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A REPORT ON THE GEOLOGY OF THE MT. NANSEN  
CLAIMS, YUKON

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## INTRODUCTION

### LOCATION AND ACCESS

The Mt. Nansen Claims lie approximately 30 miles west of Carmacks, Y. T., on the south-west flank of the Dawson Range between Nansen and Victoria Creeks. They occupy about 20 sq. miles. Access is by dirt track from Carmacks, which is on the Alaska Highway.

### REGIONAL SETTING

The area is part of a north-west trending belt of Mesozoic to Tertiary calc-alkaline igneous activity. The igneous rocks intrude and overlie metamorphic rocks of uncertain age.

### PREVIOUS WORK

The area was mapped by D. D. Cairns in 1914 and his work served as a basis for part of the G. S. C. 1: 250,000 Carmacks sheet compiled by H. S. Bostock between 1932 and 1934. Both were used by W. Walker in 1964 in producing a map of area for Mt. Nansen Mines Ltd.

### PRESENT WORK

This report is the result of field work between June 4 and June 19, 1971, and accompanies a map.

### REFERENCES

- D. D. Cairnes, 1917, Map 151A Canadian Department of Mines.  
H. S. Bostock, 1936, Carmacks District, Y. T., G. S. C. Mem 189.  
W. Walker, 1964, Geology, Mt. Nansen Mines Ltd.

## GENERAL GEOLOGY

### PETROLOGY AND STRATIGRAPHY

#### YUKON GROUP

All rocks in the area with a definitely metamorphic fabric were included in the Yukon Group (Cairns). These rocks comprise metaquartzites, mica schists, gneisses, foliated igneous rocks and migmatitic rocks. Excepted are sheared granodiorite and quartz porphyry, a fissile horizon at the base of the Mt. Nansen Group and a diorite with a lineation in amphibole. No subdivision of the Group was attempted due to its complex structure and the limited exposure. The rocks are believed by Bostock to be early Palaeozoic, perhaps Pre-Cambrian, in age.

### LINEATED DIORITE

Intrusive into the Yukon Group, and intruded by aplites of probable Tertiary age, is a coarse-grained diorite with strongly aligned amphibole. Contact specimens, not in situ, show the lineation, the contact, and the schistosity of Yukon Group metasediments to be discordant. Hence intrusion is post - Yukon Group metamorphism, but the origin of the lineation is uncertain. The rock shows a strong spatial association with Tertiary porphyritic granite and the possibility of a Tertiary age cannot be ruled out.

### MT. NANSEN GROUP

The Mt. Nansen Group consists of Mesozoic volcanic and hypabyssal rocks of predominantly andesitic composition with minor more basic and acid varieties. All are porphyritic with phenocrysts of amphibole and/or plagioclase. Occasional quartz-feldspar porphyry dykes in the volcanics may be part of the Group, or may be Tertiary.

The basal members of the group are rich in inclusions of amphibole-plagioclase porphyry and minor metamorphic fragments. These rocks are believed to result from a combination of brecciation during flow and addition of country rock fragments prior to extrusion.

The base of the Group is represented in the south of the area by a "volcanic conglomerate" - well rounded pebbles, cobbles and boulders of volcanics and minor metamorphics in an andesitic matrix, concordantly overlying a thin, fissile, fine grained horizon which in turn overlies a rubble of granitic augen gneiss.

Finely bedded tuff was noted at one locality near Victoria Mountain.

### MESOZOIC INTRUSIVES

The whole area is apparently underlain by a north-west trending batholith of granodiorite. This is predominantly coarse-grained but extensive areas of fine - to medium - grained granodiorite were mapped at its margins. The area of marginal facies indicates that the present erosion level probably corresponds fairly closely to the roof of the batholith. The presence of outlier of volcanics, some in downfaulted blocks, supports this view.

### TERTIARY INTRUSIVES

The granodiorite has been subsequently intruded by granitic porphyries of irregular geometry. These are characterized when fresh by large orthoclase phenocrysts - up to 1" long in quartz-feldspar porphyries with fine ground-mass and 2" in the granite porphyry in the south. The fine-grained varieties are generally badly altered by later hydrothermal activity. The relationship of the granite porphyry to a hornblende-rich, possibly lamprophyric, porphyry in the south (mapped as Mt. Nansen Group) is uncertain.

The hydrothermal activity was localized at the intersection of major fractures, and resulted in brecciation and silicification at these points. They now stand out as topographic highs and are surrounded by hydrous alteration zones. The map-unit "quartz-feldspar porphyry" probably includes magmatic porphyries as well as silicified and altered granodiorite. Hence its boundaries are diffuse and irregular.

Silicification has apparently permeated the roof of the intrusion as indicated by small silicified and brecciated areas in the volcanics and metamorphic rocks.

### STRUCTURE

The Yukon Group is too complex structurally for any interpretation to be made with the given exposure. There is a suggestion of north-south structural trend in foliation and minor folds.

The volcanics appear to have shallow dips and variable strike probably resulting from the effects of later intrusion and block-faulting.

The batholith dips gently north-east under Victoria Mountain and south-west under Mt. Nansen.

In general the area has been block-faulted along N to NNW and NE to ENE trending fractures, the intersections of which appear to be the loci of hydrothermal alteration, probably becoming more intense and areally extensive with depth. For example, the dome above (N) Huestis is L-shaped having arms trending ENE and NNW, with most intense silicification at the angle. Nearby fault directions are parallel with the arms. The line of silicified domes in the east centre of the area trends NNW. Structurally the domes probably are cone-shaped with vertical axes - the faults are high angle, hence their intersections will be subvertical and it is reasonable to assume that the effects of the activity will decrease upward. The faulting continued after hydrothermal activity, isolating some silicified blocks.

### MINERALIZATION

Hydrothermal silicic ore fluids admitted along the intersections of major faults have altered the host porphyry and granodiorite in a zonal fashion. Three main zones are immediately obvious:

- (1) A highly silicic and brecciated core zone.
- (2) An inner zone now characterized by very limonitic material, probably once pyrite rich.
- (3) An outer zone of hydrous alteration of the host rocks. With careful work further sub-division of this zone according to alteration products may be possible. Sericite, kaolinite and chlorite are typical products.

The second zone at the margins of strong silicification would appear to be the most favourable site for disseminated chalcopyrite mineralization at depth. This zone will probably dip steeply away from the centre of silicification and is usually identifiable at surface by a change in slope as the more resistant silica rock gives way to softer limonitic material. However, very little evidence of copper mineralization was noted at surface.

Lead-zinc-silver veining occurs in fractures apparently associated with the silicified porphyry.

#### CONCLUSIONS AND RECOMMENDATIONS

The area is one of Mesozoic and Tertiary igneous activity apparently showing a continuity in chemical trend:

Mt. Nansen Volcanics - basaltic to dacitic

Mesozoic intrusives - dioritic to granitic

Tertiary intrusives - granitic to highly silicic hydrothermal fluids

The last phases of activity, localized at the intersections of high-angle faults, have introduced Fe, Pb, Zn, Cu, Ag sulphide mineralization. The geological environment and geochemical results already obtained favour the presence of disseminated chalcopyrite mineralization. This is however not evident on the surface.

It is recommended that a detailed study of the alteration zoning around centres of silicification be undertaken, to enable plotting of the limonitic zone. Drilling on the outer margin of the zone should establish the presence or absence of economic mineralization.

P. F. Lewis

P. F. Lewis, June 25, 1971