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MOLYCORP

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Mr. LeRoy S. Person
Project Manager
US Nuclear Regulatory Commission
Low Level Waste and Decommissioning
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and
Safeguards
Washington, DC 20555-0001

RE: Response to Comments on Site
Characterization

Dear Mr. Person:

Attached are responses to comments on Molycorp's Washington, PA Site Characterization Report. These comments were prepared with the assistance of our consultant.

Sincerely,

Barbara K. Dankmyer
Resident Manager

Document: **NRC Review of Molycorp Site Characterization Report**

I Hydrogeology

1 Comment: In the chapter on site hydrogeology, Molycorp describes the modeling flow and transport at the site using MODFLOW and MT3D. This code appears to use Kd's as the retardation factors in the contaminant transport model calculations. The Kd's selected for the hazardous metals Cd, Se, and Mo were 6.5, 300, and 20 respectively. These values come from Baes, 1984. Since both selenium and molybdenum can occur as anions, the values chosen could be nonconservative. Please provide the bases for your choice of Kd's for these metals.

Response: Conservative estimates of distribution coefficients for selenium and molybdenum were chosen based upon the reference (Baes, 1984) and are default values used in the TERRA computer code used by the Health and Safety Research Division of Oak Ridge National Laboratory (ORNL). We are aware that the potential for occurrence of these solutes as mobile anions exists and that a wide range of distribution coefficients for the solutes have been reported. In the absence of site specific batch or column sorption studies, we opted for the most universally accepted values available.

2 Comment: The solubility of thorium is strongly dependent on pH and concentration of complexants (Langmuir and Herman, 1980). Analyses of the groundwater does not include constituents needed to calculate thorianite solubilities. The additional constituents that could be measured are phosphate, fluoride, alkalinity, and organic ligands (such as citrate, oxalate, and EDTA). It might be possible to eliminate the need for analyzing all of these constituents if it can be shown through a modeling exercise that varying the value of each of these constituents would not significantly increase the concentration of thorium in the groundwater. Please provide either the measured value of the aforementioned constituents or a sensitivity analysis that demonstrates that

thorium concentrations will not increase with varying concentrations of these constituents.

Response: A sensitivity analysis has been conducted as presented in draft "Simulations of Solute Transport in Groundwater at the Washington, PA Facility." These data indicate a possible range of Kd values from 50 to 50,000 cm^3/g which correspond to groundwater concentrations ranging from the order of 1% to the order of 0.001% of the solid concentration in soil. A tighter range of values would require vadose zone sampling of the thorium pile. However, groundwater sample results from monitoring wells M-10 and MW-29 between Chartiers Creek and the thorium pile indicate concentrations of radionuclides of thorium and radium level below 1 pCi/l and of uranium below 2 pCi/l. Additionally, the thoriated slag pile is the number one priority for removal during site remediation.

3. Comment: Molycorp should determine the radiological background for waters at the site. This is needed to establish a baseline upon which to compare the radiological characteristics of the waters on the site and to trace any potential contamination of the aquifer.

Response: Background data for the natural silty water-table system may be represented by upgradient monitoring well UG-3 which is located above and on the west side of Chartiers Creek from the plant area. The data indicate radionuclides of thorium, radium, and uranium consistently below 2 pCi/l. Heavy metals, e.g., arsenic, cadmium, chromium, cobalt, lead, and nickel show concentrations below 10 µg/l. Molybdenum results are below 100 µg/l. These and additional data are included in Appendix K of the SCR. Additional monitoring wells will likely be provided west of Chartiers Creek during ER investigations later this year, which will provide additional background groundwater quality data

II. Extent and Concentration of Subsurface Soil Contamination

1 Comment: The current methodology in determining thorium concentrations may be acceptable only for identifying and characterizing the approximate location and extent of contamination at the "site characterization" stage of decommissioning. However, a more sensitive method should be employed in determining thorium concentrations at levels less than 25% of the NRC guideline value. This approach is also essential in order to discriminate between affected and unaffected areas as recommended by NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Therefore, prior to final survey, the use of the gamma logging technique will need to be supplemented with soil sampling and laboratory analysis to verify the accuracy of derived soil concentrations.

Response: Gamma logging results are compared to on-site soil analyses in Appendix H of the Site Characterization Report (SCR), 1994. These data suggest that gamma-logging results provide a more accurate contamination depth profile than analytical results from discrete soil samples which are subject to disturbance from drilling and sampling. In addition the sampling area for gamma logging is an approximate one-foot radius versus a one-inch radius for split-spoon sampling. Tables H-1, H-2, and H-3 indicate a good correlation between gamma-logging results for thorium-232 particularly at concentrations below 10 pCi/g. Table H-4 indicates a fair correlation between these two types of results. The strategy for the final survey will be addressed in the Environmental Impact Statement.

2 Comment: Using average soil concentrations (e.g., 50 pCi/g for RESRAD) is not conservative since it neglected certain zones (or areas) within the site that showed much higher concentration. Therefore, the licensee should assume other concentration levels in order to account for potential residence on areas with high thorium concentration. The licensee may assume three source term scenarios in order to account for hot areas at the site. This approach is also useful to

allow for more alternatives for cleanup or remediation of different portions of the site.

Response: Responsive to your comment and suggestion, the site was divided into three general areas or sectors, the northern sector which includes the impoundment area, the area adjacent to the Findlay property and the area due south of the cooling tower; the southwestern sector which is the thorium slag pile located south of Caldwell Avenue; and the southern sector which is the area encompassing the center of Unit 2 also located south of Caldwell Avenue. These areas of contamination were evaluated using three different source terms determined from the gamma logging and borehole data. Additionally, RESRAD calculations were performed for both a no-action alternative and the removal of all contaminated soil and slag material with a concentration exceeding 30 pCi/g from each of the area sectors described above Proceeding in this manner allows for more flexibility in remedies that may be employed to effect site cleanup.

These RESRAD calculations will be provided in the facility's Environmental Report when it is submitted later this year.

3 Comment: Molycorp should model multiple source terms assuming different concentration levels at different portions of the site. Subsequently, the licensee should calculate the dose for the industrial worker and resident farmer at the site (or portion of the site) assuming different alternatives for remediation of the intermediate and high thorium concentrations.

Response: As described above, the site or portions of the site having elevated levels of contamination have been grouped into area sectors for evaluation. The volume of contaminated material with a concentration exceeding 30 pCi/g was determined for each sector The volume of material with a concentration between zero and 30 pCi/g was also determined for each sector. From these data different concentrations and source terms as well as contaminated zone thicknesses were determined for each area sector

The volumes of contaminated material greater than 30 pCi/g and less than 30 pCi/g were combined to obtain a total volume of material for evaluation of the no-action (unstabilized soil) case RESRAD calculations were subsequently performed for both the resident farmer intruder and industrial scenarios. Calculations were repeated for these scenarios assuming a residual volume of contaminated material (and its associated concentration) remaining after excavation and removal of all contaminated material having a concentration exceeding 30 pCi/g. The subject calculations were then repeated for each of the area sectors previously described.

These RESRAD calculations will be included in the Environmental Report when it is submitted later this year.

4. Comment: Please provide the input data for the three dimensional-graphics EARTHVISION systems that provides the basis for your estimate of subsurface concentration volumes.

Response: A copy of the EARTHVISION software was provided previously. A copy of the input data was downloaded on a disk and mailed under separate cover yesterday. The data can also be found in the *Site Characterization Report*, Volume 3, Appendix G.

5 Comment: Molycorp should provide a description of the alternative they would propose considering your conclusion that "Results show that leaving the waste in its present untreated-unstabilized condition in a layer on top of the ground gives a direct exposure and an inhalation that contribute to a total effective dose that exceeds current regulatory standards."

Response: Molycorp has proposed and submitted to the NRC an alternative which involves construction of an engineered disposal cell on a hill near the southwest corner of the Molycorp 55-acre property Contaminated material or zones of contaminated material exceeding 30 pCi/g and the thickness of these zones have been identified and will be excavated so that the site may achieve restricted use

status. The thorium-232 contaminated material will be transported to the hill and encapsulated in the disposal cell. The RESRAD code will be used to determine the soil guideline values and the total effective dose equivalent (TEDE) for the residual material (material will have average concentration less than 30 pCi/g). Details of the subject alternative are contained in "Decommissioning Plan for the Washington, PA Facility" submitted to the NRC in July 1995.