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RECONNAISSANCE FOR A URANOTHORIANITE-BEARING LODE IN THE VICINITY OF THE HEADWATERS OF THE PEACE RIVER, CANDLE QUADRANGLE, SEWARD PENINSULA, ALASKA

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Trace Elements Memorandum Report 355

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

AEC-1004/2

JUL 14 1952

Dr. Phillip L. Merritt, Assistant Director
Division of Raw Materials
U. S. Atomic Energy Commission
P. O. Box 30, Ansonia Station
New York 23, New York

Dear Phil:

Transmitted herewith for your information and distribution are six copies of Trace Elements Memorandum Report 355, "Reconnaissance for a uranothorianite-bearing lode in the vicinity of the headwaters of the Peace River, Candle quadrangle, Seward Peninsula, Alaska", by Walter S. West, June 1952.

The brief reconnaissance at the head of the Peace River early in the summer of 1952 failed to locate the bedrock source of the uranium and copper minerals found there in placers by the 1947 reconnaissance of the Buckland-Kiwalik district (TEI-49) primarily because of a wide spread tundra cover and the lack of heavy trenching equipment necessary to cut through this cover. Mineralogic study of such samples as were taken lends additional strength to an hypothesis that the uranium minerals and copper and other sulfide minerals occur in a lode deposit possibly a vein, in a small area (about ½ sq mi) at the head of the Peace River. Of particular import is the intimate association of gummite with galena, tetradymite, and pyrite in discrete mineral grains from the placers.

The Geological Survey plans no extensive studies in the area in the immediate future. However, should private prospecting, particularly as a result of the release of our information on the area, develop information in support of the high-grade lode hypothesis we plan to assist the prospectors with such geologic, mineralogic, and radiometric studies as are feasible.

We plan to publish this report as a Geological Survey circular. However, in order to make the information available to Alaskan prospectors interested in the area at the earliest possible date we also wish to place the report on open file. We are asking Mr. Hosted, by a copy of this letter, whether the Commission has any objection to such publication and plans for open file release.

Sincerely yours,

T.B. McKelvey
for W. H. Bradley
Chief Geologist

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Geology - Mineralogy

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plus 1 figure.
Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RECONNAISSANCE FOR A URANOTHORIANITE-BEARING LODE IN THE VICINITY OF THE HEADWATERS OF THE PEACE RIVER, CANDLE QUADRANGLE, SEWARD PENINSULA, ALASKA*

By

Walter S. West

June 1952

Trace Elements Memorandum Report 355

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*This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission

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RECONNAISSANCE FOR A URANOTHORIANITE-BEARING LODE IN THE VICINITY OF THE HEADWATERS OF THE PEACE RIVER, CANDLE QUADRANGLE, SEWARD PENINSULA, ALASKA

By Walter S. West

ABSTRACT

Reconnaissance in 1947 found uranothorianite and gummite associated with copper sulfides, iron oxides, molybdenite, gold, silver, bismuth, and thorite in placers of a headwater tributary of the Peace River in the eastern part of the Seward Peninsula, Alaska. The concentrates from these placers contain as much as about 0.8 percent equivalent uranium, or about ten times the equivalent uranium content of the average uranothorianite-bearing concentrates from other placers in the eastern Seward Peninsula.

Brief radiometric reconnaissance early in the summer of 1952 failed to locate the bedrock source of the radioactive minerals at the head of the Peace River, primarily because of the shielding-effect of widespread tundra cover. The samples obtained in 1952 indicate the presence of galena, sphalerite, pyrrhotite, covellite, and fluorite in addition to the minerals reported in the results of the 1947 reconnaissance. In these samples the intimate association of pyrite, sphalerite, chalcopyrite, and galena in discrete grains in the placers, but not in the granite country rock, indicates a possible lode source for the sulfides. Gummite, believed to be a decomposition product of the uranothorianite, occurs in mineral grains with tetradymite, galena, and pyrite; this also suggests that the uranium minerals occur along with the sulfides in a lode deposit, possibly a vein, which is located somewhere about a ½ sq mi area lying upstream from the topographically highest placer sample.

INTRODUCTION

Reconnaissance for radioactive deposits in the Buckland-Kiwalik district (fig. 1) of the Seward Peninsula, Alaska, in 1947 (West and Matzko, 1952) found significant amounts of uranothorianite in concentrates from placers in the headwaters of the Peace River (figs. 1 and 2). These concentrates contain from about 0.2 to about 0.8 percent equivalent uranium or about 10 times the equivalent uranium content of the average uranothorianite-bearing concentrates obtained at other localities in the eastern part of the Seward Peninsula. In addition to uranothorianite these concentrates contain gummite, thorite, hematite, limonite, powellite, pyrite, chalcopyrite, bornite, molybdenite, gold, silver, bismuth, and other heavy minerals, the last, for the most part, being common accessory minerals of granitic rock (West and Matzko, 1952, p. 22). The gummite is probably an alteration product of the uranothorianite. The placers from which these concentrates were obtained lie near a granite-andesite contact in a restricted drainage basin. The locations of the samples were such as to limit the source area of the radioactive minerals to a maximum size of about ½ sq mi. The presence of gummite, which is somewhat water soluble, further bears out the belief that the heavy minerals in these placers could not have traveled far from their bedrock source. A low-grade copper sulfide lode has been reported (Smith and Eakin, 1911, p. 135) in granite also in the headwaters of the Peace River.

For about one week early in the summer of 1952 Walter S. West, geologist, and Arthur E. Nessett, camp assistant, conducted a brief reconnaissance in the headwaters of the Peace River in an attempt to discover the bedrock source of the uranothorianite and associated sulfide minerals. Radiometric traverses in the area were made with a 2- by 20-in. gamma tube attached to a

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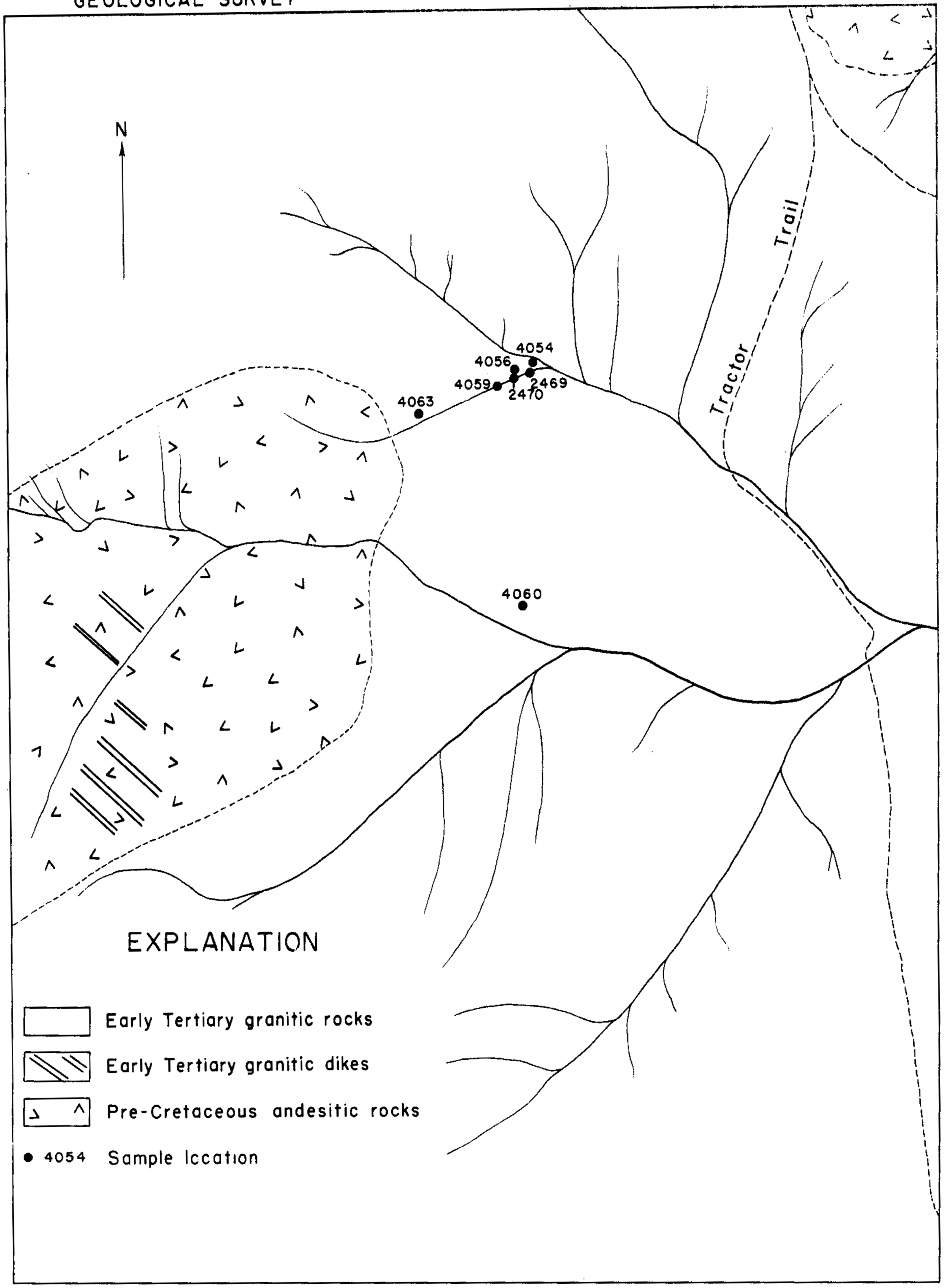
FIGURE 2



SKETCH MAP OF HEADWATERS OF THE PEACE RIVER
CANDLE QUADRANGLE SEWARD PENINSULA, ALASKA

0 — 1 Mile
Scale

commercial model of a portable survey meter. Trenches and test pits were dug by hand to expose bedrock for further radiometric tests and collection of samples. This work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

GEOLOGIC SETTING

The bedrock in the headwaters of the Peace River consists of andesitic rocks of pre-Cretaceous age, and granitic rocks and dikes of Early Tertiary age (fig. 2). The formation contacts shown on figure 2 are only tentative as much of the area is covered by tundra. It is evident that the Peace River tributary, which contains the more radioactive placers, flows across or near an andesite-granite contact, because both rock types occur in about equal amounts in the creek gravels (West and Matzko, 1952, p. 23).

Much of the headwaters area of the Peace River is covered by tundra. Because heavy mechanical trenching equipment was not available during the period of this reconnaissance in 1951, a total of 16 test pits or trenches, ranging in depth from 1½ to 8½ ft were dug by hand in an effort to expose bedrock for examination. Bedrock was reached in only four of the pits; in the remainder, excessive flow of ground water or frozen ground prevented the exposure of bedrock.

The granite exposed in the four pits is highly weathered. Networks of heavily iron-stained veins with a maximum width of 3/4 in. are prominent in the granite of two of the pits.

RADIOMETRIC AND MINERALOGIC STUDIES

Radiometric traversing in the headwaters of the Peace River was found to be impractical because the rather widespread tundra cover effectively shields any possible radiation from underlying rocks. The description and radioactivity of the samples taken from the testpits mentioned above are presented in table 1; the locations of these samples are indicated on figure 2. The mineralogic composition of the samples is given in table 2. The radioactive minerals in the concentrates from the creek gravels (samples 2469, 2470, and 4059) are uranothorianite, gummite, thorite, sphene, and zircon.

In sample 4059 some of the sulfide mineral grains are intergrowths of galena, sphalerite, chalcopyrite, and pyrite. In a few grains gummite appears to be intergrown with either tetradymite, or pyrite, or galena.

CONCLUSIONS

The brief reconnaissance in 1952 failed to find the source of the uranothorianite and associated sulfide minerals which occur in the placers of one of the headwater tributaries of the Peace River. However, the additional mineralogic data obtained support an hypothesis that the major radioactive minerals in these placers, namely uranothorianite and gummite, have their ultimate source in a lode within a restricted drainage basin above the highest point of the placers sampled. The mineralogic data, and the conclusions drawn therefrom, in support of the lode hypothesis are as follows:

1) The occurrence of sphene and zircon, but <u>not</u> uranothorianite, gummite, and thorite, in the heavy mineral suites of the granite samples; this tends to de-emphasize the theory that the uranothorianite is an accessory mineral in granite, at least in the vicinity of the headwaters of the Peace River.

2) The presence of intergrowths of galena, sphalerite, chalcopyrite, and pyrite as discrete mineral grains in the placers, but not in the granite country rock, suggests a vein source for these minerals.

3) The intimate relationship of gummite with such minerals as pyrite, galena, and tetradymite leads to the belief that the uranothorianite, from which the gummite was probably derived, occurs in a lode deposit, possibly a vein, in association with the various sulfide minerals. However, the possibility exists that other primary uranium oxide minerals may occur in the area,

as gummite is known elsewhere as an alteration product of uraninite or pitchblende.

4) The known occurrence of metalliferous lodes (West and Matzko, 1952, p. 11) both near the head of the Peace River and in the valley of Bear Creek, a few miles to the north, indicates that lode concentrations of ore minerals other than those with uranium and thorium have formed in the area and that it is conceivable the uranothorianite and gummite are associated in a lode deposit with the copper and other sulfides at the head of the Peace River.

RECOMMENDATIONS FOR PROSPECTING

To prospect further for a possible lode source of the radioactive minerals found in placers near the head of the Peace River in the eastern part of the Seward Peninsula, the following steps are suggested:

A series of short bulldozer trenches should be cut across the main drainage line of the right tributary of the left headwater branch of the Peace River. The trenches should be cut into bedrock at right-angles to the stream flow and spaced at intervals of about 500 ft upstream beginning at the location of sample 4059 (fig. 2). Similar concentrates should be taken from the gravels directly overlying the bedrock, that is, the same volume of gravels should be concentrated to equivalent smaller volumes. These concentrates should then be examined both radiometrically and mineralogically, in order to determine between which two 500-ft trenches the source of the uranothorianite, gummite, and sulfide minerals occurs. The bedrock in each of the trenches should also be checked for radioactivity to determine whether a trench has exposed, by coincidence, the possible lode source.

If the source of the radioactive minerals can be narrowed down to the 500-ft interval between two trenches, the trenching plan to be followed would be such as to narrow down the location still further, possibly by additional short trenches perpendicular to the stream flow or by cutting one long trench along the creek bed parallel to the stream flow, beginning at the downstream end of the 500-ft interval. Should a lode source of the radioactive minerals be located, and should its size and grade at the surface be of such as to warrant additional investigation, underground exploration, such as diamond drilling or exposing by shaft-sinking, would of course be necessary.

REFERENCES CITED

Smith, P. S., and Eakin, H. M., 1911, A geologic reconnaissance in southeastern Seward Peninsula and the Norton Bay-Nulato region, Alaska: U. S. Geol. Survey Bull. 449.

West, W. S., and Matzko, J. J., 1952, Reconnaissance for radioactive deposits in the Buckland-Kiwalik district, Candle quadrangle, Seward Peninsula, Alaska: U. S. Geol. Survey Trace Elements Investigations Report 49, unpublished.

Table 1.--Description and equivalent uranium content of samples taken in the vicinity of the headwaters of the Peace River, Seward Peninsula, Alaska.

Sample no.	Description	eU[1/] content (percent)
2469	Concentrate from stream gravel (obtained by panning and further concentrated in laboratory with bromoform - sp gr 2.8)	0.76
2470	-do-	.73
4054	Weathered iron-rich vein material with some granitic wall rock, weathered	.004
4056	-do-	.005
4059	Concentrate from stream gravel (obtained by panning)	.25
4060	Granite, weathered	.006
4063	-do-	.003

1/ eU - equivalent uranium; analyses of samples made by member of the Alaskan Trace Elements Unit.

Table 2.--Mineral composition of heavy-mineral fractions of samples taken in the vicinity of the headwaters of the Peace River.

NOTE: Heavy-mineral fractions of samples 2469 and 2470 are greater than 2.8 sp gr; those of samples 4054, 4056, 4059, 4060, and 4063 are greater than 3.3 sp gr. Analyses of samples 2469 and 2470 previously reported by West and Matzko (1952, p. 22); other analyses by the author.

	2469	2470	4054	4056	4059	4060	4063
	Estimated volume percent of minerals present						
Augite	-	10	-	-	-	-	-
Biotite	-	-	-	-	-	-	tr
Bismuth	-	tr	-	-	-	-	-
Bornite	-	tr	-	-	-	-	-
Chalcopyrite	X[1]	1	-	-	1	-	-
Chromite	-	tr	-	-	-	-	-
Covellite	-	-	-	-	tr	-	-
Epidote	X	-	-	-	2	-	-
Fluorite	-	-	-	-	-	tr	-
Galena	-	-	tr	2	tr	-	-
Garnet	X	40	-	-	30	-	6
Gold	X	tr	-	-	tr	-	-
Gummite	-	tr	-	-	tr	-	-
Hematite	X	1	2	-	tr	tr	-
Hornblende	X	20	-	-	-	-	-
Hypersthene	X	-	-	-	-	-	-
Ilmenite	-	1	-	-	tr	-	-
Limonite	-	-	5	tr	tr	-	-
Magnetite	-	-	60	45	15	45	60
Olivene	-	-	-	-	2	-	-
Picotite	-	1	-	-	-	-	-
Powellite	-	-	-	-	1	-	-
Pyrite	X	3	20	50	4	tr	tr
Pyrrhotite	-	-	-	-	1	-	3
Rock minerals[2]	-	-	10	-	15	30	10
Scheelite	-	-	1	1	-	tr	2
Silver	-	tr	-	-	-	-	-
Sphalerite	-	-	-	-	tr	-	-
Sphene	X	13	2	2	15	20	20
Spinel	X	-	-	-	2	-	-
Tetradymite	-	-	tr	-	tr	tr	tr
Thorite	-	tr	-	-	tr	-	-
Uranothorianite	X	2	-	-	1	-	-
Wollastonite	-	tr	-	-	-	-	-
Zircon	X	6	tr	tr	11	5	-

1/ X indicates mineral present, amount not determined

2/ mostly augite and hornblende, may include some hypersthene