

WHITING MINING SERVICES INTERNATIONAL LTD.

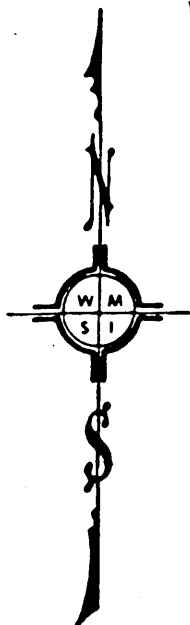
1035 GREENWOOD PLACE, WEST VANCOUVER B.C. CANADA

V 7 S - 1 V 2

(604) 926 - 5270

OFFICE: 922 - 6717.

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THE

RICHFIELD

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GOLD - SILVER - LEAD - ZINC

PROPERTY.

Topley Area

Central British Columbia.

F.B. Whiting

1981.

TABLE OF CONTENTS

	<u>Page</u>
A. SUMMARY	1.
B. CLAIMS, LOCATION & ACCESS	3.
C. HISTORY	6.
D. REGIONAL GEOLOGY	7.
E. LOCAL GEOLOGY AND MINERALIZATION	13.
F. ORE RESERVES	19.
G. GEOPHYSICAL SURVEYS	22.
H. ECONOMIC ASSESSMENT	23.
I. PLANNED WORK PROGRAMS	25.
J. CONCLUSIONS	27.

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ILLUSTRATIONS

- Fig. 1: Location Map
- Fig. 2: Claim Map
- Fig. 3: Regional Geology & Legend

Separate Maps:

- Plan of Ore Reserves
- Plan showing Location of Cross-sections
- Cross-sections
- Mine Development - Plan
- Mine Development - Section
- Plan of Exploratory Drilling
- Magnetometer Survey Plan.

## A. SUMMARY

The Richfield silver-gold-zinc-lead deposit is situated in central British Columbia. It is at a low elevation, in fairly flat terrain, close to a highway, electric power lines, the C.N. Railroad, and to several small towns.

The deposit consists of numerous layers of zinc-lead-iron sulphides carrying rich gold and silver contained within fragmental acidic volcanic beds at the top of a thick pile of andesitic volcanics. The ore layers lie parallel to the enclosing beds and evidently originated as precipitations on an ancient sea-floor close to a submarine volcanic vent.

Two old levels of mine workings driven in 1927 - 1929 expose one of the ore layers, and several underground drillholes intersected the same mineralization down-dip from the lowest level. In 1980 Cobre Exploration Ltd. drilled 28 NQ holes which followed the known shoot farther down the dip. By the end of 1980, ore reserves indicated by the old mine workings and the drillholes had been increased to 170,000 short tons averaging 0.124 ounces of gold per ton and 5.60 ounces of silver per ton. Those reserves were calculated by allowing for a minimum stope height of 6 feet, and by providing for expected dilution during mining.

An additional 20,000 - 25,000 tons is likely to occur in the same Main Shoot within the block already drilled out. The Main Shoot is open at depth; a second, stratigraphically lower ore bed has been found in three of the four deepest holes, and this ore-body is also open at depth. Two other narrow rich layers were intersected in the last and deepest hole, suggesting that other ore shoots are coming in farther down the dip. These should provide large tonnages of

mineable ore to add to the reserves already proven.

Cobre Exploration Ltd. owns a large block of mining claims surrounding the known ore block, totaling about 5600 acres, and covering the projected continuations of the belt of favorable host volcanic beds for a length of over five miles. Because of the way this class of deposit is formed, by exhalations from submarine vents, the chances are very good that other centers of rich gold-silver mineralization will be found along the belt of favorable host rocks.

Based upon expected metal prices during the future period of production from the mine, 1983 onwards, Cobre Exploration Ltd. expects the mine to be a profitable operation; with reserves now in sight, a production rate of 150 tons per day is justified. This would give a mine life of 4 - 6 years, allowing for ore that can be expected to occur directly down-dip from the present deepest holes. More reserves are likely to be found in the immediate vicinity which should extend the forecast life considerably.

Cobre Exploration Ltd. is planning for a major two-phase exploration and development program for 1981. One phase will consist of the drilling of some 70 holes spread north and south from the present mine area to explore the belt of favorable rocks in search of new ore-bodies. The other phase, to be carried on simultaneously, will be to deepen the existing inclined shaft, crosscut to the ore beds on at least two levels, and drift on the ore. This underground work will prove the grade and continuity of the ore layers and partially prepare them for stoping; it will provide large bulk samples for final mill tests; and it will demonstrate the physical characteristics of the ore and the enclosing rocks for mining purposes.

In this report, the main emphasis on the economic value of the drill-indicated ore is placed on its contents of gold and silver. Although individual beds of ore may carry 4 - 6 % lead and 5 - 8 % zinc, with a little copper, once the heavy-sulphide beds have been calculated together with intervening trace-sulphide beds to form mineable ore zones the lead-zinc contents are diluted down to only 2 - 4 %. For the preliminary economic analyses of a future producing mine no net dollar value was assigned to the lead and zinc contents.

It should be understood however that the potential for finding more-massive sulphide ore with much higher lead-zinc-copper grades is good. In the deepest drillhole the mineralization is seen to be spreading across a much thicker stratigraphic section, and tending to coalesce. In other similar districts such as the Noranda camp, New Brunswick, and Newfoundland it is common to have thin bedded ore swell out within very short distances to form thick masses of rich copper-lead-zinc ore.

A second possibility for finding exceptionally rich ore must be mentioned. At Western Mines' Lynx and Myra mines, thin layers of copper-lead zinc ore with low gold and silver were followed along strike into a volcanic vent breccia which carries rich gold and silver in addition to lead, zinc and low copper. It is likely that a similar brecciated vent exists to the north of the known ore shoots at the Richfield mine.

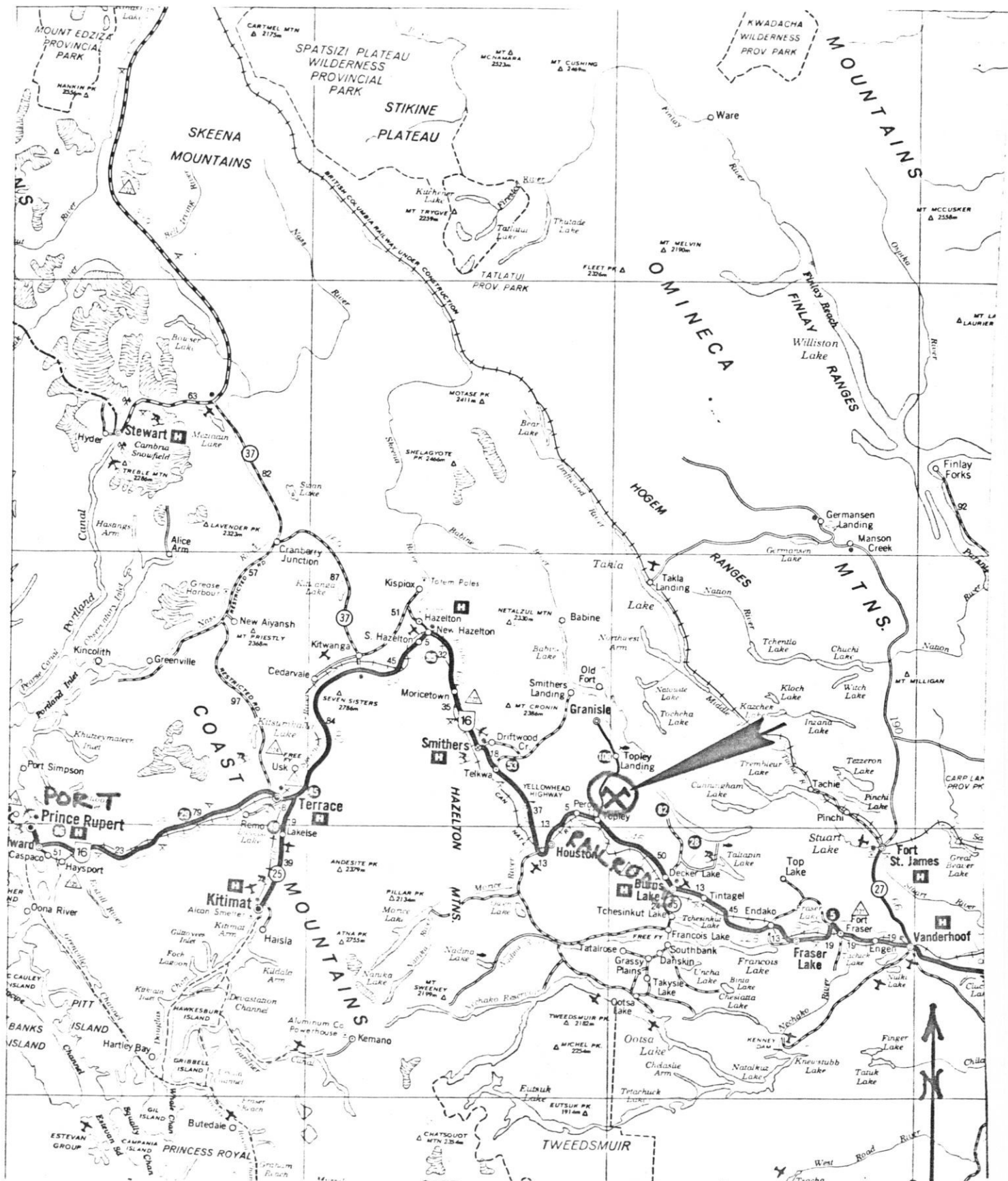


FIG. 1.  
 0 50 100  
 KM.

## B. CLAIMS, LOCATION & ACCESS

Figure 1 shows the location of the property. It is situated 7 miles almost due north from the town of Topley, B.C. on Highway 16 and on the C.N. Railroad. The claims are in the Omineca Mining Division with the center of the claim block at 54° 35' N. Lat., 126° 16' W. Long. The claims are shown on maps 93 L 9 E & W. They lie two miles east of the blacktopped Topley-Granisle highway, and are reached by one mile of gravel road and one mile of dirt road. Elevations on the claims range from 2900 feet at the southwest corner to 5100 feet on the ridge of Tachek Mtn in the northeast corner. The main workings are at 3650 feet.

The terrain around the central area is almost flat, slightly gullied, and covered by glacial drift ranging in thickness from 3 to 80 feet. East of the showings the overburden is thin, and some low rocky ridges occur; to the north, west and south the overburden cover is almost everywhere thick and continuous and the ground surface is a gently-rolling slope towards the west-southwest.

The vegetation is light brush and grass, with light timber of spruce and pine up to 2 feet in diameter. Several small creeks cross the claims, the principal one being Richfield Creek which runs from the northeast towards the southwest and lies 4000 feet south of the Main Workings. A main electric power line crosses the west edge of the claims. Meals, lodging, and housing are available at Topley and at Houston. There are daily flights by commercial air lines from Vancouver to Smithers, 1 1/2 hours drive away.

The climate is moderate, with dry summers and cold winters. Snowfall is light, generally not more than 4 or 5 feet accumulating on the claims. Work can be carried on all through the winter. Cattle grazing is carried on near Topley.

A frame building 18 x 40 feet has been re-built into a convenient office, core-logging room, and core storage space with racks. Two smaller buildings in poor condition could be re-built to give extra storage space.

The population of the district accepts mining, as many of the people work at Granisle, Endako, or Equity Silver.

### Claims

The claims owned 100 % by Cobre Exploration Ltd. are :

- the CDF # 1 - # 4, Record Numbers 1727 - 1730 inclusive, these being 2-Post claims. Record month: 4.
- the Richfield # 1 and # 2 M.Cs. , Record Numbers 1780 and 1781, each of 20 units ( 500 x 500 metres each unit ) which surround the CDF # 1 - # 4 claims. These two blocks overlap onto earlier claims near Richfield Creek that are owned by other persons.

Four adjoining groups of claims are owned 70 % by Cobre Exploration Ltd. and 30 % by Francis B. Whiting:

- the Richfield # 3 M.C., of 15 units, Rec.# 2050 (9)
- the Richfield # 4 M.C., of 12 units, Rec.# 2051 (9)
- the Richfield # 5 M.C., of 10 units, Rec.# 2397 (12)
- the Richfield # 6 M.C., of 20 units, Rec.# 3480 (12).

Because of overlapping in some places, the total of 101 claims amounts to a net of about 90 claim units of 25 hectare each, or about 5600 acres.

A claim map is given as Figure 2.

Assessment work has been filed on the CDF # 1 - # 4 and the Richfield # 1 - # 4 for 6 to 10 years, and on the Richfield # 5 for one year. Physical work has been done



M 93L/9W

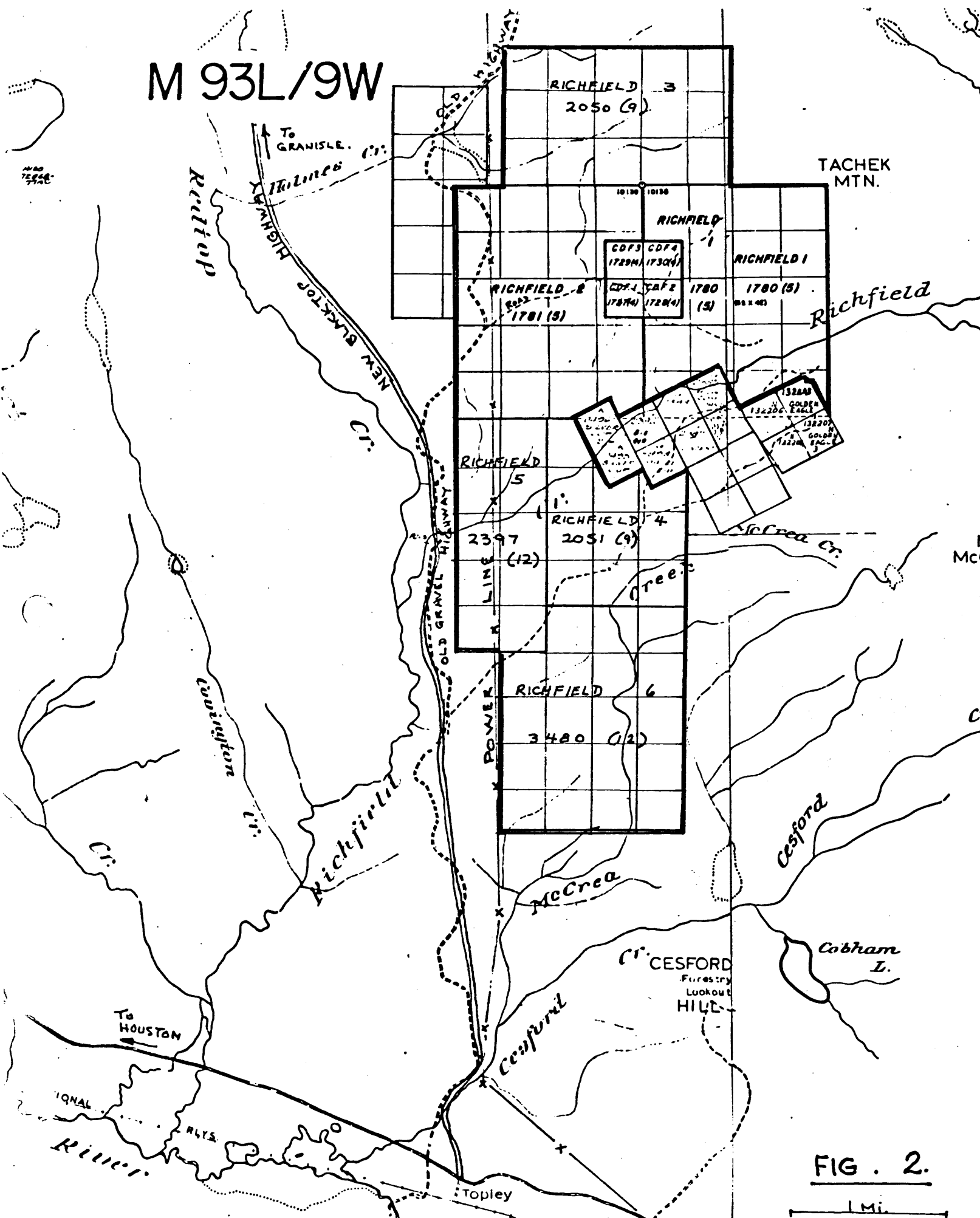


FIG. 2.

1 Mi.

that can be recorded to cover all assessment requirements for 10 years on all claims.

### References

#### B.C. Minister of Mines Reports:

1926 - p. 138-143.

1927 - p. 140-147

1928 - p. 173-174

1937 - p. C 26-27

1955 - p. 25 .

Also:

Geology in B.C. 1975 - p. G 65

Exploration in B.C. 1975 - p. E 140

Assessment Reports 5438, 5707.

### Cobre Exploration Ltd.

M.J. Fitzgerald, President and Director.

Company Office : 1289 Emery Place, North Vancouver, B.C.  
V7J1R2

Tel.: ( 604 ) 980 - 4312.

Timothy Brock , Secretary & Director.

: Suite 2050, 200 Granville St., Vancouver, B.C.

Tel.: ( 604 ) 687 - 1444.

Cobre Exploration Ltd. is a public company, listed on the Vancouver Stock Exchange.

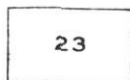
# LEGEND

## SEDIMENTARY AND VOLCANIC ROCKS

CENOZOIC

### TERTIARY

#### OLIGOCENE OR LATER ENDAKO GROUP

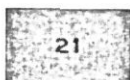


Mainly vesicular and amygdaloidal basalt, andesite and dacite; flow breccia and agglomerate; 23a, trachyte and andesite flows, dykes, and sills; may be older than 23

#### EOCENE OR OLIGOCENE



Rhyolitic flows, tuffs, and intrusions; minor dacite, andesite, and basalt



Conglomerate, sandstone, and shale; minor tuff; coal

### CRETACEOUS OR LATER

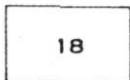
#### UPPER CRETACEOUS OR LATER



19, andesite, trachyte, and rhyolite; intercalated arkose and conglomerate; 20, rhyolite, dacite, andesite, basalt; minor related tuffs and breccias; may be partly or entirely of same age as 21

#### UPPER CRETACEOUS AND PALEOCENE

##### SUSTUT GROUP



Conglomerate, shale, greywacke, and tuff; 18a, conglomerate, sandstone, shale, greywacke, argillite, minor quartzite and andesite; may be in part younger than 18

#### LOWER CRETACEOUS OR LATER



Andesitic, dacitic, rhyolitic, and basaltic flows, tuffs, and breccias; minor sandstone, shale, and conglomerate

### CRETACEOUS

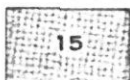
#### LOWER CRETACEOUS



USLIKA FORMATION: conglomerate; minor sandstone and shale

### JURASSIC AND CRETACEOUS

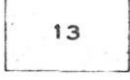
#### UPPER JURASSIC AND LOWER CRETACEOUS



Conglomerate, sandstone, shale, argillite, greywacke, quartzite, tuff, and minor lava; some coal

### JURASSIC OR (?) CRETACEOUS

#### TACHEK GROUP



Andesite and andesite breccia; basalt and rhyolite; 13a, argillite and conglomerate

### JURASSIC AND CRETACEOUS

#### HAZELTON GROUP



Andesite, rhyolite, trachyte, basalt, and related breccia and tuff; minor argillite, arkose, sandstone, and limestone. May include some undifferentiated Triassic rocks

MESOZOIC

### JURASSIC

#### MIDDLE OR UPPER JURASSIC



Andesitic, dacitic, and rhyolitic flows, tuffs, and breccias; minor argillite

#### MIDDLE JURASSIC



Argillite, argillaceous quartzite, quartzite, sandstone, limestone, and tuff; fossiliferous

#### LOWER JURASSIC (?)



Andesitic, dacitic, rhyolitic, and basaltic flows, tuffs, breccias, and agglomerates



127°00'

30

126°00'

FIG. 3

### C. HISTORY

The first discovery of gold-silver mineralization at what later became the Main Workings was made in 1926. The claims were promptly optioned by the Standard Silver-Lead Mining Co. which sank a shaft and opened up the 100-Foot Level from it. Results at first were confused, and the property was returned to the prospector, who formed the Topley-Richfield Mining Co., achieved an underwriting for \$ 1,500,000 , deepened the shaft to the 200-Foot Level, and did considerable drifting, crosscutting, raising on ore, and diamond drilling. Work by that company ceased in early 1929 as with the metal prices in effect then ( \$ 20.67 per ounce of gold and \$ 0.58 per ounce of silver) the indicated grades of 0.2 - 0.5 oz Au and 8 - 20 oz of silver were sub-marginal. The property lay idle until 1934-1935 when the price of gold had been raised; prospecting found other veins to the east, in what had at first been regarded as barren " footwall " , with rich ore across narrow widths.

Again the property was left idle until it was optioned by Silver Standard Mines Ltd in 1954-56. That company did some surface drilling, and then de-watered the old underground workings, re-sampled them, and did more underground drilling. Results are described in a later section of this report.

An Eastern Canada company, Seemar Mines, took over the claims in 1967 and reportedly had an E.M. survey made.

In 1975 the claims were optioned by Canadian Superior Exploration Limited, which did limited stream-silt sampling, a small I.P. survey, and then drilled four holes, only three of which penetrated bedrock.

The property was re-staked in 1979 by F.B. Whiting and was sold to Cobre Exploration Ltd.

#### D. REGIONAL GEOLOGY

There are two good regional geological maps for this area. The older one is G.S.C. Map 971 A " Smithers - Fort St. James ", 1948, a portion of which is reproduced as Fig. 3. A more recent map is G.S.C. O.F. 351 , " Smithers, B.C. 93L ", compiled by H.W. Tipper in 1976. The older map gives the volcanic rocks around the Richfield Mine the name " Tachek Group ", assigned to the " Jurassic or(?) Cretaceous " age, and making them part of the Hazelton Group. On Tipper's compilation, the same rocks are re-named the " Telkwa Formation ", "of Sinemurian and (?) Lower Pliensbachian " age, again being part of the Hazelton Group which is given as Lower Jurassic to Upper Jurassic in age.

The main mass of Tachek Mountain in the northeast corner of the Richfield claims is composed of andesite, which is usually green, somewhat porphyritic, and either massive or showing a coarse breccia or agglomeratic structure. Bedding is indistinct. The flows dip variably to the west; just east of the showings, the strike is northerly and the dip 45° to the west. Judging from the outcroppings of andesite to the north and south of the showings the upper contact of these flows continues to strike generally north-south through the entire claim block; the exact position of the contact cannot be traced on surface because it is covered by thick overburden everywhere except beside the main showings. The interpreted position is shown on the accompanying map " Geology of Claims ".

The Tachek/Telkwa Formation rests upon the eroded surface of the older underlying granites and granodiorites of the " Topley Intrusions " which Tipper gives an Early Jurassic age. A G.S.C. report by Hanson and Phemister describes a basal conglomerate with granitic cobbles at the base of the Tachek/Telkwa Formation, with some limestone, indicating the beginning of a submarine sequence. The andesites total some 3000 feet in thickness.

Lying more or less conformably on top of the andesites, which in the mine area are referred to as the " Footwall Andesites ", is a succession of thinly-bedded acidic tuff/carbonate rocks. This unit is of variable thickness, ranging from 30 feet at the south end of the area drilled to over 300 feet at the north end. These beds appear to be clearly of submarine depositional origin: there is a high content of carbonate material, as limestone, dolomite or ankerite; the acidic tuffs are bedded in a very regular manner without cross-bedding or channeling; the unit contains some black shale or argillite. At the top of this unit is a series of well-bedded lapilli tuffs composed of alternating beds colored green, white, and typically red-purple. This series may represent a depositional period during which the sediments were alternately under-sea, and at-surface, changing from the general submarine reducing environment to an at-surface oxidizing environment and then going back to the sub-sea position. This unit is the host for the bedded ore. The ore layers occur within these Fragmental/Carbonate beds, and lie parallel to the bedding.

The Fragmental/Carbonate beds strike northerly and dip west at 42 - 50 °, generally parallel to the attitude of the contact with the underlying Footwall Andesites.

Overlying the Fragmental/Carbonates are more andesites & some ultrabasic rocks. These are converted in part to a breccia of andesite fragments in a soft " swelling " type of pale green, chloritized gouge, which evidently has been produced by late faulting. As these rocks extend west as far as any drilling has been done, their total thickness is not known. The deepest drillholes suggest a thickness of at least 400 feet. These rocks also seem to be part of the Tachek/Telkwa Formation. The occurrence of ultrabasic and in some parts even serpentized components indicates an initiation of a second eruptive cycle, as these commonly begin with the more basic rocks, progress to intermediate andesites, and culminate in rhyolitic ejecta.

The Tachek/Telkwa Formation contains abundant rhyolite in some areas, parts of which exhibit the texture of rhyolite breccia fragments contained within a rhyolite cement; this demonstrates the former presence of explosive centers which disrupted earlier bedded rhyolites.

In the southwestern sector of the claims all of the Tachek/Telkwa beds are overlain by a near-horizontal platter



of Oligocene-age Endako Group plateau basalts and vesicular andesites.

To the east of the mine workings, overburden is shallow and numerous low ridges of andesite crop out. Starting right over the workings and extending as a uniform cover over the land to the south, west, and north is a layer of glacial drift; it ranges in thickness from 60 to over 90 feet, and may be even thicker going south down the slope towards Richfield Creek.

The Richfield claims cover the upper part of the Tachek/Telkwa andesites and the tuffaceous, more acidic and carbonate-bearing beds above the Footwall Andesites for a length of some five miles along strike. Down the dip, if the 45° angle is maintained, the two-kilometer width of the Richfield #2 claim block would include all down-dip extensions of the ore layers to a vertical depth of 2000 metres, or 6500 feet; the slope length along the ore horizon, within the claims, could therefore be as much as 9000 feet.

Volcanogenic environments, as illustrated by the many known districts around the world, ranging in age from the early Precambrian to as late as the Miocene, typically form extensive belts several miles or even tens of miles long. In those belts, individual orebodies occur at separated localities but always in and around the interfingered belt of andesite flows and acidic tuffs.

The tuffaceous materials are ejected from one, or more commonly many, volcanic submarine vents. Ore may be deposited close to each vent as a sort of sinter, being a solid material almost from the beginning, and often having been fractured or brecciated by surges of volcanic eruptions, or by slumping down the slopes of the pile. Alternatively, ore may be deposited in a " distal " location some miles away from the rhyolitic pile and incorporated in thin-bedded shaly or sandy sediments without much obvious volcanic component; these may have been soft, unconsolidated beds which may be subject to slumping and considerable contortion, before they are converted to hard rocks by deeper burial, compaction, and heating.

The significance of the typical distribution of multiple orebodies along a belt of favorable host rocks, with respect to the mine-making potential of the Richfield claims, is that the favorable rocks are exposed at surface at only one point. The remainder of the belt, running north and south from the mine workings and lying directly west of the Footwall Andesites, is everywhere covered by the glacial drift. It is highly likely that other ore-making centers occur at intervals along this belt, which the claims cover for a length of over five miles.

In many of the volcanogenic districts, a pipe of chloritic alteration with stockworks of veins lies stratigraph-

ically below the bedded ore in the tuff/carbonate series. In places , those veins make individual orebodies, or the stockwork zone may make a large bulk deposit. Often that ore is richer in copper than the bedded ore above it.

At the Richfield mine workings, a similar set of footwall veins, criss-crossing at different angles, lies due east of the workings, and is again stratigraphically below the bedded ore. Some 3500 - 4000 feet towards the south, by Richfield Creek, a second swarm of footwall veins occurs; they carry the same ore minerals and have similar gangue, and identical alteration effects along their walls. It is thought very likely that another group of bedded orebodies will be found immediately west of this southern vein swarm in the continuation of the Fragmental/Carbonate unit.

## E. LOCAL GEOLOGY AND MINERALIZATION

### Local Stratigraphy

In the area around the mine workings, the tuff/carbonate beds strike northerly and dip west at 42° - 50°.

The Footwall Andesites which lie to the east are probably some 3000 feet thick; they are massive or only indistinctly bedded, and are in part a volcanic breccia or agglomerate. The upper surface of this unit forms the footwall contact of the Fragmental/Carbonate beds. Near the 100- and 200-Foot Levels this contact appears to be a simple, west-dipping plane, and the same relation seems to exist northwards along strike. Down the dip, however, a layer or lens of andesite seems to diverge from the main footwall contact and form a sheet or flow within the Fragmental/Carbonate beds. This lens, which has been named the " Middle Andesite "; ranges from 30 to 90 feet in thickness. Where it is present, it separates the Fragmental/Carbonate beds into an Upper unit and a Lower unit.

In several of the deeper drillholes to the southwest a " Transitional Unit " is found between the Footwall Andesites and the Fragmental/Carbonates. This layer is composed of well-bedded dark greenish to tan volcanic material. Although it is interpreted as being andesitic in composition it seems to be a water-lain sediment rather than a flow. The Transitional

Unit ranges in thickness up to about 50 feet.

The Fragmental/Carbonates are tan to cream-colored rocks, originally extremely thinly-bedded ( 1 mm layers ), composed of acidic tuff with abundant carbonate. The rock has been extensively re-crystallized, and flooded by quartz and carbonate ( interpreted as being re-mobilized original components of the mass ), so that in many places the bedding has been almost obliterated. Close to ore, " green-speckling " by chlorite (?) and by mariposite-like grains gives a distinctive appearance to the rock.

At the north end of the mine workings the Fragmental/Carbonate Unit is one body, with a thickness of 315 feet. The thickness is increasing towards the north. Near the Main Ore Shoot in the central part of the workings the Fragmental/Carbonates are divided into an " Upper " and a " Lower " zone by the Middle Andesite. South of the Main Ore Shoot the Lower zone pinches out, and the Upper zone thins to as little as 10 - 15 feet in thickness. The Fragmental/Carbonates thus consist of two wedges which thin towards the southeast and thicken and coalesce towards the northwest.

The uppermost beds in the Fragmental/Carbonates are a set of strongly-banded green, white, and reddish-purple lapilli tuffs. These rocks, named the " Variegated Tuffs ",

range in thickness from zero to 35 feet. In places it appears that the unit is present but has been so strongly re-crystallized that the distinctive red/green banding has disappeared. Elsewhere part of the section may have been cut off by a hangingwall fault running nearly parallel to the beds but in some areas cutting through them.

The Fragmental/Carbonates are succeeded upwards by the " Upper Andesites ", which contain some layers of ultra-basic rock and some serpentized sections. Much of the Upper Andesites are now a mixture of solid rock fragments enclosed in a soft gouge, which has been produced by late faulting. The total thickness of the Upper Andesites is not known; as mentioned before, in the deepest drillholes a minimum thickness of about 400 feet is shown and as the wedge is opening downwards to the west the total thickness may be very much more.

#### Mineralization

Two types of deposits are known on the Richfield claims. The more important type consists of beds of gold-silver-zinc-lead ore in the Fragmental/Carbonates. The second type is veins of quartz-carbonate-galena-sphalerite-chalcopyrite-arsenopyrite cutting at various angles across the Footwall Andesites. Thin selvages of molybdenite occur along the walls of narrow quartz veins in these Footwall Andesites as well.

The bedded ore is composed of layers of pyrite, sphalerite, galena, and arsenopyrite accompanied by quartz and a mixture of carbonates : calcite, dolomite, and ankerite; sericite is common; a colorless amphibole, possibly anthophyllite, is reported to be common in the more highly re-crystallized sections. The beds are thin, generally 1 mm thick, each layer commonly being of predominantly one metallic mineral with intermixed quartz and carbonate.

Four mineralized ore beds have been recognized so far. The uppermost one, the " A " Zone, occurs within the Variegated Tuff Unit. It is thin and discontinuous, and rarely makes ore grade across a mining thickness. The second and third beds, the " B " and the " C ", occur in the central or lower part of the Upper Fragmental/Carbonates; generally these two beds are close enough together so that they would be mined as one body. For this reason they are called jointly the " B-C Zone ". Each of the " B " and the " C " layers tends to be a relatively rich thin persistent layer, with combined zinc-lead contents of several percent, and carrying gold in the range of 0.20 - 0.85 oz per short ton and silver in the range of 8 - 130 oz. per ton. The thicknesses of such high-grade material may be from a few inches to one or two feet. Commonly, two or more such beds occur, separated by several feet of low-grade material. In some holes the B-C Zone contains as many as six individual rich layers.

Where arsenopyrite is abundant the gold content is almost invariably high. Silver seems to be high where galena is present; tetrahedrite, tennantite, or electrum may be present. Polished-section studies recently initiated will clarify the mineral associations.

The fourth bed is the " D " Zone which lies within the Lower Fragmental/Carbonate Unit. In the upper areas of the workings no " D " Zone is present. Lower down, it first appears as a thin, low-grade zone, or as a very thin but rich streak. Farther down dip to the southwest, drilling has shown that the " D " Zone increases in thickness so that in three of the deepest four holes it makes ore grade over a mineable thickness.

All these ore beds are interpreted as having been deposited as sinters on the side of a growing pile of acidic volcanic tuffs, beside a volcanic vent on the sea-floor.

It is of the greatest significance that the number of ore beds increases the farther we go down the dip of the beds. In the upper mine workings only one or at most two ore layers exist. By Hole 80-28, 1000 feet down the rake of the Main Shoot, at least seven ore beds can be seen. In fact, in that hole, a new bed has appeared between the "C" Zone and the "D" Zone, and another new one has appeared a little below the " D " Zone. In all, mineralization occurs at numerous levels within the acidic pile over a stratigraphic interval of at least 230 feet.



The best mineralization in the B-C and in the D Zones occurs where there is a Middle Andesite separating the Fragmental/Carbonate Unit into an Upper Section and a Lower Section. It is not known whether this relationship is just coincidental or whether there is some genetic connection. It may be that ore forms where the acidic pile interfingers outwards with encircling flows. If so, there could be a second set of ore zones on the opposite flank of the pile, presumably northwards from the present mine workings. Or, the known zones may circle entirely around the pile.

The veins in the Footwall Andesites range in thickness up to about six feet; commonly they change width and grade rapidly along strike and down the dip. Individual samples can carry as much as 0.50 oz. gold per ton across one to four feet, and the silver may be over 20 oz. per ton over a foot or less. So far none of the veins explored appears to maintain grade and thickness sufficient to make a mineable ore body. These footwall veins occur in swarms, one of which lies directly east of the Main Shoot of bedded ore, and another of which occurs beside Richfield Creek, 3500 - 4000 feet to the south. Other swarms may occur between these two, or farther north or south, under areas where no bedrock is exposed in the Footwall Andesites.

#### F. ORE RESERVES

As of January, 1981, the reserves of ore indicated by a combination of the 1980 drilling with earlier underground drilling, and sampling of the drifts on the 100- and 200-Foot Levels, amounted to :

170,000 short tons @ 0.124 oz. Au/ s.ton, 5.60 oz. Ag /t.

These reserves were calculated to allow for expected dilution during mining, and so represent forecast average milling grades. The ore zones dip west at an average 45°. To allow for a stope in which a miner can stand upright, a minimum vertical stope height of 6 feet was assumed. All drillhole intersections of less than six feet were diluted by whatever adjacent material existed in order to give the 6-foot working height. Where the ore was thicker than needed to give the 6 feet, its actual thickness was used and where rich ore layers lay immediately against any future stope wall, an extra six inches or more was allowed to provide for deliberate overbreaking, to make sure that no rich ore were left behind.

The ore and the hangingwall and footwall beds appear to be solid, competent rocks that will stand well during mining.

In addition to the firm reserves given above, which were calculated using an approximate cut-off of \$ 100 per ton at expected gold/silver prices, there are several drillhole intersections nearby that did not measure up to ore grade over the minimum stopping height but which nevertheless show that the ore beds do continue into those localities. It is likely that another 20,000 - 25,000 tons will eventually be mined around those drillholes; these can be classed as Possible Reserves.

The reserves mentioned above lie within two shoots. The Main B-C Zone has been followed down its rake for a distance of 1150 feet with almost continuous ore throughout and is open at depth. The D Zone does not appear in the old mine workings or in the shallower drillholes; it appears at an intermediate depth and makes ore in D.H.s 14, 22, and 28; it is also open down dip. The B-C Zone has an average length along strike, i.e. a stoping extent on any one level, of about 250 - 300 feet. The thickest intersection found in this zone was in D.D.H. 80-13, where the ore, measured over a vertical intercept, is 23.1 feet high; the grade there is 0.151 oz. Au/t and 6.29 oz. Ag/t. In several other holes, intercepts of 9, 14, 16, and 19 feet were cut. These will provide stoping dimensions sufficient for efficient, low-cost extraction.

The reserves already found are, of course, only a small fraction of what can reasonably be expected to occur on the property. First, the B-C and D Zones are open at depth, being of ore quality in the deepest hole drilled so far. Second, two new ore beds have appeared, as described in the foregoing section of this report, which seem likely to provide new exploitable beds at increasing depth. Third, there are good possibilities of finding ore zones on the north side of the pile of acidic fragmentals. Fourth, the entire belt of fragmental acidic rocks lying on top of the Footwall Andesites, stretching through the claims for a length of over five miles from north to south, must be considered highly favorable for the discovery of more ore centers.

It is worthwhile to point out that the total thickness of fragmental rocks already shown to have ore material added to them amounts to 230 feet. To have had repeated periods of metal-rich exhalations coming from a vent over the time required to build up such a thick section of tuffs shows that the vent was a strong, long-established feeder. The chances

are good that at some site , presumably beside the vent itself, more massive ore may be found over very considerable stratigraphic thicknesses. The increase in the number of ore layers within the section, shown by holes 14 and 28, suggests that such a site may exist directly down dip from D.D.H. 80-28.

Note : There is a striking similarity between the Richfield occurrence of a pair of ore shoots above and below the Middle Andesite, and the identical situation at the Heath Steele mine in New Brunswick, where two pairs of orebodies, the C-1 and A, and the C-4 and D, lie above and below a flow within the pyroclastic unit. See reprint in back of this report, page 150.

COBRE EXPLORATION LTD.  
 RICHFIELD PROPERTY  
ORE RESERVE CALCULATION

Reserve Block	Drill Hole	Planimeter Average	Square Metres	Square Feet	Diluted Mining Height (Ft)	Cubic Feet	Tonnage (ST) [12 cu.ft./ton]	Au (oz/ton) [diluted]	Grade x Tons	Ag (oz/ton) [diluted]	Grade x Tons	
<b>ZONES B/C</b>												
J	80-4	355	710.	7642.38	17.5	133741.65	11145	0.073	813.58	6.29	70102.05	
K	80-10	721	1442.	15521.56	20.2	313535.51	26128	0.151	3945.33	7.75	202492.00	
L	80-11	641.25	1282.50	13804.72	9.4	129764.37	10814	0.070	756.98	1.78	19248.02	
M	80-13	747.75	1495.50	16097.43	24.1	387948.06	32329	0.145	4687.71	6.06	195913.4	
O	80-14	587.50	1175.	12647.59	10.6	134064.45	11172	0.097	1083.68	1.42	15864.24	
N	80-22	712.50	1425.	15338.57	-							
P	80-23	609.	1216.	13088.92	15.6	204187.15	17016	0.096	1633.54	2.15	36584.40	
Q	80-28	618.50	1237.	13314.96	6.8	90541.73	7545	0.160	1207.20	3.32	25049.40	
F	24U	401.5	803.	8643.42	6.2	53589.20	4466	0.200	893.20	0.60	2679.60	
G	19U	157.5	315.	3390.63	6.0	20343.78	1695	0.110	186.45	7.00	11865.00	
D	10U	172.	344.	3702.79	6.0	22216.74	1851	0.120	222.12	21.20	39241.20	
E	11U	440.5	881.	9483.01	6.0	56898.06	4742	tr	-	12.20	57852.40	
<b>Subtotal</b>							<u>128903</u>	<u>0.120</u>	<u>15429.79</u>	<u>5.25</u>	<u>676892.95</u>	
A	100'-level	341.	682.	7340.99	6.0	44045.92	3670	0.070	256.90	5.20	19084.00	
B	200'-level	1137.	2274.	24477.13	6.0	146682.79	12239	0.183	2239.74	14.21	173916.19	
R	100'-level	196.	392.	4219.45	6.0	25316.72	2110	0.050	105.50	3.76	7933.60	
<b>x-cut</b>							18019	0.144	2602.14	11.15	200933.79	
<b>Subtotal</b>												
<b>ZONE D</b>												
O	80-14			12647.59	8.0	101180.72	8432	0.179	1509.33	2.07	17454.24	
N	80-22			15338.57	6.0	92031.42	7669	0.131	1004.64	4.57	35047.33	
Q	80-28			13314.96	6.0	79889.76	6657	0.060	399.42	2.94	19571.58	
<b>Subtotal</b>							<u>22658</u>	<u>0.129</u>	<u>2913.39</u>	<u>3.18</u>	<u>72073.15</u>	
<b>RESERVE TOTAL/AVERAGE GRADE</b>							<u>169,580 Tons</u>	<u>0.124 oz/ton</u>	<u>5.60 oz/ton</u>			
<b>WEIGHTED AVERAGE MINING HEIGHTH</b>					<u>9.7 Ft</u>							

January 19, 1981

MJF/sjb

### G. GEOPHYSICAL SURVEYS

A detailed magnetometer survey has been conducted over the central sector of the Richfield #1 & #2 claims. It was found that a discernable magnetic low exists over the sub-outcrop of the main Fragmental/Carbonate Unit. This low extends north and south out to the limits of the surveyed grid, suggesting that the ore-host unit also continues there.

A partial VLF-EM or E.M.16 survey was done over much the same area as the magnetic survey. It found numerous conductors, which have not yet been tested by drilling.

A Vector Pulse E.M. survey was done over the area immediately surrounding the old mine workings. It found a wide, strong conductor just west of the known ore; subsequent drilling disclosed the presence of the thick section of highly altered and broken, gougey Upper Andesites at the inferred location of that conductor. This rock has sufficient conductivity to account for the E.M. response detected.

It is planned to extend the magnetic survey north and south over the entire claim block, to aid in tracing the favorable Fragmental/Carbonate Unit under the long overburden-covered areas north and south of the mine workings.

## H. ECONOMIC ASSESSMENT

Based upon reasonable expectations as to the prices of gold and silver that will be received over the productive life of the mine - i.e. from 1983 onwards - the ore grade and the size of the reserves are considered by Cobre Exploration Ltd. to justify putting the mine into production.

With the conservatively-calculated drillhole- and drift-indicated reserves of 170,000 tons, plus the Possible Ore in the area already drilled out, plus a fair estimate of what ore can be projected immediately down-rake from the present deepest drillholes, total reserves now more or less in hand must amount to at least 250,000 short tons. At 150 tpd and 340 milling days per year that will support an small mine operation for five years.

Net receipts from gold and silver, at 94 % recovery, with grades as given in this report, will be as follow, for the range of metal prices specified:  
Ore Grade: 0.124 oz Au/t, 5.60 oz. Ag/t: recovered: 0.117 oz gold/t., 5.3 oz. silver/t.

<u>Prices in \$ U.S.</u>		<u>Prices in \$ Can.</u>		<u>Recovered \$ Can. per ton milled.</u>
<u>Gold</u>	<u>Silver</u>	<u>Gold</u>	<u>Silver</u>	
\$ 500/oz.	\$ 14 / oz	\$ 602	\$ 16.87	\$ 159.54
\$ 600	\$ 17	\$ 723	\$ 20.48	\$ 193.13
\$ 700	\$ 20	\$ 843	\$ 24.09	\$ 226.31
\$ 800	\$ 23	\$ 963	\$ 27.71	\$ 259.53

Operating costs are estimated as follow for 150 tpd.:

Direct mining and hoisting .....	\$ 30
Milling.....	\$ 17
On-going mine development & drilling.....	\$ 10
On-site supervision, engineering.....	\$ 7

## Operating Costs, continued:

Head office costs, accounting, legal...	\$ 4	per ton milled
Miscellaneous costs ( estimate ).....	\$ 4	" " "
		<hr/>
Total .....	\$ 72	per ton.

For the ranges of metal prices given on the previous page, the expected minimum reserve of 250,000 tons would yield a gross operating profit, prior to recovery of invested capital, taxes, etc., of :

At \$ U.S.500 gold, \$14 silver .....	\$ 21,750,000
At \$ 600 " 17 "	\$ 30,750,000
At \$ 700 " 20 "	\$ 38,500,000
At \$ -800 " 23 " .....	\$ 46,750,000

Of course, the above calculations do not represent the full economic potential of the property, but simply the small fraction of what can be expected, based on present known and inferred reserves. Given the likelihood that more orebodies will be found, either near to the known ore zones or elsewhere along the five-mile length of the belt of favorable host rocks, the profit potential is several times the amounts shown above.



## I. PLANNED WORK PROGRAMS

Cobre Exploration Ltd. proposes to carry out the following programs of work.

### 1. Mine Development

The existing shaft is to be extended for 500 feet to a sump location just below the lowest of three new operating levels which are to be driven. These levels will be 40 m. apart vertically ( 131 feet ).

On the first new level, the shaft station would be cut, but no crosscutting or drifting done during this initial development program.

On the second and third new levels, crosscuts would be driven west to the Main B-C Ore Zone, and drifts would be driven north and south on that zone. Drifts would also be driven on the "D" Zone which appears to make ore in places on those two levels.

The total of drifting and crosscutting proposed amounts to approximately 1700 feet. The drifts in ore will provide ample material for final milling tests, will confirm the grade, widths, and continuity of the ore bodies, and will partially develop them in preparation for mining.

It is proposed that this work be done in 1981; together with the results of the exploratory drilling described below, it will permit the final size and site of the milling plant to be selected. Plant construction could begin in early 1982, aiming at starting regular production by the end of that year.

## 2. Exploratory Drilling

To test the immediate down-rake extensions of the B-C and D Ore Zones, and the new layers coming in between and below them, at least ten new holes are needed.

To test at 100- to 250-metre intervals north and south along the full belt of favorable host rocks within the Cobre Exploration claims, a further 60 drillholes are needed. The general lay-out of the drillholes is shown on an accompanying plan. These holes can be drilled most effectively, combining lowest cost with most information, by a combination of rotary/percussion and core-drilling. Where favorably-altered or mineralized host fragmental/carbonate sections are found, fill-in holes would be drilled to develop ore reserves.

This drilling should be done in 1981, as the information as to what other ore areas exist on the property, their locations with respect to the known ore, and the size of the new bodies, will all affect the planning as to the size and location of the mill.

## 3. Mill Tests

Cobre is putting together a representative sample of drill core reject material and will have preliminary milling tests made.

## 4. Governmental Permits

Early in the spring of 1981 work will start on obtaining the required governmental approvals, including preparation of background data on water, tailings disposal, etc., and the drawing up of an environmental impact report.

J. CONCLUSIONS

Cobre Exploration Ltd. considers that the Richfield property will make at least a small, profitable producer, and that it has excellent potential for being developed into a major, long-lived mine.

The two work programs previously described are both looked upon as fully justified by the results obtained to date, and the unusual potential for discovering numerous new orebodies.

THIS REPORT PREPARED AT THE  
REQUEST OF COBRE EXPLORATION  
BY THE UNDERSIGNED:



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F.B. Whiting - Pres.  
Whiting Mining Services  
International Ltd.

February, 1981.