State of Alaska

Department of Natural Resources

DIVISION OF MINES AND MINERALS

Lillie's Molybdenum Prospect

Kosciusko Island, Alaska

By

Willow M. Burand
Engineer-Assayer

TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	1
LOCATION	2
CLIMATE AND TOPOGRAPHY	2
GEOLOGY	2
CONCLUSIONS	4

ABSTRACT

The Angus Lillie Molybdenum Prospect is located on the northern tip of Kosciusko Island, approximately 1-1/2 miles northeast of Shakan Village. It is in an intrusive diorite a short distance northeast of a contact between the Paleozoic sediments and the Jurassic intrusives which outcrop on the island. Although the genesis of the deposit has not been ascertained, field evidence indicates that it is a metasomatic deposit with later hydrothermal enrichment. The molybdenum is found disseminated in parts of the intrusive and in vein quartz of a later period.

The Alaska Juneau Gold Mining Company's molybdenum claims, near the Village of Shakan, are located on a quartz-albite vein in the diorite. Angus Lillie's prospect was insufficiently exposed to determine whether it was part of a vein or a disseminated enrichment of the diorite. Further prospecting of the area will be required to reveal the mode of occurrence. A series of prospect pits transverse to the present line of holes could possibly reveal this, or a pack-sack type diamond drill be employed to drill and sample the deposit. The size of the timber and steep hillside prevents a series of cross cuts from being made. Thus, the diamond drill offers the cheapest and most satisfactory method for further exploration of the deposit.

The prospectors prospecting the area should watch for vein structure similar to that of the Shakan deposit, for the occurrence of minerals which could indicate other molybdenum deposits, and for contact zones of the intrusives with the sediments. An increase in sulphides, especially iron pyrite or possibly chalcopyrite, might point to another enriched area or deposit of molybdenum.

INTRODUCTION

In March of 1961, Angus Lillie, Kenneth Eichner, and Bud Hawkins of Ketchikan submitted a sample of diorite (?) for a molybdenum assay. The results of the assay coupled with the even richer appearing hand specimens induced them to request that the author visit the prospect before returning to his summer station in Nome. Therefore, on the 9th of April, 1961, a very rainy and foggy Sunday morning, he flew with Eichner and Hawkins to a sheltered cove on Prince of Wales Island, a little north of the northern tip of Kosciusko Island near Dry Pass, to join Lillie, who had gone to the cove from Ketchikan in his small fishing boat. They took a small skiff from the cove across the entrance of Dry Pass to Kosciusko Island to land at a point about 1/4 mile from the molybdenum prospect.

LOCATION

Angus Lillie's molybdenum prospect is located on the northerly tip of Kosciusko Island west of Dry Pass and about two miles from the Village of Shakan. It lies on a ridge between the watersheds of Sutters Lake and Dry Pass at approximate latitude 56° 9' and longitude 132° 28' West. It is accessible both by float plane and small boats. It is also accessible to barges and possibly larger craft. No attempt was made to determine the freight rate as it did not seem pertinent at this time.

CLIMATE AND TOPOGRAPHY

The northern end of Kosciusko Island is covered with large spruce, hemlock, and cedar timber, and an undergrowth of devils club, alder, blueberry, ferns and grasses quite typical of Southeastern Alaska. The climate is quite similar to that of Ketchikan or Wrangell. The large timber, the steep terrain, and the rather heavy cover of underbrush makes prospecting in the area quite difficult. Outcrops are rather scarce and visibility limited so that prospecting has been confined to a series of small prospect pits, and outcrops on ridges and in creek beds. Molybdenite has been exposed in a series of small prospect pits for a distance of about three hundred feet in an easterly direction up the northerly slope of the mountain spur northeast of Sutters Lake. Quartz veins are exposed on the southerly slope of this same spur on the banks and in the stream beds of creeks flowing into Sutters Lake. See Plate 1.

About four hours were spent in walking over the prospect, in examining the area, and in gathering data. Fifteen or twenty minutes was also spent in flying over the area in an attempt to get a broader perspective of the area, but limited visibility and the lack of a map prevented obtaining much information. Crystalline limestone and marble outcrops were observed as were also several outcrops of the intrusives.

GEOLOGY

The complex geology of the area consists of a series of Paleozoic sediments possibly altered by the Jurassic intrusives which underlie much of the area. On the northeasterly shore of Sutters Lake and in the bed of Sutters Creek, which drains the lake, are outcrops of a tactite or scarn zone. North and east of the lake, this zone is replaced by fine-grained intrusives that increase in coarseness to a medium-coarse crystalline diorite which is the texture of the molybdenite bearing diorite (?) exposed in the various prospect pits. The molybdenite was observed to be disseminated in the diorite (?) from nearly microscopic size to crystals approximately 1/4 inch in size. The molybdenite, in the quartz veins exposed in the beds of streams flowing into Sutters Lake, varies from small flecks to crystals nearly an inch in size.

In the early 1900's, a molybdenite deposit was discovered near the Village of Shakan. This deposit occurs in westward extensions of the same Paleozoic sediments and Jurassic intrusives as the Angus Lillie prospect. The Shakan Village molybdenite deposit has been described by Philip S. Smith in United

States Geological Survey Bulletin #926-C, pages 168-171. The following excerpts were made from those pages:

"Recently through the courtesy of the Alaska Juneau Gold Mining Co. the Geological Survey has been permited to consult a report made to the company by its geologist, Livingston Wernecke, at the time exploration of the property was most active. As that report gives especially full details as to the geology and other characteristics of the ore occurrence, it forms the source from which all the following statements have been abstracted.

"The claims forming this property were known as the Alaska Chief group and were situated one-third of a mile or more southeast of Shakan village. In the vicinity of Shakan the bedrock consists of a Lower Devonian limestone about 2,000 feet thick, striking N. 5° to 15° W. and dipping 70° W. This limestone grades upward into greenstone composed of fine volcanic tuffs, in places banded with black argillite. Lying to the east and cutting all of these older rocks is a large intrusive mass of diorite, whose contact with these older rocks is doubtless irregular in detail but broadly follows a crescentic course from near Shakan to Calder Bay. The diorite contains considerable hornblende and in places approaches the composition of gabbro. The molybdenite-bearing material is a quartz-albite vein in the diorite, about 1,000 feet from the contact of that rock with the argillite. This vein had been traced by surface cuts and a tunnel for a linear distance of 520 feet, and in that distance it had been found to range in width from 2 feet to more than 6 feet, with an average width of 4.1 feet. The vein usually is separated from the diorite on the footwall by a layer of gouge, and this condition is occasionally true for the hanging wall contact, though more commonly the vein and the diorite on that wall are "frozen" together. The course of the vein is exceedingly variable. In different places it strikes from N. 60° W. to N. 65° E. Its dip, however, is fairly uniform, at from 20° to 30° S.

"The deposit, according to Mr. Wernecke, clearly was formed by circulating thermal waters, which deposited quartz, albite, orthoclase, phrenite, epidote, biotite, chlorite, and some sericite as gangue and pyrrhotite, pyrite, chalcopyrite, and molybdenite as metallic sulfides. In places these metallic sulfides form as much as 30 to 40 percent of the vein filling, and in the order of their relative abundance are usually about as follows: pyrrhotite 50 percent, pyrite 40 percent, chalcopyrite 6 percent, and molybdenite 4 percent. The amount of molybdenite in different parts of the vein varies widely. Apparently it is most abundant in those places where the gangue consists of about 30 percent of quartz, 40 percent of albite, and 20 percent of orthoclase. Molybdenite is also especially abundant in those places where numerous fragments of the altered wall rock diorite form inclusions in the vein. The third place that appears favorable for the formation of molybdenite is where quartz is absent, or present only in small amounts, and pyrite is abundant. In these places the pyrite is cut by many small veinlets, one-sixteenth to one-fourth inch wide, which contain considerable amounts of molybdenite.

"Obviously the deposit is genetically connected with the intrusion of the hornblende diorite and was formed after the wall rocks had solidified sufficiently to fracture and were comparatively cool. The relation of the molybdenite to other vein minerals indicated to Mr. Wernecke that there were two stages during which the molybdenite was deposited. One of these was at a fairly early stage, while the temperature was relatively high; the other was at a much later time, when the temperature was considerably lower. Most of the molybdenite was deposited during this later stage, when the temperature had probably fallen below 300° C. Evidence of the lateness of its deposition is afforded by the fact that the molybdenite coats all the other sulfides and is the latest deposit on the walls of cavities."

The above was included for two reasons: First, to substantiate some of the field observations of the author and second, to alert future prospectors in the area to the type or types of structure likely to be found which might lead to further molybdenite discoveries.

Since the author's visit Mr. Lillie has prospected the area on the south side of the 1500 foot mountain and east of Sutters Lake in the area, noted on Plate 1, crossing nameless creek. Several small hand specimens submitted to the author from this area contained both molybdenite, pyrites, and a scheelite-powellite mixture as evidenced by the white florescence of several of these samples. Scheelite fluoresces blue-white, powellite golden-yellow, and the mixture varies in some shade of white between these two. The scheelite-powellite complex fluoresces more white, depending upon the predominance of molybdenum present. Scheelite is $CaWO_4$ and powellite $CaMoO_4$. Plate 1 includes the approximate locations of these later-found molybdenum outcrops marked ⊖., whereas the molybdenum prospects visited by the author are marked ⊠.

CONCLUSIONS

Molybdenite associated with the Jurassic intrusives has been found in many localities in Southeastern Alaska and neighboring Canada. See Plate 2. The molybdenum has been found in rather close proximity to the contacts of the intrusives with sediments and metamorphic rocks, in veins in all of these rocks, and at times disseminated in the intrusive itself. In exploring these deposits, an effort should be made to establish the genesis of the ore minerals. This could help in the location of the ore bodies as well as indicate the possible extent and depth of the deposit sought. For example, metasomatic type deposits are often rather small in size, only occurring in or adjacent to the contact zones, which often makes them quite costly to explore; whereas, hydrothermal deposits are often quite extensive both in area and in depth, and when once found are less costly to explore or develop.