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ROCK CREEK RADIOACTIVE MINERAL PLACER AREA, BLAINE COUNTY, IDAHO

By
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BLAINE COUNTY, IDAHO

by
A. F. Robertson 1/ and R. H. Storch 1/

INTRODUCTION

During the summer of 1953 radioactive minerals were discovered in the waste dumps from 2 old mines situated high in the mountains in which the Rock Creek drainage begins. A Bureau of Mines engineer 2/ visited the area during October and November, 1953 and took samples of the alluvial materals in and adjacent to the stream bed. Radiometric tests of the concentrates produced by panning these samples indicated the presence of radioactive minerals. Seven large grab samples of the alluvial gravels, taken in the lower end of the Rock Creek area, were concentrated in the Bureau of Mines field laboratory at Boise, Idaho. These samples were found to contain an average of 31.64 pounds of black sand per cubic yard. Tested radiometrically, the black sands contained an average of 2.14 pounds of monazite equivalent 3/ per cubic yard. It was determined by visual examination of the concentrates with a binocular microscope that only a trace of monazite was present, thus indicating that some radioactive mineral other than monazite was present in the alluvial materials.

The favorable results indicated the area to be worthy of a more detailed examination and a proposal that the Bureau of Mines further investigate the deposits by test pitting and churn drilling

1/ Mining engineer, U. S. Bureau of Mines, Spokane, Washington.
2/ Reynolds, John R., Former mining engineer, U. S. Bureau of Mines, Spokane, Washington.
3/ Radioactivity equivalent to one pound of a monazite standard containing 4.20 percent ThO_2 and 0.13 percent U_3O_8.

was submitted to the Atomic Energy Commission. The project was authorized early in 1954 and churn drill sampling began in May, 1954. The test pitting was done while drilling was in progress.

The objectives of the program were to determine: (1) the extent of minable gravels; and (2) the quantity of radioactive minerals and other minerals of potential value in the minable gravels.

SUMMARY AND CONCLUSIONS

The results of the field explorations and laboratory tests on samples taken from the alluvial deposits on Rock Creek, in Blaine County, Idaho, indicate the minable gravels are contained in 3 separate areas. Area Number 1 is near the lower end of Rock Creek and contains a large volume of gravel. Area Number 2, nearby and containing a small volume of gravel, is situated in a dry ravine which cuts across a high bench northeast of the first area. Area Number 3, containing a much smaller volume than Area Number 1, is on bottom lands about 3 1/2 miles above the mouth of Rock Creek. The first and third areas can be mined by dredging. The residual gravels of the second area, on higher ground, would perhaps be mined by surface methods.

The Rock Creek deposits are within a few miles of a railroad and a high-tension power line crosses the largest of the minable areas. Good graveled county roads connect the 3 areas with paved highway U. S. 93 and with Hailey, the county seat of Blaine County.

Sufficient water for dredge and concentrating plant operations may not be available during the fall and winter months. A supplemental water supply could be obtained by pumping from Magic

Reservoir into which Rock Creek flows.

Churn drill sampling of the gravels along Rock Creek, and its main tributary the West Fork, was begun on May 20, 1954 and was completed on June 14, 1954. A total of 44 drill holes, ranging in depth from 10 to 47 feet and having an aggregate depth of 1,126 feet, was drilled. A total of 232 samples was obtained from the drill holes.

The samples were wet-screened and treated on a laboratory shaking table to produce rough concentrates. These were shipped to Spokane, Washington where they were reconcentrated, cleaned, and estimates made of their mineral content before being sent to the Bureau of Mines laboratory in Reno, Nevada for final analyses.

While drilling was in progress, 25 test pits were excavated in the bottoms of tributary gulches and on benches where dredging operations would not be feasible but where surface mining methods can be used. The test pits ranged in depth from 2 to 17 feet and had an aggregate total depth of 233 feet. A total of 55 samples was obtained and processed in the same manner as the drill hole samples.

The quantities of heavy black-sand minerals in the 3 areas according to their decreasing abundance were found to be magnetite, sphene, ilmenite plus hematite, zircon, uranothorite, and others. The quantities of garnet and monazite present in the gravels were not calculated because these minerals were found to be present in only trace amounts.

It was determined that the uranothorite was responsible for practically all of the radioactivity in the concentrates recovered from the drill hole and test pit samples. By chemical analysis this mineral was found to contain 49.5 percent ThO_2 and 6.23 percent U_3O_8. The uranothorite concentrates have potential value as a source for thorium and uranium.

The sphene in the gravels may be of economic importance because it contains columbium, tantalum, yttrium, and titanium, It was not determined if the Cb, Ta, and Y elements are present as separate mineral inclusions in the sphene or as an integral part of the sphene crystals. From the chemical analyses of the concentrates from 4 samples it was calculated that the sphene product contains an average of 0.45 percent $(Cb,Ta)_2O_5$. Spectrographic and chemical analyses indicate the sphene concentrates average about 0.80 percent yttrium. The sphene, a calcium-titanium silicate, theoretically, contains 40.8 percent TiO_2.

Petrographic analyses show that a large percentage of the sphene crystals contain microscopic inclusions of magnetite, ilmenite, or other minerals. The separation of the sphene from the other heavy minerals in the black sands by electromagnetic and electrostatic methods may be difficult because of the included minerals which adversely affect the magnetic and electrical properties of the sphene. Special methods for the separation of the black sand minerals from each other may be necessary.

DESCRIPTION OF DEPOSIT

Location

The Rock Creek placer area is in T. 1 S., R. 17 E. and T. 1 N., R. 17 E. of the Boise Meridian in Blaine County, Idaho. The area includes the bottom lands and sloping side hills along Rock Creek and its main tributary the West Fork. The total length of the area investigated is about 9 miles but parts of the area, where the creek flows through narrow canyons or through swampy meadows, were inaccessible for drilling.

Idaho State Highway 22 crosses the southern end of the area near the backwaters of Magic Reservoir and extends easterly about 5 miles to its junction with U. S. Highway 93. From a ranch, one and a half miles up Rock Creek from Magic Reservoir, a graveled road extends northeasterly approximately 9 miles to join U. S. Highway 93 about 3 miles south from Bellevue. Another county road follows up Rock Creek, crosses the divide between Rock and Croy Creeks and joins State Highway 22 N. which continues to Hailey for a total distance of about 13 1/2 miles. A branch road extends up the West Fork from the main Rock Creek road.

A high voltage power line of the Idaho Power Company crosses the lower end of the area on a line between Sections 2 and 13, T. 1 S., R. 17 E.

The nearest shipping point on the branch line of the Union Pacific Railroad from Shoshone to Ketchum is at Bellevue.

Size

The churn drill and test pit sampling conducted by the Bureau of Mines indicates that radioactive minerals are present in variable amounts in the alluvial and residual gravels. Most of the churn drill and test pit samples taken in the area were found to contain less than one pound of monazite equivalent 4/ per cubic yard when tested radiometrically. Only holes or test pits which had a radioactive mineral content of one pound per cubic yard or more were used for determining selected areas which might be exploited commercially.

Within the large area explored, the indicated minable gravels were found to be contained in 3 separated areas. The first area is fairly large and begins about a half mile north of the mouth of Rock Creek and consists mainly of bottom lands. A second nonadjoining area, consisting mainly of residual gravel and sand, is situated on higher ground a short distance north of the first area. This area extends along a small dry ravine with gently sloping sides, and is small. The third area, about 2 1/2 miles farther up Rock Creek covers the bottom lands and is not large.

Physical Features

The climate of the area is semi-arid. During the winter months temperatures may drop to 25 degrees below zero and snow may reach a depth of 4 to 5 feet. Summer temperatures often exceed 100 degrees but stormy weather may be experienced during any month of the year. Precipitation often is negligible from July to October. Practically all streams, except those fed by springs, become dry during the summer and early fall. Rock Creek, and its main tributary

4/ See footnote 3.

the West Fork, probably would provide sufficient water for a dredging operation only during the spring and early summer. A supplemental water supply for a year around operation might have to be pumped from Magic Reservoir, a distance of about 1/2 mile from the lower end of Area Number 1.

The deposits are mainly on cultivated bottom lands or on gently sloping side hills. No clearing would be necessary except for a few cottonwoods, willows, and brush that border the creek.

Geology

The deposits are composed of materials which have been derived by erosion from the metamorphosed granitic rocks of the Idaho Batholith and from the more recent lava flows which covered a large part of the region through which Rock Creek and its tributaries flow. The granitic rocks of the Idaho Batholith, which occupies an area extending nearly 300 miles north and south and about 100 miles east and west in central Idaho and western Montana, are considered by Ross 5/to have been formed late in the Mesozoic period, probably in late Jurassic or Cretaceous time. The basalt, which poured out upon the eroded surface of the granitic rocks, may be considered as middle or late Tertiary in age.

The rocks of the Idaho Batholith, as they occur a short distance north and east from the Rock Creek deposit, have been much altered and metamorphosed; they range in composition from granodiorite to quartz monzonite. They have been described 6/ as being moderately

5/ Ross, C. P., Mesozoic and Tertiary granitic rocks in Idaho: Jour. Geol., vol. 36, No. 8, p. 692, 1928: Some features of the Idaho Batholith: Sixteenth Internat. Geol. Cong. Rept., pp. 382-283, 1936.

6/ Anderson, Alfred L. and Wagner, Warren R., A Geologic Reconnaissance of the Hailey Gold Belt,(Camas Dist.),Blaine County, Idaho: Idaho Bureau of Mines and Geology Pamphlet 76, p. 5, 1946.

coarse-grained, light in color, and contain from 20 to 30 percent of a pink colored orthoclase feldspar (microcline); 30 to 45 percent plaigioclase feldspar (andesine); about 30 percent quartz and from 5 to 10 percent biotite and hornblende.

Numerous aplitic dikes, pegmatite dikes, and lamprophyric dikes with which quartz veins containing gold, lead, and zinc minerals are associated, are found in the granitic rocks forming the mountains in which Rock Creek has its sources.

The basalt has been stripped from most of the district but remnants remain over much of the area west and north from Rock Creek.

Mineralogy

Materials in the Rock Creek placer deposits consist of erosion products derived from both the granitic rocks and the lavas through which the stream flows. They are composed mainly of fine grained granitic sand, angular or slightly rounded fragments of granitic rocks, basalt pebbles, fine silt, and clay. Few cobbles larger than 4 inches in size occur in the stream bed but large boulders may be found bordering the cultivated fields. The material, in the smallest of the estimated minable areas, consists largely of angular cobbles, pebbles, coarse and fine sand, and clay remaining from the decomposition of the granitic rocks underlying this area. A small amount of the material has been deposited as alluvium by intermittent seasonal stream action.

Mineralogical analyses made in the Bureau of Mines laboratory at Reno, Nevada, show that the concentrates from the Rock Creek

gravels contain major amounts of magnetite, sphene, hematite, quartz, feldspar, hornblende, biotite, epidote, pyroxene, allanite, and sericite. Also present are small amounts of ilmenite, zircon, garnet, cyrtolite, columbite, and thorite or uranothorite. The radioactivity of all samples is believed to be due almost entirely to the uranothorite. The sphene fractions were found to contain an appreciable amount of columbium and tantalum and about half of the sphene contained microscopic inclusions of magnetite which were partly altered to hematite. Some ilmenite inclusions also were noted.

Screen analyses of some samples from the Rock Creek area follow:

GRAVEL SCREEN ANALYSIS

Drill Hole No. 2S-41

Rock Creek Area, Blaine County, Idaho

Screen Size, Mesh	Weight Distribution, Percent	Cumulative Weight, Percent
+ 10	27.0	27.0
- 10 + 14	7.7	34.7
- 14 + 20	7.4	42.1
- 20 + 28	7.8	49.9
- 28 + 35	8.2	58.1
- 35 + 48	9.9	68.0
- 48 + 65	9.0	77.0
- 65 +100	8.5	85.5
-100 +150	4.8	90.3
-150 +200	2.8	93.1
-200	6.9*	100.0
Total	100.0	

* Does not include weight of slime material washed away during drilling operations.

SCREEN ANALYSIS OF BLACK-SAND CONCENTRATES

Sample From Drill Hole Number JT-28 Samples 1 through 3 of Concentrates

Location: Rock Creek, Blaine County, Idaho

Pounds of Black Sand per cubic yard 24.27 Pounds of Monazite Equivalent per cubic yard 1.92*

Screen Size, Mesh	Weight		Minerals Present, Percent						Percent of Total Monazite*	Cumulative Percent, Monazite*
	Table Concs. Lbs.	Monazite,* Lbs.	Magnetite	Ilmenite	Garnet	Zircon	Monazite*	Quartz, Feldspar, Sphene		
- 10 + 14	0.004	Trace	2	20	Tr.	0	Tr.	78	-	-
- 14 + 20	0.011	Trace	20	25	1	0	Tr.	54	-	-
- 20 + 28	0.024	Trace	50	10	Tr.	0	Tr.	40	-	-
- 28 + 35	0.059	0.000590	58	10	Tr.	0	10	30	0.68	0.68
- 35 + 48	0.120	0.010440	70	6	Tr.	0	8.7	20	12.07	12.75
- 48 + 65	0.209	0.019437	62	8	Tr.	Tr.	9.3	24	22.46	35.21
- 65 +100	0.276	0.026220	45	15	Tr.	1	9.5	35	30.30	65.51
-100 +150	0.184	0.017112	35	15	Tr.	2	9.3	40	19.78	85.29
-150 +200	0.067	0.007370	50	12	Tr.	7	11	25	8.52	93.81
-200	0.040	0.005360	75	3	Tr.	15	13.4	5	6.19	100.00
Total	0.994	0.086529								

* Monazite equivalent, radiometric estimate.

HISTORY

The Rock Creek placer deposits are on lands which were originally located and patented as homesteads and have been used as farming and grazing lands for many years. No placer mining has been gone. Many lode mines, situated in the mountains near the headwaters of Rock Creek have been operated intermittently since 1865 but most of these mines have been inactive during recent years. Since the discovery of radioactivity in the material on 2 of the old mine dumps was announced, a lively interest in the region has developed and several old mines have been reopened. Many new claims have also been located.

EXPLORATION

Preliminary Investigations

The first investigations of the Rock Creek placer deposits by the Bureau of Mines consisted of panning the gravels exposed in the stream bed and along the side hills. The concentrates obtained from these gravels were checked with a Geiger counter. Grab samples were taken for laboratory testing when radioactivity in the panned concentrates was noted. Radiometric tests of grab-sample concentrates from the vicinity of Tews ranch indicated the presence of radioactive minerals. A proposal that the area be investigated by churn drilling and test pitting was submitted and approved by the Atomic Energy Commission in the spring of 1954.

Churn Drilling

Churn drill sampling of the deposits near the lower end of Rock Creek was begun on May 20, 1954 and terminated on June 14, 1954. Forty-four holes ranging in depth from 10 to 47 feet and having an aggregate depth of 1,126 feet were completed. When cultivated areas were encountered which were too wet due to irrigation water to permit access, drilling was continued farther up the main creek and its tributary, the West Fork. Additional intermediate holes were drilled later when the irrigated areas became accessible.

The churn drilling was performed under Order Number Alb-3828, Contract Number 14-09-020-128. A truck-mounted churn drill was operated by the contractor.

The drill casing used had an inside diameter of 6 inches and was fitted with a drive shoe with a cutting diameter of 7 3/8 inches. Samples were bailed from the hole after each 2 1/2-foot drive of the casing. Two 2 1/2-foot samples were combined into one composite sample representing a 5-foot vertical section of the core. Parts of each 5-foot sample were panned at the drill site. The concentrates obtained were inspected with a 40-power pocket microscope and tested with a Geiger counter. This was done to determine the depth to which the hole should be drilled. The concentrates and the panned rejects were returned to the original samples.

All samples were collected in individual tubs to which were attached tags showing the hole number and the depth at which the sample was taken. The excess water in each tub was drained off and the samples were transported to a temporary concentrating plant at Hailey, Idaho where they were weighed and wet-screened on a 10-mesh screen.

The oversize was weighed and rejected; the undersize was tabled to obtain rough concentrates which were dried, sacked and weighed. These concentrates were transported to the field laboratory at Spokane, Washington for final concentration and estimation of their mineral content.

The aggregate dry weight of the 232 samples taken from the drill holes was 14,775 pounds; the discarded 10-mesh material weighed 4,900 pounds and the minus 10-mesh material 9,875 pounds. The total dry weight of the final cleaned concentrates was 118.74 pounds.

Test Pitting

While the drilling was in progress, test pits were excavated along the sides of the deposit where dredging may not be feasible but where surface mining methods can be employed. A diesel-powered trenching machine, mounted on tracks was used. A total of 25 test pits, ranging from 3 to 17 feet, was excavated. Channel samples were cut from the sides of the pits after which they were filled and a bulldozer used to level the test pit sites. The sacked samples were taken to the temporary concentration plant in Hailey where they were weighed and wet-screened on a 10-mesh screen. The plus 10-mesh material was weighed and discarded; the minus 10-mesh material was rough concentrated on a laboratory shaking-table. The concentrates were transported to the Spokane field laboratory for final concentration and estimation of mineral content.

From the 25 test pits, a total of 55 samples having a gross dry weight of 5,628 pounds was obtained. The discarded oversize material weighed 2,601 pounds. The final black sand concentrates

obtained from the 3,027 pounds of minus 10-mesh material had a total weight of 38.05 pounds.

ANALYSES

Field Estimates

A 10-gram cut of each of the individual, cleaned concentrate samples was prepared in the Spokane field laboratory. The magnetite in this 10-gram sample was removed by means of a small magnet and its weight determined. A small quantity of the remainder was then examined under a binocular microscope and a percentage estimate of the mineral content was made. The zircon content of the sample was checked further with an ultraviolet lamp. Each concentrate sample then was checked radiometrically to determine its radioactivity as compared with the radioactivity of a standard monazite sample. Composite samples, to the estimated minable depth, were then prepared for each churn-drill hole and test pit. These composite samples were shipped to the Bureau of Mines laboratory at Reno, Nevada for final chemical analyses and radiometric tests.

Only holes and test pits which had a radioactive mineral content of one pound or more per cubic yard of gravel were used for calculations.

Field estimates are sumarized in Table 1 which follows:

Table 1 - SUMMARY OF FIELD ESTIMATES, ROCK CREEK AREA

Weighted Average to Minable Depth for each Drill Hole and Test Pit

Drill Hole No.	Total depth, ft.	Minable depth, ft.	Lbs. Black Sand/ cu.yd.	Mineral Content in Black Sands in Percent to Minable Depth					
				Mag-netite	Ilmenite plus Hematite	Gar-net	Zir-con	Sphene	Mona-zite Equiv.*
2S- 1	20	20	17.30	31	21	Tr.	2	36.0	6.6
2	30	30	24.47	61	11	Tr.	2	29.0	6.2
3	33	20	35.34	49	16	Tr.	2	32.0	4.3
4	21	None		-	-	-	-	-	-
5	25	15	23.35	50	19	Tr.	3	24.0	5.7
6	19	15	15.01	29	27	Tr.	4	10.0	6.7
2S- 7	20	20		49	16	Tr.	1	27.0	3.5
JT- 8	25	25	42.91	66	8	Tr.	2	15	4.5
ST- 9	17	None		-	-	-	-	-	-
ST-10	18	None		-	-	-	-	-	-
GD-11	24	None		-	-	-	-	-	-
GD-12	29	None		-	-	-	-	-	-
ST-13	20	None			-	-	-	-	-
14	16	None			-	-	-	-	-
ST-15	47	None		-	-	-	-	-	-
SS-16	40	None		-	-	-	-	-	-
SS-17	38	38		29	10	Tr.	2	51.0	6.0
ST-18	38	None		-	-	-	-	-	-
19	28	None		-	-	-	-	-	-
20	15	15		53	9	Tr.	1	26.0	3.5
21	17	None		-	-	-	-	-	-
22	29	None		-	-	-	-	-	-
23	22	None		-	-	-	-	-	-
24	21	None		-	-	-	-	-	-
ST-25	19	19		38	28	Tr.	2	33.0	4.1
JT-26	24	None		-	-	-	-	-	-
27	18	None		-	-	-	-	-	-
28	15	15	24.27	49	11	Tr.	1	25.0	7.9
29	15	15	33.46	40	11	Tr.	1	36.0	5.7
JT-30	15	15	28.43	47	13	Tr.	2	18.0	4.8
GD-31	20	None		-	-	-	-	-	-
32	18	None		-	-	-	-	-	-
GD-33	18	None		-	-	-	-	-	-
2S-34	23	None		-	-	-	-	-	-
35	45	30	16.73	26	14	Tr.	2	38.0	9.1
36	40	30	19.17	12	12	Tr.	2	33.0	7.7
37	40	25	18.57	26	13	Tr.	1	43.0	8.0
38	18	None		-	-	-	-	-	-
39	18	None		-		-	-	-	-
40	25	None		-	-	-	-	-	-
41	45	30	14.28	25	19	Tr.	3	15.0	7.0
42	43	35	22.84	21	18	Tr.	2	40.0	7.2
43	10	None		-	-	-	-	-	-
2S-44	45	35	35.74	58	10	Tr.	1	24.0	5.7

Table 1 - SUMMARY OF FIELD ESTIMATES, ROCK CREEK AREA (Continued)

Weighted Average to Minable Depth for each Drill Hole and Test Pit

Test Pit No.	Total depth, ft.	Minable depth, ft.	Lbs. Black Sand/ cu.yd.	Mineral Content in Black Sands in Percent to Minable Depth: Mag-netite	Ilmenite plus Hematite	Garnet	Zircon	Sphene	Monazite Equiv.*
TR- 1	17	17	11.75	40	15	Tr.	2	44.0	9.5
2	4	4	20.20	45	15	Tr.	1	25.0	34.0
3	14	14	14.99	19	13	Tr.	2	52.0	7.8
4	14	14	21.70	50	10	Tr.	1	40.0	5.3
5	5	None		-	-	-	-	-	-
6	5	5	41.21	60	15	Tr.	1	25.0	9.2
7	5	5	76.58	83	6	Tr.	Tr.	6.0	3.9
8	3	None		-	-	-	-	-	-
9	2	2	20.27	55	15	Tr.	1	**	8.2
10	8	5	20.00	50	20	Tr.	1	22.0	10.5
11	8	8	58.56	78	8	Tr.	1	15.0	6.7
12	7	7	57.17	69	11	Tr.	1	20.0	8.3
13	5	None		-	-	-	-	-	-
14	8	None		-	-	-	-	-	-
15	11	11		17	28	Tr.	Tr.	57.0	11.9
16	15	None		-	-	-	-	-	-
17	15	None		-	-	-	-	-	-
18	10	None		-	-	-	-	-	-
19	17	17		58	8	Tr.	1	40.0	5.9
20	5	None		-	-	-	-	-	-
21	12	12		41	15	Tr.	1	42.0	4.9
22	5	None		-	-	-	-	-	-
23	10	None		-	-	-	-	-	-
24	12	None		-	-	-	-		-
TR-25	16	None		-	-	-	-	-	-

* Radioactivity equivalent to one pound of a monazite standard containing 4.20 percent ThO_2 and 0.13 percent U_3O_8.
** No sample split remaining to be estimated.

The procedure for calculating quantities of uranothorite from monazite equivalent is shown under the heading, Chemical and Radiometric Analyses.

Mineralogical, Chemical and Radiometric Analyses

In the Bureau of Mines laboratory at Reno, Nevada, the samples were split into representative portions. One fraction was ground to minus 150-mesh size for chemical and radiometric analyses; another fraction was retained in natural grain size for mineralogical analyses. The results of the mineralogical analyses of 3 of the composited samples are estimated as follows:

Mineral	Sample from Drill Hole No. 2S-6, Percent	Sample from Drill Hole No. 2S-36, Percent	Sample from Trench No. TR-15, Percent
Epidote	4	10	6
Ferro-Mags	2	7	4
Garnet	Trace	Less than 1	Less than 1
Ilmenite	15	9	15
Magnetite	35	18	23
Monazite	0.08	Trace	Trace
Quartz, etc.	20	15	12
Rutile	-	Trace	Trace
Titanite (Sphene)	20	38	37
Thorite	-	0.40	0.95
Zircon	2	1 - 2	2
Black Opaques	0.17	Trace	Trace

The monazite standard used for radiometric comparison with the black-sand concentrates, contained 4.2 percent ThO_2 and 0.13 percent U_3O_8. The U_3O_8 is considered to be 4.2 times more radioactive than ThO_2. The monazite standard, therefore, was calculated to have a thoria equivalent of 4.2 +(4.2 x 0.13) or 4.746 percent.

A chemical analysis of clean uranothorite, separated from one of the grab samples taken from the Rock Creek gravels, indicated that it contained 49.5 percent ThO_2 and 6.23 percent U_3O_8. The thoria equivalent of this uranothorite, as compared with the thoria

equivalent of the monazite standard used in the Spokane field laboratory, would be 49.5 + (4.2 x 6.23) or 75.67 percent.

Its calculated radioactivity would be $\frac{75.67}{4.746}$ or 15.94 times stronger than the radioactivity of the monazite standard used. This factor along with other field estimates can be used to calculate the quantities of uranothorite per cubic yard of gravel for each drill hole and test pit. Although the results using this method are not shown, the procedure is as follows:

(1) Weight of black sand x percent monazite equivalent = pounds of monazite equivalent per cubic yard of gravel.

(2) Pounds of monazite equivalent per cubic yard of gravel divided by 15.94 = pounds uranothorite per cubic yard of gravel.

This estimate of uranothorite can be used to check the results from a second method for calculating uranothorite. The second method determined by chemical analysis is as follows:

(1) $\frac{ThO_2 \text{ in sample (percent)} \times 100}{49.5}$ = Uranothorite in sample (percent)

(2) Uranothorite in sample (percent) x Pounds black sand per cubic yard = Pounds uranothorite per cubic yard of gravel.

Results for the 3 areas using the second method are shown in Table 2.

Table 2 - URANOTHORITE CALCULATIONS

Rock Creek Areas, Blaine County, Idaho
(Based on Chemical Analyses for ThO_2)

Drill Hole or Test Pit No.	Percent Thoria Equiv.	Percent ThO_2 (Chem.)	Percent Uranothorite (Calc.)	Pounds Black Sand Per Cu. Yd.	Pounds Uranothorite Per Cu. Yd.
Area No. 1					
2S- 1	0.288	0.203	0.410	17.30	0.071
2	.227	.180	.364	24.47	.089
3	.148	.103	.208	35.34	.074
5	.217	.151	.305	23.35	.071
6	.268	.180	.364	15.01	.055
35	.501	.350	.707	16.73	.118
36	.320	.310	.626	19.17	.120
37	.340	.340	.687	18.57	.128
41	.308	.030	.061	14.28	.009
42	.295	.200	.404	22.84	.092
2S-44	.233	.060	.121	35.74	.043
TR- 1	.444	.680	1.374	11.75	.161
2	.765	.650	1.313	20.20	.265
3	.327	.300	.606	14.99	.091
4	.239	.170	.343	21.70	.074
TR- 6	0.331	0.360	0.727	41.21	0.300
Area No. 2					
TR- 7	0.233	0.310	0.626	76.58	0.479
9	.440	.140	.283	20.27	.057
10	.436	.270	.545	20.00	.109
11	.268	.310	.626	58.56	.367
TR-12	0.418	0.380	0.768	57.17	0.439
Area No. 3					
JT- 8	0.163	0.103	0.208	42.91	0.089
28	.381	.210	.424	24.27	.103
29	.245	.560	1.131	33.46	.378
JT-30	0.176	0.290	0.586	28.43	0.167

As previously stated, the chemical analysis of clean uranothorite indicated it to contain 49.5 percent ThO_2 and 6.23 percent U_3O_8. To obtain the indicated ThO_2 and U_3O_8 content of the uranothorite in the gravels, multiply the pounds of uranothorite per cubic yard of gravel by 49.5 percent for weight of ThO_2, and by 6.23 percent for weight of U_3O_8 per cubic yard of gravel for each sample.

BENEFICIATION AND ECONOMICS

The Rock Creek placers are very similar to the Camp Creek deposit located about 6 miles to the west although the black sand concentrates contain different percentages of the heavy minerals. Two of the 3 separated areas along Rock Creek can be mined by dredges; the other area will perhaps require surface mining methods. Power is available in the vicinity.

Sufficient water for dredging operations is probably available in Rock Creek only during the late spring months. Water for dredging the largest of the 3 deposits located near the lower end of Rock Creek, may have to be pumped from Magic Reservoir, if year around operations are to be conducted. The pumping distance will range from 1/2 mile for the downstream portion of the deposit to over 1 1/2 miles for the upstream end.

The heavy black-sand minerals in their decreasing abundance were found to be magnetite, sphene, ilmenite plus hematite, zircon, uranothorite, and others. Screen analyses of a composited sample of black sand concentrates obtained from drill hole JT-28 indicate the uranothorite crystals or grains range in size from minus 35 to minus 200-mesh. Special concentrating equipment may be needed to insure an efficient recovery of the uranothorite from the gravels in the Rock Creek area.

The uranothorite contains large percentages of ThO_2 and U_3O_8, and the sphene contains columbium, tantalum, titanium, yttrium, and other rare metals. Little information is available on the metallurgy that will be involved for the separation of the black-sand minerals from each other.

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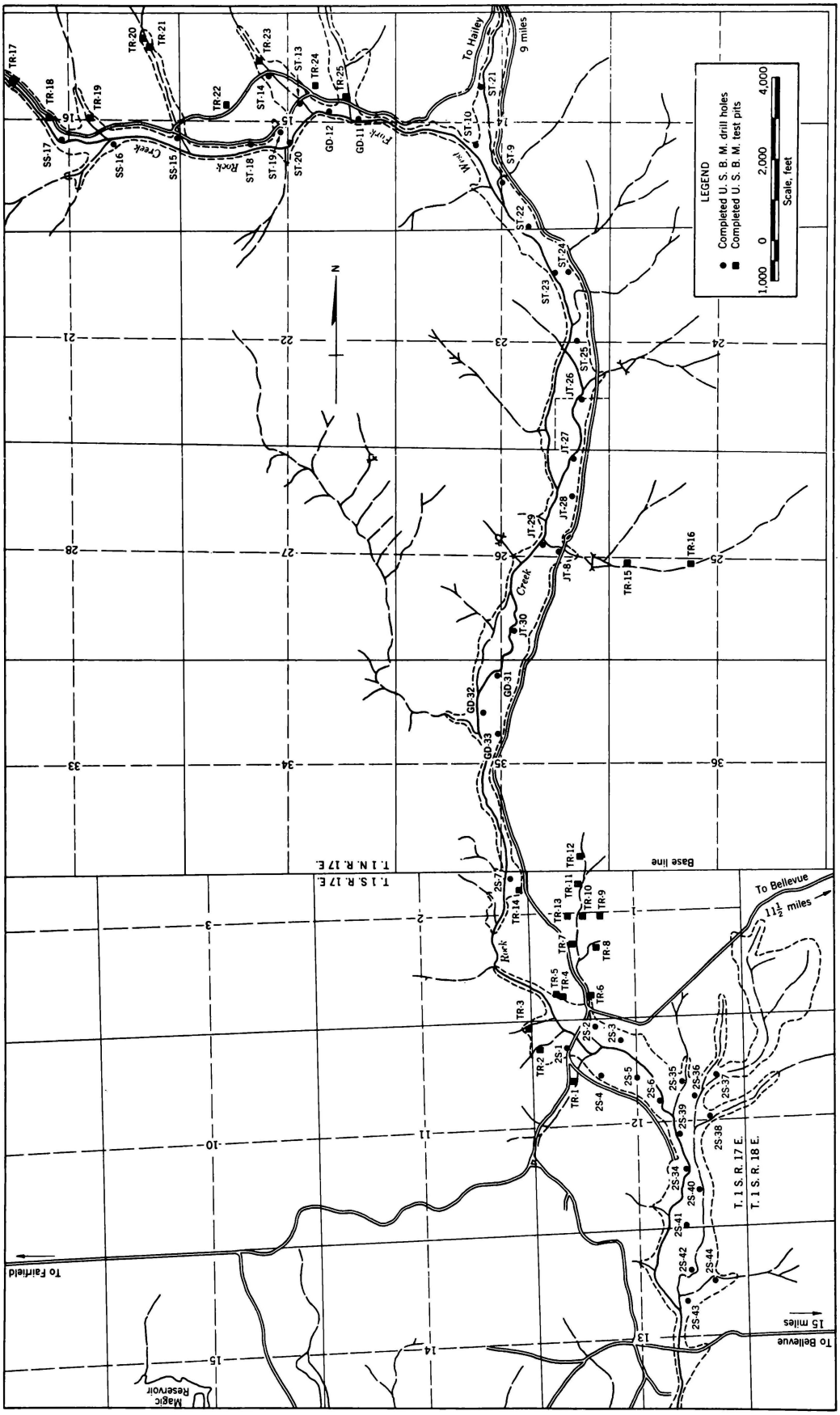

Plate 1.— Rock Creek Radioactive Mineral Placer Area, Blaine County Idaho, Branch of Rare and Precious Metals, U. S. Department of the Interior, Bureau of Mines. RME- 3139

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