

**THE GEOLOGY, EXPLORATION, AND PRODUCTION HISTORY
OF THE TENT NO. 1 URANIUM-VANADIUM MINE,
SAN JUAN COUNTY, NEW MEXICO**

New Mexico Bureau of Geology and Mineral Resources

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INTRODUCTION

The Tent No. 1 mine was developed adjacent to orebodies that were located in 1953 by drilling by the U.S. Atomic Energy Commission (AEC). The mine, in the Salt Wash Member of the Morrison Formation, produced uranium-vanadium ore in 1955, 1956, 1957 and 1963. This report is part of an ongoing study of the uranium deposits in New Mexico, especially the deposits on King Tutt Mesa, in the eastern Carrizo Mountains, San Juan County.

Location

The Tent No. 1 mine is located on a small mesa, known locally as King Tutt Mesa (Fig.1). The mesa was named after King and Despah G. Tutt who had the homestead and grazing rights. In some reports, etc. the name is spelled Tut, which is incorrect according to Navajo census records. The portal of the Tent No. 1 mine is not shown on the Horse Mesa topographic quadrangle (U.S. Geological Survey, 1982) but the portal of the adjacent Nelson Point mine is shown at 36° 42' 55" north latitude and 109° 02' 00" west longitude. The mesa is a triangular shaped area bordered on the northeast by the canyon of Oak Springs Wash, on the southeast by Blackrock Wash, and on the west by the Red Rock monocline. The mesa is accessible by several dirt roads from the graded road that heads north from Red Rock to Oak Springs and Beclabito (Fig. 1).

Land Status

King Tutt Mesa is located within the Navajo Indian Reservation. Mining permits and leases were issued by the Navajo Tribal Council and approved by the Bureau of Indian Affairs (BIA), U.S. Department of the Interior. Mining permits could be obtained by individual Navajos

only. Permit holders could assign the mining rights to another individual or a company; like the permits, these assignments had to be approved by the Tribal Council and the BIA. Leases could be issued directly by the BIA. Permits were issued for a 2-year period and could be renewed for an additional 2 years. Leases were issued for periods up to 10 years. No more than 960 acres of tribal land could be held by any one company or individual. Both the permittee and the tribe received royalties from ore production. Based on the mine value of the ore, the tribe received between 10 and 20 percent royalties and the permittee between 2 and 5 percent royalties.

In addition to mining permits, the tribe issued drilling and exploration permits. These permits were good for 120 days and were not renewable.

Previous Studies

McLemore and Chenoweth (1997) summarized the uranium-vanadium mining on King Tutt Mesa. Anderson (1981) described the condition (in 1980) of the Tent No. 1 mine in his summary of abandoned uranium mines in New Mexico.

Sources of Information

Most of the information presented in this report was obtained while the author was employed by the U.S. Atomic Energy Commission (AEC) and succeeding agencies: the U.S. Energy Research and Development Administration and the U.S. Department of Energy. Information on the Mining Permits was obtained from the Navajo Tribal Mining Department, Window Rock, Arizona. The author worked on the AEC East Carrizo drilling project in 1953 and last examined the mining operations at the Tent No. 1 in December 1956. Information on

the mining activities, in 1962 and 1963, was obtained from AEC records in the National Archives, Rocky Mountain Region, Denver, Colorado.

GEOLOGIC SETTING

The uranium-vanadium orebodies at the Tent No. 1 mine are located in the Salt Wash Member of the Upper Jurassic Morrison Formation. In the King Tutt Mesa area, the Salt Wash Member is approximately 220 ft thick and consists of gray, fine- to very fine-grained, well rounded, quartz sandstone with interbedded lenses in beds of reddish-brown and greenish-gray mudstone and siltstone. The mudstone and siltstone beds comprise between 5 to 45 percent of the total thickness.

Huffman and others (1980) have subdivided the Salt Wash Member in the Carrizo Mountains into three stratigraphic units based on depositional environments. The lowermost unit is an average of 30 ft thick and was considered to be predominantly overbank deposits of alternating thin mudstone. It reportedly contains a few channel sandstones, however, the present author notes that this unit is lithologically distinct from the overlying ore-bearing unit. It, also, does not host any uranium-vanadium ore deposits. Recent investigations of the Morrison Formation by Anderson and Lucas (1998) have determined that this lower unit should be included with the underlying Bluff Sandstone and not with the Morrison Formation.

The middle stratigraphic unit is an average of 70 ft thick and is composed of channel-sandstone deposits, partially and completely abandoned channel-fill deposits, and overbank deposits. It rests with sharp erosional contact on the lower unit. Approximately 80 percent of

the sandstone in this unit is active channel fill in a generally eastward flowing fluvial system (Craig and others, 1955).

The upper unit is 120 ft thick. Most of the unit is composed of braided-stream deposits, and thin overbank deposits. Active channel-fill sandstone and conglomerates are also present. The sequence of stratigraphic units probably represent a prograding wet, alluvial fan (Huffman and others, 1980).

The base of the sandstone containing the orebodies at the Tent No. 1 Mine is 50 ft above the base of the Salt Wash. This is within the middle stratigraphic unit.

The uranium-vanadium deposits were formed by the selected impregnation of the sandstone and adsorption by the mudstone and fossil plant material. Detrital organic plant material, such as leaves, branches, limbs and small trunks are common in the mineralized sandstone. Most all of this material is carbonized. The larger deposits were commonly associated with the plant material. Ore thicknesses at the Tent No. 1 mine ranged from a featheredge to a maximum of 3 ft, with an average of 2 ft.

The bright yellow uranium mineral in the Carrizo deposits was originally misidentified as carnotite, a potassium uranium vanadate. Later work by Corey (1958) and S.R. Austin (written communication, 1967) identified tyuyamunite, a calcium uranium vanadate, and meta-tyuyamunite as the only uranium minerals in the Carrizo deposits. The mineralogy of the Nelson Point mine just west of the Tent No. 1 was studied by Corey (1958). In this mine, vanadium clay and montrosite were present. These minerals oxidized to form a number of secondary vanadium minerals that include sherwoodite, duttonite(?), hewettite, meta-hewettite,

rossite, metarossite, and hendersonite (Corey, 1958). Calcite is a common cement in ore. Pyrite, iron oxides, and gypsum also may be present.

The beds of the Salt Wash on King Tutt Mesa dip 2 degrees to the east due to the Red Rock monocline which is directly west of the mesa where the older Jurassic rocks have eastward dip as great as 10 degrees.

EXPLORATION BY THE AEC

In the late 1940s, numerous old vanadium mines existed along the rim of the King Tutt Mesa (Chenoweth, 1991). Studies of outcrops by AEC geologists indicated that the mineralized sandstone projected eastward into the mesa where there was no drilling. Hence, the AEC decided to drill the mesa in an attempt to develop additional ore. Between February 11, 1952 and August 17, 1952, a total of 948 holes with a total footage of 100,038 ft were drilled on King Tutt Mesa and in the Oak Springs area (Masters and others, 1955). The drilling project was known as the East Carrizo No. 1 project -- Contract No. AT(30-1)-1260. The middle and lower units of the Salt Wash were cored. The drill spacing ranged from 1,000 ft in the initial grid to 25 ft where ore grade material was found (Masters and others, 1955). During the spring and summer of 1953, the AEC conducted two additional drilling projects on King Tutt Mesa and adjacent areas. The East Carrizo No. 2 project - Contract AT (30-1)-1364 drilled 49 core holes with a total footage of 4,653 ft. The East Carrizo No. 3 project-Contract AT (05-1)-231 drilled 169 percussion wagon drill holes with a total footage of 11,977 ft (Blagbrough and Brown, 1955). All drill holes had the prefix EC. The wagon drilling was on 200, 100, and 50 ft centers. Drilling on the No. 3 project encountered ore in some holes in the

vicinity of the Nelson Point mine (Blagbough and Brown, 1955, p.17). It was these holes that lead to the development of the Tent No. 1 mine.

PRODUCTION HISTORY

Anticipating the AEC's drilling project on King Tutt Mesa, Eugene Tapahonso claimed this part of the mesa not already held as Plots 1-6 of Vanadium Corporation of America's Lease I-149-IND-5705 and King Tutt's Navajo Tribal Mining Permit (MP) No. 6. Tapahonso's land was in the central and southern part of the mesa. On February 22, 1952, he applied to the Tribal Council for a mining permit covering 329.4 acres. This application contained three tracts as follows:

Navajo Tribal Mining Permit No. 24

<u>Tract Name</u>	<u>Acres</u>	<u>Location</u>
Begay No. 1	247.4	Central King Tutt Mesa
Tent	19.0	Southwest King Tutt Mesa
Junction	<u>63.0</u>	East Central King Tutt Mesa
TOTAL	329.4	

Mining Permit No. 24 was approved to Eugene Tapahonso on April 26, 1952. The mining rights to the Begay No. 1, Tent and Junction tracts were assigned to Walter Duncan Jr., Cortez, Colorado on April 26, 1952. The assignment was approved on June 17, 1952. After evaluating the tracts, Duncan released all but 55 acres in the southeast part of the Begay No. 1 tract and 4.6 acres in the eastern part of the Junction tract, on February 10, 1953.

The assignment of the Tent tract to the Texas Mining Company of Austin, Texas was approved on September 23, 1953. The Texas Mining Company did drilling in the vicinity of

the AEC holes and found an orebody which they began to mine in the spring of 1955. The mine was operated by Willard M. Leighton of Farmington, New Mexico. The adit to the mine was located in the exposure of the host sandstone at the head of a small wash adjacent to the adits of the Vanadium Corporation of America (VCA) Nelson Point mine (Fig. 2). During 1955, the Tent No. 1 mine produced 718.29 tons of ore averaging 0.23 percent U_3O_8 and 2.20 percent V_2O_5 (Table 1). The ore was shipped to the mill at Shiprock, New Mexico operated by Kerr-McGee Oil Industries, Inc. Texas Mining Company did not make any shipments in 1956 and canceled their assignment.

Eugene Tapahonso, the permittee, had previously employed miners for his operations on various VCA tracts. He resumed operations at the Tent No. 1 late in 1956. When the author examined the operations, in December 1956, two Navajo miners were working at the mine. They were mainly gophering out ore from the ribs of the mine. The mine, developed by Mr. Leighton, was mined by a modified room and pillar method with on-level track haulage.

Ore cars were moved in and out of the mine by hand. By early 1957 Tapahonso, the permittee, had completed his mining. His operation had produced 145.49 tons of ore that averaged 0.35 percent U_3O_8 and 4.25 percent V_2O_5 (Table 1). This ore was shipped to the mill at Durango, Colorado operated by VCA.

Eugene Tapahonso's Mining Permit No. 24 apparently expired in 1959 due to lack of any current mining on any of the tracts. On May 19, 1961, he was issued a new permit, MP-555, which covered to same 329.4 acres as did MP-24. This new permit contained four tracts as the original Begay No. 1 was subdivided into a Begay No. 1 and Begay No. 2 (Fig. 3).

Navajo Tribal Mining Permit No. 555

<u>Tract Name</u>	<u>Acres</u>	<u>Location</u>
Begay No. 1	136.8	South Central King Tutt Mesa
Begay No. 2	110.6	North Central King Tutt Mesa
Tent	19.0	Southwest King Tutt Mesa
Junction	<u>63.0</u>	East Central King Tutt Mesa
TOTAL	329.4	

On April 1, 1962, the AEC's allocation program (market quotas) went into effect. Under this program, the AEC would purchase uranium concentrate (yellow cake) only from ore discovered before November 24, 1958, or equal to the amount of ore produced from July 1, 1956, through June 30, 1960 (Albrethsen and McGinley, 1982). The latter method was used to help small miners who did not block out large amounts of ore prior to mining. The allocation program also was modified to allow small mines to produce up to 20,000 pounds U_3O_8 per year with the combined total of all mines not to exceed one million pounds U_3O_8 per year. Each allocation had an ore-purchase contract with a specified mill. W.L. Tripp, a mining contractor from Cortez, Colorado, informed the AEC on June 5, 1962 that he had a drilling permit on the Tent tract during May 1962 and had encouraging results. On August 17, 1962, Mr. Tripp's aunt, Hazel A. Bryant of Apache Junction, Arizona, was assigned the mining rights to the Tent tract. The assignment was approved on October 2, 1962. Mrs. Bryant received an allocation (A-494) of 1,013 pounds U_3O_8 per year. This allocation was based on past production, and was assigned to the mill at Shiprock.

Mr. Tripp began mining at the Tent No. 1 mine in late 1962 and began shipments to the mill in January 1963. In March 1963, the Shiprock mill of Kerr-McGee Oil Industries, Inc. was acquired by Vanadium Corporation of America.

When the operation was examined by an AEC engineer on May 8, 1963, Tripp was mining at the Tent tract via a new decline on VCA's Plot 3. The mine inspector had declared the old adit to be unsafe. During the second quarter 1963, 60.01 tons of ore shipped to the Shiprock mill were identified as the Tent No. 2 (Table 1). This was probably ore mined through the new entrance.

Shipments by Tripp, for Mrs. Bryant, ceased in the late summer 1963. By that time, Tripp had produced 333.95 tons of ore which averaged 0.15 percent U_3O_8 and 1.53 percent V_2O_5 (Table 1).

AEC engineers examined the Tent mine on May 7, 1964. At that time, they noted the opening near the Shadyside incline was partly filled in. An employee of Mr. Tripp's at the Begay No. 2 mine, informed the AEC engineers that the Tent mine had been abandoned in 1963, as all of the known ore had been mined.

In May 1965, Mining Permit No. 555 was replaced by Mining Permit No. 608. This new permit covered the same 329.4 acres as Mining Permit 555. On August 10, 1966, VCA received the assignment of the entire 329.4 acres of Mining Permit 608. The assignment was approved on September 12, 1966. VCA shipped ore from the Begay No. 1 and No. 2, but did not mine on the Tent tract.

SUMMARY

During the twenty-four months that the Tent No. 1 mine was in operation, it produced 1,197.73 tons of ore containing 5,302.81 pounds U_3O_8 and 54,155.97 pounds V_2O_5 (Table 1). All of the uranium concentrate produced from the ore was sold to the AEC. Vanadium concentrate produced at the Durango mill was sold to the steel industry. Although vanadium was paid for at the Shiprock mill, not all of it was recovered (Albrethsen and McGinley, 1982).

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- U.S. Geological Survey, 1982, Horse Mesa quadrangle, Arizona-New Mexico: 7 ½ minute series (topographic), provisional, scale 1:24,000.

APPENDIX

Legal Description Tent Tract, Navajo Tribal Mining Permit No. 24.

Beginning at a monument which is directly adjacent to Corner No. 11 of VCA's Plot 3, Lease No. 1-149-IND-5705, and is approximately N 61°E, 3840 ft from Milepost No. 20 on the Arizona - New Mexico State Line, thence No. 85° 22'E, 1,170 ft, thence S 8° 30'W, 880 ft, thence S. 85° W, 740 ft, thence No. 19° 30'W, 900 ft to point of beginning. This parcel contains 19 acres more or less.

From Navajo Tribal Mining Department

**Table 1, Uranium-vanadium production, Tent No. 1 mine,
San Juan County, New Mexico**

YEAR	QTR	CONTROLLER	TONS OF ORE	POUNDS U ₃ O ₈	% U ₃ O ₈	POUNDS V ₂ O ₅	% V ₂ O ₅
1955	2	Texas Mining Co.	147.53	846.15	0.29	8,176.21	2.77
1955	3	Texas Mining Co.	397.34	1,713.06	0.22	14,228.94	1.79
1955	4	Texas Mining Co.	173.42	757.52	0.22	9,237.82	2.66
1956	4	Eugene Tapahonso	124.71	893.95	0.36	11,324.00	4.54
1957	1	Eugene Tapahonso	20.78	118.64	0.29	1,030.00	2.48
1963	1	Hazel A. Bryant	36.59	152.68	0.21	1,265.00	1.73
1963	2	Hazel A. Bryant	118.35	313.47	0.13	3,494.00	1.48
1963	2*	Hazel A. Bryant	62.09	142.82	0.12	1,763.00	1.42
1963	3	Hazel A. Bryant	116.92	364.52	0.16	3,637.00	1.56
Total			1,197.73	5,302.81	0.22	54,155.97	2.26

* Identified as the Tent No. 2 mine at the Shiprock mill.

Source: Unpublished ore production records, U.S. Atomic Energy Commission,
Grand Junction office.

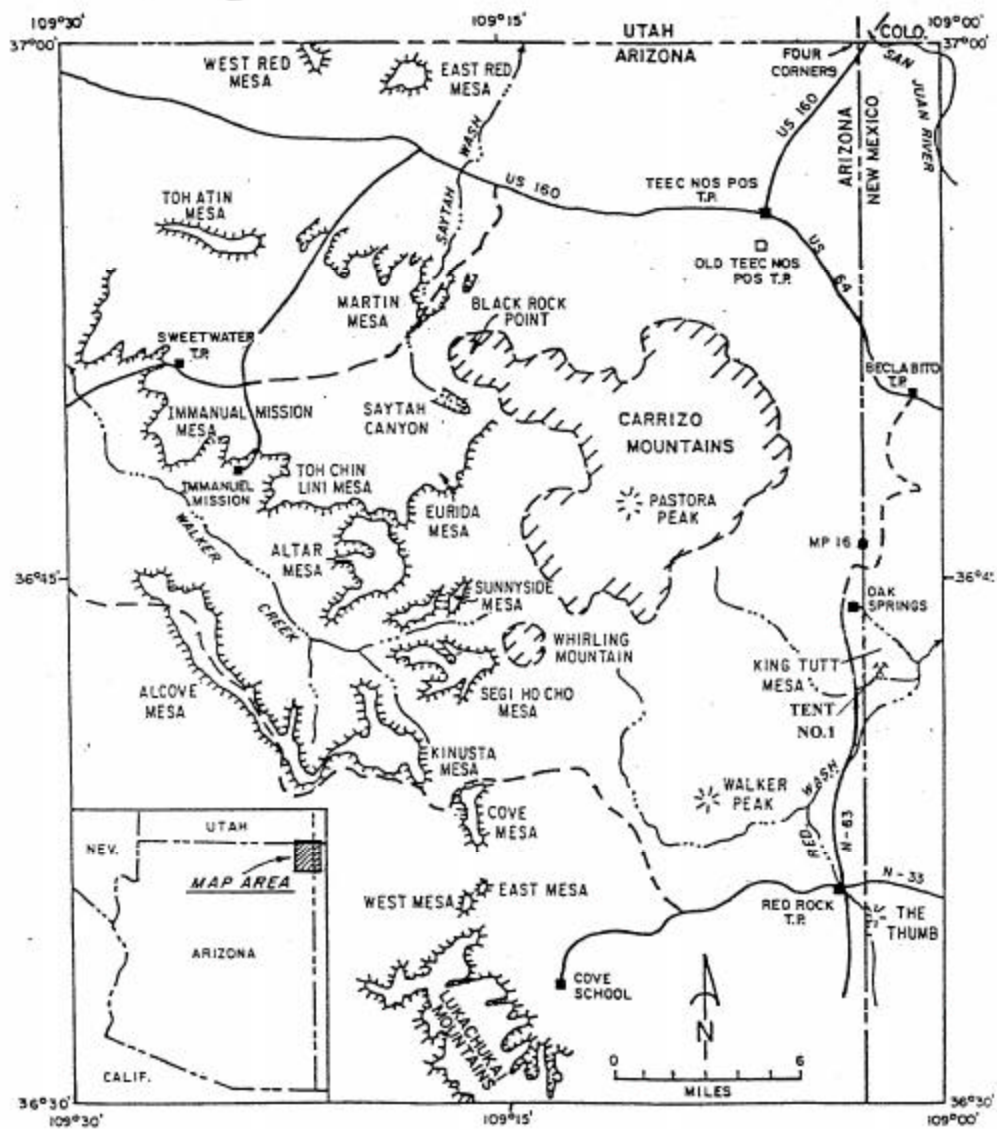


Figure 1. Index map of the Carrizo Mountains, Arizona-New Mexico showing the location of the Tent No. 1 mine

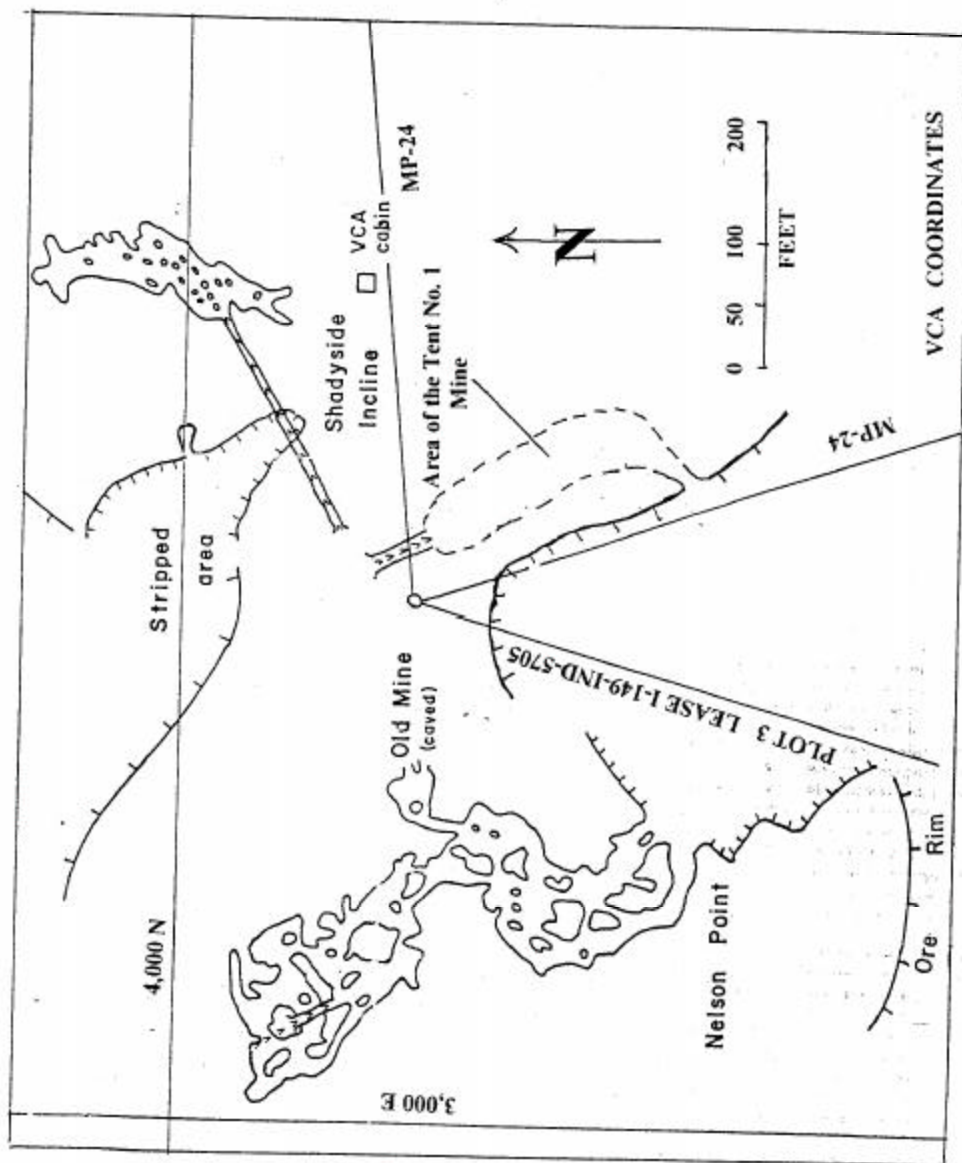


Figure 2. Map showing the location of the Tent No. 1 mine in relationship to the Nelson Point and Shadyside incline mines.

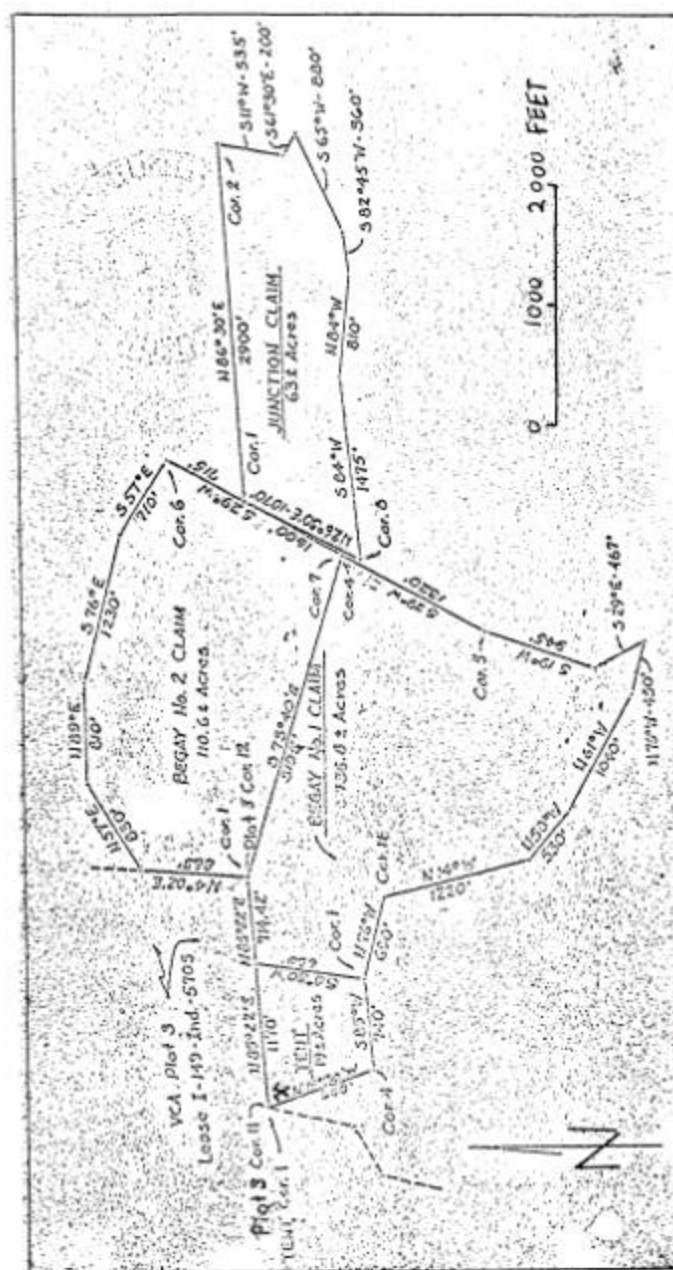


Figure 3.

Map showing the four tracts in Navajo Tribal Mining Permit No. 555