UNITED STATES

NUCLEAR REGULATORY COMMISSION

REGION IV

URANIUM RECOVERY FIELD OFFICE
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DENVER, COLORADO 80225

NOV 04 1992

URFO:CDMC
Docket No. 40-8905
04008905680E

MEMORANDUM FOR: File No. 40-8905

FROM: Cynthia D. Miller-Corbett, Project Manager

SUBJECT: QUIVIRA MINING COMPANY, AMBROSIA LAKE FACILITY: REVIEW of CORRECTIVE ACTION PLAN FOR CONFORMANCE WITH 10 CFR 4., APPENDIX A

INTRODUCTION

The corrective action plan (CAP) at the Quivira Mining Company mill, McKinley County, New Mexico, comprises recovery and disposal of seepage-bearing mine discharge from three strata. These are the surficial alluvium (Qal), the Tres Hermanos B (THB), and the Dakota Sandstone (Kd). Presently, the licensee disposes of the recovered mine discharge under an NPDES permit to a site channel which is constructed in the Qal. The discharge, that includes some monitored ground-water constituents at levels which exceed ground-water protection standards (GWPs), could act as a source of recharge to the Qal and the underlying THB and Kd, since they are hydraulically connected. The discharge, however, meets all NPDES requirements.

Recognition of the potential negative impact of this discharge method upon the referenced strata has prompted our office to review the CAP at the millsite to determine if the plan meets the objective of 10 CFR Part 40, Apperdix A, which is to return ground water to site standards. The following evaluation of the possible impact of seepage-bearing mine discharge on the referenced strata is based on the licensee's response to NRC's requests for information included in letters dated March 5, and July 7, 1992.

RESPONSE TO REQUEST FOR INFORMATION

By letters dated May 20, and August 7, 1992, the licensee submitted (a) a quantitative approach to estimating the contribution of seepage from the THB

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and Kd to the surface discharge volume, (b) a description of prior and current use of these strata as a water supply source, and (c) sufficient ground-water quality data to characterize the extent of impact from discharge of recovered seepage to the Qal, THB, and Kd strata.

Seepage Volume and Ground-Water Quality

The licensee has shown that the seepage-bearing ground-water from the THB and Kd contributes approximately 2.5 percent of the total volume of ground water recovered from the site mines. This is based on the licensee's estimate of ground-water flow which was determined using the maximum calculations for hydraulic conductivity and transmissivity for both strata. A comparison of the maximum and the average values for these properties, as well as the resultant ground-water flow rates is presented in Table 1.

Table 1. Hydrologic Properties of THB and KD Strata

SEEPAGE-BEARING STRATA	HYDRAULIC CONDUCTIVITY: $k_{average}$ (ft/day)	HYDRAULIC CONDUCTIVITY: k_{max} (ft/day)	TRANSMISSIVITY $T_{average}$ (gal/day/ft)	TRANSMISSIVITY T_{max} (gal/day/ft)	FLOWRATE: Minimum: Maximum (gpm)
Dakota Sandstone	0.1	0.84	12	100	3:26
Tres Hermanos B	0.05	0.43	4.1	35	0.7:6

In using the maximum values for hydraulic conductivity and transmissivity to estimate the flow rate of seepage from the THB and KD strata, the licensee has estimated the maximum possible contribution from these strata to the total volume of mine discharge; therefore, the estimated contribution of 2.5 percent may actually be high. If the average flow rate is employed, the contribution from seepage through the THB and Kd is less than 1 percent.

A tabulation of ground-water quality data reflecting the average concentration of hazardous constituents in samples from monitor wells and vent hole seepage is included as Table 2. The quality of NPDES discharge and GWPs are also included.

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Table 2. Water Quality and Ground-Water Protection Standards

DATA SOURCE	Gross Alpha (pCi/l)	Molybdenum (mg/l)	Pb-210 (pCi/l)	Selenium (mg/l)	Th-230 (pCi/l)	Uranium (mg/l)
NPDES	504	0.37	1.7	0.04	0.5	0.02
Qal:GWPS	57	0.06	4.9	0.05	5.1	0.06
Qal: Wells	152	0.06	8.2	0.02	2.2	0.18
THB:GWPS	21	0.08	0.9	0.04	2.2	0.02
THB: Wells	47	0.07	8.27	0.002	1.5	0.03
THB:Venthole	193	0.03	138	0.05	0.78	0.04
Kd:GWPS	56	0.06	1.9	0.04	2.3	0.02
Kd: Wells	17.5*	0.09	3.89	0.012	0.737*	0.015*
Kd:Venthole	118	0.149	8.5	0.01	0.40	0.057

Note: (a) Venthole seepage data is from licensee submittal dated December 21, 1989; (b) Average of water quality from monitor well analyses submitted with 1991 CAP review; (c) "*" for Kd monitor well data reflects omission of apparent outlier data from monitor well 36-06; and (d) NPDES data from licensee submittal dated August 7, 1992.

Aquifer Use and Impact of Seepage Disposal

Alluvium (Qal)

There is no reported domestic use of Qal ground water in the region of the Ambrosia Lake Facility. In the submittals noted above, the licensee references previous hydrologic reports which conclude that before mining, the Qal was essentially dry, or that any ground water residing in Qal comprises seepage from either the Kermac and Phillips mills, or mine water pumped to the surface from strata deeper than the Qal, THB, or Kd. Therefore, premining water quality data does not exist for the 20 wells constructed along the NPDES channel, and it is not possible to compare premining and post mining ground-water quality data to determine the impact of mining or milling activities upon the Qal.

Qal monitor wells MW 32-59 and MW 5-03 are within 320 feet of each other and equidistant from the NPDES channel. The ground water from MW 5-03 is relatively good, but ground-water data from MW 32-59 shows elevated concentrations of hazardous constituent.. Monitor well MW 24, located approximately 1 mile further downstream from other Qal monitor wells includes some of the highest concentrations of monitored hazardous constituents; this is converse to what one expects if ground-water quality is a function of NPDES discharge. If the quality is a result of surface discharge, there should be

an attenuation of hazardous constituent concentrations with an increase in distance from the NPDES outfall. The lack of correlation between the position of Qal monitor wells and hazardous constituent concentrations, as well as the observation that concentrations of several hazardous constituents is higher in Qal monitor well samples than in NPDES discharge (Table 2) indicates the quality of Qal ground water is probably due to previous site activities; it appears that Qal ground-water quality is not a consequence of NPDES discharge.

Tres Hermanos B (THB)

The THB is characterized as a tight formation that is unable to produce water at a useable rate, and no domestic or potable water wells have been constructed in the THB prior or subsequent to mining and milling. Water quality monitoring of the THB at the mill site began with commencement of mine and mill activity. Therefore, there is no data base for comparing premining ground-water quality with ground-water quality resulting from site activities.

Monitor well sample data for nine THB wells (see Discharge Plan-169 Annual Report, dated May 11, 1992) were reviewed to determine trends in hazardous constituent concentrations. The following observations indicate the ground-water quality in these wells may be due to previous mining and milling activities, and not the result of recovered seepage discharge:

A. Samples from the three monitor wells in Section 36, located upgradient and furthest from the NPDES channel, show some of the highest values for concentrations of Lead-210. Data from venthole 19-2, located more than a mile north of the channel, show higher Lead-210 concentrations than for several of the wells located proximal to the channel. Furthermore, MW 31-02, located upgradient and further from the channel than MW 31-66, MW 31-67, MW 31-62, and MW 32-64, has the highest Lead-210 concentration of all these wells.

B. The Molybdenum concentration is higher in ground-water samples from two of the three Section 36 monitor wells than it is for samples from monitor wells located proximal to the discharge channel.

C. Concentrations for Gross Alpha and Uranium are higher at MW 31-02, located upgradient and at a greater distance from the discharge channel, than the concentrations at the other four wells located relatively close to the channel.

D. For the five wells proximal to the discharge channel, there is no uniformity in the distribution for high concentrations of monitored constituents; one monitor well sample may show a very high concentration for one ground-water constituent, but then it will have a relatively low concentration for another.

Ground-water quality data from THB monitor well and venthole seepage analyses (Table 2) reveal that ground water from the monitor wells is usually comparable or better than recovered venthole seepage. This suggests that the quality of THB seepage is due to incorporation of minerals (hazardous constituents) during migration of seepage through abandoned mine workings. Although the incorporation of hazardous constituents from mine workings appears to degrade the quality of THB seepage, given the low yield of THB monitor wells (refer to licensee submittal dated March, 30, 1990), collection of venthole seepage is a viable CAP for the THB. Moreover, it may work to improve the THB ground water.

Dakota Sandstone (Kd)

The licensee notes there is little recorded information concerning the water-bearing properties of the Kd, suggesting the Kd is not used as a water supply. In their September, 1987, submittal, the licensee states that the Kd outcrops proximal and to the southwest of the Ambrosia Lake Facility, indicating position of the zero saturation line to the southwest. To the northeast of this zone, there is only a few feet of saturation at the bottom of the Kd, indicating the strata have been dewatered as a result of drainage to mines. In the licensee's September 1986 submittal, the licensee states that monitor wells are difficult to construct because of the small amount of aquifer water. This characterization of the Kd suggests it is unlikely that the Kd would be used as a ground-water supply.

The licensee has compared the Kd monitor well data for two Kd wells (located downdip of the NPDES channel) and NPDES water quality data to demonstrate the quality of Kd ground-water is a not impacted by NPDES discharge. At monitor wells MW 5-02 and MW 32-52, the concentration of Th-230 is 2.4 and 4.2 pCi/l, respectively. This compares with a lower concentration of 1.7 pCi/l for NPDES discharge. If Kd ground-water quality was a function of NPDES discharge, one would expect that the concentration of Th-230 in the surface discharge would be equal to or greater than that of the formation.

Review of Kd monitor well and recovered seepage data (Table 2) reveals that for other hazardous constituents, the concentrations in monitor well samples is commonly less than the concentration of these same constituents in NPDES discharge and venthole seepage. These observations suggest the water quality of recovered seepage is influenced by incorporation of hazardous constituents during migration through abandoned mine workings. This raises the question as to whether collection of venthole seepage is an appropriate CAP alternative; however, considering the low yield at monitor wells (refer to licensee submittal dated March 30, 1990), seepage recovery from ventholes is the best method for collection of contaminated Kd ground-water.

CONCLUSION

Based on an evaluation of (a) the negligible contribution of Kd and THB seepage to the total volume of recovered mine water discharge, (b) the observation that neither the Qal, THB, or Kd provide a ground-water supply, and (c) the lack of data to verify the negative impact of THB- and Kd-bearing mine discharge to ground-water quality, it is concluded that the disposal method for recovered THB and Kd seepage is in conformance with 10 CFR Part 40.

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