Umetco Minerals Corporation

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May 11, 2001

Mr. Dan Gillen, Acting Chief
U.S. Nuclear Regulatory Commission
Fuel Cycle Licensing Branch
Mail Stop T8-A33
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852-2738

Attention: Ms. Elaine Brummett, Project Manager

Re: Final Application for Alternate Concentration Limits, Radioactive Materials License SUA-648, Docket No. 40-0299, Gas Hills, Wyoming

Dear Mr. Gillen:

Umetco Minerals Corporation (Umetco) is submitting the final Alternate Concentration Limits (ACLs) Application for the former uranium mill site in Gas Hills, Wyoming. The initial ACL Application was submitted to the U.S. Nuclear Regulatory Commission (NRC) on February 18, 1999. Comments from the NRC were received in a request for additional information dated April 17, 2000. Umetco revised key elements of the application based on NRC comments and additional evaluation of site conditions. Please note that Section 3 with the supporting documentation will be provided under separate cover by May 18, 2001.

The application was prepared in accordance with 10 CFR 40, Appendix A Criterion 5B(5)c and 5B(6). It replaces previous submittals made to your office concerning ACLs. Attached is a document listing staff comments and a reference to the Umetco response. Copies of the ACL Application are being provided to the Wyoming Department of Environmental Quality and the U.S. Bureau of Land Management. These are courtesy copies and are presented for information purposes only.

Because approval of this application will require amendment to our license, Umetco proposes the following language as a replacement for License Condition 35.

35. The licensee shall implement a groundwater compliance monitoring program containing the following:

    A. Sample on annual frequency, wells MW1, MW21A, GW7, and GW8 for arsenic, beryllium, gross alpha, lead-210, natural uranium, nickel, radium-226+228, selenium, and thorium-230.

    B. Comply with the following aquifer standards (alternate concentration limits proposed in license submittal dated May 11, 2001) in the western flow regime (formerly referred to as the Lower Wind River Aquifer) at point of compliance wells MW1 and MW21A, with background being defined by the licensee submittal dated May 11, 2001:

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Arsenic = 1.80 mg/l, beryllium = 1.64 mg/l, gross alpha = 3,338 pCi/l, lead-210 = 35.4 pCi/l, nickel = 13.0 mg/l, radium-226+228 = 250 pCi/l, selenium = 0.161 mg/l, thorium-230 = 57.4 pCi/l, and uranium-natural = 11.9 mg/l.

Comply with the following aquifer protection standards (alternate concentration limits proposed in licensee submittal dated May 11, 2001) in the southwestern flow regime (formerly referred to as the Upper Wind River Aquifer) at point of compliance wells GW7 and GW8, with background being defined by the licensee submittal dated May 11, 2001:

Arsenic = 1.36 mg/l, beryllium = 1.70 mg/l, gross alpha = 6,223 pCi/l, lead-210 = 46.7 pCi/l, nickel = 9.34 mg/l, radium-226+228 = 353 pCi/l, selenium = 0.53 mg/l, thorium-230 = 44.8 pCi/l, and uranium-natural = 34.1 mg/l.

C. In the event the limits in Subsection (B) are exceeded, the licensee will propose corrective action with the objective of returning concentrations of arsenic, beryllium, gross alpha, lead-210, natural uranium, nickel, radium-226+228, selenium, and thorium-230 to the concentration limits specified in Subsection (B).

The licensee shall on an annual frequency submit a groundwater monitoring report by September 1 of each year.

In addition, Umetco requests deletion of the reference to the groundwater corrective action program in License Condition 10. Further, Umetco requests deletion of License Condition 59.B.(2).

If you have any questions you may contact me at (970) 256-8836.

Sincerely,

Curtis O. Sealy, P.E.
General Manager

COS:lan

cc: M. Moxley – WDEQ
R. Hoy – WDEQ
R. Specht – BLM
F. Georgeson – BLM
File

Attachment

Enclosure: ACL Application

01-082.doc

Responses to NRC Request For Additional Information Concerning Umetco's Alternate Concentration Limits Application

Land and Water Use

1. The alternate concentration limits (ACL) application does not contain a legal description of the boundary encompassing the land to be transferred to custodial care.

DISCUSSION: The long-term care boundary encompasses the land that will be transferred to the U.S. Department of Energy (DOE) and from which the public will be prevented from using the ground water. If the license is amended to allow ACL for some ground water constituents, the legal description of the boundary will be an important condition of the license. The ACL application contains a map of the long-term care boundary, but does not contain a legal description of the boundary.

ACTION NEEDED: Provide a legal description of the long-term care boundary.

Response: A legal description is provided in Section 1.6 and on Figure 1.19

2. The ACL application does not contain letters of commitment to transfer land to DOE.

DISCUSSION: The application states that to establish the long-term care boundary, land will have to be donated or control transferred to the DOE from the State of Wyoming, Umetco, and the U.S. Bureau of Land Management. However, the application does not contain written documentation from all the parties agreeing to this transfer. This is an important commitment in the ACL analysis because the long-term care boundary encompasses the land from which the public will be prevented from using the ground water. Therefore, it is important that there be a high level of confidence that this commitment can be fulfilled.

ACTION NEEDED: Submit letters of commitment to transfer land to DOE from all the current owners of land within the long-term care boundary.

Response: Letters of commitment to transfer and accept land are provided in Appendix F and discussion of involved parties is included in Section 1.6.

3. There is a conflict in land use with Power Resource Inc's *in situ* mine site application boundary.

DISCUSSION: Umetco's proposed southern long-term care boundary includes land in Power Resource Inc's *in situ* mine site application. If *in situ* mining occurs in this area, several hundred wells will be extracting ground water from an aquifer in an area that is supposed to be controlled by DOE to prevent ground-water use and public access to the land.

ACTION NEEDED: Provide evidence that the conflict in proposed land use with Power Resource Inc's *in situ* mine site application boundary is resolved so that DOE can prevent ground-water use and public access to the land once it is transferred to DOE.

Response: Umetco has completed an analysis provided in Appendix K that demonstrates the compatibility of ISL operations within the long term care boundary.

Proposed Points of Exposure (POEs)

4. The proposed POEs may not be appropriately located.

DISCUSSION: The basis for locating the POEs is not explained in the application. Points of exposure are areas outside the long-term care boundary where the public or wildlife might be exposed to contaminated ground water. A POE does not have to be a well. Commonly, the POE is located along those areas of the long-term care boundary that are directly down gradient of the disposal cell. However, both POEs are proposed by Umetco to be located within the long-term care boundary. Given the width of the impoundments, it is possible that there may be other faster or shorter ground-water flow pathways from the impoundments to the long-term care boundary.

ACTION NEEDED: Justify the POE locations or propose an acceptable alternative(s).

Response: Justification of the POE is provided in Sections 2.2.1, 2.2.2, Appendices B, and C.

Ground-Water Flow Model

5. A geologic cross section from the Above Grade Tailings Impoundment to POE is needed.

DISCUSSION: The ground-water flow model assumes that between the Above Grade Tailings Impoundment and the POE, the Upper Aquifer is missing. However, from the geologic data submitted, the staff is unable to confirm this conclusion.

ACTION NEEDED: Provide a geologic Cross Section from the Above Grade Tailings Impoundment to the western POE.

Response: Geologic cross sections are provided in Figure 2.10 and described in Section 2.2.1.2.

6. Areas where surrounding mines have penetrated either the Upper or Lower Aquifer need to be identified.

DISCUSSION: The application identifies areas of prior mining that are near the impoundments and between the impoundments and the proposed POEs. However, the application does not identify if any of these mines were excavated into either the Upper or

Lower Aquifer. This information is important in determining the extent of contamination in either the Upper or Lower Aquifer which is likely to be caused by prior mining activities.

ACTION NEEDED: Provide a map of the surrounding mines showing the areas where mines have penetrated the Upper Aquifer and/or the Lower Aquifer.

Response: The map is provided in Figure 2.2 and described in Section 2.1.1. Table 1.2 also summarizes the information regarding mine penetrations.

7. The application does not describe the source of the hydraulic conductivity and storage coefficient values.

DISCUSSION: The hydraulic conductivity and storage coefficient are important parameters in the ground-water flow code that was used to calculate ground-water flow velocity, which in turn is an important parameter in the transport code used to project future concentrations at the POE. Hydraulic conductivity and storage coefficient values used in the ground-water flow model are presented in Table 2.9 of the application. However, the application does not reference or present the pump test data, which were used to derive the hydraulic properties in Table 2.9. Therefore, the staff cannot evaluate the adequacy of the pump test interpretations.

ACTION NEEDED: Describe the pump tests and present the data from the tests (preferably with appropriate plots) or reference the data in documents that can be readily obtained by the U.S.Nuclear Regulatory Commission (NRC) staff.

Response: Hydraulic parameters are summarized and referenced in Table 2.7 and discussed in Section 2.2.1.

8. The application does not describe which hydraulic conductivities apply to either the Upper or Lower Aquifer, or provide a map of test locations.

DISCUSSION: Hydraulic conductivity values used in the ground-water flow model are presented in Table 2.9. However this table does not identify which hydraulic properties correlate with which aquifer, and the ACL application does not contain a map that identifies all the well locations in Table 2.9. Specifically, the staff has been unable to locate and determine which aquifers are monitored by wells MWC37, MWC56, MW3, RW1-1, RW1-2, RW1-3, RW3-1, RW3-2, DW2, LA4, DW2, A-9 Pit, and Mudstone.

ACTION NEEDED: Describe which hydraulic conductivity values in Table 2.9 of the application were obtained for either the upper or lower aquifer (or other hydrologic unit) and provide a map that identifies the location of all the well locations mentioned in Table 2.9.

Response: Hydraulic parameters are summarized and referenced in Table 2.7 and discussed in Section 2.2.1. Figure 2.17 shows the location of wells that have been pump tested.

9. The ground-water flow and transport models did not consider the hydraulic properties of areas that have been mined and reclaimed.

DISCUSSION: The ground-water flow and transport models assumed that the Upper and Lower Aquifers were continuous over the domain of the model. The application indicates that open pits were used to extract uranium in and around the two impoundments. However, the application does not indicate if these mines removed portions of the Upper or Lower aquifers. If these mines removed portions of the aquifers, these areas would now contain overburden material. They might have very different (faster or slower) ground-water velocities. A change in hydraulic properties may also cause different flow paths and directions to the long-term care boundary or POE.

ACTION NEEDED: Discuss the effects in the ground-water flow and transport modeling, if any, of areas that have been mined and reclaimed.

Response: The effects of mining and reclamation on groundwater flow and transport are evaluated in Sections 2.1.1, 2.2.1, and Appendix C.

10. The flow code only provides a single velocity value and not an expected range of values for input into the transport code.

DISCUSSION: The ground-water flow code was used to calculate ground-water flow velocities, which, in turn, is an important parameter in the transport code used to project future concentrations at the POE. While a sensitivity analysis was performed for the flow code to determine which model parameters most influenced the calculation of heads, the flow code only provided a single calibrated modeling interpretation of velocity. The model did not explore a reasonable range of hydrologic parameters that could also be calibrated to the head values. Therefore, the velocity values calculated by the model may not reflect a reasonable range of uncertainties in the hydrologic parameters.

ACTION NEEDED: Model a range of ground-water velocities that adequately reflect a reasonable range of expected variation in the hydrologic parameters. Alternatively, the applicant may adequately explain how the velocities calculated by the model reflect a conservative (fast velocities) analysis.

Response: A range of groundwater velocities and flowpaths was evaluated in the groundwater flow and geochemical models, as described in Sections 2.2.1, 2.2.2, Appendices B, and C.

11. Data on water levels versus time are not presented for the static condition flow direction test.

DISCUSSION: The objective of the static-condition flow-direction test was to determine the long-term direction of ground-water flow after ground-water corrective action ceased. To conduct this test, pumping from the ground-water corrective action program temporarily ceased and water level measurements were taken until the water levels were no longer rising. The final water level measurements from this test were used to calibrate the ground-water flow model which simulated ground-water flow direction and velocity. However, water level

data and time data were not presented from this test. Therefore, the staff cannot confirm if the water levels had adequately recovered from the pumping activities, and that the test results are representative of conditions after pumping stops.

ACTION NEEDED: Demonstrate that the water levels in the static condition flow direction test had adequately recovered to represent ground-water conditions after pumping ceases.

Response: This comment is no longer relevant to the current submittal. Discussion of the model calibration is presented in Appendix C.

Transport Model

12. The application provides average concentration histories.

DISCUSSION: The application states on page 2-7 that the deeper portions of the aquifer are not impacted as indicated by samples collected from wells MW28, MW30, MW70B, and MW71B. Average values are given for concentrations of contaminants from 1997-1998 data. Plots of the concentrations of constituents of concern over time for these wells would provide stronger support to the statement that the deeper portions of the aquifer are not impacted. If the concentrations started out low and have been steadily increasing, the use of the average concentration may mask a possible problem.

ACTION NEEDED: Provide plots of the concentrations of the constituents of concern for wells MW28, MW30, MW70B, and MW71B over the time period these wells were sampled.

Response: The concentration plots are provided in Appendix H and Figure 2.7 and described in Section 2.1.2

13. The application does not provide sufficient information on the geochemical model employed.

DISCUSSION: The application states that the MINTEQ database was used in the simulation (page B3-1). The elements and compounds in the MINTEQ database interacting with the surface complex (sorbing site) are H, Zn, Cd, Cu, Be, Ni, Pb, Ca, Ba, SO_4, PO_4, H_3AsO_3, H_3AsO_4, and H_3BO_3. However, the regulated constituents are **As, Be, Ni**, Se, natural U, Ra-226, Ra-228, Th-230, **Pb-210**, gross alpha, Cl, **SO_4**, and total dissolved solids (TDS) (elements in bold type are included in the MINTEQ database). The MINTEQ database doesn't include reactions that sorb the regulated constituents, selenium, natural uranium, radium, thorium, gross alpha (which includes Ra-226, Th-230, Po-218, Po-214, Bi-210, Pa-231, Th-227, Ra-223, Po-215, and Bi-210) chloride, and TDS. If Umetco used the WATEQ4F database, the reactions could sorb selenium and uranium too. Those elements that are not sorbed should be transported unretarded, unless they are involved in precipitation reactions. The report suggests radium and thorium are retarded, but the data were not provided. Because it is unclear which processes are affecting which contaminants in the model, the output files of the PHREEQC code, which can use one of three databases

including MINTEQ and WATEQ4F, are needed to show which processes are effective in attenuating the contaminants.

ACTION NEEDED: Provide the PHREEQC code input and output files for the two simulations and indicate the sources of the thermodynamic data for radium and thorium.

Response: Additional information regarding the geochemical model and the database used is provided in Appendix B and Section 2.2.2. Electronic files containing the PHREEQC data for the two simulations is also included in this submittal.

14. The application does not support the geochemical model using site-specific data.

DISCUSSION: The User Guide to PHREEQC (Parkhurst, 1995) describes some important program limitations that affect the application of geochemical modeling to this site. The "...limitation of the aqueous model is lack of internal consistency in the data in the database. Most of the log K's and enthalpies of reaction have been taken from various literature sources. No systematic attempt has been made to determine the aqueous model that was used to develop the log K's, or whether the aqueous model defined by the current database file is consistent with the original experimental data. The database files provided with the program should be considered to be preliminary. Careful selection of aqueous species and thermodynamic data is left to the users of the program."

For surface complexation, Parkhurst (1995) states, "PHREEQC incorporates the Dzombak and Morel (1990) diffuse double-layer and a non-electrostatic surface-complexation model (Davis and Kent, 1990)." Furthermore, Parkhurst (1995) states that, "Davis and Kent (1990) reviewed surface-complexation modeling and note theoretical problems with the standard state for sorbed species. Other uncertainties occur in determining the number of sites, the surface area, the composition of sorbed species, and the appropriate log K's. In many field studies, surface-complexation modeling requires experimental data on material from the study site for appropriate model application."

ACTION NEEDED: Explain why the parameters are adequate or provide site-specific corroboration of the attenuation processes for which credit is taken.

Response: Additional information regarding the geochemical model and the database is provided in Appendix B and Section 2.2.2.

15. The transport model did not consider a range of velocities.

DISCUSSION: The transport model was used to estimate future concentrations of hazardous constituents at the POE. However, the transport model only considered one set of velocity values. This means the same velocity was used to simulate transport from two different impoundments in two different directions and in two different aquifers. Without adequate justification that the analysis is a worst case analysis, a representative (expected) range of velocity values should be modeled to adequately evaluate the effect of parameter uncertainty on concentrations at the POE.

ACTION NEEDED: Either justify that the velocity value represents worst case transport conditions, or consider a representative range of values and calculate corresponding projected concentrations at the POE. It is suggested that the velocities used should be derived from velocities calculated by the ground-water flow code.

Response: A range of groundwater velocities was evaluated in the revised geochemical model, as described in Section 2.2.1, 2.2.2, Appendices B, and C.

16. It is not explained why 250 and 270 years are adequate time periods for projecting impacts at the POE.

DISCUSSION: The transport model simulated concentrations for 250 and 270-year time periods. However, the application does not explain why these are adequate time periods over which to evaluate potential impacts at the POE. In the past, the staff has found it acceptable to project impacts at the POE over a 1,000-year time frame. This is consistent with the design standard of 10 CFR 40, Appendix A, Criterion 6 (1) which states that licensees "*shall close the waste disposal area in accordance with a design which provides reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and at any case, for at least 200 years.*"

ACTION NEEDED: Project impacts at the POE for a 1,000-year period. If a 1,000-year projection does not produce a concentration that is protective of the health and safety of the public at the POE, justify why the 250 and 270-year time projections adequately protect the public. Alternatively, more realistic transport modeling could be used to project impacts at the POE for a 1,000-year period.

Response: The model was revised as described in Section 2.2.2 and Appendix B.

17. The transport model may not over predict mass loading as stated.

DISCUSSION: It is stated in the ACL application that the transport model over predicts the mass loading, because each cell of the model has a thickness of 100 feet. However, aquifer thickness is not a parameter that enters into the transport model code. The code calculates a concentration that is independent of this parameter. In addition, the staff cannot find cross-section data to confirm aquifer thickness at the POE or three-dimensional water quality data on the extent of vertical contamination within either the Upper or Lower Aquifer.

ACTION NEEDED: Adequately support the statement that the transport model over predicts mass loading.

Response: The statement was removed from the document.

18. Gross alpha values should exclude uranium and radon.

DISCUSSION: Gross alpha values should exclude uranium and radon (10 CFR 40, Appendix A, Criterion 5C) and it is not clear that this has been done for the ACL data. The staff can only determine compliance with the ground-water protection standard if uranium and radon were excluded from both baseline and point of compliance (POC) gross alpha analyses.

ACTION NEEDED: Indicate if uranium and radon were excluded from gross alpha analyses used to (1) establish gross alpha ground-water protection standards, and (2) from analyses used to determine compliance with the gross alpha ground-water protection standards. If either of these analyses did not exclude uranium and radon, reevaluate compliance with the ground-water protection standards for gross alpha. If after this comparison, ACLs are still required for gross alpha, then projections of gross alpha concentrations to the POEs should be based on gross alpha values that exclude uranium and radon.

Response: The ACLs for gross alpha presented in the revised analysis exclude uranium as described in Section 4. The data used to determine the ACLs was modified to exclude uranium (Appendix E).

19. Projection of gross alpha values at the POEs.

DISCUSSION: Alternate concentration limits for gross alpha have been proposed for both the A-9 Repository and the Above Grade Tailings Impoundment. However, the transport analysis and, therefore, the exposure analysis does not project and consider gross alpha concentrations at the proposed POEs. Gross alpha is a parameter that reflects the concentrations of whatever alpha emitting radionuclides (excluding uranium and radon) are in the ground water. Therefore, unless the specific concentrations of alpha particle emitting radionuclides are known, geochemical modeling and transport modeling cannot be done. However, gross alpha projections are necessary to evaluate health and safety impacts for this parameter at the POEs.

ACTION NEEDED: Project gross alpha values at the POEs and evaluate the health and safety impacts. It is suggested that the licensee determine the concentration of alpha emitting radionuclides at the POCs, project their concentrations at the proposed POEs, and then calculate a gross alpha value at the proposed POEs.

Response: Gross alpha concentrations at the POE were calculated as described in Section 5.2 of Appendix B.

20. Justify that deep, more reducing portions of the aquifer are not impacted.

DISCUSSION: The application states that in the deep, more reducing portions of the aquifer, ground water is not impacted. Support for this statement comes from page 2 – 7 of the application which references data from wells MW28, MW30, MW70B, and MW71B. However, these wells are not located near either impoundment and we have been unable to

locate cross section and well completion data to confirm the statement that they are located deeper than the Lower Aquifer.

ACTION NEEDED: Provide adequate technical support to justify the interpretation that aquifers beneath the Lower Aquifer that are beneath the impoundments and between the POC and POE have not been impacted by mining solutions.

Response: Data from additional deep completions is described in Section 2.1 and shown in Figure 2.8. Hydrogeologic cross sections are provided in Figure 2.10.

Remediation Alternatives

21. The ACL analysis does not consider the impact of projected solution (*in situ*) mining activities along the southern boundary.

DISCUSSION: Power Resources Inc. plans to conduct uranium solution mining activities within and south of the southern long-term care boundary. This means that several hundred wells will be extracting ground water, if not within the boundary, at least immediately adjacent to it. This activity could change ground-water velocity, and water and rock chemistries. The ACL analysis should consider the impact of projected solution mining activities along the southern boundary of Umetco's proposed long-term care (DOE) area.

ACTION NEEDED: The applicant must include in the ACL analysis the impact of projected solution mining activities along the southern boundary on: (1) monitoring at the POE; (2) ground-water velocities; (3) ground-water flow direction; (4) water chemistry; and (5) future water use at the POE.

Response: An analysis of the ISL operations is provided in Appendix K.

22. The application does not adequately characterize the ambient water quality.

DISCUSSION: In the application, "ambient" water quality is defined as pre-milling and mining impacted water quality. In part based on ambient water quality, it is concluded in the application that it is technically impracticable to restore the ground-water quality to the ground-water protection standards in the license. However, in characterizing the ambient water quality only one time maximum values were used from a variety of locations. Therefore, these values are the worst water concentrations measured and may not be representative of the ambient water quality. In addition, the application does not explain why the wells and springs from which the water quality samples were taken represent ambient values or why POE values were not included. The staff considers that it is more appropriate to compare populations of water quality data to determine if one water quality is the same or different from another water quality.

ACTION NEEDED: Provide an adequate statistical analysis of the data so that ambient water quality is adequately characterized, and provide an acceptable explanation why the

wells and springs used in the ambient water quality data are representative of ambient conditions.

Response: A statistical evaluation of ambient water quality is provided in Appendix A.

23. The application does not contain ground-water contaminant plume maps.

DISCUSSION: The application does not present any ground-water contaminant plume maps for the Upper and Lower Aquifers. These are needed to see if higher levels of ground-water contamination exist in the plume than the ACL concentrations proposed at the POC.

ACTION NEEDED: For each hazardous constituent, present isopleth (contour maps of concentration) separately for the upper and lower aquifer. Isopleth maps should be prepared for enough different time periods so that changes in water chemistry can be evaluated over time.

Response: Groundwater concentration maps are presented in Appendix G and described in Section 2.

ALARA Demonstration

24. Practicable corrective action alternatives are not considered and cost data are not presented for the as low as is reasonably achievable (ALARA) analysis.

DISCUSSION: The ALARA analysis considers ex-situ and *in situ* biological treatment options and passive containment such as slurry walls as corrective action alternatives. All three methods were stated to be ineffective and too costly. Slurry walls are usually used at depths of 10 to 20 feet, whereas the aquifers at the site are found at depths of 100 to 200 feet. Ex-situ biological treatment is not effective for radionuclides and *in situ* biological treatment has not been shown to been effective in precipitation of radionuclides and heavy metals. Therefore, all three of these alternatives do not appear to be realistic for the site and not practical. Alternatives that might be more realistic are selectively cleanup of the more contaminated areas which would reduce the need to set ACL concentrations as high or the use of more wells to effect quicker cleanup of the plume and therefore reduce time contingent costs.

Cost date is not presented for most of the ALARA alternatives. For example, cost and design data is not provided to support the conclusion that use of injection and production well fields is too expensive to use for aquifer cleanup.

ACTION NEEDED: Evaluate practical corrective action alternatives for the ALARA analysis and present cost data information for the corrective action alternatives to support the ALARA analysis conclusions.

Response: This comment will be addressed in a separate submittal.

25. An ALARA demonstration was not done for the A-9 Repository.

DISCUSSION: The application states that an ALARA demonstration was not done for the A-9 Repository, because it is not technically feasible to further reduce radionuclide concentrations for its POC wells. However, water chemistry data is not presented or referenced to support this conclusion. A corrective action that reduced non-radioactive hazardous constituents, but not radioactive constituents might be an appropriate ALARA alternative. This alternative would reduce the need to set ACL concentrations as high as proposed for non-radioactive constituents.

ACTION NEEDED: Supply water chemistry data to demonstrate that corrective actions have reduced the hazardous constituent concentrations in the Above Grade Tailings Impoundment POC wells (MW1 and MW21A), but have not reduced concentrations in the A-9 Repository POC wells (GW7 and GW8). Also, evaluate the effectiveness of the current corrective action program and evaluate other practicable corrective action alternatives for both radionuclide and non-radionuclide hazardous constituents for the A-9 Repository.

Response: This comment will be addressed in a separate submittal.

26. Ore body data is inadequate to support the Upper Aquifer ore body oxidation concept.

DISCUSSION: In the application, it is proposed that uranium concentrations in Upper Aquifer ground-water cannot be reduced by ongoing corrective actions because these corrective actions cause the continued oxidation of uranium ore bodies. To support this contention, the application contains data from ore zones that were found in the A-9 Repository, which was a former open pit uranium mine. However, the A-9 Repository is located above the water table in the Upper Aquifer. Any remaining ore in these bodies is located above the upper aquifer in rock which has not been mined and, therefore, does not support the contention that oxidizing water from previously mined areas is moving through uranium ore bodies in the Upper Aquifer.

ACTION NEEDED: If Umetco wishes to advance the concept that ore body oxidation is preventing restoration of the A-9 Repository, the concept must be adequately supported with ore body and geochemical data.

Response: The ore-body oxidation concept is described in Section 2.1.1 and illustrated on Figures 1-9 through 1-13.

27. Increases in uranium concentrations at the A-9 Repository POC may be caused by contamination from other mill-derived sources.

DISCUSSION: The application states that contamination at the A-9 Repository POC came from: (1) the A-9 repository; (2) the oxidation of uranium ore bodies; and (3) poor water quality in old surface mines. However, from 1960 to 1990 ground-water contamination from the Above Grade Tailings Impoundment moved into the Upper Aquifer as well as the Lower Aquifer. In addition, an acid heap leach operation that operated for 19 years between the two

impoundments and the reverse osmosis residue pond (GHP No. 1) may both have leaked solutions into the Upper Aquifer. Therefore, the Upper Aquifer contaminate plume may cover a larger area than the A-9 Repository and ground-water contamination may be caused by other mill-derived sources. Furthermore, since contamination from these sources would be located in ground-water up gradient from the A-9 Repository, if they contained higher concentrations of hazardous constituents than the proposed ACL values, the proposed ACL values may be exceeded at the A-9 Repository POC wells in the future.

ACTION NEEDED: Provide adequate geochemical support (such as water quality analyses from or near previously mined areas and uranium ore bodies) for the proposition that cleanup at the A-9 Repository is being prevented by the oxidation of uranium ore bodies and from poor water quality in old surface mines. Also, evaluate if up gradient concentrations of hazardous constituents from either ambient or mill-contaminated water could exceed the proposed ACL values for the A-9 Repository.

Response: The basis for the proposed ACLs is described in Section 4, and supporting data are presented in Appendix E.

Hazard Assessment

28. Tailings solution constituent data may not be representative.

DISCUSSION: Page 2-4 of the application refers to Table 2.1 as representing concentrations in the tailings solution. However, the table title says characteristics of tailings placed in the A-9 Repository and the subtitle indicates that the data were collected from the years 1980 through 1982. Since over half the A-9 tailings volume was placed during 1988 through 1990 and the material was from the Riverton Title I site, it is not clear if the Table 2.1 values are representative of the A-9 tailings solution.

ACTION NEEDED: Clarify that the data in Table 2.1 was derived from tailings pore fluid and discuss the impact of the Riverton tailings fluid on these values.

Response: Data in Table 2.1 were derived from tailings and the characteristics of the Riverton tailings is discussed in Section 2.1.2

Environmental Assessment

29. Future environmental impacts on the springs from hazardous and nonhazardous constituents are not considered.

DISCUSSION: The corrective action plans in the present license are required to address contamination from hazardous constituents. However, a result of the corrective actions is that non-hazardous constituents could degrade the ground water environment. Three springs (e.g. Medicine Spring, Lincoln Spring, and Iron Spring) are located west of the Above Grade Tailings Impoundment and discharge water from the Lower Aquifer. Water from the springs is used for stock watering and presumably by wildlife. However, the application does not

project future impacts on these springs and on ground water use in the local area from hazardous and non-hazardous constituents in the Upper and Lower Aquifers from the Above Grade Tailings Impoundment and from the A-9 Repository. This information is needed to fulfill NRC responsibilities under the National Environmental Policy Act to describe the environmental impacts associated with a federal action (approval of the ACL license amendment request).

ACTION NEEDED: Describe any future impacts on the springs (e.g., water use) from the impoundments, considering any changes to flow velocity required by previous comments. As previously stated, the staff has found a 1,000-year period an adequate length of time to consider impacts.

Response: Future impacts were evaluated as described in Section 2.2.2, Appendices B, and C.

30. The ACL analysis does not describe the changing water quality and water use that will occur at the POE from ground-water parameters that are not regulated by the NRC.

DISCUSSION: The total dissolved solids (TDS) concentrations at both proposed POE wells appears to be in the range of 500 mg/L. However, the TDS content of the water at the POC and beneath and around the two impoundments is in the range of 4,000 to 5,000 mg/L and in the case of one well in the Upper Aquifer, in the 11,000 mg/L range. Some of the constituents that commonly contribute to TDS concentrations are anions which are not readily retarded by rock water interactions. While TDS is not regulated by the NRC at conventional mill tailings sites, it is one measure of suitability for a particular use (i.e., drinking water, wildlife, agricultural, stock). The high TDS concentrations associated with water impacted by the two impoundments imply that water quality at the POE may be significantly degraded by water quality parameters which the NRC does not regulate. If the water quality at the POE is seriously degraded by changes in TDS concentrations, its water use classification may change and will need to be addressed in the environmental assessment.

ACTION NEEDED: Indicate the water quality that will exist at the POE over the period that projected impacts are considered (i.e., transport is modeled) in the revised ACL analysis.

Response: Additional modeling was performed in the revised ACL analysis to evaluate concentrations of non-hazardous constituents at the POE over the period of projected impacts as described in Section 2.2.2.7 and Appendix C. Also, discussion regarding ambient water quality and the resulting water use classification is presented in Appendix A and Section 2.3.

Exposure Assessment

31. POE water quality data may not support the "Stockman" scenario.

DISCUSSION: The water quality data submitted for the proposed POEs in the application are one time maximum values for hazardous constituents measured at the POCs and may not

be representative of the water quality at the POEs (e.g., data in the 1999 annual report). Also, isopleth (contour) maps of TDS concentrations indicate that the concentrations at the POE may be near 500 mg/L, which is the point at which water quality is usually considered to be suitable for either drinking water or agricultural use. Therefore, the present water quality at the proposed POEs may not support the interpretation that the water is suitable only for stock water use, an important assumption of the ACL exposure assessment.

ACTION NEEDED: Submit enough water quality data collected at the proposed POEs, along with appropriate statistics (mean, standard deviation, maximum value, and minimum value) to adequately represent the water quality at the POEs and to determine short-term water use.

Response: The exposure assessment has been modified based on the results of the geochemical modeling and the statistical background analysis as described in Section 2.3. This comment is no longer relevant because a stockman scenario is not used. However, it should be noted that although TDS values in the closest well to the POE (MW77) may be below Class III standards, radium values exceed the Class III standard (Tables 2.10 and 2.11 and Appendix A). Exceedence of a standard by a single constituent drives the classification of groundwater.

32. The likelihood of residents near the site has not been adequately addressed.

DISCUSSION: The exposure assessment should consider the likelihood of a ranch family living near the site boundary in the reasonably foreseeable future.

ACTION NEEDED: Justify the lack of consideration of a ranch family in the exposure assessment (e.g., why is the site area different than the ranch area 8 miles away) or provide the assessment for that scenario.

Response: This comment is no longer relevant because constituent concentrations are below background at the POEs (thereby precluding the need for a quantitative analysis of exposure and risks as demonstrated in Sections 2.2, 2.3, Appendices A, and B).

33. Not all the values in the dose calculations appear to be reasonably conservative.

DISCUSSION: The forage/fodder intake value for beef cattle is 68 kg/d in the RESRAD code and NRC (1998) indicates that 12 kg/d dry-wt (74 kg/d wet-wt) is acceptable, but Table D.4 indicates that 6 kg/d was used in the Umetco calculation. Also, page D3-4 says the annual dose was calculated from the risk-based levels but the risk-based concentration for uranium is 1/10 of the A-9 (southwestern POE) ACL value (2,200 versus 21,664 pCi/L).

Response: This comment is no longer relevant because constituent concentrations are below background at the POEs (thereby precluding the need for a quantitative analysis of exposure and risks as demonstrated in Sections 2.2, 2.3, Appendices A, and B).

ACTION NEEDED: If the forage intake value in Table D.4 is a typographical error, indicate the value used in the calculation, otherwise, justify the use of the value. Also, indicate why the southwestern ACL value for uranium was not used in the dose calculation.

34. The 100 mrem/yr estimated dose based on a 2-week exposure just from water contamination pathways is not acceptable.

DISCUSSION: A decommissioned site would not be approved for license termination if it, as the Umetco site could, potentially contribute to an above background dose from residual radionuclides in both soil and water that could approach or exceed 100 mrem/yr.

ACTION NEEDED: Demonstrate that reasonably conservative assumptions and values would result in an acceptable dose estimate for all likely land-use scenarios.

Response: As described in Section 2.3 the modeled radionuclide concentrations at the POE are indistinguishable from background. Supporting data are provided in Section 2.2.2, Appendices A, and B. Since no incremental risk to human health or the environments exists, a quantitative exposure assessment is no longer applicable.