

**THE GEOLOGY, EXPLORATION, AND PRODUCTION HISTORY  
OF THE BEGAY NO. 2 URANIUM-VANADIUM MINE,  
SAN JUAN COUNTY, NEW MEXICO**

**New Mexico Bureau of Geology and Mineral Resources**

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## INTRODUCTION

The Begay No. 2 mine was developed in orebodies that were located in 1952 and 1953 by drilling done by the U.S. Atomic Energy Commission (AEC). The mine, in the Salt Wash Member of the Morrison Formation, produced uranium-vanadium ore in the 1960s. 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 Begay No. 2 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 Begay No. 2 mine is shown on the Horse Mesa topographic quadrangle (U.S. Geological Survey, 1982) at 36° 43' 05" north latitude and 109° 01' 32 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 Begay No. 2 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. The author worked on the AEC East Carrizo drilling project in 1953 and last examined the mining operations at the Begay No. 2 in February 1962. Information on the mining activities, beginning in mid-1962 was obtained from AEC records in the National Archives, Rocky Mountain Region, Denver, Colorado.

## **GEOLOGIC SETTING**

The uranium-vanadium orebodies at the Begay No. 2 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 of the member.

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 by those authors 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 AEC's study of the core and drill hole logs of the initial AEC drilling project determined that the orebodies which would be exploited by the Begay No. 2 mine were in a channel sandstone, which they named the Shadyside sandstone. The name came from Vanadium Corporation of America's (VCA) Shadyside mine 1800 ft southwest of the Begay No. 2 mine. This unit is 10 to 15 ft thick and occupied an interval 55 to 75 ft above the base of the Salt Wash Member (Master and others, 1955). It is within the middle unit of Huffman and others (1980).

The Shadyside sandstone is a fine-grained to silty, well to poorly sorted quartzose sandstone which is overlain by a continuous bed of red mudstone. The channel sandstone is bounded by flood-plain type deposits (Masters and others, 1955).

The uranium-vanadium orebodies 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 ore-bearing sandstone. Most all of this material is carbonized. The larger orebodies were commonly associated with the plant material. Ore thicknesses at the Begay No. 2 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 ore deposits was originally misidentified as carnotite, a potassium uranium vanadate. Later work by Corey (1958) and

S.R. Austin (written communication, 1967) have 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 2,500 ft, southwest of the Begay No. 2, was studied by Corey (1958). In this mine, vanadium clay and montrosite were present. These minerals have been 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 ore-bearing 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 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. When the drilling was completed, five small orebodies (Fig. 2) were located on the Begay No. 2 tract (Blagbrough and Brown, 1955). These orebodies contained an estimated 4,500 tons of ore averaging 0.21 percent  $U_3O_8$  and 1.97 percent  $V_2O_5$ , using a cutoff of 1 ft of 0.10 percent  $U_3O_8$  (AEC unpublished ore reserve memorandum, 1955).

### 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 almost immediately and production on all three tracts occurred.

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 December 12, 1961, the mining rights to the Begay No. 2 tract were assigned to the Davis Mining Company of Dove Creek, Colorado. The assignment was approved on December 27, 1961. This company was owned and operated by Mr. Trenton O. Davis.

Wagon drilling by Davis offset the AEC drill holes on 10 and 20-ft spacing. Davis use a contractor, W.D. Tripp of Cortez, Colorado, to operate the Begay No. 2 mine. A 35-ft hand dug shaft was sunk at AEC ore hole EC-707-E (Fig. 2). The ore was hoisted with a bucket using a winch truck with an A frame. Ore shipments to the mill at Shiprock, New Mexico began in January 1962. The mill was operated by Kerr-McGee Oil Industries, Inc.



When the operation was examined by the author in February 1962, Mr. Tripp stated he planned to drift to the northwest to the area of AEC ore hole EC-25-A and to the south to the area of EC-871 (Fig 2). He also stated that he found the ore zones thinner and more discontinuous than indicated by the AEC wagon drilling.

Early in 1962, Trenton O. Davis died. On May 11, 1962, his widow Hazel Irene Davis was appointed administratrix of his estate. W.D. Tripp continued to operate the Begay No. 2 for Mrs. Davis under an agreement dated May 17, 1962.

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. Mrs. Davis applied for an allocation and on August 8, 1962 was issued one (A-413) to sell ore to the Shiprock mill.

In March 1963, the Shiprock mill of Kerr-McGee Oil Industries, Inc. was acquired by Vanadium Corporation of America. When the Begay No. 2 mine was examined by an AEC engineer on May 8, 1963, Tripp was continuing to do wagon drilling and to mine. He stated he planned to start a new decline into the southern orebodies. When examined on October 17, 1963. Mr. Tripp stated he had drilled out a new orebody in the vicinity of the shaft and also

near the new decline. On May 7, 1964, an employee of Mr. Tripp told an AEC engineer there had been no production since March 1964 and the mine was being abandoned.

In mid-1964, C D Mining, Inc. Of Naturita, Colorado was operating the Begay No. 2 mine for Mrs. Davis. When examined on October 6, 1964, it appeared that C D had abandoned the mine. During the three years (1962-1964) that the Davis' controlled the Begay No. 2, it produced 2,809.31 tons of ore averaging 0.21 percent  $U_3O_8$  and 2.20 percent  $V_2O_5$  (Table 1).

In May 1965, Mining Permit No. 555 was replaced by Mining Permit 608. This new permit covered the same 329.4 acres as Mining Permit No. 555. On July 26, 1965, Eugene Tapahonso assigned the mining rights of the Begay No. 2 tract to the Fritz-Erickson Mining Company of Dove Creek, Colorado. The assignment was approved on August 19, 1965.

Since this property had no historic production and no ore reserves, the AEC granted the company an allocation not to exceed 20,000 pounds per  $U_3O_8$  per year. The ore purchase contract of this allocation (A-768) was with the processing mill at Grand Junction, Colorado, operated by Climax Uranium Company.

Shipments to Grand Junction began in December 1965. When the operation was examined on January 11, 1966, an AEC engineer noted that a new shallow decline and a 75 - ft. drift had been completed and that drilling had located several small pods of ore. Mr. Erickson reported that the ratio of waste rock to ore in mining had been 10:1. Fritz-Erickson continued mining until mid-1966, when they canceled their assignment. Total production by the company was 1,088.00 tons of ore that averaged 0.23 percent  $U_3O_8$  and 2.43 percent  $V_2O_5$  (Table 1).

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 received an allocation (A-810) to produce up to 2,220 pounds  $U_3O_8$  per year from anywhere within the permit. This allocation was based on historic production from the Begay No. 1 and the Tent tracts and was assigned to the VCA mill at Shiprock, New Mexico.

During 1967, VCA shipped 618.17 tons of ore averaging 0.14 percent  $U_3O_8$  and 1.16 percent  $V_2O_5$  from the Begay No. 2 mine. These were the final shipments from this mine. Since then the shaft and the portal of the decline have been sealed and the surrounding area has been cleaned up (Anderson, 1981).

### **SUMMARY**

During the six years (1962-1967) that the Begay No. 2 mine was in operation, it produced 4,515.48 tons of ore containing 18,450.10 pounds  $U_3O_8$  and 190,637.93 pounds  $V_2O_5$  (Table 1). This production ranks the Begay No. 2 mine as one of the largest on King Tut Mesa (McLemore and Chenoweth, 1997). All of the uranium concentrate produced from the ore was sold to the AEC. Vanadium concentrate produced at the Grand Junction 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 Begay No. 2 Tract Navajo Tribal Mining No. 555

Commencing at Corner No. 1 which is common to Corner No. 12 of Vanadium Corporation of America Plot No. 3, Lease I-149-IND-5705, which also is common to Corner No. 3 of the Begay No. 1 claim; thence north  $40^{\circ}02'$  east, 863 ft to corner No. 2; thence north  $57^{\circ}$  east, 830 ft to corner No. 3; thence north  $89^{\circ}$  east, 810 ft to corner No. 4; thence south  $76^{\circ}$  east 1,230 ft to corner No. 5; thence south  $57^{\circ}$  east, 710 ft to corner No. 6; thence south  $29^{\circ}$  west, 1,600 ft to corner No. 7, which is common to corner No. 4 of the Begay No. 1 claim; thence north  $73^{\circ}40'$  west 3,195 ft to corner No. 1 and point of beginning. This parcel contains 110.6 acres more or less.

From Navajo Tribal Mining Department

**Table 1, Uranium-vanadium production, Begay No. 2 mine,  
San Juan County, New Mexico**

YEAR	CONTROLLER	TONS OF ORE	POUNDS U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	POUNDS V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
1962	Davis Mng. Co.	1,591.06	7,152.83	0.22	68,641.55	2.16
1963	Davis Mng. Co.	247.57	1,350.73	0.27	15,367.00	3.10
1963	Hazel I. Davis	464.63	1,942.89	0.21	23,074.00	2.48
1964	Hazel I. Davis	506.05	1,328.00	0.13	16,315.00	1.61
1965	Fritz-Erickson	206.00	951.98	0.23	8,766.46	2.13
1966	Fritz-Erickson	882.00	4,003.64	0.23	44,110.92	2.50
1967	VCA	618.17	1,720.03	0.14	14,363.00	1.16
TOTAL		4,515.48.	18,450.10	0.20	190,637.93	2.11

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



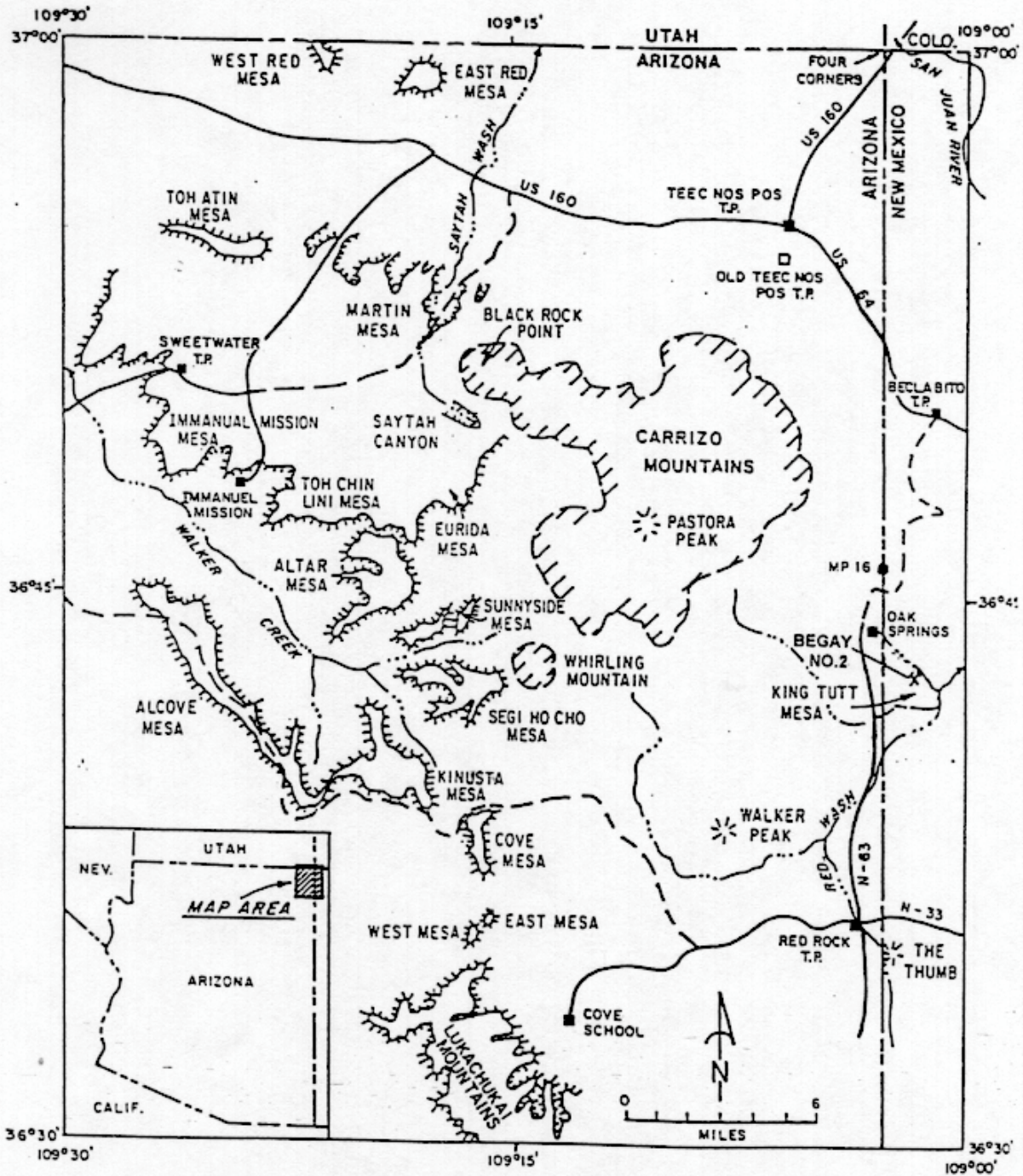


Figure 1. Index map of the Carrizo Mountains, Arizona- New Mexico showing the location of the Begay No. 2 mine.

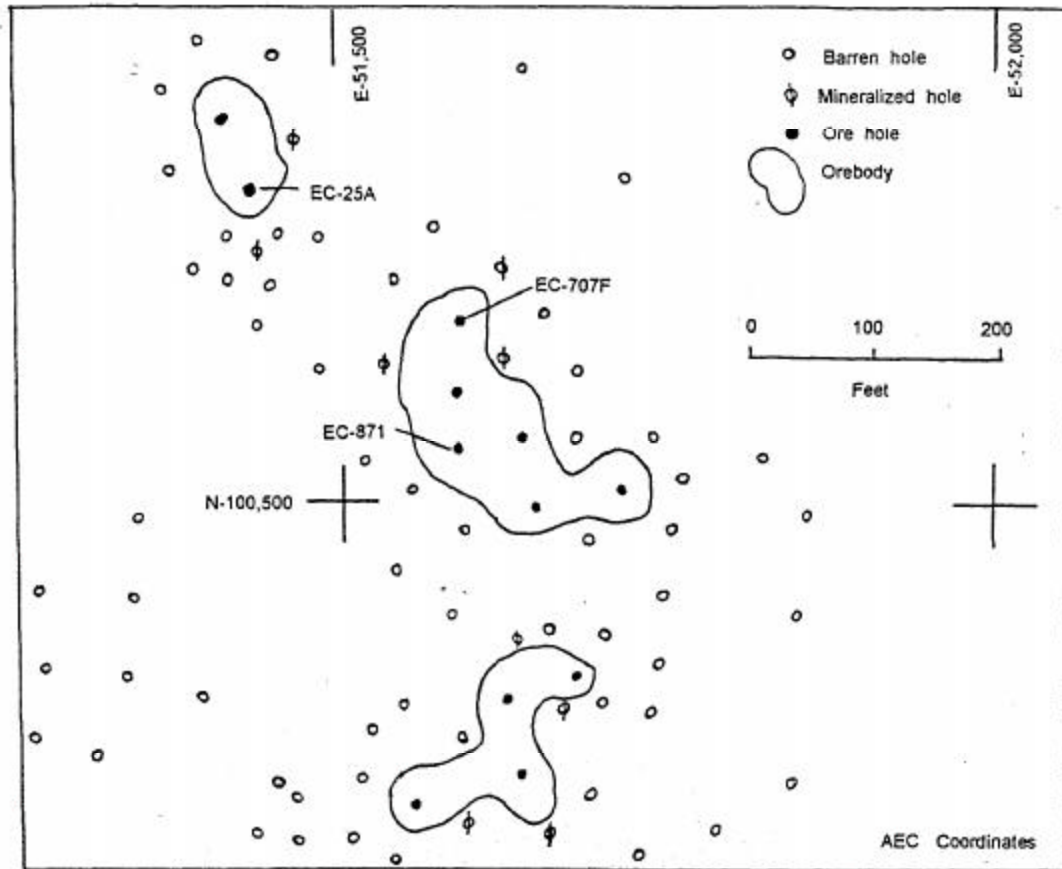


Figure 2. Map of the orebodies on the Begay No. 2 tract as delineated by AEC drilling. From Blagbrough and Brown (1955).



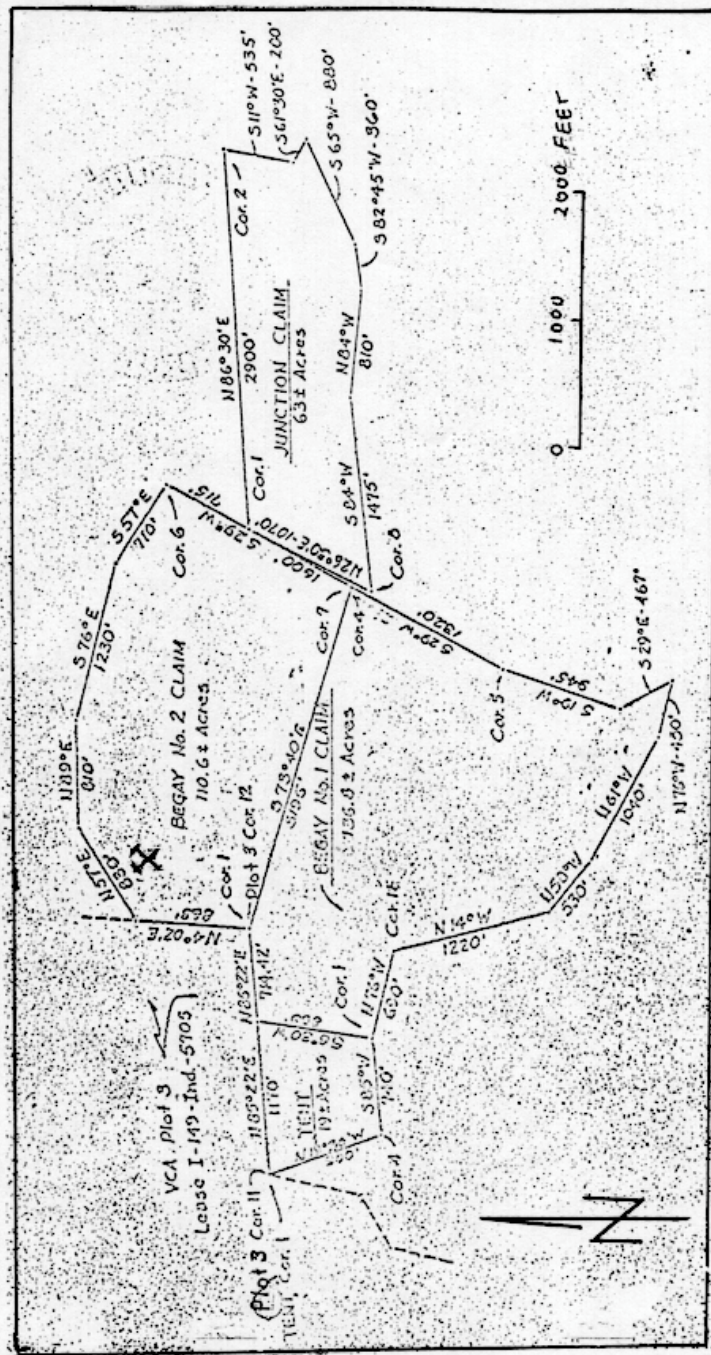


Figure 3. Map of Eugene Taphonso Navajo Tribal Mining Permit No. 555, San Juan County, New Mexico. From AEC files.