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GEOLOGY OF THE NORTHERN BABINE LAKE AREA, BRITISH COLUMBIA

93L/16E (259) McDONALD ISLAND
93M/1E (001) NEWMAN PENN

by

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INTRODUCTION

The northern Babine Lake area is 45 miles northeast of Smithers and is accessible by road from either Smithers or Topley.

The area includes at least two important copper deposits; the McDonald Island property of Granisle Copper Limited, which went into production last year, and the Newman Peninsula property of Noranda Exploration Company, Limited.

This paper is a progress report of work done by the writer during parts of the past three field seasons which included detailed work around the mineral deposits and quarter to half-mile mapping in intervening areas.

The close cooperation and assistance of all companies active in the area is gratefully acknowledged.

HISTORY

Initial prospecting was carried out on small veins on both McDonald Island and Newman Peninsula prior to 1913. McDonald Island was the scene of intermittent exploration work by several companies in subsequent years, and in 1955 the property was acquired by the Granby Mining Company. Extensive drilling has been done on the Newman property since its discovery by Noranda in 1962.

A great number of claims have been staked in the area in the past few years and several properties are under current investigation.

GENERAL GEOLOGY

The northern Babine Lake area is one of relatively moderate relief. Elevations range from 2,332 feet at Babine Lake to 5,147 feet at the summit of Old Fort Mountain, near the central part of the area. Extensive glacial deposits cover much of the area, and good exposures are confined to ridges, some of the steeper slopes, and lake shorelines. Tree cover extends to within a few hundred feet of the top of Old Fort Mountain.

Much of the area is underlain by fragmental volcanics and argillaceous sedimentary rocks of Jurassic age, cut by intrusive rocks of several varieties and ages. A tentative table of formations is listed below:

TABLE OF FORMATIONS

TERTIARY (?)	
Intrusions	Biotite-feldspar porphyry and associated rocks--some extrusive equivalents.
	Quartz latite - dacite porphyry
CRETACEOUS AND TERTIARY	
Upper Cretaceous-Early Tertiary	
Sustut Group	Conglomerate, sandstone
JURASSIC-CRETACEOUS	
Omineca Intrusions (?)	Quartz monzonite, monzonite, diorite
JURASSIC	
Middle Jurassic	
Hazelton Group	Andesite, rhyolite, tuffs, and breccias
	Argillaceous sedimentary rocks
Lower Jurassic (?)	Andesites, felsite, tuffs, and breccias
TRIASSIC-JURASSIC	
Topley Intrusions	Quartz monzonite, porphyritic
PERMIAN (?)	
Cache Creek Group	Limestone, argillite, chert, minor intermediate volcanic rocks

Older rocks are confined to the southern part of the area. Rocks believed to be of Permian age include tightly folded limestones, argillites, and cherts as exposed near the outlet of Fulton Lake, and amphibolitic volcanic rocks on the west shore of Babine Lake.

Intrusive into these rocks are porphyritic quartz monzonites and related rhyolite and quartz latite dykes of the Topley Intrusions.

Also in the southern part of the area, exposed on the west side of Babine Lake, are andesite breccias containing fragments of Topley granitic rocks. These rocks may be part of the Tachek Group, which itself is correlated with the Hazelton Group.

The area northeast of the lake is chiefly underlain by propylitized andesite tuffs and breccias, with some acid fragmentals and minor amounts of argillaceous sedimentary rocks. These rocks are believed to be older than the sedimentary and volcanic sequence of the central part of the area, although relationships are obscure. They may be a part of the Takla Group.

Rocks tentatively assigned to the Hazelton Group of Middle Jurassic age include northwest striking, moderately dipping argillaceous sedimentary rocks and intermediate fragmental volcanics. Argillaceous siltstones, siltstones, and some argillites are largely confined to the north central part of the area. Near Old Fort Mountain, these rocks have been thermally metamorphosed to biotite hornfels adjacent to intrusive rocks. Green to purple andesite tuffs, breccias, and agglomerates conformably overlie the sedimentary rocks in the central part of the area. These rocks are locally well stratified, and the subrounded nature of the fragments indicates reworking after initial deposition. A limy volcanic sandstone horizon, exposed south of Granisle mine, contains pelecypod and brachiopod fossils, of probable Middle Jurassic age. The volcanic sequence also includes massive and amygdaloidal andesites and basalts, and rhyolite tuffs and breccias.

Plutonic rocks, possibly a phase of the Omineca Intrusions, and consisting of medium- to coarse-grained quartz monzonites, monzonites, and diorites, occur as stocks and sills intruding volcanic rocks in the northeastern part of the area.

Continental sedimentary rocks of the Sustut Group, including conglomerates and sandstones with some shale, and containing carbonaceous material and fossil plant remains, are found in small patches throughout the area adjacent to major faults.

Quartz latite and dacite porphyries occur as small stocks, dykes, and sills intrusive into rocks of the Hazelton Group in the central part of the area. Their relationship to other intrusive rocks of the area is not known.

Porphyries of roughly similar age and closely associated with the copper deposits include biotite-feldspar porphyry, hornblende-biotite-feldspar porphyry, feldspar porphyry, and related quartz diorites and quartz monzonites. The porphyries occur as northeast to north striking dykes, dyke swarms, and as small plugs. Probable extrusive equivalents are sheet-like in form. The roughly circular form and radial distribution of dykes around the Newman porphyry body is suggestive of a volcanic neck.

Biotite-feldspar porphyry, the most common type, is intimately associated with all known copper occurrences. The rock is distinctive in appearance, being a light grey porphyry of quartz diorite composition, with crowded 2-millimetre phenocrysts of oligoclase-andesine and scattered

1- to 2-millimetre plates and books of fresh biotite set in a fine-grained matrix of quartz and feldspar.

Several of the porphyry bodies show more than one intrusive phase. At Granisle, fine-grained quartz diorites and related breccias preceded the emplacement of the large biotite-feldspar porphyry dyke. Later fine-grained, intrusive breccias contain fragments of both the quartz diorite and porphyry, and a dark grey, biotite-bearing feldspar porphyry is apparently post-mineral in age.

At the Old Fort property and the Buttle-Trojan prospect on Hearne Hill, fine-grained quartz diorites similar to those at Granisle are cut by dykes of biotite-feldspar porphyry. Seriate-textured quartz monzonites at the Old Fort property and west of Morrison Lake appear closely related in time and space with the porphyries. Sills of similar rocks are found around Old Fort Mountain.

Dacite porphyries, similar in composition and texture to the biotite-feldspar porphyries, but lacking in biotite, were noted cutting Sustut sediments near Morrison Lake and the north end of Newman Peninsula.

Probable extrusive equivalents of the porphyries occur on the south end of Newman Peninsula and west of Babine Lake. These porphyry bodies are sheet-like in form, and nearly flat lying, as indicated by vertical to slightly inclined columnar jointing which is locally well developed at both localities. While these rocks are similar in general appearance to the intrusive porphyries, they are distinguished from them by having a green to purple andesitic matrix, hornblende as the major mafic mineral, and a trachytic texture. Hornblende-feldspar porphyry breccias containing fragments of similar composition were noted west of the lake and an angular basal conglomerate was noted overlying the extrusive porphyries on Newman Peninsula.

MINERALIZATION

Copper mineralization is closely associated with biotite-feldspar porphyries and related rocks which display definite intrusive relationships. At Granisle, quartz, chalcopyrite, and bornite fill fractures in unaltered biotite-feldspar porphyry. Chalcopyrite is also disseminated in the quartz diorites adjacent to the porphyry dyke. At the Newman property, chalcopyrite is finely disseminated in silicified biotite-feldspar porphyry below a zone of secondary mineralization consisting of chalcocite coating pyrite in intensely altered feldspar porphyry.

Chalcopyrite occurs in fractures in intrusive biotite-feldspar porphyries at several other properties, including Morrison and Old Fort.

STRUCTURE

The major structural trend of the area is north-northwest, as indicated by the strike of the sedimentary and volcanic rocks and the major faults. Glaciers moving southeast have further accentuated this trend.

Major folds trend north to northwest. Local variations from this trend indicate a period of folding about northeast axes in addition to the more prominent folding about northwest axes.

Major faults of the area also trend north-northwest. The faults are rarely exposed but are marked by a discontinuity of rock units across prominent topographic lineaments, along which sheared rocks were noted.

Northwesterly faults extend from Granisle across Newman Peninsula and the east slope of Old Fort Mountain, where the step-like nature of the ridges is suggestive of high-angle block faulting. Another major fault of similar trend along the base of Hearne Hill separates intermediate volcanic rocks from siltstones which occur along Morrison Lake.

Granitic rocks of the Topley Intrusions are separated from Hazelton Group volcanic rocks to the north by a sharp break coincident with a topographic low which is probably the trace of a major northeast striking block fault. Northeast to east-northeast striking faults were noted in a number of other areas.

The major joint directions and topographic lineaments throughout the area strike north-northwest and northeast to east-northeast.

The distribution of biotite-feldspar porphyries and related types reflects a marked spatial relationship to major north-northwest striking faults. Not so apparent are the northeast trends in and adjacent to many of the porphyry occurrences, including the east-northeast strike of many of the mineralized fractures and offshoots of the porphyry dyke at Granisle, and the orientation of the long axis of the mineralized zone at the Newman property. Similar northeast trends were noted in several other areas of porphyry intrusions.

CONCLUSIONS

A crude distribution of known porphyries within several broadly defined northeast trending zones coincident with a few recognized faults and topographic lineaments of similar trend suggests that northeast faults were equally as important as the more obvious north-northwest faults in localizing the porphyry bodies. The most favourable areas are at or near intersections of the northeast and north-northwest structures.

REFERENCES

Minister of Mines and Petroleum Resources, B.C., Annual Reports, 1965, pages 90 to 104; 1966, pages 92 to 102.