SAND FILL PROPOSAL

at

JOHNNY M MINE, McKINLEY COUNTY, NEW MEXICO

by

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Introduction

This report, to be included with other data requested by the New Mexico Environmental Improvement Agency, describes geologic conditions pertaining to Ranchers' proposed backfill project in the Johnny M Mine.

Location

The Johnny M Mine is located in the Grants Mineral Belt of McKinley County, New Mexico, and the property includes all of Section 7 and the East One-half of Section 18, Township 13 North, Range 8 West, N.M.P.M.

General Geology of the District

The attached stratigraphic chart shows the age, thickness and lithologic characteristics of those geologic formations in proximity to the host sands of the Johnny M Mine.

The host formation for the Johnny M ores is the Morrison formation of Jurassic age. Underlying the Morrison formation is the Bluff sandstone of Jurassic age, and overlying the Morrison formation is the Dakota sandstone of Cretaceous age. Other important formations at the property not shown on the attached chart include the Mancos shale, which immediately overlies the Dakota formation, and the Gallup sandstone, which overlies the Mancos shale and outcrops near the shaft collar. Both of these formations are of Cretaceous age. Details of the host formation follow.

Local Geology of the Morrison Formation

As shown in the attached chart, the Morrison formation consists of three Members in this area. The upper Member consists dominantly of green bentonitic shales and is termed the Brushy Basin Member. The middle unit contains alternating shale and sandstone beds and is termed the Westwater Member. The lower unit consists dominantly of red shales and has been named the Recapture Member.

Ore at the Johnny M Mine occurs only in sandstone host rock and is limited to two general horizons. The upper host sand is locally termed the Poison Canyon Tongue of the Westwater member of the Morrison formation. It occurs in the Brushy Basin shale member about 25 feet above the main Westwater member. The lower ore occurs near the top of the Westwater member.

Answers to specific questions concerning water flow patterns and rates through the back-filled areas and acquifers above and below the sand-filled stopes will be given below.

Phreatic Water

The host sands were water-saturated when encountered underground but were drained via drain holes and mine workings. The drain holes ran water for six to ten weeks. Once drained, the sands do not produce additional water, suggesting that the sand units are not connected to either vadose or phreatic water sources. Since the ore bodies are below the water table but do not recharge, impervious conditions must surround the ore sands. With no permeable connection with either meteoric water sources or phreatic water sources, there will be no ground water flow through the back-filled stopes. Therefore, there will be no flow pattern or rates to determine.

Underground Leaching

Ranchers has no plans to recirculate mine waters through the back-filled material to leach uranium from the stopes. Our plan is to use a slurry system to emplace sand into dry open stopes. Once the filling has been completed and the fill-water has drained, no additional water will be directed onto the sandfill.

Overlying and Underlying Rock Types

The transmissivity of rock units above and below the Westwater Member (ore host unit) is essentially nil. The Brushy Basin Member which overlies the Westwater is composed of mostly greenish-colored mudstones that contain bentonitic clays. When this unit is encountered in mine workings, it is dry. When it is exposed to water, swelling occurs. Due to the swelling characteristic, the Brushy Basin shale tends to self-seal any fracture or drill hole that permits water contact. Sandstone lenses are present within the Brushy Basin Member but they are encased within the impermeable shale.

The underlying Recapture shale is composed of siltstone and mudstone beds that are low in permeability. The unit does not carry ore and it has not been encountered in the Johnny M stopes and haulageways.

Neither the Brushy Basin nor the Recapture Member can be considered acquifers, since they are essentially dry. They are composed of shales, mudstones and siltstones with negligible or low transmissivity characteristics.

Table 1. *Sequence of stratigraphic units containing uranium deposits in the Ambrosia Lake-Laguna area, New Mexico.*

System	Age	Formation	Thickness (feet)	Character and distribution	Uranium deposits
Cretaceous	Early and Late Cretaceous	Dakota Sandstone	<5-125	Tan to gray, medium-grained quartz sandstone, some interbedded carbonaceous shale and local coal lenses. Local conglomerate-filled scours at base as much as 25 feet deep.	Scattered small deposits, generally near base and closely related to carbonaceous material. A few in Ambrosia Lake district have yielded ore.
		Unconformity			
Jurassic	Late Jurassic	Morrison Formation	0-600	Brushy Basin Member: mostly greenish-gray mudstone and local thick arkosic sandstone units. Contains Poison Canyon sandstone of economic usage near base in Ambrosia Lake district and Jackpile sandstone of economic usage at top in Laguna district. Member is 20-300 feet thick and generally thickens eastward and northward from Ambrosia Lake district.	Sandstone lenses contain many deposits. Very large deposits occur in Jackpile sandstone in Laguna district and large ones occur in Poison Canyon sandstone and other sandstone units in Ambrosia Lake district.
				Westwater Canyon Member: light-brown to gray, poorly sorted, arkosic sandstone [illegible] some interbedded gray mudstone. Intertongues with Brushy Basin Member and thins from maximum of about 300 feet in Ambrosia Lake district to less than 50 feet in the Laguna district where locally absent.	Contains many large deposits in Ambrosia Lake district.
				Recapture Member: distinctive alternating beds of gray sandstone and grayish-red siltstone or mudstone. Beds are a foot to several feet thick. Contact with Bluff Sandstone generally sharp, but intertongues with Westwater Canyon Member. Recapture is less than 50 to more than 200 feet thick.	Contains a few small deposits. One in Laguna district has yielded ore.
		Bluff Sandstone	150-400	Pale-red to pale-brown, fine- to medium-grained sandstone. Forms massive cliffs. Upper part marked by thick sets of large-scale crossbeds; lower part grades down into smaller-scale sets of crossbeds and some flat beds.	Contains no deposits.
		Summerville Formation	90-200	Alternate beds of pale-brown, thin-bedded sandstone and reddish-brown mudstone or siltstone. Sandstone beds thicken in upper part and grade into overlying Bluff Sandstone; at base grades and intertongues with Todilto.	Contains scattered deposits at base, generally where underlying Todilto Limestone is mineralized.
		Todilto Limestone	0-85	Consists of upper gypsum-anhydrite member, exposed only in Laguna district, 0-75 feet thick; and lower limestone member, gray, laminated in lower part and more massive, contains interbedded siltstone in upper part, 5-35 feet thick.	Contains (mostly in Ambrosia Lake district) many small and some fairly large deposits in the limestone member.
		Entrada Sandstone	150-250	Consists of upper unit, 80-250 feet thick, of reddish-orange, fine-grained sandstone with thick sets of large-scale crossbeds and a medial unit, 10-85 feet thick, of red and gray siltstone. In the Laguna district, a lower sandstone unit, 0-30 feet thick, may belong in the Entrada or may be the Wingate Sandstone. Medial unit probably unconformable on Wingate Sandstone in Ambrosia Lake district; lower sandstone unit unconformable on Chinle Formation in Laguna district.	Contains scattered small deposits at top of formation, generally where overlying Todilto Limestone is mineralized. Some have yielded ore.
		Unconformity			
Triassic	Late Triassic	Wingate Sandstone and Chinle Formation		Not described.	