UNITED STATES

NUCLEAR REGULATORY COMMISSION

REGION IV

URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

MAR 31 1994

Docket No. 40-8681

Umetco Minerals Corporation
ATTN: John Hamrick
P.O. Box 1029
Grand Junction, Colorado 81502

Dear Mr. Hamrick:

This letter is a follow-up to the meeting of February 9, 1994, at the NRC Uranium Recovery Field Office (URFO) regarding the White Mesa Mill facility. During this meeting, Umetco and its consultants responded to our requests for additional information necessary to complete our review of your license renewal application of August 23, and December 13, 1991. Additional information was also presented for your amendment request to establish a monitoring program at the White Mesa facility, submitted by letters dated June 16, 1993, and February 9, 1994. The Environmental Protection Agency (EPA), the Department of Energy, and the State of Utah also attended the meeting because of your ongoing discussions with the DOE regarding using the White Mesa tailings cells for disposal of the Monticello site uranium mill tailings. Many of the issues discussed during this meeting are relevant to that issue also.

With regard to license renewal, although some hydrogeologic and tailings impoundment design issues were clarified, additional information is needed as discussed in Enclosure 1. This information is needed to allow us to evaluate the adequacy of your proposed monitoring program and to complete our environmental assessment. In consideration of your interest in using the White Mesa site for disposal of the Monticello tailings, we have included the EPA's comments and requests for information as Enclosures 2 and 3.

With regard to the element of your amendment request dated June 16, 1993 and February 9, 1994, to set point(s) of compliance, site conditions appear to warrant development of additional monitor wells and enhancement of the tailings leak detection system to provide an adequate ground-water monitoring network and prompt detection of tailings cell seepage. Furthermore, it is inappropriate to set ground-water protection standards at this time; rather, baseline water quality values which are the basis for detecting tailings seepage must be established (Refer to 10 CFR Part 40, Appendix A, Criterion 7). Previously submitted information indicates that it would take 250 years for a leak to reach wells 150 feet away (Submittal dated August 1, 1989). Moreover, during the February 9, 1994 meeting Umetco indicated that

the existing leak detection system does not provide leak detection over the entire cell area. Therefore, the point(s) of compliance proposed in the February 9, 1994 submittal are inadequate for meeting the requirement that hazardous constituents be detected as early as practicable. (Refer to Criterion 5B(1), Appendix A of 10 CFR Part 40). Please provide the following information to permit us to proceed with review of your amendment request:

A. Please propose modifications to enhance the tailings cell leak detection system to provide prompt detection of a major cell leak.

B. Please propose additional detection monitoring points for the vadose zone lying beneath or adjacent to the tailings cells, since the nonuniform plume migration can occur in this zone.

C. Please propose additional detection monitor wells in the saturated Burro Canyon formation. Umetco indicated this formation, not the Dakota sandstone, is the uppermost aquifer at the White Mesa facility. Currently, water quality in the southerly, downgradient direction is monitored only at monitor well MW-3. The areal extent of the tailings cells, and therefore the potential source of tailings seepage, requires an enhanced ground-water monitoring network.

D. You have indicated the variable quality of ground water necessitates developing (baseline) standards on a well-by-well basis. To justify your position, please demonstrate that the reported water quality is representative of only one aquifer. One way to demonstrate that your ground-water samples are from a hydraulically connected aquifer, for example, would be to perform a pressure test comprising pumping one monitor well and measuring the effects on sensors positioned in the other monitor wells. The necessary time for performing this test would be based on aquifer hydraulic properties and the various distances between sensor-equipped monitor wells and the pumping well. In addition, please provide documentation such as well logs, electric logs, or other borehole data to verify well screen positioning.

Your response to the above questions will enable us to act on your amendment request independently and prior to completing our review of your responses to Enclosure 1. Notwithstanding, please provide your responses to Enclosure 1, which addresses the license renewal application,in a timely manner following receipt of this letter.

If you have any questions, please call Cynthia Miller-Corbett of my staff at (303) 231-5811.

Sincerely,

for Ramon E. Hall
Director

Enclosures:
As stated

cc:
W. Brice, Umetco
R. Van Horn, Umetco
W. Sinclair, UT
P. Mushovic, EPA

ENCLOSURE 1

1. Please provide the laboratory analytical results for monitored ground-water constituents from four quarterly sampling events for monitor wells MW-17, MW-18 and MW-19. These wells will provide additional data for establishing background ground-water quality.

2. Please discuss alternative corrective action programs (CAP), that could be implemented in the event of detected seepage from your tailings cells. The purpose of this discussion is to enable the NRC to conclude that feasible and practical corrective actions are available.

3. Based on your evaluation of the ground-water monitoring and leak detection programs, as well as geologic and hydrogeologic information, please provide an analysis of the rate of plume migration through the Dakota/Burro Canyon formation and Brushy Basin to the underlying Entrada Sandstone aquifer, if a tailings cell leaks.

4. Please provide a technical analysis of, or a reference to a previous submittal which describes, the anticipated impact of the low pH raffinate on the clay liner integrity and potential ensuing consequences.

5. At the February 9, 1994 meeting you stated you were going to perform a drilling program at the White Mesa site. Therefore, please provide the results of the angle hole drilling, packer tests, and any other analyses you perform to determine the presence of a subsurface fracture system. Based on information you presented, in the event of a liner failure, tailings seepage could reach the Brushy Basin. The angle hole drilling program should, therefore, incorporate penetration and analyses of this strata. This is necessary to evaluate whether a fracture system exists which could provide a conduit for seepage migration through the Dakota Sandstone, Burro Canyon formation, and Brushy Basin, to impact the Entrada Sandstone. It is our understanding that the drilling program will comprise two sets of boreholes, and that each borehole will be 100 feet in length. Based on available information for the thickness of the overlying strata, this would allow as much as 20 feet of penetration into the Brushy Basin unit. Each borehole set would include one borehole perpendicular to the previously identified, primary joint system. We understand these boreholes would be at approximately 30 degrees to the vertical. The accompanying borehole would be perpendicular to the secondary joint system.

   At a minimum, the following information for the vadose zone (Dakota Sandstone), Burro Canyon formation, and the uppermost 20 feet of the Brushy Basin strata should be provided:

   A. Characterization of subsurface structure (fracture systems), and

   B. A quantitative analyses of the rate and direction of effluent migration through the system in both horizontal and vertical, cross and downgradient directions.

6. Please provide the geologic and hydrogeologic information necessary to characterize that the Brushy Basin acts as an aquitard between the Burro Canyon and the Entrada Sandstone. This information should include the vertical and horizontal conductivities characterized at the site, verification of the effective porosity, and thickness of this unit. Also, please provide this information for any wells constructed in the Entrada Sandstone.

7. In consideration of both stratigraphy and structure, please provide a quantitative assessment of horizontal and vertical effluent travel times within the Dakota Sandstone, Burro Canyon formation, and Brushy Basin.

8. Please provide well log, geophysical data, piezometric data, or other data to justify your interpretation of the southerly pinch-out of the saturated thickness of the Burro Canyon formation that was presented in the referenced meeting. As discussed in the meeting, the unit thickness isopachs are somewhat speculative in the region downgradient of the tailings cells. It is not clear whether the downgradient direction is actually south, southwest, or southeast. Please include isopach maps and a map depicting the bottom surface of the Burro Canyon formation.

9. During the meeting, four piezometric wells were noted as being constructed southwest of the tailings cells. Please identify these wells and include any piezometric and subsurface structural or stratigraphic information collected during this drilling program, such as that from electric logs or core samples, to enhance site characterization.

10. Please provide piezometric data to characterize the Burro Canyon formation and Entrada Sandstone aquifers.

ENCLOSURE 2

EPA Comments and Questions Concerning the Umetco Mineral Corporation, White Mesa Facility

EPA believes, based on the data which we have received and reviewed, the Umetco Minerals Corporation (Umetco), White Mesa facility is not in violation of any applicable Federal or State of Utah regulations. However, EPA is concerned the U.S. Nuclear Regulatory Commission (NRC) and Umetco have not agreed upon a Point of Compliance (POC) for the White Mesa facility. EPA will not allow the facility to receive the Monticello Mill tailings until such time as a POC is established and "constituent" levels have been determined, which if exceeded, will indicate a release has occurred.

After reviewing the design of cells 3 and 4A, especially the leak detection systems (LDS), we would concur with Umetco, the LDSs as designed and constructed, will only detect minor leaks positioned almost directly over the detection system unless a major breakthrough were to occur. For this reason, we are not certain what is gained by making the LDS the POC. Based on the data presented, we would agree that the "saturated" Burro Canyon-Dakota Formation would be suitable as the POC. If NRC accepts the Burro Canyon Formation as the POC, additional hydrogeological characterization of the Burro Canyon Formation needs to be conducted. Since the Brushy Basin Member of the Morrison Formation is considered to be the geological unit providing protection of potable water in the underlying Entrada Formation aquifer, the characterization effort should extend into the Brushy Basin. Additional comments addressing some of the necessary characterization efforts of the Brushy Basin Member are attached.

EPA requests that NRC and Umetco explain how background levels for constituents of concern will be determined. If it is eventually determined that "site-wide" constituent background and compliance levels cannot be developed, how will appropriate compliance levels be established for the individual wells? It might be appropriate to determine, if possible, why there is such a variation in constituent levels in the upgradient wells, (i.e., could well construction, completion, and development, sampling procedures, or other factors account for this variability?). It may be appropriate to initially set constituent levels for several of the mobile constituents, while further sampling and analyses is conducted to determine if "site-wide" background levels can be established. EPA would note, if a State of Utah Ground-Water Discharge Permit (GWDP) is required or if Umetco intends to gather the data required to substantially meet the intent for obtaining the GWDP, it may be appropriate to discuss with the State of Utah, Division of Water Quality, any additional requirements that they may have.

Our review of the Student T test ("T") analyses contained in the documents indicates that some of the data were excluded. Furthermore, the use of the "T" test may be inappropriate since the data is not normally distributed. However, we concur with Umetco that if a significant leak were to occur, the chlorides would be one of the first constituents to break through and that the background chloride constituent levels would be elevated significantly above background.

EPA believes if a major leak occurs, it will migrate through joint, fractures, and along preferential pathways and not be held in the pore spaces of the matrix, especially if the matrix is well cemented as is generally assumed by many proponents of flow mechanisms through unsaturated sediments. Water level fluctuations in excess of 1.5 feet have been observed in several wells over a 5-month period. This suggests that the ground-water table responds relatively quickly to influx. We did not evaluate or prepare detailed ground-water table maps to determine if any trends could be established; however, it might be useful to do so.

We concur with Umetco's statement that they need to confirm that the saturated thickness of sediments in the Burro Canyon is pinching out. Review of the well logs suggests that the reason Well No. 16 is dry is that the bottom of the well was screened at the bottom of the Burro Canyon Formation at an elevation of 5497 above sea level. Water elevations in Wells 5 and 12 were at approximately 5501. Based on the assumed phreatic surface, gradient, the linear distance between Well 16 and Wells 5 and 12, and the fact that the Burro Canyon Formation is unconformable over the brushy Basin Member, water at that elevation would not be detected. EPA's review and analysis of the existing well logs suggests that the bottom of the Burro Canyon-Dakota Formation is generally dipping to the southeast with the possible exception of a topographic high at Well 4.

We concur with Umetco that additional exploratory borings are needed to be made and additional piezometers constructed when water is encountered. Additional compliance monitoring wells may need to be constructed based on the results of further characterization. Additional characterization efforts should extend southerly, from a line formed b y extending the common wall/dike between cells 2 and 3, east and west to the mesa edge to confirm that the saturated thickness of Burro sediment pinches out. Data from the existing wells and any additional data collected from further characterization efforts can be utilized to prepare a geologic map depicting the bottom of the Burro Canyon Formation and an isopach map depicting the thickness of the formation and saturated intervals.

During the meeting, Umetco indicated that the hydraulic conductivity of the Brushy Basin Member was approximately 10^{-8} and that the effective porosity was approximately 15 percent. Is there any site-specific data supporting these assumptions at the Umetco site? Can Umetco provide reasonable assurance that if a significant release occurs, there will be time to put in place a contingency plan (e.g., a pump and treat system) to avoid contamination from moving horizontally offsite or vertically through the Brushy Basin Member? The angle holes, core recovery, and the packer testing should extend into the Brushy Basin Member so that confirmation of the assumed hydraulic conductivities in the Brushy Basin Member can be obtained.

Some of the well logs and any test data from the culinary wells may be useful to respond to or support the above concern. Can the culinary well locations be placed on the map, and the well logs be made available to EPA for review? As a minimum, the lithologic logs for the culinary wells should provide a good estimate of the thickness of the formations from the surface down to the Entrada.

EPA also requests that all additional compliance monitoring wells be constructed in accordance with the Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells (EPA 1991 document No. EPA/600/4-89/034) or be functionally equivalent.

EPA also requests the results of any packer tests which were completed in the vadose zone. Please provide EPA with any packer and pump/slug tests that may have been conducted and were not included or referenced in the February 1993, Ground-Water Study, White Mesa Facility, Blanding, Utah.

EPA would like to have the confidence and assurance that field sampling techniques and laboratory quality assurance and quality control procedures are in place to validate data. We would like to see, in place, a system which would preclude questionable "hits" based on sampling techniques and analytical methods.

ATTACHMENT

If the Burro Canyon-Dakota Formation is used as a point of compliance, the Brushy Basin Member of the Morrison Formation must also be characterized since it is the geologic unit separating the Burro Canyon aquifer from the underlying aquifer in the Entrada Formation. Characterization of the Brushy Basin Member should to verify the assumption that it is acting as an "aquitard." Characterization of the Brushy Basin Member should include, but not be limited to:

- lithologic and geophysical logs for the culinary wells previously installed into the Entrada Formation,
- thickness of the unit,
- any fractures observed in the unit,
- packer tests at different depth intervals,
- other data related to horizontal and vertical hydraulic conductivity, including laboratory tests conducted on samples,
- verification of 15 percent effective porosity of the Brushy Basin underlying the White Mesa area or laboratory data from tests conducted for effective porosity on samples collected from the Brushy Basin Member underlying the site, and
- any other data pertinent to characterizing the Brushy Basin Member which supports the assumption that the Brushy Basin is an aquitard.

EPA believes by extending the proposed characterization effort into the Brushy Basin Member, Umetco should be able to provide answers to our questions and comments. The minimum apparent depth of penetration into the competent Brushy Basin Member would be 20 feet. Based on the assumption that a 30-degree angle from the vertical is used for angle drilling, the total length of core would be 25 feet and the horizontal distance would be 15 feet. The decision of the actual depth occurred can be made on criteria observed in the field such as lithology, the occurrence, spacing, and orientation of joints and fractures observed in the Dakota/Burro Formation. The core should be recovered for observation and laboratory analyses. Packer testing intervals should be determined after observation of the core.

ENCLOSURE 3

Various types of leaks may occur through the bottom of Cell 4A. EPA would like to see various leakage scenarios to assess the possible leakage rates that may occur through the cell lining. Leak scenarios that examine a range of leakage rates, types of leakage that may occur through the bottom of the cell using reasonable assumptions about the subsurface characteristics directly below the cell are appropriate.

These leakage rates should include the following scenarios:

1. areal leakage through the bottom of the cell equal to the expected flux of water infiltrating the cover,

2. areal leakage through the bottom of the liner 10- to 100-times the expected flux of water infiltrating the cover,

3. a scenario that simulates a major liner failure.

Based on Umetco's figure titled "CELL 4A SCHEMATIC" from the February 9, 1994, meeting at NRC, the cover flux is projected at 0.01 $ft^3/yr/ft^2$. This flux may be considered as an areal flux through the bottom of the liner ($Q_{in} = Q_{out}$). The three-dimensional extent of leakage can be calculated using this flux rate, assuming that the leakage occurs throughout the bottom of the cell and making some reasonable assumptions about the in situ material characteristics directly below the cell clay liner. These assumptions should include flow through the matrix and the potential for fracture flow in the subsurface. If a major leak occurs, the movement of fluid will be primarily in the open fractures, if fractures are present, and not within the matrix of the sedimentary units. The cover may fail and therefore, the second scenario, leakage through the bottom of the liner at 10- to 100-times the expected cover flux (0.1 to 1.0 $ft^3/yr/ft^2$), should be calculated. Finally, a worse-case scenario that assumes a major liner failure should be calculated. For this worst-case scenario, assumptions may include the maximum water level expected in the cell, a leak in the southwest corner of the cell, and a significant leakage rate of at least 10^{-5} cm/sec.

bcc:
Docket No. 40-8681
PDR/DCS
URFO r/f
SJCollins, RIV
DBSpitzberg, RIV
RAScarano, RIV
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PM:URFO CMC	PM:URFO	DD:URFO ~~EFH~~	D:URFO:RIV ~~REH~~	
CDMiller/lv	DCWard DCW	EFHawkins	REHall for	
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