

87-570-16243

GEOLOGICAL REPORT

SULLIVAN TWO M.C.

Rec. # 3784 (7)
20 Units.

Creston Area, B.C.

NELSON M.D.

NTS 82 - F - 2E

Lat. N 49° 03' 02" 48"
Long. W 116° 37' 30"

Owners : Orion Resources Ltd.
and Francis B. Whiting.

Operator: Orion Resources Ltd.
Consultant: John M. Leask

Author : Dr. F.B. Whiting, P.Eng.

Date of Report: July 15, 1987.

Date Submitted: September 18, 1987.

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

16,243

SUB-RECORDER
RECEIVED

SEP 18 1987

M.R. # \$
VANCOUVER, B.C.

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A. INTRODUCTIONLocation & Access:

The SULLIVAN TWO M.C. is situated 10 km southwest of Creston, B.C. on the eastern slopes of Mt. Rykert, in the Nelson Mining Division. Access to the claim, which is Record # 3784 (7), of 20 units, 5N x 4E, is by Highway # 3 west from Creston, thence south by the West Creston Road and west up the Dodge Creek Forestry Access Road for 16 km to the claim.

The topography is mountainous with slopes up to 30°. The claim covers the headwaters of Urmston Creek, with elevations from 750m to 1650 m above sea level. The claim was timbered but part was burned over in the late 1920s and the upper portion was logged in 1980 - 84. The second growth and remaining timber is spruce and pine with thick alders in the old burn. Overburden is thin on the upper slopes and possibly deep lower in the valley. Outcrops are scarce, consisting mainly of cuts made by the logging roads, with some cliffs in the NW corner of the claim.

The region is on the edge of the Interior Wet Belt with annual precipitation of some 60 cm. Snowpack in winter rarely exceeds 2 m. Temperatures range from -40 ° C in winter to + 30° in summer.

Figure 1 is an Index Map. Figure 2 is the Claim Map.

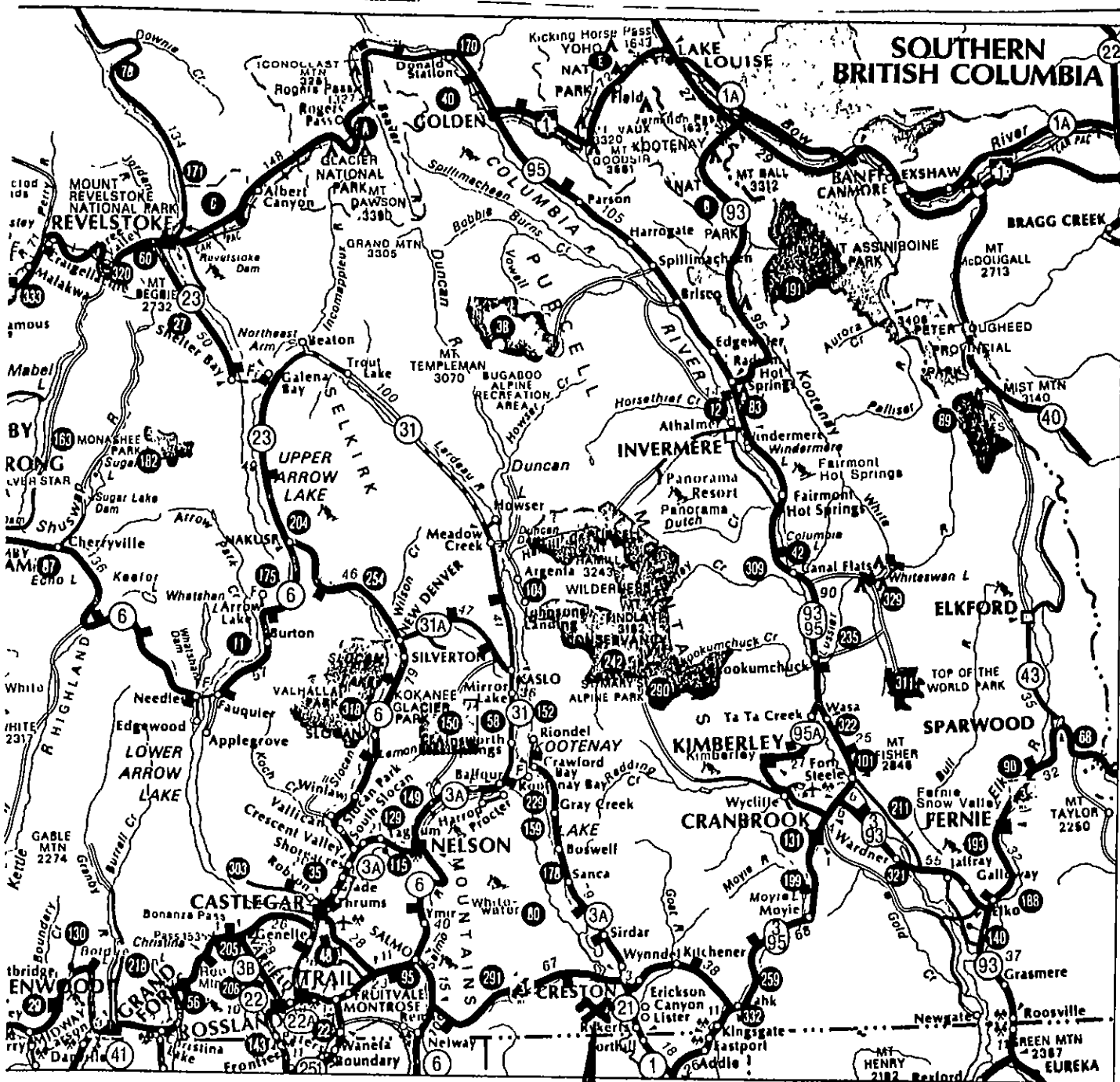
Property & History:

The Sullivan Two M.C. has Record # 3784 (7). It is of 20 units, 5N x 4E and was recorded July 11, 1984 in the name of Francis B. Whiting. By a Bill of Sale recorded June 17, 1985 a 50 % interest in the claim was transferred to Orion Resources Ltd. of # 200 - 675 West Hastings St., Vancouver, B.C. which is the " Operator " as concerns this Assessment Report.

The claim covers the drainage basin of Urmston Creek (formerly Long Creek) in which large quantities of " milling grade lead ore " float were found in 1929, according to B.C. M.M. Annual Report , 1929, page C360. The Dodge #1 - # 4 M.Cs. were staked by Cominco on the south, southwest, west and north; field work there by Cominco in 1986 discovered a showing of bedded zinc-lead mineralization which was followed to the west boundary of the Sullivan Two claim. The last exposure just west of the claim boundary carries visible galena, and the mineralized formation dips east into the Sullivan Two ground. The potential of the property is for the occurrence of a bed of mixed galena-sphalerite with significant silver content lying at shallow depth and underlying an area of perhaps one square kilometer.

Work Done:

A mapping and soil sampling program was carried out in 1985 by Orion Resources Ltd. and F.B. Whiting, which found anomalous amounts of lead, zinc and silver in the central part of the claim. In 1987 a mapping and gridding program was carried out by a geological team headed by John M. Leask, geological engineer, under the supervision of Dr. F.B. Whiting, P.Eng.



SULLIVAN TWO M.C.

Fig. 1.

INDEX MAP

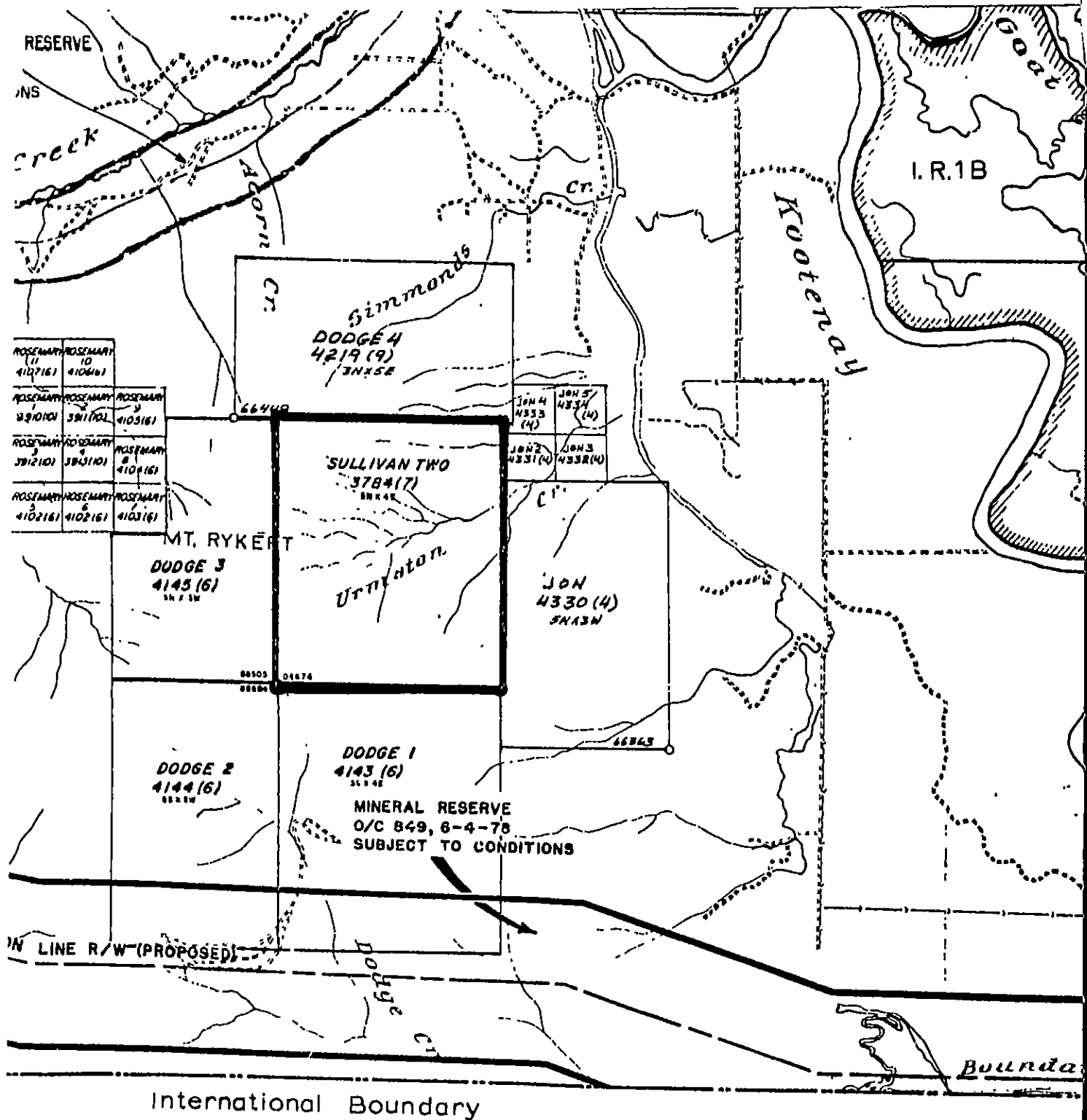
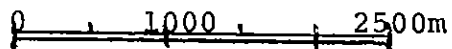


Fig. 2.

CLAIM MAP

NTS 82-F-2E.

Scale: 1: 50,000

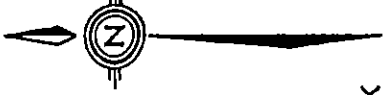
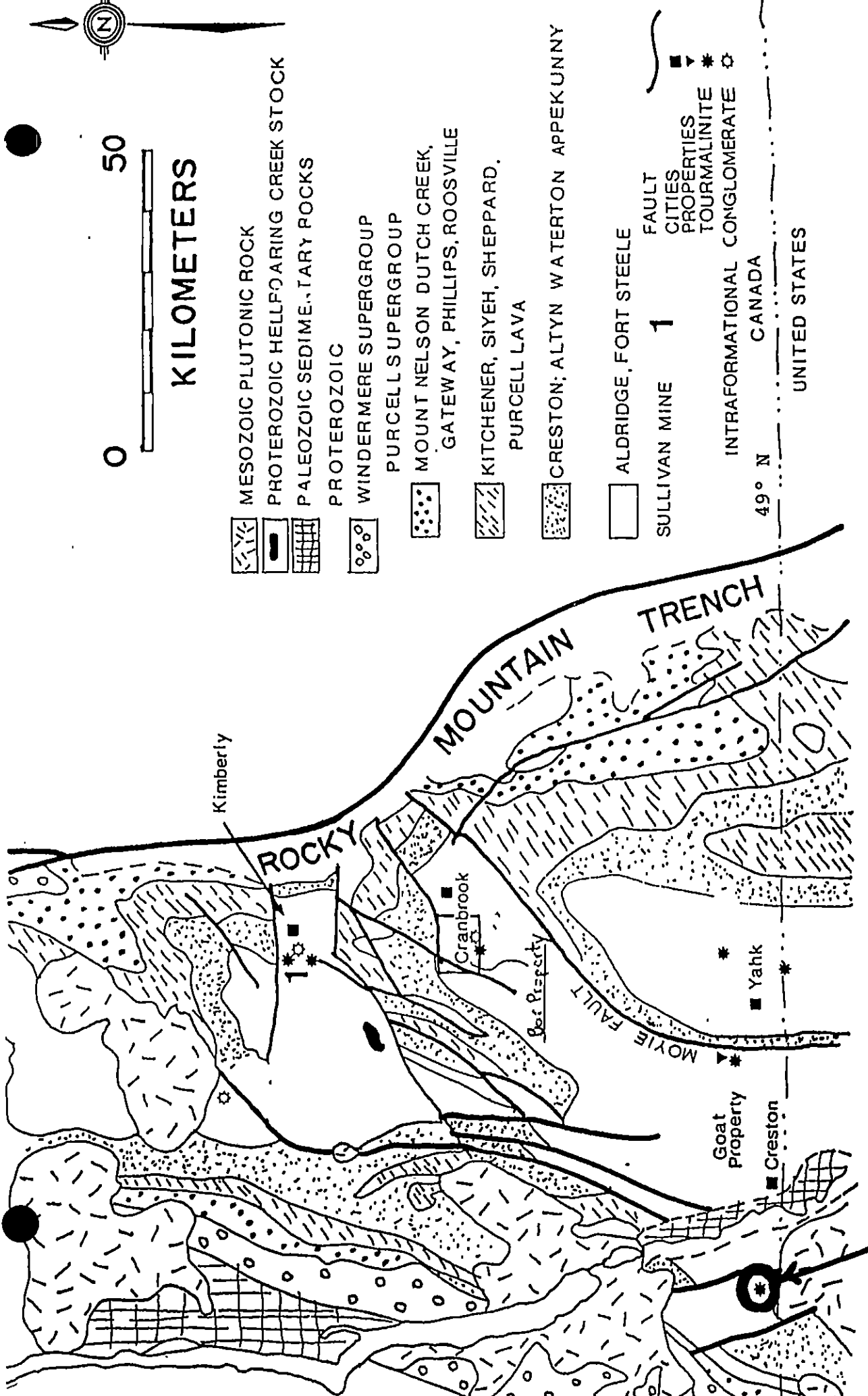


Summary of Work Done:

The work consisted of putting in a surveyed grid, blazed, flagged and picketed, with minor cutting for a total line length of 3250 m. Mapping was done over this grid, as well as on the ridges west of the claim, where natural outcrops exist. Mapping was done by John M. Leask and Gordon P. Leask, both geologists with considerable experience in the Kimberly - Cranbrook - Creston district. The total area mapped amounted to : 30 sq. km. The scale was : 1 : 10,000. See Figure 3 for Regional Geology and Figure 4 for Claim Geology. Figures 5 & 6 are cross-sections.

B. REGIONAL GEOLOGY

Regionally the area is underlain by rocks of the Purcell Supergroup on the western flank of the Purcell Anticlinorium, a broad north-plunging arch in the Helikian- and Hadrinian - age rocks. The oldest rocks exposed in the Purcell Anticlinorium are greenish thin-bedded siltites and quartzites of the Lower Aldridge formation. Overlying the Lower Aldridge is a monotonous section of Middle Aldridge quartz-wackes, subwackes and argillites over 3000 metres thick. Within this section fourteen varved marker horizons exist that can be correlated varve-for-varve over hundreds of kilometers : these represent the only effective stratigraphic control. Several areally-extensive diorite sills are present in the Lower and Middle Aldridge formations. The Middle Aldridge is overlain by the Upper Aldridge, consisting of 300 - 400 m of thin-bedded fissile rusty-weathering argillite/siltite.



KILOMETERS

- MESOZOIC PLUTONIC ROCK
- PROTEROZOIC HELLFOARING CREEK STOCK
- PALEOZOIC SEDIMENTARY ROCKS
- PROTEROZOIC**
- WINDERMERE SUPERGROUP
- PURCELL SUPERGROUP
- MOUNT NELSON DUTCH CREEK, GATEWAY, PHILLIPS, ROOSVILLE
- KITCHENER, SIYEH, SHEPPARD, PURCELL LAVA
- CRESTON; ALTYN WATERTON APEKUNNY
- ALDRIDGE, FORT STEELE
- SULLIVAN MINE
- FAULT
- CITIES
- PROPERTIES
- TOURMALINITE
- CONGLOMERATE

49° N CANADA

UNITED STATES

115° W

116° W

SULLIVAN TWO

REGIONAL GEOLOGY : FIG. 3

Conformably overlying the Upper Aldridge is the Creston Formation, comprising 1800 m of grey, green and maroon cross-bedded and ripple-marked platformal quartzites and mudstones. Above this, the Kitchener-Siyeh Formation, of 1200 - 1600 m of green-grey dolomitic mudstone and buff mudstone are shallow-water sediments, and mark the end of the Lower Purcell time. The upper portion of the Purcell Supergroup consists of the Dutch Creek Formation, 1200 m of dolomitic mudstones, overlain by the Mount Nelson Formation, 1000 m of grey-green and maroon mudstone and calcareous mudstone, which marks the top of the Purcell Supergroup.

The Aldridge Formation hosts the famous Sullivan Mine, an extremely large lead-zinc-silver producer, reported to have yielded 137,000,000 short tons of ore from 1909 to 1986, grading 6.7 % Pb, 5.8 % Zn, and 2.4 oz. Ag /t. The total deposit consists of some 180,000,000 tons. This formation is interpreted as having been deposited in a wide basin, a deep intercratonic trough, analagous to the Guaymas Basin on the west coast of Mexico, as a result of tectonic activity along an ancient crustal spreading center. It is thought that the Sullivan Mine orebody is situated at the junction of a major penecontemporaneous transform fault (the Kimberly Fault) with the oceanic spreading center, a rift zone. Transform faults are generated to relieve stresses in the crust created by the spreading. Within the Aldridge Formation zones of spreading are believed to be marked by albitization (addition of sodium), gabbro feeder dykes, and tourmalinite (produced by alteration by boron / silica - rich fluids of magmatic origin.)

C. PROPERTY GEOLOGY

The general structure of the rock units in the claim consists of an overturned homocline that dips east at -35° . Minor structures indicate that this structural panel is a remnant limb of a large overturned isoclinal fold (all observed fold vergences and cleavage to bedding angles are consistently S-vergence looking north; no closures of major units were indicated). A further phase of deformation resulted in a large gentle open fold which plunges shallowly towards the northeast. This latest deformation results in the observed map pattern. Correlation of varved marker units and graded bedding served to indicate the stratigraphic tops.

Lithologies include thin to massive-bedded grey-weathering quartz-wacke with minor siltstone and argillite of the Middle Aldridge Formation. In the " Bouma " designations these correspond to AE turbidites and are indicative of a rapid depositional environment. A rusty-weathering siltstone/calc-silicate layer and a siltstone-flaser bedded quartzite unit are included. A pair of Moyie meta-gabbro sills in this Middle Aldridge provide rough stratigraphic markers as they are mainly concordant. A belt of intense albitization with tourmalinization accompanied by intraformational conglomerates crosses the claim and is interpreted as marking the location of an early syn-sedimentary growth fault. A laminated varve marker is exposed west of the property which establishes the stratigraphic location at 900 metres above the Sullivan Mine Time Horizon. Rusty-weathering black argillite and thin-bedded siltstone of the Upper Aldridge Formation are presumed to underlie the Middle Aldridge, deduced from outcrop projections on a ridge west of Mt. Rykert.

Regional burial metamorphism increases from northwest to southeast within the claim to garnet-staurolite grade. All lithologies previously described occur as their high grade metamorphic analogues.

Mineralization :

A zone of strata-bound galena-sphalerite mineralization is hosted within the rusty-weathering calc-silicate / siltstone unit. The exposed portion of this zone lies west of the Sullivan Two claim and is marked by float and scarce outcrops. The sulphide zone is associated with pervasive quartz-sericite-talc-chlorite alteration adjacent to a large zone of tourmalinization and albitization. The closest outcrop area to the Sullivan Two claim is approximately 200m west of the western boundary of the claim. By projection of the attitude of the bedding across the sloping topography it is expected that the sub-outcrop of this Pb/Zn bed will cross into the claim at about the mid-point on its western border and then curve eastward down the northern side of the basin of Urmston Creek. This would bring it close to the locality where abundant lead float was reported to have been found in 1929.

A grab sample was taken from the last outcrop; it assayed 6.66 % Pb, 0.02 % Zn, 194.2 grams Ag/m.t. (5.67 oz Ag / short ton). As the beds dip a little more steeply than the slope of the mountain, this mineralized zone should lie as a platter at shallow depth below the surface (100 m \pm) and may exist under an area of about one square kilometer. The thickness is not known.

Modelling :

Recent studies have shown that massive sulphide deposits are forming today at the intersections of crustal spreading rifts and major cross or transform faults. Examples are sites in the Strait of Juan de Fuca, the Gulf of Afar and the Guaymas Basin.

The importance of these intersections in the localization of ore deposits is three-fold :

- 1) The fault intersections cause down-faulting and graben development which create restricted sub-basin troughs that are favorable for collecting thick accumulations of sulphides.
- 2) The transform fault localizes a " hot spot " along the rift and holds it there for sufficient time for a convection system to operate, with hydrothermal effusions coming from depth and bringing large volumes of sulphides into the sub-basin, commonly with the formation of a breccia pipe below the discharge site.
- 3) The rift / cross-fault intersection taps the deep hot magma chamber that is the source of the sulphides.

Typically a spreading center is not a single linear fracture, but rather a zone one to several kilometers wide consisting of half-graben and graben blocks formed by down-drop and rotation. These faults permit the introduction of sodium (albitization) , magnesium (talc) and boron (tourmalinization) , all integral parts of the process of sulphide exhalation.

The Aldridge Basin is the only major rifted sedimentary basin that hosts only a single major deposit known to date. All others recognized, be they ancient or present-day, host two to six large deposits. It is to be expected that more massive sulphide deposits occur somewhere within the Aldridge Basin.

D. CONCLUSIONS AND RECOMMENDATIONS

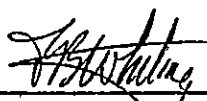
Evidence of Pb/Zn/Ag mineralization within the Sullivan Two M.C. consists of :

- :- the reported discovery in 1926 of lead float in the valley of Urmston Creek
- :- the anomalous soil sampling results obtained by the work done in 1985 by Orion Resources
- :- the finding of a galena-sphalerite bed just west of the claim, dipping into it.

A genetic similarity to the Sullivan Mine is suggested by the presence of alteration types : tourmalization, talc alteration and albitization , within the Aldridge Formation.

The Pb/Zn/Ag bed dips under the surface of the mountain at some 35°, whereas the ground slope is 25 - 30°. The upper portion of the slopes is crossed by recent logging roads, so providing easy access for drill sites.

Prior to drilling, more grid lines should be put in extending east from the present Base Line that runs north from the LCP of the Sullivan Two M.C. Soil sampling should be done on these grid lines on 25-m spacing, and the samples analysed for lead, zinc and silver. The host calc-silicate layer is recessive as it disintegrates on weathering, which should cause granular galena and sphalerite particles to enter the thin soil layer and creep down-slope. Once the position of the bed has been found it should be exposed by bulldozer or back-hoe trenching and followed down across the valley. A large-loop electromagnetic survey could then be carried out to locate the thickest or most massive areas within the platter lying under the surface of the hill. An I.P. or gravity survey could also be considered. Drilling would follow.



F.B. Whiting , P.Eng.

E. ITEMIZED COST STATEMENT

Statement of Expenditures, May 21 - June 20 , 1987.

Wages :

John M. Leask, geological engineer

May 21 - June 1, June 6 & June 20 : 14 days

@ \$ 350.00 / day \$ 4,900.00

Gordon P. Leask, geologist : May 27 - June 7 ,1987

12 days @ \$ 350.00 \$ 4,200.00

Terry L. Eldridge : Line-cutter :

3.25 km @ \$ 500 / km \$ 1,625.00

Warren Bayck : Line-cutter:

3.25 km @ \$ 500 / km \$ 1,625.00

Equipment, vehicle, accommodation:

Truck rental, 12 days @ \$ 50 / day \$ 600.00

Accommodation at trailer park \$ 100.00

Gasoline \$ 186.43

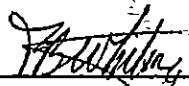
Food supplies \$ 497.82

Map blow-up \$ 100.00

Miscellaneous field supplies, flagging, pickets \$ 36.60

 TOTAL. . . . \$ 13870.85

Certified Correct:



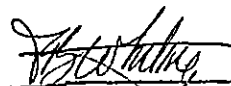
 F.B. Whiting, P.Eng.

F. STATEMENT OF QUALIFICATIONS

I , Francis Beaumont Whiting, of 5284 - 245 A St., Aldergrove, B.C. hereby certify that :

1. I am a graduate of the University of British Columbia in Geological Engineering (1946) ; I received the degree of Master of Science in Geology from McGill University (1948) ; and the degree of Ph.D. in Geology and Economics from M.I.T. (1951).
2. I have practised my profession as a geologist since 1946 as mine geologist for Hedley Mascot Gold Mines, New Jersey Zinc Explorations and St. Joseph Lead Co., then as Exploration Manager for Cia. Minera Aguilar S.A. and later as General Manager of Arrow Inter-America Corp., later as Regional Manager for Brascan Resources Ltd. to 1976.
3. Since 1977 I have been a consulting geological engineer with my company " Whiting Mining Services International Ltd. "
4. I personally supervised the work done by the Leask field party on the Sullivan Two M.C. in May - June, 1987.
5. I am a member in good standing of the Association of Professional Engineers of B.C. in Geological Engineering.

Respectfully submitted,



F.B. Whiting P.Eng

Bondar-Clegg & Company Ltd.
1301 P on Ave
Nanaimo, B.C.
Canada JP2R3
Phone: (604) 985-0681
Telex: 04-352667



Certificate
of Analysis

REPORT: 627-4060

PROJECT: NONE GIVEN

PAGE 1

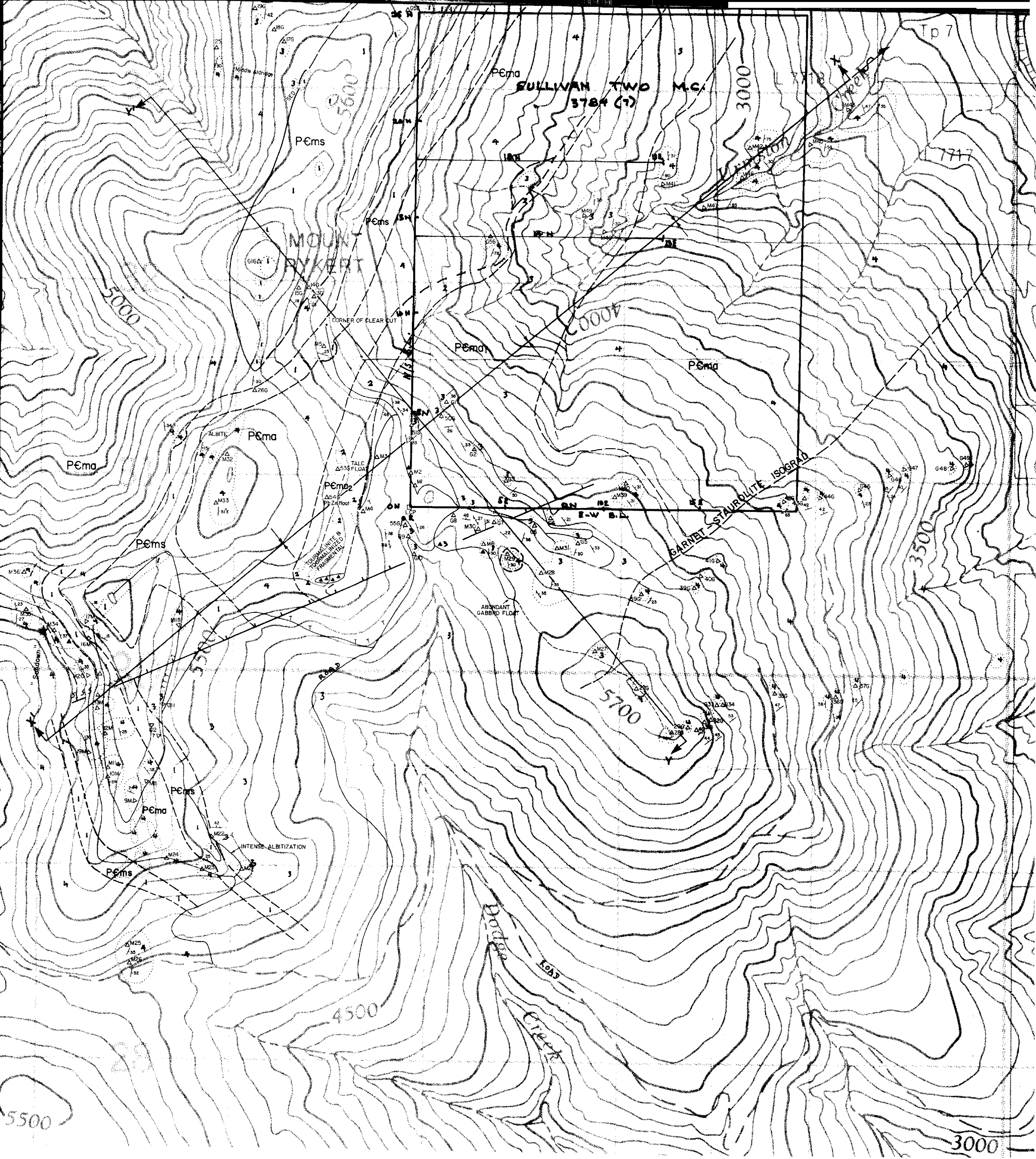
SAMPLE NUMBER	ELEMENT UNITS	Ag Gmt	Pb PCT	Zn PCT
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X2 450457		194.2	6.66	0.02
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SULLIVAN TMD

REFERENCES:

1. Property Report by John M. Leask, 1987.
2. Assessment Report by F.B. Whiting, 1985.
3. B.C.M.M.A.R. 1929, p.360.



LEGEND

- PЄma⁴ Medium to massive bedded grey weathering quartz wacke with minor interbeds of thinly laminated siltite & argillite.
- PЄma³ Flaser bedded quartzite siltstone division. Medium to thickly bedded cream weathering cross bedded siltites with interbedded quartzite.
- PЄma² Calcisilicate siltstone division. Abundant magnesium silicate alteration minerals ranging from talcose to calcisilicate, this unit hosts mineralization.
- PЄms¹ Medium to coarse grained gabbroic sills, generally concordant with bedding.

SYMBOLS

- Proposed Graben Flank
- Tourmalinite (in place)
- Tourmalinite Float
- Strike/Dip
- Schistosity
- Geologic Contact (inferred, known)
- Stratigraphic Marker
- Outcrop
- Roads
- Claim Boundary (SULLIVAN II)

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

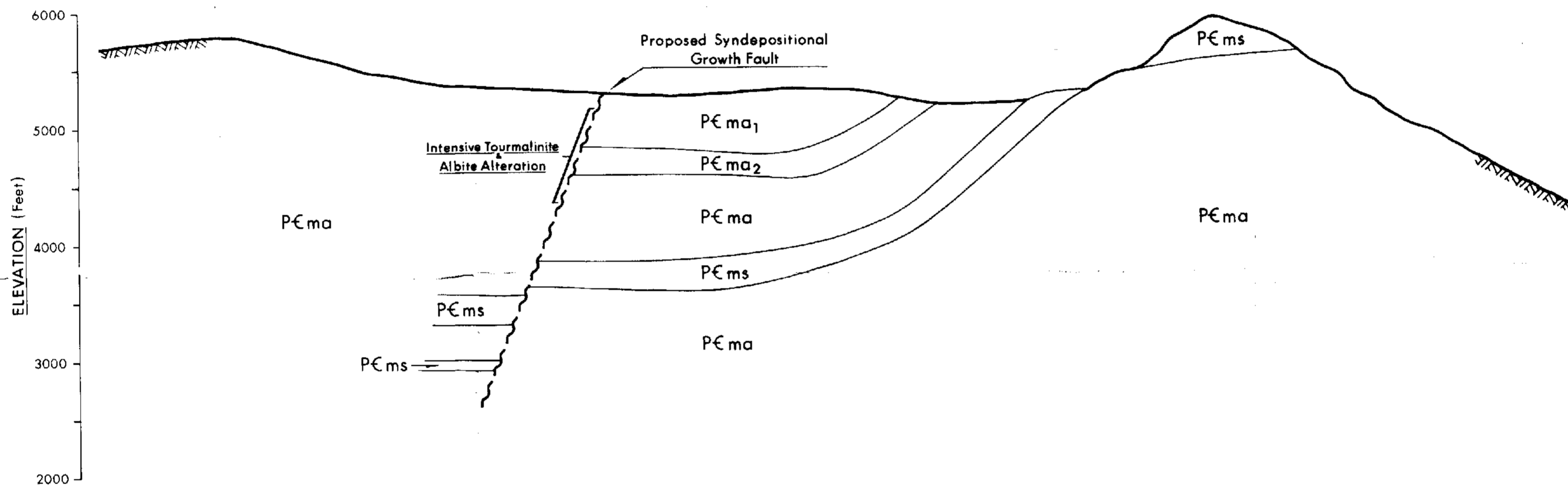
16,243



REVISED	SULLIVAN II PROPERTY	
	GEOLOGY	
	Contour interval 100'	
PROJ. No.	SURVEY BY: J. LEASK	DATE: SEPT, 1987
N.T.S.	DRAWN BY: LGC	SCALE: 1:10,000
DWG. No.	4 ORION RESOURCES LTD.	

Y—

—Y'

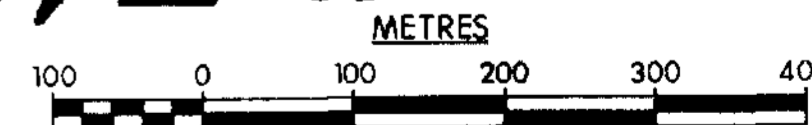


LEGEND

- PЄma Medium to massive bedded grey weathering quartz wacke with minor interbeds of thinly laminated siltite & argillite.
- PЄma₁ Flaser bedded quartzite siltstone division. Medium to thickly bedded cream weathering cross bedded siltites with interbedded quartzite.
- PЄma₂ Calcsilicate siltstone division. Abundant magnesium silicate alteration minerals ranging from talcose to calcsilicate, this unit hosts mineralization.
- PЄms Medium to coarse grained grabbroic sills, generally concordant with bedding.

GEOLOGICAL BRANCH ASSESSMENT REPORT

16,243

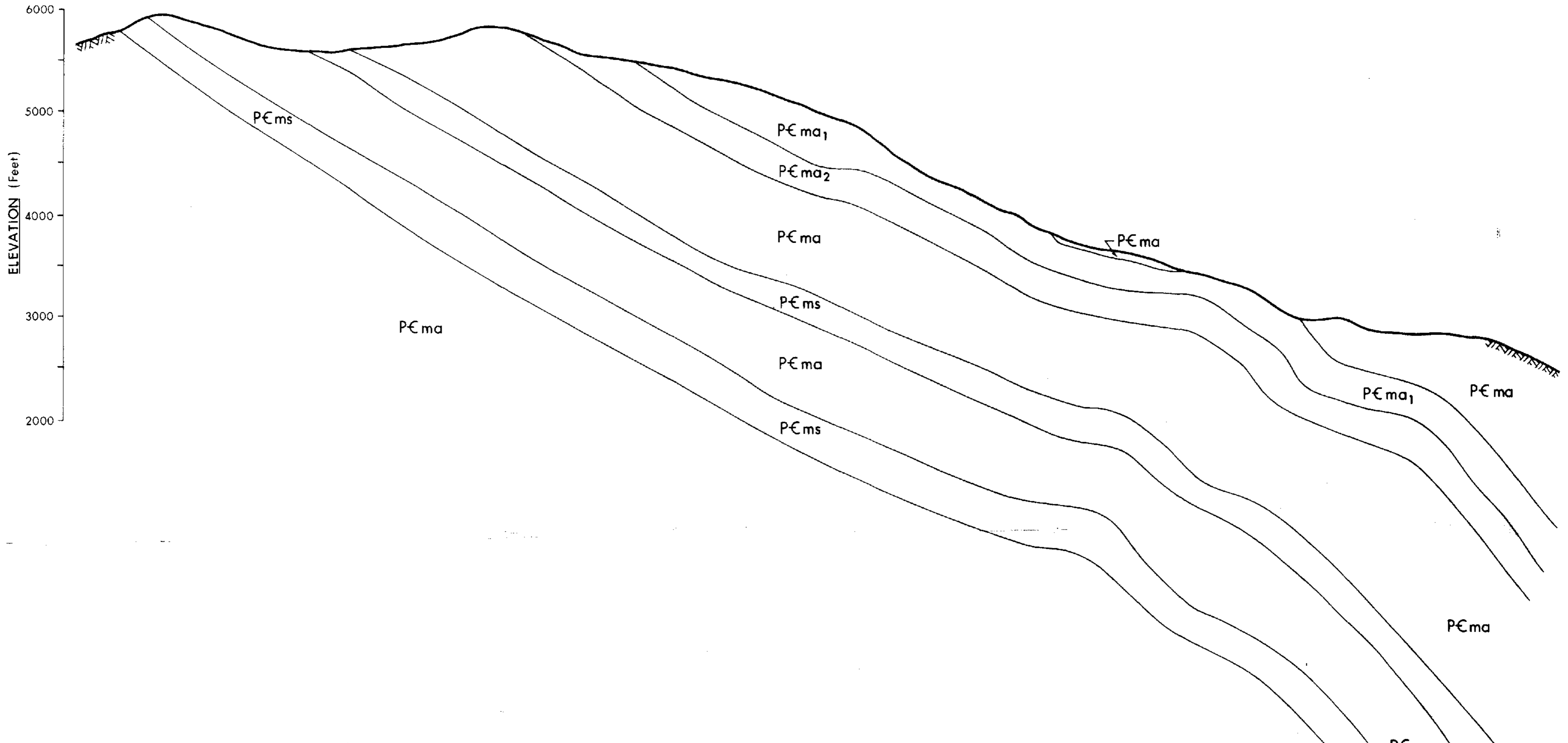


REVISED	SULLIVAN II PROPERTY	
	SECTION Y-Y' (LOOKING SOUTHWEST)	
	Az. 232°	
PROJ. No.	SURVEY BY: J. Leask	DATE: July/87
N.T.S. 82F/2	DRAWN BY: [Signature]	SCALE: 1:10,000 H. & V.
DWG. No. 6	ORION RESOURCES LTD.	
	OFFICE: Vancouver	

[Handwritten signature]
 J. Leask
 July 1987

X—

—X'

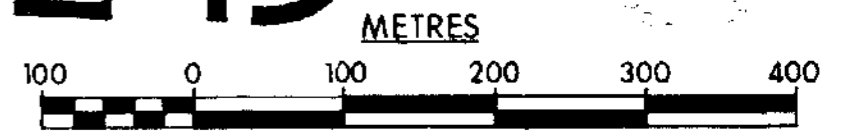


LEGEND

- PЄma** Medium to massive bedded grey weathering quartz wacke with minor interbeds of thinly laminated siltite & argillite.
- PЄma₁** Flaser bedded quartzite siltstone division. Medium to thickly bedded cream weathering cross bedded siltites with interbedded quartzite.
- PЄma₂** Calcsilicate siltstone division. Abundant magnesium silicate alteration minerals ranging from talcose to calcsilicate, this unit hosts mineralization.
- PЄms** Medium to coarse grained gabbroic sills, generally concordant with bedding.

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

16,243



REVISED	SULLIVAN II PROPERTY	
	SECTION X-X' (LOOKING NORTHWEST)	
	Az. 318°	
PROJ. No.	SURVEY BY: J. Leask	DATE: July/87
N.T.S. 82F/2	DRAWN BY: [Signature]	SCALE: 1:10,000 H. & V.
DWG. No.	ORION RESOURCES LTD.	
5	OFFICE: VANCOUVER	