IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Defense Minerals Exploration Administration
Denver Federal Center
Denver, Colorado

October 5, 1956

Memorandum

To: Executive Officer, DMEA Field Team, Region III

From: John F. Shaw
E. M. Harshman

Subject: DMEA Docket 4579 (Uranium), Texas-Zinc Minerals Corporation (Tracts 20 and 22), Navajo County, Arizona

Transmitted herewith are the original and nine copies of a joint examination report on the subject property.

The Texas-Zinc Minerals Corporation proposed to explore for uranium ore in Shinarump sediments by 37,250 feet of non-core and 5,250 feet of core drilling at a total estimated cost of $105,[illegible]37.00.

The examiners conclude, and we concur, that the requested exploration will not result in the discovery of significant uranium deposits.

Denial of the application for exploration assistance, DMEA Docket 4579 is recommended.

John F. Shaw
John F. Shaw
Superintendent of the Denver
Experiment Station

E. M. Harshman
E. M. Harshman
Member, Field Team

Enclosures (10)
EMHarshman:mp

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. Box 360
Grand Junction, Colorado

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DENVER, COLORADO

September 21, 1956

Memorandum

To: Executive Officer, DMEA Field Team, Region III
Through L. N. Harshman
J. F. Shaw

From: J. W. Hasler

Subject: Transmittal of a Geologic portion of a joint engineering and Geologic report. DMEA docket 4379 (uranium), Texas Zinc Minerals Corporation, Monument Valley, Tracts 20 and 22, Navajo County, Arizona.

The Texas Zinc Minerals Corporation applied to the Defense Minerals Exploration Administration for a loan to explore for uranium on tracts 20 and 22 on the Navajo Indian Reservation, Navajo County, Arizona. The application was referred to the field and an examination was made by Carl Bolner, U. S. Bureau of Mines and W. E. Cadzik, U. S. Geological Survey, August 28, 1956.

All the known ore deposits in the Monument Valley area are found in Shinarump sediments that fill channels cut into the upper surface of the underlying Moenkopi formation. Significant uranium deposits appear to fall in an arcuate belt from the Monument No. 2 mine on the east to the Whirlwind mine near the San Juan River on the north. Most of the deposits occur in relatively short discontinuous channels. The subject tracts lie about 8 miles outside the western boundary of the favorable belt in an area where Shinarump channels are long deep scours which are usually barren of mineralization. Recent exploratory drilling on a rather extensive scale by the applicant has verified the unfavorableness of these long deep channels in the vicinity of the applicant's property. It is concluded that the property, therefore, lies in an area where the chances of finding significant uranium deposits are poor and it is recommended that the application for government assistance be denied.

I concur with the conclusions and recommendations of the examining team. The Atomic Energy Commission was contacted relative to the appraisal of the property. Enclosed are the necessary maps for inclusion in a joint report.

The applicant transmitted 5 applications to this office, 4 of which I forwarded to the executive officer. In view of this fact we will retain our copy of the application until further notice.

J. William Hasler

J. William Hasler

JWH/pls

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION III

DMEA 5372

TEXAS-VINE MINERALS CORPORATION

NAVAJO TRIBAL TRACTS NOS. 80 AND 82

NAVAJO COUNTY, ARIZONA

Uranium

Joint Engineering and Geological Report

by

William H. Gnedik, Geologist
Geological Survey

Carl Balser, Mining Engineer
Bureau of Mines

October 5, 1956

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DMEA 4379

TEXAS-ZINC MINERALS CORPORATION
NAVAJO TRIBAL TRACTS NOS. 20 AND 22
NAVAJO COUNTY, ARIZONA

INTRODUCTION AND SUMMARY

Texas-Zinc Minerals Corporation, 628 Rood Avenue, Grand Junction, Colorado, submitted an application to the Defense Minerals Exploration Administration for aid in an exploration project on the Navajo Tribal Tracts Nos. 20 and 22, Navajo County, Arizona. The application, DMEA 4379, requested aid in completing 57,250 feet of non-core drilling and 5,250 feet of core drilling at a total estimated cost of $105,887.

A field examination was made on August 28, 1956, by a team from the Geological Survey and the Bureau of Mines.

The property consists of 1,512 acres of Navajo Tribal land, 8 miles south of Mile Post 197 on the Utah-Arizona border, in Navajo County, Arizona. Its altitude is about 5,850 feet.

The exposed rocks in the vicinity are marine and terrestrial sediments ranging in age from Permian to Jurassic.

All known uranium ore deposits in the Monument Valley area occur in the basal Shinarump member of the Triassic Chinle formation. The Shinarump member caps all of Tract No. 20 and the eastern part of Tract No. 22. The contact with the underlying

Moenkopi formation is a widespread unconformity, marked by deep channels and secure. Uranium ore is generally localized in deposits in the shorter, discontinuous channels and is notably lacking in the long, deep, continuous channels.

Significant uranium deposits in Monument Valley fall in an arcuate belt with a well-defined boundary on the south and west. The applicant's property lies about 8 miles outside of the western edge of this favorable belt.

Recent exploratory drilling on a rather extensive scale has verified the unfavorableness of long, deep channels in the vicinity of the applicant's property.

It is concluded that the subject property lies in an area where the chances of finding significant uranium deposits are poor, and it is recommended that the application for Government assistance be denied.

ACKNOWLEDGMENTS

The examining team was accompanied by Phillip H. Lamberton, geologist for the applicant.

The A. E. C. was consulted before the examination was made.

Memorandums of W. P. Williams and James Pacos have been carefully noted.

LOCATION, TOPOGRAPHY, AND CLIMATE

The two tracts lie about 1 mile apart and 8 miles south of Mile Post 197 on the Utah-Arizona border, in Navajo County, Arizona (figs. 1 and 2).

The area covers a high tableland cut by sharp ravines. Altitudes of Tribal Tracts Nos. 20 and 22 average about 5,850 feet. The main camp is reached from Mexican Hat, Utah, by traveling 35 miles southwest on Utah State Highway No. 47, thence 25 miles northwest over a fair access road. From the main camp, Tribal Tract No. 22 is 14 miles westerly by road. No access road has been built between the main camp and Tribal Tract No. 20. From the main camp it is 114 miles to Blanding, Utah, and 230 miles north to the Denver and Rio Grande Western railroad at Thompson, Utah.

Labor can be obtained from the surrounding Navajo reservation. Light materials and supplies can be purchased at Blanding, and a new uranium mill is being erected by the Texas-Zinc Minerals Corporation at Mexican Hat, Utah. Water for camp use must be hauled from a spring, 10 miles distant. Some pine and pinon trees grow in the area.

The main camp is provided with a 4,000-foot landing strip, suitable for twin-engined planes.

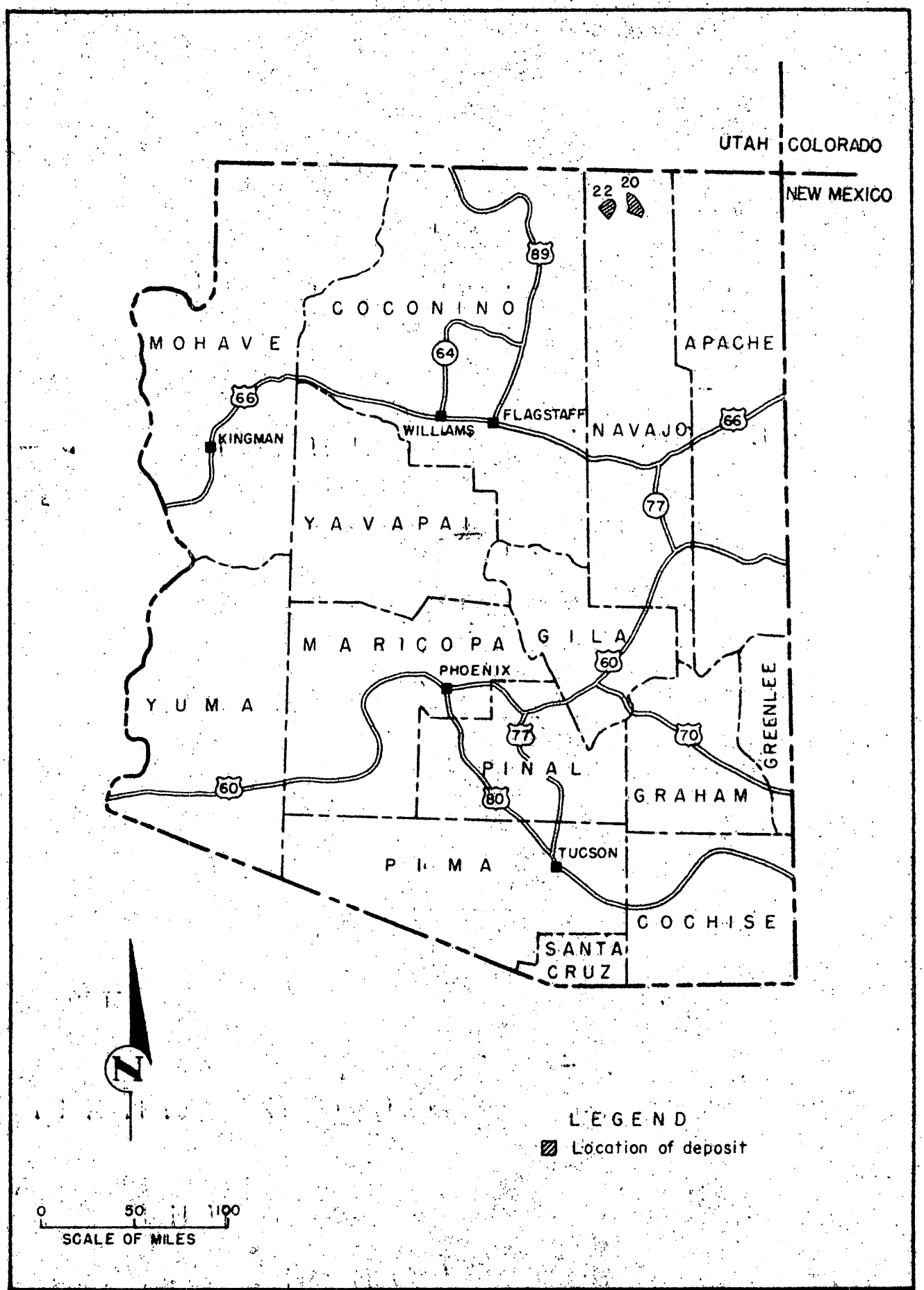

FIGURE 1 - LOCATION MAP, NAVAJO TRIBAL TRACTS NOS. 20 AND 22, TEXAS-ZINC MINERALS CORP., NAVAJO COUNTY, ARIZONA. DMEA 4379

HISTORY AND PRODUCTION

The history of the two tribal tracts as potential uranium areas begins with the exploration permits issued on the tracts on January 24, 1956. As of the date of the examination, Tract No. 22 had not been explored by drilling, but Tract No. 20 had been explored by 86 drill holes, all of which were barren of mineralization. No ore has been found on either tract. However, ore has been found in the Chinle formation, 15 miles to the northwest, east, and southeast in the Monument No. 1, Mitten Nos. 1, 2, and 3, Radium Hill, Taylor-Reid, Delight, Starlight, and Moonlight claims. A total of 43,500 tons containing 0.35 percent U_3O_8 has been mined, and reserves are 340,000 tons, containing 0.31 percent U_3O_8.

OWNERSHIP AND EXTENT

The subject properties consist of Navajo Tribal Tract No. 20, containing approximately 975 acres, and Navajo Tribal Tract No. 22, containing approximately 537 acres. The two tracts are about 4,000 feet apart and 8 miles south of Mile Post 197, on the Utah-Arizona boundary.

Drilling and prospecting permits were issued by the Navajo Tribe to the Nev-Chab-Tex Corporation on Tracts Nos. 20 and 22

on January 24, 1956. The permits are for a period of 18 months and may be extended or transferred only with the consent of the Navajo Tribal Council and the Secretary of the Interior.

It will be noticed that the application is presented by Texas-Zinc Minerals Company while the permits are issued to New-Shat-Tex Corporation.

PRESENT STATUS

Exploration and development

Tract No. 22 is being drilled under contract by the Southern Geophysical Company, Inc., which, at the time of the examination, was using four Mayhew-1,000 drills and had completed 86 holes averaging 225 feet in depth.

The drilling contractors provide a combination cook house, shop, and bunkhouse. The Texas-Zinc Minerals Corporation has a few trailerhouses at the camp.

Mining and milling equipment and other facilities

There is no mining or milling equipment on the property. Tract No. 22 is provided with a number of access and drill roads, and the A. E. C. has constructed a 4,000-foot landing strip, suitable for twin-engine planes, near the main camp. No access roads have been built to Tract No. 20.

GEOLOGY

The rocks exposed in the vicinity of the subject property are marine and terrestrial sediments ranging in age from Permian to Jurassic. Volcanic necks and lamprophyric dikes, probably of Tertiary age, intrude the sedimentary rocks about 15 miles to the east. Quaternary alluvium, dune sand, and landslide debris are present locally but rock exposures on the sides of mesas are generally excellent.

The principal structural feature in the region is a broad, asymmetrical, north-trending fold known as the Monument Upwarp. It extends from the junction of the Green and Colorado Rivers in Utah southward into Monument Valley where it plunges and disappears near Kayenta, Arizona. The upwarp is about 175 miles long and 75 miles wide. The applicant's property lies in an area where the gently dipping western flank of this major fold is interrupted by north-trending subsidiary folds that are also asymmetrical, with steeply dipping eastern flanks and gently dipping western flanks. The dip of the beds on Tract No. 20 is about 2° NW and on Tract No. 22 about 3° SW (fig. 2).

In ascending order, the rocks that crop out in the immediate area of the subject property are the DeChelly sandstone member and Hoskinnini tongue of the Cutler formation of Permian age, the

Moenkopi and Chinle formations of Triassic age, and the Wingate, Kayenta, and Navajo sandstones of Jurassic age.

All known uranium ore deposits in the Monument Valley area occur in the basal Shinarump member of the Triassic Chinle formation. In the vicinity of the subject property, this member has an average thickness of about 100 feet but locally it thickens to as much as 250 feet. It caps all of Tract No. 23 and the eastern part of Tract No. 22. The Shinarump consists predominantly of medium- to coarse-grained fluvial sandstone which locally grades into a coarse conglomerate at the base. Light-brown, gray, and green lenses of claystone and siltstone, a few inches to as much as 8 feet thick and 100 feet long, are commonly present in the upper part of the member. The sandstone and conglomerate beds are crossbedded and lenticular. Most of the fore-set beds dip northwest, indicating a southern source. Pebbles consist of quartz, quartzite, chert, silicified limestone, clay, and sandstone. Sand grains are mostly quartz, feldspar, and mica. Considerable reworked Moenkopi in the form of blocks and particles is found along the bottom and sides of channels. Silicified and carbonized wood is scattered throughout the member as fragments or logs.

The upper contact of the Shinarump is gradational and locally the member intertongues with overlying Chinle beds. The lower contact with the underlying Moenkopi formation is a widespread

unconformity marked by deep channels and scours. The sediments filling the channels are similar to Shinarump sediments outside of channels except for a greater amount of calcite and carbonaceous material included in channel sediments. In the western part of Monument Valley, the Shinarump forms a resistant sandstone ledge that caps many mesas and tends to form steep, cliff-like features as much as 100 feet high which are unscalable for considerable distances. Where the member forms a widespread erosional surface as it does on Tract No. 20, it is extremely irregular and pitted with depressions or ridged with hummocks as much as 20 feet high.

ORE DEPOSITS

In the Monument Valley area all known uranium ore deposits are localized in Shinarump sediments that fill channels cut into the upper surface of the Moenkopi formation. The channels are symmetrical or asymmetrical scours that may be exposed along mesa sides as U-shaped troughs filled with Shinarump sediments bounded by Moenkopi beds and buried beneath overlying Shinarump non-channel sediments. Where erosion has removed the softer Moenkopi siltstone and the overlying Shinarump beds, the more resistant channel fills, crop out as narrow elongate ridges. Although the detailed origin of these channels is in doubt, it appears likely that they are the result of stream erosion of one form or another.

Known channels in the Monument Valley area range in length from a few hundred feet to as much as four miles, range in width from 5 feet to 2,000 or more feet, and are from a few feet to 150 feet deep. Significant ore deposits occur in the shorter discontinuous channels and are notably lacking in the long, deep and continuous channels.

Mineralized rock occurs chiefly as sandstone or conglomerate impregnated with uranium-vanadium minerals. Smaller amounts of these minerals are contained in mudstone pebbles and seams, or replace carbonaceous material. Copper minerals, mostly carbonates and sulfates, are commonly associated with uranium-vanadium minerals but small amounts of chalcocite, bornite, and chalcopyrite also have been found.

Uranium ore is localized in tabular, lenticular deposits near the Shinarump-Moenkopi contact, but in some places mineralized rock is as much as 10 feet above the contact. The origin of the ore and factors that controlled its localization are not known. Apparently carbonaceous material and clay are closely related to localization of uranium in some complex physical and chemical way. However, the spatial relationship between channels and ore deposits is well known. No ore deposits have been found outside of channel sediments in the Monument Valley area; therefore, prospecting and exploratory drilling have been restricted to known channel outcrops.

Significant uranium deposits in Monument Valley fall in an arcuate belt, with a well-defined boundary on the south and west, trending from the Monument No. 2 mine on the east to the Whirlwind mine near the San Juan River on the north. The applicant's property lies about 8 miles outside the western edge of this favorable belt in an area where Shinarump channels are characteristically long deep and continuous scours. These channels are notably barren except for slight showings of uranium and copper mineralization as an efflorescence which probably precipitated from recently circulating ground water. Such efflorescence probably originated from the general uranium content of the Shinarump member and not from buried deposits. Recent exploratory drilling on a rather extensive scale has verified the unfavorableness of some of the large channels on and in the vicinity of the applicant's property. Channels on Tracts Nos. 2, 3, 4, 5, 8, 14, 17, and 25 were intensively explored with discouraging results (fig. 8). The Phillips Petroleum Corporation drilled 64 holes totalling 12,500 feet on Tract No. 17, about 3 miles north of the subject property. Sixty-three holes were drilled in barren ground and one hole reportedly penetrated 3 feet of mineralized rock containing 0.51 percent U_3O_8 by radiometric assay. The applicant is presently carrying out a rather extensive drilling project on Tract No. 20, one of the land tracts included in

this report. By to the time the field examination was made, 86 holes had been drilled. The drilling was confined to a large north-trending channel. No mineralized ground was encountered. The company also drilled a total of 60,000 feet in 477 holes on Tracts Nos. 3, 5, 13, and 14 (Fig. 8). All of the holes were drilled in barren ground. Available drilling data on some of the land tracts in the western part of Monument Valley are summarized below (Fig. 8).

Company	Land tract number	Holes drilled	Footage drilled	Classification of drill holes
Gibraltar Minerals Company	8,23	10	2,400	9 barren; 1 ore
Sunshine Mining Corp.	4,5,13,14	477	60,000	all barren
Rare Metals Corp.	3	184	13,400	all barren
Continental Oil & Monument Exploration	8	38	6,100	all barren
Phillips Petroleum Corp.	17	63	18,500	63 barren; 1 ore

ORE RESERVES

There are no known ore reserves on or near the subject property.

PROPOSED EXPLORATION

The applicant's proposed DMEA project consists of 470 holes requiring an estimated 57,250 feet of non-core drilling and 5,850 feet of core drilling at a total estimated cost of $109,887.

The program is set up in two stages. Stage I drilling, consisting of 38,000 feet of non-core drilling in 400 holes, is designed to delimit Shinarump channels underlying the subject property and to indicate ore bodies if present. The channels would be followed from rim exposures by drilling fences of holes normal to the inferred axial trend of the channels. The fence lines would be 600 feet apart with holes spaced 100 feet apart on the fences.

Proposed Stage II drilling consists of 70 holes requiring 5,250 feet of non-core drilling, and 5,250 feet of core drilling to offset mineralized holes found by Stage I drilling.

The applicant estimates that drill hole depths would average 130 feet for Stage I drilling and 150 feet for Stage II drilling.

The applicant's estimated costs follow:

<u>Individual contracts</u>

37,250 feet non-core drilling at $1.84/ft.	$70,990.00
5,250 feet core drilling at $2.40/ft.	12,600.00
50 hours standby time at $11.50/hr.	575.00
Total individual contracts	$84,165.00

Labor and supervision

1 geologist, 5 mos. at $540/mo.	$ 2,700.00	
1 geologist, 1/2 time, 5 mos. at $300/mo.	1,500.00	
3 geologist-engineer-samplers, 5 mos.	7,250.00	
1 electronic-technician, 5 mos.	2,100.00	
1 draftsman, 1/2 time, 5 mos.	820.00	
Pension plan, etc. 16% of $14,370	2,299.00	
Total labor and supervision		$16,669.00

Operating materials and supplies

Office and drafting supplies, 5 mos. at $75/mo.	375.00
525 core boxes at $1 each	525.00
400 assays at $3.50 each	1,400.00
150 sample bags at $0.40 each	60.00
Gas, oil, tires, etc., 5 mos. at $91/mo.	455.00
Gamma-ray logging unit maintenance, 5 mos. at $65	325.00
Total operating materials and supplies	$ 3,140.00

Operating equipment (rentals)

2-3/4 ton pickup trucks ($5,000) 5/60 of $5,000	416.00
2 Jeeps ($4,200) 5/60 of $4,200	350.00
1 Gamma-ray logging unit ($8,000) 5/60 of $8,000	666.00

1 Office trailer ($2,500) 5/60 of $2,500	$ 208.00	
2 House trailers ($1,900) 5/60 of $1,900	158.00	
Total operating equipment		$ 1,798.00
Rehabilitation and repairs	None	
New buildings, installations, improvements	None	
Miscellaneous	None	
Contingencies	None	
Total estimated cost of project		$105,887.00

CONCLUSIONS AND RECOMMENDATIONS

All known uranium ore deposits in the Monument Valley area are found in Shinarump sediments which fill channels cut into the upper surface of the Moenkopi formation. Significant deposits fall in an arcuate belt extending from the Monument No. 2 mine on the east to the Whirlwind mine, near the San Juan River, on the north. Most of the deposits occur in relatively short, discontinuous channels and are absent in the long continuous ones. The subject property lies about 8 miles outside the western boundary of a favorable belt in an area where Shinarump channels are characteristically long, deep and continuous occurs. The channels in this area are notably barren except for slight

showings of uranium and copper mineralization which probably precipitated from recently circulating ground water. Such mineralization, as an efflorescence, probably originated from the general uranium content of the Chinarump member and not from buried deposits. Recent exploratory drilling on a rather extensive scale has verified the unfavorableness of the long, deep channels on and in the vicinity of the applicant's property.

It is concluded that the subject property lies in an area where the chances of finding uranium deposits of significant size and grade are poor. It is recommended, therefore, that the application for government assistance be denied.

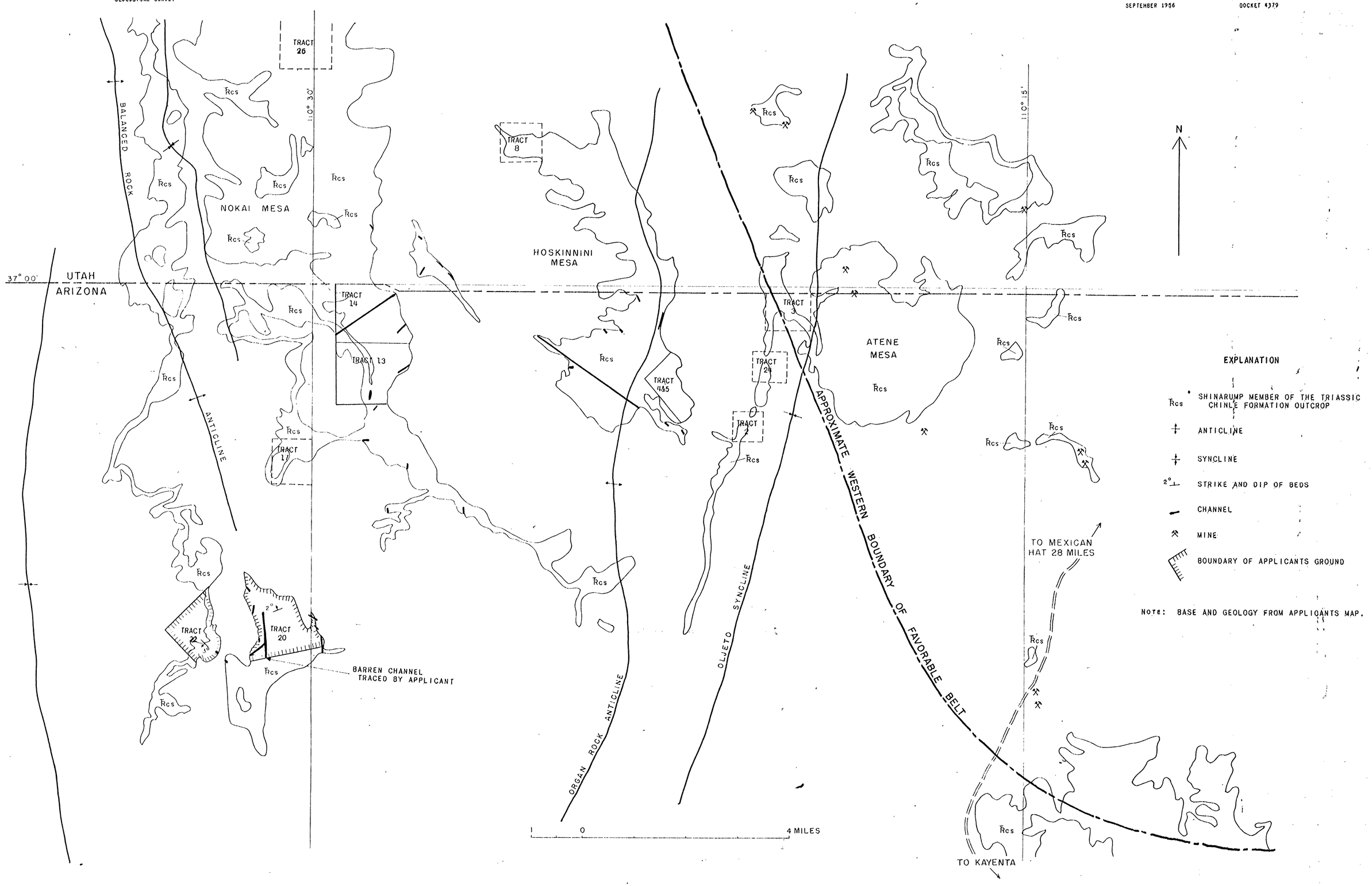

Figure 2.--GEOLOGIC MAP OF PART OF MONUMENT VALLEY SHOWING NAVAJO TRIBAL TRACTS 20 AND 22, TEXAS-ZINC MINERALS CORPORATION, NAVAJO COUNTY, ARIZONA AND SAN JUAN COUNTY, UTAH.