

ARIS SUMMARY SHEET

District Geologist, Smithers

Off Confidential: 89.11.24

ASSESSMENT REPORT 18428

MINING DIVISION: Atlin

PROPERTY: Big Bull
LOCATION: LAT 58 40 00 LONG 133 33 00
UTM 08 6503635 584108
NTS 104K12E
CLAIM(S): Bull, Co, Webb
OPERATOR(S): Cominco
AUTHOR(S): Muraro, T.W.
REPORT YEAR: 1989, 13 Pages
COMMODITIES
SEARCHED FOR: Gold, Silver, Copper, Lead, Zinc
KEYWORDS: Pennsylvanian-Permian, Mount Eaton Group, Andesite, Pyroclastics
Felsic, Sulphide lenses, Pyrite, Barite, Chalcopyrite, Sphalerite
Galena
WORK
DONE: Geological
GEOL 150.0 ha
Map(s) - 2; Scale(s) - 1:50 000, 1:5000
RELATED
REPORTS: 11361, 16983
MINFILE: 104K 008

LOG NO: 0814	RD. 7
ACTION: Date received report back from amendments. 13 p.	
FILE NO:	

LOG NO: 0222	RD.
ACTION:	
FILE NO:	

COMINCO LTD.

EXPLORATION

NTS: 104K/12E

WESTERN CANADA

24 JANUARY 1989

BIG BULL PROPERTY

YEAR END ASSESSMENT REPORT

GEOLOGICAL SURVEY

ATLIN MINING DIVISION

LATITUDE: 58° 40'N; LONGITUDE: 133° 33'W

PERIOD OF WORK

SUB-RECORDER RECEIVED FEB 17 1989 M.R. # \$ VANCOUVER, B.C.

JULY 4 TO JULY 24, 1988

FILMED

JANUARY 1989

T.W. MURARO

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

18,428

TABLE OF CONTENTS

I.	INTRODUCTION	1
	1. Location	1
	2. Property Ownership and History	1-3
	3. Summary of 1988 Work	3
II.	GEOLOGY	4
	1. Purpose	4
	2. Regional Geology	4
	3. Local Geology:	
	a) Manville Corner	5
	b) South Bull	6
	c) North Bull	6-7
	d) Northeast Bull	7
III.	SUMMARY AND CONCLUSIONS	7-8
IV.	RECOMMENDATIONS	8
	1. Mapping	8
	2. Geochemistry	8

REFERENCES

- | | |
|-----------------------------------|--|
| Irvine, W.T., 1957 | Tulsequah Chief and Big Bull Mines
Structural Geology of Canadian Ore Deposits
Vol. II |
| Kerr, F.A., 1948 | Taku River map-area British Columbia
Geological Survey Canada, Memoir 248 |
| Nelson, J. & Payne J.G.
1984 | Paleozoic Volcanic Assemblages and
Volcanogenic Massive Sulfide Deposits near
Tulsequah British Columbia
Canadian Journal of Earth Sciences, Volume 2
(pp 379 - 381) |
| Souther, J.G., 1971 | Geology and Mineral Deposits of the Tulsequah
map-area, British Columbia
Geological Survey of Canada, Memoir 362 |
| Payne, J.G. & Sisson J.G.
1988 | Geological Report on the Tulsequah Property
1987 Assessment Report |
| Muraro, T.W., 1988 | Geological Survey of Big Bull Property
1987 Assessment Report |

LIST OF ATTACHMENTS

- | | |
|--|----------|
| Ministry Claim Map (Location) - scale 1:50,000 | Figure 1 |
| Map (Geology and Topography) Big Bull area - scale 1:5,000 | Figure 2 |

- APPENDIX A - Statement of Expenditures
" B - Affidavit
" C - Statement of Qualifications

EXPLORATION
NTS: 104K/12E

COMINCO LTD.

WESTERN CANADA
24 January 1989

BIG BULL PROPERTY
1988 ASSESSMENT REPORT ON
ATLIN MINING DIVISION
LATITUDE: 58° 40'N; LONGITUDE: 133° 33'W

I. INTRODUCTION

This is a report of 1988 geological mapping on the Big Bull volcanogenic massive sulfide property in the Atlin Mining Division.

1. Location

The Big Bull mine site is at river level on the northwest side of the Taku River 4 km due north of its junction with Tulsequah River. Extensive alteration in the walls of the glory hole make the site highly visible from the air.

Access is possible by river boat via Snye Channel from Taku River. A gravel strip on the west bank of Tulsequah River 3.5 km west of the mine site can accommodate DC3 and Buffalo aircraft. By air it is 100 km due north to Atlin and about 70 km southwest to Juneau. The south end of Mt. Manville forms a rugged southerly declining ridge which terminates at the junction of the southwesterly flowing Taku and the southeasterly flowing Tulsequah Rivers. The property covers the western end of the lower south slope of Mt. Manville.

Cedar, hemlock and fir, much of it overmature and decaying, cover the steep slopes up to 400 meter elevations. Undergrowth is predominately alder and devils club.

2. Property Ownership and History

Big Bull mine is on Big Bull Crown Grant claim Lot number 6303. The property owned 100% by Cominco includes six Crown Grants and six located claims. The names of claims and their corresponding Lot numbers and Record numbers are listed below.

CROWN GRANTS

<u>Name</u>	<u>Lot No.</u>
Big Bull	6303
Bull No. 1	6304
Bull No. 5	6306
Bull No. 6	6305
Hugh	6308
Jean	6307

LOCATED CLAIMS

<u>Name</u>	<u>Record No.</u>
Big Bull Extension	37/21
Bruce (Fr.)	303
Bull Nos. 2 to 4	141/32, 142/32, 143/32
Bull No. 8	142
Bull No. 9	179
Webb 1	2766

Recorded history of the property dates from late May and early June of 1929 when the original claims including Big Bull went on record in Atlin as being owned by a partnership of seven residents of Juneau Alaska. A preliminary report (June 28, 1929) by D.C. McKechnie describes several exposures of massive sulfide in the bed of a small southeasterly flowing creek occupying a sharp gulch or ravine on the southeast flank of what is now called Mt. Manville. Fully exposed widths of massive sulfide were reported to range from 6 feet to 25 feet; the longest continuous strike exposure was 150 feet and greatest strike separation of exposures was 450 feet. McKechnie noted that the ravine occupied by the showings extended up the mountainside in a nearly straight line for 3,000 feet.

By October 1929 Alaska Juneau Gold Mining Company had acquired an option to buy 55% interest in the property. Prior to relinquishing their option sometime before August of 1930 this company drove an adit 2,000 feet northwesterly along the trend of the shear zone, completed 9 short crosscuts to examine and sample the shear zone, and drilled 8 surface holes and one underground hole.

In 1944 Leta Exploration did some underground drilling and abandoned the property rather than make the option payment.

Resampling in 1946 by C.M. & S. (Leo Telfer) confirmed results of previous sampling.

In 1946 C.M. & S. (Cominco) negotiated to acquire both the Big Bull and Tulsequah Chief properties.

During 1949 C.M. & S. drilled 12 surface holes totalling 5,469 feet and cut 135 underground samples. D.C. Malcom combined these results with earlier Leta and Alaska Juneau drill hole assays to produce an ore reserve figure in November 1947.

Production began in 1951 and by 1956 following sinking of a new shaft, underground development and stoping up to surface Cominco had mined about 400,000 tons from Big Bull which averaged 0.15 oz. Au/t, 4.5 oz. Ag/t, 1.2% Cu, 1.95 Pb and 7.3% Zn. This ore was trucked 8 km to a leased concentrator on the west side of the Tulsequah River at the site of the Polaris-Taku gold mine.

In 1987 Cominco work produced a plane table map at a scale of 1:1,000 of outcrop geology and topography on a limited area surrounding the Big Bull mine site.

In the writer's opinion the probability of the existence of additional ore on the Big Bull property is sufficiently attractive to warrant additional exploration.

3. Summary of 1988 Work

Chain, compass and altimeter controlled geological mapping by the writer and assistants was done from two fly camps. Atlin-based helicopter set out the camps from the Cominco base camp at Tulsequah Chief mine site 8 kilometers to the north on the east side of Tulsequah River.

One fly camp was on the east side of the Tulsequah River about 1 kilometer north of the bridge site on the old Big Bull-Polaris Taku haul road. The second fly camp was on the dump at the Big Bull mine site.

Mapping was conducted on the Crown Grants Big Bull, Bull No. 1, Bull No. 5 and Bull No. 6 and on located claims Bull No. 4, Webb No. 1 and CO 5.

The objectives of this 1988 mapping were to tie 1987 detail mapping of the Big Bull Mine to the adjoining area to the northeast on Located claim Webb 1 and to the adjoining area to the west and northwest on Located claim CO 5, and to establish if possible some volcanic stratigraphy which might assist in further exploration of this property. The results of this mapping are plotted at 1:5,000 on Figure 2.

Mapping shows the southwestern corner of Mt. Manville, on claim CO 5, is underlain by a comparatively thick sequence of rhyolitic rocks. In general these felsic units strike northerly and dip moderately east. Isolated outcrops show sufficient differences to suggest workable stratigraphy.

It is still unclear as to how this assemblage of felsic flows and pyroclastics relates to the sulfides and felsic rocks at the Big Bull Mine.

II. GEOLOGY

1. Purpose

During the previous (1987) season a detailed 1:1,000 scale geological map of the Big Bull mine area was produced. This allowed a preliminary and limited structural and stratigraphic interpretation in the immediate vicinity of the mined out sulfide lens.

The key to effective exploration on the Big Bull property is a better understanding of the surrounding volcanic stratigraphy and in particular how the Big Bull sulfide lens fits into the stratigraphy.

2. Regional Geology

Kerr (1948) and Souther (1971) have published GSC Memoirs on the geology in vicinity of Taku and Tulsequah Rivers. Both place the Big Bull and nearby deposits Tulsequah Chief and Polaris Taku in the Upper Triassic Stuhini Group. Both Kerr and Souther recognize two main assemblages of volcanic and associated sedimentary rocks within the Stuhini Group. The southwestern assemblage exposed in Tulsequah and Taku River valleys and of primary concern for this report is predominately andesitic and submarine in character.

Nelson and Payne (1984) mapped the Tulsequah-Taku area in 1982 and 1983 and reassigned some of Souther's Upper Triassic Stuhini Group andesitic rocks to a Pennsylvanian-Permian assemblage they called Mount Eaton Group. Big Bull and Tulsequah Chief occur within these reassigned rocks.

In 1987 Payne under contract to Cominco produced a 1:10,000 scale geological map of a six by fifteen kilometer area coinciding with the Cominco claims in the Tulsequah area. Payne identified felsic rocks at

the southwestern extremity of Mt. Manville. In addition Cominco work on the optioned Silver Talon property adjoining CO 3 and CO 5 claims on the west showed felsic rocks in the same area.

3. Local Geology

a) Manville Corner:

The southwestern corner of Mt. Manville (Figure 2) is underlain by a variety of felsic rocks called rhyolites because of their highly siliceous appearance and content of free quartz.

Exposures of these rocks extend from the corner of the mountain for 600 meters eastward above the 200 meter contour. This contour lies at the base of bedrock slope. Massive flows, some coarse lapilli tuffs give way eastward to coarse and fine lithic and crystal tuffs.

Primary layering features are not common but some exposures of massive flows provide good flow banding. Among the flows several are worth noting. A dark grey to dark blue grey variety of rhyolite flow is common in the western exposures. Very finely divided magnetite and/or hematite governs the color of these units which can be at least several tens of meters thick. Examples with good phyrlic quartz and feldspar and in some instances abundant fine leucoxene commonly display good flow banding.

Some quartz-phyric rhyolite is a pale translucent green color. A prominent light colored cliff standing forty metres above the base of slope is composed of a massive white fine grained holocrystalline rhyolite. Smaller outcrops of this unit can be found up the slope to the northwest eighty meters vertically above the base of the cliff. This could be a high level rhyolite intrusive though it does show well developed flow structure. In general, primary layering structures strike north to north-northeast and dip eastward at 35 to 40 degrees.

Course lapilli tuffs interlayered with the flows include units which are crowded with walnut sized elipsoids of white to cream aphanitic siliceous shapes producing a fabric which strikes northerly and dips east.

The finer tuffs which dominate the eastern third of this felsic sequence are generally massive quartz rich lithic and crystal tuffs which in the eastern most exposures may contain 2 to 5 percent fine, disseminated, pyrite.

The sequence of rhyolitic rocks may be as much as 200 meters thick or more and represents an economically important interval of stratigraphy in the region. Grouped as a unit this rhyolite interval appears to dip east and thus would project southeasterly beneath the 120 meter thick morain terrace.

The eastern contact of this rhyolite sequence was not observed. This contact area needs some careful work in the 200 to 300 meter elevation range. Andesite and basaltic andesite exposures extend for 150 meters east of the rhyolite tuffs to a fault mapped by Payne in 1987 as the West Bull Fault.

b) South Bull:

A second area mapped in 1988 lies south of the Big Bull glory hole and west of the southern extension of Big Bull alteration. Mapping in 1987 identified foliated metavolcanic rocks for 100 meters along the haulage road southwest of the Bull loading site.

In 1988 this mapping was extended to the limit of bedrock exposure to the southwest where the road leaves the river. From this point a traverse north northwest up the densely forested ridge carried back to the top of the open pit. An area extending over the lower end of this ridge measuring about 450 meters by 250 meters appears to be underlain by one general rock type. This rock commonly displays abundant closely spaced, parallel, millimeter-wide black to grey lines in swirled and contorted patterns in a light grey to white background matrix. The rock is fine grained but crystalline and commonly produces curved micaceous foliation surfaces on breaking. The protolith may have been a very fine grained impure siliceous sediment which deformed in a non laminar plastic fashion during metamorphism. It seems to represent a higher grade metamorphic mineral assemblage than other rocks near the mine site.

Penetrative fabric where observed seems to persist at N 30°W and steep NE. Relationships to surrounding rocks are not clear. This area may represent an erosional remnant of a faulted block for which we have no apparent explanation. It is possible that the block is a wedge with a zero edge on its northeast side lying on a northwest striking fault with a shallow dip to the southwest. The uphill edge of these metamorphic rocks needs more attention.

c) North Bull

New information northwest of the Bull pit comes from both sides of Bull Creek Fault. The linear creek draw which feeds into the north end of the foundered glory hole area is a fault trace which continues in a north-

westerly line up the east fork of Bull Creek. This fault dips vertical to steeply west and as its surface trace climbs the hillside along the creek bed it gradually truncates the thick interval of pyritic rhyolite which lies east of the mined out sulfide lens. The fault continues into the andesitic rocks which lie to the east of the pyritic rhyolite.

On the southwest side of Bull Creek mixed dark maroon and green andesites form the west side or hangingwall of Bull Creek Fault. These rocks are exposed high up at the mid point of the western edge of the pit where green varieties predominate. The large angular cliff face which occupies the central position at the north end of the pit is a 30 to 40 meter section of grey weathering maroon and minor green lithic tuffs which strike about N40°W and dip steeply SW to vertical. Continuing northwest, mixed maroon and green andesite flows and fine lithic tuffs occupy a 100 meter wide zone along the southwest side of Bull Creek for at least 350 meters.

A strong fault in the north western corner of the pit mapped in 1987 occurs within these andesites and appears to control the zone of alteration along which the early miners drifted searching for ore. Cross cuts and flat holes from this drift failed to locate additional ore.

Additional mapping of the maroon and green andesites on the surface to the northwest is required to determine the stratigraphic relationships of this package to adjoining rock units away from the Bull pit.

d) Northeast Bull

Traverses close to the 200 and 300 meter contours were run northeast of the Bull pit for about 300 m approaching the next large creek to the northeast. Feldspar phyric massive andesite and dacitic andesite flows and massive andesite breccias and flow breccias predominate in this region. A few of the exposures appear to be slightly recrystallized. Further work is necessary to determine a layering attitude which would help clarify the stratigraphic relationship of these rocks to the sulfide - associated rhyolite/dacite. Trenching the contact near the 200 m contour should be considered.

III. SUMMARY AND CONCLUSIONS

The thick rhyolitic rocks at the southwest corner of Mt. Manville appears to have the potential for developing a sulfide deposit. It is important to know if the eastern limit of this rhyolite at the 200 to 300 meter level is conformable or faulted.

Metamorphic rocks south of Bull pit are an anomaly in their apparent limited extent. The margins of this area need careful examination for possible structures.

Less metamorphosed maroon and green andesite flows and tuffs are in contact with both the metamorphic rocks and the Bull ore. These contact relationships need clarification.

The nature and attitude of the northeastern contact of the sulfide-bearing Bull rhyolite/dacite is necessary to the understanding of how this important unit projects northwestward into Mt. Manville.

IV. RECOMMENDATIONS

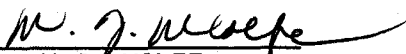
1. Mapping

Mapping in at least four specific areas mentioned above would require about ten days. This might be the limit of effective surface mapping without the creation of new exposure.

2. Trenching

A trial attempt at hand trenching is recommended for one or two locations on the margin of the Bull rhyolite/dacite.

Reported by: 
T.W. MURARO
Consulting Geologist

Approved for
Release by: 
W.J. WOLFE
Manager, Exploration -
Western Canada

APPENDIX "A"

STATEMENT OF EXPENDITURES
JULY 4 - JULY 24, 1988

Salaries		
T.W. Muraro	10 days @ \$488/day	\$ 4,880.00
H. Kang	10 days @ \$210/day	2,100.00
E. Dembiki	20 days @ \$176/day	3,520.00
Transportation		
Fixed Wing		1,000.00
Helicopter		2,347.00
Domocile & Camp Costs		
Equipment		885.00
Food	40 man days @ \$20/day	800.00
		<hr/>
Total		\$15,707.00

APPENDIX "B"

EXPLORATION

WESTERN CANADA

IN THE MATTER OF THE B.C. MINERAL ACT AND
IN THE MATTER OF A GEOLOGICAL MAPPING PROGRAM
CARRIED OUT ON THE BIG BULL PROPERTY
LOCATED IN THE ATLIN MINING DIVISION OF THE PROVINCE OF
BRITISH COLUMBIA - MORE PARTICULARLY N.T.S. 104K/12E

A F F I D A V I T

I, THEODORE W. MURARO OF THE MUNICIPALITY OF WEST VANCOUVER, IN THE PROVINCE OF BRITISH COLUMBIA, MAKE OATH AND SAY:

1. THAT I AM EMPLOYED AS AN IN-HOUSE CONSULTING GEOLOGIST BY COMINCO LTD. AND AS SUCH HAVE A PERSONAL KNOWLEDGE OF THE FACTS TO WHICH I HEREINAFTER DEPOSE:
2. THAT ANNEXED HERETO AND MARKED AS "APPENDIX A" TO THIS MY REPORT IS A TRUE COPY OF EXPENDITURES OF A GEOLOGICAL MAPPING PROGRAM CARRIED OUT ON THE BIG BULL PROPERTY.
3. THAT SAID EXPENDITURES WERE INCURRED FROM THE 4TH DAY OF JULY TO 24TH DAY OF JULY 1988 FOR THE PURPOSE OF MINERAL EXPLORATION ON THE BIG BULL PROPERTY.



T.W. MURARO

APPENDIX "C"

EXPLORATION

WESTERN CANADA

STATEMENT OF QUALIFICATION

I, THEODORE W. MURARO, OF THE MUNICIPALITY OF WEST VANCOUVER, HEREBY CERTIFY:

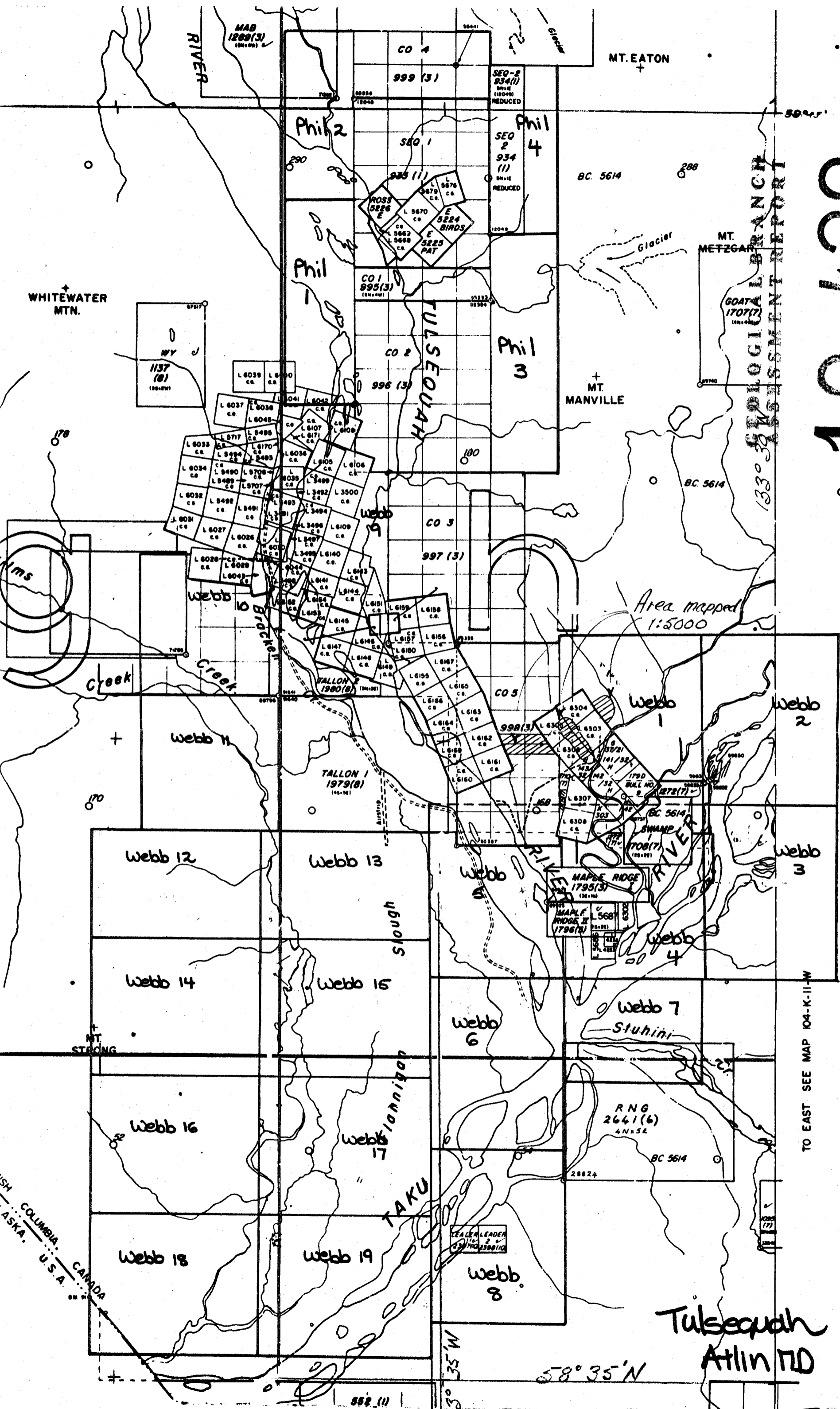
- THAT I AM A GEOLOGICAL ENGINEER RESIDING AT 4438 STONE COURT, WEST VANCOUVER, BRITISH COLUMBIA WITH A BUSINESS ADDRESS AT 2400 - 200 GRANVILLE STREET, VANCOUVER, BRITISH COLUMBIA.
- THAT I GRADUATED WITH BASC DEGREE IN GEOLOGICAL ENGINEERING FROM THE UNIVERSITY OF BRITISH COLUMBIA IN 1956 AND A MSC IN GEOLOGY FROM QUEEN'S UNIVERSITY, KINGSTON, ONTARIO IN 1962.
- THAT I HAVE PRACTISED GEOLOGY WITH COMINCO LTD. FROM 1956 TO PRESENT.
- THAT I AM A REGISTERED MEMBER OF THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF BRITISH COLUMBIA.

DATED THIS "30th" DAY OF JANUARY 1989
AT VANCOUVER, BRITISH COLUMBIA



T.W. MURARO
BASC, MSC, P. ENG.

18,428



GEOLOGICAL BRANCH
ASSESSMENT REPORT

Area mapped
1:5000

LEGEND

CROWN-GRANTED MINERAL CLAIM

REVERTED C.A. MINERAL CLAIM

FORFEITED MINERAL CLAIM

VERIFIED LEGAL CORNER POST

LEGAL SURVEY

LEGAL CORNER POST & TAG NUMBER



TO EAST SEE MAP 104-K-11-W

Tulsequah
Atlin RD

FIG 1

BRITISH COLUMBIA CANADA
ALASKA U.S.A.



LEGEND

<p>1 Rhyolite</p> <p>2 Rhyolite, Lacite</p> <p>3 Andesite, Lacite</p> <p>4 Andesite</p> <p>5 Meta-schists</p> <p>6 Basaltic Andesite</p>	<p>Flows, lapilli, ash tuffs, possible intrusive phases, disseminated magnetite in some flows, minor pyrite in some tuffs.</p> <p>Coarse to fine tuff, calcareous, green to white, fibrous, vesicular, 1-10% disseminated by trace sphaerulite grains.</p> <p>Flow, flows, breccias and tuffs, scattered quartz, calcareous, and 1-10% disseminated by trace sphaerulite grains.</p> <p>3a Similar to but not equivalent to 3.</p> <p>Massive flows and thin lithic tuffs, mixed rhyolite and quartz.</p> <p>Distinct recrystallized appearance, dark grey to grey, thin layers, fine laminated ash tuffs, commonly carbonated.</p> <p>Massive dark grey green flows and lithic tuffs.</p>
--	--

40 Bedding	Geological contact
Foliation	T Tuff
Flow banding	F Flow
Major fault	Intermittent fault

Scale 1:5000

0 500m

