May 29, 1998

Mr. Frank Bosiljevac
ERD-UMTRA
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

SUBJECT: NRC CONCURRENCE ON MODIFICATION NO. 2 TO THE REMEDIAL ACTION PLAN FOR THE GREEN RIVER, UTAH, URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT SITE

Dear Mr. Bosiljevac:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the U.S. Department of Energy's (DOE's) April 3, 1998, final Modification No. 2 to the Remedial Action Plan (RAP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project site at Green River, Utah. By this submittal, DOE proposed a change in the ground-water protection strategy for the Green River site. Additional information and page changes were provided by letters dated May 11, and May 13, 1998.

Based on its review, the NRC staff finds the modified ground-water monitoring program for the Green River site to be acceptable for compliance with the requirements of 40 CFR 192.03, and therefore, the NRC concurs in the proposed RAP modification. A Technical Evaluation Report, which documents the staff's review, is enclosed.

If you have any questions concerning this letter or the enclosure, please contact Mr. James Park, the NRC Project Manager for the Green River site, at (301) 415-6699.

Sincerely,

[Original signed by]
Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Docket No. WM-68
Enclosure: As stated
cc: W. Sinclair, UT
D. Metzler, DOE/GJPO
W. Woodworth, DOE/Alb

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UNITED STATES
NUCLEAR REGULATORY COM 'ISSION
WASHINGTON, D.C. 20555-0001

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SUPPLEMENTAL TECHNICAL EVALUATION REPORT

DATE: May 20, 1998

DOCKET NO. WM-68

FACILITY: Green River, Utah UMTRA Project Disposal Cell

PROJECT MANAGER: James Park

TECHNICAL REVIEWER: Michael Layton, Hydrogeologist

SUMMARY AND CONCLUSIONS:

On April 3, 1998, the U.S. Department of Energy (DOE) requested a modification to the Ground-Water Protection Strategy associated with the disposal and performance monitoring of the completed disposal cell at the Green River, Utah, UMTRA Site, as described in the site Remedial Action Plan (RAP) (DOE, 1989). This modification is based on additional sampling, analysis, and interpretations of the ground-water conditions at the site since the surface remediation was completed in 1990. DOE provided supplemental information and page changes by letters dated May 11, and May 13, 1998.

The NRC staff has reviewed DOE's proposed RAP modification and concludes that the proposed revisions are acceptable and comply with the provisions of 40 CFR 192.03.

BACKGROUND:

As documented in the Technical Evaluation Report dated March 22, 1990, the staff concurred on the RAP, with the exception of compliance with the 40 CFR Part 192, Subpart B ground-water cleanup. DOE deferred initiating the ground-water cleanup until a later project phase. Staff concurred with DOE's RAP Modification No. 1, on August 7, 1991, by which DOE requested removing methylene chloride from the hazardous constituent list for the site.

By letter dated October 24, 1996, DOE requested NRC's concurrence on the discontinuance of the neutron moisture monitoring program and the decommissioning of the neutron probe access holes. NRC provided a letter of no objection to the proposal on August 29, 1997.

DOE requested a second RAP modification by letter dated April 3, 1998, to revise the disposal cell ground-water monitoring program under 40 CFR 192, Subpart A. DOE provided supplemental information and page changes to this RAP modification by letters dated May 11, and May 13, 1998. The following description and evaluation pertain to this RAP modification.

DESCRIPTION OF MODIFICATION REQUEST:

DOE is requesting a modification to the original ground-water protection strategy, because its reexamination of ground-water characterization data strongly indicates that the present area of the disposal cell had been impacted by tailings leachate from the former tailings pile before the

disposal cell was constructed. This resulted in elevated concentrations of several constituents in the ground water that could be confused with any potential seepage from the disposal cell. In addition, DOE hypothesizes that a phenomenon called "harvested water" may be mobilizing some constituents naturally present in the vadose zone, causing concentrations to rise in some of the monitoring wells. DOE proposes to set the numeric concentration limits for three indicator constituents to either the maximum concentration limit (MCL) values or the concentration levels present before the disposal cell was constructed.

DOE proposes to perform post-closure ground-water monitoring of the four point of compliance (POC) wells situated down gradient of the disposal cell (i.e., wells 171, 172, 173, 813), on a quarterly schedule for a minimum of three years (i.e., through 2001). Samples from these wells will be analyzed for the following constituents indicative of tailings seepage, with the following numerical limits:

Proposed Constituents and Concentration Limits for POC Wells Green River, Utah UMTRA Disposal Cell

POC Well No.	Nitrate (mg/L)	Uranium (mg/L)*	Sulfate (mg/L)
171	10.0	0.044	3334
172	102	0.067	4985
173	10.0	0.044	4000
813	10.0	0.069	4440

* The uranium standard in 40 CFR 192, Table 1 is 30 pCi/L. Uranium at 0.044 mg/L is a concentration based on the 30 pCi/L standard with all major uranium isotopes in equilibrium.

The need for further monitoring will be jointly evaluated by the DOE, NRC and the State of Utah Division of Radiation Control (UDRC), at the end of the three-year monitoring period. If the above listed constituents are not at or trending downward to the pre-construction concentration levels after three years, then DOE will initiate a physical investigation to determine if one or more of the following potential failure scenarios may have occurred:

Potential Failure Scenarios	Potential Corrective Actions
1. Contaminated seepage emerges in an artificially-induced spring below the disposal cell.	1. Modify cover to eliminate excess infiltration.
2. Radon barrier cracks due to desiccation.	2. Replace filter layer with lower permeability layer.
3. Siltation of the erosion protection layer.	3. No action needed unless it increases infiltration or induces vegetation.

Potential Failure Scenarios	Potential Corrective Actions
4. Vegetation threatens the cover integrity.	4. Add biointrusion layer.
5. Biointrusion by animals.	5. Modify rock cover.
6 Erosion of the cover.	6. Not a realistic failure scenario (cell is designed for PMP and PMF events.)
7. Concentration limits of indicator parameters in the ground water are exceeded.	7. Additional ground-water sampling and characterization to evaluate potential of disposal cell impact on the uppermost aquifer. If the "harvest water leaching hypothesis" is accepted for elevated nitrate concentrations in ground water following evaluation the three-year quarterly monitoring investigation. DOE may implement an engineering remedy under the 40 CFR Part 192, Subpart B program.

TECHNICAL EVALUATION:

To support its technical evaluation, the staff reviewed DOE's data, analyses, and interpretations provided in support of the modification request (DOE, 1998). In addition, the staff conducted an independent analysis of the ground-water flow directions and contaminant concentration distributions in the ground water from the data provided (DOE, 1998), and reviewed as-built drawings and photographs of the site, as documented in DOE's final Completion Report for the site (DOE, 1991).

The staff constructed contaminant concentration maps of selenium, uranium and nitrate for three time periods (May/July 1988, August 1990, and December 1997) based on the DOE-provided data. The time periods represent pre-cell construction, just-following cell construction, and near-current conditions. This independent analysis confirmed DOE's contention tl " strong evidence exists that tailings-related contamination was present in the disposal cell area before the cell was constructed. Unfortunately, the extent and magnitude of the pre-construction contamination is left for interpretation, because most of the disposal cell monitoring wells were not constructed until after the cell was constructed. However, tailings-like contamination was detected in several POC wells and one up-gradient well from the first sampling event after well installation.

The staff also constructed three potentiometric surface maps of the hydrostratigraphic unit monitored by the POC wells, based on the data provided by DOE. These maps (for July 1991, January 1993, and April 1996) were constructed to represent the ground-water conditions at different seasons for evaluating any potential shifts in flow direction or increases in ground-water elevation. The maps show a generally northwesterly flow direction, which did not appear to change over the period evaluated. Each of the maps shows an unusual ground-water "trough," which is well supported by the available data, situated beneath the disposal cell. This "trough" is demarked by a flat gradient along the axis of the trough and relatively steep gradients to the northeast and to the southwest. As a result, wells 174, 175, and 176 situated

along the northeastern side of the cell, and formerly designated as down gradient POC wells, are, in fact, located hydraulically up gradient or cross-gradient to the disposal cell. Therefore, the staff concurs with DOE that these wells should no longer be designated as POC wells.

The feature causing this "trough" is not known. Pre-construction photographs (DOE, 1991) do not show a surface expression of this "trough" . The distinctive change in gradient is an indication of a marked change in hydraulic conductivity within the unit, with the larger conductivity being situated along the axis of the "trough." Speculatively, a feature, such as a paleochannel or a fracture zone could account for the conductivity and gradient differences exhibited by the "trough;" however, previous site characterization information makes no mention of either one of these features.

The presence of this "trough" does provide some interpretive insight into how contaminated ground-water from the former (and generally down gradient) tailings pile could have found its way to the disposal cell area. Potentiometric levels along the axis of the trough are generally around an elevation of 4083 feet mean sea level, while ground-water elevations on either side of the trough are 2 to 5 feet higher. Surface elevations of the former tailings area were generally around the same elevation as the potentiometric elevation in the through. Given that the tailings were placed as a wet slurry and likely remained saturated for some time, hydraulic heads could have been adequate to induce flow to the southeast toward the future disposal cell area.

From the examination of contaminant concentrations through time, the uranium concentrations in the uppermost aquifer appear to be declining since monitoring of the disposal cell commenced; however, concentrations of nitrate and selenium appear to be increasing over the same time frame. DOE indicates that a phenomenon called "harvested water" may be an explanation for these increases. "Harvested water" occurs when runoff from the reclaimed tailings collects in the anchor trench for the rip rap and seeps into the underlying vadose zone and remobilizes mineral constituents in the arid soils. The staff examined photographs and as-built drawings from the final site Completion Report (DOE, 1991) and confirmed that the rip rap anchor trench (approximately 10 feet in depth) is below the current land surface and was not designed with an outlet structure to accommodate runoff. The staff, therefore, concludes that DOE's hypothesis of "harvested water" is plausible and could influence local ground-water quality surrounding the disposal cell.

The staff concurs that DOE's proposed program for monitoring nitrate, uranium, and sulfate as indicator parameters in POC wells 171, 172, 173, and 813 on a quarterly schedule for a period of at least three years is appropriate for complying with the performance demonstration provisions of 40 CFR 192.03. The staff also concurs that the proposed corrective action scenarios of evaluating and potentially implementing engineering remedies comply with 40 CFR 192.04. Finally, the staff agrees that the need for further monitoring will be jointly evaluated by DOE, NRC and UDRC at the end of the three-year monitoring period.

RECOMMENDED CHANGE:

The staff recommends that DOE's proposed RAP Mod. No. 2 be incorporated in the Green River RAP. DOE should also revise the draft Long-Term Surveillance Plan to reflect changes in the ground-water monitoring program, potential failure scenarios, and potential corrective actions.

REFERENCES:

U.S. Department of Energy (DOE), 1998, "Modification No. 2 to the Remedial Action Plan and Site Stabilization of the Inactive Uranium Mill Tailings Site at Green River, Utah, " DOE/AL/62350-050510.GRN0.

DOE, 1991, "Green River, Utah Final Completion Report," DE-AC04-83AL18796.

DOE, 1989, "Remedial Action Plan and Final Design for Stabilization of the Inactive Uranium Mill Tailings at Green River, Utah," UMTRA-DOE/AL 050510.GRN0.