels, 2008c). For example, the Whirlwind Mine would disturb approximately 14 acres per 100 tpd of production. Based on the 20-acre estimate, this would equate to 1,290 acres of cumulative surface disturbance to produce 6,450 tpd of milling capacity. However, mills operate approximately 350 days per year and mines operate approximately 250 days per year (Energy Fuels, 2008c). Therefore, based on total milling capacity, it is reasonable to increase the estimated surface disturbance by 40 percent to reach a conservative projected cumulative surface disturbance total of 1,806 acres. It is estimated that one miner could mine 7 tons per day (Energy Fuels, 2008c), resulting in a cumulative workforce estimate of 921 workers to meet the daily production of 6,450 tons. Using these more realistic mining projections based on potential milling capacities, cumulative development in the area would not result in “thousands” of workers, trucks, and acres of surface disturbance.

When analyzing the cumulative impacts associated with uranium mining in the leasing area, DOE identified social and economic resources, traffic congestion, noxious weeds, and other land uses as the resources that would be affected. In response to the potential increase in public recreation and traffic, DOE would monitor and work with the appropriate agencies to mitigate the effects. To control the spread of noxious weeds, DOE would require leaseholders to proactively control infestations and to wash vehicles prior to their entering a lease tract. DOE would also work with county weed programs to control infestations along county roads.
In addition to mining activities, DOE looked at ongoing development of oil and gas reserves in the region. While future development is unknown, currently six to ten drill rigs are often operating at one time in the region of DOE’s uranium lease tracts. The increase in the workforce and the subsequent cumulative impacts on the regional infrastructure, socioeconomics, and truck traffic resulting from mining and oil and gas development would not be appreciably greater than those assessed under the Expanded Program Alternative in the EA (DOE, 2007) because:

- oil and gas exploration and development does not require large numbers of workers (less than 20 per drill rig);
- the duration of their actions at an individual site is typically a matter of weeks and not years; and
- pipeline transport is favored over truck.

Based on estimates BLM provided to DOE, oil and gas development requires an average of 7 to 10 weeks for construction, drilling, and completion. During this time, assorted heavy equipment and pickup trucks would add to the traffic in the region. Workers would travel daily to a well location; however, the heavy equipment needs would not result in daily transit during this period. There would be brief periods of highly intensive heavy equipment travel (e.g. 5 to 10 trucks for a few days). Depending upon the number of wells developed at any one time, localized traffic increases would likely be experienced in the region. Oil and gas development would result in additional land use and biological impacts in the region; however, as with uranium mining, oil and gas drill rig impacts are limited to the localized area of a drill pad (5 to 10 acres), which would be dispersed throughout the region. Additional linear impacts to land use might occur if additional access roads and transmission pipelines are developed. The cumulative effects on land use and biota in the region would be an increase in the acreage of public lands that would be affected by mineral exploration. However, based on the relatively small footprint of oil and gas development operations, such an increase would likely be in the hundreds and not thousands of acres scattered across the region.

5.5 CONCLUSION

In summary, the Lumsden Canyon Trail Project would be undertaken to manage the increasing number of visitors to the area in order to reduce overall resource impacts. Similarly, the intent of the BLM’s Gateway SRMA planning effort is to reduce resource impacts and resource use conflicts on public lands near Gateway. Future development of the Gateway Canyon Resort, other mines in the John Brown Canyon area, and the DOE uranium program would result in cumulative impacts to multiple resources (i.e., traffic, wildlife, air quality, etc.). The extreme case scenario discussed in the DOE Uranium Leasing Program Final Programmatic EA (DOE, 2007) is unlikely based on available milling resources and the uranium market’s volatility. Therefore, based on the cumulative analysis in this chapter as well as the DOE’s (2007) cumulative analysis and the analysis in Chapter 4 of this EA, it is unlikely that cumulative impacts would occur that could not be mitigated.
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Chapter 6
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Chapter 7
Consultation and Coordination

7.1 LIST OF PREPARERS AND PARTICIPANTS

The list of preparers and participants is presented in Table 7.1-1.

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<thead>
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<tr>
<td><strong>BLM Interdisciplinary Team</strong></td>
<td></td>
</tr>
<tr>
<td>Colorado State Office</td>
<td></td>
</tr>
<tr>
<td>John Morrone</td>
<td>State Office Review</td>
</tr>
<tr>
<td>Brian St. George</td>
<td>State Office Review</td>
</tr>
<tr>
<td><strong>Grand Junction Field Office</strong></td>
<td></td>
</tr>
<tr>
<td>Matt Anderson</td>
<td>NEPA Coordination and Review, Air Quality, Environmental Justice, Prime and Unique Farmlands</td>
</tr>
<tr>
<td>Janny Choy</td>
<td>Water Quality, Hydrology, Water Rights</td>
</tr>
<tr>
<td>Jim Cooper</td>
<td>Transportation, Recreation, Visual, Wilderness</td>
</tr>
<tr>
<td>Jim Dollerschell</td>
<td>Range, Wild Horse &amp; Burro Act, Riparian, Floodplains</td>
</tr>
<tr>
<td>Doug Paul-Angela Foster</td>
<td>Fire Ecology, Fuels Management</td>
</tr>
<tr>
<td>Bob Fowler</td>
<td>Vegetation, Riparian, Floodplains</td>
</tr>
<tr>
<td>Scott Gerwe</td>
<td>EA Review Coordination, Geology, Groundwater, Paleontology</td>
</tr>
<tr>
<td>Alan Kraus</td>
<td>Hazardous Materials</td>
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<tr>
<td>Robin Lacy</td>
<td>Land Status/Realty Authorizations</td>
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<tr>
<td>Aline LaForge</td>
<td>Cultural Resources, Native American Religious Concerns</td>
</tr>
<tr>
<td>Anna Lincoln</td>
<td>Threatened and Endangered Plant Species</td>
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<tr>
<td>Heidi Plank</td>
<td>Migratory Birds, Threatened and Endangered Species, Terrestrial and Aquatic Wildlife</td>
</tr>
<tr>
<td>Mark Taber</td>
<td>Invasive, Non-Native Species (Weeds)</td>
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<tr>
<td><strong>Moab Field Office</strong></td>
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<tr>
<td>Rebecca Doolittle</td>
<td>Geology, Minerals, Paleontology</td>
</tr>
<tr>
<td>Pamela Riddle</td>
<td>Wildlife, TES Wildlife Species</td>
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<tr>
<td>Ed Maloney</td>
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<tr>
<td>Tom Fresques</td>
<td>Threatened and Endangered Species</td>
</tr>
<tr>
<td><strong>Edge Environmental, Inc.</strong></td>
<td></td>
</tr>
<tr>
<td>Mary Bloomstran</td>
<td>Project Management, Document Review</td>
</tr>
<tr>
<td>Dan Duce</td>
<td>Soils, Wetlands, Climate, Floodplains, Riparian, Paleontology, Vegetation, Project Description</td>
</tr>
<tr>
<td>Nichole Gagnon</td>
<td>Transportation</td>
</tr>
<tr>
<td>Sandra Goodman</td>
<td>Socioeconomics and Environmental Justice</td>
</tr>
<tr>
<td>Andy Kaiser</td>
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<td>Carolyn Last</td>
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<td>Josh Moro</td>
<td>Cultural, Grazing, Recreation, Wildlife, Threatened and Endangered Species, Invasive Non-Native Species</td>
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<td>Archie Reeve</td>
<td>Wildlife, Threatened and Endangered Species</td>
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<td>Joe Thomas</td>
<td>GIS Coordinator, Mapping</td>
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<td><strong>LCR Inc.</strong></td>
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<td>Jim Bowlby</td>
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<tr>
<td>Karmen King</td>
<td>Air Quality Floodplains, Water Quality, Wild and Scenic Rivers, Geology, Noise</td>
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<td>Robert Garrigues</td>
<td>EA Coordination, Surface Water, Groundwater, Geology</td>
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<tr>
<td>Ivan Messinger</td>
<td>Invasive Non-Native Species, Vegetation, Migratory Birds, Threatened and Endangered Species, Wetlands, Riparian, Soils, Wildlife, Grazing</td>
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<td>Steve Caldwell</td>
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<td>Steve Glass</td>
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APPENDIX A

BLM Response to Public Comment
Response to Public Comment

1. General

Comment 1-1: BLM should conduct a full Environmental Impact Study for the Whirlwind Mine proposal.

Response: BLM has chosen to prepare an Environmental Assessment to evaluate the impacts resulting from implementation of Energy Fuels' Plan of Operation for the Whirlwind Mine. After conducting the analysis in the EA, BLM has determined that there would be no significant impacts resulting from implementation of Energy Fuels' Plan of Operations for the Whirlwind Mine – see BLM's Finding of No Significant Impact (FONSI).

Comment 1-2: There is a need for a programmatic/cumulative EIS.

Response: Energy Fuels' proposal is for continued work at an existing mine and is in conformance with existing land use plans. After completing the analysis in the EA, BLM has determined that there are no significant impacts associated with the Proposed Action and associated mitigation. Therefore, there is no need for an EIS.

Comment 1-3: Energy Fuels is a Canadian company which has little respect for laws.

Response: This comment represents opinion which does not warrant a specific response; however, it should be noted that Energy Fuels Resources Corporation is a Colorado Company incorporated in Colorado. Energy Fuels Inc., a Canadian Company, is the parent company of Energy Fuels Resources Corporation.

Comment 1-4: Energy Fuels has failed to submit a comprehensive emergency plan.

Response: One of the conditions included in the Conditional Use Permit issued by Mesa County states “An emergency management plan shall be prepared and provided to Mesa County and the local fire district and emergency service providers for comment and a final plan submitted to the Planning Department prior to the approval of a final development plan and operation.” Energy Fuels has submitted the Surface Facility Emergency Management Plan to Mesa County and the local fire district. The Surface Facility Emergency Response Plan is also included in Energy Fuels’ Plan of Operations (Appendix F) and in the Final SEIS (Appendix B).

Comment 1-5: The EA does not describe adequate storage for uranium ore.

Response: The size of the uranium ore stockpile was determined during Energy Fuel's permitting process with the Colorado Division of Reclamation Mining and Safety (DRMS) and BLM concurs with the DRMS determination.

Comment 1-6: The BLM should require the mine owners, contractors and sub-contractors to be held to a standard of disclosure and planning here that would prohibit this operation from causing the same outcomes that are faced in the region.
Response: Table 1-1 in Chapter 1 of the Environmental Assessment provides a list of permits and approvals that Energy Fuels either has obtained or would be required to obtain prior to implementation of the Plan of Operations. Several of the permits and approvals include Conditions that may be carried over into a decision by BLM.

Comment 1-7: Baseline data is inadequate because the affected environment section does not describe contamination levels from previous mining activities in the area.

Response: BLM knows of no current contamination levels from previous mining activities in the area. The Whirlwind and Packrat portal areas were reclaimed by previous mine operators prior to Energy Fuels initiating bulk sampling operations. The BLM and DRMS inspected the final reclamation and approved liability releases in 2004 based on the success of reclamation efforts. In addition to the liability releases, DRMS presented an award to the previous mine operators for successful reclamation. This discussion has been added to the Final EA in Chapter 2 Section 2.2.2.1.

Comment 1-8: BLM must adopt language to include enforceable communication in regard to Energy Fuel’s proposal.

Response: BLM’s decision document for the Whirlwind Mine Uranium Mining Project Environmental Assessment (the Decision Record) is enforceable.

Comment: 1-8: Unsecured stockpiles of uranium ore could be loaded up into pickup trucks and driven away and used as backfill or as deliberate contamination.

Response: This comment represents a very unlikely scenario which has not been analyzed in the EA.

Comment 1-9: Future mining operations such as connections with the Lumsden No. 2 or Rajah 49 must be reviewed in a separate NEPA process.

Response: Energy Fuels would be required to consult with BLM prior to any connection with adjacent mines and further NEPA analysis may be required.

Comment 1-10: BLM should require a comprehensive mitigation and reclamation plan.

Response: Comprehensive mitigation and reclamation plans are already in place with permits and approvals listed in Table 1-1 in Chapter 1 of the EA. BLM has required additional mitigation in their decision.

Comment 1-11: BLM has not provided adequate information on the bonding amount.
Response: The Colorado Division of Reclamation Mining and Safety (DRMS) calculated the reclamation bond for the Whirlwind Mine as $375,078.00. BLM concurs with this bonding amount.

Comment 1-12: The EA does not indicate whether the BLM has determined whether to prepare a FONSI or an EIS.

Response: BLM has determined that significant impacts would not result from implementation of Energy Fuels’ Plan of Operations. BLM has prepared a FONSI.


Response: Where appropriate, BLM has referenced certain appendices of Energy Fuels’ Plan of Operations. The Plan is available for public review at the BLM Grand Junction Field Office.

Comment 1-14: There is no indication that the BLM contacted the affected local governments of Grand County, Moab, and Castle Valley and the Ute Mountain Ute Tribe.

Response: BLM did consult the Ute Mountain Ute Tribe. In order to haul ore from the mine through Castle Valley and Moab, permits and approvals would be required from local governments. Permits may be required by the City of Moab to transport uranium ore through town.

Comment 1-15: The EA should include a history of where the ore from the various workings at the Whirlwind Mine location were processed, the amount of ore and uranium content of the ore shipped and data on federal money spent to reclaim mills and Whirlwind Mine workings.

Response: Representation of this information is outside the scope of this analysis.

Comment 1-16: The EA should identify previously disturbed un-reclaimed parts of the proposed project area.

Response: Previously disturbed areas are presented in Energy Fuels’ Plan of Operations and the existing disturbance associated with previous and current activities is described in Chapter 2 (Section 2.2.2.3) in the EA.

Comment 1-17: The use of untreated water for dust suppression and other purposes should not be permitted.

Response: Untreated water would not be used for dust suppression. All untreated water would be diverted to the untreated water tanks for treatment. Treated water may be used for dust suppression.
Comment 1-18: The BLM should provide more specific information regarding the handling and disposal of the water treatment wastes.

Response: Handling of water treatment wastes is discussed in the EA and described in detail in Energy Fuels’ Plan of Operation.

Comment 1-19: The EA should include a detailed analysis of the likely effectiveness of the proposed mitigation measures.

Response: Most of the environmental protective measures are permit conditions set forth by federal, state, and local agencies. Because the environmental protective measures have been derived from the agency’s and industry’s Best Management Practices, effectiveness once properly implemented has been demonstrated over time and at multiple locations. Monitoring and enforcement of mitigation are required of the lead agency by NEPA to ensure that proposed mitigation is actually implemented.

Comment 1-20: The allowable area of open, uncovered waste rock should be quantified and minimized (1 acre or less) to lessen the amount of air borne particulate matter suspended in the air and to limit water exposure to hot spots on the surface of the waste rock storage pile.

Response: Three to four acres are needed on the top of the Whirlwind waste rock pile to park equipment and store materials needed for underground mining. If the useable portion of the top of the waste rock pile was limited to 1 acre or less, adjacent undisturbed terrain would need to be cleared of trees, stripped of topsoil, and regraded to create a flat surface suitable for parking and material storage. Air quality permits issued by the CDPHE require that the mine use magnesium chloride and water sprays to control dust. The advancing face of the waste rock pile is limited to approximately 1 acre.

Comment 1-21: The SPCC Plan is required by 40 CFR Part 112 of EPA’s Oil Pollution Prevention Regulations rather than CDPHE.

Response: This has been clarified in the Final EA.

Comment 1-22: The term “used” oil should be used rather than “waste” oil in conformance with EPA’s RCRA regulations.

Response: This has been clarified in the Final EA.

Comment 1-23: Additional explanation should be added to the sentence beginning with “Source control measures” as follows: “Source control measures include packing and grouting of open exploration drill holes and vent shafts by plugging historical exploration drill holes and sealing around the casing of the 10-Straight Vent Shaft.”

Response: This has been clarified in the Final EA.
Comment 1-24: Suggest revising paragraph 4 on page 4-21 to read “During reclamation, the cover over the ore pad liner would be excavated and tested. If testing indicates it is nonhazardous material, the material and liner would be disposed of inside the mine in a dry area above the bulkhead seal to prevent contact with groundwater.

Response: This has been revised in the text of the Final EA.

Comment 1-25: Treated mine water will not be combined with surface water runoff in the sedimentation pond.

Response: This has been clarified in the text in the Final EA.

Comment 1-26: Weed control measures are required by the BLM rather than Mesa County.

Response: This has been clarified in the text in the Final EA.


Response: This has been clarified in the text in the Final EA.

2. Purpose and Need

Comment 2-1: The projected future demand for uranium ore must be compared to uranium ore reserves currently available for use, challenging BLM’s assertion of the existence of an international shortage, as implied within the Whirlwind EA.

Response: The EA does not imply that there is an international shortage of uranium.

Comment 2-2: BLM must prepare an EIS to analyze how the Whirlwind Mine will satisfy or contribute to meeting the international demand for uranium ore as identified within the Whirlwind EA.

Response: Any production of uranium ore from the Whirlwind Mine would contribute to meeting demand, whether small or large.

Comment 2-3: An EIS is required that analyzes the connected actions including milling and the other mining activities necessary to meet the international demand for uranium ore.

Response: BLM has determined that uranium mining and milling are not connected actions in this case. The Whirlwind Mine is not exclusively connected to either the White Mesa Mill, Energy Fuel’s proposed Piñon Ridge Mill, or any other mill. The White Mesa Mill already exists and therefore any impact analysis associated with that mill is outside the scope of this analysis.
Comment 2-4: The EA should evaluate the current and future need for uranium in the United States.

Response: Please see the Purpose and Need in Chapter 1 of the Final EA.

Comment 2-5: The EA should consider that the federal treasury will receive no royalties.

Response: This is outside the scope of this analysis.

Comment 2-6: The EA should contain data on the need for the uranium and the social, environmental, and financial costs associated with the nuclear fuel cycle.

Response: This is outside the scope of this analysis.

3. Cumulative Impacts

Comment 3-1: The EA should include an analysis of the cumulative impacts of the milling of uranium ore from federal lands in Colorado, Utah, Arizona, and New Mexico and at the White Mesa Mill.

Response: This type of analysis is outside the scope of this analysis.

Comment 3-2: The EA does not provide analysis of whether past, present, and future actions would have an impact on the four Colorado River endangered fish species.

Response: Threats to Colorado River endangered fish species were addressed generally in Section 4.23.2.1 and by reference to each species’ recovery plan in that section.

Comment 3-3: The EA does not include an analysis of the potential cumulative impacts of selenium contamination on aquatic ecosystems, fish in the Dolores and Colorado rivers, or birds.

Response: A portion of Section 4.23.2.1 is devoted to selenium contamination in the Colorado River and Dolores River, effects to vertebrates, and bioaccumulation through food chains.

4. Environmental Justice

Comment 4-1: The EA fails to identify the minority and low-income communities that will be impacted by the transportation and processing of the uranium ore.

Response: Except for John Brown Road, the transportation of uranium ore would occur on state and federal highways, not impacting minority and low-income communities. Impacts associated with the processing of uranium ore is not within the scope of this analysis.
5. Transportation

Comment 5-1: Trucks are too hazardous to safely drive on Highway 128 in Utah.

Response: This route is not the primary haul route. The Utah Department of Transportation implemented a weight restriction of 55,000 pounds on Highway 128 for through-traffic and therefore, haul trucks for the Whirlwind Mine would not be able to use this road without a variance. The reason for the weight restriction is because of safety concerns associated with tourists who are sightseeing that frequently travel the route and the possibility for collisions. Heavy loads are allowed for one-time deliveries such as furniture, cement, etc. This discussion is included in the Final EA.

Comment 5-2: Highway 141 is a narrow curvy road and there needs to be a clearly defined emergency plan in the event of either single or multiple vehicle accidents.

Response: Energy Fuels’ hauling contractor would be required to comply with U.S. Department of Transportation’s regulations for transport of radioactive materials found in Title 49 of the Code of Federal Regulations which includes preparation and implementation of an Emergency Response Plan. Preparation of the Emergency Response Plan is the responsibility of the hauling contractor. Energy Fuels has prepared an Ore Transportation Plan which identifies emergency response procedures that would be part of the Emergency Response Plan. The Ore Transportation Plan is included as Appendix C in the Final EA.

Comment 5-3: Alternate trucking routes are not considered in the EA.

Response: The text has been revised in the Final EA to discuss other potential transportation routes which may be used in the event that the primary haul route cannot be used.

Comment 5-4: All impacts associated with the transportation of ore and the potential for spills and overturns into streams must be analyzed by BLM in an EIS.

Response: Impacts associated with hauling ore and the potential for spills and overturns into streams is analyzed in the Final EA. Energy Fuels’ Ore Transportation Plan is included as Appendix C in the Final EA and further discussion has been added to Section 4.23.2.1 in the Final EA.

Comment 5-5: Energy Fuels’ Plan does not contain letters similar to the letter to Mesa County Regional Transportation Planning for Grand County, the Manti La Sal National Forest Service, San Juan County, or the State of Utah.

Response: Transportation on roads that are maintained by Grand County, San Juan County and the State of Utah would be on state and federal highways. Energy Fuels did contact the Forest Service and this reference has been added to the text in the Final EA. Before any of the haul routes other than the primary haul route could used, Energy Fuels would be required to obtain permits and approvals from local governments.
Appendix A  BLM Response to Public Comment

Comment 5-6: There is no winter maintenance on John Brown Road provided by Mesa County. Any winter maintenance is accomplished by either ranch owners or by a subcontractor of the Whirlwind Mine.

Response: This has been clarified in the text of the Final EA.

6. Recreation Resources

Comment: 6-1: Mining, milling, and transport of uranium in the region would be contradictory to the Gateway Area Recreation Management Plan Public Forums.

Response: Uranium mining is outside the scope of the Gateway Plan. In the future, BLM will address conflicts between increases in uranium mining with recreation use in the area.

Comment 6-2: BLM must anticipate potential effects upon recreation when considering impacts attributed to traffic from the Whirlwind site and the October Mine and the Cone Mountain Property.

Response: This has been considered in the Final EA. Blue Rock Energy Corporation has recently submitted a Plan of Operations for a uranium mine to the BLM. This is discussed in the Final EA.

Comment 6-3: The possibility of traffic from other mines with the possibility of growth of recreational users present significant congestion along John Brown Road.

Response: This has been discussed in the cumulative impacts section in the Final EA.

Comment 6-4: All locations and impacts resulting from transport of ore to and from all mill locations must be fully analyzed by BLM in an EIS.

Response: BLM has determined that uranium mining and milling are not connected actions. The Whirlwind Mine is not exclusively connected to either the White Mesa Mill, Energy Fuel’s proposed Piñon Ridge Mill, or any other mill. The White Mesa Mill already exists and therefore any impact analysis associated with that mill is outside the scope of this analysis.

7. Cultural and Historic Resources

Comment 7-1: The EA should have referenced the Cultural and Historic Resources that would be impacted on White Mesa.

Response: Activities at the White Mesa Mill are outside the scope of this analysis.
8. Surface Water

Comment 8-1: Energy Fuels should conduct the hydrogeologic study prior to initiation of mining activities.

Response: Energy Fuels has begun the hydrogeologic study. Part of the study (determination of connection between PR Spring and the Packrat Portal) cannot be conducted until there is safe access to the underground workings of the Packrat Mine. This information is included in the Final EA.

Comment 8-2: BLM should evaluate any discharges into the Dolores River and the resulting impacts to aquatic life, including impacts to threatened and endangered species.

Response: There will be no direct discharges to the Dolores River as a result Whirlwind Mine operations. The potential for discharge to the tributary of Lumsden Creek to reach the Dolores River is discussed in Chapter 4 Sections 415 (Surface Water) and 4.23 (Threatened and Endangered Species and Special Status Species) in the Final EA.

Comment 8-3: The BLM must analyze the waste water treatment design in detail.

Response: An analysis of the waste water treatment design is outside the scope of this analysis. The State of Colorado is the regulatory authority for the treatment and discharge of water under the CDPS permit. BLM can ensure that the design is feasible and practicable. Refinements have been and will continue to be made to the treatment system as necessary to ensure compliance with the CDPS permit requirements.

Comment 8-4: No water should be discharged from the sediment pond or from the water treatment system unless it can be demonstrated that the water meets the required standards.

Response: Energy Fuels has a CDPS Permit (CO-0047562) issued by the Colorado Department of Health and Environment Colorado Water Quality Control Division for the discharge from the water treatment system. The authority to regulate the discharge lies with the State of Colorado. As stated in Chapter 4 Section 4.15 (Surface Water), Energy Fuels is proposing to sample the sedimentation pond on a quarterly basis and implement mitigation, if necessary.

Comment 8-6: The treated water should be used to irrigate the reclaimed areas.

Response: The CDPS Permit requires that the water be discharged to the middle tributary of Lumsden Creek immediately west of the treated water tanks. There have been reclamation projects completed in the area at similar elevations and precipitation levels that are successful without irrigation.

Comment 8-7: The diversion channels around the site are designed for the 100-year storm event rather than the 10-year event. The collection ditches within the project area are designed for the 10-year event.
Response: This has been clarified in the Final EA.

9. Groundwater Resources

Comment 9-1: The Dolores Point Well provides water to a series of stock ponds and tanks in the spring and fall when cattle are grazed on this specific BLM allotment.

Response: This has been clarified in the text of the Final EA.

10. Vegetation

Comment 10-1: BLM should require only native species of grasses and forbs to be seeded – no crested wheat should be used.

Response: The proposed seed mix has been approved as part of the Colorado DRMS permit, although BLM has final approval for reclamation on lands that they manage. Crested wheat is included as a small percentage of the seed mix. It provides for quick stabilization of the soils. Crested wheat is not expected to out-compete the native species in the seed mix that will come in more slowly.

Comment 10-2: The waste rock pile and reclaimed area should be fenced to exclude livestock for 3 to 5 years after reclamation.

Response: The text in the Final EA has been revised to include a protective measure that excludes livestock for a minimum of 3 years after reclamation.

11. Invasive Species and Noxious Weeds

Comment 11-1: Language should be changed to require reseeding of disturbed areas during the first favorable season for reclamation within 8 months of completing disturbance activities.

Response: The text has been revised in the Final EA to clarify that reseeding would occur according to BLM’s Standard Design Practices and would occur after August 15 and prior to October 1.

12. Threatened and Endangered Species and Special Status Species

Comment 12-1: The EA should discuss how sediment introduced into the Dolores and Colorado Rivers might affect the four Colorado River endangered fish species.

Response: This discussion and analysis has been included in Section 4.23.2.1 in the Final EA.

Comment 12-2: The EA should provide a list of potential contaminants that could be introduced into the Dolores and Colorado rivers and a discussion of how each potential contaminant might affect the four Colorado River endangered fish species.
Response: This discussion and analysis has been included in Section 4.23.2.1 in the Final EA.

Comment 12-3: The EA should analyze whether the consumptive use of groundwater for mining activities will indirectly result in depletion of surface water in the Colorado and Dolores Rivers and how a depletion might affect the Colorado River endangered fish species.

Response: This discussion and analysis has been included in Section 4.23.2.1 in the Final EA. See response to Comment 12-8, below.

Comment 12-4: The EA should provide a detailed description of locations where potential haul routes parallel or cross river segments that may be occupied by any of the four Colorado River endangered fish species.

Response: Potential haul routes do not cross or parallel river segments that may be occupied by any of the four Colorado River Endangered Fish Species.

Comment 12-5: The EA should provide an analysis of the likelihood of ore spills into the stream segments.

Response: Potential ore spills into the Dolores River is discussed in Section 4.23.2.1 in the Final EA.

Comment 12-6: The EA should provide an analysis of the potential impacts of an accidental spill on the fish species present in the stream segment that would be affected by an ore spill.

Response: This discussion and analysis has been included in Section 4.23.2.1 in the Final EA.

Comment 12-7: The EA should include mitigation measures that address impacts to the Colorado River endangered fish species.

Response: This discussion and analysis has been included in Section 4.23.2.1 in the Final EA.

Comment 12-8: The BLM should initiate consultation with the U.S. Fish and Wildlife Service as required by Section 7 of the Endangered Species Act.

Response: BLM is required to initiate consultation with the U.S. Fish and Wildlife Service (USFWS) only if there is a determination by BLM of “may affect” to any species. The only species where this determination was made is for the Colorado River endangered fish species. Effects to Colorado River endangered fish species are addressed in BLM’s Programmatic Biological Assessment which addresses water depleting activities in the Colorado River Basin. In response to the Programmatic Biological Assessment, the USFWS issued a Programmatic Biological Opinion which determined that water depletions from the Colorado River Basin would jeopardize the continued existence of the Colorado River endangered fish species. The Biological Opinion included reasonable and prudent alternatives developed by the USFWS to
allow BLM to authorize individual projects, such as the Proposed Action, which result in water depletions of less than 125 acre-feet per year. Therefore, further consultation with the USFWS is not required.

Comment 12-9: The EA does not adequately analyze the potential impacts on special status species including southwestern willow flycatcher, Mexican spotted owl, Western yellow-billed cuckoo, Uintah Basin hookless cactus, bats, birds, sensitive plants, herpetiles (particularly canyon tree-frog), Gunnison sage-grouse, and river otter.

Response: Potential impacts to the species noted have been included in Section 4.23.2.1 in the Final EA. Gunnison sage-grouse do not occur within the project area. River otters have no special status in Colorado.

13. Wildlife and Aquatic Resources

Comment 13-1: BLM should consider appropriate measures to prevent black bear-human conflicts such as bear proof trash containers instead of open roll-of containers.

Response: These measures are included in Section 4.24.2 in the Final EA.

Comment 13-2: The untreated water pond should be netted to keep migratory birds out of the pond.

Response: Upon further discussion with the Colorado Division of Wildlife Biologist (Kirk Navo and Jon Holst), it was determined that ponds should be left un-netted and available for bats and other wildlife to use. In order to prevent bat and bird impacts and/or mortality from tank entrapment, the tanks will be equipped with escape structures based on proven methods.

Comment 13-3: The EA should identify the dates for the pre-nesting and chick fledging periods for migratory birds in the EA.

Response: Dates for migratory birds are included in Section 4.23.2.2 and Section 4.24.2 in the Final EA.

Comment 13-4: The EA should consider that there would be a temporary loss of habitat and corresponding impact to bats.

Response: A discussion of the temporary loss of bat habitat has been included in Section 4.23.2.2 in the Final EA.

Comment 13-5: To provide complete disclosure of the potential impacts to bluehead sucker, flannelmouth sucker, and roundtail chub, provide additional information on the water quality discharge permit levels that were exceeded in the past, and the estimated frequency of treated water discharge flows reaching the Dolores River.
Response: Disclosure of water quality discharge levels is included in Section 4.15.2 and effects to fish are included in Section 4.23.2.2 and Section 4.24.2 in the Final EA. A discussion of the exceedances for the discharge permit levels is included in Appendix D of the Final EA.


Comment 14-1: The EA and the applicant must go to greater lengths in describing how radio particulates will be controlled.

Response: Energy Fuels would control radio particulates and fugitive dust in accordance with applicable MSHA regulations, air quality regulations, and U.S. Department of Transportation shipping regulations. If any of the applicable regulations are revised or amended, Energy Fuels would modify policies accordingly to comply with the revised regulations.

Comment 14-2: BLM does not reference TENORM materials in the EA.

Response: A discussion on TENORM has been added to Section 4.25.2 in the Final EA.

Comment 14-3: The Colorado Department of Public Health and the Environment and the U.S. Environmental Protection Agency must be consulted by BLM as part of the NEPA process to determine how such wastes are classified, handled disposed.

Response: Energy Fuels has obtained the required permits from Colorado Department of Public Health and the Environment. Consultation with EPA is not required at this level of NEPA analysis.

Comment 14-4: The EA fails to recognize that wastes from conventional uranium mining are considered to be TENORM and are subject to EPA and State agency oversight.

Response: A discussion on TENORM has been added to Section 4.25.2 in the Final EA.

15. Human Health

Comment 15-1: Health hazards associated with uranium dust are not sufficiently addressed in the EA.

Response: Please see Protective/Mitigation Measures in Section 4.26 (Human Health).

Comment 15-2: The EA should include reference to the recently released study of the Monticello, Utah, uranium workers.

Response: The study will not be released until the Utah Department of Health and the Utah Cancer Registry have reached an agreement. Monticello, Utah was home to a uranium mill from 1941 to 1960. The study involves an investigation to determine if elevated rates of cancer occurred in Monticello compared to Utah overall.
Comment 15-3: The Colorado Medical Society has passed a resolution to ban uranium mining.

Response: In response to the resolution by the Colorado Medical Society, Colorado House Bill 08-1161 was introduced and signed into law which sets standards for permitting, operating, and reclaiming in-situ uranium mines in the state of Colorado. The Whirlwind Mine is not an in-situ uranium mine.
APPENDIX B

Emergency Response Plan
(Energy Fuels)
SURFACE FACILITY EMERGENCY RESPONSE PLAN

Section I - Emergency Response Procedures

These procedures have been developed for use during any response to an emergency situation at the Whirlwind Mine site surface facilities. An emergency situation can include, but is not limited to: spills of hazardous materials, fires, accidents involving personnel and/or material transport, or any combination of the above.

The emergency RESPONSE PROCEDURES in text form are found in Section I. A copy of the initial emergency response procedures are attached as Appendix A.

A listing of hazardous materials (HazMat) in storage or in use at the Whirlwind Mine site is included in this plan as Exhibit 1 "HazMat Table." The HazMat Table lists the materials by type and includes the location of the material, the hazard classification of the material, the maximum quantity stored at any one location, and the containment structures at that location. A site map illustrating the surface facilities and detailing the location and containment structures for hazardous materials is attached to this plan as Figure 1.

These procedures are not to be used for responding to alarms associated with routine operational problems that occur within the site systems. Examples of routine problems include, but are not limited to, equipment breakdowns and wastewater treatment system process alarms.

Section II - Emergency Response Equipment

The list of available EQUIPMENT FOR RESPONSE operations is included as SECTION II.

Section III - Emergency Response Training Program

The TRAINING PROGRAM for personnel who may be involved in an emergency situation at the Whirlwind Mine is included as SECTION III.
SECTION I: SURFACE FACILITY EMERGENCY RESPONSE PROCEDURES

Preface

These procedures have been developed for use by Energy Fuels Resources Corporation (EFR) personnel during any response to an emergency situation at the Whirlwind Mine site surface facilities. An emergency situation can include, but is not limited to, spills of hazardous materials (HazMat), fires, accidents involving personnel and/or material transport, or any combination of the above. Note that all EFR personnel located on the surface during an emergency situation are required to respond to the emergency.

These procedures are not to be used for responding to alarms associated with routine operational problems that occur within the site process and monitoring systems, unless those problems could result in an emergency situation. Examples of routine operational problems include intrusion alarms and routine process alarms at the wastewater treatment facilities.

Any emergency situation will be successfully resolved by a phased response consisting of notification, operations, and remediation. These three phases will be implemented in concert or sequentially depending upon the specific situation and available personnel.

PHASE ONE: NOTIFICATION

PHASE TWO: OPERATIONS

PHASE THREE: REMEDIATION

PHASE 1.0 NOTIFICATION

The first person to arrive at the location of an emergency situation becomes the First Responder to the incident and assumes responsibility for the subsequent emergency response until they are relieved by an Emergency Coordinator, or voluntarily relinquish their authority to a more qualified person. The First Responder can be any Energy Fuels employee or a contractor’s employee (e.g. truck driver).

The PRIMARY RESPONSIBILITY of the First Responder in an emergency situation is the prompt NOTIFICATION of other site personnel. The First Responder shall immediately relay an incident evaluation to at least one other person prior to initiating the operations phase during an emergency response. The incident evaluation must include the following information, at a minimum.

a) The location of the incident.
b) The nature of the incident.
c) The extent of injury, if applicable.
d) The type of material spilled, if known and applicable.
e) The physical extent of the spill area, if applicable.
f) The First Responder’s intended course of action.
g) Available communication devices, if communication must be maintained.
1.1 Internal Notification

The first person contacted by a First Responder notes the information provided in the incident evaluation and is then responsible for notifying the Mine Foreman. Notification procedures for work hours and off shift are detailed below.

1.1.1 Work Hours

During normal mine site work hours internal notification by the First Responder shall be made directly in person, or by utilizing the telephone or mine-phone page systems, if available.

The first person contacted by the First Responder shall notify the Mine Foreman and then ensure that the emergency alarm horn (Fire Alarm) is sounded to notify all other personnel on the surface that an emergency situation exists.

*Note: Directions on the location and use of these communications systems are attached to this procedure as Exhibit 4.*

1.1.2 Off-Work Hours

Off-hours notification of response personnel is initiated by the First Responder, who notifies the Mine Foreman, the Safety Director and any other available response personnel. The Safety Director carries a cell phone / pager and is on call for responding to abnormal process system conditions. A current list of on-call emergency response personnel is provided in Exhibit 3.

1.1.3 Incident Command

The first Emergency Coordinator shall assume the responsibility of Incident Command until officially relieved by someone of higher authority. The Incident Commander shall ensure that the Emergency Alarm Horn is sounded to alert all site surface personnel that an emergency situation exists. The Incident Commander shall then proceed to the designated response assembly point to coordinate field operations.

*Note: Once a response operation is under way, a change in Incident Command should only occur if the change would significantly improve the response to the emergency situation.*

1.1.4 Emergency Coordinator

The Mine Foreman should first and foremost to act as the Emergency Coordinator during an emergency situation at the Whirlwind Mine surface facilities.

The Emergency Coordinator will perform the following duties:

a. Maintain contact with and coordinate site operations and personnel with the incident response operation.

b. Evaluate the incident on an ongoing basis and coordinate the site incident response operation with the Safety Director, Corporate Management and any outside emergency response organizations, such as medical and fire services, responding to the mine site.

c. Designate a suitable alternate during their absence.
1.2 Notification and Coordination with External Entities

Notification and coordination with external emergency response organizations, potentially affected off-site entities, and regulatory agencies may be necessary during an emergency situation at the Whirlwind Mine.

1.2.1 External Emergency Response Organizations

The Emergency Coordinator will evaluate the need for assistance from external emergency response organizations, such as medical and fire services, at the earliest possible moment during an incident response. Notification of external response organizations must be done promptly, when necessary.

The current external medical and fire service organizations available for assistance during an emergency situation at the Whirlwind Mine are listed in Exhibit 2.

1.2.2 Non-Emergency Response Off-Site Entities and Regulatory Agencies

The General Manager will evaluate the emergency on an ongoing basis to determine whether the notification of non-emergency response off-site entities or regulatory agencies is necessary.

The General Manager will be responsible for the notification of non-emergency off-site entities or regulatory agencies, when necessary.

A list of off-site entities and regulatory agencies that may be notified during an emergency situation at the Whirlwind Mine is included below. Those agencies that must be notified within 24-Hours of the occurrence are noted as such.

For Reportable Quantity (RQ) spills:

- The State of Colorado Emergency Management Unit 24-Hour
- The USEPA National Response Center 24-Hour
- Mesa County Local Emergency Planning Commission (LEPC) 24-Hour
- The U.S. Bureau of Land Management Situation Dependent

For any fire at the surface facilities:

- The Gateway Unaweep Fire Department Immediately
- The Federal Mine Safety & Health Administration Within 2 Hours
- The U.S. Bureau of Land Management Situation Dependent
PHASE 2.0 OPERATIONS

The limiting factors of terrain and distance dictate that many emergency situations that occur at the surface facilities of the Whirlwind Mine will have to be successfully resolved or controlled by on-site personnel before external agencies or organizations will be able to mobilize and arrive on-site.

On-site personnel involved in responding to an emergency scene must carefully evaluate the situation prior to committing themselves and others to action. The severity of any injury, the quantity and concentration of any hazardous material released, the presence or absence of fire and/or energized electrical circuits, and the location of the incident are some of the primary factors used in determining an operations strategy both before and during an incident response. Responders should always perform a thorough initial and ongoing incident evaluation that accounts for these factors, and adjust their actions accordingly. A thorough incident evaluation should include the following aspects:

1) The presence of physical and electrical hazards, or hazardous materials.
2) The physical layout of the incident area.
3) The extent of injury, if applicable.
4) The type and quantity of materials spilled, if any.
5) Any actions already taken.
6) The number and skills of available personnel.
7) The type and quantity of available equipment and supplies.
8) The type and availability of both internal and external support.
9) Alternate courses of action.

Response operations will usually occur in two distinct, but often overlapping, stages once the incident evaluation and subsequent notification is complete. The first stage consists of those actions taken by the First Responder immediately after the notification phase. The second stage of operations consists of coordinated site-wide actions taken to successfully resolve a situation by multiple response personnel or external support services. Actions taken by the First Responder may, or may not, successfully resolve the emergency at the Stage 1 level of operations. If the First Responder can successfully resolve the situation then the second stage of operations will terminate with the mobilization of site personnel during the notification phase. If the First Responder cannot successfully resolve the situation, or if the situation is beyond the First Responder’s capabilities to resolve, then the second stage of response operations will continue through field response actions until a successful resolution of the emergency situation has occurred.

General guidelines for First Responder and multiple responder operations are provided below. Operational guidelines for specific types of incidents are attached as appendices to this section with HazMat response guidelines organized according to the respective USDOT hazard class of the material. The hazardous materials in use and stored on-site are listed in the HazMat Table attached as Exhibit 1 to this procedure. The HazMat Table also lists supporting information such as the container type and other containment structures associated with the materials.

Responders should always attempt to de-energize electrical equipment and eliminate ongoing leak or spill sources (re. closing valves, etc.), both prior to and during operations, if the responder(s) will not be exposed to an unwarranted level of risk while doing so.

The prompt containment of spilled materials, or the containment of fires to a limited area, is a primary goal of any field response action during these types of emergency situations. Limiting the area impacted by a spill or a fire will significantly reduce the level of cleanup required after the response is over.
The use of proper personal protection equipment (PPE) is mandatory during response operations. The type of PPE used will depend on the type of HazMat involved and the potential for contact with a hazardous material. A listing of available response equipment and its location on site is provided in Section III of this procedure.

2.1 Stage 1 Operations - First Responder

The first person to arrive at the location of an emergency situation becomes the First Responder to the incident and assumes responsibility for the subsequent emergency response until they are relieved by a more qualified person. The First Responder can be any Energy Fuels employee or a contractor's employee (e.g. truck driver).

Stage 1 response operations are coordinated individual operations undertaken by a single person upon encountering an emergency situation. The First Responder will proceed through the two distinct activity phases of Notification and Field Response Action when responding to an emergency situation.

2.1.1 Stage 1 Notification

The PRIMARY RESPONSIBILITY of the First Responder in an emergency situation is the prompt NOTIFICATION of other site personnel. The First Responder shall immediately relay an incident evaluation to one other person prior to taking any other action during an emergency response.

2.1.2 Stage 1 Field Action

After notification the First Responder will proceed to the Field Action Phase of response. The type of action taken by the First Responder during an emergency situation will depend on an ongoing evaluation of the incident and the First Responder's capability to respond.

First Responders should always make an initial response to incidents that are within the capabilities of a single person to correct, or control, until help arrives. Generally, a single person can successfully correct or control small fires, small HazMat spills, and minor accidents that do not represent an unwarranted health hazard to a single responder. The First Responder must always be prepared to retreat and monitor the situation from a safe distance until help arrives if the initial incident evaluation, or the responder's ongoing evaluation, indicate that an unwarranted hazard exists or may develop.

2.2 Stage 2 Operations - Multiple Responder

Stage 2 response operations are coordinated site-wide operations involving multiple personnel. Stage 2 response operations are initiated during the notification phase of any emergency response and proceed through the three distinct Stage 2 activity phases of Alert, Mobilization, and Field Actions.

2.2.1 Stage 2 Alert

Sounding of the Emergency Alarm Horn (Fire Alarm) during the Notification Phase of an emergency situation constitutes the Alert phase of a Stage 2 response operation and signals the beginning of a
Stage 2 site response. All EFR and non-EFR personnel on the surface are to immediately proceed to a designated assembly point when the Emergency Alarm Horn (Fire Alarm) is sounded.

2.2.2 Stage 2 Mobilization

All emergency responses to an emergency situation at the Whirlwind Mine will continue through Stage 2 Mobilization. Mobilization for Stage 2 response operations consists of the assembly and organization of site surface personnel for coordinated response operations and will terminate at the end of mobilization if the emergency situation is successfully resolved at the First Responder level. The site will demobilize and the Remediation Phase of the Emergency Response Plan will be executed if the situation is resolved at the First Responder level.

~ Mobilization: Assembly

All surface personnel are required to report to a designated assembly point when the alert signal is sounded. The primary assembly point for EFR personnel during a surface emergency situation is the Fire Alarm Control Panel located on the outside wall of the mine office. The primary assembly point for non-EFR personnel is the Road Intersection Triangle. The Water Treatment Plant is the alternative assembly area if the primary assembly points are inaccessible.

~ Mobilization: Basic PPE Requirements

All personnel reporting for Stage 2 response operations will first don hard hats, safety glasses, and steel-toed safety shoes. This is the minimum personnel protective equipment (PPE) required during response operations. EFR personnel who are not wearing the minimum PPE listed above will be restricted to support functions only during Stage 2 operations.

~ Mobilization: Mine Foreman (Emergency Coordinator - EC)

- Provide an initial situation report to all response personnel at the primary assembly point.
- Review the incident evaluation, determine a preliminary course of action, and delegate specific duties to response personnel.
- Establish an incident command post at a secure location near the incident location.
- Establish a site command post with secure communication links to off-site entities at a location unaffected by the incident and ensure that communications with the incident command post and off-site entities are functional.
- Organize response personnel for deployment based upon the initial situation report and the projected course of action. Response organization will include the delineation of responsibilities or duties; the provision of proper PPE; the collection of specialized equipment; and the establishment of a support base, including communications.
- Establish a preliminary field response plan based upon the initial situation report and the projected course of action.
2.2.3 Stage 2 Field Action

A Stage 2 Field Action is a coordinated field response to an emergency situation by multiple personnel. A Stage 2 Field Action occurs when an emergency situation cannot be successfully resolved at the First Responder level. Stage 2 field actions consist of operations undertaken in the field by multiple personnel that are designed and implemented in order to control or abate an emergency situation. A coordinated Stage 2 field response operation will continue until the situation has been successfully resolved.

Field Action: Operations

General guidelines for responding to incidents that involve specific hazardous materials classes or accident scenarios are provided under Appendix B to this procedure. The specific course of action taken during a Stage 2 Field Response Action will be determined by the ongoing incident evaluation. **Rescue is the primary duty of any field response.**

Field Action: Specified Personnel Duties

The Emergency Coordinator is the only member of the emergency response team who currently has specific duties listed in the Operations Phase section of the Emergency Response Plan. The Emergency Coordinator can be the initial First Responder or the person of higher authority who relieves the First Responder of Incident Command. The Mine Foreman will usually be the Emergency Coordinator for the Whirlwind Mine facility.

The Emergency Coordinator shall:

- Act first and foremost to prevent unwarranted occupational and environmental exposures from occurring during emergency incidents involving hazardous materials.
- Monitor response activities and suspend any response activity that creates, or may create, an unwarranted exposure risk.
- Oversee and coordinate all field response actions until the emergency situation is successfully resolved.
- Perform an ongoing incident evaluation and determine an appropriate course of action for the response activity, in coordination with other relevant personnel.
- Coordinate incident response activities with external emergency responders when they are deployed in the field.
- Ensure that communications with the incident command post and off-site entities are maintained.
- Ensure that the incident response action is provided with resources that are adequate to sustain the response activity.
- Coordinate on-site response actions with off-site response activities.
- Ensure that site response personnel are in a condition suitable for field operations, including the provision of proper PPE, sufficient quality and quantities of equipment, and adequate numbers of personnel for both operations and back-up.
PHASE 3.0 REMEDIATION

A successful resolution to the operations phase of an emergency situation at the surface facilities of the Whirlwind Mine will be followed by remediation actions designed to both mitigate the adverse effects of the emergency and reduce the potential for a recurrence of a similar situation. Remediation actions consist of clean-up activities at fire and spill locations, and formal and informal reviews of the emergency and the emergency response plan implementation.

3.1 Clean-Up

General guidelines for clean-up activities at spill and fire locations are listed below. Specific clean-up guidelines for each material or type of incident are included with the field response operational guidelines detailed in Appendix B.

3.1.1 Clean-up: General

The General Manager immediately upon the successful conclusion of field response operations will perform evaluation of cleanup requirements at any fire or spill site. This evaluation will include the following considerations, at a minimum.

1) Type of material spilled.
2) Type of material(s) or structures affected by the incident.
3) Affected area (physical extent of contamination).
4) Physical configuration of the spill or fire area.
5) Personnel requirements and availability.
6) Equipment requirements and availability.
7) Disposal requirements.

Note: Radioactive materials will be promptly retrieved from off-site areas as soon as field response operations are terminated.

The Safety Director will be responsible for coordinating cleanup activities in accordance with the post-field operations evaluation.

3.2 Review

The final stage in any emergency response activity is a complete review of the circumstances leading to the emergency, all response actions taken during the emergency and post-response remediation activities.

The General Manager will coordinate the requisite review and issue a report to corporate management summarizing the findings, including any necessary corrective actions. The Safety Director shall be responsible for preparing any requisite reports to the Federal Mine Safety & Health Administration. The General Manager will prepare any necessary five or thirty day post-incident reviews for distribution and review to corporate management and all relevant government agencies.
SECTION II: EMERGENCY RESPONSE EQUIPMENT

This list contains the equipment on site that may be used in responding to an emergency situation at the surface facilities of the Whirlwind Mine.

Chemical Handling Equipment:
- PVC Rain Suits
- Respirators (Half & Full-face)
- Rubber Gloves
- Steel-Toed Rubber Boots
- Hydrocarbon Absorbent Booms

Location:
- Tool Trailer & Water Treatment Plant
- Tool Trailer & Water Treatment Plant
- Tool Trailer & Water Treatment Plant
- Tool Trailer & Water Treatment Plant
- Fuel Station & Water Treatment Plant

Fire-fighting Equipment:
- Fire Extinguishers
  - Dry Chemical, Manual (10 & 20 lb.)
  - Equipment for fire line clearing
    (includes all earthmoving equipment)

Location:
- All Buildings, All Stationary & Mobile Equipment
- Heavy Equipment Park, Underground, Tool Trailer

Earthmoving Equipment:
- Wheel Loader (3+ yd.)
- Komatsu Bulldozer (12' blade)
- Skid Steer Loader
- 3 to 10 Ton Haul Trucks
- Hand Tools (Picks, Shovels, etc)

Location:
- Heavy Equipment Park
- Heavy Equipment Park
- Underground
- Underground
- Tool Trailer & Water Treatment Plant

Other Equipment:
- Pickup and Cargo Trucks
- Snow Plow Truck with Sander
- Emergency Response Vehicle

Location:
- Various Locations
- Heavy Equipment Park
- Parking Area A
SECTION III  EMERGENCY RESPONSE TRAINING

Training

Response personnel have the following training:

1) Forty (40) hour general safety training session for the mineral industry upon initial hiring with eight (8) hour annual refresher training. Topics include:
   ▪ First Aid
   ▪ Hazard Recognition
   ▪ Fire-fighting
   ▪ Hazardous Materials
   ▪ Basic Radiation Protection
   ▪ Safe work practices

2) HazCom Hazardous Materials Handling training, with site-specific training for hazardous materials located on-site.

3) First Responder - Medic First Aid - Basic (CPR/First Aid) Training.

5) Weekly safety meetings with an open discussion of plant processes, hazardous material handling and safety.
EMERGENCY RESPONSE PLAN
APPENDICES
EMERGENCY RESPONSE PLAN ~ Initial Response Guide

The initial Emergency Response Plan for the surface facilities at the Whirlwind Mine consists of two phases.

PHASE 1      NOTIFICATION      PHASE 2      OPERATIONS

Your PRIMARY RESPONSIBILITY as a First Responder in an emergency is the prompt NOTIFICATION of the site EMERGENCY COORDINATOR and EMS, if off-site Emergency Response Services (EMS) are needed.

NOTIFICATION:

(1) First Responder reports the following information to one other person immediately prior to starting any direct operations for an accident, spill, or fire.
   a) The location of the incident.
   b) The nature of the incident.
   c) The extent of injury, if applicable.
   d) The type of material spilled, if known.
   e) The physical extent of the spill area.
   f) The First Responder's intended course of action.
   g) Method of maintaining communication.

(2) The first person contacted by the First Responder notifies the Emergency Coordinators and 911 or Mesa County Dispatch, if needed. The Emergency Coordinator(s) for the Whirlwind Mine are:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Direct Verbal Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAVE MORTENSEN</td>
<td>MINE FOREMAN</td>
<td></td>
</tr>
<tr>
<td>ARCH MINERICH</td>
<td>MINE SUPERINTENDENT</td>
<td></td>
</tr>
<tr>
<td>ERNIE OMAHA</td>
<td>GENERAL MANAGER</td>
<td></td>
</tr>
<tr>
<td>TREY WHITE</td>
<td>SAFETY DIRECTOR</td>
<td></td>
</tr>
<tr>
<td>JESS FULBRIGHT</td>
<td>ENGINEER</td>
<td></td>
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<td>CHIP KARO</td>
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</tbody>
</table>

Following initial notification site personnel are mobilized for operations.

OPERATIONS:

(1) The Emergency Coordinator becomes the Incident Commander and activates the site Emergency Alarm Horn to mobilize the site.

(2) All surface personnel assemble at their designated assembly point.

Energy Fuels Personnel: Primary Assembly Point: Emergency Alarm Horn @ Office Building
Back-up Assembly Point: Water Treatment Plant

Contractor & Visitor Personnel: Assembly Point: Road Intersection Triangle

(3) The Incident Commander
   - Briefs the assembled response personnel.
   - Establishes a site command post and communications links on-site and off-site (911 or Mesa County Dispatch, Corporate notification).
   - Reviews the situation and develops a plan of action for response operations.
   - Delegates support functions to other response personnel.

(4) The Response Operations Plan is implemented.
Guidelines for Surface Emergency Response Operations

After notification the Responder will proceed to the Operations Phase of response. The type of action taken in the operations phase will depend on the incident and the Responder's capability. All other site personnel have response training and should immediately begin Stage 2 operations when notification is complete. The quantity and concentration of hazardous material released and the presence or absence of fire will be the primary factor in determining operations strategy. Proper personal protection equipment (PPE) is mandatory during response operations. Choice of PPE will depend on the type of material involved and the potential for contact with the material. A listing of available response equipment and its location can be found in Section II of the Emergency Response Plan.

Suggested operational strategies and PPE requirements are listed below for potential HazMat incidents involving Corrosive materials. Every effort should be made, that does not involve an unwarranted risk to responders, to eliminate ongoing leak or spill sources (re. closing valves, etc.) prior to beginning operations.

**CORROSIVES**

This category includes both acid and alkaline materials.

Corrosive materials stored onsite include:

**Large Quantities:**
- Barium Chloride - Solid (Water Treatment Plant)

**Small Quantities:**
- Ferric Sulfate - Liquid (Water Treatment Plant)
- Sulfuric Acid - Liquid (Water Treatment Plant)
- Battery Acid - Liquid (Tool Storage)

**Small Spills - No Fire**

**Dilute Acid (14%) or Ferric Sulfate Liquid**

PPE: Chemical splash protection; respirator required; face-shield; rubber gloves; and rubber boots.

Response:
- Evaluate situation.
- Secure area.
- Rescue & First Aid, if necessary & possible.
- Contain material by damming.
- Absorb spilled material with earth, when possible.
- Inside of a building, dilute acid or ferric sulfate liquid may be carefully flushed with water to the building sump and routed to the Water Treatment Plant Secondary Containment Tank.

Remediation:
- Evaluate situation.
- Do not add water.
- Absorb spilled material, when possible.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal site is determined.
CORROSIVES (continued) ~

**Ferric Sulfate Powder Form**

PPE: Chemical splash protection; respirator required; face-shield; rubber gloves; and rubber boots.

Response:
- Evaluate situation.
- Secure area.
- Rescue & First Aid, if necessary & possible.
- Avoid adding water.
- Contain spilled powders by covering with a tarp, if material may become wind carried. Contain any liquids by damming and diking.
- Carefully sweep up spilled powders and retain material for evaluation for proper disposal.
- Absorb spilled liquid material with earth, when possible.
- Inside of a building, dilute acid or ferric sulfate liquid may be carefully flushed with water to the building sump and routed to the Water Treatment Plant Secondary Containment Tank.

Remediation:
- Evaluate situation.
- Do not add water.
- Absorb spilled material, when possible.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal site is determined.

**Small Spill - Fire**

**Dilute or Concentrated Liquid Corrosives**

PPE: Full-coverage acid suit; self-contained breathing apparatus (alternately full-face respirator with combination cartridges for very small fires that can be quickly knocked down); face-shield; rubber gloves; and rubber boots.

Response:
- Evaluate situation.
- Secure area.
- De-energize electrical equipment.
- Rescue & First Aid, if necessary & possible.
- For small fire use available dry-chemical fire extinguishers to knock down fire. Avoid water, if possible.
- For a large fire, concentrate on protecting adjacent structures and slowly flood area with water from a safe distance.
- Direct extinguishing agent in a manner to avoid splashing spilled material.
- Dam and dike at a safe distance to control runoff.
- Route collected runoff to the Untreated Water Storage Tank, when possible, or excavate a temporary holding pond at a suitable location.
- Perform overhaul.

Remediation:
- Evaluate situation.
- Certify fire as extinguished.
- Absorb spilled materials, if possible, with earth or other suitable material.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until an appropriate permanent disposal site is determined.
CORROSIVES (continued) ~

Large Spills - No Fire

Dilute Acid (14%) or Ferric Sulfate

PPE: Chemical splash protection; respirator required; face-shield; rubber gloves; and rubber boots.

Response:
- Evaluate situation.
- Secure area.
- Rescue & First Aid, if necessary & possible.
- Dam or dike ahead of the spill; heavy equipment is available for earthmoving.
- Cleanup with water is allowed; contain all runoff, excavate an emergency catch basin, if possible.

Remediation:
- Evaluate situation.
- Absorb spilled materials, if possible, with earth or other suitable material.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal site is determined.

Large Spill - Fire

Dilute or Concentrated Corrosives

PPE: Full-coverage acid suit; self-contained breathing apparatus (alternately full-face respirator with combination cartridges for very small fires that can be quickly knocked down); face-shield; rubber gloves and boots.

Response:
- Evaluate situation.
- Secure area.
- All electrical equipment must be de-energized.
- Rescue & First Aid, if necessary & possible.
- For a small fire use available dry-chemical fire extinguishers to knock down the fire. Do not use water.
- For large fire, concentrate on protecting adjacent structures and slowly flood area with water from a safe distance.
- Direct extinguishing agent in a manner to avoid splashing spilled material.
- Dam and dike at a safe distance to control runoff, excavate an emergency catch basin, if possible.
- Perform overhaul, if spilled material can be avoided.

Remediation:
- Evaluate situation.
- Certify fire as extinguished.
- Absorb spilled materials, if possible, with earth or other suitable material.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal site is determined.
Guidelines for Surface Emergency Response Operations

After notification the Responder will proceed to the Operations Phase of response. The type of action taken in the operations phase will depend on the incident and the Responder’s capability. All other site personnel have response training and should immediately begin Stage 2 operations when notification is complete. The quantity and concentration of hazardous material released and the presence or absence of fire will be the primary factor in determining operations strategy. Proper personal protection equipment (PPE) is mandatory during response operations. Choice of PPE will depend on the type of material involved and the potential for contact with the material. A listing of available response equipment and its location can be found in Section II of the Emergency Response Plan.

General operational strategies and PPE requirements are listed below for potential HazMat incidents involving Flammable materials. Every effort should be made, that does not involve an unwarranted risk to responders, to eliminate ongoing leak or spill sources (re. closing valves, etc.) prior to beginning operations.

FLAMMABLES

This category includes both flammable materials and some of the more volatile combustible materials such as diesel fuel.

Flammable / Combustible materials stored onsite include:

<table>
<thead>
<tr>
<th>Large Quantities ~</th>
<th>Small Quantities ~</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Liquid Propane (Mine Office / Maintenance)</td>
<td>-Gasoline (Mobile Equipment)</td>
</tr>
<tr>
<td>-Diesel Fuel (Fuel Depot)</td>
<td>-Various Lubricants (Maintenance Building)</td>
</tr>
<tr>
<td>-Various Lubricants (Lubricant Shed)</td>
<td>-Diesel Fuel (Mobile Equipment)</td>
</tr>
<tr>
<td></td>
<td>-Cleaning Solvent (Maintenance Building)</td>
</tr>
</tbody>
</table>

Spill - No Fire

PPE: Work clothes; rubber gloves; and rubber boots (chemical cartridge air-purifying respirator if available).

Response:
- Evaluate situation.
- Secure area.
- Rescue & First Aid, if necessary & possible.
- Remove ignition sources
- Locate fire extinguisher and keep near at hand.
- Dam or dike to contain material.
- Watch for flammable or explosive vapors.
- Coat surface of spilled liquid with dry chemical extinguishing agent, if enough is available. Save enough extinguishing agent for fire fighting.
- Do not add water.

Remediation:
- Evaluate situation.
- Do not add water.
- Pick up liquids if proper equipment is available, or absorb spilled materials with compatible material if liquid retrieval is not possible.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until an appropriate permanent disposal method and site is determined.
FLAMMABLES (continued)

Spill - Fire

PPE: Work clothes; self-contained breathing apparatus (alternatively, no respirator or full-face respirator for small fires that can be quickly knocked down); eye protection; gloves; and boots (rubber is best).

Response:
- Evaluate situation.
- Secure area.
- De-energize electrical equipment.
- Rescue & First Aid, if necessary & possible.
- For small fire use available dry-chemical fire extinguishers to knock down the fire as quickly as possible. Avoid water for small fires, if possible.
- Keep area well ventilated.
- For a large fire, protect adjacent structures, use water from a safe distance. Remember water can be used as a barrier.
- Direct extinguishing agent in a manner to avoid splashing spilled material.
- Dam and dike at a safe distance to control runoff. Contain collected runoff locally, when possible.
- Perform overhaul.

Remediation:
- Evaluate situation.
- Certify fire as extinguished.
- Absorb spilled materials, if possible, with earth or other suitable material.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until an appropriate permanent disposal method and site is determined.

Liquid Propane - Spill

PPE: Work clothes.

Response:
- Evaluate situation.
- Close open valves, if valves are accessible without risk.
- Evacuate and secure area.
- Rescue & First Aid, if possible.
- Wait for gas to dissipate.

Remediation:
- Not Applicable.

Liquid Propane - Fire

PPE:
- Work Clothes

Response:
- Evacuate to a safe distance.
- Evaluate situation.
- Rescue & First Aid, if possible.

Remediation:
- Evaluate situation.
- Certify fire as extinguished.
- Clean-Up Debris.
- Transport contaminated materials to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal method and site is determined.
Guidelines for Surface Emergency Response Operations

After notification the Responder will proceed to the Operations Phase of response. The type of action taken in the operations phase will depend on the incident and the Responder’s capability. All other site personnel have response training and should immediately begin Stage 2 operations when notification is complete. The quantity and concentration of hazardous material released and the presence or absence of fire will be the primary factor in determining operations strategy. Proper personal protection equipment (PPE) is mandatory during response operations. Choice of PPE will depend on the type of material involved and the potential for contact with the material. A listing of available response equipment and its location can be found in Section II of the Emergency Response Plan.

Suggested operational strategies and PPE requirements are listed below for potential HazMat incidents involving radioactive materials. Every effort should be made, that does not involve an unwarranted risk to responders, to eliminate ongoing leak or spill sources (re. closing valves, etc.) prior to beginning operations.

RADIOACTIVE MATERIALS

This category includes all radioactive materials stored on-site. The radioactive materials stored at the Whirlwind Mine are low-toxicity alpha emitters. There are very few locations on-site that do not contain some radioactive materials. The responder must be aware that the radioactive materials may be contained within another hazardous material, such as sulfuric acid. The response should first address the material that is the more immediate health hazard.

Radioactive Materials stored on-site include:

**Large Quantities ~**
- Water Treatment Residues (Settling Ponds, Building Sumps)
- Mine Drainage (Untreated Water Pond, Water Treatment Plant, Settling Ponds)
- Surface Water Runoff (Ore Pad Area Sump)

**Small Quantities ~**
- Building Sumps (Maintenance Building)

**Spill - No Fire**

PPE: Protective clothing & respiratory protection appropriate to the most immediate health hazard; eye-protection; rubber gloves and boots.

Note: Focus response on the most hazardous situation and material first.

Radioactive Materials Response:

- Evaluate situation.
- Secure area.
- Dam or dike to contain material.
- Do not add water.

Radioactive Materials Remediation:

- Evaluate situation.
- Do not add water.
- Pick up liquids if proper equipment is available, or absorb spilled materials with compatible material if liquid retrieval is not possible.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal site is determined.
RADIOACTIVE MATERIALS (continued) ~

Spill - Fire

PPE: Protective clothing appropriate to the most immediate health hazard; self-contained breathing apparatus (alternately air-purifying respirator with at least HEPA cartridges for very small fires that can be quickly knocked down); eye-protection; rubber gloves and boots.

Note: Focus response on the most hazardous situation and material first.

Radioactive Materials Response:

- Evaluate situation.
- Secure area.
- Respond to fire and most immediately hazardous material present (see other Guidelines).
- Direct extinguishing agent in a manner to avoid splashing spilled material.
- Keep area well ventilated. Watch for airborne radioactive materials in smoke.
- Contain materials and runoff. Dam and dike at a safe distance to control runoff.
- Route collected runoff to the Untreated Water Storage Tank, if possible.
- Perform overhaul.

Radioactive Materials Remediation:

- Evaluate situation.
- Certify fire as extinguished.
- Absorb spilled materials, if possible, with earth or other suitable material.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal site is determined.
Guidelines for Surface Emergency Response Operations

After notification the Responder will proceed to the Operations Phase of response. The type of action taken in the operations phase will depend on the incident and the Responder's capability. All other site personnel have response training and should immediately begin Stage 2 operations when notification is complete. The quantity and concentration of hazardous material released and the presence or absence of fire will be the primary factor in determining operations strategy. Proper personal protection equipment (PPE) is mandatory during response operations. Choice of PPE will depend on the type of material involved and the potential for contact with the material. A listing of available response equipment and its location can be found in Section II of the Emergency Response Plan.

Suggested operational strategies and PPE requirements are listed below for potential HazMat incidents involving transportation on the main site access road (John Brown Canyon Road). Every effort should be made, that does not involve an unwarranted risk to responders, to eliminate ongoing leak or spill sources (re. closing valves, etc.) prior to beginning operations.

MAIN ACCESS ROAD & LOCAL TRANSPORT RESPONSES

This category includes response operations to hazardous material transportation incidents on John Brown Canyon Road and during transport on-site.

Materials transported at these locations include:

<table>
<thead>
<tr>
<th>Radioactive</th>
<th>Corrosive</th>
<th>Flammable</th>
<th>Combustible</th>
<th>Explosive</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Uranium Ore</td>
<td>- Gasoline</td>
<td>- Diesel Fuel</td>
<td>- Propane</td>
<td>- ANFO</td>
</tr>
</tbody>
</table>

Note that the radioactive materials transported are low-toxicity alpha emitters.

The responder must be aware that the hazardous materials transported may fall under several different hazard classes with different reactions to extinguishing agents for fires or absorbent materials. The transporting vehicle may also constitute an additional hazard for responders. The response should first address the material that is the greatest immediate health hazard.

Bulk Quantity Transported Materials Include:

Radioactive ~ Corrosive ~ Flammable ~ Combustible ~ Explosive ~
- Uranium Ore ~ - Gasoline ~ - Diesel Fuel ~ - Propane ~ - ANFO ~

Small Quantity Transported Materials Include:

Radioactive ~ Corrosive ~ Flammable ~ Combustible ~ Explosive ~
- Various Samples ~ - Sulfuric Acid ~ - Solvents ~ - Oils ~ - Detonating Cord ~
- Ferric Sulfate ~ - Paints ~ - Lubricants ~ - Nonels ~ - Prell Boosters ~

- Geldyne (Powder) ~
MAIN ACCESS ROAD EMERGENCY RESPONSES (continued)

Spill - No Fire

PPE: Protective clothing & respiratory protection appropriate to the most immediate health hazard; eye-protection; rubber gloves and boots.

Note: Focus response on the most hazardous situation and material first. Explosives and radioactive material responses must be coordinated by authorized personnel only.

Response:
- Evaluate situation.
- Secure area.
- Rescue & First Aid, if necessary & possible.
- Remove ignition sources.
- Locate fire extinguisher and keep near at hand.
- Dam or dike to contain material. Prevent material from entering major drainage channels.
- Watch for flammable or explosive vapors.
- Do not add water.

Remediation:
- Evaluate situation.
- Do not add water.
- Pick up liquids if proper equipment is available, or absorb spilled materials with compatible material if liquid retrieval is not possible.
- Recover as much material as is possible from any creek drainage channels, if material was spilled into a drainage channel.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal method and site is determined.

Spill - Fire

PPE: Protective clothing appropriate to the most immediate health hazard; self-contained breathing apparatus (alternately air-purifying respirator with at least HEPA cartridges for very small fires that can be quickly knocked down); eye-protection; rubber gloves and boots.

Note: Focus response on the most hazardous situation and material first. Explosives and radioactive material responses must be coordinated by authorized personnel only. Generally, explosive and propane fire responses will involve monitoring the fire from a safe distance.

Response:
- Evaluate situation.
- Secure area.
- Rescue & First Aid, if necessary & possible.
- For small fire use available dry-chemical fire extinguishers to knock down the fire as quickly as possible. Avoid water for small fires, if possible.
- Remember water can be used as a barrier.
- Direct extinguishing agent in a manner to avoid splashing spilled material.
- Dam and dike at a safe distance to control runoff. Prevent material from entering any drainages.
- Perform overhaul.

Remediation:
- Evaluate situation.
- Certify fire as extinguished.
- Absorb spilled materials, if possible, with earth or other suitable material.
- Transport contaminated soils to the Whirlwind Waste Dump storage area for temporary storage until a permanent disposal method and site is determined.
EMERGENCY RESPONSE PLAN
EXHIBITS 1 through 4
### HazMat Table

<table>
<thead>
<tr>
<th>Material Name</th>
<th>Material Description</th>
<th>Hazard</th>
<th>Water Reactive</th>
<th>Physical State</th>
<th>Site Location</th>
<th>Location ID Code</th>
<th>Maximum Quantity</th>
<th>Reportable Quantity</th>
<th>Container Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uranium Ore</td>
<td>Natural Uranium / Vanadium Ore</td>
<td>Radioactive</td>
<td>NO</td>
<td>Solid</td>
<td>Ore Pad</td>
<td>OP</td>
<td>15000 Tons</td>
<td>~ 50 Tons</td>
<td>Lined Compacted Pad with local sump and Berms</td>
</tr>
<tr>
<td>Mine Drainage</td>
<td>Untreated Wastewater</td>
<td>Radioactive</td>
<td>NO</td>
<td>Liquid</td>
<td>Water Treatment Plant</td>
<td>WTP UWP SPP</td>
<td>800 gals</td>
<td>&gt; 2500000 gals for U-Nat</td>
<td>Tank with Synthetic Liner (lined pond with integral sump)</td>
</tr>
<tr>
<td>Diesel Fuel</td>
<td>Diesel</td>
<td>Combustible</td>
<td>NO</td>
<td>Liquid</td>
<td>Surfacing Fuel Depot and Generators</td>
<td>FD GN</td>
<td>900 gals</td>
<td>25 gals</td>
<td>Steel Farm Tank, Steel Farm Tank, Steel Farm Tank</td>
</tr>
<tr>
<td>Propane</td>
<td>Propane</td>
<td>Flammable</td>
<td>NO</td>
<td>Gas / Liquid</td>
<td>Office / Dry Building Tool Trailer</td>
<td>LP</td>
<td>2450 gals</td>
<td>1000 lbs</td>
<td>Propane Tanks</td>
</tr>
<tr>
<td>Ferric Sulfate</td>
<td>Iron Salts Solution (pH 1)</td>
<td>Corrosive</td>
<td>NO</td>
<td>Liquid</td>
<td>Water Treatment Plant</td>
<td>WTP</td>
<td>110 gals</td>
<td>1000 pounds (~13780 gals)</td>
<td>55-gal poly drum, 150-gal HDPE Tank, Enclosed Trailer w/ Sump And Spill Containment Tank</td>
</tr>
<tr>
<td>Ferric Sulfate</td>
<td>Iron Salts Dry Reagent</td>
<td>Inhalation</td>
<td>NO</td>
<td>Solid</td>
<td>Water Treatment Plant</td>
<td>WTP</td>
<td>1000 lbs</td>
<td>80 gals</td>
<td>Enclosed Trailer w/ Sump And Spill Containment Tank</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>Liquid Reagent</td>
<td>Corrosive</td>
<td>YES</td>
<td>Liquid</td>
<td>Water Treatment Plant</td>
<td>WTP</td>
<td>85 gals</td>
<td>1000 lbs (~80 gals)</td>
<td>55-gal poly drum, 150-gal HDPE Tank, Enclosed Trailer w/ Sump And Spill Containment Tank</td>
</tr>
<tr>
<td>Used Oil</td>
<td>Motor Oil</td>
<td>Combustible</td>
<td>NO</td>
<td>Liquid</td>
<td>Maintenance Shop</td>
<td>UO</td>
<td>200 gals</td>
<td>25 gals</td>
<td>55-gal Steel Drums, Metal Basin (stock tank)</td>
</tr>
<tr>
<td>Lubricants &amp; Antifreeze</td>
<td>10W to 20W Oils Antifreeze Grease</td>
<td>Combustible</td>
<td>NO</td>
<td>Liquid / Solid</td>
<td>Maintenance Shop</td>
<td>MS</td>
<td>Total 400 gals</td>
<td>25 gals</td>
<td>55-gal Steel Drums, Shop Building Designed Containment</td>
</tr>
<tr>
<td>Septic Tank</td>
<td>Domestic Wastewater</td>
<td>Biological</td>
<td>NO</td>
<td>Liquid</td>
<td>Septic Tank w/ Leach Field Near Untreated Water Pond Tank</td>
<td>ST</td>
<td>4000 gals</td>
<td>N/A</td>
<td>Concrete Tank, Underground Tank</td>
</tr>
<tr>
<td>Used Motor Oil</td>
<td>Used Oils Other Used Lubricants</td>
<td>Combustible</td>
<td>NO</td>
<td>Liquid</td>
<td>Outside of Maintenance Shop</td>
<td>MS</td>
<td>110 gals</td>
<td>25 gals</td>
<td>55-gal Steel Drums, 150-gal HDPE Tank</td>
</tr>
</tbody>
</table>
General List of Whirlwind Mine Spill Prevention Facilities

The storage and use of materials which represent a potential major spill threat at the Whirlwind Mine site are limited to the locations listed below. The preventative features of these locations are described in the listing below and plotted on the attached ERP Site Map.

<table>
<thead>
<tr>
<th>Location</th>
<th>Spill Prevention Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lubricant Storage Shed and Maintenance Shop</td>
<td>Enclosed buildings. Absorbent materials on-hand</td>
</tr>
<tr>
<td>2. Used Oil Barrels (above ground)</td>
<td>150-gallon HDPE Tank holds two 55 gallon drums</td>
</tr>
<tr>
<td>3. Domestic Water Tank (Chlorinated Water)</td>
<td>Underground Tank (Earthen Secondary Containment)</td>
</tr>
<tr>
<td>4. Aboveground Fuel Storage Tanks</td>
<td>Up to four steel &quot;farm&quot; tanks each set within a galvanized steel secondary containment basin. Tank farm will be surrounded on three sides by an additional earthen containment berm, with the open side located on the uphill side of the tank farm.</td>
</tr>
<tr>
<td>5. Septic System Holding Tank</td>
<td>Hi-Level Alarm</td>
</tr>
<tr>
<td>6. Untreated or In-Process Water Tanks.</td>
<td>Two low-permeability geomembrane liners with leak detection, geosynthetic clay underliner, graded towards sedimentation pond.</td>
</tr>
<tr>
<td>7. Ore Storage</td>
<td>Drainage to local sump for solids removal, with liquid diverted to the Untreated Water Tank for treatment.</td>
</tr>
<tr>
<td>8. Acid Storage</td>
<td>2 150-gallon HDPE Tanks hold two 55 gallon drums each</td>
</tr>
</tbody>
</table>
ACCESS NUMBERS FOR SURFACE FACILITY EMERGENCY RESPONSE

Off-Site Emergency Services Available to the Whirlwind Mine ~

<table>
<thead>
<tr>
<th>Service</th>
<th>Organization</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and Rescue:</td>
<td>Mesa County Dispatch</td>
<td>911 or 242-6707</td>
</tr>
<tr>
<td>Ambulance Services:</td>
<td>Mesa County Dispatch</td>
<td>911 or 242-6707</td>
</tr>
<tr>
<td>Helicopter Rescue:</td>
<td>Mesa County Dispatch</td>
<td>911 or 242-6707</td>
</tr>
</tbody>
</table>

When utilizing the satellite telephone do not use 911, dial the Mesa County Dispatch number. Refer to satellite phone operating procedures found on page one of Exhibit 4.

Energy Fuels Emergency Coordinators for Surface Emergency Response ~

The following personnel are authorized to act as coordinators for emergency situations that occur at the surface facilities of the Whirlwind Mine. An emergency incident is defined as a spill of hazardous materials, a fire, and an accident involving surface personnel and/or material transport, or any combination of the above..

The following personnel must be contacted during any emergency situation at the surface facilities of the Whirlwind Mine.

<table>
<thead>
<tr>
<th>TITLE</th>
<th>TELEPHONE</th>
<th>SPECIALTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMERGENCY COORDINATORS ~ HAZARDOUS MATERIALS, FIRE, RADIATION PROTECTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ernie Omaha</td>
<td>970-428-7008</td>
<td>Site Knowledge, Fire, Injury</td>
</tr>
<tr>
<td>Trey White</td>
<td>970-327-4847</td>
<td>Fire, HazMat, Radiation</td>
</tr>
<tr>
<td>Jess Fulbright</td>
<td>970-864-2116</td>
<td>Fire, Injury, HazMat, Radiation</td>
</tr>
</tbody>
</table>

CORPORATE MANAGEMENT ~

<table>
<thead>
<tr>
<th>TITLE</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Filas</td>
<td>303-241-3773</td>
</tr>
<tr>
<td>Stephen Antony</td>
<td>303-378-8254</td>
</tr>
</tbody>
</table>

State Agency Emergency Contacts ~

Colorado Department of Public Health and Environment ~

- Emergency Management Unit 24-Hour Spill Reporting Line 1-877-518-5608
OFF-HOURS NOTIFICATION

March 9, 2008

OFF-HOURS NOTIFICATION ~

Off-hours notification of Energy Fuels emergency response personnel is initiated by the First Responder using the telephone system.

The following personnel are currently on call for responding to abnormal conditions during off-work hours:

<table>
<thead>
<tr>
<th>ON-CALL PERSONNEL</th>
<th>PHONE NUMBER</th>
<th>SPECIALTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trey White</td>
<td>970-428-7005</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td></td>
<td>970-327-4847</td>
<td>Radiation Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire</td>
</tr>
<tr>
<td>Jess Fulbright</td>
<td>970-428-7001</td>
<td>Radiation Safety</td>
</tr>
<tr>
<td></td>
<td>970-864-2116</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire</td>
</tr>
<tr>
<td>Ernie Omaha</td>
<td>970-428-7008</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire</td>
</tr>
<tr>
<td>Chip Karo</td>
<td>970-428-7014</td>
<td>Hazardous Materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire</td>
</tr>
</tbody>
</table>
EMERGENCY RESPONSE COMMUNICATIONS SYSTEMS

The following communications systems are available for use during an emergency response situation at the Whirlwind Mine:

- The Telephone System
- Cellular Telephones
- Satellite Telephone
- The Mine Page Phone System
- The Emergency Alarm Horn
- Stench Gas Induction System

TELEPHONE (POTS)

To operate the radiotelephone system located in the mine office use standard telephone operating procedures.
The telephone at the Packrat Shop is a standard hard line telephone, use standard telephone operating procedures.

Cellular Telephones

A minimum of one cellular telephone will be on-site at all times. The cellular telephone will be carried by the responsible person in charge on the surface or kept in the mine office for charging purposes. Utilize standard cellular telephone operating procedures.

Satellite Telephone

The satellite telephone is located in the bottom drawer of the filing cabinet in the mine office. The Safety Director will insure that the satellite phone is charged, inspected and tested on a weekly basis.
Operating procedures for the satellite telephone are as follows:

1. Go outside to a clear area, away from trees or buildings, with an open view of the sky.
2. Extend the antenna on the phone.
3. Press and hold the power button (located bottom left of keyboard) until the phone beeps and you see the animations on the screen.
4. When prompted enter the PIN 1111.
5. Wait for the phone to search for a signal and register; the screen will display “registered”.
6. Press and hold the zero key until a “+” is displayed on the screen.
7. Enter the phone number as you would when making a long distance phone call within the United States. For example to reach Mesa County Dispatch, enter 1-970-242-6707.
8. Press the OK button on the top right side of the keypad to connect the call; you will hear a series of beeps as the phone contacts the satellite.

Do Not Hang Up! Connection will take longer than a standard hard line or cellular phone.
MINE PAGE PHONE

The Whirlwind Mine page-phone system, with units at the following locations:

~ General Surface Facilities:
  (1) Mine Office
  (2) The Whirlwind Decline Portal
  (3) The Tool Trailer

~ Underground:
  (1) X-Cut #3 in the decline
  (2) At each Refuge Chamber

The mine page system is accessed by:

Step 1 = Depress and hold down the switch in the center of the handset.
Step 2 = Depress and hold down the button switch on the front of the phone box.
Step 3 = Speak into the handset to page.
Step 4 = Release the button switch on the front of the phone box when the page is answered and resume speaking with only the switch on the handset depressed.

EMERGENCY ALARM HORN

The Emergency Alarm Horn (Fire Alarm) is an audible warning device sounded to alert personnel of an emergency situation. The control panel for the Alarm Horn is located near the Main Entrance on the exterior of the Mine Office Building. The Emergency Alarm Horn must be sounded during any site emergency to alert personnel on the surface and is operated in the following manner:

Step 1 = Turn the control unit selector switch labeled Fire Alarm to “ON” The Alarm Horn will now sound.
Step 2 = To turn the Alarm Horn off; turn the control unit selector switch labeled Fire Alarm to the “OFF” position.

Stench Gas Induction System

The Stench Gas Induction System is a warning system based on the sense of smell used to notify the underground personnel of an emergency. This system will be utilized in the event of a surface emergency that could endanger the personnel underground, the control is a rotary valve located on the main mine fan. Operational procedures are as follows:

Step 1 = Rotate the valve approximately two full turns counter clockwise to full open.
Step 2 = Verify flow at nozzle and close valve in approximately 15 seconds.
Step 3 = Record time, go to portal to verify the smell of stench and monitor the phone.
Step 4 = Record time and have personnel brass out as they exit mine and proceed to assembly point.
APPENDIX C

Ore Transportation Plan
(Energy Fuels)
ORE TRANSPORTATION PLAN
ENERGY FUELS RESOURCES CORPORATION

1.0 Introduction

Energy Fuels Resources Corporation’s (Energy Fuels’) procedures and methods for shipping uranium ore from a mine site to an offsite mill are described in this plan. The plan may also be used for shipping to an off-site ore buying station, should one become available. The plan is based on compliance with federal, state and local regulations. The primary regulatory authority for ore haulage is the U.S. Department of Transportation (USDOT). To allow for efficient interstate commerce, the Colorado Department of Transportation (CDOT), the Utah Department of Transportation (UDOT) and other adjacent state highway departments have adopted USDOT regulations in their entirety. USDOT’s regulations for transport of radioactive materials are codified in Title 49 of the Code of Federal Regulations (CFR). The procedures in this plan are designed to meet the requirements of Title 49 and are to be incorporated into contractual arrangements with the trucking and milling companies prior to the start of offsite ore shipments.

2.0 Ore Characteristics and Shipping Classification

The majority of the ore that will be shipped will average 0.15 to 0.25 percent U\textsubscript{3}O\textsubscript{8} based on gamma readings (typically expressed as eU\textsubscript{3}O\textsubscript{8}). This is equivalent to a uranium activity level of approximately 1.4 x 10\textsuperscript{-9} Curies/gram (Ci/g). Although this represents a relatively low radioactivity level, it is above USDOT’s exemption level for uranium of 2.7 x 10\textsuperscript{-10} Ci/g (see CFR Title 49 Part 173.436). Accordingly, uranium ore is regulated as a Class 7 radioactive material under the hazardous material regulations in Title 49. Under Title 49 Part 173.403, uranium ores and concentrates of uranium ore are classified as Low Specific Activity (LSA), Group - 1 material. Because of their low specific activity, ore shipments are generally exempt from most of the packaging, marking, labeling, and placarding requirements of other Class 7 radioactive materials.

In addition to uranium ore, LSA-1 material may also include other low-toxicity alpha emitters that may be shipped from the mine to the mill such as:

1) Precipitated residues from the water treatment plant
2) Soils and rubble contaminated by uranium
3) Loaded ion exchange resins from water treatment facilities (not proposed at this time)

Materials 1 and 2 can be loaded and shipped in the same manner as uranium ore. Some additional restrictions apply to ion exchange resins that should be incorporated into the plan if resin columns are installed at a mine site for water treatment purposes.
3.0 Loading Requirements

The uranium ore is to be loaded into highway haul trucks using a front-end loader. Required dust and contamination control measures during loading include:

1) The loader operator and truck driver are to avoid inhalation of dust during loading operations. The ore is expected to be moist to wet when hauled from the mine to the ore pad. If the ore should dry out prior to loading, the stockpile will be sprayed with water to minimize the amount of dust generated during loading operations. Water sprays will be applied only to the extent necessary to moisten the ore and ore pad area.

2) Spillage onto the transport truck is to be avoided during loading operations. Any loose material that drops onto the cab, bumpers, running boards, or other exterior surfaces will be removed and placed back on the ore pad prior to leaving the site. The truck tailgate will be closed and a tarpaulin (or other suitable cover) will be placed over the entire load and adequately secured so that fine ore particles cannot be released to the environment during transport.

3) The tonnage to be shipped is not limited by Title 49, but rather, by the size of the trailer(s) and any weight restrictions imposed by local or state agencies on the roads to be traveled. Care shall be taken to not overload transport vehicles.

4) Shipment during muddy conditions is to be avoided to minimize off-site contamination and the potential for an accident. Muddy conditions could result in the tracking of ore material from the site onto adjacent public roads. A gravel tracking pad will be constructed at the exit to the ore pad if muddy conditions cannot be completely avoided.

4.0 Vehicle Survey and Shipping Papers

Prior to leaving the site, the loaded truck must be surveyed for leakage and radiation. Shipping papers must be completely filled out and in the possession of the driver. Mine personnel will be required to maintain records of the inspections and radiation scans performed for each shipment. Specific survey and shipping requirements include:

1) The truck will be scanned to verify that it meets gamma exposure rates stipulated in Title 49. Radiation levels shall not exceed 1rem/hr (10 millisievert/hr (mSv/hr)) at 3 meters from the load for an unshielded cargo, 200 mrem/hr (2 mSv/hr) on the conveyance or package surface, and 10 mrem/hr (0.1 mSv/hr) at 1 meter from the conveyance or package surface. The transport index (TI) is equal to the maximum gamma exposure rate in mrems/hr at 1 meter (3.3 feet) from the conveyance or package surface, rounded up to the nearest tenth. The TI must be below 10. The TI measurements will be performed at the front of the tractor, on both sides of the trailer, and at the tailgate.
2) A gamma survey will be conducted within the cab of the transport tractor. The average reading in mrem/hr will be recorded to verify that the occupied space does not exceed the regulatory limit of 2 mrem/hr at one meter from the interior surface or 10 mrem/hr at the interior surface.

3) The truck and trailer will be visually inspected to ensure that the load is adequately covered, there is no leakage from the bed of the truck/trailer, and there is no loose ore spilled onto the tractor or trailer.

4) Shipping papers will be prepared by mine personnel and provided to the truck driver. Each ore shipment must include the following information.

   a) Date of shipment:
   b) Name and address of shipper:
   c) Name and address of transporter:
   d) Name and address of mill destination:
   e) Shipping name: Radioactive Material, Low Specific Activity (LSA-1, non-fissile)
   f) Hazard Class: Class 7 Radioactive Material
   g) Identification Number: UN 2912
   h) Quantity of Material (lbs.):
   i) Transport Index:
   j) Grade U₃O₈:
   k) Activity of Radioactive Material (Terabecquerels, Tbq):
   l) Emergency Contact Telephone Numbers:
   m) Energy Fuels’ shipper certification
   m) Exclusive use statement

The activity level of the shipped ore is dependent on the tonnage and grade. The activity level, in units of terabecquerels (Tbq), can be found from the table presented in Appendix A. One Tbq is equal to about 27 Curies (Ci).

The emergency contact numbers should include the emergency response contractor stipulated in the ore haulage contract, appropriate Energy Fuels personnel, appropriate mill personnel, state patrol offices, and local fire station and sheriff offices. Home telephone numbers are to be included for all key response personnel.

The shipping papers will include the following certification statement that will be signed by the responsible person at the mine: "This is to certify that the above-named materials are properly classified, described, packaged and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation."
An exclusive use statement must be included on or with the shipping papers indicating that the tractor and trailer are used exclusively for shipping uranium ore. An example of an exclusive use statement is: “This shipment of uranium ore is being shipped as an exclusive (sole) use shipment. Accordingly, the contents of the shipment must be loaded at the mine and unloaded at the mill, absent any unloading or additional loading prior to delivery at the mill. The transportation conveyance trailer must be utilized only for uranium ore transport until such time that mill personnel conduct a survey of the interior and exterior of the trailer and determine that the trailer can be released for unrestricted use. At such time that the trailer is released for unrestricted use, all markings related to the radioactive material must be removed from the conveyance trailer.”

5.0 Ore Transport

The contract carrier will be responsible for compliance with all applicable laws and adhering to the following procedures and protocols during transport of the ore from the mine to the mill.

1) The truck must be equipped with appropriate vehicle markings. The words “RADIOACTIVE LSA” must be stenciled or otherwise affixed to both sides of the trailer in 3-inch letters. The words “FOR RADIOACTIVE MATERIALS USE ONLY” must be stenciled in 3-inch letters in a conspicuous place on both sides of the trailer.

2) The trailer must be kept closed at all times, when containing uranium ore and when empty, by use of a tarpaulin or other suitable cover. The carrier must ensure that there is no leakage or spillage of uranium ore from the truck trailer.

3) The carrier will inform appropriate mine and mill personnel of the route to be taken from the mine to the mill.

4) Shipments of ore will be transported without unnecessary delay from the mine to the mill. The carrier may designate suitable locations for temporary storage of vehicles along the route from the mine to the mill if it is necessary to coordinate delivery times at the mill. These “safe havens” are subject to approval by the mine and the mill.

5) Carrying and delivering to the mill a copy of the shipping papers.

6) Maintaining exclusive use of the transport vehicle for uranium ore shipment. An unrestricted use release survey will have to be conducted by the mill before the vehicle can be used for other purposes.

7) Unloading the uranium ore shipment at the mill in accordance with the procedures stipulated by the mill.

8) Carrying and adhering to an Emergency Response Plan (see Section 6).

9) Ensuring that all drivers are properly trained (see Section 7).
6.0  Emergency Response

The transportation contractor is responsible for preparing an emergency response plan and implementing the plan in the event of an accident that results in the spillage of uranium ore (or other spillage during transport) on public roads. The plan must meet the requirements of 49 CFR 172 Subpart G and be approved by Energy Fuels and the mill. Guidelines for preparing an emergency response plan are provided in Appendix B.

Energy Fuels can and would prefer to be the primary provider of technical support and cleanup assistance in the event of an accident because the company has the expertise and specialized equipment necessary to do the work. However, emergency response functions may also be provided by the transportation contractor, the mill, or a 3rd-party emergency response contractor. The mine’s role in an accident will depend on contractual requirements between the mine and the transportation contractor. These responsibilities need to be clearly spelled out and understood prior to the start of ore haulage. The emergency response plan must clearly define who is responsible for each type of emergency response action and provide the necessary emergency contact information.

7.0  Training

Mine safety personnel will provide training to mine and carrier personnel for the proper loading and transporting of uranium ore. The training will include: basic radiation concepts, dust and contamination control, vehicle scanning requirements, exclusive use transport provisions, and emergency response contact and response information. The training record will be documented and maintained on site.

The transportation contractor will be required to provide training to its drivers in accordance with 49 CFR Subpart H including job functions to be performed by the employee, emergency response procedures, self protection measures, and accident prevention methods. A record of current training, inclusive of the preceding three years, will be kept for every employee of the transportation contractor.

In accordance with the requirements of 49 CFR 177.800 and 177.816, each truck driver and any other carrier personnel involved in the loading or unloading of uranium ore onto and from the uranium transport truck must be trained in the applicable requirements of 49 CFR Parts 390 through 397 and the procedures necessary for the safe operation of the vehicle. Driver training must include the following subjects:

1) Pre-trip safety inspection;
2) Use of vehicle controls and equipment, including operation of emergency equipment;
3) Operation of vehicle, including turning, backing, braking, parking, handling, and vehicle characteristics including those that affect vehicle stability, such as effects of braking and curves, effects of speed on vehicle control, dangers associated with maneuvering through
curves and steep grades, and dangers associated with weather or road conditions that a driver may experience (e.g., storms, high winds);

4) Procedures for crossing through tunnels, bridges, and railroad crossings;

5) Requirements pertaining to attendance of vehicles, parking, smoking, routing, incident reporting, and loading and unloading of materials.

The above training is the responsibility of the transportation contractor and may be satisfied by compliance with the current requirements of a Commercial Driver’s License with a hazardous materials endorsement.
APPENDIX A
ACTIVITY OF RADIOACTIVE MATERIAL
CONTAINED IN TRUCK (TBq)
Appendix C

C-8

Ore Transportation Plan

Whirlwind Mine Uranium Mining Project EA


APPENDIX B
EMERGENCY RESPONSE GUIDELINES
ORE TRANSPORATION CARRIERS
EMERGENCY RESPONSE GUIDELINES
ORE TRANSPORTATION CARRIERS

The following guidelines provide direction to Energy Fuels personnel in evaluating the effectiveness of an Emergency Response Plan (Plan) for ore transportation carriers. Each ore transportation contractor must have a comprehensive plan in place for responding to accidents and other incidents involving the spillage of uranium ore. It is recommended that the principal emergency responders named in each Plan be contacted to verify their capability of responding to an incident that might occur anywhere along the proposed haulage route(s).

Emergency Contact Information: The Plan should include emergency telephone numbers for the transportation contractor, the mine, the mill, and a third-party emergency response contractor, if applicable. Additionally, the Plan should include telephone numbers for the state patrol, local fire stations, local law enforcement, and emergency medical services. These telephone numbers should include all localities along the carrier’s route to the mill. The plan should clearly spell out who is to be contacted depending on location and type of incident. The driver should also be provided with a radio and/or mobile telephone suitable for the area traveled. Because of the relative remoteness of our mine sites, some communication units may not provide adequate coverage.

Scene Assessment: Prior to performing any action at an accident, the scene will need to be quickly evaluated for potential hazards including injuries, fires, fuel spills, downed power lines, traffic hazards, and proximity to streams or rivers. Identified hazards are to be avoided and, if possible, abated as soon as possible. It is recommended that the driver carry a copy of USDOT’s current Emergency Response Guidebook and be trained in its use so that he/she can better identify potential hazards and the appropriate response procedures. Contacting the local fire station and/or sheriff’s department is often the fastest method for gaining assistance when responding to identified hazards.

Succession of Authority: The driver, if capable, is responsible for the accident site and related area on public roads or highways until the arrival of the fire department or law enforcement personnel. Once the site has been secured and the preliminary investigation is complete, the assigned supervisor of the contracted Emergency Response Team shall be in charge of traffic control and cleanup activities.

Traffic Control: Initially, reflective triangles, flares, and volunteer flaggers can be used to control traffic until emergency responders arrive. Professional traffic control measures will be needed for any subsequent clean-up actions.

Qualifications of Emergency Response Crews: General construction skills are needed plus experience in the use of radiological monitoring instruments. Emergency response crews should be located in close proximity to the ore haulage route. If a haulage route is relatively long, different crews may be needed to respond to different sections of the route.
Potential for Exposure: The uranium ore transported to the mill ranges from 0.15 to 0.35 percent \( \text{eU}_3\text{O}_8 \). Based on EPA and NRC health-based standards, a cleanup action of material having this low of uranium content will not result in a worker becoming overexposed to radiation, even if the action extends over several work days.

Required Personal Protection Equipment (PPE): Level “D” PPE consisting of work pants, sleeved work shirt, and sturdy work boots or shoes is required. Gloves, hard hats, safety glasses, dust masks, and steel-toed safety shoes/boots may be also required as needed.

Cleanup Procedures: Because of its potential to cause a fire or contaminate nearby water courses, containment and cleanup of any fuel spills is normally the first priority. Many of the fire departments carry adsorbents and booms to contain and clean up these types of spills. Spilled ore materials, depending on the size of the spill, can be cleaned up with a loader, hand shovels, rakes, and shop brooms. If the spill is large, the ore should be transferred directly to another truck approved for uranium ore haulage. Smaller spills can be placed in barrels or other suitable containers. If it is windy, dust can be controlled with light water sprays; however, large volumes of water should not be used because this could result in runoff of water containing uranium and other contaminants. If the spill occurs near or within a stream or river, efforts should be made to limit the quantity of ore released to the water course. Because of its relatively low uranium content, however, no long-term environmental impacts would be expected if some of the material cannot be safely recovered.

Cleanup Verification: After visible spilled ore material has been removed, a scintillometer or gamma meter should be used to identify any “hot spots” of residual radiation on ground surfaces. The hot spots can be marked using spray paint, chalk, or utility flags. After these hot spots are further cleaned, they should be rechecked with the instrument to verify that the area is at or near background radiation levels. This is normally readily achievable on hard surfaces such as concrete or asphalt. Some over-excavation of underlying soils may be necessary in gravel or grassy areas. If there is a concern regarding the cleanup levels achieved, soil samples can be taken of the contaminated area and a nearby uncontaminated area to establish background levels. Cleanup to a level of 5 pCi/g above background is normally considered adequate for protection of the environment.

Disposal of Recovered Materials: Recovered materials that have been loaded for transport can be released by the assigned cleanup supervisor to be transported to the mill. Any materials contaminated with oil or fuel should be containerized and transported to a suitable holding area for later characterization and appropriate disposal.

Decontamination of Equipment and Tools: The contract Emergency Response Team should have specific procedures in place for decontaminating equipment and tools for “free release” of these items. These procedures generally include cleaning protocols, collecting swipe samples for analysis, and scanning for radiation levels.

Agency Notifications: Depending on the severity of the incident, one or more state and federal agencies may need to be notified. These notifications may include both verbal and written requirements and should be made by the transportation contractor with the assistance of the
Emergency Response Team supervisor. Notification requirements, including contact information, should be included in the carrier’s Plan. Depending on location, potential notifications include:

1. Colorado Department of Public Health and Environment, Division of Emergency Management: (303) 756-4455
2. The Utah Department of Environmental Quality, 24-Hour Answering Service: (801) 536-4123
3. The U.S. Environmental Protection Agency, National Response Center: (800) 227-8914
4. The U.S. Department of Transportation: Written report within 30 days

The reportable quantity (RQ) for uranium is 0.1 Ci or 0.0037 TBq (see 49 CFR 172.101). It is unlikely that this threshold will be exceeded in an accident unless the ore is of relatively high grade and the entire load is spilled (see activity levels in Appendix A). However, associated events such as fire, serious injury, public evacuation, or closure of a major transportation artery can also trigger the reporting requirement. Agency notifications typically have time limits that must be observed, so it is important that the Plan clearly lists the notification requirements for each agency that may be involved.
APPENDIX D

Whirlwind Water Treatment System
Compliance Summary
July 2, 2008
Energy Fuels Resources (Energy Fuels) is presenting this compliance summary for the Whirlwind Mine treatment plant to assist the BLM in understanding and informing the interested public of the steps that we have taken to meet the requirements of Colorado Discharge Permit System (CDPS) Permit Number CO-0047562.

**Discharge History**
Because of the relatively small and intermittent need for mine water treatment and discharge at the Whirlwind Mine, Energy Fuels worked with Lyntek Inc. to develop a small portable treatment system that could effectively treat radium, uranium, and trace metals. This system was later refined in consultation with Mark Reinsel of Apex Engineering PLLC to better treat for selenium. Although the system has had some exceedances of the discharge limits, Energy Fuels has aggressively and successfully worked to resolve these effluent exceedances as they have arisen.

The Whirlwind water treatment plant began discharging on November 28, 2007. Treatment and discharge of water was conducted 4 to 7 days per week until the mine was completely dewatered on January 29, 2008. Since that time, the treatment plant has treated and discharged water 3 to 7 days per month (i.e., from February to June 2008) to keep the mine dewatered.

Table 1, on the next page, shows the 30-day average and daily maximum effluent limitations and discharge sample analytical results for selenium, dissolved radium$^{226}$ (Ra$^{226}$) and total radium$^{226} +$ radium$^{228}$ (Ra$^{226+228}$), pH, and total suspended solids (TSS). These parameters are shown because there have been one or more instances of non-compliance for these parameters since discharge began. Permit exceedances have been limited to TSS during the past three month time period (i.e., March – May 2008).

Seventeen other parameters have been analyzed for and reported in accordance with the discharge permit and have not had any instances of non-compliance. These parameters include flow, chemical oxygen demand (COD), oil and grease, total dissolved solids (TDS), whole effluent toxicity (WET), arsenic, boron, beryllium, cadmium, trivalent chromium, lead, manganese, nickel, vanadium, zinc, uranium, and weak dissociable cyanide.

In reviewing Table 1, it is important to note that it takes an average of three to four weeks before analytical results from discharge samples are received which creates an unavoidable lag time in identifying permit exceedances and making adjustments to the water treatment system. When possible, Energy Fuels has rushed analysis of parameters with known issues to more quickly resolve them.

Summaries of the effluent limitation exceedances that Energy Fuels has encountered and the steps taken to resolve these issues are provided below.
Table 1
Summary of Discharge Results

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<tbody>
<tr>
<td>Se, total$^{1}$</td>
<td>µg/L</td>
<td></td>
<td></td>
<td>20</td>
<td>30-day</td>
<td>27</td>
<td>25</td>
<td>22</td>
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<td>16</td>
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<tr>
<td>Ra$^{226}$, Dissolved$^{1}$</td>
<td>pCi/L</td>
<td>3.0</td>
<td>30-day</td>
<td>&lt;1</td>
<td>4.1</td>
<td>1.3</td>
<td>1.2</td>
<td>&lt;1.2</td>
<td>&lt;0.6</td>
<td>&lt;0.2</td>
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<tr>
<td>Total Ra$^{226+228}$</td>
<td>pCi/L</td>
<td>5</td>
<td>Daily</td>
<td>&lt;2</td>
<td>6.3</td>
<td>8.4</td>
<td>2.7</td>
<td>3.1</td>
<td>0.6</td>
<td>&lt;1.4</td>
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<td>pH$^{2}$</td>
<td>s.u.</td>
<td>6.5-9.0</td>
<td>Daily</td>
<td>8.11</td>
<td>8.19</td>
<td>7.69</td>
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<td>7.78</td>
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<tr>
<td>TSS</td>
<td>mg/L</td>
<td>20</td>
<td>30-day</td>
<td>&lt;10</td>
<td>11</td>
<td>18</td>
<td>44</td>
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<tr>
<td>TSS</td>
<td>mg/L</td>
<td>30</td>
<td>Daily</td>
<td>&lt;10</td>
<td>20</td>
<td>30</td>
<td>44</td>
<td>48</td>
<td>14</td>
<td>64</td>
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<tr>
<td>Total number of exceedances</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>0</td>
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<tr>
<td>Total Flow</td>
<td>gal</td>
<td>900,000$^{3}$</td>
<td>30-day</td>
<td>38,843</td>
<td>511,025</td>
<td>490,657</td>
<td>54,957</td>
<td>105,591</td>
<td>91,083</td>
<td>54,398</td>
</tr>
</tbody>
</table>

Shaded boxes indicate effluent limitation exceedances

Daily = Daily maximum effluent limitation
30-day = 30-day average effluent limitation
1 No daily maximum effluent limitations are set for selenium or dissolved Ra$^{226}$
2 No 30-day average effluent limitations are set for pH or total Ra$^{226+228}$
3 900,000 gallons per month is based on the 30-day average effluent limitation of 0.03 million gallons per day over an average 30-day month

Total Selenium

Total selenium levels in the treated water were a concern during the initial phase of water treatment at the Whirlwind Mine. Average selenium levels of 27 micrograms per liter (µg/L) were recorded during the first month (November 2007) of water treatment compared to the permit limit of 20 µg/L. Corrective measures were implemented as soon as we became aware of the problem including installing larger static mixers for more thorough mixing of reagents, increasing the holding time in the reaction tanks, and consulting with a mine water treatment specialist (Mark Reinsel, Ph.D., P.E.). At the recommendation of Dr. Reinsel, Energy Fuels increased the dosage of ferric sulfate to lower the pH and temporarily eliminated the addition of barium chloride treatment to check on possible reagent interference. Selenium, unlike most metals, precipitates out as the pH is reduced.

Although the selenium concentrations were steadily reduced throughout the month of December 2007, they still remained slightly above the effluent limit. In January 2008, Energy Fuels took further action in an effort to reduce selenium concentrations including installing a baffle in the settling tank to increase reaction time and adding sulfuric acid to further reduce the pH. Barium chloride was reintroduced to the treatment system as radium levels had increased in the treated water in its absence (see radium discussion below). During January 2008, the selenium levels decreased further; however the average concentration was still slightly above the effluent limitation.

In February 2008, the pH levels were unintentionally reduced further to 6.3 standard units (see pH discussion below). Despite the lower pH, which is ideal for precipitation of selenium, the selenium concentration in the treated water still persisted at slightly above the effluent limitation. In early March 2008, Energy Fuels performed a speciation analysis of the selenium and this revealed that 85 percent of the selenium in the untreated mine water was in the much more rare selenate (selenium IV) form. Selenate is virtually untreatable with ferric sulfate and pH reduction, the primary methods employed to this point. Addition of sodium metabisulfite in...
March 2008 resulted in the immediate reduction of selenium to 15-16 µg/L, below the 30-day average effluent limitation of 20 µg/L. Selenium has remained below the effluent limit since March.

The 20 µg/L effluent limit for selenium was established for the site based on chronic toxicity in the aquatic food chain. This aquatic-based limit is well below the federal drinking water standard of 50 ug/L. The aquatic standard has been set very low because selenium tends to bioaccumulate in fish and waterfowl and gradually poison these species. However, the nearest aquatic habitat to the mine is at the Dolores River, which is about five miles away. The only manner in which the discharge can reach the river is during storm events and spring snowmelt when the treated water mixes with and is strongly diluted by natural flows within the drainage.

**Dissolved Radium**$^{226}$ and **Total Radium**$^{226+228}$
Dissolved Ra$^{226}$ and total Ra$^{226+228}$ became an issue in mid-December 2007 through early January 2008. Radium levels in the treated mine water were negatively affected while Energy Fuels attempted to treat for selenium levels. At the recommendation of a mine water treatment specialist, Energy Fuels eliminated the barium chloride addition to reduce possible interference with the selenium treatment. Energy Fuels immediately reintroduced barium chloride when the increased radium results were received in early January 2008. Levels of dissolved Ra$^{226}$ and total Ra$^{226+228}$ subsequently decreased to below the effluent limitations and have remained in compliance with the permit limits since that time.

**pH**
One exceedance of the daily maximum effluent limitation for pH occurred in February 2008. In an effort to reduce selenium concentrations in the discharge and at the recommendation from a mine water treatment specialist, Energy Fuels began lowering the pH of the water in December 2007. In February, the mine had just recently been dewatered and mine water was being pumped from the mine as it accumulated in the mine sump. Energy Fuels believes this led to a change in water chemistry (i.e. treatment of standing mine water vs. fresh mine water flow) and reduced the pH buffering capacity in the mine water. As a result, the pH dropped more than previously experienced, although the dosage of acid added during treatment had not changed. Immediate action was taken to reduce the amount of acid being added during treatment. The exceedance was a one time event and the result of attempting to better treat for selenium.

**Total Suspended Solids**
TSS levels in the mine water became a concern in February 2008 after the mine was dewatered. From that time forward, water has been pumped from the mine sump as it accumulates and then it is treated in batch runs. Up until recently, the sump contained a considerable amount of sediment that was pumped out with the mine water to the untreated water tank. Energy Fuels did not receive the laboratory results for February indicating TSS levels above the effluent limitations until late March 2008. At this time, Energy Fuels immediately began investigating possible solutions to this problem. However, in the meantime, samples taken from three discharge events in March 2008 failed to meet effluent limitations for TSS leading to two more exceedances, once for the 30-day average and once for the daily maximum effluent limitations (daily maximum limitations were achieved for two events).

In April 2008, Energy Fuels began adding a polymer to the untreated mine water in the untreated water tank to settle out much of the TSS prior to treatment and in the treatment plant to further settle out TSS in the settling tank. The April discharge event results showed marked improvement in the TSS levels of treated water and the Energy Fuels met all effluent limitations.
for the month of April 2008. Unfortunately, during the May 2008 discharge, the following factors led to higher TSS levels in the treated water once again.

a. Rehabilitation activity in the mine sump area resulted in higher levels of sediment in the untreated water tank.

b. A clogged polymer line resulted in less pretreatment of the water.

c. High winds during the period of discharge may have re-disturbed solids in the water tanks that had previously settled out.

During the month of June, Energy Fuels began adding both a flocculent and the polymer to the untreated water tank and in the treatment system in order to better control TSS levels in the untreated and treated mine water. The results of this additional treatment look to be promising. Preliminary analytical results from the June discharge event indicate that TSS is less than 10 mg/L in the treated water.

As part of its rehabilitation work within the mine, Energy Fuels cleaned out and enlarged the size of the mine sump during May and June 2008. Afterwards, the sump area was shotcreted and the mine pump was re-installed within a filter system. It is hoped that these upgrades will eliminate the need to add flocculants and polymers to control TSS.

The TSS standards for the site were established based on discharging to a stream. In the case of the Whirlwind Mine, the treated water is discharged to a dry drainage where it flows along the base of the streambed until it gradually seeps into the soil. Accordingly, the elevated TSS experienced during the months of February, March and May would not have resulted in any measurable environmental impact to the Lumsden Canyon drainage.