

40-8905



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION IV

611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

ML16113A390

March 4, 1997

Mr. Bill Ferdinand, Manager
Radiation Safety, Licensing, and
Regulatory Compliance
Quivira Mining Company
6305 Waterford Building, Suite 325
Oklahoma City, Oklahoma 73118

SUBJECT: NRC INSPECTION REPORT 40-8905/97-01

Dear Mr. Ferdinand:

On February 13, 1997, the NRC completed an onsite inspection at your Ambrosia Lake uranium mill facility. The enclosed report presents the results of that inspection. The inspection included a review of your decommissioning activities and your uranium processing operation. The inspection disclosed that the activities at the site have been conducted in accordance with NRC regulations and the conditions of the license. No violations or deviations were identified during the inspection; therefore, no response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room.

Should you have any questions concerning this inspection, please contact Ms. Linda McLean at (817) 860-8116 or Mr. Charles L. Cain at (817) 860-8186.

Sincerely,

A handwritten signature in cursive script that reads "Charles L. Cain".

Charles L. Cain, Acting Director
Division of Nuclear Materials Safety

Docket No.: 40-8905
License No.: SUA-1473

Enclosure:
NRC Inspection Report
40-8905/97-01

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Quivira Mining Company

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cc w/enclosure:

**Terry L. Fletcher, Manager
Quivira Mining Company
Ambrosia Lake Operations
P.O. Box 218
Grants, New Mexico 87020**

**Mr. J. Virgona, Project Manager
U. S. Department of Energy
Grand Junction Project Office
P. O. Box 2567
6425 S. Highway 191
Grand Junction, Colorado 81502**

**Mr. Pat Mackin, Assistant Director
Systems Engineering & Integration
Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road
San Antonio, Texas 78238-5166**

New Mexico Radiation Control Program Director

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ENCLOSURE

**U.S. NUCLEAR REGULATORY COMMISSION
REGION IV**

Docket No.: 40-8905

License No.: SUA-1473

Report No.: 40-8905/97-01

Licensee: Quivira Mining Company

Facility: Ambrosia Lake Facility

Location: McKinley County, New Mexico

Inspection Dates: February 11-13, 1997

Inspector: M. Linda McLean, Senior Health Physicist
Nuclear Materials and Fuel
Cycle/Decommissioning Branch

Approved by: Charles L. Cain, Acting Director
Division of Nuclear Materials Safety

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EXECUTIVE SUMMARY

Ambrosia Lake Facility NRC Inspection Report 40-8905/97-01

This inspection included a review of site status, management organization and controls, site operations, and the licensee's radiation protection, radioactive waste management, and environmental monitoring programs.

Management Organization and Controls

- The site's organization and management controls met the requirements of the license. The site staffing was appropriate for the amount of work in progress at the facility (Section 2).

Operations Review

- Site activities appeared to have been conducted in accordance with applicable license and regulatory requirements. Site fences were in good condition, and perimeter postings were appropriate. The procedures appeared appropriate for the type of work being performed at the facility (Section 3).

Radiation Protection/Radioactive Waste Management

- The licensee had implemented radiation protection and radioactive waste management programs that met the requirements of 10 CFR Part 20 and conditions of the license. The radiation work permit (RWP) program was considered to be a strong point in the licensee's radiation safety program (Section 4).

Environmental Monitoring

- The licensee's implementation of its environmental monitoring program appeared effective and met applicable regulatory requirements and the conditions of the license (Section 5).
- An inspection followup item was opened involving the increase concentrations of the radionuclide Th-230 at the mill diversion environmental sample station.

Report Details

1 Site Status

Quivira Mining Company's Ambrosia Lake facility's conventional mill operations have been in standby since 1985. However, the licensee continues to produce yellowcake by extracting uranium from mine water. Reclamation activities during this inspection period involved cleaning up the remaining windblown areas, placement of the final radon barrier on two tailings impoundments, and the placement of rock cover on Impoundment 1 to provide erosion protection.

In addition, the licensee conducted radon flux measurements on both impoundments in 1996. Impoundment 1 contains approximately 30 million tons of mill tailings and covers 263 acres. Impoundment 2 contains about 3 million tons of tailings and covers 78 acres. The Ambrosia Lake facility also has six unlined ponds and twelve lined ponds on site.

Eight ion exchange columns were used to recover uranium from the water of five mines owned by the licensee. Two new ion exchange columns were installed in the uranium production area in 1996 but were not yet in use. Approximately 17,000 pounds of yellowcake slurry were produced monthly from this operation.

The licensee employed 33 workers and had a round-the-clock operating schedule. Site security was provided by a contract organization.

2 Management Organization and Controls (88005)

2.1 Inspection Scope

The organizational structure was reviewed to ensure that the licensee had established an organization with defined responsibilities and functions.

2.2 Observations and Findings

Site staffing requirements are established in License Condition 10 which incorporates the licensee's submittals by reference. At the time of the inspection, the senior company official located at the site was the general manager. The radiation safety and environmental affairs supervisor (the radiation safety officer [RSO]) reported to the general manager. Two environmental technicians reported to the RSO.

In January 1997, the responsibilities of the industrial safety supervisor were assigned to the RSO. The licensee did not intend to refill the industrial safety position in the near future. The impact of the added responsibility to the RSO was too soon to assess.

2.3 Conclusions

The licensee's organization and management controls met the requirements of the license. The site staffing was appropriate for the amount of work in progress at the facility.

3 **Operations (88020)**

3.1 Inspection Scope

The inspector reviewed licensee operations to determine compliance with applicable requirements specified in the license. Site procedures were reviewed for technical accuracy and applicability to the work in process.

3.2 Observations and Findings

A site tour was performed to verify that site activities were being conducted in accordance with applicable regulations and the conditions of the license. During the tour, fences and gates were observed to be in good condition and were properly posted. In addition, the inspector observed the reclamation activities that had been completed since the last inspection and those that were currently in progress.

During the inspection, heavy earth moving equipment were in operation cleaning up the windblown tailings areas. License Condition 40 requires, in part, that the licensee complete site reclamation in accordance with an approved reclamation plan. In addition, to ensure timely compliance with target completion dates, windblown tailings retrieval is to be completed by July 31, 1997. At the time of the inspection, the licensee was actively pursuing completion of the windblown tailings areas to meet the scheduled completion date.

Quivira is authorized by License Condition 13 to operate mine water uranium recovery treatment facilities at Ambrosia Lake. These facilities included treatment plants at the main facility, at the Section 35-36 area, and the individual ion exchange units located above or underground at the mine sites. Section 35-36 located approximately 4 miles east of the main facility has not been in use since 1991. The ion exchange column at this location has been removed. Other structures remained in a fenced and posted area. The licensee stated that they would eventually dispose of a water tower and the other material in the approved disposal area at the mill site. Quivira does not currently operate any underground mines.

The inspector reviewed several operating procedures required by the license. The procedures were found to be appropriate for the site's operations. The inspector noted that the licensee had performed the annual review of the procedures as required by License Conditions 14 and 16 during January and February 1997.

3.3 Conclusions

Site activities appeared to have been conducted in accordance with applicable license and regulatory requirements. The procedures appeared appropriate for the type of work being performed at the facility.

4 **Radiation Protection (83822) Radioactive Waste Management (88035)**

4.1 Inspection Scope

The purpose of this portion of the inspection effort was to determine if the licensee's radiation safety and radioactive waste management programs were in compliance with requirements established in the license and 10 CFR Part 20 regulations.

4.2 Observations and Findings

A representative sample of records systems related to the radiation safety program were reviewed. Records relating to instrument calibrations, personnel training, employee exposures, and equipment releases was performed, and no oversights in documentation were noted. Calibration records for radiological survey instruments were reviewed, and all instrument calibrations were noted to be current.

a. Personnel Monitoring Programs

License Condition 15 requires the use of RWPs for all for work where the potential for exposure to radioactive materials exists and for which no procedures exist. Several RWPs were issued since the last inspection. The inspector reviewed a representative sample of the RWPs issued since the last inspection and concluded that the RWPs adequately addressed safety hazards involved with the associated activities. During the inspection, one RWP was still active, all others had been completed. The open RWP involved the crushing of used yellowcake barrels. Since it appeared that this activity would become routine, the RSO stated that a procedure would be established for this activity. The procedure for generating, issuing, and controlling RWPs was comprehensive. All RWPs were reviewed and signed by the RSO. The RWP program was well managed and considered to be a strong point in the licensee's radiation safety program.

The licensee's personnel external monitoring program consisted of issuance of thermoluminescent dosimeters (TLDs) to all site employees. The TLDs were being exchanged on a quarterly basis for male workers and monthly for female workers. Monthly badges were provided to female workers to monitor more closely the exposures to potential declared pregnant workers.

A review of dosimetry records indicated that exposures were well within the regulatory limits. For example, the highest total effective dose equivalent recorded during 1996 was 411 millirems, well below the annual 10 CFR 20.1201 limit of 5000 millirems. Based on these results, site workers received less than 10 percent of the occupational dose limit established in 10 CFR 20.1201. Pursuant to 10 CFR 19.13, the licensee provided the personnel monitoring results for 1996 to all individuals monitored for radiation exposure.

The licensee's personnel internal monitoring program consisted of urine bioassays and breathing zone air sampling. Bioassays were performed in conformance with the licensee's bioassay program outlined in the "Health Physics and Environmental Programs Manual." During 1996, 51 samples were collected and analyzed for natural uranium. No sample exceeded the licensee's first action limit of 15 $\mu\text{g/l}$ for natural uranium.

Exposures from radon daughters were calculated using a time weighted average. The highest radon daughter exposure reported in 1996 was 0.3 working level-month. Air sampling for radon daughters was conducted in 7 locations: the mill ion exchange plant, the yellowcake area, the chemistry laboratory, the raffinate building, the general shop, the leach building, and the slurry loading station. The highest weekly concentration in 1996 was 0.05 working levels found in the mill ion exchange plant. The derived air concentration specified in 10 CFR Part 20 is 0.33 working levels.

The licensee monitors for soluble uranium intake from data obtained from the air sampling program. The licensee's weekly intake calculations conservatively assumed continuous occupancy within the area (i.e., 40 hours per week). The licensee reported that the average weekly calculated intake of soluble uranium was 0.2 milligrams per week (mg/wk). The maximum calculated intake for one week during 1996 was 0.64 mg/wk. The limit specified in 10 CFR Part 20 for soluble uranium intake is 10 mg/wk.

b. Annual ALARA Review

10 CFR 20.1101(c) requires that the licensee periodically (at least annually) review the radiation protection program content and implementation. The 1996 ALARA program audit for the Ambrosia Lake facility was conducted by the general manager, the RSO, the mill operations supervisor, and an individual from the industrial relations office on February 3, 1997. The audit involved the review of the 1996 ALARA summary report produced by the RSO. The report, submitted to the NRC by letter dated January 31, 1997, summarized the results of all of the radiation safety program activities during 1996. The inspector found the summary report to be comprehensive. The results of the ALARA program audit was not available for review during the inspection.

c. **Radioactive Waste Management Program**

The licensee is authorized to conduct various disposal activities at the Ambrosia Lake facility: License Condition 30 authorizes disposal of damaged yellowcake drums into tailings pond 2; License Condition 32 authorizes disposal of contaminated waste materials from past milling operations; and License Condition 36 authorizes disposal of byproduct material from their Wyoming in-situ leach facility.

Records relating to the disposal activities were reviewed by the inspector. The records included the quantities and locations of all waste material disposed of at the site. In addition, procedures had been established and implemented for the management of the waste activities. The radioactive waste management program was in compliance with requirements established in the license.

4.3 **Conclusions**

The licensee had implemented radiation protection and radioactive waste management programs that met requirements of 10 CFR Part 20 and the conditions of the license. The RWP program was considered to be a strong point in the licensee's radiation safety program.

5 **Environmental Protection (88045)**

5.1 **Inspection Scope**

The environmental monitoring program at the site was reviewed to assess the effectiveness of the licensee's program and to evaluate the effects, if any, of the site's activities on the local environment.

5.2 **Observations and Findings**

A compliance monitoring program is required to be implemented by License Conditions 10 and 34. Also, the licensee is required by License Conditions 19 and 34.D to submit semiannual reports and an annual program review to the NRC.

The semiannual environmental and effluent report for the first half of 1996 was submitted to the NRC by letter dated August 30, 1996. (The report for the second half of 1996 had not been submitted to the NRC at the time of the inspection.) A review of the report showed that all samples required by the license were obtained and were sampled at the specified time intervals.

The environmental monitoring program in place at the site included air particulate sampling, radon sampling, and measurement of the ambient gamma exposure rates at five sample stations. The licensee sampled for natural uranium, thorium-230 (Th-230), radium-226, and lead-210 particulates.

The licensee reported that the airborne concentration at the mill diversion sample station for the radionuclide Th-230 for the first and second quarter of 1996 was $3.8E-14$ and $5.0E-14$ microcuries per milliliter ($\mu\text{Ci/ml}$), 192 and 200 percent, respectively, of the effluent concentration limit listed in Appendix B of 10 CFR Part 20. The mill diversion sample station was located within the licensee's restricted area north of Pond 9.

The licensee discussed their investigation of the increased concentration in the report, and attributed the high concentration to analytical error. However, a review of previous years' data found that the Th-230 concentration at that sample station has been consistently high. For example, in 1995 the Th-230 results ranged from 10 to 43.8 percent of the effluent concentration. The licensee planned to continue the investigation into the cause of the increased Th-230 concentration at this location.

A groundwater compliance monitoring program is required by License Condition 34. The compliance program consisted, in part, of sampling at compliance wells for a number of chemical and radiological constituents. A review of the licensee's documentation revealed that the licensee had obtained all groundwater samples as required by the license.

Vegetation samples were required to be taken three times per year and were obtained near the five sample stations. The samples were analyzed for natural uranium, Th-230, radium-226, lead-210, and polonium-210. For the first half of 1996, the highest value measured was for the radionuclide Th-230 found at the mill diversion sample station ($6.3E-4$ microcuries per kilogram [$\mu\text{Ci/kg}$]). For the years 1995 and 1994, the results were $1E-4$ $\mu\text{Ci/kg}$ and $8.7E-4$ $\mu\text{Ci/kg}$, respectively.

Soil and sediment sampling were required on an annual basis. Soil samples were taken at the five sample stations, and sediment samples were taken at four creek locations. The samples were analyzed for natural uranium, radium-226, Th-230, and lead-210. The highest soil concentration measured was 24 picocuries per gram (pCi/g) of Th-230 at the mill diversion station. (In comparison with data from previous reports of 10 pCi/g in 1995 and 4 pCi/g in 1994 at the same location.)

Gamma radiation levels were continuously monitored at the five sample station locations using TLDs. Environmental TLDs were exchanged on a quarterly basis. Reported results for the background location was 69.6 millirems for the first half of 1996. The nearest residence location was reported as 68.4 millirems (gross) for the same period.

5.3 Conclusions

The licensee's implementation of its environmental monitoring program appeared effective and met applicable regulatory requirements and the conditions of the license.

Exit Meeting Summary

The inspector presented the inspection results to the site representatives of the licensee at the conclusion of the inspection on February 13, 1997. Licensee representatives acknowledged the findings as presented.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. Fletcher, General Manager
P. Luthiger, Supervisor, Radiation Safety and Environmental Affairs

INSPECTION PROCEDURES USED

IP 88005: Management Organization and Controls
IP 88020: Operations Review
IP 83822: Radiation Protection
IP 88045: Environmental Protection
IP 88035: Radioactive Waste Management

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS USED

RSO	radiation safety officer
RWP	radiation work permit
TLD	thermoluminescent dosimeter