

**THE GEOLOGY, EXPLORATION AND
PRODUCTION HISTORY OF THE CAPITAN
BENALLY NO. 4A URANIUM-VANADIUM
MINE, APACHE COUNTY, ARIZONA**

by

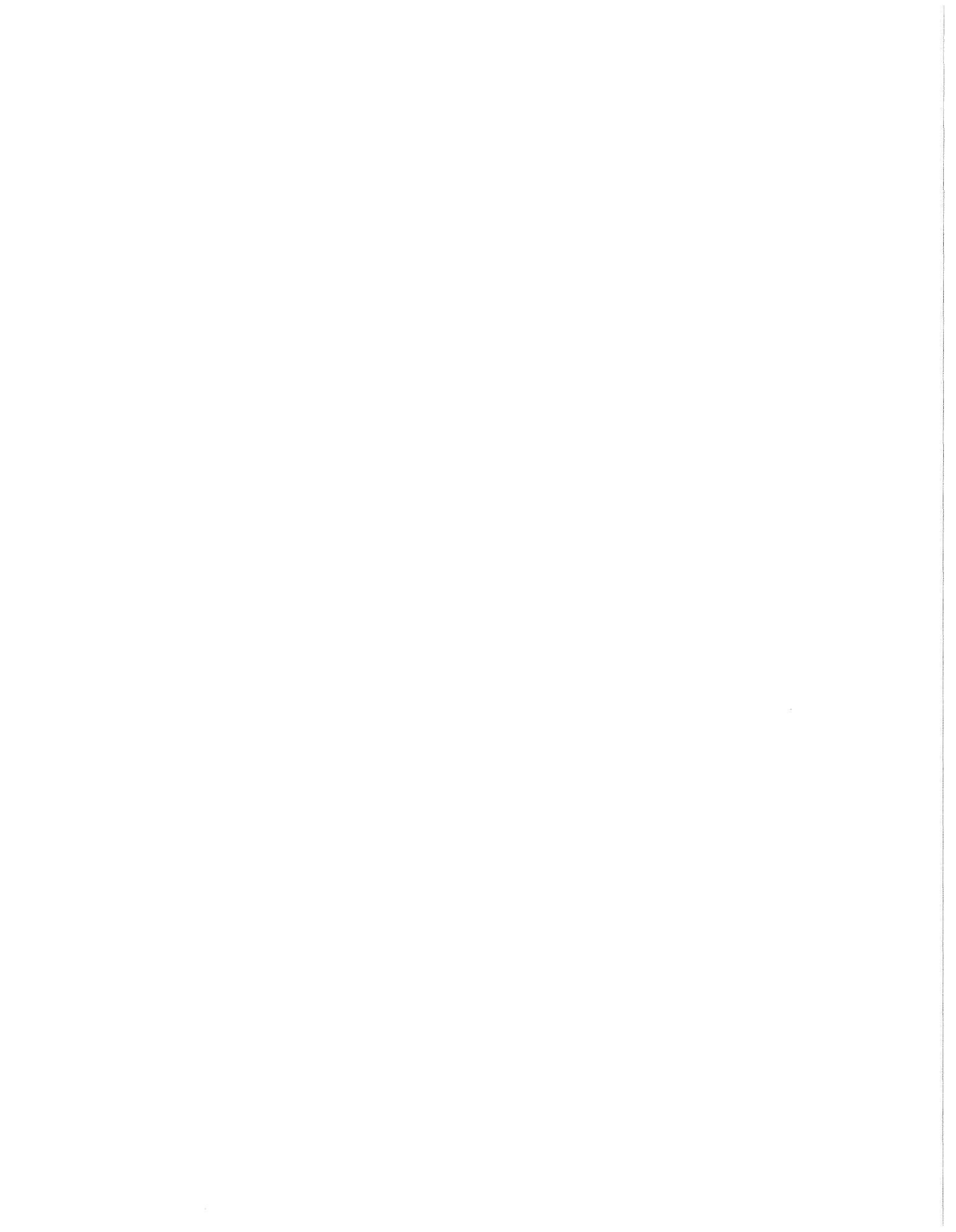
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and do not necessarily coincide with those of the staff of the Arizona
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INTRODUCTION

The Capitan Benally 4A uranium-vanadium mine was developed as the result of uranium minerals located by a single drill hole drilled by the U.S. Atomic Energy Commission (AEC). This exploration hole was drilled as part of a project to test the uranium favorability of the Salt Wash Member of the Morrison Formation in a large area north of the Rattlesnake mines in the northwestern Carrizo Mountains Apache County, Arizona (Figure 1).

Drilling by a private company located additional ore holes adjacent to the AEC drill hole. Unfortunately, mining indicated that the uranium - vanadium ore was not very continuous and occurred as small pods which the drill holes had penetrated. Also, this mine had the distinction of having some of the higher-grade ore from the mine stockpile illegally removed.

Recently, information regarding this operation was located in the author field notes etc., which were made while he was employed by the AEC. This brief report summarizes this information.

LOCATION AND LAND STATUS

The Capitan Benally 4A mine was located approximately 10 miles west of Tec Nos Pas, Arizona in the sand covered plain southeast of East Red Mesa and north of Black Rock Point (Figure 1). It was approximately one mile south of Navajo Route 1 (now U.S. Highway 160) and was reached by a sandy road that turned off of the highway. Although not shown on the Toh Atin Mesa East 7½ minute topographic quadrangle (U.S. Geological Survey, 1982) the mine site was at latitude 36° 56' 15" N, and longitude 109° 15' 45" W.

The mine was 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 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. 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% royalties and the permittee between 2% and 5% royalties.

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

GEOLOGIC SETTING

Uranium-vanadium deposits in the Carrizo Mountains were found in the lower 40 feet of the Salt Wash Member of the Upper Jurassic Morrison Formation. In the northwest Carrizo Mountains, the Salt Wash Member is 180 to 200 feet thick. The ore-bearing interval consists of pale gray to greenish-gray, fine-grained, well sorted, quartz sandstone with minor lenses of greenish-gray mudstone. Carbonaceous plant material is common throughout the sandstone. Individual sandstone lenses rarely reach a thickness of 20 feet.

Tyuyamunite, a calcium uranium vanadate, and metatyuyamunite were the only uranium minerals identified in the Carrizo deposits [Corey, 1956; S.R. Austin, written communication, 1967]. The vanadium minerals pascolite, volborthite and montrosite have been identified by Corey [1956] from the Martin mine (Figure 1). Calcite is a common cementing agent in the ore. Pyrite, iron oxides and gypsum also may be present. The ore minerals are commonly associated with fossil plant material and also impregnate the sandstone adjacent to mudstone seams and clay galls. In

the Rattlesnake mines, individual ore bodies were as large as 150 by 75 feet with an average thickness of 2 feet. In many of the mines an individual ore body was only 10 feet by 20 feet [Chenoweth, 1955].

The majority of the mines in the northwest Carrizo Mountains area are located on the northeast flank of the Toh Atin anticline where the Salt Wash Member dips 7° to the northeast under the sand covered plain (Chenoweth, 1955). The north flank of the syncline is eroded away and the Salt Wash that remains caps the two Red Mesas (Figure 1). The AEC drilling programs were concentrated in the area of the syncline. With the exception of a small ore body located a short distance down dip from the existing mines, no economic ore was found [Bollin and others, 1956].

EXPLORATION AND PRODUCTION HISTORY

Between August 8, 1953 and March 30, 1955, the AEC completed five separate drilling projects in the northwest Carrizo area. The total footage drilled during these projects was 144,950 feet [Bollin and others, 1956]. The majority of the drilling was to test the uranium favorability of the Salt Wash Member of the Morrison Formation in the shallow syncline between Martin Mesa and East Red Mesa (Figure 1).

Since the AEC did not request the Navajo Tribal Council to withdraw the drilling area from claim staking, individual Navajos such as Capitan Benally, Mike Brodie, Cato Sells, and others, staked claims between the existing mines and the highway. One of the few AEC drill holes penetrating ore, J-520, was on Capitan Benally's claim 4A. This claim and No. 5 were included in Navajo Tribal Mining Permit MP-260. This mining permit was approved to Capitan Benally on January 17, 1955. The assignment of the mining rights to MP-260 were approved to the Climax Uranium Company of Grand Junction, Colorado on November 25, 1955.

Sometime during 1956, Climax Uranium Company drilled several holes as offsets to J-520, where an AEC gamma-ray log had indicated 3.5 feet of uranium mineralization averaging 0.30 percent U_3O_8 at a depth of 150 feet. Climax's drilling included three ore holes and two mineralized holes (less than 0.20 percent U_3O_8) (Figure 2). The company reported to the AEC they had located approximately 1,400 tons of ore.

A minus 20 degree decline, 400 feet long was started in late 1956. This mine was known as the Tse Tah incline, from the nearly drainage, Tsitah Wash (also spelled Saytah). When the mine was examined on February 14, 1957, the mine workings had encountered hole S-21 where only a thin, small pod of uranium - vanadium minerals had been found. Only one ton of low grade ore had been recovered, according to the Navajo miners.

During a visit to the mine on March 13, 1957, the miners told the author that at hole S-27 only a pod of ore measuring 5 feet by 10 feet and 3 feet thick had been found. An even smaller pod had been found around hole S-13. During March, 1957, Climax shipped 36.02 tons of ore averaging 0.16 percent U_3O_8 and 1.14 percent V_2O_5 to its mill at Grand Junction, Colorado (Table 1). The source of the ore was identified as the Capitan Benally No. 4A mine to the AEC and the Navajo Tribal Mining Department.

When the operation was visited on April 11, 1957, the miners reported they had found a larger pod of ore around the AEC drill hole which contained 70 to 80 tons of ore. At the time of the visit, some 60 tons were stockpiled at the mine. The miners were surprised there was no continuity of ore between the drill holes and the pods were so small (Figure 2). During April a total of 56.48 tons of ore averaging 0.20 percent U_3O_8 and 1.32 percent V_2O_5 were shipped to Grand Junction (Table 1). A visit to the mine on May 15, 1957 found the decline closed, and all equipment removed.

During May, 1957, Jimmie King of Beclabito, New Mexico delivered 21.61 tons of ore averaging 0.31 percent U_3O_8 and 1.91 percent V_2O_5 to the processing mill at Shiprock, New Mexico, operated by Kerr-McGee Oil Industries, Inc. (Table 1). This shipment was identified as coming from the Saytah mine, in the northwest Carrizo Mountains. King had mines in the eastern Carrizo Mountains and in the Lukachukai Mountains and had been a miner for the Vanadium

Corporation of America. However, the Saytah mine was located on George Simpson's MP-48, near the Martin mine (Figure 1). An investigation by Kerr-McGee, Climax and the Tribal Mining Department determined that the ore had been removed from the stockpile at the Capitan Benally 4 A mine when the miners took weekends off. King had taken the highest grade material based on the visible minerals in the rock.

Climax canceled the assignment of their mining permit on November 25, 1957. Capitan Benally did not renew his permit in 1958 and there had been no further activity at the site.

SUMMARY

During the three months the mine was being operated, a total of 114.11 tons of ore averaging 0.21 percent U_3O_8 and 1.37 percent V_2O_5 were produced. The ore was not as continuous as in the Rattlesnake and Martin mines to the south. Also, it was believed that erroneous interpretations of the company's gamma-ray logs of the drill holes gave higher grades and greater thicknesses than were found by mining.

All of the uranium concentrate produced from the Capitan Benally ore was sold to the AEC. Vanadium concentrate produced at the Climax mill was sold to the steel industry.

REFERENCES

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- Corey, U.S., 1956, Petrographic report on the Martin mine, northwest Carrizo Mountains, Apache County Arizona: U.S. Atomic Energy Commission Technical Memorandum TM-282, 23p.
- U.S. Geological Survey, 1982, Toh Atin Mesa East quadrangle, Arizona-Utah: 7.5 minute series (topographic) provisional, scale 1:24,000.

Table 1. Ore production, Capitan Benally 4 A mine, Apache County Arizona

YEAR	QTR	TONS OF ORE	POUNDS U_3O_8	% U_3O_8	POUNDS V_2O_5	% V_2O_5	SHIPPER
1957	1	36.02	117.65	0.16	818.72	1.14	Climax Uranium Co.
1957	2	56.48	225.90	0.20	1,490.95	1.32	Climax Uranium Co.
1957	2	21.61	133.97	0.31	825.43	1.91	Jimmie King
Mine Total		114.11	477.52	0.21	3,135.10	1.37	

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



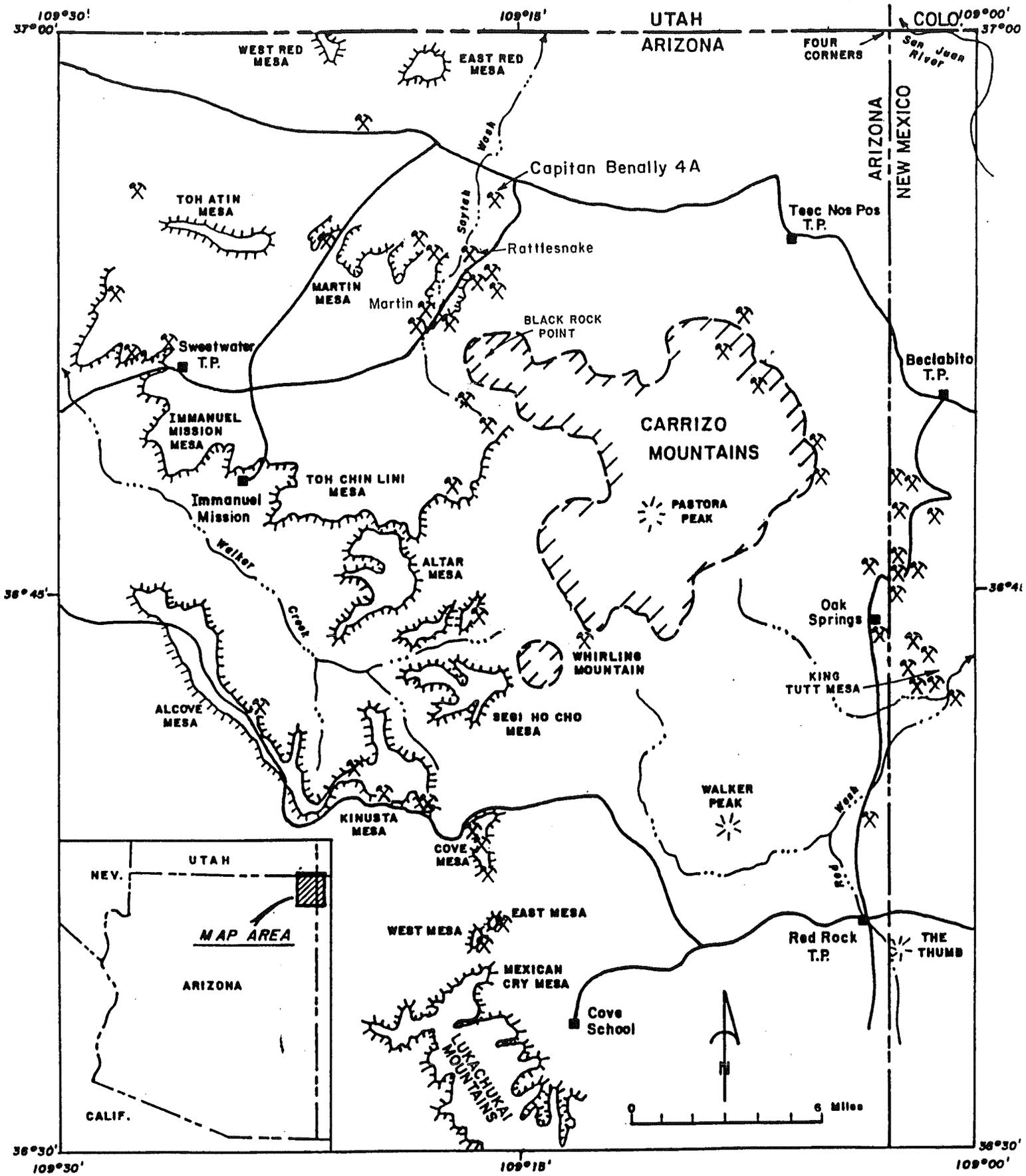


Figure 1. Index map of the Carrizo Mountains showing the location of uranium - vanadium mines, including the Capitan Benally 4A.

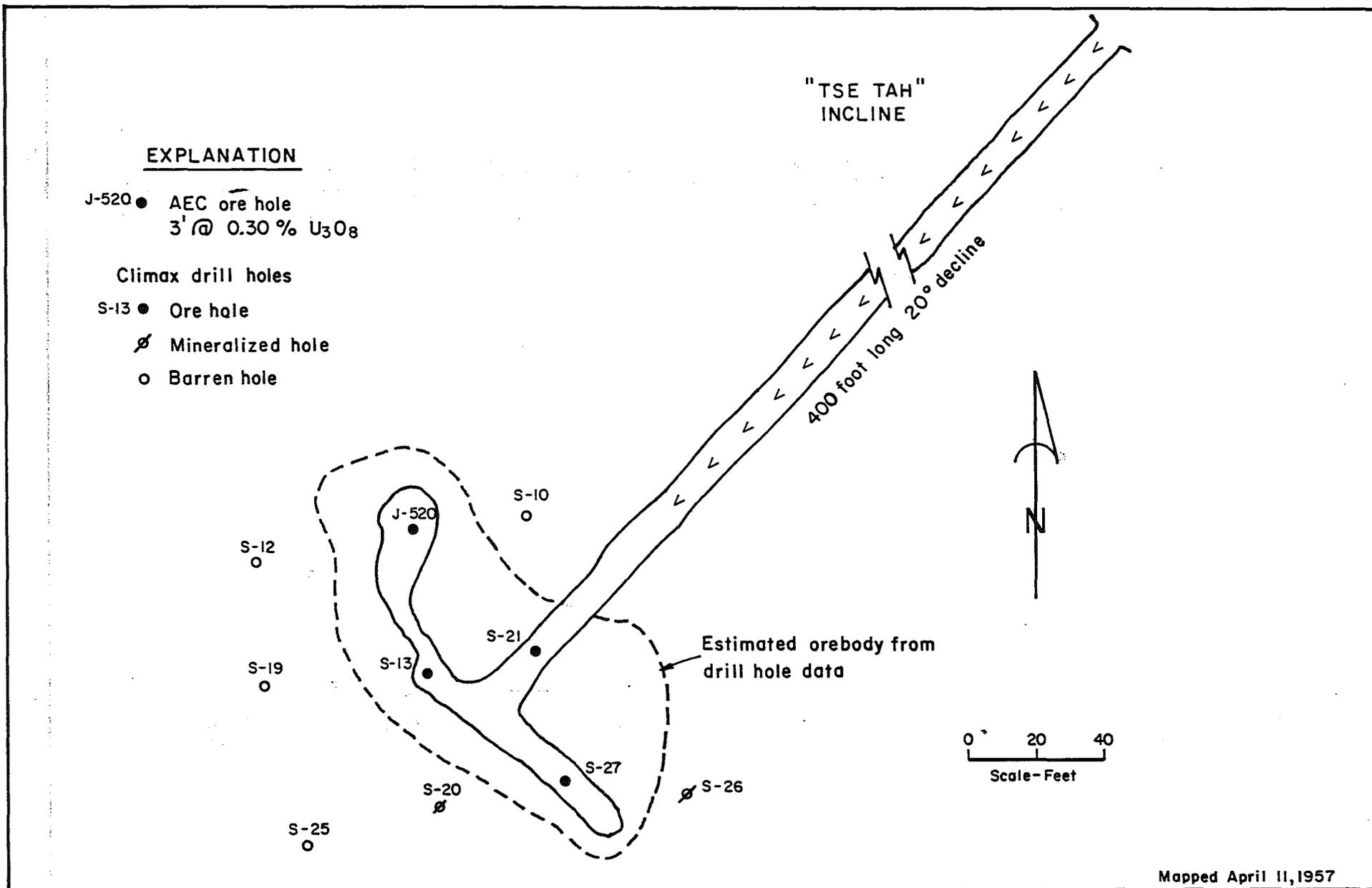


Figure 2. Plan map of the Capitan Benally 4A uranium-vanadium mine, Apache County, Arizona