Talk given to Northwest Mining Association

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Re: Tasu Operation - Wesfrob Mines Limited

Tasu Sound is on the West Coast of the Queen Charlotte Islands. The terrain and climate are typical of the Coast of B.C. and southeastern Alaska - rugged, heavily forested, and oceanic - i.e. wet. Magnetite-chalcopyrite deposits at Tasu are being brought into production by Wesfrob Mines Limited, a subsidiary of Falconbridge Nickel Mines Limited. As there are no permanent settlements in the area, this means establishment of an integrated community with shopping and recreation centres, housing, schools, hospital, etc., in addition to the mining plant and shipping facilities. An expenditure of some 25-30 million dollars will be required to bring the property into production.

Tasu is one of the series of contact metasomatic magnetite deposits that occur along the B.C. Coast. The operating mines at Texada Island, at Nimpkish, Quinsam, Quatsino and Brynnor on Vancouver Island, and at Jedway on the Queen Charlotte Islands are of this type. All have similar geological settings.

Within the last couple of years there have been several excellent papers on the economic geology of the contact metasomatic magnetite deposits along the B.C. coast by Sutherland-Brown, by Eastwood (B.C. Dept. of Mines) and by Sangster. An article on the Tasu project by the Wesfrob staff appears in the current issue of the Western Miner. So with all this first class up-to-date material available, this will be more an illustrated talk than a technical geologic paper.

The country rocks involved are Upper Triassic. A thick series of andesitic and basaltic flows known as the Karmutsen is overlain conformably by a limestone formation called the Quatsino on Vancouver Island and the Kunga on the Queen Charlotte Islands. The basal member is a massive white or light grey limestone that may be up to 600' thick. This is overlain by darker flaggy limestone and by argillites. On Vancouver Island the Bonanza formation of bedded andesitic tuffs and thinner flows overlies the Quatsino limestone.

Cutting these Upper Triassic rocks are small stocks and batholiths of intrusives typical of the Western or Island Belt of the Coast Range intrusives.

These magnetite deposits all show similar stratigraphic and structural controls. They are found at or near the contact of the limestone with the volcanics where these rocks have been cut by the Coast Range intrusives. Structurally they are further localized by second order folds, by faults and by re-entrants in the intrusive contact

All these deposits are associated with skarn zones, usually garnet-pyroxene-epidote skarns though amphibole or chlorite may be present. and take the place of pyroxene. The development of skarn appears to have been the first stage in the emplacement of the ore. Skarn and ore replace limestone, limy tuffs and intrusives. Most deposits have Pre- and Post-ore porphyries and dykes.

The most reasonable source for the iron of the deposits is via the assimilation of iron by the ascending intrusives from the iron-rich Karmutsen volcanics.

The pre-requisites for an orebody are the conjunction of limestone, volcanics and a younger intrusive.

Slide 1 is a portion of the G.S.C. Geol. Map of B.C. with Sutherland-Brown's B.C. Dept. of Mines preliminary mapping included. Identify Prince Rupert, Sandspit, Jedway, Tasu, Coast Range Intrusives, Moresby Island, San Cristoval Batholith.

Slide 2 is a later edition of the Moresby Island map, showing the syntectonic San Cristoval batholith of diorite extending up the west coast of the island to Tasu and terminating there. Flanked by Karmutsen volcanics except at Tasu where in addition the limestone appears. Post Tectonic stocks cut volcanics and limestone at the iron deposits at Burnaby Island and Ikeda. Note the strike slip faulting and major offshore fault determined by seismic activity to be of the San Andreas type.

Slide 3 In 1960 Sutherland-Brown did more detailed mapping at Tasu Sound on the nose of the batholith and found an open syncline with 3rd order flanking anticlines all plunging 20° - 30° northwesterly parallel to the trend of the batholith. These gently plunging folds showed that the Kunga draped north and west in the #1 zone area roughly paralleling the slope of the hill.

Regional mapping shows the Kunga limestone overlies the Karmutsen lavas conformably. The massive white or light grey limestone at the base of the Kunga can be up to 600' thick but it can lense out rapidly. It is overlain by thin-bedded dark limestones and these in turn by thin-bedded argillites.

Identify - Karmutsen, Kunga limestone, San Cristoval batholith,

Porphyries, #1, #2 and #3 Zones

Slide 4 - is generalized from 1" = 50' mapping.
#3 zone which is copper bearing, plunges gently N 75° W. It is controlled by a roll and zone of faulting and dykes and lies along the Kunga-Karmutsen ls-gs contact.
#2 zone is along the same contact and is localized by a roll and a more prominent N 65° W fault. It has a smaller chalcopyrite content.
In both these zones skarn and magnetite replace limestone, and the controls are typical for this type along the coast.
#1 zone is different. It lies above the Karmutsen in a complex area of porphyries that have intruded thin bedded sediments. There are about 7 mappable feldspar porphyry with gradations between. Some of these are definitely Pre-ore and some Post ore. Many are sill-like. The remnants of sediments now comprise only 10-15% of the rock. These sediments have been largely altered to skarn. Two or three types of pre-ore porphyry show skarn and magnetite but a grey porphyry is apparently the host of the bulk of the skarn and ore in #1 zone, and, the roughly stratiform or bedded appearance of the zone results from the replacement of the margins of sill-like bodies of porphyry of this type.
Sutherland-Brown has proposed that these porphyries were intruded into Middle or Upper Kunga sediments as a complex Christmas tree type of laccolith. This gives a reasonable explanation for what we now know, provided the massive lower Kunga limestone has thinned rapidly to the north of #3 and #2 zones.
Slide 5 (S.B.) gives a better picture by grouping the porphyries. It shows the diorite (purple), the Karmutsen lavas, the Kunga limestones (blue), the Upper Kunga (grey), the porphyries (orange) and the ore (red); the Karmutsen dipping gently west under the limestones and the porphyries; #3 zone plunging at 20° N.W.; #2 zone at the roll and N.W. trending fault in the limestone-greenstone contact; #1 zone with a steep N20°E trending edge and extending west at a gentle dip in the laccolith or multiple sill complex.
Slide 6 shows two generalized sections attempting to illustrate these concepts.
Identify - diorite, Karmutsen, Kunga limestone, porphyry and ore.

Slide 7 - is a thickness X Fe assay contour plan of the zones. This illustrates the N65°W control of #3 and #2 zones by faulting and rolls in the limestone-greenstone contact and the control exerted on the north portion of #1 zone by the N20°E faulting.

#5 zone may contain the deeper N.W. extensions of #3 and #2 zone as well as that of #1 zone.

Slide 8 - is a typical cross section of #3 zone, showing the underlying Karmutsen volcanics (dark green), overlain by the Kunga limestone (blue). For scale the orebody (red) is some 200' thick and 400'+ wide. Post ore dykes - (brown). Unfortunately the small high angle faults and pre ore dykes which parallel the roll of the limestone-greenstone contact are not shown.

Slide 9 - is a cross section of #2 zone again showing the ore replacing limestone immediately above the limestone-greenstone contact and localized by the pre-ore N65°W faulting. This faulting produced or is associated with the steep N.E. flank of the orebody.

Both #3 and #2 zones have been drilled off for a length of over 1000 feet.

Slide 10 - is a cross section of #1 zone with the volcanic contact steep on the East because of N20°E faulting. The uncolored area in which the ore lies is the jumble of the porphyry laccolith. In a typical section the volcanics would underlie the laccolith but here the diorite purple of the batholith has cut up through them.

Slide 11 - tabulates the ore reserves. Most of the ore is massive magnetite with pyrite and/or chalcopyrite. The sulphur content is a rather uniform 2-3%, so there is no direct shipping ore. The grade of the ore going to the cobbing plant is expected to be about 41% including the skarn and dykes.

GEOLOGICAL RESERVES

T = Tons in million metric tons

ZONE	REASONABLY ASSURED		
	T	Fe	Cu
1	10.6	40	-
2	7.6	38	.14
3	6.8	48	.66
Sub Total	25.0	41	-
	INDICATED		
4	not drilled off		
5	14.2	45	.20
Total	39.2	43	

OPEN PITS

ZONE	PREPRODUCTION STRIPPING		PRODUCTION		W/O RATIO
	Ore	Waste	Ore	Waste	
1	0.3	0.5	6.6	3.1	0.52 : 1
2		2.0	7.8	4.4	0.82 : 1
3		7.9	5.5	4.9	2.31 : 1
Total	0.3	10.4	19.9	12.4	1.12 : 1

CONTRACTED PRODUCTION

	METRIC TONS PER YEAR	Fe	Cu	Mesh
Pellet Feed Concs.	550,000 ± 10%	65	.05	80% -325
Sinter Concs.	400,000 ± 10%	63	.05	30% -100
Copper Concs.			22%	

Slide 11 - cont'd.
The open pits, as presently planned, are expected to recover 20 million tons ore with a stripping ratio of 1.12 to 1.
Production scheduled to start in the Winter of 1966-67 is at a yearly rate of 550,000 metric tons pellet concentrates produced from #3 and #2 zones after the copper has been removed by flotation, plus 400,000 tons of sinter concentrates from #1 zone.
Slide 12 - is an airphoto of the area - top to the north. The cleared area outlines the #3, #2 and #1 zone pit areas. The plant and dock side are on the point and a causeway connects to the townsite on Gowing Island. The distance from #3 zone outcrop to the dock at the point is approximately 4000'.
Slide 13 - is a generalized long section from #3 zone to the point showing the outlines of the proposed pits. The pits will be drained by drainage raises in the pit walls leading down to drainage adits. The ore from #3 and #2 zones will drop by ore passes to the main haulage adit, thence by 100 ton car and locie to the ore pass to the underground crusher. #1 zone sinter ore has a separate ore pass. From the crusher by conveyor belt adit to the cobbing plant, concentrator, etc.
Slide 14 - Also looking west shows the pre-production stripping proceeding in the limestone on the upper benches of #3 zone pit, the plant site, camp site, harbour and harbour entrance to the Pacific.
Slide 15 - is an earlier picture looking south at the project site showing the clearing for the open pits, causeway, etc. and looking up Fairbox or Wright Inlet.
Slide 16 - is looking north down Wright Inlet, with Wright Lake - which is to be the water supply - in the foreground and the property some 5 miles away. The corner of Gowing Island shows - an anomalous condition in an area of 200 inches rain per year.

That concludes the slides.

Tasu is, for its type, a rather large deposit.

Its two distinctive features geologically are:

(1) its location at the nose of the large syntectonic diorite batholith

(2) The composite porphyry laccolith with its gradations, and the replacement by #1 zone of certain of this porphyries.

Slide No.	Subject
1	Portion G.S.C. Map B.C. Prince Rupert and Queen Charlotte Islands
2	Moresby Island Sutherland-Brown
3	Tasu Sound geology Sutherland-Brown folds
4	G. K. Polk, Composite Geol. Tasu 1" = 400'
5	Tasu Geology after Sutherland-Brown 1" = 300'±
6	Ted Wade's Gen. Sections Same scale
7	Thickness Contour map
8	Cross Section #3 zone - Sec. 28A
9	" " #2 zone - Sec. 54
10	" " #1 zone - Sec. 84?
11	Tabulation Ore Reserves Pits Production
12	Airphoto
13	Generalized Pit outlines & Cross Section of Mine layout
14	Kodachrome looking west at mine area
15	Ektachrome looking south at mine area
16	Ektachrome Wright Lake

FELDSPAR PORPHYRIES - TASU

Light grey	PRE - ORE	DIORITE	Almost no skarn
Light grey	PRE - ORE	PORPH. DIORITE	Almost no skarn
White	PRE - ORE	WHITE PORPHYRY	Almost no skarn
Light green-white	PRE - ORE	MOTTLED PORPHYRY	Skarn & Mag Stringers
		Slight break in emplacement	
Grey	PRE - ORE	GREY PORPHYRY	Extensive Skarn & Mag
ORE FORMATION		Break in emplacement	
	POST - ORE	DIORITE PORPHYRY	Light green
	POST - ORE	ANDESITE PORPHYRY	Apple green
	POST - ORE	GABBRO PORPHYRY	Dark green
		Extensive break in emplacement ?	
	POST - ORE	GABBRO II	Often chilled considerable movement