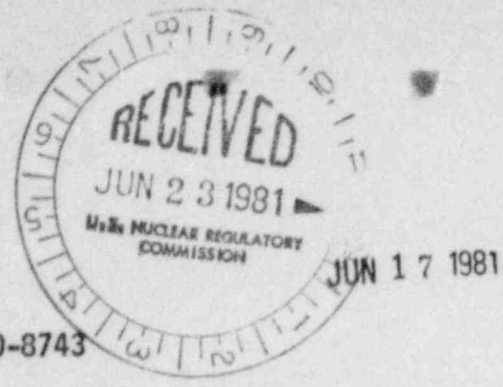


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MEMORANDUM FOR: Tom E. Fleming
New Facilities Section
Uranium Recovery Licensing Branch

THRU: Harry J. Pettengill, Section Leader
Operating Facilities Section II
Uranium Recovery Licensing Branch

FROM: Gregory G. Eadie
Operating Facilities Section II
Uranium Recovery Licensing Branch

SUBJECT: SAND ROCK MILL PROJECT RADIOLOGICAL DATA
DOCKET NO. 40-8743

I have reviewed the radiological data presented in Section 2.10 of Conoco's July 31, 1980 Source Material License Application submittal, and have the following comments. The complete evaluation of the ground and surface water monitoring program as discussed in Sections 2.10.2 and 2.10.3 will be discussed in a separate memorandum.

Section 2.10.1.1 Airborne Particulates

Air particulate sampling was performed at six locations using a continuous, low-volume air sampler. Samples were collected weekly, composited quarterly, and analyzed for uranium, radium-226, thorium-230, and lead-210. The analytical methods used for sample analysis had lower limits of detection (LLD) as recommended in Regulatory Guide 4.14.

Airborne particulate results were given for three calendar quarters for the three on-site air samplers. Data for four calendar quarters was given for an air sampler at the on-site meteorological tower, and at the background location (JIM), and at the nearest receptor (ARC). However, the footnote to Figures 2.10-3 and 2.10-4 indicates that the airborne concentration units are in "pCi/l" - but this must be in error. For example, the radium-226 results at ARC for the 2nd Quarter 1979 were reported as 0.3 pCi/l which is equivalent to 300 pCi/m³, a value which is about 6 orders of magnitude higher than typical background radium-226 airborne concentrations (i.e., 0.0001 pCi/m³ as reported in NCRP Report No. 45).

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Recommendations

The airborne particulate concentration units for the data given in Figures 2.10-3 and 2.10-4 must be corrected. It is recommended that the airborne concentrations be given in units of microcuries per milliliter ($\mu\text{Ci/ml}$). In order to establish the preoperational baseline values, air samples should be collected and analyzed so that at least four calendar quarters of results are obtained for each sampling location.

Section 2.10.1.2 Ambient Radon

Ambient radon measurements were made at the same locations as were used for the airborne particulate sampling. The radon samples were obtained on three consecutive two day intervals every month by using the Tedlar bag method. Analysis for radon was by the Lucas cell-gamma spectroscopy method, with a lower limit of detection of 0.01 pCi/l.

Radon results were reported for 11 months, starting in May 1979 and running through March 1980. Data for the background location (JIM) ranged from an average low value of 0 up to 0.05 pCi/l. Data for the nearest resident (ARC) ranged from an average low value of 0 up to 0.07 pCi/l. Data for the four on-site samplers, irrespective of sampling location, ranged from an average low value of 0 up to 0.23 pCi/l. All reported radon values were typical fluctuations about background radon levels.

Recommendations

Hopefully, radon samples were collected and analyzed during April 1980. This data should be reported so that radon samples are reported for each month for a one year period as recommended in Regulatory Guide 4.14.

Also, the terms "zero", "not detected", "less than the lower limit of detection", or similar terms should never be used. Each reported result should be a value and its associated error estimate, including values less than the lower limit of detection or less than zero.

Section 2.10.4 Direct Environmental Radiation

Direct gamma radiation exposure rates were measured at 148 locations in August 1979 using a pressurized ionization chamber and a portable survey meter. Measurements were taken at 150 meter intervals out to a distance of 1525 meters on two grids centered at the mill site and at the tailings disposal area. The on-site results ranged from 13 to 16 $\mu\text{R/hr}$, averaging

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about 14.3 μ R/hr over the site. These results are typical of background gamma radiation levels in uranium mining areas. Measurements were also made at each of the five air particulate sampling locations; however, this data was not provided on Figure 2.10-7.

Recommendations

Report the August 1979 results of the gamma radiation measurements made at the five air particulate sampling locations.

Continuous passive integrating devices (e.g., TLD) should be used to monitor the direct gamma radiation at the five air particulate sampling locations during the operational radiological monitoring program.

Section 2.10.5 Surface Soils

Forty-three surface soil samples were collected in August 1979. All samples were analyzed for radium-226, with results ranging from 0.10 to 1.86 pCi/g. In addition, 12 locations including the five air particulate sampling locations had soils analyzed for uranium, radium-226, thorium-230, and lead-210 contents. The highest reported soil content, irrespective of any particular sample, were: 5.1 pCi/g for uranium, 3.2 pCi/g for radium-226, 2.7 pCi/g for thorium-230, and 60 pCi/g for lead-210. Except for the high lead-210 of 60 pCi/g at location T-S6, all surface soil sampling results are typical of background contents of the measured radionuclides. The soil sampling procedures, analytical methods and their lower limits of detection are acceptable and consistent with Regulatory Guide 4.14.

Section 2.10.6 Subsurface Soils

Subsurface soil samples were collected in August 1979 at six on-site locations at distances of 763 and 1525 meters in each of four directions from the center of the mill site. The subsurface soils were collected at 30 centimeter intervals down to a depth of 90 centimeters. All samples were analyzed for radium-226, and the highest value reported was 2.4 pCi/g. Two locations also had the subsurface soil analyzed for uranium, thorium-230, and lead-210 content, and the highest reported results were: 3.6 pCi/g for uranium, 3.3 pCi/g for thorium-230, and 3.1 pCi/g for lead-210. All results reported for the subsurface soil sampling are typical of background contents of the measured radionuclides. The subsurface soil sampling procedures, analytical methods and their lower limits of detection are acceptable and consistent with Regulatory Guide 4.14.

Section 2.10.7.1 Terrestrial Vegetation

Samples of four indigenous species of vegetation (clover, composite grasses, sagebrush and aquatic vegetation) were collected in July 1979

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at three locations near the mill site. A second set of vegetation samples was collected in September 1979, and a third set during the summer of 1980. Each sample was analyzed for uranium, radium-226, thorium-230, lead-210 and polonium-210 contents. The highest reported results, irrespective of any particular sample, were: 0.14 pCi/g for uranium, 0.052 pCi/g for radium-226, 0.033 pCi/g for thorium-230, 3.2 pCi/g for lead-210, and 0.41 pCi/g for polonium-210.

Recommendations

The reporting units for the vegetation samples should be given as "pCi/kg-wet weight". Also, the lower limits of detection given in Section 6.1.5.10 should be given in units of "pCi/kg-wet weight".

Section 2.10.7.2 Aquatic Vegetation

Samples of aquatic vegetation were taken from four surface on-site impoundments. Figure 2.10-15 shows only two sampling sites, and results are given for only two samples. The highest reported results, irrespective of any particular sample, were: 0.92 pCi/g for uranium, 0.065 pCi/g for radium-226, 0.20 pCi/g for thorium-230, 1.9 pCi/g for lead-210, and 0.27 pCi/g for polonium-210.

Recommendations

The reporting units for the aquatic vegetation samples should be given as "pCi/kg-wet weight". Also, the lower limits of detection given in Section 6.1.5.10 should be given in units of "pCi/kg-wet weight".

Section 2.10.8 Sediments

Sediment samples were taken during September and October 1979 for each of the five surface streams, and at 13 ponds. The highest reported results, irrespective of any particular sample, were: 4.47 pCi/g-dry weight for uranium, 3.5 pCi/g for radium-226, 2.0 pCi/g for thorium-230, but lead-210 analysis was not completed at the time of report preparation. All reported results are typical of background contents of the measured radionuclides.

Recommendations

Analytical results which were not available at the time of report preparation should be included.

Section 2.10.9 Radon Emanation

Radon flux measurements were made four times during August, September, and October 1979 using two independent procedures--the accumulator

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(drum) method and the charcoal canister method. Radon flux measurements were made at seven locations. Radon flux rates ranged from 0.7 to 9.9 pCi/m²-sec. Six out of the 23 reported measurements were equal to or greater than 2.0 pCi/m²-sec.

Section 2.10.10 Terrestrial Food Pathways

Wheat, sheep, cattle and locally grown vegetables were identified as the only food items found within 5 kilometers of the mill site. The highest reported results for vegetation, irrespective of any particular sample, were: 0.13 pCi/g-dry weight for uranium, 0.20 pCi/g for radium-226, 0.03 pCi/g for thorium-230, 0.02 pCi/g for lead-210, and 0.034 pCi/g for polonium-210. The highest reported results for any meat sample, irrespective of any particular sample, were: 0.78 pCi/g-dry weight, 0.70 pCi/g for radium-226, 0.10 pCi/g for thorium-230, 0.99 pCi/g for lead-210, and 0.30 pCi/g for polonium-210. The food pathways sampling procedure, and analytical methods are acceptable and consistent with Regulatory Guide 4.14.

Recommendations

The reporting units for the food pathway samples should be given in units of "pCi/kg-wet weight". Also, the lower limits of detection given in Section 6.1.5.10 should be given in units of "pCi/kg-wet weight".

Summary

The subject report provides the results of the preoperational radiological monitoring program completed for the Sand Rock Mill Project. The data fulfills the requirements for frequency of sample collection and analysis for the sample types as recommended in Regulatory Guide 4.14. The only deficiency in this report is the apparent error in reporting the airborne particulate results; therefore, the actual corrected values in units of "µCi/ml" should be reported. Also, the units for soil and sediment samples should be given as "pCi/g-dry weight", and the units for food and vegetation should be given as "pCi/kg-wet weight". Results which were not available at the time of report preparation should be reported.

Original Signed By:

Gregory G. Eadie
 Operating Facilities Section II
 Uranium Recovery Licensing Branch
 Division of Waste Management

Approved by: Original Signed By:
 H. J. Pettengill, Section Leader
 Uranium Recovery Licensing Branch
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