State of Utah
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Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF RADIATION CONTROL
Rusty Lundberg
Director

"DRC-2013-002816"

MEMORANDUM

TO: File

THROUGH: Phil Goble, Compliance Section Manager PRG 7/15/2013

FROM: Tom Rushing, P.G. JR 7/15/13

DATE: July 15, 2013

SUBJECT: Review of the 1st Quarter, 2013 (dated May 28, 2013) Groundwater Monitoring Report, Groundwater Discharge Permit UGW370004 – Energy Fuels Resources (USA) Inc., White Mesa Uranium Mill, Blanding, Utah

This is a summary of Division of Radiation Control ("DRC") staff review of the Energy Fuels Resources (USA) Inc. ("EFR") groundwater monitoring report for the 1st Quarter 2013 (Jan.–March), dated May 28, 2013 (received by DRC on May 29, 2013). The review included all sampling events and accelerated monitoring during the quarter. DRC staff additionally reviewed the EFR notices and documents (written notification for monitoring exceedances and source assessment reports) as follows:

1. Energy Fuels Resources (USA) Inc., May 10, 2013, *Notice Pursuant to Part I.G.1(a) Q1, 2013*
2. Energy Fuels Resources (USA) Inc., May 7, 2013, *Transmittal of Source Assessment Report for Total Dissolved Solids in MW-29 White Mesa Mill Ground Water Discharge Permit UGW370004 Conditional Approval of December 13, 2012 Plan and Time Schedule.*

1. Checklist of Significant Findings and Associated Actions at the White Mesa Uranium Mill

1. The subject Monitoring Report was received by the due date; June 1, 2013.
2. A May 25, 2012 EFR Permit modification request was made in order to document accelerated reporting and monitoring agreements made during a teleconference with the Utah Division of Radiation Control (DRC). Per DRC staff discussions: The May 25, 2012 request will be included with the White Mesa Mill Ground Water Permit Renewal (Currently in the application review process). DRC review of the 1st Quarter 2013 Report recognized the telephone agreements regarding timelines for EFR to submit compliance notices.
3. The EFR source assessment report for previously documented out-of-compliance parameters (multiple parameters), required per Stipulated Consent Agreement, Docket No. UGW12-03 was submitted to DRC, dated October 10, 2012. Per DRC review findings as documented in a DRC review memo dated April 23, 2013 and transmitted via letter to EFR dated April 25, 2013, it is recommended that specific GWCL parameters for

monitoring wells be modified (12 instances) and that GWCL's be removed from the permit for 3 up-gradient monitoring wells, additionally 2 monitoring well parameters are recommended to have modified GWCL's pending additional discussion between DRC and EFR regarding a potential modified approach for statistical evaluation.

4. The EFR pH report, which evaluates monitoring wells out-of-compliance for pH, required per Stipulated Consent Agreement, Docket No. UGW12-03 was submitted to DRC, dated November 9, 2012. The EFR pyrite investigation report, required per Stipulated Consent Agreement, Docket No. UGW12-03 was submitted to DRC, dated December 7, 2012. Per DRC review findings as documented in a DRC review memo dated April 23, 2013 and transmitted via letter to EFR dated April 25, 2013 it is recommended that GWCL's for pH at all MW series monitoring wells be reset based on the revised statistical evaluation (calculated using field measured pH instead of laboratory measured values). In regards to the pyrite investigation DRC notes that "*the Pyrite Report does not propose changes in Permit GWCL's but does provide support for the determination that current out-of-compliance parameters are due to background chemical concentrations within the aquifer matrix and are not caused by the release of tailings solution to the environment.*"
5. DRC noted that several groundwater samples were collected with field turbidity measurements greater than 5 NTU. Per the current approved White Mesa Mill Quality Assurance Plan Rev. 7.2 (QAP) it is not required that the readings be below 5 NTU. Also, per DRC review of an EFR Well Development Report (dated September 30, 2011) DRC staff found that turbidity greater than 5 NTU would not affect laboratory analysis of the samples or quality of the sample results.
6. Laboratory QA/QC flags were documented on the review period analytical data reports from the contract laboratories. Per DRC review it appears that all discrepancies were self-reported by EFR and that none of the discrepancies are violations of Permit or QAP.
7. One new monitoring well went into out of compliance status (two consecutive GWCL exceedences) during the period, THF at monitoring well MW-1. EFR failed to submit a plan and time schedule for the well/parameter as required by the Permit Part I.G.4.c. DRC staff recommends the issuance of an NOV for this failure. Per the 1st Quarter 2013 report, EFR made a unilateral decision not to prepare and submit the plan and time schedule since DRC has agreed to remove GWCL's at MW-1 from the Permit in a future renewal. However, the approval has not been finalized in the Permit and has not undergone public notice and public participation activities which will be required for that change.
8. EFR failed to identify one new semi-annual monitoring well/parameter which went into probable out of compliance status during the period, pH at monitoring well MW-1. The exceedence was incurred during an accelerated monitoring event, and DRC suspects that the POOC status was identified by EFR since it did not occur during a baseline monitoring event. DRC will notify EFR of the exceedence and request that accelerated monitoring for pH be instituted at monitoring well MW-1.
9. Two new quarterly monitoring wells and parameters were identified with new exceedances during the 1st quarter reporting period. Chloride in monitoring well MW-25 exceeded the GWCL in the sampling event and uranium in monitoring well MW-30 exceeded the GWCL in the sampling event. EFR will commence accelerated monitoring for the wells/parameters.
10. EFR request approval of a modified GWCL for total dissolved solids at monitoring well MW-29 per the May 7, 2013 source assessment document. DRC staff recommends approval of the proposed revised TDS GWCL (from current 4400 mg/L to 4,570 mg/L)

based on review of the source assessment and statistical evaluation and calculations as detailed in the memo below.

2. Accelerated Monitoring and POC Wells Exceeding GWCL's

When a monitoring well has a pollutant that exceeds a Ground Water Compliance Limit (GWCL) set forth in Table 2 of the Permit it is in Probable Out-of-Compliance (POOC) status. According to the Permit, EFR is then required to immediately initiate accelerated sampling of that pollutant (see the Permit, Part I.G.1). When monitoring wells have parameters that have exceeded the Ground Water Compliance Limit (GWCL) two or more consecutive times they are in Out of Compliance (OOC) status (see the Permit, Part I.G.2).

In the event a constituent is in OOC status, EFR is required to prepare and submit within 30 calendar days to the Director a plan and a time schedule for assessment of the sources, extent and potential dispersion of the contamination, and an evaluation of potential remedial action to restore and maintain groundwater quality to insure that Permit limits will not be exceeded at the compliance monitoring point and that DMT or BAT will be reestablished, in accordance with Part I.G.4(c) of the Permit.

The DRC issued a February 7, 2012 Notice of Enforcement Discretion (NOED) for failure on the part of EFR to comply with these timelines for acceleration of groundwater monitoring at well MW-35.

EFR stated in a March 26, 2012 response to the NOED that based on an agreement made between DRC and EFR during a telephone conference call on April 5, 2010, EFR is not required to implement accelerated monitoring until "*the month following the submission of the Exceedance Notice for a specified quarter.*" Based on DRC review of notes taken during the April 5, 2010 telephone conference (Loren Morton 4/5/10, 0900), EFR verbally requested to wait until the end of the quarter to send in the notice of out-of compliance status – but within 30 days of the last lab report that EFR receives for the quarterly monitoring event.

DRC notified EFR by letter (dated April 16, 2012) that in order to formalize the April 5, 2010 discussion items related to out-of-compliance reporting and sampling, a written request for a groundwater permit modification (groundwater permit, out-of-compliance notification and accelerated monitoring requirements) is required for Director review and approval.

EFR submitted a May 25, 2012 written request for a Permit modification, including redline copies of pertinent pages of the Permit to reflect the agreements made during the April 5, 2010 conference call. The Permit modification request is currently under DRC review and is pending modification in the renewal permit. In the interim, DRC is honoring the teleconference agreements and is not pursuing Permit enforcement based on EFR failure to meet the current time and schedule submission requirements as stated in the Permit.

The table below (Table 1) lists monitoring wells with parameters currently in OOC or POOC status and are currently under accelerated monitoring requirements.

Table 1 - Wells Monitored Quarterly Accelerated to Monthly Monitoring

Well	Class	*Position	Parameter	Date of First Exceedance of GWCL	Date Accelerated Monitoring First Required
MW-11	Class II water	D-3	Manganese	February 2010	May 2010
MW-14	Class III water	D-4A	Field pH	February 2010	May 2010
			Manganese	2nd Quarter 2012	August 2012
MW-25	Class III water	C-3	Field pH	4th Quarter 2010	January 2011
			Uranium	September 2010	January 2011
			Cadmium	4th Quarter 2012	March 2013
			Chloride	1st Quarter 2013	June 2013
MW-26[(a)]	Class III water	C-2	Field pH	February 2010	May 2010
			Nitrate + Nitrite (as N)	February 2010	May 2010
			Chloroform	February 2010	May 2010
			Uranium	February 2010	May 2010
			Chloride	February 2010	May 2010
			Dichloromethane	April 2010	June 2010
MW-30	Class II water	D-2	Nitrate + Nitrite (as N)	February 2010	May 2010
			Chloride	1st Quarter 2011	May 2011
			Selenium	April 2010	July 2010
			Uranium	4th Quarter 2011	March 2012
MW-31	Class III water	D-2	Nitrate + Nitrite (as N)	February 2010	May 2010
			Chloride	1st Quarter 2011	May 2011
			Sulfate	4th Quarter 2010	March 2011
			TDS	September 2010	January 2011
			Selenium	3rd Quarter 2012	December 2012
MW-35	Class II	C-4B	Uranium	2nd Quarter 2011	July 2011
			Manganese	2nd Quarter 2011	July 2011
			Thallium	3rd Quarter 2011	July 2011
			Adjusted Gross Alpha	3rd Quarter 2011	October 2011
			Selenium	3rd Quarter 2012	December 2012
			Molybdenum	4th Quarter 2012	March 2013

D = Down-gradient; U = Up-gradient; C = Cross-gradient; 1,2,3,4A = Cell #
a = Monitoring well MW-26 is a pumping well for the Chloroform investigation

Wells Monitored Semi-annually Accelerated to Quarterly Monitoring

Well	Class	*Position	Parameter	Date of First Exceedance of GWCL	Date Accelerated Monitoring First Required
MW-1	Class II water	U-1	Tetrahydrofuran	4th Quarter 2012	1st Quarter 2013
			Sulfate	4th Quarter 2012	1st Quarter 2013
			Manganese	4th Quarter 2012	1st Quarter 2013
MW-3	Class III water	D-4A	Selenium	2nd Quarter 2010	3rd Quarter 2010
			Field pH	2nd Quarter 2010	3rd Quarter 2010
			Fluoride	2nd Quarter 2010	3rd Quarter 2010
MW-3A	Class III water	D-4A	Field pH	2nd Quarter 2010	3rd Quarter 2010
			Sulfate	2nd Quarter 2010	3rd Quarter 2010
			TDS	2nd Quarter 2010	3rd Quarter 2010

			Selenium Nitrate + Nitrate (as N)	4th Quarter 2010 4th Quarter 2012	1st Quarter 2011 1st Quarter 2013
MW-5	Class II water	D-3	Uranium	4th Quarter 2010	1st Quarter 2011
MW-12	Class III water	D-3	Field pH Selenium	4th Quarter 2010 2nd Quarter 2010	1st Quarter 2011 3rd Quarter 2010
MW-15	Class III water	D-4A	Iron Selenium	4th Quarter 2011 2nd Quarter 2012	1st Quarter 2012 3rd Quarter 2012
MW-18	Class III water	U-1	Thallium Field pH Sulfate TDS	2nd Quarter 2010 2nd Quarter 2010 2nd Quarter 2010 2nd Quarter 2010	3rd Quarter 2010 3rd Quarter 2010 3rd Quarter 2010 3rd Quarter 2010
MW-19	Class III water	U-1	Field pH Nitrate + Nitrite as N Adjusted Gross Alpha	2nd Quarter 2010 4th Quarter 2011 4th Quarter 2012	3rd Quarter 2010 1st Quarter 2012 1st Quarter 2013
MW-23	Class III water	D-3	Field pH Manganese	2nd Quarter 2010 4th Quarter 2011	3rd Quarter 2010 1st Quarter 2012
MW-24	Class III water	D-1	Cadmium Thallium Field pH Fluoride	2nd Quarter 2010 2nd Quarter 2010 2nd Quarter 2010 4th Quarter 2012	3rd Quarter 2010 3rd Quarter 2010 3rd Quarter 2010 1st Quarter 2013
MW-27	Class III water	U-1	Nitrate + Nitrite (as N) Adjusted Gross Alpha Sulfate TDS Chloride Field pH	2nd Quarter 2010 4th Quarter 2010 2nd Quarter 2010 1st Quarter 2010 1st Quarter 2010 3rd Quarter 2011	3rd Quarter 2010 1st Quarter 2011 3rd Quarter 2010 3rd Quarter 2010 2nd Quarter 2010 4th Quarter 2011
MW-28	Class III water	D-1	Field pH Chloride Manganese	2nd Quarter 2010 2nd Quarter 2010 2nd Quarter 2012	3rd Quarter 2010 3rd Quarter 2010 3rd Quarter 2012
MW-29	Class III water	D-2	Field pH Iron Manganese TDS	4th Quarter 2010 3rd Quarter 2011 2nd Quarter 2012 2nd Quarter 2012	2nd Quarter 2011 4th Quarter 2011 3rd Quarter 2012 3rd Quarter 2012
MW-32	Class III water	C-2	Adjusted Gross Alpha Field pH	2nd Quarter 2010 2nd Quarter 2010	3rd Quarter 2010 3rd Quarter 2010

** D = Down-gradient; U = Up-gradient; C = Cross-gradient; 1, 2, 3, 4A = Cell #*

Table 1 above is a comprehensive list of all Groundwater Monitoring Wells in Accelerated Status. EFR is required to notify the DRC on a quarterly basis regarding wells and parameters which went into accelerated monitoring during the period [Part I.G.1(a), Accelerated Monitoring Status Reports (AMSR)]. For the 1st quarter 2013 monitoring, the AMSR and follow up Plan and Time Schedule [Required by the Permit Part I.G.4(d)] were received as follows:

1. AMSR received for the 1st Quarter 2013 period, dated May 10, 2013 and received by DRC on May 13, 2013.

Two new quarterly wells/parameters with new exceedances are noted per review of the May 10, 2013 AMSR; monitoring well MW-25 for Chloride and monitoring well MW-30 for Uranium. DRC notes that

Uranium at monitoring well MW-30 was already under accelerated monitoring per a previous exceedance (10/4/2011 sample). Per Table 1 above, EFR will commence accelerated monitoring for Chloride in monitoring well MW-25 during June, 2013.

There were no semi-annual wells/parameters with new exceedances identified by EFR in the May 10, 2013 AMSR, however, per DRC review of the accelerated monitoring data for well MW-1 it appears that pH was lower than the GWCL, reported value 6.76 S.U. (GWCL 6.77 -8.5 S.U.). The monitoring for pH is done with the accelerated monitoring to ensure field parameter stabilization, however, pH was not a required accelerated parameter, and it is possible that EFR missed the new exceedence due to this fact. A notice will be included in the letter correspondence notifying EFR that pH at monitoring well MW-1 is required to be added to the accelerated monitoring table.

One new well/parameter went into OOC status during the 1st Quarter 2013, THF at monitoring well MW-1. Per DRC review of the EFR May 10, 2013 Notice Pursuant to the Permit Part I.G.1(a) "Accelerated Monitoring" and the EFR May 28, 2013 1st Quarter Groundwater Monitoring Report it was noted that the THF monitoring results at monitoring well MW-1 exceeded the Permit Ground Water Compliance Limit ("GWCL") for two consecutive accelerated monitoring periods (4th Quarter 2012 and 1st Quarter 2013). Specifically, the Permit lists the THF GWCL for monitoring well MW-1 as 11.5 µg/L. The fourth quarter 2012 THF result was 21.8 µg/L and the first quarter 2013 monitoring result was 12.6 µg/L. Monitoring well MW-1 therefore entered out-of-compliance status upon EFR receipt of the first quarter 2013 laboratory data results for MW-1 as defined by the Permit Part I.G.2.

Per the EFR May 10, 2013 AMSR "*THF has exceeded the GWCL for both the Q4 2012 sampling event and the Q1 2013 sampling event. In the October 10, 2012 SAR, EFRI requested the removal of GWCLs for the far upgradient wells (MW-1, MW-18, and MW-19) at the Mill which cannot be impacted by Mill activities. In correspondence dated April 25, 2013, DRC noted (DRC agrees with the justification provided by EFR, that far upgradient wells are not likely to be impacted by current revision of the GWDP). A plan and schedule is not necessary because the exceedance is not caused by Mill activities. Until such time as the GWCL's are removed, the exceedances will continue to be noted and reported.*"

THF out of compliance status at well MW-1 was not addressed in the EFR October 10, 2012 Source Assessment Report. The THF out of compliance status at well MW-1 was recently added with the results of the 1st Quarter 2013 monitoring. Previous studies to determine the source of THF at well MW-1 were inconclusive. THF is not naturally occurring (is a produced organic solvent) in the environment and is not considered a background monitoring parameter. THF has been historically detected in facility groundwater monitoring wells at concentrations exceeding Permit ground water compliance concentrations at several locations including wells hydraulically downgradient from the tailings cells (MW-3, MW-5, MW-11, and MW-12).

A DRC staff review memorandum, dated April 23, 2013, was attached to a Director's approval letter for modified GWCL's (dated April 25, 2013) and states "*If future groundwater gradients change such that there is reasonable evidence to suggest that any of the upgradient wells MW-1, MW-18 or MW-19 may be impacted by tailings cell discharge or other Mill related activities, then the Director will re-institute GWCL's in the Permit at any or all of the monitoring wells. Continued semi-annual (baseline) monitoring for all contaminants listed in Table 2 of the current Permit (Current - DRC 8/24/2012) will be required to continue for continued assessment of background groundwater quality at monitoring wells MW-1, MW-18 and MW-19.*"

Removal of Permit GWCL's from upgradient monitoring well MW-1 is pending permit renewal (authorization by the Director) including required public notice, public participation and comment periods (*UAC § R317-6-6.5*). Therefore, until such time as the Permit is renewed; all listed GWCL's and conditions (e.g. Plan and Time Schedules for Source Assessment of Out-of Compliance Parameters) are applicable and enforceable.

3. Discussion Regarding Downgradient Monitoring Wells MW-20 and MW-22

DRC has recently received comments and had discussion with the Ute Mt. Ute Tribe regarding the possibility that relatively high concentrations of certain parameters in monitoring wells MW-20 and MW-22 (e.g. Cadmium, Manganese, Molybdenum, Uranium, Nitrate + Nitrite as N), which are hydraulically far down gradient from the White Mesa Mill tailings cells, could potentially be due to leakage of tailings solution or caused by other uranium ore processing activities and/or chemical and reagent storage. Per DRC review, and based on evidence related to concentration trends of indicator parameters at these wells, as well as hydrogeological aquifer parameters and calculated estimates of contaminant travel times to reach these points of exposure it appears highly unlikely that the observed concentrations are due to impacts from the White Mesa Mill. The location of monitoring well MW-20 is approximately 4,000 feet south of the southwest corner of cell 4B (closest current potential tailings cell solution release) and is hydraulically down gradient from the White Mesa Mill; MW-22 is approximately 5,700 feet southeast of the southeast corner of cell 4A (closest current potential tailings cell solution release) and is hydraulically cross gradient.

DRC Review of Indicator Parameter Trends at Monitoring Wells MW-20 and MW-22:

Per past EFR reports the indicator parameters are ordered as the best indicators of tailings solution release as follows; chloride, then fluoride, then sulfate, then uranium. These indicator parameters are based on relative concentrations in the tailings solution and mobility (partitioning coefficients and retardation factors) in groundwater. It is noted that, in terms of metals and radionuclides, uranium is the most mobile and best indicator parameter. A list of each parameter and summary of the justification for its use in early detection of tailings cell release is below:

1. Chloride -- Chloride is listed as the best indicator of tailings solution release since the retardation Factor (Rf) equals 1 (transported in saturated zone at the same velocity as the groundwater). High concentrations of chloride are present in the tailings solution with an average concentration of approximately 20,752 mg/L using 2012 data from Cell 1, Cell 2 Slimes Drain, Cell 3 and Cells 4A and 4B. Per EFR reports, this concentration is "sufficient to guarantee" that chloride would be measurable in groundwater before any substantial volume had entered the system.
2. Fluoride – Fluoride shares similar chemical properties and transport velocity as chloride. However it is noted that fluoride is in the tailings impoundment solution at a lower concentration than chloride, approximately 486 mg/L based on 2012 concentrations measured in Cell 1, Cell 2 Slimes Drain, Cell 3 and Cells 4A and 4B. Additionally, apatite acts as a solubility control and can reduce fluoride concentrations along a ground water flow path (higher Rf).
3. Sulfate – Sulfate is present in ambient groundwater at proportionally higher concentrations than chloride. Calcium sulfate minerals are more soluble than chloride minerals which limit the amount of sulfate that can remain dissolved and subsequently may retard sulfate concentrations along a flow path. The tailings cells contain an average concentration of approximately 96,040 mg/L calculated from 2012 samples of Cell 1, Cell 2, Slimes Drain, Cell 3 and Cells 4A and 4B. Given these high concentrations in the tailings solution, sulfate is still a good indicator parameter to assess potential discharge.

4. Uranium – Uranium is the most mobile of trace metal elements. Uranium is more mobile in ground water with low pH values and typically the retardation coefficient is significantly higher at pH values above the 3 to 4.5 range.

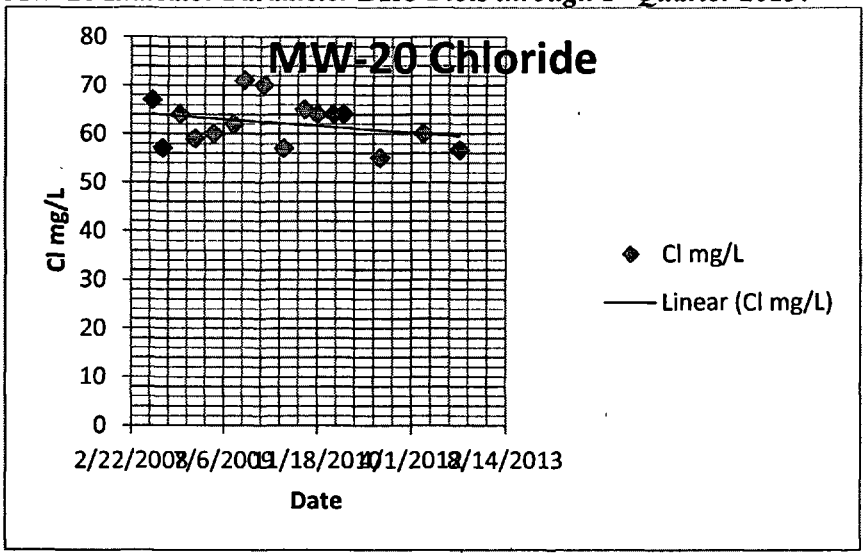
Per DRC review of current and historical groundwater concentrations for indicator parameters at monitoring wells MW-20 and MW-22 the following was found:

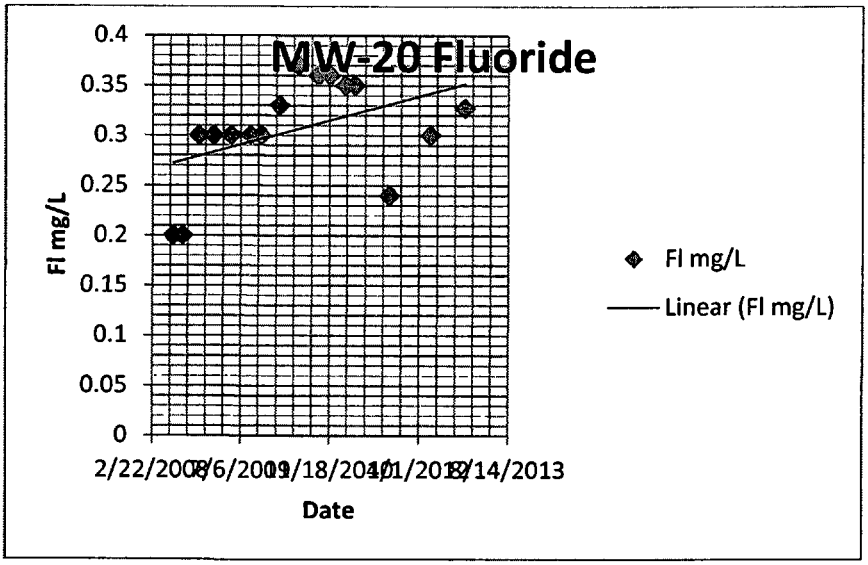
1. Chloride shows a flat or slightly decreasing concentration trend in both MW-20 and MW-22.
2. Fluoride shows an increasing trend in both MW-20 and MW-22. Fluoride concentrations at monitoring well MW-20 are an order of magnitude lower than the Utah groundwater quality standard at monitoring well MW-20. Fluoride concentrations at monitoring well MW-22 have been historically constant with concentrations near the Utah groundwater quality standard. The most recent data has shown a significant spike in fluoride concentrations which creates the apparent concentration trend.
3. Sulfate shows a flat or decreasing trend in both MW-20 and MW-22.
4. Uranium shows significant decreasing trends in both MW-20 and MW-22.

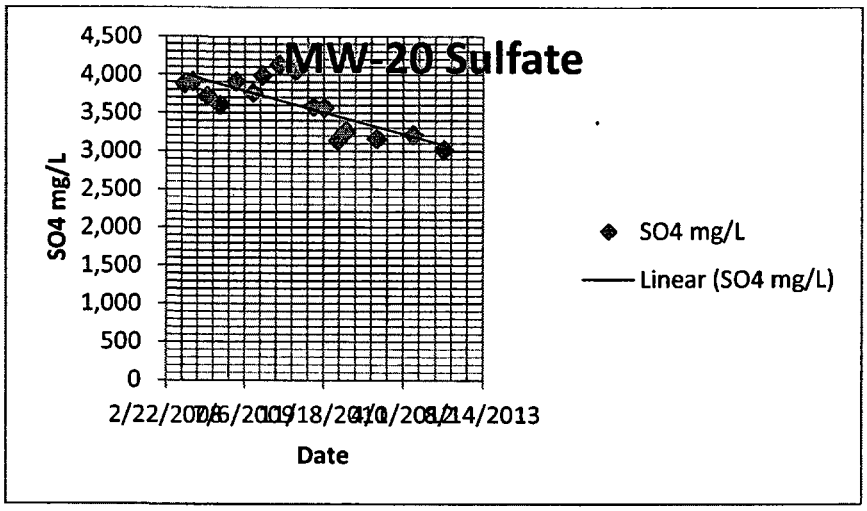
Based on review of the indicator parameters, there is no indication of a systemic increase in indicator parameter concentrations and no observed justification that that tailings solution is present in the groundwater at these monitoring wells.

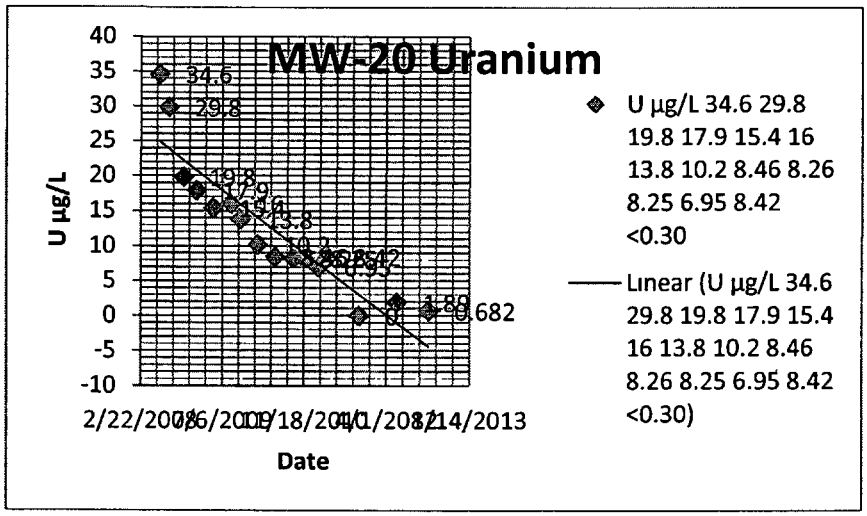
Time/concentration plots of indicator parameters results for monitoring well MW-22 are as follows:

MW-20 Indicator Parameter DRC Plots through 1st Quarter 2013:



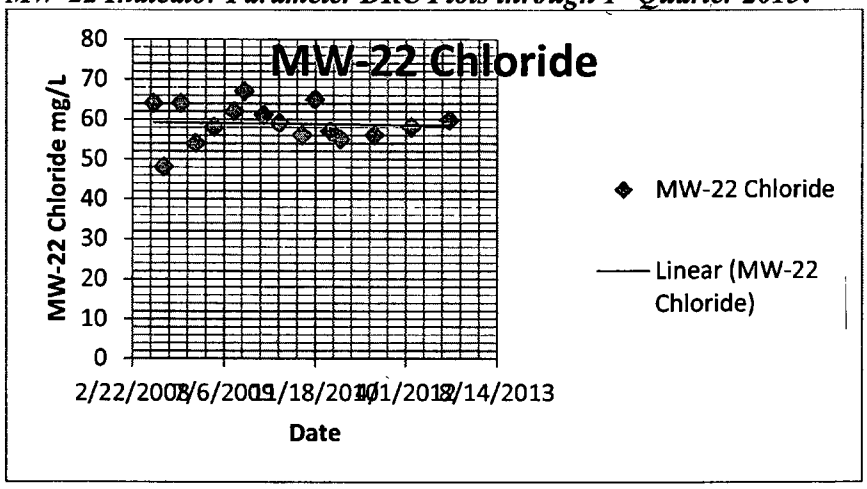

MW-20 Fluoride
Fl mg/L
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2/22/2008
8/6/2009
1/18/2011
7/1/2012
12/14/2013
Date
Fl mg/L
Linear (Fl mg/L)

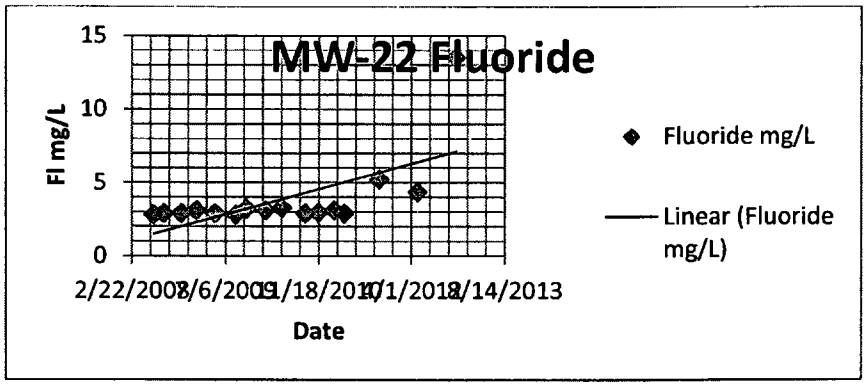

MW-20 Sulfate
SO4 mg/L
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2/22/2008
8/6/2009
1/18/2011
7/1/2012
12/14/2013
Date
SO4 mg/L
Linear (SO4 mg/L)

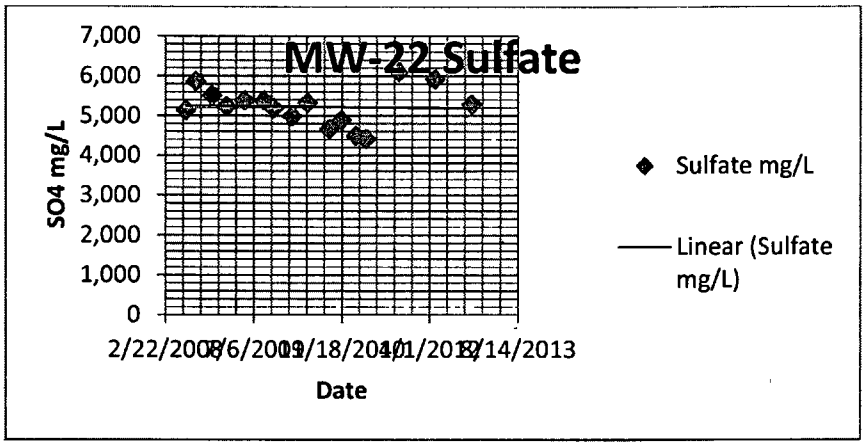

MW-20 Uranium
U µg/L
40
35
30
25
20
15
10
5
0
-5
-10
34.6
29.8
19.8
17.9
15.4
13.8
0.682
2/22/2008
8/6/2009
1/18/2011
7/1/2012
12/14/2013
Date
U µg/L 34.6 29.8 19.8 17.9 15.4 16 13.8 10.2 8.46 8.26 8.25 6.95 8.42 <0.30
Linear (U µg/L 34.6 29.8 19.8 17.9 15.4 16 13.8 10.2 8.46 8.26 8.25 6.95 8.42 <0.30)

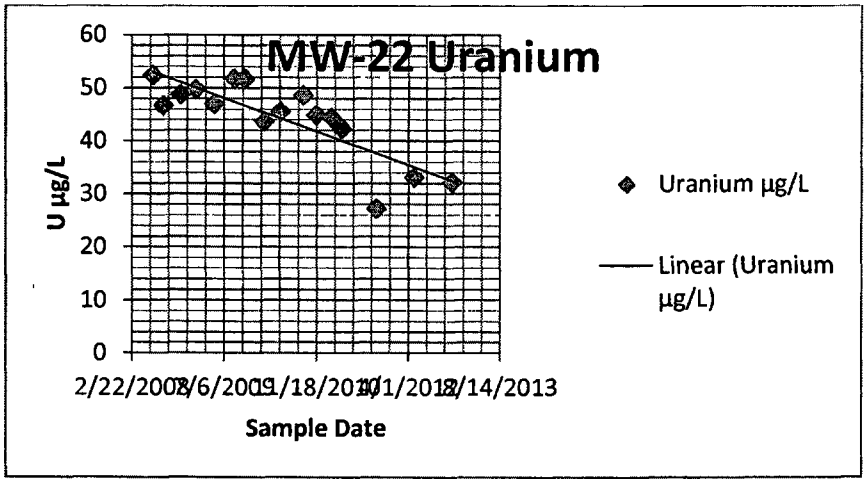
Time/concentration plots of indicator parameters results for monitoring well MW-22 are as follows:

MW-22 Indicator Parameter DRC Plots through 1st Quarter 2013:









DRC review of estimated travel times for groundwater to reach monitoring wells MW-20 and MW-22:

Per DRC review of the EFR November 7, 2012 "*Transmittal of Revised Southwest Hydrogeology Investigation Report Utah Groundwater Discharge Permit UGW370004 White Mesa Uranium Mill*" it was agreed by DRC and EFR that the measurement of hydraulic parameters for areas south of the White Mesa Uranium Mill using a single falling head slug test (at each well) was adequate to provide an estimate of groundwater pore velocities in that area. Additionally, DRC agreed that the Burro Canyon formation of the study area appeared to show very low hydraulic conductivity values (10^{-5} ft/yr– 10^{-6} ft/yr).

The results of the study estimated pore velocities to be from 0.26 ft/yr to 0.91 ft/yr based on hydraulic flow paths to White Mesa discharge springs/seeps in the area (Ruin Spring, Cottonwood Spring, Westwater Seep). Assuming a similar hydraulic gradient for the flow paths to monitoring wells MW-20 and MW-22 and using the most conservative pore velocity result of the study (0.91 ft/yr); the travel time from the nearest potential tailings solution release to monitoring well MW-20 would be approximately 4,395 years and would be 6,263 years to monitoring well MW-22. Based on these estimates it appears unlikely that current monitoring parameter concentrations are due to tailings solution release.

4. Monitoring Wells Purged for Two Casing Volumes Before Sample Collection

As stated in Section 6.2.7 of the EFR Quality Assurance Plan (QAP), Rev. 7.2 which was in effect during the 4th Quarter 2012 monitoring period, EFR has a choice regarding purge volumes as follows:

"*1. Purging three well casing volumes with a single measurement of field parameters*
2. Purging two casing volumes with stable field parameters (within 10% RPD)
3. Purging a well to dryness and stability of a limited list of field parameters after recovery"

Per DRC review of the 4th quarter report the following methods were used for each Quarter (including accelerated samples):

Quarter	# Purged 2 Casing Volumes	# Purged to Dryness	# Purged 3 Casing Volumes
4th 2012	36	2	0

When purging two casing volumes EFR QAP Rev. 7.2 directs EFR to first calculate the amount of time to evacuate two casing volumes and then pump for that length of time. Per DRC cross check of the field data sheets for each of the reports reviewed, it appears EFR correctly calculated the well casing volumes and evacuated the required two casing volumes (when 2 casing volume method selected) in monitoring wells prior to sample collection during the 4th Quarter 2012 and 3rd Quarter 2012 monitoring period. Per past DRC onsite sampling inspections it was noted that EFR sample collectors additionally use a graduated carboy and cross check purged values to insure that the required amount of groundwater was evacuated.

In cases where wells are evacuated to dryness the QAP Rev. 7.2, applicable to 3rd Quarter 2012 sample collection requires that:

"(vii) If the well is purged to dryness:

Record the number of gallons purged on the Field Data Worksheet.

The well should be sampled as soon as a sufficient volume of groundwater is available to fill sample containers.

Upon arrival at the well after recovery or when sufficient water is available for sampling measure depth to water and record on the Field Data Worksheet.

Take one set of measurements of field parameters for pH, specific conductance and temperature only. Collect the samples into the appropriate sample containers.

Take an additional set of measurements of field parameters for pH, specific conductance and temperature after the samples have been collected.

If the field parameters of pH, specific conductance and temperature are within 10% RPD the samples can be shipped for analysis.

If the field parameters of pH, specific conductance and temperature are not within 10% RPD, dispose of the sample aliquots, and purge the well again as described above.

Repeat this process if necessary for three complete purging events. If after the third purging the event, the parameters of pH, specific conductance and temperature do not stabilize to within 10% RPD, the well is considered sufficiently purged and collected samples can be submitted for analysis."

DRC staff verified that in cases where the monitoring well was evacuated to dryness, the number of gallons evacuated was recorded for the 1st Quarter 2013 in compliance with the QAP. Also, DRC staff verified that depth to groundwater was measured and recorded (comments field) on the field sheet.

DRC staff verified that in cases where the monitoring well was evacuated to dryness during the 1st Quarter 2013 that the field parameter stabilization requirements per the QAP Rev. 7.2 (listed above) were followed. DRC noted that EFR additionally recorded field readings directly after the purge although this reading is not required.

5. Groundwater Samples Collected with Turbidity Measurement > 5 NTU

As stated in Section 6.2.7(d)(v) of the EFR QAP Rev. 6: *"... turbidity measurement in the water should be ≤5 NTU prior to sampling unless the well is characterized by water that has a higher turbidity."* This language was removed from the QAP under Rev. 7.2. Turbidity measurement in the water should be < 5 NTU prior to sampling unless the well is characterized by water that has a higher turbidity.

During the 4th Quarters 2012 monitoring event, there were 10 compliance well samples with readings above 5 NTU's as follows:

Table 2 - Groundwater Samples Collected with Turbidity Measurement ≥5 NTU

Groundwater Monitoring Event	Well	Turbidity, NTU
1st Qtr, 2013	MW-01 (1)	5 35
1st Qtr, 2013	MW-11 (1)	19
1st Qtr, 2013	MW-23 (1)	9 2
1st Qtr, 2013	MW-28 (1)	10 05
1st Qtr, 2013	MW-29 (1)	24.02
1st Qtr, 2013	MW-31 (1)	47
1st Qtr, 2013	MW-32 (1)	53
1st Qtr, 2013	MW-37 (1)	49
1st Qtr, 2013	MW-31 Accl (2)	28
1st Qtr, 2013	MW-25 Accl (2)	19 5
1st Qtr, 2013	MW-31 Accl (2)	31

Footnotes
[1]Data for this well was obtained from Tab B of the 1st Quarter 2013 Groundwater Monitoring Report
[2]Data for this well was obtained from Tab C of the 1st Quarter 2013 Groundwater Monitoring Report

EFR undertook a redevelopment project for groundwater monitoring wells during calendar years 2010/2011, in response to a DRC letter dated June 1, 2010. A redevelopment report was prepared and submitted to DRC on September 30, 2011 (Received by DRC on October 3, 2011) which was reviewed by DRC.

Per the DRC review memo dated November 6, 2012 a summary was provided regarding DRC interaction with independent laboratories regarding the effect of turbidity measurements above 5 NTU on laboratory methods included in the QAP. Per the review, DRC found "*based on the above information turbid samples > 5 NTU should not affect analysis for the monitoring parameters required in the QAP.*" It is noted that the high NTU would affect only the nutrient and background parameters since other samples are field filtered.

Based on the updated QAP language (Rev. 7.2) and DRC Redevelopment Report findings, the turbidity readings are not in violation of the Permit or current approved QAP.

6. Relative Percentage Difference Calculations for Blind Duplicate Analysis

DRC conducted a review of the blind duplicate samples collected during the 4th Quarter 2012. Per the facility QAP, one blind duplicate must be collected with each sample batch. DRC confirmed that one blind duplicate was collected for each batch (2 total – baseline and accelerated events).

The duplicates are required to be within 20% Relative Percent Difference (RPD), unless "*the measured concentrations are less than 5 times the required detection limit (Standard Methods, 1998).*"

Per updated language in the QAP Rev. 7.2 Part 9.1.4, if any of the samples do not meet the comparison criteria (and are not qualified according to the 5 times method detection limit criteria) then EFR is required to conform to the procedures for corrective action listed as follows:

1. Notify the laboratory,
2. Request the laboratory review all analytical results for transcription and calculation errors, and,
3. If the samples are still within holding time, the QA Manager may request the laboratory re-analyze the affected samples.

The results of the 4th Quarter of 2012 blind duplicate for Selenium did not meet the 20% criteria (30.48 %) and Thallium did not meet the 20% criteria in the accelerated sample duplicate (27.23%). DRC notes that the both nonconformance's were identified by EFR in Section 3.4.7 of the 4th Quarter Monitoring Report, as well as on Table G7-A in appendix G of the report. Per the EFR Report "*The sample results reported for both parameters were not five times greater than the reporting limit and as such the deviation from the 20% RPD requirement is acceptable.*"

Per DRC staff review, the EFR blind duplicate comparisons and explanations seem appropriate and no further action is required.

7. Analytical Laboratories Used by EFR Certified by State of Utah to Perform Analysis for all Analytes

The analytical laboratories (GEL Laboratories LLC, Charleston, SC and American West Analytical Laboratories, Salt Lake City, UT) were contracted by EFR to perform analysis on the samples collected during the 1st Quarter, 2013. Per DRC review of the National Environmental Laboratory Accreditation Management System Website (cross check of laboratory certification for specific parameters) it appears that the EFR contract laboratories were certified to perform analysis for the specified parameters during the review period as follows.

GEL Laboratories Utah Certification is currently active.

American West Analytical Utah Certification is currently active.

8. Laboratory Report Turn Around Times

Per DRC review of EFR Table 1 included in the 1st Qtr. 2013 Report, it was noted that laboratory report turnaround times (from date of EFR sample submission to the contract laboratory) was generally in the range of 1 month or less. There is not a turnaround requirement in the current QAP, therefore, current turnaround times are judgment based. DRC has raised concern over excessive laboratory turn-around times in the past and the Director may require a turn-around date be included in the facility QAP if additional concerns are noted. The turn-around times for the 1st Quarter data appear to be reasonable.

9. Laboratory QA/QC Flags – 1st Quarter 2013

QA/QC issues and DRC findings for the 1st Quarter 2013 are summarized below:

Non-Conformance Summary	Self-Identified?	EFR Corrective Action Summary	DRC Findings
Sample duplicate MW-14/MW-65 had an RPD >20% (46.04%)	Y	Per the approved QAP, an RPD greater than 20% is acceptable if the reported results are less than 5 times the RL.	Sample results are 0.05 mg/L and 0.0799 mg/L. The ammonia RL is 0.05 mg/L. Result range is acceptable by current approved QAP.
Samples for Gross Alpha (MW-2, MW-11, MW-19, MW-25, MW-31, MW-35, MW-36) had counting errors >20%.	Y	Counting errors were less than 20% of the activity as required by the GWDP.	Counting errors appeared to be less than 20% of the activity reported for all instances.

Note: DRC reviewed the holding time summary chart; no exceedances of holding times were noted DRC reviewed the temperature check charts, all sample batches were received by the laboratory ≤6° C

10. Review of Time-Concentration Plots

The Permit Part I.F.1.g requires EFR to submit Time-Concentration Plots for each monitoring well for chloride, fluoride, sulfate and uranium.

Per DRC review of the Time-Concentration Plots for the 1st Qtr. 2013 it appears that all issues which were reported and discussed during previous DRC review (1st, 2nd, and 3rd Quarters 2011 Reports) have been resolved. Specifically, EFR is no longer culling data from the plots based on the EFR findings that certain concentrations are outliers. DRC requested that EFR plot all ground water data historically and it appears that the plots are representative of the data.

DRC notes that per the discussions with EFR it was agreed to that EFR need not plot trend lines on the Time Concentration Plots. Therefore, the plots no longer include trend lines. The reviewed plots appear to be in conformance with the agreed upon changes.

11. Review of Depth to Groundwater Measurements and Water Table Contour Maps

Per DRC cross checks of groundwater elevation measurement calculations used for the 1st Quarter 2013, approximately 5% of wells cross checked, comparing current depth to water measurements with plotted elevations, no errors were noted. DRC noted that groundwater elevations appeared stable and in conformance with historical levels during the review periods.

12. May 7, 2013 EFR Source Assessment Report for Total Dissolved Solids at Monitoring Well MW-29 Review

A May 7, 2013 Source Assessment Report (May 7, 2013 SAR) for Total Dissolved Solids in Monitoring Well MW-29 was submitted to the Director, received on May 8, 2013 for review and approval. The May 7, 2013 SAR was prepared per a conditional approval letter from the Director, dated May 30, 2013. The conditional approval was for an EFR March 14, 2013 Plan and Time Schedule which was approved with the following conditions: "*1. The SAR for Selenium at groundwater monitoring well MW-31 will include all study elements and report structure of the October 10, 2012 EFR Source Assessment Report*

(approved by the Director through Stipulated Consent Agreement UGW12-03), including graphs, plots and charts, and; 2. The SAR will be submitted on or before 90 calendar days from EFR receipt of this conditional approval letter."

DRC staff requested additional information regarding the May 7, 2013 SAR, specifically, DRC staff requested a table which included the specific data and dates used for statistical evaluation to calculate the EFR proposed modified GWCL. The data was requested via e-mail on July 1, 2013 and was received, via e-mail, on July 2, 2013. Review is below in two sections; Section 1 is the review of the Source Assessment, and Section 2 is review of the statistical analysis for the proposed modified TDS GWCL.

May 7, 2013 EFR TDS Source Assessment

Monitoring well MW-29 is located in the vicinity of the tailings cells, therefore a hydrogeologic analysis to determine if transport was feasible was not conducted with the assumption that transport of TDS constituents would be possible.

Current TDS data was compared with the Revised Background Groundwater Quality Reports to determine if any geochemical changes in indicator parameter (chloride, sulfate, fluoride and uranium) behavior could be identified which were not determined to be attributable to background influences. Based on this geochemical evaluation EFR concludes:

1. *"The results of the geochemical analysis of TDS in MW-29 show that concentrations are not behaving differently than they were at the time of the Background Report. TDS in MW-29 was decreasing (not significantly) at the time of the Background Report. Appendix B indicates that at the time of this SAR, the trend line for TDS is still slightly sloping downward (r=0.02, however, no real trend is observed."*
2. *"Chloride analysis at the time of the Background Report displayed a decreasing trend that was not significant. At the time of this SAR, chloride is showing a significantly decreasing trend."*
3. *"Sulfate concentrations are also showing a decreasing trend, however the trend is not significant."*
4. *"Uranium concentrations are increasing in MW-29, however, that trend is not identified as being significant in the Mann-Kendal trend analysis. Further, without the increase of other indicator parameters, increasing uranium concentrations can be attributed to natural influences at the site rather than any potential tailings cell seepage."*

Based on these findings EFR concludes that *"because there is not a rising trend in TDS and the key indicator parameter chloride is decreasing, the groundwater in MW-29 is not behaving differently than at the time of the Background Report. It is therefore appropriate to revise the GWCL for TDS in MW-29 to better reflect natural background conditions."*

EFR further concludes that a probable reason for the apparently higher TDS concentrations at well MW-29 is due to more data being available now than at the time of the GWCL calculations for the Background Reports. Specifically, the Background Report used eight groundwater sample results whereas the proposed modified GWCL uses twenty-five.

DRC additionally reviewed the time-concentration plots included with the source assessment (included current plots and plots of data used for the previous background reports) and concurs that the geochemical behavior of indicator parameters does not appear to have changed significantly. Based on DRC staff review of the source assessment it does not appear that the recent TDS GWCL exceedences at monitoring

well MW-29 are due to tailing cell solution release to the groundwater, this is primarily shown by no increase in chloride concentration or a rising chloride concentration trend.

May 7, 2013 EFR Proposed TDS GWCL for MW-29

The current Permit GWCL for TDS in monitoring well MW-29 is 4,400 mg/L, EFR proposes a modified GWCL be included of 4,570 mg/L based on the following data analysis:

1. Shapiro-Wilk Test for Normality
2. Least Squares Regression Trend analysis
3. Calculation of proposed GWCL's based on the Director approved statistical flow chart (includes criteria based on number of no detects in the data set and results of trend analysis).

DRC staff conducted a cross check of the Shapiro-Wilk test of normality and calculation of mean and standard deviation calculations in the source assessment report, included as an attachment to this memo. The cross check was based on the data set (N = 25) provided by EFR, as the data set used in the source assessment report, by e-mail dated July 2, 2013.

Per DRC staff review it appears that the data set used was valid, no issues identified, and that the normality test and development of the proposed GWCL based on mean + 2α was correct and was in conformance with the Director approved flow chart. It is recommended that the revised GWCL for TDS, 4,570 mg/L be included in the Permit renewal.

13. Conclusions and Recommendations

Based on DRC staff review of the above listed documents it is recommended that a correspondence letter and a Notice of Violation and Order be sent to EFR with the following items:

1. Summary of DRC review of the May 7, 2013 TDS Source Assessment Report for monitoring well MW-29 and recommendation that the proposed modified GWCL be included in the Permit renewal. Notification that the modification is subject to public notice and public participation requirements.
2. A notice regarding the pH GWCL exceedance at Well MW-1 and request to include the well/parameter on the accelerated monitoring schedule.
3. A notice of violation and order regarding failure to provide a time and schedule document for THF out of compliance status (2 consecutive exceedances) at well MW-1.

14. References

[1] Energy Fuels Resources (USA) Inc., May 28, 2013, *1st Quarter2013 Groundwater Monitoring Report Groundwater Discharge Permit UGW370004, White Mesa Uranium Mill*

[2] Energy Fuels Resources (USA) Inc., May 10, 2013, *Notice Pursuant to Part I.G.4(d) Q1, 2013*

[3] Energy Fuels Resources (USA) Inc., May 7, 2013, *Source Assessment Report for TDS in MW-29 White Mesa Uranium Mill*

[4] Energy Fuels Resources (USA) Inc., June 6, 2012, *White Mesa Uranium Mill Ground Water Monitoring Quality Assurance Plan (QAP), Revision 7.2*

[5] Utah Department of Environmental Quality, August 24, 2012, *Utah Division of Radiation Control, Ground Water Discharge Permit, Permit No. UGW370004, Energy Fuels Resources (USA) Inc.*

Attachment – DRC cross check of Shapiro Wilk Test for Normality of Data and Development of a proposed revised GWCL based on Mean + 2α for TDS evaluation of Monitoring Well MW-29

Shapiro Wilk (n<50) Method DRC Cross Check | Data Entered 7/1/2013 TR

Energy Fuels Monitoring Well MW-29 TDS Shapiro Wilk

i	x(i)	x(n-1+1)	x(n-i+1)^x(i)	a(n-i+1)	bi
1	4,080	4,600	520	0 445	231 4
2	4,180	4,520	340	0.3069	104 346
3	4,190	4,430	240	0.2543	61.032
4	4,230	4,430	200	0.2148	42 96
5	4,250	4,430	180	0 1822	32.796
6	4,260	4420	160	0 1539	24 624
7	4,260	4400	140	0.1283	17.962
8	4,280	4,400	120	0.1046	12 552
9	4,320	4,400	80	0.0823	6 584
10	4,340	4400	60	0.061	3.66
11	4,370	4,390	20	0.0403	0 806
12	4,380	4,390	10	0.02	0.2
13	4,380	4,380	0		
14	4,390	4,380	-10		
15	4,390	4,370	-20		
16	4400	4,340	-60		
17	4,400	4,320	-80		
18	4400	4,280	-120		
19	4400	4,260	-140		
20	4,420	4,260	-160		
21	4,430	4,250	-180		
22	4,430	4,230	-200		
23	4,430	4,190	-240		
24	4,520	4,180	-340		
25	4,600	4,080	-520		total =
					538.922

Standard Deviation Calculation:

Mean = 4349 2 Variables = 304784

Standard Deviation = 110.4

W Statistic = 0.992632358 01 Critical n(25) = 0 888

DRC Calculated Limit 4570 0

Energy Fuels Calculated Limit = 4570