SMITHERS FAME REPORT (E134) 15751

Province of British Columbia | Ministry of Energy, Mines and Petroleum Resources

ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TYPE OF REPORT/SURVEY(S)	TOTAL COST
Geological	$2478680.00

AUTHOR(S) E.D. Titley. SIGNATURE(S)

DATE STATEMENT OF EXPLORATION AND DEVELOPMENT FILED 27 Feb/87 YEAR OF WORK 1986.

PROPERTY NAME(S) Golden Bear

COMMODITIES PRESENT Au

B.C. MINERAL INVENTORY NUMBER(S), IF KNOWN 104K - 79

MINING DIVISION Atlin NTS 104K/1W

LATITUDE 58° 13' LONGITUDE 132° 17'

NAMES and NUMBERS of all mineral tenures in good standing (when work was done) that form the property [Examples: TAX 1-4, FIRE 2 (12 units); PHOENIX (Lot 1706); Mineral Lease M 123; Mining or Certified Mining Lease ML 12 (claims involved)]:

Bear, Totem, Sam 2, Pole

OWNER(S)

(1) Chevron Minerals Ltd. (2)

MAILING ADDRESS

OPERATOR(S) (that is, Company paying for the work)

(1) North American Metals BC Inc (2)

MAILING ADDRESS

SUMMARY GEOLOGY (lithology, age, structure, alteration, mineralization, size, and attitude):

Permian to Upper Triassic limestone, dolomite, tuff and pyroclastics are cut by north-trending faults that control the quartz-carbonate alteration zones and associated gold mineralization. Sub-micron size gold is associated with disseminated and fracture-filling pyrite. Current reserves are 1.2 million tonnes of 11.7g Au/tonne.

REFERENCES TO PREVIOUS WORK

A.R. 10754, 11663, 13112

(over)

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	COST APPORTIONED
GEOLOGICAL (scale, area)			
Ground			
Photo			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for ....)		Bear	
Soil			
Silt			
Rock			
Other			
✓ DRILLING (total metres; number of holes, size)			
Core	DIAD 1890.8, 17 holes, –		
Non-core			
RELATED TECHNICAL			
✓ Sampling/assaying	5843, Au, Ag		
Petrographic			
Mineralogic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY/PHYSICAL			
Legal surveys (scale, area)			
Topographic (scale, area)			
Photogrammetric (scale, area)			
Line/grid (kilometres)			
Road, local access (kilometres)			
Trench (metres)			
Underground (metres)	UNDV. 914.1 m		
		TOTAL COST	2 478 680.00

FOR MINISTRY USE ONLY	NAME OF PAC ACCOUNT	DEBIT	CREDIT	REMARKS:
Value work done (from report) 2 478 680.00				
Value of work approved				
Value claimed (from statement)				
Value credited to PAC account				
Value debited to PAC account				
Accepted EK Date	Rept. No. 15751			Information Class (1)

GOLDEN BEAR PROJECT

1986 GEOLOGICAL REPORT

ON THE

BEAR AND BEAR 1
MINERAL CLAIMS

ATLIN MINING DIVISION

NTS 104K/1 AND 8

Latitude	58° 11' N
Longitude	132° 17' W

ON

CLAIMS OWNED BY

CHEVRON MINERALS LTD.

AND

OPTIONED BY

NORTH AMERICAN METALS B.C. INC.

BY

E.D. TITLEY, B.Sc.

FEBRUARY 20, 1987

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A. SUMMARY

North American Metals B.C. Inc. holds, under option agreement with Chevron Minerals Ltd., the Golden Bear property near Dease Lake, British Columbia. In 1986 North American Metals completed a $3.5 million exploration program on the property. The purpose of this program was to upgrade Chevron's drill-indicated reserve base on the Bear Deposit. These drill indicated reserves total 661,000 tonnes at average grade of 15.4 g Au/t. The North American Metals work program consisted of 914 metres of underground excavation and 1860 metres of surface and underground diamond drilling. It defined a significant tonnage of gold mineralization that could be extracted by both open pit and underground mining methods. A mine feasibility study is in progress.

Exploration work centered on the Bear Main Zone, one of several gold deposits situated on a 7 km long north trending structure known as the Bear Fault. Brecciated, quartz-carbonate altered Permian limestone and Pre-upper Triassic volcanic rocks of the Stikine Terrane assemblage host the mineralization. Alteration associated with mineralization is Early to Middle Jurassic.
A 1987 drift and diamond drill program will test exploration targets north of the Bear Main Zone. The potential to expand the Chevron reserve base is excellent.

B. INTRODUCTION

The Golden Bear project is now at the mine feasibility stage. The project started in 1979 with a study on potential gold areas in British Columbia. This work led to a regional reconnaissance program that resulted in the discovery of gold mineralization in 1981. Since that time, the property has passed through stages of staking, surface exploration, trenching and diamond drilling under the direction of Chevron Canada Resources Limited.

In June 1986, North American Metals Corp. optioned the property and initiated an extensive field program. Work began on July 21 and ended on December 20, 1986. The $3.5 million program consisted of detailed diamond drill and underground exploration work on the Bear Main Zone. This report describes the results of the 1986 program.

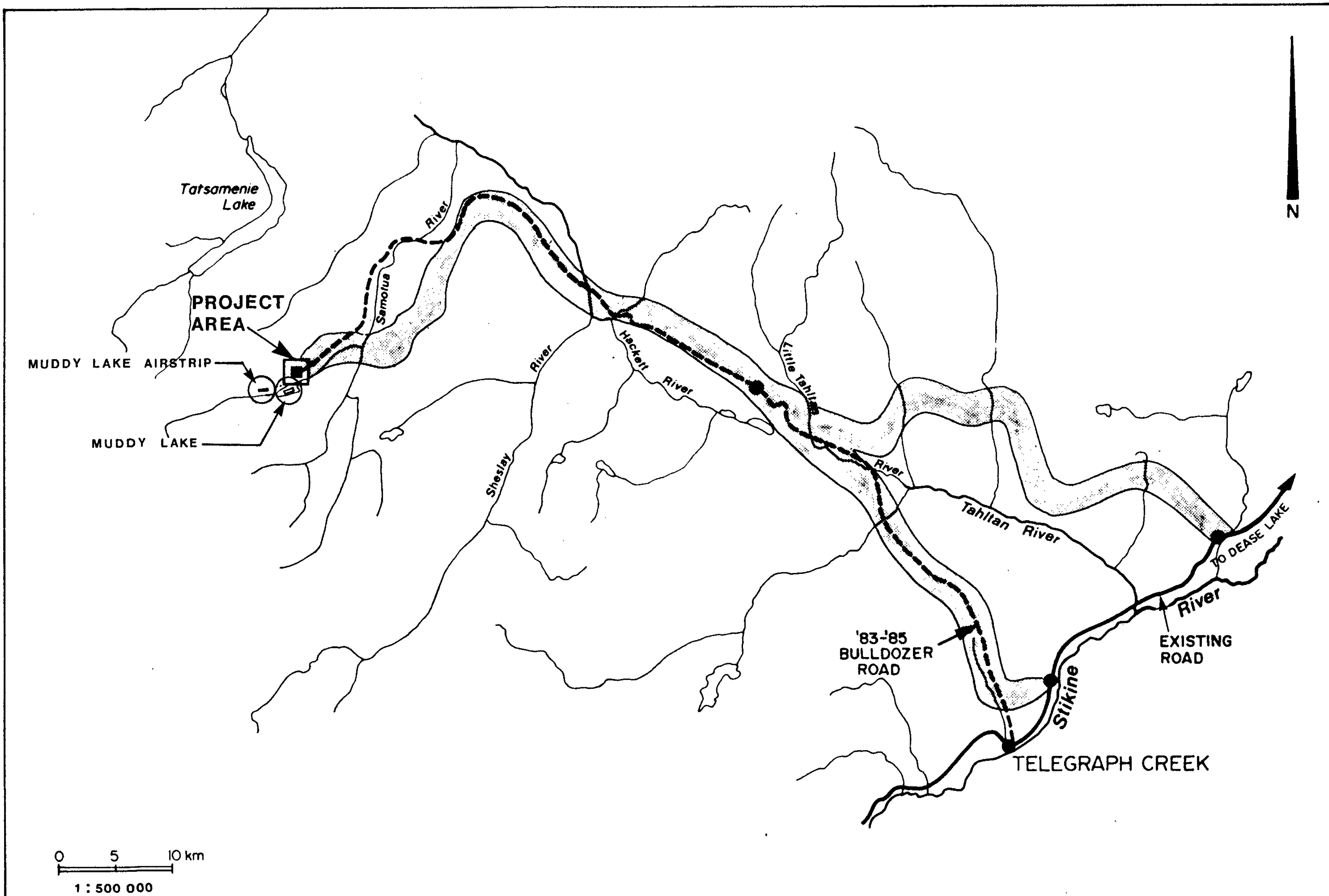
Geotechnical, metallurgical, environmental and engineering studies are in progress. This work will form the basis of a Wright Engineers Limited feasibility study to be completed by May 1987.

C. LOCATION AND ACCESS

The Golden Bear project is in the northwest corner of British Columbia (Figure 1). The work area is at longitude 132° 17' W and latitude 58° 11' N.

Surface access to the property is limited to a 130 km winter bulldozer trail between Telegraph Creek and camp (Figure 2). Chevron used the trail over a three year period to move heavy equipment, including a ten ton dump truck, tracked loader, incinerator and diamond drill equipment into the project area with D6, D7 and D8 tractors. The route is usable only during winter months.

Aircraft provide the only reliable, year-round means of reaching the project area. Landing facilities consist of a rough 900 m airstrip at the west end of Muddy lake and the 1500 m long lake (Figure 2). Chevron constructed the floatplane dock in late spring 1983 and in late summer of that year cleared an airstrip on the floodplain of the Samotua River, 11 km northeast of camp. The latter facility was used during the late summer and fall of 1983 and early in 1984. Since then it has deteriorated due to the annual flooding of the Samotua River and is now no longer usable. In late summer 1984 Chevron cleared the airstrip on the west end of Muddy Lake, and in 1985 a rough track was bulldozed to connect it with the camp. This airstrip and the access road were upgraded by North American



PROPOSED ACCESS ROUTES

Figure 2

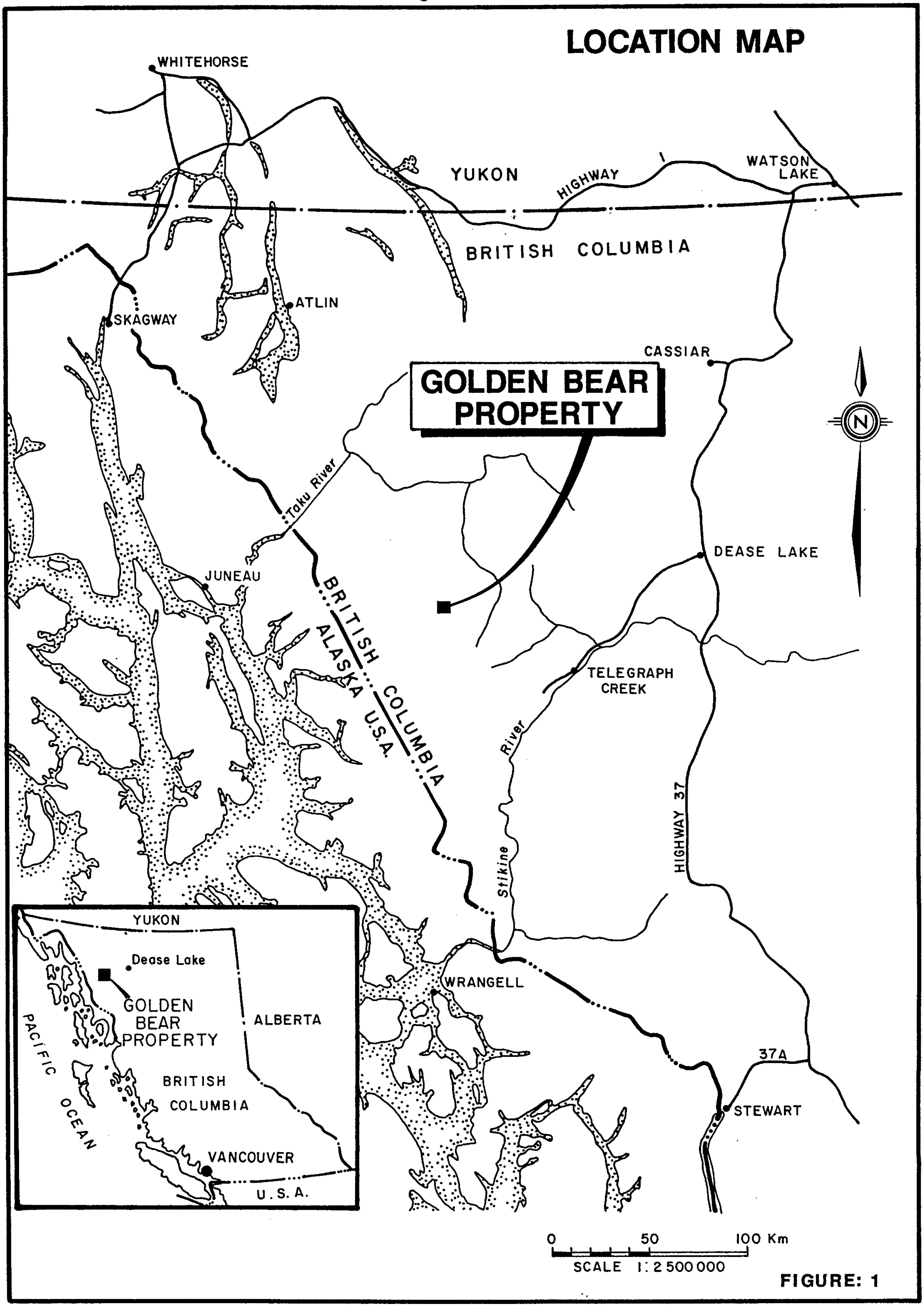

LOCATION MAP
WHITEHORSE
YUKON
HIGHWAY
WATSON LAKE
BRITISH COLUMBIA
ATLIN
SKAGWAY
CASSIAR
GOLDEN BEAR PROPERTY
N
Taku River
DEASE LAKE
JUNEAU
BRITISH COLUMBIA
ALASKA U.S.A.
TELEGRAPH CREEK
River
Stikine
HIGHWAY 37
YUKON
Dease Lake
GOLDEN BEAR PROPERTY
ALBERTA
PACIFIC OCEAN
BRITISH COLUMBIA
VANCOUVER
U.S.A.
WRANGELL
37A
STEWART
0
50
100 Km
SCALE 1: 2 500 000

FIGURE: 1

Metals in 1986. These facilities, when maintained in their present state, allow wheeled planes to access the property all year round. Float planes are able to operate at Muddy Lake between early June and late October. The season for ski-equipped aircraft is generally late November to early May.

North American Metals' personnel, equipment and supplies were flown into the site by charter aircraft. The principle landing facility was the 900 m gravel strip at the west end of Muddy Lake. Vehicles, mine and drill equipment and 230,000 litres of diesel fuel were transported to the strip by Caribou aircraft. Cessna 206 and other small fixed-wing aircraft, predominantly on wheels, were used to haul personnel and the bulk of the day to day supplies to the project. These supplies were trucked from Terrace to Dease Lake and then flown from Dease Lake (140 km to the east) into camp on a weekly basis.

A network of access roads links the camp with the mine site, airstrip, Samotua River and various work areas on the Golden Bear property. These roads were constructed by Chevron during the 1983 to 1985 programs and were improved and upgraded by North American Metals. In the 1986 program, six light trucks, a heavy dump truck, a D7 tractor and a tracked loader were used on the property.

Commercial production at the Golden Bear property will require the construction of an all-weather Access road. North American

Metals B.C. Inc. will submit a proposal to the Government of British Columbia to construct a 147 km all-weather access road. This would connect the property with the Dease Lake-Telegraph Creek road (Figures 1 and 2).

D. PHYSIOGRAPHY

The Golden Bear project is on the lee side of the coast Mountains near the edge of the Stikine Plateau. Rugged alpine terrain and deeply incised valleys on the property range in elevation from 600 m to 2200 m asl. At least five alpine glaciers occur on the claims.

Northeasterly flowing drainages cut across the property and eventually empty into the Sheslay River (Figure 2). The Sheslay in turn flows into the Inklin River, Taku River and finally into Taku Arm on the Pacific coast of Alaska. Base camp is at 960 m asl on the northeast shore of Muddy (Bearskin) Lake. The adit is directly above camp at elevation 1400 m.

Because Muddy Lake is 60 km west of tidewater, the transition from heavy coastal precipitation to drier conditions of the interior plateau takes place on the property. Weather often changes rapidly; snowfalls can occur at any time of the year. Muddy Lake is generally ice-free from June through October, although snow may remain on many north-facing slopes until early July. Surface exploration is most productive during July and August and some work can be accomplished in June and September. Climatological data are summarized in Table 1.

CLIMATOLOGICAL DATA

MUDDY LAKE, B.C.

TABLE 1

		TEMPERATURE			PRECIPITATION		
Month	Year	Mean	Mean Max	Mean Min	Rain mm	Snow cm	Total Equivalent(mm)
Jan	1986	- 8.6	- 3.9	-13.4	2.0	76.0	78.0
Feb	1986	-14.9	- 7.9	-22.0	20.1	41.0	61.1
March	1986	- 4.7	0.9	-10.3	2.8	96.0	98.8
April	1986	- 4.9	2.2	-12.0	8.0	61.0	69.0
May	1986	2.1	7.5	- 3.3	11.0	10.2	21.2
June	1986	8.0	13.0	3.0	6.4	-	6.4
July	1986	11.8	16.0	7.6	7.1	-	7.1
Aug	1986	9.8	14.0	5.7	12.7	2.3	15.0
Sept	1986	6.3	11.5	1.1	28.0	5.2	33.2
Oct	1986	3.4	5.9	0.9	35.0	-	35.0
Nov	1986	- 8.3	- 4.9	-11.7	5.0	49.5	53.5
Dec	1986	- 5.1	- 0.7	- 9.6	3.0	78.0	81.0

Much of the claim block is sparsely vegetated. Soils are generally poorly developed. Timberline is at approximately 1000 m elevation. However, patches of dense scrub and bush occur up to 1300 m elevation in some areas. To date, all known surface mineralization is above 1300 m elevation. Trees suitable for mine support occur on the AMOK group of claims in the Samotua River valley (Figure 3).

Permafrost-related solifluction deposits are found on north-facing slopes. Frozen ground conditions can extend to depths of 20 m to 40 m in some areas. Ice-filled fractures have been encountered to depths of 15 m in drillholes and underground workings in the Bear Main Zone.

The range of several mammal species extends onto the property. Black and grizzly bears, stone sheep, mountain goat and moose, as well as a variety of smaller mammals are commonly seen on the property. Fish habitats are poor. There are no fish in Muddy Lake. A limited number of fish occur in the Samotua River. The Sheslay River, 25 km downstream from camp, is an important salmon river.

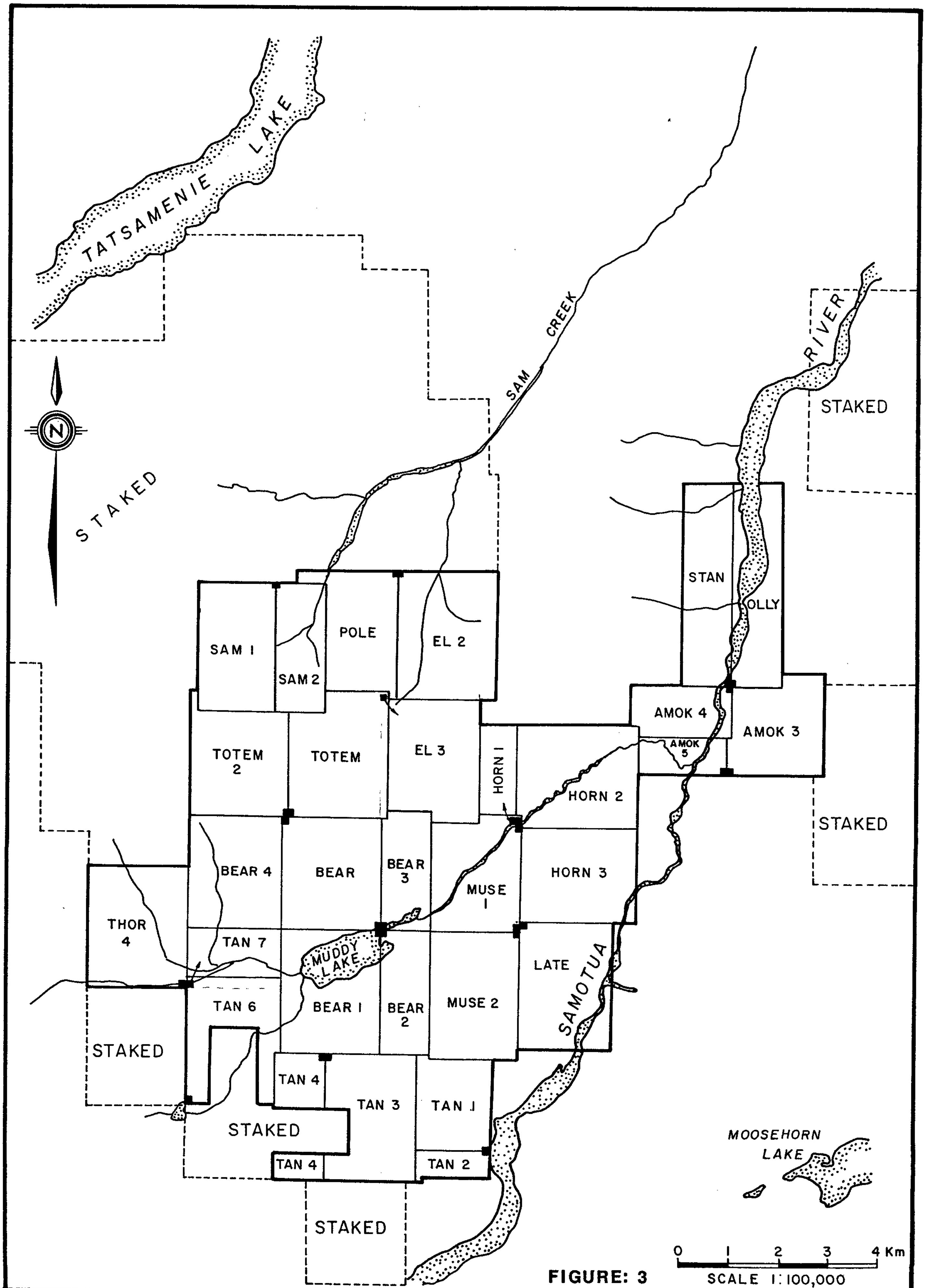

TATSAMENIE LAKE
SAM CREEK
RIVER
STAKED
N
SAM 1
SAM 2
POLE
EL 2
STAN
OLLY
TOTEM 2
TOTEM
EL 3
HORN 1
AMOK 4
AMOK 5
AMOK 3
HORN 2
BEAR 4
BEAR
BEAR 3
MUSE 1
HORN 3
THOR 4
TAN 7
MUDDY LAKE
LATE
SAMOTUA
TAN 6
BEAR 1
BEAR 2
MUSE 2
TAN 4
TAN 3
TAN 1
TAN 2
MOOSEHORN LAKE
0 1 2 3 4 Km
SCALE 1:100,000

FIGURE: 3

E. PROPERTY HISTORY

Prospectors have been active in the Tulsequah map-area since the 1890's but rugged conditions of this remote region discouraged them from exploring very far from major river valleys. Mineral exploration in the area expanded with the advent of float-equipped aircraft in the 1930's and helicopters in the 1950's.

The first known mineral claim in the Golden Bear area was staked by K.A. Gamey (Walton, pers. comm.) NICKO No. 30 (Record No. 3077 - Tag No. 228415) was recorded on September 17, 1956 and covered a number of small copper showings near Muddy Lake. There is no known record of work on these lapsed claims. The ground remained open and largely unexplored until the arrival of Chevron.

Chevron became interested in the Tulsequah area as a result of a company study that examined potential gold exploration areas in British Columbia (Dyson, 1980). Regional geological reconnaissance work by L.A. Dick in 1980 gave support for a broader exploration program, and in early 1981 the SAM 1 and SAM 2 claims were staked (Figure 3).

In the summer of 1981, geochemical reconnaissance was carried out south of Tatsamenie Lake. One soil sample taken just northeast of Muddy Lake yielded a 700 ppb Au value. This resulted in the staking of the BEAR, TOTEM and POLE claims. Later that summer,

M. Thicke filled-in the original 300 m lines with four contour soil lines at a 100 m sample spacing. One of these samples returned a 9200 ppb Au value directly below the Bear Main Zone. Grab samples taken that summer by L.A. Dick on the Bear Main Zone yielded assay values as high as 24.0 g Au/t (Wober and Shannon, 1985).

A program of trenching, prospecting and mapping was completed by Chevron in 1982. This program outlined the Bear Main Zone and led to the discovery of surface mineralization at Fleece Bowl on the TOTEM claim (Figure 3). In 1983 diamond drill equipment was brought into the property by D6 and D8 tractors along the winter trail from Telegraph Creek. Drilling on the Bear Main Zone commenced in April of that year and a total of 27 holes were completed on the BEAR claim. In addition, five holes were drilled on the TOTEM claim and a number of interesting intersections were obtained in Fleece Bowl. Trenching and drill road building with heavy tracked equipment were initiated in 1983 and base camp was established.

The Bear-Totem project expanded in 1984. Four diamond drills completed a total of 58 holes and portions of the BEAR and TOTEM claims were mapped (McAllister, 1984). The main switchback road was also constructed in the summer of 1984.

The program was scaled down in 1985 and 14 holes were drilled on the BEAR claim. A total of 17 holes were drilled on the TOTEM claim north of Fleece Bowl; however, no new mineralization was discovered. Surface trenching and mapping programs were also completed.

The 11,850 hectare property consists of a contiguous block of 30 claims totalling 474 units (Figure 3). Claim status is summarized in Table 2. North American Metals has completed work required to keep the claims in good standing.

Table 2

CLAIM STATUS - GOLDEN BEAR PROJECT

CLAIM	GROUP	RECORD NO.	RECORD DATE	EXPIRY DATE Approved	NO. UNITS
TOTEM 2	BEAR	1726	August 26, 1982	1994	20
BEAR	"	1489	August 21, 1981	1994	20
BEAR 1	"	1547	August 31, 1981	1994	20
BEAR 2	"	1548	August 31, 1981	1994	10
BEAR 3	"	1724	August 26, 1982	1994	10
BEAR 4	"	1725	August 26, 1982	1994	20
MUSE 1	MUSE	1911	June 13, 1983	1987	20
MUSE 2	"	1912	June 13, 1983	1987	20
HORN 3	"	1946	July 4, 1983	1987	20
LATE	"	1949	July 4, 1983	1987	20
TAN 1	"	1937	July 4, 1983	1987	12
TAN 2	"	1938	July 4, 1983	1987	3
HORN 2	AMOK	1945	July 4, 1983	1987	20
AMOK 3	"	2061	November 1,1983	1987	16
AMOK 4	"	1947	July 4, 1983	1987	8
AMOK 5	"	1948	July 4, 1983	1987	8
STAN	"	1955	July 4, 1983	1987	16
OLLY	"	1954	July 4, 1983	1987	16
SAM #2	TOTEM	1291	March 5, 1981	1994	10
POLE	"	1490	August 21, 1981	1994	20
EL 2	"	1730	September 15,1982	1994	20
EL 3	"	1745	September 22,1982	1994	20
TOTEM	"	1488	August 21, 1981	1994	20
HORN 1	"	1944	July 4, 1983	1994	8
SAM 1	MISTY	1290	March 5, 1981	1987	15
THOR 4	THOR	1952	July 4, 1983	1987	20
TAN 7	"	1943	July 4, 1983	1987	12
TAN 3	TAN	1939	July 4, 1983	1987	20
TAN 4	"	1940	July 4, 1983	1987	10
TAN 6	"	1942	July 4, 1983	1987	20

F. 1986 WORK PROGRAM - SCOPE AND OBJECTIVES

The 1986 work program focused on the Bear Main Zone. The main objectives were to place the drill indicated reserves into a proven category and to obtain bulk samples for metallurgical testing. Program results would provide the data base required for a Wright Engineers Limited feasibility study.

North American Metals B.C. Inc. co-ordinated and supervised the Golden Bear Project. Project support and camp maintenance were provided by Company personnel based in Muddy Lake. The 20 man workforce was drawn primarily from the local area. A team of eight geologists collected data at the project site.

Underground excavation work was contracted to Vicore Mining Developments Limited. This work is summarized in Table 3. The adit was collared at the 1400 m elevation on the south end of the Bear Main Zone. The main drift was driven for 325 m north along a 1.85 m x 2.15 m tracked heading. Fifteen cross-cuts and drill stations were cut into the hanging wall for a total of 222 m. Nine footwall cross-cuts, stubs and drill stations were excavated for a total of 101 m. Two raises were driven for a total length of 145 m.

Surface and underground drilling was contracted to E. Caron Diamond Drilling Limited. Diamond drill work is summarized in Table 4. The skid-mounted surface drill completed 1457 m in 15

GOLDEN BEAR PROJECT

1986 UNDERGROUND WORK SUMMARY

TABLE 3

MONTH	DAYS MINING	DRIFT & CROSS-CUT ADVANCE (m)	SLASHING (m^3)	RAISING (m)	TOTAL (linear m)
Aug	18	64.8	10.0	-	67.3
Sept	30	180.2	71.8	-	198.7
Oct	31	204.9	92.8	35.6	264.3
Nov	30	171.1	49.7	126.7	310.5
Dec	8	26.9	52.0	33.1	73.3
TOTAL	117	647.9	276.3	195.4	914.1

holes. Two air-driven underground core rigs completed 434 metres in 12 holes.

Sample preparation and fire assay analyses for gold and silver were completed on site. Chemex Labs Ltd. operated the project lab on a contract basis. Table 5 summarizes the 1986 assay work. Check and duplicate samples were analyzed at the Chemex Lab in North Vancouver.

GOLDEN BEAR PROJECT
DIAMOND DRILL SUMMARY

TABLE 4

Operator	Year	Surface Holes	Surface Metres	Underground Holes	Underground Metres	Total Holes	Total Metres
NAMC	1986	15	1457.1	12	433.7	17	1890.8
Chevron	1983-1985	121	19809.6	-	-	121	19809.6
TOTAL	1983-1986	136	21266.7	12	433.7	148	21700.4

GOLDEN BEAR PROJECT

1986 ASSAY SUMMARY

TABLE 5

MUDDY LAKE FIRE ASSAY LAB	
Original Assays	
Chip	1565
Core	687
Muck	187
Sludge	89
Other	69
Total	2591
Control Assays	
Quality Control	272
Inquarts	263
Standards	212
Lab Re-runs	136
Blanks	34
Total	1440
GRAND TOTAL ON-SITE	4031
Chemex Labs Vancouver	
Core and Mine Originals	656
Property Originals	545
Checks	209
Total	1410
MIN-EN LABS VANCOUVER TOTAL	402
TOTAL PROJECT ASSAYS	5843

Technical work on the project consisted of geotechnical studies by Piteau and Associates, baseline environmental and road impact studies by Norecol Environmental Consultants and metallurgical and mine studies by Wright Engineers Limited. Technical reports completed by North American Metals in 1986 include: a statistical study of assay results (Harris, 1986), a re-evaluation of TOTEM geology (Wasylyshyn, 1987), a study of specific gravity of material from the Bear Main Zone (Boyce, 1987), a study of water content of rocks of the Bear Main Zone (Baxter, 1987), and assessment reports for the SAM 1 and MUSE group (Wasylyshyn and Titley, 1987 a and b).

This report deals with the geology of the Golden Bear Project. Most of the information is drawn from 1986 work on the Bear Main Zone. This work consisted of detailed mapping and sampling of all faces, ribs and backs in the underground headings and detailed core logging and sampling. This work was performed by: E.D. Titley, B.Sc., M.H. Harris, B.Sc., P.T. Baxter, B.Sc., R.W. Hulstein, B.Sc., R. Wasylyshyn, B.Sc., R.A. Boyce, B.Sc., B. Augsten, B.Sc., G.W. Lowey, Ph.D., and M. Phillips. The project was managed by J.P. Franzen, P.Eng.

G. REGIONAL GEOLOGY

The western end of the Stikine Arch incorporates elements of the Coast Plutonic Complex and the Intermontane Belt (Figure 4). In this area eugeosynclinal arc-type sedimentary and volcanic rocks of the Intermontane Belt range in age from Permian to Recent (Souther, 1971). These strata were variably deformed and altered by three major tectonic episodes. Periods of plutonic activity took place throughout the region from middle Triassic to Tertiary time.

G.1 Pre-Upper Triassic

Pre-Upper Triassic rocks underlie much of the region. They were deposited in an oceanic island arc environment on a basement of poorly understood rocks of unknown age. The pre-Upper Triassic rocks of the project area belong to the Stikine Terrane Assemblage. This package contains abundant mafic to intermediate volcanic rocks, associated volcanoclastic rocks, epiclastic sediments and carbonate sequences. Stikine rocks are distinguished from the Perma-Triassic oceanic Cache Creek Group on the basis of faunal content (Monger, 1977).

Ultramafic rocks of Permian age or older outcrop along the Nahlin Fault and along fault zones within Stikine rocks southeast of Tatsamenie Lake. These serpentinite bodies are deep-seated in origin and were emplaced by complex structural or intrusive activity.

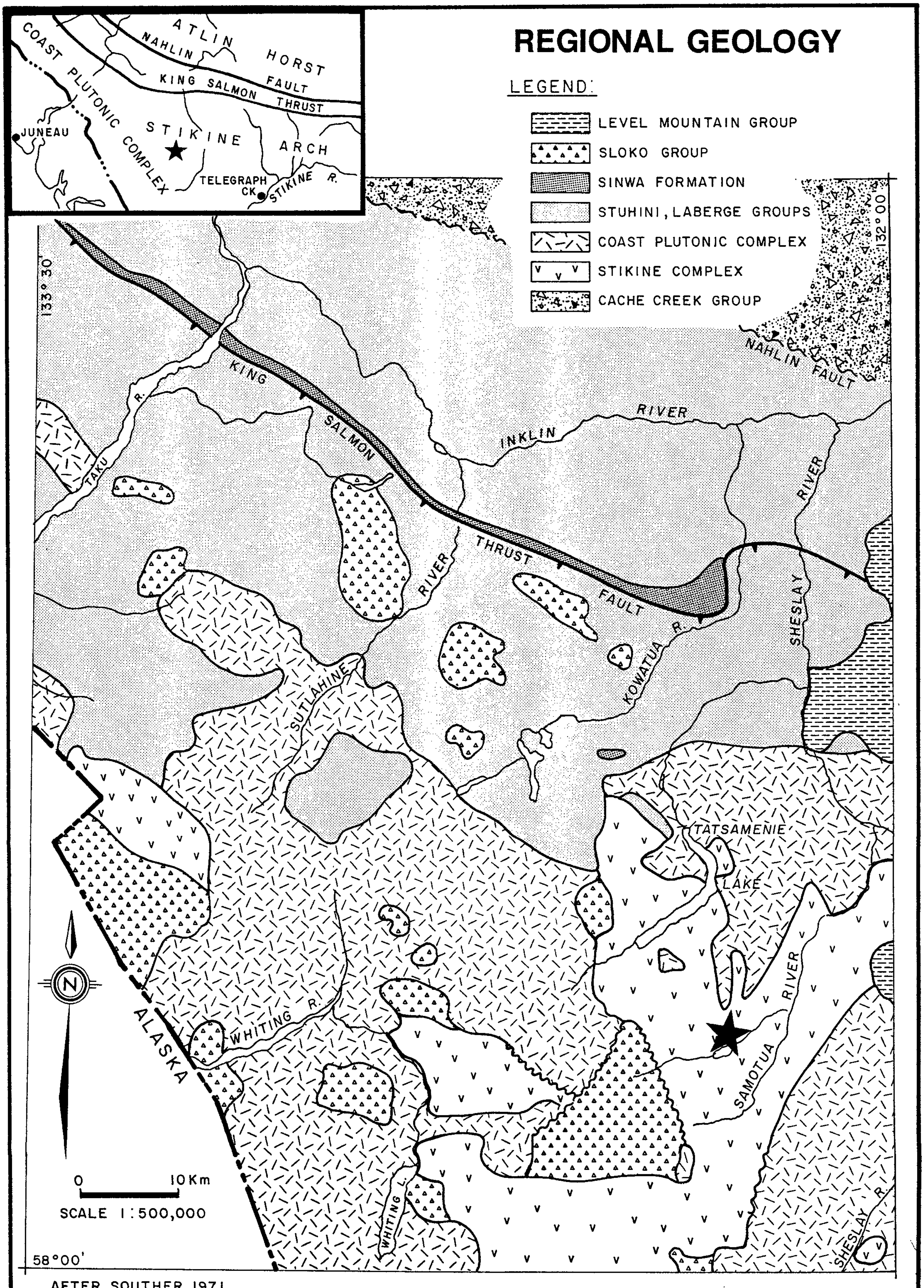

REGIONAL GEOLOGY
LEGEND:
LEVEL MOUNTAIN GROUP
SLOKO GROUP
SINWA FORMATION
STUHINI, LABERGE GROUPS
COAST PLUTONIC COMPLEX
STIKINE COMPLEX
CACHE CREEK GROUP
ATLIN HORST
NAHLIN FAULT
KING SALMON THRUST
COAST PLUTONIC COMPLEX
JUNEAU
STIKINE ARCH
TELEGRAPH CK
STIKINE R.
133° 30'
132° 00'
KING SALMON THRUST FAULT
NAHLIN FAULT
INKLIN RIVER
TAKU R.
RIVER
SHESLAY
KOWATUA R.
SUTLAHINE
TATSAMENIE LAKE
RIVER
SAMOTUA
WHITING R.
WHITING
ALASKA
SHESLAY R.
N
0 10Km
SCALE 1:500,000
58°00'
AFTER SOUTHER 1971.

FIGURE: 4

G.2 Late Triassic

Late Triassic rocks of the Stuhini Group and Sinwa Formation occur in the north-central part of the region. The Stuhini Group is made up of a complex succession of andesitic and basaltic volcanic rocks and agglomerate that unconformably overlap the Stikine assemblage north of Tatsamenie Lake. The King Salamon Formation is an important clastic sedimentary unit in the Stuhini Group. The Sinwa Formation disconfromably overlies Stuhini Rocks. This Norian limestone unit is widespread and is used as a regional marker bed.

G.3 Jurassic

Lower Jurassic rocks are represented by the Inklin and Takwahoni Formations. The Inklin Formation consists predominantly of distal laminated turbidite deposits of greywacke and siltstone. This unit disconformably overlies the Sinwa limestone. The Takwohoni Formation is made up of proximal coarse conglomerate and sandstone. They are locally difficult to distinguish from Inklin rocks.

G.4 Cretaceous-Tertiary

A gap in the sedimentary record separates early Jurassic sediments from the late Cretaceous or Early Tertiary Sloko Group. These volcanic deposits consist of felsic pyroclastics that vary from coarse explosion breccias and agglomerates to finely banded tuffs and ignimbrites. Minor equivalent intrusives and volcanoclastics are closely associated with these flat-lying or gently tilted rocks.

G.5 Miocene-Recent

Basaltic to rhyolitic volcanic rocks from large strato-volcanoes are found in the eastern part of the region. These are units of the Level Mountain Group and the Heart Peaks Formation. Felsic lavas and tuffs which often weather bright red, yellow and orange, make up the Heart Peaks Formation. Extensive flat lying basalt flows and interflow breccias comprise the Level Mountain Group. These rocks erupted onto the relatively flat surface that resulted from Tertiary peneplanation.

G.6 Plutonic Rocks

Various phases of the Coast Plutonic Complex have intruded the pre-Miocene rocks of the region. These rocks are predominantly diorite to monzonite in composition and form large batholiths, stocks, plugs and tabular bodies. Three main phases of intrusion are noted. The are early to middle Triassic, middle Jurassic to early Cretaceous and late Cretaceous to early Tertiary. Most of the plutonic activity of the Coast Complex occurred in late Cretaceous to Eocene time.

G.7 Early Tectonism

Emplacement of the Stikine Terrane involved complex transcurrent movement, subduction and obduction (Monger, 1977). The sutured boundary between the Stikine Assemblage and the

Cache Creek Group may be concealed by Upper Triassic to Jurassic layered rocks. This boundary could also be represented by the Nahlin fault, a major regional structure with abundant alpine ultramafic bodies.

G.8 Later Tectonism

Three main episodes of tectonic activity are evident in the Tulsequah area. The Mid-Triassic Tahltanian Orogeny was characterized by faulting and intense folding of Pre-Upper Triassic Strata. During this phase Stikine Assemblage and Cache Creek rocks underwent regional greenschist facies metamorphism and the early to middle Triassic intrusive rocks were foliated. In the late Jurassic, a period of uplift was followed by broad open folding. This folding is related to overthrusting from the northeast along the King Salmon thrust fault. Tectonic activity in the early Tertiary resulted in extensive normal block faulting and uplift of a high plateau-like peneplane. This period roughly corresponds with the intrusion of the bulk of the Coast Plutonic Complex. Since then, the area has been subject to deep glacial erosion and stream dissection.

G.9 Alteration and Mineralization

Hydrothermal alteration is widespread in the Tulsequah map-area. Bright orange, red, yellow and brown gossans ranging from a few metres to thousands of metres in size are common. Extensive zones of quartz-carbonate alteration occur in the

Tatsamenie Lake area. These zones are often localized along or near major fault structures. Small, irregular sulphide-bearing quartz-carbonate veins are also widespread.

To date gold production in the Tulsequah region has been from vein-replacement and volcanogenic massive sulphide ores. Over 8,400,000 grams of gold were produced from the Polaris Taku and Tulsequah Chief mines in the northwest part of the map-area. This ore was hosted by altered Stuhini volcanic rocks.

H. PROPERTY GEOLOGY

H.1 Summary

About 85% of the Golden Bear property is underlain by rocks of the Stikine Terrane Assemblage. Basement has not been identified beneath Stikine rocks. Rocks of the Coast Plutonic Complex make up a further 5% of the surface area. Quaternary deposits, glaciers and water account for most of the remaining 10%. A simplified property geology map and geologic column are shown in Figure 5 and Table 6.

Stikine rocks consist of Permian carbonates and pre-Upper Triassic greenstones. They are intruded by various phases of the Coast Plutonic Complex, Sloko Group, and Level Mountain Group dykes. Episodes of folding, faulting metamorphism, alteration and mineralization chronicle the geologic history of the property (Table 7). More recently, glaciation and slope movements have given the topography its present shape.

H.2 Ultramafics

Ultramafic rocks of unknown age (possibly Permian) are near the property. These rocks consist mostly of serpentinite and occur along deep-seated fault zones. Structures containing these units cut across the claims; however, no large bodies of ultramafic rocks are seen on the property.

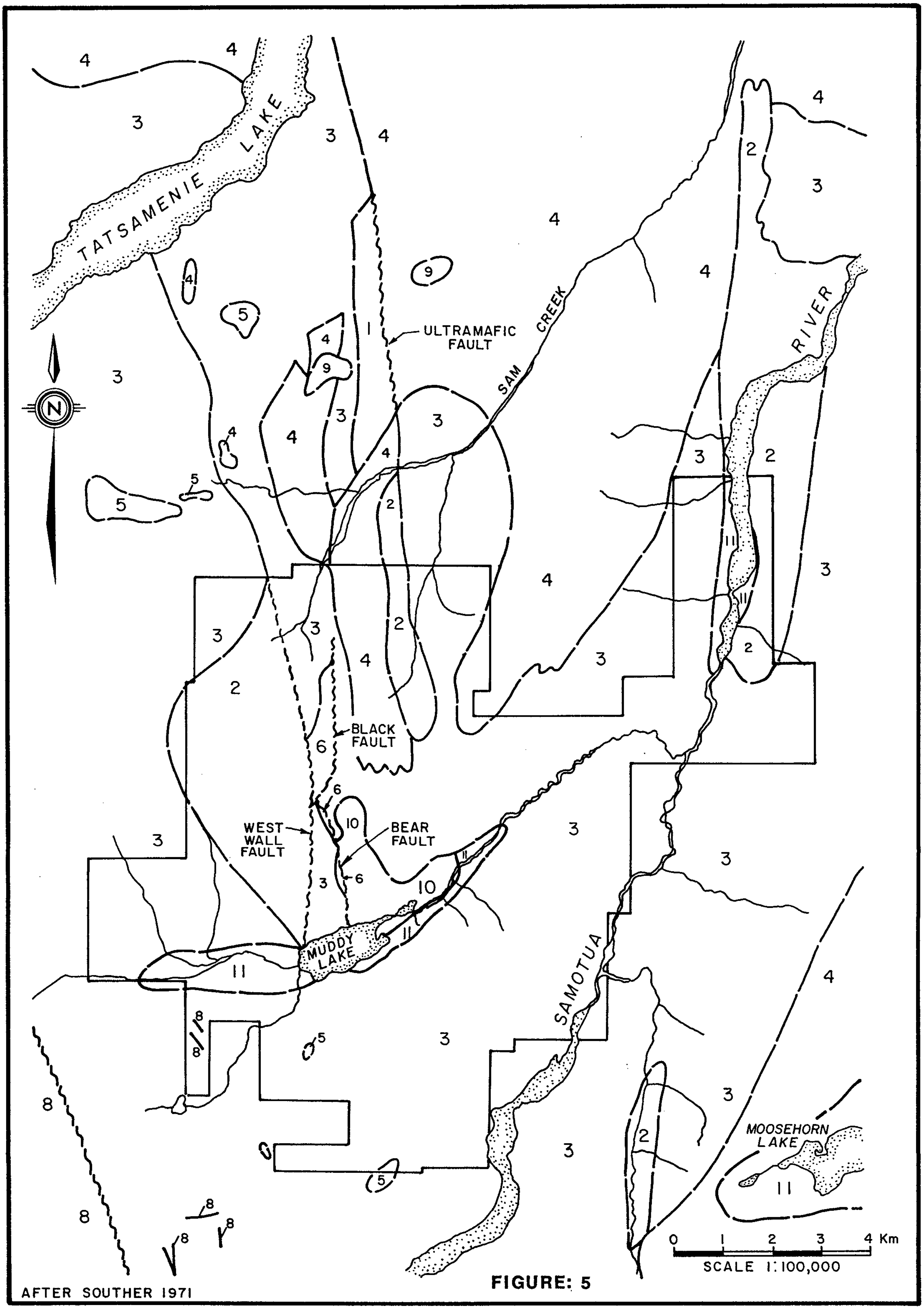

TATSAMENIE LAKE
ULTRAMAFIC FAULT
SAM CREEK
RIVER
BLACK FAULT
WEST WALL FAULT
BEAR FAULT
MUDDY LAKE
SAMOTUA
MOOSEHORN LAKE
0 1 2 3 4 Km
SCALE 1:100,000
AFTER SOUTHER 1971

FIGURE: 5

GOLDEN BEAR PROJECT

GEOLOGIC LEGEND FOR PROPERTY GEOLOGY MAP

TABLE 6

QUATERNARY

11 UNDIFFERENTIATED UNCONSOLIDATED SEDIMENTS: alluvium, colluvium, glacial outwash, till, alpine moraine, felsenmeer.

10 SLOPE MOVEMENT DEPOSITS: broken rock avalanche debris, debris flow deposits, talus solifluction deposits.

MIOCENE TO RECENT

LEVEL MOUNTAIN GROUP

9 BASALT DYKES AND FLOWS.

LATE CRETACEOUS TO EOCENCE

SLOKO GROUP

8 FELSIC PORPHYRY DYKES, RHYOLITE DYKES

MIDDLE TO LATE JURASSIC

7 ALTERED GREENSTONES: altered tuff, altered gabbro, greenstone breccia.

6 ALTERED CARBONATES: silicified limestone, silicified dolomite, siliceous breccia.

5 HORNBLENDE DIORITE: non-foliated intrusives, albitites, felsic dykes.

EARLY TO MIDDLE TRIASSIC

4 HORNBLENDE DIORITE: strongly foliated intrusives, dykes.

INTRUSIVE CONTACT

PRE-UPPER TRIASSIC

STIKINE TERRANE ASSEMBLAGE

3 GREENSTONES: Mafic volcanics, laminated tuff, banded tuff, fine ash tuff, crystal tuff, lapilli tuff, tuff with bomb-size pyroclastics some andesitic, chloritic schist, mafic to felsic phyllite, argillaceous volcaniclastics, microgabbro, gabbro, augite porphyry, mafic dykes,

FAULT CONTACT, LOCALLY CONFORMABLE

PERMIAN

STIKINE TERRANE ASSEMBLAGE

2 LIMESTONE: chemical and minor clastic sediments, argillaceous mudstone, chert, sedimentary breccia.

UNKNOWN (PERMIAN?)

1 ULTRAMAFICS: amphibolite, serpentinite.

GOLDEN BEAR PROJECT

GEOLOGIC CHRONOLOGY OF THE GOLDEN BEAR PROPERTY

TABLE 7

Time Period	Ma	Event	Feature
Quaternary	0-2	Sedimentation	Alluvium, glacial deposits, landslide debris
Quaternary to Late Tertiary	0-25	Vulcanism	Level Mountain Group Dykes and Flows
Quaternary to Middle Tertiary	0-38	Erosion	Glacial and Stream Dissection
Early Tertiary	38-65	Tectonism	Uplift and Extensional Block Faulting
Early Tertiary to Late Cretaceous	38-98	Vulcanism	Sloko Group Dykes
Late to Early Jurassic	150-200	Alteration	Golden Bear Mineralization
Middle Jurassic	163-181	Intrusion	Non-Foliated Diorite, F-1 Dykes
Middle Triassic	231-243	Tectonism	Tahltanian Orogeny
Middle To Lower Triassic	231-248	Intrusion	Foliated Diorite
Pre-Upper Triassic	231-286	Vulcanism	Stikine Terrane Volcanic (± 2600m)
Permian	248-286	Sedimentation	Stikine Terrane Carbonates (± 750m)
Permian or Older	248+	Intrusion?	Serpentinite

H.3 Limestone

The Permian limestone unit is resistant to erosion, often forming areas of high relief with rugged cliffs. It consists mainly of massive to well-bedded, fine to medium-grained, medium grey limestone. Minor amounts of dolomite, quartz, argillaceous and organic material are also present. The limestone typically has a sugary texture of sand sized grains.

Fusulinids, crinoids and minor coral fossils are present in the limestone. These fauna are indicative of a shallow marine carbonate bank environment. Monger and Ross (1971) assigned a Permian age to the limestones on the basis of fusulinids collected from the property.

The limestone unit is strongly altered in several areas adjacent to major fault structures. At the West Wall Fault, silicification, dolomitization and brecciation gradually increase (over tens of metres) as the fault is approached. Limestone is thermally recrystallized to marble adjacent to intrusions. Strongly altered limestones are discussed separately later in this chapter.

Primary silica (or chert) and digenetic dolomite are difficult to distinguish from secondary silica and dolomite in the limestone unit. Layers of silica that alternate with limestone within a unit were considered to be chert bands by Shannon (pers. comm). Shannon considered dolomite to be of hydrothermal origin, mainly because dolomitic rock is only found adjacent to major fault structures. Lowey (1986) noted that dolomite occurs in at least two phases. The second phase dolomite forms the matrix for many carbonate breccias. Minor amounts of primary silica occur within the unaltered limestone unit. Zones of highly altered limestone also have minor amounts of original chert and chert fragments as part of their silica content.

A variety of breccias and brecciated textures are seen in the Permian carbonates. These breccia textures are complex and the zones are often irregular. Within the carbonate unit and altered equivalents, at least four distinct types of brecciation are present. Intraformational beds of monolithic sedimentary breccia are seen on the TOTEM claim, (Wober and Shannon, 1986). These breccias are minor in extent occurring within the shallow carbonate bank depositional environment. A second type is crackle brecciation which resulted from tight folding of the carbonates. This brecciation occurred in the middle Triassic and is often found in the nose of isoclinal folds within the district. Several modern examples of karst solution collapse breccias are seen on the property and evidence for ancient ones is also strong (Lowey, 1986; Read, 1986). The fourth and most important type of breccia is the tectonic-hydrothermal variety. These breccias are often highly altered and mineralized. They vary from intense stockwork breccias to heterolithic contact breccias. They occur along major fault structures and in zones of intense hydrothermal alteration. In structurally complex areas it is often difficult to distinguish the various types of breccias when they occur in combination. These units are often quite irregular with indistinct or gradual contacts.

The Stikine limestones have been affected by two major phases of folding. The first phase (F_1) developed during the middle Triassic Tahltanian Orogeny. It resulted in tight, often isoclinal folds with thinned elongate limbs. Rare diapiric folds, where the nose of the fold is separated from its limbs, have also been observed. The F_1 axial plane is not well developed on the claim group. Regionally it dips steeply in a north-south orientation. The more open second phase (F_2) developed in the late Jurassic. These folds lack axial planar foliation and are oriented southeast-northwest.

H.4 Greenstones

The term "greenstone" is used to describe extrusive and intrusive igneous rocks of basaltic composition. The pre-Upper Triassic greenstone unit is part of the Stikine Terrane Assemblage. This unit is largely made up of mafic pyroclastics and related rocks. These rocks often form high ridges with steep slopes on the claim group. In spite of this, surface exposure is typically poor. Extensive middle Triassic shearing and greenschist facies metamorphism has obscured the primary textures in many areas. Measurement of bedding and structural attitudes is usually not possible.

The contacts between the greenstone unit and the underlying limestone unit are variable on the property. In the northern part of the TOTEM claim, cessation of carbonate deposition was closely followed by the deposition of finely laminated mafic tuffs. Intercalation of the limestones with transitional argillites and tuffs suggests that the contact is gradational. In other areas, notably on the BEAR claim, the contact is marked by complex fault structures and polymictic breccias.

The greenstone package consists of mafic to intermediate volcanic rocks and interbedded fine-grained clastic sediments. Some subvolcanic intrusive rocks are also seen. Hydrothermal altered and brecciated greenstones are considered separately and are discussed later in this section.

Fine to medium-grained, dark green, massive mafic tuff is the most common rock type in the greenstone package. Laminated to bedded tuffs, lapilli tuff, tuff with bomb size pyroclastics and crystal tuff are recognized from drill core and underground exposures. The pyroclastic fragments usually consist of dark green, amygdular, basaltic flow material and range from lapilli size (2-50mm) to bomb size (50-250mm). Amygdules are commonly calcite and chalcopyrite-filled.

Laminated and bedded tuffs range from light grey green to dark green and are usually fine grained. The different coloured bands usually reflect variations in grain size. Bedded tuffs locally show features such as greaded beds, cross bedding, soft sediment deformation, flame structures and rip-up clasts. These features indicate stratigraphic tops are right-side up. A narrow-banded tuff unit surrounded by distinctive tuff with lapilli containing chalcopyrite amygdules has been used as a local marker bed. This unit occurs in 18 drill holes on the BEAR claim north of the Bear Main Zone. From structure contour mapping, an orientation of $185^{o}/20^{o}$ E has been determined for the marker. The unit is of limited areal extent (200 x 300m).

Several rock types that occur within the greenstone package are not well understood. Intensive metamorphic overprinting and poor exposure have obscured their textures and their lithologic relationships. In some instances the distinction between pyroclastics, flows and intrusives is uncertain and their age relationships are not clear. The crystal tuff, feldspar porphyry, microgabbro and gabbro units fall into this category. Greenstone rocks are generally compositionally similar and have a close spatial relationship. For this reason, all mafic volcanic and mafic intrusive rocks on the Golden Bear property are grouped within the pre-Upper Triassic Stikine Terrane greenstone package.

Sedimentary rocks are interbedded within the Stikine greenstone package. These well-bedded rocks include tan to green

green and are usually fine grained. The different coloured bands usually reflect variations in grain size. Bedded tuffs locally show features such as graded beds, cross bedding, soft sediment deformation, flame structures and rip-up clasts. These features indicate stratigraphic tops are right-side up. A narrow-banded tuff unit surrounded by distinctive tuff with lapilli containing chalcopyrite amygdules has been used as a local marker bed. This unit occurs in 18 drill holes on the BEAR claim north of the Bear Main Zone. From structure contour mapping, an orientation of $185^{\circ}/20^{\circ}$ E has been determined for the marker. The unit is of limited areal extent (200 x 300m).

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Sedimentary rocks are interbedded within the Stikine greenstone package. These well-bedded rocks include tan to green phyllitic argillites, black pyritic "cherty" mudstones and limy sediments. Some contain crinoid stems (Walton, 1985). Occasionally the units are carbonaceous. Most of the sedimentary rocks occur at the base of the greenstone package, but they are common throughout the sequence.

The greenstone package was intensely sheared and fractured by Tahltanian deformation. Numerous small to medium sized faults resulted from this activity. Many rocks were altered to chlorite amphibole schist and phyllite. A strong mineral foliation developed locally. Folding, as seen in the carbonates, is rarely evident in the greenstones. This may be due in part to a lack of marker beds in the greenstones. Also, the more massive greenstones may have responded differently to deformation.

H.5 Foliated Diorite

A foliated hornblende diorite intrudes the pre-Upper Triassic rocks in the north-central part of the claim block. Contacts of the diorite unit with the Stikine rocks indicate that the intrusive is definitely younger (Wober and Shannon, 1986; Schroeter, 1985). This middle Triassic unit is resistant to weathering and forms prominent ridges. The strong metamorphic foliation and alteration in these rocks resulted from middle Triassic tectonic events.

H.6 Non-Foliated Diorite

Rocks of hornblende diorite composition intrude the Stikine strata. These rocks are relatively uncommon. They occur as felsic dykes on the TOTEM claim and as stocks south of Muddy Lake (Walton, 1985). Rocks of this unit are not foliated and usually have sharp, regular contacts with the country rock. They have been assigned a middle to late Jurassic age based on dates obtained from similar rocks in the surrounding area. (Hewgill, 1985; Schroeter, 1987). Felsic dykes contain substantial gold mineralization at Fleece Bowl. They are hydrothermally altered adjacent to the mineralized Fleece Fault. These dykes have not been successfully age dated; however, they seem to closely predate mineralization. Their relationship with the hydrothermal system is not known.

H.7 Altered Carbonate

A wide range of carbonates of various compositions and textures occur on the property. The altered carbonate group includes rocks where less than 85% of the original Permian limestone remains. Carbonate rocks plot on a ternary diagram with limestone, dolomite and quartz as end members (Figure 6). Five altered carbonate lithologies are derived from this diagram. They include dolomitized limestone, silicified limestone, silicified dolomite, dolomite, quartz-and their brecciated equivalents. Fine sulphides (mostly pyrite) and precious metal mineralization also occur in some altered carbonate units. These rocks were recrystallized and brecciated as a result of

LIMESTONE–DOLOMITE–QUARTZ LITHOLOGY TRIANGLE

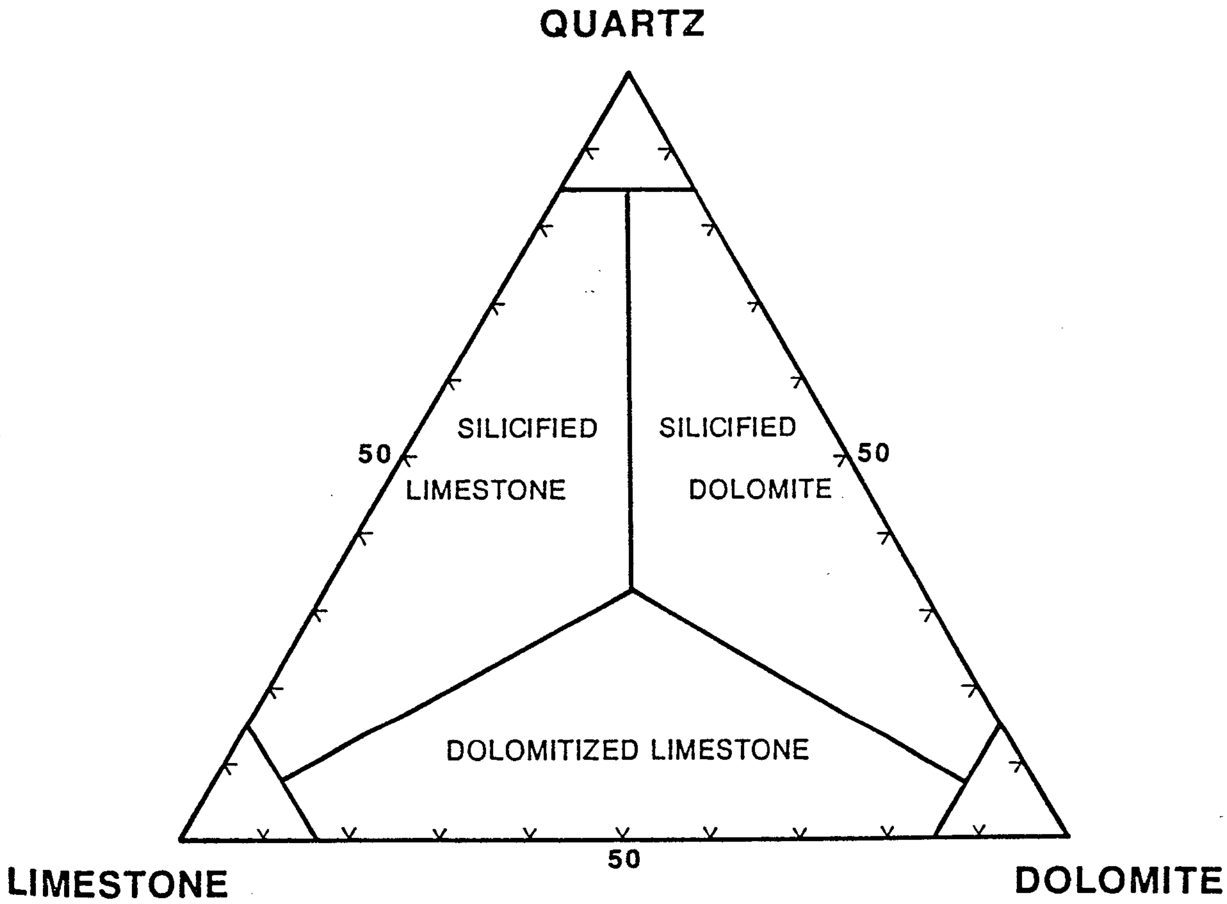


FIG. 6

middle to late Jurassic alteration. They often form resistant ridges such as the hogs back of the Bear Main Zone.

Quartz is the property name for an altered carbonate that has greater than 85% silica. This unit is characteristically brecciated. Crackled, banded and stockwork textures are also common. The colour varies from milky white to dark grey with shades of red, brown, orange and yellow. Grain size ranges from very fine, almost glassy, to medium sand size with common quartz euhedra. The unit is often vuggy. Cavities may be lined with a variety of minerals; drusy quartz, calcite and limonite are common.

Four other lithologic units of altered carbonate are derived from the lithology triangle. Silicified dolomite and silicified limestone are the most common of these altered units. Although contacts within these units are often gradational, several important sub-units are recognized in the Bear Main Zone. These sub-units are discussed in the next.

H.8 Altered Greenstone

The altered greenstone unit includes bleached, carbonatized, chloritized and clay-altered tuffs and gabbros. Pyrite, fine sulphides and precious metal mineralization are also present in these rocks. Alteration in this unit and the carbonate unit is presumed to be middle to late Jurassic. These altered units are closely related to fault structures. They form conspicuous red and orange gossans throughout the property. The altered greenstones of the Bear Main Zone are discussed in detail in Section I.

H.9 Rhyolite Dykes

Rhyolite dykes cut the Stikine greenstones on the west side of the TAN 6 claim (Walton, 1985). These rocks belong to the late Cretaceous to Eocene Sloko Group. The intrusives are part of a dyke swarm that parallels the contact of a large body of Sloko Group felsic extrusives 2 km west of the property.

H.10 Basalt Dykes

Very late stage intrusive rocks of the Level Mountain Group outcrop on the property. These rocks are black, magnetic, unaltered vesicular basalt. They occur as 0.2 to 1 m wide dykes which cross-cut all other lithologic units.

In the Bear Main Zone and in Fleece Bowl they occur within the mineralized zones and clearly post-date the mineralization. The dykes trend north-south and are steeply inclined. They roughly parallel the main fault structure and appear to follow prominent fracture planes. Local irregularities and offsets are common. Contacts with the host rocks are sharp. The dykes have intruded several lithologies of the altered units and possibly some of the older surficial deposits. The basalt unit is Miocene to Recent in age. Basalt flows outcrop 4 km north of the property.

H.11 Slope Movement Deposits

Slope movement deposits were first mentioned by Souther (1971). He recognized the main rock avalanche that impounds Muddy Lake in the Bearskin Valley. The discovery of mineralization on the BEAR claim in 1981 led to speculation by Chevron personnel about the extent of slope movement deposits.

The Bear-Totem geology map by McAllister (1984) outlines blocky debris piles on the lower part of the BEAR and BEAR 3 claims as landslide debris. In 1985 the surficial deposits on these claims were mapped in detail (Titley, 1986). This map accompanying notes describe slope movement deposits over a wider area. In July and August 1986 these deposits were again examined in detail by D.C. Martin and H.W. Newcomen of Piteau and Associates and by J.J. Clague and S.G. Evans of the Geological Survey of Canada. These workers have substantiated and refined the knowledge of the widespread landslide deposits on the BEAR claim.

A major landslide with a volume of about 100 million m^3 is evident on the east side of the BEAR claim (Figures 5 and 7). Slide debris extends over a 2 km^2 area. This slide occurred as a catastrophic rock avalanche that descended onto a glacier in Bearskin Valley about 10,000 years ago. (Clague, pers. comm.). The glacier probably occupied a re-entrant in sheared greenstones just beyond the more resistant carbonates at the head of Muddy lake. As the glacier retreated, the slopes were

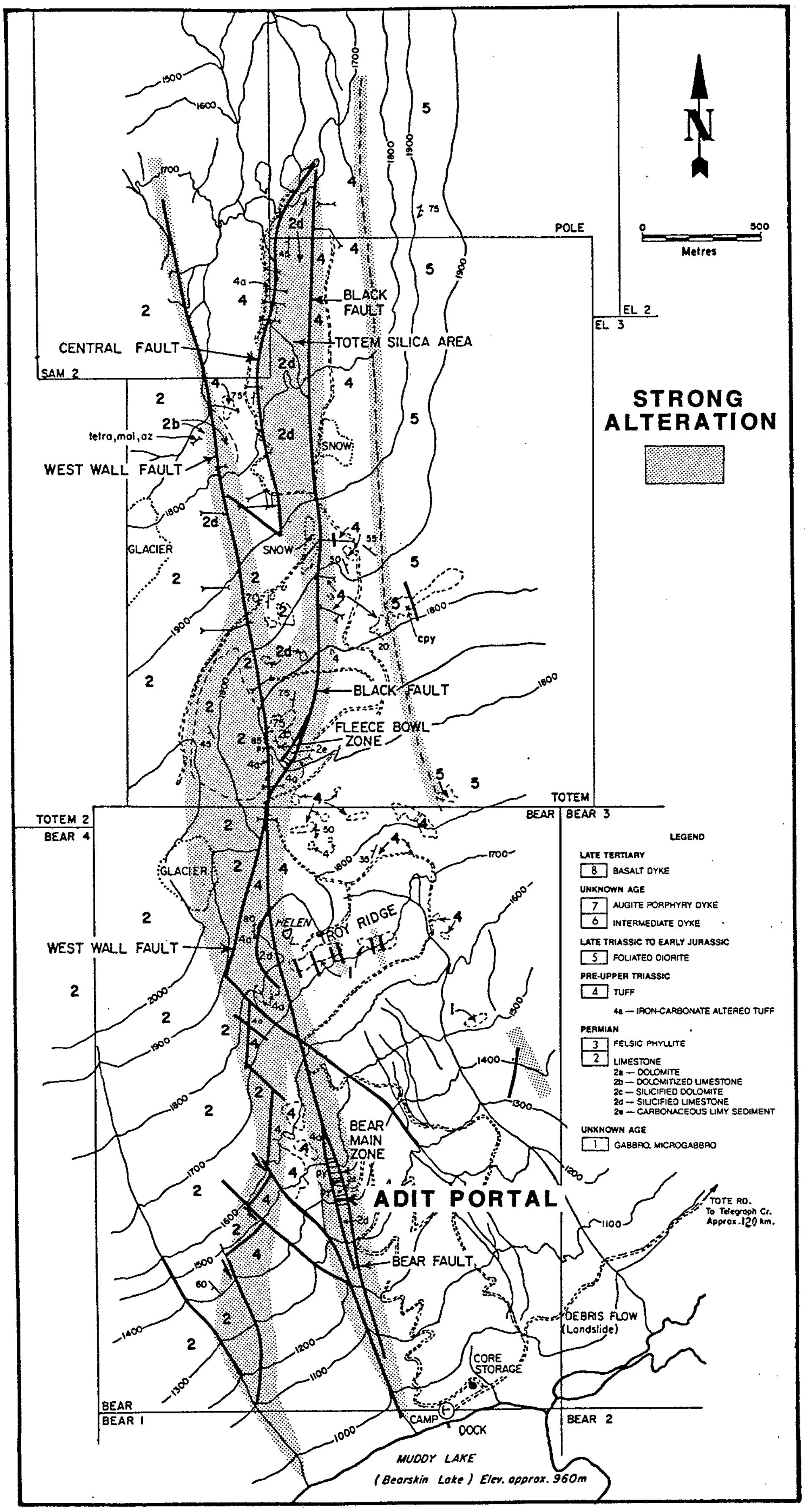

N
0 500
Metres
STRONG ALTERATION
POLE
EL 2
EL 3
SAM 2
BLACK FAULT
TOTEM SILICA AREA
CENTRAL FAULT
tetra,mal,az
WEST WALL FAULT
SNOW
GLACIER
cpy
FLEECE BOWL ZONE
TOTEM
TOTEM 2
BEAR 4
BEAR
BEAR 3
HELEN
ROY RIDGE
BEAR MAIN ZONE
ADIT PORTAL
BEAR FAULT
DEBRIS FLOW (Landslide)
CORE STORAGE
CAMP
DOCK
BEAR 1
BEAR 2
MUDDY LAKE
(Bearskin Lake) Elev. approx. 960m
TOTE RD. To Telegraph Cr. Approx. 120 km.
LEGEND
LATE TERTIARY
8 BASALT DYKE
UNKNOWN AGE
7 AUGITE PORPHYRY DYKE
6 INTERMEDIATE DYKE
LATE TRIASSIC TO EARLY JURASSIC
5 FOLIATED DIORITE
PRE-UPPER TRIASSIC
4 TUFF
4a — IRON-CARBONATE ALTERED TUFF
PERMIAN
3 FELSIC PHYLLITE
2 LIMESTONE
2a — DOLOMITE
2b — DOLOMITIZED LIMESTONE
2c — SILICIFIED DOLOMITE
2d — SILICIFIED LIMESTONE
2e — CARBONACEOUS LIMY SEDIMENT
UNKNOWN AGE
1 GABBRO, MICROGABBRO

FIGURE: 7

left in an oversteepened condition. Slope failure may have occurred as a result of high pore pressure and/or a seismic event. Slide debris did not run up the opposite side of the valley but continued for some 2 km down the valley. These features suggest that the slide came down on a wasting mass of ice (Clague and Evans, pers. comm.).

Slope movement has directly affected rocks of the Bear Main Zone although it is uncertain to what extent. Rock avalanche debris occur in surface diamond drillholes and in underground cross-cuts in the hanging-wall of the Bear Main Zone (see geological cross-sections in pockets). This material is difficult to drill and excavate.

Around the flanks of the main slide, several large, relatively coherent blocks of rock also exhibit slope movement features. Some of these blocks occur in the immediate vicinity of the Bear Main Zone. The Radio Telephone slump block occurs directly above and to the west of Bear Main Zone. This block is marked by 150 m long arcuate surface depression and truncates the top of the mineralized carbonate body at the 1460 m elevation (see geological cross-sections in pockets).

Within the Bear Main Zone slope movement has opened up large cracks in the altered carbonate rocks. In the hanging-wall zone, the landslide has removed altered and mineralized tuff and gouge. This material has spread out in a series of slip surfaces that roughly parallel topography south of Section 23760 N. Drill intersections and surface samples of this material indicate that it contains significant gold mineralization. The distribution and volume of this material are not well known.

An investigation of the gold content of the broken slope movement deposit was carried out. The talus deposits south of the Bear Paw outcrop, immediately below the adit site, were sampled and found to average 2.8 g Au/t. Landslide material lower down in the Bearskin Creek valley has also been investigated and sampled. The results have not been encouraging.

H.12 Unconsolidated Recent Sediments

Unconsolidated Quaternary sediments on the claim group consist of alluvium, glacial outwash, till, alpine moraine, colluvium and felsenmeer. Some broad alluvial or outwash deposits occur in the Samotua River and Bearskin Creek valleys. These form the only large flat areas on the property and are subject to annual floods. Till occurs as thin, scattered, widespread deposits. Alpine moraine forms low ridges and thick accumulations in local areas. Thin deposits of colluvium and felsenmeer cover much of the claim block and often obscure bedrock geology.

H.13 Faults

Several important fault structures occur on the Golden Bear property (Figure 7). The most prominent orientation is north-south (350°). Southwest-northeast (040°) and northwest-southeast (140°) fault orientations are also recognized. These structures tend to be vertical and steeply inclined.

North-south faults such as the Bear Fault (B.F.), the West Wall Fault (W.W.F.) and the Black Fault (W.O.B.) occupy a major 500 m wide structural zone known as the Ophir Break. This break has been traced north of Muddy Lake for a distance of 15 km. Intense alteration and gold mineralization are localized along faults within this zone.

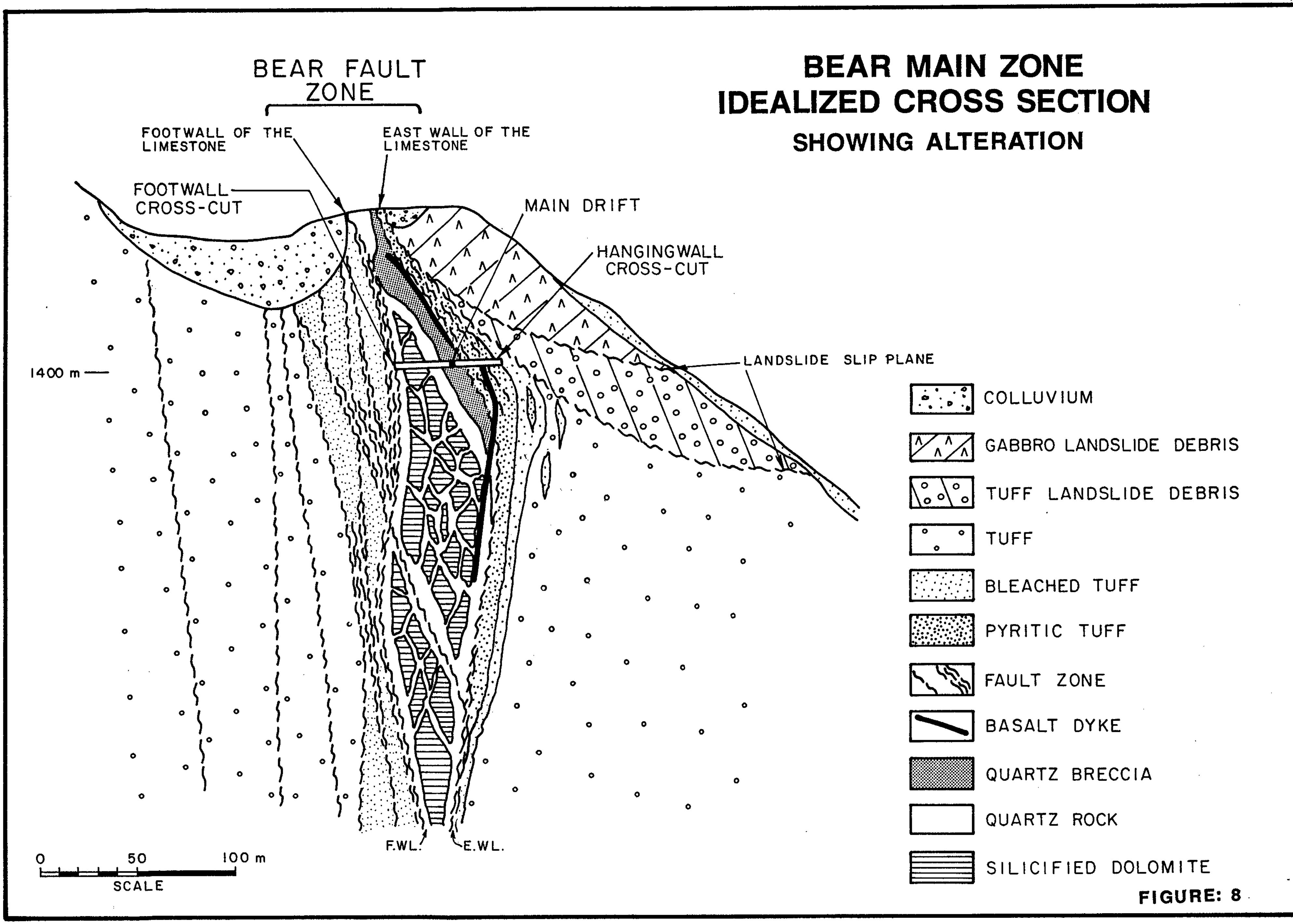
Intense alteration occurs in a 50 m to 100 m wide sheared zone centred on an upright carbonate block. This major structure is known as the Bear Fault Zone. It merges with the West Wall Fault in an area known as the "Gap" (Figure 7). The Bear Fault Zone occupies the margins of a tectonically emplaced sliver of brecciated and altered Permian limestone. This sliver is bounded by steeply dipping north-south faults sheared and altered pre-Upper Triassic greenstones surround the carbonate block.lts.

The mineralized hanging-wall, or Bear Fault, is marked by the east wall of the limestone (E.W.L). This fault rolls from a 45° east dip to a 65° west dip (see geological cross-sections and Figure 8). The footwall fault occurs along the west side of the limestone sliver (F.W.L.) and is part of a larger footwall Structure. This anastamosing structure is marked by strong shearing and gouge over a width of 25 metres.

The West Wall Fault bounds the east side of the Permian limestone (Figure 7). It occurs just below the prominent West Wall limestone cliffs. The fault extends from the northwest corner of Muddy Lake to Fleece Ridge. Here it is joined by the Bear Fault and continues north to form the Fleece Fault in Fleece Bowl.

The Fleece Fault zone is centred on a tectonically emplaced sliver of tuff within altered carbonates. The tuff body is bounded by a hanging-wall fault (H.W.T.) and a footwall fault (F.W.T.). The mineralized hanging-wall fault zone is often referred to as the Fleece Fault (F.F.). The tuff body pinches out in the northern part of Fleece Bowl (Figure 7).

The West Wall Fault has been traced north of Fleece Bowl towards Tatsamenie Lake by Chevron. North of the TOTEM claim the structure weakens. Locally it splays out into breccia. In the central part of the TOTEM claim limestone-greenstone contacts appear to be conformable. Faults do not have contrasting wallrocks.


BEAR MAIN ZONE
IDEALIZED CROSS SECTION
SHOWING ALTERATION
BEAR FAULT ZONE
FOOTWALL OF THE LIMESTONE
EAST WALL OF THE LIMESTONE
FOOTWALL CROSS-CUT
MAIN DRIFT
HANGINGWALL CROSS-CUT
LANDSLIDE SLIP PLANE
1400 m
F.WL.
E.WL.
0
50
100 m
SCALE
COLLUVIUM
GABBRO LANDSLIDE DEBRIS
TUFF LANDSLIDE DEBRIS
TUFF
BLEACHED TUFF
PYRITIC TUFF
FAULT ZONE
BASALT DYKE
QUARTZ BRECCIA
QUARTZ ROCK
SILICIFIED DOLOMITE
FIGURE: 8

The Black Fault cuts altered limestone and greenstone on the TOTEM claim (Figure 7). It emerges from the Gap and trends northeast to the central part of Fleece Bowl where it swings north. This fault occurs mainly in sulphide-rich, often graphitic, black argillites. These argillites are interbedded with the greenstones and limestones along much of the fault. In the north, the structure bounds the east side of the Totem silica area. This area is made up of totally silicified limestone (quartz).

The Central fault bounds the west side of the TOTEM silica area. This fault is similar to the Black Fault or Totem Fault which it parallels.

The significance of northeast and northwest-trending faults is not understood. Evidence for these structures is from apparent offsets in lithologic units and from surface lineaments. Prominent steeply dipping foliations also parallel these orientations, as do some small (< 1 m) offsets seen in the underground workings. There is no evidence for large, tectonic cross-structures with these orientations in the Bear Main Zone.

I. ALTERATION AND MINERALIZATION

I.1 Summary

Quartz-carbonate alteration on the Golden Bear property is associated with fault structures in Stikine Assemblage rocks (Figure 7). The most intense zones of alteration occur along fault contacts between Permian limestone and pre-Upper Triassic greenstone. Here, limestone has undergone quartz-dolomite alteration. Dolomite-kaolinite ± chlorite and dolomite-illite ± pyrite alteration have developed in greenstones wallrocks (Read, 1986).

Age dates from sericitic tuffs suggest a genetic relationship between alteration and mineralization events and early Jurassic intrusive activity (Schroeter, 1987). Ages range from 177 Ma to 206 Ma and compare with nearby non-foliated dioritic intrusive rocks dated at 156 Ma to 171 Ma. Alteration and intrusion occurred along regional fault structures over a 50 million year period from early to late Jurassic.

I.2 Bear Main Zone

The Bear Main Zone has undergone intense alteration. An idealized cross-section of this area is shown in Figure 8. Alteration is associated with steeply dipping north-south faults of the Bear Fault zone. These deep-seated faults acted as channelways for ascending hydrothermal fluids. Alteration is most intense at fault contacts between contrasting wallrock lithologies where brecciation and fracturing resulted in increased permeability. Alteration is pervasive over a wide area. Several distinct alteration zones are recognized. The reader should refer to plan section and maps in the pockets.

I.3 Hanging-wall Zone

Hanging-wall rocks consist of altered and unaltered tuff east of the hanging-wall fault contact (E.W.L.). Mineralization and alteration in these rocks decreases away from the contact.

An important feature of the Bear Main zone is the hanging-wall roll. This feature extends from Sections 23700 N to 23940 N and is marked by an inflection in the hanging-wall fault contact between 1360 m and 1380 m elevation. Above the inflection, the fault contact between tuff and limestone dips from 45^{o} to 80^{o} east. Below the inflection, the fault dips steeply to the west.

Slope movements have had an important influence on the Bear Main Zone (Figure 8). Rock avalanche deposits are in contact with the hanging-wall zone. Locally, rock avalanches have removed parts of the zone. A large block of relatively coherent rock has moved, in the order of tens of metres, across the upper part of the Bear Main Zone north of 23925 N and above 1450 m elevation. These slope movements have locally obscured structure, displaced mineralized material and caused intense fracturing and cracking of "in-situ" rocks of the zone. Rock avalanches have completely removed altered hanging-wall zone rocks above the roll south of Section 23750 N. Partial removal of this material took place south of Section 23925 N. A 100 m plus thickness of rock avalanche debris deposits occur in the hanging-wall zone. The deposits large, wedge-shaped to sheet-like lobes of poorly sorted debris. The debris lobes have a consistency similar to unconsolidated overburden with abundant large (up to house size) fragments. Drilling and underground mining conditions in these deposits are usually poor.

Several contemporaneous rock avalanche debris lobes occur in the hanging-wall zone. These deposits consist predominantly of gabbro and tuff with some gouge, altered tuff, altered gabbro and rare carbonate debris. At least three, lithologically distinct lobes have been identified. A lobe of gabbro debris extends from Sections 23600 N to 23825 N. Overlapping this, a lobe of tuff debris occurs between Sections 23775 N to 24100 N. The base of this tuff was intersected in the 1-3784 E, 1-3809 E and 1-3832 E crosscuts. A second gabbro lobe covers the tuff from Sections 23775 N to 24025 N (Figure 8). These lobes are lithologically homogeneous. Some altered and gouge material, containing gold mineralization, was removed from the hanging-wall roll area by slope movement. This material occurs between Sections 23600 N to 23825 N. It has been cored and sampled in several drillholes. More drilling is required to establish the grade and continuity of this material.

I.4 Bleached Tuff

Mafic volcanics and gabbros which have a pervasive, diffuse or irregular pale green colouration, particularly along fractures, are termed bleached. This feature is generally a result of dolomitization (Read, 1986).

Bleaching is closely associated with faults and fractures throughout the property. In the Bear Main Zone, calcite veins increase in number, over tens of metres, towards the hanging-wall fault. Within several metres of the fault zone, the number of calcite veins decreases, and dolomite veins become more abundant. Bleached areas along veins also increase towards the fault contact. Within a few metres of the zone, the carbonate content of the greenstones is commonly 10% to 30% and may be as high as 60%. This carbonate occurs as veins and replacements of mafic phenocrysts and lithic fragments (Read, 1986).

Bleached tuffs occur in the hanging-wall and footwall zones of the Bear Main Zone. The bleached areas tend to form irregular patches that roughly parallel the E.W.L. Some wallrocks are bleached along fractures and carbonate veins and in small patches for tens of metres away from the contact. The most intensely bleached areas occur within several metres of the fault, usually adjacent to, or within areas of pyritic tuff. Basalt dykes are commmonly centred on these bleached zones.

Original textures such as lapilli and laminations are evident in some bleached tuffs. Local variations in the intensity of bleaching may be largely structurally controlled. Primary lithologic variation does not seem to affect the intensity of bleaching.

Intensity of bleaching is of limited use in defining geologic units. Some rocks which are intensely dolomitized, but also have abundant fine sulphide or chlorite, and do not appear bleached. Pyritic tuffs are often a good example of this feature. Also, some rocks in the Footwall Zone which are pale in colour, as a result of compositional variation and not alteration, have been termed bleached.

Recognition of bleached tuffs may be of economic importance. These rocks are readily identifiable and could be used to visually define assay cut-offs in a mining situation. Gold values are consistently poor in bleached rocks which lack fine sulphides or gouge. These rocks are adjacent to high grade mineralization in some areas of the hanging-wall zone.

I.5 Pyritic Tuff

Tuffaceous rocks which contain one percent or greater secondary pyrite and/or fine sulphides are known as pyritic tuff. In the hanging-wall zone, pyritic tuff is a well-defined lithologic unit (Figure 8). It is bounded on the west side by the E.W.L. and is generally 2 m to 10 m wide. This zone contains significant amounts of gold mineralization in the Bear deposit. Other zones of pyritic tuff occur further out in the hanging-wall zone; in tuff slivers within the carbonate; and in the footwall fault zone. These pyritic zones are commonly auriferous; gold grade is variable.

The pyrite occurs as replacements of original minerals and in veinlets. At least two kinds of pyrite are evident. Fine to very fine-grained, dark pyrite occurs as diffuse disseminations and in pervasive patches throughout the rock and along veins and fractures. Fine to medium-grained, brassy, euhedral pyrite is well developed on vuggy veins and fractures.

Chalcopyrite occurs as rare crystals in amygdules and veins. It is not a significant sulphide mineral. With the exception of chalcopyrite, no other sulphide minerals have been macroscopically identified at the Bear Deposit.

Microscope work by Heyse (1984) identified arsenopyrite, tellurides, tetrahedrite, native silver and traces of chalcopyrite in samples of pyritic tuff. The presence of other trace elements including arsenic and mercury, has been indicated by metallurgical studies.

Gold mineralization occurs as minute particles and disseminations in the pyritic tuffs of the hanging-wall zone. The gold occurs as native gold in the 1 to 50 micron size range and submicron sized grains which are probably disseminated or in solid solution in sulphides (Wober and Shannon, 1986). At least two phases of mineralization were responsible for the development of the pyritic tuffs. A silver-rich sulphide phase is in the footwall of the 1-2 North drift. Superimposed on this is a gold-rich sulphide phase. In hand specimen, different phases of mineralization are indistinguishable.

I.6 Limonitic Gouge

Limonitic gouge is a property name for sheared, weathered pyritic tuff and fault gouge. This material occurs along the hanging-wall fault contact against the altered carbonate and is typically crumbly, friable to punky in texture with numerous irregular gouge surfaces. It occurs in many shades of white, grey, grey-blue yellow, orange, red, pale green, purple, brown and black. Clay is often present. It is often vuggy with limonite, hematite, calcite, sericite and gypsum filling and coating fractures. This unit is strongly carbonatized and contains 15% to 60% dolomite and calcite.

The limonitic gouge unit is typically two to eight metres wide and occurs above 1385 m from Section 23775 N to 23900 N. It is seen in the 1-3784 E, 1-3809 E, 1-3832 E and 1-3879 E cross-cuts and on the surface just north of the portal collar. This material also occurs in a narrow seam adjacent to the east wall of the limestone in many areas.

Slope movements and weathering had important influences on the development of the limonitic gouge. This material is best developed where pyritic tuffs are in direct contact with the rock avalanche debris. Presumably, the pyritic tuffs were strongly fractured and sheared as a result of the large slope movements which took place on top of them. These rocks were intensely oxidized by water flowing through a permeable zone at the base of the landslide. Several other important features of the limonitic gouge have developed as a result of slope movement. Gouge surfaces have a variety of easterly dips, some of them quiet shallow. Some unaltered, unmineralized material occurs in the limonitic gouge zone. Conversely, some altered material and mineralized gouge occurs within the rock avalanche debris.

Limonitic gouge has the highest gold grade of any material in the Bear deposit. This material has also produced the only visible gold (panned from gouge in the 1-3832 E cross-cut) on the Golden Bear property. The nugget effect, which is negligible in the gold-bearing pyritic tuff and silicic breccia, can be appreciable in the limonitic gouge. Supergene enrichment may have occurred in parts of the limonitic gouge zone.

I.7 East Wall of Limestone

The fault contact between altered carbonate and altered greenstone in the Bear Main Zone is known as the east wall of the limestone (E.W.L.). This planar feature has also been referred to as the hanging-wall contact and the Bear Fault, where it is mineralized. The E.W.L. is usually quite well-defined, although some mechanical mixing of tuff and silicified carbonate has produced narrow, irregular heterolithic breccias in some areas. The area immediately east of the portal entrance is one example of this kind of breccia, which generally has a siliceous, sulphide-rich matrix.

I.8 Carbonate Zone

The carbonate zone is a fault-bounded block of altered limestone surrounded by volcanic rocks. The Bear deposit is centred on this zone. The carbonate body outcrops from Section 23710 N to 23925 N. In the sub-surface this body is 10 m to 60 m wide, in excess of 900 m long and extends from the 1500 m elevation to the below 1150 m elevation. The carbonate is bounded by major faults that trend north-south and dip steeply. Emplacement of the carbonate took place as a result of complex movement along these faults.

Brecciated silicified dolomite makes up the heart of carbonate body. Various totally silicified carbonates and silicic breccias occur along faults in the upper part of the zone. These rocks include a quartz breccia of white quartz fragments in a dark grey sulphide-rich siliceous matrix, a tan quartz breccia with an orange tan stain and a siliceous matrix, and crackle brecciated dark grey quartz.

Brecciation in the carbonate zone is complex. Textural evidence presented by Lowey (1986) and Read (1986) favours a solution-collapse breccia model, rather than a fault breccia model to account for most of the brecciation in the carbonates. The presence of karst pipes, exotic clasts, clast-supported breccias, and the shape of quartz crystals and remnants of open spaces in the matrix-filling supports this theory. Later tectonic brecciation has been superimposed on these features. Recent slope movements have resulted in further fracturing and intense cracking in these rocks. Several open cracks with voids up to 1 m x 5 m x 10 m have been encountered in underground workings.

I.9 Quartz Breccias

Quartz breccias are important gold-bearing rocks in the Bear deposit. These clast-supported breccias are made up of white to medium-grey, angular, banded to massive quartz fragments (totally silicified limestone?) in a dark grey matrix of fine quartz crystals. Quartz breccias with in a dark, fine sulphide (pyrite) matrix are often auriferous. Gold content ranges from 3 g/t to 15 g/t. Tan quartz breccias have tan or orange limonitic coatings on the fragments and in the matrix. These quartz breccias generally have only minor fine sulphides in the matrix and typically average less than 3 g Au/t.

The origin quartz-rich rocks is problematical. Lowey (1986) suggested that primary deposition of chert was important. Solution collapse introduced quartz-rich clasts into the limestone block. The fact that a major hydrothermal system was active in the rocks makes hydrothermal silicification more likely. Tectonic brecciation was then overprinted on some of these breccias. Some quartz crystals show evidence of this tectonic strain (Read, 1986). Silica in the matrix of sulphide-rich and gold-rich breccias is contemporaneous with main mineralizing events. Minor, later stage unmineralized white quartz veins have also been noted.

A major zone of quartz breccia occurs in the Bear Main Zone. This unit is made up of dark, fine-sulphide matrix breccias and tan breccias. It has an irregular outline and often indistinct contacts. It occurs from Section 23775 N to 24100 N and is generally above the 1400 m level. This breccia is best seen in the back of the 1-3789 W cross-cut. The base of the breccia follows the hanging-wall roll along the E.W.L. In the 1-3926 E and 1-3962 E raises, it occurs as tan quartz breccia.

I.10 Silicified Dolomite

Silicified dolomite is as a tan grey to pale buff, brecciated rock with irregular tan to grey silicified patches. Most of the 1986 underground excavations in the Bear Main Zone, were driven through the silicified dolomite because it is the only large body of competent rock at the 1400 m level.

Dolomite occurs in at least two phases in the rocks. The first phase is a preferential replacement of original micrite and calcite. The second phase of dolomitization resulted from brecciation and the formation of a dolomitic matrix (Lowey, 1986).

Most of the dolomite breccias formed as a result of solution-collapse or karst activity. Dolomite-rich breccias tend to have a dolomitic matrix. Tectonic brecciation is overprinted on these breccias. The development of an orange rind on some silicified dolomite probably resulted from limonite precipitation from iron liberated from oxides, sulphides or ferroan dolomite (Read, 1986). Read also noted that some mylonitized dolomite is selectively coated with orange limonite, possibly because the rock is more permeable. Two generations of dolomite-quartz veins are noted, an early, strained generation and a later, unstrained generation.

Presumably, dolomitization took place after the development of karsts. This would correspond with the main period of hydrothermal alteration and tectonic brecciation. Several phases of dolomite suggest that dolomitization processes were active in the early and later stages of alteration and possibly throughout the alteration time period.

Mineralization in the silicified dolomite is widely distributed, low grade and erratic. Samples containing up to

30 g Au/t have been taken in the silicified dolomite; however, with the exception of some hanging-wall contact zone mineralization, these samples lack continuity. Generally the silicified dolomite has less than 10 g Au/t. A large area of predominantly silicified dolomite talus and rubble south of the Bear Paw averaged 2.7 g Au/t. Pyrite and fine sulphide mineralization are not common in silicified dolomite.

I.11 Grey Quartz

Grey quartz is a dark, glassy, strongly crackle brecciated variety of totally silicified carbonate. This unit is similar in origin to the quartz breccias, but the development of a true breccia texture is not as evident. Grey quartz rocks usually have an intense stockwork of pale orange-grey quartz veinlets.

Grey quartz occurs in 2 m - 15 m wide lenses which roughly parallel the F.W.L and E.W.L. Several of these lenses are seen in the 1-2 North drift. The contact between grey quartz and silicified dolomite in the 1-3895 cross-cut is a sharp, regular plane with traces of gouge on the surface. Contacts between grey quartz and quartz breccia are not as well known, but are probably not as sharp.

Mineralization in the grey quartz is not as significant as in the quartz breccias. Some intersections of grey quartz at the footwall fault in the Section 23800 N - 1400 m elevation area contain up to 30 g Au/t gold and 50 g Ag/t over narrow widths.

Other areas of weak mineralization in grey quartz occur adjacent to interior faults or tuff slivers in the carbonate and where the grey quartz occurs at the hanging-wall contact below 1400 m.

I.12 Interior Faults-Tuff Slivers

Interior faults cut across the carbonate body in the Bear Main Zone. These faults are oblique to sub-parallel with the E.W.L. Altered tuff commonly occurs along these faults in sheet-like or lensoid slivers. Alteration and mineralization are concentrated along these zones.

An interior fault-tuff sliver extends from the hanging-wall contact at 1340 m towards the footwall contact above 1400 m between Sections 23925 N to 24075 N. It was intersected in the 1-N 'A' drift from Section 24000 N to 24075 N and in the 1-4000 W cross-cut. The fault zone contains an altered, pyritic tuff sliver in this area and grades up to 15 g Au/t gold over less than 2 m widths. The wall adjacent to the fault consists of silicified dolomite, grey quartz and quartz breccia. These rocks are not unusually altered, although they do carry anomalous gold values.

I.13 Footwall of Limestone Contact

The footwall of the limestone contact (F.W.L.) bounds the west side of the carbonate body where it is in fault contact with altered tuffs of the footwall zone. The general appearance of alteration at the contact and the overall outline of the F.W.L. is similar to the E.W.L. A roll in the footwall fault occurs at 1365 m to 1385 m from Section 23725 N to 23950 N. Below this roll, the F.W.L. dips steeply to the west (Figure 8).

Unlike the hanging-wall contact, the footwall of the limestone contact is not known to host any major zones of gold mineralization. Although alteration was intense at the footwall contact, brecciation and altered solution-collapse breccias are not widespread. The structural trap which occurs at H.W.L. is also not as well developed at the F.W.L. Thus, areas tested on the F.W.L. contact lack wide, consistent zones of gold mineralization. The strong pyritic alteration which did take place along the footwall contact may be related to another alteration pulse, which was enriched in silver relative to gold.

The plane of contact between altered carbonate and altered tuff at the footwall is not as distinct as the hanging-wall contact. Heterolithic contact breccias and lenses of grey quartz within pyritic tuff make it difficult to determine an actual contact plane in many areas of the footwall.

I.14 Footwall Zone

The footwall zone includes the predominantly tuffaceous rocks which lie to the west of the footwall of the limestone fault contact. In this zone, strong alteration has occurred along the F.W.L. and over a wide area that contains several parallel structures (Figure 8). Kaolinite-dolomite-pyrite-illite assemblages have completely over-printed the original footwall volcanic rock in some instances. Common pale green illite has been widely mistaken for fuchsite.

Lithologies of this zone include sheared tuff, with minor mudstone and lenses of silicified limestone. Gold mineralization is not known in the footwall zone away from F.W.L.

A 15 m to 25 m wide strongly sheared and locally crushed zone is in the footwall zone. Termed Fosters Fault, it dips steeply to the east and trends north-south. It splays off the footwall fault below the footwall roll at 1325 m at the south end and this detachment climbs to 1400 m north of Section 24000 N. The fault is open-ended and it extends south of Section 23700 N and north of Section 24100 N. Fosters Fault contains significant volumes of water. Geotechnical holes B86-UG-1 and B87-UG-12 were abandoned due to excessive water flows from this structure. It is possible that this structure was re-activated by recent slope movements.

I.15 Synthesis

The most significant gold mineralization in the Bear Main Zone occurs between 1350 m elevation and the surface in an area which extends from Section 23760 N to 2400 N. Three types of potential ore have been recognized in the Bear Main Zone (Figure 9). They include pyritic tuff, limonitic gouge and quartz breccia. Mineralized pyritic tuff occurs from 1365 m to 1450 m elevation in area which extends from Section 23810 N to 24025 N. The best zones of this material are between 1385 m to 1450 m - Section 23839 N to 24000 N. True widths are up to 12 m and grades range from 10 to 45 g Au/t. Mineralized quartz breccia occurs from 1355 m to 1500 m elevation in an area which extends from Section 23760 N to 24000 N. Widths are up to 15 m and grades range from 7 to 16 g Au/t. Limonitic gouge material is closely associated with the base of the rock avalanche. Widths range form 1 m to 10 m with grades of 8 to 50 g Au/t.

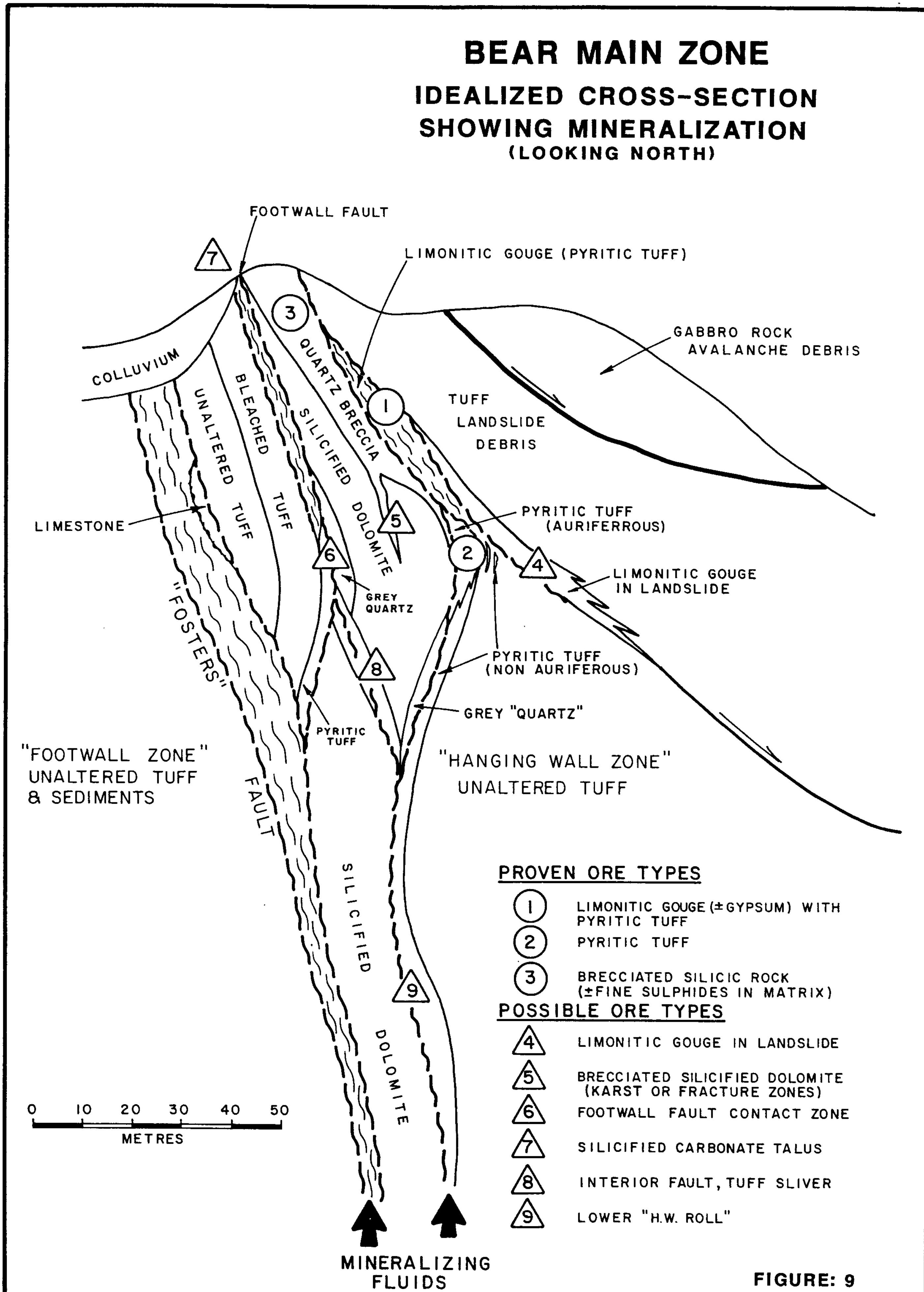

BEAR MAIN ZONE
IDEALIZED CROSS-SECTION
SHOWING MINERALIZATION
(LOOKING NORTH)
FOOTWALL FAULT
7
LIMONITIC GOUGE (PYRITIC TUFF)
3
QUARTZ BRECCIA
GABBRO ROCK
AVALANCHE DEBRIS
COLLUVIUM
UNALTERED TUFF
BLEACHED TUFF
SILICIFIED DOLOMITE
1
TUFF
LANDSLIDE
DEBRIS
5
LIMESTONE
PYRITIC TUFF
(AURIFERROUS)
6
2
4
LIMONITIC GOUGE
IN LANDSLIDE
GREY
QUARTZ
"FOSTERS"
PYRITIC TUFF
(NON AURIFEROUS)
8
GREY "QUARTZ"
PYRITIC
TUFF
"FOOTWALL ZONE"
UNALTERED TUFF
& SEDIMENTS
FAULT
"HANGING WALL ZONE"
UNALTERED TUFF
SILICIFIED
DOLOMITE
9
PROVEN ORE TYPES
1 LIMONITIC GOUGE (± GYPSUM) WITH PYRITIC TUFF
2 PYRITIC TUFF
3 BRECCIATED SILICIC ROCK (±FINE SULPHIDES IN MATRIX)
POSSIBLE ORE TYPES
4 LIMONITIC GOUGE IN LANDSLIDE
5 BRECCIATED SILICIFIED DOLOMITE (KARST OR FRACTURE ZONES)
6 FOOTWALL FAULT CONTACT ZONE
7 SILICIFIED CARBONATE TALUS
8 INTERIOR FAULT, TUFF SLIVER
9 LOWER "H.W. ROLL"
0 10 20 30 40 50
METRES
MINERALIZING
FLUIDS

FIGURE: 9

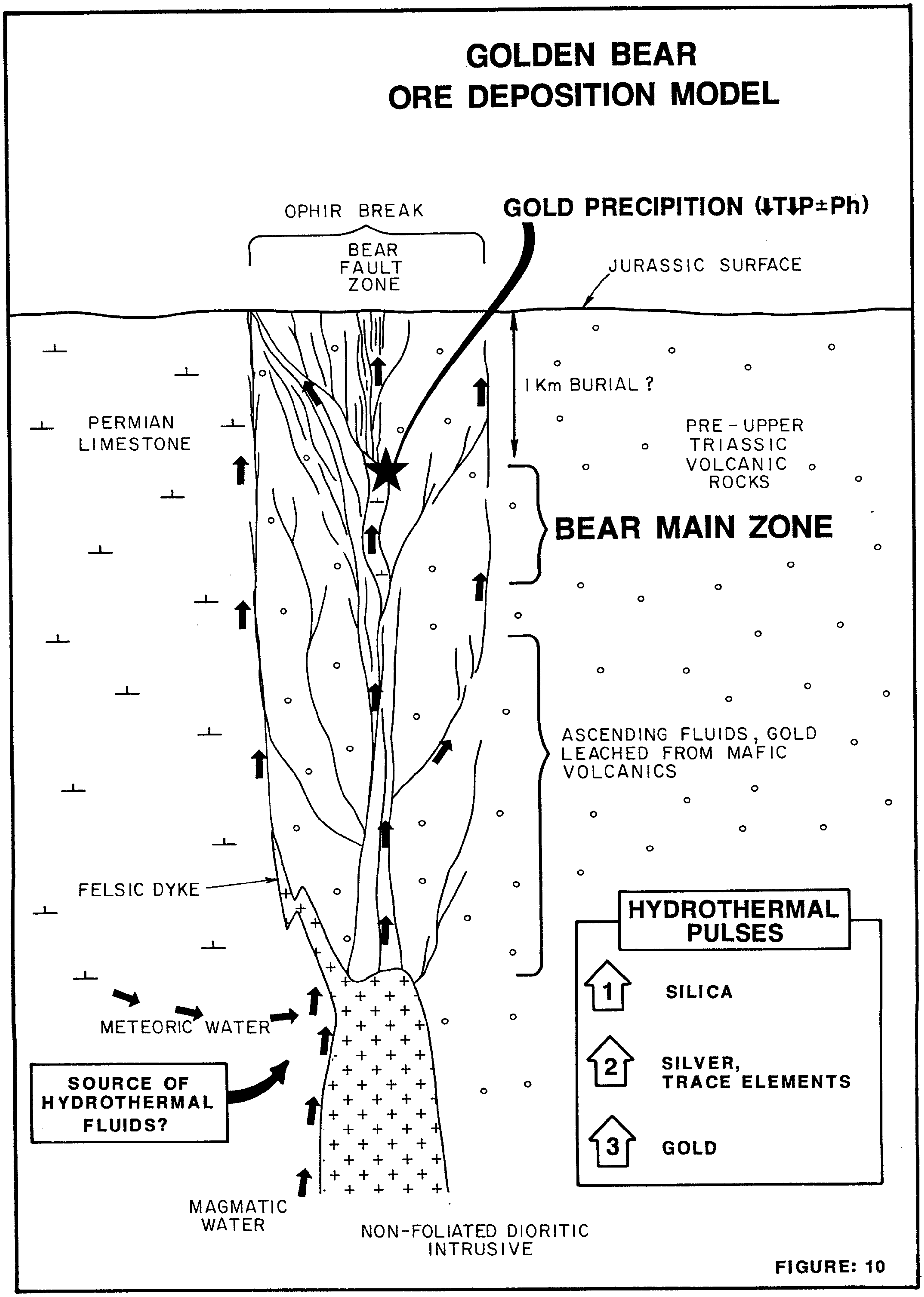
J. ORE DEPOSITION MODEL

J.1 Summary

Mineralization on the Golden Bear property is primarily epigenetic. Gold was deposited in chemically receptive rocks from a hydrothermal system developed on pre-existing fault structures. The deposit is characteristic of a low to medium temperature, low salinity mesothermal system (Wober and Shannon, 1985). Unpublished oxygen isotope work by Nesbitt (1986) agrees with this model. Schroeter (1987) noted that the Bear deposit has characteristics similar to vein-type, epithermal, precious metal-bearing deposits elsewhere in the region. Alteration and mineralization in these deposits are associated with a period of widespread igneous activity. Figure 10 is an ore deposition model for the Golden Bear property.

J.2 Host Rock Mineralization

Gold mineralization in the Bear deposit occurs in tuffaceous rocks and limestone. Mineralization in the tuffaceous rocks is associated with disseminated pyrite, dolomitization and clay alteration. In the limestone, silicification, dolomitization and pyrite alteration are the most important alteration features. Sulphide and associated gold mineralization in the carbonates occur predominantly in the matrix of breccias.


GOLDEN BEAR
ORE DEPOSITION MODEL
OPHIR BREAK
BEAR FAULT ZONE
GOLD PRECIPITION (↓T↓P±Ph)
JURASSIC SURFACE
1 Km BURIAL ?
PERMIAN LIMESTONE
PRE-UPPER TRIASSIC VOLCANIC ROCKS
BEAR MAIN ZONE
ASCENDING FLUIDS, GOLD LEACHED FROM MAFIC VOLCANICS
FELSIC DYKE
HYDROTHERMAL PULSES
1 SILICA
2 SILVER, TRACE ELEMENTS
3 GOLD
METEORIC WATER
SOURCE OF HYDROTHERMAL FLUIDS?
MAGMATIC WATER
NON-FOLIATED DIORITIC INTRUSIVE
FIGURE: 10

According to Read (1986) and Lowey (1986) this matrix developed as solutions filled open-spaces in the breccias.

Although the deposit has varied characteristics, it is not a vein-type deposit. The general lack of quartz and carbonate veins is conspicuous. Alteration in the tuff occurred as pervasive replacement of pre-existing mineralogy at the fault contact between tuff and limestone. Minor carbonate and quartz veins which occur within and outside this zone are essentially unmineralized. Gold mineralization is typically evenly disseminated within certain areas of strong sulphide replacement and breccia matrix filling. Most of the gold is submicron size, with the exception of that in some limonitic gouge zones within the altered tuffs.

J.3 Hydrothermal System

The most intense alteration on the Golden Bear property took place in areas of high permeability. A strong hydrothermal system developed in the fractured and brecciated zones adjacent to major pre-existing faults. These structures are associated with the middle Triassic Tahltanian orogeny which resulted in strong deformation of the host rocks. Deep-seated fault zones were activated at this time.

Permian limestones were folded and faulted against pre-Upper Triassic volcanics. Brecciation, particularly within the limestones, took place as a result of this activity. Uplift resulted in the development of some karst features within the limestone. Volcanic rocks were sheared and metamorphosed to the greenschist facies by this tectonic activity. Zones of high permeability were able to concentrate the flow of large volumes of hydrothermal fluids.

Hydrothermal fluids ascending through a column of mafic volcanics leached significant amounts of gold from the country rock. Deposition of gold and sulphide complexes took place at zones where the temperature, pressure and pH conditions changed.

J.4 Synthesis

The Bear Main Zone is part of a several kilometre long hydrothermal system. Wall rock alteration in tuffs and limestones is pervasive along faults in this major structural break. The extent and intensity of alteration in this system suggests that large, favorable areas remain unexplored.

A genetic relationship between middle Jurassic dioritic intrusive activity and the development of the hydrothermal system is likely. These non-foliated diorites occur on the property as felsic dykes. They have not been successfully age-dated but are related to a middle Jurassic albitite body dated by Hewgill (1985). Dates obtained from sericite in altered tuffs and a hornblende porphyry dyke by Schroeter (1987), agree with this hypothesis.

APPENDIX I

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APPENDIX II

CAMP COSTS

1986 GOLDEN BEAR PROLECT

CAMP COSTS

Site Equipment	$ 21,800
Radio Telephone	18,900
Assays & Analysis	66,600
Equipment Rentals	89,300
Equipment Repairs	16,500
Field Supplies	161,900
Contract Drilling	322,200
Contract Underground Development	1,001,500
Explosives	176,000
Room & Board	134,800
Transport-Helicopter	10,200
Transport-Fixed Wing	273,600
Transport-Vehicle	300
Transport-Freight	39,600
Transport-Commercial	27,600
Camp & Equipment Fuel	196,500
Salaries/Wages	458,500
TOTAL	$3,015,800

APPENDIX III

TOTAL COSTS

1986 GOLDEN BEAR PROLECT

TOTAL COSTS

Camp Total	$3,015,800
Legal	6,900
Lic., Fees, Insur.	13,200
Office Delivery	6,500
Project Engineering	83,700
Geological Engineering	90,500
Geotechnical Engineering	38,900
Road Engineering	170,200
Other Engineering	5,000
Drafting, Maps, Etc.	8,700
Environmental Engineering	68,000
Overhead	419,500
	$3,507,400

APPENDIX IV

STATEMENT OF QUALIFICATIONS

STATEMENT OF QUALIFICATION

I, Eric D. Titley, of 1155 Pacific Avenue, Vancouver, B.C. do hereby certify that:

1. I am a graduate of the University of Waterloo, Ontario with a Bachelor of Science (Honours Earth Sciences) degree in 1980.
2. I am an Associate Member of the Geological Association of Canada.
3. I have practiced my profession in Canada and Australia continuously since 1980.
4. This report is based on a work program completed by the writer July 21st to December 12th, 1986 and on research of published reports and maps.
5. I have no direct or indirect interest in the securities of North American Metals Corp.

Vancouver, British Columbia
February 19, 1987

E.D. Titley

NORTH AMERICAN METALS B.C. INC.
1020 - 800 W. PENDER ST.
VANCOUVER, B.C.

GOLDEN BEAR PROJECT
ASSAY SECTION
SECTION 23750N A

DATE:	NOVEMBER 7, 1986.
SCALE:	1:250
DRAWN BY:	GORDON SCLATER
CHECKED BY:	JEFF FRANZEN
PROJECT ENGINEER:	
DRAWING No: XS-5	
PROJECT No:	FILE No:

REVISIONS

DATE	COMMENTS	DRWN BY:	CHKD BY:

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9 BASALT DYKE
8 FAULT
8a FAULT IN LANDSLIDE
8b LIMONITIC FAULT GOUGE (± GYPSUM)
7 GABBRO
7a GABBRO IN LANDSLIDE
6 TUFF
6a TUFF IN LANDSLIDE
5 BLEACHED TUFF
5a BLEACHED TUFF IN LANDSLIDE
4 PYRITIC TUFF
3 QUARTZ BRECCIA
2 SILICIFIED DOLOMITE
2a SILICIFIED DOLOMITE TALUS AND DEBRIS
2b LIMESTONE
1 GREY QUARTZ (SILICIFIED CARBONATE)
LANDSLIDE SURFACES
CONTACTS
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METERS
NORTH AMERICAN
METALS B.C. INC.
1020 - 800 W. PENDER ST.
VANCOUVER, B.C.
GOLDEN BEAR PROJECT
GEOLOGY
SECTION 23750N A
DATE: NOVEMBER 7, 1986.
SCALE: 1:250
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CHECKED BY: JEFF FRANZEN
PROJECT ENGINEER:
DRAWING No: XS-5
PROJECT No:
FILE No:
REVISIONS
DATE
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DRWN BY:
CHKD BY:
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METERS
NORTH AMERICAN METALS B.C. INC.
1020 - 800 W. PENDER ST.
VANCOUVER, B.C.
GOLDEN BEAR PROJECT
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DATE: NOVEMBER 7, 1986.
SCALE: 1:250
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CHECKED BY: JEFF FRANZEN
PROJECT ENGINEER:
DRAWING No: XS-9
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DATE
COMMENTS
DRWN BY:
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NORTH AMERICAN METALS B.C. INC.
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GOLDEN BEAR PROJECT
GEOLOGY
SECTION 23800N

DATE:	NOVEMBER 7, 1986.
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CHECKED BY:	JEFF FRANZEN
PROJECT ENGINEER:	
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PROJECT No:	FILE No:

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ASSAY SECTION
SECTION 23875N C

DATE:	NOVEMBER 10, 1986
SCALE:	1:250
DRAWN BY:	GORDON SCLATER
CHECKED BY:	JEFF FRANZEN
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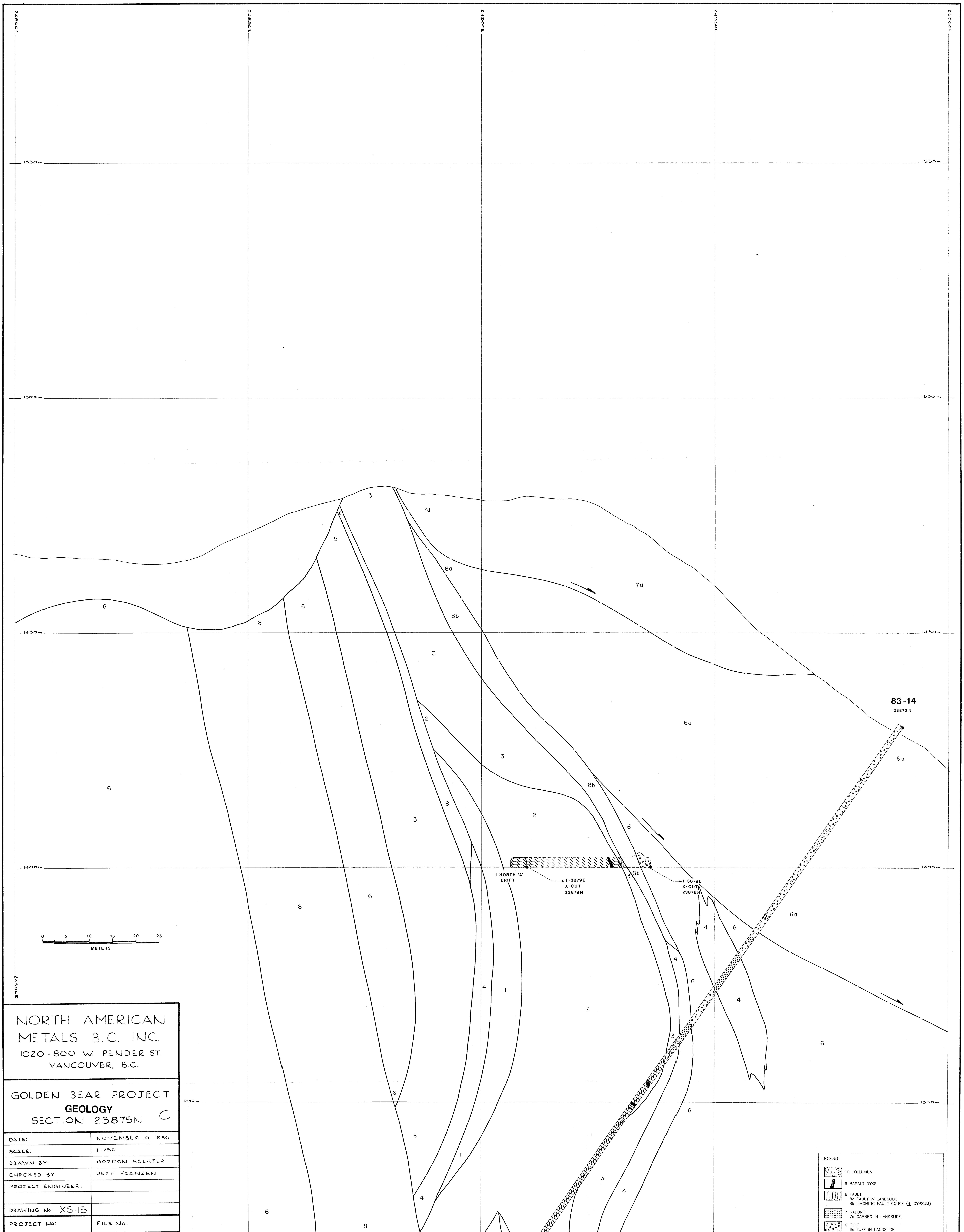

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GOLDEN BEAR PROJECT
GEOLOGY
SECTION 23875N C

DATE:	NOVEMBER 10, 1986
SCALE:	1:250
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PROJECT ENGINEER:	
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PROJECT No:	FILE No:

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ASSAY SECTION
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DATE	NOVEMBER 18, 1986
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PROJECT ENGINEER:	
DRAWING No. XS-19	
PROJECT No:	FILE No

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2a SILICIFIED DOLOMITE TALUS AND DEBRIS
2b LIMESTONE
1 GREY QUARTZ (SILICIFIED CARBONATE)
LANDSLIDE SURFACES
CONTACTS
NORTH AMERICAN
METALS B.C. INC.
1020 - 800 W PENDER ST.
VANCOUVER, B.C.
GOLDEN BEAR PROJECT
GEOLOGY
SECTION 23925N
DATE NOVEMBER 18, 1986
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DATE	NOVEMBER 18, 1986
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DATE	NOVEMBER 18. 1986.
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ASSAY SECTION
SECTION 24012.5N F

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PROJECT ENGINEER:	
DRAWING No: XS-26	
PROJECT No:	FILE No

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METALS B.C. INC.
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VANCOUVER, B.C.
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ASSESSMENT REPORT
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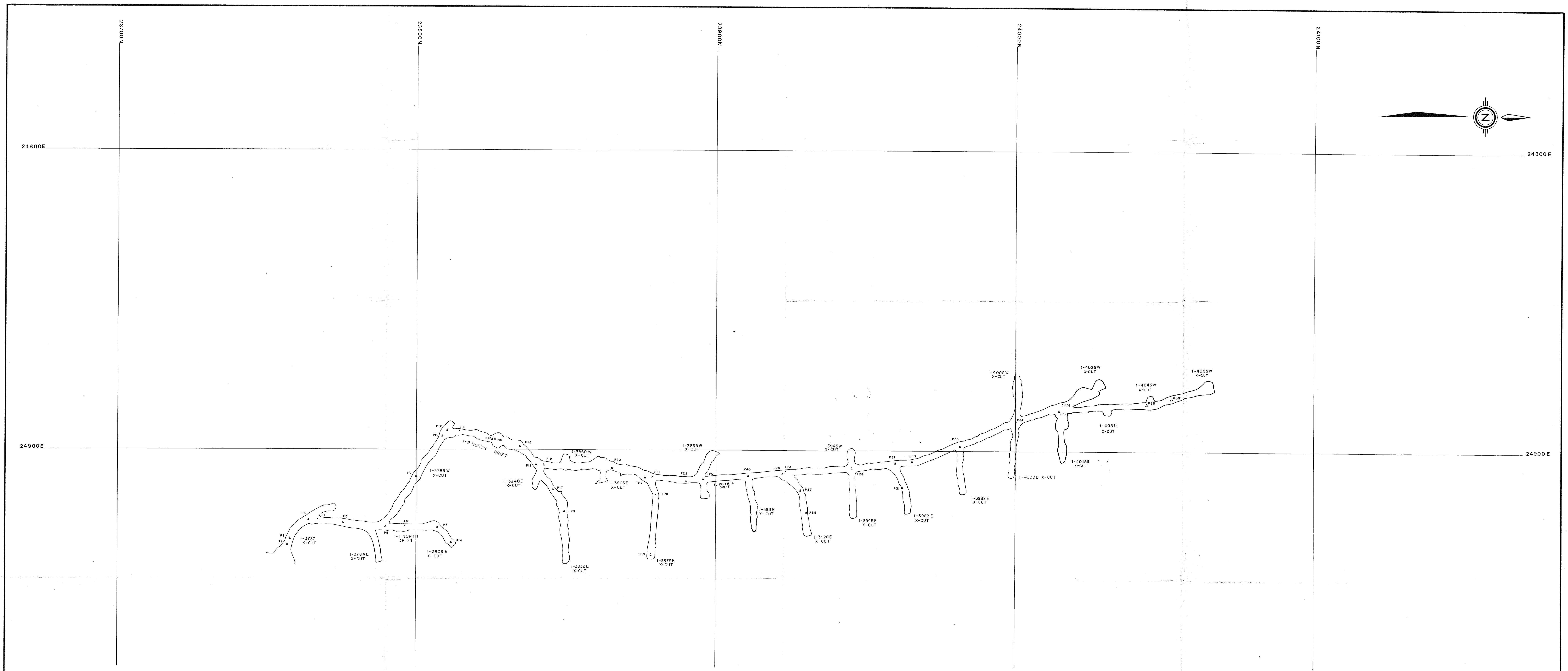
LANDSLIDE SURFACES
CONTACTS



PLAN

PYRITIC TUFF
VERTICAL LONGITUDINAL SECTION

Revisions:		

NORTH AMERICAN METALS B.C. INC.
1020-800 W. Pender St.
Vancouver, B.C.

Golden Bear Project	Date: FEBRUARY 1987
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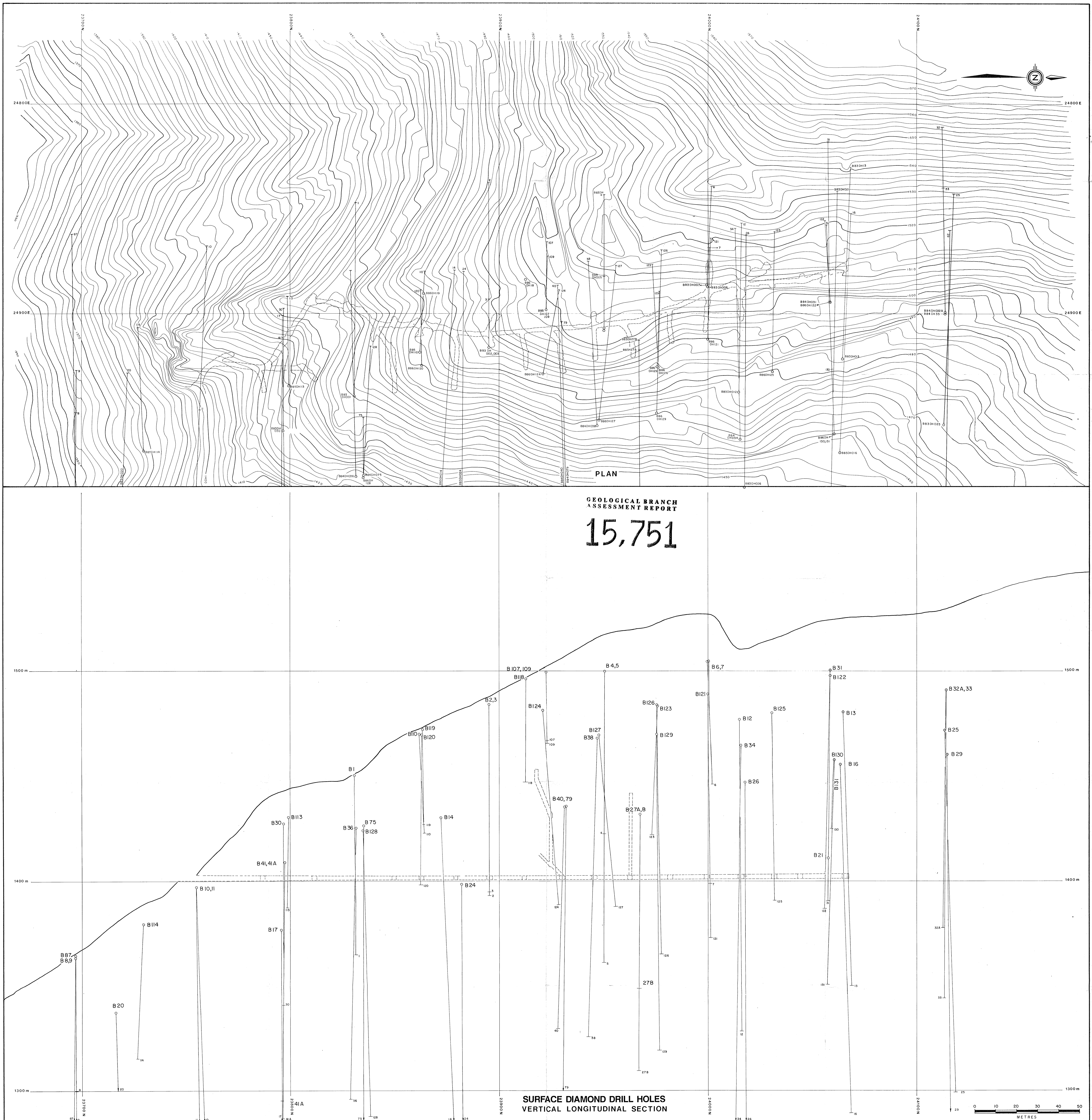
	Chkd by:
Project No:	Drwg No:



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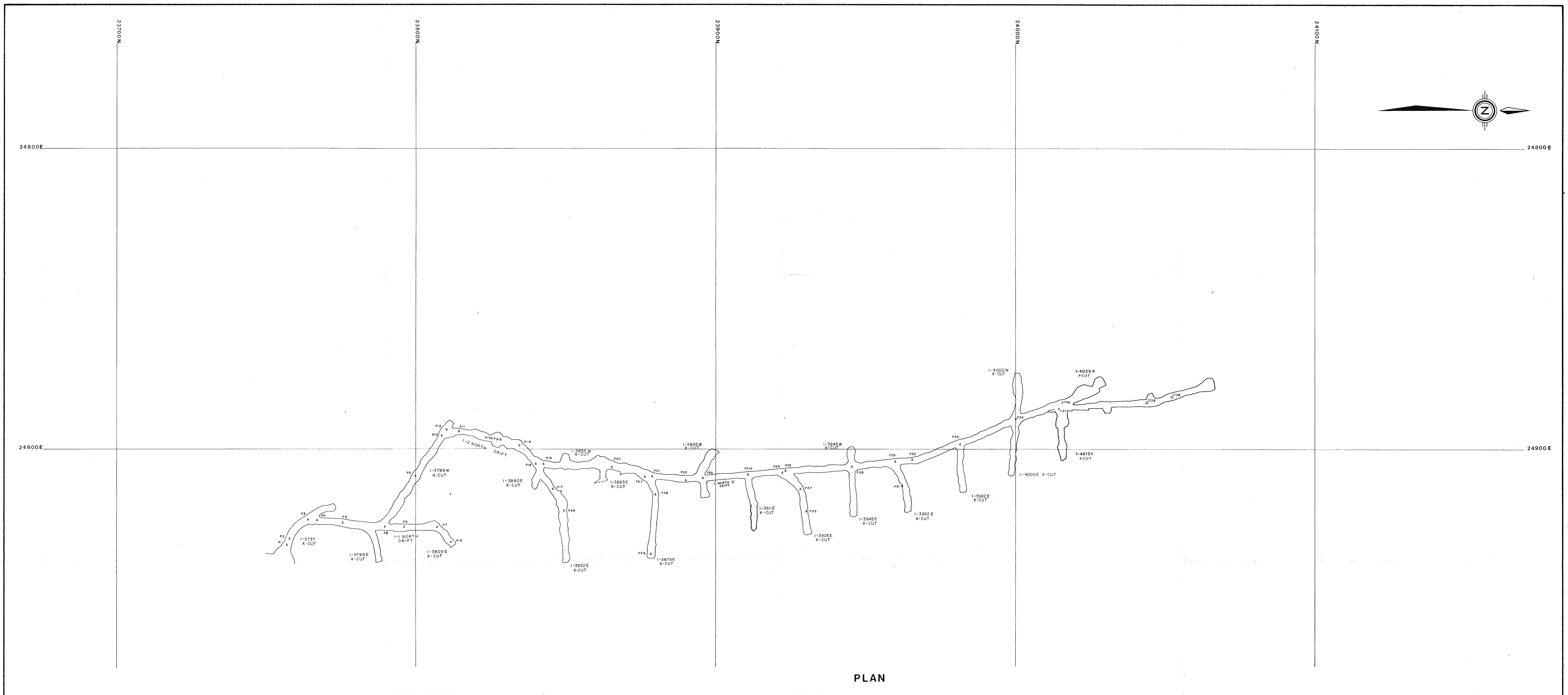

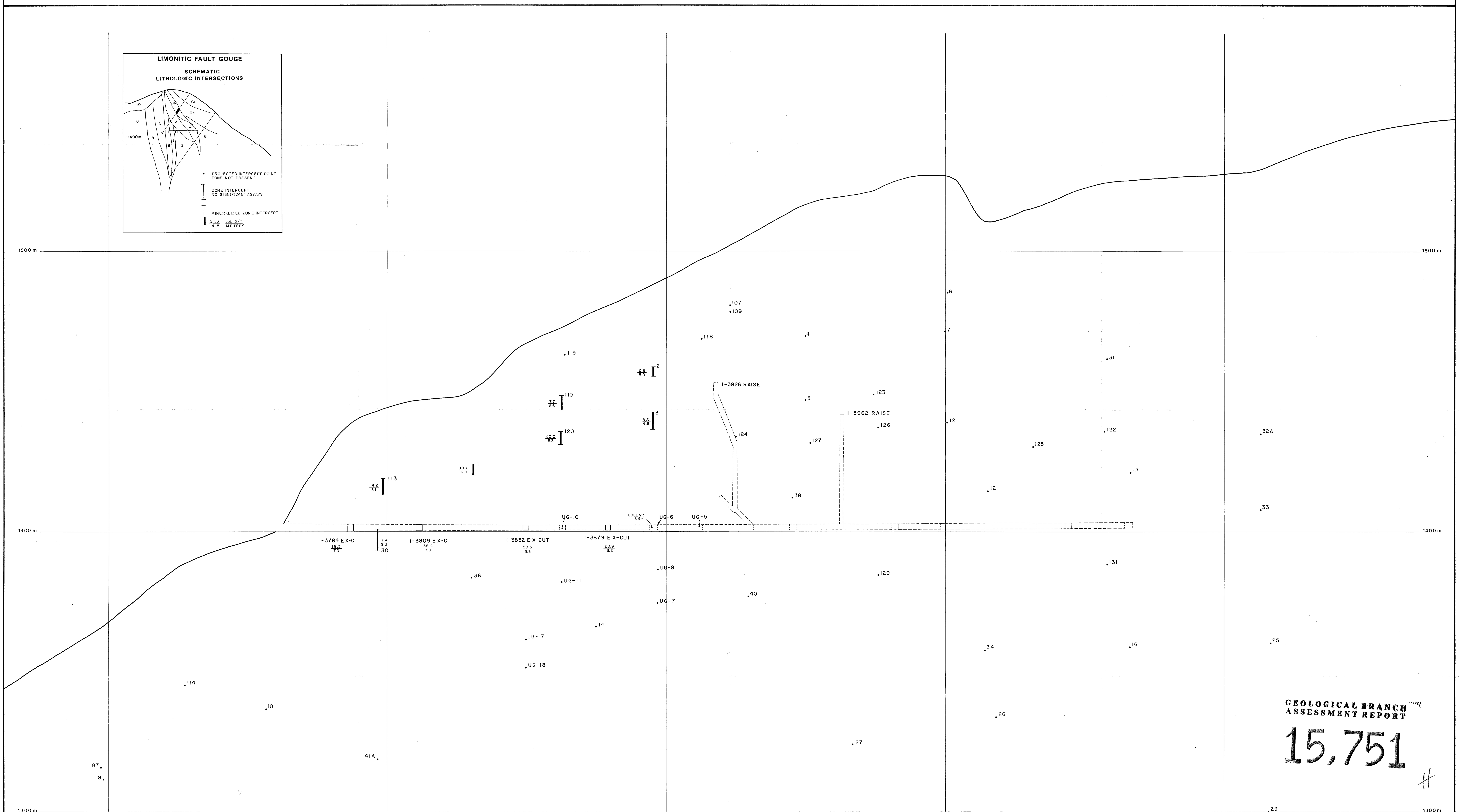

LIMONITIC FAULT GOUGE
VERTICAL LONGITUDINAL SECTION

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Revisions:			NORTH AMERICAN METALS B.C. INC. 1020-800 W. Pender St. Vancouver, B.C.	Golden Bear Project 23700N to 24150N	Date: FEBRUARY 1987
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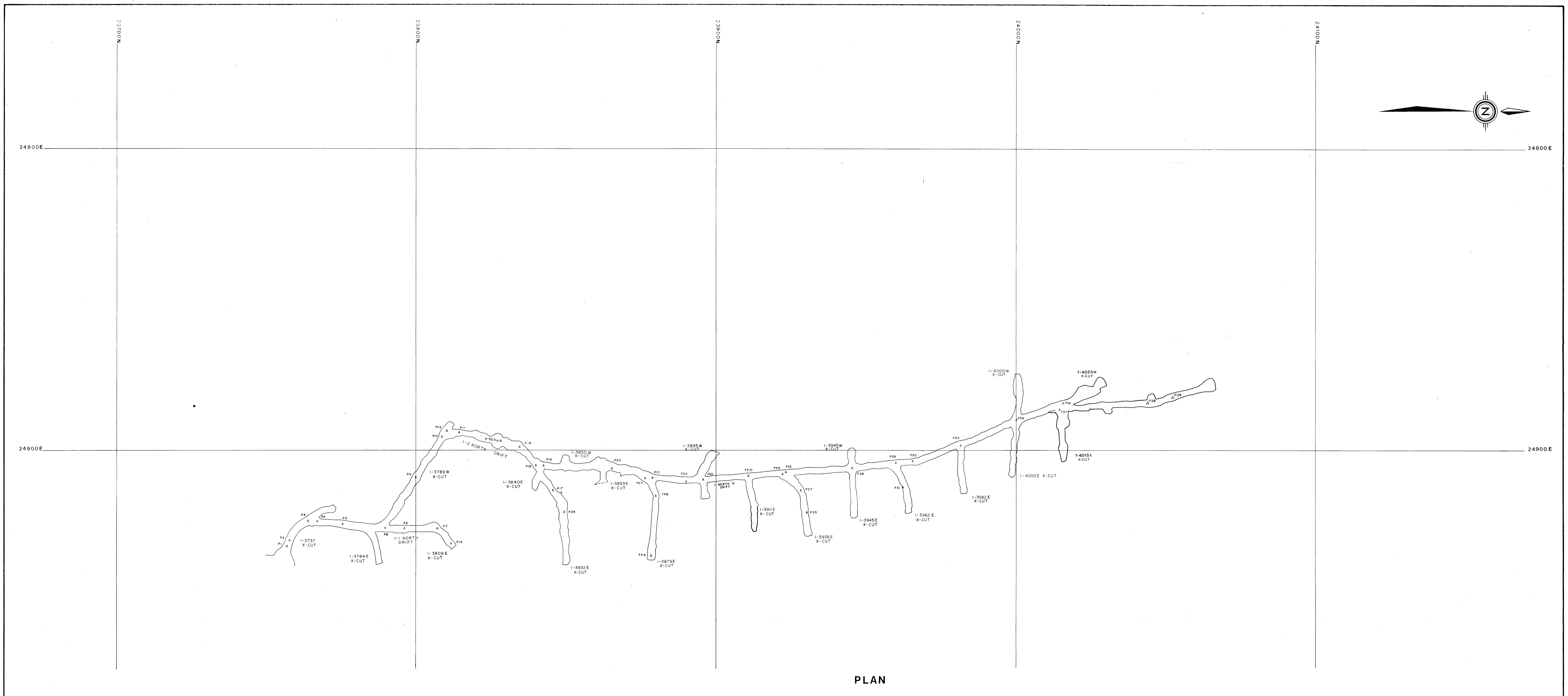

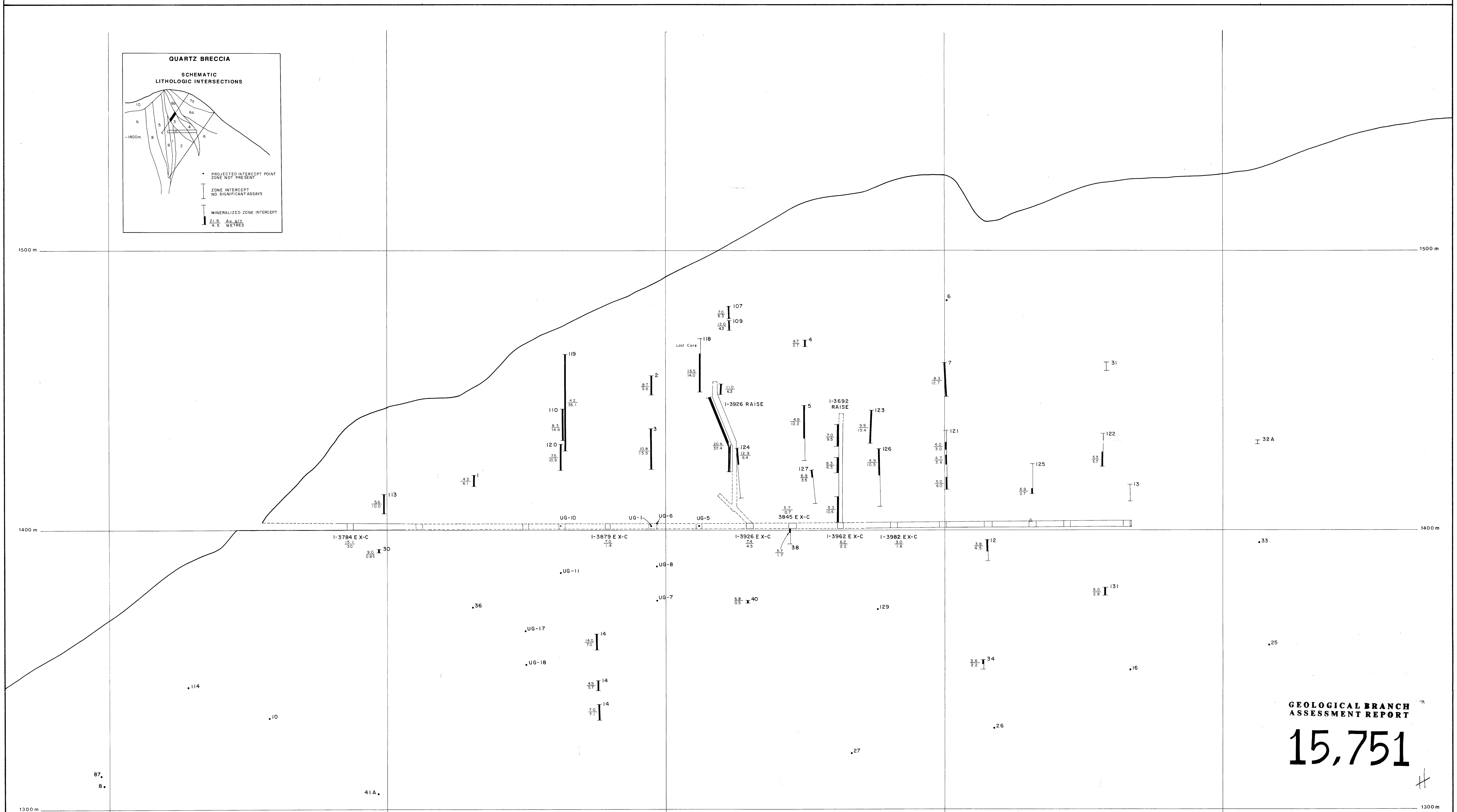

QUARTZ BRECCIA
VERTICAL LONGITUDINAL SECTION

GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,751

Revisions:		

NORTH AMERICAN METALS B.C. INC.
1020-800 W. Pender St.
Vancouver, B.C.

Golden Bear Project	Date: FEBRUARY 1987
23700N to 24150N	Scale: 1:500
	Drwn by: R.W.
	Chkd by:
Project No:	Drwg No:

REVISIONS:			NORTH AMERICAN METALS B.C. INC. 1020-800 W. Pender St. Vancouver, B.C.	VICOR DRIFT	DATE: JANUARY 20, 1987.
				1400m LEVEL	SCALE: 1:250
				23750N To 24075N	DWG. BY: GORDON SCLATER
				GEOLOGY, FACE MAPPING	CHKD. BY: JEFF FRANZEN
				PROJECT No:	DWG. No: G-0

REVISIONS:		

NORTH AMERICAN METALS B.C. INC.
1020-800 W. Pender St.
Vancouver, B.C.

VICOR DRIFT	DATE: JANUARY 20, 1987.
1400m LEVEL	SCALE: 1:250
23750N To 24075N	DWG. BY: GORDON SCLATER
CHIP SAMPLES	CHKD. BY: JEFF FRANZEN
PROJECT No:	DWG. No: C-0

GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,751

1400 M LEVEL PLAN

CROSSCUT MUCK SAMPLES

REVISIONS:		

NORTH AMERICAN METALS B.C. INC.
1020-800 W. Pender St.
Vancouver, B.C.

VICOR DRIFT		DATE:	JANUARY 20, 1987
1400m LEVEL		SCALE:	1:250
23750N To 24075N		DWG. BY:	GORDON SCLATER
MUCK SAMPLES		CHKD. BY:	JEFF FRANZEN
PROJECT No		DWG. No:	M-0

1400 M LEVEL PLAN

DRILL HOLES

GEOLOGICAL BRANCH
ASSESSMENT REPORT

15,751

REVISIONS:					
			NORTH AMERICAN METALS B.C. INC. 1020-800 W. Pender St. Vancouver, B.C.	VICOR DRIFT	DATE: JANUARY 20 1987
				1400m LEVEL	SCALE: 1:250
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				DIAMOND AND SLUDGE DRILLING	CHKD. BY: JEFF FRANZEN
				PROJECT No	DWG. No: D-0