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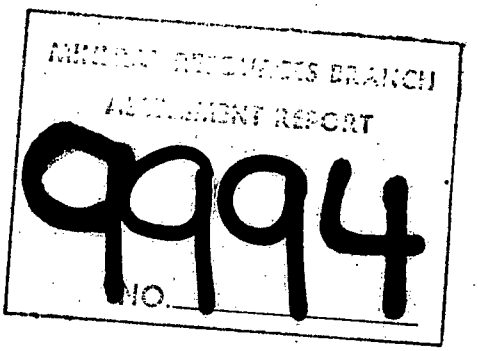
GEOLOGY OF THE MGM PROPERTY

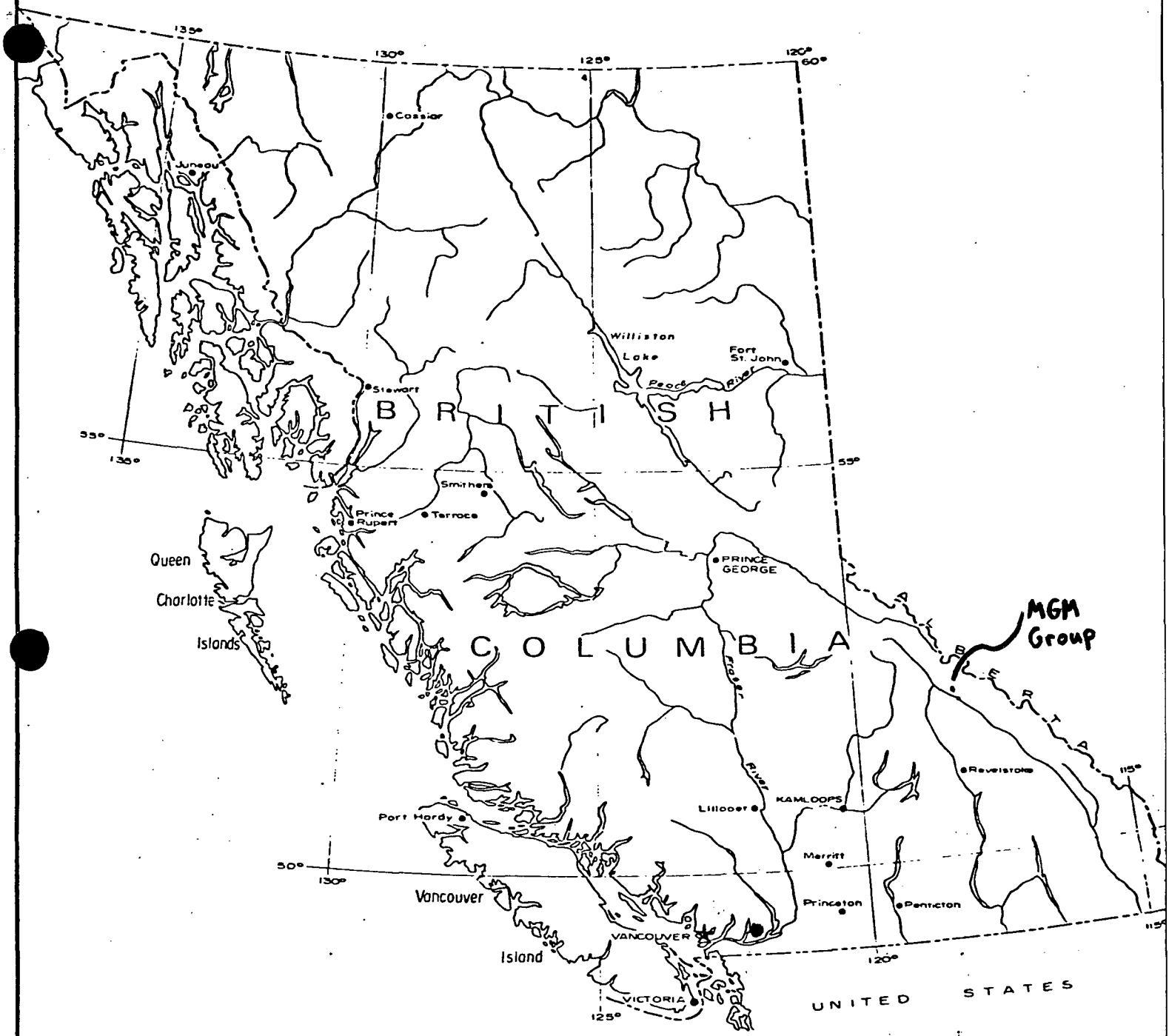
BIG BEND DISTRICT, EAST CENTRAL BRITISH COLUMBIA

By

John Michael Leask, BASc.



GOLDEN MINING DIVISION
NTS 83 D1
52°10 N. 118°15 W.
Owner- John M. Leask
Operator- John M. Leask



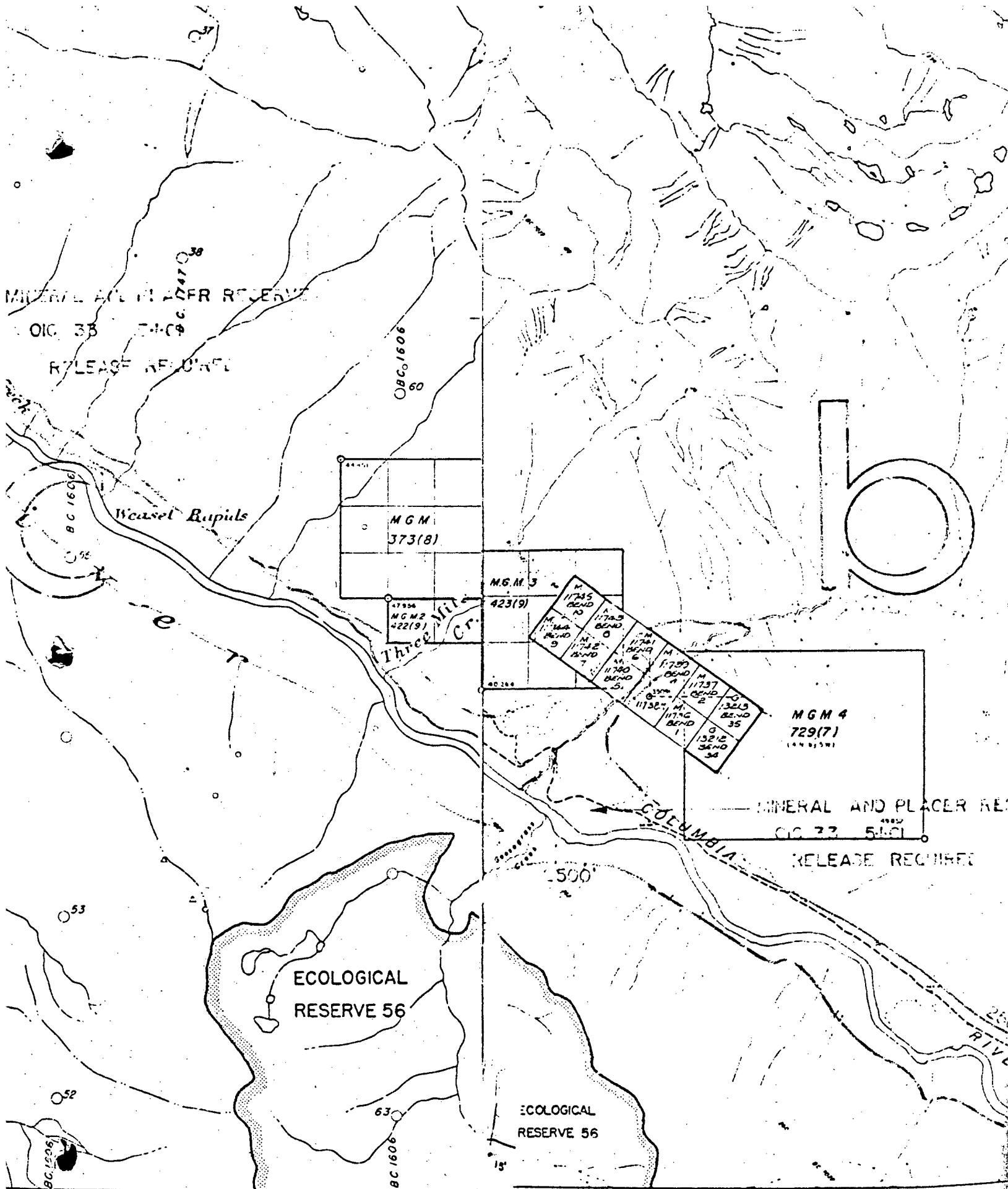
E & B EXPLORATIONS INC.

LOCATION MAP

100 50 0 100 200

SCALE IN MILES

ALTAIR drafting services ltd.


MINERAL AND PLACER RESERVE
OIC 33
RELEASE REQUIRED
BC 1606
Weasel Rapids
MGM 373(8)
M.G.M. 3
423(9)
MGM2 422(9)
Three Mile Cr.
MGM 4 729(7)
MINERAL AND PLACER RE
OIC 33
RELEASE REQUIRED
COLUMBIA
ECOLOGICAL RESERVE 56
ECOLOGICAL RESERVE 56
BC 1606
GOLDEN MINING DIVISION
International Boundary
Provincial Boundary
Mining Division Boundary
Bridge
Tunnel
Power Transmission Line
Pipeline

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SUMMARY AND RECOMMENDATIONS

Reinterpretation of known Zn-Pb showings in the McNaughton Lake area provided the impetus for the 1981 geological mapping project. Results obtained were favourable, establishing a model correlating massive stockwork pyrrhotite mineralization in Tsar Creek and Zn-Pb showings to the north.

A geophysical survey is recommended for the designated target areas (page 11) in the forthcoming exploration season, with drilling contingent upon favourable results. Execution of these recommendations are estimated to cost $70,000 (see page 12 for details).

BACKGROUND

Mineralization was first discovered in the Cummins River Canyon in late 1940. In 1966, Cominco staked 45 units and tested the grade of the Canyon zone with eight (8) short holes and the MGM with five (5) short holes. Cominco still retains eight (8) claims straddling the Canyon.

Cominco geologists considered the occurrence to be of "fissure vein" type and considered it to have small tonnage potential.

In August 1979, Leask and Associates conducted a preliminary reconnaissance of the McNaughton Lake area and staked the MGM claim group on the strength of evidence which indicated that in fact the occurrence was of the shale-hosted type.

INTRODUCTION

This geologic study gives a better understanding of the genesis and economic potential of several sulphide occurrences located on and adjacent to the MGM and Bend claim groups.

Reinterpretation of this showing as a shale-hosted massive sulphide similar to the Cirque and Howards Pass deposits, as opposed to the Cominco and B.C. Mines "fissure vein" description, led to renued interest in the area by Leask and Associates (1979).

Mapping (1981) aided greatly in developing exploration parameters to assess and test the specific target areas for mineral occurrences of economic significance.

A significant sulphide bearing basinal structure has been delineated and the potential for such an economic occurrence is very good.

LOCATION AND PHYSIOGRAPHY

The claims[1] are located immediately east of the Rocky Mountain Trench, north and south of the Cummins River Canyon, McNaughton Lake Area.

Geographically the property is within the southern extent of the Selwyn Range.

These mountains have rugged peaks with moderately inclined lower slopes. Relief is in the order of 6,000 feet.

52°10'N. 118°15'W.

[1] Map Coordinates

CLIMATE AND VEGETATION

Climatologically the property lies within the Interior Wet Belt where precipitation exceeds 40 inches per year. Vegetation is thick and lush at lower elevations where devil's club constitute a large portion of the underbush. Common evergreens are cedar, douglas fir, and hemlock at lower elevation giving way to lodgepole pine and balsam fir above 4500 feet.

Treeline is approximately 6,000 feet.

Winters in the area are usually long and severe with snowfall often exceeding 30 feet.

ACCESS

A paved highway runs from Revelstoke to the Mica Dam site, from the dam site a good gravel road extends to Red Rock Harbour on McNaughton Lake. At this point a boat is necessary to travel seven miles down the Columbia Reach to the showing area.

REGIONAL GEOLOGY

The project area is underlain by a conformable series of quartzites, carbonates, and pelites of the Proterozoic Windermere Supergroup through the Lower Cambrian Gog Group to Middle Cambrian Tsar Creek and Kinbasket Formations (Fyles, 1960).

Windermere Supergroup rocks are divided as follows:

1) A grit unit at the base of the sequence consists of interbedded quartzose grit and pelite sub-units. (Total thickness exceeds 1,000 meters).

2) A pelite unit with minor sandstone grit and calcareous sandstone interbeds. (Thickness 800 to 1,000 meters).

3) A sandy dolomitic carbonate with minor calcareous quartzites and pelites. (Thickness 20 to 200 meters).

4) A 150 meter thick upper clastic unit with interbeds of fine grained pelite and quartzite 1 to 10 meters thick. The proportion of quartzite increases upwards to a gradational contact with the overlying Gog Group.

The Gog Group consists of three recognizable formations:

1) At the base the McNaughton Formation comprises mainly medium to coarse grained quartzite with minor pelite. Up-section the proportion of pelitic interbeds increases to about 50% at the top of this 600 meter thick sequence.

2) Marble and dolomitic sandy carbonate of the Mural Formation. (Thickness varies from 0 to 150 meters).

3) The Mahto Formation overlies the Mural Carbonate and consists mainly of a fine grained, medium to thinly bedded pink quartzite. (Thickness in the showing area is approximately 30 meters although it approaches 250 meters in thickness to the north).

Immediatley overlying the Gog Group is the Tsar Creek argillite. This unit is subdivided into a lower black clastic argillite and an upper pelite (garnet mica schist). (Total thickness varies from 200 to 1,500 meters).

Conformably overlying the Tsar Creek argillite is the Kinbasket Limestone, a 1,000 meter thick succession of grey and white banded marble with minor dark graphitic clastic limestone.

PROPERTY GEOLOGY

Overall structure from detailed mapping consists of a series of westerly dipping thrust homoclines exhibiting a series of step-like folds. To the east the steeply dipping homoclines abut the western flank of a broad open anticline. Correlation with other units in the Rockies and fossil dating (Fyles 1960) served to indicate the stratigraphic order.

Lithologies present within the property and adjacent area include blocky quartzites of the Lower Gog Formation.

Shaly quartzites, pelites, (garnet mica shist), carbonate and minor chert of the Upper Gog form a marked contrast with the Lower Gog.

Black clastic orgillite, turbidites (Greywacke), pelite (garnet mica schist), and minor Chert of the Tsar Creek Formation overly the Gog Group.

The youngest rocks in the area are banded grey and white micritic limestones of the Kinbasket Formation.

Lateral facies changes are common within the Tsar Creek unit.

STRATIGRAPHY

Stratigraphy of the Gog Group, Tsar Creek Formation, and Kinbasket Formation is poorly exposed on the lower slopes of the project area except for creek cuts, roads, ridges, lake shoreline, and the Cummins River Canyon. Dips are moderate to steep to the west. Lithologies present in stratigraphic succession from lowest to highest ore:

1. Unit 1 - McNaughton Formation; a medium to massive bedded clean quartzite with minor pelite interbeds near the top. (Thickness 600 meters).

2. Unit 1B - Mahto Formation; a medium bedded creamy coloured sparry limestone. In the Cummins Canyon the Mahto Formation has thinned to 10 meters.

3. Unit 1C - Mural Formation; characteristically a medium to thinly bedded, fine grained, pink quartzite. (Thickness 90 meters).

4. Unit 2A - Lower Tsar Creek Formation; black, thinly bedded, clastic argillite, and poorly sorted pelitic sediments (garnet mica schist). The black clastic unit appears just south of the Cummins Canyon and reaches a maximum thickness of 200 meters north of Tsar Creek. The garnet mica schist is a correlative facies but has thinned to approximately 20 meters in the Canyon.

5. Unit 2B - intensely silicified, finely laminated quartzite with minor medium bedded pink quartzite which is absent in the Canyon section. The finely laminated, silicified rock directly underlies the mineralization. (Thickness 5 meters).

6. Unit 2C - silification with disseminated and massive sulphides, Pyrite, sphalerite, galena. Porphyroblastic pyrite textures are common (Thickness from 1 to 10 meters).

7. Unit 2D - chocolate weathering maganiferous dolomite with disseminations and blebs of pyrite sphalerite, and galena. Quartz filled tension cracks are common (Thickness 6 meters).

8. Unit 2E - Upper Tsar Creek Formation; thinly bedded shaly quartzites, mica schist with interbedded garnet mica schist, massive bedded grey and creamy coloured micritic limestone, and minor chert. Rare ultramafic tuffs occur in the Canyon section near the gradational contact between the Tsar Creek Formation and overlying Kinbasket Limestone. Thickness of the Tsar Creek Formation varies from 600 to 1,600 meters in the project area.

9. Unit 3 - Kinbasket Formation; mainly finely banded white and grey micritic limestone with minor black graphitic clastic limestone and rare ultra-mafic tuff lenses.

All contacts except the Tsar Creek-Kinbasket are sharp but interformational lateral facies changes are common between the lithologies present.

STRUCTURE

Regionally, the rocks of the area lie on the western limb of the Porcupine Creek Anticlinorium, (Craw, 1976), a broad structure with no local parasitic structures.

Second phase steplike or near isoclinal folds are macroscopic and ubiquitous within the series of westerly dipping thrust homoclines on and adjacent to the property. Folds are concentric with minor hinge thicknening of incompetent units.

Pervasive F_1 mineral cleavage, folded around second phase fold axes, is a result of burial metamorphism.

Phase two cleavage resulted from recrystallization of muscovite and chlorite parallel to the phase two axial planes.

The two phases of folding are nearly coaxial with a trend of 305 degrees and plunge of 10 degrees.

Homoclinal thrusts sheet resulted from the progression of the same stress condition that gave rise to F_1 and F_2 folds. All observed fold vergences were consistant with the geologic and structural interpretation.

SULPHIDE MINERALIZATION

Canyon Zone - At minimum lake level this showing constitutes a 10 meter bed of massive pyrite with disseminated sphalerite and galena. A two meter thick siliceous bed with disseminated pyrite-sphalerite-galena overlies the pyrite. Six meters of chocolate weathering manganiferous dolomite occur in the hanging wall.

Primary sedimentary features observed within the canyon section include bedding, slump features, and soft sediment deformation.

A wedge shaped turbidite splits the dolomite into upper and lower divisions. Lithologies in the canyon section are shaly quartzites, garnet mica schists, carbonates, with minor chert and thin ultramafic tuff units.

All units including the sulphide bed thicken rapidly downdip. Pb-Zn grades approximate 8% combined, with 2 oz/ton Ag.

Road Zone - Two known showings 3.5 kilometers north of the canyon occur at the same stratigraphic level as the Canyon Zone Massive Sulphide. The upper showing consists of fine grained sphalerite and galena in manganiferous chocolate weathering dolomite stratigraphically correlated with Canyon Zone hanging wall. Mineralization is exposed on a dip slope with an extent of 300 meters x 150 meters x 2 meters. Massive chlorite is developed at the base of the upper showing and massive sulphide blebs are associated with silicification in tension cracks. Overall grade is 3% zinc, 1% lead.

The lower showing was discovered in August 1979 on the new Cummins Mountain lookout road. Mineralization consists of disseminated sphalerite-galena in silicified manganiferous dolomite (6 meters thick). Grade has increased to 6% zinc, 2% lead, .8% oz/ton Ag. The mineralization is underlain by a silicified, thinly laminated quartzite and overlain by garnet mica schist.

Tsar Creek - Recently massive pyrrhotite with stockwork quartz veins were located in the Tsar Creek Canyon. Mineralization is 4 meters thick and roughly conformable with bedding although bedding features are not exhibited. Lithologic units in Tsar Creek are correlatable to those in

the Cummins Canyon and likewise thicken rapidly down-dip. Copper grades are .3%.

Geologic features and setting observed indicate that this occurrence is a classic shale-hosted deposit related to basinal subsidence and subsequent growth fault development. The following features compatible with this conclusion were observed:

1. Pyrite-sphalerite-galena mineralization is strata-form; at the contact between the Upper and Lower Tsar Creek units.

2. Anomalous thickening of Tsar Creek sediments in the showing area and rapid depositional features (turbidites).

3. Mineralized manganiferous chocolate weathering dolomite stratigraphically correlated to massive sulphide is a classic example of proximal-distal relationships.

4. Recognition of a mineralized growth fault structure in Tsar Creek area.

The genesis of mineralization proposed involves the development of growth faults due to oversteepening of unconsolidated and partially consolidated basin slope sediments.

The slump blocks are formed by movement along these growth faults. Rotation of the block results in the formation of sub-basins where metal bearing precipitates may pond.

Metal-rich brines are derived from expulsion of connate water within slump block sediments by compaction. These brines travel laterally until they intersect the growth fault which serves as a channelway to the seawater-sediment interface.

When these anoxic brines circulate and mix with oxygenated sea water colloidal precipitates of metallic hydroxides and sulphides result.

Degens and Ross (1970) propose sulphide deposition by bacterial sulphate reduction at the anaerobic/aerobic interface. Sulphate reducing bacteria, desulphovibrium have been identified in several present day geothermal brine pools. Sato (1972) states that these hydrothermal brines and colloidal precipitates may travel down a very low gradient slope by turbidity current phenomenon and precipitate sulphides many miles from the source.

Manganese-iron rich carbonate precipitates peripheral to the sulphide as a reult of decreased solubility with decreased temperature.

PROPOSED EXPLORATION ON MGM CLAIM GROUP

Conclusions - In light of its present interpretation as a shale-hosted massive sulphide with known showings over a strike length of 12 km further evaluation for economic possibilities is warranted.

From the geologic features observed, it appears that both the Canyon and Road Zone are peripheral to a large subbasin, although the Canyon zone is more proximal to the hydrothermal source. It is very likely that one or more

local depressions at the time of formation hosted a thick accumulation of bedded sulphide colliods. The wedge-shaped nature of units in the Cummins Canyon and Tsar Creek sections indicate a steep-sided tectonically derived sub-basin.

Sulphides in the Canyon zone thicken rapidly in a down-dip direction. If this rate of thicknening continues down-dip a major sulphide body will exist.

Stockwork mineralization of pyrhhotite-chalcopyrite (.3% Cu) located in Tsar Creek Canyon is likely the growth fault which acted as a channelway for ore forming solutions.

Geochemical conditions within the conduit allowed pyrhhrotite to precipitate but not sphalerite or galena. This is common in other shale-hosted deposits around the world.

Recommendations - Favourable target areas delineated by the 1981 mapping project should be tested by E-M geophysics.

Areas targeted by the mapping are the region between the Road Zone and Canyon Zone and its "on strike" extension south to Tsar Creek.

Drilling would be contingent upon the delineation of significant geophysics targets.

ESTIMATED EXPENDITURES

Line Cutting (40 km)		$16,000
Geophysics (E-M)		50,000
Transportation:	Barge from Redrock Harbour/ Cummins Road/ Evans Camp	1,000
	Truck (1 month)	800
	Boat and motor	1,200
TOTAL		$69,000

TABLE 1

SOME 'SHARE'- HOSTED AND POSSIBLE
'SHALE'- HOSTED SULPHIDE DEPOSITS

Deposit	m tons	Grade	Dimensions
McArthur River (Australia)	200	10% Zn, 4% Pb, 0.2% Cu, 1.5 oz/t Ag	1.5 Km^2 x 55 m thick
Sullivan (B.C.)	170	6.2% Pb, 6.0% Zn, 1.66 ox/ton ag	2.5 Km^2 x up to 25 m thick
Howards Pass (Yukon)	100	4% Zn + Pb	Individual bodies 25 Km^2 x up to 60 m thick
Cirque (B.C.)	33	10% Pb + Zn	
Meggan (Germany)	66	10% Zn, 1.3% Pb, Cu, 3 oz/ton Ag, .05 oz/t Au, 22% $BaSO_4$	
Tom	9	8.6% Pb, 8.4% Zn, 2.8 oz/t Ag, 25-30% $BaSO_4$	West Zone - 1200 m x 10 m East Zone - 162 m x 3-2, steeply dipping
Mt. Isa (Australia)	100	7.8% Pb, 6% Zn, 4 oz/t Ag, 3% Cu - South Zone	4 Km x 1.4 Km (max) 1-50 m thick
Hilton (Australia)	35	7.7% Pb, 9.6% Zn, 3.6% oz/t Ag	Steeply dipping
Broken Hill (Australia)	200	12% Pb, 12% Zn, 3.3 oz/t Ag	Steeply dipping

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Simony, P.S., 1978. Preliminary Report, unpublished.

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Fyles, J.T., 1960. Geological reconnaissance of the Columbia River between Bluewater Creek and Mica Creek, British Columbia Minister of Mines Annual Report, 1959, pp. 90-105.

Degens, Egor T. and Ross, David A., 1970. "The Red Sea Brines" in Scientific American, April, 1970, pp. 32-42.

Sato, Takeo, 1972. The Kuroko and Associated Deposits of Japan; A Review of Their Features and Metallagenesis, Economic Geology, V.69, pp. 1215-1236.

Expenditures (1981)

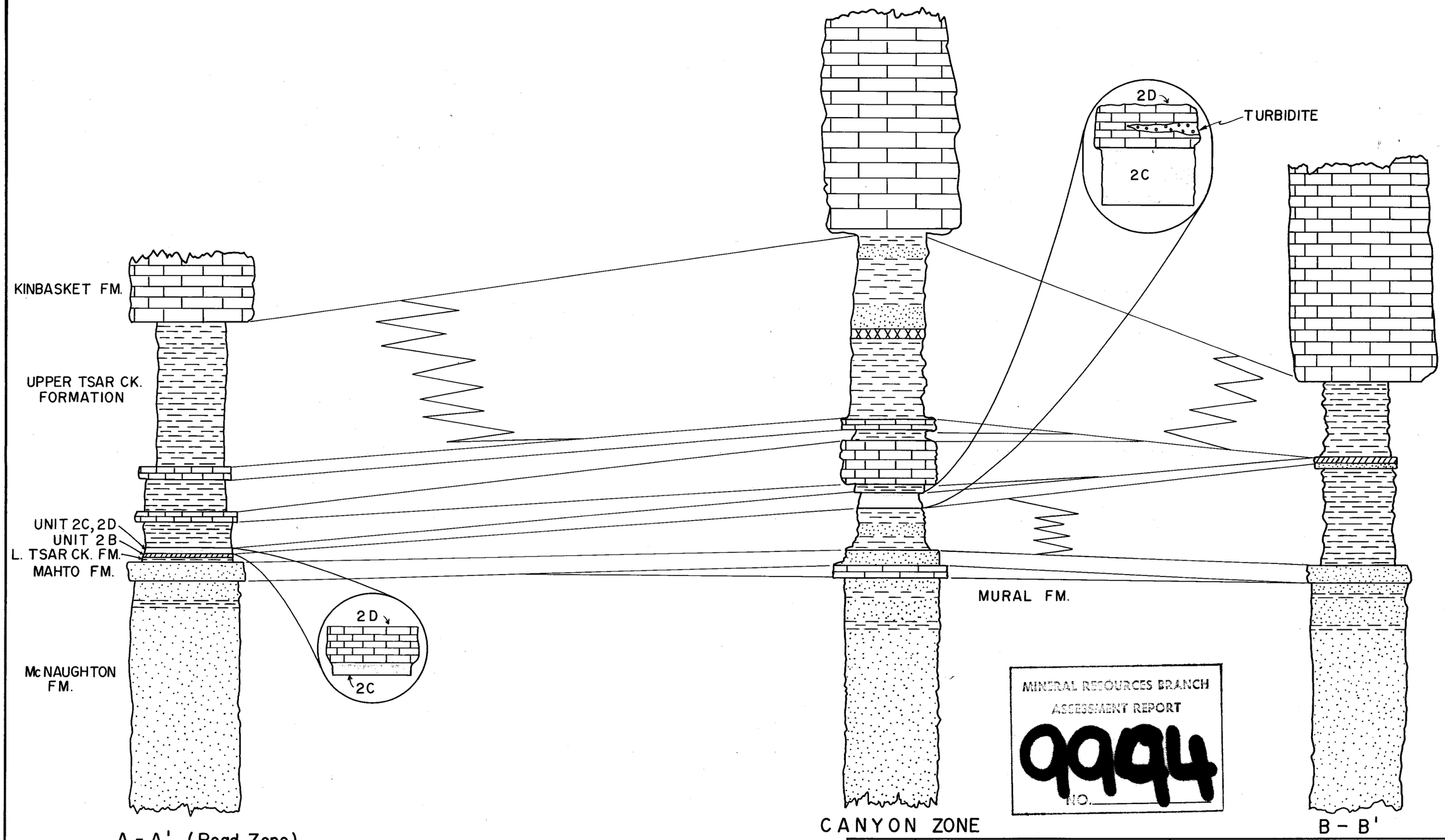
Consulting geologist	40 days at $150/day	$6000
Assistant geologist	30 days at $75/day	$2250
Base map		$1500
Draughting and report preparation on Micom		$1200
Truck (lease,gas,maintenance) 1 month		$ 800
Boat and motor (lease,gas,maintenance)		$ 500
Helicopter	6 hours at $435/hr.	$2610
Room and board		$ 800
TOTAL		$15,660

Declaration

I, JOHN MICHAEL LEASK hereby certify that

1. I am a graduate geological engineer (University of British Columbia,1980)
2. I have been involved in various aspects of mineral exploration for the past five years.
3. I reside at 507-14th Ave. South Cranbrook, B.C.

John M. Leask



E & B EXPLORATIONS INC.
VANCOUVER CANADA

WOODRIVER PROJECT

SCHEMATIC SECTIONS

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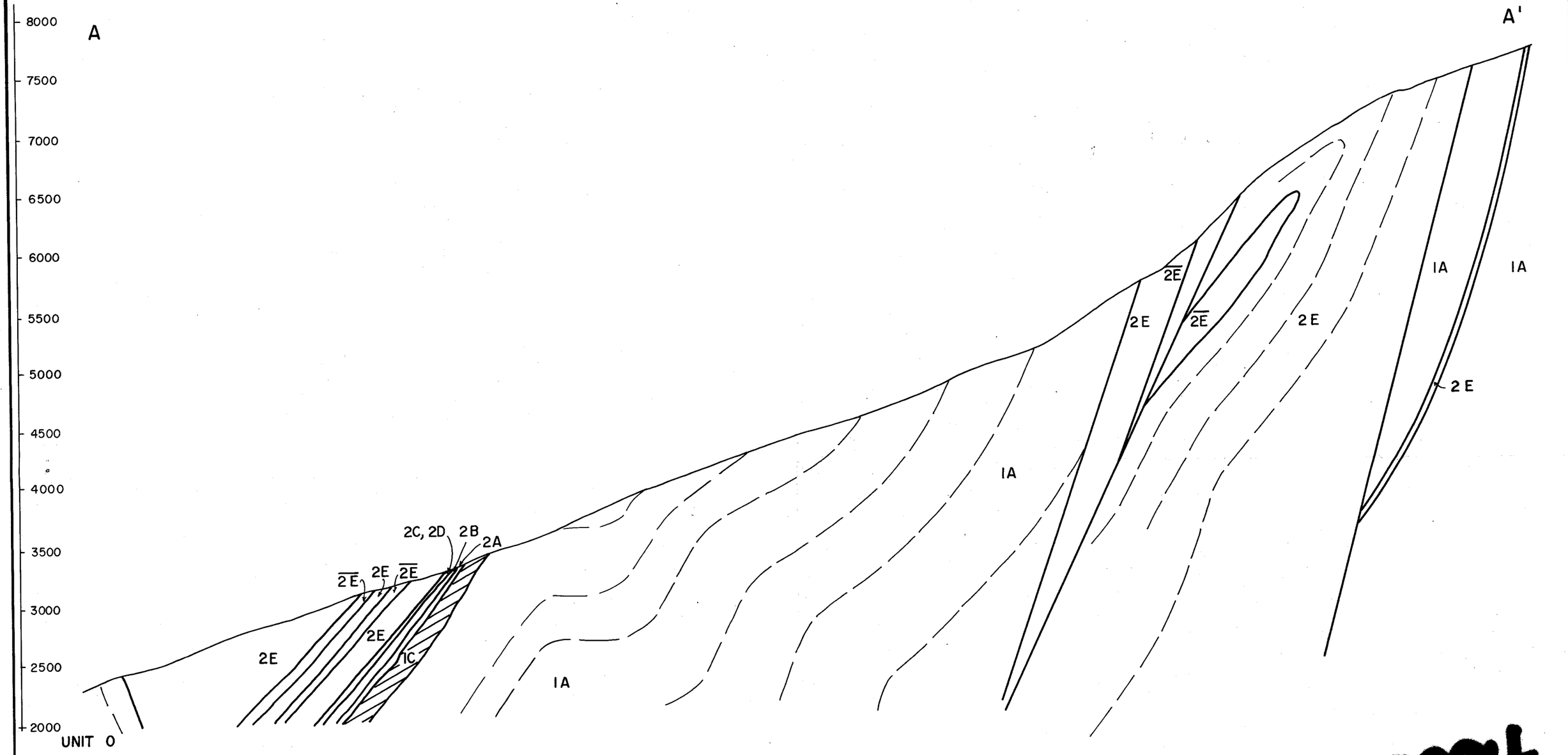

E&B EXPLORATIONS INC. VANCOUVER CANADA			WOODRIVER PROJECT		
			SECTION A-A' Looking N W		
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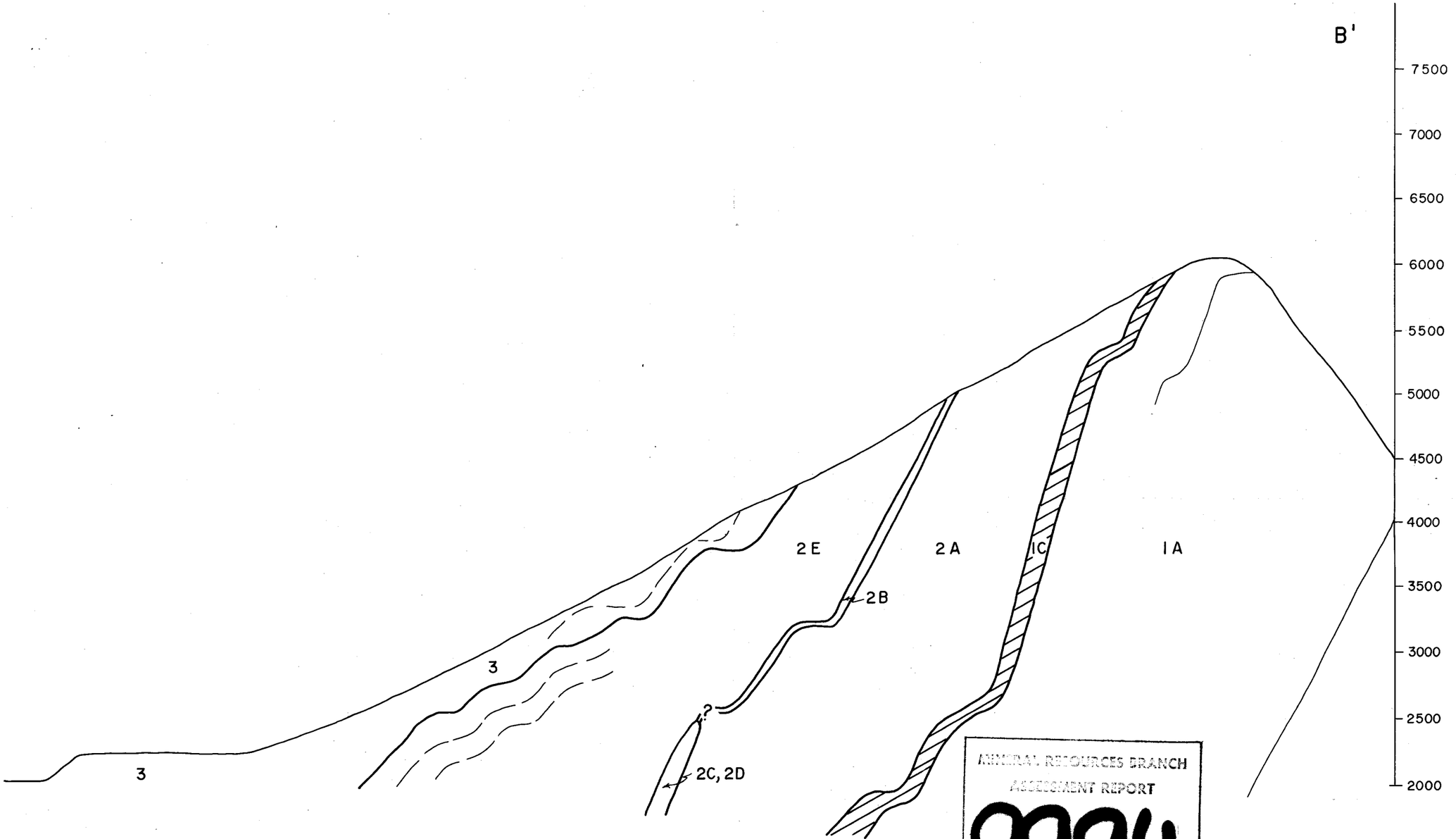
B

B'



E & B EXPLORATIONS INC. VANCOUVER CANADA			WOODRIVER PROJECT		
			SECTION B-B' Looking N W		
DATE	OFFICE	DEPARTMENT	MAP INDEX NO.	SCALE	DRAWING NO.
10/14/81	-			~~No~~ Scale 1:10,000	

LEGEND

KINBASKET FORMATION
M. CAMBRIAN

3	KINBASKET FORMATION, MAINLY FINELY BANDED WHITE AND GRAY MICRITIC LIMESTONE WITH MINOR BLACK GRAPHITIC CLASTIC LIMESTONE AND RARE ULTRA-MAFIC TUFF LENSES (1000 Meters +)

TSAR CREEK FORMATION
M. CAMBRIAN

2E	UPPER TSAR CREEK FM., THINLY BEDDED SHALY QUARTZITES, MICA SCHIST WITH INTERBEDDED GARNET MICA SCHIST 2E MASSIVE BEDDED GRAY AND CREAMY MICRITIC LIMESTONE, AND MINOR CHERT RARE ULTRAMAFIC TUFFS OCCUR NEAR THE GRADATIONAL CONTACT WITH THE KINBASKET FM. (300 - 700 Meters)
2D	CHOCOLATE WEATHERING MANGANIFEROUS DOLOMITE WITH DISSEMINATIONS AND BLOBS OF PYRITE, SPHALERITE, AND GALENA. QUARTZ FILLED TENSION CRACKS ARE COMMON. (6 Meters)
2C	SILICIFICATION WITH DISSEMINATED AND MASSIVE SULPHIDES, PYRITE > SPHALERITE > GALENA PORPHYROBLASTIC TEXTURES ARE COMMON (1 - 10 Meters)
2B	INTENSELY SILICIFIED, FINELY LAMINATED SEDIMENT WITH MINOR PINK QUARTZITE (5 Meters)
2A	LOWER TSAR CREEK FM, BLACK, THINLY BEDDED, CLASTIC ARGILLITE WITH RARE PELITE AND THINLY BEDDED QUARTZITE. MINOR POORLY SORTED PELITIC SEDIMENTS (GARNET MICASCHIST) 0 - 600 Meters.

GOG GROUP
LOWER CAMBRIAN

IC	MURAL FM., CHARACTERISTICALLY A MEDIUM TO THINLY BEDDED PINK QUARTZITE WITH PELITE INTERBEDS (50 Meters)
IB	MAHTO FM, A MEDIUM BEDDED CREAMY COLOURED SPARRY LIMESTONE (0 - 30 Meters)
IA	Mc NAUGHTON FM., MEDIUM TO MASSIVE BEDDED CLEAR QUARTZITE WITH MINOR PELITE (GARNET MICA SCHIST) INTERBEDS NEAR THE TOP (600 Meters +)

WINDERMERE SUPERGROUP
PROTEROZOIC

O	PELITE DIVISION, MICA SCHIST, GARNET MICA SCHIST WITH MINOR CALCAREOUS SANDSTONE.

SYMBOLS

- ATTITUDE OF BEDDING
- ATTITUDE OF CLEAVAGE
- MINOR FOLD AXES
- FAULT (KNOWN, APPROX. INFERRED)
- GEOLOGIC CONTACT (KNOWN, APPROX., INFERRED)
- (H) HELIPORT
- THRUST FAULT
- OUTCROP

MAP SCALE
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METERS
NTS 83 D

REVISIONS	No.	Date	MADE BY	DESCRIPTION
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	2			
	3			
	4			
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DATE	DRAWN BY	CHECKED	APPROVED
APRIL 1981	J.V.V.		

E & B Explorations Inc.

OFFICE	DEPARTMENT

WOOD RIVER PROJECT

GEOLOGICAL PLAN

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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