
**IN THE MATTER OF
ENERGY FUELS RESOURCES (USA) Inc.
225 UNION BLVD., SUITE 600
LAKEWOOD, CO 80228**

: DOCKET No. UGW20-01-SCO

**STIPULATION AND CONSENT
ORDER: CHLOROFORM PLUME
REMEDATION**

This **STIPULATION AND CONSENT ORDER ("ORDER ")** is between **ENERGY FUELS RESOURCES (USA) INC. ("EFR")** and the **DIRECTOR** of the Division of Radiation Control ("**DIRECTOR**"), concerning violations of the Utah Water Quality Act, ("**ACT**"), including sections 19-5-104, -106, -111,-115, Utah Code Annotated ("**UCA**") and in accordance with the Utah Administrative Procedures Act, UCA 63-46b-1 to 601.

STIPULATION

1. The **DIRECTOR** has authority to administer the **ACT**, for purposes of groundwater quality at a facility licensed under the jurisdiction of the Division of Radiation Control ("**DRC**"). UCA § 19-5-102(6).
2. The **DIRECTOR** will administer the terms and provisions of this **ORDER** pursuant to UCA § 19-5-115.
3. This **ORDER** does not in any way relieve **EFR** from any other obligation imposed under the Act or any other State or Federal laws.
4. **EFR** accepts the following facts and stipulations:
 - A. **EFR** receives and processes natural uranium-bearing ores including certain specified alternate feed materials, and also possesses byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by the licensee's milling operations at its White Mesa uranium mill ("Mill" or "Facility"). This facility is located approximately six miles south of Blanding, Utah on White Mesa in Sections 28, 29, 32, and 33, Township 37 South, Range 22 East, Salt Lake Baseline and Meridian, San Juan County, Utah.
 - B. UCA §19-5-107(1)(a) requires that; "Except as provided in this chapter or rules made under it, it is unlawful for any person to discharge a pollutant into waters of the state or to cause pollution which constitutes a menace to public health and welfare, or is harmful to wildlife, fish or aquatic life or impairs domestic, agricultural, industrial, recreational, or other beneficial uses of water, or to place or cause to be placed any wastes in a location where there is probable cause to believe it will cause pollution."
 - C. The **DRC** issued **EFR** an August 23, 1999, Notice of Violation and Groundwater Corrective Action Order Docket No. UGW-20-01 ("**NOV**") relating to contamination in the shallow aquifer below their Facility with chloroform concentrations in excess of the 70 µg/L Utah Ground Water Quality Standard ("**GWQS**"). The August 23, 1999 **NOV** included an order to submit and conduct a Groundwater Contamination Investigation, submit a report thereon

("CIR"), and submit a plan and schedule for implementation and completion of a Groundwater Corrective Action Plan ("GCAP") pursuant to the provisions of the Utah Administrative Code ("UAC") R317-6-6.15(D).

- D. In response to the NOV, **EFR** submitted a series of documents outlining plans for investigation of the chloroform contamination. This plan of action and preliminary schedule was set out in **EFR** submittals dated: September 20, 1999; June 30, 2000; April 14, 2005; and November 29, 2006.
- E. During the course of the investigation, **EFR** submitted multiple reports. These reports were reviewed by the DRC, and additional information was requested as needed.
- F. In an effort to define the magnitude and physical extent of contaminant concentrations in the shallow aquifer, **EFR** submitted multiple quarterly monitoring reports. These reports were reviewed by the DRC and requests for information made as needed.
- G. In the course of the investigation, chloroform and other related man-made solvents were found in concentrations above their respective GWQS in the White Mesa shallow aquifer. These man-made solvents include: dichloromethane, chloromethane, and carbon tetrachloride. Collectively, these four solvents are contained in the Chloroform Plume. The physical extent of the chloroform plume is defined by concentrations of chloroform in excess of the GWQS for chloroform.
- H. Based on this investigation, the contamination has been attributed to the Mill operation by a former owner/operator of a temporary laboratory facility that was located at the site prior to and during construction of the Mill, and from septic drain fields that were used by the former owner/operator for laboratory and sanitary wastes prior to construction of the Mill's tailings cells.
- I. **EFR** submitted a draft GCAP dated August 22, 2007. The draft GCAP was reviewed by the DRC, and the DRC advised **EFR** in 2013 that it was incomplete. In an effort to expedite and formalize active and continued remediation of the Chloroform Plume, both parties have agreed to the GCAP found in Attachment 1, below.
- J. Corrective action to completely remediate the contamination will be in accordance with the terms of this **ORDER**. If future information indicates that the Corrective Action is inadequate, additional measures may be required at the discretion of the Director. **EFR** retains all administrative and judicial rights to appeal or otherwise contest such required measures.

ORDER

EFR IS HEREBY ORDERED (unless otherwise authorized by the **DIRECTOR**) to implement corrective action in accordance with the terms of this **ORDER** including but not limited to the following:

1. **EFR** shall permanently restore groundwater quality in all pumping wells and performance monitoring wells completed in the White Mesa shallow aquifer for all contaminants of concern in accordance with the Ground Water Corrective Action Objectives found in Part I of the GCAP before termination of either this **ORDER** or the Radioactive Materials License No. UT 1900479.

2. **EFR** shall comply with all groundwater corrective action performance standards found in Part II of the GCAP.
3. **EFR** shall comply with all groundwater corrective action monitoring and reporting requirements found in Part III of the GCAP.
4. **EFR** shall comply with all general reporting requirements found in Part IV of the GCAP.
5. **EFR** shall fulfill all compliance responsibilities found in Part V of the GCAP.
6. **EFR** shall comply with all general requirements found in Part VI of the GCAP.
7. If **EFR** determines that:
 - A. The number of years of future groundwater pumping required to remove the Chloroform Plume contaminants and permanently return the shallow ground water quality to levels below their respective GCALs as defined in Table 2 of the GCAP (Part I.G), after taking into consideration any changes or potential changes identified in paragraph J of this **ORDER**, will or could exceed the operational life of the Mill, or;
 - B. Determines that continuation of such pumping would be ineffective, impracticable or would not be cost-effective, then **EFR** may, at its option, submit a separate application for revision to the GCAP for **DIRECTOR** review and Water Quality Board approval. Any application for a revised GCAP would be a separate action and outside the scope of this **ORDER**. Such an application may evaluate other technologies to remediate the Chloroform Plume and would include performance of a transport assessment, a hazard assessment, and an exposure assessment along with a corrective action assessment including an evaluation of best available remedial technologies. **EFR** selection of a technology for implementation will be based on an evaluation whether the technology will remediate contamination to meet the requirements of UAC R317-6-6.15.
8. On or before 120 days after the date of this **ORDER**, **EFR** shall submit a Chloroform Project Reclamation Plan and Cost Estimate (CPRP-CE) for **DIRECTOR** approval that will include:
 - A. Specific details on how the Chloroform Plume remediation system will be:
 - 1) Operated, maintained (including monitoring and reporting), modified (if needed) for at least a six year period, and
 - 2) Decommissioned at the time of facility closure which will include, but is not limited to: well plugging and abandonment, and removal of pipelines from the pumping wells to tailing cells or the Mill process, and
 - B. A cost estimate of all activities found in Item 8.A of this **ORDER**. Said cost estimate shall be prepared by or under the direction of a Utah Licensed Professional Engineer.

In the event that the **DIRECTOR** determines the CPRP-CE to be incomplete, or for any reason additional information is required, **EFR** shall fully resolve and satisfy any request for additional information within 60 calendar days of written **DIRECTOR** request or such other schedule as may be approved by the **DIRECTOR**.

9. Within 60 calendar days of **DIRECTOR** approval of the CPRP-CE required by Item 8 of this **ORDER**, **EFR** will modify the financial surety required by Condition 9.5 of their Radioactive Materials License Number UT1900479, to include the approved groundwater corrective action system operation and decommissioning costs.
10. After Director approval of the CPRP-CE required by Item 8, **EFR** will, at the request of the **DIRECTOR** revise the CPRP-CE every two years as necessary to reflect any needs or performance concerns of the pump and treat groundwater remediation system, as documented in the two-year Corrective Action Comprehensive Monitoring Evaluation (“CACME”) report required under Part III.H of the GCAP. If, after receipt of the CACME report, the Director determines additional information or changes are needed to the revised CPRP-CE, **EFR** shall provide the required information, modify the document, and resolve all Director concerns within 60 calendar days of written Director notice, or such other schedule as may be approved by the **DIRECTOR**.

STIPULATED PENALTIES

EFR agrees to the following stipulated penalties upon receipt of written demand and/or notice from the **DIRECTOR**:

1. In the event that **EFR** fails to submit the CPRP-CE on or before 120 days after the date of this **ORDER**, as mandated by Item 8 of this **ORDER**; **EFR** agrees to pay stipulated penalties in the amount of \$1,000 per calendar day.
2. In the event that **EFR** fails to fully resolve and satisfy any **DIRECTOR** request for additional information regarding the CPRP-CE within 60 calendar days of **DIRECTOR**'S written request or such other schedule as approved the **DIRECTOR**, pursuant to Item 8 of this **ORDER**; **EFR** agrees to pay stipulated penalties in the amount of \$1,000 per calendar day per violation.
3. In the event that **EFR** fails to adequately revise the financial surety required by Item 9 of this **ORDER** within 60 calendar days of **DIRECTOR** approval; **EFR** agrees to pay stipulated penalties of \$2,000 per calendar day.
4. In the event that **EFR** fails to comply with any groundwater corrective action objectives required by Parts I.C, D, E, F, H or J of the GCAP, **EFR** agrees to pay stipulated penalties in the amount of \$500 per calendar day per violation.
5. In the event that **EFR** fails to comply with the chloroform plume monitoring network performance standards of Part II.F of the GCAP, **EFR** agrees to pay stipulated penalties in the amount of \$500 per calendar day per violation.
6. In the event that **EFR** fails to comply with any compliance monitoring well excursion requirement mandated by Part II.H of the GCAP, **EFR** agrees to pay stipulated penalties in the amount of \$2,000 per calendar day per violation.
7. In the event that **EFR** fails to comply with any other requirement of Part II of the GCAP (other than Part II.G), not listed above, **EFR** agrees to pay stipulated penalties in the amount of \$500 per calendar day per violation.
8. In the event that **EFR** fails to comply with any requirement mandated by Parts IV, V and VI of the GCAP, **EFR** agrees to pay stipulated penalties in the amount of \$500 per calendar day per violation.

GENERAL PROVISIONS

1. **EFR** agrees to pay any required penalties within 30 calendar days of written notice from the **DIRECTOR** in the form of a check, made payable to the State of Utah, and delivered or mailed to:

Division of Radiation Control,
Utah Department of Environmental Quality
P.O. Box 144850
195 North 1950 West
Salt Lake City, Utah 84114-4850
2. The DRC will view completion of all requirements as outlined in this **ORDER** as compliance with the **ORDER**.
3. Nothing contained in this **ORDER** shall preclude the DRC from taking additional actions to include additional penalties against **EFR** for violations not resolved by this **ORDER**.
4. Nothing in this **ORDER** shall constitute a waiver by **EFR** to raise in defense any legal or factual contention for future allegations of noncompliance.
5. Nothing in this **ORDER** shall constitute or be considered as a release from any claims, to include natural resource damage claims, cause of action, or demand in law or equity which the **STATE** may have against **EFR**, or any other person, firm, partnership or corporation for any liability arising out of or relating in any way to the release of pollutants to waters of the State.
6. While the **DRC** is presently not considering additional enforcement actions for any past or ongoing violations, nothing in this **ORDER** shall preclude the **DRC** from taking such actions to include other penalties against **EFR** for violations of the ACT or violations not resolved by this **ORDER**.

AGREED to this ____ day of _____, 2015.

ENERGY FUELS RESOURCES (USA) INC. UTAH WATER QUALITY BOARD

By _____
David C. Frydenlund
Sr. Vice President and General Counsel
Energy Fuels Resources (USA) Inc.

By _____
Rusty Lundberg
Director
Division of Radiation Control

ATTACHMENT 1

Groundwater Corrective Action Plan (GCAP)
For the
Energy Fuels Resources (USA) Inc. Chloroform Plume
At the White Mesa Uranium Recovery Facility
Near Blanding, Utah

Docket No. UGW20-01-SCO

Groundwater Corrective Action Plan (GCAP)

For Energy Fuels Resources (USA) Inc.
White Mesa Uranium Mill Chloroform Plume
Near Blanding, Utah
Docket No. UGW20-01-SCO

December, 2014
Revision 0

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PART I. GROUNDWATER CORRECTIVE ACTION OBJECTIVES

- A. Duty to Complete Corrective Action - Energy Fuels Resources (USA) Inc. (“**EFR**”) shall remediate and permanently restore groundwater quality of the shallow aquifer at the White Mesa uranium mill (the “Mill” or “Facility”) to meet the Groundwater Corrective Action Limits (“GCALs”) defined in Part I.G, below, before termination of Utah Radioactive Materials License UT1900479. This groundwater remediation shall be completed through use and application of pump and treat technology as approved in this Groundwater Corrective Action Plan (“GCAP”).
- B. Chloroform Remediation Well Designation - all shallow wells associated with this GCAP are designated by the Director into one of three categories, defined as follows¹ and listed in Tables 1A and 1B, below:
- 1) Pumping Wells - whose purpose is to provide chloroform mass removal and, to the extent practical, hydraulic containment of the Chloroform Plume (as defined by Part II.A), by continuous extraction of groundwater as a means to arrest, control, and remove all chloroform related contaminants until they fall below their respective GCAL, as defined in Part I.G, Table 2.
 - 2) Performance Monitoring (PM) Wells - including shallow monitoring wells found inside the physical boundaries of the Chloroform Plume (as defined in Part II.A). These wells may have groundwater contaminant concentrations above the GCAL concentrations defined in Part I.G, Table 2.
 - 3) Compliance Monitoring (CM) Wells - including wells: 1) found hydraulically down or cross-gradient of both the Chloroform Plume and the chloroform contamination source(s) and 2) that shall at all times contain groundwater with chloroform concentrations at or below the 70 ug/l GCAL concentration defined in Table 2 (Part I.G).

Table 1A. **EFR** Chloroform Plume Well Designations

Pumping Wells	Performance Monitoring (PM) Wells	Compliance Monitoring (CM) Wells	Monitoring
MW-4	TW4-6	MW-32	TW4-23
MW-26	TW4-7	TW4-3	TW4-26
TW4-19	TW4-8	TW4-5	TW4-27
TW4-20	TW4-10	TW4-9	TW4-28
TW4-4	TW4-16	TW4-12	TW4-30
TW4-1*	TW4-29	TW4-13	TW4-31
TW4-2*	TW4-33	TW4-14	TW4-32
TW4-21*		TW4-18	TW4-34
TW4-11*			TW4-35

¹ See EPA guidance “A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems”, January, 2008 (EPA 600/R-08/003).

Pumping Wells	Performance Monitoring (PM) Wells	Compliance (CM) Wells	Monitoring
TW4-37**			TW4-36

*Existing Chloroform Well to be converted to a pumping well (see Part I.C).

**New Pumping Well to be installed (see Part I.D)

Table 1B. EFR Nitrate Plume Well Designations Subject to this GCAP

Pumping Wells ²
TW4-22
TW4-24
TW4-25

C. Duty to Convert Certain Existing Monitoring Wells to Pumping Wells

1) Within 120 calendar days of Director written approval of this GCAP, **EFR** shall convert existing monitoring wells TW4-1, TW4-2, TW4-11 and TW4-21 to Pumping Wells to meet the requirements of Parts I and II of this GCAP. For these wells **EFR** shall comply with the requirements of Part II.C of this GCAP.

2) As these are existing wells, no as-built reports will be required.

Failure to meet these requirements in whole or in part will constitute non-compliance.

D. Duty to Install Additional New Pumping Well

1) Within 120 calendar days of Director approval of this GCAP, **EFR** shall install and make operational a new Pumping well (TW4-37) between existing pumping wells TW4-20 and TW4-22, at a location to be approved by the Director, to meet the requirements of Parts I and II of this GCAP. For this new Pumping Well, **EFR** shall comply with the requirements of Parts II.C and III.F of this GCAP.

2) Within 60 calendar days of well completion, **EFR** will complete aquifer testing and submit a well as-built report for Director approval for the new Pumping Well, in accordance with the requirements of Part I.F.6 of the Mill's Groundwater Discharge Permit.

Failure to meet these requirements in whole or in part will constitute non-compliance.

E. Duty to Protect, Operate, and Maintain All Monitoring and Pumping Wells - for purposes of

2 Pumping Wells TW4-22, TW4-24 and TW4-25 approved by the Director and operated by **EFR** under the Nitrate groundwater remediation project (i.e., Nitrate GCAP), shall also be subject to all requirements of the Chloroform GCAP, as they should also contribute to the cleanup of the chloroform plume.

corrective action and determination of compliance, **EFR** shall protect, operate and maintain at all times the Pumping Wells, Performance Monitoring Wells, and Compliance Monitoring Wells as defined in Part I.B, Table 1A and 1B, and all associated equipment as authorized in this GCAP, in accordance with the currently approved **EFR** document entitled: “*Operations and Maintenance Plan Chloroform Pumping System, White Mesa Mill, Blanding Utah.*” (“**EFR** O&M Plan”), pursuant to Part II.E of this GCAP.

F. Duty to Provide Adequate Compliance Monitoring Well Network - **EFR** shall at all times provide sufficient design, construction, numbers and locations of Compliance Monitoring Wells as approved by the Director. At a minimum, the network of Compliance Monitoring wells shall:

- 1) Provide early warning of any Chloroform Plume contamination migration, pursuant to the well designations and functions of Part I.B, and
- 2) Meet the requirements of Part II of this GCAP at all times.

Failure to comply with any plan or schedule required by the Director in order for **EFR** to meet this standard, in whole or in part, shall constitute non-compliance.

G. Groundwater Corrective Action Limits (“GCAL”s) - **EFR** shall fully and completely remediate groundwater quality in the White Mesa shallow aquifer by permanently restoring shallow groundwater contaminants at all points in the aquifer to concentrations at or below the GCAL found in Table 2, below before termination of Utah Radioactive Materials License UT1900479.

Table 2. Groundwater Corrective Action Limits (GCALs)

Contaminant	GWQS (µg/l) ³	GCAL (µg/l)
Chloroform	70.0	70.0
Dichloromethane	5.0	5.0
Chloromethane	30.0	30.0
Carbon Tetrachloride	5.0	5.0
Total Nitrate + Nitrite (as N)	10.0 mg/l	10.0 mg/l

H. Duty to Perform Corrective Action - under no circumstances shall **EFR** cease, desist from, or modify any activity required by this GCAP without prior written Director approval, and, where required, completion of public notice and comment period pursuant to Utah Administrative Code (“UAC”) R317-6-6.15.E.

I. Director Modification of Groundwater Corrective Action Plan Requirements - in the event that non-compliance is determined pursuant to Parts I or II, additional Pumping Wells, Performance Monitoring Wells and/or Compliance Monitoring Wells may be required by the Director.

3 GWQS defined in Ground Water Discharge Permit UGW370004, Part I.D.1 and Table 2.

J. Two-Year Reviews of GCAP - Every two years, the Director will evaluate the Two-Year Corrective Action Comprehensive Monitoring Evaluation (CACME) Report submitted by **EFR** under Part III.H to determine whether this GCAP continues to be protective of public health and the environment.

1) If, based on these reviews, the Director determines that this GCAP is not protective of public health and the environment, the Director may, in accordance with a schedule to be approved by the Director, change the current designation of any specific well in Part I.B, Tables 1A or 1B, or require the addition of new wells in order to ensure protection of public health and the environment. Likewise, as groundwater remediation improves local groundwater quality, the Director may authorize conversion of Pumping Wells to Performance Monitoring Wells.

2) Without limiting the generality of paragraph 1), if, based on a review of the CACME, the Director determines that the chloroform mass removal rates from pumping during the two-year period have dropped substantially, then the Director may take one of the following courses of action:

- i. If the Director determines that the mass removal rates have dropped substantially during the two-year period as a result of reduced concentrations within the plume, then no action may be required.
- ii. If the Director determines that the mass removal rates have dropped substantially during the two-year period as a result of lost well productivity, and the lost productivity is determined to be a well efficiency problem, then the Director may require **EFR** to re-develop or replace the inefficient wells in accordance with a schedule to be approved by the Director.
- iii. If the Director determines that the lost productivity is due to a general reduction in saturated thickness, then the Director may require **EFR** to perform analytical or numerical models, in accordance with a schedule to be approved by the Director, to evaluate the potential effectiveness of adding existing or new wells to the pumping network to improve overall productivity. If the analysis indicates that overall productivity will not improve significantly by adding wells, or if suitable well locations are not available, then no action may be required. No action may also be appropriate because a reduction in saturated thickness is expected to correspond to a reduction in the volume of contaminated water within the plume, which may be an indication that the system is working satisfactorily.

Failure to comply with any plan or schedule required by the Director in order for **EFR** to meet these requirements, in whole or in part, will constitute non-compliance.

PART II. GROUNDWATER CORRECTIVE ACTION PERFORMANCE STANDARDS

- A. Chloroform Plume Definition - for purposes of groundwater remediation the chloroform plume (“Chloroform Plume”) shall consist of those areas of the shallow aquifer at the White Mesa facility where groundwater chloroform contamination is found in concentrations above the 70 ug/l GCAL value listed in Part I.G, Table 2. The physical extent of the contaminant plume shall be defined and circumscribed by a 70 ug/l isoconcentration line for chloroform, as approved by the Director. This CAP applies to the Chloroform Plume as so defined and does not apply to any other groundwater contamination not found in Part I.G, Table 2, that may be identified elsewhere at the White Mesa Facility.
- B. Long Term Chloroform Plume Control Standard - **EFR** shall maintain the Chloroform Plume on property owned and controlled by **EFR** including, but not limited to lands found in Sections 28, 29, 32 and 33, Township 37 South, Range 22 East, Salt Lake Base and Meridian, San Juan County, Utah.
- C. Well Construction Standards - all Pumping, Compliance Monitoring, or Performance Monitoring Wells shall be designed and constructed to meet the following minimum requirements:
- 1) Be permanent in both design and construction;
 - 2) Fully screened and completed in the shallow aquifer; and
 - 3) Designed and constructed in compliance with Utah Admin. Code (“UAC”) R317-6-6.3(I)(6), including the EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document, 1986, OSWER-9950.1
- D. Disposal of Extracted Groundwater - all groundwater extracted by the Pumping Wells (Part I.B, Tables 1A and 1B) will only be disposed of in the Mill’s Tailings management system or fed into the Mill process.
- E. Pumping Well Operation Requirements - the Pumping Wells and pumping system will be operated and maintained in accordance with the currently approved **EFR** O&M Plan. In the event any conflict exists between the **EFR** O&M Plan and the requirements of this GCAP, the mandates of the GCAP shall prevail. Failure to meet this performance standard, in whole or in part, will constitute non-compliance.
- F. Chloroform Plume Monitoring Network Performance Standards - **EFR** will at all times provide and maintain the number and locations of Pumping Wells, Performance Monitoring Wells and Compliance Monitoring Wells set out in Tables 1A and 1B of Part I.B (subject to adjustment pursuant to Part I.J) and as may be required to install additional wells pursuant to Parts I.J or Parts II.H, I or J. Said well network shall ensure that the full physical extent and location of the Chloroform Plume is bound by determination of both:
- 1) The physical location of the 70 µg/l chloroform iso-concentration boundary in the shallow aquifer; and 2) Demonstration and justification that sufficient numbers and locations of monitoring wells are present to show groundwater flow directions at and near the outer margins of the Chloroform Plume (i.e., at and beyond 70 µg/l chloroform iso-concentration boundary).

Failure to maintain the wells as designated in Tables 1A or 1B of Part I.B (subject to adjustment pursuant to Part I.J) or to install and make operational any additional wells required under Part I.J or Parts II.H, I or J within the time frames set out in those Parts will constitute non-compliance.

- G. Compliance Monitoring Well Performance Standard - all Compliance Monitoring Wells, as defined in Part I.B, Table 1A, shall at all times maintain contaminant concentrations that are at or below their respective GCAL values, defined in Part I.G, Table 2. An exceedance shall be defined as the presence of chloroform in any Compliance Monitoring Well in excess of the Table 2 GCAL (70 ug/l) for two or more consecutive quarters.
- H. Compliance Monitoring Well Chloroform Excursion Requirements - if chloroform in any Compliance Monitoring Well exceeds its Part I.G, Table 2 GCAL concentration (70 ug/l) in two consecutive quarterly sampling events, **EFR** will:
- 1) At any time **EFR** submits a quarterly report that demonstrates an exceedance (second quarter of chloroform exceedance), **EFR** will provide a written exceedance notice to the Director (“Exceedance Notice”) for all wells that have demonstrated such an exceedance.
 - 2) Within 60 days after the time of submittal of a quarterly report that demonstrates an exceedance as defined in Part II.G, **EFR** will provide a plan and schedule for remedial actions to address and resolve the excursion, for Director approval. This plan and schedule may include, but is not limited to:
 - i) Installation of one or more Pumping Wells in the vicinity (or an alternate pumping location as approved by the Director due to low productivity of certain wells/areas of the site) of the former compliance monitoring well found in exceedance, or alternatively, **EFR** may convert the former compliance monitoring well, now in exceedance, to a Pumping Well; and/or
 - ii) Installation of one or more Replacement Compliance Monitoring Wells at locations that are no greater than 200 feet downgradient of the former compliance well, currently in exceedance.
 - 3) Within 90 calendar days of Director approval, or such other schedule as may be approved by the Director of said plan and schedule, **EFR** shall install and make operational all new or replacement Compliance Monitoring Wells and Pumping wells to meet the requirements of Parts I and II of this GCAP. For any modified or new well installed, **EFR** shall comply with the requirements of Part II.C of this GCAP, and for any new wells installed, **EFR** shall also comply with the requirements of Part III.F of this GCAP. The revised well network shall comply with the requirements of Part II.F.

Failure to complete installation of any new well under this Part, within required time frames will constitute non-compliance.
 - 4) Within 60 calendar days of new well completion, **EFR** will complete aquifer testing and submit a well as-built report for Director approval for all newly installed, Pumping Wells

and Compliance Monitoring Wells (not included in previously submitted as-built reports), in accordance with the requirements of Part I.F.6 of the Mill's Groundwater Discharge Permit.

I. Chloroform Plume Monitoring Network Performance Standards for Wells within 500 feet of **EFR** Property Boundary.

- 1) If chloroform in any Compliance Monitoring Well located within 500 feet of **EFR** property boundary exceeds its Part I.G, Table 2 GCAL concentration (70 µg/l) in any single sample event, **EFR** will collect an additional sample from the well within 30 calendar days from the date of receipt of the initial analytical results to confirm the result. If the result is confirmed to be greater than 70 µg/l, **EFR** will:
 - a) Notify the Director within five calendar days of receiving the confirmation sample results and, within 30 days thereafter, provide a Plan and Schedule for remedial actions to address and resolve the excursion for Director approval. This plan and schedule will include, but is not limited to:
 - i) Within 60 calendar days of Director approval the monitoring well in exceedance, or other well approved by the Director, will be converted to a pumping well. Pumping well determination will be based upon hydraulic properties and anticipated effects of future pumping.
 - ii) Within 60 days of Director approval at least two additional Compliance Monitoring wells will be installed no further than 200 feet downgradient of the new pumping well or 50 feet from the property boundary (whichever is closer to the well in exceedance). If the wells are to be placed 50 feet from the property boundary, an additional downgradient well for a total of three wells will be installed.
 - iii) Within 90 days of Director approval the new pumping well and new monitoring wells will be sampled for contaminants listed in Table 2 of Part I.G.
 - b) **EFR** shall install and make fully operational all new or modified equipment, components, and or procedures of the revised Chloroform remediation system. For any modified or new well installed, **EFR** shall comply with Part II.C of this GCAP, and for any new wells installed, **EFR** shall also comply with the requirements of Part III.F of this GCAP.
 - c) Within 60 calendar days of new well completion, **EFR** will complete aquifer testing and submit a well as-built report for Director approval for all newly installed Pumping Wells and Compliance Monitoring Wells (not included in previously submitted as-built reports), in accordance with the requirements of Part I.F.6 of the Mill's Groundwater Discharge Permit.
- 2) If chloroform in any Compliance Monitoring Well located within 50 feet of **EFR** property boundary exceeds its Part I.G, Table 2 GCAL concentration (70 µg/l), **EFR**

will:

- a) Notify the Director within five calendar days of discovery and perform the following:
 - i) Within 30 calendar days of receipt of initial analytical results convert the exceeding monitoring well to a pumping well.
 - ii) Within 30 calendar days of receipt of initial analytical results submit for Director approval a plan to prevent chloroform contamination from leaving the Mill property.
 - iii) Within 30 calendar days of installation new monitoring wells, including pumping wells, which are installed at or within 50 feet from the property boundary, will be sampled.
 - b) **EFR** shall install and make fully operational all new or modified equipment, components, and or procedures of the revised Chloroform remediation system. For any modified or new well installed, **EFR** shall comply with Part II.C of this GCAP, and for any new wells installed, **EFR** shall also comply with the requirements of Part III.F of this GCAP.
 - 3) Within 60 calendar days of new well completion, **EFR** will complete aquifer testing and submit a well as-built report for Director approval for all newly installed Pumping Wells and Compliance Monitoring Wells (not included in previously submitted as-built reports), in accordance with the requirements of Part I.F.6 of the Mill's Groundwater Discharge Permit.
- J. Director Notice - in the event that the Director provides written notification to **EFR** that additional Performance Monitoring Wells, Compliance Monitoring Wells, Pumping Wells and/or other equipment or procedures are needed at the facility to monitor, control, contain and/or remove the Chloroform Plume in accordance with this CAP, **EFR** will install, modify, operate and maintain the required wells, equipment, or procedures in accordance with the requirements found in Part II of this GCAP. Changes mandated by the Director may be subject to the public notice and comment requirements of UAC R317-6-6.15(E). Upon completion of this public participation, **EFR** will install and make operational any new or modified Pumping Well, Performance Monitoring Well, or Compliance Monitoring Wells within 90 calendar days of written Director Notice.
- K. Cessation of Groundwater Corrective Action - before termination of Utah Radioactive Materials License UT1900479 ("License") for the White Mesa facility, **EFR** shall perform all activities required by this GCAP, until completion of:
- 1) Steady-State Chloroform Plume Remediation Demonstration - including an affirmative demonstration that the groundwater contaminant concentrations in and near the Chloroform Plume, currently found under all land owned and operated by **EFR**, have permanently fallen and remain below their respective Part I.G, Table 2 GCALs in all Pumping Wells, Performance Monitoring Wells and Compliance Monitoring Wells as found in Part I.B, Table 1A. This requirement will be considered to be satisfied if all contaminants in all White Mesa shallow aquifer wells remain below such GCALs for a

minimum continuous period of five-years after cessation of all Pumping Well operations for purposes of removing the Chloroform Plume; and

- 2) Public Participation and Director Approval - completion of public participation pursuant to UAC R317-6-6.15(E) and receipt of prior written approval of the Director.

PART III. CORRECTIVE ACTION MONITORING AND REPORTING REQUIREMENTS

- A. Quarterly Monitoring Requirements - **EFR** shall perform quarterly monitoring of all Pumping Wells, Performance Monitoring Wells and Compliance Monitoring Wells, as follows:
- 1) Groundwater Monitoring Quality Assurance Plan - all groundwater monitoring and analysis performed under this GCAP shall be conducted in accordance with the Quality Assurance Plan under the Mill's Groundwater Discharge Permit ("QAP") currently approved by the Director. In addition to GCAL Parameters specified in Table 2 (Part I.G), each well shall also be analyzed for chloride. Any nonconformance with QAP requirements in a given quarterly groundwater monitoring period will be corrected and reported to the Director on or before submittal of the next quarterly groundwater monitoring report.
 - 2) Groundwater Monitoring Modifications - before any modification to the procedures, methods, or equipment specified in the approved groundwater monitoring QAP, **EFR** must obtain prior written approval from the Director.
- B. Quarterly Monitoring Report Content Requirements and Schedule - **EFR** shall submit quarterly groundwater monitoring reports for Director approval, as follows:
- 1) General Chloroform Corrective Action Report Content Requirements - will include, but are not limited to the following information:
 - a) Introduction
 - b) Sampling and Monitoring Plan Description
 - Description of monitor wells.
 - Description of sampling methodology, equipment and decontamination procedures.
 - Identification of all quality assurance samples, e.g. trip blanks, equipment blanks, and duplicate samples.
 - c) Data, Maps and Figures - including, but not limited to:
 - Copies of all field data sheets used to record all equipment and sampling procedures used to collect groundwater quality samples, including results of all field measurements and chain of custody forms.
 - Copies of all laboratory analytical reports of all groundwater quality samples collected each quarter.
 - Summary tables of depth to groundwater and water level elevation for each groundwater sampling event during the quarter.
 - Groundwater equipotential maps for each groundwater quality sampling event.

- Groundwater capture zone maps for each pumping well at the White Mesa facility, including both chloroform and nitrate pumping systems. Each map will display groundwater flowlines or streamtubes.
- Chloroform isoconcentration maps for each groundwater quality sampling event ⁴.
- Hydrographs (time series charts) of groundwater elevations in each Performance Monitoring Well, Compliance Monitoring Well, and Pumping Well, for each groundwater quality sampling event.
- Contaminant concentration time series graphs for chloroform laboratory results in all monitoring and pumping wells sampled during each quarter. In the case of Performance Monitoring Wells, **EFR** will include linear regression analysis on each time series concentration graph.

d) Data Interpretation

- Interpretation of groundwater levels (head and elevation), groundwater gradients and flow directions, including a discussion on:
 - 1) A current site groundwater contour map for the quarter will be contemporaneous for all wells on site, not to exceed a maximum time difference of seven calendar days;
 - 2) Hydrographs to show groundwater elevation in each monitor well over time;
 - 3) Depth to groundwater measured and groundwater elevation from each monitor well summarized in a data table that includes historic groundwater level data for each well; and
 - 4) An evaluation of the effectiveness of hydraulic capture of all contaminants of concern.
- Interpretation of all analytical results for each well, including a discussion on:
 - 1) Current chloroform isoconcentration map with one of the isoconcentration lines showing the 70 µg/L boundary;
 - 2) Graphs showing chloroform concentration trends in each well thru time; and
 - 3) Analytical results for each well summarized in a data table that includes historic analytical results for each well.
- Calculate chloroform mass removed by each Pumping Well, as based on mass and groundwater volume. Calculations will include:
 - 1) Total historic quarterly chloroform mass removed from each Pumping Well to date, and a sum thereof (to the extent historic data are available);
 - 2) Total chloroform mass removed for the quarter, based on all Pumping

⁴ Each quarterly shallow aquifer chloroform isoconcentration map will be prepared at the same X-Y scale as the capture zone map.

- Wells in operation (to the extent historic data are available); and
- 3) Time series graph to display the quarterly chloroform mass removed from each pumping well over the life of pumping operations (to the extent historic data are available).
- e) Current **EFR** compliance status regarding all performance standards required under Part II of this GCAP.
- 2) Quarterly Contour Map Based Chloroform Plume Mass Calculations (“CPMC”) - the quarterly report shall include a determination of the total chloroform mass remaining in the shallow aquifer for the current quarter at White Mesa, as calculated by **EFR** in accordance with the Director approved CPMC Method pursuant to Appendix A. Said chloroform plume mass calculations shall include the following information:
- a) Surfer® (“Surfer”) Electronic Input File⁵ - used by **EFR** to generate the Chloroform Contour Map for the quarter. The Surfer input file will be submitted to the Director in electronic form as an Excel spreadsheet, and will include, but is not limited to the following information:
 - Well name
 - Well location in Universal Transverse Mercator (“UTM”) coordinates; in Easting and Northing coordinate pairs in units of meters (m).
 - Laboratory reported chloroform concentration (ug/l) in each well sampled during the quarter, and the corresponding log equivalent value.
 - Any artificial or pseudo-data added by **EFR** to enhance or modify the measured data for the quarter.
 - Identification of any **EFR** substitution of measured data from the previous quarter under Step 1.a of the CPMC Method, including either detectable or non-detectable values.
 - b) Surfer Gridding Parameters - **EFR** will disclose the gridding parameters used in the software to generate all Grid files and Maps for the quarter of interest. At a minimum, this information shall include:
 - Minimum and maximum X values used⁶
 - Minimum and maximum Y values used⁷
 - Grid cell area and spacing interval used in both X and Y directions⁷
 - Gridding method used - **EFR** will use omnidirectional linear kriging technique to create all contour map Grid files. Key kriging parameters and properties will also be disclosed in the quarterly report, including, but not

5 Surfer® is a contouring and 3-D surface mapping software for scientists and engineers, created by Golden Software, Inc., of Golden, Colorado USA.

6 In units of horizontal measurement, i.e., feet or meters.

7 All grid cells shall have a uniform X-Y geometry.

limited to: kriging type (point or block); mathematical model used; variogram range, sill, and nugget effect; and anisotropy ratio and angle; etc.

- c) Chloroform Concentration Grid File - which will include both measured and Surfer interpolated chloroform concentration data created by Step 1.d of the CPMC Method for the quarter of interest. This Surfer electronic output file shall be submitted in 2 different formats: 1) Surfer v.8 GRD format and 2) ASCII XYZ file format.
- d) Chloroform Contour Map - which will include the Surfer generated quarterly chloroform isoconcentration map produced by Step 1.e of the CPMC Method. This contour map will include appropriate chloroform isoconcentration lines for groundwater concentrations both below and above 70 ug/l. This map will be submitted as a graphical plot in both paper and electronic (PDF) format.
- e) Concentration GE 70 Grid File - including an electronic copy of the Surfer generated grid math output file produced by Step 2 of the CPMC Method. This information will be submitted in two different file formats: 1) Surfer v.8 GRD format; and 2) ASCII XYZ file format for each quarter of interest. Data found in these electronic files shall be equivalent to the Chloroform Concentration Grid values, with the exception that all cell values less than 70 ug/l will be replaced with a "0" value via use of the Surfer Grid Math option and a text editor. In the event that **EFR** uses some other method for this data replacement, **EFR** will disclose and justify this deviation in each quarterly report.
- f) Intermediate Surfer Grid Files - as produced by Steps 3 through 6 of the CPMC Method. These Surfer Grid files shall be generated using the same grid spacing, physical area, and geometry as the Chloroform Concentration Grid and Chloroform Concentration Map. All of the intermediate Surfer Grid files shall be submitted in 2 different electronic formats: 1) Surfer v.8 GRD file format, and 2) ASCII XYZ file format; and shall include the following:
 - Water Level Grid (Step 3) - to be generated by Surfer to produce measured and interpolated water table elevations for each grid cell (in feet above mean sea level [amsl]) in and around the White Mesa facility, for the quarter of interest.
 - Aquifer Base Grid (Step 4) - to be generated by Surfer to produce the measured and interpolated elevations of the base of the shallow aquifer for each grid cell (in feet amsl) in and around the White Mesa facility, for the quarter of interest, and
 - Saturated Thickness Grid (Step 6) - including a grid math Surfer output file generated by subtracting the corresponding Aquifer Base Grid values from the Water Level Grid values, to determine shallow aquifer thickness in feet.
- g) Calculated Groundwater Volume Grid (Step 7) - groundwater volume (in m³) is to be calculated from the Step 6 aquifer thickness results (in feet) for each grid cell by performing the following calculations for the quarter of interest: 1) unit conversion of each cell's saturated thickness from feet to meters [a factor of 0.3048 m per foot],

approved by the Director.

- C. Chloroform Corrective Action Reports Schedule - these reports shall be submitted by **EFR** according to the following schedule:

Quarter	Period	Due Date
First	January – March	June 1
Second	April – June	September 1
Third	July – September	December 1
Fourth	October – December	March 1

- D. Chloroform Plume Network Non-compliance Reporting - if at the time of submittal of any quarterly report, **EFR** observes a failure of the chloroform monitoring network to meet the performance standards of Part II.F, **EFR** will notify the Director in writing at the time of submittal of the quarterly report in question.
- E. Compliance Monitoring Well Contaminant Excursion (Non-compliance) Reporting - **EFR** shall complete the following:
- 1) Director Notification - If any contaminant in any Compliance Monitoring Well exceeds its respective GCAL in Table 2 (Part I.G) in two consecutive quarterly sampling events (“discovery”), **EFR** will provide an exceedance notice to the Director with submittal of the next quarterly report, in accordance with Part II.H.1.
- F. New Well Completion Reports (Pumping, Performance and Compliance Monitoring) - within 60 calendar days after installation of any new well not found in Part I.B, Table 1A of this GCAP, **EFR** will submit a final well completion report for Director approval. Said report shall satisfy the requirements of Part I.F.6 of the Mill’s Groundwater Discharge Permit.
- G. Submittal Deadlines for New Well Monitoring Results - **EFR** shall sample any new, modified, or re-designated corrective action wells required (Pumping, Performance Monitoring, and/or Compliance Monitoring Wells), within 90 calendar days after well installation, modification or such other schedule as approved by the Director, and shall submit the results of groundwater sampling and analysis in the next regularly scheduled quarterly report following receipt of all sample results.
- Failure to perform such sampling or submit the required monitoring results, in whole or in part, in accordance with the foregoing schedule shall constitute non-compliance.
- H. Two-Year Corrective Action Comprehensive Monitoring Evaluation (“CACME”) Report - on or before March 31, 2015, and every two-years thereafter, **EFR** shall submit a comprehensive groundwater monitoring evaluation report for Director review and approval. The purpose and content of this report shall:
- 1) Summarize and interpret the results of all past quarterly groundwater monitoring performed

- after December 31, 2012 in accordance with Parts III.A through E of this GCAP;
- 2) Review chloroform mass removal rates resulting from pumping to evaluate the performance of the Pumping Wells. In the event that the mass removal rates have dropped substantially, such evaluation shall include a determination whether the removal rates have dropped as a result of reduced concentrations within the plume, lost well productivities or a general reduction in saturated thickness;
 - 3) Demonstrate how and why this GCAP continues to be protective of public health and the environment; and
 - 4) Bear the seal of a Professional Engineer or Professional Geologist, pursuant to UAC R317-6-6.15.D.3.

PART IV. GENERAL REPORTING REQUIREMENTS

- A. **REPRESENTATIVE SAMPLING.** Samples taken in compliance with the monitoring requirements established under Part III shall be representative of the monitored activity.
- B. **ANALYTICAL PROCEDURES.** Water sample analysis must be conducted according to test procedures specified under UAC R317-6-6.3(L) unless other test procedures have been specified in advance by the Director.
- C. **PENALTIES FOR TAMPERING.** The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this GCAP shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six months per violation, or by both.
- D. **REPORTING OF MONITORING RESULTS.** Monitoring results obtained during reporting periods specified in the GCAP, shall be submitted to the Director, Utah Division of Radiation Control at the following address no later than the date specified following the completed reporting period:

Attention: Compliance Program
Division of Radiation Control
Utah Department of Environmental Quality
P.O. Box 144850
195 N. 1950 W.
Salt Lake City, Utah 84114-4850

The quarterly due dates for reporting are: June 1, September 1, December 1, and March 1.

- E. **ADDITIONAL MONITORING.** If **EFR** monitors any pollutant more frequently than required by this GCAP using approved test procedures as specified in this GCAP the results of this monitoring shall be included in the calculation and reporting of the data submitted. Such increased frequency shall also be reported.
- F. **RECORDS CONTENTS.**
- 1) Records of monitoring information shall include:
 - a) The date, exact place and time of sampling, observations, or measurements;
 - b) The individual(s) who performed the sampling, observations, or measurements;
 - c) The date(s) and time(s) analyses were performed;
 - d) The name of the certified laboratory which performed the analyses;
 - e) The analytical techniques or methods used; and
 - f) The results of such analyses.
- G. **RETENTION OF RECORDS.** **EFR** shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this GCAP, and records of all data related thereto, for a period of at least five years from the date of the sample,

measurement, report or application. This period may be extended by request of the Director at any time.

H. NOTICE OF NONCOMPLIANCE REPORTING.

- 1) **EFR** shall verbally report any noncompliance which may endanger public health or the environment as soon as possible, but no later than 24-hours from the time **EFR** first became aware of the circumstances. The report shall be made to the Utah Department of Environmental Quality 24-hour number, (801) 538-6333, or to the Division of Radiation Control at (801) 536-4250, during normal business hours (8:00 am - 5:00 pm Mountain Time).
- 2) A written submission shall also be provided to the Director within five calendar days of the time that **EFR** becomes aware of the circumstances. The written submission shall contain:
 - a) A description of the noncompliance and its cause;
 - b) The period of noncompliance, including exact dates and times;
 - c) The estimated time noncompliance is expected to continue if it has not been corrected; and
 - d) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
- 3) Reports shall be submitted to the address in Part IV.D, Reporting of Monitoring Results.

I. **OTHER NONCOMPLIANCE REPORTING.** Instances of noncompliance not required to be reported within five calendar days, shall be reported at the time that monitoring reports for Part III are submitted.

J. **INSPECTION AND ENTRY.** **EFR** shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

- 1) Enter upon the premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the GCAP;
- 2) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this GCAP;
- 3) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this GCAP; and
- 4) Sample or monitor at reasonable times, for the purpose of assuring compliance or as otherwise authorized by the Act, any substances or parameters that are subject to this GCAP, at any location.

PART V. COMPLIANCE RESPONSIBILITIES

- A. **DUTY TO COMPLY.** **EFR** must comply with all conditions of this ORDER/GCAP. Any noncompliance constitutes a violation of the ACT and is grounds for enforcement action, re-issuance, or modification. **EFR** shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with GCAP requirements.
- B. **PENALTIES FOR VIOLATIONS OF ORDER/GCAP CONDITIONS.** The ACT provides that a person who violates an ORDER/GCAP condition implementing provisions of the ACT is subject to a civil penalty not to exceed \$10,000 per day for each day of violation. A person who with criminal negligence violates an ORDER/GCAP condition is subject to a fine not exceeding \$25,000 per day for each day of violation. A person who knowingly violates ORDER/GCAP condition is subject to a fine not exceeding \$50,000 per day for each day of violation. Nothing in this ORDER/GCAP shall be construed to relieve **EFR** of the civil or criminal penalties for noncompliance.
- C. **NEED TO HALT OR REDUCE ACTIVITY NOT A DEFENSE.** It shall not be a defense for **EFR** in an enforcement action that it would have been necessary to halt or reduce the required activity in order to maintain compliance with the conditions of this GCAP.
- D. **PROPER OPERATION AND MAINTENANCE.** **EFR** shall at all times properly operate and maintain all facilities and systems of groundwater treatment and control (and related appurtenances) which are installed or used at the facility to achieve compliance with the conditions of this GCAP. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by **EFR** only when the operation is necessary to achieve compliance with the conditions of the GCAP.

PART VI. GENERAL REQUIREMENTS

- A. **PLANNED CHANGES.** **EFR** shall give a minimum 90-day written notice to the Director of any planned physical alterations or additions to the groundwater corrective action monitoring, capture, and treatment works required by this GCAP. 90-day notice is also required when the alteration or addition could significantly change the nature or performance of the groundwater corrective action activities, or decrease the degree or effectiveness of hydraulic and/or groundwater contaminant control in the shallow aquifer.
- B. **ANTICIPATED NONCOMPLIANCE.** **EFR** shall give at least 30 days advance written notice of any planned changes in the groundwater corrective action monitoring, capture, treatment works or activity which may result in noncompliance with GCAP requirements.
- C. **GCAP ACTIONS.** The GCAP may be modified, revoked and reissued, or terminated for cause. The filing of a written request by **EFR** for a modification, revocation and re-issuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any GCAP condition or requirement.
- D. **DUTY TO PROVIDE INFORMATION.** **EFR** shall furnish to the Director, within 30 calendar days, any information which the Director may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating this GCAP or to determine compliance with this GCAP. **EFR** shall also furnish to the Director, upon request, copies of records required to be kept by this GCAP.
- E. **OTHER INFORMATION.** When **EFR** becomes aware that it failed to submit any relevant facts, or submitted incorrect information in any report to the Director, it shall promptly submit such facts or information, not later than 30 calendar days after discovery thereof.
- F. **SIGNATORY REQUIREMENTS.** All applications, reports or information submitted to the Director shall be signed and certified.
- 1) All reports required by the GCAP and other information requested by the Director shall be signed by a responsible corporate officer or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a) The authorization is made in writing by a responsible corporate officer and submitted to the Director; and
 - b) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).
 - 2) **Changes to Authorization.** If an authorization under Part VI.F.1 is no longer accurate because a different individual or position has responsibility for the overall operation of the

facility, a new authorization satisfying the requirements of Part VI.F.1 must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

- 3) Certification. Any person signing a document under this section shall make the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

- G. PENALTIES FOR FALSIFICATION OF REPORTS. The ACT provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this ORDER/GCAP, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six months per violation, or by both.
- H. AVAILABILITY OF REPORTS. Except for data determined to be confidential by **EFR**, all reports prepared in accordance with the terms of this ORDER/GCAP shall be available for public inspection at the offices of the Director. As required by the ACT, permit applications, permits, effluent data and groundwater quality data shall not be considered confidential.
- I. PROPERTY RIGHTS. The issuance of this ORDER/GCAP does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.
- J. SEVERABILITY. The provisions of this ORDER/GCAP are severable, and if any provision of this GCAP, or the application of any provision of this ORDER/GCAP to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this ORDER/GCAP, shall not be affected thereby.
- K. TRANSFERS. This ORDER/GCAP may be automatically transferred to a new facility owner/operator if:
- 1) **EFR** notifies the Director at least 30 calendar days in advance in writing of the proposed transfer date; and
 - 2) The notice includes a written agreement between **EFR** and the new facility owner/operator containing a specific date for transfer of GCAP responsibility, coverage, and liability between them.

- L. STATE LAWS. Nothing in this GCAP shall be construed to preclude the institution of any legal action or relieve **EFR** from any responsibilities, liabilities, penalties established pursuant to any applicable state law or regulation under authority preserved by Section 19-5-115 of the ACT.
- M. Reopener Provision. The Director may modify this GCAP (following proper administrative procedures) to include appropriate limitations, requirements or compliance schedules, if necessary, if one or more of the following events occur:
- 1) If new groundwater quality standards relating to the contaminants subject to this GCAP are adopted by the Board;
 - 2) Determination of any new chloroform contaminant source term at the White Mesa facility, beyond those accepted by the Director as of December 1, 2014, namely: 1) the **EFR** Scale House Septic Tank Drainfield, and 2) **EFR** Administration Building Septic Tank Drainfield;
 - 3) The Director determines a modification is needed to protect human health or the environment;
 - 4) The Board approves alternate corrective action concentration limits under UAC R317-6-6.15.G; and,
 - 5) If it appears that the groundwater remediation strategy described in this ORDER/GCAP, or any performance thereunder by **EFR**, does not appear to be protective of public health and the environment, the Director may require **EFR** to determine other ways to achieve compliance.

APPENDIX A

Chloroform Groundwater Plume Mass Calculation Method OCTOBER 2014

Procedure for estimating chloroform plume mass October, 2014

- 1) Using Surfer software (any Windows version should work – version 8 will be used initially) ¹ grid (krige) chloroform data using a uniform 15.24 meter (50-foot) spacing. (Note: site well locations are in UTM meters, and elevations in feet amsl.)
 - a) Using the laboratory reported chloroform concentration data for the quarter in question, transform each laboratory result to a log equivalent value, and include both the original laboratory result and log equivalent in the quarterly report ². Data from all wells routinely sampled for chloroform will be used. This includes all TW4-series wells and all non-dry MW-series wells (except MW-34). Chloroform concentrations in all sampled MW-series wells (except MW-4 and MW-26) are typically non-detect (< 1 ug/L) because they are located up-gradient, cross-gradient, and downgradient of the plume. MW-4 and MW-26 have detectable concentrations greater than 70 ug/L because they are within the plume. All non-dry MW-series wells (except MW-34) are sampled during the second and fourth quarters. However, only a portion of the MW-series wells are sampled during the first and third quarters.

To ensure that the same number of data points is used in each quarter's calculation, if a particular MW-series well was not sampled for chloroform during the quarter of interest, the previous quarter's chloroform value will be used in the gridding process, whether it is a detectable concentration (≥ 1 ug/l) or not. These substitutions will occur during the first and third quarters when not all MW-series wells are sampled for chloroform. Substituting the previous quarter's value for wells not sampled during the quarter of interest is appropriate because 1) in most cases the substitutions will apply to historically non-detect wells distant from the plume, 2) the substituted values will represent real data from the previous quarter, and 3) the substitutions will eliminate the need to pre-select the wells that will be used in the gridding process, and as noted above, ensure that the same number of data points is used in each quarter's calculation. In each quarterly report covering the first and third quarters, EFR will identify in the text and on the relevant chloroform maps each well where previous quarter concentration substitutions have been made.

¹ In all quarterly reporting, EFR will disclose all Surfer software settings and algorithms used to produce each map.

² As a part of each quarterly report, EFR will provide a Surfer data input file (or spreadsheet), that will include the following information for each well: name or identity, 'x'-location, 'y'-location, laboratory reported concentration in ug/L (or 'z' value), and corresponding log transformed 'z' value.

All non-detects will be assigned a value equal to 50% of the laboratory reporting limit for the given quarter, well, and sample in question in ug/L. The non-detect value will typically be 0.5 ug/L.

- b) Choose a grid area sufficient to encompass the entire chloroform plume (Note: because data used in the gridding process will not be restricted to the gridded area, but extend significantly beyond (outside) the 70 ug/l chloroform isoconcentration area, “boundary effects” will not be a concern).
 - c) Following Step 1.a, use the default Surfer settings for kriging (unlimited isotropic search, all available laboratory data points, point kriging, omnidirectional variogram, no nugget effect, linear variogram model, etc.), kriging the logged values of the reported chloroform concentrations, and generate a Surfer grid output file ³.
 - d) Back-transform the data in the Surfer output grid file to restore the concentrations in units of ug/l by taking the antilog of each kriged cell value. This back-transformed data constitutes the “Chloroform Concentration Grid” (in ug/L). In each quarterly report, EFR will provide an electronic copy of the Chloroform Concentration Grid in two different Surfer generated formats: 1) Surfer, version 8 (v.8) GS ASCII (.grd) grid file format and 2) ASCII XYZ (.dat) data file format.
 - e) EFR will then use Surfer to plot the Chloroform Concentration Grid as a contour map (hereafter “Chloroform Contour Map”) for the quarter in question, using the same data, grid spacing, and Surfer kriging function settings. The areal extent of the Chloroform Concentration Grid may be smaller than that used to generate the quarterly “Chloroform Contour Map” for the convenience of using grids no larger than necessary to perform the mass calculations. (Because data used in producing either mass calculation grids or Quarterly Chloroform Contour Map grids will not be restricted to the full or complete gridded areas, and the same data will be used, contour maps produced using the larger or smaller gridded areas will be essentially identical) The Chloroform Contour Map will continue to be reported to DRC as part of each quarterly monitoring report.
- 2) Create a ‘Concentration GE 70 Grid’ by mathematically transforming the original Chloroform Concentration Grid values, from Step 1.d, such that a value of zero is assigned to all grid cells that have a chloroform concentration less than 70 ug/L.

³ The interim Surfer output file or grid will consist of a 2-dimensional (x-y locations) kriged interpolation of the original laboratory concentration results (z-values) expressed in equivalent log notation.

This may be done by several methods, including using a FORTRAN program. One method is outlined below:

- a) use the Surfer 'max' grid math function as follows:
 $c = \max(a, 69.999)$, where a is the input grid file (Chloroform Concentration Grid), c is the output grid file, and '69.999' is the constant that will be assigned to all grid cells less than or equal to 69.999 ug/l. Specify output grid file c to have Surfer GS ASCII (.grid) grid file format.

- b) using a text editor, globally replace all values of '69.999' in the ascii format output grid with '0' and save under a new grid file name. All grid cells outside the plume in this grid will have a concentration of zero. This grid will be the 'Concentration GE 70 Grid'. In each quarterly report, EFR will provide an electronic copy of the final Concentration GE 70 Grid produced by Step 2 in two different Surfer generated formats: 1) Surfer v.8 (.grid) grid file format and 2) ASCII XYZ (.dat) data file format.

If EFR uses other methods to generate the Concentration GE 70 Grid, this will be disclosed and justified in each quarterly report, and subject to Director approval. EFR will then use Surfer to generate an isoconcentration map from the final Concentration GE 70 Grid (hereafter Concentration GE 70 Map), at the same scale and for the same physical area and geometry as the Chloroform Concentration Map (from Step 1), and include both maps in the quarterly report. In the event the Director requests these 2 maps for a given quarter be plotted at a different scale, EFR will provide the re-plotted maps within 15 calendar days of written Director request.

The Concentration GE 70 Map will be generated for quality control purposes, to ensure that no errors were made in mathematically transforming the Chloroform Concentration Grid to the Concentration GE 70 Grid. The Concentration GE 70 Map will not be representative of the chloroform plume because it will slightly underestimate the area of the plume, owing to the fact that chloroform concentrations in all grid cells outside the plume have been set to zero (which is necessary to ensure that the mass estimate based on this grid represents only the mass of chloroform inside the plume). Setting all grid values outside the plume to zero will cause the position of the bounding 70 ug/L contour line drawn by Surfer to move slightly inward, making the plume area to appear slightly smaller than it actually is, because the position of the line depends on grid values both inside and outside the plume. However, this is an artifact of the grid transformation and contouring procedure, and does not mean that the mass of the plume will be underestimated. Visual inspection will be used to confirm that the Chloroform Concentration Map and Concentration GE 70 Map are similar except for the fact that the plume area will be slightly smaller in the Concentration GE 70 Map. If

significant differences other than the above are noted, the Concentration GE 70 Grid will be checked for errors.

- 3) Using Surfer, EFR will grid (krige) the shallow (perched) aquifer water level elevations on the same 15.24 meter (50-foot) centers to produce a perched water level grid (hereafter Water Level Grid)⁴. In each quarterly report, EFR will provide an electronic copy of the Water Level Grid in 2 different Surfer generated formats: 1) Surfer v.8 (.grd) grid file format, and 2) ASCII XYZ (.dat) data file format.
- 4) Using Surfer, EFR will grid (krige) the top of Brushy Basin elevations on the same 15.24 meter (50-foot) centers to produce a grid representing the base of the perched water zone (hereafter Aquifer Base Grid)⁵. In each quarterly report, EFR will provide an electronic copy of the Aquifer Base Grid in 2 different Surfer generated formats: 1) Surfer v.8 (.grd) grid file format, and 2) ASCII XYZ (.dat) data file format.
- 5) EFR will ensure that both the Water Level Grid and Aquifer Base Grid have the same x-y grid limits, number of cells (including both rows and columns), uniform cell areas, and same area and geometry.
- 6) EFR will subtract the top of Aquifer Base Grid from the Water Level Grid to get the Saturated Thickness Grid in feet (ft). In each quarterly report, EFR will provide an electronic copy of the Saturated Thickness Grid in 2 different Surfer generated formats: 1) Surfer v.8 (.grd) grid file format, and 2) ASCII XYZ (.dat) data file format.
- 7) EFR will multiply each cell in the Saturated Thickness Grid (in ft) by 0.3048 to get saturated thickness in meters, then by the uniform grid cell area (approximately 232.2349 m²) determined in Step 1, and the porosity (0.18) to get the Groundwater Volume Grid in units of m³. Alternatively, EFR may make these 3 conversions in a single operation using the Surfer Grid Math option, by multiplying each Step 6 grid cell result by a combined equivalent factor of 12.7413. In each quarterly report, EFR will provide an electronic copy of the “Groundwater Volume Grid” generated by the Surfer Grid Math option in 2 different formats: 1) Surfer v.8 (.grd) grid file format and 2) ASCII XYZ (.dat) data file format.
- 8) EFR will Multiply each cell in the Groundwater Volume Grid (in m³) from Step 7 by the corresponding cell in the Concentration GE 70 Grid (from Step 1), using the Grid Math option of Surfer, and yielding results in units of ug-m³/L (hereafter

⁴ To support the water table elevation grid / contour map, EFR will provide a Surfer input file that includes the following well information: name or identity, ‘x’-location, ‘y’-location, and elevation (‘z’ value). Similar to Step 1.a, if EFR elects to substitute of any individual well water level elevation, with that of a previous quarterly measurement, this will be fully disclosed in each quarterly report.

⁵ To support the Brushy Basin elevation grid / contour map, EFR will provide a Surfer input file that includes the following well / boring information: name or identity, ‘x’-location, ‘y’-location, and elevation (‘z’ value).

Step 8A). Subsequently, the Surfer Grid Math option will be used again to multiply each grid cell result by 2.2×10^{-6} (lb per $\text{ug}\cdot\text{m}^3/\text{L}$) to produce the Chloroform Plume Mass Grid values in pounds (lb) [hereafter Step 8B]. In each quarterly report, EFR will provide an electronic copy of the final Step 8B Chloroform Plume Mass Grid in 2 different Surfer generated formats: 1) Surfer v.8 (.grd) grid file format, and 2) ASCII XYZ (.dat) data file format. [Note: $1 \text{ ug}\cdot\text{m}^3/\text{L} \times 1000 \text{ L}/\text{m}^3 \times 1 \text{ g}/10^6 \text{ ug} \times \text{lb}/454\text{g} = 2.2026 \times 10^{-6} \text{ lb}$] EFR will provide all conversion factors used in these calculations as part of the quarterly report to DRC. Because all grid cells outside the plume boundary in the Concentration GE 70 Grid will be zero (as noted above), the Chloroform Plume Mass Grid will have masses of zero assigned to all cells outside the plume boundary.

- 9) EFR will import the final Chloroform Plume Mass Grid file, from Step 8B, in ASCII XYZ (.dat) data file format into an Excel spreadsheet, EFR will then sum the masses (“Z” values) of each cell in the “Chloroform Plume Mass Grid” from Step 8B to get the total chloroform mass inside the 70 ug/L plume contour boundary for the quarter of interest.

NOTE: The gridding procedures described above are essentially identical to those used to make quarterly concentration and water level contour maps, except that in the above procedure the gridded areas and grid cell dimensions are identical for water level, Brushy Basin, and concentration grids, to allow mathematical operations between grids, and the gridded areas may be smaller for the convenience of using grids no larger than needed to perform the mass calculations. (As discussed above, because all data used in producing either mass calculation grids or Quarterly Chloroform Contour Map grids will not be restricted to the gridded areas, and the same data will be used, contour maps produced using the larger or smaller gridded areas will be essentially identical). Furthermore, ‘pseudo data points’ will not be added to the data sets to control the gridding processes.