



State of Utah

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DIVISION OF WASTE MANAGEMENT  
AND RADIATION CONTROL

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Director

November 6, 2023

Kathy Weinel, Quality Assurance Manager  
Energy Fuels Resources (USA) Inc.  
225 Union Blvd., Suite 600  
Lakewood, CO 80228

RE: Energy Fuels Resources (USA) Inc. September 27, 2023, Source Assessment Report for Selenium in MW-11 and pH in Monitoring Well MW-37, White Mesa Uranium Mill Utah Groundwater Discharge Permit No. UGW370004

Dear Ms. Weinel:

The Division of Waste Management and Radiation Control (Division) has reviewed the Energy Fuels Resources (USA) Inc. (EFRI), March 27, 2023, document titled "*White Mesa Uranium Mill, State of Utah Groundwater Discharge Permit No. UGW370004, Source Assessment Report Under Part I.G.4 for Exceedances in MW-11 and MW-37 in the First Quarter of 2023*" (SAR). The SAR includes an evaluation of "out of compliance" (OOC) parameter selenium in monitoring well MW-11 and Field pH in MW-37. Monitoring Well MW-11 is located hydraulically downgradient from Cell 2, Cell 3, and the chloride and nitrate/nitrite plumes. MW-37 is located downgradient from Cell 4B and portions of Cell 4A.

**MW-11 Selenium**

Per the SAR, EFRI finds that based on assessment and factors demonstrating that MW-11 has not been impacted by seepage from the tailings cell, that current changes in groundwater chemistry and selenium OOC at monitoring well MW-11 are due to groundwater background and impacts from the nitrate/chloride plume migration. The SAR includes discussion of the assessment and Section 3.5.1.1 lists the 8 factors supporting that EFRI conclusion. Specifically, per the SAR:

1. *"Key indicator parameter fluoride is decreasing.*
2. *pH has been stable to increasing since 2016.*
3. *Iron (which is the constituent having the highest concentration in the TMS) has been decreasing since the first quarter of 2012.*

(Over)

4. *A statistically significant increasing trend in indicator parameter sulfate was present in MW-11 at the time of the Hurst and Solomon (2008) isotopic investigation report which included MW-11 in its analysis and that concluded there were no impacts to groundwater from the TMS, indicating that this trend is not the result of potential TMS seepage. In addition, while the complete data set for MW-11 sulfate exhibits a significantly increasing trend, the post-inflection (post-July 2019) data set for MW-11 sulfate exhibits no significant trend.*
5. *Although not within the plume, concurrently increasing chloride and nitrate at MW-11 since 2018 result from the increasing influence of the nitrate/chloride plume. The increasing influence of the nitrate/chloride plume, which originates approximately 1,000 feet upgradient of the TMS, results from continued downgradient migration of the plume towards MW-11. One consequence of the increasing nitrate is mobilization of naturally occurring uranium (and selenium) at MW-11*
6. *Because uranium is substantially less mobile than nitrate or chloride at the near neutral pH conditions at MW-11, concurrently increasing uranium, nitrate, chloride (and selenium) indicate geochemical changes in the immediate vicinity of MW-11 (cause in part by the increasing influence of the nitrate/chloride plume) rather than transport from a remote source such as the TMS.*
7. *Increasing water levels are expected to impact the MW-11 groundwater chemistry and contribute to trends in dissolved constituents.*
8. *Mass balance analysis indicates that water level increases at MW-11 are unrelated to potential TMS seepage.”*

Per Division review of the SAR and historical data for MW-11, the out-of-compliance status for selenium in monitoring well MW-11 does not appear to be associated with contamination from a tailing wastewater source. Division findings are detailed in a separate SAR review memorandum. Based on these findings it is appropriate to adjust the Permit groundwater compliance limit for selenium in MW-11, consistent with the currently approved groundwater data statistical process flow chart for the Mill and associated guidance.

### **MW-37 Field pH OOC**

Per the SAR, EFRI finds that based on assessment and factors demonstrating that MW-37 has not been impacted by seepage from the tailings cell, that current changes in groundwater chemistry and pH OOC at monitoring well MW-37 are due to changing groundwater background. The SAR includes discussion of the assessment and Section 3.5.2.1 lists the 4 factors supporting that EFRI conclusion. Specifically, per the SAR:

1. *“Key indicator parameters chloride, fluoride, sulfate, and uranium are stable to decreasing.*
2. *pH has been stable to increasing since 2016.*
3. *Increasing water levels are expected to impact the MW-37 groundwater chemistry and contribute to trends in dissolved constituents.*
4. *Mass balance analysis indicates that water level increases at MW-37 do not result from potential TMS seepage.”*

Per Division review of the SAR and historical data for MW-37, the OOC status for pH in monitoring well MW-37 does not appear to be associated with contamination from a tailing wastewater source. Division findings are detailed in a separate SAR review memorandum. Based on these findings it is appropriate to adjust the Permit groundwater compliance limit for pH in MW-37, consistent with the currently approved groundwater data statistical process flow chart for the Mill and associated guidance.

### **MW-11 Statistical Analysis**

Based on Division review of the SAR statistical analysis for MW-11, it was noted that selenium in MW-11 exhibits a significant increasing trend and is not normally distributed. The statistical analysis was conducted for selenium on the complete historic data set and for a post July 1, 2019, data set. After July 1, 2019, a steady increase in nitrate concentrations occurred and a point of inflection is observed.

The Division approved statistical flow chart for the White Mesa Mill groundwater monitoring wells clarifies that if an upward trend is apparent for a constituent, then a modified approach should be considered. The modified approach should allow for a Ground Water Compliance Limit (GWCL) which considers the increasing concentration. The Proposed GWCL for selenium in MW-11 was calculated based on mean + 2 $\sigma$  of the post July 1, 2019, data set. The calculations and findings are summarized on a table in the SAR (Appendix A-1 of the SAR).

EFRI Statistical methods used in the SAR included: 1. Descriptive statistics for the complete and modified data sets; 2. Mean and Standard Deviation Calculation; 3. Shapiro-Wilk Test for normality; and 4. Mann-Kendall Trend Analysis (non-normally distributed data sets) and Linear Trend Analysis.

### **MW-37 Statistical Analysis**

Based on Division review of the SAR statistical analysis for MW-37, it was noted that field pH in MW-37 does not exhibit a significant decreasing trend and is not normally distributed. The Division approved statistical flow chart for the White Mesa Mill groundwater monitoring wells dictates that the greater (lower for pH) of the fraction approach or the highest historic value (lowest for pH) is selected for the proposed GWCL in these circumstances. Because field pH is measured on a logarithmic scale, the fractional approach results in a value that is unnecessarily low, so the proposed GWCL for field pH in MW-37 is based on the lowest historical value.

The analysis for pH in MW-37 was conducted on the complete historic data set. EFRI Statistical methods used in the SAR included: 1. Descriptive statistics for the complete and modified data sets; 2. Mean and Standard Deviation Calculation; 3. Shapiro-Wilk Test for normality; and 4. Mann-Kendall Trend Analysis (non-normally distributed data sets) and Linear Trend Analysis.

### **Approved Modified GWCLs for MW-11 and MW-37**

Per review of the SAR Section 4.3 regarding proposed modifications to the GWCL and statistical analysis of the data, the GWCL will be modified in the White Mesa Uranium Mill Groundwater Permit for selenium in monitoring well MW-11 and field pH in MW-37 as summarized on the table below:

Well Number	Parameter	Current GWCL	Modified GWCL	Method of Analysis
MW-11	Selenium	12.5 $\mu\text{g/L}$	20.49 $\mu\text{g/L}$	Mean + 2 $\sigma$ *
MW-37	Field pH	6.61-8.5	6.05-8.5	Lowest Historical Value

\*Based on the Mean + 2 $\sigma$  of the Selenium background data set post July 1, 2019

Note that the modified GWCL's will not be effective until future issuance of a modified Permit, and that the modifications will be subject to formal public notice and public participation requirements. These Permit modifications are anticipated to be made during calendar year 2023.

If you have any questions, please call Chris Leahy at 385-602-5505.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Phil Goble', written over a horizontal line.

Phil Goble, Uranium Mills and Radioactive Materials Manager  
Division of Waste Management and Radiation Control

PG/CL/wa

c: Grant Sunada, Executive Director/Health Officer, San Juan County Public Health Department  
Ronnie Nieves, Environmental Health Director, San Juan County Public Health Department  
Russell Seeley, District Engineer, UDEQ