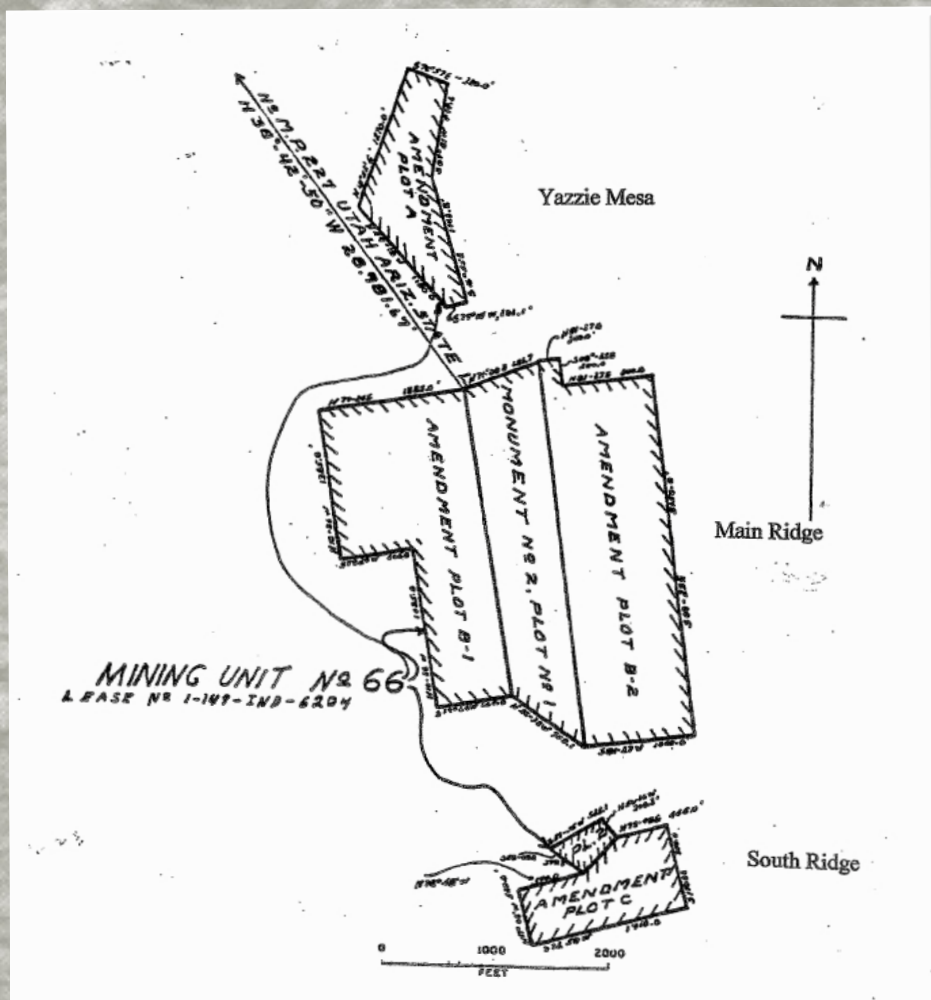


## CONTRIBUTED REPORT CR-11-G

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## THE EXPLORATION AND PRODUCTION HISTORY OF THE BLACK AND BLACKWATER URANIUM-VANADIUM MINES, MONUMENT VALLEY, APACHE COUNTY, ARIZONA

August 2011

William L. Chenoweth

ARIZONA GEOLOGICAL SURVEY

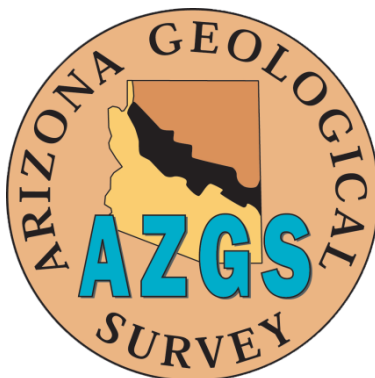
# Arizona Geological Survey Contributed Report CR-11-G

## The Exploration and Production History of the Black and Blackwater Uranium-Vanadium Mines, Monument Valley, Apache County, Arizona

August 2011

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Note: Originally prepared for the Arizona Department of Mines and Mineral Resources  
and the Navajo Abandoned Mine Lands Reclamation Project



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## **INTRODUCTION**

In 1950, two Monument Valley Navajos, Jessie Black and Harvey Blackwater, determined that the ground claimed by Cato Sells did not completely surround Vanadium Corporation of America's (VCA) 1943 Monument No. 2 lease in northwestern Apache County, Arizona. This lease was originally mined for vanadium and was now being mined for uranium and vanadium. This report is to document the production history of the mining on Black and Blackwater's Navajo Tribal Mining Permit.

### **Location**

The Monument No. 2 mine area is located in the extreme northwestern area of Apache County, Arizona (Figure 1). The mine is in the Cane Valley on the eastern flank of the Monument Uplift. Access to the mine area was via a 19-mile dirt road that headed south from U.S. Highway 163 one mile south of the bridge over the San Juan River at Mexican Hat, Utah. Another access road went from the mine, over Comb Ridge, and connected to U.S. Highway 160 near Mexican Water, Arizona. The Monument No. 2 open pit mine is shown at the center of the right margin of Rooster Rock topographic quadrangle (USGS, 1988).

### **Land Status**

The area of the Monument No. 2 mine 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 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.

### **Previous Studies**

The geology and mineralogy of the Monument No. 2 area have been described by Witkind and Thaden (1963). The mining and upgrading of the ore at the Monument No. 2 mine is given in a guidebook on uranium deposits of the western United States (AEC, 1959). Gregg and Evensen (1989) mapped the underground workings of the Monument No. 2 and adjacent mines and described the early mining history of the area.

### **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 and the Lease was obtained from the Navajo Tribal Mining Department, Window Rock, Arizona. Some of the early history of the property was found in an AEC report located in the National Archives (AEC, 1960). The AEC ore production data is now in the National Archives, Rocky Mountain Region, Denver Colorado, Record Group 434-00-287. Details of the pre 1954 ore production are from U.S. Geological Survey (USGS) royalty check reports to the Navajo Indian Service (Allport, 1951, 1952, 1953).

## **GEOLOGIC SETTING**

The Monument No. 2 ore deposit is in the basal Shinarump Member of the Triassic Chinle Formation. The Shinarump here is unusually thick, filling a large and deep erosional depression in the underlying Moenkopi Formation and, at the deepest point, extending down through the Moenkopi to the Permian De Chelly Sandstone. The Monument No. 2 ore deposits are in a short channel or scour that strikes N.18°W. and is about 2 miles long. It ranges in width, in its central part, from 400 to 700 ft and has been cut 50 ft into the underlying strata. The Black and Blackwater deposits as well as those on Cato Sells Tract No. 1 North are in the east flank of this channel.

The host rock is "trashy", cross-bedded, conglomeratic sandstone, containing considerable clay and fossil wood. The wood is partly carbonized, but much has been replaced by silica, tyuyamunite, limonite or uraninite.

The principal ore minerals are tyuyamunite and carnotite; others include the oxides montroseite, uraninite, navajoite and the hydrous oxides becquerelite and fourmarieite; the vanadates rauvite, volborthite, steigerite, hewettite and corvusite; the silicate uranophane; the phosphate torbernite; and the arsenate metazerunerite. For additional details on the ore occurrences and mineralogy the reader is referred to a report by Witkind and Thaden (1963).

## **VANADIUM CORPORATION OF AMERICA'S LEASE**

During the 1940s, the carnotite deposits in the Four Corners area were being sought for their vanadium content, used to harden steel. As the result of a find by Luke Yazzie in Cane Valley, the Office of Indian Affairs advertised an exploration lease sale for carnotite and related minerals on July 21, 1943. The area in Apache County, Arizona, was described as follows: "beginning at a point south 32°28' east, 28,949.78 feet from mile post 227 on the Utah-Arizona line and running thence north 25°00' east one mile; thence east one and one quarter miles; thence south 25°00' west one mile; thence south one and one quarter miles; thence west one and one quarter miles; thence north one and one quarter miles to the point of beginning, containing approximately 1,845 acres."

When the bids were opened on August 3, 1943, Vanadium Corporation of America (VCA) was the only bidder with a bonus bid of \$3,000.00. Lease I-149-IND-6204 with VCA was

executed on August 6, 1943, effective September 23, 1943, for a period of ten years. The lease was named Monument No. 2 by VCA.

On March 6, 1944, the exploration lease was reduced to a permanent operating lease with two plots (claims) totaling 42.09 acres selected to be retained. Plot 1, about 39 acres, covered the mineralized Shinarump channel on the Main Ridge, and Plot 2, about 3 acres, covered the projection of the channel on South Ridge (Figure 2).

During the period October 1943 through January 1946, small underground mines and open pits produced 489 tons of ore containing 13,737 pounds of  $V_2O_5$  (Chenoweth, 1985). This ore was processed at the vanadium mill at Monticello, Utah.

### **JESSIE BLACK AND HARVEY BLACKWATER'S MINING PERMIT**

About 1950, in response to the developing uranium boom, the Navajo Tribal Council adopted a series of resolutions dealing with uranium which were approved by the Commissioner of Indian Affairs. These resolutions developed regulations for prospecting and mining permits, mining leases, and royalty schedules. All prospectors needed to obtain permits for prospecting. Mining permits were granted to only Navajos who could then assign them to non-Navajos. Mining leases were no longer the subject of competitive bidding, but were negotiated with the Tribal Council, subject to approval of the Bureau of Indian Affairs. As a result of these new rules, five Navajos obtained mining permits on the land adjacent to VCA's lease.

Jessie Black and Harvey Blackwater determined that Cato Sells' tracts did not completely surround Plot 1 of VCA's lease. On June 6, 1950, they were issued an unnumbered Navajo Tribal Mining Permit for a 15.5 acre tract. This tract was contiguous with the south boundary of Sells' Tract No. 1 North and the east boundary of VCA's Plot 1 (Figure 2).

The two men formed Blackwater Mining Company with the assistance of Morgan L. Neilson of Blanding, Utah. Mr. Neilson became manager of the mining company. No doubt Blackwell Mining did exploration drilling on their permit in order to locate orebodies, but no records of any drilling could be located.

An initial shipment of 6.51 tons of ore, averaging 0.16 percent  $U_3O_8$  and 1.01 percent  $V_2O_5$  was made to the AEC ore buying station at Monticello, Utah on July 5, 1950. Sustained production did not begin until October 1950 and would continue until early 1953. In March 1952, the unnumbered mining permit was reissued as Mining Permit No. 47. Figure 3 is a map of the underground mine on the permit as of November 15, 1951. The majority of Blackwater's ore was shipped to the AEC ore buying station at Monticello, Utah. However, AEC records show that some 110 tons in 1952 were hauled to the U.S. Vanadium Corporation's ore buying station at Thompson, Utah. This station was buying ore for the company's mill at Rifle, Colorado.

The mining rights to MP-47 were assigned to Bruce M. Byler and William E. Pollack of Bluff, Utah in mid-March 1953. These operators continued shipments to the Monticello ore

buying station, but also shipped some ore to the AEC ore buying station at Shiprock, New Mexico in 1953 and 1954.

AEC records show that in 1953, Byler and Pollack made a 103.90 ton shipment labeled as the Marion Mine (Table 1). However, the Bureau of Indian Affairs royalty records indicate the ore came from MP-47.

In 1959, Byler and Pollack cancelled their assignment. Blackwater Mining Company resumed production in 1955 before the assignment was made to Mex Air Uranium Company of Blanding, Utah. These new operators continued mining until early 1957 with ore shipments being made to the ore buying station at Monticello, Utah.

When the large underground mine on MP-47 was examined by an AEC geologist on May 24, 1960, he noted that the underground workings appeared to exceed one mile in total length (AEC, 1960).

## **SUMMARY**

A careful review of the USGS royalty records (Allport, 1951, 1952, 1953) and the AEC ore production records show that during the years 1950 through 1957 mines on Jessie Black and Harvey Blackwater's Navajo Tribal Mining Permit No. 47 produced 5,449.47 tons of ore averaging 0.25 percent  $U_3O_8$  and 1.01 percent  $V_2O_5$  (Table 1). While the number of tons are the same, the number of pounds of  $U_3O_8$  and  $V_2O_5$  are less than those given in Gregg and Evensen (1989).

Ore purchased by AEC ore buying stations were processed at the adjacent mills. The mill at Monticello, Utah was operated by contractors for the AEC. The mill at Shiprock, New Mexico was operated by Kerr-McGee Oil Industries, Inc. until early 1963 when VCA acquired this mill. All the uranium produced was purchased by the AEC. Vanadium was recovered at the Monticello mill up to April, 1956. The vanadium that was recovered was later sold at auction or transferred to the General Services Administration. Vanadium produced at the Rifle mill was sold to the steel industry. Excess vanadium produced at Rifle was sold to the AEC. No vanadium was recovered at Shiprock while Kerr-McGee operated that mill (Albrethsen and McGurley, 1982).

## **LATER DEVELOPMENTS**

On July 20, 1959, VCA modified their original 1943 lease to include the adjacent mining permits held by individual Navajos. These permits include the following:

### **Yazzie Mesa**

Chee Nez MP-189

John Yazzie and Thomas Clani MP-288

### **Main Ridge**

Cato Sells MP-55 Tract No. 1 North

Cato Sells MP-55 Tract No. 2  
Jessie Black and Harvey Blackwater MP-47

**South Ridge**  
Willie Waters MP-188

The amended lease would later be known as VCA's Mining Unit No. 66 (Figure 4) for the AEC's allocation program that began in 1962. Any ore produced from these former mining permits would now be credited to the Monument No. 2 mine. When an AEC geologist examined the property on May 25, 1960, he noted that VCA was planning to do some stripping in the area of former Mining Permit No. 47 to obtain some low grade material for their upgrader (AEC, 1960).



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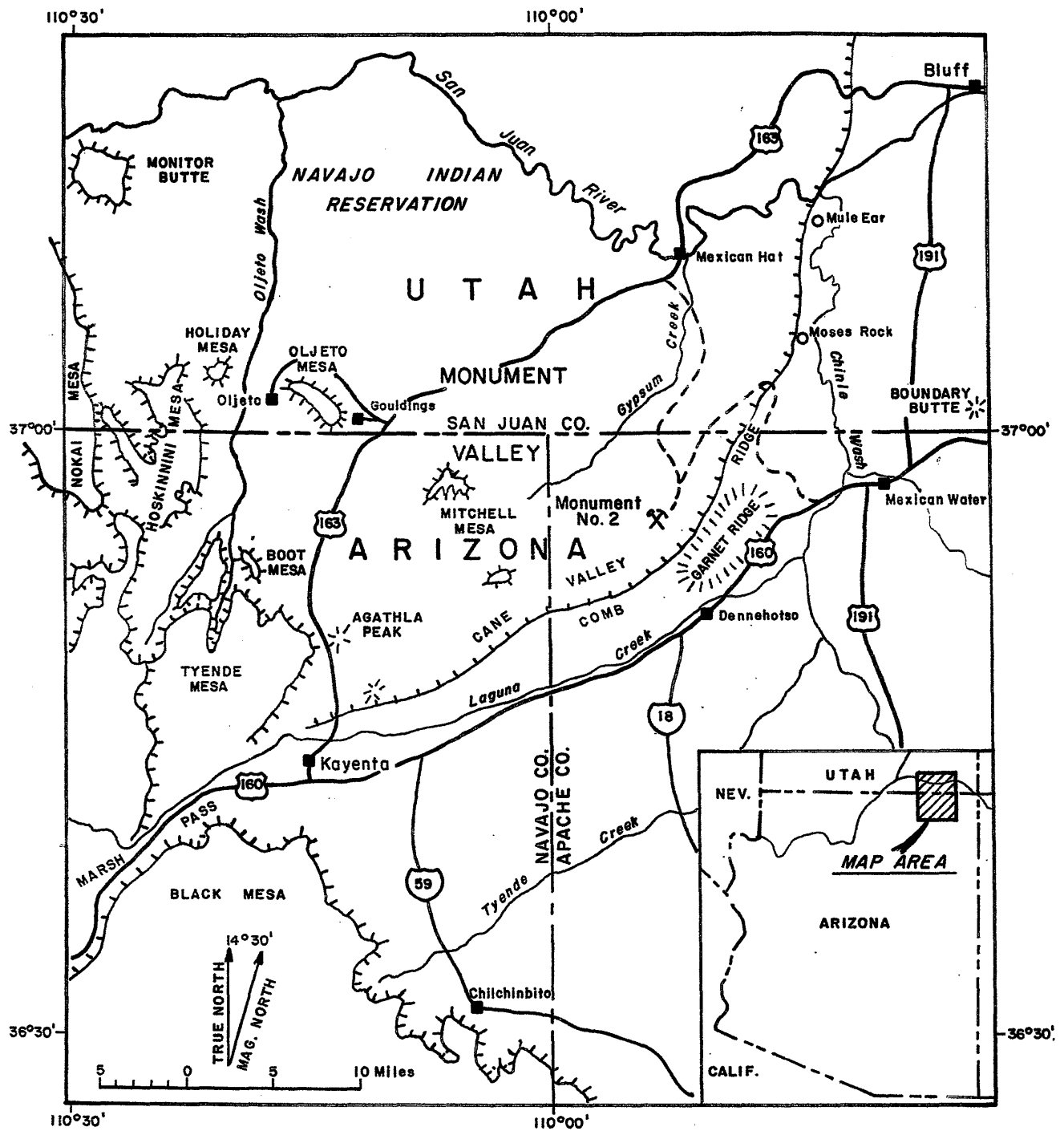
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**Table 1. Ore Production, Black and Blackwater Mining Permit, Monument Valley, Apache County, Arizona.**

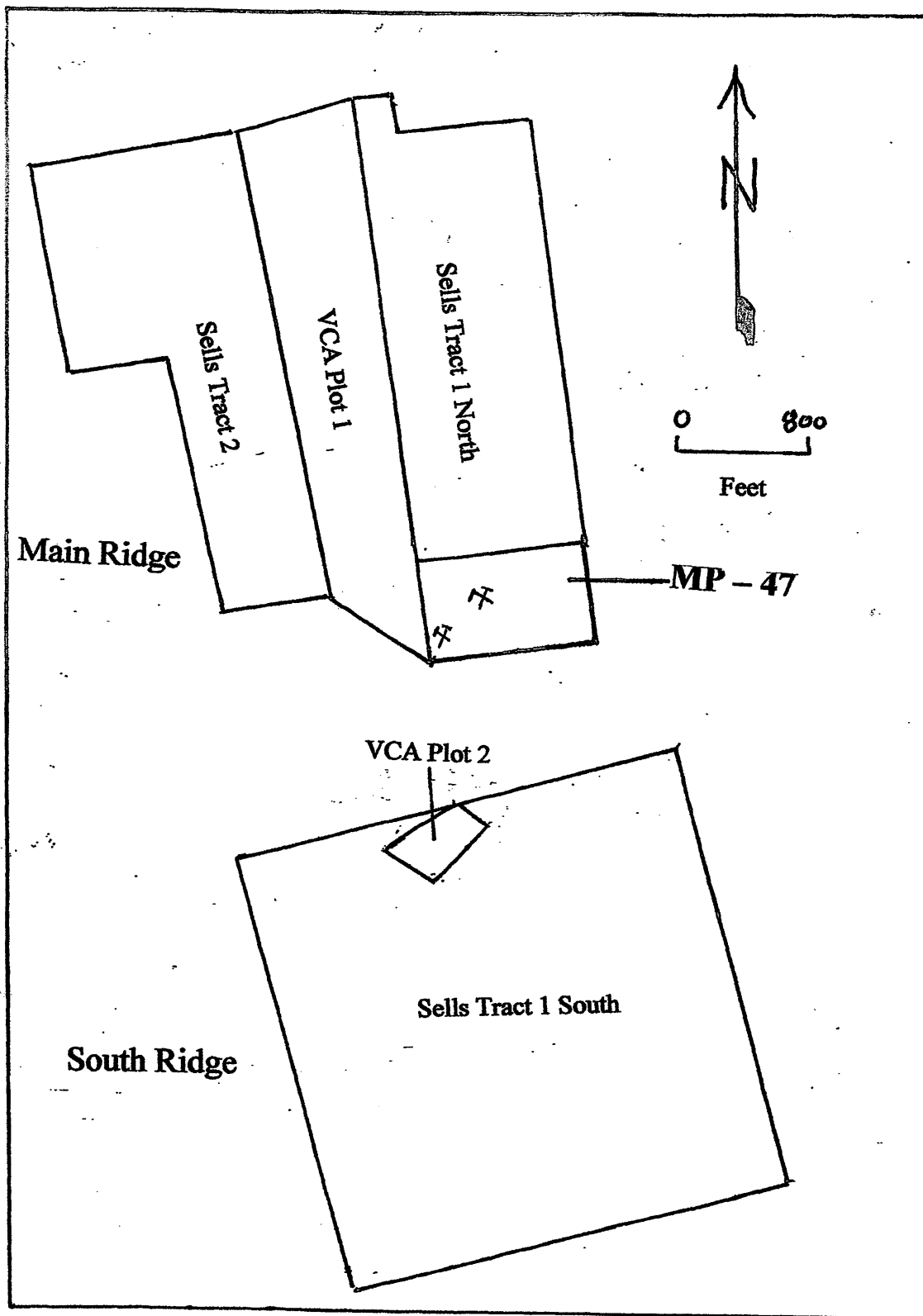
YEAR	OPERATOR	TONS OF ORE	POUNDS U <sub>3</sub> O <sub>8</sub>	% U <sub>3</sub> O <sub>8</sub>	POUNDS V <sub>2</sub> O <sub>5</sub>	% V <sub>2</sub> O <sub>5</sub>
1950	Blackwater Mining	685.75	2,382.85	0.17	12,620.12	0.92
1951	Blackwater Mining	971.39	3,819.89	0.19	19,141.76	0.99
1952	Blackwater Mining	1,271.98	6,963.68	0.27	27,142.58	1.07
1953	Blackwater Mining	229.19	1,329.30	0.29	5,269.61	1.15
1953	Byler & Pollack	47.80	349.18	0.37	1,403.97	1.47
1953	Byler & Pollack*	103.92	641.78	0.31	2,587.95	1.25
1954	Byler & Pollack	87.04	637.77	0.37	2,587.96	1.49
1955	Blackwater Mining	226.73	1,290.68	0.28	3,797.41	.84
1955	Mex Air Uranium	315.29	1,824.36	0.29	5,097.44	.81
1956	Mex Air Uranium	1,325.37	7,240.66	0.27	27,101.23	1.02
1957	Mex Air Uranium	185.55	1,016.24	0.27	2,961.29	.80
TOTAL		5,449.97	27,496.39	0.25	109,711.32	1.01

\*Shipped as the Marion Mine

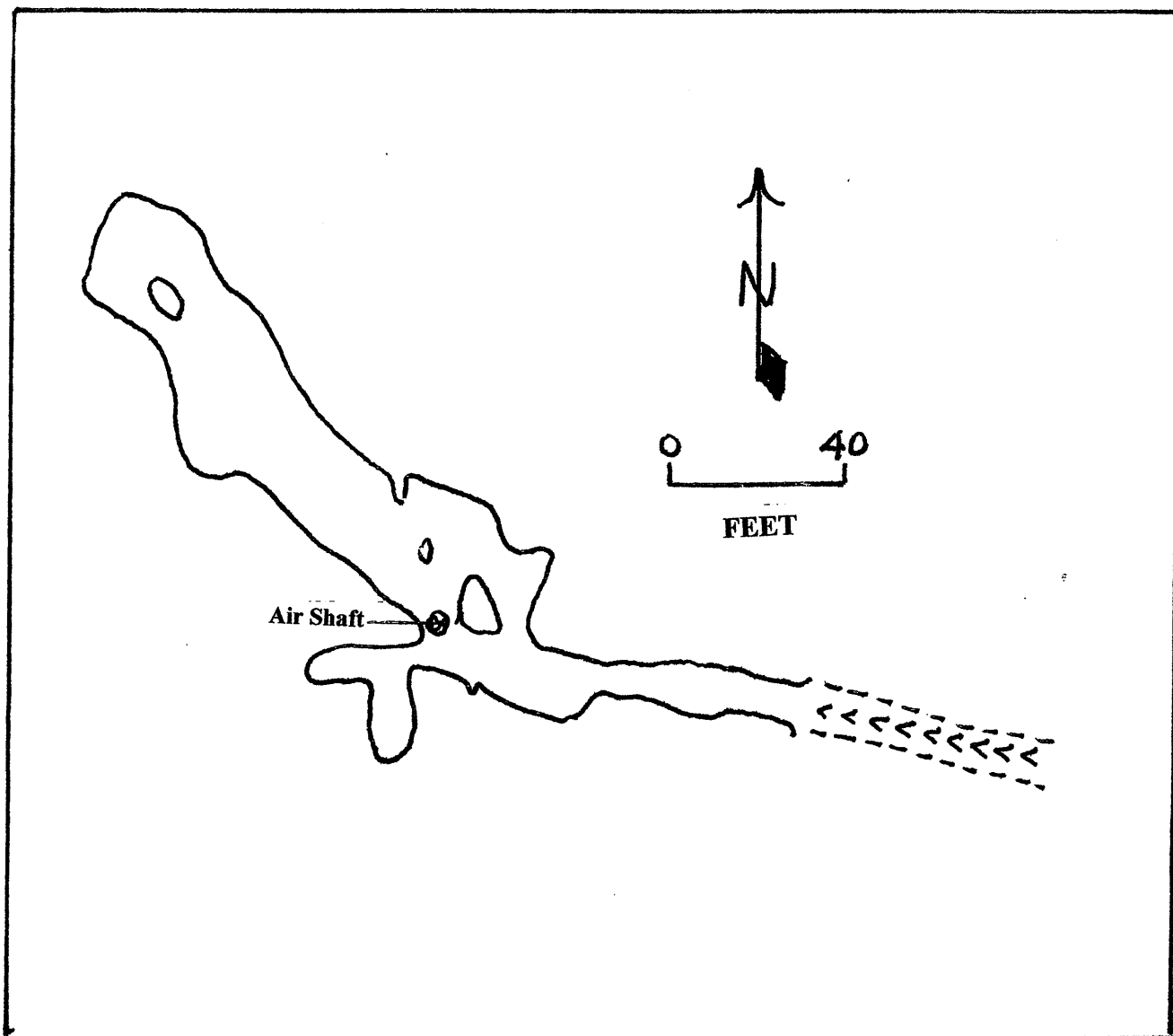
Source: Unpublished AEC records and USGS records



**Figure 1.** Index map of the Monument Valley area showing the location of the Monument No. 2 mine.



**Figure 2.** Map of VCA's Plots, Cato Sells Tracts and MP-47 (AEC, 1960).



**Figure 3.** Map of the underground mine on MP-47 as of November 15, 1951 (AEC, 1960).

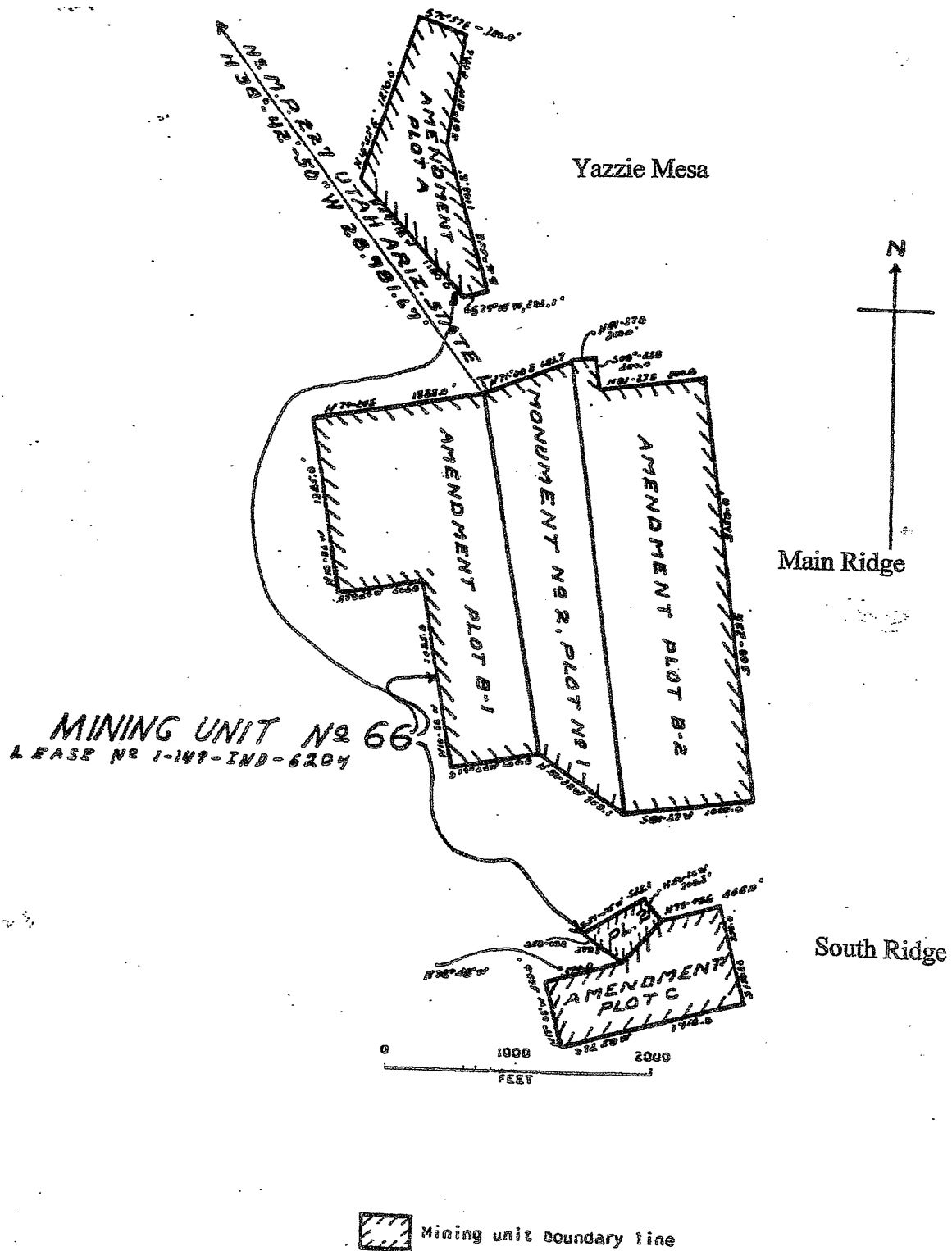


Figure 4. Map of the Monument No. 2 Lease, Amended, from AEC files.