

July 19, 2002

Ms. Donna Bergman-Tabbert, Manager
U.S. Department of Energy
Grand Junction Office
2597 B3/4 Road
Grand Junction, CO 81503

SUBJECT: CONCURRENCE IN THE GROUND WATER COMPLIANCE ACTION PLAN FOR
THE URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT SITE AT OLD
RIFLE, COLORADO

Dear Ms. Bergman-Tabbert:

In separate letters dated September 23, 1999, the U.S. Department of Energy (DOE) submitted the Final Site Observational Work Plan (SOWP) and Ground Water Compliance Action Plan (GWCAP) for the Uranium Mill Tailings Remedial Action Project site at Old Rifle, Colorado. In a letter dated September 29, 2000, the U.S. Nuclear Regulatory Commission (NRC) staff provided its acceptance of the Old Rifle SOWP. However, the staff also identified several issues which required resolution to complete the review of the GWCAP. These issues were in relation to DOE's proposed surface water sampling program and the use of alternate concentration limits (ACLs) and institutional controls as part of DOE's strategy for ground water protection. To address these issues, DOE submitted a detailed response for each issue and a revised GWCAP by letter dated November 21, 2000. Subsequently, DOE submitted revisions to the GWCAP and responses to the staff's identified issues in a letter dated April 13, 2001. Further revisions to the GWCAP were provided in DOE letters dated July 2, 2001, September 20, 2001, and December 21, 2001.

The staff has completed its detailed review of the revised GWCAP and DOE's detailed response to the issues raised in the staff's September 29, 2000, letter. The staff's review is documented in the enclosed Technical Evaluation Report (TER). The staff concludes that DOE has addressed adequately the issues identified in the staff's September 29, 2000, letter.

As described in the GWCAP, DOE's proposed ground water protection strategy for the contaminants of concern (COCs) at Old Rifle is to use natural flushing of the surficial aquifer (uppermost aquifer) in conjunction with alternate concentration limits (ACLs) and institutional controls. Institutional controls provide protection of public health and the environment until natural flushing degrades any groundwater COCs to acceptable levels. The primary COCs at the Old Rifle site are uranium, vanadium, selenium, and arsenic and DOE has proposed ACLs for vanadium and selenium.

While arsenic levels are elevated, the concentrations do not exceed the acceptable standards in 40 CFR Part 192 for groundwater concentration limits. DOE groundwater flow and fate and transport modeling predicts that the concentration of uranium will decrease to levels below acceptable standards (40 CFR Part 192) well within the 100 year time period associated with the natural flushing option. The proposed ACL for selenium is the maximum concentration limit (MCL) in the Safe Drinking Water Act and modeling predicts that selenium concentrations will also degrade to the MCL well within the 100 year period. With regard to vanadium, no drinking water standard exists and DOE has proposed an ACL for vanadium that is slightly above the historical maximum-observed concentration of vanadium in on-site groundwater. However, the current plume concentrations of vanadium and, correspondingly, the proposed ACL, exceed levels which are protective of human health and the environment and modeling predicts that it will take approximately 100 years of natural flushing for the elevated concentrations of vanadium to degrade to levels protective of human health and the environment. As such, DOE has proposed the use of institutional controls during the 100 year period of natural flushing for protection of public health and the environment from elevated levels of uranium, selenium and vanadium in groundwater at Old Rifle. These controls will remain in place (i.e., beyond 100 years, if necessary) until the DOE demonstrates that the concentration of vanadium in on-site groundwater, has degraded to levels which are protective of human health and the environment. While the use of institutional controls beyond 100 years is outside the regulatory framework of the natural flushing option, DOE's proposal to employ these controls, for as long as is necessary, will be protective of human health and the environment within the ACL framework. The institutional controls would be in the form of a deed restriction for the Old Rifle site which would prohibit the use of groundwater for any purpose, including use as drinking water, coupled with a deed restriction prohibiting the installation of wells within the surficial aquifer. These restrictions would be enforced by the city of Rifle.

With the proposed use of institutional controls, the staff finds the proposed ACLs and DOE's overall groundwater protection strategy to be protective of public health and the environment and, accordingly, acceptable. However, the institutional controls are not yet in place as the state of Colorado is currently in the process of transferring the Old Rifle site property with the deed restrictions to the city of Rifle. Therefore, the staff concurs in DOE's GWCAP for Old Rifle contingent upon completion of the property transfer with the deed restrictions to the city of Rifle.

If you have any questions regarding this letter, please contact Rick Weller, the Project Manager for Old Rifle, at (301) 415-7287 or by e-mail to RMW2@nrc.gov.

D. Bergman-Tabbert

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In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Daniel M. Gillen, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards

Docket No.: WM-62

Enclosure: Technical Evaluation Report for the Ground Water Compliance Action Plan For the
Old Rifle UMTRA Project Site

cc: D. Metzler, DOE GJO
R. Plieness, DOE GJO
J. Jacobie, CDPHE Den

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| OFC | FCLB | | FCLB | | OGC | | FCLB | |
| NAME | RWeller* | | GJanosko* | | MSchwartz* | | Mleach D.Gillen | |
| DATE | 11/2/01 | | 11/5/01 | | 11/16/01 | | 7/19/02 | |

*See previous concurrence OFFICIAL RECORD COPY

**TECHNICAL EVALUATION REPORT
REVISED GROUNDWATER COMPLIANCE ACTION PLAN
FOR THE UMTRA PROJECT OLD RIFLE SITE**

FACILITY: Old Rifle, Colorado

TECHNICAL REVIEWERS: William von Till and Richard Weller

PROJECT MANAGER: Richard Weller

SUMMARY AND CONCLUSIONS:

In separate letters dated September 23, 1999, the U.S. Department of Energy (DOE) submitted the Final Site Observational Work Plan (SOWP) and Ground Water Compliance Action Plan (GWCAP) for the Old Rifle, Colorado, Uranium Mill Tailings Remediation Action (UMTRA) Project site. In a letter dated September 29, 2000, the U.S. Nuclear Regulatory Commission (NRC) staff provided its acceptance of the Old Rifle SOWP, however, the staff also identified several issues which required resolution to complete the review of the GWCAP. These issues were in relation to DOE's proposed surface water sampling program and the use of alternate concentration limits (ACLs) and institutional controls as part of DOE's strategy for ground water protection. To address these issues, DOE submitted a detailed response to each issue and a revised GWCAP in letters dated November 21, 2000 and April 13, 2001. Lastly, in making further refinements to its groundwater protection strategy, DOE submitted a revised GWCAP in letters dated July 2, 2001, September 20, 2001, and December 21, 2001.

The staff has reviewed the revised GWCAP and has concluded that DOE adequately addressed the issues raised in the staff's September 29, 2000, letter. DOE's proposed ground water protection strategy is to use natural flushing of the surficial aquifer (uppermost aquifer), in conjunction with institutional controls and ACLs. Groundwater modeling by DOE, using the codes MODFLOW and MT3D, predicts that all of the contaminants of concern (COCs) will degrade to below the U.S. Environmental Protection Agency (EPA) standards (40 CFR Part 192) or risk concentration values for ground water protection with the exception of selenium and vanadium. DOE is proposing ACLs for selenium, 0.05 milligrams per liter (mg/l), and vanadium, 1.0 mg/l, to address these constituents. Both the point of compliance (POC), which is any well onsite, and the point of exposure (POE), which is the Colorado River, will be monitored. DOE estimates that the Colorado River will not have elevated levels of selenium or vanadium due to dilution. To confirm this estimate, DOE has provided an additional surface water sampling location adjacent to the site to monitor groundwater discharges to the Colorado River.

DOE has proposed institutional controls as a component of its groundwater protection strategy. A deed restriction for the Old Rifle site will prohibit the use of ground water when the site is transferred by the state (Colorado) to the city of Rifle. This will be coupled with a deed restriction prohibiting the installation of water wells within the surficial aquifer. This would eliminate the drinking water risk exposure pathway. The institutional controls will remain in place until DOE demonstrates that the concentration of vanadium in on-site groundwater has degraded to levels which are protective of human health and the environment. The staff finds

Enclosure

that these proposed institutional controls are acceptable in protecting human health and the environment. The approval of these ACLs and the natural flushing option is contingent on the use of the institutional controls to remove the potential for a groundwater ingestion risk exposure pathway. However, the institutional controls are not yet in place as the state of Colorado is currently in the process of transferring the Old Rifle site property with the deed restrictions to the city of Rifle. Therefore, the staff concurs with the DOE GWCAP for Old Rifle contingent upon completion of the property transfer with the deed restrictions to the city of Rifle.

BACKGROUND:

The Old Rifle UMTRA site is a former ore processing facility located approximately 0.3 miles east of the city of Rifle, Colorado. The site is situated on a low-lying river terrace of the Colorado River.

The DOE completed surface reclamation of the abandoned uranium mill tailings and other contaminated surface material at the site by removing and transporting the material to the Estes Gulch disposal cell approximately 9 miles north of Rifle. Surface reclamation began in 1992 and was completed in 1996.

Geology consists of quaternary flood plain deposits and Tertiary age sedimentary beds of the Wasatch Formation. The flood plain deposits consist of alluvial silt, sand, and cobble gravels in stream channels and beneath flood plains and in terraces along the Colorado River Valley and its major tributaries. The Wasatch Formation consists mostly of claystone, siltstone, and sandstone of fluvial origin. The former processing site is situated on an alluvial terrace that directly overlies several thousand feet of Wasatch Formation.

Groundwater in the surficial alluvial aquifer and the shallow Wasatch Formation directly beneath the site are of primary interest. Groundwater either flows into or parallel to the Colorado River depending on high or low river stages. Hydraulic conductivities of the alluvial aquifer range from 96 to 125 ft/day and groundwater velocities range from 1.4 to 2.0 ft/day.

Alluvial groundwater has been contaminated by site derived constituents with uranium, vanadium, selenium and arsenic being the most prevalent. The maximum concentration of uranium (0.27 mg/l) is 4.6 times the upper range in natural background. The maximum vanadium concentration (0.87 mg/l) is 480 times the upper range in natural background. Selenium concentrations are as high as 9 times the UMTRA standard and arsenic levels are elevated but do not exceed the UMTRA maximum concentration limit of 0.05 mg/l. DOE focused their GWCAP on the constituents uranium, vanadium, selenium and arsenic. Groundwater contamination at the Old Rifle site has been characterized and is mainly confined to the old processing site area. DOE concluded that the Wasatch Aquifer has not been impacted and that contamination is limited to the Alluvial Aquifer.

DOE used fate and transport modeling to simulate natural flushing into the Colorado River. The time required for one pore volume of contaminated ground water to migrate into the river is estimated at 2.4 years. This estimate assumes 1,500 ft for the maximum length of the plume and 1.7 ft/day as the average linear groundwater flow rate. Single point distribution coefficients, or K_d s, were determined for As, V, U, and Se.

REGULATORY FRAMEWORK:

The UMTRA Project regulatory framework provides several ways to comply with the EPA groundwater protection standards (40 CFR Part 192) as outlined in DOE's Programmatic Environmental Impact Statement (DOE, 1996):

- 1) No remediation:
- 2) Natural flushing
- 3) Active groundwater remediation

The natural flushing option is outlined in 40 CFR Part 192.12(c)(2) as follows:

- (2) (i) If the Secretary determines that sole reliance on active remedial procedures is not appropriate and that cleanup of the groundwater can be more reasonably accomplished in full or in part through natural flushing, then the period for remedial procedures may be extended. Such an extended period may extend to a term not to exceed 100 years if:
 - A) The concentration limits established under this subpart are projected to be satisfied at the end of this extended period,
 - B) Institutional control, having a high degree of permanence and which will effectively protect public health and the environment and satisfy beneficial uses of groundwater during the extended period and which is enforceable by the administrative or judicial branches of government entities, is instituted and maintained, as part of the remedial action, at the processing site and wherever contamination by listed constituents from residual radioactive materials is found in groundwater, or is projected to be found, and
 - C) The groundwater is not currently and is not now projected to become a source for a public water system subject to provisions of the Safe Drinking Water Act during the extended period.

The definition of a public water system under the SDWA per part 141.2 is:

Public water system or PWS means a system for the provision to the public of water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes: any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Such term does not include any "special irrigation district." A public water system is either a "community water system" or a "noncommunity water system."

- (ii) Remedial actions on groundwater conducted under this subpart may occur before or after actions under Section 104(f)(2) of the Act are initiated.

Within 40 CFR 192.02(c)(3)(ii), the option for ACLs is established. ACLs are established on a site-specific basis, provided it is demonstrated that the constituents will not pose a substantial present or potential hazard to human health or the environment, as long as the ACLs are not exceeded.

The hazard assessments for ACLs will be acceptable if they meet the following criteria:

- 1) The point of exposure is identified.
- 2) The hazardous constituent source term and the extent of groundwater contamination are characterized.
- 3) The hazardous constituent transport in groundwater, and hydraulically connected surface water, and the adverse effects on water quality, including the present and potential health and environmental hazards, are assessed.
- 4) An assessment of human or environment exposures to hazardous constituents, including the cancer risk and other health and environmental hazards, is provided.
- 5) An evaluation of potential alternatives is provided.

Factors used in evaluating the ACL application can be found in Appendix 1 of this report as outlined in 40 CFR Part 192.02(c)(3)(ii)(B)(1 and 2).

TECHNICAL EVALUATION:

DOE's proposed strategy for ground water protection is to use natural flushing of the surficial aquifer in conjunction with ACLs and institutional controls.

The COCs at the site are arsenic, selenium, uranium, and vanadium. The POC is any monitoring well on-site and the POE is the Colorado River. The ACL proposed for selenium is 0.05 mg/l which is the Safe Drinking Water Act (SDWA) maximum concentration limit (MCL). The selenium ACL is acceptable because, as an MCL, this value has been found to be safe for drinking water. With regard to vanadium, no drinking water standard exists and DOE has proposed an ACL of 1.0 mg/l which is slightly above the historical maximum-observed concentration of vanadium in on-site groundwater. While this value is higher than the risk-based level (0.33 mg/l) which DOE indicates as protective of human health and the environment, the ACL would be acceptable if used in conjunction with institutional controls during the period of natural flushing. With use of institutional controls to prevent a groundwater ingestion scenario, all of the proposed ACLs would be safe.

Computer groundwater flow and fate and transport modeling was utilized by DOE to simulate the natural flushing of the COCs. The codes MODFLOW and MT3D were used. Uranium is predicted to decrease to levels below the standard of 0.044 mg/l in a period of approximately 10 years. Since this concentration is predicted to occur well within the 100 year threshold, this is acceptable. Background levels for uranium have been high in some wells, therefore, if background levels are shown to be higher than the standard of 0.044 mg/l, the goal will be background. Selenium concentrations are predicted to degrade to the ACL of 0.05 mg/l at the

POC in 50 years, well within the 100 year threshold. The current plume concentrations of vanadium exceed the risk-based level (0.33 mg/l) which is protective of human health and the environment and modeling predicts that it will take approximately 100 years for the elevated concentrations of vanadium to degrade to the level protective of human health and the environment. As such, DOE has proposed the use of institutional controls during the 100 year period of natural flushing for protection of public health and the environment from elevated levels of uranium, selenium, and vanadium in groundwater at Old Rifle. These controls will remain in place until DOE demonstrates that the concentration of vanadium in on-site groundwater has degraded to levels which are protective of human health and the environment. This demonstration must be made by showing that sampled vanadium concentrations are below the risk-based level (0.33 mg/l) for three consecutive years.

DOE proposes to monitor groundwater and surface water twice yearly for the first 5 years, at high river stage and low river stage, then once every five years until 2030. At that time the monitoring strategy will be re-evaluated. DOE has proposed to add another surface water monitoring location adjacent to the site, in the area of monitoring well 310. Based on the SOWP, this is the area that would be expected to have the highest concentrations of uranium flushing into the river (SOWP Figure 5-21). With this additional surface water sampling point, staff deems the Site Monitoring Plan to be adequate.

Institutional Controls:

As part of a natural flushing option under 40 CFR Part 192.12(c)(2), it is necessary to protect human health and the environment during the 100 year natural flushing period. Per 40 CFR Part 192.12(c)(2)(i)(2):

“Institutional control, having a high degree of permanence and which will effectively protect public health and the environment and satisfy beneficial uses of groundwater during the extended period and which is enforceable by the administrative or judicial branches of government entities, is instituted and maintained, as part of the remedial action, at the processing site and wherever contamination by listed constituents from residual radioactive materials is found in groundwater, or is projected to be found”

The land is currently owned by the state and the state is in the process of transferring the land to the city of Rifle (likely in 2001). DOE proposes to implement institutional control for the Old Rifle site in the form of a deed restriction prohibiting the use of groundwater. At the time of the transfer, it is proposed that the restriction prohibiting the use of groundwater will be coupled with an additional deed restriction that prohibits the installation of wells into the shallow aquifer. The city of Rifle would enforce the restrictions. Additionally, the state of Colorado passed a law in 2001 which provides the opportunity to establish environmental covenants for remedial action sites like Old Rifle. These environmental covenants could be proposed by the city of Rifle following the property transfer to provide an additional layer of restrictions for groundwater protection.

Modeling indicates that vanadium will not naturally flush to acceptable concentrations within 100 years, therefore, DOE is proposing to implement these institutional controls until vanadium degrades to safe levels (below 0.33 mg/l). Applying institutional controls beyond 100 years is outside the regulatory framework of the natural flushing option since the institutional controls must be limited to 100 years. However, the staff finds DOE's proposal protective of human health and the environment within the ACL framework. Institutional controls will prevent the risk pathway scenario of groundwater ingestion via water wells. The institutional controls will also

prevent water wells from being drilled over the area of groundwater contamination into the surficial aquifer. Since these controls will be enforced by a government entity (city of Rifle), and with the DOE oversight, the staff finds this proposal acceptable as an institutional control. However, these institutional controls are not in place at this time. Therefore, NRC concurrence in the Old Rifle GWCAP is contingent upon completion of the property transfer with the deed restrictions to the city of Rifle.

REFERENCES:

U.S. Department of Energy (DOE), 1996. Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project, DOE/IS-0198, October, 1996.

DOE, 1999. Final Site Observational Work Plan for the UMTRA Project Old Rifle Site and Groundwater Compliance Action Plan, September 23, 1999

U.S. Regulatory Commission (NRC), 2000. Letter from P. Ting of the NRC to Ms. Donna Bergman-Tabbert of the DOE providing comments on DOE's September 23, 1999 SOWP, September 29, 2000.

DOE 2000. Revised Old Rifle Ground Water Compliance Action Plan, November 21, 2000.

DOE 2001(A). Revised Old Rifle Ground Water Compliance Action Plan, April 13, 2001.

DOE 2001(B). Revised Old Rifle Ground Water Compliance Action Plan, July 2, 2001.

DOE 2001(C). Revised Old Rifle Ground Water Compliance Action Plan, September 20, 2001.

APPENDIX 1

FACTORS TO CONSIDER FOR ACLS, 40 CFR PART 192.02(c)(3)(ii)(B)

- 1) Potential adverse effects on groundwater quality
 - i) The physical and chemical characteristics of constituents in the residual radioactive material at the site, including their potential for migration.
 - ii) The hydro geological characteristics of the site and surrounding land.
 - iii) The quantity of groundwater and the direction of groundwater flow.
 - iv) The proximity and withdrawal rates of groundwater users.
 - v) The current and future uses of groundwater in the region surrounding the site.
 - vi) The existing quality of groundwater, including other sources of contamination and their cumulative impacts on the groundwater quality.
 - vii) The potential for health risks caused by human exposure to constituents.
 - viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents.
 - ix) The persistence and permanence of the potential adverse effects.
 - x) The presence of underground sources of drinking water and exempted aquifers identified under 144.7.
- 2) Potential adverse effects on hydraulically-connected surface water quality considering:
 - i) The volume and physical and chemical characteristics of the residual radioactive material at the site.
 - ii) The hydro geological characteristics of the site and the surrounding land.
 - iii) The quantity of groundwater and the direction of groundwater flow.
 - iv) The patterns of rainfall in the region.
 - v) The proximity to the site to surface waters
 - vi) The current and future uses of surface waters in the region surrounding the site and any water quality standards established for those surface waters.
 - vii) The existing quality of surface water, including other sources of contamination and their cumulative effect on surface water quality
 - viii) The potential for health risks caused by human exposure to constituents.
 - ix) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents.
 - x) The persistence and permanence of the potential adverse effects.