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

JUN 0 8 1979

WMUR:RC
M-15

Colorado Department of Health
ATTN: A. J. Hazle
Director
Radiation and Hazardous Wastes
Control Division
4210 East 11th Avenue
Denver, CO 80220

References:
1. Letter from A. J. Hazle to J. Martin, November 20, 1978.
2. Letter from A. J. Hazle to R Scarano, November 28, 1978.
3. Letter from A. J. Hazle to J. Rothfliesch, November 28, 1978.
4. Letter from A. J. Hazle to R. Cooperstein, March 16, 1978.
5. Letter from K. R. Schendel, Wyoming Mineral Corporation, to R. Cooperstein, April 3, 1979.

Gentlemen:

The NRC staff has reviewed the Wyoming Mineral Corporation's (WMC) radioactive materials license application and environmental report for the Keota Project (a commercial-scale uranium solution extraction activity) in Weld County, Colorado, per References 1-3. We presume, however, from References 4 and 5 that these submittals will be undergoing revision. The staff comments derived from a review of the in-hand submittals are attached. These should nevertheless be useful towards an evaluation of any anticipated revised submittal.

The application and the environmental report reviewed are both too general. Meager site specific and process information are presented precluding a comprehensive review of the environmental impacts and safety aspects of the proposed project. This can be seen from the attached comments and questions developed by the staff. Subsequent submittals should include the following specific data for a proposed commercial-scale project:

1. Subsurface geologic maps and/or cross-sections that depict the local structure and stratigraphy in some detail.

2. A specific description of the vertical sequence of aquifers and aquacludes at the proposed well field area(s). This should coincide with 1.

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3. Baseline water quality analyses of samples from each of the aquifers at the well field and monitor well area(s).

4. A more complete description of the proposed production/injection and monitor well system layout for specific well field areas. Monitor wells should be completed in both aquifers above and below the ore bearing stratum as well as in it. Bases for the selection of monitor well locations should be discussed.

5. A discussion of the possible existence of exploratory boreholes in the production area and the means by which they have been or will be plugged.

6. A discussion of proposed injection/production rates and pressures (quantified).

7. The specific details of the proposed environmental and safety monitoring programs.

8. A more comprehensive description of the proposed restoration program, which should coincide with 3.

9. A specific discussion of proposed site reclamation procedures, the schedule for their initiation, and the projected costs involved re-surety bond(s).

10. A discussion of other possible conflicting land or subsurface uses, e.g., oil, gas or coal production, with the proposed project.

11. A discussion of the status of other Federal or State regulatory requirements.

12. Quantitative discussions of socioeconomic effects and cost-benefits resulting from such a project.

13. A comprehensive discussion of alternatives with regard to processing operations, groundwater quality restoration techniques and waste management.

The applicant's submittals are intended to address a commercial-scale uranium solution extraction project. The text, however, indicates that an experimental approach would be taken in the development of the project. This is not considered to be adequate by the staff. NRC believes that an R&D effort at the site, initially, would be more appropriate and helpful to the applicant in generating needed data for a commercial-scale undertaking.

The objectives of an R&D project would be to (1) determine the potential of economic success of a full-scale project, (2) establish the engineering design of a commercial-scale undertaking, and (3) generate site specific environmental data.

The NRC does not consider initiation of construction for uranium solution extraction activities, e.g., site hydrologic testing and characterization to require a license exemption This consideration, however, would not relieve the applicant of any responsibilties or requirements of Colorado's State regulatory agencies.

If there are any questions on this matter contact me or Dr. R. Cooperstein (301-427-4103) of my staff.

Sincerely,

R. A. Scarano, Section Leader
Uranium Recovery Licensing Branch
Division of Waste Management

Enclosure: As stated

Questions, Clarifications and Comments from NRC Staff
Review of Wyoming Mineral Corporation Source Material
License Application to Colorado Department of Health
Keota Project, Weld County, Colorado. Project M-15

Page 1-2 1. "... The development of the details of the process, the equipment, and the facility is a lengthy reiterative process of engineering design and development. ..." and "... frequent changes and improvements are the rule, not the exception...."

These statements indicate the paucity of details in the application concerning the operating plans and procedures. It reinforces our suggestion that an R&D licensing approach, initially, would be preferable.

Page 2-1 2. "... An initial area of approximately 21,250 acres has been identified for study and evaluation and an area of 1,400 acres has been selected for licensing as the First Mine Unit." Further in the text, it states that the area is "sized to allow flexibility in implementation of the mine plan...."

a. This implies that a 33.2 square mile area would eventually be worked and that a 2.2 square mile area is proposed for this licensing action. A 2.2 square mile well field area is unusually large compared to existing commercial-scale areal operations even at a development rate of 30 acre production units (more than 40 years).

b. Definition of the term "flexibility" is called for.

Page 2-1 3. The applicant states that the initial facility will be situated on a total of about 150 acres. Of this, 80 acres would be used to accommodate a centralized processing plant and ancillary facilities and an initial well field would occupy 30 acres. The purpose for the remaining 40 acres is not specified.

Page 2-1 4. No specific lixiviant is proposed for the project. The vagueness of the statements would inhibit the performance of a necessary full-scale environmental impact evaluation.

Page 2-4 5. "... Final choice of the lixiviant will be made after the first year of operating the Keota facility on a development and demonstration basis."

a. The staff concurs with the applicant that the project should proceed on a development and demonstration basis. However, a smaller (about one acre) rather than a 30 acre well field area should equally serve the purpose with minimal potential environmental impact ensuing from the study. Use of a smaller area would also facilitate and expedite the necessary groundwater quality restoration

condition which NRC and other agreement states where uranium solution extraction activities are being performed require of the licensees.

b. A discussion of the meaning of "development and demonstration basis" is in order.

Page 2-4 6. An elaboration on the intent of the statement that "... some product may be temporarily stored under water in a lined pond prior to packaging." is needed.

7. Discuss the anticipated variations in the quantities to be shipped, the number of shipments to be made and the shipment mode(s) due to production capacity increases from 150,000 lbs/yr to 500,000 lb/yr.

8.a. Discuss the justification(s) for proposing to restore the ammonia level to 20 to 50 ppm in the groundwater after operations are terminated.

b. Describe the procedure(s) to be used to establish the baseline water quality values for the proposed 1400 acre mine unit.

c. Provide the assumptions and calculations made to support the statement that consumption of 50 acre-feet of water for each 10 acres of well field will be required to effect groundwater quality restoration.

d. Estimate the quantity of solid waste/brine that would result from this operation and discuss the proposed management of this solid waste.

Page 2-5 9.a. Estimate the number of ponds planned for each well field area and their areal disposition.

b. Discuss the design of the ponds for a well field area and their sequential management relative to the text.

c Discuss the proposed variations in the operations that will result from increasing the production capacity from 150,000 pounds/year to 250,000 pounds/year, and to 500,000 pounds/year. Include the proposed flow rate capacities, injection rates (pressures), ponding requirements and other related topics in the discussion.

Page 2-6 10.a. Discuss the basis that will be used to select the lixiviant for the operation by 1981.

b. Describe the groundwater quality restoration plans for the lixiviants that will be studied.

c. Provide a more detailed description of how the First Mine Unit of 1400 acres will be subdivided for solution extraction activities

during the initial three year period. Include in the discussion, the proposed plans for obtaining the requisite hydrologic and water quality baseline data for the further well field areas.

d. Describe how groundwater quality restoration and uranium recovery production activities will be performed concurrently in the plant building.

Page 27 11. The management of chemical wastes is discussed on this page.

a. Provide the anticipated radium content in the calcite waste considering the possible lixiviants to be studied.

b. Discuss the potential variation in quantities of waste calcite generation with change(s) in production capacity and the effect on the quantity proposed to be shipped off site (250 tons/year).

Page 3-1 12. The site location and project layout is described but the activities to be located in Township 8 North are not apparent. Provide the proposed plans for Township 8 North for this project.

Page 3-3 13. Indicate the proposed storage area for the recovered uranium product on Figure 3.2 for both the "as drummed" and "underwater" conditions.

Page 3-4 14. The number of samples for radiologic analysis are not considered to be adequate for the First Mine Unit area.

Page 3-76 15. Footnote Figure 3-4 on Table 3-18 should read Figure 3-39.

Page 3-77 16. Table 3-19 lists the averaged water quality parameters for the Keota site. Discuss how these values were established and the continuing preoperational plans.

Page 4-4 17. Provide a plan drawing of the proposed main process building and equipment layout indicating proposed radiological monitoring points.

Page 4-5 18.a. Discuss the status of State permits for sanitary waste management and construction.

b. Furnish the baseline water quality analyses for on site wells that will supply potable, plant and process waters.

c. Estimate the average volumes of water that will be required for each proposed uranium production capacity.

Page 4-11 19.a. Discuss the justification for locating monitor wells at a distance of about 400 feet and trend wells at about 200 feet from

the well field since the rate of groundwater movement was determined to be 1.2 feet/year.

b. Provide a specific proposed well field unit array and control wells layout for the First Mine Unit and/or . initial well field unit(s).

Page 4-19 20.a. Identify the source(s) of the data presented in Table 4-1.

b. Di cuss the variability/non-variability of the values listed in the table for Cl^-, $SO_4^=$, U_3O_8 and Ra-22.

Page 4-23 21. Identify the proposed location of the proposed yellowcake drying facility and discuss its proposed operating characteristics.

Page 4-26 22. Describe the processing steps involved in the preconcentration circuit.

Page 4-30 23.a. Explain why a mean porosity of about 25% is used in Table 4-2 while it is stated on Page 3-63 that porosity measurements of the Keota and Buckingham sands were found to average 35.6% and 39.5% respectively.

b. Provide backup calculations for the values listed in Table 4-2.

c. Discuss why the alkaline-earth process requires less cleaning to maintain injection flow.

d. Discuss the ponding increment requirements (if any) for concurrent groundwater quality restoration requirements.

Page 4-31 24. Cite the reference(s) for the data presented in Table 4-3.

Page 4-35 25.a. Discuss how the quantity of calcite generated will vary with production capacity.

b. It is estimated that less than 2.8 pounds of calcite will be produced per pound of U_3O_8 recovered. Discuss the applicability of this value for each of the contemplated leachants.

Page 4-31 26. Table 4-3 should read Table 4-2.

Page 4-36 27. Solid wastes generated by evaporative concentration of impounded solution and their management are discussed. NRC requires licensees to transfer such wastes to a licensed mill tailings pile rather than permitting on site burial. Shipments of such solid waste should be made on a regular frequency; not when the project's operation is terminated.

Page 5-4 28. Describe the development and field evaluation plans for groundwater quality restoration currently in progress at the proposed site.

Page 5-11 29. Provide the basis for the anticipated Ra-226 concentration (3.28×10^{-8} pCi/yr).

Page 5-16 30. Identify and describe the residence in Section 20 mentioned in Section 5.3.4.

Page 5-23 31. Product storage and transport are mentioned. Discuss

a. The estimated number of shipments to be made annually for the projected production capacities.

b. The proposed mode(s) of product transport.

c. The anticipated average travel distance.

Page 6-1&ff 32.a. Discuss the status of the preoperational monitoring program and describe the details of the proposed operational monitoring program.

b. Discuss the basis for excluding trend well monitoring for excursion detection in the proposed well field monitoring program.

c. Provide a copy of the model used to predict the effect of the proposed solution extraction activities on the Wild Horse Creek groundwater flow as discussed on Page 3-85 & ff.

Page 6-23 33. Discuss the proposed notification plans for the case where a leaking pond is detected and the criteria for requirements for transferring the contents from a leaking pond.

Page 6-28 34.a. Discuss the possible variation(s) of indicators that would result from utilizing the different potential lixiviants.

b. Define the nominal volume of "one bore displacement."

Page 6-31 35.a. Describe the Characteristics of the anticipated evaporation ponds to be used for the groundwater quality restoration of the individual well field units.

b. Provide a discussion to show that sufficient pond capacity to accommodate all waste water produced for excursion control from a production zone will be in place.

c. Discuss the proposed recovery plant flow rate(s) for normal operations at the various production capacities; for

excursion control, and for groundwater quality restoration activities.

Page 7-1 36. Provide the assumptions used and calculations made to support the conclusion that a worst case release from a rupture of a sump or feed and return pipeline would be of the order of 12,000 gallons, that is, the maximum storage tank capacity.

Page 7-9 37. Provide copies of corporate policies and procedures for solving site specific safety problems.

Page 9-9 38. Provide supporting data for the statement "this mining process (ammonium carbonate/bicarbonate leaching) is understood and can be restored to acceptable water quality criteria."

Page 9-11 39. It is stated "as restoration and mining proceed along the roll front, a buffer zone where no mining is taking place is needed between the mining area and restoration area so that no hydraulic coupling of the two operations can occur."

a. Provide a detailed description of the proposed operating plan for this case including estimated pore volumes and areas involved and ancillary facilities, i.e., plant equipment, ponds, etc., that would be required for this case.

b. Described their proposed disposition(s) at the site.

c. Indicate what other commercial sites have successfully completed such operations.

Page 9-16 40. Provide supporting information for the restoration process waste water composition values noted in the text for uranium and radium-226.

Page 9-16 41. Indicate the area(s) of the Keota site for which premining groundwater quality analyses have been performed.

Page 9-16 42. Discuss the basis for the claim that approximately 50 acre-feet of water will be committed due to groundwater quality restoration for each 10 acres of mining well field worked.

Page 9-18 43.a. Provide water quality data for the water removed in this restoration process and discuss its acceptability for irrigational use.

b. Provide an estimate of the number of pore volumes that will be removed to effect restoration of the groundwater quality for its premining use.

c. Estimate the costs to be incurred by use of this water quality restoration technique.

d. Describe the ponding requirements expected for this technique.