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No task
M0370043
Tom is lead.

From: "Rogers, Zach" <ZRogers@EnergyFuels.com>
To: "Filas, Frank" <f.filas@EnergyFuels.com>, "Robert Herbert" <rherbert@uta.
Date: 3/3/2009 12:27 PM
Subject: RE: Enegy Queen - Rad QA/QC
Attachments: Pages from Pinon-Ridge_SUP-App - Reg history.pdf; PR Mill website - history .pdf; Whirlwind Mine EA - Human Health.pdf

CC: "Paul Baker" <paulbaker@utah.gov>

Rob,

Please see a list of the environmental permits and plans that we have obtained/prepared or expect to obtain/prepare in the future. The highlighted permits are ones we have not applied for at this time.

Large Mine NOI Transfer, UDOGM

Large Mine Amendment, UDOGM

Water Discharge Permit, UDWQ

Storm Water Pollution Prevention Plan, UDWQ

Construction Permit, UDWQ

Groundwater Discharge Permit (Ponds), UDWQ

Groundwater Discharge Permit (Land Application), UDWQ

Water Right for Supply Well, UDWR

Water Right for Mine Water, UDWR

Stream Alteration/404 Permit, UDWR/USACE

APEN - Fugitive Dust (small source exempt), UDAQ

Hazardous Waste Generator Permit (Shop solvent station, Conditionally Exempt), UDSHW

County Building Permit, San Juan Cty.

SPCC Plan, Various

Chemical Storage and Handling Plan, Various

Also attached are excerpts that relate to legacy health issues from the reports/applications that Frank mentioned. Let me know if this is what you were expecting.

ENERGY FUELS RESOURCES CORPORATION

Zach Rogers, EIT | Environmental Engineer

Direct: 303.974.2151 | Fax: 303.974.2141 | Cell: 303.916.8541

zrogers@energyfuels.com

44 Union Boulevard, Suite 600

Lakewood, Colorado 80228

-----Original Message-----
From: Filas, Frank
Sent: Tuesday, March 03, 2009 9:53 AM
To: Robert Herbert
Cc: Paul Baker; Rogers, Zach
Subject: RE: Enegy Queen - Rad QA/QC

Rob.

Zach will send you a list of our permits. The NRC is not involved at the mining level since the state (DOGM) has primacy in that area. We are regulated by MSHA at the mines and by DOT on our ore haulage. They will not be on Zach's list, since they are not technically environmental permits.

As you are aware, the uranium legacy issues (both health and environmental) are associated with the practices that were in place from the 1940s through the early to mid-1970s. Since most of the environmentalists are still living in the 60s, they are not (or choose not to be) aware of the regulatory controls that are now in place. I will ask Zach to also send you PDFs of some of the text we have put together to address these issues for the Whirlwind EA, our Special Use Permit for our proposed mill, and our web site for our proposed mill. Bottom line, we are an extremely regulated industry.

With regard to wildlife, the ponds will be enclosed within chain link fencing, which should exclude our four legged friends (both wild and domestic) from the ponds. I worry more about drowning and damage to the liner than poisoning because the pond liner is slick and untreated water is not acutely toxic and only slightly chronically toxic.

I talked to Woody last fall about birds and bats. He felt that any bird

controls that we might install would be under the umbrella of DOGM. I raised the question with Paul Baker at DOGM at that time, but so far they have not required us to install any additional wildlife controls.

Although we could install bird netting or place bird balls on the water surface, it would be an additional cost with very little benefit because the untreated water is near neutral (slightly basic) with relatively low rad and metal counts. Concentrations of selenium in the untreated water are considered chronically toxic to aquatic organisms due to bioaccumulation; however, we are not on a major migratory route and do not expect to have fish or other aquatic organisms in our lined ponds. My preference would be to monitor the situation and report any bird mortalities that may occur. If mortalities were to occur, we would then need to install netting or bird balls.

Paul's telephone number is 801-538-5261.

Regards, Frank Filas

Frank

-----Original Message-----

From: Robert Herbert [mailto:rherbert@utah.gov]

Sent: Tuesday, March 03, 2009 8:25 AM

To: Filas, Frank

Subject: Re: Enegy Queen - Rad QA/QC

That sounds reasonable Frank,

We received a comment letter from a La Sal resident with concerns about birds and wildlife being affected by the pond, and the legacy health issues from the uranium mining boom of the 50s. It would help me address these comments if you could send me info on agency oversight and permits, licenses, inspections, surveillance, monitoring etc. that the mine is under (e.g., NRC, DRC, MSHA, DOGM).

Thanks,

Rob

>>> "Filas, Frank" <f.filas@EnergyFuels.com> 3/3/2009 7:59 AM >>>

Ron: We will have comments back to you by the end of the week. In the meantime, I am forwarding information that Zach put together on QA/QC for the rad sampling. I think the 10% rule was good when we were looking at compliance levels of 5 to 15 pCi/L. However, as the compliance levels get pushed down, the labs cannot increase their precision significantly and the error term goes up. We will work on alternative language for this QA/QC requirement, but I wanted to give you a heads up on this.

Frank

From: Rogers, Zach

Sent: Monday, March 02, 2009 4:34 PM

To: 'Frank Filas'

Subject: Draft email to Ron

Frank - let me know what you think.

Ron,

I was looking at the data we have collected to date from the Energy Queen Mine monitoring wells in relation to their error counts for gross alpha and radium 226+228. I am particularly concerned about including in the QAPP that an "A counting error term for gross alpha or radium-226+radium-228 is greater than the corresponding approved acceptance limit (10% of the ground water protection level)" would require resampling and/or reanalysis of the sample. Our counting errors are as follows:

Parameter

Error Counts (pCi/L)

10% of protection level (pCi/L)

Notes

Gross alpha - U and Rn

0.4 - 0.5

0.375 - 1.7

based on one sampling event (remaining sampling events were estimated values based on gross alpha and converted uranium results)

Radium 226+228

0.81 - 1.07

0.125 - 0.145

based on three sampling events (remaining sampling events did not include counting errors for ND values) and primarily attributable to the error count of Ra-228

As you can see, we would exceeding this requirement frequently with gross alpha minus U and Rn (especially for the lowest protection level at HMW-4) and we would not even be close to meeting this requirement with Ra 226+228. I spoke with Energy Labs and they indicate that they could not reasonably achieve a significantly lower error count. In addition, Energy Labs error counts are very much in line with results we've received from ACZ labs from a duplicate sample taken from one of the Energy Queen wells during the last sampling event. It does not seem to be technologically feasible to meet this requirement. I would like to not include this requirement in the QAPP as I do not feel we could meet it in any case at this time.

ENERGY FUELS RESOURCES CORPORATION

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http://www.eset.com

History

Uranium mining and nuclear energy has a long history, full of both extraordinary successes and sad tragedies. Yet, we have come a long, long way in the last century in our understanding of the risks of exposure to radiation and uranium mining and milling. We now know that there are risks, but they are highly manageable and easily mitigated. We also know how to protect the environment, public health and our workers. Comparing today's understanding and control of radiation with the methods employed in uranium mining and milling decades ago is like comparing a modern high-performance automobile with a Model T Ford. The following paragraphs describe this history, focusing on how far we've really come.

Uranium is a weakly radioactive metallic element that was probably first used during Roman times to add yellow coloration to ceramic glazes. Later during the Middle Ages, pitchblende (a concentrated uranium ore) was extracted from silver mines in Europe and used as a coloring agent for glass. The discovery and identification of uranium is credited to the German chemist Martin Heinrich Klaproth, who isolated a yellow compound in 1789 that was likely sodium diuranate. However, the phenomenon of radioactivity was not discovered until the late 1800's when Henri Becquerel placed a sample of uranium salt on top of an unexposed photographic plate. In 1903, Becquerel along with Pierre and Marie Curie received the Nobel Prize in Physics for their discovery and work with radioactivity.

Carnotite ore was mined in the Paradox Valley in the early 1900's for the recovery of radium for medical uses. The first large-scale mining and milling of uranium in the southwest United States occurred as a result of World War II. The federal government encouraged the mining and milling of uranium to obtain uranium necessary for testing and eventual use of nuclear weaponry.

The Cold War further fueled uranium development as vast quantities of uranium were stockpiled by the United States government for use in nuclear weaponry. It was also at this time that the first nuclear reactors were built. This government driven demand forced the price of uranium to great heights and encouraged the development of uranium mines in Colorado, Utah, New Mexico and Arizona, including many in Paradox Valley. Once the Cold War ended, nuclear electrical generation fell out of favor and the price of uranium dropped significantly. As a result, most uranium mines and mills closed.

Unfortunately, during the early years of uranium development, little was known about public safety, effects of radiation, worker safety and environmental damage associated with unregulated uranium mining and milling. Since then the former uranium milling sites have been cleaned, residual radioactive material and tailings collected and placed in tailings cells. Those cells are lined to protect groundwater from contamination and covered to contain the radium and thorium in the tailings and collected materials. The covers reduce radon emissions to environmentally acceptable levels. Today, most former mill sites are contained and safe.

In addition, mine workers suffered many health issues resulting from the inhalation of high levels of uranium decay products. We also know that the problems were seriously exacerbated by smoking cigarettes while working in the mines and being exposed to high levels of radon. Nowadays, extensive ventilation is required in uranium mines and smoking is prohibited within the mines.

A new story is being written for uranium production today:

- Uranium miners no longer have to worry about the affects of radon and smoke on their lungs because of the extensive ventilation today in the mines.
- Engineering controls such as ventilation and shielding are used to protect mill workers from radiation.
- Mill workers are continually monitored to ensure that their radiation doses are "as low as reasonable achievable" under restrictions set by Federal and State regulators.
- Environmental releases are strictly controlled by Federal and State limits.

Emissions from the mill and tailings cells are monitored and very low emissions modeled to make sure radiation doses to nearby residents are well below the limits set for the general public.

2008 ©Piñon Ridge Mill

- If a solvent station is installed to clean parts, it would consist of a sink mounted on a small drum of solvent. The solvent would be recycled to the drum after each use. Periodically, the solvent drum would be exchanged with the vendor for a new drum with the old solvent being recycled.

4.26 HUMAN HEALTH

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

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

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

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

- In the third study, the same researchers that conducted the first study, completed a mortality study for Karnes County, Texas in which they contrasted cancer rates in the county before, during and after uranium operations (Boice, et al., 2003). The study also compared nearby counties with similar demographic characteristics. In conclusion, the study found that those cancers which might be increased following high exposures to uranium and its decay products were not elevated. The researchers qualified their conclusions with a statement that the ecological nature of the study design tempered the strength of the conclusions.

4.26.1 No Action Alternative

Similar to the Uranium Leasing Program Final Programmatic EA (DOE, 2007), most of the Whirlwind Mine project area is accessible to members of the public. Although members of the public are not permitted to permanently or temporarily reside in the Whirlwind Mine project area, some visitors may camp for one or more days. Other activities that bring public visitors include hunting, hiking, and mountain biking. In general, a public visitor would not spend more than 2 weeks per year in the area. An individual may be exposed to radiation in the Whirlwind Mine project area through three primary pathways: (1) external exposure to gamma radiation, (2) inhalation and ingestion of resuspended radioactive particulates, and (3) inhalation of radon and radon daughter products.

For the No Action Alternative, Energy Fuels' mining activities under the prospect and bulk sampling permit would be governed by MSHA, which establishes radon exposure limits for workers and is described in more detail in Section 4.26.2. These health and safety requirements are the same as those that would be implemented for the Proposed Action. Surface reclamation measures approved under the prospect and bulk sampling permit would be similar to those outlined in the Proposed Action; however, the amount of topsoil cover over the Whirlwind waste rock storage area would be less (i.e., approximately 6 inches versus a minimum of 12 inches for the Proposed Action). The topsoil cover thickness for prospecting and bulk sampling activities is based on the volume of salvageable topsoil available for reclamation.

4.26.2 Proposed Action Alternative

The short-lived decay products of radon-222 gas are the primary radioactive constituents of concern in a uranium mine. These "radon daughters" are also the same elements that can accumulate in a basement, resulting in elevated radiation levels and increased risk of cancer. As provided in the Uranium Leasing Program Final Programmatic EA (DOE, 2007), EPA evaluated exposures from radon emissions for individuals located near uranium mines (EPA, 1989). For underground uranium mines, radon concentrations for nearby individuals (within 0.33 to 33 miles) ranged from 2.0×10^{-6} to 0.0031 working levels (EPA, 1989). Assuming that an individual was continuously exposed, this is equivalent to a probability of a latent cancer fatality of 5.5×10^{-8} to 8.5×10^{-5}, or about 5 chances in 100 million to 8 chances in 100,000. Over 10 years, the probability of a latent cancer fatality would range from 5.5×10^{-7} to 8.5×10^{-4}, or about 5 chances in 10 million to 8 chances in 10,000. For perspective, an individual has a lifetime probability of dying of cancer from all sources of about 220,000 in 1 million, or a risk of lung cancer of 60,000 in 1 million.

At the Whirlwind Mine, the radon ventilated from the mine would quickly disperse upon reaching exhaust shafts or portals. The air emissions would be measured for radon levels and flow rates in accordance with EPA regulations. This data would then be input into an EPA air modeling program to predict radiation levels at the nearest residence. The collected data and modeling results would be reported annually to the CDPHE. Because of its remote location (i.e., about one-third mile from the nearest potential resident), no impacts to the general public are predicted.

Workers are protected through MSHA regulations, which establish maximum exposure levels of radon and radon-daughter products. Over the period 1985 through 1989, the average occupational radiation dose for uranium miners in the United States was 350 mrem/yr (United Nations Committee on the Effects of Atomic Radiation - USCEAR, 2000). This radiation dose is equivalent to a probability of a latent cancer fatality of 2.1×10^{-4}, or about 2 chances in 10,000. Over 10 years, the probability of a latent cancer fatality would be 2.1×10^{-3}, or about 2 chances in 1,000.

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

Outside the mine during operations, the uranium ore and recycled materials such as scrap metal, batteries, and tires are the only radioactive materials that could leave the site and potentially affect the general public. USDOT regulations require that the ore trucks be tarped and checked for radiation levels prior to leaving the mine site and the mill site on the return leg. In the event of an accident resulting in an ore spill, the spilled material and surrounding area would be cleaned up to background levels. Cleanup levels would be verified using a gamma meter or similar instrument. Energy Fuels' company policies require that all scrap metal and other recyclables be checked with a gamma meter prior to leaving the mine site. If gamma readings were found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards.

To determine the potential safety risks of the waste rock storage area to a casual visitor (i.e., camper) following completion of mining activities and reclamation, a radiological dose rate was projected (Golder, 2007). The modeling projections included a 12-inch topsoil cover using a clay loam texture which is characteristic of the native soils in the waste rock storage area that would be salvaged for reclamation purposes (see Section 3.18). Dose calculations were made using RESRAD v6.3, a dose calculation code developed jointly by the DOE and the U.S. Nuclear Regulatory Commission (NRC) for site-specific dose assessments of residual radioactivity. The model is capable of calculating the dose to an individual from a known source with a wide variety of radionuclides and from all direct exposure, biological and airborne pathways. The radiological content of the waste rock storage area was conservatively modeled by including 25 percent proto-ore (i.e., 0.0558 percent U_3O_8) with 75 percent waste rock. Normally, the lower grade ore material is blended with the higher grade ore and shipped to the mill. Energy Fuels has indicated that it is very unlikely that the waste rock storage area would contain this much uranium.

The resulting Ra-226 level used in the modeling effort was equal to 31 pCi/g, which is above the waste-rock pile average of 23.7 pCi/g reported by the EPA (EPA, 1991). Results of the modeling efforts indicated that the calculated dose for a camper who resides on the reclaimed waste rock storage area over a 7-day period (24 hours/day) would be about 0.2 mrem/yr. This dose represents only 2 percent of the EPA's 10 mrem/yr guideline for radiation exposure. The BLM in Colorado has established a 14-day camping limit on public lands. This requires a camper to leave an area for a minimum of 7 days after a 14-day period. After 7 days the camper may return to the same area for another 14-day period. Therefore, the maximum number of days a camper could legally reside on the reclaimed waste rock storage area in one year would be 244 days, resulting in a dose of 6.8 mrem, which is below the EPA's guideline. Therefore, potential health risks from the reclaimed waste rock storage area would be low.

Protective/Mitigation Measures. The following protective/mitigation measures would be implemented to proactively prevent risks to human health that may be caused by the mining operation.

- The mine would operate in accordance with federal regulations that are designed to protect the mine workers and the general public from radiation exposure.
- The miners would be protected through establishment of adequate ventilation and monitoring of radiation levels in the underground work areas in accordance with MSHA regulations.

- The general public would be protected by monitoring of radiation emissions from the mine using methods approved by the EPA and adhering to ore transportation regulations established by the USDOT.
- The Whirlwind Mine would maintain a minimum of 20,000 cubic feet per minute of air flow at the working area. A radon-daughter monitoring program would be established in accordance with 57 CFR §5037 in which exposure levels would be monitored and recorded. If radiation levels in a working area are found to be in excess of MSHA standards, the ventilation would be corrected immediately and more frequent monitoring would be implemented to verify compliance.
- The air emissions would be measured for radon levels and flow rates in accordance with EPA regulations. This data would then be input into an EPA air modeling program to predict radiation levels at the nearest residence. The collected data and modeling results would be reported annually to the CDPHE.
- Ore haul trucks would be tarped and checked for radiation levels prior to leaving the mine site and the mill site on the return leg. If gamma readings are found to be elevated, the ore truck would be cleaned using a power wash or other method to meet appropriate radiation standards.
- All scrap metal and other recyclables would be checked with a gamma meter prior to leaving the mine site. If gamma readings are found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards.

4.27 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

4.27.1 No Action Alternative

Under the No Action Alternative, there would be no impact to Areas of Critical Environmental Concern.

4.27.2 Proposed Action Alternative

Under the Proposed Alternative, there would be no impact to Areas of Critical Environmental Concern.

Energy Fuels selected the Piñon Ridge Mill site, in large part, because of its location. Not only is the mill located central to the uranium ore deposits on the Colorado Plateau, it is also relatively remote with the nearest residences located three to four miles away. Despite the large buffer area between the mill property and the closest residences, Energy Fuels must still meet regulatory limits for radiation dose at the property boundary. To verify compliance with these requirements, air monitoring stations have been established both on site and off site to measure radiation levels prior to, during, and after milling operations. Meteorological stations have also been installed to measure wind direction, wind speed, and other parameters. The meteorological data collected during pre-operations will be combined with emission data collected from the mill and tailings cells to predict radiation levels at the fence line of the property, at the nearest residence, and at communities within an 80-mile radius of the site. The later data will be used to maintain and verify compliance with regulatory standards during milling operations and closure activities.

Regulatory History

A significant number of people that worked in the uranium industry during the 1940s through the 1960s were exposed to high levels of radiation and radioactive dust that, in many cases, resulted in lung cancer. The 1990 Radiation Exposure Compensation Act was passed, in part, to provide compensation to uranium miners, millers, and ore transporters who contracted cancer or other specified diseases as a result of exposure to radiation. The uranium industry was not unlike other industries during that time period when chemicals and materials such as solvents, caustics, PCBs, and asbestos were used in manufacturing and construction without a full understanding of their health effects on exposed workers.

As understanding of the radiation health risks grew, so did the applicable regulations and the required protection measures for workers and the general public. State and federal regulations on permissible radiation levels were initially implemented in the late 1960s and early 1970s. Since that time, the rules have become increasingly strict with regard to radiation exposure and monitoring in all areas of the uranium industry starting with the mining, transporting and milling of uranium ore and continuing through to the generation of nuclear power.

Today, the Mine Safety and Health Administration ("MSHA") requires adequate ventilation for underground uranium miners to reduce their exposure to radiation and radioactive materials to acceptable levels. The USDOT requires that ore shipments be covered, placarded, and monitored for gamma radioactivity levels at specified distances from the trailer. USDOT also requires that shipments of yellowcake be below their established radiation limits, packaged in leak-tight containers, and that the containers be free of any surface contamination. Similarly, as described above, the NRC and state radiation programs require that radiation doses at mill sites be reduced to levels that are ALARA through the use of modern technology and monitoring instruments.