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DRC-2020-016101

September 25, 2020

Div of Waste Management and Radiation Control

SEP 28 2020

Sent VIA E-MAIL AND OVERNIGHT DELIVERY

Mr. Ty L. Howard
Director
Division of Waste Management and Radiation Control
Utah Department of Environmental Quality
195 North 1950 West
Salt Lake City, UT 84116

Re: Response to Public Comments on the White Mesa Mill Groundwater Discharge Permit and Radioactive Materials License

Dear Mr. Howard:

Pursuant to the Division of Waste Management and Radiation Control's ("**DWMRC's**" or the "**Division's**") letter dated August 21, 2020, Energy Fuels Resources (USA) Inc. ("**EFRI**") is providing responses to the select list of public comments listed below relating to proposed Amendment 10 (the "**License Amendment**") of White Mesa Mill's (the "**Mill's**") State of Utah Radioactive Materials License No. UT1900479 (the "**License**") and State of Utah Groundwater Discharge Permit No. UGW370004 (the "**GWDP**").

For ease of review, this letter provides the public comments verbatim, in italics, below, followed by EFRI's response.

1. EFRI GENERAL RESPONSE:

The DWMRC received many comments regarding the proposed License amendment and the proposed permit action (GWDP revision). Many of those comments relate to the Mill License generally and do not relate specifically to the License Amendment. As the licensing action at hand is the License Amendment, and not the Mill License generally, those comments are not relevant to this licensing action. Examples of those types of comments, that are prevalent in the public comments reviewed are:

- The Mill's financial surety may not have enough funding to cover the cost of reclamation of the Mill;
- The tailing cells at the Mill are leaking and are contaminating groundwater; and
- The Mill is receiving radioactive materials that it is not allowed to receive and disposes of those radioactive materials in the tailing cells (i.e., the Nuclear Regulatory Commission's ("**NRC's**") alternate feed program is not legal).

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Although these types of comments are not relevant to the License Amendment, EFRI will address these general comments in this Section 1, and will then respond to each individual comment as assigned by DWMRC by letter dated August 21, 2020 in the following Sections. If an individual comment pertains to the Mill generally and is not applicable to the License Amendment, EFRI will note that fact, but will address each question, even if it is not relevant to the License Amendment.

1.1. Financial Surety

Under applicable federal and state regulations, EFRI must provide adequate financial assurance or surety, to complete all decommissioning and remediation efforts required at the Mill should EFRI prove unable or unwilling to perform those tasks at the time they are required. Several commenters have made suggestions to the effect that DWMRC should increase the amount of financial assurance for the Mill, assuming that insufficient moneys have been set aside for the decommissioning and closure of the Mill site. Again, these types of comments apply to the Mill License generally and not to this specific License Amendment, and are therefore not relevant to this licensing action.

R313-22-35(1)(a) requires EFRI, as Licensee of the Mill, to submit a decommissioning funding plan as the basis of the Mills surety. The Division has incorporated at R313-22-35(h) a requirement to follow the recommendations of NRC's *Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness (Revision 1)* NUREG-1757, Volume 3, applicable to all radioactive materials licensees, to develop the surety estimate, even though NUREG-1620 (Revision 1), *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*, was intended to apply more specifically to uranium recovery facilities. The Division did this, in part, to achieve uniformity, so all radioactive material licensees would be treated alike.

The amount of the financial surety is set based on specific regulatory requirements, as they apply to the Mill's reclamation plan. Annually, DWMRC reviews in detail the adequacy of the EFRI financial assurance, as required by applicable regulations and the License. DWMRC does not have authority to require financial assurance in excess of that required by the application of applicable regulations to the Mill's site and specific reclamation plan.

Some commenters have challenged DWMRC on more than this one occasion to compare decommissioning costs as estimated by EFRI with the cost of cleanup efforts at other mill sites. Each facility's financial assurance determination is site-specific. Comparison of reclamation costs at various mill sites is often not a useful exercise because of unique, site-specific factors. The following, non-exclusive list of examples is noted as compared to the White Mesa Mill:

- Other decommissioned mill sites were constructed when standards for environmental protection were weaker or nonexistent. For example, their tailings impoundments were not lined, so their process fluids readily leached into groundwater. Treating the Mill site in this manner would not take into account all of the preventive measures already in place, and would thus overestimate the reclamation costs involved;

- Previous sites had little or no monitoring networks in place to facilitate early detection and cleanup of releases. At the Mill, robust monitoring networks are in place. Those networks have detected historic chloroform and nitrate plumes (which do not relate to the impoundments onsite), which are currently in cleanup or control phases. The monitoring network has also proved successful in confirming the success of liner-breach repair efforts at Cell 1.

- Previous sites had no ongoing cleanup efforts; the entire expense was borne at the decommissioning phase of the project life cycle. That is not true for the Mill site in the case of the chloroform plume, which is undergoing cleanup, and surety funds have been set aside for work yet to be done. In the case of the nitrate plume, money has also been set aside in the surety to address the plume, and money has already been expended to isolate the plume from storm water so it will not be driven into the groundwater.

- Many of the previously decommissioned mill sites were poorly sited. For an extreme example, Atlas was located on the bank of the Colorado River near Moab, Utah. The Mill property underwent a different siting process as required by 10 CFR Part 40 Appendix A, leading to fewer potential impacts offsite and more opportunity to address problems at lower cost. Groundwater is deep at the Mill site (excepting the small perched aquifer under the site). A substantial clay/rock aquiclude prevents rapid migration of water from the surface into the groundwater. This geologic setting provides opportunity to address any potential releases, if they occur, before they could impact the groundwater and become much more expensive to handle. Furthermore, with the arid climate and a good cover system, the tailings will not need to be moved, sparing the expense that sites like Atlas experienced.

The surety is complete and conservative. Again using the Atlas site as an example, the Atlas Licensee successfully avoided securing even 1% of the required surety because of a weak historic regulatory regime. Such is not the case at the Mill, which is subject to a more modern, stricter regulatory regime.

The current contingency value in the reclamation cost estimate of 25% is in line with industry standards, and is higher than that recommended in NUREG-1620 which is the guidance for uranium mill sites. Rule R313-22-35(3)(h) incorporated NUREG-1757 Volume 3 by reference. That volume specifies a contingency value of no less than 25% in several locations.

It is important to note that EFRI is required to include the construction of the legacy rock armor cover in the surety. The rock armor cover is projected to cost more than the proposed evapotranspiration cover system. If decommissioning occurs prior to the evapotranspiration cover study program concluding or if the study demonstrates that the proposed cover does not function sufficiently well, the legacy cover will be implemented. Since the more expensive cover is included in the surety, the question of sufficiency for this line item is answered in the affirmative.

1.2. Tailings Cells and Groundwater

Some commenters have challenged the Mill's tailings system and have asserted a concern about potential impacts to groundwater. Again, these comments apply to the Mill License generally, which is not the subject of this licensing action, and are not relevant to the License Amendment.

Nevertheless, the Mill is highly regulated to ensure that all applicable standards are met during operation.

Uranium mill tailing impoundments must be designed to provide reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years. In contrast, hazardous waste disposal facilities licensed under Subtitle C of RCRA have a 30-year design standard.

There is no reason that the rules applicable to the Mill should not inspire public trust and confidence. The rules were developed by the NRC. The Mill was licensed by the NRC in 1979. DWMRC took over for the NRC in 2004 but only after the NRC determined that state radiation control laws were equivalent to federal law.

Because the Mill is the only operating uranium mill in the state, it is the subject of most of DWMRC's uranium mill section's time and attention. DWMRC conducts 18 routine inspections per year of the Mill, plus additional inspections as needed. DWMRC's staff is onsite at the Mill an average of 40 days per year and is very familiar with the details of Mill operations and conditions.

With regard to the Mill's Tailings Management System ("**TMS**"), several commenters noted the differing ages, construction standards and uses of the impoundments on the Mill property; however, there are no technical or legal issues associated with the continued use of the impoundments. There is no evidence of any seepage from the TMS to groundwater or that any of the impoundments are leaking to the environment. As a result, there is no technical or legal basis to support a finding requiring remedial or retrofit efforts with respect to the TMS in use at the Mill. All applicable technical and legal requirements are being met with the current facilities. These conclusions are based on the facts and data, all of which are included in the administrative record.

All impoundments were constructed to the required standard for conventional impoundments at the time of construction. From the monitoring data, the impoundments all operate within mandated parameters, and are not manifesting formation of any contaminant plumes.

The continued misuse and mischaracterization of the impoundments as "pits" is incorrect. The terminology is patently incorrect based on professional engineering standards of care and professionally accepted, and widely used technical definitions. The correct usages of pits and impoundments are referenced throughout SMA Surface Mining 2nd edition, B.A. Kennedy and SME Mining Engineering Handbook, 2nd edition, Howard Hartman. The correct usages as noted in these technical references are as follows:

- A pit is an unlined, deep hole, with high-walled, steep-sided slopes that materials are removed ***from*** (emphasis added) (as an open pit mine).

- An impoundment (or pond) is a shallow excavation that materials are placed ***into*** (emphasis added) to store, reuse or evaporate.

With respect to groundwater, there have been no detected releases from any of the Mill's TMS to groundwater at the site since the Mill commenced operations in 1980. The extensive groundwater monitoring network has produced data that demonstrates that no contaminant plumes have developed from the tailings and fluid management impoundments. Two small plumes of contaminants, chloroform and nitrate/chloride, unrelated to the processing of uranium have been detected in the perched Burro Canyon Aquifer near the Mill facility, long distances away from off-site potential receptors, and both non-radioactive plumes are being managed to prevent spread beyond the Mill property. Neither plume is related to the TMS. The chloroform plume appears to have resulted from the operation of a temporary laboratory facility that was located at the site prior to and during the construction of the Mill, and from septic drain fields that were used for laboratory and sanitary wastes prior to construction of the Mill's tailings cells. The nitrate/chloride plume likely originated primarily from a former stock pond ***upgradient*** of the TMS, and may have received a contribution from a chemical spill some distance also ***upgradient*** from the TMS. Both have cleanup initiatives under way.

The commenters claim that the Mill has impacted water quality in the White Mesa Community. Likewise, this comment has no basis in fact. Based on analysis of data acquired through the monitoring network on the Mill property, the groundwater gradients do not flow in the direction required to impact the White Mesa Community. Therefore, even if a plume were to develop, its influence would not reach the White Mesa Community.

The natural conditions present at the Mill property provide additional layers of safety and protection for groundwater. Any potential discharges from the Mill to groundwater would be isolated in a perched aquifer system defined as the Burro Canyon Aquifer. The Burro Canyon Aquifer is classified as "perched" due to the presence of significant, naturally low-permeability formation materials underneath it. The perched Burro Canyon Aquifer is separated from the deep Navajo Aquifer (which is locally used as a primary drinking water source), by approximately 1,100 feet of Morrison and Summerville Formation materials. These formations have unusually low average vertical permeability. For example, the underlying formation includes more than 200 feet of Brushy Basin Member bentonitic clay, a material with extremely low vertical permeability. Located directly below the Burro Canyon Aquifer, the Brushy Basin Member bentonitic clay perches the Burrow Canyon groundwater so well that it forces lateral flow from the perched aquifer to the margins of the mesa. This unique stratigraphy effectively isolates the perched Burro Canyon Aquifer from the Navajo Aquifer, prohibiting the discharge of potential contaminants from the perched aquifer to the deep aquifer. These natural conditions were a significant consideration in the siting of the White Mesa Mill in the 1970s.

The commenters give little or no credit to the network of 74 monitoring wells EFRI has installed to detect any potential releases, the five piezometers installed for that same purpose and to monitor groundwater elevations and the 18 wells installed to monitor groundwater elevations and movement.

In addition to the extensive groundwater data collected by EFRI, at the request of DWMRC, T. Grant Hurst and D. Kip Solomon of the Department of Geology and Geophysics of the University of Utah performed a comprehensive groundwater study at the Mill in July 2007 to characterize groundwater flow, chemical composition, noble gas composition, and age (Hurst and Solomon, 2008). The objective of the study was to determine whether or not the increasing and elevated trace metal concentrations in monitoring wells at the Mill, all of which were identified in Background Reports submitted to DWMRC, may indicate that potential leakage from tailings cells is occurring.

Hurst and Solomon (2008) concluded that:

> *"[i]n general, the data collected in this study do not provide evidence that tailings cell leakage is leading to contamination of groundwater in the area around the White Mesa Mill. Evidence of old water in the majority of wells, and significantly different isotopic fingerprints between wells with the highest concentrations of trace metals and surface water sites, supports this conclusion. The only evidence linking surface waters to recharging groundwater is seen in MW-27 and MW-19. Measurable tritium and CFC concentrations indicate relatively young water, with low concentrations of selenium, manganese, and uranium. Furthermore, stable isotope fingerprints of δD and $\delta^{18}O$ suggest mixing between wildlife pond recharge and older groundwater in MW-19 and MW-27. $D^{34}S$-SO4 and $\delta^{18}O$-SO4 fingerprints closely relate MW-27 to wildlife pond water, while the exceptionally low concentration of sulfate in MW-27, the only groundwater site to exhibit sulfate levels below 100 mg/L, suggest no leachate from the tailings cells has reached the well."*

Current groundwater quality data do not support the claims that any groundwater contamination exists or is being caused by any potential leakage from the tailings cells. Pre-existing background concentrations were confirmed by the University of Utah Study. Background Reports also identified pre-existing data trends. In cases where these trends are continuing or where the groundwater compliance limit is exceeded two consecutive times, Source Assessment Reports ("**SARs**") are completed. All of the SARs completed to date have concluded that none of the exceedances have been shown to be caused by the TMS.

Lastly, references are made to a study report from Geo-Logic. This report does not confirm evidence of a signature of tailings solution in the groundwater at the Mill. The Geo-Logic Report, explains the method used to calculate the average concentrations and provides the data used. The selection of data is biased and not representative of well-by-well analysis which considers background concentrations determined for individual wells. Using this culled data and estimated solubility limits for individual metals (using specified pH's of 5 and 7), Geo-Logic has combined average metals concentrations for selected sets of wells and plotted these average concentrations in comparison with average tailings solution concentrations on different logarithmic scales. According to the Geo-Logic Report, "the patterns observed show a general similarity in the relative

concentrations of the various heavy metals, particularly for Tailing Cell 1, suggesting that the tailings solution is a likely source for the observed heavy metals concentrations in groundwater below the tailings cells."

This conclusion is not correct and is not supported by objective scientific data or analysis. This data analysis is not representative of concentrations which would be expected in the event of a potential tailings solution release. The Geo-Logic report does not consider relative mobility of contaminants, background concentrations of metals, comparisons with groundwater compliance limits ("**GWCLs**") at the Mill, or rising trends caused by natural influences. It is expected that in the case of metals, the same metals will be found in the shallow (perched) aquifer Burro Canyon Formation as are found in the ore used to produce the tailings, and therefore the same metals will be found in natural background concentrations as are found in the tailings solution. The Geo-Logic Report has simply compared a biased assessment of background concentrations in the Burro Canyon Aquifer with average tailings solution concentrations.

1.3. Mill Processing and Acceptance of Alternate Feed Materials, Ore and 11e.(2)

Many commenters have stated that alternate feed material is not "ore," and hence the tailings from processing the materials do not qualify as 11e.(2) byproduct material, because they are not "the tailings or wastes produced by the extraction or concentration of uranium or thorium from the processing of any ore primarily for its source material content" as required by the definition of 11e.(2) byproduct material. And, since the tailings from processing the materials are not 11e.(2) byproduct material, they cannot be disposed of in the Mill's TMS, they assert.

These comments are incorrect for a number of reasons. This legal question is a matter of federal law. DWMRC applies the definition of "ore" developed by the NRC for the regulation of alternate feed materials and for alternate feed guidance documents.

When reviewing a prior NRC Commission interpretation of the Atomic Energy Act's ("**AEA's**") definition of byproduct material, the Court of Appeals for the District of Columbia Circuit found that the term "ore" could have more than one meaning and that there was clear implication in the Uranium Mill Tailings Radiation Control Act ("**UMTRCA**") that residual radioactive material (i.e., wastes and tailings from Title I abandoned uranium mill sites) bearing source material could be treated as "ore." See *Kerr-McGee Chemical Corp. v. NRC*, 903 F. 2d 1 (D.C. Cir. 1990).

In that case, the Court stated:

> "It is clear from this exchange [an exchange between then NRC Chairman Hendrie and Subcommittee Chairman Dingell when UMCTRA was being enacted] that the definition of 'byproduct material' proposed by Dr. Hendrie and adopted by Congress was designed to extend the NRC's regulatory authority over all wastes resulting from the extraction or concentration of source material in the course of the nuclear fuel cycle."

. . .

> "The word "ore" is also subject to more than one meaning. In fact, there is ample basis within the AEA for applying the term to the stockpiled material remaining after the rare earth had been extracted from the feedstock ore and before that material had been processed for its thorium content."
>
> "The clear implication is that if such production is not in accordance with section 7918(b) [a specific program for the re-milling of residual radioactive materials in connection with the remediation of a site, where a share of the net profits is paid to the Government], then production from residual radioactive materials may be treated as production from ores."

This case law's broad interpretation of "ore" for these purposes is binding on the NRC.

The present definition of "ore" used by the NRC in its Alternate Feed Guidance in 1992 and 1995 is in response to the court's interpretation in *Kerr-McGee v. NRC*. And again in 2000, when the NRC was still the regulatory authority for the Mill, the State of Utah challenged decisions made by the NRC to approve a proposed amendment to the Mill's license which would allow the Mill to take an alternate feed material. The arguments the State made were similar to many of the comments now being made in this licensing action. The Commission finally decided against the State, determining that alternate feed material could be milled at the facility and that the resulting tailings would still be byproduct material. See *In the Matter of International Uranium (USA) Corporation*, CLI-00-01, Feb. 10, 2000 (commonly referred to as "Ashland-2"). The Commission followed that decision by issuing a guidance document incorporating the important elements of the decision and establishing criteria for acceptance of applications for alternate feed materials.

DWMRC is bound to follow federal law on these questions, which have long been resolved beyond legal dispute. The Division uses the definition of ore developed by the NRC for the regulation of alternate feed materials and for alternate feed guidance documents.

This position did not need to be added in an amendment or addition to any NRC regulation. The Federal Register entry was the mechanism by which the NRC announced its position and guidance which was formally stated in RIS 00-023: *Recent Changes to Uranium Recovery Policy*, November 30, 2020 (the Alternate Feed Guidance). The Alternate Feed Guidance does not purport to amend a federal statute or regulation. Rather, it sets out the manner in which the NRC, as implementing Agency, interprets and applies certain provisions of the AEA, in this case the term "ore" in the definition of 11e.(2) byproduct material.

As a result, there are no issues raised in the submitted comments that have not already resolved in the NRC proceedings and the *Kerr-McGee* court case. Rather the challenges made by interested parties have been efforts to re-litigate the NRC's decision to accept the *Kerr-McGee* material as feed stock for milling. The *Kerr-McGee* case forms the basis of the alternate feed doctrine employed by the NRC and defines what the NRC deems as "ore" for the purposes of uranium recovery operations. A Summary of the History of the Definition and Interpretation of Alternate Feed Materials is included in Attachment A.

Other commenters have argued that alternate feed materials, are "waste," and tailings from the processing of alternate feed materials do not meet the definition of 11e.(2), byproduct material. This comment is not supported as a matter of law. As discussed above, the tailings from processing alternate feed materials are legally classified as "byproduct material" under federal law.

Regardless of the legal classification, however, the Silmet material is not waste; it is a valuable clean energy resource. The Silmet material contains more uranium than typical Colorado Plateau uranium ores. After processing at the Mill, the Silmet material will actually generate fewer tailings than typical Colorado Plateau ores. These commenters are mistakenly suggesting that because only a small percentage of the total Silmet material will be recovered as product, with the rest being tailings, the Silmet material should be considered a waste not an ore. However, the highest-grade uranium ores in the United States average about 0.25% to 1% U_3O_8, with Colorado Plateau ores typically averaging about 0.25% U_3O_8. This means that over 99% of U.S. uranium ore becomes tailings. The Silmet material, which averages about 0.30% U_3O_8 is very similar. As a comparison, according to the World Gold Council, the largest and best-quality underground gold mines have ore grades of about 8 to 10 grams/ton, or 0.001%. This means that over 99.999% of the ore mined at the best gold mines in the world eventually becomes tailings.

There were also comments regarding the direct disposal of In-situ Recovery ("**ISR**") material from other uranium recovery sites at the Mill. License Condition 10.5 allows the disposal of byproduct material from other 11e.(2) facilities such as ISR facilities. Disposal of 11e.(2) byproduct material from ISR facilities at the Mill is an integral part of the U.S. uranium recovery program. 10 CFR 40 Appendix A Criterion 2 (as incorporated by reference in UAC R313-24-4) states "To avoid proliferation of small waste disposal sites and thereby reduce perpetual surveillance obligations, byproduct material from in situ extraction operations, such as residues from solution evaporation or contaminated control processes, and wastes from small remote above ground extraction operations must be disposed of at existing large mill tailings disposal sites; unless, considering the nature of the wastes, such as their volume and specific activity, and the costs and environmental impacts of transporting the wastes to a large disposal site, such offsite disposal is demonstrated to be impracticable or the advantages of onsite burial clearly outweigh the benefits of reducing the perpetual surveillance obligations."

1.4. Mill Regulatory Oversight, Recycling and Sustainability

1.4.1. Regulatory Oversight

The NRC provides rigorous oversight of DWMRC's regulation of the Mill and has never raised any issues. This is not surprising since DWMRC's regulation of the Mill has been effective. For example, when DWMRC took over regulation of the Mill, there were only six groundwater monitoring wells that were monitored for only four constituents. Now there are 74 compliance groundwater monitoring wells that are regularly measured for some 38 required constituents.

1.4.2. Jobs

The Mill has been the largest private employer in San Juan County, Utah, during most of its 40-year history. San Juan County is the poorest county in Utah and well within the 50 poorest counties in the United States.

The Mill supports the local economy not only through the taxes it pays to local authorities and the salaries and wages it pays to its employees and to numerous third party contractors, such as transportation companies, equipment rental companies, equipment vendors and service providers, but also indirectly through the "multiplier effect" to the communities as a whole. That is, the money the Mill pays directly to its employees, contractors vendors and providers is spent by them in the communities, thereby providing income to local businesses and wages and salaries to employees and owners of those business, who in turn spend their income, salaries and wages on other businesses in the community, and so on. Indeed, as the largest private employer in San Juan County, Utah, the Mill is a very significant factor in the local economy.

Over the Mill's 40-year history, it has never had an overexposure of any of its workers or any members of the public, and in fact operates well below the regulatory exposure limits. For example, the Mill has never exceeded its ALARA goal of 1,250 millirem per year ("**mrem/yr**") for workers, and typically the maximally exposed worker is less than 500 mrem/yr, which is one tenth of the regulatory standard of 5,000 mrem/yr. Similarly, emissions at the boundary monitoring stations around the Mill show emissions at less than the As Low As Reasonably Achievable ("**ALARA**") goal of 25% of the regulatory standard, and modeling shows that exposures at the Mill property boundary are a small fraction of the 100 mrem/yr standard.

1.4.3. Recycling and Sustainability

Uranium mill tailings are not wastes, as they contain residual metals that Energy Fuels actively recovers. For example, the Mill has recycled its tailings in recent years to recover uranium and vanadium from recirculated tailings solutions ("**Pond Returns**"). Characterizing the plant operation as a "waste disposal" operation is therefore not accurate. Rather, its alternate feed material and Pond Return programs should be recognized as important recycling operations. Since 1998, the Mill has recovered and recycled 6 million pounds of uranium from its alternate feed recycling program and from Pond Returns.

- For context, this recycled uranium would produce the same amount of electricity as about 50 million tons of coal – or enough coal to fill a coal train from LA to NYC, and almost all the way back again;

- This recycled uranium would eliminate over 85 million tons of CO_2 emissions compared to coal, or the same amount of annual emissions as 18 million passenger vehicles. 85 million tonnes of CO_2 emissions is about 1.5 times the annual CO_2 emissions for the entire country of Sweden;

- This recycled uranium would produce the same amount of electricity in one year as 24,500 wind turbines (which is almost half of the 60,000 wind turbines in the U.S. in 2019); and

- Over 110 million acres of forest would be required for one year or 1.4 billion seedlings would need to grow for 10 years to sequester that amount of CO_2 emissions. 110 million acres of forest would be a forest larger than the entire State of California.

Over the last 20 years, over 47% of our uranium production has been from the recycling of uranium-bearing materials.

Even this one small Silmet ore project is expected to generate from 7,096 to 10,692 pounds of U_3O_8 by itself.

- When converted to nuclear fuel, this amount of U_3O_8 will generate the same amount of electricity as 55,682 - 83,905 tons of coal. That amount of coal when burned to make electricity will generate 101,472 to 152,208 tonnes of CO_2 emissions;

- 152,208 tonnes of CO_2 emissions avoided by recycling the Silmet material, would be equivalent to the amount of CO_2 emissions from 32,874 passenger vehicles for one year;

- It would require a forest the size of 197,673 acres for one year to sequester the same amount of CO_2 emissions. A forest that size would exceed the combined area of Zion and Bryce Canyon National Parks, would be 4.5 times the area of the District of Columbia, and 234 times the area of Central Park, NYC); and

- Finally, that amount of uranium when converted to nuclear fuel, would generate as much electricity as about 44 wind turbines for one year.

All from one small recycling project at the Mill.

Vanadium, which today is mainly used in the steel, aerospace, and chemical industries, also contributes to environmental sustainability, as this critical mineral is seeing considerable interest in next generation batteries that store energy generated from renewable sources. The Mill has recycled enough vanadium through Pond Returns, which would otherwise have been lost to direct disposal, to provide the vanadium needed for enough steel girders today to build four and a half Golden Gate Bridges. Over the last 10 years, over 26% of our vanadium production has been from this recycling program.

According to the Nuclear Energy Institute ("**NEI**"), nuclear energy provides nearly 55 percent of carbon-free electricity in the United States, more than any other source. The amount of electricity generated with nuclear energy avoids the emissions of more than 476 million metric tons of carbon dioxide every year. That's more than the emissions from more than 100 million passenger vehicles. Nuclear plants are the most efficient source of electricity, operating 24/7 at a more than 93 percent average capacity factor. (Capacity factor is the ratio of the actual amount of electricity generated by a plant compared to the maximum amount that it could potentially generate.) That's more than

two times the capacity factor of any other carbon-free source. During the 2019 polar vortex, U.S. plants operated at more than 98 percent capacity.

2. UTE MOUNTAIN UTE TRIBE'S POSITION REGARDING PROPOSED ACTIONS

2.1. Ute Mountain Ute Tribe Comment 4.

The Mill was originally designed, evaluated for environmental impacts, and licensed in 1979 - over 40 years ago - on the limited basis that it would process conventional uranium ores mined locally from the Colorado Plateau over an operational life of only 15-20 years and then be reclaimed.

EFRI Response:

This question relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

There is nothing in the Mill's License or in the 1978 Dames and Moore Environmental Report ("**ER**") or the NRC's 1979 Final Environmental Statement ("**FES**") that limits the Mill's License to any set number of years, nor do any of the four License renewals since that time impose any limits on the Mill's operational life or License term.

The Mill was designed with an operational capacity of approximately 2,000 tons of ore per year and with an initial Mill tailings capacity of 10 million tons of tailings. Operating at full capacity of approximately 660,000 tons of ore per year, it would take approximately 15 years to fill up the initial tailings capacity of 10 million tons. The mention of 15 years in the ER and FES is only a reference to the time it would take to fill up the initial tailings capacity if the Mill were to run at full capacity. There is no requirement for the Mill to run at any capacity level, let alone at full capacity. Therefore there is no set operational life for the Mill.

Under 10 C.F.R Part 40, Appendix A, uranium mills must be sited to meet strict criteria to ensure that the Mill site has the maximum protections afforded by nature over the short- and long-term, and uranium mill tailings facilities must be designed to an engineering standard of 1,000 years, to the extent reasonably practicable, and to an engineering standard of 200 years at a minimum, regardless of the operational life of the facility. The Mill meets all of those strict siting criteria, and all of the Mill's tailings cells have been designed and constructed to those standards, which are not dependent on the operational life of the tailings cells.

In fact, the Mill operates with several smaller tailings cells that are filled up in sequence, rather than having one large tailings impoundment, such as was the case at older uranium mills, like the Atlas mill in Moab and the Monticello uranium mill. Under the Mill's reclamation plan, it engages in staged reclamation, so that, during its operational life, it reclaims each of its tailings cells as the tailings cell fills up. Tailings Cell 2 has been filled up and is in reclamation, so its operational life is over. Tailings Cell 3 is almost filled up, so it will go into full reclamation soon. Cell 4A was only brought into operation in [2008], so its operational life has only been 12 years to date. Cell

4B has no tailings solids and is being used as an evaporation pond at this time, so its operational life so far as a tailings impoundment is zero years. Tailings cells 5A and 5B are currently being permitted, so their operational life to date is zero years. Therefore, while it may make some sense to talk about the operational life of a mill with only one large tailings cell, it makes no sense to talk about the operational life of the Mill, when the operational lives of each tailings cell is staged. In other words, the operational life of the Mill is not tied to its tailings cells, each of which has its own operational life (which is not limited).

In fact, all new tailings impoundments are constructed to best available technology standards ("**BAT**"), so all new cells benefit from improved engineering practices and standards as they evolve. While tailings cells No. 2 and 3 were built to best available technology standards at the time they were constructed, have synthetic liners, leak detection systems and slimes drains, and have shown no signs of any leaks to the environment, Cells 4A and 4B have been built to even higher standards, each with two synthetic liners, a geoclay underliner, and more elaborate leak detection and slimes drain systems. Cells 5A and 5B will be constructed to similar standards as Cell 4A and 4B. As a result, the fact that the Mill has operated with staged tailings cells and has not operated at full capacity over its life to date, has actually resulted in improved tailings management practices compared to the situation where the Mill would have operated at full capacity and utilized older technology for all of its tailings cells.

Since the Mill was constructed in 1980, the ownership has invested close to $30 million dollars in equipment replacement and upgrades, over and above its expenditures on the TMS, to keep the Mill operating at peak efficiency. Almost every major piece of equipment and tankage has been replaced or re-built in accordance with BAT. With regular maintenance and scheduled replacement the Mill circuit has an unlimited life. The rigorous 1,000-year design standard, the requirement to use BAT for any new construction, including all new tailings cells, the requirement to maintain all equipment if good repair and the extensive ongoing monitoring requirements, are why there is no need to impose an operational life limit in the Mill's license.

We are proud of the fact that the Mill has been able to operate over the last 40 years and hope it can operate for another 40 years or more. During the last 40 years the Mill has been the largest private employer in San Juan County and has provided a major economic stimulus to one of the poorest counties in the United States. We have been able to do this without any significant impacts to the environment from Mill operations, and in a manner where the Mill is updated on a continuous basis to conform to BAT and thereby improve protections to public health, safety and environment over its operating life.

2.2. Ute Mountain Ute Tribe Comment 5.

The original Environmental Report for the Mill, written in 1978, made scant mention of the public health, safety and environmental quality concerns of either the Ute Mountain Ute Tribe's White Mesa Community or their neighbors to the south, the Navajo Nation. Both federally recognized Tribes are downwind and downgradient from the White Mesa Mill and depend upon the Navajo Aquifer as the sole source for their drinking water and domestic use, and also utilize the shallow Burro Canyon aquifer that is being contaminated by the Mill.

EFRI Response:

This question relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

There have been no detected releases from any of the Mill's tailings cells to groundwater at the site since the Mill commenced operations in 1980. It is therefore incorrect to claim that the shallow Burro Canyon aquifer is being contaminated by the Mill. The extensive groundwater monitoring network has produced data that demonstrates that no contaminant plumes have developed from the tailings and fluid management impoundments. Two small plumes of contaminants, chloroform and nitrate/chloride, unrelated to the processing of uranium have been detected in the perched Burro Canyon Aquifer near the Mill facility, long distances away from off-site potential receptors, and both non-radioactive plumes are being managed to prevent spread beyond the Mill property. Neither plume is related to the TMS. The chloroform plume appears to have resulted from the operation of a temporary laboratory facility that was located at the site prior to and during the construction of the Mill, and from septic drain fields that were used for laboratory and sanitary wastes prior to construction of the Mill's tailings cells. The nitrate/chloride plume likely originated primarily from a former stock pond ***upgradient*** of the TMS, and may have received a contribution from a chemical spill some distance also ***upgradient*** from the TMS. Both have cleanup initiatives under way.

The commenters claim that the Mill has impacted water quality in the White Mesa community. Likewise, this comment has no basis in fact. Based on analysis of data acquired through the monitoring network on the Mill property, the groundwater gradients do not flow in the direction required to impact the White Mesa Community. Therefore, even if a plume were to develop, its influence would not reach the White Mesa Community.

The natural conditions present at the Mill property provide additional layers of safety and protection for groundwater. Any potential discharges from the Mill to groundwater would be isolated in a perched aquifer system defined as the Burro Canyon Aquifer. The Burro Canyon Aquifer is classified as "perched" due to the presence of significant, naturally low-permeability formation materials underneath it. The perched Burro Canyon Aquifer is separated from the deep Navajo Aquifer (which is locally used as a primary drinking water source), by approximately 1,100 feet of Morrison and Summerville Formation materials. These formations have unusually low average vertical permeability. For example, the underlying formation includes more than 200 feet of Brushy Basin Member bentonitic clay, a material with extremely low vertical permeability. Located directly below the Burro Canyon Aquifer, the Brushy Basin Member bentonitic clay perches the Burrow Canyon groundwater so well that it forces lateral flow from the perched aquifer to the margins of the mesa. This unique stratigraphy effectively isolates the perched Burro Canyon Aquifer from the Navajo Aquifer, prohibiting the discharge of potential contaminants from the perched aquifer to the deep aquifer. These natural conditions were a significant consideration in the siting of the White Mesa Mill in the 1970s.

The commenters give no credit for the network of 74 monitoring wells EFRI has installed to detect any potential releases, the five piezometers installed for that same purpose and to monitor groundwater elevations and the 18 wells installed to monitor groundwater elevations and movement.

In addition to the extensive groundwater data collected by EFRI, at the request of DWMRC, T. Grant Hurst and D. Kip Solomon of the Department of Geology and Geophysics of the University of Utah performed a comprehensive groundwater study at the Mill in July 2007 to characterize groundwater flow, chemical composition, noble gas composition, and age (Hurst and Solomon, 2008). The objective of the study was to determine whether or not the increasing and elevated trace metal concentrations in monitoring wells at the Mill, all of which were identified in the background reports that had been filed with the State, may indicate that potential leakage from tailings cells is occurring.

Hurst and Solomon (2008) concluded that:

> *"[i]n general, the data collected in this study do not provide evidence that tailings cell leakage is leading to contamination of groundwater in the area around the White Mesa Mill. Evidence of old water in the majority of wells, and significantly different isotopic fingerprints between wells with the highest concentrations of trace metals and surface water sites, supports this conclusion. The only evidence linking surface waters to recharging groundwater is seen in MW-27 and MW-19. Measurable tritium and CFC concentrations indicate relatively young water, with low concentrations of selenium, manganese, and uranium. Furthermore, stable isotope fingerprints of ðD and $ð^{18}O$ suggest mixing between wildlife pond recharge and older groundwater in MW-19 and MW-27. $D^{34}S$-SO4 and $ð^{18}O$-SO4 fingerprints closely relate MW-27 to wildlife pond water, while the exceptionally low concentration of sulfate in MW-27, the only groundwater site to exhibit sulfate levels below 100 mg/L, suggest no leachate from the tailings cells has reached the well."*

Current groundwater quality data do not support the claims that any alleged groundwater contamination is being caused by potential leakage from the tailings cells. Pre-existing background concentrations were confirmed by the University of Utah Study. Background reports also identified pre-existing data trends, in cases where these trends are continuing or where the groundwater compliance limit is exceeded two consecutive times, SARs are completed. All of the SARs to date have concluded that none of the exceedances have been shown to be caused by tailings wastewater.

Lastly, references are made to a study report from Geo-Logic. This report does not confirm evidence of a signature of tailings solution in the groundwater at the Mill. The Geo-Logic Report, explains the method used to calculate the average concentrations and provides the data used. The selection of data is biased and not representative of well-by-well analysis which considers background concentrations determined for individual wells. Using this culled data and estimated solubility limits for individual metals (using specified pH's of 5 and 7), Geo-Logic has combined average metals concentrations for selected sets of wells and plotted these average concentrations

in comparison with average tailings solution concentrations on different logarithmic scales. According to the Geo-Logic Report, "the patterns observed show a general similarity in the relative concentrations of the various heavy metals, particularly for Tailing Cell 1, suggesting that the tailings solution is a likely source for the observed heavy metals concentrations in groundwater below the tailings cells."

This conclusion is not correct and is not supported by objective scientific data or analysis. This data analysis is not representative of concentrations which would be expected in the event of a potential tailings solution release. The Geo-Logic report does not consider relative mobility of contaminants, background concentrations of metals, comparisons with GWCLs, or rising trends caused by natural background influences. It is expected that in the case of metals, the same metals will be found in the shallow aquifer Burro Canyon Rock as are found in the ore used to produce the tailings, and therefore the same metals will be found in natural background concentrations as are found in the tailings solution. The Geo-Logic Report has simply compared a biased assessment of background concentrations in the Burro Canyon Aquifer with average tailings solution concentrations.

It is also incorrect to state that the ER and FES "made scant mention of the public health, safety and environmental quality concerns of either the Ute Mountain Ute Tribe's White Mesa Community or their neighbors to the south, the Navajo Nation. Both federally recognized Tribes are downwind and downgradient from the White Mesa Mill and depend upon the Navajo Aquifer as the sole source for their drinking water and domestic use, and also utilize the shallow Burro Canyon aquifer that is being contaminated by the Mill." The ER and FES evaluated all potential impacts to public health, safety and the environment, including all potential impacts to nearby residents and potential residents. The FES concluded that the Mill could be operated in compliance with all applicable standards as designed and with its License conditions, with no significant impacts to public health, safety and the environment (which has been borne out by 40 years of environmental monitoring). As the FES concluded there would be no significant impacts to public health, safety and the environment to any receptors, there was no need to mention the White Mesa community or Navajo Nation specifically, as they are not the nearest receptors or potential receptors and would not be impacted in any manner different from all other potential receptors. However, specific attention was previously and continues to be given to the responsible preservation of cultural resources, including historical artifacts, ancient human remains and historic properties at the site, particularly when the Mill engages in activity not previously assessed for potential impacts, in accordance with all applicable laws. The Mill's site-specific responsibilities relating to the preservation of cultural resources are more particularly set out in its License Condition 9.7, which was recently revised to better correspond to applicable State of Utah laws governing antiquities, historic sites and Native American graves protection and repatriation.

In fact, both the White Mesa Community and the Navajo Nation were in favor of and supported the siting and construction of the Mill, as evidenced by their letters to the NRC in support of the Mill included as an Appendix to the FES, copies of which are attached to this letter as Attachment B.

The letter from the White Mesa Ute Tribe states:

> "The White Mesa Ute Indian Tribe supports the construction and operation of the proposed Energy Fuels uranium mill to be located on White Mesa approximately five (5) miles north of the Ute Reservation. The White Mesa project should be a benefit to the Ute Tribe insofar as tribe members will benefit from the jobs created in the immediate area. The Tribe urges your favorable consideration of the issuance of the source material license for the Energy Fuels Mill. Your earliest possible action on the issuance of this license will permit the opening of a substantial number of job opportunities to the Ute tribe."

The letter from the Navajo Nation states:

> "The undersigned as a representative of the Navaho Indian Tribe in southeastern Utah wishes to advise you that we support the Energy Fuels White Mesa Uranium Mill project. This project will provide needed jobs to the Navaho Indians and should have a beneficial economic impact on the Tribe as a whole. A number of our Tribe are already employed in the Energy Fuels Buying Station and mines in the area of the Mill. Approval of this project at the earliest possible time will no doubt open jobs during the construction and operation phases of this project."

We are proud to be able to state that the Mill has fulfilled these expectations over the last 40 years, and we hope it will continue to do so for many years to come. Not only is the Mill the largest private employer in San Juan County, it also typically employs about 50% Native Americans, and has done so since it first started operating in 1980. This typically means 40 to 100 jobs for Native Americans, depending on the Mill's operating level.

2.3. Ute Mountain Ute Tribe Comment 6.

Despite the limited purpose and design life of the Mill and its legacy tailings cells and the limited scope of the environmental analysis, EFRI now takes the position that the "mill has no predetermined operation life," and "Since there's no set schedule for filling any one of the ponds, there's no set schedule for actual final closure of the mill." See response of Harold Roberts of EFRI to question from Scott Clow of the UMUT regarding the expected remaining operational and pre-reclamation life of the Mill as recorded in the Transcript of June 8, 2017 Public Hearing, Corrected Version, during the 2018 License Renewal. More recently, in a May 1, 2020, interview with Crux Investor posted on Youtube, Energy Fuels Resources (USA) (EFRI) CEO Mark Chalmers described the Mill as "state of the art, designed for a thousand years."

EFRI Response:

This question relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. See the response to Ute Mountain Ute Tribe Question 4 above.

2.4. Ute Mountain Ute Tribe Comment 7.

The state of Utah must recognize and acknowledge the reality that the Mill is far past its design life and no longer a conventional uranium mill, but, instead, a radioactive waste dump seeking to operate for decades, if not a millennium. By incrementally approving new and expanded radioactive waste streams from around the world, Utah is implicitly fostering that reality without fully explaining the reality of the facility and the state's regulatory actions to the public and without undertaking robust and comprehensive review of the Mill's impacts and potential impacts on surrounding communities, public health and the environment. Utah does not take this type of lax regulatory approach in evaluating radioactive waste streams sought by licensed low-level radioactive disposal facilities utilizing dry disposal in RCRA-compliant disposal cells located far from residential communities. Utah must face the reality, inform the public, and allow a full and fair opportunity for public input on whether a 40-year-old conventional uranium mill with a design life of only 15-20 years that utilizes wet disposal in tailings cells and has already extensively contaminated the shallow groundwater should be transformed into a radioactive waste disposal facility with an indefinite operational life receiving radioactive waste shipped to Utah from around the World.

EFRI Response:

It is incorrect to say that the Mill is far past its design life. The Mill is licensed to have an indefinite life, due to: the strict siting criteria for the Mill which ensures natural protections over the long term; the 1,000 year TSM design standard; the phased reclamation of tailings cells as they are filled up; the construction of new cells in accordance with BAT to replace filled up cells; the leak detection systems and slimes drain systems for all tailings impoundments required by BAT; the requirement to maintain existing Mill equipment and to make any replacements of equipment in accordance with BAT; and the extensive monitoring requirements to ensure that all of these technologies and protections perform as engineered. In fact, as technology advances, the Mill becomes more protective of public health, safety and the environment over time. See Section 2.1, Response to Ute Mountain Ute Comment 4, above for more details.

The commenter has referred to the Mill as a "waste dump" and has referred to some of the feeds as "waste streams". This is incorrect. Uranium mills are designed to process uranium ores for the recovery of uranium, alone or in combination with other metals. Even for the highest-grade uranium ores in the United States, and for the vast majority of the uranium mines around the world, the product recovered is generally less than 1% of the mass of the ore fed to process, which means that typically over 99% of the ore mass is required to be disposed of permanently in the mill's TMS as 11e.(2) byproduct material. Those tailings are not all wastes, as they contain residual concentrations of uranium and other metals that can be recovered, as witnessed by the Mill's very successful uranium and vanadium Pond Return programs, which have resulted in very significant amounts of uranium and vanadium being recycled from the tailings solutions. Alternate feed materials, such as the Silmet materials, are classified as ore and are treated the same as any conventional ore at the Mill. The Silmet materials contain more uranium than typical Colorado

Plateau ores. As with any conventional ores or other alternate feed materials, approximately 99% of the mass of the Silmet alternate feed materials will end up as tailings and will be disposed of permanently in the Mill's TMS as 11e.(2) byproduct material. The Mill is not a "waste dump" or being transformed into a radioactive waste disposal facility, it is, always has been and will continue to be a mineral processing facility that generates tailings which must be permanently disposed of. See the response in Section 2.2, Response to Ute Mountain Ute Comment 5, above for more details.

Whether the Mill is processing conventional ores or alternate feed materials, and whether the ores or alternate feed materials originate in Utah, Arizona, Canada or elsewhere in the world does not change the nature of the Mill as a mineral processing facility. One of the main purposes of the License amendment process for alternate feed materials is for DWMRC to be satisfied that the receipt, handling, processing of the alternate feed material and the disposal of the resulting tailings in the Mill's TSM is not materially different from processing conventional ores and other previously approved alternate feed materials. The purpose of the License amendment process is to ensure that the receipt and processing of an alternate feed material falls within the previously evaluated environmental impacts for the facility and that there are no significant incremental public health, safety or environmental impacts from receiving and processing the alternate feed material at the Mill over and above previously licensed activities. There is no need to undertake a "robust and comprehensive review of the Mill's impacts and potential impacts on surrounding communities, public health and the environment" because that was done under the FES and previous environmental analyses, and the purpose of the alternate feed amendment process is to ensure that receipt and processing of the alternate feed material fits within that previous analysis. There is no need to redo an analysis that the feed material falls within.

It is incorrect to say that DWMRC takes a lax approach to the Mill regulation and applies more stringent standards to Resource Conservation Recovery Act ("**RCRA**") facilities. As an agreement state, DWMRC must follow all NRC regulations and NRC regulations require that uranium mill tailings impoundments must be designed to provide reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years. In contrast, hazardous waste disposal facilities licensed under Subtitle C of RCRA have a 30-year design standard. Cells 4A and 4B each have dual synthetic liners and a third geoclay liner, leak detection systems and slimes drain systems, all of which are the same standards as for RCRA facilities. However, over and above those requirements, the Mill's tailings must additionally comply with the 1,000-year design criteria, rather than the 30-year design standard for RCRA disposal facilities. Cells 4A and 4B are therefore designed to a much stricter standard than RCRA facilities. The tailings from the Silmet alternate feed material will be disposed of in Cell 4A at the Mill, so there should be no concern about the management of tailings from processing the Silmet material.

It is also incorrect to say that the Mill has "already extensively contaminated the shallow groundwater." See the discussion in Section 1.2, Tailings Cells and Groundwater, above for more details.

While the commenter feels it is inappropriate for the Mill to accept materials for recycling, it is important to note that over the last 20 years, over 47% of EFRI's uranium production has been

from the recycling of uranium-bearing alternate feed materials and Pond Returns, which would otherwise have been lost to direct disposal. As a member of the global community, we need to responsibly recycle everything we mine, to the extent practicable, so that the world minimizes the disturbances it needs to make to the environment and sustains the resources in the ground to the extent possible for future generations.

We need to be able to do this in our own country, in our own backyards, rather than merely sweep our responsibilities to the World under the carpet, by relying on metals mined from other countries, which in most cases have lesser protections for public health, safety and the environment than we have. In the United States, we are highly regulated and operate to the highest standards. We should be proud of that, and not be afraid to do properly in our country what we rely on others to do for our benefit in their countries. America needs to set an example of how it can play its role in satisfying its own and the world's needs in a responsible manner. There is only one "globe," so anything the Mill can do to help prevent global warming through recycling uranium will help us all, including all the people in the vicinity of the Mill.

2.5. Ute Mountain Ute Tribe Comment 9h.

As set forth in greater detail in the Tribe's comments regarding water quality concerns, the lack of an assessment of long-term impacts on groundwater is of particular concern in light of the Division's questionable regulatory approach of allowing EFRI to resolve noncompliance with its groundwater compliance limits by continually adjusting background concentrations and statistically relaxing the compliance limits without any regard or consideration of how the quality of the shallow Burro Canyon aquifer can be preserved and protected over the long-term. The regulatory approach gives a green light to continued degradation of classified groundwater without an endpoint - contrary to the goals of the Utah Groundwater Protection Program of preserving Utah's groundwater within their quality and use classifications and without any assessment of the long-term impacts on the quality, uses and potential uses of the Burro Canyon aquifer from the existing and increasing contamination, the indefinite operation of the Mill, and the continued relaxation of compliance limits.

EFRI Response:

The White Mesa Community has repeatedly expressed concerns regarding long-term water quality in and around the Mill and potential contamination of down gradient water resources. The concept of "existing and increasing contaminations" is not correct and is not supported by objective scientific data or analysis.

When the State of Utah became an Agreement State, it required the Mill to do an extensive background groundwater study at the site, which resulted in a number of background groundwater quality reports (the "**Background Reports**"). The Background Reports identified numerous constituents with rising trends at the site, including constituents in upgradient wells, far-downgradient wells and site wells, which were attributed to natural background causes. A few examples are: manganese in MW-11, selenium in MW-12 and MW-15, thallium, uranium and

sulfate in ***upgradient*** well MW-18, fluoride and selenium in ***upgradient*** well MW-19, and uranium in MW-26.

Because the Mill had an operating history at that time, as a double check on the analyses performed in the Background Reports, the State of Utah engaged T. Grant Hurst and D. Kip Solomon of the Department of Geology and Geophysics of the University of Utah to perform a comprehensive groundwater study at the Mill in July 2007 to characterize groundwater flow, chemical composition, noble gas composition, and age (Hurst and Solomon, 2008). The objective of the study was to determine whether or not the increasing and elevated trace metal concentrations in monitoring wells at the Mill, all of which were identified in the Background Reports submitted to DWMRC, may indicate that potential leakage from tailings cells is occurring.

Hurst and Solomon (2008) concluded that:

> *"[i]n general, the data collected in this study do not provide evidence that tailings cell leakage is leading to contamination of groundwater in the area around the White Mesa Mill. Evidence of old water in the majority of wells, and significantly different isotopic fingerprints between wells with the highest concentrations of trace metals and surface water sites, supports this conclusion."*

A number of the wells analyzed by Hurst and Solomon had rising trends in various constituents, which had been identified in the Background Reports (for example, manganese in MW-11, selenium in MW-12 and MW-15, thallium, uranium and sulfate in ***upgradient*** well MW-18, fluoride and selenium in ***upgradient*** well MW-19, and uranium in MW-26). Hurst and Solomon concluded that those rising trends were the result of natural influences and not Mill influences.

It is therefore undisputed that there are natural influences at the site that have given rise to rising trends in a number of constituents in a number of monitoring wells. To address these rising trends, the DWMRC has taken a very conservative approach. Rather than setting GWCLs based on a trend, where the GWCLs would increase over time automatically along with the naturally rising background concentrations, DWMC set fixed GWCLs, recognizing that those GWCLs would need to be re-evaluated each time the rising natural background concentrations reached the set GWCL level. Similarly, it was recognized that the two historic plumes at the site, the chloroform and nitrate/chloride plumes, which are not attributed to Mill's TSM, could also give rise to rising trends in chloride and nitrate/chloride, respectively, to the extent they migrate downgradient.

The groundwater monitoring system at the Mill was therefore designed on the assumption that GWCLs are expected to be exceeded due to natural influences, or the migration of historic plumes, and that they would need to be re-evaluated at the time of each exceedance. This conservatively allows the State to determine whether or not any non-natural influences could have occurred that would implicate Mill activities. Each such exceedance requires the Mill to prepare and submit a SAR to analyze the exceedance, to verify that it is due to natural, or historic plume influences, or determine if Mill activities could have contributed to the exceedance. The SARs are thorough and are reviewed and approved by DWMRC, thereby ensuring that DWMRC thoroughly and carefully reviews each exceedance to make sure it is not due to Mill influences. The frequent preparation

and submittal of SARs is therefore an indication of the strict regulation of groundwater at the site, and not an indication of lax regulation.

The technical basis for each SAR is based on an individual well and individual parameter in out-of-compliance status. The source investigations include several supporting lines of evidence to eliminate the Mill as the source of the exceedances, including:

- Evaluation of Tailings Solution Discharge Indicator Parameters of chloride, fluoride, sulfate and uranium ("Cl, F, SO4, U") concentration and trends. These indicators are used in comparison to other compliance parameters since, based on distribution coefficients, retardation factors and high concentrations in the tailings solution they would be expected to arrive at the groundwater earlier than other parameters.

- Mass Analysis – Volumes of tailings wastewater which would be required to cause the concentration increase.

- Contaminant transport time of arrival to the point of exposure with consideration of unsaturated transport through the vadose zone and measured groundwater velocity.

- Pre-identified background concentrations and pre-identified concentration trends as documented in the groundwater Background Reports.

- Comparison to groundwater age dating and evaluation of isotopic fingerprint analysis as part of the University of Utah Groundwater Study at the Mill.

Subsequent to the findings of the source assessments, if it is determined that the exceedance is due to natural background concentrations and not caused by Mill activities, then the GWCL is recalculated using all recent data and according to prescribed statistical guidance from the Environmental Protection Agency ("**EPA**"). These calculations are reviewed and affirmed by the DWMRC. These measures are wholly conservative and provide GWCLs which are updated as required after a full and thorough review by DWMRC, and are highly protective of the environment.

2.6. Ute Mountain Ute Tribe Comment 9j.

There is no environmental analysis taking into account the fact that the Moffat Tunnel waste, which is derived from treatment of contaminated groundwater, will be generated in perpetuity. By proposing to approve that waste, stream, the Division is again acknowledging that the Mill will be a perpetual repository for radioactive waste material from outside sources forever. There needs to be a comprehensive Environmental Analysis of perpetual radioactive waste disposal from perpetual sources.

EFRI Response:

The Mill prepared an environmental analysis relating to the receipt and processing of the Moffat Tunnel material as part of its License amendment application. This analysis indicates that there will be no changes or impacts to the Mill as a result of processing the Moffat Tunnel material for as long as the Mill is in operation. DWMRC has provided a "Cross-Walk" of EA topics and a listing of source documents where the pertinent information can be found. The Cross-Walk is Table 2, Page 32 of the DWMRC Technical Evaluation and Environmental Analysis ("**TEEA**") for Moffat Tunnel Alternate Feed Request, dated April 2020. Since all of the relevant topics are covered in previous documents or in the current EFRI application all of the regulatory requirements of R313-24-3 and the AEA [42 USC §2021(o)(3)(C)] have been met.

Having said this, however, the Mill's commercial arrangements for the Moffat Tunnel material do not require the Mill to be in operation in perpetuity in order to receive the material. Rather, the Mill may terminate its agreement if it goes into reclamation at any time, or for other reasons. In other words, the Moffat Tunnel arrangement is subject to Mill Licensing, it does not dictate Mill licensing or operations. So, by approving the Moffat Tunnel License amendment, DWMRC will not be acknowledging that the Mill will be "a perpetual repository for radioactive waste material from outside sources forever."

2.7. Ute Mountain Ute Tribe Comment 11.

Cell 3 is inadequate to safely continue to receive in-situ leachate wastes in perpetuity. It has no leak detection system until groundwater becomes polluted, and the DWMRC continues to use unsubstantiated and outdated hypotheses and lines of evidence provided by Energy Fuels Resources (USA) (hereafter EFRI) that the groundwater is not being polluted. While proposing an increase in the disposal of ISL waste and no limitation on how long into the future this can occur, DWMRC is simultaneously relaxing groundwater standards around the perimeter of Cell 3. In an inspection in 2017, U.S. EPA officials expressed their preference that alternate feeds and by-products thereof from EPA clean-up activities be disposed of in Cells 4A and 4B, "since these are double-lined cells with leak detection systems." (EPA report on CERCLA Offsite Rule Inspection May, 2017. Linda Jacobson, EPA Inspector, to David Frydenlund, EFRI, February 15, 2018)

EFRI Response:

This comment is incorrect. Cell 3 has a fully functioning leak detection system ("**LDS**") that was installed during cell construction. The installation of the LDS used for collection and detection of any potential leakage below the liner consists of:

- A 12-inch thick compacted sand layer on the upstream face of the Cell 3 Dike.
- A three-inch diameter Polyvinyl Chloride ("**PVC**") slotted pipe installed at the toe of the sand layer and capped at both ends.
- A 12-inch diameter Driscopipe access riser.

The Cell 3 LDS is inspected annually to ensure the system piping is open, fully functioning and free of soil, debris and detritus by video camera pursuant to the approved License, Part 11.3.A.

Further, Cell 3 is operated as required by the regulations, the License and GWDP. No evidence has been presented to contradict the records on file, which indicate Cell 3 is functioning as required. Cell 3 is fully functional, is operating as engineered, and is licensed to continue to accept 11e.(2) byproduct material. The commenter has provided no evidence to refute the continued operation of Cell 3.

The comment states that "DWMRC continues to use unsubstantiated and outdated hypotheses and lines of evidence provided by EFRI that the groundwater is not being polluted." This comment is based on opinion and is not based on scientific data or analysis. First, as noted in the EFRI response to comment 9.h above (Section 2.5), the technical basis for each SAR is based on an individual well and individual parameter in out-of-compliance status. The SARs include several investigations based on all available data to provide supporting lines of evidence to eliminate the Mill as the source of the exceedances.

Contrary to the statement that EFRI uses "unsubstantiated and outdated hypotheses", the geochemical mechanisms put forth in Mill reports are well documented in the literature. Furthermore, the compliance data collected at the Mill are compiled and added to the existing dataset. The comprehensive dataset for the Mill is frequently reviewed and the review consistently verifies, substantiates and supports the geochemical mechanisms established in Mill reports.

There is no relaxation of groundwater standards as the commenter implies. The standards are based on well-specific background values established and calculated based on many years of analytical data. Geochemical changes resulting from natural conditions present in the subsurface cause changes to the groundwater, which must be addressed. Many of the geochemical changes are evident upgradient from the TMS and could not be caused by Mill activities. Adjustments are made to GWCLs when natural processes cause changes outside of the Mill's control.

That an EPA inspector may have expressed "preference" for Cells 4A and 4B is irrelevant. EPA does not regulate the Mill site. As stated above Cell 3 is fully functional, is operating as engineered and is licensed to continue to receive 11e.(2) byproduct material until it is filled up (and it is almost filled up at this time). The formal Offsite Rule determinations made by EPA for the Mill do not limit the use of Cell 3 or indicate a preference for Cells 4A or 4B.

2.8. Ute Mountain Ute Tribe Comment 12.

Allowing twice as much ISL waste from external entity facilities and as much as they want from their own ISL facilities further demonstrates that the profitable use of the White Mesa facility is not as a mill but as a disposal facility or "dump."

EFRI Response:

The NRC regulations in 10 CFR 40 Appendix A, Criterion 2, focus on avoiding proliferation of numerous small radioactive waste disposal sites and thereby reduce perpetual surveillance obligations at in-situ uranium recovery ("**ISR**") operations and other small remote uranium extraction sites. Accordingly, ISR facilities do not have permanent 11e.(2) disposal facilities on site. Instead, upon final closure ISR facilities are decommissioned to free-release (clean closure) standards. In order to accomplish this, as a condition of their licenses they are required to enter into and maintain a contract for the disposal of their 11e.(2) byproduct materials, during operation and at closure, at an existing off-site licensed 11e.(2) byproduct disposal facility, such as the Mill. In response to Criterion 2 referenced above, and to accommodate the license requirements of ISR facilities under this program, the Mill has received and disposed of 11e.(2) byproduct material from ISR facilities since 1993 under Section 10.5 of the Mill's License, UT1900479.

The portion of the Mill's revenues from acceptance of 11e.(2) byproduct has always been small in comparison to revenues from its milling and recycling operations. The Mill does not accept ISR 11e.(2) byproduct materials out of a profit motive or to be a direct disposal facility, but because it is mandated to do so by federal regulation and federal non-proliferation strategies. The Mill is doing its part to avoid the proliferation of radioactive waste disposal sites.

2.9. Ute Mountain Ute Tribe Comment 13.

Allowing twice as much ISL waste from external entity facilities and as much as they want from their own ISL facilities increases the risk of transportation accidents. EFRI continues to disregard the Tribe's request for neighborly notification of unusual events like roadside spills or facility malfunctions. The Tribe has provided the information EFRI requested in this regard, but EFRI has not followed through to make it happen. The State of Utah should impose this upon EFRI to notify the Tribe when undesirable events occur to alleviate fear and reduce risk to public health and environment.

EFRI Response:

The quantity of 11e.(2) byproduct material transported to the Mill will be low compared to licensed Mill operations at full capacity. At full capacity, the Mill operates at approximately 2,000 tons of ore per day, or up to 720,000 tons per year. An amount of up to 10,000 cubic yards (or approximately 10,000 tons) per year of 11e.(2) byproduct material from ISR facilities will be just over one percent of truck traffic compared to full licensed operations. The unlimited amount of 11e.(2) byproduct material from EFRI-owned sites is not expected to add significantly to that number, if at all. The risk of traffic accidents is well within the risks of traffic incidents analyzed for normal Mill operations, and would not increase the risks of accidents.

License Condition 9.2 requires the Mill to notify the DWMRC in accordance with UAC R313-15-1202 and R313-19-50. Due to the kinds and quantities of materials received and processed at the Mill, the typical incident that may occur would require notification to the DWMRC within 24 hours. EFRI would then be required to file a written report with the DWMRC regarding the

incident within 30 days. In the case of transportation incidents, the incident would be required to be reported in accordance with United States Department of Transportation ("**DOT**") requirements which would mean the shipper would be responsible for reporting the incident in compliance with 49 CFR 171.15. The shipper would be required to notify the National Response Center as soon as possible but no later than 12 hours after the incident. Please note that the Mill is not the shipper of the materials.

If the incident requires emergency response (e.g. a fire or a chemical spill) then the Mill would follow its Emergency Response Plan and contact local emergency responders (e.g. fire department, sheriff department, etc.).

The radioactive materials received and processed at the Mill are not high-level radioactive materials. The final product the Mill produces is yellowcake, which must go through conversion and enrichment at other facilities before it becomes concentrated to the point that it can be used as fuel for a nuclear power plant. The Mill is the first step in the process, and material at the Mill does not have the same level of hazards found at nuclear power plants. The material at the Mill cannot cause a fission event to occur, so the emergency response requirements for power plants do not apply to the Mill. The incidents that have occurred at the Mill are not incidents that have caused an issue for individuals in either the City of Blanding or the White Mesa Community.

As with any other business in the State of Utah, the Mill would contact the local emergency responders if there was a need for a response from the police, the fire department, or for medical assistance. Since the White Mesa Community does not provide emergency services to the Mill and the Mill is outside of the jurisdiction of the White Mesa Community, the Mill would not contact the emergency officials at the White Mesa Community. Since the police, the fire department, or medical assistance would be provided by the City of Blanding or San Juan County in case of an emergency at the Mill, the Mill would contact those emergency officials, not the emergency officials in the White Mesa Community.

Although it is very unlikely that an incident requiring the citizens of the City of Blanding or the Community of White Mesa to evacuate due to radiation exposure levels would ever occur, if the citizens in either Blanding or White Mesa need to take specific actions due to an incident at the Mill, emergency personnel are much more efficient at notifying necessary emergency personnel in surrounding jurisdictions and the citizens in those jurisdictions of any necessary actions that need to be taken. Mill personnel would not have time to make multiple phone calls to different jurisdictions since they would either be addressing the emergency issue or evacuating the area themselves. By notifying the local emergency personnel for their facility, the Mill would effectively be opening the emergency network and notification process for the surrounding jurisdictions. If additional jurisdictions would be involved in the response to an incident, emergency personnel have set protocols and are much more efficient in notifying all of the necessary emergency personnel regarding the need for response.

Having said this, however, the Mill has advised the Ute Tribe that it is prepared to consider providing courtesy notifications to the White Mesa Community in a manner that would not interfere with actions taken by emergency response personnel with jurisdiction over the site.

2.10. Ute Mountain Ute Tribe Comment 15.

No description of transportation routes to White Mesa from Estonia have been provided by the State. An Environmental Impact Analysis for the transportation must be conducted by someone. If not the State of Utah, then the Nuclear Regulatory Commission. While the DWMRC has repeatedly indicated that it is not their responsibility to conduct transportation related analyses, DWMRC is proposing to permit the activity, and as an Agreement State, they have inherited the obligation to consider the impact beyond the borders of the State of Utah if authorizing it to happen.

EFRI Response:

The comment is incorrect regarding both rail and road transport.
Rail Transport

EFRI's license amendment application for receipt of material from Silmet provided a description of rail transportation routes from arrival in the US (from Estonia) to the Mill. The primary route involves unloading shipping containers onto intermodal rail cars at the port of entry and transported by rail to one of the existing rail transfer yards in Utah (e.g., Green River), followed by transfer to intermodal truck tractors from the railhead to the Mill. This was stated in the license amendment application.

Regardless of port of entry, if rail transport from the port of entry is chosen, the rail transfer yards are northeast of the Mill, and road transport for the last leg of the trip would be along US Highway 191 to the Mill. The route does not approach the White Mesa Community or tribal land. The Utah portion of the route was evaluated in the license amendment application, including:

- Transportation radiological impacts;
- Traffic impacts; and
- Transportation accidents.

Truck Transport

EFRI's license amendment application for receipt of material from Silmet provided a description of truck transportation routes from arrival in the US (from Estonia) to White Mesa Mill.

For the use of trucks from the port of entry the Utah portion of the route was evaluated in the license amendment application, including:

- Transportation radiological impacts;
- Traffic impacts; and
- Transportation accidents.

DWMRC does not have any authority to conduct transportation evaluations or limit transportation activities outside of the boundaries of the state of Utah. The NRC has evaluated regional and national impacts from transportation of materials related to licensed Mill activities in its *1980 Final Generic Environmental Impact on Uranium Milling* ("**GEIS**") and the original ER for the White Mesa Mill. The NRC GEIS evaluated effects from transportation of uranium ores and yellowcake product with far greater radioactivity than the Silmet material. The NRC GEIS evaluated the transport of tank trucks of leach acid, ammonia, sodium hydroxide caustic, and other powdered and liquid chemicals with far greater chemical hazard properties than the Silmet material. Under the Agreement the State of Utah made with the NRC, DWMRC has the responsibility to use its "best efforts" to maintain compatibility with the federal program. The federal program, though the NRC GEIS, has evaluated and accepted the transportation of radioactive materials and hazardous chemicals throughout the western US, within and outside the boundaries of the State of Utah.

Moreover, DOT, not the NRC or DWMRC, regulates the use of roads and rail, whether from international ports of entry, or US points of origin along US transportation corridors. DOT does not perform Environmental Impact Assessments on a per-project basis. Instead, they follow an even stricter control strategy under which they have established for every type of hazardous material transported on US corridors specific requirements and inspection programs for:

- Package, container and vehicle type;
- Marking and placarding;
- Documentation;
- Route notification;
- Spill and emergency notification;
- Spill and emergency response action;
- Carrier and driver training; and
- other requirements.

As a matter of federal regulation, the Silmet material, regardless of rail or road transport or selected route, will be subject to all of these requirements. As a result there is no need for DWMRC to perform any further evaluations on transportation matters.

2.11. Ute Mountain Ute Tribe Comment 16.

In the Technical Evaluation and Environmental Analysis (TEEA) for the Silmet (Estonia) Alternate Feed White Mesa Uranium Mill renewal application (Silmet Application) on page 21, and repeated in the TEEA for the Moffat Tunnel Alternate Feed on page 41-41, the Division wrote:

> *"In previous licensing actions, there have been several comments and concerns from the public about radon emanating from the White Mesa Uranium Mill. In a recent NRC guidance document, DIVISION OF DECOMMISSION/NG, URANIUM RECOVERY, AND WASTE*

PROGRAMS INTERIM STAFF GUIDANCE DUWP-ISG-01 EVALUATIONS OF URANIUM RECOVERY FACILITY SURVEYS OF RADON AND RADON PROGENY IN AIR AND DEMONSTRATIONS OF COMPLIANCE WITH 10 CFR 20.130,1 published in June of 2019 the NRC references a study that indicates that radon emissions from a uranium recovery facility would be statistically no different, or indistinguishable, from natural background radon levels at a distance of one mile from the source of the radon. This is due to air dispersion. The closest residences to the White Mesa Uranium Mill in any direction are more than one mile away. This means radon emission from the White Mesa Uranium Mill is not a significant contributor to Public dose outside the mill fence line."

The Silmet and Moffat Tunnel TEEA completely neglected the very important discussion also stated in that section referenced above, (from the NRC guidance document) which discusses radon concentrations from mill tailings from a variety of mill locations:

"In many cases, the low speed, drainage winds that occur at night under relatively stable atmospheric conditions are the winds that may result in the highest radon concentrations and may contribute the most to annual doses. Thus, effects of topography should be considered when determining likely locations of highest radon concentrations."

As indicated in the 2017 response to the WMM License renewal, the wind rose below (Figure 1), a compilation of meteorological data from the White Mesa Community, indicated the majority of the calm winds come from several of the northern sectors toward the White Mesa Community and are less than 3.6 m/s or 8 miles per hour. This same observation has been documented in the WM Mill's own data files Figures 2-6 (taken from Appendix C to the EFR's 2018 Cells 5A and 5B License and GWDP Amendment Request which are presented below). The windroses present the exact conditions of ***low speed drainage winds,*** *which are cautioned by the NRC as those that pose the most risk or highest radon concentrations. These low speed winds impact the White Mesa Community and members and visitors sense these impacts through the smell of surrogate organic fumes that, unlike radon, can be experienced by the human population.*

The natural features surrounding the mill and the White Mesa Community are varied, indicating a 'complex' terrain which is not accounted for in models such as MILDOS, and should be seriously evaluated as a concern to the community downwind who may be at risk.

EFRI Response:

This question relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

It should be noted that that the natural (topographic) features surrounding the Mill are in fact appropriately reflected in local meteorology as measured onsite and used in evaluation of air dispersion at the Mill. McVehil-Monnet Associates (MMA) indicate in their 21 May 1998 report, that:

> *"However, as discussed below, existing meteorological and air monitoring is fully adequate to assess concentrations at all locations where winds transport mill effluents." (MMA Response 3)*

and further, MMA state in their summary that:

> *"[MMA] believes that the existing monitoring program is fully protective of public health in the region. We believe, based on our careful evaluation of site specific dispersion conditions and historical monitoring data that an additional [monitoring] station is not warranted" in the vicinity of the White Mesa Community.*

Nevertheless, the Mill voluntarily added BHV-6 in 1998, between the Mill and the White Mesa Community, at the request of the White Mesa Community.

With respect to radon levels at the Mill, the measured radon concentrations at the Mill's BHV locations typically show levels of about 0.2 pCi/L after background subtraction. BHV-3, the background station is located, for practical purposes, due west of the Mills tailings ponds with winds blowing from the Mill towards BHV-3 relatively rarely, of the order of <5% of the time, which means that site conditions have little effect on the concentrations measured at BHV-3.

It should be noted that radon monitoring had been carried out earlier, but was discontinued with the agreement of the NRC in 1995. However, in 2013 EFRI voluntarily began ambient Radon-222 monitoring at some stations and later in 2014 the monitoring program was expanded to include collection of Radon-222 data all BHV stations.

As discussed in the Mill's Semi Annual Effluent reports, the measured incremental (i.e., above background) radon-222 concentration are all quite low with most values below 0.4pCi/L, which is the average outdoor background level in the United States; reported by the EPA.(see for example, Citizens Guide to Radon: EPA402/K-12/002|2016|www.epa.gov/radon). Thus, the effect of the Mill on local radon levels is very small.

Finally, in addition to the comprehensive environmental monitoring performed by EFRI at the Mill, the MILDOS AREA computer code which has been approved and is widely used to assess potential doses arising from operation of the Mill (and similar facilities) demonstrates that the people who might live around the Mill would receive very small doses of less than 10 mrem/yr. These potential doses are not only small compared to the Utah requirement (Utah Administrative Code R313-15-301(1)(a)) requires that the dose to an individual should be below 100 mrem/yr) but an even smaller fraction of the unavoidable dose from natural background of about 300 mrem/yr.

2.12. Ute Mountain Ute Tribe Comment 17.

Also on page 31 of the TEEA for the Silmet, (also reiterated in the Moffat Tunnel TEAA on page 41-42) the Division wrote,

"Radon measurements collected from the Mill's environmental monitoring stations and reported to the Division in the semi-annual environmental reports confirm this study's conclusions. Therefore, processing the Si/met uranium bearing material will not increase the public dose from radon."

Regarding monitoring efforts by the WM Mill, in the 1998 Study at White Mesa Mill by Nielson and Walter of Rogers Engineering and Associates, the background location for radon had been questioned with the statement below.

"However, analysis of the total concentrations at the background location (BHV-3) during active and inactive mill operations shows that the "background" levels are about twice as high during active operations as during inactive periods.

The cause of the background bias may be that the back ground sit is too close to the Mill (about 2.6 miles, instead of the 9.4 mile minimum originally stated by NRC in its Environmental Statement for the White Mesa Mill)/."

In effect, this statement proves that the background location is not measuring true background, but a value higher than background. Because the net effluent concentrations are a result of the effluent measurements data where the 'higher than background value' is subtracted out, this causes the reported effluent concentrations to be lower than actual.

(From Nielson, K. K., Walter, P., Rogers and Associates Engineering Corporation Preliminary Risk Assessment for the White Mesa Community. P17, 1997)

EFRI Response:

This question relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

It has been noted above, in our response to Question 16, that the location of BHV-3 is in fact appropriate for a background station.

In addition to the low frequency of time that winds blow from the Mill towards BHV-3 as noted above, it is important to understand that radon concentrations from the tailings areas for example would decrease by more than a factor of ten through natural atmospheric dispersion, further decreasing the potential for background levels at BHV-3 to be impacted by radon arising from Mill activities.

Interestingly, the average wind speed for all directions at the Mill meteorological station is about 3.6 m/s, with winds blowing from east to west from the Mill toward BHV-3 having an average speed of about 4.3 m/s suggesting, that on average, dispersion of radon released from Mill activities would be dispersed more readily when winds blow from east to west than on average. This observation is contrary to the opinion expressed by Rogers Engineering in their 1998 report. (see for example the wind data reported in the Mill's Semi Annual Report for January1-June 30, 2020).

It should be noted also that outdoor radon levels vary widely by location local (geology), by time of day and by season depending on such factors as season, soil moisture and weather, and thus a variation in natural background radon levels is not unexpected. Further, the average background radon concentrations measured at BHV-3 are approximately 0.21 (with an upper 95th percentile of 0.49 pCi/L) pCi/l, which is typical for radon background concentrations in the United States. As noted, typical United States background is about 0.4 pCi/L with a range of about 0.16 pCi/L to 0.57 pCi/L, comparable to that seen at BHV-3. The ambient radon levels on the Colorado Plateau are typically higher than average continental US levels on the Colorado Plateau which provides further support for the choice of BHV-3 as an appropriate background station for radon monitoring at the Mill (NCRP 2009).

National Council on Radiation Protection and Measurements ("**NCRP**") Report No. 160, *Ionizing Radiation Exposure of the Population of the United States (2009)*

2.13. Ute Mountain Ute Tribe Comment 18.

The Silmet Materials are from what could be considered as a 'legacy' site from a country ruled under the old USSR. The plant began processing uranium in 1940, and operated through until 1990, manufacturing reactor-fuel-grade uranium during that time period from other Soviet block countries. Though the application maintains that the waste stream had operations "in a separate portion" of the facility, as stated In the Silmet Alternative Feed Application (April 2019), cross-contamination could have occurred as it had in some facilities in the US, where fission product contamination had been discovered in a uranium metal facility.

In the application, there was testing data for expected radionuclides (Ra-226 and Ra-228) and not any others. More thorough testing to include ***gamma spectroscopy for possible fission product identification*** *from possible contaminants from this 'legacy' site is essential prior to acceptance and processing.*

EFRI Response:

The commenter is incorrect in stating there was testing data for *"(Ra-226 and Ra-228) and not any others."* Silmet provided data on Ra-226, Th-228, Th-230, Th232, U-nat, and Pb-210 from over 30 composite samples which included material from every single drum of material.

The commenter is incorrect in stating that ***"gamma spectroscopy for possible fission product identification. . . is essential".*** The Silmet facility provided sufficient data to confirm that enriched uranium, reactor fuel, or reactor fission products were not present. Of the dozens of radionuclide analyses, and 15 or more metal assays, there was more than enough data to confirm that the Silmet material was neither enriched reactor fuel-grade material nor reactor waste/spent fuel.

Specifically,

- The data on "expected radionuclides" Ra-226, Th-228, Th-230, Th232, U-235, U-238, Pb-210 are present in relative abundances which indicate that the material is natural uranium bearing material. Even without measuring other isotopes, the isotopic ratios demonstrate that this material cannot be either enriched material (which, for example, would have uranium values far higher relative to other isotopes), nor spent fuel.

- The metals analyses showed only 1.8 mg/kg of beryllium, the primary neutron absorber in a uranium reactor. This value is far too low to be reactor fuel or spent fuel.

- The assays and laboratory analyses for metals did not show fission byproduct metals such as palladium, rhodium, or ruthenium, among others. Hence the material did not originate from spent fuel.

The commenter is also incorrect in stating that the site could have "fission products based on its *"legacy"* activities. Fission products could only appear on site in one of two ways. Either:

- The site would have had to operate a nuclear reactor and remove and manage spent fuel on site, and cross contaminate the Silmet uranium material; or

- The site would have had to recycle spent fuel from reactor sites elsewhere to recover metals and re-usable uranium for fissionable fuel, and cross contaminate the Silmet uranium material.

The facility did neither. The facility never operated a nuclear reactor on site. As stated in the amendment application, over its history, the facility produced fuel grade uranium from uranium ores, not recycled fuel. Additionally, as stated in the amendment application, the part of the facility which produced the uranium material was not simply "separate", it was hermetically sealed from the feed stage through packaging.

As a result, no further testing of the Silmet material is required.

2.14. Ute Mountain Ute Tribe Comment 19.

What is the technical basis for the Silmet Materials or the materials consisting of the residuals from niobium and tantalum recovery from columbite and tantalite ore concentrates not being disposed or further processed in Estonia? Estonia processed the materials and the materials should be kept there, reducing risk from transportation and ultimately to the White Mesa Community Members in Utah.

EFRI Response:

First, as discussed in the amendment application, Silmet cannot maintain the material on site in Estonia nor can it be further processed on site in Estonia. Silmet prefers not to dispose of the

uranium material as waste, whether on site in Estonia or elsewhere in Europe or the US, but instead desires to recycle the uranium content of the material to the extent possible. The Mill is the only available facility capable of recycling the uranium content of the material, inside or outside the US. As a responsible global citizen, Silmet favors recycling over direct disposal when it is an option.

Second, as discussed in multiple other comment responses, the transportation, receipt, handling, processing and disposal risks at the Mill from the Silmet materials are no different from the risks associated with conventional ore processing operations at the Mill, which the Mill has been doing safely and in compliance with regulatory requirements for the last 40 years. The Silmet materials represent a very small percentage of normal Mill operating capacity and will impose no risks to public health, safety or the environment over and above previously licensed activities.

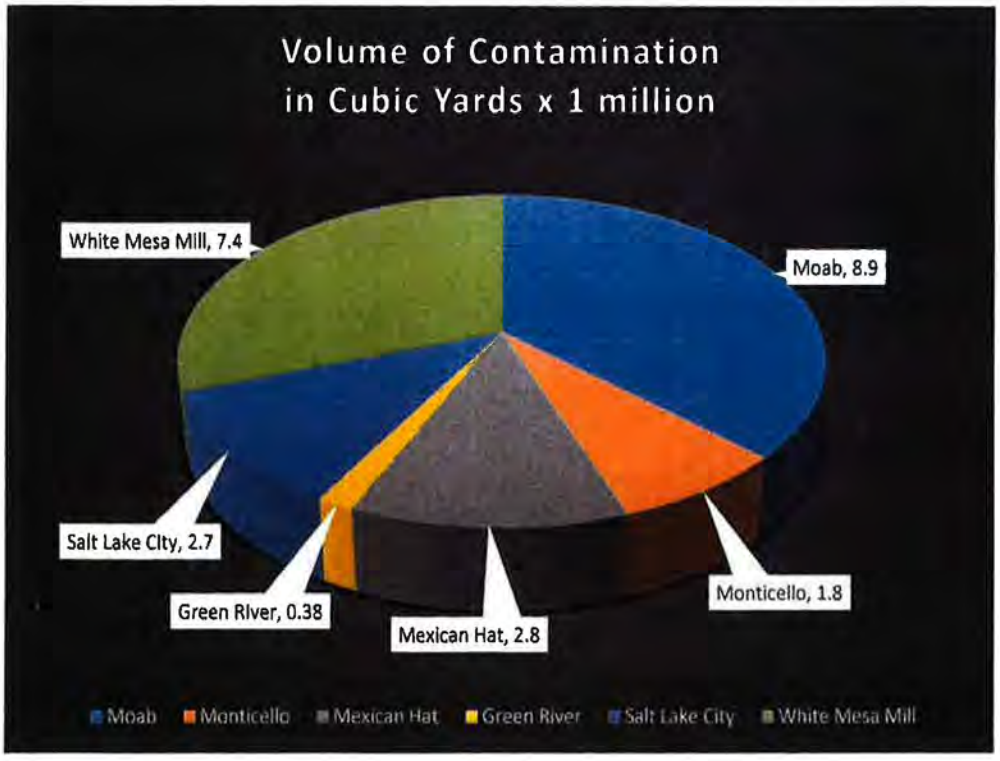
2.15. Ute Mountain Ute Tribe Comment 20.

According to the original EA of 1978 and historical practices, the White Mesa Mill should have already entered closure and ceased accepting any more material. The Tribe has commented over the past years on the Alternate feed materials being processed at a Mill (originally stated in the Environmental report of 1978 that the uranium materials would be from the Colorado Plateau mines and Arizona Strip Mines). The Tribe upholds that opinion and opposes the importation of feed material from overseas. For the conventional tailing impoundments, based on maximum capacity of Cell 2 and 3, and Cell 4a processed volume (as of 2016), the amount of radioactive tailings in the White Mesa cells are about 7,360,000 cubic yards, which is about half the total volume of ***all*** *the past Uranium Mill Tailing Remediation Act or Superfund Project Sites (mill tailing sites) in Utah. In fact, the tailings impoundments at the White Mesa Mill in Utah are currently almost as large as the Moab Mill cleanup. See Table 1, The Utah Uranium Mill Site Contamination Volumes and associated Areas and Costs, and Figure 7: The Utah Uranium Mill Site Contamination Volumes.*

Table 1: The Utah Uranium Mill Site Contamination Volumes and associated Areas and Costs

Utah Uranium Mill Sites	Volume of contamination (Cubic Yards x 1,000,000)	Per cent of Past Total U Mill Sites	Area of Tailings	Costs of Cleanup normalized to 2010 (In Millions of Dollars)
Moab	8.9	0.54	160	720
Monticello	1.8	0.11	318	520
Mexican Hat	2.81	0.17	250	105
Green River	0.38	0.02	48	NA
Salt Lake City	2.71	0.16	128	177
Total Utah	**16.59**		904	
White Mesa Mill	*7.36*	*0.44*	*284*	

Figure 7: The Utah Uranium Mill Site Contamination Volumes



EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Cell 4A is only 35% full as of September 2020, which reduces the above numbers for the Mill to 6.0 million. There is no basis for comparing the sites above to the Mill since they were legacy sites that all involved relocations to offsite, newly constructed disposal cells.

Under applicable federal and state regulations, EFRI must provide adequate financial assurance or surety, to complete all decommissioning and remediation efforts required at the Mill should EFRI prove unable or unwilling to perform those tasks at the time they are required. Several commenters have made suggestions to the effect that DWMRC should increase the amount of financial assurance for the Mill, assuming that insufficient moneys have been set aside for the decommissioning and closure of the Mill site. Again, these types of comments apply to the Mill License generally and not to this specific License Amendment, and are therefore not relevant to this licensing action.

R313-22-35(1)(a) requires EFRI, as Licensee of the Mill, to submit a decommissioning funding plan as the basis of the Mills surety. The Division has incorporated at R313-22-35(h) a requirement to follow the recommendations of NRC's *Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness (Revision 1)* NUREG-1757, Volume 3, applicable to all radioactive materials licensees, to develop the surety estimate, even though NUREG-1620 (Revision 1), *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*, was intended to apply more specifically to uranium recovery facilities. The Division did this, in part, to achieve uniformity, so all radioactive material licensees would be treated alike.

The amount of the financial surety is set based on specific regulatory requirements, as they apply to the Mill's reclamation plan. Annually, DWMRC reviews in detail the adequacy of the EFRI financial assurance, as required by applicable regulations and the License. DWMRC does not have authority to require financial assurance in excess of that required by the application of applicable regulations to the Mill's site and specific reclamation plan.

Some commenters have challenged DWMRC on more than this one occasion to compare decommissioning costs as estimated by EFRI with the cost of cleanup efforts at other mill sites. Each facility's financial assurance determination is site-specific. Comparison of reclamation costs at various mill sites is often not a useful exercise because of unique, site-specific factors. The following, non-exclusive list of examples is noted as compared to the Mill:

- Other decommissioned mill sites were constructed when standards for environmental protection were weaker or nonexistent. For example, their tailings impoundments were not lined, so their process fluids readily leached into groundwater. Treating the Mill site in this manner would not take into account all of the preventive measures already in place, and would thus overestimate the reclamation costs involved;

- Previous sites had little or no monitoring networks in place to facilitate early detection and cleanup of releases. At the Mill, robust monitoring networks are in place. Those networks have detected historic chloroform and nitrate plumes (which do not relate to the impoundments onsite), which are currently in cleanup or control phases. The monitoring network has also proved successful in confirming the success of liner-breach repair efforts at Cell 1.

- Previous sites had no ongoing cleanup efforts; the entire expense was borne at the decommissioning phase of the project life cycle. That is not true for the Mill site in the case of the chloroform plume, which is undergoing cleanup, and surety funds have been set aside for work yet to be done. In the case of the nitrate/chloride plume, money has also been set aside in the surety to address the plume, and money has already been expended to isolate the plume from storm water so it will not be driven into the groundwater.

- Many of the previously decommissioned mill sites were poorly sited. For an extreme example, Atlas was located on the bank of the Colorado River near Moab, Utah. The Mill property underwent a different siting process as required by 10 CFR Part 40 Appendix A, leading to fewer potential impacts offsite and more opportunity to address problems at lower cost. Groundwater is deep at the Mill site (excepting the small perched aquifer under the site). A substantial clay/rock aquiclude prevents rapid migration of water from the surface into the groundwater. This geologic setting provides opportunity to address any potential releases, if they occur, before they could impact the groundwater and become much more expensive to handle. Furthermore, with the arid climate and a good cover system, the tailings will not need to be moved, sparing the expense that sites like Atlas experienced.

The surety is complete and conservative. Again using the Atlas site as an example, the Atlas Licensee successfully avoided securing even 1% of the required surety because of a weak historic regulatory regime. Such is not the case at the Mill, which is subject to a more modern, stricter regulatory regime.

The current contingency value in the reclamation cost estimate of 25% is in line with industry standards, and is higher than that recommended in NUREG-1620, which is the guidance for uranium mill sites. Rule R313-22-35(3)(h) incorporated NUREG-1757 Volume 3 by reference. That volume specifies a contingency value of no less than 25% in several locations.

It is important to note that EFRI is required to include the construction of the legacy rock armor cover in the surety. The rock armor cover is projected to cost more than the proposed evapotranspiration cover system. If decommissioning occurs prior to the evapotranspiration cover study program concluding or if the study demonstrates that the proposed cover does not function sufficiently well, the legacy cover will be implemented. Since the more expensive cover is included in the surety, the question of sufficiency for this line item is answered in the affirmative.

2.16. Ute Mountain Ute Tribe Comment 21.

Statement on the Reclamation Plan Surety Costs:

In Table 1, the costs associated with the closed and reclaimed uranium mills in Utah are listed with inflation to indicate the expenses in 2010. The Energy Fuels surety required by the license should be raised to comparable levels to ensure environmental (including land, surface water and groundwater) risks will be reduced to 'safe' levels during and postclosure at the mill site for one thousand years. Current surety bonds for the White Mesa Mill are in the ***tens*** *of millions (approximately $20 million on average) while clean-up costs for similar mills historically have been in the* ***hundreds*** *of millions.*

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

See the responses to Section 2.15, Ute Mountain Ute Tribe Comment 20, above.

2.17. Ute Mountain Ute Tribe Comment 23.

Preservation and protection of the groundwater and seeps in and around White Mesa is a matter of extreme concern to the Tribe and its members.

The Mill overlies the deep Navajo aquifer which is the source of drinking water for Tribe's White Mesa Community. The shallow Burro Canyon aquifer underlies White Mesa and is connected to surface water springs relied on for cultural use which may include drinking water and for the support of native ecology and wildlife.

Under Utah's Groundwater Protection Program, the deep Navajo aquifer beneath the White Mesa is classified as a Class Ia_ and 1b groundwater as both a pristine and irreplaceable active source of community drinking water, while the shallow Burro Canyon aquifer is classified varyingly as Class 1c, II and Class III groundwater.

Class 1a pristine groundwater is to be protected for use as drinking water or other similar beneficial use. UAC R317-6-3.2

Class 1b irreplaceable groundwater is a source of water for a community public drinking water system and is to be protected for use as drinking water or other similar beneficial use. UAC R317 6-3.3.

Class 1c groundwater is ecologically important groundwater to be protected for the continued existence of wildlife habitat. UAC R317 6-3.4.

Class II ground water is to be protected for use as drinking water or other similar beneficial use with conventional treatment prior to use. UAC R317-6-4.5.A.

Class III ground water is to be protected as a potential source of drinking water, after substantial treatment, and as a source of water for industry and agriculture. UAC R317-6- 4.6.A.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

This comment demonstrates the generally poor quality and highly variable character of perched groundwater within the Burro Canyon Formation, which is consistent with the variable background water quality found at the Mill. Groundwater within the deep Navajo aquifer is of relatively high quality and does not communicate with the shallow perched groundwater because of natural protections that are in place. The deep Navajo aquifer is also protected from Mill operations due to these same natural protections in addition to engineered protections as outlined below:

- The Navajo aquifer is located approximately 1,200 feet beneath the Mill and more than 1,000 feet beneath the base of the monitored perched water zone;
- The Navajo aquifer is separated from the base of the perched zone by more than 1,000 feet of materials having low average vertical permeability, including hundreds of feet of bentonitic shale which functions as an aquiclude;
- The Navajo aquifer is protected by bore seals in the deep wells;
- The Navajo aquifer is additionally protected by artesian pressure, which causes water in the deep wells to rise nearly 800 feet above the top of the aquifer; and
- With respect to perched groundwater flow, all three wells (WW-2, WW-4 and WW-5) are located either upgradient to far upgradient (north-northeast) or far cross-gradient (southeast) of the TMS and Mill processing areas. Their locations make it even more unlikely that they could ever be affected by perched water potentially impacted by Mill activities.

There is therefore no real possibility of the Mill impacting the Navajo aquifer. As discussed in Section 1.2 above, there is no evidence of any contamination of the perched aquifer from the TMS or other Mill activities.

2.18. Ute Mountain Ute Tribe Comment 24.

Quarterly groundwater monitoring reports submitted by EFRI, including the most recent in 2020, show progressive and alarming degradation of the quality of the shallow groundwater, with

exceedances of groundwater contaminant levels (GWCLs), lowering pH to more acidic conditions, and increasing trends in many monitored metals and other parameters.

24.a. Ongoing corrective actions to address the chloroform contaminant plume and the nitrate/chloride contaminant plume have not achieved any significant reductions in the areal extent, concentrations or contaminant masses of these plumes after several years of corrective action. Corrective Action Plan Comprehensive Monitoring Reports submitted by EFRI conclude that the current corrective actions will not remove the plumes or reduce them to acceptable levels for decades or hundreds of years, if ever.

24.b. The Tribe urges the Division to require EFRI take additional effective investigative and corrective actions to identify and address the root causes of the contamination, rather than artificially relaxing GWCLs to excuse noncompliant data and allow further degradation of groundwater quality.

24.c. The Division should not approve additional waste streams and feed materials at the Mill until the root causes of the contamination have been identified and controlled.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

As discussed in HGC (2012) [the pyrite report], the site-wide nature of pH declines at the Mill, which occurs in wells upgradient, cross-gradient, within, and downgradient of the TMS, indicate a natural cause such as pyrite oxidation, which is now even more plausible because of the generally high dissolved oxygen ("**DO**") measured in site wells. As discussed in the pyrite report and HGC (2018a), nitrate within the commingled nitrate and chloride plumes (collectively the nitrate/chloride plume), which originates upgradient of the Mill and TMS, may also oxidize pyrite; calculations showing that oxidation of pyrite by nitrate does occur is provided in HGC (2017) (the nitrate Corrective Action Comprehensive Monitoring Evaluation ["**CACME**"]) and HGC (2018b). Pyrite degradation by oxygen, and by one nitrate pathway, releases acid which lowers pH and causes mobilization of naturally-occurring pH-sensitive metals within the formation. Mobilization of such metals with decreasing pH is discussed in various publications including Gardner et al (2015); Boschi and Willenbring (2016); Lodenius and Autio (1989); McClean and Bledsoe (1992); Warwick et al (1998); and Yanhao et al (2018). Because the causes of site-wide pH decrease and corresponding pH-sensitive metals increase have been identified as naturally-occurring, there is no need for additional investigation other than as required for the preparation of the SARs when a GWCL is exceeded at a particular well.

With regard to the chloroform and nitrate/chloride plumes: 1) the primary sources of these plumes pre-date Mill operations and are located either upgradient of the Mill and TMS (nitrate/chloride), or up and cross-gradient of the TMS (chloroform); and 2) both average and maximum concentrations, and residual mass estimates within these plumes are decreasing, as discussed in HGC (2020) [the chloroform CACME]; and the nitrate CACME).

For example, the highest measured chloroform concentration at TW4-20 (61,000 micrograms per liter [µg/L] during the second quarter of 2006) had dropped by an order of magnitude (to less than 6,000 µg/L) by the second quarter of 2020; and the highest nitrate concentration of 111 milligrams per liter (mg/L) at TWN-2 during the fourth quarter of 2013 had dropped to approximately 16 mg/L by the second quarter of 2020. In addition, although the boundaries of the plumes have expanded in some areas and contracted in others, the total areas of the chloroform and nitrate/chloride plumes have been relatively stable since mid-2016 and the end of 2018, respectively. The area of the nitrate plume was approximately 77 acres in the fourth quarter of 2018 and in the second quarter of 2020; and the area of the chloroform plume was nearly 50 acres in the second quarter of 2016 and less than 49 acres in the second quarter of 2020. Furthermore, the downgradient (southern) boundary of the nitrate plume has been stable since 2010; and the proportion of the chloroform plume mass under hydraulic capture has exceeded 97% since the first quarter of 2019, indicating that both plumes are under control.

Both concentrations and residual mass estimates for the chloroform and nitrate/chloride plumes were expected to temporarily increase after cessation of water delivery to the unlined northern wildlife ponds in 2012. Seepage of water from these upgradient ponds provided a source of dilution for both chloroform and nitrate which limited concentrations, residual mass estimates, and plume areas. However, seepage from these ponds had created a perched groundwater mound that was increasing hydraulic gradients and contributing to faster migration of both plumes. Because temporarily increased concentrations were judged less important than plume migration, water delivery to the wildlife ponds ceased in 2012, the groundwater mound and hydraulic gradients began to diminish, and concentrations within the plumes, especially the chloroform plume, which was closer to and more directly downgradient of the northern wildlife ponds, temporarily increased as expected. However, since 2010, residual mass estimates for the nitrate plume have trended downward in spite of the reduced dilution; and concentrations and residual mass estimates for the chloroform plume, while demonstrating the expected temporary increase, dropped after mid-2016. Since the second quarter of 2016 the residual mass estimates for the chloroform plume have decreased by more than 50%. Since 2010, residual mass estimates for the nitrate plume have decreased by more than 30%.

Both plumes are under active remediation by pumping; however, as discussed above, both plumes are also degrading naturally. Calculations of natural degradation rates in both plumes indicate that both would naturally degrade within less than 200 years if all pumping ceased immediately (chloroform and nitrate CACME reports). Due to generally small rates of groundwater migration downgradient of both plumes, neither plume is expected to reach a property boundary before degrading naturally. However, ongoing active pumping substantially increases mass removal rates and will significantly reduce remediation times and plume migration rates.

Because the likely sources of both plumes, which pre-date Mill operations, have been identified; and because both plumes are under active remediation and would degrade naturally before reaching a property boundary even if active remediation activities ceased; there is no need for any additional investigation or remedial action.

Boschi, Vanessa and Jane K Willenbring, 2016. The Effect of pH, Organic Ligand Chemistry and Mineralogy on the Sorption of Beryllium over Time. Environmental Chemistry 13(4) 711-722 https://doi.org/10.1071/EN15107, February 11, 2016.

Gardner, Kevin H; Emese Hadnagy; Brant A Smith; Karen O'Shaughnessy; Ryan Fimmen; Deepti K Nair; and Heather V Rectanus, 2015. Guidance Document: Assessing the Potential for Metals Mobilization During the Application of In Situ Chemical and Oxidation Technologies. Prepared for SERDP Project Number ER-2132. May, 2015.

HGC 2012. Investigation of Pyrite in the Perched Zone. White Mesa Uranium Mill Site. Blanding, Utah. December 7, 2012.

HGC 2017. Nitrate Corrective Action Comprehensive Monitoring Evaluation (CACME) Report. White Mesa Uranium Mill Near Blanding, Utah. December 11, 2017.

HGC 2018a. Hydrogeology of the White Mesa Uranium Mill and Recommended Locations of New Perched Wells to Monitor Proposed Cells 5A and 5B. July 11, 2018.

HGC 2018b. Revised Phase III Nitrate Corrective Action Planning Document and Recommended Phase III Corrective Action. December 13, 2018.

HGC 2020. Corrective Action Comprehensive Monitoring Evaluation (CACME) Report, White Mesa Uranium Mill Near Blanding, Utah. March 30, 2020.

Lodenius, Martin and Sari Autio, 1989. Effects of Acidification on the Mobilization of Cadmium and Mercury From Soils. Archives of Environmental Contamination and Toxicology, Vol. 18, pp 261-267, January 1989.

McClean, Joan E and Bert E Bledsoe, 1992. Behavior of Metals in Soils. USEPA Groundwater Issue EPA/540/S-92/018, October 1992.

Warwick, P; A Hall; V Pashley; J Van der Lee; and A Maes, 1998. Zinc and Cadmium Mobility in Sand: Effects of pH, Speciation, Cation Exchange Capacity (CEC), Humic Acids and Metal Ions. Chemosphere, Vol. 36, Issue 10, pp 2283-2290, April 1998.

Yanhao Zhang, Haohan Zhang, Zhibin Zhang, Chengying Liu, Cuizhen Sun, Wen Zhang, Taha Marhaba, "pH Effect on Heavy Metal Release from a Polluted Sediment", Journal of Chemistry, vol. 2018, Article ID 7597640, 7 pages, 2018. https://doi.org/10.1155/2018/7597640

2.19. Ute Mountain Ute Tribe Comment 25.

25. EFR is being allowed to circumvent the Utah Groundwater Protection Regulations by constantly adjusting background levels to justify successive resetting of GWCLs to more lenient compliance levels to bring the facility into compliance, rather than being required to take effective

corrective action to identify and control the sources of contamination and to achieve compliance with the Groundwater Contamination Limits specified in its permit.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Trends in monitored constituents have been identified to result from natural causes and not potential seepage from the TMS (see the discussion in Section 2.5, Ute Mountain Ute Tribe Comment 9h, above). Increases in nitrate and chloride in some wells is attributed to the positions of these wells within or at the boundary of the nitrate/chloride plume, which originates upgradient of the Mill and TMS. Increases in uranium in some wells within the nitrate/chloride plume are most likely related to the increased mobility of uranium in the presence of nitrate, by the mechanisms documented in Senko et al (2005); Wu et al (2010); Westrop et al (2018); and Asta et al (2020). In addition, increased oxygen transport to groundwater facilitated by the installation, routine purging and sampling of monitoring wells; by pumping of chloroform and nitrate remedial wells; and by past infiltration of oxygen-rich water from the wildlife ponds, can raise DO and mobilize uranium by mechanisms discussed in Moon et al (2007).

As discussed in the response to Section 2.18, Ute Mountain Ute Comment 24, above, the site-wide decrease in pH in wells upgradient, cross-gradient, within, and downgradient of the TMS, consistent with a natural cause such as pyrite oxidation, which is now even more plausible because of the high DO measured in site wells, can account for increases in pH-sensitive metals concentrations as the result of mobilization of these naturally-occurring metals in the formation. As noted above, the sources for high DO include direct oxygen transport to groundwater via the monitoring and pumping wells; and former seepage of oxygen-rich water from the unlined wildlife ponds. Oxygen transported via wells is expected to change groundwater chemistry in the vicinities of the wells; and oxygen delivered from wildlife pond seepage is expected to impact groundwater chemistry over more extensive areas. Details of these mechanisms are provided in HGC (2012) [the pyrite report].

As discussed in the pyrite report, mechanisms that increase oxygen transport to groundwater near wells include, but are not limited to 1) diffusion into the vadose zone immediately above groundwater via screens extending into the vadose zone, aided by barometric pumping; and 2) increased direct mixing of oxygen into groundwater via agitation of the water in the wells and formation surrounding the wells as a result of routine purging and sampling, pumping, and the 2011 site-wide well redevelopment effort (HGC, 2011). Because of the large amount of naturally occurring pyrite in the formation and the continuing supply of oxygen, constituent trends such as the pH decrease related to pyrite oxidation and the consequent increases in pH–sensitive metals concentrations are expected to continue. Furthermore, it is appropriate for the DWMRC to take these natural mechanisms into account when adjusting GWCLs, once it is demonstrated that the cause is not potential TMS seepage. The extensive list of monitored parameters required by the DWMRC provides sufficient data to separate natural causes for constituent trends from those that

may potentially arise from potential TMS seepage, and to allow the DWMRC to make appropriate adjustments to GWCLs.

Asta, M., Beller, H., & O'Day, P. (2020). Anaerobic Dissolution Rates of U(IV)-Oxide by Abiotic and Nitrate- Dependent Bacterial Pathways. Enviornmental Science and Technology 54, 13, 8010-8021.

HGC 2011. Redevelopment of Existing Perched Monitoring Wells. White Mesa Uranium Mill Near Blanding, Utah. September 30, 2011.

HGC 2012. Investigation of Pyrite in the Perched Zone. White Mesa Uranium Mill Site. Blanding, Utah. December 7, 2012.

Moon, Hee Sun; John Komlos; and Peter R Jaffe, 2017. Uranium Reoxidation in Previously Bioreduced Sediment by Dissolved Oxygen and Nitrate. Environ. Sci. Technol. 2007, 41, 13, 4587–4592.

Senko, J. M., Suflita, J. M., & Krumholz, L. R. (2005). Geochemical Controls on Microbial Nitrate -Dependent U(IV) Oxidation . Geomicrobiology Journal 22, 371-378.

Westrop, Jeffery P; Nolan, PJ; Healy, Olivia; Bone, Sharon; Bargar, John R; Snow, Daniel; and Weberm Karrie J. 2018. Mobilization of Naturally Occurring Uranium Following the Influx of Nitrate into Aquifer Sediments. Geological Society of America Abstracts With Programs, Vol. 50 No. 4.

Wu, W.-M., Carley, J., Green, S., Lou, J., Kelly, S., Van Nostrand, J., et al. (2010). Effects of Nitrate on the Stability of Uranium in a Bioreduced Region of the Subsurface. Environmental Science and Technology 44, 5104-5111.

2.20. Ute Mountain Ute Tribe Comment 27.

Under the Corrective Action regulations in UAC R317-6.15, the Division may approve Alternate Corrective Action Concentration Limits ("ACACLs"), provided that numerous requirements are satisfied, including, among others, that the facility take steps to correct the source of the contamination and that any proposed Alternate Corrective Action Concentration Limit ***"shall be protective of human health, and the environment....*** *" UCA R317-6.15 G.1. Protection of human health and the environment is the over-arching standard for corrective action, and therefore, it must necessarily be the standard for assessing ongoing compliance.*

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Please see General Response in Section 1.2 above and Section 2.5, Ute Mountain Ute Tribe Comment 9h, above.

2.21. Ute Mountain Ute Tribe Comment 28.

The groundwater monitoring data show that rare toxic metals, including cadmium, beryllium, thallium, cobalt, nickel, selenium, and uranium, are accumulating in increasing concentrations in the Burro Canyon aquifer. These very same metals are found in abundance in the tailings cells, mill facility, and process solutions. There is no validated empirical evidence confirming that these toxic metals come from any other source. The state and EFRI claim these metals occur naturally in the Burro Canyon formation and aquifer, yet the state has never required EFRI to do any specific testing of the geochemistry of the Burro Canyon formation to support their assumption that the metals derive from the formation in the levels being detected in the contaminated groundwater. This is a critical data gap that must be addressed if shallow groundwater is to be preserved in accordance with the Utah Groundwater Protection Program. In the absence of such test data on the geochemistry of the Burro Canyon formation, there is no scientific basis to conclude that the alarming accumulation of toxic metals comes from any source other than the Mill's tailings cells, facility, and process solutions. The state must require EFRI to test the geochemistry of the Burro Canyon formation and provide empirical evidence to confirm whether or not the rare metals accumulating the shallow groundwater are present naturally at the levels at which they are being detected in the shallow groundwater. The state must also require an updated comprehensive isotopic study of the shallow groundwater to provide empirical evidence of whether or not the Mill's process solutions in the tailings cells are present in the shallow groundwater.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Metals monitored at the Mill occur naturally in the crust of the Earth at concentrations high enough to be mobilized in groundwater at the concentrations detected in perched monitoring wells. For example, Fleisher (1953) reports the following estimated average crustal abundances converted to parts per billion (ppb) by weight: cadmium (100 to 5,000 ppb); beryllium (5,000 to 30,000 ppb); thallium (0.8 to 600 ppb); cobalt (10,000 to 40,000 ppb); nickel 80,000 to 200,000 ppb); selenium (30 to 800 ppb); and uranium (200 to 9,000 ppb).

There is no compelling reason to suppose that these elements would not naturally be present in the perched water-bearing Burro Canyon Formation and Dakota Sandstone beneath the Mill. Some or all of these metals have been detected in far upgradient and cross-gradient wells that could not have been impacted by the TMS. In addition, the Mancos Shale directly overlying these formations is anomalous in many metals including selenium and uranium (US Department of Energy, 2011). Furthermore, as discussed in Shawe (1976), the Dakota and Burro Canyon are considered 'altered facies' rocks primarily as a result of the invasion of pore waters expelled from the overlying Mancos Shale during compaction that caused removal of hematite coatings on sand grains,

destruction of detrital black opaque minerals, and the growth of iron sulfide minerals such as pyrite. Not only were the metals contents of the Dakota and Burro Canyon increased by the invasion of Mancos Shale pore waters, the pyrite created as a result of invasion of these solutions is expected to contain significant trace metals including selenium. As discussed in Deditius et al (2011) pyrite commonly contains arsenic, lead, antimony, bismuth, copper, cobalt, nickel, zinc, gold, silver, selenium and tellurium ("As, Pb, Sb, Bi, Cu, Co, Ni, Zn, Au, Ag, Se and Te"). Oxidation of pyrite by oxygen introduced into the formation via wells or wildlife pond seepage, or by nitrate within the nitrate/chloride plume (which originates upgradient of the Mill and TMS) is expected to directly release these metals.

Furthermore, the Dakota Sandstone and Burro Canyon Formation host naturally-occurring uranium mineralization that is expected to be mobilized in the presence of oxygen and/or nitrate. Rose and Wright (1980) indicate that elements associated with sandstone-type uranium deposits include silica, vanadium, selenium, arsenic, copper, silver, chromium, lead, zinc, nickel, cobalt, rhenium, beryllium, phosphorus, manganese ("S, V, Mo, Se, As, Cu, Ag, Cr, Pb, Zn, Ni, Co, Re, Be, P, Mn") and rare earths.

Overall, considering that the Dakota Sandstone and Burro Canyon Formation have been impacted by the Mancos Shale, and that uranium mineralization with associated elements occurs naturally within these formations, it is possible that the concentrations of many or all of these metals may exceed average crustal abundances.

It is therefore not necessary for the State to require EFRI to test the geochemistry of the Burro Canyon formation or to require any additional isotopic studies of the shallow groundwater.

Brobst, Donald A, and Walden P Pratt (Editors) 1973. United States Mineral Resources. USGS Professional Paper 820, 1973.

Craig, Lawrence C, 1982. Uranium Potential of the Burro Canyon Formation in Western Colorado. USGS Open-File Report 82-222. 1982.

Deditius, Artur P; Satoshi Utsonomiya; Martin Reich; Stephen E Kesler; Rodney C Ewing; Robert Hough; and John Walshe, 2011. Trace Metal Nanoparticles in Pyrite. Ore Geology Reviews, Vol. 42, Issue 1, Nov. 2011, pp 32-46.

Fleisher, 1953. Recent Estimates of the Abundance of the Elements in the Earth's Crust. United States Geological Survey Circular 285.

Pierson, Charles T and Morris W Greene, 1980. Factors That Localized Uranium Deposition in the Dakota Sandstone, Gallup and Ambrosia Lake Mining Districts, McKinley County, New Mexico. USGS Bull 1485, 1980.US Department of Energy, 2011. Natural Contamination from the Mancos Shale. LMS/SO7480 ESL-RPT-2011-01, April 2011.

Rose, Arthur W and Robert J Wright 1980. Geochemical Exploration Models for Sedimentary Uranium Deposits. Journal of Geochemical Exploration, Nov. 1980, pp 153-179.

US Department of Energy Environmental Sciences Laboratory, 2011. Natural Contamination From the Mancos Shale. ESL-RPT-2011-01. April, 2011.

2.22. Ute Mountain Ute Tribe Comment 28a.

Cadmium is an indicator parameter of facility impact to the groundwater. Raising the GWCL for cadmium in MW-25 will conceal continuing facility releases and impact to the Burro Canyon aquifer. MW-25 is now the fifth well which shows rising trends of Cadmium at concentrations greater than 1.5 ug/L (Map 1) and is on the way to joining MW-22, MW-24/MW-24A, MW-28 exceeding health based water quality standards (UT R-317-6).

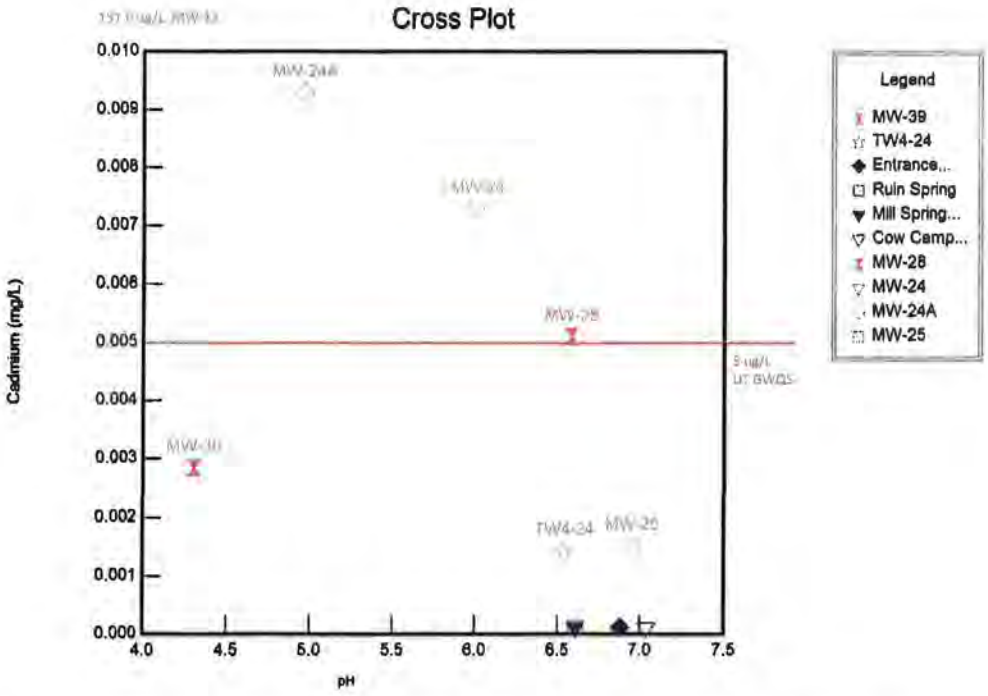
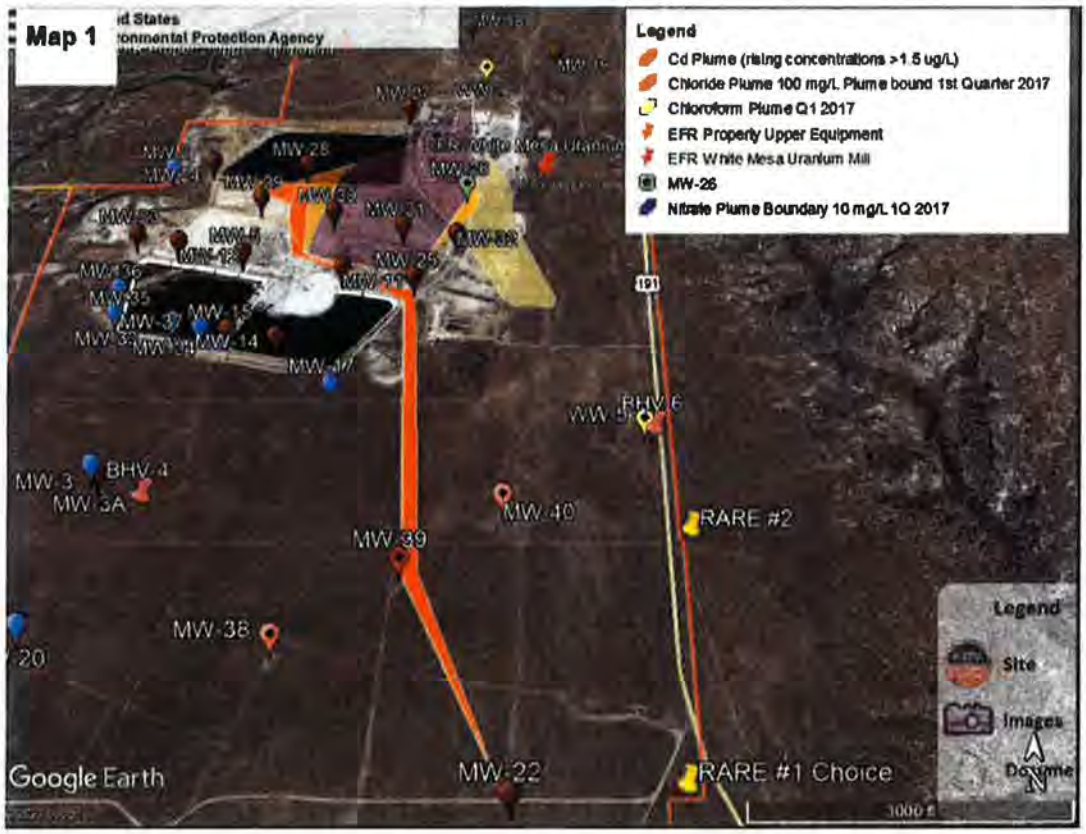


Figure 8: Cadmium/pH cross plot data for wells is from the 1st Quarter 2020 Quarterly monitoring report



EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Cadmium is a pH-sensitive metal that is only one of many parameters monitored in groundwater at the facility and is not one of the key indicator parameters for the site (i.e., chloride, sulfate, fluoride and uranium). Increases in one or even a few key indicator parameters do not necessarily indicate a TMS impact. As a pH-sensitive metal, naturally-occurring cadmium in addition to other naturally-occurring pH-sensitive metals, can be expected to be mobilized as a result of the site-wide pH decrease (McCain and Bledsoe, 1992).

In addition, there is no plausible 'pathway', as shown in 'Map 1' for transport of cadmium from the vicinity of MW-28 south to cell 3; then east to MW-11 and MW-25; then south to MW-39; then southeast to MW-22. First, the general southeast trend of the pathway is cross-gradient with respect to the southwest direction of groundwater flow. MW-25 is located generally cross-gradient of the TMS; and MW-22 and MW-39 are both located far cross-gradient of the TMS. Second, groundwater would have to migrate upgradient between MW-11 and MW-25 overcoming an increase in groundwater elevation of approximately 7 feet between these wells (which is impossible); then migrate more than 3,800 feet south to MW-39, then more than 2,500 feet

southeast to MW-22, which is also impossible over the operational period of the Mill due to the low rates of groundwater migration through the materials within which these wells are completed.

MW-25 has a hydraulic conductivity of approximately 10^{-4} centimeters per second ("**cm/s**"); MW-39 a hydraulic conductivity of approximately 2×10^{-5} cm/s; and MW-22 a hydraulic conductivity of approximately 10^{-6} cm/s. The geometric average conductivity of these wells is approximately 1.2×10^{-5} cm/s or 0.034 feet per day ("**ft/day**"). Even if groundwater were flowing southeast along this 'pathway', assuming a porosity of 0.18, and a conservatively large hydraulic gradient of 0.013, it would take more than 7,000 years to migrate from MW-25 to MW-22. By comparison, the eastern portion of the chloroform plume, which occupies materials having hydraulic conductivities one to two orders of magnitude higher, and which was driven by historic hydraulic gradients that were more than three times larger (due to the perched groundwater mounds that resulted from wildlife pond seepage), has migrated less than 2,300 feet in more than 40 years. Because of smaller hydraulic gradients and orders of magnitude smaller hydraulic conductivities, groundwater migration rates in the vicinities of MW-22 and MW-39 are expected to be at least two orders of magnitude smaller than within the area of the chloroform plume. Because of their distance, cross-gradient position, and low permeability conditions, MW-22 and MW-39 could not have been impacted by Mill operations and their chemistry is therefore reflective of background conditions.

In addition, based on the extensive study of the character of the Burro Canyon Formation and Dakota Sandstone that host perched groundwater at the site, there is no plausible physical mechanism to allow groundwater to migrate along a pathway having abrupt changes in direction of up to 90 degrees as suggested by 'Map 1'. Nor could any groundwater plume remain as narrow thousands of feet from the presumed source as in the vicinity of the presumed source area as depicted; such behavior would be precluded by the effects of hydrodynamic dispersion.

Furthermore, groundwater quality generally improves moving along a line northwest from far cross-gradient well MW-22 (more than 1 mile from the TMS) to near cross-gradient well MW-17 (adjacent to the TMS). As of the latest sampling, the total dissolved solids ("**TDS**") concentrations decrease from 9,390 milligrams per liter ("**mg/L**") at MW-22; to 4,380 mg/L at MW-39; and to 3,010 mg/L at MW-17. TDS at MW-25 (2,960 mg/L) and MW-17 (3,010 mg/L), which are both adjacent to the TMS, are both relatively low and approximately the same. Cadmium is also lowest near the TMS at MW-17 (non-detect) and MW-25 (1.5 micrograms per liter ["**µg/L**"]); next highest at MW-39 (2.7 µg/L) and highest at MW-22 (175 µg/L). The improvement of water quality along a line from far cross-gradient well MW-22 to near cross-gradient well MW-17 is the exact opposite of expectation should the TMS be the source of cadmium or other constituents detected at MW-22 and MW-39.

Finally, if the TMS were a source of cadmium to MW-22, MW-25 and MW-39, and because these wells are not impacted by the nitrate/chloride plume (which originates upgradient of the Mill and TMS) a conservative constituent such as chloride should be increasing, yet it is not. Not only is chloride relatively stable at these wells but is lowest at MW-25 (approximately 27 mg/L), which is closest to the TMS; second highest at MW-39 (approximately 39 mg/L), having an intermediate distance from the TMS; and highest at MW-22 (approximately 58 mg/L), the most distant (more

than 1 mile) from the TMS; precisely the opposite of expectation if the TMS were impacting these wells.

McClean, Joan E and Bert E Bledsoe, 1992. Behavior of Metals in Soils. USEPA Groundwater Issue EPA/540/S-92/018, October 1992.

2.23. Ute Mountain Ute Tribe Comment 28b.

The water chemistry at MW-25 places it in a group with five wells which are exhibiting rising trends in cadmium with a corresponding decline in pH. This group is distinguished by an ion signature elevated in sulfate and depleted in sodium and alkalinity compared to monitoring wells completed in the nitrate and chloride plume like MW-30 and MW-31. TW4-24 has been revealed to have extremely elevated and dangerous concentrations of uranium (663 ppb, 05/17/2018) after we requested the well be screened for the full analyte table in the GWDP during a previous re-licensing action also has a distinct ion signature and should be required to be investigated with isotopic testing to calculate the activity ratio for uranium isotopes to determine conclusively if it is associated directly with the mill facility.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

In general, as pH declines, many naturally-occurring metals such as cadmium are expected to be mobilized, causing increases in groundwater concentrations as discussed in Boschi and Willenbring (2016); Lodenius and Autio (1989); McClean and Bledsoe (1992); Warwick et al (1998); and Yanhao et al (2018). At the site, general decreases in pH have occurred at wells upgradient, cross-gradient, downgradient and within the area of the TMS, consistent with a site-wide mechanism unrelated to the Mill and TMS such as pyrite oxidation (HGC, 2012).

Within areas unaffected by the nitrate/chloride plume, chloride is the best indicator parameter for potential TMS seepage, followed by fluoride and sulfate. These are generally good indicator parameters because they are anions and do not readily sorb onto or react with aquifer materials. Chloride is expected to be the least sorbed or reactive, followed by fluoride and then sulfate. Sulfate can be impacted by pyrite oxidation which releases acid and sulfate.

MW-25 is located generally cross-gradient of the TMS with respect to the southwesterly direction of perched groundwater flow. Because MW-25 is not impacted by the nitrate/chloride plume, chloride is the best indicator parameter for any potential TMS seepage. However, the chloride at MW-25 is relatively low (approximately 30 mg/L) and is stable. Furthermore, fluoride, the second-best indicator parameter is also relatively low (approximately 0.3 mg/L) and is stable to decreasing. Based on the behavior of these conservative parameters, there is no impact to MW-25 from the TMS.

TW4-24 is a pumping well located upgradient of the TMS within the nitrate/chloride plume and draws water primarily from the nitrate/chloride plume upgradient of the TMS. The relatively high uranium in TW4-24 is explained by the high calcium and bicarbonate at this well (approximately 616 mg/L and 945 mg/L, respectively, as of the second quarter of 2020) which likely mobilize naturally-occurring uranium in the formation. High mobility and elevated concentrations of uranium are frequently associated with relatively high calcium and carbonate species concentrations (Desbarats et al, 2017; Drage and Kennedy, 2013). Burow et al (2017) note the correlation between increases in groundwater uranium and bicarbonate concentrations in the arid west. Because TW4-24 is located within the nitrate/chloride plume, it is also likely that the mobility of naturally-occurring uranium is increased by the presence of nitrate, through the mechanisms documented in Senko et al (2005); Wu et al (2010); Westrop et al (2018); and Asta et al (2020).

Because TW4-24 is located within the nitrate/chloride plume, chloride is not a good indicator for potential TMS impacts; however fluoride at TW4-24 is relatively low (approximately 0.3 mg/L) and, based on the limited amount of data collected to date, does not appear to be trending upward, which is inconsistent with a TMS impact.

Because TW4-24 is a pumping well that 1) is located upgradient of the TMS, and 2) draws water primarily from the nitrate/chloride plume upgradient of the TMS, and due to the apparent low and stable fluoride at TW4-24, there is no reason to do any additional testing at TW4-24 other than continued monitoring.

Asta, M., Beller, H., & O'Day, P. (2020). Anaerobic Dissolution Rates of U(IV)-Oxide by Abiotic and Nitrate- Dependent Bacterial Pathways. Enviornmental Science and Technology 54, 13, 8010-8021.

Boschi, Vanessa and Jane K Willenbring, 2016. The Effect of pH, Organic Ligand Chemistry and Mineralogy on the Sorption of Beryllium over Time. Environmental Chemistry 13(4) 711-722 https://doi.org/10.1071/EN15107, February 11, 2016.

Burow, KR; K Belitz; NM Dubrovsky; and BC Jurgens, 2017. Large-Scale Decadal Changes in Uranium and Bicarbonate in Groundwater of the Irrigated Western US. Sci. Total Env. 586: 87-95. May 15, 2017.

Desbarats, Alexander J; Jeanne B Percival; and Katherine E Venance, 2017. Uranium Mobility in Groundwater in Historical Mine Sites in the Bancroft Region of Ontario, Canada. Presented at GSA Annual Meeting in Seattle, Washington USA – 2017. Geological Society of America Abstracts With Programs, Vol. 49 No. 6.

Drage, John and Gavin W Kennedy, 2013. Occurrence and Mobilization of Uranium in Groundwater in Nova Scotia. GEO Montreal, 2013.

HGC 2012. Investigation of Pyrite in the Perched Zone. White Mesa Uranium Mill Site. Blanding, Utah. December 7, 2012.

Lodenius, Martin and Sari Autio, 1989. Effects of Acidification on the Mobilization of Cadmium and Mercury From Soils. Archives of Environmental Contamination and Toxicology, Vol. 18, pp 261-267, January 1989.

McClean, Joan E and Bert E Bledsoe, 1992. Behavior of Metals in Soils. USEPA Groundwater Issue EPA/540/S-92/018, October 1992.

Senko, J. M., Suflita, J. M., & Krumholz, L. R. (2005). Geochemical Controls on Microbial Nitrate -Dependent U(IV) Oxidation . Geomicrobiology Journal 22, 371-378.

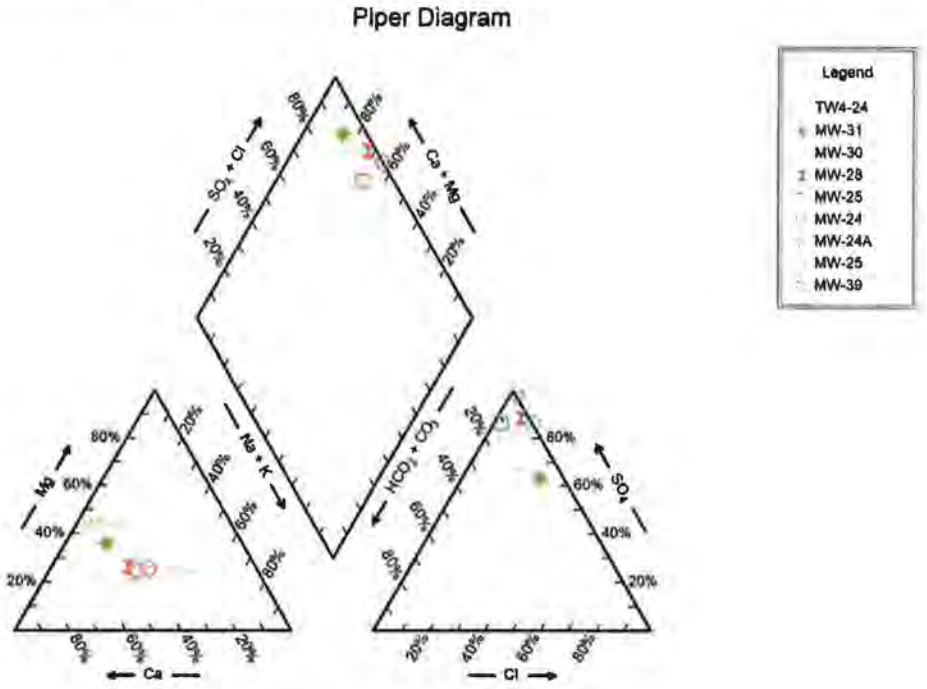
Warwick, P; A Hall; V Pashley; J Van der Lee; and A Maes, 1998. Zinc and Cadmium Mobility in Sand: Effects of pH, Speciation, Cation Exchange Capacity (CEC), Humic Acids and Metal Ions. Chemosphere, Vol. 36, Issue 10, pp 2283-2290, April 1998.

Westrop, Jeffery P; Nolan, PJ; Healy, Olivia; Bone, Sharon; Bargar, John R; Snow, Daniel; and Weberm Karrie J. 2018. Mobilization of Naturally Occurring Uranium Following the Influx of Nitrate into Aquifer Sediments. Geological Society of America Abstracts With Programs, Vol. 50 No. 4.

Wu, W.-M., Carley, J., Green, S., Lou, J., Kelly, S., Van Nostrand, J., et al. (2010). Effects of Nitrate on the Stability of Uranium in a Bioreduced Region of the Subsurface. Environmental Science and Technology 44, 5104-5111.

Yanhao Zhang, Haohan Zhang, Zhibin Zhang, Chengying Liu, Cuizhen Sun, Wen Zhang, Taha Marhaba, "pH Effect on Heavy Metal Release from a Polluted Sediment", Journal of Chemistry, vol. 2018, Article ID 7597640, 7 pages, 2018. https://doi.org/10.1155/2018/7597640

Figure 9: Piper Diagram: 1st Quarter 2020 Groundwater Data



2.24. Ute Mountain Ute Tribe Comment 28c.

In addition to the ion and cadmium signature, the presence of rising concentrations of Cobalt and nickel in MW-24/MW-24A, MW-28, MW-39 and MW-22 distinguish this group of wells as impacted by the mill facility and are two constituents that can be expected to show up at MW-25 in the near future as impacts from the facility continue to increase to dangerous levels in the aquifer if this GWCL proposal is authorized and the facility is allowed to continue to discharge to the groundwater.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Because MW-39 and MW-22 are far cross-gradient (southeast) of the TMS with respect to generally southwesterly perched groundwater flow, and are completed in relatively low permeability materials (approximately 10^{-5} cm/s and 10^{-6} cm/s, respectively), even if groundwater flowed from the TMS toward these wells, as discussed above in response to comment 28a, it would take thousands of years for the groundwater to impact either well. In addition, the stable chloride

at both wells is inconsistent with a TMS impact. Because these wells are located cross-gradient and too far from the Mill and TMS to have been impacted by Mill operations, their chemistry is reflective of background conditions.

MW-24 and MW-24A have small saturated thicknesses, large proportions of their screens in the vadose zone, relatively low permeability, and relatively large pyrite contents. The pyrite content of MW-24 drill cuttings submitted for laboratory analysis was the largest measured (see HGC, 2012: the pyrite report). All these factors are expected to facilitate oxygen transport to groundwater and enhance pyrite oxidation, which lowers pH and is expected to mobilize naturally-occurring metals such as cobalt and nickel (McClean and Bledsoe, 1992; Papelis, 1996). Not only is the reduction in pH expected to mobilize these naturally-occurring metals from the formation, but these metals are expected to exist as contaminants in pyrite (as discussed in Deditius, 2011) and to be released directly to groundwater as a result of pyrite oxidation. In addition, because MW-24 is not yet impacted by the nitrate/chloride plume (which originates upgradient of the Mill and TMS), chloride is the best indicator for TMS impacts. Yet chloride is stable at MW-24, inconsistent with a TMS impact.

Furthermore, MW-24 was anaerobic when first installed as indicated by the presence of ammonia and iron; however, as oxygen was introduced to MW-24, and it became more aerobic, iron and ammonia decreased to near non-detect levels. The evolution of groundwater chemistry in the vicinity of MW-24 from anaerobic to aerobic is expected to cause trends in many naturally-occurring monitored constituents that are unrelated to the TMS.

MW-28 is impacted by the nitrate/chloride plume. MW-28 is located within the leading edge of the chloride component of the plume and is just downgradient of the leading edge of the nitrate component of the plume. As discussed above, the nitrate/chloride plume originates upgradient of the Mill and TMS. Although nitrate has not reached 10 mg/L, it has been generally increasing at MW-28, and is likely contributing to the oxidation of pyrite near MW-28, causing changes in the chemistry of MW-28. The change in groundwater chemistry at MW-28 due solely to the arrival of the nitrate/chloride plume is expected to cause trends in many monitored constituents. Because MW-28 is within the nitrate/chloride plume, chloride is not a proper indicator of potential TMS impacts and fluoride is the next best indicator. However, fluoride is not increasing at MW-28, nor is cobalt or nickel. Stable fluoride is inconsistent with a TMS impact.

Deditius, Artur P; Satoshi Utsonomiya; Martin Reich; Stephen E Kesler; Rodney C Ewing; Robert Hough; and John Walshe, 2011. Trace Metal Nanoparticles in Pyrite. Ore Geology Reviews, Vol. 42, Issue 1, Nov. 2011, pp 32-46.

HGC 2012. Investigation of Pyrite in the Perched Zone. White Mesa Uranium Mill Site. Blanding, Utah. December 7, 2012.

McClean, Joan E and Bert E Bledsoe, 1992. Behavior of Metals in Soils. USEPA Groundwater Issue EPA/540/S-92/018, October 1992.

Papelis, Charalambos 1992. Evaluation of Cobalt Mobility in Soils From the Nevada Test Site. Submitted to Nevada Operations Office, U S Department of Energy, September 1996.

2.25. Ute Mountain Ute Tribe Comment 28d.

Thallium is now exceeding the Utah criteria of 2 ug/L in both MW-24 and MW-39 and beryllium is exceeding the state criteria of 4 ug/L at MW-39 and MW-22. A rising trend in Beryllium with levels rapidly approaching the criteria for this metal is apparent at MW-24/MW-24A as well.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

MW-22 and MW-39, which are far cross-gradient of the Mill and TMS, and which are completed in materials having low to very low permeability, could not have been impacted by the TMS as discussed in the response to Section 2.22, Ute Mountain Ute Tribe Comment 28a, above. These wells are both good examples of background conditions.

MW-24, as discussed above in the response to Section 2.24, Ute Mountain Ute Tribe Comment 28c, above, has construction characteristics that are conducive to oxygen transport which is consistent with the relatively large dissolved oxygen (DO) concentrations (greater than 80% saturation) detected in that well. The large measured pyrite content of the formation at this well and the high DO are conducive to pyrite oxidation which most likely explains the pH decreases at the well. The pH decreases likely mobilize naturally-occurring metals such as beryllium and thallium (Boschi and Willenbring, 2016; Karlsson, 2006).

Boschi, Vanessa and Jane K Willenbring, 2016. The Effect of pH, Organic Ligand Chemistry and Mineralogy on the Sorption of Beryllium over Time. Environmental Chemistry 13(4) 711-722 https://doi.org/10.1071/EN15107, February 11, 2016.

Karlsson, Ulrika 2006. Environmental Levels of Thallium – Influence of Redox Properties and Anthropogenic Sources. Orebro Studies in Chemistry 5, Orebro University. 2/2006.

2.26. Ute Mountain Ute Tribe Comment 28e.

Presence of manganese and ammonia for this group of wells also distinguishes them as impacted and indicates reducing conditions which are present in the aquifer at the margins of the oxidized conditions present in the nitrate plume. It is important that the Director and regulatory staff recognize that geochemical conditions at the site are strongly influencing contaminant fate and migration

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

Again, MW-22 and MW-39, which are far cross-gradient, and which are completed in materials having low to very low permeability, could not have been impacted by the TMS as discussed above in the response to Section 2.22, Ute Mountain Ute Tribe Comment 28a, above. These wells are both good examples of background conditions.

MW-25 is generally cross-gradient of the TMS; as discussed in the response to Section 2.23, Ute Mountain Ute Tribe Comment 28b, above, this well is outside the nitrate/chloride plume (which originates upgradient of the Mill and TMS), and chloride is the best indicator parameter. However, as discussed above, chloride and the next best indicator parameter fluoride, are both relatively low, and stable to decreasing. Ammonia concentrations are less than 1 mg/L and are stable to decreasing; and manganese concentrations are stable to decreasing and relatively low compared to these other wells. Magnitudes and trends in concentration of all these constituents are inconsistent with a TMS impact.

MW-24, as discussed in the response to Section 2.24, Ute Mountain Ute Tribe Comment 28c, above, has construction characteristics that are conducive to oxygen transport which is consistent with the relatively large measured dissolved oxygen (DO) concentrations. The large measured pyrite content of the formation at this well and the high DO are conducive to pyrite oxidation, which most likely explains the pH decreases at this well. The pH decreases likely mobilize naturally-occurring metals such as manganese (Gardner et al, 2015).

As discussed above, MW-28 is located within the leading edge of the chloride component of the nitrate/chloride plume and is just downgradient of the leading edge of the nitrate component of the plume, which originates upgradient of the Mill and TMS. Although nitrate has not reached 10 mg/L, it has been generally increasing at MW-28, and is likely contributing to the oxidation of pyrite near MW-28, causing changes in the chemistry of MW-28. The change in groundwater chemistry at MW-28 due solely to the arrival of the nitrate/chloride plume is expected to cause trends in many monitored constituents. Because MW-28 is within the nitrate/chloride plume, chloride is not a proper indicator of potential TMS impacts and fluoride is the next best indicator. However, fluoride is not increasing at MW-28. Furthermore, manganese is stable to decreasing; and ammonia, while detected at small concentrations of up to 0.27 mg/L prior to 2011, has dropped to near non-detect levels. Stable fluoride, stable to decreasing manganese, and decreasing, small to non-detectable ammonia are all inconsistent with a TMS impact.

Gardner, Kevin H; Emese Hadnagy; Brant A Smith; Karen O'Shaughnessy; Ryan Fimmen; Deepti K Nair; and Heather V Rectanus, 2015. Guidance Document: Assessing the Potential for Metals Mobilization During the Application of In Situ Chemical and Oxidation Technologies. Prepared for SERDP Project Number ER-2132. May, 2015.

2.27. Ute Mountain Ute Tribe Comment 29.

Since the state has not compelled EFR to do any specific leach testing of Burro Canyon aquifer materials to prove they may be the real source of the rare list of toxic metals accumulating in the groundwater beneath the site or an updated comprehensive isotopic study of groundwater for over a decade which has seen a radical deteriorating change in groundwater condition, the most likely source of the contaminants are the tailing cells and the mill facility. The process solutions and cells are absolutely loaded with extreme concentrations of cadmium, beryllium, thallium, cobalt, nickel, selenium, uranium and remain the most likely explanation and source of pollution. In the past the Director has stated that contamination in the Burro Canyon aquifer is of little concern because it is a long way from potential receptors and un related to the mill and the Director also implies the aquifer is not used for domestic supplies and that it doesn't deserve protection for that future use. In fact, the Burro Canyon aquifer does serve nearby residents as a home domestic supply and also supplies irrigation and stock water to hundreds of users (Kirby, 2008) and the Burro Canyon aquifer extends continuously beneath White Mesa from north of the Mill through the Mill area to the White Mesa community south of the Mill. See Stefan Kirby, Utah Geological Survey Special Study 123, "Geologic and Hydrologic Characterization of the Dakota-Burro Canyon Aquifer near Blanding, San Juan County, Utah" (2008), Plate 3 - Structure Contour Map of the Base of the Burro Canyon Formation, and Plate 4 - Potentiometric Surface for the Dakota-Burro Canyon Aquifer. (Available online at: https://ugspub.nr.utah.gov/publications/special studies/ss-123/ss- 123.pdf);see also Charles Avery, State of Utah Department of Natural Resources Technical Publication No. 68, "Bedrock Aquifers of Eastern San Juan County, Utah (1986), Figure 19. - "Areal extent, water levels, and water quality in the D aquifer, 1982-83." (Available online at: https://waterrights.utah.gov/docSys/v920/w920/w92000ab.pdf. The State's role in protecting drinking water quality should be much more active. For example, with the State's agreement that the pollution in the Burro Canyon aquifer on the mill site is due to naturally occurring conditions from pumping wells, what is the implication for nearby residents with a well pumping water from the same formation every day into their drinking, cooking and bathing water? Are they at risk of exposure from cadmium, beryllium, thallium, cobalt, nickel, selenium or uranium that may naturally be rising in the formation to toxic conditions? The state has a responsibility to future generations to protect our shared water resources at the highest possible level.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

As discussed above, and as documented in numerous studies of the Mill facility, increases in naturally-occurring metals such as cadmium, beryllium, thallium, cobalt, nickel, selenium and uranium in some of the site wells are attributable to natural causes such as pH decrease due to pyrite oxidation and not potential seepage from the TMS. These metals occur naturally in the crust of the earth at concentrations high enough to be mobilized in groundwater at the concentrations detected in perched monitoring wells. Furthermore, metal-bearing pore fluids from the overlying Mancos Shale invaded the Dakota Sandstone and Burro Canyon Formations during compaction

and contributed to formation of pyrite that is expected to contain many metals as contaminants that would be released directly through pyrite oxidation. Pyrite oxidation, pH declines which release naturally-occurring pH-sensitive metals, and direct release of metal contaminants in pyrite are likely exacerbated by the large numbers of wells at the facility that are routinely purged and sampled, or continuously pumped, which contributes to oxygen transport to the perched groundwater and facilitates pyrite oxidation and pH decrease. An additional source of oxygen to groundwater was former seepage from the unlined wildlife ponds; and nitrate within the nitrate/chloride plume also oxidizes pyrite.

Although there are many perched groundwater monitoring and pumping wells at the facility, there are no potential offsite perched groundwater receptors downgradient of the facility. Perched groundwater is used to a limited extent upgradient (north) of the site where saturated thicknesses and well productivities tend to be higher. In addition, perched groundwater, because of its generally poor quality, is typically used for irrigation and stock watering rather than domestic purposes. Although perched groundwater extends from the area of the site southeast to the White Mesa community, groundwater beneath the Mill and TMS does not flow to the southeast toward the White Mesa community but rather to the south-southwest towards Ruin Spring, (HGC, 2018a).

As discussed in HGC (2018a) and based on the information provided above in Section 2.17, Ute Mountain Ute Tribe Comment 23, perched groundwater has naturally variable and poor quality. Variable and generally poor perched groundwater quality at the facility is likely exacerbated by the oxidation of naturally-occurring pyrite through oxygen introduction into the perched zone and though reaction with nitrate in the nitrate/chloride plume. In addition to the oxygen transport mechanisms discussed above (past infiltration of water from wildlife ponds and the historic pond and the large number of both pumping and non-pumping wells at the site), saturated thicknesses (which facilitate increases in DO concentrations) are relatively small compared with conditions north (upgradient) of the site.

Because any private wells completed in the perched groundwater north (upgradient) of the facility are likely to be relatively isolated; pumped less continuously as those at the facility; and to intercept relatively large saturated thicknesses, the amount of DO increase and pyrite oxidation is likely to be much smaller compared to most wells at the facility. All these factors (consistent with the analysis presented in HGC [2012]) are expected to reduce, or at least reduce the impacts of, pyrite oxidation. Furthermore, there will be no contribution to pyrite oxidation expected from nitrate.

The typical use of perched groundwater for irrigation and stock watering rather than domestic purposes due to its generally poor quality; and the minimization of factors expected to enhance the oxidation of pyrite at any private wells that may be in use north of the site; make it likely that few (if any) private wells actually pump perched groundwater for domestic use, and even if so used, would be much less likely to pump groundwater negatively impacted by pyrite oxidation.

HGC 2012. Investigation of Pyrite in the Perched Zone. White Mesa Uranium Mill Site. Blanding, Utah. December 7, 2012.

HGC 2018a. Hydrogeology of the White Mesa Uranium Mill and Recommended Locations of New Perched Wells to Monitor Proposed Cells 5A and 5B. July 11, 2018.

2.28. Ute Mountain Ute Tribe Comment 30.

The proposed GWCL increase for selenium and uranium at well MW30 would not be protective of human health and the environment. Rising trends in both of those parameters along with a strongly increasing trend in chloride are a signature of facility impact to the groundwater and the source of the continuing contamination must be conclusively determined with an updated comprehensive isotopic test of groundwater condition at each POC well along with a selection of wells from the general monitoring wells and the TW4 and TWN series.

EFRI Response:

As discussed in INTERA (2019), chloride concentrations are increasing at MW-30 due to its position within the nitrate/chloride plume. Because MW-30 is impacted by the nitrate/chloride plume, which originates upgradient of the Mill and TMS, fluoride and sulfate are the next best indicator parameters for potential TMS impacts. Stable to decreasing fluoride and sulfate at MW-30 are inconsistent with a TMS impact.

As discussed in INTERA (2019) selenium can be released as a result of pyrite oxidation (consistent with Deditius (2011); and uranium can be mobilized through the pH decrease that has been detected across the site. Increases in uranium in some wells within the nitrate/chloride plume are most likely related to the increased mobility of uranium in the presence of nitrate, by the mechanisms documented in Senko et al (2005); Wu et al (2010); Westrop et al (2018); and Asta et al (2020).

Because the parameter trends at MW-30 are inconsistent with a TMS impact, they provide no basis for any additional investigation other than continued monitoring of the same wells for the same parameter lists, and should GWCLs be exceeded at a particular well, performance of a source assessment investigation and preparation of a SAR.

An Isotopic Groundwater Investigation and Report is not necessary for the Mill site because it is not required under any applicable EPA guidance. Furthermore, there are no standardized analytical techniques approved by EPA or other comparable certification bodies, and therefore it is impossible to set compliance standards. Without standardized methodologies and no acceptable method to set compliance standards, it is not appropriate to include isotopic studies in the Mill's GWDP for compliance purposes. In any event, detailed isotopic investigations of groundwater at the site have already been carried out and published, which confirm the conclusions and validity of the existing groundwater monitoring program. Further isotopic studies are not warranted. A brief summary of the isotope systems used, findings, and interpretations are given below.

Hurst and Solomon (2008) surveyed surface water (tailings cells and wildlife ponds) and groundwater (monitoring wells) in the area around the Mill. They used noble gas and

tritium/helium-3 measurements to determine the age of water and found a trend of more recent ages for groundwater monitoring wells near the wildlife ponds, and increasing ages (to greater than 50 years) downgradient from these wells. The source of water in these downgradient wells is thus older than the onset of milling in 1980. Deuterium and oxygen-18 measurements revealed that surface water samples were isotopically enriched, indicative of evaporation. Groundwater samples revealed values that plotted linearly on a mixing line of deuterium and oxygen-18, with a similar slope, but slightly enriched, relative to that of the Utah Meteoric Water Line. Isotopic measurements of sulfate showed that tailings cell water and wildlife ponds were isotopically enriched in oxygen-18 relative to groundwater monitoring wells, and depleted in sulfur-34 relative to groundwater monitoring wells. MW-27 was the only well that exhibited oxygen-18 and sulfur-34 values for sulfate that were close to those measured in tailings water and the wildlife ponds. Sulfate concentrations in MW-27 were relatively low, however, so potential leakage and transport of tailings water to MW-27 is unlikely. Groundwater monitoring sites with high dissolved metals concentrations were isotopically distinct from tailings cell water in terms of oxygen-18 and sulfur-34 in sulfate. The authors concluded that "the data collected in this study do not provide evidence that tailings cell leakage is leading to contamination of groundwater in the area around the White Mesa Mill" (pg. 58-59).

Naftz et al. (2011) collected surface water samples of local springs, stock ponds, and Recapture Reservoir, and groundwater samples of local monitoring wells and domestic and public supply wells. They measured noble gases and tritium/helium-3 and found that wells completed in the Dakota Sandstone and Burro Canyon formations exhibited apparent ages greater than 50 years. Local springs (Cow Camp, Oasis, and Entrance Springs) exhibited apparent ages ranging from 19 years to present. Deuterium and oxygen-18 measurements revealed values that fell along a mixing line between isotopically enriched Recapture Reservoir water and relatively depleted samples that fell directly on the Global Meteoric Water Line. The latter samples corresponded with groundwater of greater age. Values in Entrance Spring were similar to those for Recapture Reservoir, the water from which is used for milling operations on site. Measurement of sulfur-34 and oxygen-18 in sulfate revealed that results for monitoring wells and springs were isotopically distinct from tailings cell water. In addition to stable isotope measurements, the authors measured uranium-234, -235, and -238. The activity ratio ("**AR**") of uranium-234 to uranium-238 was calculated to assess the possibility of potential tailings leakage, given that samples of milling-impacted waters tend to have a uranium AR near 1 (Zielinski et al., 1997). Most samples exhibited dissolved uranium concentrations below the EPA maximum contaminant level ("**MCL**") of 30 µg/L, and uranium AR values ranged between 1.4 to 3.4, which is a range expected for non-impacted waters (Zielinski et al., 1997). The uranium AR values for Entrance Spring exhibited a general decline towards those expected for mill-impacted water. This spring is located up- to cross-gradient of expected groundwater flow, however, so if uranium AR values are indeed indicative of a milling input, this milling input is most likely to be from eolian transport of tailings.

These investigations have utilized isotope measurements to determine water ages, important processes such as evaporation and mixing, and possible water sources. Both studies conclude that groundwater is not likely to be impacted by any potential tailings cell leakage based on the age of the water and the isotopic signatures of sulfur and uranium.

These isotopic studies should be taken as confirmation of the conclusions and validity of the existing groundwater monitoring program at the Mill, and hence the sufficiency of the existing program. There is therefore no need to perform any further isotopic analysis at the Mill. As stated above there are no standardized analytical techniques for isotopic studies and it would therefore not be appropriate to add them to the existing program.

Asta, M., Beller, H., & O'Day, P. (2020). Anaerobic Dissolution Rates of U(IV)-Oxide by Abiotic and Nitrate- Dependent Bacterial Pathways. Enviornmental Science and Technology 54, 13, 8010-8021.

Deditius, Artur P; Satoshi Utsonomiya; Martin Reich; Stephen E Kesler; Rodney C Ewing; Robert Hough; and John Walshe, 2011. Trace Metal Nanoparticles in Pyrite. Ore Geology Reviews, Vol. 42, Issue 1, Nov. 2011, pp 32-46.

Hurst, T.G., and Solomon, D.K., 2008. *Summary of Work Completed, Data Results, Interpretations and Recommendations for the July 2007 Sampling Event at the Denison Mines, USA, White Mesa Uranium Mill Near Blanding Utah.* Prepared by Department of Geology and Geophysics, University of Utah.

INTERA, 2019. Source Assessment Report for MW-30, White Mesa Uranium Mill, Blanding, Utah. January 15, 2019.

Naftz, D.L., Ranalli, A.J., Rowland, R.C., Marston, T.M., 2011. *Assessment of Potential Migration of Radionuclides and Trace Elements from the White Mesa Uranium Mill to the Ute Mountain Ute Reservation and Surrounding Areas, Southeastern Utah.* U.S. Geological Survey Scientific Investigations Report 2011-5231.

Senko, J. M., Suflita, J. M., & Krumholz, L. R. (2005). Geochemical Controls on Microbial Nitrate -Dependent U(IV) Oxidation . Geomicrobiology Journal 22, 371-378.

Westrop, Jeffery P; Nolan, PJ; Healy, Olivia; Bone, Sharon; Bargar, John R; Snow, Daniel; and Weberm Karrie J. 2018. Mobilization of Naturally Occurring Uranium Following the Influx of Nitrate into Aquifer Sediments. Geological Society of America Abstracts With Programs, Vol. 50 No. 4.

Wu, W.-M., Carley, J., Green, S., Lou, J., Kelly, S., Van Nostrand, J., et al. (2010). Effects of Nitrate on the Stability of Uranium in a Bioreduced Region of the Subsurface. Environmental Science and Technology 44, 5104-5111.

Zielinski, R.A., Chafin, D.T., Banta, E.R., Szabo, B.J., 1997. Use of 234U and 238U Isotopes to Evaluate Contamination of Near-Surface Groundwater with Uranium-Mill Effluent: A Case Study in South-Central Colorado, U.S.A. *Environmental Geology* 32: 124-136.

2.29. Ute Mountain Ute Tribe Comment 31.

New Well MW-24a is chemically identical to existing Well MW-24 and there is no need to spend two more years collecting data to develop new GWCL for new well MW-24a. The existing GWCL for MW-24 should be used to recognize the exceedances at this location as a POC well for old outdated cells 1 and 2. MW-24 is associated chemically with a signature of facility impact as discussed in our Comment #1. The Director is proposing to allow EFR more than two years to collect data from a new well, MW24a, as they explore if a well construction issue is to blame for the rise in specific ions and metals in MW-24 (See Comment #1, MW-24 fits in a group with MW-25, MW-28, MW-39 and MW-22). Data from the first quarter 2020 first sampling event show water chemistry in MW-24a is obviously similar to that in MW24 (Stiff diagrams, piper diagram and comparison table below from the 1st Quarter 2020 Groundwater Monitoring Report). There is no need to wait for additional quarterly samples, and it makes no sense to delay for two years. Water chemistry trends in MW24 are confirmed. The trends at this location fit into a distinct pattern with other site wells including MW-25, which indicates an anthropogenic continuing source from the Mill site. A source ID requirement for cadmium sitewide needs to be conducted and must include updated comprehensive geochemistry and isotopic tests for all POC wells and general monitoring wells along with TW4 and TWN series wells to conclusively determine the sources of the recognized nitrate chloride plume which is associated with uranium concentrations far above health based standards (TW4-24, 663 ppb 05/17/2018), the chloroform plume which continues to increase in size and concentration (1st Quarter 2020 chloroform report) and the cadmium plume associated with cobalt, nickel, molybdenum, thallium, beryllium and manganese.

Figure 10

Stiff Diagram: MW-24, 1st Quarter 2020

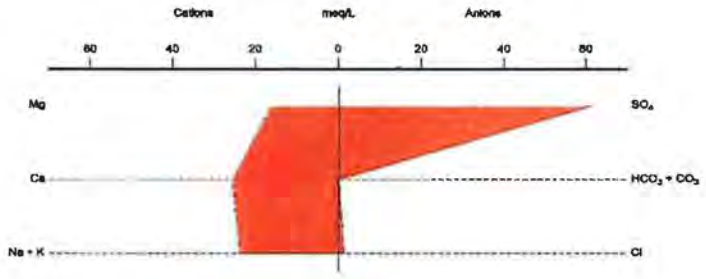


Figure 11:

Stiff Diagram: MW-24A, 1st Quarter 2020

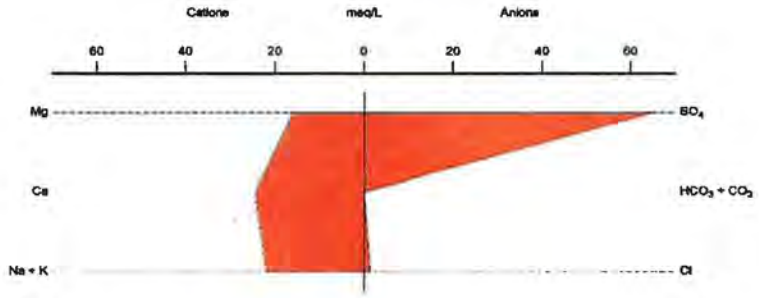


Figure 12:

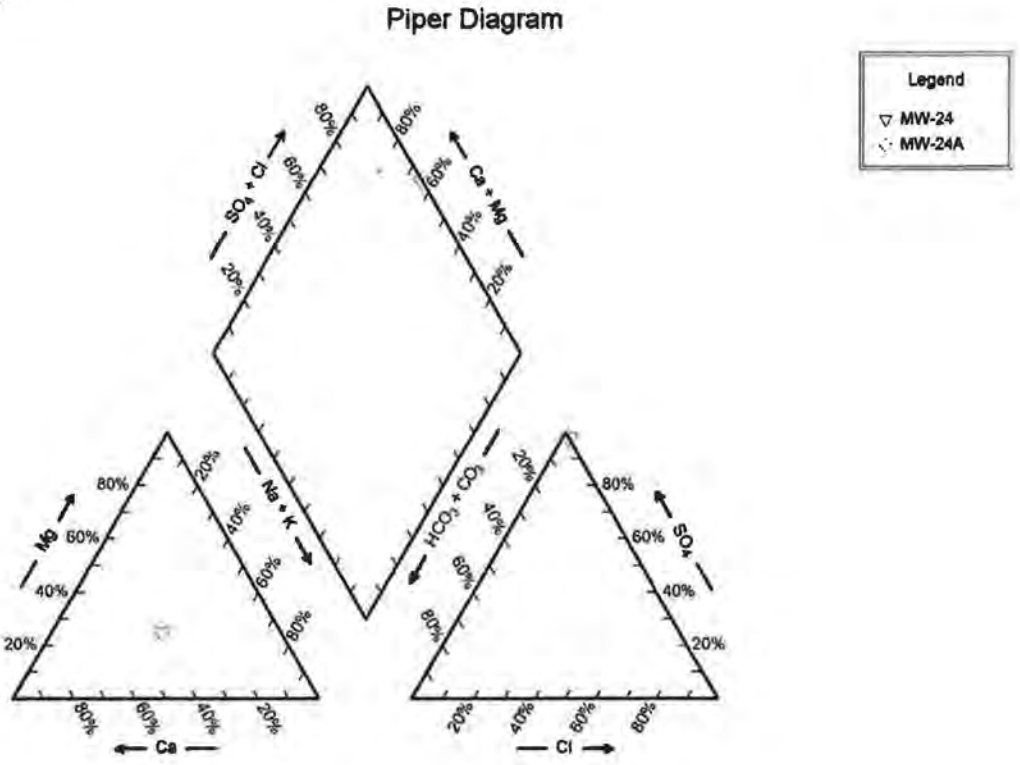

Piper Diagram
Legend
MW-24
MW-24A
SO4 + Cl
Ca + Mg
Na + K
HCO3 + CO3
Mg
Ca
Cl
SO4
20%
40%
60%
80%

Table 2: MW-24 and MW24A Data Comparison

Name	Unit	MW-24	MW-24A
Sample ID		MW-24	MW-24A
Date		1/22/2020	1/22/2020
Calcium	mg/L	515	492
Magnesium	mg/L	199	196
Sodium	mg/L	542	498
Potassium	mg/L	13.1	12.7
Bicarbonate	mg/L	10	5.2
Sulfate	mg/L	2960	3130
Chloride	mg/L	47.8	47.5
Dissolved Solids	mg/L	4160	4420
pH		6.01	4.96
Fluoride	mg/L	0.808	1.41
Ammonia	mg/L	0.118	0.174
Nitrate	mg/L	0.332	0.189
Beryllium	mg/L	0.00207	0.00396
Cadmium	mg/L	0.0073	0.0093
Chromium	mg/L	0.01	0.01
Cobalt	mg/L	0.115	0.138
Copper	mg/L	0.01	0.0122
Iron	mg/L	0.0698	0.001
Lead	mg/L	0.0016	0.001
Manganese	mg/L	7.01	7.43
Molybdenum	mg/L	0.01	0.01
Nickel	mg/L	0.0681	0.065
Selenium	mg/L	0.00816	500E-6
Thallium	mg/L	0.00192	0.00125
Uranium	mg/L	0.00489	0.00543
Vanadium	mg/L	0.015	0.015
Zinc	mg/L	0.143	0.125
Conductivity	µmho/cm	4400	4298
Eh	mV	693	619

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

As discussed above in the response to comment 28, cadmium is a naturally-occurring element with an average crustal abundance high enough to result in the concentrations measured in some site wells. There is no need to perform a site-wide source assessment. As discussed above in the response to comment 28a, because of their distance, cross-gradient position, and low permeability conditions, MW-22 and MW-39 could not have been impacted by Mill operations and their chemistry is therefore reflective of background conditions.

MW-25 has stable chloride which is inconsistent with a TMS impact. The high DO at MW-24 and MW-24A and the expected resulting oxidation of pyrite, which is known to occur at high concentrations at MW-24, can explain the groundwater chemistry. Therefore there is no reason to take any immediate actions regarding MW-24 and MW-24A.

As discussed in the pyrite report (HGC, 2012) and above in the response to comment 28c, MW-24 had the highest laboratory-measured pyrite concentration. Also as discussed above, MW-24 was initially anaerobic and gradually became aerobic over time, causing changes in groundwater chemistry which, along with pyrite oxidation and the resulting decrease in pH, are expected to result in trends in constituent concentrations including increases in metals. The close proximity of MW-24A to MW-24 and the similar chemistry are consistent with the gradual change in groundwater conditions in the vicinity of MW-24 from anaerobic to aerobic. As discussed in the pyrite report, relatively small saturated thicknesses, relatively low permeability, and relatively large extension of screened intervals into the vadose zone will combine to enhance oxygen transport to groundwater at this location and result in enhanced pyrite oxidation.

Contrary to the assertions in comment 31, there is no cadmium plume; concentrations at most of the 'Map 1' wells are below the MCL of 5 µg/L; and as discussed above in the response to comment 28a, there is no plausible 'pathway', as shown in 'Map 1' for transport of cadmium from the vicinity of MW-28 south to cell 3; then east to MW-11 and MW-25; then south to MW-39; then southeast to MW-22. First, the general southeast trend of the pathway is cross-gradient with respect to the southwest direction of groundwater flow. MW-25 is located generally cross-gradient of the TMS; and MW-22 and MW-39 are both located far cross-gradient of the TMS. Second, groundwater would have to migrate upgradient between MW-11 and MW-25 overcoming an increase in groundwater elevation of approximately 7 feet between these wells (which is impossible); then migrate more than 3,800 feet south to MW-39, then more than 2,500 feet southeast to MW-22, which is also impossible over the operational period of the Mill due to the low rates of groundwater migration through the materials within which these wells are completed.

MW-25 has a hydraulic conductivity of approximately 10^{-4} cm/s; MW-39 a hydraulic conductivity of approximately 2×10^{-5} cm/s; and MW-22 a hydraulic conductivity of approximately 10^{-6} cm/s. The geometric average conductivity of these wells is approximately 1.2×10^{-5} cm/s or 0.034 ft/day.

Even if groundwater were flowing southeast along this 'pathway', assuming a porosity of 0.18, and a conservatively large hydraulic gradient of 0.013, it would take more than 7,000 years to migrate from MW-25 to MW-22.

Furthermore, contrary to the assertions in comment 31, the primary source of the nitrate/chloride plume is the historic pond located upgradient of the Mill and TMS (HGC, 2018a); the nitrate/chloride and chloroform plumes are under active remediation by pumping and both are degrading naturally (HGC, 2017 and HGC, 2020); and the area of the chloroform plume is stable and concentrations and mass estimates are decreasing (HGC, 2020). Because the likely sources of these plumes have been identified and both plumes are under control, there is no need for any additional action to be taken beyond those related to the remedial actions that are underway.

Finally, as discussed above in the response to comment 28b, TW4-24 is a pumping well located upgradient of the TMS within the nitrate/chloride plume and draws water primarily from the nitrate/chloride plume upgradient of the TMS. The relatively high uranium in TW4-24 is explained by the high calcium and bicarbonate at this well (approximately 616 mg/L and 945 mg/L, respectively, as of the second quarter of 2020) which likely mobilize naturally-occurring uranium in the formation. High mobility and elevated concentrations of uranium are frequently associated with relatively high calcium and carbonate species concentrations (Desbarats et al, 2017; Drage and Kennedy, 2013). Burow et al (2017) note the correlation between increases in groundwater uranium and bicarbonate concentrations in the arid west. Because TW4-24 is located within the nitrate/chloride plume, it is also likely that the mobility of naturally-occurring uranium is increased by the presence of nitrate, through the mechanisms documented in Senko et al (2005); Wu et al (2010); Westrop et al (2018); and Asta et al (2020).

Because TW4-24 is located within the nitrate/chloride plume, chloride is not a good indicator for potential TMS impacts; however fluoride at TW4-24 is relatively low (approximately 0.3 mg/L) and, based on the limited amount of data collected to date, does not appear to be trending upward, which is inconsistent with a TMS impact.

Asta, M., Beller, H., & O'Day, P. (2020). Anaerobic Dissolution Rates of U(IV)-Oxide by Abiotic and Nitrate- Dependent Bacterial Pathways. Enviornmental Science and Technology 54, 13, 8010-8021.

Burow, KR; K Belitz; NM Dubrovsky; and BC Jurgens, 2017. Large-Scale Decadal Changes in Uranium and Bicarbonate in Groundwater of the Irrigated Western US. Sci. Total Env. 586: 87-95. May 15, 2017.

Desbarats, Alexander J; Jeanne B Percival; and Katherine E Venance, 2017. Uranium Mobility in Groundwater in Historical Mine Sites in the Bancroft Region of Ontario, Canada. Presented at GSA Annual Meeting in Seattle, Washington USA – 2017. Geological Society of America Abstracts With Programs, Vol. 49 No. 6.

Drage, John and Gavin W Kennedy, 2013. Occurrence and Mobilization of Uranium in Groundwater in Nova Scotia. GEO Montreal, 2013.

HGC 2017. Nitrate Corrective Action Comprehensive Monitoring Evaluation (CACME) Report. White Mesa Uranium Mill Near Blanding, Utah. December 11, 2017.

HGC 2018a. Hydrogeology of the White Mesa Uranium Mill and Recommended Locations of New Perched Wells to Monitor Proposed Cells 5A and 5B. July 11, 2018.

HGC 2020. Corrective Action Comprehensive Monitoring Evaluation (CACME) Report, White Mesa Uranium Mill Near Blanding, Utah. March 30, 2020.

Lodenius, Martin and Sari Autio, 1989. Effects of Acidification on the Mobilization of Cadmium and Mercury From Soils. Archives of Environmental Contamination and Toxicology, Vol. 18, pp 261-267, January 1989.

Senko, J. M., Suflita, J. M., & Krumholz, L. R. (2005). Geochemical Controls on Microbial Nitrate -Dependent U(IV) Oxidation . Geomicrobiology Journal 22, 371-378.

Westrop, Jeffery P; Nolan, PJ; Healy, Olivia; Bone, Sharon; Bargar, John R; Snow, Daniel; and Weberm Karrie J. 2018. Mobilization of Naturally Occurring Uranium Following the Influx of Nitrate into Aquifer Sediments. Geological Society of America Abstracts With Programs, Vol. 50 No. 4.

Wu, W.-M., Carley, J., Green, S., Lou, J., Kelly, S., Van Nostrand, J., et al. (2010). Effects of Nitrate on the Stability of Uranium in a Bioreduced Region of the Subsurface. Environmental Science and Technology 44, 5104-5111

2.30. Ute Mountain Ute Tribe Comment 32.

The elevated iron concentrations in groundwater downgradient of the tailings cells indicate impact to groundwater from tailings solutions. The Division should evaluate this line of inquiry. As recognized in the technical evaluation of the Moffat tunnel waste suggests that iron concentrations in groundwater can serve as a surrogate for monitoring potential impact to groundwater from this waste stream stating, "Analogous geochemical behavior of iron in the tailings wastewater with iron as a more conservative tracer of potential tailings wastewater in the groundwater than aluminum (UDWMRC, 2020.)" We presented a report in 2015 and again in 2017 with updated data (Geologic, 2017) which also used an analysis of iron concentrations in groundwater along with concentrations of other metals present in the tailings wastewater to identify tailings impact to the groundwater downgradient of the facility. These findings were presented in the report in both a written narrative and illustrated with figures like the one below and show iron and other metals spiking in concentration in the groundwater downgradient of the tailings cells:

Figure 13: from Geo-Logic Report, Geo-logic, 2017.

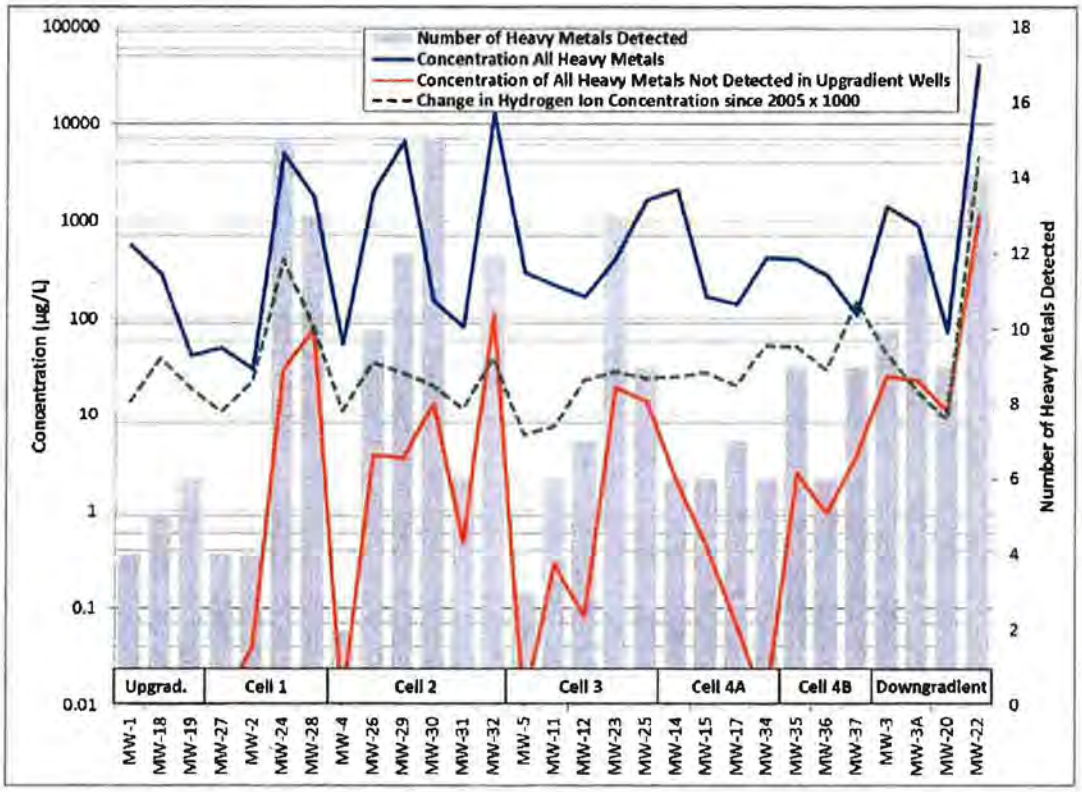


FIGURE 27 - HEAVY METALS IN MONITORING WELLS

State of Utah Department of Environmental Quality. Division of Waste Management and Radiation Control. Technical Evaluation and Environmental Analysis Moffat Tunnel Alternate Feed Request Energy Fuels Resources (USA) Inc. White Mesa Uranium Mill Utah Division of Waste. Management and Radiation Control April 2020.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

First, the highest iron concentrations occur at cross-gradient well MW-32 and far cross-gradient well MW-39. Iron concentrations at MW-32 typically exceed 5,000 µg/L and have been as high as approximately 12,000 µg/L; and iron concentrations at far cross-gradient well MW-39 exceed 10,000 µg/L and have been as high as approximately 15,000 µg/L. In addition, iron concentrations of hundreds to more than 1,000 µg/L have been detected at far upgradient well MW-1. Neither

MW-1 nor far cross-gradient well MW-39 could have been impacted by the TMS; and it is unlikely that MW-32 could be impacted because, although it borders the TMS, it is located on the cross-gradient eastern margin. Furthermore, iron concentrations at well MW-35, located on the southwest (cross- to downgradient) margin of Cell 4B are typically smaller than those detected at MW-1; and iron is typically not detected at wells MW-11, MW-14 nor MW-37, located along the downgradient southern margin of the TMS. That the highest iron concentrations are detected at wells that could not have been impacted by the TMS indicates that locally high iron concentrations reflect background conditions that are unrelated to the TMS.

Second, as discussed above, the selection of data for the above Geo-Logic Figure 27 is biased and not representative of well-by-well analysis which considers background concentrations determined for individual wells. Using this culled data and estimated solubility limits for individual metals (using specified pH's of 5 and 7), Geo-Logic has combined average metals concentrations for selected sets of wells and plotted these average concentrations in comparison with average tailings solution concentrations on different logarithmic scales. According to the Geo-Logic Report, "the patterns observed show a general similarity in the relative concentrations of the various heavy metals, particularly for Tailing Cell 1, suggesting that the tailings solution is a likely source for the observed heavy metals concentrations in groundwater below the tailings cells."

This conclusion is incorrect and unsupported by objective scientific data or analysis. This data analysis is not representative of concentrations which would be expected in the event of a potential tailings solution release. The Geo-Logic report does not consider relative mobility of contaminants, background concentrations of metals, comparisons with GWCLs, or rising trends. It is expected that the same metals will be found in the shallow (perched) aquifer Burro Canyon Formation as are found in the ore used to produce the tailings, and therefore the same metals will be found in natural background concentrations as are found in the tailings solution. The Geo-Logic Report has simply compared a biased assessment of background concentrations in the Burro Canyon Aquifer with average tailings solution concentrations.

Finally, considering the relative mobility of metals is particularly important as iron would be strongly retarded compared to conservative constituents chloride and fluoride; and most metals, especially iron, would be retarded with respect to uranium. High metals concentrations alone are not indicative of potential impacts from the TMS.

2.31. Ute Mountain Ute Tribe Comment 33.

As suggested in the Division's June 27, 2000 review memorandum and as recommended in the 2017 Geo-Logic Report as a standard industry practice, EFRI should be required to calculate an annual water balance for water received, consumed and lost at the Mill, and report the balance with annual DMT reports to assist with evaluation and performance of the discharge minimization technology required under the Groundwater Permit. Currently, there is no accounting of water use and loss at the Mill.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

The inherent error in such calculations, in particular evaporation from the TMS, would render it useless in assessing whether or not there had been a release.

3. Uranium Watch Public Comments on White Mesa Mill by letter dated July 10, 2020

3.1. Uranium Watch General Comment 1.2.

During more than two decades, the White Mesa Uranium Mill has turned into a disposal site for radioactive wastes from other mineral processing operations, due to the use guidance documents developed by the Nuclear Regulatory Commission (NRC) and adopted by the NRC and the State of Utah, Department of Environmental Quality (DEQ). Guidance documents are not statutes or regulations. They have no legal force and effect. The Division is not legally bound by the NRC Guidance[7] that Energy Fuels and the Division state is the governing document for the processing of wastes from other mineral processing operations (also known as "alternate feed material).

What Energy Fuels and the Division are bound by are the Atomic Energy Act (AEA) and the applicable NRC and Environmental Protection Agency (EPA) regulations. There is nothing in the Atomic Energy Act of 1954, as amended by the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA)[8]; the NRC and EPA regulations promulgated in response to UMTRCA, and EPA regulations that regulate radon emissions and the construction of tailings impoundments at licensed uranium mills at 40 C.F.R Part 61 Subpart W. There is nothing in the Atomic Energy Act, NRC and EPA regulations, and the history of the AEA and the promulgation of EPA and EPA regulations that supports the use of NRC Guidance to process feed materials other than natural ore and dispose of the resulting wastes in tailings impoundments. The Division does not have the authority to use an NRC Guidance, or any guidance, to amend or make fundamental changes to NRC and EPA regulations.

There is no evidence that the regulations adopted by the NRC governing uranium mills in any manner considered the processing of materials other than natural ores and disposing of the wastes in a uranium mill tailings impoundment when they promulgated the regulations at 10 C.F.R. Part 40,[9] specifically Appendix A,[10] in response to UMTRCA. The NRC did not evaluate the environmental impacts of the processing of such wastes in the 1980 Final Generic Environmental Impact on Uranium Milling[11] accompanying the promulgation of 10 C.F.R. Part 40 regulations applicable to uranium mills and the disposal and perpetual care of 11e.(2) byproduct material.

There is no evidence that the EPA regulations that apply to uranium mills, radon emissions, and the disposal and perpetual care of 11e.(2) byproduct material at 40 C.F.R. Part 192[12] and 40 C.F.R. Part 61 Subpart W[13] ever considered the processing of materials other than natural ores

and disposing of the wastes in a uranium mill tailings impoundment when the EPA promulgated these regulations.

These statutes and regulations use plain language and specific, unambiguous regulatory definitions. It was not the intent of Congress and the NRC and EPA to create additional environmental health, safety, and environment risks, hazards, and impacts—with no analyses of those risks, hazards, and impacts—by using a guidance document to manipulate regulatory definitions and create a new regulatory program never anticipated by Congress or the NRC and EPA when they adopted UMTRCA and Clean Water Act implementing regulations.

7 NRC Interim Position and Guidance on the Use of Uranium Mill Feed Material Other Than Natural Ores; November 30, 2000. https://www.nrc.gov/reading-rm/doc-collections/gen-comm/reg-issues/2000/ri00023.html
8 Uranium Mill Tailings Radiation Control Act; Public Law 95-604, 95th Congress; November 8, 1978. 92 STAT. 3021. https://www.govinfo.gov/content/pkg/STATUTE-92/pdf/STATUTE-92-Pg3021.pdf
9 10 C.F.R. Part 40 — Domestic Licensing of Source Material. https://www.nrc.gov/reading-rm/doc-collections/cfr/part040/
10 Appendix A to Part 40 — Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content. https://www.nrc.gov/reading-rm/doc-collections/cfr/part040/part040-appa.html
11 Final Generic Environmental Impact on Uranium Milling; Project M-25; NUREG-0706; Volumes I - III; October 1980. U.S. Nuclear Regulatory Commission. https://www.nrc.gov/docs/ ML0327/ML032751661.html
12 40 C.F.R. Part 192 — Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings. https://www.epa.gov/radiation/health-and-environmental-protectionstandards-uranium-and-thorium-mill-tailings-40-cfr
13 40 C.F.R. Part 61 Subpart W — National Emission Standards for Radon Emissions From Operating Mill Tailings Source. https://ecfr.io/Title-40/Part-61/Subpart-W

EFRI Response:

The commenter in incorrect in stating that *"The Division is not legally bound by the NRC Guidance[7] that Energy Fuels and the Division state is the governing document for the processing of wastes from other mineral processing operations."*

DWMRC is bound to follow federal law on these questions, which have long been resolved beyond legal dispute. The Division uses the definition of ore developed by the NRC for the regulation of alternate feed materials and for alternate feed guidance documents. See the discussion in Section 1.3 above for a more detailed discussion.

The commenter is also incorrect in stating that *"There is no evidence that the regulations adopted by the NRC governing uranium mills in any manner considered the processing of materials other than natural ores and disposing of the wastes in a uranium mill tailings impoundment when they promulgated the regulations at 10 C.F.R. Part 40,[9] specifically Appendix A."*

In 10 CFR 40 Appendix A, Section V Criterion 13, NRC identifies a full list of constituents from 40 CFR 192 "for which standards must be set and complied with if the constituent is reasonably expected to be in or derived from the byproduct material and the constituent is material and has been detected in groundwater."

In other words, the list demonstrates that NRC groundwater protection regulations applicable to uranium mills contemplated the processing of and disposal of materials containing (per the 40 CFR 192 list):

- Chlorinated solvents;
- Polar oxy solvents (ketones and aldehydes)
- Aromatic solvents and chlorinated aromatics;
- Pesticides;
- Cyanides;
- Phthalates and isocyanates;
- Sulfides;
- Nitro compounds;
- A full range of heavy metals and metal products, among others.

Hence, the NRC groundwater protection regulations do, in fact, contemplate a much larger range of chemical constituents and hazardous properties than are present in any alternate feed material that has been or could potentially be processed at the Mill.

Moreover, Criterion 13 states "***NRC does not consider the list imposed by 40 CFR 192 to be exhaustive*** and may determine other constituents to be hazardous on a case-by-case basis."

One of the purposes of each alternate feed license amendment is for the DWMRC to evaluate the feed material to ensure that receiving and processing the materials and permanently disposing of the tailings as 11e.(2) byproduct material in the Mill's tailings impoundment does not result in any incremental public health, safety or environmental impacts over and above previously licensed activities. Rather than attempting to perform a generic environmental analysis of alternate feed materials as a category of materials, the alternate feed program more conservatively requires an environmental evaluation applicable to each specific feed material.

The commenter is also incorrect in attempting to assign regulatory authority over the definition and management of uranium mill tailings to EPA. Under UMTRCA, the NRC is the implementing Agency relating to uranium mills, and as a result its interpretation and application of the term "ore" in the definition of 11e.(2) byproduct material is governing. When reviewing an agency's interpretation of an ambiguous provision in its organic Act, a court will defer to the agency's construction if it is reasonable (*Chevron U.S.A. Inc. v. Natural Resources Defense Council, 467 U.S. 837*). The EPA is not implementing agency for these purposes, so any definition of ore the EPA may have is not determinative. EPA has no authority to determine what is or is not 11e.(2) byproduct and what can be transferred to uranium tailings impoundments.

EPA has however had an opportunity to comment on the Alternate Feed Guidance during its development (first draft guidance published on May 13, 1992, final guidance published on September 22, 1995 and current guidance published on November 30, 2000), and has not objected to the application of the Alternate Feed Guidance since its promulgation.

EPA's authority with respect to the tailings impoundments pursuant to 40 C.F.R. Part 61 Subpart W is limited to regulation of radon emissions from tailings impoundments, by requiring compliance with either design criteria or monitoring, depending on the age of the impoundment. As mentioned above, EPA had the opportunity to object to the Alternate Feed Guidance, and therefore the introduction of residuals from alternate feed materials into tailings, but has not objected in 28 years.

3.2. Uranium Watch General Comment 1.5.

The Division must take a hard look at fact that the White Mesa Mill is now becoming a waste disposal site for international radioactive wastes,[14] in addition to the domestic waste materials that have been processed at the White Mesa Mill. The State of Utah must explain why Utah should now become the go-to place for the disposal of such international radioactive wastes. The State of Utah must provide a legal, technical, and environmental justification, not just for the disposal of materials from Estonia, but from any international source.

The State of Utah cannot justify this to the Ute Mountain Ute Tribe, the tribal members who live a short distance away from the White Mesa Mill and are impacted by radiological and non-radiological emissions from the Mill. The State of Utah cannot continue to ignore the consistent and continuing opposition of the Utah Mountain Ute Tribe and the White Mesa community to turning the White Mesa Mill into a repository for domestic and international wastes from other mineral operations and waste cleanup projects. The State of Utah has a legal obligation to abide by the Atomic Energy Act and NRC and EPA regulations and legally promulgated regulatory programs, none of which support the processing of radioactive wastes such as the Silmet and Moffat Tunnel materials at White Mesa and turning the Mill into a perpetual repository for wastes from the cleanup of domestic and international radioactive materials.

NRC regulations at 10 C.F.R. Part 110.4 define the materials to be imported to the White Mesa Mill from Estonia as "radioactive waste."

EFRI Response:

The Silmet Materials are not wastes. They are a valuable ore that can be recycled for the recovery of valuable uranium that would otherwise be lost to direct disposal. The Silmet material is more valuable as an ore than typical Colorado Plateau uranium ores. See the discussion in Section 1.3 above. Further, as detailed in the License amendment application, the NRC has concluded that alternate feed materials are not "radioactive wastes" within the meaning of 10 CF Part 110.

Importing material from other countries for further processing and recycling in the U.S. happens all the time, all over the country. In fact, the Mill is currently importing alternate feed materials from Canada and has been doing so for over 20 years. It has imported ore from outside North

America in the past. Many U.S. metals producers import ores from overseas and then utilize U.S. technology and facilities to add value by producing metals and other final materials from the ores. For example, U.S. companies import bauxite (an aluminum ore) and produce aluminum metal, and import iron ore, to supplement domestic production, for the manufacturing of steel. U.S. Tantalum and niobium producers import all of their ores from foreign countries. The Mill is licensed to process uranium ores, and with License amendments, alternate feed materials, regardless of their jurisdiction of origin, which is common for other metal producers in the U.S. The question is whether or not the ore or alternate feed material is being processed safely in accordance with all applicable licenses, permits, legal and regulatory requirements, which it is, not on its jurisdiction of origin.

As discussed in more detail above in response to Section 2.2, Ute Mountain Ute Comment 5, as the receipt and processing of the Silmet material will not result in any impacts to public health, safety or the environment, over and above existing licensed operations, the White Mesa Community will not be impacted by the receipt and processing of the Silmet material over and above normal licensed Mill operations. The nearest receptors to the Mill are north of the Mill and are not the White Mesa Community. As mentioned in Section 1.4 above, the Mill has been the largest private employer in San Juan County over the last 40 years, and has widespread support in the City of Blanding. Approximately 50% of the Mill's workforce is typically Native American.

3.3. Uranium Watch Comment 2: Modification of License Condition 10.5.

The Division proposes to modify License Condition 10.5 (LC 10.5) to increase the amount of in situ leach (ISL)[15] uranium recovery decommissioning debris (defined as 11e.(2) byproduct material) to be placed in the the Mill's tailings impoundments from 5,000 cubic yards (cy) to 10,000 cy from any one ISL facility and allow unlimited amounts of waste from any ISL facility that is owned by Energy Fuels, or an Energy Fuels' subsidiary, to be disposed of at White Mesa. This is provided that there is adequate tailings impoundment volume. Currently, the ISL wastes transported to the White Mesa Mill can only be disposed of in tailings Impoundment 3.

EFRI Response:

Cell 3 has enough capacity remaining for several more years of ISR waste disposal at current annual rates. Once all capacity in Cell 3 is used up, the Mill will switch over to disposing of ISR waste in Cell 4A. At that time a request will be submitted to the State of Utah to begin ISR waste disposal into Cell 4A.

3.4. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.1.

The Division did not include the Energy Fuels' "Volume and Procedural Modification Request" (DRC-2019-012708), dated October 9, 2019, in the list of White Mesa Mill License Amendment Requests posted on the DWMRC website.[16] Rather, that request was only available on the e-Docs system,[17] which is slow and rather difficult to navigate. The Division erred in not making this amendment request readily available during the public comment period by posting on the DWMRC website associated with License Amendment #10.

EFRI Response:

The list of documents was not intended to provide every reference document relevant to the License amendment process because doing so would make the listing cumbersome and difficult to download due to size. As noted the document was available on the e-Docs system and as such was readily available for review by interested parties.

3.5. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.2.

The Division failed to develop a Technical Evaluation and Environmental Analysis for this amendment. No such document was provided in the 2020 DWMRC Public Notice.[18] The Amendment # 10 Statement of Basis, Summary of License Changes, page 1, indicates that this is a Major Change in the License. The Division failed to comply with the Atomic Energy Act [19] and Utah regulatory requirements[20] to develop an Environmental Analysis for major license amendments. Such an analysis must be made available to the public ***before*** *the comment period and public hearing. The Division failed to comply with these statutory and regulatory requirements.*

EFRI Response:

The commenter is misinterpreting the requirements in 42 USC §2021(o)(3)(C), which applies only to licenses which have "a significant impact on the human environment."

While the volume change has been listed as a major change for Amendment 10, it clearly will not have a "significant impact on the human environment." The initial authorization by NRC to dispose of 11e.(2) by product material from licensed in-situ facilities was considered a minor change. Specifically, NRC stated the following, when allowing 10,000 cubic yards from each generator:

> "The staff has determined under exclusions contained in 10 CFR 51.22(c)(ll) that further environmental documentation is not required for this amendment request. The proposed amendment makes only minor changes to operations at the White Mesa Mill, and in addition, this action is encouraged by Criterion 2 of Appendix A to 10 CFR 40 to avoid the proliferation of small waste disposal sites. Therefore, an environmental assessment by this office for the proposed action is not required since this action is categorically excluded under 10 CFR 51. 22(c) (11), and is not required by 10 CFR 5l.60(b)(2)."

Environmental analysis of this site by regulatory authorities began with the review of the initial Environmental Report submitted by Dames and Moore on behalf of EFRI in 1978. Every significant change in plant configuration and equipping, every license amendment, and every license or permit renewal since that time has added to the environmental analysis of the site and the facility, and to the knowledge base about those subjects. It is only necessary to ascertain what has changed since the earlier analyses, not to prepare a new analysis from scratch. As there will be

no changes to the Mill as the result of the increase in ISR volumes, there will be no significant impact to the human environment, and a separate EA reiterating information available elsewhere is not warranted.

Further, specific TEEAs are available for those changes which warrant detailed documentation. DWMRC has provided a "Cross-Walk" of EA topics and a listing of source documents where the pertinent information can be found for those proposed changes for which that information is applicable. For example, there is a Cross-Walk included as Table 2, Page 32 of the DWMRC TEEA for Moffat Tunnel Alternate Feed Request, dated April 2020.

3.6. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.3.

The Summary of License Changes regarding License Condition 10.5, page 2, states, "Upon examination staff learned that the current license limits were not set in response to demonstrated health effects concerns or other scientific analysis."

Here, the Division does not identify the documents reviewed. According to the June 17, 2010, White Mesa Mill License, Amendment # 4, LC 10.5, was based on the Licensee's submittal to the NRC, dated May 20, 1993. That document is not posted on the DEQ e- Docs system for the White Mesa Mill. Nor have the NRC documents associated with that Amendment, such as the License Amendment or technical or environmental evaluation, been made available. The Division claims that the LC 10.5 limits were not set in response to "demonstrated health effects concerns or other scientific analysis." The Division does not state whether the NRC developed any technical evaluation or environmental or health analyses in connection to this amendment request. The Division should not rely on an inadequate NRC license amendment review in 1993 to support a Division license amendment review in 2020.

EFRI Response:

As noted above, environmental analysis of this site by regulatory authorities began with the review of the initial Environmental Report submitted by Dames and Moore on behalf of EFRI in 1978. Every significant change in plant configuration and equipping, every license amendment, and every license or permit renewal since that time has added to the environmental analysis of the site and the facility, and to the knowledge base about those subjects. It is only necessary to ascertain what has changed since the earlier analyses, not to prepare a new analysis from scratch.

As there will be no changes to the Mill as the result of the increase in ISR volumes, a separate EA reiterating information available elsewhere is not warranted.

Further, the NRC did not require any environmental documentation for the approval of the License amendment approving the disposal of 11e.(2) by product material due to the categorical exclusions cited in the paragraph above.

3.7. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.4.

From 1981 to 1994, the regulation of the White Mesa and other uranium mills in Utah was the responsibility of the NRC Uranium Recovery Field Office (URFO) in Colorado.

Many URFO-approved uranium mill license amendments lacked an Environmental Assessment or Environmental Impact Statement, under the National Environmental Policy Act. Rather, URFO, and later NRC headquarter staff, relied categorical exclusions —thereby avoiding any environmental analysis and any assessment of the cumulative impacts of disposing of ISL waste and other materials that were not assessed in the original 1978 White Mesa Mill environmental analysis. Unless the Division can show otherwise, it is unlikely that URFO staff did any analysis of the health effects or other concerns related to the disposal of ISL waste at White Mesa.

EFRI Response:

The history of the Uranium Recovery Field Office's ("**URFO's**") actions with regard to the Moab Mill tailings or other facilities is not relevant to DWMRC's current decisions regarding this or other licensees since Utah's achievement of agreement state status.

The Mill License has been renewed three times since License condition 10.5 was approved. Each of those License renewals involved an EA, a review of facility compliance, and a determination that, if the License is renewed, the facility will be able to continue to operate in compliance with all applicable licenses, permits, laws and regulations. On each renewal, NRC and DWMRC, as applicable, found that the Mill, with License condition 10.5, was operating in compliance with all applicable licenses, permits, laws and regulations and that renewal of the License, with condition 10.5, would not result in any significant impacts to public health, safety or the environment over and above previously licensed activities. As a result, any potential impacts from License condition 10.5, if categorically excluded from analysis when originally approved, was reviewed as part of the subsequent License renewal EAs.

Although DWMRC has reviewed and considered previous NRC decisions, DWMRC evaluates each License renewal, each alternate feed material License amendment request, and each request for any other amendment of the Mill's License on its own merit. In the current licensing action, DWMRC has concluded that the amendment to License condition 10.5 will not have a significant impact on the human environment and that no further environmental evaluations are required in connection with the amendment.

3.8. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.5.

URFO had a troubled history, including the withholding from the public over twenty thousand (20,000) Uranium Mill Tailings Radiation Control Act Title I and Title II documents, in violation of the Atomic Energy Act and NRC regulation. It took the NRC Public Document Room four (4) years to accession the documents URFO withheld to make them publicly available. It was URFO that decided to allow the Moab Mill tailings to remain on the flood plain of the Colorado River, a determination that the State of Utah adamantly opposed. That URFO decision and the Finding of

No Significant Impact regarding the Moab Mill reclamation led to the closure of URFO in 1994. Given that history, it is surprising that the Division would in any manner rely on URFO's determinations and analyses, or lack thereof.

EFRI Response:

As mentioned above, the history of the Uranium Recovery Field Office's ("**URFO's**") actions with regard to the Moab Mill tailings or other facilities is not relevant to DWMRC's current decisions regarding this or other licensees since Utah's achievement of agreement state status.

Although DWMRC has reviewed and considered previous NRC decisions, DWMRC evaluates each License renewal, each alternate feed material License amendment request, and each request for any other amendment of the Mill's License on its own merit. In the current licensing action, DWMRC has concluded that the amendment to License condition 10.5 will not have a significant impact on the human environment and that no further environmental evaluations are required in connection with the amendment.

3.9. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.6.

Even if there had been a health and safety or environmental analysis in 1993, it would be way out of date. It would not have considered cumulated impacts over the past 27 years, nor the impacts from transportation accidents and spills. The 2016 spill of ISL barium sulfate sludge from the Cameco Resources Inc. Smith Ranch ISL operation in Wyoming, is an example of the serious risks associated with the transport of ISL waste. The spill of the Smith Ranch waste, which had been radiologically mis-characterized and mis-packaged at the point of origin, could have been a real radiological, health, safety, and environmental disaster. If the spill, or possibly a much larger spill, had occurred on Hwy. 191 or other highway, as those routes go through towns and population centers such as White Mesa, Blanding, Monticello and Moab, the radioactive sludge could have been spread widely throughout the region and been very difficult to track down and clean up. The more decommissioning debris and sludges that are shipped to the Mill, the greater the likelihood of transportation accidents that would expose people on the transportation routes to radiological hazards.

EFRI Response:

As mentioned above, the Mill License has been renewed three times since License condition 10.5 was approved. Each of those License renewals involved an EA, a review of facility compliance, and a determination that, if the License is renewed, the facility will be able to continue to operate in compliance with all applicable licenses, permits, laws and regulations. On each renewal, NRC and DWMRC, as applicable, found that the Mill, with License condition 10.5, was operating in compliance with all applicable licenses, permits, laws and regulations and that renewal of the License, with condition 10.5, would not result in any significant impacts to public health, safety or the environment over and above previously licensed activities. As a result, any potential impacts from License condition 10.5, if categorically excluded from analysis when originally approved, was reviewed as part of the subsequent License renewal EAs. DWMRC has concluded that the

amendment to License condition 10.5 will not have a significant impact on the human environment and that no further environmental evaluations are required in connection with the amendment.

With respect to potential transportation incidents, the risks associated with 11e.(2) byproduct material from ISR facilities is no higher than, and in most cases less than, the risks from truck traffic associated with conventional milling operations, including the transportation of yellowcake from the Mill.

As discussed above in response to Section 2.10, Ute Mountain Ute Comment 15, the NRC has evaluated regional and national impacts from transportation of materials related to licensed Mill activities in its *1980 Final Generic Environmental Impact on Uranium Milling* ("**GEIS**") and the original ER for the White Mesa Mill. The NRC GEIS evaluated effects from transportation of uranium ores and yellowcake product generally with far greater radioactivity than ISR byproduct material. The NRC GEIS also evaluated the transport of tank trucks of leach acid, ammonia, sodium hydroxide caustic, and other powdered and liquid chemicals generally with far greater chemical hazard properties than ISR byproduct material. The federal program, though the NRC GEIS, has evaluated and accepted the transportation of radioactive materials and hazardous chemicals throughout the western US, within and outside the boundaries of the State of Utah. The volume of truck traffic associated with ISR byproduct material under amended License condition 10.5 will be a very small percentage of the total truck traffic associated with routine Mill operations.

Moreover, DOT, not the NRC or DWMRC, regulates the use of roads and rail. DOT does not perform Environmental Impact Assessments on a per-project basis. Instead, they follow an even stricter control strategy under which they have established for every type of hazardous material transported on US corridors specific requirements and inspection programs for:

- Package, container and vehicle type;
- Marking and placarding;
- Documentation;
- Route notification;
- Spill and emergency notification;
- Spill and emergency response action;
- Carrier and driver training; and
- other requirements.

As a matter of federal regulation, ISR byproduct material, regardless of rail or road transport or selected route, will be subject to all of these requirements. As a result there is no need for DWMRC to perform any further evaluations on transportation matters relating to ISR byproduct material.

3.10. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.7.

The Division failed to provide an analysis of the current capacity of Impoundment 3, the age and condition of the Impoundment 3 liner, potential of leakage and contamination of the groundwater over time, potential spills of ISL sludges and other wastes during transport and at the mill, or an overall analysis of the cumulative impacts associated with the disposal of ISL 11e.(2) byproduct material at the White Mesa Mill. Therefore, there is no basis for the approval the proposed changes to LC 10.5.

EFRI Response:

Cell 3 has enough capacity remaining for several more years of ISR waste disposal at current annual rates. Once all capacity in Cell 3 is used up, the Mill will switch over to disposing of ISR waste in Cell 4A. At that time a request will be submitted to the State of Utah to begin ISR waste disposal into Cell 4A.

The Mill is licensed to dispose of 11e.(2) byproduct material in both Cell 3 and Cell 4A. As discussed above, ISR 11e.(2) byproduct material is not significantly different from any other 11e.(2) byproduct material authorized to be disposed of in the Mill's TMS. It should be remembered that upon final reclamation of the Mill, very similar materials from decommissioning the Mill site, such as building demolition debris and all other wastes on site, will be disposed of in the Mill's TMS, and that the Mill is required to maintain enough capacity in its TMS at all times to accommodate such final decommissioning wastes and debris. Additional ISR byproduct material is no different from those wastes and debris and is well within the types of materials that are required to be disposed of in the Mill's tailings impoundments.

3.11. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.8.

The Division should not approve an increase in the amount of ISL waste at the White Mesa Mill, due to the age of Impoundment 3 and the need to close and reclaim Impoundment 3 as soon as possible. Additionally, the Division failed to provide the required Environmental Analysis, failed to properly notice the proposed license condition changes, and has not complied with the AEA and Utah regulation regarding a major license amendment.

EFRI Response:

See the responses to:

- Section 3.5, Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.2, above;
- Section 3.7, Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.4, above; and

- Section 3.10, Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.7, above.

3.12. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.9.

In sum, the Division must reject the proposed changes to License Condition 10.5 to authorize the disposal of additional amounts of ISL waste at the White Mesa Mill.

EFRI Response:

This conclusion must be rejected, for the reasons stated above.

3.13. Uranium Watch Comment 2: Modification of License Condition 10.5; Comment 2.10.

License Condition 10.5.A.(3). The Division proposes an amendment to authorize the disposal of 11e.(2) byproduct material in unlimited quantities from any source within the State of Utah. The Summary for LC 10.5 indicates that this condition would be for the purpose of disposing of small quantities of uranium mill tailings that have been historically used as backfill for construction sites or found in other unexpected places in Utah. The Division defines these materials as "11e.(2) byproduct material." However, only materials that originally came from an UMTRCA Title II commercial uranium recovery operation can be defined as "11e.(2) byproduct material." Materials that come from a site that is an UMTRCA Title I site would be defined as "residual radioactive materials." There are four (4) Title I mill sites, three (3) Title II mill sites,[21] and one Department of Energy Superfund site in Utah. Since most off-site tailings came from Title I sites and the Monticello Superfund site, those tailings would not be defined as 11.(2) byproduct material. The Division should properly characterize the tailings that it intends to authorize for disposal in the White Mesa Mill tailings impoundments.

EFRI Response:

The Division has already addressed the issues in this comment in the Statement of Basis for the proposed amendments to the License, which is summarized below.

> "The disposal of 11e.(2) material from other uranium recovery facilities is in regulation in 10 CFR 40 Appendix A Criterion 2. The State of Utah adopted 10 CFR 40 Appendix A Criterion 2 in UAC R313-24-4.
>
> The Licensee requested a change in the license to allow receipt of greater quantities of materials from in situ uranium recovery (ISR; also known as in situ leach, or ISL) facilities. The Director also chose this opportunity to add the other of 11e.(2) material, i.e., uranium mill tailings, to the list of materials acceptable for disposal at the mill site. Mill tailings must originate inside the boundaries of the State of Utah to qualify under the proposed amendment.

> On rare occasions, small quantities of uranium mill tailings have been discovered as backfill at home construction sites, or in other unexpected places in the state. Typically, robust efforts are made to find and remove all tailings from such public places during decommissioning of mill sites. These discoveries are uncommon. However, when these situations arise, disposal of the tailings becomes challenging. This license change provides a safe alternative means of responding to uncommon discoveries of tailings that were missed during previous cleanups. Again, DWMRC would not be approving, and the Mill would not be receiving 11e.(2) transferred from cleanups outside the boundaries of the State of Utah.
>
> It should be noted that current regulations do not allow transporting tailings offsite for use as fill material as was sometimes done in the past. Inasmuch as the materials involved are virtually identical to material in the tailings impoundments, the risk to human health and the environment remains unchanged as a result of this revision. The condition is also consistent with NRC policy to reduce the proliferation of 11e.(2) byproduct disposal facilities10 CFR 40 Appendix A Criterion 2."

It should also be noted that the definition of 11e.(2) byproduct material is not limited to Title II sites under UMTRCA. Title I sites under UMTRCA also have a definition of "residual radioactive material, which is broad and includes 11e.(2) byproduct material as a subset. The Mill tailings at a Title I site are 11e.(2) byproduct material, and also residual radioactive material, and non-Mill tailings at Title I sites are residual radioactive material.

15 The change in the term "in situ leach (ISL)" to "in situ recovery (ISR)" was done at the behest of the uranium recovery industry. The industry changed the term "in situ leach" to "in situ recovery" as a public relations gimmick.
16 https://deq.utah.gov/waste-management-and-radiation-control/energy-fuels-resources-usa-inc
17 http://eqedocs.utah.gov/
18 https://deq.utah.gov/waste-management-and-radiation-control/public-notices-energy-fuelsresources-usa-inc
19 42 U.S. § 2021(o)(3).
20 Utah Administrative Code; Uranium Mills and Source Material Mill Tailings Disposal Facility Requirements; R313-24-3. Environmental Analysis. https://rules.utah.gov/publicat/code/r313/r313-024.htm#T3
21 https://www.energy.gov/sites/prod/files/2018/12/f58/UMTRCAFactSheet.pdf

3.14. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.1

The Environmental Protection Agency (EPA) promulgated regulations that apply to uranium mills and uranium mill tailings impoundments. These relevant standards and regulations are found in 40 C.F.R. Part 192 and 40 C.F.R. Part 61 Subpart W.

The Uranium Mill Tailings Radiation Control Act of 1978, an amendment to the Atomic Energy Act of 1954, directed the EPA to establish standards that apply the uranium mills and the handling of 11e.(2) byproduct material. Those EPA standards are found at 40 C.F.R. Part 192 — Health and Environmental Standards or Uranium and Thorium Mill Tailings. EPA regulation at 40 CFR Part 192 Subpart D[24] — Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended, states regarding Applicability, "This subpart applies to the management of uranium byproduct materials under section 84 of the Atomic Energy Act of 1954 (henceforth designated "the Act"), as amended, during and following

processing of uranium ores, and to restoration of disposal sites following any use of such sites under section 83(b)(1)(B) of the Act."

Part 192 Subpart D defines uranium byproduct material:

> *(b) Uranium byproduct material means the tailings or wastes produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction operations and which remain underground do not constitute "byproduct material" for the purpose of this subpart.*

Section 192.01 defines "tailings":

> *Tailings means the remaining portion of a metal-bearing ore after some or all of such metal, such as uranium, has been extracted.*

There is nothing in the Part 192 definitions of "uranium byproduct material" or "tailings" that demonstrates or implies that these terms apply to the tailings or wastes from the processing of materials other than natural ore. There is nothing in these regulatory definitions that demonstrate or imply that these terms apply to the tailings or wastes from "any other matter from which uranium or thorium is extracted in a licensed uranium or thorium mill." There is no evidence that the EPA Standards for Management of Uranium Byproduct Materials were meant to apply to tailings or wastes produced by the extraction or concentration of uranium from any ***matter*** *processed primarily for its source material content.*

EFRI Response:

As stated in the response to multiple comments above, the commenter is incorrect in attempting to assign regulatory authority over the definition and management of uranium mill tailings to EPA. Under UMTRCA, the NRC is the implementing Agency relating to uranium mills, and as a result its interpretation and application of the term "ore" in the definition of 11e.(2) byproduct material is governing. The EPA is not implementing agency for these purposes, so any definition of ore the EPA may have is not determinative. EPA has no authority to determine what is or is not 11e.(2) byproduct material and what can be transferred to uranium tailings impoundments.

EPA's authority with respect to the tailings impoundments pursuant to 40 C.F.R. Part 61 Subpart W is limited to regulation of radon emissions from tailings impoundments, by requiring compliance with either design criteria or monitoring, depending on the age of the impoundment.

As mentioned above, EPA has had an opportunity to comment on the Alternate Feed Guidance, and therefore the introduction of residuals from alternate feed materials into tailings, both during its development (first draft guidance published on May 13, 1992, final guidance published on September 22, 1995 and current guidance published on November 30, 2000). EPA has not objected to the application of the Alternate Feed Guidance since its promulgation.

DWMRC is bound to follow federal law on the definition of what is ore, and therefore what is 11e.(2) byproduct, which have long been resolved beyond legal dispute. DWMRC uses the definition of ore, and by extension 11e.(2) byproduct, as developed by NRC.

There is nothing in the foregoing provisions that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative. See the discussion in Section 1.3 above.

3.15. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.2

The EPA "Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites," Final Rule, were promulgated on October 7, 1983, by publication in the Federal Register at 48 Fed. Reg. 45926, 45926-45927. See Exhibit A. Public input on the establishment of these standards was extensive and included private citizens, public interest groups, members of the scientific community, representatives of industry, and State and Federal agencies.[25] The Final Rule provides information on background information on The Uranium Industry, Hazards Associated With Uranium By-product Materials, Control of Hazards from Tailings, and Environmental Standards and Guidance Now Applicable to Uranium Tailings. There is no mention in this background information that the EPA is considering anything other than the processing of natural ores and the disposal of the resulting tailings at licensed uranium recovery sites. There is no consideration given to the radiological and nonradiological constituents found in the Silmet Material and other feed materials other than natural ore that have been processed at the White Mesa Mill. The standards, as developed by the EPA did not contemplate the processing of materials other than natural ore or the radiological and non-radiological impacts and hazards associated with such receipt, storage, processing, tailings disposal, and long term care of these materials. Congress, the EPA, and the public did not contemplate the use of uranium mills as permanent repositories for the wastes from the processing of a wide range of waste materials (including cement, asphalt and other debris) at uranium mills.

EFRI Response:

See the response to Section 3.14, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.1, above. There is nothing in the foregoing provisions that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative.

3.16. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3

In 2010, the EPA undertook a review of Standards for Uranium and Thorium milling facilities, with a focus on in-situ leach uranium recovery operations. As part of that review the EPA held meetings in Casper, Wyoming, and Denver, Colorado. EPA Uranium and Thorium Standards, Fact Sheet #2, Background on Uranium Mining and Milling, provided information to the public at these meetings. The information addressed: What is uranium?, How is uranium mined?, What happens once the uranium is mined?, What is milling, and What are the environmental impacts of

uranium mining and how are they regulated? The Fact Sheet contains the following relevant statements:

> *Uranium ore is mined, then milled to separate the uranium from the ore.*
>
> *Uranium ore typically contains low concentrations of uranium, making uranium mining volume-intensive.*
>
> *Milling is a process that removes the uranium from the ore. After the ore is ground up, it is treated with chemical solutions to dissolve the uranium from the ore. This process produces a waste byproduct called mill tailings.*
>
> *There is no mention in the Background on Uranium Mining and Milling Fact Sheet that states or implies that ore is any uranium-bearing material, other than natural ore, that a uranium mill owner wishes to process.*

EFRI Response:

Once again, the commenter is incorrect in attempting to assign regulatory authority over the definition and management of uranium mill tailings to EPA. Under UMTRCA, the NRC is the implementing Agency relating to uranium mills, and as a result its interpretation and application of the term "ore" in the definition of 11e.(2) byproduct material is governing. The EPA is not implementing agency for these purposes, so any definition of ore the EPA may have is not determinative. EPA has no authority to determine what is or is not 11e.(2) byproduct and what can be transferred to uranium tailings impoundments.

DWMRC is bound to follow federal law on the definition of what is ore, and therefore what is 11e.(2) byproduct, which have long been resolved beyond legal dispute. DWMRC uses the definition of ore, and by extension 11e.(2) byproduct, as developed by NRC. The technical and legal issues presented in the case of Silmet alternate feed, and the three alternate feed materials approved by DWMRC were analogous to those addressed by NRC and the federal courts in the Kerr-McGee decision and the Ashland 2 decision, as discussed in DWMRC's TEEA and Statement of Basis for the Silmet material. The issues raised by the commenter are an attempt to re-litigate issues already resolved by NRC and the courts and binding on DWMRC.

There is nothing in the foregoing Fact Sheet that purports to limit "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative. See Section 1.3 above for a more detailed discussion.

3.17. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.4

In sum, the EPA "Standards for Management of Uranium Byproduct Materials" do not apply to the processing of materials other than natural ore at licensed uranium mills. The tailings or wastes from the processing of any matter for its uranium content, such as the Silmet Material, do not fall under the EPA definition of 11e.(2) byproduct material. Under EPA standards and regulations

applicable to the White Mesa Mill, the wastes from the processing of the Silmet Material are not 11e.(2) byproduct material.

EFRI Response:

See the response to Section 3.16, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3, above. There is nothing in the foregoing provisions that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative.

3.18. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.5

Therefore, the Division must not authorize the processing of the Silmet material at the White Mesa Mill, because EPA standards do not apply to the processing of materials other than natural ore and to the disposal of tailings or wastes from the processing of materials other than natural ore. Under EPA regulations, the tailings and wastes from the processing of the Silmet material do not meet the statutory and regulatory definition of 11e.(2) byproduct material.

EFRI Response:

See the response to Section 3.16, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3, above. There is nothing in the foregoing provisions that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative.

3.19. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.6

The Statement of Basis, Summary of License Changes, March 2020, which is part of the Radioactive Material License No. UT 1900479, Amendment #10, licensing package, provides information about changes in the White Mesa Mill License Conditions. Changes to the License include changes to terminology. The Summary states that changes to License Condition 9.5 "reflect terminology in 40 CFR Part 61 Subpart W, which governs radon emission (conventional or nonconventional impoundment)."

Therefore, the Division recognizes the applicability of 40 C.F.R. Part 61 Subpart W — National Emission Standards for Radon Emissions From Operating Mill Tailings to the White Mesa Mill License provisions. Subpart W (40 C.F.R. §§ 61.250 to 61.256) states, with respect the designation of facilities:

> *§ 61.250 Designation of facilities.*
> *The provisions of this subpart apply to owners or operators of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings. This subpart does not apply to the disposal of tailings.*

Subpart W defines "uranium byproduct material or tailings":

(g) Uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction and which remain underground do not constitute byproduct material for the purposes of this subpart.

Subpart W defines "conventional impoundment":

(h) Conventional impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility uranium recovery facility which contains mostly solid uranium byproduct material or tailings from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

Subpart W defines "uranium recovery facility":

Uranium recovery facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct material or tailings during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

Subpart W defines "non-conventional impoundment":

Non-conventional impoundment. A non-conventional impoundment is used for managing liquids from uranium recovery operations and contains uranium byproduct material or tailings. .

There is nothing in Subpart W or in the history of the promulgation of Subpart W that supports the conclusion that Subpart W applies to the facilities that process materials other than natural ore or to the tailings and wastes from the processing of materials other than natural uranium ore. Subpart W does not apply to a facility that processes materials other than natural ore for its uranium content or to the tailings or wastes from the processing of any matter other than natural ore that may contain uranium.

EFRI Response:

See the response to Section 3.16, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3, above. There is nothing in the foregoing provisions that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative.

3.20. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.7

The EPA undertook a complete review of Subpart W, which took several years. The EPA published proposed changes in rule on May 2, 2014.[26] The final rule was published on January 17, 2017.[27] In that Rulemaking, the EPA did not alter its 1986 definitions of uranium byproduct material. The Final Rule states:

The definition of uranium byproduct material or tailings in Subpart W, as it was promulgate in 1989 and not modified by this rule, establishes that Subpart W broadly addresses radon emissions from operating structures used to manage wastes produced during and following the concentration or extraction of uranium from ore processed primarily for its source material content.[28]

The EPA did not change its regulations to apply to the tailings and wastes produced during and following the concentration or extraction of uranium from ***any matter*** *processed for its source material content.*

EFRI Response:

See the response to Section 3.16, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3, above. There is nothing in the foregoing regulations that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative.

3.21. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.8

Under Subpart W, the tailings or wastes from the processing a material other than natural ore, such as the Silmet material, are not "uranium byproduct material." A facility that processes material other than natural uranium or thorium ore and the tailings impoundments that receive the waste from that processing are not within the scope of EPA regulation at Subpart W. Therefore, the Division cannot authorize the processing of materials at a facility that does not fall under the provisions Subpart W.

EFRI Response:

See the response to Section 3.16, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3, above. There is nothing in the foregoing regulations that limits "ore" to "natural ore". NRC and the Court in Kerr-McGhee have interpreted "ore" to be broader than "natural ore," which is determinative.

3.22. Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.9

In sum, the Division cannot approve the Energy Fuels request to receive and process the Silmet material, because a facility that processes material other than natural uranium or thorium ore and the tailings impoundments that receive the waste from that processing are not within the scope of EPA regulation at 40 C.F.R. Part 192 and 40 C.F.R. Part 61 Subpart W.

EFRI Response:

See the response to Section 3.16, Uranium Watch Comment 3.4: EPA Regulations: Comment 3.4.3, above.

24 https://www.law.cornell.edu/cfr/text/40/part-192/subpart-D
25 48 Fed. Reg. 45926, 45927 (col. 1).
26 EPA Revisions to National Emission Standards for Radon Emissions From Operating Uranium Mills. 79 Fed. Reg. 25388, May 2, 2014. Docket ID EPA-HQ- OAR-2008-0218.
27 EPA Revisions to National Emission Standards for Radon Emissions From Operating Uranium Mills. 82 Fed. Reg. 5142, 5142-5180; January 17, 2017. https://www.govinfo.gov/content/pkg/FR-2017-01-17/pdf/2016-31425.pdf#
28 82 Fed. Reg. 5142, 51474, column 3.

4. Navajo Utah Commission of the Navajo Council Resolution Number NUCJUN-821-20

Note: Only those comments that warrant a response are repeated herein.

4.1. Navajo Utah Commission Comment Recital 8.

The Navajo Utah Commission recognize that the White Mesa community is located directly adjacent to the White Mesa Mill on Ute Mountain Ute reservation lands;

EFRI Response:

The Mill is located on fee land and mill site claims, covering approximately 5,415 acres, encompassing all or part of Sections 21, 22, 27, 28, 29, 32, and 33 of T37S, R22E, and Sections 4, 5, 6, 8, 9, and 16 of T38S, R22E, Salt Lake Base and Meridian. For clarification it is important to note that all operations authorized by the License are conducted within the confines of the existing site boundary. The milling facility currently occupies approximately 50 acres and the current tailings disposal cells encompass another approximately 290 acres. The Mill facility and tailings impoundments are approximately 2.5 miles from Ute Mountain Ute Reservation lands.

4.2. Navajo Utah Commission Comment Recital 11.

Energy Fuels Resources intends to extract uranium from the residual material to produce fuel rods for nuclear power plants;

EFRI Response:

It appears from this comment, that there may be a misunderstanding regarding the uranium received, produced and shipped from the Mill. The Mill does not produce fuel rods. The radioactive materials received and processed at the Mill are not high-level radioactive materials. The final product the Mill produces is yellowcake, which must go through conversion and enrichment at other facilities before it becomes concentrated to the point that it can be used as fuel for a nuclear power plant. The Mill is the first step in the process, and material at the Mill does not have the same level of hazards found at a nuclear power plant. The material at the Mill cannot cause a fission event to occur.

4.3. Navajo Utah Commission Comment Recital 13.

The Ute Mountain Ute Tribe, a sovereign nation whose lands the mill sits upon is opposed to Energy Fuels accepting this waste; and

EFRI Response:

See Section 4.1, Navajo Utah Commission Comment Recital 8, above. The Mill does not sit upon Ute Mountain Ute Tribe lands.

4.4. Navajo Utah Commission Comment Recital 14.

Local community members have concerns about the lack of oversight, safety, and contamination of local groundwater resources on and around the White Mesa Mill.

EFRI Response:

The Mill is highly regulated to ensure that all applicable standards are met during operation.

Uranium mill tailing impoundments must be designed to provide reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years. In contrast, hazardous waste disposal facilities licensed under Subtitle C of RCRA have a 30-year design standard.

Current groundwater quality data demonstrate that groundwater is not being impacted by any potential leakage from the tailings cells. Pre-existing background concentrations were confirmed by the University of Utah Study. Background Reports also identified pre-existing data trends, in cases where these trends are continuing or where the groundwater compliance limit is exceeded two consecutive times, SARs are completed. All of the SARs have concluded that none of the exceedances have been shown to be caused by tailings wastewater.

The concerns expressed by the local White Mesa Community are misplaced and not based on the analytical and monitoring data. The data collected over the 40-year Mill history indicate that the Mill is operating safely and with no significant impacts to the surrounding areas.

4.5. Navajo Utah Commission Comment Resolution.

The Navajo Utah Commission is hereby opposing importation of radioactive waste from the country of Estonia in Eastern Europe into the White Mesa Mill near Banding, Utah.

EFRI Response:

The Silmet Materials are not wastes. They are a valuable ore that can be recycled for the recovery of valuable uranium that would otherwise be lost to direct disposal. The Silmet material is more valuable as an ore than typical Colorado Plateau uranium ores. See the discussion in Section 1.3 above. Further, as detailed in the License amendment application, the NRC has concluded that alternate feed materials are not "radioactive wastes" within the meaning of 10 CF Part 110. See Section 3.2, Uranium Watch Comment 1.5, above.

Estonia is a European democratic country that is a NATO ally of the United States.

Approximately 50% of Mill employees are Native Americans, and the Navajo Nation supported construction of the Mill. See Section 2.2, Ute Mountain Ute Tribe Comment 5, above.

5. Grand Canyon Trust Comments on Proposed Amendment No. 10 to the Radioactive Materials License for the White Mesa Uranium Mill dated July 10, 2020

5.1. Grand Canyon Trust Introductory Comments.

For ease of review, the principal requests we make in these comments are listed below. This list isn't exhaustive and isn't meant to diminish the importance of other requests or critiques made elsewhere in these comments. We ask the Division to:

> *If the Division nonetheless approves Energy Fuels' application concerning the material from Estonia, the Division should make its approval subject to two conditions: (a) that Energy Fuels acquires a specific import license from the Nuclear Regulatory Commission; and (b) that Energy Fuels returns to Silmet in Estonia all waste resulting from processing the Silmet material at the mill.*

EFRI Response:

Upon issuance of a license amendment authorizing the Mill to receive and process the Silmet Material as an alternate feed material, the material may be imported into the US as "source material" under 10 CFR 110.20(a), because it is covered by the NRC general license described in 10 CFR 110.27(a), and because the material:

- is not in the form of irradiated fuel, as contemplated by 10 CFR 110.27(b); and
- is not a radioactive waste, as contemplated by 10 CFR 110.27(c). As an approved alternate feed material ore the Silmet material will not be a radioactive waste as defined in 10 CFR 110.2 because (A) the material will be processed for its source material content, and will therefore be imported solely for the purposes of recycling and not for waste management or disposal, and (B) there is a market for the recycled uranium.

Further, in its November 1998 approval of Amendment 9 to the Mill's License – Approval to Process Materials from Cameco Corporation's Facilities in Ontario, Canada," which are alternate feed materials from Canada, the NRC came to the same conclusion in the same circumstances:

> "Finally, import of radioactive materials from Canada required a license from NRC. As discussed above, the staff has determined that these uranium-bearing materials from Cameco's Blind River and Port Hope facilities will be processed for their source-material content. Therefore, with the staff's approval of IUC's request to process these materials, IUC also is authorized to import them under the general license at 10 CFR 110.27."

The applicability of the foregoing regulations is clear, and a formal opinion from or consultation with the NRC is not necessary. However, even though not required, the NRC was consulted and acknowledged its agreement with this analysis and that a specific import license is not required for the Silmet material. See Attachment C

The commenter apparently doesn't understand recycling and the benefit of recycling, particularly recycling uranium that would otherwise be lost to direct disposal, and how important recycling uranium is to the global environment. Even this one small Silmet ore project is expected to generate from 7,096 to 10,692 pounds of U_3O_8 by itself.

- When converted to nuclear fuel, this amount of U_3O_8 will generate the same amount of electricity as 55,682 - 83,905 tons of coal. That amount of coal when burned to make electricity will generate 101,472 to 152,208 tonnes of CO_2 emissions;

- 152,208 tonnes of CO_2 emissions avoided by recycling the Silmet material, would be equivalent to the amount of CO_2 emissions from 32,874 passenger vehicles for one year;

- It would require a forest the size of 197,673 acres for one year to sequester the same amount of CO_2 emissions. A forest that size would exceed the combined area of Zion and Bryce Canyon National Parks, would be 4.5 times the area of the District of Columbia, and 234 times the area of Central Park, NYC); and

- Finally, that amount of uranium when converted to nuclear fuel, would generate as much electricity as about 44 wind turbines for one year.

All from one small recycling project at the Mill.

The commenter's suggestion that EFRI return to Silmet in Estonia all waste resulting from processing the Silmet material at the Mill, further illustrates its lack of understanding of how recycling works and how it needs to be encouraged not discouraged to be a viable option to industry and a net benefit to the global environment. The commenter's suggestion that the tailings from this recycling be returned to Estonia is absurd and would defeat the purpose of recycling, by eliminating recycling as a viable option to Silmet. For the Mill to produce the equivalent amount of uranium from EFRI's Colorado Plateau mines, it would need to mine and Mill approximately 2,000 tons of uranium ore from the ground and would still dispose of the same amount of tailings in the Mill's TMS as would be generated from processing the Silmet material. So in both cases the same amount of uranium would be produced and the same amount of tailings would be created that would need to be permanently disposed of in the Mill's TMS as 11e.(2) byproduct material. The only difference is that by mining and milling 2,000 tons of uranium ore (or 83,905 tons of coal for the same amount of electricity output), there would be a bigger hole in the ground in Utah that would require reclamation and the Country's uranium (or coal) resources would be depleted.

Recycling of uranium is a very good thing. *As miners, we need to responsibly recycle everything we mine, to the extent practicable, so that the world minimizes the disturbances it needs to make to the environment and sustains the resources in the ground to the extent possible for future generations.*

Equally as important, we need to be able to do this in our own country, in our own backyards, rather than merely sweep under the carpet our responsibilities to the World, by relying on metals mined from other countries, which in most cases have lesser protections for public health, safety and the environment than we have. In the United States, we are highly regulated and operate to the highest standards. We as Americans should be proud of that, and not shirk our duty to do properly in our country what we rely on others to do for our benefit in their countries. America needs to set an example of how it can play its role in satisfying its own and the world's needs in a responsible manner.

Further, even if it could possibly make any sense to return the Mill tailings to Estonia, the Mill is prohibited from doing so. As a condition of its License, and pursuant to the 1978 ER for the Mill, every subsequent environmental analysis for the Mill, and the conditions of every license renewal for the Mill, the Mill is not licensed to release any 11e.(2) byproduct material or tailings material, that is, any residual generated from the processing of source material for the extraction of uranium, for transport outside the boundaries of the Mill's licensed area. Therefore, waste resulting from processing of the Silmet material cannot leave the Mill site, and the DWMRC's approval cannot be contingent on such a requirement.

5.2. Grand Canyon Trust Introductory Comments; II. Background; A The White Mesa Mill; Statement 1.

No description of the mill's operations appears in any of the documents on which the Division is seeking comment. So that the record is complete, and for the sake of readers who aren't already familiar with the White Mesa mill and the regulatory framework at issue, we've set out below a brief factual background about the mill. The last time the Grand Canyon Trust submitted comments with a background section along these lines, the Division responded that "[m]uch but not all of this information is accurate."[3] If the Division continues to believe that any part of the following account is inaccurate, we would be grateful for an explanation of what specific points the Division disputes so that we may reevaluate our understanding of the facts.[4]

EFRI Response:

The above statements are patently false. The Public Participation Summary by DWMRC, dated 2018 for the previous License Renewal finalized in 2018 contained a timeline of controls and license renewal events associated with the Mill (page 21). The descriptions below are anything but factual and contain misleading, inflammatory, and speculative language, framed for purposes of advocating a position against the Mill and its operations.

5.3. Grand Canyon Trust Introductory Comments; II. Background; A The White Mesa Mill; Statement 2.

The White Mesa mill is an acid-leaching, uranium-processing mill that turns uranium ore and other uranium-bearing substances into a product called yellowcake, which is then enriched for use in nuclear reactors. Black flake, a substance used in other industrial processes, has also been made at the mill by extracting vanadium from some feeds. Mostly what comes out of the mill, though, is radioactive waste. This waste, commonly called tailings, is discarded in big pits spanning about 275 acres next to the mill. There are five of these pits, or "impoundments," at the mill, named Cell 1, Cell 2, Cell 3, Cell 4A, and Cell 4B. They and the mill are about five miles north of the centuries-old Ute Mountain Ute community of White Mesa and about six miles south of downtown Blanding.

EFRI Response:

It is incorrect to state that "mostly what comes out of the mill, though, is radioactive waste." What comes out of the mill is 11e.(2) byproduct material, which is defined as the "tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content." Some of the 11e.(2) byproduct material is tailings and some is wastes. Uranium mill tailings are not wastes, as they contain residual metals that Energy Fuels actively recovers. For example, the Mill has recycled its tailings in recent years to recover uranium and vanadium from recirculated tailings solutions ("**Pond Returns**"). Characterizing the plant operation as a "waste disposal" operation is therefore not accurate. Rather, its alternate feed material and Pond Return programs should be recognized as important recycling operations. Since 1998, the Mill has recovered and recycled 6 million pounds of uranium from its alternate feed recycling program and from Pond Returns.

- For context, this recycled uranium would produce the same amount of electricity as about 50 million tons of coal – or enough coal to fill a coal train from LA to NYC, and almost all the way back again;

- This recycled uranium would eliminate over 85 million tons of CO_2 emissions compared to coal, or the same amount of annual emissions as 18 million passenger vehicles. 85 million tonnes of CO_2 emissions is about 1.5 times the annual CO_2 emissions for the entire country of Sweden;

- This recycled uranium would produce the same amount of electricity in one year as 24,500 wind turbines (which is almost half of the 60,000 wind turbines in the U.S. in 2019); and

- Over 110 million acres of forest would be required for one year or 1.4 billion seedlings would need to grow for 10 years to sequester that amount of CO_2 emissions. 110 million acres of forest would be a forest larger than the entire State of California.

Over the last 20 years, over 47% of EFRI's uranium production has been from the recycling of uranium-bearing materials.

Vanadium, which today is mainly used in the steel, aerospace, and chemical industries, also contributes to environmental sustainability, as this critical mineral is seeing considerable interest in next generation batteries that store energy generated from renewable sources. The Mill has recycled enough vanadium through Pond Returns, which would otherwise have been lost to direct disposal, to provide the vanadium needed for enough steel girders today to build four and a half Golden Gate Bridges. Over the last 10 years, over 26% of EFRI's vanadium production has been from this recycling program.

See Section 1.4.3 above for a more detailed discussion of the value of Mill tailings and the Mill's recycling program from Mill tailings.

Further, the continued misuse and mischaracterization of the Mill's tailings impoundments as "pits" is incorrect. The mischaracterization is patently incorrect and inflammatory. The correct usages of pits and impoundments are referenced throughout SME Surface Mining 2nd edition, B.A. Kennedy and SME Mining Engineering Handbook, 2nd edition, Howard Hartman. The correct usages as noted in these technical references are as follows:

- A pit is an unlined, deep hole, with high-walled, steep-sided slopes that materials are removed ***from*** (emphasis added) (as an open pit mine).

- An impoundment (or pond) is a shallow excavation that materials are placed ***into*** (emphasis added) to store, reuse or evaporate.

5.4. Grand Canyon Trust Introductory Comments; II. Background; A The White Mesa Mill; Statement 3.

A company called Energy Fuels Nuclear, Inc., began building the mill in the late 1970s to process low-grade uranium ore from the surrounding region.[5] Back then, the company planned to run the mill for 15 years, then close and reclaim it.[6] The radioactive tailings were to be cleaned up in phases while the mill was operating.[7]

But that didn't happen. Instead, Energy Fuels Nuclear, fired up the mill in 1980, made yellowcake for about three years, and pumped the resulting radioactive tailings into Cells 1, 2, and 3.[8] Then, when the price of yellowcake plummeted, the company laid off most of the mill's workers and let the mill go mostly, if not completely, dormant.[9] This pattern has continued ever since. An ore-processing "campaign" is run when enough source material has piled up at the mill and yellowcake is fetching a good enough price, and then the mill lapses into "standby" when the price of yellowcake falls.[10] Though about 40 years have now passed, not one of the mill's big waste pits has been completely reclaimed.

Ownership of the mill has been similarly tumultuous. Over the years, it has changed hands at least four times.[11] In the mid-1990s, after Energy Fuels Nuclear sold and rebought the mill, the company ran out of money. When it couldn't pay its employees, it laid them off.[12] Within a month, the asset-holding parts of Energy Fuels Nuclear declared bankruptcy,[13] and the mill was sold for "almost nothing."[14]

EFRI Response:

These statements are factually incomplete and generally not true.

The following italicized words and phrases are misleading, inflammatory, and speculative language and are framed for purposes of advocating a position against the Mill and its operations, and should not be endorsed as descriptive of the Mill and its operations:

- *low-grade* uranium ore;
- *fired up* the mill;
- *but that didn't happen. Instead pumped* the resulting *radioactive* tailings;
- when the price of yellowcake *plummeted*;
- *mostly, if not completely, dormant*;
- This *pattern has continued ever since*;
- yellowcake is *fetching* a *good enough* price;
- mill *lapses into* "standby;
- *not one of* the mill's *big waste pits* has been completely reclaimed;
- Ownership of the mill has been *similarly tumultuous*;
- the company *ran out of* money;
- When it *couldn't pay* its employees, it laid them of; [1]
- the mill was sold for "*almost nothing*."

Contrary to the foregoing statements, the Mill was constructed to process all grades of uranium ores available to it, not "low-grade" ores. Colorado Plateau ores are not "low-grade" by world standards.

As discussed in more detail in Section 2.1, Ute Mountain Ute Comment 4, above, the Mill was designed with an operational capacity of approximately 2,000 tons of ore per year and with an initial Mill tailings capacity of 10 million tons of tailings. Operating at full capacity of approximately 660,000 tons of ore per year, it would take approximately 15 years to fill up the initial tailings capacity of 10 million tons. The mention of 15 years in the ER and FES is only a reference to the time it would take to fill up the initial tailings capacity if the Mill were to run at full capacity. There is no requirement for the Mill to run at any capacity level, let alone at full

capacity. Therefore, there is no set operational life for the Mill. There was no expectation at the time the Mill was constructed that it would run at full operational capacity for 15 years straight and then go into reclamation.

Tailings Cell 2 at the Mill has been substantially reclaimed and is going through a test period to verify the performance of the final layers of the cover design. The test period is an added step required by DWMRC to ensure that the tailings cover will perform as designed and be fully protective of the environment. Tailings Cell 2 could have been fully reclaimed by now, had this added step not been required. Tailings Cell 3 is almost full and is partially reclaimed at this time. Sequential reclamation of the Mill's tailings cells has always been contemplated at the site, and is the preferred approach to ensure that the Mill's tailings cells are reclaimed after each use and that replacement tailings cells are constructed in accordance with BAT standards. See Section 2.1, Ute Mountain Ute Comment 4, above, for a more detailed discussion.

The ownership history of the Mill described above is not accurate, but in any event is not relevant to this licensing action. Energy Fuels Nuclear Inc. was a responsible operator, and is a completely separate entity from and is unrelated to EFRI. EFRI and its predecessors bought the Mill and various mines operated by Energy Fuels Nuclear Inc. as assets out of bankruptcy. There are no concerns about any previous Energy Fuels Nuclear Inc. operations or entity liabilities.

5.5. Grand Canyon Trust Introductory Comments; II. Background; A The White Mesa Mill; Statement 4.

Today, a company called Energy Fuels, Inc., owns and operates the mill through subsidiaries. Energy Fuels is careful to claim that it and Energy Fuels Nuclear are "unrelated entities," [15] perhaps to distance itself from any environmental liabilities that Energy Fuels Nuclear could not discharge through bankruptcy. But Energy Fuels, Inc., was formed in 2005 by a prior owner of Energy Fuels Nuclear[16] and touts on its website that "much of our senior management team began their careers and learned about the U.S. uranium industry from the earlier successes of Energy Fuels Nuclear."[17]

EFRI Response:

The ownership history of the Mill and the history of EFRI and its affiliates described above is not accurate, but in any event is not relevant to this licensing action.

Further, language such as "*careful to claim that it and Energy Fuels Nuclear are "unrelated entities," [15] perhaps to distance itself from any environmental liabilities that Energy Fuels Nuclear could not discharge through bankruptcy*"; and "*touts on its website*", are inflammatory and speculative and should not be endorsed as descriptive of the Mill or EFRI.

5.6. Grand Canyon Trust Introductory Comments; II. Background; A The White Mesa Mill; Statement 5.

The mill's business model has also changed over time, no doubt due to volatility in the uranium market. Around the early 1990s, Energy Fuels Nuclear began pursuing a new source of revenue by processing "alternate feeds" and discarding the resulting waste at the mill. These feeds include uranium-bearing wastes from other contaminated places around the country. In 1998, for example, Energy Fuels[18] was paid over $4 million to process and dispose of radioactive soil that was contaminated not only by the Manhattan Project, but also by other industrial and chemical ventures.[19] From these sorts of feeds, the waste pits at the mill now contain radioactive and contaminated wastes from rare-metals mining,[20] uranium-conversion plants,[21] and contaminated defense facilities,[22] among other sources. The two new "alternate feeds" that the company is seeking permission to accept—which the Division calls the Silmet "material" and the Moffat Tunnel "material"—would bring the list of materials that Energy Fuels has been licensed to process and discard to around twenty.

Processing alternate-feeds is not the mill's only waste-disposal business. Wastes generated at operations that recover uranium by in-situ leaching are also buried in the mill's pits. Unlike alternate feed, these wastes aren't processed at the mill before being discarded. These wastes include, for example, barium-sulfate sludge from treating waste solutions at an in-situ uranium leaching operation Wyoming.[23] Leaking shipments of that sludge have arrived at the mill twice since 2015.[24] In the past, similar wastes have been shipped, at a minimum, from Texas, Nebraska, and Wyoming to be buried at the mill.[25] By running its business, Energy Fuels has also fouled the groundwater beneath the mill. Exactly how some of that contamination got into the groundwater aquifers beneath the mill is a subject of debate. But it's undebatable that the groundwater is contaminated by pollutants like nitrate, nitrite, chlorides, and chloroform.

EFRI Response:

As discussed in more detail in Section 5.3 above, it is incorrect to state that Mill tailings are "wastes." What comes out of the Mill is 11e.(2) byproduct material, which is defined as the "tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content." Some of the 11e.(2) byproduct material is tailings and some is wastes. Uranium mill tailings are not wastes, as they contain residual metals that Energy Fuels actively recovers. For example, the Mill has recycled its tailings in recent years to recover uranium and vanadium from recirculated tailings solutions ("**Pond Returns**"). Characterizing the plant operation as a "waste disposal" business is therefore not accurate. Rather, its alternate feed material and Pond Return programs should be recognized as important recycling operations.

Alternate feed materials are valuable ores and are not wastes, any more than conventional ores are wastes before they are processed. Both are ores. As discussed in more detail in Section 5.3 above, since 1998, the Mill has recovered and recycled 6 million pounds of uranium from its alternate feed recycling program and from Pond Returns.

As discussed in more detail in Section 5.3 above, the continued misuse and mischaracterization of the Mill's tailings impoundments as "pits" is incorrect.

With respect to groundwater, as discussed in more detail in Section 1.2 above, there have been no detected releases from the Mill's TMS to groundwater at the site since the Mill commenced operations in 1980. The extensive groundwater monitoring network has produced data that demonstrates that no contaminant plumes have developed from the tailings and fluid management impoundments. Two small plumes of contaminants, chloroform and nitrate/chloride, unrelated to the processing of uranium have been detected in the perched Burro Canyon Aquifer near the Mill facility, long distances away from off-site potential receptors, and both non-radioactive plumes are being managed to prevent spread beyond the Mill property. Neither plume is related to the TMS. The chloroform plume appears to have resulted from the operation of a temporary laboratory facility that was located at the site prior to and during the construction of the Mill, and from septic drain fields that were used for laboratory and sanitary wastes prior to construction of the Mill's tailings cells. The nitrate/chloride plume likely originated primarily from a former stock pond ***upgradient*** of the TMS, and may have received a contribution from a chemical spill some distance also ***upgradient*** from the TMS. Both have cleanup initiatives under way.

With respect to the disposal of ISR byproduct material in the Mill's TMS, the NRC regulations in 10 CFR 40 Appendix A, Criterion 2, focus on avoiding proliferation of numerous small radioactive waste disposal sites and thereby reduce perpetual surveillance obligations at ISR operations and other small remote uranium extraction sites. 10 CFR 40 Appendix A Criterion 2 (as incorporated by reference in UAC R313-24-4) states "To avoid proliferation of small waste disposal sites and thereby reduce perpetual surveillance obligations, byproduct material from in situ extraction operations, such as residues from solution evaporation or contaminated control processes, and wastes from small remote above ground extraction operations must be disposed of at existing large mill tailings disposal sites; unless, considering the nature of the wastes, such as their volume and specific activity, and the costs and environmental impacts of transporting the wastes to a large disposal site, such offsite disposal is demonstrated to be impracticable or the advantages of onsite burial clearly outweigh the benefits of reducing the perpetual surveillance obligations."

Accordingly, ISR facilities do not have permanent 11e.(2) disposal facilities on site. Instead, upon final closure ISR facilities are decommissioned to free-release (clean closure) standards. In order to accomplish this, as a condition of their licenses they are required to enter into and maintain a contract for the disposal of their 11e.(2) byproduct materials, during operation and at closure, at an existing off-site licensed 11e.(2) byproduct disposal facility, such as the Mill. In response to Criterion 2 referenced above, and to accommodate the license requirements of ISR facilities under this program, the Mill has received and disposed of 11e.(2) byproduct material from ISR facilities since 1993 under Section 10.5 of the Mill's License, UT1900479.

The portion of the Mill's revenues from acceptance of 11e.(2) byproduct has always been small in comparison to revenues from its milling and recycling operations. The Mill does not accept ISR 11e.(2) byproduct materials out of a profit motive or to be a direct disposal facility, but because it is mandated to do so by federal regulation and federal non-proliferation strategies. The Mill is

doing its part to avoid the proliferation of radioactive waste disposal sites, in accordance with federal and State regulations.

Further, language such as *"discard;" "buried in the mill's pits;" "leaking shipments of that sludge;" and "fouled"* are inflammatory and should not be endorsed as descriptive of the Mill or EFRI's business.

5.7. Grand Canyon Trust Introductory Comments; II. Background; B. Source-Material and Byproduct Material Licensing; Statement 1

To mill uranium, Energy Fuels is required to get a license from the Utah Division of Waste Management and Radiation Control that authorizes the company to possess and process "source material"—generally meaning uranium ore—and to dispose of the waste "byproduct material" that the mill generates.[26] The Division is authorized to issue this license under state law, exercising authority delegated to the state by the U.S. Nuclear Regulatory Commission.

That delegation was made under the Atomic Energy Act of 1954, the fundamental federal law regulating source, byproduct, and other nuclear materials. That Act authorizes the Nuclear Regulatory Commission to issue regulations governing the possession and use of source and byproduct material "to promote the common defense and security or to protect health or to minimize danger to life or property...."[27]

The Commission has issued three main rules regulating uranium milling: the agency's general standards setting radiation dose limits for the general public and mill workers (10 C.F.R. Part 20); (2) the Commission's rules for domestic licensing of source material (10 C.F.R. Part 40), which establish health, safety, financial, and other requirements that uranium-mill operators must meet to get a license; and (3) Appendix A to those licensing regulations, which establishes standards for managing and reclaiming mill tailings. The State of Utah has set its own radiation dose standards and has adopted wholesale many, but not all, of the latter two Commission rules.[28]

The main requirements for managing and disposing of tailings originate from a federal law passed in 1978 called the Uranium Mill Tailings Radiation Control Act. Congress found in UMTRCA that "uranium mill tailings located at active and inactive mill operations may pose a potential and significant radiation health hazard to the public" and sought to regulate tailings in "a safe and environmentally sound manner ... to prevent or minimize radon diffusion into the environment and to prevent or minimize other environmental hazards from such tailings."[29] It was to comply with UMTRCA that the Commission issued Appendix A.[30]

EFRI Response:

No Comment.

5.8. Grand Canyon Trust Comments; III. The Division should reject Energy Fuels' requests to process the Silmet and Moffat Tunnel Materials; A. The Silmet Material

The "Silmet material" is a waste generated by a rare-metals plant in Sillamäe, Estonia run by NPM Silmet OÜ.[31] The plant sits on land that has been an industrial site for about a century.[32] The area first housed a production plant for oil shale,[33] but in the 1940s, it was converted by the Soviet Union into a "top secret," "large industrial complex" for producing uranium.[34] Modifications in the 1970s allowed the plant to begin producing niobium, tantalum, and rare earth metals, which the plant continues to do today.[35]

Until Estonia joined the European Union in 2004, wastes from the industrial operations at the Silmet plant site were dumped in a pit about twenty to fifty meters from the Baltic Sea.[36] Owing to the threat this posed to the environment and public health, the pit was taken out of use in 2004 and cleaned up over the next four years.[37]

But that created a new problem for Silmet, for it continued to produce a radioactive waste stream in its rare-metals operations.[38] And by 2004, under Estonia's Radiation Act, these wastes could not be discarded in Estonia, for "there is no radioactive waste management operator for [naturally occurring radioactive materials] waste in Estonia."[39] As a result, the plant's operator has been packaging the wastes in 55-gallon drums and storing them at the plant for about the last 15 years while searching for a foreign, waste-disposal option.[40] When operating, the plant generates about 80 tons per year of this waste.[41] Silmet now has about 600 metric tons of this waste stored at its Sillamäe plant in about 2,000 drums.[42] The company's radiation practice license allows it to accumulate no more of this waste, and as a consequence, the plant's niobium and tantalum operations have ceased, and the Estonian Ministry of Environment has refused to allow operations to resume until the waste is discarded off site.[43] It is this waste, and any additional waste generated if operations at the plant resume, that Energy Fuels is seeking permission to process and discard at the White Mesa mill.

EFRI Response:

The statement regarding Silmet's situation and the Radiation Control Act are incomplete and misleading. While it is correct that there is not yet a facility to recover or dispose of the material *in Estonia*, and there are no *recycling* facilities within the European Union of which Estonia is a member, there are *disposal* facilities within the European Union. Silmet does, in fact, prefer to ship the material to a location that affords recovery/recycling, in lieu of direct disposal, despite the increased cost of transport. Silmet has decided to be environmentally responsible by seeking a recycling option over direct disposal. As discussed in more detail in Section 5.1 above, recycling the Silmet material at the Mill will result in the recovery of a significant amount or uranium that would otherwise be lost to direct disposal, in accordance with the strictest environmental regulations in the world, and will significantly reduce greenhouse gas emissions to the benefit of the global environment.

5.9. Grand Canyon Trust Comments; III. The Division should reject Energy Fuels' requests to process the Silmet and Moffat Tunnel Materials; B. The Moffat Tunnel Material

The Moffat Tunnel "material" is a waste containing radionuclides that is generated by a water-treatment plant in Winter Park, Colorado that was built to clean up discharges from the Moffat Tunnel.[44] The Moffat Tunnel was built a century ago to allow trains to travel under the Continental Divide near Colorado's Front Range.[45]

Groundwater and other precipitation seeps into the tunnel and flows out each end, carrying with it contaminants picked up on the way.[46] About five years ago, the Colorado Department of Public Health and Environment required the Tunnel's operator, the Union Pacific Railroad, to build a water treatment plant at the Tunnel's west end to treat the discharge before it flows into the Fraser River.[47]

Because the outflows from the west end of the tunnel contain radionuclides, the "centrifuge cake" generated by the water treatment plant has "elevated" levels of radionuclides.[48] As a consequence state regulators in Colorado have required the Union Pacific Railroad to get a radioactive materials license to dispose of this waste centrifuge cake.[49] This is the Moffat Tunnel "material" that Energy Fuels is seeking permission to process and discard at the White Mesa mill. Energy Fuels anticipates that it may receive this waste material "indefinitely" in quantities of up to 200 tons per year on a wet basis.[50]

EFRI Response:

The water flowing out of the Moffat Tunnel requiring treatment contains solely natural radionuclides, solely from contact with native matter, which is natural Colorado Rocky Mountain rock. Numerous commenters, including the commenter cited herein, have insisted that the Mill should process only uranium from native matter. The uranium in the material is natural uranium from native matter possessing radionuclides in their natural relative abundances. They are present in the tunnel rock and tunnel water at the same relative abundances they would exhibit if Union Pacific had chosen to excavate the rock mass as ore.

It should also be noted that 200 tons per year of tailings is a trivially small quantity. At full operation, the Mill is licensed to receive up to approximately 720,000 tons of ore per year. The tailings from processing the Moffat Tunnel material will not be noticeably different from the tailings from conventional ore processing.

5.10. Grand Canyon Trust Comments; III. The Division should reject Energy Fuels' requests to process the Silmet and Moffat Tunnel Materials; C. The Division may deny the alternate-feed applications to protect the environment and public health, and it should exercise that authority.

Licensing alternate feeds for processing and disposal at the mill is a practice that ought to end outright, absent the consent of the Ute Mountain Ute Tribe, absent an act of Congress specifically

allowing uranium mills to process alternate feeds, and absent an open public debate about whether that practice should occur at the White Mesa mill.

The Division has the discretion under existing law to reject alternate-feed license applications upon finding that their issuance would be "inimical to the health and safety of the public."[51] We urge the Division to exercise that discretion to deny the applications to process the Silmet and Moffat Tunnel materials.

To lawfully make yellowcake and bury the resulting wastes at its mill, Energy Fuels must process "ore" primarily for its "source material" content.[52] Source material means uranium or thorium, or any ore containing one of those elements at concentrations established by the Nuclear Regulatory Commission.[53] In the 1990s, Commission staff released guidance that defined "ore" to mean anything from which uranium or thorium are extracted in a licensed mill.[54] This tautological definition had the effect of allowing Energy Fuels to run anything from which it could extract uranium through the White Mesa mill and discard the resulting wastes on site, provided the feed wasn't a so-called "listed" hazardous waste.[55] And Energy Fuels took the view that it could even charge fees to process and discard wastes that the waste generator was willing to pay to get rid of.[56]

The State of Utah balked at this idea and took the issue to the Nuclear Regulatory Commission.[57] The Commission ultimately decided against the State.[58] As a result, through a guidance document issued by Commission staff and an administrative appeal before the Commission, Energy Fuels was given permission to make money disposing of radioactive waste at the White Mesa mill. That outcome bypassed any true public debate about how to get rid of a host of uranium-bearing wastes that have been discarded at the mill since the early 1990s. Indeed, Energy Fuels' "alternate-feed" business has never been blessed by an act of Congress, nor a state law, nor any other publicly debated kind of lawmaking.

The result of this quiet revolution in the law is that the White Mesa mill, as a practical matter, has been given a license to operate indefinitely, not milling much or any uranium ore, but instead accepting wastes for "processing" and disposal. The core problem with that outcome, though there are others, is that the prospect of an indefinitely operating waste-disposal business was not at all the subject of discussion and analysis when the federal government and Energy Fuels chose in the late 1970s to build the mill on White Mesa. What was debated back then was whether to license a uranium mill to process low-grade uranium ore from the region for 15 years, before closing and reclaiming the mill.[59] Forty years later, the community of White Mesa is burdened by something else entirely: a landfill for low-level radioactive waste that may forever be running, fed by massive waste-hauling trucks, polluting the air, killing wildlife, and making the already-polluted groundwater ever more toxic.

Indeed, for most or all alternate feeds, the additional pollution from running the mill to process those feeds—the toxins the mill puts into the air, the chemicals it uses to extract yellowcake, and the like—burdens the environment and the people around the mill only so that the resulting waste may be deemed "byproduct material" that can be discarded on site. This pollution would not happen if it was the market for selling yellowcake, rather than the market for disposing of

radioactive waste, that controlled whether these alternate-feed deals occurred. Put another way, the expense of transporting and processing the feeds so far outweighs the value of the resulting yellowcake that it is only for waste-disposal that most or all alternate-feeds are ever brought to the mill.

All of this is happening over the persistent objections of the Ute Mountain Ute Tribe. And rather than listen to those objections and confront the failure of governance motivating them, the Division appears to believe that it is bound by federal law to approve any alternate-feed application if the feed has uranium in it (i.e., is ostensibly "ore"), does not contain listed waste, and will be processed at the mill.[60] *But this is not so, for the Division has discretion to reject alternate-feed license applications on the grounds that they are "inimical to the health and safety of the public" regardless of the Commission's guidance,*[61] *and the Utah Waste Management and Radiation Control Board has the power—which it could exercise at the Division's behest—to amend or abandon the Commission's guidance altogether.*[62]

The Division contends that, when Utah first obtained agreement-state status, it agreed to use "best efforts … to assure that the State's program will continue to be compatible with the program of the Commission for the regulation of like materials."[63] *Yet that commitment does not require the Division to approve any license amendment that would be "inimical to the health and safety of the public," including an amendment to process alternate feeds, for protecting the health and safety of the public is surely compatible with the Commission's regulations.*[64]

The Division also observes, without citation, that the State committed in its 2003 agreement-state application to apply the Commission's guidance for evaluating whether to license alternate feeds for processing.[65] *But that description of the application omits a crucial caveat: The agreement said nothing about the alternate feed guidance, but made only a general commitment to follow guidance issued by the Commission writ large "unless doing so will compromise protection of human health* and the environment."[66] *And the amendment that the Commission and the State of Utah ultimately signed to expand the State's agreement-state power, which reflects the binding commitments each party made, says nothing about following the Commission's guidance, concerning alternate feeds or any other subject.*[67]

Added to that, the State of Utah has the authority to depart from the Commission's alternate-feed guidance, for the Atomic Energy Act explicitly allows agreement states to adopt requirements that are more stringent than federal law:

> *In the licensing and regulation of byproduct material … a State shall require … compliance with standards which shall be adopted by the State for the protection of the public health, safety, and the environment from hazards associated with such material which are equivalent, to the extent practicable, or more stringent than, standards adopted and enforced by the Commission for the same purpose….*[68]

It is consequently not true that the Division's hands are tied by federal law.

We accordingly urge the Division to exercise its authority to find that it is inimical to the health and safety of the public to allow Energy Fuels to process the Silmet and Moffat Tunnel wastes at the mill. At the very least, the Division has the power to find that it is inimical to the health and safety of the public to allow alternate feeds to be shipped to the White Mesa mill when the feed's generator is incurring more expense in the deal than Energy Fuels stands to gain from processing the feed, for in that circumstance the feed would never be sent to the mill but for the ability to discard the resulting waste in Utah's environment, next to Utah's communities. This financial arrangement, as explained below, doubtless applies to the Silmet material, and we suspect it is true of the Moffat Tunnel waste too. And at least on this basis, we urge the Division to deny the applications to process these alternate feeds.

EFRI Response:

The Mill is a fully licensed and permitted facility on private land that is operating in compliance with all applicable licenses, permits, laws and regulations. Its ability to continue to operate in accordance with all applicable licenses, permits, laws and regulations is not subject to the consent of the Ute Mountain Ute Tribe. Further, nothing requires an act of Congress for a fully licensed and permitted facility to continue operating in accordance with its licenses and permits.

As discussed in detail in Section 1.3 above, DWMRC is bound to follow federal law on the definition of what is ore, and therefore what is 11e.(2) byproduct, which have long been resolved beyond legal dispute. DWMRC uses the definition of ore, and by extension 11e.(2) byproduct material, as developed by NRC. The technical and legal issues presented in the case of the Silmet alternate feed materials, and the three alternate feed materials approved by DWMRC were analogous to those addressed by NRC and the federal courts in the Kerr-McGee decision and the Ashland 2 decision, as discussed in DWMRC's TEEA and Statement of Basis for the Silmet material.

In rejecting the argument that the processing of Ashland 2 materials was a sham because the Mill accepted a processing fee that exceeded the value of the uranium recovered from the material, the full Commission of the NRC in the Ashland 2 decision concluded that (see Attachment A below):

> "Our review of UMTRCA and its legislative history confirms the Presiding Officer's conclusion that the requirement that material be processed primarily for its source material content most logically refers to the actual act of processing for uranium or thorium within the course of the nuclear fuel cycle, and does not bear upon any other underlying or "hidden" issues that might be driving the overall transaction

The NRC Commission further stated that "the purposes behind the wording of § 11e.(2)'s definition served: (1) to expand the types of materials that properly could be classified as byproduct material; (2) to make clear that even feedstock containing less than 0.05% source material could qualify as byproduct material; and (3) to assure that the NRC's jurisdiction did not cross over into activities unrelated to the nuclear fuel cycle. IUSA license amendment is consistent with these statutory intentions, regardless of whether IUSA's bigger interest was payment for taking the material or payment for the recovered uranium. Indeed, even accepting the State of Utah's claim that the four

million dollar payment IUSA contracted to receive for processing and disposing of the Ashland 2 FUSRAP site material was the primary motivator for this transaction, the tailings generated from the processing can still properly be classified as § 11e.(2) byproduct material".

The issues raised by the commenter are an attempt to re-litigate issues already resolved by NRC and the courts and binding on DWMRC.

As discussed in more detail in Section 2.1 above, the Mill was designed with an operational capacity of approximately 2,000 tons of ore per year and with an initial Mill tailings capacity of 10 million tons of tailings. Operating at full capacity of approximately 660,000 tons of ore per year, it would take approximately 15 years to fill up the initial tailings capacity of 10 million tons. The mention of 15 years in the ER and FES is only a reference to the time it would take to fill up the initial tailings capacity if the Mill were to run at full capacity. There is no requirement for the Mill to run at any capacity level, let alone at full capacity. Therefore, there is no set operational life for the Mill.

As discussed in more detail in Section 1.4 above, the Mill has been the largest private employer in San Juan County, Utah, during most of its 40-year history. San Juan County is the poorest county in Utah and well within the 50 poorest counties in the United States. The Mill's workforce is typically approximately 50% Native American.

The Mill supports the local economy not only through the taxes it pays to local authorities and the salaries and wages it pays to its employees and to numerous third party contractors, such as transportation companies, equipment rental companies, equipment vendors and service providers, but also indirectly through the "multiplier effect" to the communities as a whole. That is, the money the Mill pays directly to its employees, contractors vendors and providers is spent by them in the communities, thereby providing income to local businesses and wages and salaries to employees and owners of those business, who in turn spend their income, salaries and wages on other businesses in the community, and so on. Indeed, as the largest private employer in San Juan County, Utah, the Mill is a very significant factor in the local economy.

Over the Mill's 40-year history, it has never had an overexposure of any of its workers or any members of the public, and in fact operates well below the regulatory exposure limits. For example, the Mill has never exceeded its ALARA goal of 1,250 millirem per year ("**mrem/yr**") for workers, and typically the maximally exposed worker is less than 500 mrem/yr, which is one tenth of the regulatory standard of 5,000 mrem/yr. Similarly, emissions at the boundary monitoring stations around the Mill show emissions at less than the As Low As Reasonably Achievable ("**ALARA**") goal of 25% of the regulatory standard, and modeling shows that exposures at the Mill property boundary are a small fraction of the 100 mrem/yr standard.

As stated in Section 1.4 above, uranium mill tailings are not wastes, as they contain residual metals that Energy Fuels actively recovers. For example, the Mill has recycled its tailings in recent years to recover uranium and vanadium from recirculated tailings solutions ("**Pond Returns**"). Characterizing the plant operation as a "waste disposal" operation is therefore not accurate. Rather, its alternate feed material and Pond Return programs should be recognized as important recycling

operations. Since 1998, the Mill has recovered and recycled 6 million pounds of uranium from its alternate feed recycling program and from Pond Returns.

- For context, this recycled uranium would produce the same amount of electricity as about 50 million tons of coal – or enough coal to fill a coal train from LA to NYC, and almost all the way back again;

- This recycled uranium would eliminate over 85 million tons of CO_2 emissions compared to coal, or the same amount of annual emissions as 18 million passenger vehicles. 85 million tonnes of CO_2 emissions is about 1.5 times the annual CO_2 emissions for the entire country of Sweden;

- This recycled uranium would produce the same amount of electricity in one year as 24,500 wind turbines (which is almost half of the 60,000 wind turbines in the U.S. in 2019); and

- Over 110 million acres of forest would be required for one year or 1.4 billion seedlings would need to grow for 10 years to sequester that amount of CO_2 emissions. 110 million acres of forest would be a forest larger than the entire State of California.

Over the last 20 years, over 47% of our uranium production has been from the recycling of uranium-bearing materials.

Even this one small Silmet ore project is expected to generate from 7,096 to 10,692 pounds of U_3O_8 by itself.

- When converted to nuclear fuel, this amount of U_3O_8 will generate the same amount of electricity as 55,682 - 83,905 tons of coal. That amount of coal when burned to make electricity will generate 101,472 to 152,208 tonnes of CO_2 emissions;

- 152,208 tonnes of CO_2 emissions avoided by recycling the Silmet material, would be equivalent to the amount of CO_2 emissions from 32,874 passenger vehicles for one year;

- It would require a forest the size of 197,673 acres for one year to sequester the same amount of CO_2 emissions. A forest that size would exceed the combined area of Zion and Bryce Canyon National Parks, would be 4.5 times the area of the District of Columbia, and 234 times the area of Central Park, NYC); and

- Finally, that amount of uranium when converted to nuclear fuel, would generate as much electricity as about 44 wind turbines for one year.

All from one small recycling project at the Mill.

Vanadium, which today is mainly used in the steel, aerospace, and chemical industries, also contributes to environmental sustainability, as this critical mineral is seeing considerable interest in next generation batteries that store energy generated from renewable sources. The Mill has

recycled enough vanadium through Pond Returns, which would otherwise have been lost to direct disposal, to provide the vanadium needed for enough steel girders today to build four and a half Golden Gate Bridges. Over the last 10 years, over 26% of our vanadium production has been from this recycling program.

There is no evidence whatsoever that the processing of alternate feed materials results in killing wildlife. The commenter is respectfully asked to demonstrate which wildlife have died or which species populations have been reduced due to processing of alternate feed materials.

Additionally, as stated in the TEEA and Statement of Basis for the Silmet material, DWMRC found that the Silmet material is comparable to other materials and therefore is not "inimical to the health and safety of the public." DWMRC concurred with the Licensee's conclusion that "there are no anticipated impacts to the environmental via any of the above [evaluated] pathways, above those already anticipated in the existing environmental statements and environmental assessments associated with the Mill's approved license." DWMRC did not find a public health and safety or environmental basis related to radiation protection, as a justification to deny processing of the material. In conclusion, DWMRC does not have either the discretion, or the basis to deny the Silmet alternate feed application and an amendment to the license.

5.11. Grand Canyon Trust Comments; IV. If the Division approves the request to process the Silmet material, that approval should be contingent on Energy Fuels' acquisition of a specific import license.

While we urge the Division to deny outright Energy Fuels' application to process the Silmet waste, if the Division nonetheless approves that request, that approval should be conditioned on Energy Fuels' acquisition of a specific-import license from the Commission, for the Commission's general-import license does not authorize Energy Fuels to import the Silmet material.

A. Energy Fuels cannot import the Silmet material using a general import license.

Energy Fuels has asserted that it may bring the Silmet material into the United States from Estonia using a general-import license established by 10 C.F.R. § 110.27(a).[69] The Division has concurred with that view.[70] Yet the general license in § 110.27(a) does not allow for the importation of "radioactive waste," as that term is defined by the Commission's import regulations.[71] And because the Silmet material is a "radioactive waste," it cannot be imported under a general license.

The Silmet material is a "radioactive waste" if Energy Fuels will not import it "solely" for the purpose of recycling.

The Commission's regulations provide that "a general license is issued to any person to import ... source ... material if the U.S. consignee is authorized to receive and possess the material under the relevant NRC or Agreement State regulations."[72] But that general license is subject to

conditions,[73] one of which provides that "radioactive waste" may not be imported under a general license.[74]

"Radioactive waste" has a unique and complex definition in the Commission's export and import rules, which provides in pertinent part:

> *Radioactive waste … means any material that contains or is contaminated with source … material that by its possession would require a specific radioactive material license in accordance with this Chapter and is imported or exported for the purposes of disposal in … a disposal area as defined in Appendix A to 10 CFR part 40...; or recycling, waste treatment or other waste management process that generates radioactive material for disposal in … a disposal area as defined in Appendix A to 10 CFR part 40....[75]*

Further complicating the matter, some radioactive materials that would otherwise be radioactive wastes under this definition are excluded by rule. These include materials "[i]mported solely for the purposes of recycling and not for waste management or disposal where there is a market for the recycled material and evidence of a contract or business agreement can be produced upon request by the NRC."[76] It is under this exclusion that Energy Fuels asserts that it can import the Silmet material.[77] But that assertion is flawed.

For the Silmet material to qualify under this exclusion, it must be imported solely for the purpose of recycling.[78] When adopting this exemption in 2010, the Commission warned against its misuse:

The Commission is aware that there could be instances in which a person intends to import what is in fact radioactive waste, but which is argued to be for recycling purposes (i.e., sham recycling). Any person who imports materials under a general license for recycling, but with the purpose of disposing of them in the United States, would be subject to NRC enforcement action.[79]

The Commission further recognized that "there may be instances in which some small value may be obtained from the materials that are imported, but the primary intention is for disposal."[80] In such cases, to avoid possible enforcement action, the staff recommends that the Commission be consulted before any such imports are made."[81]

For the reasons explained below, the possible value that Energy Fuels might obtain from processing the Silmet material is a small fraction of the expense of transporting it to White Mesa and processing it, not accounting for permitting costs, overhead, marketing, and the like. At best, this is the precise circumstance that the Commission envisioned would amount to "sham recycling" and warned licensees not to attempt.

And it is important to stress that, on the subject of "sham recycling," the analysis under the Commission's import rules is different than the domestic-licensing rules for alternate feeds. The core question of law for "alternate feeds" originating in the United States is whether processing them will result in "wastes produced by the extraction or concentration of uranium … from any ore processed primarily for its source material content."[82] The Commission has interpreted this language to allow a licensee to process a "source material"—like an alternate feed—even if the

licensee's primary motive is to receive a disposal fee, so long as the act of processing is completed primarily to extract the feed's source-material content and not something else.[83] *In so holding, the Commission observed that there is "no reason under UMTRCA why licensees cannot have several motives for a transaction."*[84]

But this analysis does not apply when evaluating how a foreign-sourced "alternate feed" should be treated under the Commission's import regulations, for those regulation require that the material be imported "solely" for the purpose of recycling. It is not enough that "recycling" is one ostensible reason, however trivial, among other reasons for importing a material: It must be the sole reason.

For similar reasons, the Division's legal review of the import-license question should be revisited. In that analysis, the Division reasons that the Commission would not require an import license today because it did not require one when Energy Fuels began importing materials from Cameco Corporation's operations in Ontario, Canada in 1998.[85] *But the Commission changed its import rules in 2010 to adopt the definition of "radioactive waste" discussed above, including the recycling exclusion.*[86] *Thus, the Commission's conclusions about the 1998 import license have no bearing on how its modified import rules apply today.*

All told, conceding for the sake of argument that Energy Fuels may process domestically sourced "alternate feeds" at the mill even if the company's primary motivation is to generate waste-disposal fees, that is not true of whether Energy Fuels may import foreign-sourced "alternate feeds." On that score, it must import the material "solely" for the purpose of recycling, a requirement that—as explained below—is not met here.

Energy Fuels is not importing the Silmet material solely for the purposes of recycling.

Even assuming, for the sake of argument, that one of the purposes for importing the Silmet material is to "recycle" the tiny fraction of uranium it contains, there is no denying that another purpose—and indeed, in our view, the only purpose[87]*—is disposal of the remaining 99.5-plus percent of the Silmet material. This is evident for several reasons.*

First, Energy Fuels estimates that the Silmet material averages about 0.27 percent U3O8.[88] *So, if Energy Fuels receives 2,000 drums of the Silmet material, Energy Fuels would effectively bury just over 1,994 of those drums in the mill's waste pits and produce a bit less than 6 drums' worth of yellowcake (assuming all the uranium could be extracted from the Silmet material, which it cannot).*[89] *As a simple mathematical matter, the outcome of importing the Silmet material will be to discard nearly all of it permanently at the mill.*

Second, it is plain that Silmet treats the "Silmet material" as waste that Silmet is anxious to dispose of. Energy Fuels' application to process the material explains that the Republic of Estonia has refused to renew Silmet's radiation activity license and has shut down Silmet's plant until it gets rid of the "Silmet material."[90] *For Silmet, and for the Republic of Estonia, the only goal is to export the material from the country because it cannot be lawfully discarded in Estonia due to its radioactive content.*[91] *Silmet's purpose is decidedly not "recycling," but rather, waste disposal.*

Third, the finances of the transaction reveal that the value in the deal for Silmet and Energy Fuels is from waste disposal, not "recycling." Though Energy Fuels has not disclosed any information about the financial aspects of the Silmet deal, we have no doubt that the cost of transporting the material to White Mesa and processing it far exceed the revenues Energy Fuels could generate from selling uranium "recycled" from that material.

Indeed, the cost of transporting the Silmet material alone surely exceeds the value of any yellowcake it can yield. The rough estimates we've unearthed suggest that shipping 20' intermodal or similar containers from the Port of Tallinn in Estonia to the Port of Houston is likely to cost at least $1,700 per container, with a range up to $2,800, perhaps more.[92] At the midpoint of those rates, shipping 50 containers, as Silmet plans to do to export the material it currently has on hand, would cost $112,500.[93] And judging by Energy Fuels' past estimates for transporting similar shipments by truck to the mill, the cost to deliver the material to White Mesa from Houston is likely to be on the order of another $160,000.[94] These calculations, though rough, suggest that transporting the materials from Estonia to White Mesa will cost somewhere around $275,000.

That probable shipping cost will far exceed the value of any uranium produced from the Silmet material at today's uranium prices. Assuming that the Silmet material contains on average 0.27% U3O8 and that the mill has a 100% recovery rate (which it does not), processing 600 metric tons of Silmet material would yield about 3,500 pounds of yellowcake.[95] At a spot-market price of $33/lb, 3,500 pounds of yellowcake would fetch about $115,500.[96] Thus, considering only the transportation costs, the deal to "recycle" the material at the mill will generate a net financial loss of somewhere around $150,000.

And the milling cost will only significantly increase the net financial losses entailed by the Silmet transaction. In 2008, the Nuclear Regulatory Commission estimated that the per-ton milling cost for another alternate feed was about $125, a figure we suspect does not include overhead, marketing, and other expenses necessary to sell the resulting yellowcake.[97] Using that cost estimate adjusted to today's dollars, processing 600 tons of material would set Energy Fuels back by about $91,000.[98] Taken together with the transportation cost, the expense to process the Silmet materialwill far exceed the value of the yellowcake that can be made from that material. Indeed,we suspect that Silmet is willing to pay not only the cost to transport the material to White Mesa but also a tipping fee to compensate Energy Fuels for processing the material and discarding the waste.

Added to all this, there is no evidence, in the record or otherwise that Silmet has an alternative option for disposing of the "Silmet material" and is electing instead to incur additional cost to "recycle" it out of environmental goodwill or for some other reason. That is, it is not the case that Silmet prefers to spend more to "recycle" the material even though it could discard it in Estonia or elsewhere. What matters to Silmet is securing some way to dispose of the waste that it cannot lawfully discard in Estonia.

All told, it is overwhelmingly clear that the purpose for sending the Silmet material to the White Mesa mill is to reclassify it as a "waste[] produced by the extraction or concentration of uranium

... from any ore processed primarily for its source material content" so that the Division will allow Energy Fuels to discard that waste at the mill. Put differently, there can be no doubt that if the waste could not be discarded at the mill, Energy Fuels and Silmet would not contract to transport the material 5,000 miles to White Mesa for "recycling."

We recognize that the figures we've used to reach this conclusion are estimates, though those estimates are based on the best information we've been able to gather. And consequently, we fear that the Division may be inclined to contend that our analysis is imperfect and therefore should be disregarded. If that's the case, we urge the Division to check our work by performing and disclosing to the public an independent analysis of the economics of the Silmet deal and also by requiring Energy Fuels to submit information about its projections of the costs and revenues for importing, processing, and marketing the Silmet material. We're confident the Division's analysis will confirm our estimates, and without the Division having performed that analysis, there is no basis for concluding that Energy Fuels may import the Silmet material using a general license.

And regardless of whatever forecasts the Division makes about the Silmet deal and the parties' intent in undertaking it, we ask the Division to impose a simple test in the license that will unequivocally reveal whether "recycling" is the sole purpose for importing the Silmet material: Require Energy Fuels to ship back to Estonia for disposal all the waste that results from "recycling" the Silmet material at the mill. If Silmet and Energy Fuels decline to go forward with their deal with that condition, it will be plain that the purpose of importing the Silmet material is to discard it at the mill, not to recycle it.

It is plainly evident to us, as we believe it should be to the Division, that the Silmet material will not be imported "solely for the purposes of recycling" if Energy Fuels' license application is granted. That material is consequently a "radioactive waste" for the purposes of the Commission's import rules. And it therefore may not be imported under a general license. As a result, if the Division approves Energy Fuels' application to allow for possession and processing of the Silmet material, the Division should make its approval subject to two conditions: (1) that Energy Fuels acquires a specific import license from the Commission; and (2) that Energy Fuels returns to Silmet in Estonia all waste resulting from processing the Silmet material at the mill.

EFRI Response:

Upon issuance of a license amendment authorizing the Mill to receive and process the Silmet Material as an alternate feed material, it will become licensed as an ore at that time and, to the extent it was classified as a radioactive waste before that time, will cease to be a radioactive waste at that time. Because the Silmet material will be classified as an ore upon approval of the License amendment and because it contains greater than 0.05% source material, the entire mass of the Silmet material will be classified as source material under 10 C.F.R 40.4. As a result, the Silmet material cannot be a "material that contains or is contaminated with source" material, as contemplated by the definition of "radioactive waste" in 10 C.F. 110.2, because it will be 100% source material. In other words, it will be source material ore, and not a radioactive waste containing source material. As an ore it must be processed for the recovery of uranium at the Mill. The law is clear that processing an ore at a licensed uranium mill for the recovery of uranium is

not a "sham," regardless of the economics of processing. Therefore, all of the commenter's economic arguments, which do not accurately reflect the applicable costs associated with processing the Silmet materials, are irrelevant, and will not be discussed in detail here (although not relevant, it should be noted for the record that the costs borne by Silmet are not relevant to Mill activities).

As discussed in Section 5.1 above, the Silmet material may be imported into the US as "source material" under 10 CFR 110.20(a), because it is covered by the NRC general license described in 10 CFR 110.27(a), and because the material:

- is not in the form of irradiated fuel, as contemplated by 10 CFR 110.27(b); and

- is not a radioactive waste, as contemplated by 10 CFR 110.27(c). As an approved alternate feed material ore the Silmet material will not be a radioactive waste as defined in 10 CFR 110.2 because (A) the material will be processed for its source material content, and will therefore be imported solely for the purposes of recycling and not for waste management or disposal, and (B) there is a market for the recycled uranium.

Further, in its November 1998 approval of Amendment 9 to the Mill's License – Approval to Process Materials from Cameco Corporation's Facilities in Ontario, Canada," which are alternate feed materials from Canada, the NRC came to the same conclusion in the same circumstances:

> "Finally, import of radioactive materials from Canada required a license from NRC. As discussed above, the staff has determined that these uranium-bearing materials from Cameco's Blind River and Port Hope facilities will be processed for their source-material content. Therefore, with the staff's approval of IUC's request to process these materials, IUC also is authorized to import them under the general license at 10 CFR 110.27."

The applicability of the foregoing regulations is clear, and a formal opinion from or consultation with the NRC is not necessary. However, even though not required, the NRC was consulted and acknowledged its agreement with this analysis and that a specific import license is not required for the Silmet material. See Attachment C.

The Silmet material has a higher uranium concentration than typical Colorado Plateau ores, and will generate no more tailings than, and the tailings generated will not be significantly different from, the tailings generated from processing conventional ores. There is no difference between importing Silmet materials as ore for the recovery of uranium and importing a conventional natural ore with the same uranium content. There is no question that ores can be imported for the recovery of uranium. As an alternate feed material, the Silmet material is an ore. The economics to the Mill of receiving and processing Silmet material is the same as receiving and processing the same quantity of a typical Colorado Plateau ore, *except without the cost of mining associated with the Colorado Plateau ore.* The fact that the Mill was able to negotiate a processing fee is irrelevant.

Further, the commenter apparently doesn't understand recycling and the benefit of recycling, particularly recycling uranium that would otherwise be lost to direct disposal, and how important recycling uranium is to the global environment. As stated above, even this one small Silmet ore project is expected to generate from 7,096 to 10,692 pounds of U_3O_8 by itself.

- When converted to nuclear fuel, this amount of U_3O_8 will generate the same amount of electricity as 55,682 - 83,905 tons of coal. That amount of coal when burned to make electricity will generate 101,472 to 152,208 tonnes of CO_2 emissions;

- 152,208 tonnes of CO_2 emissions avoided by recycling the Silmet material, would be equivalent to the amount of CO_2 emissions from 32,874 passenger vehicles for one year;

- It would require a forest the size of 197,673 acres for one year to sequester the same amount of CO_2 emissions. A forest that size would exceed the combined area of Zion and Bryce Canyon National Parks, would be 4.5 times the area of the District of Columbia, and 234 times the area of Central Park, NYC); and

- Finally, that amount of uranium when converted to nuclear fuel, would generate as much electricity as about 44 wind turbines for one year.

The commenter's suggestion that EFRI return to Silmet in Estonia all waste resulting from processing the Silmet material at the Mill, further illustrates its lack of understanding of how recycling works and how it needs to be encouraged not discouraged to be a viable option to industry and a net benefit to the global environment. The commenter's suggestion that the tailings from this recycling be returned to Estonia is absurd and would defeat the purpose of recycling, by eliminating recycling as a viable option to Silmet. For the Mill to produce the equivalent amount of uranium from EFRI's Colorado Plateau mines, it would need to mine and Mill approximately 2,000 tons of uranium ore from the ground and would still dispose of the same amount of tailings in the Mill's TMS as would be generated from processing the Silmet material. So in both cases the same amount of uranium would be produced and the same amount of tailings would be created that would need to be permanently disposed of in the Mill's TMS as 11e.(2) byproduct material. The only difference is that by mining and milling 2,000 tons of uranium ore (or 83,905 tons of coal for the same amount of electricity output), there would be a bigger hole in the ground in Utah that would require reclamation and the Country's uranium (or coal) resources would be depleted.

10 CFR 110.27(a) was never intended to discourage recycling, and the fact that the Silmet Material is an ore and is being imported for recycling cannot be disputed.

3 Ex. 1 at 214.

4 We recognize that the Division prefers to use a "regulatory lexicon," Am. 10 Statement of Basis at 3, that varies from the ordinary language we often use, and we take as a given that the Division disputes our word choice. Our request is simply to understand if the Division believes we've misunderstood the facts.

5 Ex. 2 at 1-3 (arguing that the mill has independent utility for the purpose of processing low-grade, regional ores); id. at 10-21 (observing that small mines with low-grade ore would not be economically viable without the mill); Ex. 3 at 2-1.

6 Ex. 2 at iii (explaining that production will last for 15 years); id. at 1-1, 3-15 (same); id. At 3-18 (showing projected operating life of 15 years and phased reclamation schedule extending no more than 5 more years); id. at 4-3 ("Based on the capacity of the tailings cells, the mill has a potential to operate 15 years."); Ex. 4 at 1-2 ("The mill is planned to have a 2,000

tons-per-day capacity and a projected life of 15 years."); id. at 5-38 ("The area occupied by the proposed mill and tailing retention system (about 310 acres) would be committed until the life of the mill ends, about 15 years.").
7 Ex. 2 at 3-17 ("The tailings cells will be reclaimed sequentially as each cell is filled, beginning after about the fourth year of operation and every four years thereafter until termination of project operations.").
8 Ex. 5 at 11 (Table 3 showing "tailings placement period" beginning in 1980 for Cell 2, 1981 for Cell 1, and 1982 for Cell 3).
9 Ex. 6 at 2–3; Ex. 7; Ex. 8.
10 Ex. 5 at 5 (showing "standby" periods with no production of U3O8 in 1984, 1991–1994, 2000–2004, with minimal production in 1998 and 2005).
11 Ex. 3 at 2-1.
12 See Ex. 9.
13 Ex. 10 at Addendum to Permit Transfer Request (PDF p. 38).
14 Stephane A. Malin, The Price of Nuclear Power: Uranium Communities and Environmental Justice, 96 (2015) ("Malin").
15 Ex. 11 at PDF p. 4.
16 Malin at 95–96.
17 Ex. 11 at PDF p. 4.
18 At the time, the mill was owned by a company called International Uranium (USA) Corporation. For simplicity's sake, these comments generally refer to the mill's prior owners as Energy Fuels.
19 See Ex. 12 at 1 (observing that Energy Fuels would be paid a fee of $4 million to process and dispose of the material, an amount that far exceeded the value of the yellowcake to be produced).
20 See Ex. 13 at 2–3.
21 See Ex. 14 at 1.
22 See, e.g., Ex. 15 at 1–4.
23 *See* Ex. 16.
24 *Id.*
25 Ex. 17.
26 Utah Code § 19-3-104.
27 42 U.S.C. § 2201.
28 Utah Admin. Code R313-24-4 (incorporating much of 10 C.F.R. Part 40 and Appendix A by reference); Utah Admin. Code R313-15 (establishing standards that apply to the Division's licensees for protection against ionizing radiation).
29 42 U.S.C. § 7901.
30 "Uranium Mill Licensing Requirements," 45 Fed. Reg. 65,521 (Oct. 3, 1980).
31 Silmet Application at 1.
32 *Id.* at 3.
33 *Id.*
34 Ex. 18 at 171.
35 *Id.*
36 *Id.* Energy Fuels uses a different set of dates in the Silmet Application. *See* Silmet Application at 4. It is unclear which dates are accurate, so we've elected to use those given in the article attached as Exhibit 18, which was co-authored by a staff member of the Estonian Radiation Safety Department.
37 Ex. 18 at 171–72.
38 *Id.* at 172.
39 *Id.* at 173.
40 Silmet Application at 4.
41 *Id.*
42 *Id.* at 1.
43 *Id.* at 1–2.
44 Ex. 19 at 3; Ex. 20 at 1-1, 2-2.
45 Ex. 19 at 2; Ex. 20 at 1-1.
46 Ex. 19 at 3; Ex. 20 at 1-1.
47 Ex. 19 at 3; Ex. 20 at 2-2.
48 Moffat Tunnel Application at 1.
49 *Id.*
50 *Id.* at 3.
51 Utah Admin. Code R313-22-33(1)(d).
52 *See* 42 U.S.C. § 2014(e)(2).
53 42 U.S.C. § 2014(z).
54 "Uranium Mill Facilities, Notice of Two Guidance Documents: Final Revised Guidance on Disposal of Non-Atomic Energy Act of 1954, Section 11e.(2) Byproduct Material in Tailings Impoundments; Final Position and Guidance on the Use of Uranium Mill Feed Materials Other Than Natural Ores," 60 Fed. Reg. 49,296, 49,296 (Sep. 22, 1995).

55 60 Fed. Reg. at 49,296–297.
56 Ex. 12 at 1.
57 *Id.*
58 *Id.*
59 Ex. 2 at 1-3 (arguing that the mill has independent utility for the purpose of processing low-grade, regional ores); *id.* at 10-21 (observing that small mines with low-grade ore would not be economically viable without the mill); *id.* at iii (explaining that production will last for 15 years); *id.* at 1-1, 3-15 (same); *id.* at 3-18 (showing projected operating life of 15 years and phased reclamation schedule extending no more than 5 more years) *id.* at 4-3 ("Based on the capacity of the tailings cells, the mill has a potential to operate 15 years."); Ex. 4 at 1-2 ("The mill is planned to have a 2,000 tons-per-day capacity and a projected life of 15
years."); *id.* at 5-38 ("The area occupied by the proposed mill and tailing retention system (about 310 acres) would be committed until the life of the mill ends, about 15 years.").
60 Utah Division of Waste Management and Radiation Control, "Technical Evaluation and Environmental Analysis: Silmet Alternate Feed Request," DRC-2020-007005, p. 13 (Apr. 2020) ("Silmet Technical Evaluation") ("The Division concludes that using its "best efforts" includes following established judicial and administrative precedents, as well as NRC guidance and regulations.").
61 *See* Utah Admin. Code R313-22-33(1)(d).
62 *See* 42 U.S.C. § 2021(o)(2); Utah Code §§ 19-3-104(7) and 19-3-104(8)(a).
63 *See* Ex. 21, Article VI.
64 *See* Utah Admin. Code R313-22-33(1)(d).
65 Silmet Technical Evaluation at 15; Utah Division of Waste Management and Radiation Control, "Technical Evaluation and Environmental Analysis: Moffat Tunnel Alternate Feed Request," DRC-2020-007007, p. 16 (Apr. 2020) ("Moffat Tunnel Technical Evaluation").
66 *See* Ex. 22 at PDF p. 3.
67 Ex. 23.
68 42 U.S.C. § 2021(o)(2) (emphasis added); *see also* Utah Code §§ 19-3-104(7) and 19-3-104(8).
69 See Silmet Application at 12–13.
70 See Silmet Technical Evaluation at 20.
71 10 C.F.R. § 110.27(c); 10 C.F.R. § 110.2 (defining "radioactive waste").
72 10 C.F.R. § 110.27(a).
73 Id. (granting license "[e]xcept as provided in paragraphs (b) and (c) of this section...").
74 10 C.F.R. § 110.27(c).
75 10 C.F.R. § 110.2.
76 Id.
77 See Silmet Application at 12–13.
78 10 C.F.R. § 110.2. There is no question that the remaining elements of the definition of "radioactive waste" are satisfied. Processing the feeds will generate radioactive material to be disposed of in a "disposal area"—the tailings cells at the mill—as that term is defined in Appendix A. See 10 C.F.R. Part 40, App. A ("Disposal area means the area containing byproduct materials to which the requirements of Criterion 6 apply.").
79 "Export and Import of Nuclear Equipment and Material," 75 Fed. Reg. 44,072, 44,076 (July 28, 2010).
80 Id.
81 Id.
82 42 U.S.C. § 2014(e)(2) (emphasis added).
83 In re Int'l Uranium (USA) Corp., 51 NRC 9, 23 (2000).
84 Id. at 18.
85 Silmet Technical Evaluation at 20.
86 75 Fed. Reg. at 44,076.
87 For this reason, we believe that it is proper to conclude that Energy Fuels is importing the Silmet waste "for the purposes of disposal in ... a disposal area as defined in Appendix A to 10 CFR part 40..." and that the recycling exclusion does not apply at all, though we direct our comments here to disputing Energy Fuels' claim that it is importing the material "solely" for the purposes of recycling.
88 Silmet Application at 6.
*89 2,000 * 0.0027 = 5.4 drums of yellowcake.*
90 Silmet Application at 1–2.
91 See Ex. 18 at 170–74 (explaining that the Radiation Control Act, as amended after Estonia joined the European Union, imposes disposal requirements that cannot currently be met, for "[t]here is no radioactive waste management operator for [naturally occurring radioactive material] waste in Estonia.")
92 See Ex. 24 at 1, Ex. 25 at 1. Energy Fuels' application does not describe the container size that would be used to ship the materials from Estonia to Houston, but based on the math, it appears the company intends to use 20' shipping containers, given the volume of materials

(2,000 drums) and the number of containers Energy Fuels expects to ship (50).
*93 $2,250 * 50 = $112,500.*
*94 See Ex. 26 at F-11 (estimating, in 2008, average per-ton cost to truck raffinate sludge 975 miles from Gore, Oklahoma to White Mesa of $189.40). We calculated a figure of $160,000, by adjusting this per-ton trucking cost to account for inflation and the distance from Houston to White Mesa (1,200 miles), as so: $189/975 mi. = $0.1938 cost per mile * 1,200 = $232.61/per ton * 600 tons = $139,569 (2008). Adjusted for inflation, this figure comes to $165,186.*
*95 600 metric tons = 1,322,772 lbs. 1,322,772*0.0027 = 3,500 lbs.*
96 See Ex. 27 at 1 (showing average spot price as of late June 2020 of about $33/lb).
97 See Ex. 26 at F-11, F-24 (showing estimated processing cost of $125/ton from "NRC, 1/23/08"). Sillamäe, Ida-Viru County, Estonia
*98 $125 (2008) in today's dollars = $152 * 600 tons = $91,200.*

6. Bikepacking Roots Comments on White Mesa RML Renewal: Modification to Groundwater Quality Discharge Permit No. UGW370004 and Amendment #10 of the 11e.(2) Byproduct License No. UT1900479 for Energy Fuels Resources, Inc. White Mesa Uranium Mill

6.1. Bikepacking Roots Comment 1.

I write on behalf of the Bikepacking Roots not-for-profit organization and our 5,000+ members in expressing dismay at the interpretations of monitoring well data from down hydraulic gradient of the White Mesa Mill site. These analyses and interpretations would never stand up in peer reviewed scientific journals, and that is absolutely unacceptable when there exists the potential long-term poisoning of local communities and the broader landscape. DEQ completely neglects equally viable interpretations of data specifically from monitoring well MW-30 that could legitimately show groundwater contamination from at least one of the tailings impoundments beginning around 2010. Thus, without further scrutiny of these and other data, no discharge permit amendments or byproduct license amendments should be made for the White Mesa Mill – no increases in groundwater compliance limits (GWCLs), no increase in materials to be added to tailings impoundments, and no acceptance of materials from other countries for processing.

EFRI Response:

As will be discussed in detail below, an analysis of the chemistry at MW-30 clearly shows there is no impact from the TMS, and the DWMRC acted appropriately in accepting the results and recommendations of the MW-30 SAR. Furthermore there is no evidence to suggest that the SAR analyses would not hold up to peer review and there is no reason for the DWMRC not to approve discharge permit amendments or byproduct license amendments or not to allow appropriate increases in GWCLs when the causes for GWCL exceedances are the result of background conditions and not TMS impacts.

6.2. Bikepacking Roots Comment 2

Our mission at Bikepacking Roots is to advocate for the bikepacking experience and for the landscapes through which we ride on behalf of the bikepacking community and our members. The Bears Ears and Grand Canyon regions are both popular among bikepackers, and the potential for future uranium mining in these region's futures, as well as any related contamination of the landscape, are especially concerning. We also have worked extensively with colleagues and

organizations on Navajo Nation, and the long-term toxic impacts of uranium mining are all too real there. Given that Energy Fuels Resources owns the uranium mines in the Grand Canyon region (currently flooded with contaminated groundwater) and lobbied heavily for areas underlain by uranium-bearing bedrock to be removed from the original boundaries of Bears Ears National Monument, we find it important to engage in this current process related to the White Mesa Mill.

EFRI Response:

This comment relates to the Mill generally and is not relevant to the License Amendment approval. It is therefore not relevant to this licensing action. Nevertheless, we address it below.

It is unclear what mines are referred to here. If the commenter is referring to the Canyon Mine, water is not allowed to accumulate in the Canyon Mine; it is collected in a lined sump at the base of the shaft and pumped to a lined evaporation at the surface. Therefore there is no 'flooding' of the Canyon Mine.

We are the first to acknowledge the very poor legacy of uranium mining on the Navajo Nation and in the western United States generally, which resulted in hundreds of abandoned, un-reclaimed or improperly reclaimed mine sites that were developed and mined during the early years of the Cold War era. The long-lasting, adverse impacts were due in large part to reclamation standards that were far less stringent (or non-existent) than those implemented later in the 20th Century. However, modern laws, rules and regulations ensure that such practices could not, and do not, occur today. The EPA is currently spearheading the effort to clean up these sites, many of which are located on Navajo Nation land. Neither EFRI nor any of its successors-in-interest contributed to the uranium-based pollution found on Navajo Nation lands.

Contrary to the commenter's assertion, EFRI did not "lobb[y] heavily for areas underlain by uranium-bearing bedrock to be removed from the original boundaries of Bears Ears National Monument.

6.3. Bikepacking Roots Comment 3

In writing this comment, I am representing the Bikepacking Roots organization and our members. As a geologist with a background in geochemistry, I personally have the expertise to delve into the data from the White Mesa Mill.

What is particularly dismaying is that in DRC-2019-006502, the DEQ memo reviewing the 2019 Source Assessment Report for MW-30, the DEQ

(1) Accepts the linear regression fits through the 2005-2018 groundwater chemistry data despite the fact that the data show a clear change in behavior around 2010. Forcing a linear regression through this full dataset is nothing more than sloppy and deceptive statistical analysis.

(2) Accepts the argument that a minor decrease in pH (less than 0.5 pH units) could alter uranium concentrations. This would only be the case if the groundwater was nearly

saturated with respect to uranium, and that is very much not the case. Minor changes in pH in the historic range of groundwater pH values will not change uranium concentrations

(3) *Accepts that tailings solution indictor parameters conclusively do not suggest contamination. Below I share an equally plausible interpretation of the same data and plots that point to contamination being able to just as easily explain the geochemistry trends at MW-30*

(4) *Points to "long-standing upward trends" in SAR parameters. Again, uranium, sulfate, chloride, and pH all show a marked change in any trends around 2010. Forcing a linear regression through a longer period does not prove the existence of a long-standing trend.*

(5) *Points to a 2008 University of Utah study that dated the groundwater in MW-30 to being older than the mill construction date of 1980. That may in fact be completely correct. But it is still possible to contaminate "old" water.*

EFRI Response:

With regard to point 1, there is no evidence to suggest 'sloppy' statistical analyses; these analyses were performed by competent professionals, and reviewed and approved by competent professionals; and, based on decreasing to stable sulfate and stable to decreasing fluoride concentrations, the SAR appropriately concluded that there were no TMS impacts to MW-30. Reliance on fluoride and sulfate is necessary because, although chloride is the best indicator parameter outside of the nitrate/chloride plume (which has an upgradient origin), MW-30 is located within the leading edge of the nitrate/chloride plume, and fluoride and sulfate are the next best indicator parameters. The SAR also appropriately concluded that increasing selenium likely results from oxidation of selenium-bearing pyrite, and site-wide decreases in pH are likely mobilizing uranium, which is causing an upward trend in uranium concentrations; however, the SAR notes that increases in uranium are small and that uranium concentrations are relatively low.

In general, the site-wide decline in pH is the most likely mechanism for increasing trends in pH-sensitive metals concentrations (including uranium) detected within some of the site wells, especially because outside the nitrate/chloride plume, which originates upgradient of the Mill and TMS, chloride is stable. As discussed above in the response to Ute Mountain Ute Comment 28b, outside the nitrate/chloride plume, chloride is the best indicator parameter, with fluoride and sulfate next in utility. Sulfate is the least useful of the three because both acid and sulfate can be produced from pyrite oxidation. However, wells within the nitrate/chloride plume that may exhibit chloride trends resulting from migration of that plume typically have stable fluoride and/or sulfate concentrations.

In addition, uranium may be mobilized in the presence of nitrate as discussed in Senko et al (2005); Um et al (2008); Wu et al (2010); Westrop et al (2018); and Asta et al (2020). Therefore, mobilization of naturally-occurring uranium within the nitrate/chloride plume, and increased uranium concentrations in wells within that plume, are expected.

Furthermore, contrary to the assertion in point 1, there is no clear change in MW-30 parameter trends around 2010; the changes in trend occur in late 2012 to early 2013, correlating with cessation of water delivery to the northern wildlife ponds in early 2012 and the resulting change

in water level trend at MW-30 in late 2012. Prior to 2013, water levels were increasing at MW-30; the water level increased by 5 feet between the fourth quarter of 2006 and the first quarter of 2013; however, between the first quarter of 2013 and the third quarter of 2020, water levels have changed by only 0.15 feet. Changes in parameter behavior may result from effects that include (but are not necessarily limited to) the following: 1) reduced dilution by wildlife pond seepage after 2012 (discussed in HGC, 2017 and HGC, 2020); and 2) the geochemistry of the nitrate/chloride plume differs from the groundwater that the plume is displacing. The change in chloride is most likely related to migration of the nitrate/chloride plume but may partly result from reduced dilution from wildlife pond seepage.

Although the changes in parameter trends are evident circa 2013 (not 2010), an aggressive well re-development effort conducted in 2010 and 2011 that included surging, bailing and overpumping has likely influenced constituent concentrations at many site wells. As discussed in HGC (2012) the water level fluctuations created by this effort likely enhanced the transport of oxygen into the formation near redeveloped wells and enhanced the oxidation of pyrite. The redevelopment not only added oxygen but is expected to have opened up new pathways within the formation that likely made naturally-occurring pyrite more accessible to oxygen derived from the wells. Furthermore, pH decline occurs site-wide: upgradient, cross-gradient, downgradient and within the area of the TMS. This pattern alone indicates that this trend is the result of background conditions and not Mill operations.

With respect to point 2: uranium sorbs onto iron oxides in porous media and the sorption is pH dependent (Um et al, 2008). Such sorption is expected to occur at the Mill as iron oxides are present in the perched groundwater zone as presented in HGC (2012). Contrary to the assertion made in point 2, relatively small changes in pH can affect the amount of uranium sorbed onto iron oxides; and small decreases in pH can mobilize sorbed uranium, causing increases in groundwater concentrations. In addition, uranium can sorb onto pyrite (Luo et al. 2016) and then be released during pyrite oxidation. Pyrite oxidation by nitrate is expected to occur within the nitrate/chloride plume as discussed in HGC (2017) and HGC (2018b).

With regard to point 3: the data analysis presented in the SAR (INTERA, 2019) is sufficient for the DWMRC to have concluded that parameter trends in MW-30 are not related to the TMS. In particular, stable to decreasing fluoride and sulfate are sufficient to conclude that a well located within the nitrate/chloride plume (such as MW-30) is not impacted by the TMS.

With regard to point 4: there is no clear change in trend in the above referenced MW-30 parameters around 2010; rather the changes in trend occur in late 2012 to early 2013, correlating with cessation of water delivery to the northern wildlife ponds in early 2012 and the resulting change in water level trend at MW-30 in late 2012. Fluoride appears to have an overall generally decreasing trend. In addition, pH has been generally noisy and no 'marked change' is evident circa 2010; the MW-30 data do not seem to support such a change.

With respect to point 5: 'old' water can be contaminated; however the 2008 Hurst and Solomon study did not find any signatures of such contamination nor have data collected since 2008.

Asta, M., Beller, H., & O'Day, P. (2020). Anaerobic Dissolution Rates of U(IV)-Oxide by Abiotic and Nitrate- Dependent Bacterial Pathways. Environmental Science and Technology 54, 13, 8010-8021.

HGC 2012. Investigation of Pyrite in the Perched Zone. White Mesa Uranium Mill Site. Blanding, Utah. December 7, 2012.

HGC 2017. Nitrate Corrective Action Comprehensive Monitoring Evaluation (CACME) Report. White Mesa Uranium Mill Near Blanding, Utah. December 11, 2017.

HGC (2018b) Revised Phase III Nitrate Corrective Action Planning Document and Recommended Phase III Corrective Action. December 13, 2018.

HGC 2020. Corrective Action Comprehensive Monitoring Evaluation (CACME) Report, White Mesa Uranium Mill Near Blanding, Utah. March 30, 2020.

INTERA, 2019. Source Assessment Report for MW-30, White Mesa Uranium Mill, Blanding, Utah. January 15, 2019.

Luo, Mingbao; Liu Shujuan; Li Jianqiang; Luo Feng; Lin Hailu; Yao Pepei, 2016. Uranium Sorption Characteristics Onto Synthesized Pyrite. Journal of Radioactive and Nuclear Chemistry, Vol. 307, pp 305-312.

Senko, J. M., Suflita, J. M., & Krumholz, L. R. (2005). Geochemical Controls on Microbial Nitrate -Dependent U(IV) Oxidation . Geomicrobiology Journal 22, 371-378.

Westrop, Jeffery P; Nolan, PJ; Healy, Olivia; Bone, Sharon; Bargar, John R; Snow, Daniel; and Weberm Karrie J. 2018. Mobilization of Naturally Occurring Uranium Following the Influx of Nitrate into Aquifer Sediments. Geological Society of America Abstracts With Programs, Vol. 50 No. 4.

Wu, W.-M., Carley, J., Green, S., Lou, J., Kelly, S., Van Nostrand, J., et al. (2010). Effects of Nitrate on the Stability of Uranium in a Bioreduced Region of the Subsurface. Environmental Science and Technology 44, 5104-5111.

Um, Wooyong; R Jeffery Serne; Christopher F Brown; and Kenton A Rod, 2008. Uranium(VI) sorption on iron oxides in Hanford Site sediment: Application of a surface complexation model. Applied Geochemistry, Vol. 23, Issue 9, pp 2649-2657. September, 2008.

6.4. Bikepacking Roots Comment 4

Each of these points on their own raises flags about the veracity of the interpretations of groundwater chemistry data coming from any of the monitoring wells at the White Mesa Mill site. But the fact that the validity of five of the six primary conclusions of the 2019 SAR summarized in the DRC-2019-006592 DEQ memo can be called into question is hugely problematic. The

statistical analyses and interpretations of the 2019 SAR data from MW-30 (and likely other wells) would not stand up to any sort of scientific peer review, and DEQ's seemingly unquestioning acceptance of those analyses and interpretations does nothing to inspire faith in DEQ oversight.

EFRI Response:

As discussed above, points 1-5 are refuted, and decreasing to stable fluoride and sulfate are alone sufficient to indicate there is no impact from the TMS. There is no reason to suppose that the statistical analyses would not hold up to peer review in spite of the above assertions; and even if they did not, the fluoride and sulfate behavior alone, without any formal statistical analyses, are sufficient to conclude there is no impact from the TMS.

6.5. Bikepacking Roots Comment 5

Let's explore a bit of the geochemistry data from MW-30 over the years in a bit more depth, including some past interpretations of those data.

An analysis of historic chloride concentrations in a variety of wells at the White Mesa Mill site using data from 1983 to 2006 demonstrates that "chloride values are similar from 1983 to 2005-2006, indicating that, in spite of the variable magnitude of concentrations across the site, these comparative snap shots demonstrate that there has been little change in concentrations in samples from each well" (BGQR12292006). It was not until 2010 that chloride concentrations in MW-30 began to rise steadily (see MW-30 data plots at the end of comment with pre- and post-2010 periods highlighted for clarity; plots are taken directly from DRC-2019-000747). This increase in chloride concentrations around 2010 occurred at roughly the same time as uranium concentrations in MW-30 began to rise. It was also around 2010 that a steady decrease in sulfate concentrations at MW-30 leveled out. And no notable change in pH at MW-30 occurred at this time. Since 2010 at MW-30, the data show a steady rise in uranium and chloride concentrations and generally steady sulfate concentrations and pH; fluoride trend interpretation is hampered by high scatter pre-2010.

EFRI Response:

As discussed above, the change in chloride and uranium occurs circa 2013 (rather than 2010). The change in chloride likely results from nitrate/chloride plume migration but may also result in part from reduced dilution caused by reduced wildlife pond recharge. Sulfate is trending downward prior to 2013, and appears relatively stable (but noisy) thereafter. The pre-2013 downward trend in sulfate may also have resulted in part from dilution from former wildlife pond seepage.

Increases in uranium in wells within the nitrate/chloride plume are likely related to the increased mobility of uranium in the presence of nitrate, by the mechanisms documented in Senko et al (2005); Um et al (2008); Wu et al (2010); Westrop et al (2018); and Asta et al (2020); and by release of uranium sorbed onto pyrite that is oxidized by nitrate (Luo et al. 2016).

Overall, even without any formal statistical analysis, fluoride and sulfate behavior at MW-30 are sufficient to demonstrate there is no impact from the TMS.

6.6. Bikepacking Roots Comment 6

What might all this mean, and how should each of these indicators be interpreted? In the discussion of the merits of various "indicators of potential impact" in BGQR1229-2006 (a 2006 Background Groundwater Quality Report for the White Mesa Mill), chloride is identified as a "primary indicator of potential tailings impact." Fluoride, which has similar chemical properties as chloride, can have solubility controlled along ground water flow paths by the trace mineral apatite, resulting in fluoride being considered secondary to chloride in terms of reliability as an indicator of impact. Similarly, solubility differences between calcium chloride and calcium sulfate mineral species complicates the interpretation of sulfate data.

EFRI Response:

As discussed above, chloride is the best indicator parameter outside of the nitrate/chloride plume; and fluoride and sulfate are the next in line. All three are generally good indicator parameters because they are anions and do not readily sorb onto or react with aquifer materials. Chloride is expected to be the least sorbed or reactive, followed by fluoride and then sulfate. As noted above, sulfate can be impacted by pyrite oxidation.

However, if chloride is increasing because a well is impacted by the nitrate/chloride plume, fluoride and sulfate behavior can be examined; and the stable and/or decreasing fluoride and sulfate concentrations at MW-30 are inconsistent with a potential TMS impact.

6.7. Bikepacking Roots Comment 7

Returning to the MW-30 data, the steady decrease in sulfate concentrations at MW-30 between 2005 and 2010 levels off. 2010 is approximately the year that uranium and chloride concentrations at MW-30 began to increase steadily. If the steady decrease in sulfate concentrations between 2005 and 2010 was due to influences external to the mill site (as argued in the 2019 MW-30 SAR), groundwater contamination from mill operations could responsible for the relatively steady sulfate concentrations since 2010 as sulfate from tailings could have offset that prior decrease in sulfate concentrations (or in other words, the longer-term decrease in sulfate concentration due to environmental factors external to the mill site is masking contamination since 2010).

EFRI Response:

As discussed above, changes in MW-30 parameters occur circa 2013 (not 2010). Sulfate is decreasing prior to 2013 and relatively stable (but noisy) thereafter. Changes in chloride most likely result from migration of the nitrate/chloride plume that originates upgradient of the Mill and TMS; however chloride may also be impacted by reduced dilution resulting from reduced wildlife pond seepage after 2012. Changes in sulfate behavior may also result from reduced dilution by wildlife pond recharge as well as changes in geochemistry caused by displacement of pre-existing

groundwater by the nitrate/chloride plume. It is highly unlikely, however, that sulfate could be decreasing or stable if there were an impact from the TMS because of the extremely high sulfate concentrations within the TMS solutions (about an order of magnitude greater than chloride). Uranium is likely mobilized by the nitrate present within the nitrate/chloride plume by more than one mechanism, including degradation of pyrite having sorbed uranium [Senko et al (2005); Um et al (2008); Wu et al (2010); Luo et al. (2016); Westrop et al (2018); and Asta et al (2020)].

In addition, uranium is expected to be relatively strongly sorbed and retarded with respect to chloride, fluoride and sulfate, especially at the near-neutral to slightly acidic pH conditions characteristic of MW-30, and changes in uranium concentrations could not correlate so closely in time with changes in these more mobile constituent concentrations if the TMS were the source. Changes in uranium at MW-30 are most likely the result of changes in aquifer geochemistry in the immediate vicinity of the well and not due to potential seepage from a relatively remote source such as the TMS.

6.8. Bikepacking Roots Comment 8

To summarize this simply, all the trends observed in uranium, chloride, and sulfate concentrations at MW-30 could potentially be explained by groundwater contamination from the mill site. The conclusions from the 2019 MW-30 SAR accepted by DEQ are not the only viable explanation for these trends, and I would argue that what I have presented is arguably a more viable explanation.

EFRI Response:

As discussed above, stable fluoride and stable to decreasing sulfate at MW-30 are sufficient to preclude a TMS impact.

In summary, the analysis by Bikepacking Roots is speculative and based on nearly simultaneous changes in trends in highly mobile solutes such as chloride and sulfate, and metals such as uranium that are expected to have comparatively poor mobility at the near-neutral to very slightly acidic pH conditions measured at MW-30 (USEPA 2008). It is highly unlikely that a mobile solute such as chloride, which migrates at about the same rate as groundwater, and a metal such as uranium, which is expected to sorb and have relatively poor mobility at the pH conditions characteristic of MW-30, could seep from the TMS, migrate through the vadose zone to groundwater, and then travel to a monitoring well and cause nearly simultaneous changes in both the mobile and the relatively poorly mobile solute concentrations. Changes in the relatively low mobility metal concentrations are expected to be substantially delayed with respect to those of the mobile solute and would not correlate closely in time. Simultaneous changes in mobile and relatively immobile solute concentrations are evidence for changes in groundwater chemistry in the immediate vicinity of the well and not potential seepage from the TMS. Nearly simultaneous changes in mobile and relatively immobile solute concentrations could only have a TMS origin if there were a 'fast pathway' directly from the TMS to the well; however, under these conditions, all monitored TMS solutes would increase nearly simultaneously, and not just a select few, as in the case of MW-30. Certainly, if a "fast pathway" directly from the TMS to the well were to exist, a dramatic rise in sulfate would result, due to its mobility and high source term in the TMS. The absence of such a

result for sulfate rules out any chance of a "fast pathway." As stated above, stable fluoride and stable to decreasing sulfate at MW-30 are sufficient to preclude a TMS impact.

USEPA Office of Radiation and Indoor Air Radiation Protection Division, 2008. Technical Report on Technologically Enhanced Naturally-Occurring Radioactive Materials From Uranium Mining Volume 2: Investigation of Potential Health, Geographic, and Environmental Issues of Abandoned Uranium Mines. EPA-402-R-08-005, April 2008.

6.9. Bikepacking Roots Comment 9

As explained in detail in BGQR12292006, the interpretation of indicators of potential impact is complicated by environmental variability in groundwater geochemistry. Thus, if interpretation of monitoring well data shows any potential sign of contamination, the onus is on the DEQ to require a far more thorough analysis and investigation than has been done. Decisions regarding potential uranium contamination must not be based on difficult to interpret data, shoddy and deceptive statistical analyses or conclusions that ignore other viable explanations. Far too much is at stake.

EFRI Response:

Whenever a potential impact is discovered, the DWMRC requires a detailed analysis to be performed and presented in a SAR. The large number of monitored constituents, which collectively have a large range in mobility in soils and groundwater, allows such analyses to distinguish between potential TMS impacts and those arising from natural changes unrelated to the TMS.

6.10. Bikepacking Roots Comment 10

Based on all this, we request that

No changes be made in the uranium GWCLs be made. It has not been demonstrated convincingly that the increasing trends in uranium are not due to contamination.

No license amendment be issued for an increase in the annual limit of material added to the tailings impoundments be granted.

No license amendment be issued for the acceptance of alternate feed material from Estonia be granted.

The toxic legacy of uranium contamination is all too visible today across the Colorado Plateau, and particularly on Navajo Nation where so many families face the realities of cancer, birth defects, poisoned wells, and so much more as a result of past uranium mining. And just down hydraulic gradient a few miles from the White Mesa Mill sits the White Mesa Community, poised to intercept any groundwater contamination from the mill. One undetected leak is all it would take. And it has not been convincingly demonstrated that the changes in groundwater geochemistry at MW-30 are not evidence of a contamination that began around 2010.

EFRI Response:

Contrary to the above assertions, and as discussed in the preceding responses to the Bikepacking Roots comments, changes in groundwater chemistry at MW-30 (and other site wells) result from causes unrelated to the TMS. Furthermore, as discussed in the response to Ute Mountain Ute Comment 29, the White Mesa Community is not downgradient of the White Mesa Mill. Because there is no demonstration of an impact by the TMS there is no reason not to adjust GWCL's appropriately and no reason not to grant the license amendment.

Please contact me if you have any questions or require any further information.

Yours very truly,

ENERGY FUELS RESOURCES (USA) INC.
David C. Frydenlund
Chief Financial Officer, General Counsel and Corporate Secretary

cc: Scott Bakken
Mark Chalmers
Doug Chambers (Arcadis)
Julia Hoffmeier
Harold Roberts
Logan Shumway
Terry Slade
Stewart Smith (HGC)
Jo Ann Tischler (Tischler Consulting)
Kathy Weinel

Attachment A

A Summary of the History of the Definition and Interpretation of Alternate Feed Materials

A Summary of the History of the Definition and Interpretation of Alternate Feed Materials

Year	Description
1990	In the *Kerr-McGee vs. NRC* court decision, which was argued before the United States Court of Appeals, District of Columbia Circuit in 1989 (see *Kerr-McGee Chemical Corp. v. NRC*, 903 F. 2d 1 (D.C. Cir. 1990)), Kerr-Mcgee challenged the NRC's definition of byproduct material. In the Background section the court describes the regulatory framework of this decision and how the AEA and UMTRCA apply to the decision. In the Factual Background section the court describes how Kerr-Mcgee owned a Thorium Mill near West Chicago, Illinois. It also discusses that a portion of the material processed for its thorium content was first processed for its rare earth minerals content. At that time, the NRC determined that the tailings from processing this material (referred to as the "offsite tailings" or "offsite wastes" was not considered byproduct material because it had been previously processed before it was reprocessed for its thorium content and the tailings would be classified as source material not byproduct material. The court also discussed that the material that was processed for the rare earth content as well as the thorium content were identical to the material that was processed for its thorium content in physical composition and in potential health hazards. In the Discussion section the court discusses the definition of ore. It states: "The word "ore" is also subject to more than one meaning. In fact, there is ample basis within the AEA for applying the term to the stockpiled material remaining after the rare earth had been extracted from the feedstock ore and before that material had been processed for its thorium content. For example, section 101 of the UMTRCA states that "[a] license for the production of any uranium product from residual radioactive materials shall not be treated as a license for production from ores ... if such production is in accordance with section 7918(b) of this title." 42 U.S.C. Sec. 7911(6) (1982) (emphasis added). The clear implication is that if such production is not in accordance with section 7918(b), then production from residual radioactive materials may be treated as production from ores. Moreover, the NRC's designation of the offsite tailings as "source material" implies that they may be properly categorized as "ore" because the NRC defines source material as "ores which contain by weight ... (0.05%) or more of ... thorium." 10 C.F.R. Sec. 40.4(h) (emphasis added); see also 42 U.S.C. Sec. 2014(z) (statutory definition of source material). The NRC cannot have it both ways. If the offsite tailings may be characterized as ore, so must the stockpiled material from which they were derived. The NRC's construction is not saved by the happenstance that the tailings in this case have a sufficiently high thorium content (0.05% or more by weight) to enable the agency to classify the offsite wastes as "source material" and therefore subject to its licensing authority under another

	part of the AEA. In the first place, statutory definitions are intended to have general applicability. A construction of section 11(e)(2) is not acceptable if it will orphan mill tailings having a source material content of less than the 0.05% threshold, as is usually the case. Second, the NRC's interpretation would exclude the offsite wastes from coverage by the regulations promulgated pursuant to Title II that are designed to protect the public health against the hazards created by mill tailings produced in the course of the nuclear fuel cycle." In the Conclusion section the court states "The UMTRCA was intended to bring previously unregulated radioactive end products of the source material extraction process within the scope of NRC regulation and to provide a comprehensive remedial program for the safe stabilization and disposal of uranium and thorium mill tailings. The NRC's interpretation of section 11(e)(2), however, places a portion of the thorium tailings from Kerr-McGee's West Chicago facility outside of the UMTRCA's regulatory regime even though they are in all relevant ways identical to tailings found by the NRC to be byproduct material and thus subject to the UMTRCA's remedial program. The NRC's construction thus frustrates the purposes of the UMTRCA by rendering it inapplicable to waste material that it was clearly intended to reach and recreating a jurisdictional gap it was intended to close. As we find that interpretation impermissible, and as we have considered the other arguments put forth by Illinois and Kerr-McGee and found them without merit, we grant the petitions for review in Nos. 88-1636 and 88-1726, and deny the petition for review in No. 87-1254."
1992	In the May 13, 1992 publication of the Federal Register pgs. 20530 -20533 the NRC published its first discussion of alternate feed materials as "ores" being processed for the extraction of source material such as uranium. This included a discussion of the 11e section of the AEA and examples of NRC licensing actions which allowed the processing of alternate feed materials. The NRC recognizes that the AEA and UMTRCA do not have a definition of "ore" and refers to the court decision of *Kerr-McGee vs. NRC* and its definition of ore as it applies to the AEA and UMTRCA. The NRC also discusses the definition of 11e.(2) byproduct material and the importance of the words "any ore" in that definition. The NRC then proposed its own definition as "Ore is a natural or native matter that may be mined and treated for the extraction of any of its constituents or any other matter from which source material is extracted in a licensed uranium or thorium mill." This definition took into account two major considerations: It is broad enough to include a wide variety of feed materials. The definition continues to be tied into the nuclear fuel cycle. The remainder of the discussion revolves around the issues with RCRA, low-level radioactive waste and alternate feed materials.
1995	On August 15, 1995 the NRC publishes SECY-95-211 titled *"Final Revised Guidance on Disposal of Non-Atomic Energy Act of 1954, Section 11e.(2) Byproduct Material in Tailings Impoundments," and Final "Position and Guidance on the Use of Uranium Mill Feed Materials Other Than Natural Ores"*. In the Background section of that document the NRC discusses the history of the development of the guidance document. The document discusses what needs to be

	reviewed and determined to approve an alternate feed material for processing at a uranium mill.
1995	In the September 22, 1995 publication of the Federal Register pgs. 49296 and 49297, the NRC finalizes the Uranium Mill guidance document for the use of Uranium Mill Feed Material Other than Natural Ores. In the discussion, three criteria are identified to assist Staff for determining if an alternate feed material can be processed as an ore: • Determination of whether the feed material is ore. To do this the following definition is to be used "ore is a natural or native matter that may be mined and treated for the extraction of any of its constituents or any other matter from which source material is extracted in a licensed uranium or thorium mill;" • Determination of whether the feed material contains hazardous waste. So, if the material contains listed waste under subpart D of RCRA, than the material would not be accepted to avoid dual regulation of the material by the NRC/EPA; and • Determination of whether the ore is being processed primarily for its source material content. This is to be determined by the co-disposal test and the licensee certification and justification test.
1998	The State of Utah filed a Request for Hearing and Petition for Leave to Intervene in the Ashland 2 alternate feed license amendment request. The State argued that the NRC staff improperly granted the license amendment because the Mill was not processing the Ashland 2 material "primarily" to recover its relatively minimal uranium content, but rather to obtain the generous handling and disposal fee. The State of Utah also emphasized that the Mill's license amendment application failed to adequately substantiate that the material was to be "processed primarily" for its uranium content. The State of Utah insisted upon "some objective documentation" to show that recovery of the uranium, not payment for disposal, was Mill's primary interest behind the license amendment.
1999	On February 9, 1999, the NRC issued its decision on the State of Utah's Petition to Intervene in the Ashland 2 alternate feed license amendment request. According to this document the issue in the proceeding was the Atomic Energy Act's definition of 11e.(2) material, defined by the statute as "the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content." The NRC's Presiding Officer explained, the adverb 'primarily,' applies to what is removed from the material by the process and not to the motivation for undertaking the process." The Presiding Officer further stated ". . . it is reasonable to predict that the milling will actually occur. Since the milling will occur, it is not a "sham" as the State has argued. It is real," and "It seems to me that the only "sham" that stops material from being byproduct material is if it is not actually milled. If it is milled, then it is not a sham."

	The Presiding Officer went on to conclude that the NRC staff appropriately granted the license amendment because IUSA "is milling ore" to extract uranium and therefore is "not involved in a sham." The Presiding Officer also rejected Utah's claim that the Guidance was intended to prevent material from being categorized as 11e.(2) byproduct material if the Licensee's primary economic motive was to receive a fee for waste disposal instead of to recover the uranium. "The Alternate Feed Guidance," the Presiding Officer stated, "is not supportive of the position, taken by the State of Utah, that material is to be considered byproduct only if the primary economic motivation is to remove uranium rather than to dispose of waste."; (2) to make clear that even feedstock containing less than 0.05% source material could qualify as byproduct material; and (3) to assure that the NRC's jurisdiction did not cross over into activities unrelated to the nuclear fuel cycle. The Mill's license amendment was consistent with these statutory intentions, regardless of whether the Mill's bigger interest was payment for taking the material or payment for the recovered uranium. Indeed, even accepting the State of Utah's claim that the four million dollar payment the Mill contracted to receive for processing and disposing of the Ashland 2 FUSRAP site material was the primary motivator for this transaction, the tailings generated from the processing can still properly be classified as § 11e.(2) byproduct material.
2000	The State of Utah appealed the Presiding Officer's decision to the full Commission of the NRC. In its Memorandum and Order, the Commission upheld the Presiding Officer's decision. See "*In the Matter of International Uranium (USA) Corporation (Request for Materials License Amendment)*, Docket No. 40-8681-MLA-4, February 10, 2000. In its Memorandum and Order, the Commission stated: "Our review of UMTRCA and its legislative history confirms the Presiding Officer's conclusion that the requirement that material be processed primarily for its source material content most logically refers to the actual act of processing for uranium or thorium within the course of the nuclear fuel cycle. and does not bear upon any other underlying or "hidden" issues that might be driving the overall transaction . . . Not only was it reasonable to conclude that uranium could be recovered from the Ashland 2 material, but it was also reasonable to conclude that the processing would indeed take place. . . . This was not an instance, then, where there was no reasonable expectation that the mill operator would in fact process material through the mill to extract recoverable uranium. Moreover, it is also the Commission's understanding that the Ashland 2 material has in fact

	been processed in the IUSA mill and that approximately 8,000 pounds of uranium were extracted. While that quantity of uranium was on the low end of IUSA's estimates, it nevertheless represents more than a minute or negligible recovery of uranium." The Commission also noted: "Here, the Ashland 2 material has been approved for processing and disposal, and the resulting byproduct material will be disposed of pursuant to the same health and safety standards that apply to any other 11e.(2) material in an NRC-licensed mill: 10 C.F.R. Part 40, Appendix A. Though Utah may be dissatisfied with those standards, an adjudicatory proceeding is not the appropriate forum to contest generic NRC requirements or regulations. See. e.g., *Duke Energy Corporation (Oconee Nuclear Station, Units 1, 3, and 3)*, CLI-99-11, 49 NRC 328, 334 (1999)." The NRC Commission further stated that "the purposes behind the wording of § 11e.(2)'s definition served: (1) to expand the types of materials that properly could be classified as byproduct material; (2) to make clear that even feedstock containing less than 0.05% source material could qualify as byproduct material; and (3) to assure that the NRC's jurisdiction did not cross over into activities unrelated to the nuclear fuel cycle. IUSA license amendment is consistent with these statutory intentions, regardless of whether IUSA's bigger interest was payment for taking the material or payment for the recovered uranium. Indeed, even accepting the State of Utah's claim that the four million dollar payment IUSA contracted to receive for processing and disposing of the Ashland 2 FUSRAP site material <u>was</u> the primary motivator for this transaction, the tailings generated from the processing can still properly be classified as § 11e.(2) byproduct material".
2000	NRC amended its guidance on "*Processing of Material Other than Natural Uranium Ores*" (SECY-99-012), to reflect the Commission's decision in Ashland 2. See RIS 00-023: *Recent Changes to uranium Recovery Policy.*
2004	State of Utah becomes an Agreement State for Uranium Recovery

Attachment B

Letters from the Navajo Nation and White Mesa Ute Tribe in Support of the Mill

February 7, 1979

Director
Division of Fuel Cycle
and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Energy Fuels White Mesa Uranium Mill

The White Mesa Ute Indian Tribe supports the construction and operation of the proposed Energy Fuels Uranium Mill to be located on White Mesa approximately five (5) miles north of the Ute Reservation. The White Mesa project should be a benefit to the Ute Tribe insofar as tribe members will benefit from the jobs created in the immediate area. The Tribe urges your favorable consideration of the issuance of the source material license for the Energy Fuels Mill. Your earliest possible action on the issuance of this license will permit the opening of a substantial number of job opportunities to the Ute tribe members.

Councilman
White Mesa Ute Tribe

February 7, 1979

Director
Division of Fuel Cycle
and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Energy Fuels White Mesa Uranium Mill

The undersigned as a representative of the Navaho Indian Tribe in Southeastern Utah wishes to advise you that we support the Energy Fuels White Mesa Uranium Mill project. This project will provide needed jobs to the Navaho Indians and should have a beneficial economic impact on the Tribe as a whole. A number of our Tribe are already employed in the Energy Fuels Buying Station and mines in the area of the Mill. Approval of this project at the earliest possible time will no doubt open jobs during the construction and operation phases of this project.

Navaho Indian Tribe
Off Reservation Chapter President

Attachment C

NRC Acknowledgement that a Specific Import License is not Required for the Silmet Material

From: Jones, Andrea <Andrea.Jones2@nrc.gov>
Sent: Thursday, May 28, 2020 7:31 AM
To: Phillip Goble <pgoble@utah.gov>; David Frydenlund <DFrydenlund@energyfuels.com>
Cc: Ty Howard <tyhoward@utah.gov>; Rusty Lundberg <rlundberg@utah.gov>; Bret Randall <bfrandall@agutah.gov>; Ryan Johnson <rmjohnson@utah.gov>; Habighorst, Peter <Peter.Habighorst@nrc.gov>; White, Duncan <Duncan.White@nrc.gov>
Subject: RE: Re: Re: Article about White Mesa

Caution: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good Morning

I just wanted to close the loop on the discussions on the White Mesa article and consultation with a senior colleague, I learned the prevailing regulatory citation for the proposed Estonia import is Section 110.27(a) General License for Import, which states in part, except as provided in paragraphs (b) and (c) of this section, a general license is issued to any person to import byproduct, source, or special nuclear material if the U.S. consignee is authorized to receive and possess the material under the relevant NRC or Agreement State regulations.

(b) The general license in paragraph (a) of this section does not authorize the import of more than 100 kilograms per shipment of source and/or special nuclear material in the form of irradiated fuel.

(c) Paragraph (a) of this section does not authorize the import under a general license of radioactive waste.

I spoke to both Phillip and David, and the NRC has determined that the proposed shipment can be imported under the general license and a specific import license is not required. In addition, the alternative feed is not radioactive waste, as defined in Part 110. My apologies for any confusion, but I wanted to resolve the issue as quickly as possible.

Best,
Andrea