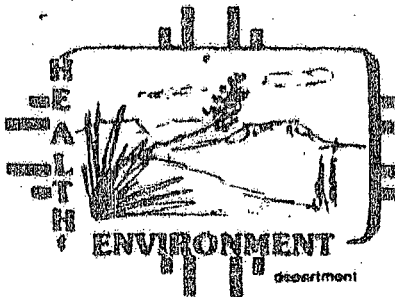


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RADIATION PROTECTION BUREAU

April 25, 1986

Ms. Colleen Kelley
6500 Mineral Drive
Box C-8000
Coeur d'Alene, ID 83814-1931

Dear Ms. Kelley:

We have received and reviewed the analytical results for the samples jointly collected at the Johnny M Mine site last fall, and have reviewed your consultant's report on these results. The following discussion expresses our views on the consultant's report and the results.

Your consultant's report discusses in some depth the many processes that can create a chain of radionuclides that are out of equilibrium with each other. All these processes are geologic processes that occur over geologic time periods, and could have previously affected the equilibrium of the ore before it was mined. The milling process removes only isotopes of uranium, and the secular equilibrium of the remaining isotopes will be essentially unchanged in the tailings. None of the geologic processes mentioned could have measurably altered the equilibrium of the radionuclides in the tailings material during the time the material has been at the Johnny M Mine site. Previous analyses of the ore and tailings have indicated that the Ambrosia Lake ore is not in disequilibrium. Therefore, it is unreasonable to expect disequilibrium between any U-238 decay chain radionuclides except uranium, which, in tailings, should be depleted. If uranium is found to be at secular equilibrium with its daughters, the material may be assumed to be "natural" material and not tailings.

The consultant's report attempted to explain the highly variable ratios between uranium and radium as the result of geologic processes. We do not feel that this is a viable explanation. Your consultant mentioned the apparent discrepancy in the uranium results from the Eberline lab, and mentioned the possibility that the laboratory results could be in error. We have reviewed our radiochemistry results from the Scientific Laboratory Division (SLD) and the results you received from Eberline. The results from Ra-226 from both laboratories agree very well and have an average ratio (Eberline/SLD) of 1.00 excluding the only outlier of 0.03. The results for U-238 and U-235 however, show a large discrepancy between the two labs. Uranium-238 results from Eberline are an average

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of 85 times higher than those from SLD and a factor of 37 higher for U-235.

For a number of reasons, we suspect that the uranium results from Eberline are in error. First, there appears to be no mechanism that could selectively increase U-238 concentrations over Ra-226 concentrations to the degree observed in the results. This is particularly true considering that the material is known to be tailings. Second, Eberline U-238 concentrations for background soils are in the 100 pCi/g range which is clearly above any known concentration for background soils in the area. Third, given the very low percent abundance for U-235 of 0.7%, it is very unlikely to see any soil concentrations above a few pCi/g. Fourth, the radionuclide concentrations in background soils show a high degree of disequilibrium as reported by Eberline.

Another indication that the Eberline uranium results are suspect is the magnitude of the uranium values. Total uranium of 1000 pCi/g is equivalent to approximately 0.14% uranium; this is about the average grade of uranium ore from the Ambrosia Lake District. As analyzed by Eberline, most of the samples are richer (by up to 10 times) than the ore being mined!

We do not disagree with your consultant's point regarding the lack of consistent sampling techniques or map locations. However, it should be remembered that the previous EID sampling or radiation surveys were done to determine whether the licensee's attempts to clean up the contamination, as required by the license, were successful or not. The EID surveys were not intended to accurately quantify the contamination or determine detailed spatial patterns of radionuclides.

A previous contention (concerning the source of the contamination at the mine site) was that the contamination in the soil was from ore or background (non-regulated) sources and not from tailings (licensed) that were left over from the backfill operation. The "signature" of tailings is the depletion of uranium relative to all the other isotopes in the U-238 decay chain. All our analyses of soils from the area in question indicate that uranium is depleted. In addition, all of our gamma spectral data from both sampling periods indicate that U-238 is depleted in soils collected from the cover material at both boreholes but is in equilibrium for background soils. Therefore, we feel that additional analyses of samples would be a waste of resources and would not result in any meaningful insights. The last series of samples has served to further convince us that the contamination around the boreholes is from tailings that were accidentally left and mixed into the cover soil. Therefore, we feel that Helca must make another attempt to clean up the tailings material that unfortunately has been spread over the areas around the two boreholes. We feel that the criteria for determining whether the area has been cleaned up should be based on Radium-226

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* [concentration in the soil and not on gamma readings. This will also be the criteria that the NRC will use (after they assume licensing authority) to determine whether the license may be terminated. For the future, it will be NRC's responsibility to review and approve any proposed plan for cleanup of the site. We stand ready to help the NRC and Hecla in arriving at an acceptable plan.]

If you have any questions on this matter, please feel free to call on either of us.

Sincerely,

Terry Morgan

Terry L. Morgan
Acting Program Manager, ULS/RPB

Jere B. Millard

Jere B. Millard
Radiation Specialist, RPB

TLM/JBM/cvg

cc: Dale Smith, URFO, NRC