Review of Piñon Ridge Project Environmental Report, Montrose County, Colorado

Prepared for

Montrose County, Colorado

March 11, 2010

DE-00075

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CONTENTS Page

EXECUTIVE SUMMARY ES.1

1.0 INTRODUCTION 1.1

2.0 ALTERNATIVES 2.1

2.1 ***No Action Alternative*** 2.1
2.2 ***Proposed Action Alternative*** 2.1
2.2.1 Mill 2.1
2.2.2 Tailings Liner Concept 2.2
2.2.3 Tailings Cells Closure 2.3
2.3 ***Alternatives Considered but not Analyzed in Detail*** 2.4

3.0 AFFECTED ENVIRONMENT 3.1

3.1 ***Land Use*** 3.1
3.2 ***Transportation*** 3.1
3.3 ***Geology and Soils*** 3.2
3.4 ***Water Resources*** 3.3
3.5 ***Ecological Resources*** 3.4
3.6 ***Meteorology, Climatology, and Air Quality*** 3.5
3.7 ***Noise*** 3.6
3.8 ***Historic and Cultural Resources*** 3.6
3.9 ***Visual/Scenic Resources*** 3.7
3.10 ***Socioeconomics*** 3.7
3.11 ***Public and Occupational Health*** 3.7

4.0 ENVIRONMENTAL IMPACTS, MITIGATION, AND MONITORING 4.1

4.1 ***Land Use*** 4.1
4.2 ***Transportation*** 4.1
4.3 ***Geology and Soils*** 4.2
4.4 ***Water Resources*** 4.4
4.5 ***Ecological Resources*** 4.5
4.6 ***Air Quality*** 4.7
4.7 ***Noise*** 4.8
4.8 ***Historic and Cultural Resources*** 4.8
4.9 ***Visual/Scenic Resources*** 4.9
4.10 ***Socioeconomics*** 4.10
4.11 ***Public and Occupational Health*** 4.12

CONTENTS (Continued) Page

4.12 ***Waste Management*** 4.15

5.0 SUMMARY OF IMPACTS 5.1

6.0 CUMULATIVE IMPACTS 6.1

7.0 COST BENEFIT ANALYSIS 7.1

7.1 ***Benefits*** 7.1
7.2 ***Costs*** 7.2
7.3 ***Cost/Benefit Analysis*** 7.2
7.4 ***Findings*** 7.2

EXECUTIVE SUMMARY

Pincock Allen & Holt (PAH) conducted a review of Energy Fuel's Piñon Ridge Project Environmental Report (ER) for the Montrose County Board of County Commissioners. The ER is one component of Energy Fuel's application submittal to the Colorado Department of Public Health and Environment (CDPHE) to license a uranium and vanadium processing mill in Montrose County. PAH's ER review was technical in nature, and not oriented towards the legal, regulatory, and political requirements and process.

PAH's approach was to review, summarize and comment on each of the ER sections and major subsections. Consequently, this report is organized with the same sections/subsections as the ER, i.e., PAH's summary and comments on Section 3.2 Transportation of the ER are presented in Section 3.2 Transportation of this report.

This Executive Summary presents PAH's findings per the following:

- ER consideration of CRS 25-11-203(2)(c)(I) through (VI)
- Major Comments on the Environmental Report

CRS 25-11-203(2)(c)(I) through (VI)

Montrose County requested that the review consider issues associated with CRS 25-11-203(2)(c)(I) through (VI). Basic consideration of issues associated with each of the six criteria is presented below in *italics*, and more detail is provided throughout the body of this report.

(c) As used in paragraph (b) of this subsection (2), "environmental assessment" means a report and assessment submitted to the department by a facility upon and in connection with application for a license, a fire-year renewal, or license amendment pertaining to the facility's receipt of classified material, proposing to receive classified material for storage, processing, or disposal at a facility that addresses the impacts of the receipt for storage, processing, or disposal of such material. The environmental assessment shall contain all information deemed necessary by the department, and shall include, at a minimum:

I - The identification of the types of classified material to be received, stored, processed, or disposed of: The ER identifies the materials that may be used or stored on site including the name of the material, its purpose, the maximum quantity on-site, and the storage location at the site. There is a discussion on how these materials will be delivered (received) at the site. The materials will be used in some manner to process the uranium ore. When mill operations cease a plan is discussed on how the disposal of residual liquids and solids would be managed.

II - A representative presentation of the physical, chemical, and radiological properties of the type of classified material to be received, stored, processed, or disposed of: The potential sources of radionuclides which are a result of the uranium 238 series are discussed. Specifically, the five which have

sufficiently long half-lives to be transferred from their source through exposure medium to plants, animals, and/or humans. There is a discussion of where these five radionuclides would be present, what the potential source would be, and the mitigation approaches to be taken to minimize the impact of these radionuclides.

III - An evaluation of the short-term and long-range environmental impacts of such receipt, storage, processing, or disposal: For the most part, the ER evaluates the short- and long-term environmental impacts for the proposed Project; although some deficiencies were identified during the review and are addressed further in following sections of this Executive Summary and in the body of this report.

IV - An assessment of the radiological and nonradiological impacts to the public health from the application; The ER discusses how the environmental impacts of radiological and nonradiological will impact mill employees and public health and how the impacts will be managed. It includes a review of regulatory agencies which would be involved in primary health and safety regulating. In the ER, plans are reviewed to avoid or mitigate radiological risks through implementation of the mill design and health and safety plans which are presented in the license application.

V - Any facility-related impact on any waterway and ground water from the application: The ER incorporates a relatively extensive consideration of potential impacts to waterways and groundwater. However, despite fairly comprehensive field investigations and testing; specific groundwater impacts and aquifer response to Project water withdrawal is inconclusive at this point. The Proponents intends to further evaluate the aquifer situation during operations and has established a backup water supply source form the Town of Naturita if the available groundwater supply cannot meet the mill demands.

VI - An analysis of the environmental, economic, social, technical, and other benefits of the proposed application against environmental costs and social effects while considering available alternatives. The ER discusses the benefits and cost associated with the proposed project. A cost/benefit analysis is done based on estimates for revenue and costs over the life of the project. The market price assumed for uranium plays a key role in the value of benefits calculated. The ER does not discuss how the market price was determined over the 40 year projected Mill life.

Major Comments on the Environmental Report

For the most part the ER appears to be relatively comprehensive and credible. The following general comments about the document are noted:

- In some cases the specific methodologies used to characterize and evaluate a particular component of the study (e.g., transportation) is not fully described in the ER; making it more difficult to evaluate the credibility of the assessment work. The document would be enhanced by further description of the methodologies employed.

- For the most part it is understood that the ER and most permit applications assume a 500 ton per day processing mill facility. However, the document notes that the submitted air permit application is

based on 1,000 tons per day, which Energy Fuels states they plan "to ultimately ramp up to." This discrepancy suggests that the actual impacts of the Project, when it ramps up to 1,000 tons per day, on such things as water resources, traffic, noise, socioeconomics, etc. will not be fully considered unless an additional assessment is performed prior to expansion.

- The project assumes a 40 year life, but the supporting assumptions for this estimate are not explained in the ER.

Specific comments on ER issues include:

- There are a couple issues associated with water resources. Premier is that the aquifer testing is inconclusive at this point, and consequently Energy Fuels is not sure the mill needs can be met using local groundwater. Similarly, since aquifer response to groundwater withdrawals is not completely understood, potential impacts cannot not be reliably projected. PAH recommends that Energy Fuels increase initial operations production well monitoring above what is currently planned, and develop a response/contingency plan with triggers and associated response actions.

- The ecological resources assessment had a couple loose ends including: current design does not use pond netting with the mesh size recommended by the US Fish and Wildlife Survey; and Energy Fuels states they "may" cooperate with ongoing efforts to enhance Gunnison Sagegrouse habitat to mitigate for possible Project impacts, but planned activities and level of effort is not specified.

- Energy Fuels should consider collecting air quality PM_{10} baseline and ongoing monitoring data at offsite locations, including the downgradient residence. Also, the ER notes that an air quality impact model will be conducted; however, it would have seemed appropriate to have that information in this impact assessment.

- Noise baseline data was not collected at the site or nearby residences, and instead was estimated.

- Cultural resource awareness training for chance finds should be conducted for the construction and operations crews.

- Inhalation of radionuclides from the Mill Facility to employees and people in the vicinity of the mill will be one of the main potential exposure pathways. This will require carefully management control over the life of the project.

- Section 4-10 does not contain any mitigation for the closure of the project. Considering the long life potential of the project and its potential to become imbedded in the local community and economy over that period; it will be important for Energy Fuels to provide some indication regarding the mitigation of closure impacts and how these will be incorporated in the ongoing planning during operations.

PAH also provides several recommendations in Section 2.2 to enhance the tailings facility closure design.

Ultimately, the incorporation of mitigation measures in the final design and the implementation of measures during construction and operations are critical to minimizing environmental and socioeconomic impacts. As such, Energy Fuels should develop and implement a credible environmental management system (EMS) for the Piñon Ridge Project to ensure classified material is handled appropriately, mitigation measures implemented effectively, and monitoring performed. Montrose County may want to review and comment on the EMS plan(s).

1.0 INTRODUCTION

Pincock Allen & Holt (PAH) performed a review of the Piñon Ridge Project Environmental Report (ER) for the Montrose County Board of County Commissioners. The ER is one component of Energy Fuel's application submittal to the Colorado Department of Public Health and Environment (CDPHE) to license a uranium and vanadium processing mill in Montrose County. PAH's ER review was technical in nature, and not oriented towards the legal, regulatory, and political requirements and process.

PAH's approach was to review, summarize and comment on each of the ER sections and major subsections, as applicable. Consequently, this report is organized with the same sections/subsections as the ER – i.e., PAH's summary and comments on Section 3.2 of the ER - Transportation are presented in Section 3.2 of this report.

PAH has no specific comments on Section 1 of the Environmental Report.

2.0 ALTERNATIVES

2.1 *No Action Alternative*

If the proposed Project does not go forward, Energy Fuels states that Montrose County will not experience the positive economic benefits to local economies; mines would have to transport ore further to reach a processing mill, which may not be economical; and, uranium resources may not be developed to support the 2005 Energy Policy Act.

On the other hand, if the Project does not go forward, the status quo will be maintained and environmental impacts described in the ER will not occur.

2.2 *Proposed Action Alternative*

PAH has the following comments on several specific design components of the proposed Project as presented in the ER, and based on a review of the 2009 Kleinfelder "Tailings Cell Closure Design Report" (note that appendices and computations were not available for review).

2.2.1 Mill

Section 2.2.3.3 states that the "Mill Facility would be designed to treat up to 500 tpd (tons per day) of ore..." However, Section 4.6 of the ER states that Energy Fuels "...plans to ultimately ramp up to processing 1,000 tpd of uranium/vanadium ore." It is understood that for the most part the ER assessment for various environmental and socioeconomic components (e.g., water supply, number of employees, etc.), except for air quality permitting, is based on 500 tpd. However, it is not clear if the mill facilities are being designed in a manner that the processing capacity can be doubled at some point in the future.

At the 500 tpd, the ER states, "most of the ore would be produced and delivered by mines owned by Energy Fuels." Energy Fuels is not currently producing uranium ore from any site near the proposed Mill. The ER does not state the total quantity of mineable reserves currently available for processing through the Mill. The ER does state the Whirlwind Mine and the Energy Queen Mine "...are capable of producing 200 tpd (each) or more of uranium ore and are fully permitted." The ER states the Mill is proposed to operate for 40 years. It is not clear how the daily tonnage rate was determined or how the Mill's operating life was determined.

The proposed Mill design is a proven basic process with semi-autogenous grinding, acid leaching, counter current decantation, solvent extraction and drying and packing. This is similar to other plants which have operated in the United States starting from at least the early 1960s. The process and equipment has previously been proven in the field. Some technology improvements have been made over time.

2.2.2 Tailings Liner Concept

Prevention of downward migration of contaminants that could impact groundwater is addressed with double-geomembrane liners with an intermediate leak detection/collection system. The liner material is 60 mil HDPE and not susceptible to degradation in the presence of tailing solution. The liner will cover surfaces in contact with the tailings solutions and solids except for the interim cover. A dewatering (underdrain) system will remove drainable liquid from the tailings during mill operations and subsequently as needed, to remove the tailing liquid freed up both by natural gravity drainage of the tailings and by consolidation of tailings. No design figure or discussion of the dewatering underdrain system was available for review.

A geosynthetic clay liner (GCL) is proposed as a substitute for the compacted clay normally used as the base layer in a double composite system. This layer is the final component to prevent leakage through the liner system. This a crucial layer because if any contaminate get through here, the containment has failed. The cells are sited is a good location, so a failure will not endanger human health and no immediate danger to the environment as no close ground water occurs and the cells are over a salt collapse structure. But if a leak contaminates the subsurface, clean-up will be required.

A GCL is approximately ¼-inch thick, so any compromise to the integrity of the GCL will constitute a failure. GCL's have sodium montmorillite sandwiched between two nonwoven geotextiles. Compatibility testing of the proposed GCL with strong acid solutions (pH less than 2 standard units) indicated that tailings leachate would not significantly increase the permeability on the liner system.

However, PAH has some concerns regarding the stated insignificant impact to GCL permeability, although the laboratory testing results were not reviewed. Prior experience with acids and sodium montmorillite has shown that the sodium montmorillite strongly flocculates, and in the case of GCLs the permeability will increase 2 to 3 orders of magnitude. Given that the tailings slurry is expected to have a pH of 2 to 3, compatibility testing should be performed with the expected tailings fluid solutions on samples of the actual GCL to be installed. Testing and reporting of results should follow procedures outlined in ASTM D 5084 (Standard Test Method for the Measurement of the Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter) and ASTM D 6766 (Standard Test Method for Evaluation of Hydraulic Properties of Geosynthetic Clay Liners Permeated with Potentially Incompatible Liquids).

The same liner system is proposed beneath the evaporation ponds and the same comments apply.

Figure 2.2-3. Figure 2.2-3 may be somewhat misleading as it states: "Groundwater not encountered beneath proposed facility." However, Section 4.4.1.2.3 states: "Groundwater is absent below most of the tailings cells (i.e., Tailing Cells B and C) and all of the evaporation ponds. Where water is present below the M and tailings Cell A, it is of poor quality, limited in extent, and more than 450 feet deep."

2.2.3 Tailings Cells Closure

The design concept for long-term containment is to us an evapo-transpiration (ET) cover or water balance cover to manage infiltration, and for implied long-term, low maintenance sustainability. From the top downward, the proposed cover will consist of 6-inch rock mulch over 18 inches of native soil. These layers will operate as the rooting medium for the cover. Beneath the native soil layer is a 12-inch biointrusion layer, underlain by a 6-inch filter sand layer, in turn underlain by a 12-inch thick capillary break/drainage layer.

The tailing cells are designed with slopes not steeper than 5H:1V, with final outslopes (slopes from the cell berms to the outer edge of the cells) at 10H:1V. Top slope grade is specified at 2 percent which is too great for vegetative covers designed in accordance with NUREG -1623, but is reasonable for a ½-inch D50 rock.

The construction method discussed for the cover indicates the "rock mulch in the top lift of the erosion barrier/vegetative cover will be applied after the last lift of native soil is placed, then mechanically mixed into the soil before final finish grading. Seeding of this finished surface will occur during the same year as ET construction and at the end of the season, before first snowfall. A specification for seeding will be developed base on NRCS recommended seed mixes and application methods." This will likely produce too much rock in the surface cover for optimum plat growth. The final volume of rock in the rock mulch needs to be specified. Experience gained on other uranium tailings closures that use a soil/rock matrix cover (UMTRA Title I disposal cell at Durango, CO; CERCLA repository at Monticello, UT) have shown that approximately 15 percent rock is near the maximum before plant growth is limited.

Radon barrier is designed with applicable methods.

Freezing and thawing concerns of the cover are mentioned in the closure report; however, computations are not provided for review so underlying assumptions cannot be determined. For example, it is stated that native soil used in the erosion barrier/vegetative cover will have moderate susceptibility to frost action down to approximately 30 inches depth. However, frost susceptibility of the native soil should not be a concern. The native soil provides frost protection to the underlying radon/infiltration barrier. To determine the adequate site-specific thickness of frost protection needed, computations can be performed in accordance with: Smith, G.M. and R.E. Rager, 2000. "Protective layer design in landfill covers based on frost penetration," *ASCE Journal of Geotechnical and Geoenvironmental Engineering,* 128:9 pp 704-799.

All design methods and materials meet general accepted methods. However, research and new information may reveal more efficient methods to meet long-term sustainability requiring flexibility in the proposed design. Concerns include:

- Expected species will include forbs and deep rooted woody plants (Big Sage, Fringed Sage, Winter Fat, etc). These species and more exist in the surrounding native area; therefore, they will be

present the remediated tailings cells after construction. The local ecology must be mimicked in the final design to achieve long-term sustainability.

- A rangeland ecologist should be consulted when developing the planting for the cover. A diverse mixture of grasses, forbs, and deep-rooted woody species is necessary for optimum ET and long-term sustainability.

- Soil cover is too thin for expected species. Preliminary thickness for the plant rooting medium should be based on the thickness of native soils discussed in the Affected Environment section (Section 3.3).

- Placing the last lift of soil over the rock and blending the soil and rock together will likely produce a cover layer with too much rock. When the percentage of rock to soil exceeds approximately 15 percent by volume the plants have difficulty establishing and reaching an optimal transpiration, hence the removal of infiltration is greatly diminished. A specified soil/rock ratio should be determined with field test pads prior to cover construction, a stockpile of the premixed soil/rock produced and hauled and placed in the final remedy.

- The filter layer will operate as a capillary break, so the capillary break/drainage layer can be eliminated. Experience dictates that the filter layer can be replaced with a geotextile to a form break between bio-barrier and capillary break.

Construction of a cover test pad is highly recommended. Not only can the moisture in the cover system be monitored the design, the layer thicknesses, construction methods and plant species can be optimized. Suction lysimeter installations suggested for monitoring in the design are not recommended because moisture can pass as preferential flow and be totally missed. To perform hydrologic monitoring, suggest using drainage lysimeters, i.e. “brute-force hydrology” which have been successfully used in all ACAP lysimeter designs (see Benson, C.H., Abichou, T., Wang, X., Gee, G.W., and Albright, W, H., 1999. *Test Section Installation Instructions Alternative Cover Assessment Program,* Environmental Geotechnics Report No. 99-3, University of Wisconsin-Madison, Madison, Wisconsin).

2.3 *Alternatives Considered But Not Analyzed in Detail*

This subsection of the ER briefly discusses five alternative site locations and three technical alternatives to the proposed Project. Basic reasons for rejecting each of the alternatives are noted.

3.0 AFFECTED ENVIRONMENT

This section presents PAH's review of the Energy Fuels assessment of the current status, baseline conditions of the various environmental and socioeconomic components which could be impacted by the Piñon Ridge Project. In most cases, for each subsection a brief summary of the ER material is provided followed by consideration of its appropriateness and thoroughness.

3.1 *Land Use*

The basic purpose of the Land Use section is to describe the regional and local setting in which the proposed Project will be situated, in terms of how the land is currently used, and future land use planning.

The section considered both regional (i.e., within a 50 mile radius) and local (i.e., within a 5 mile radius) land use planning patterns and notes the following:

- Majority of the land is controlled by the US Bureau of Land Management (BLM) or the U.S. Forest Service.
- Locally, 88 percent of the land is undeveloped and 12 percent is privately owned.
- In Montrose County the primary land uses include agriculture, e.g., farming, grazing and forestry; mineral resources and mining; and recreation, e.g., rafting, hunting, hiking, etc.
- Mineral resources and mining include: uranium, oil and gas, coal, gold, copper, vanadium, silver, and zinc.

The Environmental Report also states that Montrose County is in the process of updating the Master Plan. Reportedly the municipalities of Naturita and Nucla are targeted as urban growth areas in western Montrose County.

In general, this section is adequate and appropriate for the Environmental Review.

3.2 *Transportation*

Since increased traffic associated with the Project will impact regional and local traffic patterns and road use, baseline transportation data are needed to evaluate the potential magnitude of impacts.

The Transportation section identifies the primary regional routes in western Colorado and eastern Utah which may be used by vehicles associated with the Project. The roadway system in the vicinity of the site is also discussed. The 2008 annual average daily traffic volumes are presented, along with the

results of a peak hour traffic count for the intersection of state highways 90 and 141. Finally, traffic accident statistics are presented for Montrose and other nearby counties.

This section appears adequate for its purpose; especially when supported by the more substantive and descriptive Transportation discussion in Section 4.2. However, the write up could be enhanced by a discussion of how the transportation study was conducted (i.e., study plan and methodology).

3.3 *Geology and Soils*

The section is to provide a brief summary of regional and site geology in accordance with CDPHE statute 6 CCR 1007-1, Part 18, and the Nuclear Regulatory Commission NUREG 1748. ER discussion topics include regional and local structure, the site stratigraphy, characteristics of the soil, major structural and tectonic features (e.g., faults), other significant geological conditions, local and regional seismicity data, and volcanism.

The ER describes geology and soils at the proposed mill site in terms of the affected environment. General regional geology is discussed from referenced literature publication prior to the site geology description. Field verification studies were undertaken

Geologic characterization begins with a literature review of United States Geological Survey, Colorado Geological Survey, and New Mexico Bureau of Mines and Mineral Resources sources. Aerial photographs of the area were obtained and reviewed to assist in the identification of larger scale geologic features. Regional geology is described beginning with the Colorado Plateau Physiographic Providence, down to the Paradox Valley geomorphology and bounding salt dissolution faulting, to the sacrificial geology. Geologic mapping was conducted in August 2007 on a topographic base map using a scale of 1 inch = 200 feet and a contour interval of 2 feet.

Supplemental geologic reconnaissance and mapping was conducted in December 2008 in the northern half of the Site and on the adjacent property to investigate the presence of any sinkholes or other karst features. The investigation included field reconnaissance of an observed sinkhole north of the Property Boundary, field observations of multiple circular-shaped clearings observable in aerial photographs, and reconnaissance of the contact between the alluvial valley fill deposits to the south and the weathered surface of the Paradox member of the Hermosa Formation to the north.

The Colorado Geologic Survey earthquake database was reviewed to determine frequency and magnitude seismic events. Natural earthquake with significant magnitude are not frequent in the region; however, most of the earthquakes in Colorado have been due to induced seismicity caused by human activities. The injection of salty water in deep formations below the Paradox Valley Unit, approximately 9 miles west of the Site, by the Bureau of Reclamation is also discussed.

Refraction and reflection geophysical survey were conducted in 2007, to determine if faults could be detected in the Quaternary deposits, and to obtain any evidence regarding groundwater in the area.

Additionally, two pilot tests using electromagnetic methods were conducted in February and March 2008 to further investigate an anomalous soil feature identified in trenching efforts.

Three trenches were excavated and mapped in December 2007 over possible subsurface faults inferred from the seismic refraction and reflection surveys. The purpose of the trench excavations was to assess if fault rupture or displacement has occurred in Quaternary alluvium overlying the inferred faults (to see if faults have been recently active). During the trench mapping activities, organic samples were collected for radiocarbon analysis to help establish the ages of the alluvium.

Results from these investigations are summarized in plan view surface geologic maps with subsurface features reported on cross-sections shown on plan maps.

Geologic hazards evaluated at the site include slope instability, flooding and headward erosion, karst or dissolution features, faulting, seismicity, liquefaction, and collapsible soils. Volcanism is an additional potential geologic hazard that NRC has identified in its guidelines to be identified. No geologic hazards were noted.

The National Resource Conservation Service soil survey for the site area was researched to characterize the soils at the Site and to determine if any wetlands are indicated through the presence of hydric soils. Copies of the soil survey are no longer in print; however, soil surveys are available on the NRCS Web Soil Survey data. Accordingly, soils at the Site are comprised of six soil series. The soils are derived from alluvium from the surrounding sandstone and shale bluffs to the south of the valley and the majority of the soils are classified as fine sandy loams. The soils are slightly sloping, and have deep profiles with restrictive layers greater than 80 inches in depth. The soils are non-saline to slightly saline at depths and all are considered non-sodic. The soils have moderately high to high saturated conductivities and the available water capacity varies by soil type. The water table depth is greater than 80 inches. The literature did not identify hydric soils as being present at the site, although, soil survey data from one series indicates that the series can be partially hydric in some areas. However, field investigations did not identify the presence of any hydric soils within the site.

Findings. Analysis and reporting presented in the Geology and Soils section are acceptable and consistent with the current standard of practice. Regional and site geology are found to be suitable for a uranium mill and disposal of tailings. Site soils are appropriate for disposal cell cover and revegetation purposes. No fatal flaws are apparent.

3.4 *Water Resources*

Colorado [CRS 25-11-203(2)(c)(V)] and the Nuclear Regulatory Guidelines require potential impact assessments of surface and groundwater resources, of which a baseline characterization is one of the initial steps.

Energy Fuels used available documentation and exiting water resource investigations, supplemented by additional field studies, to develop the baseline characterization presented in this section of the ER. The

additional field studies were initiated in 2007 and included the following activities: literature searches; installation of geotechnical borings, groundwater monitoring wells, pumping test wells, and observation wells; performing pumping tests; and, identifying offsite wells, springs and water rights.

Surface Water. The hydrologic characterization identified the major surface flow systems in the region and locally. The ER concluded that the Piñon Ridge location is generally hydrologically isolated in that no surface water other than storm runoff enters, leaves, or passes close to the Site. Surface water quality samples were collected from snow-melt and rainfall runoff events from four locations within the site. The results are presented in the ER and will serve as baseline data.

The section also addresses water quality issues for the nearest primary surface water body the Delores River. It is noted that this river is viewed as impaired due to iron concentrations and is undergoing a Total Maximum Daily Load (TMDL) analysis by CDPHE.

Groundwater. Regional and local hydrogeologic conditions are presented. It is noted that the location of the Site in the southeast end of Paradox Valley isolates it from regional aquifers. Energy Fuels advanced 35 borings, with nine completed as monitoring wells, three as pumping test/production wells, and six as observation wells. They concluded that the "Valley Margin Triassic Aquifer," situated beneath the southern portion of the site, was the only hydrologic formation in the immediate vicinity that contained significant water.

The ER also presents the location and brief description/status of other wells (46) and springs (3) in the vicinity of the Site. Reportedly there are eight permitted wells in the southern part of Paradox Valley; of which, five are operational and three are dry or inoperable. Baseline groundwater quality was documented from samples collected from 20 locations over a two year period. Data are presented in the ER.

Findings. The baseline data collection and analysis appears to be relatively comprehensive and appropriate for the ER.

3.5 *Ecological Resources*

Ecological resource studies are conducted to categorize the existing ecology, to establish the baseline, and to identify any species of special status on or in the vicinity of the proposed Site. Energy Fuels divided the ecological resource assessment into three components: vegetation, species of special concern, and wildlife.

Vegetation. Vegetation surveys were conducted on the 880 acres Site on multiple dates during four seasons from 2007 and 2008 to establish baseline. Transects were established, flora were identified, and various measurements were performed (e.g., canopy height, percent ground cover, etc.). Additionally, wetlands and vegetation assessments of 10 ephemeral streams and a non-jurisdictional retention pond were conducted. Vegetation sampling was also conducted on the 80 acre well field parcel west of the site.

The dominant vegetation communities at the site are: Pinyon-Juniper Woodland; Big Sagebrush; and, Mixed Grasslands. No US Army Corps of Engineer's (USACE) jurisdictional wetlands were observed at the site; just the non-jurisdictional wetland – retention pond. The ER states that the USACE supported the conclusion that the Site was entirely comprised of upland and that the work would not require Corps authorization. Finally, the ER addresses the presence of invasive, non-native species.

Species of Special Status. The ER considers the status and potential existence of terrestrial, aquatic and floral species of special status at or near the Site, including:

- Federally Listed Threatened and Endangered Species
- Candidate Species to the Listed Threatened and Endangered Species
- BLM Sensitive Species and State of Colorado Species of Special Concern

The potential status of species of special concern at the site was evaluated through; available documentation, databases, and literature; consideration of available habitat; and surveys for wildlife, wildlife habitat, and migratory birds.

Wildlife. The ER considers the status of and availability of habitat for numerous wildlife species at the Site that are considered recreationally valuable to the public, including: big game, small game, waterfowl, game birds, migratory birds, non-game species, aquatic species, etc. Again, surveys were conducted and literature and databases were consulted.

Findings. In general, the ecological resources approach and baseline data gathering appears to be comprehensive and appropriate for this Project.

3.6 *Meteorology, Climatology, and Air Quality*

Meteorological, climatological, and air quality data are collected to not only establish baseline, but also as input for various project design features. For instance, precipitation data can be used for stormwater management system design, and wind measurements are used to locate appropriate air quality monitoring stations.

Meteorology and Climatology. Two meteorology stations were installed at the Site in March 2008. Measurements included: wind speed and direction; temperature; relative humidity; solar radiation; barometric pressure; precipitation; and evaporation. Collected data are generally summarized in the ER and compared with longer-term data gathered at regional weather stations. In addition, other assessments are made such as consideration of atmospheric stability in order to evaluate dispersion of emissions and possible effects of climate change.

Air Quality. Three onsite air monitoring stations and two offsite stations were installed in March 2008. Site stations are on the north, west and eastern property boundaries; one offsite station is situated 2 miles northwest and upwind of the Site; and, the other offsite station is located at the nearest residence, downwind and approximately 3 miles to the southeast. All stations are equipped for radionuclide

monitoring, while only two onsite stations are equipped for monitoring particulate matter less than 10 microns (PM_{10}).

It is noted that Montrose County is designated as an "attainment" area for all critical pollutants. The ER also identifies other air emission sources in the region. PM_{10} data from the two onsite monitoring stations are also presented and compared with regulatory standards.

Findings. While not necessarily a fatal flaw, it is unclear why PM_{10} data are not being collected at all the monitoring stations, and in particular the offsite station at the nearest residence. Establishing this baseline could be important for diffusing possible future criticisms of the operation. Also, it may be prudent for Energy Fuels to consider $PM_{2.5}$ data now, as it is becoming more of a regulatory concern.

3.7 *Noise*

Increased noise levels can impact not only human, but also animal populations. Consequently, it is important to establish current conditions to evaluate potential noise increases and associated impacts as a result of future activities.

The ER states that: "Noise measurements are not available for the vicinity of the Site." The section goes on to speculate that the existing average ambient Site noise level is expected to average 40 dBA (decibels on the A-weighted scale – averaged for day and night periods) from such sources as traffic and wind. The section also presents information on traffic noise and noise attenuation based on distance and site ground characteristics.

In general, this section is sparse and does not really develop a strong assessment of existing noise conditions. While not a fatal flaw, it may be prudent to establish actual baseline conditions at the Site and possibly at the nearest residence.

3.8 *Historic and Cultural Resources*

Potential project impacts to cultural resources need to be: considered during the design stage; discussed with appropriate authorities (e.g., State Historical Preservation Officer – SHPO); and mitigated for, as necessary. Consequently, cultural resource surveys and inventories need to be conducted to establish their presence or absence at the Site.

Energy Fuels had a consultant perform cultural resource inventories and testing in 2007 and 2009 to comply with Section 106 of the National Historic Preservation Act (NHPA). During the 2007 inventory 20 new archeological sites and 14 isolated finds were documented. In 2009 four new archeological sites and two isolated finds were identified. Reportedly the consultant's full report was submitted to SHPO, who agreed with the finding of "no historic properties affected."

It appears that Energy Resources has followed the appropriate procedures and methods for establishing the status of cultural resources at the Piñon Ridge Site.

3.9 *Visual/Scenic Resources*

One component of most environmental assessments is evaluation of possible project impacts to the existing scenery. The purpose of this ER section is to establish the existing visual resource baseline at and around the site, so that in Section 4 Project impacts to these resources can be evaluated.

The ER provides a description of the existing character of the landscape in and around the Piñon Ridge Site. The document also addresses different views from which the site can be seen, and scenarios as to who might actually encounter these views (e.g., passing traffic, hunters on adjacent mesas, etc.). It is also noted that an open pit mine with an overburden pile is adjacent to the Site's southeastern boundary and visible from surrounding viewpoints.

This description of baseline visual/scenic resources seems appropriate.

3.10 *Socioeconomics*

The purpose of this section is to review the social and demographic characteristics of the counties and communities that may be affected by the Proposed Action.

The report has studied the distribution of populations in the Montrose county and surrounding area of influence based on a 50 mile radius from the project location. Population characteristics including absolute population, population growth, minority distribution and income levels have all been discussed.

There has been a particular focus on the Montrose county population and a comparative analysis of this group versus surrounding Counties and the State of Colorado. In some cases national statistics for income levels were also incorporated into the study.

Major employers, commuting patterns, housing and infrastructure have also been reviewed along with the associated taxation and other revenue collection facilities available to the local governments.

Findings. Section 3-10 of the report appears to provide a reasonable review of the demographics and local populations potentially affected by the Proposed Action.

3.11 *Public and Occupational Health*

The section presents the current base line conditions at the site with regard to public and occupational health so that possible impacts can be assessed, both in the ER and during operations.

A high level review of U.S. regional and Colorado background radiation doses is presented. An explanation is provided of the current sources of radiation doses. In Colorado, the average exposure rate is reported to be 400 millirens per year (mrem/yr). The largest contributor is 301 mrem/yr resulting from a combination of internal radioactivity and inhaled radioactivity.

A brief review is made of fatal occupational injuries in Colorado by selected industries. In 2008 all industries in Colorado reported 102 fatal injuries with mining reporting 6 fatal injuries.

A review of recent studies investigating current public health status in relation to past possible exposure to uranium and vanadium milling and mining activities is presented in the ER. Specific areas studied included Montrose County, various areas in the Colorado Plateau, and areas in other western states where there was historical uranium and vanadium mining and milling.

The radiological baseline report prepared by Energy Fuel's contractor Environmental Restoration Restoration Group, Inc. is summarized. The discussion includes a review of the various survey methods/endpoints, the baseline investigation scope, and the parameters evaluated. The ER includes the conclusions of the investigation.

Energy Fuels contracted with Kleinfelder to prepare a baseline meteorology, air quality, and climatology report. As a part of this work data was collected from monitors at the proposed mill site. A summary of the results of the radionuclide monitoring data is reported and discussed and compared to the DOE derived concentration for the inhalation doses of different radionuclides.

A separate baseline survey of radionuclides in animal tissues at the mill site area was conducted to allow comparison to future similar measurements during and after mill operations to assess radiological impact to animals in the proposed plant area. The study involved the radionuclide analysis of three cottontail rabbits, three jackrabbits, and tissues from three cows. The specific tissue samples taken for analysis were lung, liver, muscle, and bone.

Findings. The method of reporting and analysis of currently available radiation exposure information for people living in Colorado, the Colorado industry accident information, and studies reviewing the impact on workers who previously worked in the uranium industry is an acceptable approach for determining potential future impacts on the public at large and the occupational health of workers. Since the studies included information on Montrose County, the Colorado Plateau and other western uranium producing states, it is appropriate for comparison of potential future impacts to Montrose County.

The establishment of baseline data studies to measure the current conditions in the proposed project area is an accepted practice and the studies performed are found to be suitable.

Overall the information in this section is sufficient and appropriate.

4.0 ENVIRONMENTAL IMPACTS, MITIGATION, AND MONITORING

In accordance with the various Section 3 baseline characterizations, Section 4 of the Environmental Report (ER) addresses the potential Project-created environmental impacts to each, notes proposed mitigation measures, and presents monitoring approaches. Impacts are considered for the three phases of the Project: construction, operations, and closure. In this section, PAH briefly summarizes the ER's evaluation process and conclusions, and considers its appropriateness.

4.1 *Land Use*

The purpose of this section is to consider how the Piñon Ridge Project will impact land use in the region, based on the baseline land use discussion presented in Section 3 of the ER.

Impacts. The document notes there are no commercially produced crops within 5 miles of the site, so farming land should not be directly impacted. During construction and operation, recreational activities should only be minimally impacted, although there will be increased traffic. Uranium and vanadium mines within 180 miles of the Site are projected to be stimulated by the mill development. Perhaps the most significant land use impact will be that the 880 acre Site will be unavailable for seasonal grazing land, winter range, and hunting during construction and operations. However, upon mill closure, 772 of the 880 acres will again become available; although the remaining 158 acres will be permanently unavailable as the Restricted Tailings Cell Area.

Mitigation. Proposed mitigation measures deal with conforming to Montrose County standards and returning the Site to rangeland use upon closure.

Monitoring. Energy Fuels will also provide the funding for long-term surveillance and monitoring of the Restricted Tailings Cell Area.

Findings. The assessment of land use impacts and mitigation measures seem appropriate for the proposed Project.

4.2 *Transportation*

Transportation routes will be impacted by the proposed Piñon Ridge Project through increased traffic levels and congestion, the potential for an increase in traffic accidents, and the possibility of public risks from possible spills of reagents, yellowcake, etc. during transport.

Impacts. The ER presents an estimate of traffic increases to various rural arterial highway segments affected by the proposed Project during construction, operation, and closure, and the associated increase in road design hour volumes (DHV). Statistical consideration is also given to potential vehicular accidents and fatalities associated with the increased traffic volumes. Additionally, it is noted that accidents

involving shipments of yellowcake and reagents, and in particular, anhydrous ammonia could pose environmental and public health risks.

Mitigation. Energy Fuels has proposed a number of mitigation measures, including:

- Widening State Highway 90 at the Site access point and constructing a left-turn deceleration lane.
- Utilizing dust suppression measures on internal roads.
- Qualifying transportation contractors, including verification the contractors have appropriate emergency response plans.
- Establishing emergency response teams to assist with cleanup of offsite accidents and releases.

Monitoring. As requested, Energy Fuels will make available all transport records.

Findings. The evaluation of potential impacts for the Site vicinity seems relatively comprehensive and appropriate. It is noted that contactors will be used for reagent and yellowcake shipment, and that they will be responsible for cleanup of any releases due to accidents. Also, yellowcake shipment will likely involve long distance transport crossing many states. However, at least on a local level, Energy Fuels may want to provide some education and training to local fire and police units who may be required to respond to a reagent or yellowcake release.

4.3 *Geology and Soils*

The purpose of this section is to describe how the proposed facility development will impact the environment, specifically to geological and soils impacts. The geology and soils have been previously described in Section 3. The general goal in sitting and design of a uranium mill and tailings disposal facility is permanent isolation of tailings and associated contaminants by minimizing disturbance and dispersion by natural forces, doing so without ongoing maintenance.

Geology-related potential environmental impacts could occur during construction, operation, or during closure. Potential impacts could result from geologic hazards such as slope instability, flooding and headword erosion, karst or dissolution features, faulting, seismicity, liquefaction, collapsible soils, and volcanism.

Potential impacts to soil resources within the Site would be associated with development activities from the construction, operation, and closure of the Mill Facility. Construction activities would include site clearing and grading activities required to install the project components which include the Mill, administration building, ore stockpile pad, tailing cells, evaporation ponds, and surface water control features, as well as disturbance associated with general site grading requirements, roads, soil stockpiles, and other minor ancillary facilities.

Work Performed. Geologic hazards from slope instability and rock fall dangers are discussed as unlikely because the site is located in a generally flat area away from any unstable slopes. Field investigations did not find evidence of mass-movements and native vegetation appeared quite old, indicating stable land surfaces. As discussed in Section 3.3, trenching efforts did not discover evidence of subsurface movements or dissolution features near the Site.

Seismic concerns are mitigated through sitting final disposal cell and milling operation away from capable faults. Tailing cells and mill buildings will be designed and constructed in accordance with the latest International Building Code specifications using a Maximum Credible Earthquake of magnitude 4.8 located approximately 10 miles from the Site causing a peak ground acceleration of 0.16g.

Environmental impacts related to soils are mitigated through site selection in an area that is protected from wind erosion, is capable of sustaining a vegetated final cover for both final tailing disposal and site reclamation, or can be protected using stones. Soil disturbances are expected and mitigation procedures discussed including topsoil stripping and stockpiling. Revegetation of stockpiles is emphasized.

Standard geotechnical engineering foundation preparation recommendations and practices concerning all mill facilities structures are specified.

Arguments are presented demonstrating that the Site is located in a suitable area with regards to seismic stability, and provides adequate room for below-grade final disposal cell construction with regards to erosional stability.

Revegetation seed mixes are provided, however only grasses species are included. In Section 3.4 describing the affected environment, a diverse plant community is described: grasses, shrubs and forbs, trees. The revegetation plan indicates that some forbs species may be included if desired, but not required. Deep rooted plant species are not recommended. For a self-sustaining plant community to succeed, a diverse species composition; i.e., grasses, forbs and deep-rooted woody species are needed, and in fact naturally exist on site. If a diverse species composition is not implemented, it will be established by the local ecology. Therefore it is prudent to establish and plan for a diverse ecology.

Findings. The approach documented in the ER, follows accepted methods and are consistent with current standard engineering practice. Based on the finding stated above, the site is appropriate for construction of a uranium mill and tailings disposal cells.

A diverse plant community and ecology should be planned for and implemented from the start of any and all construction phases for a successful, no active maintenance long-term closure as required by regulation. Final designs should be performed in conjunction with a Rangeland Ecologist to incorporate local ecology in all reclamations.

4.4 *Water Resources*

As noted in Section 3, Colorado [CRS 25-11-203(2)(c)(V)] and the Nuclear Regulatory Guidelines require potential impact assessment of surface and groundwater resources; including possible impacts from construction, operation and closure activities. Impacts could potentially involve surface and groundwater quality and quantity changes, discharges, impacts to other users, hydrologic/hydraulic alterations, etc.

Impacts. From a surface water quantity perspective, perhaps the largest potential impacts is the reduction of drainage basin flow and infiltration due to capturing stormwater from 240 acres of the Site; although this only comprises 0.7 percent of the drainage basin. Given the zero discharge from the portion of the site with the most activity, there should be minimal surface water quality impacts under normal conditions. However, there is the possibility of spills involving releases around the site or along transport routes, which in turn could contaminate surface and/or groundwater. Also, the ER notes that if dust is not suppressed, offsite migration via wind could impact surface water quality.

Groundwater volume and water table level will be reduced due to water withdrawal, and the flow direction will be altered. Further, withdrawals could potentially impact other groundwater users and springs, and somewhat deplete flows to the Dolores River. However, at this point the ER notes that the testing performed does not provide conclusive answers as to what volume of groundwater supply can be counted on or how the aquifer will respond to groundwater withdrawal. Thus possible quantity impacts and possible impacts to other users cannot be fully assessed. The primary potential impacts to groundwater quality are associated with leaks and spills of reagents and fuels, or releases from the tails cells. Although it is noted that groundwater is absent beneath most of the tailings cells and where it is present, the groundwater is more than 450 feet below ground surface.

Mitigation. Among Energy Fuels' proposed mitigation measures are:

- Zero-discharge mill facility site.
- Extensive stormwater diversion and management system, designed in some cases for a 1,000-year storm.
- Leak detection systems for tailings and evaporation cells.

Additionally, as part of the Montrose County Special Use Permit, Energy Fuels has agreed to provide water to any nearby users who's supply is impacted by the Piñon Ridge aquifer withdrawals.

Monitoring. In addition to monthly evaluations of the stormwater management system and semiannual compliance evaluations, runoff will be sampled on a quarterly basis.

Groundwater monitoring will involve five site monitoring wells, three production wells (including one offsite), seven exploratory holes, four domestic wells, and one spring. Groundwater presence and quality is to be monitored on a monthly basis for the first year and quarterly thereafter. Also, initially water

levels in production wells and associated observation wells will be monitored twice each month until water levels stabilize.

Findings. While this section appears to be relatively comprehensive, there are a couple issues that should be noted.

- It is understood that water right not yet obtained to capture surface water and that the groundwater water rights process is still ongoing.

- Despite baseline studies and aquifer testing/evaluation, the dependability of a groundwater supply for the mill is inconclusive. Reportedly Energy Fuels has made arrangements with the City of Nauria in the event the well field cannot supply sufficient water to meet the mill's requirements. It is assumed that this arrangement is acceptable to Montrose County and achieves Condition #11 of the Special Use Permit.

- Aquifer response and sustainability to groundwater withdrawal is a major questions mark for the Project. As such, it would seem prudent at the very start of operations to intensify the monitoring efforts of the water levels in the production/observation wells (perhaps twice a week or more versus twice a month). Additionally, a contingency plan should be developed which specifies how the data will be considered, what triggers will require action (e.g., certain degree of water table depression, impacts to other users, etc.), and what type of actions will be instituted (e.g., cycling of wells, determining when and how much Nauria water will be used, etc.) based on the conditions encountered.

- If local springs are impacted – is there an associated potential impact to wildlife water supplies?

4.5 *Ecological Resources*

Potential impacts to the Site and vicinity ecological resources from proposed Project activities is an important factor to be evaluated during the licensing process.

Impacts. The ER presents an evaluation of potential Project impacts to vegetation, Species of Special Status, and wildlife, per the baseline assessment presented in Section 3.5. Some of the highlight of the impact evaluation include:

- No disturbance is planned to the one non-jurisdictional wetland feature – retention pond – located on Site.

- There is a potential for invasive, non-native species to invade the Site when the land surface is disturbed.

- For various reasons (e.g., not present on Site or habitat is not present, etc.) the following Species of Special Status and/or wildlife were not evaluated further in the ER: black-footed ferret, Colorado

hookless cactus, clay-loving buckwheat, western yellow-billed cuckoo, peregrine falcon, midget faded rattlesnake, canyon tree frog, northern leopard frog, Great Basin silverspot butterfly, sensitive vascular plants, waterfowl, and turkeys.

- Increased traffic could impact, mortalities of Species of Special Status (e.g., Canadian Lynx), birds (e.g., bald eagle), and other wildlife (e.g., deer).

- Reduction of the winter range currently situated onsite could impact deer and elk populations.

- Project location and activities could potentially impact efforts to re-establish Gunnison Sage-Grouse populations.

- Project noise could impact wildlife populations (e.g., migratory birds, Mexican spotted owls; if present, etc.).

Mitigation. The following provides a sampling of some of the many proposed Energy Fuels' mitigation measures:

- Implementation of a weed control plan to minimize noxious weeds.

- Develop and implement stormwater management and spill prevention, control and containment plans.

- Provide environmental awareness training to employees.

- Install fencing and netting to prevent wildlife access to the evaporation and tailings ponds.

- Install special lighting to minimize attracting insects and thus sensitive species of bats.

- Conduct vegetation removal actions during periods when birds are not nesting.

- Coordinate with Colorado Department of Wildlife to develop a Habitat Improvement Plan to provide compensatory mitigation to improve wildlife habitat near the site.

Monitoring. Every five years, prior to renewing the CDPHE license, Energy Fuels proposes to conduct Site and vicinity surveys for Species of Special Status, as well as other wildlife. Revegetation progress in disturbed areas would also be monitored, and semi-annual weed surveys and control programs are proposed.

Findings. In general the ecological resources evaluation appears to be relatively thorough and appropriate. For the most part, potential impacts are based on the presence of a species or a species' habitat at the Site.

It was noted in the text that the 2-inch mesh net currently included in the design to exclude birds from the tailings and evaporation ponds is larger than the mesh size recommended by the US Fish and Wildlife Service (USFWS); although no further explanation for this is provided.

Also, the ER states that Energy Fuels "may cooperate in ongoing efforts to reopen sagebrush habitats/ remove piñon-juniper woodlands on Monogram Mesa to mitigate for impacts to Gunnison sage grouse by the Proposed Action;" however, no specific activities or investment amount is specified.

4.6 *Air Quality*

The ER discussion of potential air quality impacts primarily focuses on possible impacts associated with the operation of the mill, because construction and closure emissions are not a large component of the air permit application. Energy Fuels submitted an application to the CDPHE Air Pollution Control Division (APED) for authorization to construct the mill. It is stated in the ER that potential emissions do not exceed major source permit thresholds, and thus a "minor source permit" is sought. Additionally, it is not anticipated that prevention of significant deterioration (PAD) thresholds will be exceeded. Note also that the application is based on a planned 1,000 tons per day processing rate, as opposed to the 500 tons per day rate other permits are being based on.

Impacts. Basic estimates of the emissions inventory for particulate and various gas/combustion emissions are presented along with a brief description of the emissions from various components of the mill facility and how they will be controlled at each (e.g., the SAG mill will include a dust scrubber).

The ER also describes Energy Fuels' conclusions from their Reasonably Available Control Technology (REACT) Analysis and identifies the processing upgrades and waste minimization techniques which are being included in the facility design.

Ultimately, however, note that the ER states: "In conversations between Energy Fuels and APCD, PM_{10} is the only emission that is anticipated to be a concern…"

Mitigation. Examples of proposed air quality mitigation measures include:

- Enforced low vehicle speeds and road treatment/watering to reduce particulate emissions.
- Installation of water sprays, scrubbers, and other particulate control devices at various process facility components.
- Enclosing process tanks and spraying beaches in tailings cells and ponds.
- Various process infrastructure and procedure modifications to reduce volatile organic compound and kerosene emissions.
- Implementing a Fugitive Dust Control Plan to minimize impacts during construction and closure.

Monitoring. Air quality monitoring at the stations which were used for baseline data collection, would be continued during construction, operation, and closure. Meteorological data would also continue to be collected.

Findings. In general, the air quality evaluation seems appropriate. However, it appears that air quality impact modeling is planned, but has yet to be conducted to evaluate Site emissions relative to air quality standards. This would seem to be an important component of an impact assessment.

Additionally, as noted in Section 3.6, Energy Fuels should consider sampling particulates at more than just two onsite stations.

4.7 *Noise*

The purpose of this section is to assess the potential for noise impacts on humans and possibly wildlife populations. Noise sources include traffic, equipment operation, etc.

Impacts. The ER evaluates the potential for noise impacts assuming the estimated 40 dBA background level discussed in Section 3.7 and using noise equipment etc. levels and attenuation data from the literature. Energy Fuels concludes that noise levels from the Project construction would attenuate to background levels at each of the five residences located within 5.5 miles of the site. A table is also presented showing the anticipated traffic noise and attenuation rates and modeled noise levels at the property boundary are estimated 60 dBA – which is stated to be below Montrose County's most restrictive permissible level of 75 dBA.

Mitigation. None proposed.

Monitoring. None proposed.

Findings. This section is not completely convincing that adequate assessment has been conducted to evaluate possible noise impacts. Although possible impacts to nearby residences from the Site are estimated, possible traffic noise impacts to residences are not specifically addressed, nor are possible impacts to wildlife.

4.8 *Historic and Cultural Resources*

This subsection considers the potential impacts to historical and cultural resources, an issue which is closely regulated through various laws and the office of the SHPO.

Impacts. Potential cultural resource impacts fall into two primary categories: possible impacts to sites known through the cultural resources survey/inventories; and, chance find sites, which would most likely occur during construction.

Regarding known sites, it appears that Energy Fuels intends to either avoid disturbing identified sites or show that the site does not qualify for special status. The ER text suggests that Energy Fuels is still in the process of sorting out the status and plans for the various cultural discoveries: "A determination of "no historic properties affected," pursuant to 36 CFR 800.5 of the NHPA is recommended for both the 800-acre Site and the 80 –acre well field, contingent upon the avoidance of all sites recommended eligible and upon concurrence by OAHP (i.e., Office of Archeology and Historical Preservation) of all sites recommended not eligible (i.e., for listing in the National Register of Historic Places – NRHP)."

Mitigation. Proposed mitigation measures include:

- Avoidance of four sites in the well field area, where feasible.
- Ongoing Native American consultation.
- Implementing an Unanticipated Discovery Plan for chance cultural resource finds.

Monitoring. Monitoring and protection of NHRP-eligible sites is to be performed if Project ground-disturbing activities take place in the immediate vicinity of a cultural site.

Findings. The cultural resources component of the environmental assessment appears to be progressing in accordance with applicable laws and regulations. As a mitigation measure, Energy Fuels may want to conduct construction contractor and employee training for chance finds using the procedures delineated in the Unanticipated Discovery Plan.

4.9 *Visual/Scenic Resources*

The purpose of this section is to evaluate the potential impacts to visual/scenic resources during Project construction, operation and closure.

Impacts. Visual impacts during construction would include the raising of infrastructure, presence of large equipment/vehicles, the removal of vegetation and the stockpiling of soil. Operational impacts, in addition to the infrastructure, would include the full development of the evaporation and tailings cells. Impacts would be most prominent from ridge and mesa viewpoints. Outdoor lighting would also impact nighttime views. Upon closure and decommissioning, the only major visual impact would be associated with the fenced Restricted Tailings Pond Area.

Mitigation. Mitigation measures proposed to reduce visual impacts include:

- Painting above ground structures to blend with the surrounding landscape. Fences would be coated with non-reflective surface.

- Minimizing the use of outdoor lighting and directing lights down to minimize glare and light scattering.

- Minimize ground disturbance and associated erosion, and use the natural landscape, as possible, to screen facilities and operations.

- Re-contour and vegetate disturbed areas as soon as possible.

- Use dust abatement measures.

Monitoring. Visual assessments from key observation points will be performed to assess the effectiveness of the mitigation measures.

Findings. In general, the assessment of visual impacts and mitigation measures seems appropriate.

4.10 *Socioeconomics*

The purpose of section 4.10 of the ER is to report on and provide some insight into the potential impacts of the project on the socio-economic landscape. This section builds off of section 3.10 of the ER which defines the region and populations considered in assessing impacts from the Proposed Action.

History and Regulatory Framework. Montrose County and the surrounding region have been involved in mining and ranching activities for over 100 years. Several mining operations consistent with the nature and scale of the proposed project have operating in the areas over the past 20 years and the local populations are experienced with mining and processing activities. An important part of the socio-economic review is to ensure that a regulatory framework is in place that supports the type and scale of the proposed action (PA). Information contained in the Environmental Report (ER) indicates that there is a regulatory framework in place that supports the development of the PA provided regulatory requirements can be met. There appears to have been some issues with the proposed land use varying from the original land use designation for the area of the proposed project; however, this was addressed through the issuance of a Special Use Permit by the Montrose County. In issuing this permit the County noted that the project will have a positive economic impact and that on and off site impacts have been satisfactorily mitigated.

Social Impacts. Demographics have been reported in some detail and indicate a significant capacity to absorb the projected employment levels for the project without causing significant inflation in local wage structures. It is expected that approximately 85 employees will be working at the facility when in full production with up to 60 percent of this workforce coming from the local region. The total workforce in Montrose County is estimated at approximately 25,000, with approximately 1,800 in the construction, utilities and mining sectors. Population distribution, demographics and income levels have been taken into account and seem to indicate that a benefit will be gained by the addition of relatively high paying, long lasting jobs associated with the proposed project. Support services including education and health care are available and sufficient to support the project while education facilities have been undergoing a reduction in enrollment, indicating that there will be sufficient physical structures available if enrollment increases.

Economic Impacts. Montrose County is a lower income region in Colorado at 70 percent of the per capita income for Colorado. The average monthly combined income is estimated at $2,858/month with mining estimated at a monthly income of $4,396. Direct and indirect wages estimated from the 85 jobs associated with the project and the estimated 230 additions spin off jobs is $18.7 million/year along with an estimate of $US140 million in regional business sales/year during full operation. This translates to an annual tax/funding benefit to the local communities of approximately $0.4 million per year with other monetary benefits flowing to the regional governments and state of Colorado.

Negative economic impacts include cost associated with higher traffic levels, increased burdens on security, education and medical systems. The analysis presented indicates that the negative economic aspects of the project are offset by the positive economic contribution. There appears to be adequate information in the study material to support this conclusion.

Construction Impacts. Construction of the site is expected to last for approximately 18 months with peak manpower levels reaching approximately 200 persons (not including spin offs). There will be some impact on the local support facilities including short term housing as well as emergency support facilities, however there are adequate resources in the area to mitigate this impact. Approximately 20 percent of the construction workforce is expected to come from the local population, further mitigating migrant impacts during construction. The construction workforce is also expected to have a significant positive economic impact offsetting increases in community support costs during the construction period.

Free Prior and Informed Consultation (FPIC). FPIC appears to have been undertaken with a series of public meetings held by both the municipality and the proponent (Energy Fuels). There is a sufficient regulatory framework in the State of Colorado to ensure that public meetings are held in conjunction with permitting of the project. Records of meetings, including public comments, have been kept and there is evidence of a significant effort to respond to specific concerns by non-government organizations (NGO's) reviewing the project. The project does not require any resettlement and the closest inhabited structure appears to be a crude structure approximately 3 km from the site housing up to two people. American Indian groups in the area have been consulted and there is sufficient evidence that information has been made available to support the consultation process.

Mitigation. The mitigation measures present by Energy Fuels have focused on the employment of the local population and reducing the burden to the County with the addition for Energy Fuels own Emergency Response Plan. For the most part this is adequate considering the size and scale of the PA.

Section 4-10 does not contain any mitigation for the closure of the project. Considering the long life potential of the project and its potential to become imbedded in the local community and economy over that period, it will be important of Energy Fuels to provide some indication regarding the mitigation of closure impacts and how these will be incorporated in the ongoing planning during operations.

Findings. The socio-economic impacts analysis provides sufficient detail to support the assessment of impacts from the Proposed Action and mitigations proposed for the project. The socio-economic impacts

of the project have been considered for construction, operations and closure. Overall the assessment appears adequate; however, a greater focus on closure mitigation in the ER should be considered.

4.11 *Public and Occupational Health*

The section addresses the potential impacts of the mill on public and occupational health, the protective/mitigation measures in place to manage the impacts, and the proposed monitoring systems.

Impacts. The ER presents a discussion of how the general impacts will be managed. It includes a review of the regulatory agencies involved who would be the primary health and safety regulators and a summary of their specific regulations. The regulatory agencies include the Mine Safety and Health Administration (MSHA) for non-radiological issues and CDPHE for radiological issues. Also noted are the Environmental Protection Agency (EPA), the Colorado Department of Labor and Employment, Division of Oil and Public Safety, the U.S. Department of Transportation, and the Colorado Department of Transportation. The discussion includes the radiological and safety programs Energy Fuels will be required to implement to protect the health and safety of the workers and the public.

A specific discussion of non-radiological impacts is also provided. The non-radiological impacts are similar in nature to the impacts from many industrial chemical processing plants.

Radiological impacts are discussed, including the limits of maximum exposure for mill workers; which is 5,000 mrem/year versus their typical exposure which is less than 100 mrem/year. Energy Fuels plans to adhere to the limits by sampling and monitoring at the mill. There is a review of the exposure area residents will face as a result of the mill facility and a discussion of the management of mill operations radiological impacts to the mill employees and visitors.

Potential mill facility accidents including fire, explosion, chemical releases, or transportation were examined. Energy Fuels indicates they have prepared and they will implement various health and safety plans to minimize and manage accidents. In general, non-radiological accidents at uranium mill facilities are not much different than many plants. There is a higher risk of fire than many plant processes because of the large volume of kerosene used in the solvent extraction process. An example is the Olympic Dam copper and uranium mine in Australia which had two fires in their solvent extraction circuit. One fire occurred in December 1999 and the other fire in October 2001 in the same area. The October 2001 fire caused substantial damage to the solvent extraction unit. After the fire, substantial changes were instituted in the operation including new standards for fire prevention and fire protection. The uranium portion of the plant was re-commissioned in mid-2003.

During construction of the mill facility, the risks of non-radiological public and occupational health would be similar to those at any typical industrial construction sight. Radiological impacts above the naturally-occurring radiological baseline conditions at the site would be minimal during construction.

During operations non-radiological impacts to the health of mill workers are similar to the accidents experienced in other operating industrial plants. The ER reviews the various materials (chemicals and

fuels) that may be used or stored onsite, and it discusses how materials will be handled to minimize potential impact on the mill employees, the general public, and the environment. A table is provided which gives the name of the material (chemical), its purpose, maximum quantity on site, and the storage location. Protection measures are discussed to minimize the impact on wildlife.

The ER describes the pathways which may result in radiological exposure. Specifically, potential radiological impact to mill employees and visitors would be exposure to gamma rays from radionuclides in the Mill and exposure from the inhalation of yellowcake dust, ore dust, radon progeny, and tailings dust.

The ER addresses radiological exposure pathways including the following:

- Air Exposure Pathways – This includes inhalation of various ore particles from ore receiving, grinding, leaching, solvent extraction and particles from the yellowcake drying and packaging area and the tailings cells. Inhalation would be the main pathway of radionuclides from the Mill Facility to employees and people in the vicinity of the Mill.

- Water Exposure Pathways – The Mill Facility components that may provide water exposure pathways for radiation are identified and the designed protective features are described. The water exposure pathways include the ore pad facility, process lines, tailings, and raffinate disposal.

- Flora And Fauna Pathways - These are a primarily a result of radioactive fugitive dust downwind of the tailings cells and to a lesser extent the ore pad. Because the Mill is designed as a zero discharge facility, the only potential source of radionuclides is the atmospheric deposition on the soil, vegetation, and through agriculture products. Modeling work indicates this impact would be small. Both uranium and radium have very low solubility in fat and therefore, would expect to have very poor bioaccumulation through the food chain. Uranium and vanadium are also transported poorly from soils to plants.

- General Public Pathways – Modeling of the off-site radiation dose indicates that the Mill Facility would have a minimal radiological impact within a 50 mile radius. Data tables are provided including a table showing the estimated maximum dose to receptor points at the property boundary for all age groups and operational scenarios. The modeling indicates estimated radiation doses to members of the public due to operations and material storage at the Mill Facility would be well below the criteria set by EPA and CDPHE regulations.

Operational accident scenarios were classified and grouped based on the type of the accidents and their potential health and environmental impacts. These accident scenarios included conventional accidents and radioactive related accidents. The probability, impact, and risk were basically rated low, moderate, or high. The probability and risk categories for accidents were rated low with one exception which was extremely low. Impacts are rated from low to high.

During closure, non-radiological impacts to public and occupational health include potential for spills and releases of chemical reagents, fuels, feedstock, and process and waste streams that could expose

workers to corrosive, toxic, or flammable chemicals. Radiological closure risks to the public and occupational health during closure of the site would primarily be related to residual radioactivity above background, which remains on equipment, structures and in soils.

Mitigation. General protective and mitigation measures include the various health and safety plans which would be implemented to meet applicable requirements. Non-radiological protective and mitigation measures include standard items expected for an industrial facility such as installing sprinkler systems and fire extinguishers in accordance with building codes and government agency requirements. Radiological protective and mitigation measures involve construction, implementation, creation, installation, and other activities which are outlined in current plans.

Plans were discussed on how to avoid or mitigate radiological risks through implementation of the mill design and health and safety plans which are presented in the license application. For each pathway, the associated protective features that have been designed for radiological pathway are described. Systems for mitigating the problems associated with air exposure pathways are reviewed and include scrubber stacks and sprinkler spraying systems. Mitigation plans for water exposure pathways include zero discharge design, concrete secondary containment, pipe sleeves, and primary and secondary liner systems for tailings cells.

The basic closure plan is included in the ER and outlines the various steps to be taken at the end of the mill facility's operations to minimize the long term impact. Non-radiological risks would be minimized by implementing programs for training, air sampling, respiratory protection, exposure determination and inspections. Radiological closure mitigation would be in accordance with Energy Fuels' Mill Decommissioning Plan, which was developed in accordance with applicable State of Colorado regulations and Nuclear Regulatory Commission technical guidance documents. Any contaminated equipment materials that are intended to leave the site would be decontaminated below approved limits before being released from the site. Decontamination would be performed at the truck decontamination station. Included in the closure plans are such items as covering the tailing cells to limit the release of radon.

Monitoring. Monitoring of non-radiological chemical constituents would be conducted on a quarterly basis to characterize these materials on a situational basis. Effluent monitoring of water, groundwater, and air would be conducted for environmental monitoring. Numerous monitoring systems would be utilized at the mill facility to monitor worker exposures to radioactive material and to verify that the work environment is safe. A Facility Radiation Safety Officer would direct activities with regard to the radiation monitoring program and procedures. Discussion of these monitoring systems is detailed in this section. At closure an effluent monitoring program which would include the collection and analysis of airborne and liquid effluents, for assessing radiation exposures to members of the public, and for demonstrating compliance with applicable regulations. Monitoring of radiological exposure is carefully controlled by the CDEHP, EPA, and MSHA.

Findings. The analysis of the mill facility's potential impacts during construction, operations, and closure is detailed. Inhalation of radionuclides from the Mill Facility to employees and people in the vicinity of the mill will be one of the main potential exposure pathways and this will require careful management

attention over the life of the project. The ER has done a satisfactory job of discussing the impacts, mitigation and monitoring for air exposures. Overall the discussion of impacts, mitigation, and monitoring is reasonable.

Fires involving flammable liquids in the SX circuit area have been sources of serious damage at several uranium mills in the past. Sufficient fire protection and fire prevention standards need to be in place to minimize this risk.

Under section 4.11.2 Protective/Mitigation Measures there is discussion of emergency response plans for transporting ore, chemical reagents and fuel. There is no discussion of responding to a truck accident involving a yellowcake spill on a public highway. A truck carrying yellowcake overturned on a state highway in southeastern Colorado in the late 1970s. The company which owned the yellowcake monitored and cleaned up the site under the direction of representatives of the State of Colorado. It is understood Energy Fuels plans to place the responsibility for yellowcake spill prevention and cleanup on the freight company, but plans should be in to support cleanup efforts. Energy Fuels notes that they do intent to assist on yellowcake spills.

With the exceptions of the comments above, the section sufficiently address the topics required.

4.12 *Waste Management*

Environmental impacts associated with construction, operation, and closure of the Mill Facility could generate non-radiological and radiological solid and liquid waste streams. The possible waste streams are identified in this section. Mitigation measures to control impacts and disposal methods are also discussed.

Waste streams generated through construction of the mill facilities are non-radiologic and will be controlled as general construction waste. Environmental protection will also be undertaken by implementation of Best-Management-Practices to control storm water runoff (through Storm Water Management Plans-SWMP), potential spills fuels and oils will be handled with Spill Prevention Control and Countermeasure (SPCC) plans.

Waste streams generated through operation of the facility will also be handled with traditional means. As equipment wears out during the life of the facility, verification that the equipment in non-radiologic will be verified prior to release. All other solid, hazardous and non-hazardous waste will be disposed with common means (i.e., commercial landfills, recycling, and special landfills regulated to receive hazardous waste).

Radiologic waste will be handled in tailings impoundments, raffinate and evaporation ponds. Again, standard industry practices will be followed to contain waste streams.

Findings. All waste streams are to be handled with standard, accepted methods and means. PAH agrees with the approach used to evaluate generation of waste stream and mitigating effects to the environment. Operational monitoring procedures of the tailings and raffinate ponds is acceptable.

5.0 SUMMARY OF IMPACTS

The ER Section 5 just presents a tabular summary of the impacts discussed in Section 4.

6.0 CUMULATIVE IMPACTS

PAH has no specific comments on this section.

7.0 COST BENEFIT ANALYSIS

The purpose of this section of the ER is to discuss the cost benefit analysis of the proposed Piñon Ridge Mill. This includes comparing the value of the costs and benefits that can be quantified through cost-benefit analysis, and discuss qualitatively the costs and benefits that cannot be measured

7.1 *Benefits*

The Piñon Ridge Mill is a private venture. The Mill would support the expansion of domestic uranium sources, and the primary product of the Mill would be used in nuclear reactors to generate electricity which would benefit the general public. The U.S. Secretary of Energy under existing statues has a continuing responsibility for the domestic uranium industry to encourage use of domestic uranium. As late as 2008, the U.S. was only providing approximately 15 percent of the of the uranium oxide purchased by U.S. civilian nuclear power plants. With the exception of the 3 percent of electricity produced by hydropower, nuclear power plants represent the only source of carbon emissions-free reliable base-load electricity. Reducing carbon emissions continues to be an important issue nationally and internationally.

Besides electricity production, small nuclear reactors also produce isotopes for medical, industrial and research purposes. The primary use of vanadium oxide, the secondary product of the Mill, is as an alloying agent in the manufacture of high strength, low-alloy steels, which are known for their strength and durability. Vanadium is used in several applications including surgical instruments, and it is also a catalyst in a number of industrial processes. New battery technology in the form of the vanadium redox batter is another future potential demand for vanadium.

Potential benefits for state and local communities would include tax revenues from the sale of goods to the mill facility. In addition, other taxes in the form of property tax revenues to various local government agencies including the local school district would be primary benefit to local communities.

Besides taxes, the Mill would create jobs directly at the Site during construction, operations, and closure. On average these would be significantly higher paying jobs when compared to the average salary in Montrose County.

The Cost/Benefit Analysis shows present value Total Benefits at a discount of 3 percent of $3.6 billion with the major benefit being $2.3 billion of Mill Output (sales), and at a discount of 7 percent there is $2.0 billion present value Total Benefits with the major benefit being $1.3 billion in Mill Output (sales). The price of uranium plays a very important role in the overall benefits. Assuming an annual production of 700,000 pounds of U_3O_8 per year or 28 million pounds of U_3O over the 40 years of estimated production, the present value revenue over the life of the project is at a 3 percent discount is $83 per pound U_3O_8 and $46 per pound U_3O_8 at a 7 percent discount. The present value discounted costs are $25 per pound U_3O_8 at a 3 percent discount and $16 per pound U_3O_8 at a 7 percent discount. The

market priced assumed in the benefit analysis is very important. No details were provided on the pricing assumptions for the Mill output sales.

7.2 *Costs*

Costs occur in several categories. Primary (Energy Fuels) costs include capital costs for land acquisition, land approval, and facility construction. Other primary costs are for operating, maintenance, plant decommissioning, closure, site reclamation, and regulatory costs. External costs would include such things as the long term loss of 722 acres of seasonal grazing land. There is an opportunity cost for the loss of 227 acre feet of water per year which the Mill will use. In addition, there are potential external costs that are not amenable to monetary evaluation. An example of this would be the potential drawdown of groundwater in the offsite wells in the vicinity of the Mill. The Cost/Benefit Analysis is only presented for financial costs and financial benefits. At times, intangible items can be included but this brings in an element of subjectivity into the estimate. Some values of natural resources are difficult to quantify. Cost/Benefit is a reasonable approach, but it is not possible to quantify all elements perfectly.

7.3 *Cost/Benefit Analysis*

The ER provides a Cost/Benefit analysis. The net present value of benefits and costs are discounted at both 3 percent and 7 percent as recommended by the Nuclear Regulatory Commission. As calculated in the ER, the benefit-cost ratio is between 5 and 6 to 1, and the Mill project provides a positive benefit to the community. PAH did not make any effort to validate the number in the Cost/Benefit Analysis.

7.4 *Findings*

There are limitations on the extent to which the economic and social benefits and cost can be evaluated and quantified. The ER does a credible job of examining the benefits to the USA as a whole, the State of Colorado, the local government entities, and the local labor market which will receive positive benefits. The market price for U_3O_8 is very significant in the benefits analysis. More details on market price assumptions would clarify how these benefits were calculated. Long term forecasting over 40 years is difficult. Cost are identified for primary internal costs such as facility construction and external cost not borne directly by Energy Fuels such as long term loss of grazing land. Some costs not amenable to monetary quantification were also reviewed such as increased truck traffic on rural county highways, but no value was placed on these costs. PAH believes the ER utilizes a reasonable methodology for developing the cost-benefit analysis, but PAH believes a clear explanation of how the Mill Output (sales) is determined is important.