January 29, 2002

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

SUBJECT: REVIEW OF THE FINAL SITE OBSERVATIONAL WORK PLAN FOR THE URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT SITE AT GUNNISON, COLORADO

Dear Ms. Bergman-Tabbert:

By letter dated April 11, 2001, the U.S. Department of Energy (DOE) submitted the Final Site Observational Work Plan (SOWP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project at Gunnison, Colorado. The U.S. Nuclear Regulatory Commission (NRC) staff has completed its detailed review of the Gunnison SOWP as documented in the enclosed (Enclosure) Technical Evaluation Report (TER). As discussed in the TER, DOE's strategy for compliance with U.S. Environmental Protection Agency Groundwater Protection Standards (40 CFR Part 192) is based on natural flushing of the alluvial aquifer in conjunction with institutional controls. However, the institutional controls necessary to protect all of the residents within the proposed institutional control area are not yet in place. Additionally, the staff has identified a need for monitoring wells in the area where the groundwater flow and transport model predicts the uranium concentrations may exceed the EPA standard at 100 years. Accordingly, the staff is withholding acceptance of the Gunnison SOWP pending resolution of these issues.

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

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/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Sincerely,

/RA/c/GSJ

Melvyn Leach, Chief
Fuel Cycle Licensing Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards

Docket No.: WM-61
Enclosure: Technical Evaluation Report for the
Final Site Observational Work Plan
For the Gunnison UMTRA Project Site
cc: D. Metzler, DOE GJO
R. Plieness, DOE GJO
J. Jacobi, CDPHE Den

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U.S. Department of Energy
Grand Junction Office
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| **DATE** | 01/28/02 | | 01/29/02 | | 01/29/02 | | | |

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**TECHNICAL EVALUATION REPORT**
**FINAL SITE OBSERVATIONAL WORK PLAN FOR THE GUNNISON, COLORADO, URANIUM MILL TAILINGS REMEDIAL ACTION (UMTRA) PROJECT SITE**

**FACILITY:** Gunnison UMTRA Project Site

**TECHNICAL REVIEWER:** William von Till

**PROJECT MANAGER:** Rick Weller

**SUMMARY AND CONCLUSIONS:**

By cover letter dated September 27, 2000, the U.S. Department of Energy (DOE) submitted the Final Site Observational Work Plan (SOWP) for the UMTRA Project Site at Gunnison, Colorado. The SOWP was subsequently revised by letter dated April 11, 2001, in response to comments from the State of Colorado. For the strategy to ensure compliance with the U.S. Environmental Protection Agency Groundwater Protection Standards (40 CFR Part 192), DOE has proposed natural flushing of the alluvial aquifer, in conjunction with institutional controls.

From conversations with the Colorado Department of Public Health and Environment (CDPHE) and DOE, it is apparent that issues relating to the institutional controls aspect of the compliance strategy have not been resolved. Accordingly, additional work is necessary to resolve these issues prior to NRC's acceptance of the SOWP and concurrence on the Groundwater Compliance Action Plan (GCAP). In order for DOE's compliance strategy to be protective of public health and the environment, the institutional controls must be finalized and enforceable, durable, and defensible. Without these controls in place, the natural flushing criteria would not be met, per 40 CFR Part 192.12(c)(2), and other options would have to be considered.
In addition, long-term monitoring wells are needed in the area where the groundwater flow and transport model has predicted the uranium concentrations may exceed the EPA standard at 100 years (see Figure 42, Appendix H).

**BACKGROUND:**

The Gunnison site is a former uranium processing facility located in Gunnison, Colorado. The mill was constructed in 1957 and processed approximately 540,000 dry tons of ore. By the mid 1970s, all of the tailings were moved to a 35 acre area with the mill equipment moved to a 16 acre area. During the 1980s, the tailings pile was contoured, covered with material excavated at the adjacent gravel pit, and seeded with grasses in accordance with plans approved by the Colorado Department of Public Health and Environment. Contaminated material consisted of approximately 450,000 cubic yards (CY) of tailings, 214,000 CY of contaminated soil from the ore storage area, millsite, subpile, and other areas, 25,300 CY of windblown material, 10,500 CY of rubble, and 10,000 CY of contaminated materials from vicinity properties. From 1992 to 1995 most of the residual radioactive material and other contaminated materials were transported to a permanent disposal cell located approximately 6 miles east of Gunnison.

Regulatory Framework:

The UMTRA Project regulatory framework provides several ways to comply with the EPA groundwater protection standards 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.

Groundwater Conditions:

The site is underlain by an unconfined alluvial aquifer consisting of poorly sorted sediments ranging from clay through gravel and cobbles resulting from a flood plain environment. Groundwater lies from 2 to 11 feet below grade with groundwater elevation fluctuations of over 10 feet in a year. Groundwater generally flows to the southwest at an average gradient of 0.005. At the present time, the Valco, Inc. gravel pit, to the south of the site, influences groundwater flow by pumping 2,00 to 4,000 gallons per minute (gpm) from May to August each year. Water from this pumping is discharged into an adjacent pond which creates a groundwater mound to the south. Hydraulic conductivity (measure of the aquifer's permeability) estimates range from 103 to 171 feet per day (ft/day) giving a groundwater velocity of 1.9 to 3.2 ft/day (with a hydraulic gradient of 0.005 and effective porosity of 0.27). The Gunnison River and Tomichi Creek are the main discharge and recharge points for the alluvial aquifer depending on the time of year.

DOE has characterized the areal extent of the site derived constituents which have migrated to the south and southwest of the site. The maximum concentrations for uranium (0.912 mg/L), sulfate (1,295 mg/l) and manganese (19 mg/L) were detected in the groundwater at the millsite. The uranium plume has migrated 7000 feet downgradient of the site to the southwest, however, concentrations over the maximum concentration limit (MCL) are only measured 1000 feet downgradient from the site. Manganese is another chemical of concern measured at concentrations up to 19 mg/L, eleven times higher than DOE's risk level of 1.7 mg/L.

**TECHNICAL EVALUATION:**

For the Gunnison site, DOE has proposed natural flushing of the surficial aquifer, in conjunction with institutional controls. Groundwater modeling (MODFLOW and MT3DMS), estimates that uranium concentrations in groundwater will decrease to below the standard within 100 years. However, the uranium plume has migrated off-site into areas used for drinking water. Therefore, DOE has proposed the use of institutional controls to avoid ingestion of groundwater with site derived uranium over the MCL. DOE has also proposed continued monitoring until the natural flushing is complete.

Results of the MT3DMS modeling simulations, performed by DOE, predict that the maximum concentration of uranium in groundwater will decrease to 0.037 mg/L after 100 years with a low probability (28 percent) that the standard will be exceeded over an area of the alluvial aquifer south of the site. In other words, there is a 72 percent probability that the standard will not be exceeded. The results of the stochastic MT3DMS simulations are similar, predicting a maximum uranium concentration of 0.032 after 100 years. A distribution coefficient ($K_d$) of 3.47 (average) was used for the model simulations. This was estimated using site data (sample from well 0002) and following the American Society for Testing and Materials (ASTM) procedure for batch-type experiments (ASTM, 1993). The bulk parameter $K_d$ is a distribution coefficient that measures the rate at which a contaminant is distributed between the solid and liquid phases as it migrates through the groundwater. This causes the contamination to travel at a slower rate that the average groundwater velocity.

DOE proposes that monitoring will take place annually for the first ten years, then every five years thereafter until natural flushing is completed. At the end of the ten years, an evaluation

will be made with the NRC and State of Colorado to determine the need and frequency of future groundwater monitoring. If it is determined that natural flushing is not proceeding as indicated, reevaluation of the compliance strategy will be conducted. Staff feels that groundwater monitoring until natural flushing is complete is important to compensate for the uncertainty of the model predictions. In this regard, long-term monitoring wells are needed in the area where the model has predicted the uranium concentrations may exceed the EPA standard at 100 years (see figure 42, appendix H).

Institutional Controls:

In 1990 groundwater sampling indicated that 22 domestic water supply wells contained concentrations of uranium and manganese above background levels. DOE funded an alternate water supply system for affected residents which was constructed from 1992 to 1994 and by July 1994, most residents were hooked up. However, DOE also indicates that there are 14 residences within the proposed institutional control area that are not hooked up to the water supply system and still use groundwater from domestic wells in the alluvial aquifer for drinking water. This issue needs to be resolved before NRC can accept the Gunnison SOWP.

To address the above issue regarding protection of residents within the proposed institutional control area, DOE has been working with Gunnison County who owns the water distribution system that provides drinking water to the entire area potentially affected by site-derived contamination. DOE would like to have Gunnison County formalize a requirement that all current and future residents in the area connect to the system. This would be an administrative institutional control enforceable by a county ordinance. The period of time that these controls would be in effect would be based on risk. However, the desired institutional controls are not yet in place. Accordingly, the NRC is withholding acceptance of the Gunnison SOWP pending resolution of this issue.

In order for DOE's compliance strategy to be protective of public health and the environment and meet the criteria for natural flushing per 40 CFR Part 192.12(c)(2), the institutional controls must have:

> "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"

Without these controls in place, other options would have to be considered to provide protection from potentially contaminated groundwater.

**REFERENCES:**

American Society for Testing and Materials (ASTM), 1993. "Standard Test Method for 24-h Batch-Type Measurement of Contaminant Sorption by Soils and Sediments, " Designation D 4646-87, 1993.

Colorado Department of Public Health and Environment (CDPHE), 2000. Comments on the Gunnison, Colorado Site Observational Work Plan. December 1, 2000.

U.S. Department of Energy (DOE), 1990. Baseline Risk Assessment of Ground Water Contamination of the Uranium Mill Tailings Site in Gunnison, Colorado.

DOE, 1996. Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project, DOE/EIS-0198, October, 1996.