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CARNOTITE DEPOSITS IN CRAVEN AND COAL CANYONS, FALL RIVER COUNTY, SOUTH DAKOTA

Trace Elements Memorandum Report 166

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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Sincerely yours,

O.E. McKelvey

for W. H. Bradley
Chief Geologist

Geology - Mineralogy

This document consists of 17 pages, plus 1 figure.
Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

CARNOTITE DEPOSITS IN CRAVEN AND COAL CANYONS, FALL RIVER COUNTY, SOUTH DAKOTA*

By

W. E. Bales and R. L. Erickson

March 1952

Trace Elements Memorandum Report 166

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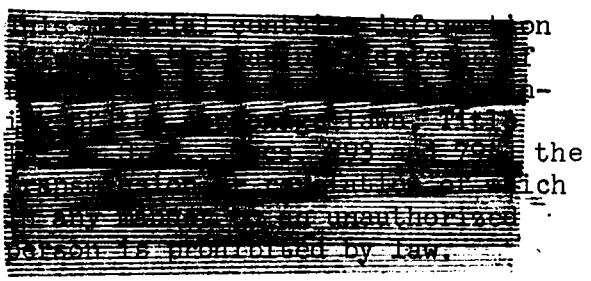

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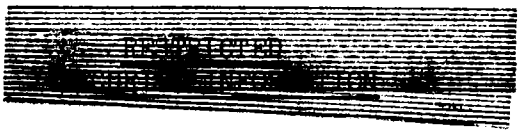

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By W. E. Bales and R. L. Erickson

ABSTRACT

The carnotite deposits recently discovered at several stratigraphic levels in the Lakota sandstone of Cretaceous age in Craven and Coal Canyons, Fall River County, S. Dak., have been described in part by L. R. Page and J. A. Redden in Trace Elements Memorandum Report 152. This report presents the results of a study of 13 additional deposits, 8 of which were discovered by the writers.

Carnotite is disseminated in thinly bedded Lakota sandstone and forms streaks that are parallel to the bedding planes. It occurs as coatings on quartz grains, as interstitial aggregates, fracture fillings, and as thin films on joint faces and massive beds. It is associated chiefly with closely spaced, thin laminae of carbonaceous material or with scattered fragments and casts of fossil plants in fine- to medium-grained sandstone. To a lesser extent, carnotite is associated with iron and manganese surface stains.

The deposits for the most part have an outcrop length of less than 40 feet but the close spacing of individual deposits along canyon walls suggests that some of the carnotite exposures connect beneath the surface.

New discoveries in Coal Canyon and reported carnotite showings on 46 claims in Red Canyon have extended the original discovery in the Craven

Canyon area, a distance of 1½ miles east and about 2 miles west.

INTRODUCTION

This report presents, in tabular form, the results of radiometric and geologic reconnaissance made in the Craven and Coal Canyon areas during the period November 27 to December 7, 1951, in accordance with plans outlined in Trace Elements Memorandum Report 152, "The carnotite prospects of the Craven Canyon area, Fall River County, South Dakota." Assay data from the claims examined by L. R. Page and J. A. Redden are not included in this report. This work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

Additional radiometric reconnaissance and examination of new claims will be continued when weather conditions permit.

Location and accessibility

The known carnotite deposits in Craven Canyon are in what would be secs. 19 and 30 of unsectioned T. 7 S., R. 3 E., and secs. 24 and 25, T. 7 S., R. 2 E., about 8 miles north of Edgemont, S. Dak. (fig. 1). New discoveries to the west in Coal Canyon, which were not examined by Page and Redden, are in sec. 22, T. 7 S., R. 2 E. Forty-six new claims are reported to have been staked on the east side of Red Canyon by a Mr. Cord.

The Coal Canyon discoveries are most easily reached from Edgemont by following the road log given on page 7.

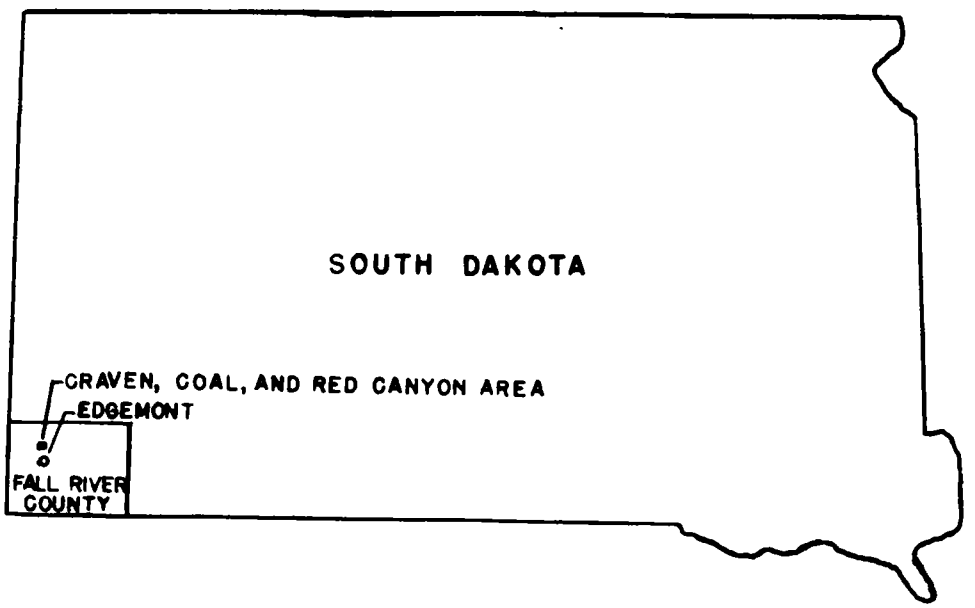

FIGURE 1.—INDEX MAP SHOWING THE LOCATION OF CRAVEN, COAL, AND RED CANYONS, FALL RIVER COUNTY, SOUTH DAKOTA

Miles

0.0 Junction of U. S. Highways 85A and 52 at Edgemont, S. Dak. Proceed east on Highway 85A.

0.7 Junction of U. S. Highway 85A and gravel road. Turn left on gravel road, cross railroad tracks and take left fork at junction of gravel roads.

3.6 Junction. Keep straight ahead.

6.4 Junction. Turn left.

9.1 Junction. Keep straight ahead on trail road through gate.

10.4 Gate in fence near old wooden farm buildings.

10.4 Junction. U. S. Forest Service sign post. Turn left on Coal Canyon road. Proceed to earthen dam and drive down face of dam.

11.9 Gate.

12.4 Road cut. Radioactive brown sandstone with no visible uranium minerals (No. 13, table 1) crops out here.

The Coal Canyon road is a narrow, seldom-used Forest Service access road and can be traveled only with a car such as a jeep or jeep station wagon.

Field work

The field work consisted chiefly of sampling the deposits and plotting their location on aerial photographs. An assay map (fig. 2) prepared from aerial photographs, shows location of samples, sample numbers, and percentages of uranium. Thirteen deposits not previously reported upon were examined in the course of this work, of which 8 are believed to be previously unknown. Six of the 8 new deposits are on claimed land, however.

The eight new localities of carnotite-bearing sandstone were discovered by radiometric car traversing with 36-inch gamma probes and foot traversing with a Halross scintillometer (table 1). The most promising of these, to judge from surface exposures, is in Coal Canyon, SE¼ sec. 22, T. 7 S., R. 2 E., about 20 feet from the top of the mesa in what are probably the basal beds of the Dakota sandstone (No. 12, table 1). Weather conditions permitted only one day of reconnaissance in Coal Canyon; however, the potential of this area appears to be as great as Craven Canyon.

GEOLOGY

The geology of the Craven Canyon-Coal Canyon area has been described by Darton (1904), and by Page and Redden (1952), and only a brief summary is presented in the section that follows.

Three formations are exposed in Craven and Coal Canyons. The upper part of the Morrison formation of Jurassic age is exposed in valley bottoms; the overlying Lakota formation of Cretaceous age, 200 to 250 feet thick, is exposed in the mesa scarps; and the Dakota sandstone forms the caprock of the higher mesas.

The known carnotite deposits are in the lower part of the Lakota formation and the basal beds of the Dakota sandstone. The Lakota is chiefly a white to buff, massive to thin-bedded, fine- to medium-grained sandstone. On the east side of Craven Canyon in the lower part of the formation, numerous thin silty beds as much as 10 inches thick contain closely spaced laminae of carbonaceous material. These beds are not so conspicuous on the west side of the canyon.

A black carbonaceous shale, in this area about 1 to 3 feet thick, is the best marker bed. The shale, exposed about 110 feet above the base of the formation, weathers to curly, papery plates. Northward, it thickens and is interbedded with gray siltstone.

In Coal Canyon, about 1½ miles west of Craven Canyon, massive, cross-bedded and thin-bedded sandstone still predominates. Channeling in the sandstone also is much more conspicuous in Coal Canyon, and the lower part of the formation contains numerous lenticular beds of black, coaly shale as much as 2 feet thick, and at least one bed, 1 foot thick, of hard sandy limestone.

ORE DEPOSITS

The known carnotite deposits occur in several stratigraphic positions in the Lakota sandstone in Craven and Coal Canyons and also in the basal beds of the Dakota sandstone in Coal Canyon. Most of the deposits listed in table 1 are surface showings. Lack of development work makes it difficult to evaluate the extent of the uraniferous zones or to determine what controlled the deposition of the uranium.

Mineralogy

The mineralogy of the carnotite deposits in Craven Canyon has been discussed previously by Page and Redden (1952). Carnotite is the only uranium mineral that has been identified. An unknown green mineral that occurs in patches as a thin surface coating is often associated with

carnotite. Semiquantitative spectrographic analysis suggests that this mineral is a calcium vanadate.

Thin films and laminae of carbonized plant fragments and black manganese surface stains in many places are weakly radioactive; however, no uranium minerals have been recognized in this material.

Size and shape

The size and shape of the carnotite deposits is poorly known, because the deposits examined by the writers were chiefly surface exposures. In general, the deposits are tabular; the carnotite forms narrow streaks that are parallel to the bedding planes. The largest continuous exposure of carnotite-bearing beds examined is in the lower beds of the Dakota sandstone in Coal Canyon, about 20 feet below the rim of the canyon. This deposit was traced for 350 feet; the maximum thickness is 6 feet and the average, about 2 feet. Most of the deposits, however, have an outcrop length of less than 40 feet.

Controls

The distribution of carnotite deposits suggests a directional trend ranging from west to northwest. However, no large structural or sedimentation controls on the localization of carnotite are evident. Channels, common in the Lakota sandstone in Coal Canyon, may contain concentrations of organic debris that would provide favorable conditions for the localization of uranium. These channels should be intensively prospected.

In detail, carnotite is associated chiefly with thin films and laminae of carbonized plants or scattered small plant fragments in thin-bedded sandstone. Eight samples of carbonaceous beds with no visible uranium minerals gave equivalent uranium determinations ranging from 0.003 to 0.033 percent. The chemical uranium was less in all samples of carbonaceous beds except two. Four of the most significant analyses are presented below:

Sample number	Equivalent uranium (percent)	Uranium (percent)
RE-8-Ed.	0.029	0.024
RE-10-Ed.	0.042	0.025
RE-11-Ed.	0.033	0.027
WEB-5-Ed.	0.012	0.006

Analyses of carnotite-bearing sandstone indicate that the chemical uranium is in excess of the equivalent uranium, suggesting that most of the carnotite has been recently precipitated.

Sample number	Equivalent uranium (percent)	Uranium (percent)
RE-6-Ed.	0.13	0.15
RE-7-Ed.	0.070	0.089
RE-9-Ed.	0.29	0.34
WEB-1-Ed.	0.28	0.35
WEB-2-Ed.	0.18	0.22
WEB-12-Ed.	0.29	0.43
WEB-13-Ed.	0.33	0.41
RE-24-Ed.	0.70	0.96

A possible explanation for this relationship is that uranium is leached from carbonaceous beds and redeposited as carnotite. In view of the apparent widespread association of uranium with carbonaceous material, a sampling

program of carbonaceous beds in the Lakota and Dakota sandstones should be made to determine whether or not the equivalent uranium content is consistently higher than chemical uranium. However, these differences may be due to repeated selective solution and redeposition of carnotite by ground waters.

To a lesser extent carnotite is intimately associated with iron and manganese-stained surfaces. It forms halos around irregular patches and streaks of iron oxides or coats manganese-stained joint surfaces.

RESERVES

The uranium reserves estimated in this report are in addition to those given by Page and Redden. The estimation of reserves is difficult because of the lack of development work on any of the claims. The large number of carnotite deposits in Craven Canyon, the discovery of new deposits in Coal Canyon about 2 miles to the west, and the reported occurrence of carnotite on 46 claims in Red Canyon, about 1½ miles to the east, however, indicate that this area is potentially an important new source of uranium.

Surface exposures of the deposits that were examined during this survey show inferred reserves of at least 50 tons containing more than 0.2 percent uranium, about 350 tons containing 0.1 to 0.2 percent uranium, and 7,700 tons containing 0.06 to 0.10 percent uranium. The reserve estimates of individual deposits are shown in table 1.

The potential reserves are probably several times greater than the reserve estimates above. In addition many more deposits probably will be

Table 1.--Description, analyses, and tonnage of carnotite deposits in Craven and Coal Canyons, Fall River County, South Dakota

Number	Claim	Owner	Address	Location 1/	Mineralogy	Association	Average length (feet)	Average thickness (feet)	Assumed width (feet)	Sample number	Type	Length of sample (feet)	Equivalent uranium (percent)	Uranium (percent)	V_2O_5 (percent)	Average grade (percent uranium)	Inferred 2/ tonnage	Remarks
1	S and D.	S. Runner, D. Hall.	Unknown.	NW1/4, sec. 30, T. 7 S., R. 3 E. West side of Craven Canyon.	No uranium minerals identified.	Carbonaceous layers.	30	0.3	15	RE-2-Ed. RE-3-Ed. RE-4-Ed. RE-5-Ed.	Grab. Channel. do. Grab.	--- 0.3 2.0 ---	.003 .006 .006 .005	.003 .005 .005 .004	< .02 < .04 .04 < .02	.004	Not estimated.	Samples from some of the numerous thin silty beds up to 10 inches thick containing films of carbonized plant remains exposed in canyon wall. These beds are detectably radioactive but there are no visible uranium minerals.
2	Western Edge.	John Challinor, Harold Lundberg, W. E. Beedle, Joe Smith.	do.	Discovery pit. NE1/4, sec. 25, T. 7 S., R.2 E.	Carnotite.	Iron- and manganese-stained sandstone.	40	1.0	20	RE-7-Ed.	Channel.	3.0	.070	.089	.05	.089	50	Carnotite mineralization in streaks parallel to bedding and vertical fractures across bedding; chiefly associated with iron-stain, forming halos around iron-stained patches. Radioactivity spotty over 40-foot strike length.
3	Little Ant.	do.	do.	Discovery pit. NE1/4NE1/4, sec. 25, T.7 S., R. 2 E.	Carnotite and unknown green vanadium-bearing mineral.	Carbonized plant remains and iron stain.	40	2.0	20	RE-6-Ed.	Channel.	2.5	.13	.15	.10	.15	100	Carnotite disseminated in sandstone and concentrated along bedding planes, particularly those which are iron-stained or have thin films of carbonized plant remains. Upper bed, 1 foot thick, contains small fragments of carbonized plant remains. Carnotite intimately associated with these pieces, giving the rock a speckled appearance.
4	Pushover.	do.	do.	Discovery pit. SE1/4, sec. 25, T. 7 S., R. 2 E.	Carnotite.	Scattered small fragments of carbonized fossil plants.	6	1.0	10	WEB-2-Ed.	Channel.	1.0	.18	.22	.15	.20	5	Carnotite is disseminated in sandstone and forms coatings on sand grains. In claims 1, 2, and 3 above, the carnotite appears to be in the same stratigraphic zone. Since these claims are aligned along canyon wall, it is possible that larger deposits or extensions of known carnotite deposits may be found with additional development work.
5	Joanie.	L.E.Shaffer, E.R.Drevdahl, E.H.Stevens, M.J.Voelker.	Mining Dept., S.Dak. Sch.of Mines, Rapid City, S.Dak.	SE1/4, sec. 24, T. 7 S.,R.2 E. West side of Craven Canyon. Deposit may be off south-western boundary of claim.	Carnotite and radioactive carbonized plant material.	Thin laminae of carbonized fossil plant fragments.	100	1.0	20	RE-8-Ed. RE-10-Ed. RE-11-Ed.	Channel. Grab. Grab. (2-inch carbonized bed).	1.3 --- ---	.029 .042 .033	.024 .025 .027	.04 .06 .07	.025	125	Spotty showings of carnotite associated with thin laminae of carbonaceous material in thin-bedded Lakota sandstone. Carbonaceous material is radioactive. Carnotite showings are at base of massive sandstone which gives way to talus slope so that continuity of radioactivity along strike of outcrop could not be determined. Four shows of mineralized beds averaging 10 feet in length found along 100 feet of strike.
6	Alice.	L.E.Shaffer, E.R.Drevdahl.	do.	Discovery pit. East boundary of SE1/4, sec. 24, T. 7 S., R.2 E. West side of Craven Canyon.	Carnotite and unknown green vanadium-bearing mineral.	Joints and fractures in Lakota sandstone.	100	2	10	WEB-7-Ed.	Channel.	6.0	.075	.082	.07	.08	125	Carnotite disseminated in streaks and patches lower part of Lakota sandstone, and staining surface of massive beds. Mineralization chiefly related to joints and fractures from which solutions have migrated along bedding planes and spread out and evaporated on surface of more massive beds. Sporadic carnotite showings traced 100 feet south and 50 feet north of discovery pit.
7	Clara.	do.	do.	SE1/4, sec. 24, T.7 S.,R.2 E. Deposit may cross southern boundary of Clara into Alice claim.	Carnotite.	Iron and manganese stain.	20	2	10	RE-9-Ed.	Channel.	1.0	.29	.34	.17	.34	25	Abnormal radioactivity traced at same stratigraphic horizon for about 100 feet with Halross Scintillometer, beyond limit of outcrop.

1/ Samples are from discovery pits when designated. All other samples are from new surface showings.

2/ Assumed that 16 cubic feet equals one ton of carnotite-bearing sandstone. Numbers rounded off.

Table 1.--Description, analyses, and tonnage of carnotite deposits in Craven and Coal Canyons, Fall River County, South Dakota--Continued

Number	Claim	Owner	Address	Location	Mineralogy	Association	Average length (feet)	Average thickness (feet)	Assumed width (feet)	Sample number	Type	Length of sample (feet)	Equivalent uranium (percent)	Uranium (percent)	V_2O_5 (percent)	Average grade (percent uranium)	Inferred 2/ tonnage	Remarks
8	Betty.	L.E.Shaffer, E.R.Drevdahl.	Mining Dept., S.Dak. Sch.of Mines, Rapid City, S.Dak.	Discovery pit. NE1/4,SE1/4, sec.24,T.7 S., R. 2 E.	Carnotite.	Carbonaceous material and casts of fossil wood.	3	3	10	WEB-6-Ed.	Channel.	1.0	.051	.068	.07	.06	5	Disseminated carnotite in fractures across bedding and in streaks parallel to bedding. Carbonaceous layers and casts of fossil wood associated with carnotite. Radioactive zone extends 150 feet northwest of discovery pit, as determined by Halross Scintillometer.
										WEB-5-Ed.	Grab.		.012	.006	.03			
9	Eunice.	do.	do.	SW1/4, sec. 19; NW1/4, sec. 30, T.7 S.,R.3 E.	Carnotite.	Iron and manganese stain.	3	1	5	RE-16-Ed.	Grab.	---	.028	.034	.02	---	---	Several patches of carnotite mineralization along rim on both sides of small canyon running south from Eunice discovery pit. Disseminated carnotite chiefly in narrow streaks in Lakota sandstone, associated with iron stain. Largest individual deposit traced for 15 feet along strike.
							10	1	10	RE-13-Ed.	Grab.	---	.043	.043	.03	---	5	
							15	2	10	RE-15-Ed.	Channel.	1.3	.077	.084	.05	.08	20	
							10	2	10	RE-17-Ed.	Channel.	2.0	.012	.012	.09	.01	15	
							5	1	10	WEB-8-Ed.	Channel.	1.0	.24	.29	.17	.29	5	
10	Helen.	L.E.Shaffer, E.R.Drevdahl, E.H.Stevens, M.J.Voelker.	do.	Sec.19, T.7 S., R.3 E. Near north boundary of Helen claim, east side of Craven Canyon.	Carnotite.	Carbonized plant remains and iron stain.	Undetermined because of talus cover.			WEB-1-Ed.	Grab.	---	.28	.35	.21	.35	---	Samples are of carnotite disseminated in Lakota sandstone. Mineralized zone, as determined by Halross Scintillometer, follows bench on rim of canyon southwest to discovery pit under area covered by talus.
11	Pictograph.	J.G.Brennan.	615-1/2 Main St., Rapid City, S.Dak.	About 200 yards north of discovery area. NW1/4 sec. 30, T. 7 S., R.3 E.,	Carnotite.	Thin laminae and fragments of carbonaceous material.	6	1	10	RE-19-Ed.	Channel.	1.0	.21	.23	.14	.23	5	Nine showings of carnotite-bearing sandstone at 3 stratigraphic levels about 30 feet apart were found in canyon wall of Lakota sandstone, below black paper-shale horizon. Largest examined deposit exposed for 80 feet along strike. Carnotite occurs disseminated in sandstone lenses parallel to bedding, associated with carbonaceous material and iron stain, in vertical fractures across bedding, and as stains on surface of more massive beds.
							10	0.5	10	RE-18-Ed.	Grab.	---	.16	.26	.12	---	5	
							80	2	20	RE-20-Ed.	Channel.	3.0	.12	.12	.08	.12	200	
							10	1	10	WEB-9-Ed.	Channel.	1.0	.14	.16	.22	.16	5	
							20	0.5	10	WEB-10-Ed.	Channel.	0.5	.11	.074	.09	.07	5	
							8	1	10	WEB-11-Ed.	Channel.	1.3	.24	.26	.09	.26	5	
							15	1	10	WEB-12-Ed.	Channel.	1.0	.29	.43	.23	.43	10	
							6	0.5	10	WEB-13-Ed.	Channel.	0.5	.33	.41	.21	.41	---	
12	None.	Unknown.	---	SE1/4 sec. 22, T. 7 S., R.2 E. Coal Canyon.	Carnotite, radioactive carbonized plant remains; black vanadiferous mineral.	Thin laminae of carbonized fossil plants.	300	2	200	RE-21-Ed.	Channel.	2.0	.014	.012	2.39		7,500	Samples are from lower part of Dakota (?) sandstone and contain carnotite and radioactive carbonized plant material. Much of the rock has purplish black color suggesting vanadium oxides; highest radioactivity associated with thin films of carbonized material. Radioactivity found on both north and south rims of narrow finger-like mesa, 250 to 300 feet across, which suggests that mineralization may be continuous through the mesa at this stratigraphic horizon. Inferred tonnage is estimated on this assumption.
										RE-22-Ed.	Channel.	2.0	.052	.047	.66			
										RE-23-Ed.	Channel.	1.0	.16	.16	2.86			
										RE-24-Ed.	Channel.	1.0	.70	.96 3/	.77	.07		
13	None.	Unknown.	---	SE1/4 sec. 22, T. 7 S., R. 2 E. Coal Canyon.	No uranium minerals visible.	Manganese stain.	3	1	10	RE-25-Ed.	Grab.	---	.043	.001	.12	---	---	Radioactive, brown, medium-grained sandstone with manganese surface stain in upper part of Lakota sandstone. A three-foot ledge of sandstone is exposed in road cut. Upper 1-foot of this ledge gave high readings on 2.0 scale (Beckman Counter) but no uranium minerals are visible. Strongest radioactivity is associated with minute fractures and manganese-stained surface. One other small area of radioactivity was found about 100 yards downstream but weather conditions did not permit further reconnaissance. Chemical analysis suggests that uranium has been thoroughly leached from this area.
										Totals -						.01 to .96	8,215	

3/ This analysis not considered in figuring average grade.

found in adjacent canyons wherever the Lakota sandstone is exposed.

SUGGESTIONS FOR PROSPECTING

The following suggestions are made for prospecting:

1. All exposures of the Lakota formation and the basal beds of the Dakota formation should be examined with either a Geiger counter or scintillometer. The scintillometer is the more satisfactory instrument for detecting radiometric anomalies in this area because it has a greater sensitivity and can be used both for car traversing and foot traversing.

2. All carbonaceous layers should be examined for radioactivity. The widespread association of uranium with carbonaceous material makes this relationship a particularly valuable ore guide.

3. Channel-filling sandstone and thin-bedded sandstones should be closely examined because of the possibility of finding concentrations of organic debris in these beds.

4. All yellow-stained and green-stained outcrops should be checked for radioactivity. The green mineral is probably a calcium vanadate.

PLANS FOR FUTURE WORK

In accordance with agreements made in the budget conferences held in the latter part of January 1952, the Geological Survey will undertake a district study of the carnotite deposits in Fall River County, S. Dak., in fiscal year 1953. It is understood that the Atomic Energy Commission will

be responsible for radiometric reconnaissance and the economic evaluation of individual claims or prospects. In fiscal year 1953, the Survey also plans to begin extensive airborne radiometric surveys of the Powder River-Black Hills region; from 1,500 to 2,000 square miles will be surveyed during the year.

The Survey will have a two-man party in the district during the latter part of fiscal year 1952 as weather permits, to: (1) continue radiometric reconnaissance of the Lakota formation and basal beds of the Dakota formation in Craven, Coal, and Red Canyons until the size of the district has been delimited, (2) sample and describe new discoveries and plot their location on aerial photographs.

During the spring of 1952, the Survey plans to begin the district study to:

1. Map on appropriate scale (approximately 1:12,000) the carnotite-bearing district. More detailed maps (approximately 1:2,400) will be made in areas of known deposits. These detailed maps tentatively would cover about 1 square mile in each of the three canyons known to contain carnotite deposits (Craven, Coal and Red Canyons).

2. Study the facies changes and sedimentary structures in the Lakota formation and their relation to the carnotite deposits.

3. Conduct radiometric and geologic reconnaissance studies as necessary to determine the limits of the district to be mapped.

4. Make preliminary evaluations of any deposits that might be required to carry out the district studies.

5. Report new occurrences to the Atomic Energy Commission for detailed economic evaluation.

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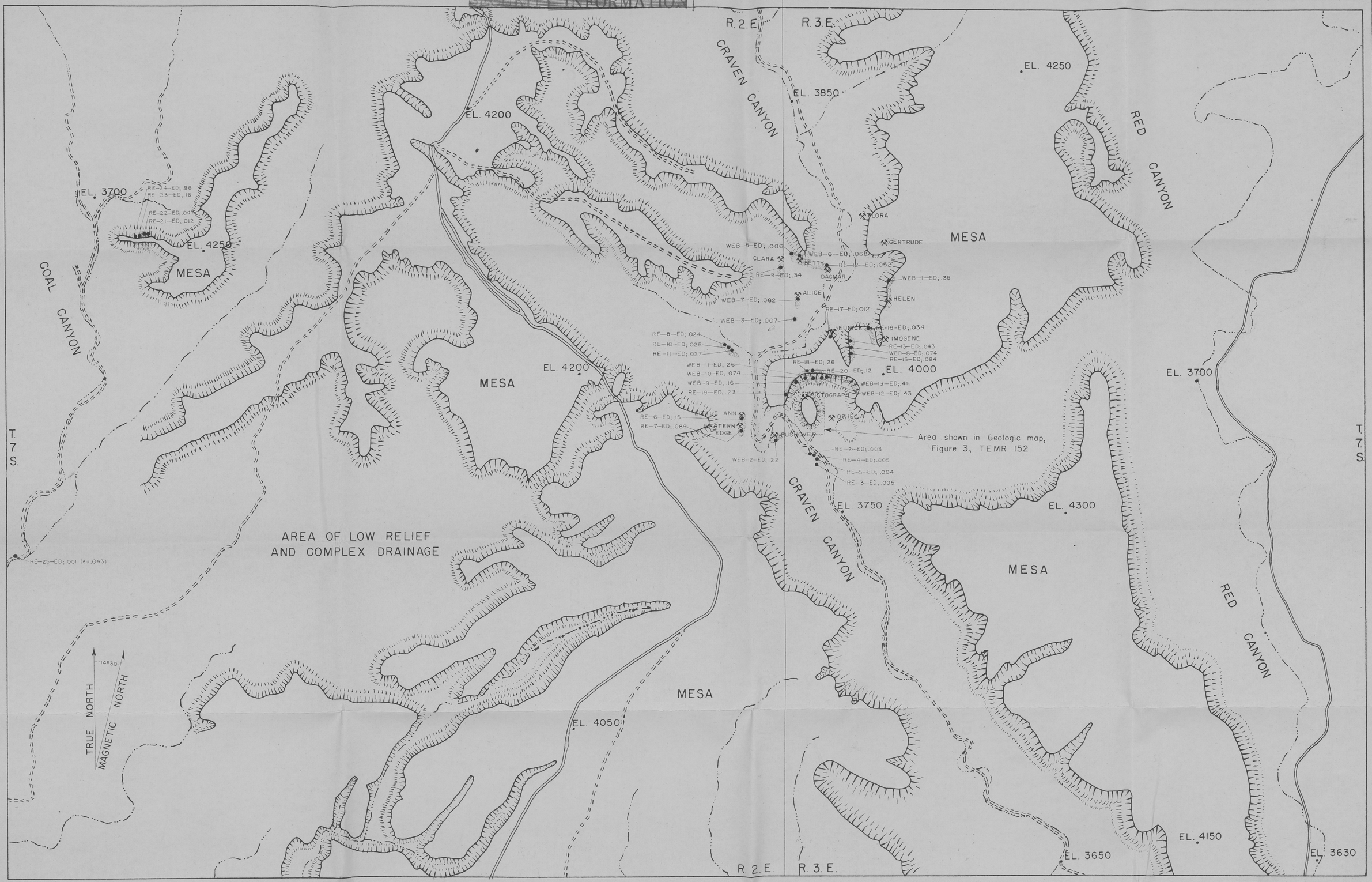
Page, L. R., and Redden, J. A., 1952, The carnotite prospects of the Craven Canyon area, Fall River County, South Dakota: Trace Elements Memorandum Rept. 152.



EXPLANATION

MESA

Area is largely undissected upland surface.
Hachures indicate cliffs or talus slopes

WEB-1-ED;.35

Sample number; Percent uranium

Radioactive zone

PUSHOVER

Discovery pit and name of claim

Improved dirt road

Unimproved dirt road

Intermittent stream

Map compiled from United States Geological Survey Atlas
Folio No. 108, 1904, and aerial photographs.

0 1000 2000 3000 4000 5000 FEET

Datum is mean sea level

FIGURE 2. — ASSAY MAP OF PARTS OF CRAVEN, RED, AND COAL CANYONS, FALL RIVER COUNTY, SOUTH DAKOTA