

**LEASING AND MINING OF CARNOTITE  
DEPOSITS IN THE 1920'S, CARRIZO  
MOUNTAINS, APACHE COUNTY,  
ARIZONA AND SAN JUAN COUNTY,  
NEW MEXICO**

by

William L. Chenoweth  
Consulting Geologist, Grand Junction, Colorado

Arizona Geological Survey  
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416 W. Congress, Suite #100, Tucson, Arizona 85701

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# LEASING AND MINING OF CARNOTITE DEPOSITS IN THE 1920'S, CARRIZO MOUNTAINS, APACHE COUNTY, ARIZONA AND SAN JUAN COUNTY, NEW MEXICO

## INTRODUCTION

During the early 1920's there was a small amount of exploration and mining of carnotite ores in the Carrizo Mountains for their radium content. Very little factual information on this activity has been published, and some is incorrect. For example, a recent paper by Finch and McLemore (1989) states that these ores were mined from 1923 to 1927, when the only recorded production occurred in 1920.

The principal source of data presented here is a detailed report prepared by the General Services Administration (GSA), Indian Trust Accounting Division for the Navajo Tribe. This document (GSA, 1981) was admitted as evidence in U.S. Claims Court, Navajo Tribe vs. United States, Docket Nos. 69 and 299 (copper, vanadium, uranium, sand, rock and gravel claims) held in Albuquerque, New Mexico, February 24-March 4, 1983. A copy of the vanadium and uranium section was obtained by the Grand Junction Area Office of the U.S. Department of Energy, where the author was formerly employed.

## HISTORICAL BACKGROUND

The discovery of radium by Marie and Pierre Curie in 1898 led to the realization that all uranium ores contained this new element. Experiments which showed that radium inhibited the growth of certain cancers so astonished the medical profession that an incentive to mine the uranium-bearing ores was created.

Shortly before 1910, metallurgical processes for relatively large-scale recoveries of radium from carnotite ores were perfected. The improved processes resulted in greatly increased demands for carnotite and in accelerated prospecting in southern Colorado. About one gram of radium is present in every 200 to 300 tons of ore containing 2.0%  $U_3O_8$ .

Shortly after 1910, the carnotite deposits in southwestern Colorado and southeastern Utah became one of the principal world sources of radium (Tyler, 1930). For about 12 years, these deposits were mined for radium and yielded some byproduct uranium and vanadium. A summary of carnotite occurrences, mining methods, processing and uses in the early 1910's is given in a report by Moore and Kithil (1913).

## GEOLOGIC SETTING OF THE CARNOTITE DEPOSITS

Nearly all the carnotite deposits in southwestern Colorado and the adjacent parts of Utah, Arizona, and New Mexico occur in the Salt Wash Member of the Morrison Formation of Late Jurassic age. In the 1910's and 1920's this unit was

included in the McElmo Formation, a name now abandoned. Several carnotite deposits were known in the Triassic Chinle Formation, but only a few were mined in the 1920's.

The Salt Wash Member is exposed around the perimeter of the Carrizo Mountains in northeastern Apache County, Arizona, and in the extreme northwestern corner of San Juan County, New Mexico. The mountains consist of an irregularly shaped 68-Ma (Armstrong, 1969) intrusive mass composed of a central stock and several sills of light-gray diorite porphyry that have been injected laterally into the surrounding sedimentary rocks. The mountains are about 13 miles in diameter and rise 2,000-3,000 feet above the surrounding plain. Pastora Peak, elevation 9,420 feet, is the highest point (Figure 1). On the east side of the Carrizo Mountains the Salt Wash Member crops out as a belt from Red Rock to Beclabito roughly paralleling the Arizona-New Mexico state line; south of Beclabito it rims Beclabito dome. West of the dome, a narrow band of Salt Wash Member is exposed on the margin of the intrusion. On the north side of the Carrizo Mountains there is a large exposure of the upper Salt Wash Member southwest of the Four Corners area. The lower Salt Wash is exposed in a small area at the foot of the mountains and in separate exposures interbedded with igneous sills in the northeastern part of the intrusive complex. The Toh Atin anticline exposes the lower Salt Wash Member in the northwest Carrizos at Martin Mesa. The large amount of Salt Wash Member north of the Toh Atin anticline is largely covered with dune sand, and the lower Salt Wash Member is also exposed near the Utah state line. West and south of the Carrizo Mountains the Salt Wash Member caps numerous mesas. In the central part of the Carrizo Mountains, discontinuous outcrops of Salt Wash Member occur within the intrusive sills.

In the Carrizo Mountains the Salt Wash Member consists of 180-250 feet of fluvial, light tan to white, fine-grained sandstone with interbedded, thin beds and lenses of gray, grayish-green and reddish-gray mudstone. The sandstone comprises from 5 to 30% of the member.

The uranium-vanadium orebodies are formed by the selective impregnation of the sandstone and adsorption by the mudstone and fossil plant material. Orebodies are commonly associated with detrital plant fragments in the sandstone. The orebodies are roughly tabular in cross-section and irregular in plan. They range from several feet in width to a few hundred feet in length. Thicknesses range from a feather edge to up to ten feet. Small high-grade pods of ore are associated with replaced fossil wood. Throughout the Carrizo Mountains the orebodies occur at various stratigraphic horizons in the Salt Wash member; however, the ore is always found in the lower one-half of the member.

The bright yellow mineral carnotite, a potassium uranium vanadate, has given the deposits their name. Later work by Corey (1956,1958) and Austin (written communication, 1967) have identified tyuyamunite, a calcium uranium vanadate, and meta-tyuyamunite as the only uranium minerals in the Carrizo deposits. Vanadium clay and montroseite are present. These minerals have been oxidized to form a number of secondary vanadium minerals that include sherwoodite, duttonite(?), hewettite, metahewettite, rossite, metarossite, and hendersonite (Corey, 1958). Calcite is a common cement in ore. Pyrite, iron oxides, and gypsum may also be present.

The ore grades range from 0.10 to more than 0.50%  $U_3O_8$  and from 1.00 to 5.00%  $V_2O_5$ . Some fossil logs contain material in excess of 1.00%  $U_3O_8$ .

## EARLY PROSPECTING

Outcrops containing uranium and vanadium minerals in the Carrizo Mountains were discovered by John F. Wade about 1918 (personal communication, 1955). Wade of Farmington, New Mexico, operated Sweetwater Trading Post in the western Carrizo Mountains. Through business contacts and field trips, he had determined that the same rocks that contained the carnotite deposits of southwestern Colorado were present in the Carrizo Mountains. The newly discovered deposits could not be mined because the Navajo Reservation was closed to prospecting and mining. A Congressional Act of June 30, 1919, opened the Navajo Reservation to prospecting and locating mining claims in the same manner as prescribed by the United States Mining Law of 1872. This Act allowed prospectors to enter the Reservation and stake a mining claim if their prospecting located promising mineralization. The locator of the claim then obtained a lease on this land under terms that included escalating advance royalties and rentals, and annual work commitments.

During the 1920's the Office of Indian Affairs (later changed to Bureau of Indian Affairs), U.S. Department of the Interior, issued four leases for metal mining in the Carrizo Mountains (GSA, 1981). Three of these leases were for carnotite mining. A fourth lease, located in the northeastern Carrizo Mountains is believed to have been for copper (Chenoweth, 1989).

## NORTHWESTERN CARRIZO MOUNTAINS

### Radium Ores Company Lease

After the Navajo Indian Reservation was opened to prospecting, Radium Ores Company, John F. Wade, president, located 28 claims in the northern and western Carrizo Mountains (Figure 1). Details of the location and size of the claims are given in Table 1.

In November, 1920 Radium Ores Company produced 40,000 pounds of ore valued at \$1,600. A transportation charge of \$1,200 left the value at only \$400 (Table 2). It is possible that this material was shipped to the Standard Chemical Co.'s ore-buying station near Naturita, Colorado, which was buying carnotite ores for their radium content in the 1910's and 1920's. The November, 1920 shipment represented the first production of carnotite ore from the Carrizo Mountains. According to Wade (personal communication, 1955) this shipment came from mineralized exposures along Saytah Wash. This shipment was apparently made in trespass, as Radium Ore Company's lease did not become effective until December 23, 1922 (Table 3). At that time, Radium Ores paid their first year rental of \$142.50 for the 570.016 acres held under lease (Table 2).

Radium Ores apparently never cancelled their lease and by 1931, some \$3,990.00 in back rent was due (see McCray in Appendix). The Federal govern-

ment apparently settled with the bonding company in 1932 for \$500.00 (Table 2).

## EASTERN CARRIZO MOUNTAINS

### Carriso Uranium Company Lease

John F. Wade operating as the Carriso Uranium Company, also located 40 claims astride the Arizona-New Mexico state line in the vicinity of Milepost 16 (Figure 1).

In April, 1921 the area was examined by W.H. Staver, a consulting mining engineer (see Appendix). Staver noted that the company's holding consisted of the South Butte, Bluebell, North Star, and Hilltop claim groups. The North Star Group was located astride the state line, with five claims in New Mexico and six claims in Arizona, and contained the only development. Thirty-seven sacks of high-grade ore from these claims were stored at Beclabito Trading Post (Figure 1). Staver estimated that a total of 2,900 tons of probable ore could be developed on the property. Hess (1924) also visited the area of the Carriso Uranium Company's activities in 1921 and reported that no shipments had been made.

The GSA (1981) could not locate the details of the Carriso Uranium Company's lease, except for the first year's rental on 177.45 acres paid in May, 1922 (Table 4). No production was recorded, and the disposition of the sacked ore at Beclabito is not known.

### Williams and Johnson Lease

By 1922 the radium industry in southwestern Colorado was beginning to decline as the carnotite ores were no longer competitive with the newly developed high-grade pitchblende ore in the Belgian Congo (now Zaire). A vanadium market never developed, as there was little demand for domestic vanadium because of imports from Peru.

In spite of the lack of demand for carnotite ores, George O. Williams and Nephi Johnson leased 20.661 acres on June 8, 1923, effective January 22, 1924 (Table 5). This lease covered the Upper Bell Lode Claim of U.S. Mineral Survey Number 1887. The only description of the location is T. 11 N., R. 5 W., Navajo Baseline and Meridian, San Juan County, New Mexico. Since King Tutt Mesa is located in the north-central part of this township, it is very possible that the lease was located here. No production was located by the GSA (Table 6), but an Office of Indian Affairs memorandum of December 4, 1936 (see McClellan in Appendix) noted a 20-foot-deep shaft, or hole, had been dug on the claim, and about one ton of ore had been hauled to Durango, Colorado. Williams and Johnson paid rental on their lease for five years, totalling \$47.27 (Table 6), through February, 1927.

## MONUMENT VALLEY

Although Gregory (1917) and Butler and Allen (1921) noted the occurrence of carnotite in the Shinarump Member of the Chinle Formation in Monument Valley, records of the Office of Indian Affairs indicate no leases were made during the 1920's (GSA, 1981).

## LATER DEVELOPMENTS

On March 25, 1936, the Secretary of the Interior closed the Navajo Indian Reservation to claim location and prospecting for minerals until further authorization. In July 1936, an application to prospect was made to the Executive Committee of the Navajo Tribal Council. The application asked the council to pass a resolution requesting the Secretary of the Interior to open the Navajo Reservation for mining to the applicant. The resolution was rejected by the Executive Committee, which evidently did not want prospecting or mining on the Reservation at that time. The Navajo Indian Reservation was again opened for prospecting and mining by a Congressional Act of May 11, 1938.

## SUMMARY

During the early 1920's the Office of Indian Affairs, U.S. Department of the Interior issued four leases in the Carrizo Mountains for metal mining. Three of these leases were for carnotite, the fourth is believed to have been for copper. No leases were issued in the Monument Valley area.

The only carnotite production from the Carrizo Mountains was in November, 1920, when 40,000 pounds of ore were shipped from surface exposures along Saytah Wash in the northwestern Carrizo Mountains in Apache County, Arizona. The operator, Radium Ores Company, was paid \$0.04 per pound for a total value of \$1,600.00. A transportation charge of \$1,200.00 decreased the net value to \$400.00. The host rock was the Salt Wash Member of the Morrison Formation.

**ACKNOWLEDGEMENT:** A review of this report by John W. Welty, Arizona Geological Survey greatly improved it.

## REFERENCES

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- Moore, R.B., and Kithil, K.L., 1913, A preliminary report on uranium, radium and vanadium: U.S. Bureau of Mines Bulletin 70, 101 p.
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TABLE 1

Details of Claims Included in Radium Ores Company's Carnotite Leases

<u>Acres</u>	<u>Claims</u>	<u>Location</u>
20.661	Sunnyside	Sunnyside Mesa
103.305	Eurida Nos. 1, 2, 3, 5	Eurida Mesa
20.661	Eurida No. 4	Eurida Mesa
61.983	Preston, Preston No. 1, Stormy Day	Saytah Wash
82.644	Preston Nos. 2, 3, 4, 5	Saytah Wash
41.322	Say Tah, Martin	Saytah Wash
<u>230.440</u>	Martin Nos. 2-13	Saytah Wash

570.016 total acres

Source: GSA (1981), Dyer (1928)[see Appendix].

See Figure 1 for locations.

TABLE 2

NAVAJO RESERVATION

Metalliferous Reciepts

RADIUM ORES COMPANY

Date	Pounds of Ore	Price per Pound	Total Value	Transporation Deduction	Net Value (For Royalty)	Royalty (12.5%)	Official Receipt Number	Official Receipt Date	Amount	Note
11/20/20	40,000	\$0.04	\$1,600.00	\$1,200.00	\$400.00	\$50.00	132606	11/29/20	\$50.00	1
02/22/22	None						260648	02/01/22	\$142.50	2
11/22/32	None						-----	11/30/32	\$500.00	3
TOTAL	40,000		\$1,600.00						\$692.50	

<sup>1</sup>Royalty on ore shipment.

<sup>2</sup>Annual rental on 570.016 acres at \$0.25/acre.

<sup>3</sup>Payment received at U.S. Treasury for the Radium Ores Co. in settlement of U.S. vs. Radium Ores Co.; settlement by surety.

Compiled from Bureau of Indian Affiars records by the Indian Trust Accounting Division, General Services Administration, May 13, 1979.

TABLE 3

## NAVAJO

## METALS LEASE/CONTRACT INFORMATION

CONTRACT -- 1/

DOCKET NOS. 69, 299, 353

EXECUTION DATE --

Effective Date	Lessee	Acres	Rental	Royalty Terms	Due Dates		Payable To
					Rental	Royalties	
12/23/22 <u>2/</u>	Radium Ores Company	570.016	Per annum Rate per acre	--	In advance		U.S. Government
			1st year - \$ .25				
			2nd year - .50				
			3rd year - .50				
			4th year - .75				
			5th year - .75				
			Thereafter - 1.00				

LEGAL DESCRIPTION

(See Exhibit 19-2 for description of location)

1/ Exhibit No. 19 - Lease Information2/ Exhibit No. 20 - Date of Lease

Exhibits No. 19 and 20 could not be located.

Compiled from Bureau of Indian Affairs records by the Indian Trust Accounting Division,  
General Services Administration, 1979.

TABLE 4

NAVAJO RESERVATION

Metalliferous Receipts

CARRISO URANIUM COMPANY

Date	Pounds of Ore	Price per Pound	Total Value	Transportation Deduction	Net Value (For Royalty)	Royalty (12.5%)	Official Receipt Number	Official Receipt Date	Amount	Note
05/22/22	None						260711	05/19/22	\$44.36	1
TOTAL	None								\$44.36	

<sup>1</sup>First year annual rental on 177.45 acres at \$0.25/acre.

Compiled from Bureau of Indian Affairs records by the Indian Trust Accounting Division, General Services Administration, May 13, 1979.

TABLE 5

NAVAJO

## METALS LEASE/CONTRACT INFORMATION

CONTRACT 1/

DOCKET NOS. 69, 299, 353

EXECUTION DATE 06/08/23

Effective Date	Lessee	Acres	Rental	Royalty Terms	Due Dates		Payable To
					Rental	Royalties	
01/22/24	George O. Williams and Nephi Johnson	20.661	Per annum. <u>Rate per acre</u>	<u>Per cent of net value</u>	In advance	Within 10 days after the close of each month	U.S. Govern- ment
			1st year - \$ .25	5% up to \$ 20			
			2nd year - .50	6% up to 40			
			3rd year - .50	7% up to 60			
			4th year - .50	8% up to 80			
			5th year - .50	9% up to 100			
			Thereafter <u>2/</u> - 1.00	10% over 100			
			See below <u>2/</u>				

LEGAL DESCRIPTION

Upper Bell Lode Claim, San Juan County, New Mexico; fully described in the field notes of U.S. Mineral Survey No. 1887.

LEGAL DESCRIPTION

Township 11 North, Range 5 West N.E. and M. San Juan County, New Mexico, Mineral Survey No. 1887, covering 20.661 acres

1/ Exhibit No. 21 - Contract on lease

2/ Rental - To be credited against any royalties accruing during that year if production begins therein

Exhibit No. 21 could not be located.

Compiled from Bureau of Indian Affairs records by the Indian Trust Accounting Division,  
General Services Administration, 1979.

TABLE 6

## NAVAJO RESERVATION

## Metalliferous Receipts

## WILLIAMS AND JOHNSON

Date	Pounds of Ore	Price per Pound	Total Value	Transportation Deduction	Net Value (For Royalty)	Royalty (12.5%)	Official Receipt Number	Date	Amount	Note
03/13/23	None						354461	03/13/23	\$5.17	1
03/24/24	None						365068	03/08/24	\$10.50	2
02/25/25	None						603409	02/12/25	\$10.50	3
02/26/26	None						630727	02/06/26	\$10.50	4
02/27/27	None						630499	02/16/27	\$10.50	5
TOTAL	None								\$47.27	

<sup>1</sup>First year's annual rental on 20.661 acres at \$0.25/acre.

<sup>2</sup>Second year's annual rental on 20.661 acres at \$0.50/acre.

<sup>3</sup>Third year's annual rental on 20.661 acres at \$0.50/acre.

<sup>4</sup>Fourth year's annual rental on 20.661 acres at \$0.50/acre.

<sup>5</sup>Fifth year's annual rental on 20.661 acres at \$0.50/acre.

Compiled from Bureau of Indian Affairs records by the Indian Trust Accounting Division, General Services Administration, May 13, 1979.

## **A P P E N D I X**

**The Appendix includes the following documents:**

**Dyer, B.W., 1929, Report on the lease of the Radium Ores Company on the Navajo Indian Reservation: U.S. Geological Survey unpublished report, 4 p.**

**Staver, W.H., 1921, Report on the Carriso Uranium Company's claims in the San Juan Indian Reservation: unpublished report, 25 p.**

**Letter from Mr. W.W. McClellan, Jr., Supervisor, Navajo Service, Office of Indian Affairs, Shiprock, New Mexico, to Mr. Ray Walker, Acting Director Land Management, Navajo Service, Office of Indian Affairs, Window Rock, Arizona, dated December 4, 1936.**

**Letter from E.R. McCray, Superintendent, Northern Navajo Agency, Office of Indian Affairs, Shiprock, New Mexico, to the Commissioner of Indian Affairs, Washington, D.C., dated August 17, 1932.**

1929

R E P O R T

O N

THE LEASE OF THE RADIUM ORES COMPANY

ON THE

NORTHERN NAVAJO INDIAN RESERVATION

BY

B. W. Dyer  
U.S. Geological Survey

ENGINEER'S REPORT ON THE  
LEASE OF THE RADIUM ORES COMPANY  
ON THE  
NORTHERN NAVAJO INDIAN RESERVATION  
EXAMINED OCTOBER 17 & 18, 1929 by D.W. DYER

The lease of the Radium Ores Company on the Northern Navajo Indian Reservation was examined May 23 and again on October 17, and 18, 1929 by D.W. Dyer. On the first visit the writer was accompanied by Mr. Six, Supt. of the Shiprock Agency. At that time no map of the property was available and the property was located through the efforts of Mr. Six who found an Indian who knew the location of one of the prospects. Later, maps were received and on the second visit the writer was accompanied by Mr. J.J. Bourquin, Mining Engineer, U.S. Geological Survey. The four northern leases, consisting of 21 claims, were the only ones examined. It would have been necessary to establish a camp to examine the three leases in the next township south.

LOCATION:

The leases, seven in number containing 28 claims, are located forty miles west of Shiprock, New Mexico, on the Northern Navajo Indian Reservation, Apache County, Arizona, and are from two to four miles west of the Carrizo Mountains. Four of the leases when the area has been surveyed will probably be located in the northwest corner of Township 13 North, Range 7 West, Navajo Base Line and the other leases in the next township south. The distance by road from the northerly group of leases to Shiprock is approximately forty miles. The railroad shipping points are Farmington New Mexico on the Denver & Rio Grande Western Railroad and Gallup New Mexico on the Atchison, Topeka & Santa Fe Railway. The distance from Shiprock to Farmington is thirty miles and Gallup ninety miles. The road from the property to Shiprock is poor but with a comparatively small cost could be made a good hauling road. The road connecting Shiprock to either Gallup or Farmington is very good.

HOLDINGS AND DESCRIPTION OF PROPERTY:

The holdings comprise seven leases containing a total of 28 claims and 570.016 acres. The claims held under each lease are as follows:

Martin #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, and #13	consisting of twelve claims of -----	239.44 acres
Preston #2, #3, #4, and #5	consisting of four claims of -	82.644 "
Say Tah and Martin	" " two " "	41.322 "
Preston, Preston #1, and Stormy Day	" three " "	61.983 "
Eurida #4	" one " "	20.661 "
Eurida and Eurida #1, #2, #3, and #5	" five " "	103.305 "
Sunnyside	" one " "	20.661 "

total... 570.016 "

## HOLDINGS AND DESCRIPTION OF PROPERTY (cont'd)

The property lays west of the Carrizo Mountains in the typical desert country of Northern Arizona. Two maps (Exhibits A & B) showing location of claims are attached to this report. The leases shown in Exhibit A were the only ones examined.

### GEOLOGY:

The ore, which is carnotite, is deposited in the McElmo sandstone of either the lower Cretaceous or upper Jurassic Age. View #1 is a view of the McElmo formation 2500 foot south of the Martin claim. Where examined, the ore body was practically flat, lenticular in shape and varied in thickness from a few to 42 inches. View #2 shows distant view of two prospects and Views #3 and #4 are close-up scenes of the same prospects. Due to surface slides, the ore could not be traced continuously for more than a few hundred feet but prospect pits had been dug along the outcrop at various intervals on the claims and in each of these prospects the ore was encountered, but generally in too small quantities to be commercial.

Two samples were taken on the Say Tah claim: One sample was cut from an exposed face 3' 3" in thickness and the second was a grab sample from the same place. The analysis of these samples are as follows:

Sample cut 3' 3"	$V_2 O_5$	1.61%	$U_3 O_8$	0.53%
Grab sample	$V_2 O_5$	1.24%	$U_3 O_8$	0.12%

A sample 1' 5" in thickness was cut from the yellow colored soft sandstone outcrop on the Martin #3 claim. The analysis of this sample showed only traces of vanadium and uranium. According to Mr. J. L. Wade, Agent for the Radium Ores Company, ore of commercial thickness has been encountered which averaged approximately 4%  $V_2 O_5$  and 0.50%  $U_3 O_8$ . These values were probably obtained on the southern group of claims which were not examined.

### DEVELOPMENT:

The development work on the four northerly leases consists of open cuts dug along the outcrop. These cuts are from 10 to 90 feet in length with a face 6 to 10 feet in height and are dug at intervals of from 300 to 1000 along the outcrop on the claims. Besides the open cuts, a substantial stone house, shown in View #5, has been constructed and is in a fair state of repair. Approximately \$10,000 has been spent upon the leases in constructing roads, buildings, prospecting and surveying.

FUTURE OUTLOOK OF THE LEASES:

Some ore of probably commercial value has been exposed in the prospect pits on claims examined, but since all the development consists of open cuts along the outcrop the extent of the ore body has not been determined. The present showing does not warrant the construction of any permanent mining structures but does warrant additional prospecting. If sufficient ore was developed to justify the construction of a mill, water for its operation could probably be developed with a few miles of the claims. Also oil for fuel could be obtained from the Rattlesnake field about 10 miles west of Shiprock or coal could be had from the coal field 10 miles east of Shiprock.

RENTALS:

The leases were issued December 23, 1923 and the rentals due are as follows:

<u>Lease average</u>	1st yr. 25¢ per acre	2nd yr. 50¢ per acre	3rd yr. 50¢ per acre	4th yr. 75¢ per acre	5th yr. 75¢ per acre	6th yr. 1.00 per acre
239.44 acres	\$60.00	\$120.00	\$120.00	\$180.00	\$180.00	\$240.00
20.661 "	5.25	10.50	10.50	15.75	15.75	21.00
82.664 "	20.75	41.50	41.50	62.25	62.25	83.00
41.322 "	10.50	21.00	21.00	31.50	31.50	42.00
103.305 "	26.00	52.00	52.00	78.00	78.00	104.00
20.661 "	5.25	10.50	10.50	15.75	15.75	21.00
61.983 "	15.50	31.00	31.00	46.50	46.50	62.00
total....	\$143.25	\$286.50	\$286.50	\$429.75	\$429.75	\$573.00

Total rental due since lease was issued	\$2,148.75
Total rental paid to Oct.15,1929	142.50
Balance unpaid Oct.15,1929	\$2,006.25

STATUS OF LEASE:

The annual assessment work of \$100.00 per claim per year as required by the leases has not been done during the last few years and it is probably that no work has been done since 1924. This may be construed as a violation of one of the terms of the lease and be sufficient cause of action toward cancelling the leases.

At the time of the examination in October, only the first year's rental had been paid. At that time the Superintendent of the Shiprock Agency had been negotiating for about six months with the lessee regarding the paying of the unpaid rentals and had not been able to collect any of the amount due. If the rentals by this time have not been paid in full, it is recommended that action be taken toward cancelling the leases and collecting the rentals due.

The ore on these leases is well exposed along the outcrop, yet there is no knowledge of its extent beyond the outcrop. Before any mining can be done, a considerable expenditure for prospecting will be necessary.

In most cases the original claim corners are standing in their original position. In case the present leases are cancelled, it is recommended a permit to prospect be allowed as more prospecting is necessary before attempting to do actual mining or erection of permanent structures.

It is also recommended that if the leases are again issued as lode mining claims that the lessee not be required to resurvey all the claim but only be required to re-establish the corners that have been destroyed.

The nature of the deposit is such there appears to be no reason why it cannot be located and leased as placer claims. To locate a deposit such as this under the placer law would be advantageous both to the Indian Service and the lessee. It is recommended if these claims are again leased that the lessee be allowed to make his location under the placer law.

*Maps + Pictures not obtained*

*Returned to Ind. office*

*MDR*

**REPORT ON THE CARRISO URANIUM COMPANY'S CLAIMS IN THE  
SAN JUAN INDIAN RESERVATION**

by

**W.H. Staver  
Mining Engineer**

**July, 1921**

A copy of this report was given to the Grand junction office of the U.S. Atomic Energy Commission by Karl L. Kithil, U.S. Bureau of Mines. No maps were included with this copy.

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## LOCATION

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The mineral claims located in the San Juan Reservation for the Cariso Uranium Co. are situated on and near the Arizona-New Mexico line, sixteen miles south of the Four Corners of Arizona, New Mexico, Utah and Colorado.

They are on the south-eastern side of the Carrizo Mountains at an elevation of 5500 to 6500 feet above sea level.

The next sheet of this report is constructed from two U. S. G. S. topographic sheets and shows the approximate location of the forty claims of the Cariso Uranium Co.

Five blue prints, showing the Hilltop Group, the North Star Group, the Vadium and Cave Claims, the Bluebell Group, and the South Butte Group, and giving ties from one group to the next, accompany this report. The prints are from maps by Kroeger and Ritter, Durango, Colorado.

From data supplied by these prints and from ties supplied by the engineers referred to above I made a smaller scale claim map, showing the claims by groups, in outline. A print from this map accompanies this report.

## TRANSPORTATION

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The nearest railroad is at Farmington, N. M., nearly sixty miles distant by the present wagon roads. This can be shortened at a moderate expense. An automobile can be driven, over good roads save two short steep pitches from Farmington to Beclabeto, (Morris' Trading Post). A poor wagon and auto road leads to the Valley View Camp seven miles south of the trading post referred to. An auto can be driven now to most of the claims and a wagon can go to all but two.

An expenditure of a few thousand dollars will provide better transportation from the mines to the railroads than from any of the radium ore camps of Colorado and, I think, Utah.

This group of claims possesses this great advantage over other radium ore camps chiefly because of the natural conditions.

The auto ride from Beclabeto, near the mines, to Shiprock, 23 miles distant, was made by three of us in an overloaded Ford in about an hour and a half. After some delay, we continued the trip by riding from Shiprock to Farmington, over nearly level roads, in two hours, with two passengers. From Farmington To Durango we made the trip by auto in less than four hours. The same auto, under better conditions, has made the same trip in less than three hours. It is 33 miles from Shiprock to Farmington and about 56 miles from Durango to Farmington. The entire trip from Beclabeto to Durango took nine hours of elapsed time or seven and a half hours or less of running time. We did not hurry, stopping at several small towns en route, and the roads from Farmington to Durango were in bad condition for a third of the distance.

There is little doubt the Navajos will freight ore, in wagons, to Shiprock, for \$10.00 per ton. This is from the mines. A section of road from the mines to Red Wash needs to be finished. The distance from the mines to Farmington will be about 55 miles by this route, and the distance from the South Butte claims several miles less than this.

The cost of auto freight for ore is apt to be no cheaper but more reliable. However, it may be advisable to use all the Navajo labor possible and the competition of autos and Navajo wagons should be encouraged.

The present freight rate from Farmington to Shiprock is \$20.00 per ton in small lots. It is likely \$10.00 per ton will be reached in large lots, or even less.

On the trip from the radium ore fields of the Paradox Valley to Flacerville, or from Gateway to Whitewater, a greater mileage for less money, over much poorer roads, has been obtained.

Freighting of ore outside the agency can best be done by auto, in my opinion, as the Indians will thus be kept in their reservation, and excellent roads are usually found outside the reservation.

The contracting of freighting should be easier than in other districts, as conditions are nearer uniform, as regards climate and road surface.

An improvement of the road from Farmington past Shiprock to north-western Arizona, passing close to Beclabeto, is contemplated. It will be a part of the Park to Park Highway leading to the Natural Bridge section of Utah. Various governmental, state and other officials have lately inspected the route, by auto, past the section that interests us.

Agitation has been renewed lately for the construction of a railroad from Farmington to Gallup, N. M. or Fort Defiance, N. M. on the Atchison, Topeka and Santa Fe Railroad. This is a revival of the plan contemplated by E. H. Harriman. The farmers in the San Juan from Durango to Shiprock are to turn in farm land at \$50.00 per acre for railroad bonds and fifty thousand acres are to be thus turned over to the railroad.

company for its bonds. Meetings are being held in various parts of the sections interested and it appears probable that this long needed railroad will be constructed. An outlet to California for coal and cattle will be thus secured. It is reported that the Southern Pacific Railway contemplates a return to the use of coal instead of oil for its engines. This will require, under present conditions, access to the coal fields of Colorado, if nearness and cheapness be the deciding factors. A railroad passing near Shiprock would help the transportation situation materially. It cannot be counted on but it is a probability and deserves consideration.

TOPOGRAPHY

There is less relief in this region than is usual in Arizona and the radium ore fields of Colorado and Utah. There is much variety, however, due to the combination of mesas, washes, cliffs, and buttes. The Carrizo Mountains rise to a height of 9000 feet above sea level, while the south-eastern flanks, in which we are interested, are at an elevation of 5500 to 6500 feet above sea level.

The volcanic intrusion, resulting in the Carrizo Mountains distorted the sedimentaries, (common to the region), in an irregular way. On the south-east side of the mountains, mesas of sedimentary origin, underlain by the laccolith which formed the mountains, show their common topographic form. These mesas are eroding rapidly. They are usually bounded by low peneplains. Cliffs over fifty feet in height are rare here though common in the Colorado-Utah radium ore fields.

Between the mesas are located the water channels, frequently called "washes". In a few places erosion has washed the sandstone down to a certain red sandstone that better resists erosion, leaving a rounded, irregular gently inclined surface, free from pebbles, soil, or vegetation for a space hundreds of feet wide and a half-mile in length.

Additional variety is given the topography by a number of volcanic buttes or necks, some of several hundred feet in height and a half mile in length. Farther to the east is the well known Shiprock, rising above its level surroundings, like a full-rigged ship in a brown sea.

With all this distortion of sedimentary forms the erosion has been sufficient to build up gentle talus slopes along which one can ride, even by auto, over a large part of the area, with little in the way of road building.

In the region under consideration erosion has not cut below the McElmo nor is anything exposed much above the Dakota strata, save the volcanic rocks already referred to.

Road building in this region will be easy save for the crossing of the washes and they present no unusual problems.

DRAINAGE  
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The area under consideration is drained by the San Juan River which flows into the Colorado River in Utah. The drainage waters of the northerly slopes of the Lukichukai Mountains flow into "Red Wash" on the easterly end of the located claims. The "Red Wash" presents the only transportation difficulty. At present, steep grades of 300 yards in length of good surface, lead down to the sandy stretch, several hundred yards wide, with a little water flowing over it and much underneath, constituting the "Red Wash".

There are many brooklets flowing from the Carrizo Mtns. After a shower they flow for days, then sink into the sand, to flow under the surface into the "washes" or silt-laden rivers so typical of this section. The water is well filtered and of good quality but hardly more than sufficient for drinking purposes and for the need of the stock that grazes in the vicinity. It is probable that water for a mill could be developed in the "Red Wash" and this would be a convenient location.

INDUSTRIES  
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The Navajos live by the grazing of sheep and goats, supplemented by the raising of grain, and a few vegetables on a small scale, sufficient for their needs. Wool, hides, pelts, blankets and baskets, together with a few articles for the tourists, are all they have to sell to the trader. A few can work in silver and semi-precious stones. At present their wool is bringing but a few cents per pound. All else is in proportion. The Navajos need work as their basic industries are suffering. The opening up of a mine will give them a source of revenue they need at present. They work for less than our American labor and some of them are willing and competent.

The government school at Shiprock has taught the Indians many useful arts which they rarely use after leaving the school. It is likely the building up of a mining industry will help the Indians and will result in cheaper mining than by the use of white labor.

CLIMATE, SOIL, VEGETATION.  
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The climate is semi-arid, though the Carrizo Mountains receive much snow in the winter and spring. They were snow-capped in April, the time of my visit. Snow fell in the Valley View Camp at that time, as well. The wind blew at least a ten mile per hour rate. There was also an abundance of

water then. Rain fell several times with the usual thunder and lightning accompaniment.

The climate of the region is peculiar to it; violent thunder storms, stretches of sunny days, cool nights, and alternations of the dry desert air with moist mountain air are some of its qualities. The region is on the border of a desert and its climate has some of the qualities expected in a desert.

A mesa may and usually has quite a different climate from the base of the cliffs at its edges. The mesas are nearly barren of trees, pinon and juniper (cedar) being the only specimens. A thin growth of grass is found in patches. There is every sign that the wind is active on the mesas, many of the trees being bent away from the south-west.

There is but little soil on the mesas and but small patches of soil in the "washes". I saw no cultivable fields of a size greater than an acre. Some corn, beans, melons, etc. are grown and the meagre grassy pastures furnish food for the few sheep and goats pasturing in this vicinity. There are a few cottonwood trees along the "washes".

The Carrizo Mountains once had much wild game, as deer, bear, turkey, grouse and rabbits. The Navajos have killed off most of the game since they moved to this area a generation ago. The Carrizo Mountains once had a favorable reputation for wild game.

There is an ample supply of timber for mining purposes consisting chiefly of pine, pinon, and juniper. It is located within a few miles of the claims, higher up on the mountains. It appears more than sufficient for mining needs and its transportation affords no difficulties.

#### GEOLOGY

The portion of the Navajo country under consideration is a region of uplifted, slightly distorted, somewhat inclined, sedimentaries forming dissected mesas and underlain by laccolithic masses. These, in a few places, have intruded to the surface as necks or buttes, of varying form. The whole region is extensively but not deeply eroded. The mesas generally rise a few hundred feet above the valleys, the latter sloping gently to within a hundred feet or so of the edge of the mesas.

The elevation is from 5500 to 7000 feet above sea level. The Carrizo mountains, to the west, nearby, rise to 9000 feet and form a mountain range 20 miles long and fifteen miles wide, one of the prominent features of the geology and topography of north-eastern Arizona.

The erosion forms are those common to the Navajo country but generally occur in miniature, as compared to the Canyon

de Chelly and similar places. "Rincones", "esquinas", mushroom shapes, caves, washes, buttes, mesas and slightly wooded valleys, all occur in this region but in diminutive forms as compared to the Mesa Verde, Dolores River, Paradox Valley, etc. The forms suggest those near Long Park, Colo., but the mesas are more like "tables" as the word suggests.

The influence of the winds and the severe showers is plain in the washed and wind-swept reddish Navajo Sandstone lower beds which are a part of the "Washes" commonly separating a part of the "island" mesas of this region.

The sedimentary rocks exposed in the region under consideration are of Mesozoic age-Triassic, Jurassic and Cretaceous. H. E. Gregory in the "Geology of the Navajo Country", U. S. Geol. Survey, Professional Paper No. 93.) divides the sedimentaries of the Cretaceous into Post Mesa Verde, Mancos Shale, and Dakota sandstone. The latter is the only one that is of importance in the section we are studying. Gregory calls it from 0 to 295 feet thick and describes it as composed of "gray and brown coarse sandstone with lenses of arenaceous and argillaceous shale and coal, stratification very irregular; conglomerate in places; plant fossils."

The lower part of the Dakota interests us as being near the next, and ore bearing formation, but ore may occur in the Dakota and hence it must be watched. Gregory's reference to the conglomerates is of interest. These conglomerates resemble those found in the Colo.-Utah fields, also near Sawpit, and near Telluride. I am inclined to believe they do not belong in the Dakota but do not care to go into the details of that here.

There is an "unconformity" noted by Gregory below the Dakota as has been noted in the entire San Juan region and the Colo-Utah fields. It is known to many that the relations and history of the Dakota, McElmo and La Plata formations are not clearly understood by the trained geologist.

Below the "unconformity" mentioned above, occur the McElmo beds of the Jurassic (?) system. They are 400 to 700 feet thick. Gregory describes them as "green-white gray and brightly banded sandstones and shale with beds of gypsum, fossils of Morrison age."

Next below he refers to another "unconformity" with the La Plata group of formations which he divided into three formations. He calls them Navajo sandstone, 400-1000 feet thick, a light-red, massive, cross-bedded uniformly fine-grained sandstone, with variable amounts of lenticular limestone near the top; a prominent cliff maker, (2) Todilto formation, 3 to 200 feet thick, limestone and calcareous and arenaceous shales with dinosaur footprints, (3) Wingate sandstone 30-450 feet thick, massive cross bedded, uniformly fine-grained, bright red sandstone, cliff maker.

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Below this he finds another convenient "unconformity", then the Chinle formation of over a thousand feet, none of which could be seen in the area we are studying.

From my observations, during three days, examining the claims located for the Carriso Uranium Co., and a few adjoining claims, I found the geology described by Mr. Gregory quite unsatisfactory.

I think the formations exposed in the area visited are chiefly McElmo and that the ore occurs in two different horizons in the McElmo. I located these horizons by their position above certain red sandstones, probably Gregory's Navajo Sandstone, and as he does not even refer to these prominent and unusual ore deposits although they have been Indian paint sources for many years, I do not care to refer to his geology any more than is necessary.

In the Colo.-Utah fields the "slick rock" of the La Platas is a convenient guide to the ore horizon or horizons. There the ore is generally in the McElmo lower strata on the first bench above the slick rock.

In the Carriso Mountain section, at least on the side we are interested in, there is no "slick rock" but the formations corresponding to it are present and lie below the ore horizon. It is likely, but I am not convinced as yet, that the term McElmo is a proper one to apply to the ore horizon as observed on the south-east flank of the Carriso Mountains.

For the purposes of this report it is not important what we call the ore horizons, so we will continue to refer to them as McElmo, but not being sure this is the correct name.

The ore horizons contain much fossil material. This material is generally black, probably because the yellow has been used for paint by the Indians, leaving the undesirable black. The Indians state they and their ancestors have long secured paint from this source. Many evidences of "high-grading" of logs, were observed. On the Valley View claim No. 2., three logs were followed in for four to twelve feet, with a diameter of six to twenty inches. The visible material is black rather than yellow, yet enough yellowish carnotite is disseminated through the black to suggest there was once more of the yellow present.

Beds of black, rounded, flattish objects suggesting shells or pinon nuts, are often seen, with a thickness of a few inches to a foot in thickness. A perfect mollusk was found.

Some signs of fossil leaves and pine needles, also of woody branches and twigs, were noted. Judging the whole fossil evidence I would say there is more fossil evidence of the age of the ore horizon here than in any part of the Colo-Utah field and that the age of the ore deposits here ought to be fairly well calculated by a competent expert in this branch of geology.

As in Utah and in the northern part of the Colorado fields, the amount of vanadium ores is greater than the uranium ores, as judged by the eye.

As in McIntyre Canyon and elsewhere in Colorado coal in tiny seams occurs with the ore, here in the Carriso Mountain section.

The sandstones in this district have been shattered, by their elevation when the laccolith forming the mass of the Carrizo mountains was intruded, and by subsequent movement, to a greater degree than I have observed elsewhere in the ore bearing regions of Colorado and Utah. It is possible this will lead to secondary ore deposits to be found by exploration, in suitable strata connected through fissures with the original ore-bearing strata.

Signs of wave action near the ore bodies was sought but not noted. As there has been much erosion and as the ore deposits are not well opened this observation proves nothing.

Evidences of secondary ore deposition were noted in many places. As the sandstones are much dislocated, with fracture lines frequent, it is probable much ore has been moved by meteoric waters to lower and more nearly impervious levels.

I expect that careful exploration of this and similar areas will lead to ore bodies of considerable thickness, if a suitable structure be found to retain them.

From a half dozen places observed, where "trees" altered to ore were seen, it appears that a direction of north-east-southwest is a common one for the trend of the ore of this section.

In some places vanadium ores were above the uranium, in others the reverse was true, hence no conclusions were reached on this point.

The exposures of ore, though generally thin, are remarkable considering their exposure to the weather, with its violent storms and alternations of heat and cold, rain and sun.

#### PROPERTY

The claims located in the San Juan Reservation for the Carriso Uranium Co. and surveyed by U. S. Deputy Mineral Surveyors are in four groups, called the South Butte Group, the Blue bell Group, the North Star Group and the Hilltop Group.

The names of the claims are as follows:

1. South Butte
2. South Butte No. 2.
3. South Butte No. 3.
4. South Butte No. 4.
5. South Butte No. 5.
6. South Butte No. 6.
7. South Butte No. 7.
8. South Butte No. 8.
9. South Butte No. 9.
10. South Butte No. 10.
11. South Butte No. 11.
12. South Butte No. 12.
13. South Butte No. 13.
14. Big Tom.

SOUTH BUTTE GROUP.

A blue print showing the location and relative position of the claims of this group accompanies this report.

16. Bluebell
17. Bluebell No. 2.
18. Bluebell No. 3.
19. Bluebell No. 4.
20. Bluebell No. 5.
21. Bluebell No. 6.
22. Bluebell No. 7.

BLUEBELL GROUP.

A blueprint showing the location and relative position of the claims, also a tie to the South Butte group accompanies this report.

23. North Star.
24. North Star No. 2.
25. North Star No. 3.
26. North Star No. 4.
27. Canary.
28. Valley View No. 1.
29. Valley View No. 2.
30. Valley View No. 3.
31. Valley View No. 4.
32. Vadium
33. Cave

North Star Group.

A blueprint showing the location and relative position of the first nine of the claims, with a tie to the Hilltop group, accompanies this report. A blue print showing the last two claims of this group, with a tie to the main group also accompanies this report.

34. Hilltop.
35. Wolf.
36. Wolf No. 2.
37. Wolfe No. 3.
38. D.P. No. 2.
40. D. P. No. 3.
41. D. P. No. 4.

Hilltop Group.

A blue print showing the claims of this group with a tie to U. S. Mineral Monument Valley View accompanies this report

South Butte.

There is a considerable area of this claim with the surface close to the ore horizon. A high grade exposure, sample

35, showed 6.28%  $V_2O_5$  and 1.02%  $U_3O_8$ . A type sample at the same place, sample 35a gave 2.87%  $V_2O_5$  and 0.76%  $U_3O_8$ . Another exposure on this claim, sample 36, gave 2.09%  $V_2O_5$  and only a trace of Uranium. This was from 4 inches below surface and no attempt was made to sample deeper.

#### South Butte No. 2.

There were many small exposures and ore was found in several places by merely scratching away the surface. A sample, No. 34 gave 4.84%  $V_2O_5$  and 0.91%  $U_3O_8$ , being a composite sample from two exposures made by scratching away the surface to a depth of only four inches at points forty feet apart. It is probable a large part of this claim has its surface very close to the ore horizon.

#### South Butte No. 3.

Several exposures along rims, only a few feet high, were visited. One of them, showing 20 inches of canary colored ore, resembling vanadium rather than uranium ore, was sampled being sample No. 33. It gave 2.03%  $U_3O_8$  and 2.57%  $V_2O_5$ . The exposure was protected from the prevailing south-westerly winds.

#### South Butte No. 4.

There were several exposures visited on this claim and the ore horizon is close to the surface as in all the South Butte group visited. A sample No. 32 that looked rich gave only 1.97%  $V_2O_5$  and 0.32%  $U_3O_8$ .

#### South Butte No. 5.

There were a number of exposures of weathered ore on the flattish surface and one, No. 31 gave 1.68%  $V_2O_5$  and 0.66%  $U_3O_8$ .

#### South Butte No. 6.

This claim showed the usual, frequent exposures that looked worth exploring but only one sample, a type sample, No. 30, was taken. It gave no results, as it was of reddish sandstone, probably chiefly iron-stained, greatly resembling ore. This type sample was taken to give information to Mr. Dalton as a certain, reddish sandstone here has shown values. I do not doubt good ore samples could be taken on this claim, in fact I saw several exposures that were promising.

#### South Butte No. 7.

A very thin streak of ore near the surface was worked on for a distance of 24 feet. It was a good exposure on the surface and this development did not show up much ore. I did not sample it. The claim is in a section showing but little ore exposed, and its surface is quite flat. The value of the claim is still undetermined. This claim, perhaps the most barren in ore exposures of any of the forty controlled by the company,

offers, in my opinion, better chance to find ore by shallow drilling, many of the similar operations in the Colorado-Utah fields.

South Butte No. 8.

This claim showed a number of excellent exposures one of which was sampled. The results from this sample No. 27, were 5.56%  $V_2O_5$  and tr. of uranium. The exposure was thirty feet long and varied from a thin seam to 54 inches in thickness. The exposure faces the prevailing winds and rains and like similar exposures shows the effect of the weather. No work has been done here but this exposure appears likely to yield a good many tons of good ore, when the rim has been penetrated beyond the effect of the weather. The overburden here is ten to twenty feet.

South Butte No. 9.

This claim shows a number of exposures mostly on a rim with ten to twenty feet of overburden and at least one hundred feet above the red Navajo sandstone exposed by a big "wash".

One of the first exposures visited was sampled, and photographs of South Butte and of the location of the sample were taken. The sample No. 26, gave 2.93%  $V_2O_5$  and 1.02%  $U_3O_8$  from an exposure 45 feet long and ten inches thick or more at this place. The exposure had been dug away to a depth of two feet, leaving an overhanging bank which had protected the ore from the weather.

South Butte No. 10.

This was visited and shows a number of exposures of interest but none were sampled.

South Butte No. 11.

Several rim exposures and some surface exposures were observed and left unsampled. The exposures were quite up to the average of those generally seen on this group.

South Butte No. 12.

Of the several exposures, one was sampled with results high in vanadium. The sample, No. 29, ran 10.88%  $V_2O_5$  and tr. of uranium. The sample was a series of grabs from exposures with no overburden, near an Indian mud and brush shelter.

South Butte No. 13.

This was not visited as our time was limited. Mr. Dalton stated the exposures were similar to those we had seen elsewhere on the South Butte group. This claim lies detached from the main group.

Big Tom.

### Big Tom.

We did not visit this but were close to it. The probable ore horizon could be seen and exposures of one are reported.

### Camp Site.

This is located so as to be of advantage in the probable operations to be conducted here. It is close to water but fuel is scarce in the vicinity.

### General Description of South Butte Group.

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The group, of 14 claims and a camp site, is well located and covers the rims and flats that appear best mineralized in this section, though some outlying rims appear likely as places to prospect. Time did not permit of much visiting of ground distant from the claims to be visited.

The area is one of flattish, eroded sedimentaries, cut by several wide "washes". The washes flow enough water for the sheep and goats of the Navajos that pasture here and is likely that a considerable underflow of water could be found by shallow wells in the washes, as they drain a great area, above, in the Carriso Mountains, as well as part of the Lukachukai Mountains.

A rude wagon road has been cheaply built or dug into and out of the washes at no great expense. The average slope at the rims is hardly 30 degrees with much of it below 20 so that road building will not be difficult. On the tops of the mesas or flats one can drive almost anywhere.

There are several old Navajo trails for wagons in this vicinity. All the claims can be visited by wagon, even now, I believe. We drove from the camp at Valley View to near South Butte No. 9, had the driver make a circuit and we met him far away at the other end of the group.

The ore, generally, on this group is on the surface and hence erratic in value, with much uranium leached. There are also dozens of rim exposures with the overburden rarely as much as 20 feet thick. The sandstone is McElmo, is shattered not much faulted, and will be easily followed but mining will require the removal of the overburden. The average dip of the strata will be under eight degrees and will be in several directions. The mining will probably be done by different methods from those used in Colorado and Utah and for a fraction of the cost except as regards sorting, which will present no unusual difficulties as far as can be seen. In fact, the arrangement of different qualities of ore in layers is common here.

There is almost no mining timber on these claims. There is some grass, and a few wind twisted cedars, a number of pinons and but little else in the way of vegetation.

A few Navajos have their hogans here and will no doubt be useful in furnishing laborers, in bringing timbers from the mountains near by and as common laborers. They now earn from \$1.50 to \$2.20 per day in common labor.

BLUEBELL GROUP  
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Bluebell.

This was visited by O. E. Hanno, for me. He reports several good exposures.

Bluebell No. 2.

This was visited by O. E. Hanno for me. He reports several good exposures.

Bluebell No. 3.

This was visited by O. E. Hanno for me. He reports several good exposures.

Bluebell No. 4.

This was visited by O. E. Hanno for me. He reports several good exposures. I saw this claim as well and took sample 37, giving 5.09%  $V_2O_5$  and 1.38%  $U_3O_8$ .

Bluebell No. 5.

This was visited by O. E. Hanno for me. He reports several good exposures. I saw this also and it has a number of good showings on it.

Blue bell No. 6.

This claim shows several good exposures, on rims, rather thin but of good quality. Hanno's sample No. 8, gave 5.38%  $V_2O_5$  and 1.48%  $U_3O_8$  for an average of fifty feet and a thickness of 2 inches.

Bluebell No. 7.

There are many exposures of vanadium and much float on this claim. The overburden is from nothing to a few feet. No samples were taken.

Bluebell Group General Description

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The group lies north-west of the South Butte group and almost touches the Arizona-New Mexico line. The nearest claim of the South Butte group is about 1/2 mile distant from the nearest claim of this Group. The elevation of these claims is about the same as the South Butte claims, perhaps somewhat

lower on the average.

The formation is the same and the type of ore and typical exposures of one group are much like the other, as would be expected.

Between the two groups are typical washes and eroded valleys, the tops of the higher places being flattish, as is common in this section. There are a few notable exceptions, the occurrence of buttes of igneous material which are a feature of this section.

These buttes are often connected by volcanic dikes, forming prominent ridges less eroded than the sandstones about them. The buttes are dark, carry seams of gypsum, and often resemble, in outline, a full rigged ship. One of them, some miles away, called SHIPROCK, is visible for hundred of miles and is a prominent landmark. The Navajos have an interesting tradition that all the birds of the universe originated there.

These buttes are volcanic intrusions from the laccolithic forms that caused the Carrizo Mtns. The uplift or uplifts that formed the Carrizo mountains carried the sedimentaries up with them, rarely tilting them greatly. Erosion has destroyed over half of the sedimentaries above the Navajo sandstones, in the area we visited.

#### NORTH STAR GROUP

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##### North Star.

The tents of the camp are close to the line, in New Mexico, near the north west corner of this claim.

The ore exposures covered by the claim are to the south-east, across the little valley or wash on the low rims seen in the photograph of the tent with two figures near it, that is one of the many photographs accompanying this report.

There are several exposures of ore on the claim. One, across from the tent referred to, is ten inches thick and two feet long, chiefly of vanadium ore. Another, to the west, shows 9 inches of ore for 15 feet in length. There are several minor exposures visible which suggest the continuity of the ore along this rim. The overburden is less than twenty feet here.

##### North Star No. 2.

This claim is half in Arizona and half in New Mexico. There are about six good exposures of ore on this claim along the same rim and with the same small overburden as with the North Star claim. The first exposure showed a thickness of 8 inches for a length of six feet. The ore is a saturated ore, much  $V_2O_5$  with  $U_3O_8$  stain. Another exposure shows a length of five feet, another that is 25 feet long and six to 24 inches thick shows much vanadium and some uranium. Another showing 2 feet thick and six feet long, looked well.

A sample was taken of still another exposure, of a black, fibrous material, which ran 12.10%  $V_2O_5$  and 0.86%  $U_3O_8$ . The sample was my number 15. An exposure of 24 inches in thickness for 25 feet in length showed well in vanadium. 100 feet farther along the rim, making these exposures a fairly continuous line, for the whole length of claim, is an exposure that still indicates the remarkable continuity of these ores, even where exposed to the weather and the south west winds as is this case.

#### North Star No. 3.

There are only a few exposures of ore on this claim. One exposure is 20 feet long and 4 inches thick, of which 2 feet in length is good uranium ore, perhaps 1 1/2%  $U_3O_8$ . Another sampled by Mr. Hanno, his sample No. 6, gave 8.60%  $U_3O_8$ ,  $V_2O_5$  and 2.01%  $U_3O_8$ . The quality of ore in this claim appears high.

#### North Star No. 4.

This claim, located near the camp, as will be seen by the map, has a number of indifferent exposures of ore.

#### Canary.

This is located over a part of the North Star No. 4 and includes a number of small exposures of fair ore, in a section of strata that is badly out of place. The claim will produce considerable ore when it is opened up.

#### Valley View No. 1.

This claim appears to be of little importance, except to include a small block of ground that has some ore on it, free of overburden. Most of the claim was not visited by me.

#### Valley View No. 2.

This claim has been opened up more than any other. The photographs include two taken on this claim. There is one exposure of 140 feet, another of 20 feet, of 30 feet and of 60 feet all of a good width, up to four feet and all in good looking ore.

The surface indications were probably not much better than in many other places on this group, before this work was done. It appears as if less than six hundred dollars worth of work has been done on this claim but there are fully 300 tons of ore in sight and as good as sacked on this claim.

U. S. Mineral Mon. Valley View is located on this claim. It was established by U. S. Deputy MinLand Surveyors lately.

Valley View No. 3.

This lies alongside V. V. 1 and is not of much importance except to tie in a little block of ground that makes the group more compact. There are some unimportant exposures on the claim.

Valley View No. 4.

This claim includes a number of good exposures and covers some ground that is useful.

Vadium.

I did not see this claim.

Cave.

I did not see this claim.

North Star Group General Description.

-----

The following claims are in New Mexico: Cave, North Star, Canary, North Star No. 4, and half of North Star No. 2. The remaining claims of this group are in Arizona.

There has been a little work done on this group, perhaps ten times as much as on all the other groups. This work has uncovered ore for a total length of 400 feet. Most of the sacked ore, 37 sax, at Morris trading post came from this group.

The claims of this group are well located to cover all the probable ore horizon on both sides of two mesas slightly connected near the end line of Valley View No. 2 and North Star No. 3. This group alone would constitute a valuable property.

The camp site is well located and suitable. There is good water near the camp, and plenty of wood for fuel.

The ore in this group is chiefly in one horizon, the upper strata of the two that have been found ore bearing in this district. The sandstone is shattered, crossbedding is much in evidence, swells and pinches of the ore strata as well as the sandstones are common. Conditions for the formation of secondary ore deposits are unusually good. Ore is found on both sides of the Valley View hill where the mineral monument is located and logically ore should be found in the hill, free from erosion effects.

The group of claims is a valuable one, for the ore visible and potential.

Since my visit a 75 foot exposure thirty inches wide has been exposed on the North Star No. 2 claim. It is

of high quality, judging from samples sent me. (W.H.S.)

### HILLTOP GROUP

Hilltop.

This claim is partly in Arizona and partly in New Mexico. It occupies and covers a small mesa, which lies 150 feet above the general level of the sedimentaries in the vicinity. This is due to differences in the amount of the volcanic uplift of the region, the Hilltop being nearer the slopes of the Carrizo Mtns. than any other of the claims of the Carrizo Uranium Company.

The sedimentaries are nearly level on the Hilltop, which claim is easily visible from its several sides, nearby. I did not set foot on the claim, but visited the other claims of the group. Mr. Dalton says there are many small exposures of the same character as those near by on the other claims of the group. A visit to this one claim would have taken an extra two hours, on a snowy day, and the trip was postponed for better weather.

Wolf.

This and other claims of the group shows the ore horizon at or near the surface and the strata are much distorted.

Almost no work has been done on this and the other claims of the group so the amount of ore to be expected can be only guessed at. The soil covers many an ore exposure as we found by scraping away the surface in many places, resulting in the finding of ore and frequently of good appearance.

Two samples gave good vanadium values. The deposit appeared spotted.

Wolf No. 2.

The description of the Wolf claim fits that of this claim as well. A sample ran 3%  $V_2O_5$  and 1.13%  $U_3O_8$  where there was no overburden, the sample being scraped from a few inches below the thin soil of the mesa.

Wolf No. 3.

This claim resembled, in ore exposures, the two preceding. It is a region of sedimentary frgements, gullies of a depth of twenty feet, where erosion is proceeding at a more rapid rate than the average in this region. The ore exposures are few and close to the surface.

D. P.

D. P. No. 2.

D. P. No. 3.

D. P. No. 4.

These claims are located so as to cover ground that will be useful as an approach to the other claims of the group. They have a few exposures of unattractive appearance, better ones are possible as the ground is well located. It will require development on this group of four claims to demonstrate their value, while most of the other claims of the Hilltop group have sufficient exposures to justify mining at once.

#### General Description of the Hilltop Group.

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All the claims are in New Mexico except half of the Hilltop. The Hilltop is the only claim that does not connect with the others of this group.

The group lies nearer the Carrizo Mountains proper, and above the general level of the sedimentaries which are here separated into isolated sections of a square mile to several in area. The direction and dip of the sedimentaries are less regular in this vicinity than near the other groups of claims of the company.

The conditions for ore deposition seem fully as good here as elsewhere on the claims of the company but exposures are fewer though some are of good grade. There is no doubt that when it is considered advisable, the exposures can be opened and made more attractive to the eye than they are at present. By kicking away the surface soil I found in several places very favorable indications when we covered again. All the ore possibilities are not yet located by claims in this region.

The ore horizon is on or near the surface in this group, as well as the other groups of claims. The Indians have done no "highgrading" near here for paint materials.

#### ASSAY RESULTS FROM CARISO URANIUM CO. 666-----

Samples by O. E. Hanno, on his first trip.

Hanno's Nos.	W. H. S. Nos.	V <sub>2</sub> O <sub>5</sub> %	U <sub>3</sub> O <sub>8</sub> %	Description
1.	2.	7.40	1.79	Valley View No. 2 Saturated ore from exposure 12 ft. long and 18 in. thick.
2.	3.	1.57	trace	Vanadium ore from point 10 ft. west of No. 1. Brown ore.

Hanno's Nos.	W. H. S. Nos.	V <sub>2</sub> O <sub>5</sub> %	U <sub>3</sub> O <sub>8</sub> %	Description
3.	4.	2.24	tr.	6 in. mottled clay ore from opposite side of hill, 150 ft. from No. 1. Ore evidently goes through hill.
4.	9.	7.57	3.24	Specimens from sacked ore from where 1 was taken.
5.	8.	3.45	1.51	Valley View No. 2, S.E. end. 12 in. streak four ft. long.
6.	7.	8.60	2.01	North Star No. 3. Fifth exposure, a "coal" vug hole, 2 ft. long and 6 in. thick. High grade V205 ore. It runs into U308 ore to left.
7.	5.	2.35	tr.	Canary Claim, third exposure S.E. end of claim, 4 to 18 in thick for 20 ft. in length Typical float.
8.	6.	5.38	1.48	Blue Bell No. 6. Upper 2 in. streak from exposure 50 ft. long. The U308 appears leached from the lower streak. "Hogan" and corral 100 feet to east.
9.	1.	4.75	2.35	Grab from broken sack of (wet method) ore in barn at Morris' Trading Post.

Samples by W. H. Staver. April 12, 13, 14, 15, 1921

Number	V <sub>2</sub> O <sub>5</sub> %	U <sub>3</sub> O <sub>8</sub> %	Description
1.	2.14	tr.	Exposure 6 in. by 10 ft., 75 ft. East of Discovery. Grayish ore. 2% V205 says O.E.H. Canary Claim.
2.	3.21	tr.	Canary Claim, same location as No. 1, but selected for U308, if any. Cut 9 in. wide and 2 feet long.
3.	5.35	1.27	Canary Claim, second exposure visited, same location as Hanno's No. 7, but his sample was selected float for V205. Width 6 inches, length 3 feet.
4.	5.09	5.35	North Star, facing the camp. Carnotite and black, sandy, ore not sampled by O.E.H. Exposure 10 in. wide and 12 feet long.
5.	5.62	tr.	Same as No. 4, Brownish, bark like material.
6.	5.49	0.94	Valley View No. 2. A "pan" or flat showing about 10 tons of ore, 2 sax of ore were gathered from surface and stored here. Exposure 10 in. thick, 30 ft. long
7.	4.73	1.47	Location, same as 6, but selection made for U308 ore. Width 10 in., length 30 ft.
8.	20.16	2.39	Location, just above 7, and 50 feet west. Selected ore, soft, yellow, decomposed.

Number	V <sub>2</sub> O <sub>5</sub> %	U <sub>3</sub> O <sub>8</sub> %	Description
9.	6.47	1.21	Valley View No. 2, in front of old location stake. This sample is of carbonaceous material 7 in. thick and 5 ft. long. O.E.H.'s. sample 5 came from same place but was selected for a different material.
10.	7.41	0.77	Valley View No. 2. A typical "log" from which a cross section was carefully taken. This "log" has been partly mined by the Nevajos for paint material. The log is 15 feet long and was only 6 inches thick where sample was taken.
11.	7.72	1.88	Valley View No. 2. Exposure 10 feet long and 14 inches wide. Carnotite sandstone includes some high grade.
12.	8.75	1.78	Valley View No. 21 Exposure where O.E.H. took photo showing a pendant tape to indicate the thickness. The exposure at this point is 30 inches thick. There is a continuous and irregular showing for 140 feet, or more. The material in this sample is of yellow and black spotted fossiliferous material. The only active work is being done at this exposure.
13.	11.44	0.85	Same location as preceding sample but of different material. This sample is of black, fossiliferous material. An excellent bivalve, about 5/8 of an inch long. In addition to the two types sampled there is a third type of ore a dark sandstone.
14.	2.76	tr.	Valley View No. 2. from other side of hill the north side. It was taken by O.E.H. from a small exposure 300 feet N. of U.S. Mineral Monument recently established. The sample merely proves the continuity of the deposits through the hill, or suggests it. The overburden is heavy here which is unusual.
15.	12.10	0.86	North Star No. 2 Exposure 3 ft. long, 12 inches thick, This is a special sample of soft, black, fibrous, fossiliferous material, common in this district and is evidently a metamorphosed product.
16.	2.04	tr.	North Star No. 2. Leached vanadium ore, from an exposure on center line of the claim. Hanno guessed this ore as 1.60% V <sub>2</sub> O <sub>5</sub> .
17.	7.78	4.56	North Star No. 3. Same as O.E.H. sample No. 6. This is a specimen of good ore, from a width of 24 inches and a length of 5 feet. There is much material like this at the point sampled. Hanno's sample ran 8.60 and 2.01 as shown on first sheet.
18.	11.63	2.68	Same location as preceding. Sample of purplish ore obtained by a little digging. There is probably much of this material.
19.	9.82	3.66	North Star No. 3. Another exposure, a "log" 14 inches thick, slightly exposed.

Number	V <sub>2</sub> O <sub>5</sub> %	U <sub>3</sub> O <sub>8</sub> %	Description.
20.	5.56	1.75	Valley View No. 2. Open, flat, country. 12 In. vanadium ore, no overburden.
21a	2.88	tr.	Wolf Claim, 70 feet South from Stake. A. vanadium outcrop. V.D. says 4% V and 2.55 U oxides.
22	2.99	1.13	Wolf No. 2, 50 ft. W. of discvy. No overburden.
23,	7.37	0.45	Wolf Claim, darkheavy ore, several hundred feet from last. Soil overburden. Scratching away the soil this sample was obtained. Thickness of ore unknown, as in many of the samples taken.
24.	3.47	0.40	Wolf No. 2. A four inch exposure showing some carnotite.
25.	0.00	0.00	A basic dike, six to nine feet wide, which cuts the sandstone and extends in an irregular line for half a mile to a volcanic neck, which appears to be of the same material.
26.	2.93	1.02	South Butte No. 9, 100 feet above the red sandstone near Crow Butte. 10 inches carnotite and black ore. Exposure 45 feet long, nearly continuous. Overburden 20 feet.
27.	5.56	tr.	South Butte No. 8. 54 inches ore tapering to thin seam at either end. Thirty Ft. long. General Sample.
28.	2.27	tr.	South Butte No. 12, near discovery, 18 inches ore, 40 feet long, reddish ore, sandstone only slightly impregnated. Sandstone has typical McElmo appearance, as observed in McElmo Canyon far to the north.
29.	10.88	tr.	South Butte No. 12. Grab of surface ores, no overburden, near Navajo "hogan", several exposures, sample represents a depth of six inches. Uranium probably all leached.
30.	0.00	tr.	South Butte No. 6. Some reddish sandstone that resembles ore. Mr. Dalton says this is a puzzle.
31	1.68	0.66	South Butte No. 5. Surface showing.
32.	1.97	0.32	South Butte No. 4. High grade carnotite, 5 ft. long. Thickness 4 inches. (This is my original description and shows how badly I was fooled). A black seam just below was not sampled. The yellow was probably vanadium.
33.	2.57	2.03	South Butte No. 3. 20 inches of ore, much canary colored ore, not like carnotite. (Another case of being fooled).
34.	4.84	0.91	South Butte No. 2. Four inches of ore found six inches below surface on the level top of a mesa, a common condition in this district. Also, six inches of ore from a point 40 feet distant, also six inches below the surface. There were almost no ore indications at these points but the location of the ore strata on the near by rims lead to the scratch away of the soil and the finding of this ore.

Number	V <sub>2</sub> O <sub>5</sub> %	U <sub>3</sub> O <sub>8</sub> %	Description
35	6.28	1.02	High grade outcrop on flat surface, a nice showing.
35a	2.87	0.76	Special type sample taken by O. E. Hanno. Both the two preceding were from the South Butte claim.
36.	2.09	tr.	South Butte from 4 in. below surface. Blackish ore.
37.	5.09	1.38	Blue Bell No. 4. Surface showing, thickness unknown.

SUMMARY OF REGULATIONS REGARDING MINING  
ON UNALLOTTED INDIAN LANDS.

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The Secretary of the Interior, through the Commissioner of Indian Affairs has issued various Regulations to govern prospecting for and mining of metalliferous minerals on unallocated lands of Indian Reservations. From copies of these Regulations sent me by the Commissioner of Indian Affairs I deduce the following:

Citizens and corporations of the U. S. may prospect for metalliferous minerals on the San Juan Reservation, in which we are interested, and locate mineral claims, camp sites, millsites, etc. Location certificates must be filed with the Supt of the Reservation.

The Secretary of the Interior may issue 20 year renewable leases on such located mineral lands. Camp sites, mill sites, etc. are to cost at least \$1.00 per acre per year.

Locators must perform at least \$100.00 in work on each claim per year. Claims are standard size, 1500 X 600 ft. No extralateral rights will be allowed, all boundaries being vertical planes. The regulations of U. S. Mining Code are followed, as far as consistent with the act creating the power to lease these lands.

A royalty of at least 5% on the "net value of the output of the minerals at the mine" is construed to mean all costs save prospecting of preliminary workings, and the cost of the mining plant. It is probable a 12 1/2% royalty on the net product will be charged for the leases on these lands. Forms for leases are given in the Regulations issued Sept. 10, 1919. Amendments to these Regulations were issued on March 3, 1921, and lease Form 5-155 was amended on same date. On Apr. 23, 1921, a further amendment of the Regulations was made and no doubt there will be many more. The last amendment calls for the payment of \$5.00 per acre for assesment work, instead of \$100. per claim of 20 acres or less, thus being of benefit to the lessee. It also calls for advance payments on royalties of 25 cents per acre the first year, 50 cents the second, third, fourth, and fifty years and \$1.00 per year thereafter. This ought to be no hardship.

On September 20, 1919, a description of the lands subject to lease was issued in the form of a lengthy circular. The lands

we are interested in are included so the circular is not described here.

Copies of all these circulars and regulations can be obtained from the Commissioner of Indian Affairs or from the Secretary of the Interior or from the Supt of the San Juan Reservation.

The government prescribes methods of keeping accounts so that royalties can be figured. The minimum royalty is 5% as stated elsewhere and it is likely that 12 1/2% will be charged for the leases on the land described herein.

#### PROBABLE ORE

On the South Butte Group I estimate there are over 800 tons of PROBABLE ORE that can be mined at a reasonable expense, to be expected from the present surface showings.

On the Bluebell Group, which I did not see much of but which was inspected by Mr. Hanno, my assistant, I estimate there are 600 tons PROBABLE ore that can be mined at a reasonable expense.

On the North Star Group, on which the most development has been done, in fact about the only development, there are over 1200 tons of PROBABLE ORE that can be mined at a reasonable expense

On the Hilltop Group, I estimate but 300 tons of PROBABLE ORE that can be won at a reasonable expense.

The total of these figures gives 2900 tons of PROBABLE ORE as an estimate of what can be counted on as shipping ore of permissible grade, under present market conditions, that can be won for a reasonable mining cost. I make this estimate with the proper amount of fear and trembling, for no two men would agree on this but my experience and judgment tell me that these figures would be SAFE and yet not too conservative and DEFINITE FIGURES are a necessity in a report of this nature. I should not be surprised if a tonnage of many times my estimate be won from these claims, but if a tonnage of only half my estimates be the final yield I should be surprised. I have tried to err on the conservative side.

#### POSSIBLE ORE

The possibilities of the region for ore of milling grade are very great. I use the adjective "very" with due regard for its meaning.

I have recently visited most of the radium ore fields of Colorado and some of Utah. The chief purpose of this trip, was to make a fresh comparison of the well known fields with this new district.

I found but three places in the old fields where the developed ore showing impressed me more favorably than these un-

developed ores of the south-eastern Carrizo mountains. The possibilities of a large tonnage of ore for milling and bringing up to a shipping grade are very great, as before stated.

While details of these comparisons might be of value and would certainly be interesting I will not make them here as they would do more harm than good.

#### PROBABLE MINING COSTS

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This is a difficult matter to predict. I judge the costs here, due to the use of Navajo labor and its abundance, will be somewhat lower than in the Colo.-Utah fields. The ore here will be easily won, compared to the other fields, except that the known beds will be thin, comparatively. The violent storms that may come, with little warning, will handicap the work and will have to be guarded against.

In the Colo.-Utah fields, costs range from \$20 a ton to \$150 a ton and an average, under profitable mining conditions, will be around \$110 per ton, where the property is well developed. These figures include all the costs of developing the property and getting the ore to a market at the railroad.

In the field we are studying we have but two disadvantages, thin beds and freakish weather. All the other factors are favorable, as labor supply, cost of labor, cost of hauling to railroad, accessibility of ore deposits, probable low overhead expense.

I calculate that the total cost of getting the first 1000 tons of shipping grade ore to the railroad at Farmington will not exceed \$70,000.

#### PROBABLE VALUE OF ORE

-----

With the present lack of development, only a guess can be made as to the value of ore one cannot see. The assays of fifty samples lead one to expect a vanadium content of several times the uranium content. They also lead one to expect to be able to sort out a ton of 2%  $U_3O_8$  ore with several per cent vanadium oxide in it, storing several tons of milling grade at the same time, at a safe place. The market value of such an ore is what it cost you plus what the ore buyer thinks you will take as a minimum profit. The real value is several times what the ore buyer will pay you. This real value can only be secured by entering the refining business, which requires millions. A fair price for ore should be obtained by having sufficient capital to enable one to store ore until he obtained a fair price. Lack of capital has been the common cause of failure in the radium ore business.

At present the Standard Chem. Co. has a schedule of prices which is well over the cost price I have estimated under PROBABLE MINING COSTS. It seems unnecessary to quote such prices here.

With sufficient capital to make vanadium oxide or radium sulphate and sell this intermediate product to the refiner he should secure a part of the refiner's profits.

To do this will require much capital but not an impossible amount.

#### RECOMMENDATIONS

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The development of this valuable property is advised. I suggest that several typical ore exposures be selected, for such development and that all milling ore found be removed and stored away from the effect of water even at an additional expense of several dollars per ton.

I advise securing capital to mine and store 1000 tons of shipping grade, at Farmington, free of governmental royalty. The presence of such a tonnage of good quality will attract buyers, in my opinion. Until this ore be sold, I advise doing the minimum amount of work required by governmental regulations.

The careful study of governmental regulations under which mining must be conducted, records kept, royalties paid, etc. must be the first consideration for your mine manager.

I further advise that you begin milling experiments on a semi-working scale at once, to be followed by working scale tests. It is likely the profits from this will be greater than from your shipping ore.

#### CONCLUSIONS

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You have the first chance at a valuable lease from the government of an unusually fine showing of vanadium and uranium ores. Your success or failure will depend mostly on capital, partly on your management. I know of no other chance in the business that is better than yours, for an undeveloped property.

Yours resp'y

(Signed) W. H. Staver

Mining Eng.

Idaho Springs, Colo.  
July, 1921.

K. E. KITHIC  
229 SYMES BUILDING  
DENVER, COLORADO

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
OFFICE OF INDIAN AFFAIRS

FIELD SERVICE  
Navajo Service  
Shiprock, N. M. District #12  
Dec. 4, 1936

NAVAGO SERVICE

DEC 5 1936

*41-12-12*

*Long-4*

Mr. Ray Walker  
Acting Director Land Management  
Window Rock, Ariz.

Att; Mr. M. D. Long

Dear Mr. Walker;

Reference is made to a letter from your office October 22,  
regarding mining claims in this district.

Lease executed January 22, 1924 in favor of George Williams,  
and Nephi Johnson in T. II N., R. 5 W., covering 20.661 acres  
in San Juan County was checked, and found as follows;  
A shaft or whole about twenty feet deep was worked, and about  
one ton of ore taken out, hauled to Durango. The vein was lost  
and further development work stopped. I can not find out the  
date the development work stopped, but from people who have  
been in this area for the past eight years know nothing of any  
activity of this sort being carried on.  
Files in this office have been searched, and no record can  
be found of any royalty being paid. Letters were written to  
the parties of the lease which were returned as undelivered.

The lease executed by the Navajo Mining Co., Sections 29, and  
30, T. 13 N., R. 5 W., in Apache County Arizona, on claims  
number one, two, four, I cannot find where any ore was taken  
out. However some prospecting was done.

Mr. Jack Frost, District Engineer of the Geological Survey  
in Farmington, N. M. gave his time and help in trying to  
get the needed information.

Ore taken out on lease executed by Mr. Williams and Mr. Johnson  
could not exceed in value of \$60.00 on which a royalty of 7%  
would be due, in addition to the rental per acre. No record  
of payment found.

Navajo Mining Co. lease, no ore taken out, but a rental fee  
per acre due. No record of any payments made.

Yours very truly,

*Wm. W. McClellan, Jr.*  
Wm. W. McClellan, Jr.  
Supervisor.

Northern Navajo Agency  
Shiprock, New Mexico  
August 17, 1932

Commissioner of Indian Affairs  
Washington, D. C.

Dear Mr. Commissioner:

Yesterday a delegation of business men from Farmington called on me in connection with a claim by the United States against them in the amount of \$2900.00, which charges were to cover rentals on the lease granted Radium Ore Company, approved December 23, 1922. It appears that R.T.P. Simpson, J.E. Reese, B.P. Woods, and W.A. Hunter signed the bond for this company under date of August 15, 1922. The company was formed by two local men, J. L. Wade, as president, and W. D. Barnes, as secretary, a prospect had been located on the Northern Navajo Reservation, but all the funds of the company were used up in making locations, filing claims, etc., and they were never able to do any development work. The above named gentlemen, as bondsmen figured that in that no development work was done that the leases had automatically been cancelled, and they had been relieved as bondsmen; they have had no intimation until just recently that they were being held. It seems that both Mr. Wade and Mr. Barnes left this section of the country shortly after their company became inactive, and these gentlemen claim, as bondsmen that they had no way of knowing that they were in any way liable for damage or rentals. I find, upon inquiry, that no damage was done to the reservation nor to the Navajo Indians and that no ore was ever mined or removed from the reservation. I feel that to attempt to collect from these bondsmen would be unjust and recommend that your office place the matter before the secretary of the Interior and Attorney General with recommendations that the charge be cancelled.

Very sincerely,

E. R. McCray,  
Superintendent

ERM:ME  
CC; Hugh Woodward  
G. W. R. Hoy

Approved Dec. 1922 & lease paid for  
Dec. 23 295.00  
24 295.00  
25 295.00  
26 295.00  
27 570.00  
28 570.00  
29 570.00  
30 570.00  
31 570.00  
2970.00

