MAGNETOMETER SURVEY OF HUDSON BAY MOUNTAIN SMITHERS, B.C.

Vancouver Office January 16, 1963.

R.E. ANDERSON, Prof. Eng.

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Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 545 MAP



INTRODUCTION

The following report and attached maps detail the results obtained by Climax Molybdenum (B.C.) Ltd. in completing an airborne magnetometer survey of a claim group located on Hudson Bay Mountain near Smithers, B.C. The survey was completed by company personnel during the early part of August, 1963.

LOCATION AND ACCESS

British Columbia, lying from 1 to 5 miles northwest of the town of Smithers, B.C. at latitude 54°50'N and longitude 127°20'W. The general topography of the mountain is rugged and precipitous with surface elevations ranging from 2000 to 8500 feet above sea level. Permanent snow fields cover most of the higher peaks and extensive areas of glacial ice are present on the eastern flank at the head of Glacier Gulch and on the northern flank near the headwaters of Toboggan Creek. Several roads and numerous trails leading to scattered points on the mountain provide good access from Smithers.

AREA OF INVESTIGATION

The survey covered an area of approximately 35 square miles, which included a major part of Hudson Bay

Mountain and a portion of Mount Evelyn lying immediately to the north of Toboggan Creek (see Map I and Ia). Because of the precipitous terrain, flight paths could not be flown at regularly spaced, straight line intervals. As an alternative, a method of contour flying was adopted whereby closure was obtained on 1000 foot contours lying between the 4000 and 8000 foot elevations. The 6500 foot contour was also included and detailed investigations were completed in the cirque area lying at the head of Glacier Gulch. Survey stations and flight paths utilized in completing the survey are noted on Map I and Ia.

SURVEY EQUIPMENT

In addition to a Hiller 12E helicopter assigned to the project, the survey equipment consisted of a Varian Assoc. Portable ProtonPrecession Magnetometer Model No. 49A and a standard battery powered tape recorder.

GENERAL STATEMENT

Experience in other parts of the world has indicated that, while the relationship is by no means universal or simple, hydrothermal processes, of which molybdenum mineralization might be one phase, are often accompanied by large scale destruction of magnetite in the country rocks. This is also a fairly common feature associated

with porphyry copper deposits and, of course, many barren pyrite zones.

As overburden and near surface patches of unaltered country rock can break up an otherwise continuous and extensive area of alteration into a group of apparently isolated and minor pockets of alteration, it is often extremely valuable to obtain complete magnetometer coverage of the area of interest to determine whether or not these apparently isolated patches of alteration are indeed discontinuous or are merely the surface expression of an extensive, continuous, and deep seated alteration zone. Conversely, there have been many cases of alteration being confined to a comparatively thin surface skin, the underlying rocks being quite fresh and unaltered.

It has been found that good quality magnetic coverage can be extremely useful in helping determine the extent and degree of alteration.

To be of any value in this regard, it is extremely important that the survey extend well beyond the limits of the zone or area of immediate interest. Any magnetic feature can have a variety of causes; more often than not, selection of the most likely of a variety of sources for any anomaly can be made only on the basis of geologic probability for the particular area in question. It is

obviously important to extend the survey far enough out from the center of interest to establish clearly, for example, that what looks like a magnetic low is in fact a real "low", and not just a return to normal values between areas of somewhat higher than normal magnetic intensity. Similarly, in areas of marked topographic relief, it is advisable to extend the survey to cover several of any one kind of topographic feature to help determine whether any given anomaly of interest is really unique or merely a normal function of its topographic location.

Apart from the above, it is obvious that any information regarding the structural setting of an area of interest is of value in assessing its mineral potential.

Adequate magnetic coverage of suitable quality can provide,
in many cases, a variety of structural information.

For the above reasons, it was decided that to be of any real value, a magnetometer survey of the claim group along Toboggan Creek should extend out to cover the greater part of the Hudson Bay Mountain.

Experience has shown that, to be of value in the detection and delineation of zones of alteration, a survey must be accurate to about 50 gammas. We have found that it is difficult or impossible to obtain the kind and extent of

information required by ground methods in areas of rugged topography. Topography and near surface effects are reduced or eliminated by having the magnetometer 300' to 500' above surface.

In areas as rugged as Hudson Bay Mountain it is impossible to maintain constant ground clearance with fixed wing aircraft; even with a helicopter it is impossible to fly straight line profiles and keep constant clearance, so we have been forced to fly selected topographic contours. This involves many sudden turns and we have found that the only instrument sufficiently insensitive to orientation of the measuring head is the proton precession magnetometer.

At the time of the 1963 surveys, the only suitable instrument was manufactured by Varian Associates of Palo Alto in California, and a unit was rented for the Hudson Bay Mountain survey.

SURVEY TECHNIQUES

A Hiller 12E helicopter, with space for a pilot, one operator, and one navigator, was used for the survey. The operator sat with the magnetometer on his lap and read off the individual magnetometer readings as they appeared on the instrument dial. These values were simultaneously dictated into a portable battery operated tape recorder.

The operator clicked a tally counter each time he took a reading, holding the tally counter dial so the navigator could see the numbers. The navigator followed the flight path around the pre-selected contour on a large scale topographic map, marking on the map the appropriate number shown on the tally counter as each recognizable topographic feature was These features would be the nose of a ridge, the back or apex of a cirque or gully, streams, etc. Meanwhile, the pilot maintained a fixed altitude on his altimeter, and flew around the mountain, thus automatically following the selected contour. Each contour flight would start and finish at a point where the selected contour crossed a prominent feature at a recognizable point, such as a stream junction, edge of a lake, etc. Thus, by flying up the mountain to this point, climbing to 400' ground clearance, then commencing the flight, the magnetometer head dangling on a 50' cable, was kept at constant 350' ground clearance.

The particular instrument used on the survey gave a reading every 6 seconds. For safety, the aircraft airspeed was kept at 35 m.p.h. giving a magnetometer reading at 200' to 500' intervals over the ground, depending on the direction and force of the wind. Good topographic location points averaged about 1500' apart.

The data was plotted by assuming constant ground speed between consecutive control points. Any error caused by this assumption would be confined between adjacent control points.

Normally, after starting at a selected point on a contour, flying completely around the mountain back to the known starting point would take 20' to 45'. The first 10 to 20 readings of each contour were repeated after completing the circuit and normally checked to within 10 to 20 gammas.

ACCURACY

The repeat checks mentioned above, and other checks during the course of the three days spent on the survey, showed that readings could be repeated to 10 to 20 gammas. The greatest source of error was faulty location when flying along a side hill which had a steep magnetic gradient at right angles to the aircraft path. In such cases, a reflight might be a hundred feet too far up or down the slope and an apparent error of 100 to 200 gammas could be produced. When such conditions were noticed a down hill profile was flown at constant elevation. The true location, and intensity of the change in magnetic values was then given by this check profile.

- 1) The pronounced low on the north flank of Elliot
 Mountain, south of Elliot Creek. This is suggestive of an
 area of alteration with complete destruction of the magnetic
 constituents through a considerable depth extent. The zone
 is about 4,000' long and 600' wide. The low does not appear
 to be caused by topographic effects and is roughly parallel
 to the north contact of the Elliot Mountain granodiorite.
- 2) The area around 15,000E, 17,000N is mapped as sediments. The magnetic data suggests that this is probably underlain by Igneous rocks or fragmentals at a shallow depth.
- 3) There is an area of apparent magnetic complexity around the cirque at the head of Glacier Gulch.

a 350 to 700 gamma low closely coincident with the area of the glacier. The major part of this low is not produced by a deficiency of magnetite in the underlying rocks. Part at least is the normal low or negative found on the north side of a magnetic dipole, here produced by the very steep south wall of the cirque. This low is accentuated by the increased separation between the rock head and the magnetometer over the ice. While normal terrain clearance is 350', this would be increased to 750' because of the thickness of the ice.

PRESENTATION OF DATA

The results of the survey are shown on maps at a scale of 4" to 1 mile. The individual readings are shown on two separate sheets; the finished magnetic contours and the topographic contours are also presented on separate sheets.

In the preparation of the individual results and the completed contour sheet, 57,000 gammas was subtracted from the total field readings.

INTERPRETATION

In general, the areas of sedimentary rocks are magnetically featureless at about 58,000 gammas or less (<1,000 on map) in contrast to the areas of volcanic fragmentals or flows. The predominantly volcanic areas are also uncomplicated and have a field level of about 59,000 gammas.

There is little or no contrast between the areas of volcanic fragmentals and the areas of intrusive and extrusive rocks.

There are no features of interest in the area of Toboggan Creek. Here the magnetic data are typical of an area of sediments lying on top of volcanics.

There are a few areas within the surveyed area which do not fit the existing geologic data and which might be of interest.

There is a genuine low of some 200 gammas centered at 13,000E, 18,000N and trending NW. This probably reflects the quartz eye tuff unit encountered in drilling in the cirque area, known from susceptibility measurements in the drill core to be very deficient in magnetite.

4) The most pronounced positive feature in the survey area runs obliquely across the northern wall of the Glacier Gulch cirque at about the ice/rock contact. This linear high does not extend over into the Toboggan Creek Glacier and has an intensity of 1,000 gammas above the general level of the surrounding volcanic fragmentals and flows.

The source may be in the coincident series of rhyolite flows which extends eastward into the grid area.

If this is the case, the anomalous intensity must be due to remnant magnetism in the flows, as the rhyolite encountered in drilling has very low susceptibility.

Such anomalous high remnant magnetism is fairly common in extrusives.

Aircraft:

Hiller 12E

Crew:

1 Pilot, 1 Navigator, 1 Magnetometer Operator

Magnetometer Data: Varian Associates Portable Proton Precession Magnetometer Model 49A

Accuracy - 10 gammas

Read out cycle - 6 seconds

Sensing head towed 50' below helicopter

Navigation Control - 4" to 1 mile topographic Contour Map compiled from National Topographic Series and private survey by Hunting Surveys for Southwest Potash Corporation

Costs:

- x Helicopter 17 hours at \$120.00 hour = \$2040.00 Geophysicist/Operator 6 days at \$25.00 day = \$ 150.00 Geologist/Navigator 6 days at \$25.00 day = \$ 150.00 Draftsman 6 days at \$20.00 day = \$120.00xx Magnetometer rental 1 month = \$408.46xxx Import Duty = \$1016.43\$3884.89
 - x No charge has been made for experimental and development flying.
 - xx Minimum rental period 1 month.
- xxx Canadian Customs duty on U.S. equipment nonrefundable when equipment returned to U.S.

January 16, 196.

LIST OF MINERAL CLAIMS

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in. April 30. 1963

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DOMINION OF CANADA:

PROVINCE OF BRITISH COLUMBIA.

To Wit:

In the Matter of

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JAN 1 7 1964

M.R. # 65373560.00

VANCOUVER, B.C.

CUB - WHING RECORDER

I, R. E. ANDERSON, Agent for CLIMAX MOLYBDENUM (B.C.) LTD.

of 718 GRANVILLE STREET, VANCOUVER 2, B.C.

in the Province of British Columbia, do solemnly declare that

EXPENDITURES

Helicopter (Hiller 12E)	17 hours	0	\$120.00/hr	= \$	2040.00
Geophysicist/Operator	6 days	(3)	25.00/day	===	150.00
Geologist/Navigator	6 days	0	25.00/day	==	150.00
Draftsman	6 days	3	20.00/day	=	120.00
Magnetometer Rental (1		408.46			
Import Duty				==	1016.43
				\$	3884.89

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

R. E. ancheson

Declared before me at the City

of Vancauser

,-in the

Province of British Columbia, this 17

day of

1964 AD

Jale Turner.

A Commissioner for taking Affidavits within British Columbia or A Notary Public in and for the Province of British Columbia.

Sub-mining Recorder

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