



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

PDR

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WMUR:GGE  
Docket No. 40-8602

MEMORANDUM FOR: Jeffrey L. Kotsch  
Operating Facilities Section II  
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: REVIEW OF UNC'S EMP REPORT DATED JANUARY 29, 1980



I have reviewed the "Pre-Operational Radiological Environmental Monitoring Program Report" (dated January 29, 1980) and have the following comments:

Table A - Food

The food sample collection and analysis as reported in Table A are consistent with the recommendations of Regulatory Guide 4.14. The analytical results reported for samples from the two cows and one ewe indicate background levels of uranium decay chain series radionuclides. The highest reported values, irrespective of any particular sample, were: 0.034 pCi/g for uranium, 0.4 pCi/g for Ra-226, 0.11 pCi/g for Th-230, 0.22 pCi/g for Pb-210 and 0.54 pCi/g for Po-210.

Table B - Surface Soil

The surface soil sample collection and analysis as reported in Table B are consistent with the recommendations of Regulatory Guide 4.14. It appears that an error has been made in the column headings on pages 28

and 30 where the correct heading should be "uranium and thorium-230" instead of the headings "radium-226 and lead-210". The analytical results reported for surface soil samples indicate background levels of uranium decay chain series radionuclides. The highest reported values, irrespective of any particular sample, were: 5.5 pCi/g for Ra-226, 4.7 pCi/g for uranium, 5.3 pCi/g for Th-230, and 0.5 pCi/g for Pb-210.

#### Table C - Subsurface Soil

The subsurface soil sample collection and analysis as reported in Table C are consistent with the recommendations of Regulatory Guide 4.14. The analytical results reported for subsurface soil samples indicate background levels of uranium decay chain series radionuclides. The highest reported values, irrespective of any particular sample, were: 4.5 pCi/g for Ra-226, 2.7 pCi/g for uranium, 4.7 pCi/g for Th-230, and 2.2 pCi/g for Pb-210.

#### Table D - Air Particulate

Four high-volume air particulate samplers were operated near the site boundaries with collection periods of about 24 hours every week. Regulatory Guide 4.14 recommends the continuous collection with weekly filter changes and the quarterly compositing and analysis of these weekly samples. Two low-volume air particulate samplers were operated continuously; one sampler was located at the nearest offsite structure downwind of the mill site, and the second sampler was located at a representative background or control station about 15 km SE of the site. Except for a few gaps in the sampling periods, the two low-volume air samplers were operated on a continuous basis with a quarterly composite and analysis of these samples, as recommended in Regulatory Guide 4.14.

The radium-226 analytical results given in Table D are given in units of " $\mu\text{g}/\text{m}^3$ " which for Ra-226 would be equivalent to " $\mu\text{Ci}/\text{m}^3$ " and would represent impossibly high Ra-226 airborne concentrations. Therefore, these Ra-226 units are most likely in error and should be corrected to read " $\text{pCi}/\text{m}^3$ ". Given the correct Ra-226 concentration units (i.e.,  $\text{pCi}/\text{m}^3$ ), the analytical results reported for the air particulate samples as reported in Table D indicate background levels of uranium decay chain series radionuclides. The highest reported air particulate values, irrespective of any particular sample, were:  $0.0061 \text{ pCi}/\text{m}^3$  for Ra-226,  $0.00139 \text{ pCi}/\text{m}^3$  for uranium,  $0.00456 \text{ pCi}/\text{m}^3$  for Th-230, and  $0.0371 \text{ pCi}/\text{m}^3$  for Pb-210.

It is recommended that a summary table be provided which gives the basic data and the annual average for each sampling location. For example, the attached table gives the results of sampling at the nearest residence (i.e., location ASVX5), and a similar format should be used for each sampling location.

Table-Air Particulate Sampling  
Nearest Residence (location ASVX5)

Sampling Period	Ra-226 <sub>3</sub> ( $\text{pCi}/\text{m}^3$ )*	Uranium ( $\text{pCi}/\text{m}^3$ )**	Th-230 <sub>3</sub> ( $\text{pCi}/\text{m}^3$ )	Pb-210 <sub>3</sub> ( $\text{pCi}/\text{m}^3$ )
4th Quarter 1978	7.06E-4	4.76E-4	7.95E-4	0.0212
1st Quarter 1979	5.57E-4	3.59E-4	5.93E-4	p.0211
2nd Quarter 1979	4.66E-4	2.50E-4	3.49E-4	0.0115
3rd Quarter 1979	No Data	2.91E-4	3.36E-4	0.0219
Annual Average	5.76E-4	3.44E-4	5.18E-4	0.0189

\*Ra-226 concentration units of Table D have been corrected to be " $\text{pCi}/\text{m}^3$ ".

\*\*Conversion factor of 0.677 pCi per  $\mu\text{g}$  of uranium - natural.

Table E - Radon

The radon gas sample collection and analysis as reported in Table E are consistent with the recommendations of Regulatory Guide 4.14. Except for four samples (i.e., ASVX2 on 10/6 to 10/8/79 with 6.32 pCi/l, ASVX3 on 11/2 to 11/4/79 with 3.88 pCi/l, ASVX3 on 3/9 to 3/11/79 with 3.55 pCi/l, and ASVX4 on 10/4 to 10/6/79 with 3.59 pCi/l), the analytical results reported for radon gas levels indicate typical fluctuations of radon gas concentrations. All other radon samples reported in Table E were less than the applicable MPC-Table II value (i.e., unrestricted area permissible concentration) of 3 pCi/l. These other results ranged from real values measured at the LLD of about 0.03 pCi/l, up to 2.94 pCi/l; whereas, typical background radon concentrations in non-mining areas are usually less than 1.0 pCi/l.

Table F - Meteorological Data

This basic data should be summarized in a wind rose chart.

Table G - Vegetation

Vegetation samples were collected three times at each of the four high-volume air particulate sampling locations, and two times at the two low-volume air particulate sampling locations. Therefore, this vegetation sample collection and analysis as reported in Table G are consistent with the recommendations of Regulatory Guide 4.14. The analytical results reported for the vegetation samples indicate background levels of uranium decay chain series radionuclides. The highest reported values, irrespective of any particular sample, were: 600 pCi/kg for Ra-226, 1400 pCi/kg for uranium, 800 pCi/kg for Th-230, 900 pCi/kg for Pb-210, and 1000 pCi/kg for Po-210.

Table I - Gamma Exposure Survey

The gamma exposure rate survey as reported in Table I is consistent with the recommendations of Regulatory Guide 4.14. The gamma exposure rates which were reported as "corrected to PIC" indicate typical fluctuations about background levels for direct gamma radiation. The highest reported value was 22.41  $\mu\text{R/hr}$  as measured at location ASVX2, with the typical value of about 14  $\mu\text{R/hr}$ .

Table J - Sediment

Sediment samples were taken at the surface water sampling sites, and this collection and analysis as reported in Table J are consistent with the recommendations in Regulatory Guide 4.14. The analytical results reported for the sediment samples indicate levels of uranium decay chain series radionuclides typical of a uranium ore mining region. The highest reported values, irrespective of any particular sample, were: 5.2 pCi/g for Ra-226, 35.2 pCi/g of uranium, 24 pCi/g of Th-230, and 2.1 pCi/g for Pb-210.

Table K - Radon Flux

The radon flux measurements as reported in Table K are consistent with the recommendations of Regulatory Guide 4.14. The exact units should be provided in the table; however, it has been assumed that the proper units of " $\text{pCi/m}^2\text{-sec}$ " are applicable. Therefore, the analytical results reported for the radon flux measurements indicate typical fluctuations about background values. The highest value reported was 3.55  $\text{pCi/m}^2\text{-sec}$  for sampling location A-10 for the period 9/15 to 9/17/79.



Table L - Topsoil and Overburden

This table represents an extensive radiological and chemical analysis of topsoil and overburden samples collected at 25 sites to depths as deep as 280 feet below the ground surface. The analytical results reported for the topsoil and overburden samples indicate levels of uranium decay chain series radionuclides typical of a uranium ore mining region. The highest reported values, irrespective of any particular sample, were: 210 pCi/g for Ra-226, and 508 pCi/g for uranium. This type of information will be useful for site construction and reclamation activities.

Table M - Ground Water

The complete evaluation of the ground water sampling program as described in this report (i.e., well locations, depth, sampling technique, and results of chemical analyses) will be discussed in a separate memorandum. The discussion below evaluates only the radiological results reported in Table M.

Ground water sampling was conducted at four wells located down gradient of the tailings disposal area, one well used by the licensee for drinking water purposes, one well used for livestock watering purposes, and the remaining 7 wells at various locations to monitor the potential impact of mill operations. The ground water sample collection and analysis as reported in Table M are consistent with the recommendations of Regulatory Guide 4.14. The analytical results reported for the ground water samples indicate background levels of uranium decay chain series radionuclides. The highest reported values, irrespective of any particular sample, were: 3.7 pCi/l for Ra-226, 515 pCi/l for uranium, 10.3 pCi/l for Th-230, 5.6 pCi/l for Pb-210, and 3.2 pCi/l for Po-210.

It is recommended that a summary table be provided for each sampling location giving the sampling date and radiological analysis results, with a separate summary table giving the sampling date and chemical analysis results. Such a reporting format based on sampling site would improve the readability of the report and would expedite the evaluation of data obtained at each specific sampling site.

#### Table 0 - Surface Water

The surface water sample collection and analysis as reported in Table 0 are consistent with the recommendations of Regulatory Guide 4.14. The analytical results reported for the surface water samples indicate background levels of uranium decay chain series radionuclides. The highest reported values, irrespective of any particular sample, were: 5.4 pCi/l for Ra-226, 244 pCi/l for uranium, 1.9 pCi/l for Th-230, 2.9 pCi/l for Pb-210, and 2.6 pCi/l for Po-210.

#### Supplemental Information

The supplemental information regarding sampling equipment, operating procedures, calibration of air samplers, analytical procedures and lower limits of detection appear to be adequate to support a meaningful environmental monitoring program. The Quality Control Program as used at the CDM/Accu-Labs, as described on pages 454 to 465, appears to be adequate to determine the precision, accuracy and consistency of sample analysis necessary for the environmental monitoring program.

Summary

The subject report describes a preoperational environmental monitoring program (EMP) which fulfills the requirements for frequency of sample collection and analysis for each of the sample types as recommended in Regulatory Guide 4.14. The only apparent deficiency in the subject program is that the air particulate sampling at the four site boundary locations (i.e., locations ASVX1, ASVX2, ASVX3 and ASVX4) is being conducted on a 24 hour collection period every six days rather than the recommended continuous air sampling with weekly filter compositing. Therefore, it is recommended that the operational EMP be required to conduct continuous air particulate sampling at all sampling locations (ASVX1 thru 6) with weekly filter change or more frequently as required by dust loading with quarterly composites of such continuous weekly samples.

The effort which the licensee has expended to conduct the radon gas monitoring utilizing the 48 hour collection period for weekly sampling each month is commendable and this particular effort should be continued.

In order to avoid confusion about sampling locations and the reliance on a map of the site vicinity to show such locations, the preferable method of sampling location identification is to provide a written description of the location in the tables rather than using symbols or numbers. Also, the presentation of basic data should be better organized

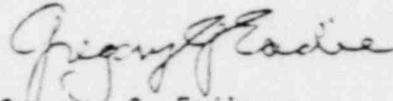


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by providing a summary table for each specific sampling location which lists sequential sampling results rather than the mere reporting of data as in this initial report.



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Approved by:



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Case Closed: 04008602M01E