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Dr. Phillip L. Merritt, Assistant Manager
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U. S. Atomic Energy Commission
P. O. Box 30, Ansonia Station
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Dear Phil:

Transmitted herewith are five copies of Trace Elements Investigations Report 45, Part 2, "Radiometric and mineralogic studies of the granitic complex in the Cape Nome area, Seward Peninsula, Alaska", by W. S. West and J. J. Matzko, May 1950.

Other copies of this report are being distributed as indicated on the attached distribution sheet.

We are not classifying this report, as we believe that it will be suitable for publication either separately or combined with other reports on Alaska. We would appreciate being informed whether or not you have any objections to its release on grounds of security before we prepare it for publication.

Sincerely yours,

W. H. Bradley
Chief Geologist

Noted
M. L. R.

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

SHORTER CONTRIBUTIONS TO ALASKAN TRACE ELEMENTS STUDIES FOR 1947

1950

Trace Elements Investigations Report 45

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RADIOMETRIC AND MINERALOGIC STUDIES OF THE GRANITIC COMPLEX IN THE CAPE NOME AREA SEWARD PENINSULA, ALASKA

By

W. S. West and J. J. Matzko

May 1950

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RADIOMETRIC AND MINERALOGIC STUDIES OF THE GRANITIC COMPLEX IN THE CAPE NOME AREA, SEWARD PENINSULA, ALASKA

By W. S. West and J. J. Matzko

ABSTRACT

An early report on the Cape Nome area, Seward Peninsula, Alaska, stated that granitic rocks there contain allanite as a common accessory mineral. Results of studies in 1947 indicate that very little allanite is present, and that the slight amount of radioactivity of the granitic complex is attributable to the accessory minerals zircon and sphene.

INTRODUCTION

Location of area

Cape Nome is 15 miles east of Nome, Alaska, on Norton Sound. The Cape Nome area as described in this report covers approximately 8 square miles and is bounded on the south by Norton Sound, on the west by Hastings Creek, and on the east by a large lagoon and the estuary of the Flambeau and Eldorado Rivers. The area extends about 4 miles inland from the seacoast. (See fig. 1.) A gravel road connects the Cape Nome area with Nome.

Purpose and scope of investigation

In June 1947, a Geological Survey field party made a brief trace elements reconnaissance in the Cape Nome area. The reconnaissance was undertaken for three reasons:

1) In an early report it was claimed that the Cape Nome granitic complex contains allanite as a common accessory mineral. (Moffit, 1913, p. 33.) In 1946 a trace elements examination disclosed concentrations of radioactive minerals associated with allanite in late-stage pegmatitic zones in the Hot Springs granite at the head of Hot Springs Creek, a tributary of the Serpentine River, in northwestern Seward Peninsula. (Moxham and West, 1949.) The possibility existed, therefore, that the Cape Nome granitic complex might also contain associated late-stage concentrations of radioactive materials.

2) Although samples from stream gravels and placer-gold-mining localities in the Nome area were essentially non-radioactive, the nearby Cape Nome granite mass, aside from its reported allanite content, seemed to be one of the types of bedrock in the general area most likely to contain radioactive minerals and warranted study from this standpoint alone.

3) The Cape Nome granite mass is also one of the more accessible of the Seward Peninsula intrusive bodies and thus could be examined with relative ease.

GEOLOGY

Field work in the Cape Nome area during the season of 1947 was confined to the granitic complex. Figure 1 shows the approximate extent of the intrusive mass as well as other formations. Because outcrops are few and all contacts are covered with tundra, the position of the formational boundaries on the map are only approximate.

The western 3-3/4 miles of the Cape Nome granitic complex, as described by Moffit (1913, pp. 33, 34), is made up of granite, gneiss, and schist. The original granite has undergone varying degrees of metamorphism which have resulted mainly in the formation of gneiss but have also produced schist, especially toward the northern and eastern boundaries of the mass. Greenstone and a coarse dark-gray porphyritic rock with feldspar phenocrysts as much as 2 inches in length intrude both the granite and gneiss. The porphyritic intrusion is cut by a later granite. These various intrusives are believed to belong to several widely separated periods, possibly ranging from the Paleozoic into the Mesozoic.

In general the granitic rocks are gray in color, tending to weather slightly yellow, and have a fine to medium texture. Practically all the granitic rocks are rich in muscovite and biotite. Chlorite is a common secondary mineral. Mineralogical determinations disclosed that allanite is only a sparse accessory mineral.

Table 1 gives the mineralogy of some of the heavier-than-bromoform fractions of the samples collected during this investigation. Sample locations are shown on figure 1. (The only locations of rock samples shown on this map are for those samples which have been studied in the laboratory.)

RADIOACTIVITY

Readings were made with an Eck and Kreb beta-gamma tube attached to a Victoreen counter on bedrock outcrops, talus, and the finer types of mantle rock. The average background in the area is 25 to 30 counts per minute. A considerable amount of traversing was attempted, but the results were unsatisfactory as the instrument is not sufficiently sensitive for successful traversing. Seven stream and beach concentrates, one sample of slope wash, and numerous other rock samples were collected for testing in the field and laboratory.

Granite talus and bedrock gave relatively high readings on the outcrop, apparently a result of mass effect; but individual rock samples from the same talus blocks and bedrock outcrops gave counts that were not appreciably above background.

The equivalent uranium (hereafter referred to as eU) content of the heavier-than-bromoform fractions of the rock samples ranges from less than 0.001 to 0.012 percent, and the heavier-than-bromoform fractions of the stream and beach panned concentrates contain between 0.001 and 0.003 percent eU. (See table 1.) The heavier-than-bromoform fraction of a sample panned from slope wash contains 0.006 percent eU.

Radiometric tests on the bromoform-heavy fraction of the slope-wash sample show that a very small amount of the radioactive mineral can be concentrated by sizing to minus 250-mesh material as shown below:

Mesh size	Percent eU	Concentration ratio
-20 (whole sample)	0.006	1:1
-20+60	0.004	2:1
-60+100	0.006	4:1
-100+150	0.007	9:1
-150+250	0.020	14:1
-250	0.025	41:1

The heavy minerals in the slope wash are garnet, glaucophane, muscovite, epidote, sphene, chlorite, tourmaline, zircon, biotite, ilmenite, magnetite, and hematite. Probably the sphene and zircon contain the radioactive elements, and because the minus 250-mesh material gave negative bead tests for uranium, it is assumed that the radioactive element is thorium. This same conclusion may be applied to the rock, stream, and beach concentrates although the presence of minor amounts of allanite in a few of the samples may account for some of the radioactivity.

CONCLUSIONS

The Cape Nome granite mass contains very little allanite. No concentrations of radioactive minerals were found in the talus blocks or in the exposed bedrock. Although talus and tundra blanket most of the area, samples panned from places where heavy minerals would tend to concentrate contain no significant amounts of radioactive minerals. These facts indicate the probability that no radioactive deposits of commercial value occur in the Cape Nome area.

BIBLIOGRAPHY

Moffit, F. H., Geology of the Nome and Grand Central Quadrangles, Alaska: U. S. Geol. Survey Bull. 533, 140 pp., 1913.

Moxham, R. M., and West, W. S., Trace elements investigations in the Serpentine-Kougarok area, Seward Peninsula, Alaska: U. S. Geol. Survey Trace Elements Investigations Report 39, unpublished, 1949.

Table 1

Mineralogy and equivalent uranium content of the heavier-than-bromoform fractions of the samples from the Cape Nome area, Seward Peninsula, Alaska.

File no.	Nature of sample and location	Percent equivalent uranium in heavier-than-bromoform fraction	Mineralogy of heavier-than-bromoform fraction (minerals listed in order of abundance; percentages by approximate volume.)
2440	Stream sample - right tributary to estuary of Flambeau and Eldorado Rivers.	< 0.001	
2441	Stream sample - tributary to Hastings Creek.	0.001	
2442	Stream sample - Goldengate Creek, just above old dam site.	0.001	
2443	Stream sample - Goldengate Creek.	0.003	
2444	Stream sample - Goldengate Creek, near mouth on new beach and below old placer workings of W.A.E. Cramer.	0.001	

Table 1 (continued)

Mineralogy and equivalent uranium content of the heavier-than-bromoform fractions of the samples from the Cape Nome area, Seward Peninsula, Alaska.

File no.	Nature of sample and location	Percent equivalent uranium in heavier-than-bromoform fraction	Mineralogy of heavier-than-bromoform fraction (minerals listed in order of abundance; percentages by approximate volume.)	
2445	Slope-wash sample - from sea cliff on south side of granite mass, along Norton Sound, near Cape Nome.	0.006	Garnet (29.9) Glaucophane (22.7) Muscovite, Epidote, Sphene, Chlorite, Tourmaline, Zircon, Biotite (46.8)	*Ilmenite (0.2) Magnetite (0.4) Hematite (tr.) Tungstates (tr.)
2446	Beach sample - 50 yards west of sample 2445, Norton Sound, near Cape Nome.	0.001		
2447	Stream sample - tributary to lagoon.	0.001		
3273	Crushed granite gneiss float sample - west of limestone outcrop.	0.010	Muscovite Biotite Chlorite Secondary hematite	Sericite Sphene Zircon(?) Rutile(?)

*Flux test indicates traces of columbium(?)

Table 1 (continued)

Mineralogy and equivalent uranium content of the heavier-than-bromoform fractions of the samples from the Cape Nome area, Seward Peninsula, Alaska.

File no.	Nature of sample and location	Percent equivalent uranium in heavier-than-bromoform fraction	Mineralogy of heavier-than-bromoform fraction (minerals listed in order of abundance; percentages by approximate volume.)	
3274	Crushed granite gneiss float sample - from highest point in area about 1 mile NE of Cape Nome.	0.008	Muscovite Biotite Chlorite Sericite Goethite	Sphene Chromite Garnet Fluorite
3275	Crushed coarse-grained granite sample - from outcrop along coast of Norton Sound near Cape Nome.	0.007		
3276	Crushed granite sample - from sea cliff along Norton Sound near Cape Nome.	0.007		
3277	Crushed granite sample - from sea cliff along Norton Sound east of Cape Nome.	0.007		
3278	Crushed granite gneiss sample - from sea cliff along Norton Sound east of Cape Nome.	0.006		

Table 1 (continued)

Mineralogy and equivalent uranium content of the heavier-than-bromoform fractions of the samples from the Cape Nome area, Seward Peninsula, Alaska.

File no.	Nature of sample and location	Percent equivalent uranium in heavier-than-bromoform fraction	Mineralogy of heavier-than-bromoform fraction (minerals listed in order of abundance; percentages by approximate volume.)	
3279	Crushed granite gneiss sample - from highest point on granitic hill northeast of Snow Gulch.	0.008		
3280	Crushed granite gneiss sample - NE slope of granite hill to the west and north of Goldengate Creek.	0.012	Muscovite Chlorite Secondary hematite Sericite Goethite Magnetite	Epidote Zircon Sphene Spinel Fluorite
3281	Crushed granite sample - from west slope of hill east of Goldengate Creek (near headwaters).	0.007		
3282	Crushed pegmatite float sample - from pit between limestone outcrop and road to CAA camp.	0.002		

Table 1 (continued)

Mineralogy and equivalent uranium content of the heavier-than-bromoform fractions of the samples from the Cape Nome area, Seward Peninsula, Alaska.

File no.	Nature of sample and location	Percent equivalent uranium in heavier-than-bromoform fraction	Mineralogy of heavier-than-bromoform fraction (minerals listed in order of abundance; percentages by approximate volume.)	
3287	Crushed granite sample - from furthest granitic hill north of Cape Nome.	0.012	Biotite Muscovite Hematite Sphene	Epidote Garnet Allanite Zircon
3288	Crushed granite sample - from furthest granitic hill north of Cape Nome.	0.012	Muscovite Biotite Hornblende (tr.)	Epidote Fluorite Allanite
3289	Crushed greenstone sample - from saddle north of highest granite hill in Cape Nome area, about 1½ miles N of Cape Nome.	< 0.001		
3290	Crushed fine-grained granite sample - from sea cliff along Norton Sound near Cape Nome.	0.003		