EVALUATION REPORT

OF THE

MUSTANG - JACKPINE CLAIM GROUP

CASSIAR MAP AREA, NTS MAP SHEET 104 P

LIARD MINING DIVISION, BRITISH COLUMBIA

FOR

DUKE MINERALS LTD.

March 25, 1989
Richmond, B.C.

Fred Holcapek P.Eng
Consultant Geologist

ARIS SUMMARY SHEET

District Geologist, Smithers Off Confidential: 90.05.29

ASSESSMENT REPORT 18787 MINING DIVISION: Liard

PROPERTY: Mustang
LOCATION: LAT 59 10 30 LONG 129 40 00
UTM 09 6559520 461891
NTS 104P04E

CAMP: 052 Cassiar Camp

CLAIM(S): Mustang
OPERATOR(S): Duke Min.
AUTHOR(S): Holcapek, F.
REPORT YEAR: 1989, 66 Pages
COMMODITIES
SEARCHED FOR: Gold,Arsenic,Zinc,Copper
KEYWORDS: Mississippian,Permian,Sylvester Allochthon,Greenstones,Argillites
WORK
DONE: Drilling,Geological,Geochemical
DIAD 380.1 m 4 hole(s)
GEOL 150.0 ha
Map(s) - 5; Scale(s) - 1:1250
PETR 5 sample(s)
SAMP 60 sample(s) ;AU

TABLE OF CONTENT

APPENDIX: THIN SECTIONS AND POLISHED SECTION STUDY

MAPS IN POCKET:

FIGURE I:	GEOLOGY MAP	SCALE: 1 : 1,250
FIGURE II:	GEOCHEMISTRY SURVEY RESULTS AU	SCALE: 1 : 1,250
FIGURE III:	GEOCHEMISTRY SURVEY RESULTS AS	SCALE: 1 : 1,250
FIGURE IV:	VLF-EM SURVEY (QUADRATURE & INPHASE READINGS)	SCALE: 1 : 1,250
FIGURE V:	VLF-EM SURVEY FRASER FILTER CONTOUR MAP	SCALE: 1 : 1,250

EVALUATIOMN REPORT
MUSTANG - JACKPINE CLAIM GROUP
McDAME MAP SHEET, NTS 104 P
FOR DUKE MINERALS LTD.

SUMMARY:

The Mustang - Jackpine Claim Group is located 14 km southeast of Cassiar, B.C. Highway 89 passes just west of the property. An all weather gravel road, the old Cusac mine road, leads through the northern part of the claims.

The property is bisected by Camp Creek, which forms a steep V-shaped valley, cut into thick glacial till.

The property is held by Duke Minerals Ltd and Gulf Titanium Ltd. to 50% each.

With the discovery of auriferous quartz-carbonate veins at Erickson and Cusac during 1980, and the completion of a reconaissance silt sampling program by the Department of Mines, the Mustang-Jackpine claims were located.

Initial exploration consisted of prospecting and regional soil sampling which outlined several spot gold anomalies. Detailed gridding followed by trenching was initiated in 1987.

In 1988 percussion drilling, additional trenching and fill in soil sampling followed by geological mapping and diamond drilling was completed.

The property is underlain by the Silvester Group Allochthon, consisting of volcano-sedimentary assemblages devided into two distinct thrust sheets, each with its own characteristic rock assemblage.

The Upper Thrust sheet (Pennsylvanian to Permian) consists of pillow basalts and argillites, siltstones and minor limestone.

The Lower Thrust sheet (Mississippian and Permian) consists of an interbeded sequence of andesite and argillite with splay thrusts containing serpentine bodies considered to be oceanic terrain.

The age relationship between the two main thrust sheets has not been clarified. The two stages of recumbant folding (F1 & F2) in the NE part, and only F2 in the main part of the map area may be related to two independent events of thrusting. F3 folding is much younger and related to the Cassiar Batholitic intrusive revent.

The Upper and Lower Thrust sheets were changed to greenschist by low to intermediate temperature metasomatism, but underlaying Earn Group clastics intersected in drill holes, show no metasomatism. This suggests that the Sylvester greenstones were metamorphosed at their place of origin prior to thrusting.

Several stages of quartz-carbonate veins occur within the district, but only the oldest, easterly trending veins are auriferous.

The hydrothermal system forming the gold-quartz-carbonate veins and changing serpentine to listwanite along the Upper Thrust plane and in the Lower Thrust assemblage, is considered pre Lower Thrust Fault. This is supported by the absence of quartz-carbonate alteration along the Lower Thrust plane, and the absence of metamorphism from limey clastic rocks of the underlaying Earn Group.

Gold mineralization associated with the quartz-carbonate veins in the Sylvester Allochthon is older than the Cassiar intrusion. Studies have shown that the mineralogy of the alteration haloes can be used in prospecting for gold.

At the Taurus Mine the Upper Thrust shows re-activation, it cuts all quartz veins. A younger auriferous-pyritic shear zone parallel to the Upper Thrust, cuts east-west trending auriferous quartz-carbonates suggesting a second phase of gold mineralization from a different source.

The alteration zone on the Mustang property is associated with northerly trending faults ie. the Danny Fault. It consists of a greenschist facies mineral assemblage, enriched in gold, arsenic, and minor quartz-carbonate-tremolite veinlets. These faults acted as conduits for hydrothermal solutions. The depositional environmemt was not optimum for gold deposition.

The northerly faults are considered the youngest event of faulting in the district. On the Mustang claims they are offset by NE and NW trending faults.

Diamond drilling suggests that the Danny Fault is cut by the Lower Thrust and does not penetrate into the underlaying Earn Group clastics.

Work completed on the Mustang claim group was not successful in locating economic auriferous quartz carbonate veins. Regional and local geological data suggests that rock units on the Mustang claims are at the base of the Lower Thrust sheet, therefore not favourable for Cassiar type gold deposits.

The Earn Group clastis are known to host exhalative, stratiform massive sulphide deposits and barite deposits.

Besshi type sulphide deposits are known to occur within the Lower Thrust sheet, hosted by an interbedded argillite-andesite sequence.

The geochemical survey outlined two gold anomalies. One coincides with the trace of the Danny Fault, the other coincides with the southern extention of the Danny Fault which has been shifted west.

Three electromagnetic anomalies were outlined. The first lies along the down dip projection of the the Danny Fault, the second over areas underlain by the Earn Group, and the third is interpreted as a false anomaly.

Trenching traced the alteration zone associated with the Danny Fault. Between trench 5 and trench 7 the fault is displaced to the east along a NE Fault. North of trench 8 the fault appears to have been displaced to the west along a NW fault.

Diamond drilling intersected the Danny Fault alteration in DDH 88-2. The other drill holes penetrated through the Lower Thrust Sheet, the thrust fault, and stopped in the Earn Group clastics. A study of thin sections and polished sections from diamond drill core shows that Earn Group clastics host syngenetic pyrite and remobilized chalcopyrite and sphalerite associated with hairline fractures and as blebs. Rock geochemistry shows that anomalous Cu and Zn are present.

CONCLUSIONS:

1. The Silvester Allochthon consists of at least 2 individual thrust sheets thrusted over the Earn Group clastics.

2. Three ages of quartz veins have been identified within Sylvester rock units, but only the oldest, easterly trending veins carry gold.

3. Gold mineralization is localized within quartz-carbonate vein zones. At Erickson and Cusac Mine these veins terminate against a carbonate-listwanite zone localized along the Upper Thrust plane forming the andesite-argillite contact. The listwanite was derived from serpentinized peridotite lenses, dykes or sills. The age of the gold is pre Cassiar Intrusion (137 ma).

4. At the Taurus Mine a second phase of gold mineralization is localized along young reverse faults. No quartz-carbonate alteration is associated with gold. The fault cuts all quartz veins. Late movement is indicated along the Upper Thrust Plane.

5. At the Mustang claims gold anomalies are associated with northerly trending faults showing quartz-carbonate-tremolite alteration. Rock geochemistry encountered values up to 0.05 oz/ton Au across 1 m.

6. Trenching traced the mineralization along strike, but diamond drilling showed that the alteration-fault zone stops against the lower thrust and does not cut the Earn Group sediments.

7. The Mustang property is underlain by rocks representing the lower stratigraphic section of the Lower Thrust sheet.

8. Thin sections and polished sections cut from drill core show evidence of epigenetic and remobilized pyrite, chalcopyrite and sphalerite.

9. Certain horizons within the Earn Group are known for stratiform massive sulphide deposits of the exhalative type.

10. The argillites and andesites near the Lower Thrust may host Besshi type massive sulphide deposits (Lang Creek & others).

11. Atan Group Carbonates are known for manto type base metal deposits. A zinc geochem anomaly and sphalerite mineralization as replacement and fracture filling was found within the carbonates. The showing has not been explored and warrants more detailed investigation.

RECOMMENDATIONS:

Based on the results of the exploration program completed the following is recommended:

1. Locate outcrop area or approximate trace of Upper Thrust and trace westerly into the Mustang Property.

2. Prospect eastern part of Mustang property and establish the relative stratigraphic position of the Upper Thrust.

3. Check all quartz-carbonate zones found for gold or gold indicators as outlined by alteration studies.

4. Locate contact of Sylvester Lower Thrust Sheet with Earn Group Clastics and investigate lower Sylvester for possible massive sulphide potential.

5. Check area underlain by Earn Group clastic and establish, if possible, the stratigraphic position. Test for barite and base metal concentrations.

6. Additional deep drilling in the vicinity of the carbonate-quartz-alteration zone to clarify its geological setting.

7. Prospecting for auriferous pyrite zones related to young reverse faults.

March 25, 1989
Richmond, B.C.

Fred Holcapek P. Eng.
Consulting Geologist.

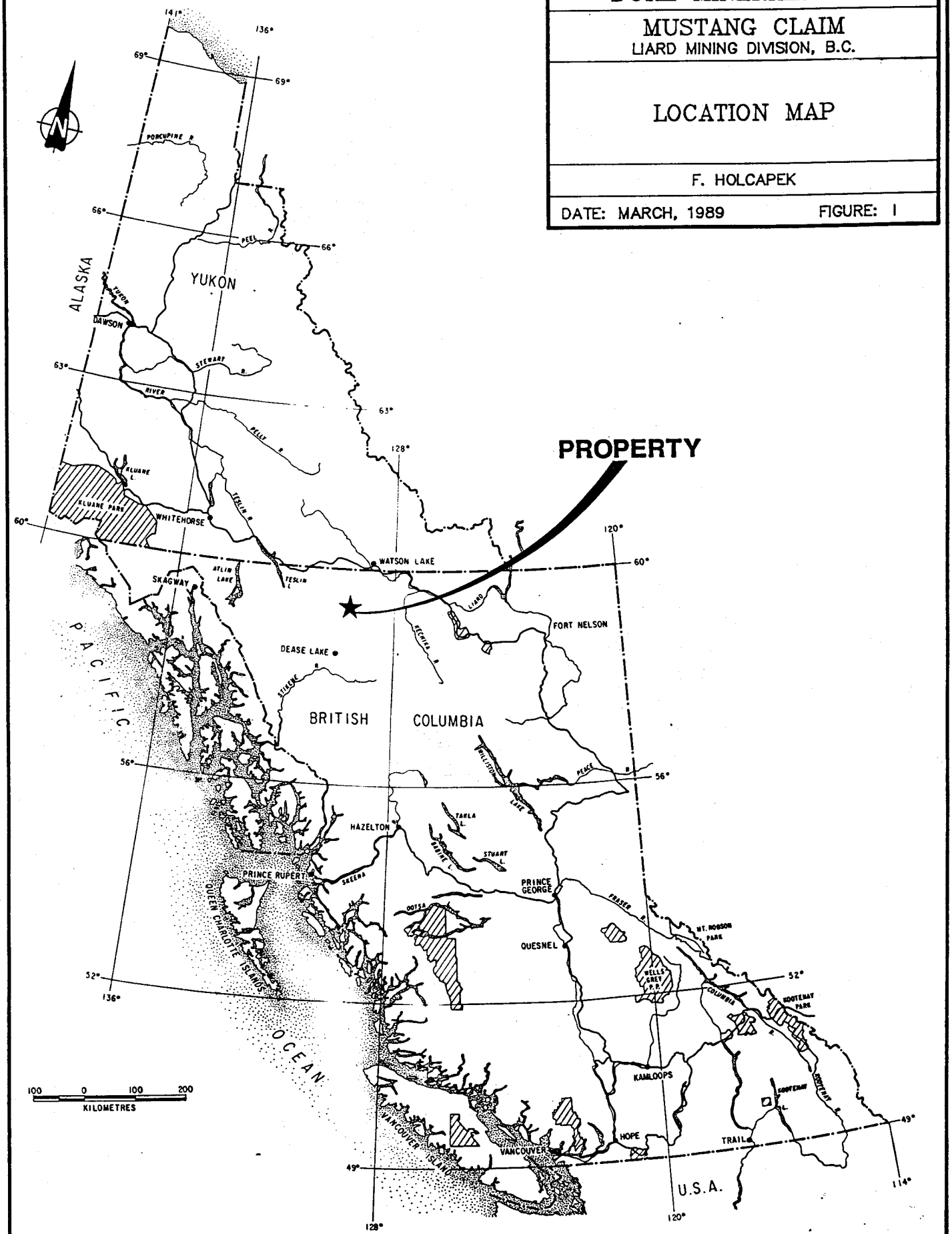
DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

LOCATION MAP

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 1



RWR MINERAL GRAPHICS LTD.

1 - 00 INTRODUCTION:

At the request of Dave Brett, President of Duke Minerals Ltd, the writer visited the Mustang and Jackpine mineral claims from July 25 to August 3, and September 11 to 13, 1988. The purpose of the field trips was to conduct geological mapping, to clarify the geological setting of the area investigated by geochemical sampling, to select areas for backhoe trenching, and relog diamond drill core.

This report is based on the results of exploration completed on the Jackpine property and data published on the general area.

2 - 00 GEOGRAPHY: (Figure 1)

2 - 10 LOCATION AND ACCESS:

The property is located about 14 km southeast of Cassiar, a mining community in northwestern British Columbia. Access to the property is via commercial airliner from Vancouver to Watson Lake, Yukon Territory, and from there via the Alaska Highway to its junction with the Stewart-Cassiar Highway, and then to Cassiar, B.C., a total distance of 142 km.

The property lies south of Vines Lake, covering the north toe of Needlepoint Mountain, 14 km south from the Cassiar turn off along the Stewart-Cassiar Road. Road access from Vancouver is via the Stewart - Cassiar Road which passes Vines Lake.

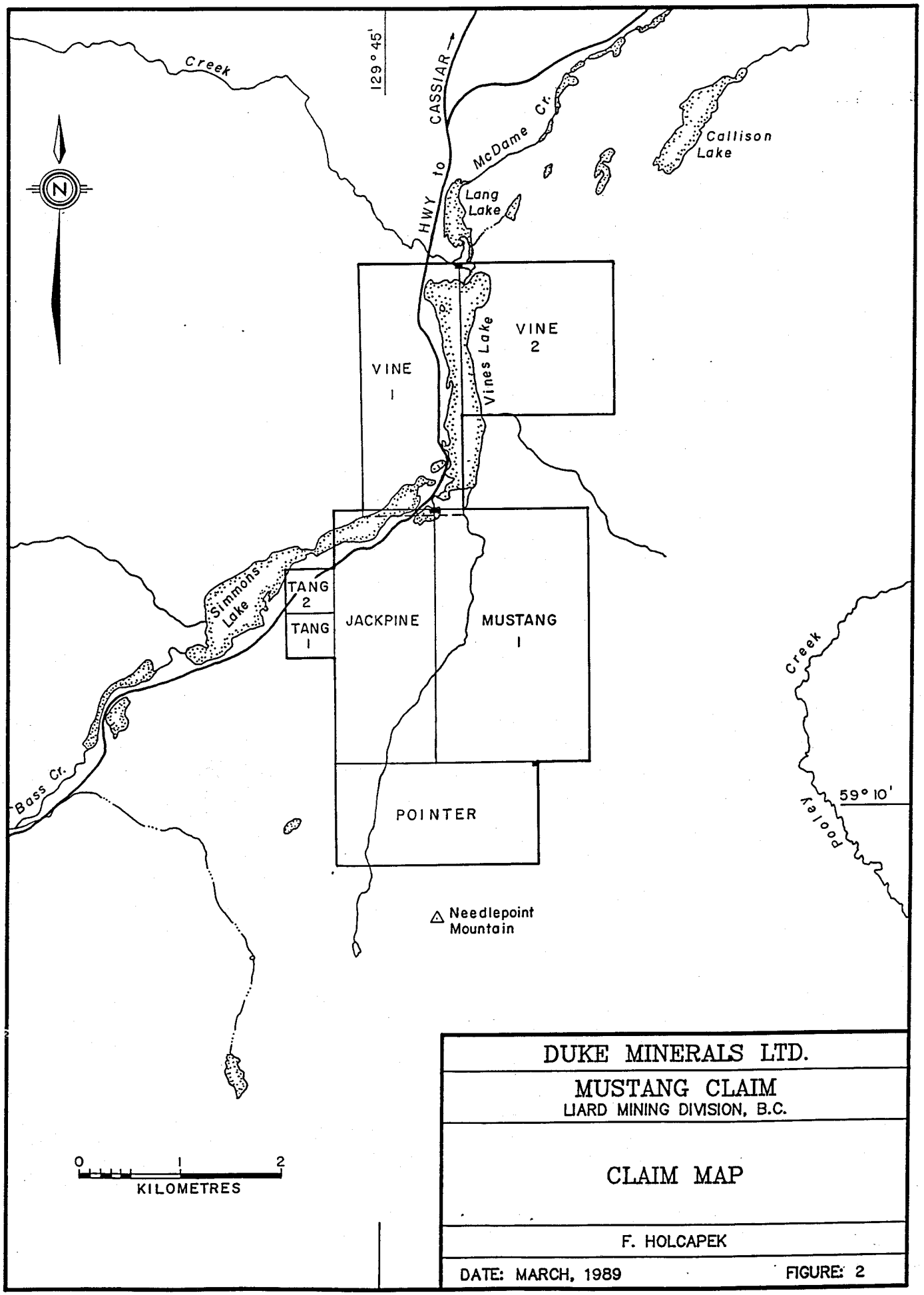
2 - 20 PHYSIOGRAPHY:

The Mustang claims lie within the physiographic province of the Cassiar Mountains, a northwesterly trending rugged mountain range with a maximum relief of 1,350 m.

The area was covered by northeasterly to easterly moving ice sheets leaving only the highest peaks ice free. Glacial cirques and steep needle-like spires are evidence of extensive glacial erosion. Large erratics, resting on bed rock, were observed above the 6,000 ft elevation contour.

The deranged drainage pattern in the district is typical of glacial terrain. The main rivers and streams meander through wide, swampy, U-shaped valleys with steep walls. Oxbow lakes, choked river channels and alpine lakes, meltwater channels, terraces and kettle lakes are numerous. Glacial till forms a thick mantle covering the lower slopes of the mountains and all of the low lying areas.

The Jackpine property is bisected by Camp Creek cutting a steep V-shaped valley. From about 6+00S to 11+00S, 9+00E the east side of the valley is formed by the foot wall of a N5E trending fault. South of 11+00S the steep east side is terminated by a north slope, fault trace(?).



DUKE MINERALS LTD.

MUSTANG CLAIM

LIARD MINING DIVISION, B.C.

CLAIM MAP

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 2

Above the steep slope the ridge is gently rolling with numerous small creeks cutting through thick moss growing on glacial outwash boulders. The south end of the property is a high ridge.

To the west of the creek the slopes are steep dropping into the western branch of Camp Creek. Glacial till appears to be thick in this area.

3-00 PROPERTY: (Figure 2)

The property is held by Duke Minerals Ltd and Gulf Titanium Ltd. as to 50% interest. The following claim information was made available to the writer by Duke Minerals Ltd:

Claim Name:	Record # (Units):		Expiry Date:
Jackpine	843	(6)	June 15,1990
Mustang	844	(6)	June 15,1990
Tang #1	864	(7)	July 17,1990
Tang #2	865	(7)	July 17,1990
Vine 1, Vine 2, Pointer	no information made available.		

4-00 WORK HISTORY MUSTANG CLAIMS:

No mineral prospects or exploration records prior to 1980 could be found in the literature for the area of the Mustang claim group. Discussions of known mineral showings with the local prospectors (Pat Cook, Johnny Bartle, Joe Reed, Glen Hope, Bob Williams) during the writers stay in the Cassiar area from 1959 to 1965 referred repeatedly to reported quartz veins within the headwaters of Pooley Creek. This suggests prospecting extended across the lower slopes of Needlepoint Mountain and within the Mustang Claim Group during the Cassiar gold rush at the turn of the century and during the 1930's.

In the 1980 B.C. Minister of Mines report a zinc-geochem anomaly along lower Camp Creek was mentioned. Follow up prospecting by Guil Brett in 1982 - 83 located a possible stratabound zinc deposit within Sandpile Group dolomites.

Silt sampling in 1982 by Gulf Titanium located three gold silt anomalies within the main branch of Camp Creek. Esso Minerals complemented the work by geochemical sampling the headwall of the Camp Creek drainage basin.

Following the above work four N - S lines were flagged, chained and sampled at 25 m intervals line 7+00E, 9+00E, 11+00E and 13+00E. The samples were analysed for Au, Ag, As, Zn, Pb. The results outlined several areas anomalous in Au & As, and spot anomalies in the Ag, Zn and Pb. During 1987 a detailed grid consisting of E-W lines 25 m apart and 25 m stations was established and sampled. Anomalous areas were cat trenched.

On July 25, 1988, the writer arrived on the property to complete geological mapping of the detailed grid, to select areas for additional trenching and to prospect the eastern part of the claim group.

During September 1988 a diamond drill program was initiated under the supervision of Mike Densky. The writer relogged the diamond drill core during his September 1988 visit to the property. This report is based on all field data made available to the writer and on literature research.

5-00 TECTONIC SETTING: (Figure 3)

The Cassiar District (Mustang claim group) lies within the northern segment of the Canadian Cordillera which are made up of 5 distinctive geological and physiographic belts as follow:

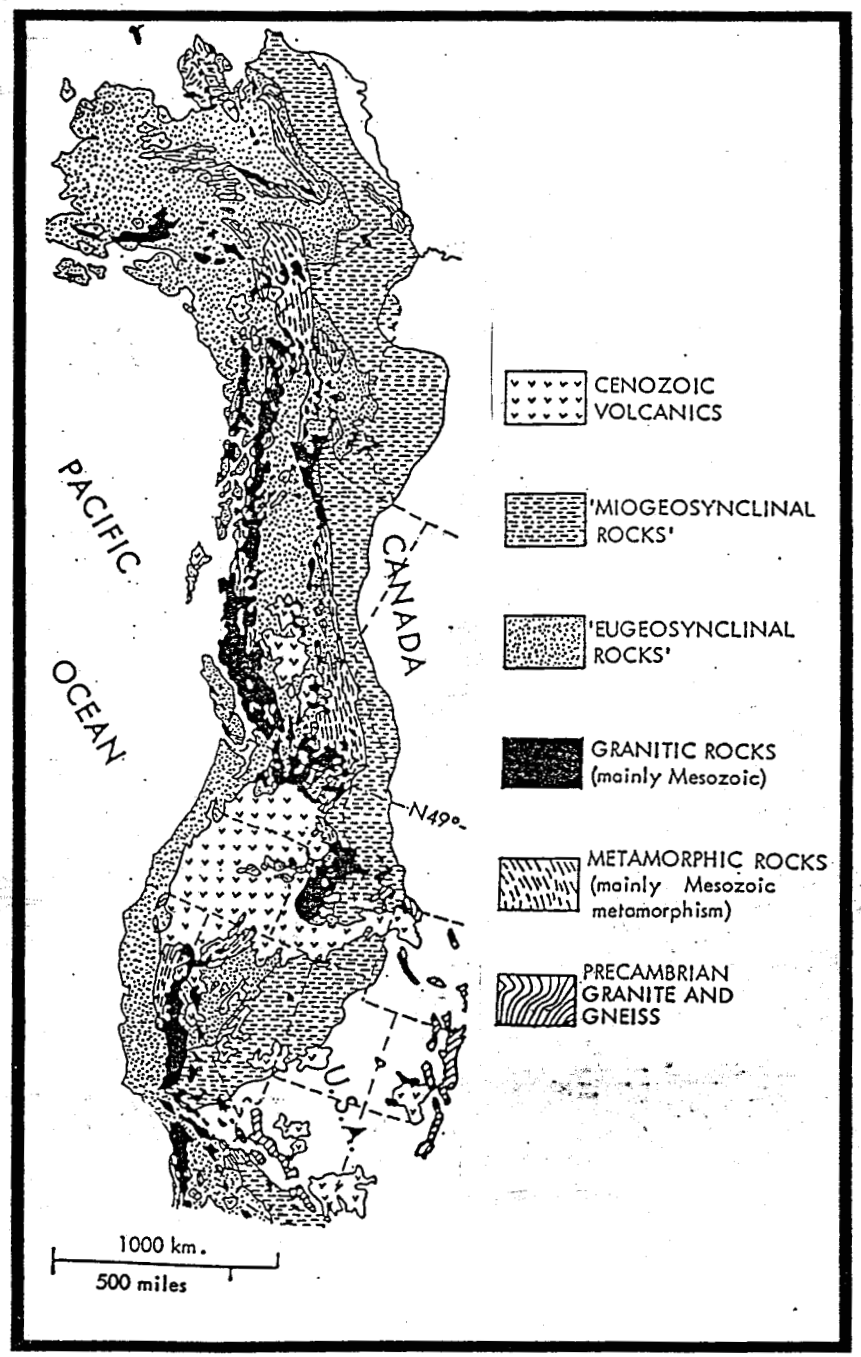


Figure 3: Sketch map of the North American Cordillera. (Monger et al 1972)

1. Rocky Mountain Belt.
2. Omineca Crystalline Belt
3. Intermontane Belt
4. Coast Plutonic Belt.
5. Insular Belt.

The Cordillera are considered to be a mosaic of over 50 fault bounded geological "Terranes". Many of these "terranes" are considered to be allochthonous because their paleogeographic position with respect to the North American Craton cannot be established (Coney et al 1980).

Paleomagnetic orientation, stratigraphic and fossil data, and structural information suggest that northward transport and rotation of the "terranes" were the main elements in shaping the Cordillera.

The Mustang claims lie within the Silvester Allochthon which is composed of at least 3 discrete, mildly deformed, fault bounded assemblages overlaying autochthonous strata, Earn Group, of the North American Miogeocline.

Based on lithology and the structural setting the Silvester Allochthon (Figure 4) is postulated (Monger 1977) to consist of oceanic assemblages representing Paleozoic and early Mesozoic Pacific Ocean floor obducted over a broad arc terrane in the Jurrasic.

Recent work by Gabrielse and others re-assigned the Lower Sylvester assemblages to the Earn Group, a rock unit intensively investigated in the East-Central Yukon for its exhalative stratiform and distal massive sulphide and barite deposits.

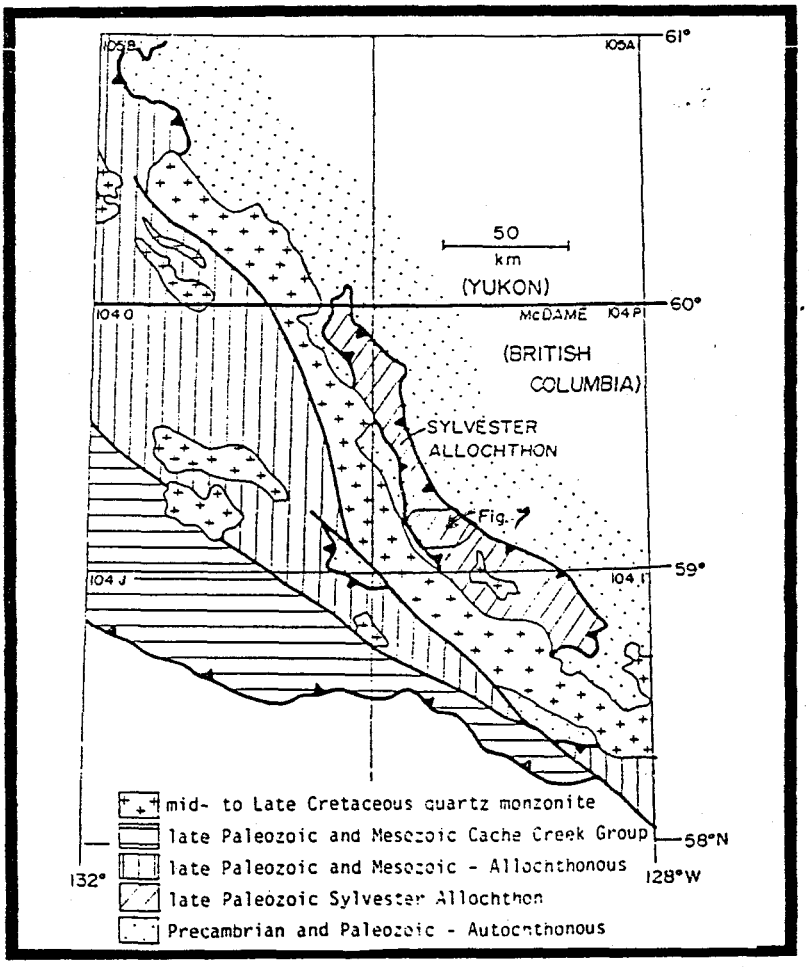


Figure 4: Location and geological setting of Sylvester Allochthon. (Gordey 1982; modified from Tipper et al 1981).

6 - 00 REGIONAL GEOLOGY:

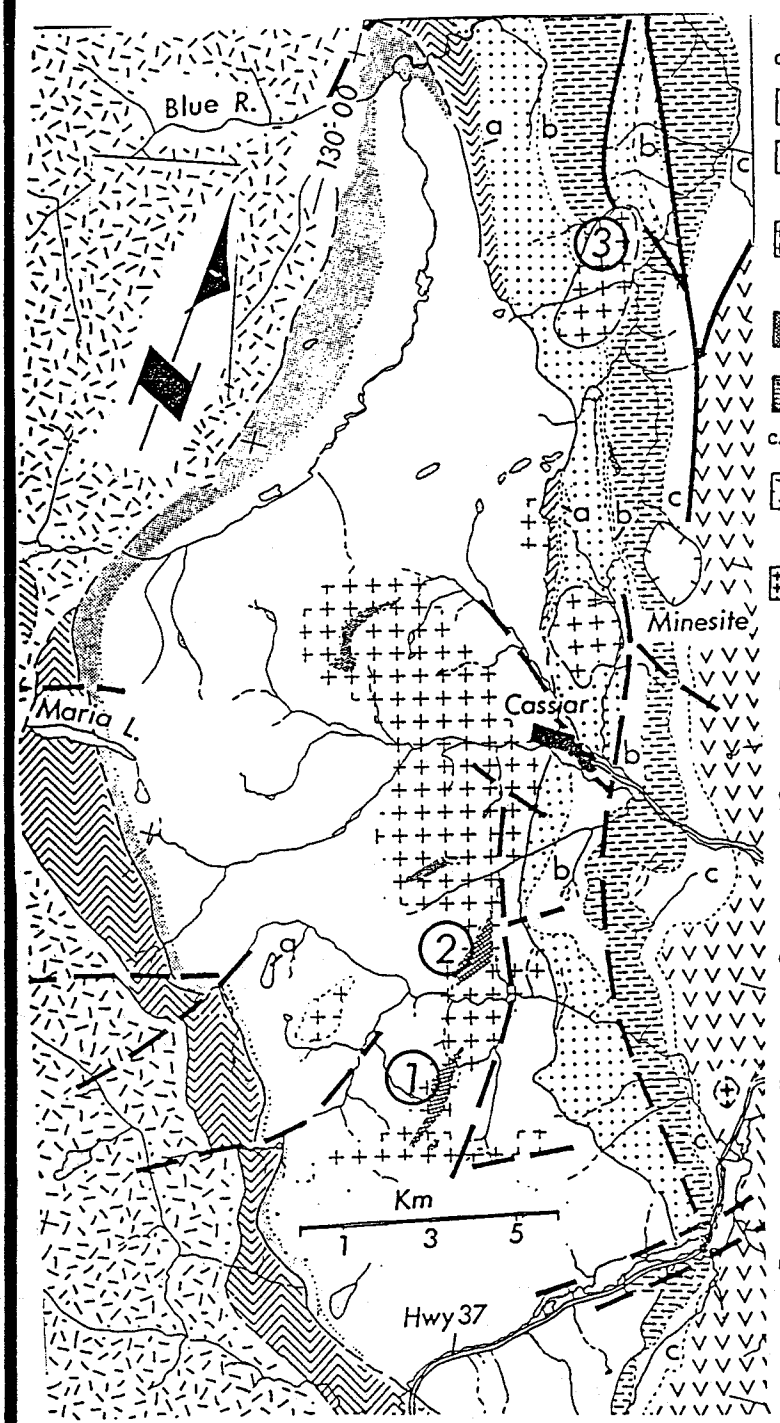
The McDame-Cassiar area was mapped by the Geological Survey of Canada (L.L. Price 1949; Gabrielse 1950 - 1954, 1981; Gordy et al 1982) and by the British Columbia Ministry of Mines & Petroleum Resources (Panteleyev 1979, 1980; Panteleyev & Diakow 1981)

The Mustang claim group lies along the eastern limb of the northwesterly trending Cassiar Anticlinorium underlaying the Cassiar Mountain Range. Faulting and thrusting cut the sedimentary and volcanic units.

6 - 10 DISCUSSION OF ROCK UNITS: (Table: 1)

Troutline Creek Quartz Monzonite (Figure 5) is separated from the main Cassiar Batholitic intrusions by a metamorphosed band of Good Hope Group rocks. Along the east and south the monzonite intrudes the Good Hope, Atan, Ketchika, Sandpile, and McDame Groups. The contact zone exhibits thermal metasomatism. Numerous dykes of grey quartz monzonite and quartz feldspar porphyry form small bodies within the core area of porphyritic quartz monzonite. The presence of micrographic texture in both rock types suggests a zone of hydrothermal fluid separation. A cogenetic relationship is indicated for molybdenum mineralization and quartz monzonite. This relationship is supported by an average K/Ar age of 73 Ma for both the intrusion and molybdenum mineralization (Panteleyev 1979, 1980).

Cassiar Batholith, dated at 89 to 109 Ma., consists of fine to medium-grained, equigranular to porphyritic granodiorite and quartz monzonite. Subtle but persistent foliation, caused by orientation of biotite grains, is present. The main outcrop area lies west of the Troutline Creek monzonites.



INTRUSIVE ROCKS

CASSIAR STOCK (73±2.5 Ma)

MEGACRYSTIC HORNBLENDE BIOTITE QUARTZ MONZONITE PORPHYRY

EQUIGRANULAR MEDIUM-GRAINED TO PORPHYRITIC QUARTZ MONZONITE AND GRANITE (BORDER ZONE)

BIOTITE QUARTZ MONZONITE PORPHYRY; MANTLED K-FELDSPAR AND PORPHYRITIC TO EQUIGRANULAR MEDIUM-GRAINED QUARTZ MONZONITE, CONTAINS SOME MUSCOVITE (GRADATIONAL WITH MEGACRYSTIC ROCKS)

QUARTZ FELDSPAR PORPHYRY (PINK QUARTZ MONZONITE TO GRANITE DYKES WITH ASSOCIATED MOLYBDENUM)

GREY FINE TO MEDIUM-GRAINED QUARTZ MONZONITE (DYKES)

CASSIAR BATHOLITH (~100 Ma)

FINE TO MEDIUM-GRAINED PORPHYRITIC GRANODIORITE AND QUARTZ MONZONITE (MINERAL ALIGNMENT AND FOLIATION EVIDENT)

PALEOZOIC (?)

DIORITE (SYLVESTER INTRUSION)

BEDDED ROCKS

DEVONIAN AND MISSISSIPPIAN

SYLVESTER GROUP

SILTSTONE, SLATE, BLACK CHERT, GREENSTONE

ORDOVICIAN AND DEVONIAN

SANDPILE AND McDAME GROUPS (UNDIVIDED)

c McDAME: BLACK FETID DOLOMITE AND LIMESTONE, LIMESTONE
SANDPILE: GREY AND BUFF DOLOMITE, SANDY DOLOMITE, GREY AND PURPLE QUARTZITE

CAMBRIAN AND ORDOVICIAN

KECHIKA GROUP

SHALE, CALCAREOUS SHALE, MINOR SLATE AND LOCAL CALC-SILICATE HORNFELS

LOWER CAMBRIAN

ATAN GROUP

b RUSTY WEATHERING CORDIERITE AND BIOTITE HORNFELS, SPOTTED HORNFELS, SILTSTONE, QUARTZITE; UPPER UNIT 'b': GREY, PINK, AND BUFF DOLOMITE, GREY AND BLACK LIMESTONE, MARBLE, SKARN, MINOR SLATE

PROTEROZOIC

GOOD HOPE (INGENIKA) GROUP

a LAYERED CALC-SILICATE HORNFELS, CORDIERITE AND BIOTITE HORNFELS, MICACEOUS QUARTZITE, PHYLLITE, MICA SCHIST; UPPER UNIT 'a': MARBLE, GREY LIMESTONE, DOLOMITE, MINOR SKARN

SYMBOLS

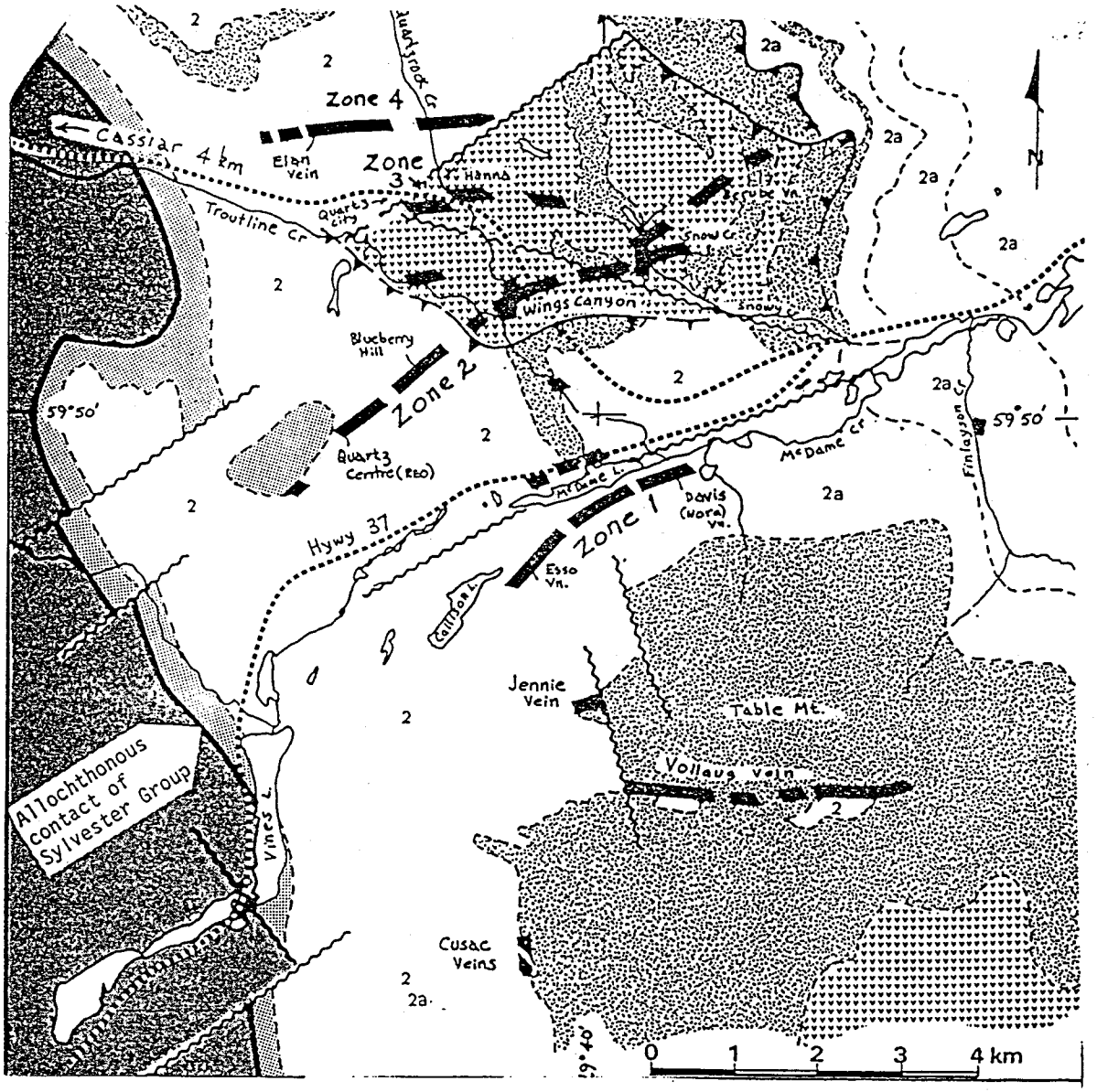
MAJOR ROAD

FAULT: NORMAL, REVERSE

INTRUSIVE CONTACT: DEFINED, APPROXIMATE

K/Ar SAMPLE SITE (MAIN Mo PROSPECTS) (1)

Figure 5: Geology of Cassiar Area - West, with K/Ar sample site (Panteleyev 1979, 1980)



SYLVESTER GROUP (MISSISSIPPIAN TO ? PERMIAN)

2 GREENSTONE–CHERT ASSEMBLAGE: MASSIVE PALE TO DARK GREEN ANDESITE FLOWS, TUFF, IN PART FINE–GRAINED DYKES AND SILLS, SOME CHERT, INCLUDES PORPHYRITIC FELDSPATHIC ANDESITE FLOWS (AND ? SILLS)

2a CHERT, TUFFACEOUS CHERT, INCLUDES SOME ARGILLITE; IN NORTHEAST WELL–LAYERED CHERT–PHYLLITE; TUFFACEOUS CHERT, RIBBONNED CHERT, AND ARGILLITE

1 ARGILLITE, SILTSTONE, CHERT, QUARTZITE, LIMESTONE, PEBBLE CONGLOMERATE, TUFF; INCLUDES NUMEROUS DIABASE AND ANDESITE SILLS

4 BASALT: WIDESPREAD PILLOWS, SOME BRECCIA, TUFF, AND MINOR ARGILLITE; IN SOUTHEAST, ABUNDANT BRECCIA, TUFF, AND SMALL LIMESTONE PODS

3 SILTSTONE, ARGILLITE, GREYWACKE, PEBBLE CONGLOMERATE, QUARTZ ARENITE, CALCAREOUS SILTSTONE, LIMESTONE

VEIN SYSTEM

Figure 6: Geology of Cassiar Area – East, Sylvester Allochthon; Auriferous Quartz Veins and Quartz Carbonate Zones (Panteleyev et al 1982)

CENOZOIC:	
PLEISTOCENE to RECENT:	GLACIAL DEPOSITS: Till, moraine deposits, outwash and stream deposits.
LOWER TERTIARY:	MT. REED & MT. HASKIN STOCK (50 Ma): Monzonite, porphyritic, granodiorite.
MESOZOIC:	
UPPER CRETACEOUS:	CASSIAR STOCK (73 Ma): TROUTLINE CREEK - Quartz Monzonite, related rocks.
MID - CRETACEOUS:	CASSIAR BATHOLITH (100 Ma): Quartz monzonite, granodiorite, granite, pegmatites, aplite, porphyritic granite.
PALEOZOIC:	
MISSISSIPPIAN TO PERMIAN:	SYLVESTER ALLOCHTHON:
PERMIAN:	Massive, blue-grey weathering, crinoidal, fusilinid bearing limestone, contains abundant clasts of aphanitic green volcanics.
PENNSYLVANIAN AND PERMIAN:	Thin bedded red and green radiolarian chert; minor limestone.
PENNSYLVANIAN:	Pale green, massive augite porphyry basalt, volcanic breccia and tuffs, pillow basalts, lenses & pods of crinoidal limestone.
MISSISSIPPIAN (?)	Grey to black shale, quartz chert sandstone, siltstone.
********** THRUST FAULT **********	
MISSISSIPPIAN and PERMIAN:	Greenstone-chert assemblage: Serpentinite, pale to dark green, massive aphanitic basalt flows; may include intrusives, flows and fine grained pyroclastic varieties.
	Pale green grey or black thin bedded chert, siliceous shales, includes many small intrusives and extrusive bodies of basalts.
	Diorite & Gabbro small plugs and sills.
********** SOLE THRUST **********	
UPPER DEVONIAN - MIDDLE MISSISSIPPIAN:	EARN GROUP: Argillite, siltstone, quartzite chert, limestone, conglomerate, diabase and andesite sill, exhalative and distal stratiform sulphide-barite deposits.
---------- UNCONFORMITY ----------	
MIDDLE DEVONIAN:	SANDPILE & McDAME GROUPS: Limestone, black fetid limestone, dolomite.
CAMBRIAN & ORDOVICIAN:	KECHIKA GROUP: Shale, argillite, phyllite.
LOWER CAMBRIAN:	ATAN GROUP: Calc-silicate hornfels, hornfels, limestone, shale, dolomites.
PROTEROZOIC:	
PRE CAMBRIAN:	GOOD HOPE GROUP: Limestone, dolomite, slate, argillite, red & green slate.

Table 1: Stratigraphic units in the Cassiar Map Area compiled from field work and various sources (Gabrielse 1963 Panteleyev 1979, 80, Diakow et al 1981, Panteleyev et al 1982, Gordey et al 1982, McIntyre 1983, Nelson et al 1986, Orchard et al 1988).

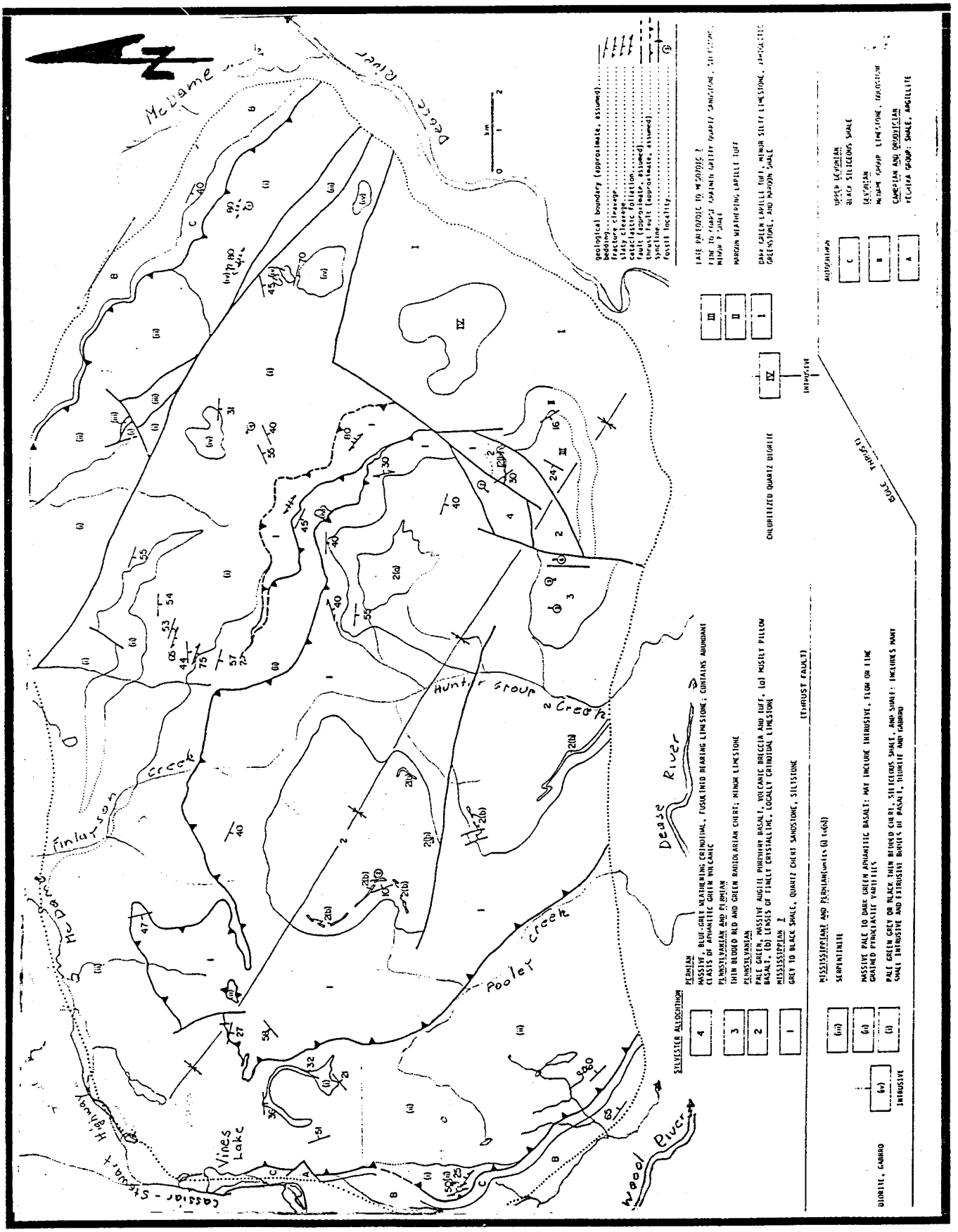


Figure 7: Geological map - Central Sylvester Allochthon, Southwestern McDame area. Mustang claims cover southwest part of map (Gordey et al 1982).

Silvester Allochthon (Figure 7) consists of a Lower Thrust sheet - shale, chert, greenstone and serpentine, and an Upper Thrust sheet - shale, augite-basalt, pillow basalt, chert and limestone.

The rock units of the two thrust sheets are nearly time equivalent, but of diverse lithologies which suggests a large distance between their original depositional sites (Gordey et al 1982). Small diorite and gabbro stocks cutting the Silvester volcanic complex are interpreted as intrusives related to the volcanic event.

Earn Group: (Figure 8 & 9), formerly considered to be the basal section of the Silvester Group, is not well exposed within the area of discussion. The unit, a miosynclinal sedimentary assemblage, consists of siltstones, sandstones, and limestone having interbedded exhalative barite and sulphide horizons. Composition of the sulphides depends on the distance from the vent and changes from a massive pyrite zone with lenses of high-grade sphalerite-galena to massive barren barite. It rests unconformably on the Sandpile-Atan Group carbonates.

Trenching and diamond drilling on the Mustang claims intersected strongly deformed black siltstones and sandstone considered to lie below the basal thrust plane of the Silvester Allochthon, Earn Group sediments.

Sandpile and McDame Groups are carbonate units outcropping along the western margin of the Silvester Allochthon. The units consist of grey limestone, black fetid limestone and dolomite. The basal contact is conformable. They are intruded by the Troutline monzonites and exhibit contact metasomatism.

Ketchika Group consists of grey to brown weathering calcareous phyllites, shales, argillites and intercalated limestone. It rests conformably on the Atan Group carbonates.

Atan Group consists of thick bedded grey blue limestone and thick beds of quartzite. Along the contact with the Troutline monzonite calcsilicate hornfels and hornfels formed due to contact metasomatism.

6 - 20 STRUCTURAL GEOLOGY:

Structural features observed in the area consist of thrusting, normal faulting and 2 major phases of folding and a 3rd fold phase is suspected.

FOLDING:

PHASE 1: Asymetrical recumbent folding is reported in the northeast part of the Cassiar district. Fold axis plunge flat to gently NW. This phase of foldings is thought to be related to northeasterly directed thrust faulting.

PHASE 2: Folds are recumbent, axis inclined to the NW trending at N55°E. In siltstone weak foliation parallel to the axial trend is recognizable.

PHASE 3: The McDame synclinorium is part of the youngest and most important fold event in the district. Folds are upright, with axis trending at N30°W and plunging SE (Diakow and Pantaleye 1981).

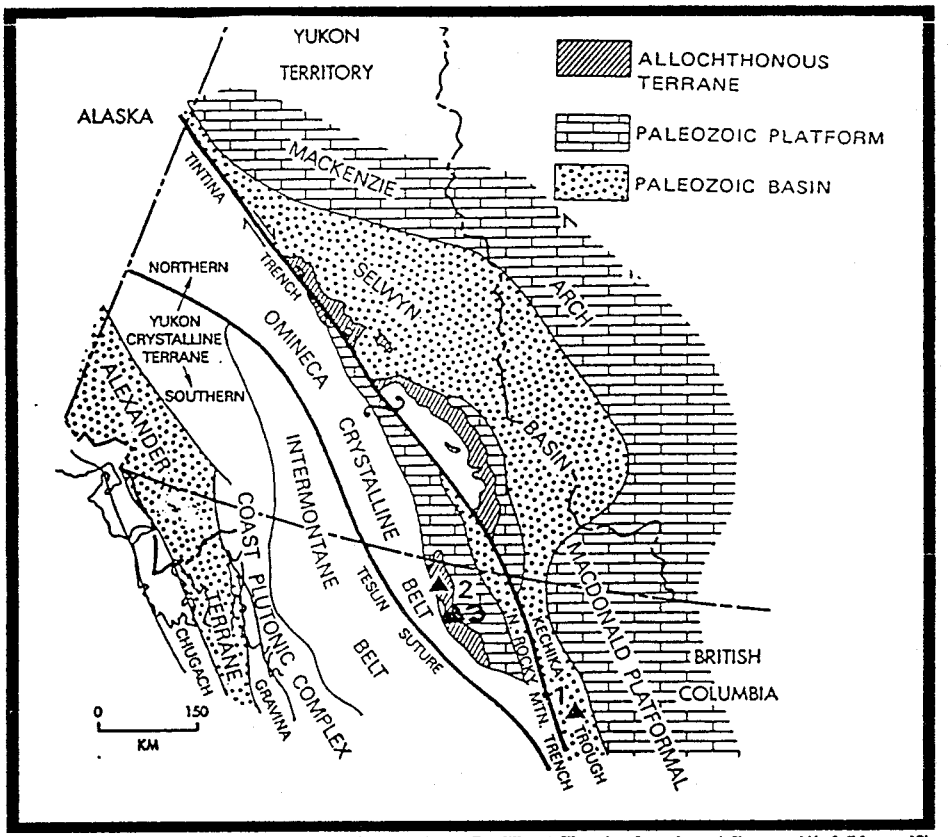


Figure 8: Enlargement of the tectonic setting, northern Cordillera. Showing location of Gataga (1), Midway (2), Cassiar (3), (Modified after MacIntyre 1983)

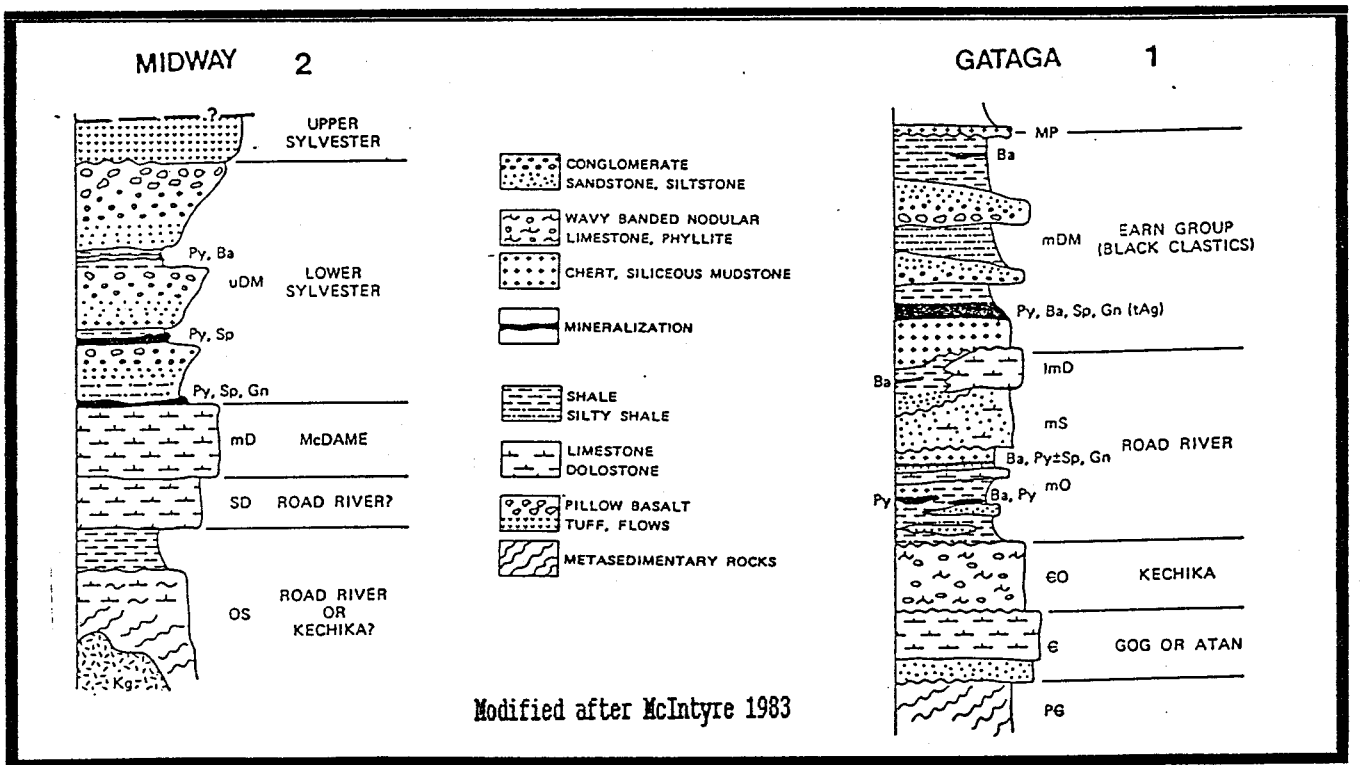


Figure 9: Stratigraphic Columns for Gataga (1) & Midway (2) of the Earn Group. The unit outcrops at Cassiar but has not been studied. (McIntire 1983)

FOLD RELATED STRUCTURES:

Jointing: appears to be related to Phase 3 folding. The major directions are N70°E to N85°E and N15°E. Joint density is highest in the greenstones.

Fold Cleavage: is northwesterly and associated with a zone of tension gashes trending N50°E. Individual gash veins within the zones trend N40°E and are worked for gold in several places.

Crenulation: trending northeasterly, was observed within the argillites.

THRUSTING: (Figure 7)

Upper Thrust Sheet: A thrust fault was identified north of Snowy Creek. The fault strikes NW and dips gently to the west. The surface trace is expressed by stacking of the phyllite-basalt units.

East of Quartz Rock Creek and south of Snowy Creek a southerly dipping thrust fault has been mapped. This fault was also intersected in new mine workings at the Taurus Mine and in drill holes. Older greenstones appear to have been thrusted over younger argillites and basalts (Diakow and Panteleyev 1981).

On Table Mountain the Vaugh Vein is interpreted as following a thrust plane along the greenstone argillite contact. The indicated dip is gently north; steepening with depth is indicated.

On the Cusac claims north of Pooley Creek, a flatly, easterly dipping thrust plane follows the andesite-argillite contact. A hydrothermal alteration zone up to 20 m wide consisting of a carbonate-quartz-mariposite assemblage, listwanite, with minor pyrite follows the thrust plane.

Lower Thrust Sheet: On Camp Creek, Mustang claims, a thrust fault was exposed in road cuts. The fault plane lies within greenstones and has an attitude of N80°E/30°S. Numerous flatly dipping faults appear to follow bedding planes of the argillite - greenstone contact. Slickensides, crushed rocks, quartz veins and carbonates mark the fault trace. Black, contorted, sooty argillites have been observed along the base of the thrust sheet.

FAULTING:

Most faults in the district strike northerly with dips of 45°W to 80°W. Indicated movement as suggested by the Erickson fault can be large. These faults cut the major thrust faults in the area.

A second major fault direction is N45E°/40°S to 75°S. These faults are best observed along the intrusive-sedimentary contact where appreciable movement is indicated.

The third direction trends N45°W and is not well exposed within the Sylvester Group but has been found on Camp Creek and along the south end of Vines Lake.

6 - 30 ECONOMIC GEOLOGY:

Within the Cassiar area numerous mineral deposits are recognized which are divided into mineral prospects within or related to the Troutline Monzonite intrusion, and deposits related to or within the Sylvester Allochthon.

The description of individual deposits has been taken from Panteleyev 1978, 1979, Panteleyev & Diakow 1981, 1982.

6 - 31 Mineral Deposits Within The Troutline Monzonite:

The two most important deposits are the Storie (New Jersy Zinc) and the Cassiar molybdenum deposit. Both were extensively explored during the 1970's. Both deposits are associated with small dyke-like bodies related to Troutline monzonite intrusions. At both deposits breccia zones and large scale quartz vein stockwork is absent.

Cassiar Molybdenum: Mineralization is associated with a northeasterly trending, steeply dipping dyke up to 360 m wide. Three intrusive phases are recognized. Molybdenite occurs along contacts, as fracture filling, flakes and rosettes. Small high grade lenses are associated with greisen along the border of quartz-porphyry dykes. Pyrite is associated with fractures.

Storie Molybdenum: The deposit is localized within a series of north to northeast trending, gently westerly dipping sheets. Molybdenite is disseminated throughout the youngest porphyry dyke, as fracture filling, and in quartz veins. Where coarse muscovite is abundant purple flourite is present. Sericite from one vein and gave a K/Ar age of 71 -Ma.

Other Molybdenum Showings: Molybdenite flakes occur within Atan Group banded calc silicates, within weakly porphyritic quartz monzonites, in pegmatites, and quartz veins. These deposits are of no economic importance.

6 - 32 Mineral Deposit Related To The Troutline Monzonite Intrusives:

a. Tungsten Deposits:

Scheelite was found to occur in small amounts within the contact aureole of the Troutline Monzonite. The most common occurence of scheelite is in garnet-pyroxene skarns formed within the Atan and Good Hope Groups.

Scheelite was also found within massive pyrrhotite localized within the intrusives as replacement bodies near the contact or within tactite zones.

The best scheelite showing is located northwest of Cassiar on Lamb Mt. Here scheelite is localized within a pyrrhotite rich skarn band near a finger of porphyritic quartz monzonite. Molybdenite was found within greisen veins at the contact.

East of the Storie Molybdenum deposit scheelite was found within quartz veinlets cutting Atan Group hornfels. Along strike to the north the banded skarn contains lenses of massive magnetite, pyrrhotite, minor quartz, wollastonite and tremolite. The showing contains tungsten, copper, galena, tin and bismuth.

b. Beryllium Deposits:

At Needlepoint Mountain a magnetite rich skarn was found to contain helvite, a beryllium mineral, and donalite. Green beryl crystals were found associated with vuggy quartz veins at the Storie molybdenum deposit.

c. Base Metal Vein Type Deposits:

Base metal veins are abundant within the area. Lead-zinc veins carrying variable amounts of silver predominate. These veins follow east-west fractures or fault zones within the Good Hope and Atan Group carbonates or metamorphic equivalent.

Manganiferous magnetite associated with base metals occurs at Needlepoint, Marble Basin and west of the Cassiar Mine. Similar veins carrying abundant pyrite instead of magnetite outcrop south of Cassiar. These pyritic veins carry about 0.15% Sn. The mineralogy suggests that these veins are higher temperature equivalents of the magnetite bearing veins.

d. Tin Deposits:

At the north bank of Lang Creek a 4 m wide replacement zone is localized along a faulted contact between the Atan Group carbonates and the Kechika black shales. A sample cut across 3.3 m assayed 2 ppm Au, 22 ppm Ag, 0.11% Cu, 0.03% Pb, 0.005% Zn, 0.04 % Bi and 1.40% Sn.

6 - 33 Stratiform Massive Sulphide Deposits-Sylvester Allochthon:

The Lang Creek copper deposit lies comformably at the base of the Silvester Group within an argillite bed which is interbedded with greenstone. The deposit is up to 2 m thick. A 1 m sample reportedly cut across the sulphide zone assayed 1.7 ppm Au, 36 ppm silver, 1.84% Cu, 0.12% Pb, and 0.77% zinc. This is the only massive sulphide deposit known from Sylvester Group rocks.

6 - 34 Chrysotile Asbestos in Serpentine cutting Sylvester Greenstone:

At the Cassiar Mine chrysotile is mined from a serpentine lense located along a dyke following a fault zone cutting Sylvester argillites and greenstones. The footwall of the chrysotile zone is a talc-carbonate zone carrying chalcopyrite, bornite, and pyrite as dissemination.

The serpentine body is intensively fractured and slickensided. Chrysoltile and magnetite occur as fracture filling. Magnesite veinlets are common. No quartz veins or lenses are present.

6 - 35 Exhalative Sulphide-Barite Deposits Within The Earn Group:

Earn Group rocks were explored for carbonate hosted massive sulphide deposits overlain by clastic rocks containing sedimentary - exhalative type mineralization in the East Central Yukon (Selwyn Basin), at Midway the northern limits of the Sylvester Allochthon, and the Gatage area (Kechika Trough) to the south-east.

Mineralization at Midway consists of agentiferous galena and sphalerite. A weighted average of composite results obtained from 8 drill holes contain 0.35% Cu, 0.14% Ti, 0.11% Bi and 650 ppb Au.

The Earn Group was intersected in drill holes (Mustang claims, September 1988) underlaying the lower thrust sheet of the Sylvester Allochthon.

6 - 36 Taurus Mine Pyrite Zone:

A reverse fault hosting a pyrite zone 3.10 m wide, consisting of fine grained, massive to semi massive pyrite, is localized within a major reverse fault (Figure 10). The fault is up to 15 m thick, lies structurally above and strikes parallel N10°W/37°E to the Upper Thrust Fault. Sheared quartz veinlets within the fault zone indicate right lateral sense of shearing. The fault hosting the pyrite zone appears to cut easterly trending gold quartz veins.

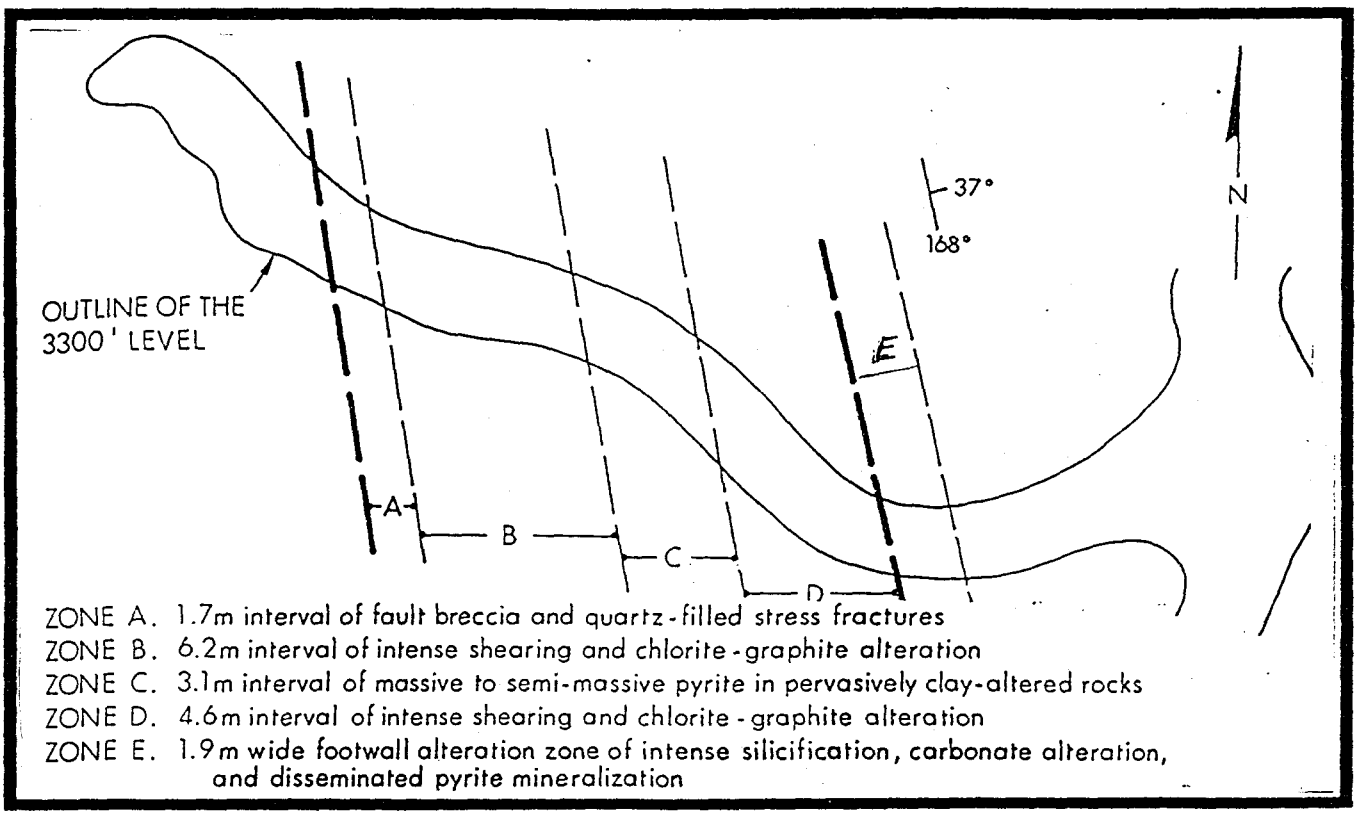


Figure 10: Crossection of Pyrite Zone, 3,300 level - Taurus Mine (Gunning 1988)

6 - 37 Gold-Quartz Veins AND Quartz-Carbonate Veins, Sylvester Allochthon: (Fig. 6)

1. Gold in Quartz Gash Veins: Four main zones of auriferous quartz veins have been recognized in the Cassiar district:

1. Callison Veins
2. Quartz Centre-Snowy Creek
3. Taurus (Hanna) Mine - Upper Snowy Creek
4. Elan Vein System

The vein zones occupy east to northeast trending, subparallel fractures cutting greenstone, and includes en echelon steeply dipping gash or ladder veins, bulbous quartz lenses, or just quartz stringer zones. At least three ages of quartz veins are recognized.

The Oldest Phase Of Quartz Veins consists of white auriferous quartz with alteration envelopes cutting massive basaltic rocks within the upper thrust sheet. The veins strike from N80°E to E and dip at 50°S to 60°S. Individual quartz veins are usually short (average 1m wide, 60m long), but the zone of veining is persistent.

Veins pinch and swell, terminate by horse tailing or pinch out. Average grade is in the order of 0.25 oz/ton. At the limit of the veins or above certain elevations the veins have vugs lined with milky white quartz, chlorite, and coarse crystalline calcite but are barren of gold or sulphides.

Metallic Minerals present in the quartz-carbonate veins are: gold, pyrite, tetrahedrite, chalcopyrite local minor arsenopyrite, sphalerite and galena.

Gangue Minerals are quartz, ankerite, locally black tourmaline and white mica. Several impulses of quartz are indicated by fine quartz as fracture healing.

Alteration envelopes (Figure 11) 5 to 10 times the width of the vein structure surround all veins. The alteration can be up to 100 m wide enveloping small discontinuous quartz veinlets. Mineralogy of the alteration halo consists of carbonates, quartz, mica and coarse pyrite with local arsenopyrite. Contacts with the wall rocks are sharp.

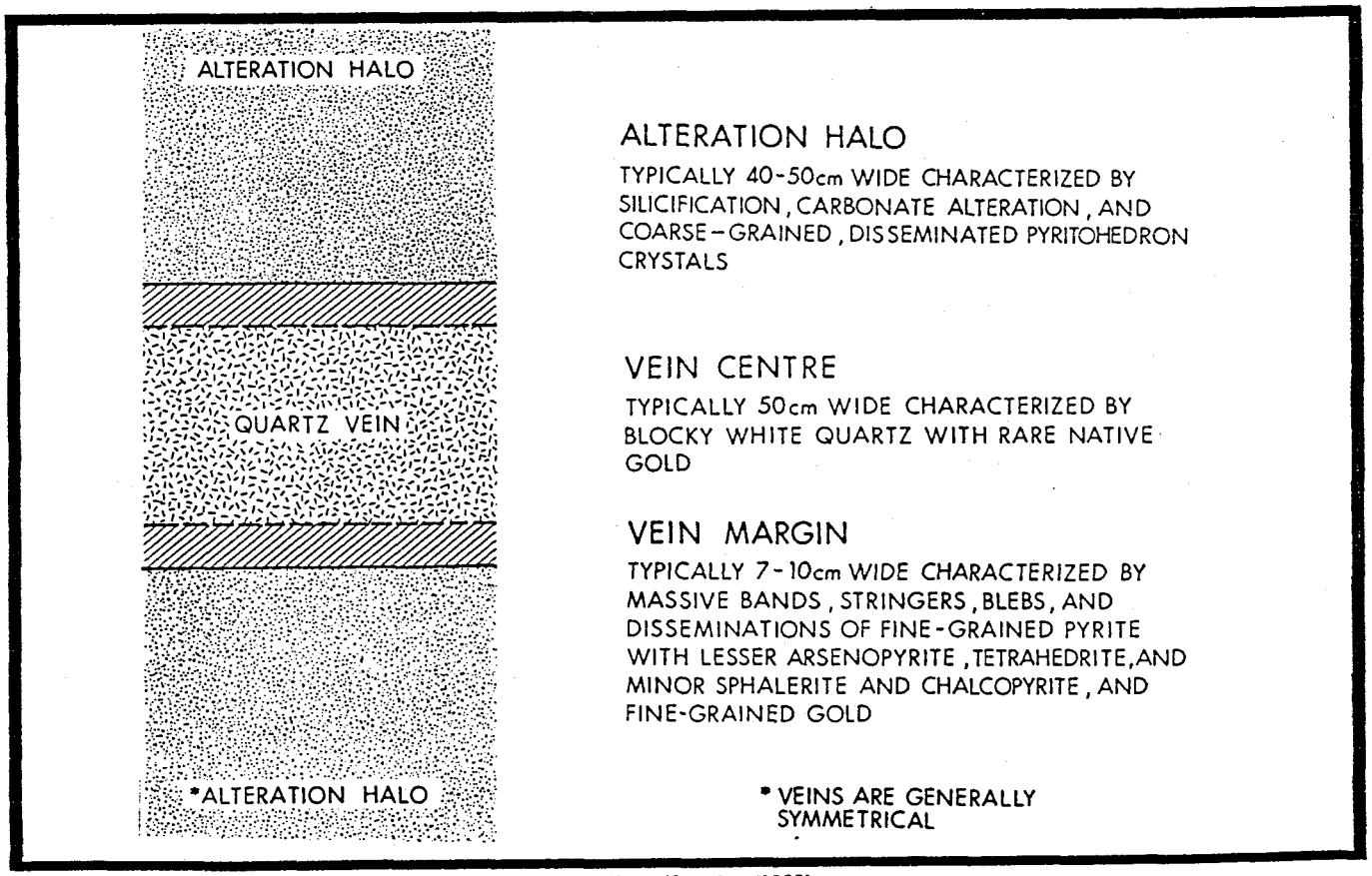


Figure 11: Alteration Halo - Quartz Veins at Taurus Mine (Gunning 1988).

Second Phase Quartz Veins consist of massive bull quartz several meters thick with graphitic banding. Attitude of these veins is N45°W/S.

Third Phase Quartz Veins are localized by reverse faults trending N30°E. The veins consist of bull quartz showing graphitic banding and lie within the fault zone.

Phase two and three quartz veins crosscut and offset the auriferous phase 1 quartz veins.

2. Quartz veins or Carbonate-Quartz Zones:

These zones follow the greenstone-argillite contact an apparent thrust fault (upper thrust) localized along bedding planes. The productive quartz veins terminate against the flat lying carbonate-quartz zones (Figure 10).

Example of the above are:

1. Vaugh & Jenny Veins
2. Erickson Mine
3. Quartz - Carbonate Zone
4. Cusac Mine.

The Vaugh Vein has attitude E/30N and lies along the bedding plane contact within greenstone or splays into argillite where the vein dies out.

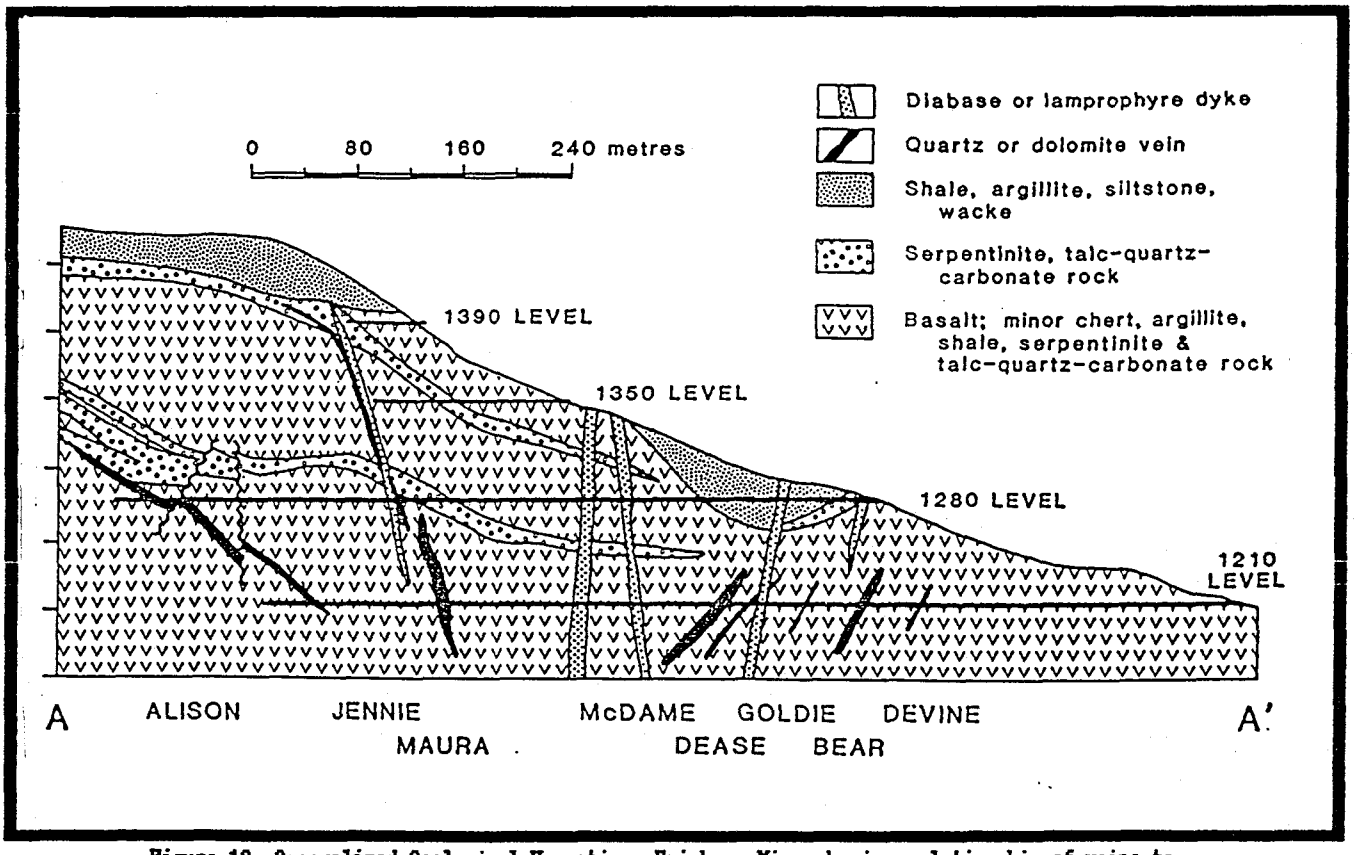


Figure 12: Generalized Geological X-section, Erickson Mine showing relationship of veins to rockunits (Sketchley et al 1986)

Alteration envelopes surrounding these veins were investigated by Sketchley and Sinclair, 1987. Drill core samples were taken from the Erickson Mine. (Table 2)

Zone	Thickness	Occurrence	Colour	Mineralogy
Basalt	-	Country	pale to dark	plagioclase, chlorite, actinolite, epidote, augite, calcite, green titanium oxide, possible pyrite, quartz.
Transition Carbonate	< 1m	very common	pale green buff, light grey,	plagioclase, chlorite, ankerite, siderite, quartz, sericite. titanium oxide, poss. kaolinite, dolomite, pyrite, carbon, calcite, epidote, augite, actinolite.
Interned. Carbonate	<10m	very common	buff to pale grey,	ankerite, siderite, quartz, sericite, titanium oxide, possible kaolinite, dolomite, pyrite, carbon.
Inner Carbonate	< 4m	common	buff to pale grey, minor green.	ankerite, quartz, sericite, pyrite, titanium oxide, possible, siderite, carbon, arsenopyrite
Outer Carbon	< 1m	uncommon	buff to black	ankerite, quartz, sericite, pyrite, titanium oxide, carbon, possible siderite, arsenopyrite.
Inner Carbon	< 3m	uncommon	black	ankerite, quartz, sericite, carbon, pyrite, titanium oxide possible siderite, arsenopyrite.

Table: 2 Characteristics of Ideal Alteration Zoning Related to white quartz veins and layered dolomite veins, Erickson Gold Mine. (Sketchley & Sinclair, 1986)

The results show that carbonate alteration envelopes can be used as a guide for auriferous quartz veins.

1. If no quartz vein is present within the inner carbonate zone and dolomite is, a layered dolomite vein may be present.

2. If dolomite is not present, but ankerite is, an auriferous quartz vein may lie within the alteration envelope.

The trace element study showed that enrichment in potassium, barium, and boron suggest carbonate alteration surrounding gold quartz veins. No enrichment was found to be associated with layered dolomite veins.

The the quartz veins are ribboned, sinewy and consist of milky quartz, ankerite, siderite, and graphite.

Metallic minerals present are gold, pyrite, tetrahedrite, chalcopyrite and locally minor arsenopyrite, sphalerite and galena.

At the Cusac Mine, the quartz veins trend easterly and dip steeply north. The veins terminate against a listwanite zone (Quartz-Carbonate-mariposite-talc-rock) which follows the andesite-argillite contact, a thrust fault (Upper Thrust). From the listwanite contact to a depth of about 30m extremely high grade gold ore was found.

A detailed study of the formation of listwanite at the Erickson Mine showed that the temperature of crystallization for quartz veins was mesothermal, (assumed 360°C) at a pressure of 625 atms. Gold was transported as a bisulphide complex. The ore solution infiltrated and metasomatized serpentinized peridotites producing listwanite (Dussell 1986).

Carbonate-mariposite rocks (listwanite), from the California Motherlode studies showed a similar origin for the listwanite alteration zone. The hydrothermal fluids responsible for the alteration and the auriferous quartz veins were formation water or metamorphic waters enriched in CO2, SiO2 and K2O. Temperature of crystallization for mariposite and ankerite was 320°C. K/Ar dating gave an age of 127 to 108 my.

Type	Width	Occurence	Colour	Au oz/ton	Mineralogy
Mariposite Carbonate	-	From Serpentinite along shears.	off white to pale to emerald green	< 0.10	magnesite, dolomite, talc, chloride, opaque oxides, mariposite & chlorite, sulfides traces. Not associated with all veins.
Grey Ore	<20m	Wall alteration fault blocks Qtz veins in area.	pale grey to brown, exposed faces,	<0.30	ankerite, sericite, albite, pyrite, arsenopyrite, relict textures and structure preserved. Alteration of breccias, tuffs augite greenstones. Associated quartz veins may be up to 18m wide and barren.
Schist Ore	<30m	Wall alteration outward from fissures or shears.	brown to grey fresh cream to buff.	<0.15	ankerite, sericite, quartz, albite pyrite and arsenopyrite. Quartz ankerite-veinlets form stockwork within the alteration zone. Quartz veins are often large and barren altered schist. Original rock was an amphibole schist.

Table: 3 Mineral Composition of Grey Ores, schistose ores, Carbonate - Mariposite Alteration Zones, K-Ar dating, Geothermometry results and fluid isotope studies, Mother Lode System, California, U.S.A. (Knopf 1929, Kistler, Dodge, Silverman 1983).

Along the western Mother Lode are several known Besshi Type massive sulphide deposits (the Blue Moon, the Green Hills and the Plymouth Mine), similarly within the Silvester Allochthon are Besshi type massive sulphide deposits localized in argillites and andesites above the lower thrust sheet (Lang Creek).

6-40 DATING OF ROCK UNITS AND GEOLOGICAL EVENTS:

Numerous pottassium-argon ages have been obtained from the Cassiar District. Material sampled was derived from intrusives and from hydrothermal quartz veins. The table below summarizes the important ages.

Location:	Material Analysed:	Apparant Age, Ma:	Source:
Mount Reed stock	?	48.8 - 51.4	Gunning 1988
Mount Haskin stock	?	" "	"
Troutline Monzonite Stock:			
Cassiar Mo	biotite	73.6±2.5	Panteleyev 1980
	muscovite	71.4±2.5	" "
Storie Mo	biotite	71.5±2.5	" "
	muscovite	73.9±2.5	" "
Cassiar Batholith:	numerous samples	89.0 - 109	Gunning 1988
Snowy Creek	hydrothermal mica from auriferous tourmaline quartz veins.	131.0±5.0	Panteleyev & Diakow 1980
Taurus Mine	sericite from auriferous quartz veins	137.0±2.6	Sketchley 1986

Table 4: K/Ar ages from different intrusives, molybdenum deposits and auriferous quartz veins within the Cassiar district.

The Sylvester Allochthon was dated using conodont collections from the southwest McDame map area, Cassiar District (Gordey et al 1982).

The ages obtained established that (Figure 7):

a. The Lower Thrust Sheet, units (i) to (iv), is Mississippian ? and Permian in age.
b. The Upper Thrust Sheet, units 1 to 4, is Pennsylvanian to Permian in age.

These ages show that the deposition of the rock units involved is, at least in part, time contemporenous. The rock assemblages show that the units were deposited in two very different depositional environments.

The Earn Group sediments were investigated in detail in East-Central Yukon. Dating of fossils suggests an early Devonian to pre-Late-Mississippian age. These ages suggest a partial overlap between the Lower Thrust sheet of the Silvester Allochthon and the Upper Earn Group.

7-00 SUMMARY REGIONAL GEOLOGY:

During the Upper Devonian - Lower Mississippian, the Earn Group, a sedimentary clastic assemblage, was deposited along the continental margin and within off shore basins. Faulting and possibly rifting provided fracturing along which hydrothermal fluids circulated producing exhalative massive sulphide and barite deposits.

At Cassiar, the Sylvester Volcanics contain two distinct thrust sheets, each with its own characteristic rock assemblage, Lower Thrust sheet-Mississippian and Permian, Upper Thrust sheet-Pennsylvanian to Permian in age, separated by a thrust fault from the Earn Group. Additional thrust sheets are possible (Gordey et al 1982).

The Upper and Lower thrust sheets are interpreted as two stratigraphically distinct assemblages deposited contemporaneously in widely separated depositional environments (Gordey et al 1982).

The alpine type ultramafics localized along and within the volcanics below the Upper Thrust plane have a chemistry similar to ophiolites. They are interpreted as oceanic crust thrusted over a sedimentary sequence lying close to the continental margin (Monger 1977).

Dykes and sills intruding the lower Sylvester group sediments have a different composition from the Sylvester volcanics and cannot be considered volcanic feeders (Monger 1972).

The age of overthrusting is indicated as pre-Early Cretaceous, assuming that the auriferous quartz-carbonate veins at Cusac and Erickson are the same or similar in age as the Snowy Creek and Taurus Mine auriferous quartz-carbonate veins (137 Ma).

The age relationship between the two main thrust sheets has not been clarified. The two stages of recumbant folding (F1 & F2) in the NE part, and only F2 in the main part of the map area may be related to the thrusting event ie:

NE part F1 & F2 - both thrust sheets preserved;
Central part F1 - Lower thrust sheet and thin remnant of Upper thrust sheet preserved.

At the Erickson and Cusac Mines listwanite, derived from serpentine, has been localized within the Upper Thrust sheet. Easterly trending auriferous quartz-carbonate veins cut the greenstone below the thrust plane and terminate against the listwanite zone.

At the Taurus Mine easterly trending auriferous quartz-carbonate veins are cut by the Upper Thrust. Here possible post quartz vein reactivation of thrusting is indicated.

The Upper and Lower Thrust sheets were changed to greenschist by low to intermediate temperature metasomatism (see table 6), but the Earn Group siltstones and mudstones, intersected in drill holes, show no metasomatism. This suggests that the Sylvester greenstones were metamorphosed at their place of origin prior to thrusting.

Stratiform copper-gold (Lang Creek) and copper-zinc-silver-gold (several small prospects) are found within the Lower Thrust sheet interbedded with argillites and greenstone. These deposits are similar to Besshi type volcanogenic deposits.

The hydrothermal system forming the gold-quartz-carbonate veins and changing serpentine to listwanite which occupies the Upper Thrust and thrust slices, was active post Upper Thrust but pre Lower Thrust. This is supported by the absence of quartz-carbonate alteration within, and the absence of metamorphism from rocks below the Lower Thrust fault.

A detailed study of listwanite from the Erickson Mine (Dussell 1986) suggests that the quartz-carbonate veins were emplaced at a temperature of 350°C - Mesothermal and at a pressure of 625 atms. Gold was transported as a bisulphide complex. The ore solution changed serpentinized peridotites to listwanite. A change of pH in the ore solution allowed precipitation of gold.

At the Mother Lode California a similar study (Kistler 1983) gave similar results, but temperatures were established by oxygen isotope fractionaton giving 320°C for precipitaion of quartz and formation of mariposite. Oxygen-hydrogen isotopes indicate that formation water or water of metamorphic origin produced the hydrothermal fluids.

Silvester volcanics, deposited on the ocean floor, may have been altered by convective circulation of sea water which changed pillow basalts-andesites to greenschist. Sea floor hydrothermal systems are capable of leaching metals ie Mn, Fe, Co, Ni, Cu, Zn, Ag and Au, from the mafic rocks and re-depositing them on the ocean floor (Boyle 1979). Later metamorphic or hydrothermal events remobilized the metals and concentrated gold into structurally favourable positions forming auriferous quartz-carbonate veins. Numerous diorite and gabbro stocks, dykes and sills cut the Sylvester volcanics, capable of providing the energy to drive a hydrothermal system.

This process is postulated for many of the Archean greenstone belt gold deposits. Carbonate alteration is often the dominent alteration associated with gold. The energy source to concentrate gold into economic deposits is believed to be younger felsitic dykes or stocks.

A similar origin is possible for the Cassiar auriferous quartz-carbonate veins. Numerous diorite and gabbro stocks, dykes and sills cut the Sylvester volcanics, capable of providing the energy to drive a hydrothermal system which remobilized and concentrated gold into structurally favourable positions.

The hydrothermal system forming the gold-quartz-carbonate veins and changing serpentine to listwanite which occupies the Upper Thrust and thrust splices, was active post Upper Thrust but pre Lower Thrust. This is supported by the absence of quartz-carbonate alteration within, and the absence of metamorphism from rocks below the Lower Thrust fault.

A detailed study of listwanite from the Erickson Mine (Dussell 1986) suggests that the quartz-carbonate veins were emplaced at a temperature of 350°C - Mesothermal and at a pressure of 625 atms. Gold was transported as a bisulphide complex. The ore solution changed serpentinized peridotites to listwanite. A change of pH in the ore solution allowed precipitation of gold.

Gold mineralization in the Sylvester Allochthon is older than the Cassiar intrusion. Possibly age of emplaced is indicated as prior to the last stage of thrusting (Lower Thrust or Sole Thrust) about 135 Ma predating the Cassiar intrusions (K/Ar age 100 Ma).

At the Mother Lode California a similar study (Kistler 1983) gave similar results, but temperatures were established by oxygen isotope fractionaton giving 320°C for precipitaion of quartz and formation of mariposite. Oxygen-hydrogen isotopes indicate that formation water or water of metamorphic origin produced the hydrothermal fluids.

A younger, parallel reverse fault with an associated pyritic gold zone, cutting all other structures is found at the Taurus Mine. This suggests reactivation of thrusting and at least one later event of gold mineralization originating from a different source.

South of Cassiar, a shear zone separating the Atan Group from Kechika black shale is mineralized with pyrrhotite, arsenopyrite, tin and gold. Tin is associated with many of the sulphide veins and skarn zones related to the Cassiar Stock - Troutline Monzonite.

The absence of gold from the skarn deposits (in Atan Group - Good Hope Group carbonates) and from base metal deposits related to the Cassiar Stock suggests a source from the clastic sediments underlaying the Sylvester Allochthon (Road River, Ketchika Formation, Earn Group). These sediments are known to have interbedded exhalative sulphide deposits carrying excess gold.

Remobilization of gold and base metals, with the Troutline Monzonite intrusions (70 Ma) supplying the neccessary energy, from the clastic sedimentary units and redeposition within structurally favourable zones is indicated.

8-00 PROPERTY GEOLOGY: (Map 1)

The Mustang property was mapped by the writer during July and September 1988. Overburden consisting of glacial till is widespread, more than 70% of the claims, masking the relationship of outcrops and making structural interpretation difficult.

CENOZOIC	
PLEISTOCENE TO RECENT:	GLACIAL DEPOSITS: Glacial till, erratics, stream and lake deposits, moraines, esker and outwash deposits.
MESOZOIC:	
UPPER CRETACEOUS:	CASSIAR STOCK (73-Ma): TROUTLINE CREEK-Quartz Monzonite, related rocks.
PALAEOZOIC	
	Lamprophyre dykes, diabase dykes, quartz veining, carbonate veins.
MISSISSIPPIAN and PERMIAN:	SYLVESTER ALLOCHTHON: LOWER THRUST SHEET: Greenstone-chert assemblage: pale to dark green, includes intrusives, flows and fine grained pyroclastic varieties.
	Pale green grey or black thin bedded chert, siliceous shales, includes small intrusives and extrusive bodies of basalt, diorite & gabbro plugs and sills.
********** THRUST FAULT **********	
UPPER DEVONIAN-MISSISSIPPIAN:	EARN GROUP: Argillite, siltstone, quartzite, chert, limestone, conglomerate, diabase & andesite sills, tuff. Vent & exhalative deposits, proximal & distal.
---------- UNCONFORMITY ----------	
ORDOVICIAN AND DEVONIAN:	SANDPILE & McDAME GROUPS: Black fetid limestone, dolomite.

Table 5: Stratigraphy - Mustang Claim area, based on field mapping and correlation with published data.

8-10 DISCUSSION OF ROCK TYPES: (Table 5)

Thrust Sheet: Greenstone-Argillite Assemblage

The Greenstone is massive and changes its colour with distance from structural zones. Near N-S faults silicification, pyrite, carbonate, and possible tremolite give the rock a pale green colour. Black line fractures and crackle texture were observed in several places. Away from structural zones the greenstones are dark to light green, less siliceous and less pyritic. Surface weathering is greenish brown with limonite staining.

Several Argillite beds are interbedded with the greenstone. Within the argillite, banded cherty sections associated with quartz veinlets and lenses were found. Black argillites appear to change to green phyllitic argillites away from structural zones. The relationship of individual outcrops suggests fault blocks.

Earn Group: The upper argillites crop out just south of the camp and along the lower part of the road leading up Camp Creek. The argillites are grey to black, hard, and show well developed phyllitic cleavage. Crenulation trending easterly was observed. Limonite staining is prominent along fractures and joints.

The dominent attitude of the argillite beds is NE/45°SE suggesting that the property lies along the west limb of a syncline. The Cassiar synclinorium trends N30°W; local faulting may have affected the attitude of the rock units.

Trenching across the Danny Fault exposed lenses of black, sooty argillites within the hanging wall side. Similar argillites are exposed in road cuts and trenches next to splays of the Lower (Sole) Thrust.

Diamond drilling intersected mylonitic, black argillites and siltstones. Deformational flowage, silica flooding, and brecciation are the main textural features in the drill core. Some sections show carbonate introduction.

Thin Section description of diamond drill core samples from DDH 88-3 and DDH 88-4 are included as Appendix I.

Sandpile and Atan Groups: Along the western margin of the claim group a northerly trending fault separates the Earn Group clastic sediments from the Atan Group black fetid limestone. Sphalerite occurs as fracture filling, fine dissemination and possible replacement; limestone - manto type deposit (?).

Lamprophyre dykes, trending east and north, are exposed in two road cuts. The dykes cut quartz veins or veinlets following splays of thrust faults. They are in turn cut by north trending faults. Field relationships suggest that the dykes are younger than the quartz veins following the thrust but older than the northerly trending faults.

8-20 STRUCTURAL GEOLOGY:

On the Mustang property evidence for only 1 stage of folding was found. Small, infrequent outcrops made structural observation difficult.

Folding:

F1 folding was not observed, but this may be caused by poor exposure of the argillite and cherty argillites. The greenstones are too competent and massive to exhibit folding on an outcrop scale.

Easterly trending crenulation was observed in black argillites. The general strike is N35°E/40°S. Crenulation with similar attitude occurs on a regional scale and is interpreted as related to F2 - recumbant folding. Jointing is well developed within the argillite and trends easterly with northerly dips.

The McDame Syncline (F3), is indicated by bedding measurements within the argillites. The regional trend of the fold axis is reported as N30°W, plunging to the southeast. The mean attitude of about N10°E to N30°E with dips at 30°E to 60°E suggests that the Mustang claims lie along the western limb of a syncline. Local variations in attitude, as large as 60° were observed near shears or fault zones. This event affects all rock units and thrust faults in the district.

Thrust Faulting - Lower Thrust:

Diamond drilling penetrated the Sylvester greenstones with interbedded argillites, the Lower Thrust, and the underlaying Earn Group. Mylonite development, breccia, and gouge developed within black argillite and siltstone suggest that the thrust faults at 11+50S, 9+00E and 10+25S 9+50E are splays from the Lower Thrust Sheet. The deformed argillites encountered west of trenchs 1 and 2 supports the above.

A splay of the Lower Thrust is exposed at line 11+50S, 9+00E (Figure 13, 14), within the road cut. The east and centre part is overlain by orange to red soil suggesting the presence of a carbonate zone. Northerly faulting cuts the thrust plane into segments. The thrust trends N25°E/35°S. The fault plane is followed by a 2 m thick zone of gouge, quartz veining, and sheared dark andesites and is cut by numerous faults. Pyrite was observed within the andesites and carbonate zone.

Normal Faults:

Several directions of normal faulting are exposed in the trenches. The relationship to each other is not clear because of limited outcrop.

1. Faults trending N10°E to N10°W/45°W to 60°W are the main structural feature on the property. The "Danny Fault" belongs to this set. Trenching from line 8+50S to 10+25S established the strike of the fault. The foot wall is dark green, weathered andesite and argillite. A reddish orange gouge zone 1.5 m wide (Figure 14) is overlain by a siliceous, light grey to green, altered andesite. Testing the altered rock with 5% HCl solution for carbonate is positive on rock powder. Disseminated pyrite and arsenopyrite forms 5% of the rock.

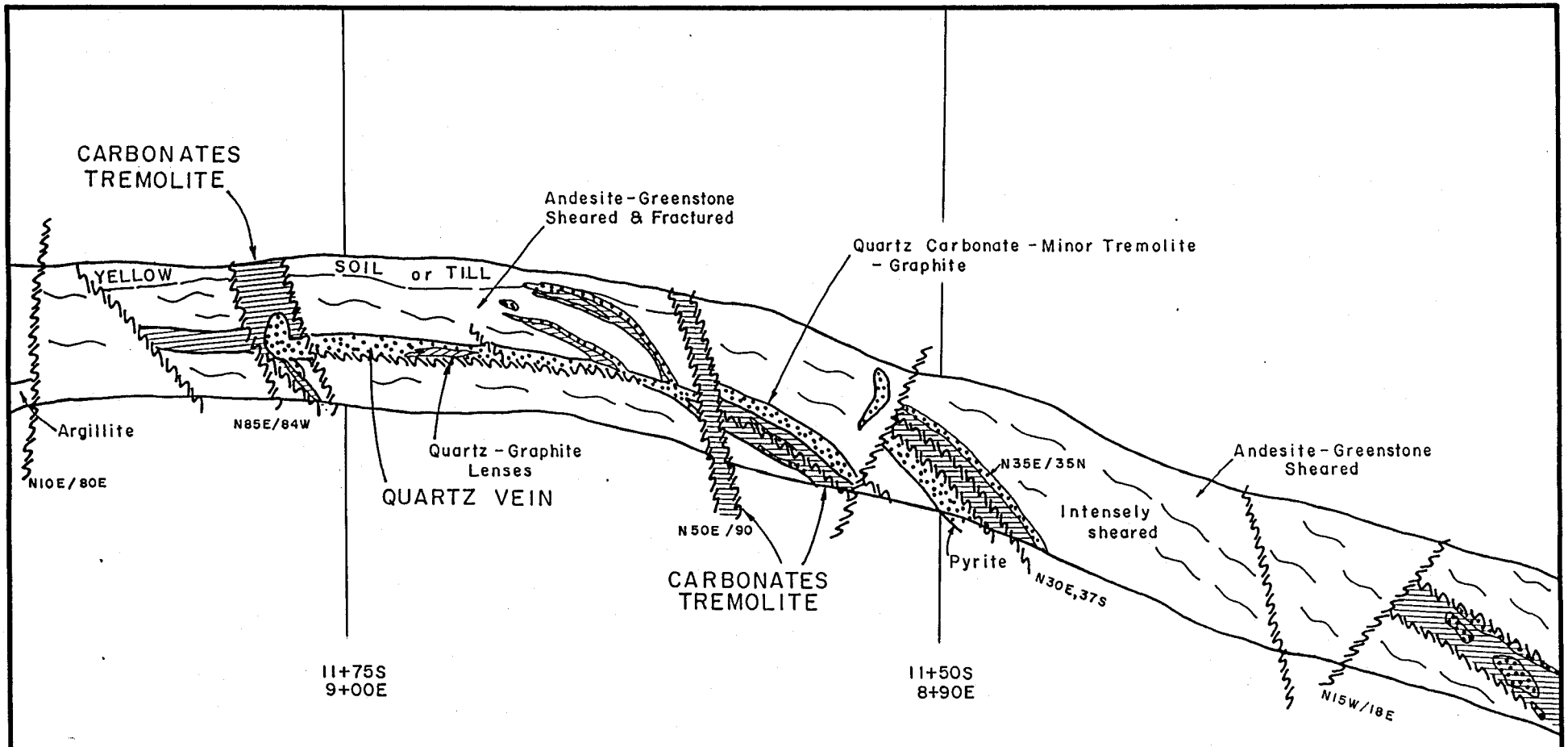
The hanging wall consists of broken, dark green to black, soapy along fractures, argillite. Fresh broken faces have a fine grained texture, light green to black colour, and no phyllitic foliation. Euhedral pyrite is disseminated within the wall rock. Graphite is present as fine coating on fracture planes. Hydrothermal alteration, coinciding with strong Au - As anomalies, is localized along these northerly trending structures.

From 11+75S, 8+75E to 12+25S, 8+75E trenching (trench 1 - 3,5,6) intersected a fault alteration zone. The zone lies 150 m further to the west than on line 10+25S, but is thought to be the faulted extension of the zone described above.

A N10°E/75°W fault cuts across the eastern part of trench 7. A carbonate vein, 4 cm thick follows along the foot wall. This fault appears to cut the alteration zone. A lamporphyre dike, trending east, is off set about 4 m, west side south.

2. Faults trending N35°E/45°W are exposed in trench 7 at 10+00S, 9+75E. The 15 m wide zone exposes several alteration zones, each about 1 m wide separated by orange gouge. The appearance of the alteration is identical to that described above and is anomalous in gold and arsenic. This structure displaces the main N10°E structure. The indicated movement is left lateral.

3. N80°E/40°S and N85°E/85 fault, (Figure 13, 14) cuts the thrust splay. A quartz vein following the thrust is off set and shows 1 m vertical movement, east side down. Along the west side a similar fault cuts off the thrust plane.



SCALE 1:250

5 0 10

METRES

DUKE MINERALS LTD.

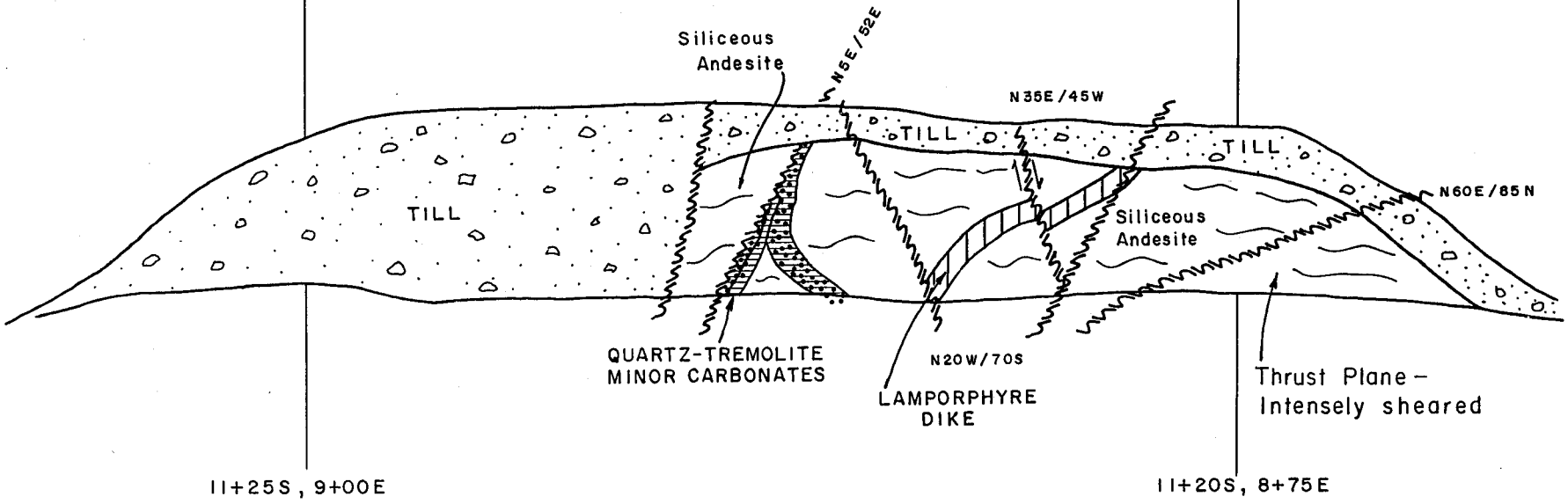
MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

GEOLOGY
ROAD CUT

(FACING S45W)

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 13



SCALE 1:100

0 1 2 3 4 5

METRES

DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

GEOLOGY
ROAD CUT

(FACING S35W)

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 14

4. A N45°W trending fault brings argillites in contact with andesites at 11+50S, 9+75E. This fault possibly off sets the hydrothermal zone localized along the N10°E fault as exposed in trench 7.

5. Numerous NE to E trending faults and shears are exposed within road cuts and indicated along the creek south of line 11+50S. The relationship to the other fault structures is not known. Regional data suggests that they predate the N trending faults.

8-30 QUARTZ VEINING AND HYDROTHERMAL ALTERATION:

Quartz veins, lenses or fracture and joint filling were observed in several locations within the mapped area. The most important quartz occurrences are:

Quartz Veins Along Thrust Splays: (Figure 13, 14)

A 1 m thick quartz vein is exposed at line 11+50S, 9+00E following a thrust splay. The vein consists of white quartz, buff carbonates, fibrous tremolite and minor dark inclusions. The vein is broken, pinches and swells, feathers upwards along subsidiary thrust planes, and forms lensoid masses. Along shear planes the vein is crushed forming veinlets and lenses of dark grey to black sooty quartz. The black quartz contains blebs of carbonates and graphite. Orange coloured gouge seams appear to follow along shear planes in the hanging wall. Over laying andesites are broken, but dark green; no hydrothermal alteration. The foot wall shows serpentinization (?) and pyrite.

Quartz in Veinlets, Lenses or Joint Filling:

Small quartz lenses, irregular in outline, occupying fractures or joints, were observed just west of the Creek, between lines 11+50S to 12+00S, 9+75E in greenstone. The veins appear to be localized by northerly trending fractures from which they spread into joints. Vein filling is white bull quartz, minor dolomite and tremolite.

Quartz veinlets, as hairline fracture filling in argillites along or above the argillite-andesite contact occur on line 12+50S, 9+75E. The vein filling is white bull quartz showing rusty discolouration. Neither graphite nor tremolite were observed.

At line 13+00 E, about 12+00S quartz as veining, lenses, inclusions, joint filling and as irregular replacement masses was observed within grey, banded cherts and as fracture filling in greenstone.

The white bull quartz with minor tremolite and patches of chlorite returned background values in Au and As.

Hydrothermal Quartz-Carbonate-Tremolite Alteration:

Andesites and cherty andesites show low grade greenschist metamorphism changing the andesites to greenstones. Primary textures, ie. porphyritic textures, breccia fragments, and pyroxene phenocrysts are recognizable as ghosts. Disseminated fine pyrite and arsenopyrite are common.

West and south of line 10+25S, 9+75E a strong alteration zone crops out. The area has been mapped as a hydrothermally altered greenstone. Thin sections were interpreted as rhyodacite, but the mineral assemblage is characteristic of greenschist grade metamsomatism (Table 6).

Sample#:	Colour:	Texture:	Structure:	Au ppb	Mineralogy
R125	colourless, green rusty brown	Brecciated	X-cutting, veins & fractures	510	15% Calcite, 10% Tremolite, 42% Quartz, 25% Feldspar, 4% Opaques, 3% K-spar,
R126	colorless, orange	Porphyritic	Veins & fractures Brecciated	795	10% Tremolite, 50% Quartz, 12% K-Feldspar, 25% Plagioclase, tr. White Mica, 1% Hornblende, 1% Fe oxides
R127	colourless, pale green, rusty brown	Porphyritic	X-cutting fract.	101	10% Tremolite, 50% Quartz, 10% Feldspar 2% Amphibole, or Biotite.
R127A	colourless, rusty green	Brecciated	Veins, fractures	335	35% Tremolite, 28% Quartz, 4% Opaques, 12% K-Feldspar, 20% Plagioclase.
R129	colourless, light green to brown	Porphyritic rock frags,	Veins, fractures	825	15% Tremolite, 30% Quartz, 7% Opaques 12% Plagioclase, 10% Calcite, 25% K-Feldspar 1% Chlorite.
R130	green orange	Slightly Porphoritic.	Veins, fractures	570	45% Tremolite, 45% Quartz, 10% Opaque.

Table 6: Summary of thin section descriptions. Rock samples collected from alteration zones on lines 10+00S to 10+50S, 9+50E to 10+00E. Description by Bob Lane, U.B.C., M.Sc. Geol. Candidate.

Near the N5°E fault structure the pyrite and arsenopyrite increases, silicification and hydrothermal alteration consisting of quartz-carbonate-tremolite is intense. Carbonate veins (dolomite) up to 4 cm wide, were found along fault planes associated with fault gouge. Gouge zones observed are up to 1 m wide. These alteration zones are anomalous in gold and arsenic and show spot anomalies in Cu and Zn.

Sample#:	Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm	Ba ppm	B ppm	K %
125	510	0.80	990	96	45	16	27	3	0.02
R126	795	1.50	657	59	14	174	24	3	0.02
R127	101	7.60	122	4,219	20	1,641	9	2	0.01
R127A	335	18.00	53	27	5	294	37	9	0.02
R129	825	0.50	1,036	10	11	22	42	2	0.08
R130	570	0.30	460	24	32	15	60	3	0.02

Table 7: Rock geochemistry of samples collected from alteration zones, for thin section study, lines 10+00S to 10+50S, 9+50E to 10+00E,

The following is a summary of the individual minerals and their associations:

Plagioclase - always intensively altered showing sericite, albite, epidote and calcite.

Quartz - primary and secondary, fracture and vein filling, foam texture, sutured boundaries and undulous extinction, strained.

Tremolite - as veinlets with quartz and calcite or as matrix within breccia fragments, Fe stains.

K-Feldspar - within fragments and veinlets, intergrown with tremolite.

Opaques Euhedral grains - pyrite or Fe-Ti oxides, pseudomorphs after hornblende, inclusions of tremolite.

The compositon and texture - suggest that originally andesitic volcanics were changed to greenstone by regional metamorphism.

In thin sections brecciation, fracturing and strained quartz give evidence of dynamic metamorphism. Quartz-tremolite veinlets, tremolite-K Feldspar intergrowths, open space filling, euhedral masses of quartz-sericite- albite-epidote, calcite, silica flooding, pyrite, arsenopyrite ?, suggest hydrothermal activity.

Andesite samples collected from the proximity of N5°E to N15°E trending faults, have been affected by a higher grade of greenschist metamorphism. In hand specimens a notable colour change from dark green andesitic greenstone to a light grey, pale green greenstone is evident.

The carbonate alteration, quartz-tremolite veins and black graphitic quartz veins localized along the splay of the thrust are not anomalous in gold or arsenic suggesting that these alterations are related to a different hydrothermal event than the quartz-carbonate-tremolite zones associated with northerly trending faults.

8 - 40 GEOCHEMICAL SAMPLING: (Figure II, III)

A reconnaissance soil survey on the Mustang claims was completed in the 1987 field season. Based on the configuration of auriferous quartz veins in the district four N-S lines, 200 m apart with 25 (50) m stations were sampled.

Samples were collected with a grub hoe and put into kraft paper bags, marked and shipped to Vancouver for analysis. A total of 121 soil samples were taken and analysed by I.C.P.

Samples were taken from the B horizon where possible. In general the soil profile is poor developed. Cover consists of glacial till along the creek valley and along the slopes. The top of the ridge is covered by boulders trains resting on silty clay and till.

Topographic relief on the sample grid is high with slopes up to 60° and numerous steep cliffs along the east side of the creek. The flatter part of the grid area is normally swampy and gives rise to many small water courses.

The anomalous part of the grid was covered by a detailed grid. The lines trend E-W, 25 m apart with stations at 25 m intervals, 243 samples were collected as described above and assayed by I.C.P.

Statistical Analysis:

All samples were grouped depending on their origin and the individual statistical parameters were calculated. Threshold is defined as the mean plus 1 standard deviation.

Regional reconnaissance results - 121 soil samples:

Element:	Au ppb	Ag ppm	Zn ppm	Cu ppm	Pb ppm	Sb ppm
Max. value:	670.0	2.00	229.0	231.0	111.0	22.00
Min. value:	1.0	0.00	19.0	2.0	3.0	0.0
Mean value:	12.5	0.82	65.7	35.0	10.5	2.72
St.Deviation	53.8	0.28	34.0	33.0	10.5	2.54
Threshold:	66.3	1.10	99.7	65.0	11.00	5.27
Coeff.Varia:	4.3	0.34	0.5	0.9	1.0	0.93

Detailed grid result - 243 soil samples:

Element:	Au ppb	Ag ppm	Zn ppm	Cu ppm	Pb ppm	As ppm
Max. value:	2,980.00	2.40	883.00	380.00	203.00	1,788.00
Min. value:	1.00	0.10	12.00	6.00	2.00	2.00
Mean value:	82.00	0.40	76.00	41.00	18.00	112.00
St.Deviation:	273.00	0.30	63.00	37.00	17.00	214.00
Threshold:	355.00	0.70	169.00	78.00	35.00	326.00
Coeff. Varia:	3.33	0.75	0.83	0.90	0.94	1.91

A comparison of the two sets of soil data shows that the east-west grid delineated northerly trending anomalies which can be correlated to north trending faulting. No east-west structures were delineated as anomalous.

Gold and As values from soil samples (1987 & 1988 surveys) were plotted and contoured using the threshold value from the 1987 regional survey.

The anomalous gold area consists of two main segments:

1. This anomalous area is centered about line 9+50E between 9+75S and 11+25S and coincides with trench 7. The hydrothermal alteration zone (see thin sections) exposed in Trench 7 confirmes northerly and northeasterly trending faults are the loci for anomalous gold and arsenic.

2. Centered about 9+50E, 11+75S to 12+25S an anomalous area in gold and arsenic has been defined. The source of gold and arsenic is unknown. The area is underlain by greenstone with a greenstone argillite contact just to the east. Numerous quartz-tremolite lenses, joint filling or veinlets are known in the general area, but all quartz samples assayed were barren.

A break, trending north-easterly along line 11+50S separates the two main anomalies.

A spot anomaly at 8+50E, 11+00S having a value of 550 ppb Au and no As is thought to be caused by downslope transport.

At 8+50E, 12+50S to 13+25S an isolated Au anomaly was trenched (trench 9). The anomaly is underlain by a quartz-carbonate-tremolite alteration zone localized along northerly trending structures.

The main difference between the Au anomlies lying east of line 9+00 E and to the west is that the western areas have no associated arsenic anomalies.

Rock Geochemistry:

In July 1988 additional trenching and sampling was executed to check anomalous areas. A total of 43 samples were submitted for analysis. All samples were assayed for Au, Ag, As, Zn, Pb, and Cu, but only 21 samples were submitted for 30 element I.C.P.

Element:	Au ppb	Ag ppm	Zn ppm	Cu ppm	Pb ppm
Maximum Value:	1,690.00	18.00	14,980.0	1,641.0	490.00
Minimum Value:	1.00	0.10	7.0	4.0	2.00
Mean Value:	484.35	1.27	78.6	83.8	47.60
Standard Deviation:	445.15	2.85	NA	NA	80.00
Threshold:	929.00	4.12			127.00
Coeff. Variation:	0.92	2.25			1.68

Element:	As ppm	Ba ppm	B ppm	W ppm	K %
Maximum Value:	3,342.00	158.00	16.00	38.00	0.26
Minimum Value:	4.00	8.00	2.00	1.00	0.01
Mean Value:	945.74	62.60	3.70	7.35	0.05
Standard Deviation:	937.69	47.52	3.29	11.31	0.06
Threshold:	1,883.43	110.12	6.99	18.66	0.11
Coeff. Variation:	0.99	0.76	0.89	1.54	1.20

Highly anomalous concentrations of Au, As, Zn and Cu are present in the hydrothermal system sampled.

Alteration zones associated with northerly trending faults are strongly anomalous in gold, arsenopyrite, and show spotty highs in zinc, copper and lead. A small sample population analysed for Ba, K, B, and W shows anomalous Ba and a low anomaly in W, B, and K, but the trace element results are inconclusive.

8-50 ELECTROMAGNETIC VLF SURVEY: (Figure IV, V)

During the 1987 field program D. Brett conducted a VLF EM survey over the detail grid. The instrument was a Sabre Model 27 EM unit using the Seattle Station. The field data was reduced using Fraser Filter and plotted. The survey outlined 3 anomalous area:

Area 1 - 7+50S to 10+50S, 9+50E to 11+00E:

The anomaly lies along the eastern limits of the surveyed grid and is open to the east and north. Geological mapping shows that the area lies just east of outcropping interbedded argillites and andesite. The centre and eastern part is swampy. It lies north of geochemical anomaly 1 and is interpreted as being caused by the swamp producing a conductive zone along the glacial till - bedrock interface.

Area 2 - 7+50S to 9+50S, 8+00E to 8+75E:

The anomalie lies just west of the surface trace of the Danny Fault and may represent its down dip extension. DDH 88-1 was located within the southern part of the anomaly. The drill hole intersected grey carbonate alteration within broken andesites before passing through graphitic, broken argillites and siltstone lying within the Lower Thrust sheet of the Sylvester Allochthon.

Area 3:

Area 3 represents 2 joining anomalies separated by a north trending low conductivity area.

Area 3 East - 11+00S to 13+50S, 8+00E to 9+50E:

This EM anomalies coincides in part with a gold anomaly. Trenching within the anomalous area located a strong quartz-carbonate-tremolite alteration zone carrying low gold values. Gouge, graphite and shearing along north trending faults may represent a conductive zone. Excessive pyrite was found adjoining the structural zones.

DDH 88-4 intersected the Lower Thrust plane and stopped in clastic sediment having sulphide banding and sulphides within quartz-carbonate hairlines. Additional drilling will be required to clarify this anomaly.

Area 3 West - 9+25S to 13+50S, 7+00E to 7+50E:

The anomaly is open to the west and to the south. In general the area is underlain by clastic sediments of the Earn Group as indicated by one outcrop and intersections of DDH 88-3 and DDH 88-4. The Lower Thrust plane and its associated zone of conductivity may be responsible for part of the anomaly. Minor banded sulphides, blebs and veinlets of quartz-carbonates carrying chalcopyrite, pyrite and sphalerite are known to occur within the clastic sediments. The clastic sediments are known to have several horizons of exhalative massive sulphides associated with barite.

8-60 TRENCHING:

A program of backhoe trenching was initiated in 1987 and extended in 1988. The purpose of the program was to expose bedrock in areas having anomalous gold and arsenic concentration in soils or rock. A total of 9 trenches were completed. All trenches accessible in 1988 were mapped in detail (Figure 1).

The main target for trenching was the Danny Fault, a N5°E/45°W structure, and its apparent southern extension and its associated hydrothermal alteration zone anomalous in gold and arsenic.

Trench # 1:

This trench was back filled in 1987, hence it was not mapped. The location of the trench lies along strike of the Danny Fault. Sample results made available to the writer suggest that the alteration zone was intersected.

Sample#	Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm	Description
R113	1,650	0.20	95	68	28	39	Pyritic, hard siliceous, grey to pale green.
R114	540	2.50	2,445	136	133	429	As above
R115	560	1.10	1,104	358	33	52	As above
R117	185	0.70	1,196	25	16	170	Gouge from FW 10cm wide, yellow orange.

Trench: # 2

The trench excavated in 1987 was sloughed during the property visit in 1988. Samples listed below were made available to the writer.

Sample#	Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm	Description
R009	490	1.20	2,739	63	61	47	Pyritic, hard siliceous, grey, to greenish.
R010	1,250	0.70	2,386	246	48	23	As above
R011	410	0.50	351	61	15	53	As above
R112	1	0.20	95	68	28	39	Andesite rubble hanging wall.
R119	495	0.90	1,566	73	81	34	Siliceous Argillite in middle of trench.

Trench: # 3 (figure 15)

The trench was originally excavated in 1987 but was cleaned and extended in 1988. It runs east-west and has dimensions of 18m x 2m x 2m. The east end of the trench is formed by the footwall of the Danny Fault dipping at 65°W. Directly overlaying the foot wall is a grey siliceous, hydrothermally altered greenstone. The hanging wall is formed by 1 m gouge and black broken, chloritic argillite (?). A northeasterly diabase dyke cuts across the hanging wall. The hanging wall is formed by a mixture of broken argillites, greenstone and gouge.

Sample#	Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm	Description
R116	1,190	0.30	1,497	59	34	12	Pyritic, hard siliceous, grey to greenish.

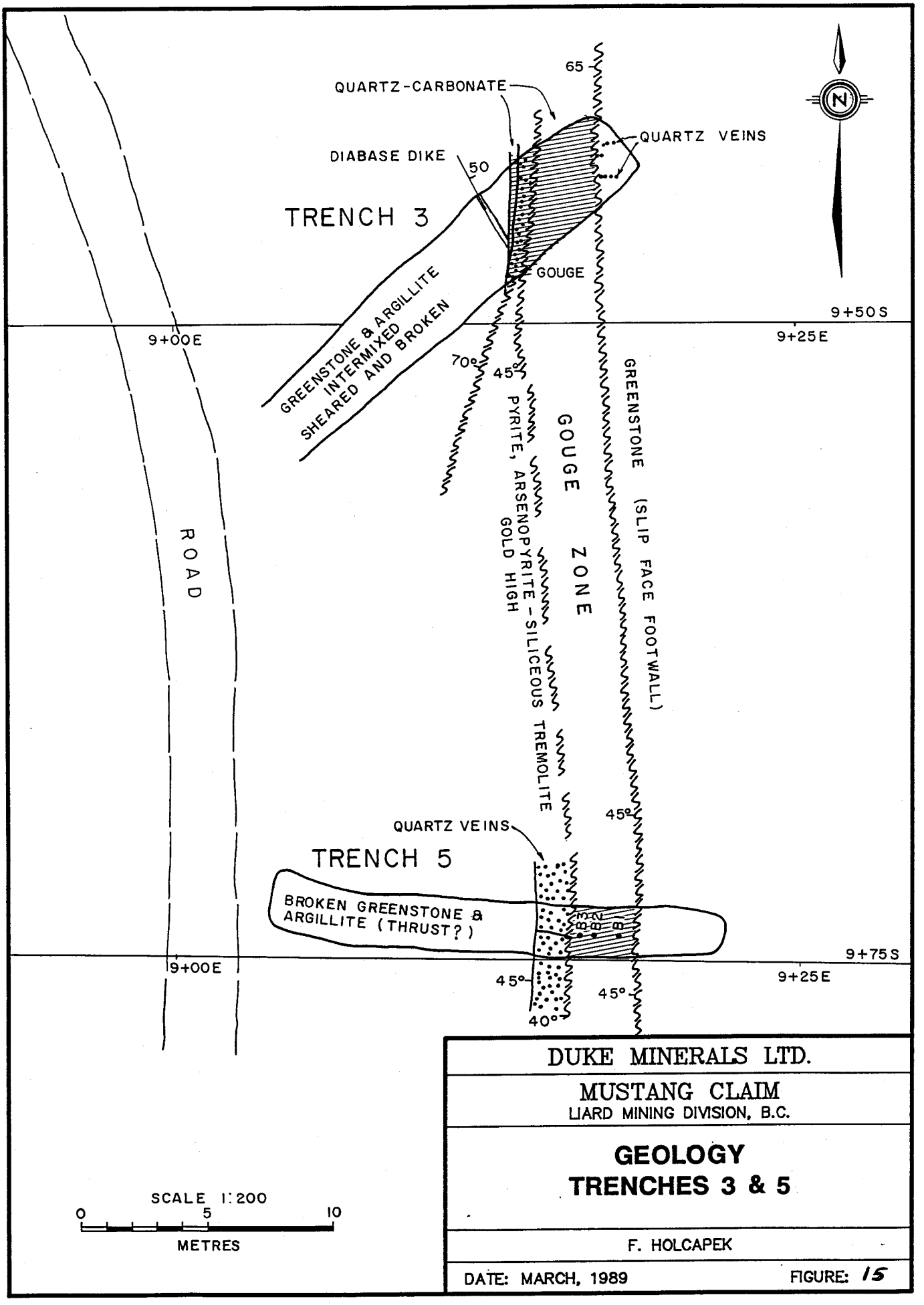
Trench: # 4

The trench was closed in 1988. No samples are available.

Trench: # 5 (Figure 15)

The purpose of this trench was to fill in a gap between trench 2 and 3 and to help establish the trend of the alteration zone. Dimensions of the trench are 18m x 2m x 2.5m. The eastern end of the trench is the foot wall of the Danny Fault dipping at 45°W. The quartz-carbonate alteration zone is 2 m wide overlain by 1 m gouge, broken argillites and quartz veinlets. The hanging wall consists of a mixture of broken argillites, greenstone and gouge.

Sample#		Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm		Description
13115	B1	1,230	0.90	1,749	66	52	22	1.3m	Tr 2 Gouge along footwall, orange red.
13116	B2	770	1.30	1,142	124	220	41	Grab	Greenstone, sheared, pyritic, gouge.
13117	B3	670	2.00	1,319	164	490	10	0.8m	Siliceous zone as in Tr.1, light green, breccia,



DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

GEOLOGY
TRENCHES 3 & 5

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 15

Trench: # 6

Bed rock was not reached except the dip slope of the foot wall. Overburden was too deep to allow cutting the alteration zone.

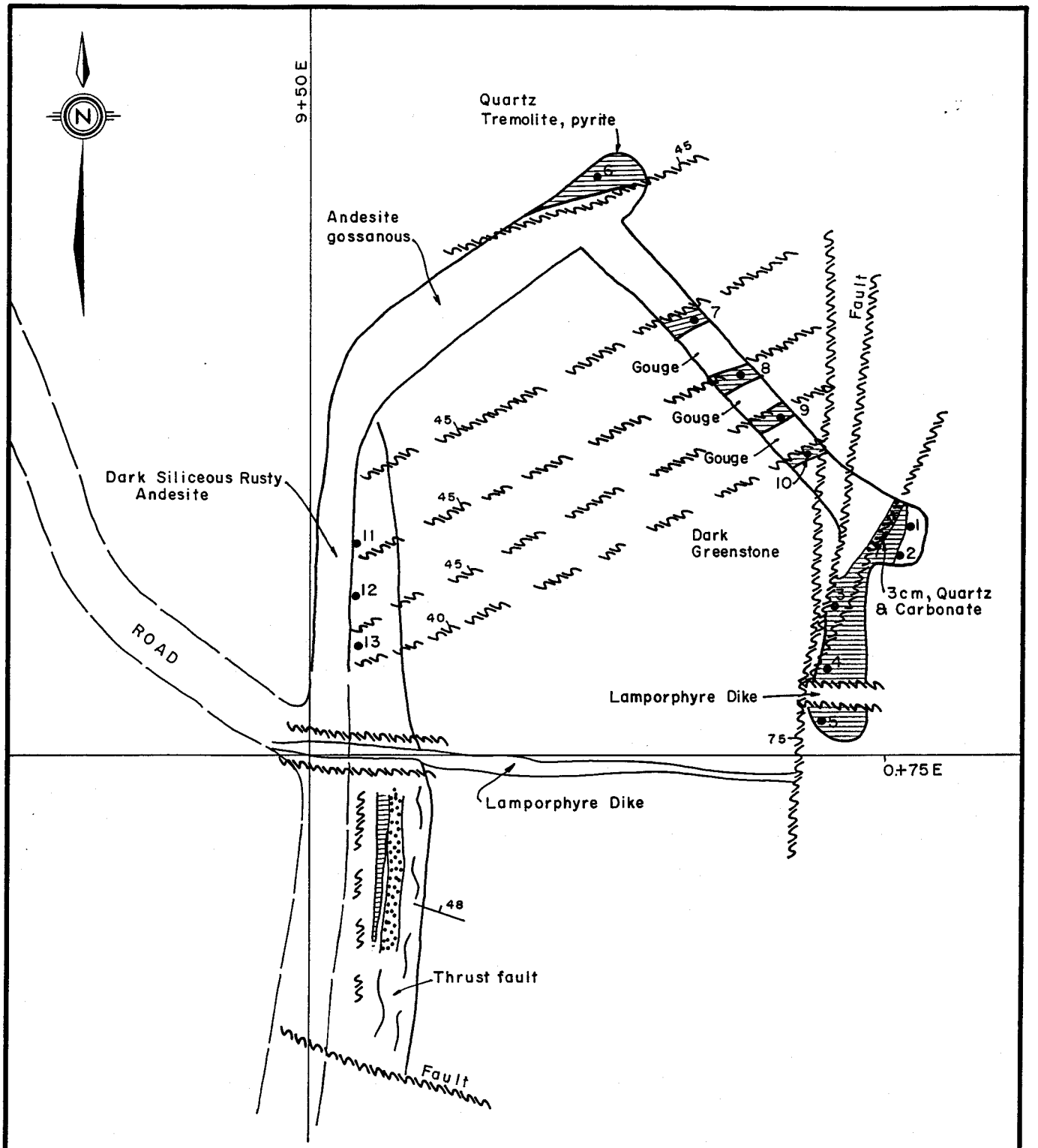
Trench: # 7 (Figure 16)

The purpose of this trench was to open the large alteration zone anomalous in gold and arsenic found during 1987. For surface rock sample see sample description in section 8 - 30 Quartz-carbonate-tremolite alteration. Trench 7 is a composite trench consisting of 3 parts having the following dimensions:

1. N - S 10m x 2.0m x 2m;
2. SE-NW 20m x 1.5m x 2m;
3. NE-SW 15m x 1.5m x 2m.

Trenching intersected several NE trending alteration zones, each about 1 m wide. Along the eastern trench wall N-S faulting showing carbonate veining cuts and off set a lamprophyre dyke. The foot wall is light green to tan greenstone. The hanging wall is strongly rusty andesites and dark gouge. Sampling showed unusually high copper and zinc values.

Sample#:		Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm		Description
13101	1	24	0.20	142	45	12	56	Grab	Siliceous, breccia with pyrite, pale green, fault N25E/90
13102	2	520	0.30	2,249	72	25	48	Grab	more siliceous and pyrite, arsenopyrite fault as above.
13103	3	480	0.30	974	54	51	20	1.3m	pyritic, siliceous, hard light to pale green, intersection N25E/90 with N5E/75W, carbonate and quartz stringers along fault plane
13104	4	35	0.20	379	272	21	159	0.5m	Siliceous, pyritic, green pale, tremolite along contact of lamporphyre dike E/90.
13105	5	410	0.40	861	162	17	32	0.8m	as above, south of dike, siliceous, pale to light green, micro breccia
13106	6	40	0.10	18	93	16	58	0.5m	rusty, brown to green pyritic, less siliceous, greenstone, broken, arsenopyrite, tremolite.
13107	7	610	0.30	317	32	23	7	1.0m	Fault N35E/45W, siliceous, light colored pyritic zone. Gouge on footwall.
13108	8	1,145	0.60	3,342	112	137	47	1.0m	As above, gouge on foot wall.
13109	9	775	0.60	1,821	29	58	25	0.66m	As above, footwall gouge and broken dark greenstone.
13110	10	230	1.40	1,635	14,980	52	289	Grab	exremely hard, siliceous, pale to light green, intersection of N/75W fault with N35E/45W fault. Wall rock very broken black sulphide, pyrite, Arsenopyrite.
13111	11	1,690	0.80	2,963	104	24	126	Grab	broken, rusty, siliceous breccia greenstone, gossaneous.
13112	12	650	0.30	2,118	115	23	66	2.0m	siliceous, dark broken greenstone, highly limonitic and pyritic.
13113	13	690	0.20	1,746	37	8	26	Grab	Quartz vein material, minor carbonates, tremolite, limonitic



DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

GEOLOGY
TRENCH 7

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 16

During Febuary 1987 several percussion holes were drilled west of trench 7. The writer has not seen the results of these percussion holes. In 1988 DDH 88-2 was spotted in the the same location. The objective was to test the alteration zone at depth.

Trench # 8: (Figure 17)

Prior to trenching, samples were collected along the road and creek south of 11+25S from altered andesite and quartz-carbonate-tremolite veins to check on gold concentration within and near the splay thrust.

Sample#	Au ppb	Ag ppm	As ppm	Zn ppm	Pb ppm	Cu ppm	Description
R002	31	0.10	4	7	2	13	
R003	62	1.30	6	22	54	288	
R004	31	1.00	141	50	92	150	
R005	155	2.00	77	27	26	100	quartz vein, white, tremolite fibrous
R101	5	0.10	51	27	6	30	Andesite, sulphides, alteration minor.
R102	2	0.20	36	29	8	4	Andesite, cherty, pyritic.
R103	33	0.10	163	73	10	21	Andesite, cherty, broken, pyritic.
R104	27	0.10	509	26	4	5	Andesite, foliated, cherty, pyritic.
R105	3	1.30	22	23	5	42	Andesite, pyritic.
R106	122	0.20	21	34	3	14	Andesite, siliceous, altered, pyritic.

The purpose of this trench was to investigate a soil gold and arsenic high located within an overburden covered area. The trench was excavated by backhoe, trends N45°W with the south end located at 11+90S, 8+85E, and has dimensions of 16m x 1.5m x 1.5m.

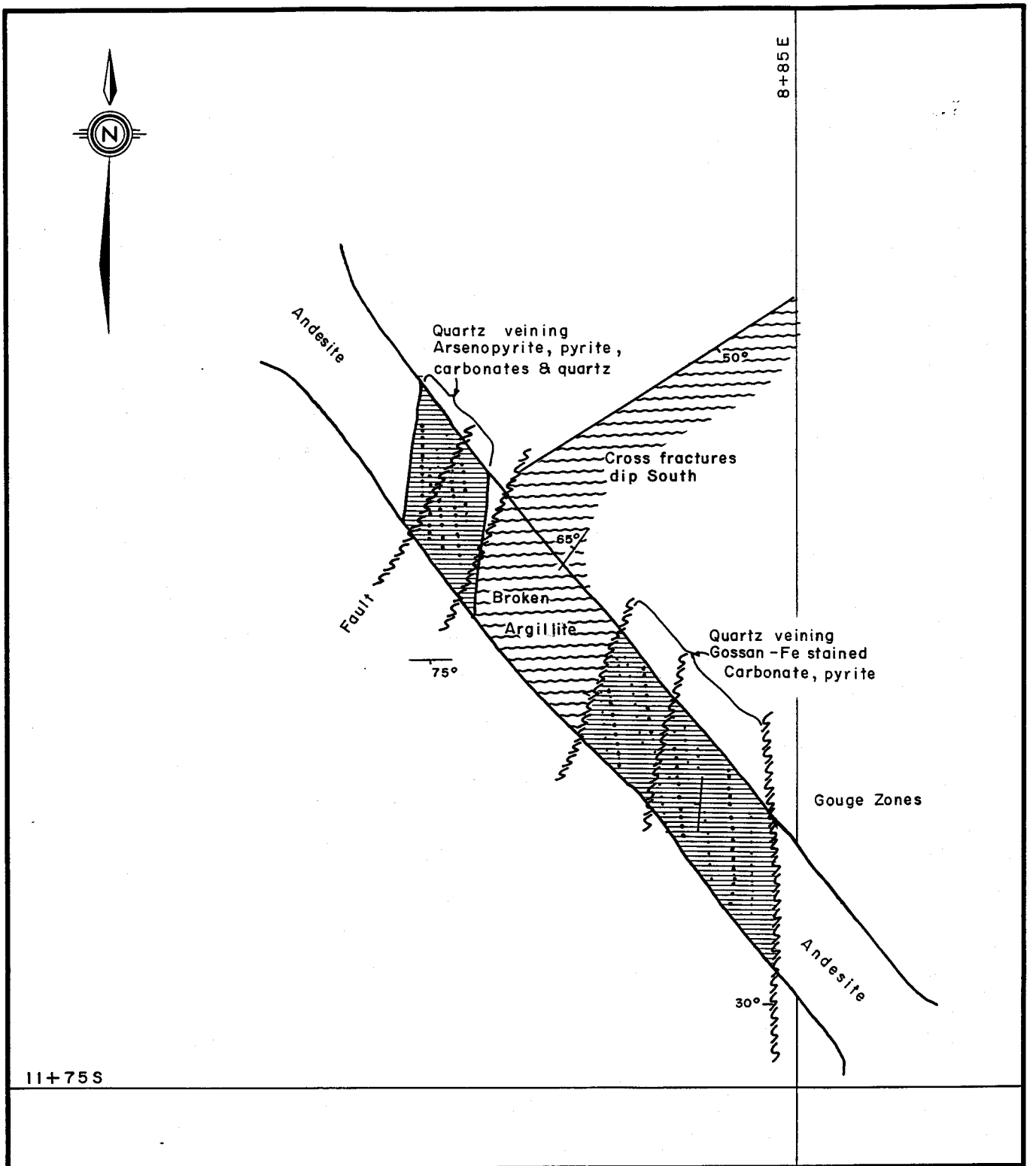
The trench was mapped and sampled by Mike Densky, geologist. The writer checked the trench during his property visit in September 1988. All samples taken are missing.

A strongly gossanous quartz-carbonate zone cut by numerous small quartz veinlets, and by NE and N trending faults is exposed in the centre of the trench, overlain by a thin blanket of broken argillites. Both the north and south limits of the trench cut greenstones.

The quartz-carbonate zone is strongly weathered forming orange soil and limonite. The indicated trend is about N5°E with a westerly dip. A N-S fault dipping at 30°W forms the apparent foot wall.

The argillites appear to form a thin blanket. The rocks are strongly fractured, broken,and black to sooty in colour. Indicated strike is variable from E/75°S to N25°E/65°W.

Andesites, fractured, dark green to tan with limonite, form the hanging wall and foot wall. DDH 88-4 is located in this trench.



SCALE 1:100

0 1 2 3 4 5

METRES

DUKE MINERALS LTD.

MUSTANG CLAIM

LIARD MINING DIVISION, B.C.

GEOLOGY
TRENCH 8

F. HOLCAPEK

DATE: MARCH, 1989

FIGURE: 17

Trench # 9: (Figure 18)

The trench was mapped and sampled by Mike Densky, geologist. The writer checked the trench during his property visit in September 1988. All samples descriptions are missing.

The purpose of this trench was to check on spot gold highs in an area completely covered by overburden. The trench is of irregular out line consisting of 3 interconnected branches with the south end located at 13+25S, 8+50E. Dimensions of the branches are:

19.0 m x 3.0 m x 1.5 m
6.5 m x 2.5 m x 1.3 m
5.0 m x 1.5 m x 1.0 m

The trench uncovered a strongly faulted and brecciated area within the greenstone which forms both the hanging wall and foot wall. The quartz-carbonate alteration zone is brecciated and consists of fault blocks. The general trend of the alteration is N20°E to N.

Numerous northerly trending faults cut the alteration zone. These faults are anomalous to the area since they have a easterly dip varying from 45°E to 80°E. A N60°E/70°N fault cuts and displaces the northern part of the zone.

Sample#:		width ft:	Au oz/ton	Ag oz/ton	As %	Zn %
D13118	A	1.5	0.001	0.01	0.01	0.01
D13119	B	4.0	0.001	0.01	0.01	0.01
D13120	C	3.0	0.001	0.02	0.01	0.01
D13121	D	5.0	0.001	0.02	0.01	0.01
D13122	E	6.0	0.001	0.06	0.01	0.01
D13123	F	5.0	0.001	0.01	0.01	0.01
D13124	G	5.0	0.001	0.06	0.01	0.01

8 - 70 PERCUSSION AND DIAMOND DRILLING:

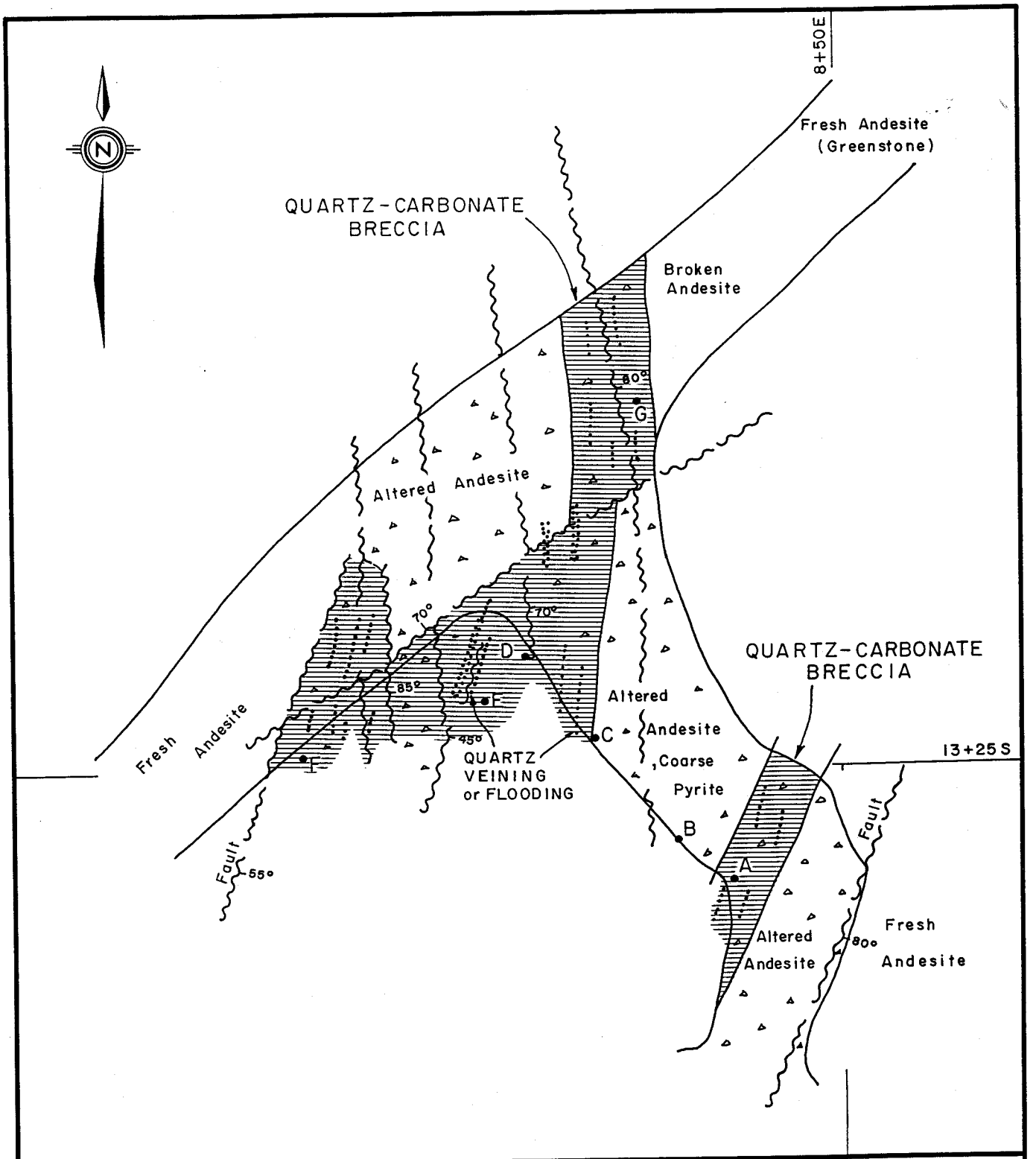
Percussion Drilling February 1988:

During February 1988 a percussion drill program consisting of 4 drill holes was completed. The objective was to test the alteration zone associated with the Danny Fault. No results were made available to the writer.

During the property visit in July 1988, the drill holes were found.

Location 1: HM 88-1, E, -80°; 9+62S, 9+25E
HM 88-2, E, -70°; 9+62S, 9+40E

The drill holes are located between Trench 1 and Trench 2. The dip of the Danny Fault 45° to 65°E suggests that the drill location was too far to the east to intersect the alteration zone.



DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

GEOLOGY
TRENCH 9

F. HOLCAPEK

DATE: MARCH, 1989

FIGURE: 18

Location 2: HM 88-3, S45°E, -45°; 10+37S, 9+45E
HM 88-4, N30°E, -50°; 10+62S, 9+50E

Cuttings laying beside the drill holes suggest that argillites were intersected in both drill holes. The holes appear to have been spotted in a strongly disturbed structural area.

Both of the drill holes were angled to intersect the gold anomaly associated with the quartz-carbonate-tremolite zone believed to be localized along strike of the Danny Fault.

Diamond Drilling - September 1988:

The diamond drill program was supervised by Mike Densky, Geologist. The recommendations made by the writer for drill locations were followed in part because of access problems. The writer revisited property in September 1988, after the drilling was completed.

Drill section were drawn by M. Densky, Geologist. Elevations and location of drill holes were surveyed by chain and Bruton. The writer modified the drill sections.

DDH 88 - 1: (Figure 19) Location: 8+25E, 8+75S, Depth: 229 ft
Bearing: N85°E, Dip: -45°

Purpose: To intersect the Danny Fault between Trench 3 and Trench 5, but the hole was moved to the north to drill under Trench 6.

The drill hole cut (from 20 ft to 35 ft) cherty, brecciated andesite and passed into argillites and siltstone below. The contact is extremely broken, graphitic and sheared suggesting the Lower Thrust plane was intersected. From 35 ft - 229 ft intense shearing is the main feature. From 120 ft to 140 ft carbonate and quartz veinlets cut graphitic, sheared siltstones.

Sylvester : Andesite-argillite
to
Earn Group: Graphitic argillite-siltstone, sandstone.

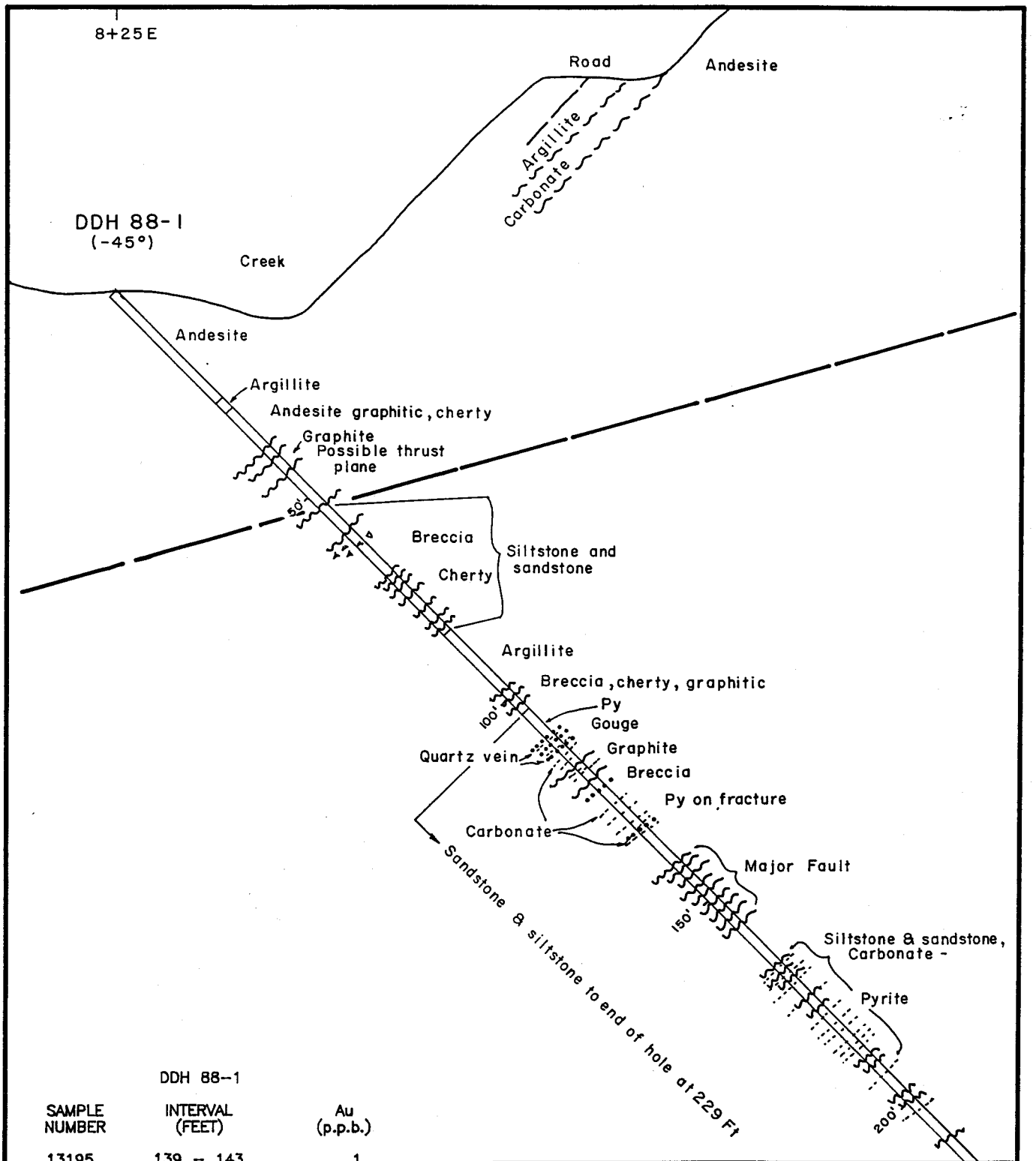
The Danny fault was not intersected. A down dip projection shows that the hole should have cut the fault and alteration zone at 50 ft.

No samples assayed were anomalous in gold.

DDH 88 - 2: (Figure 20) Location: 9+30E, 9+70S, Depth: 250 ft
Bearing: S45°E, Dip: -45°

Purpose: To test the alteration zone along the Danny Fault at depth. HM 88-3 and HM 88-4 were drilled in the same general area.

DDH 88-2 was for its entire length within andesite-argillite of the Lower Thrust sheet - Sylvester Allochthon. From 17.3 ft to 56 ft the alteration zone intersected is highly anomalous in gold. Pyrite, pyrrhotite and graphite occur in variable amounts as fracture filling or dissemination within shear zones.



DDH 88-1

SAMPLE NUMBER	INTERVAL (FEET)	Au (p.p.b.)
13195	139 – 143	1
13196	143 – 147	6
13197	147 – 148.5	4

0 10 20 30 40 50 Ft.

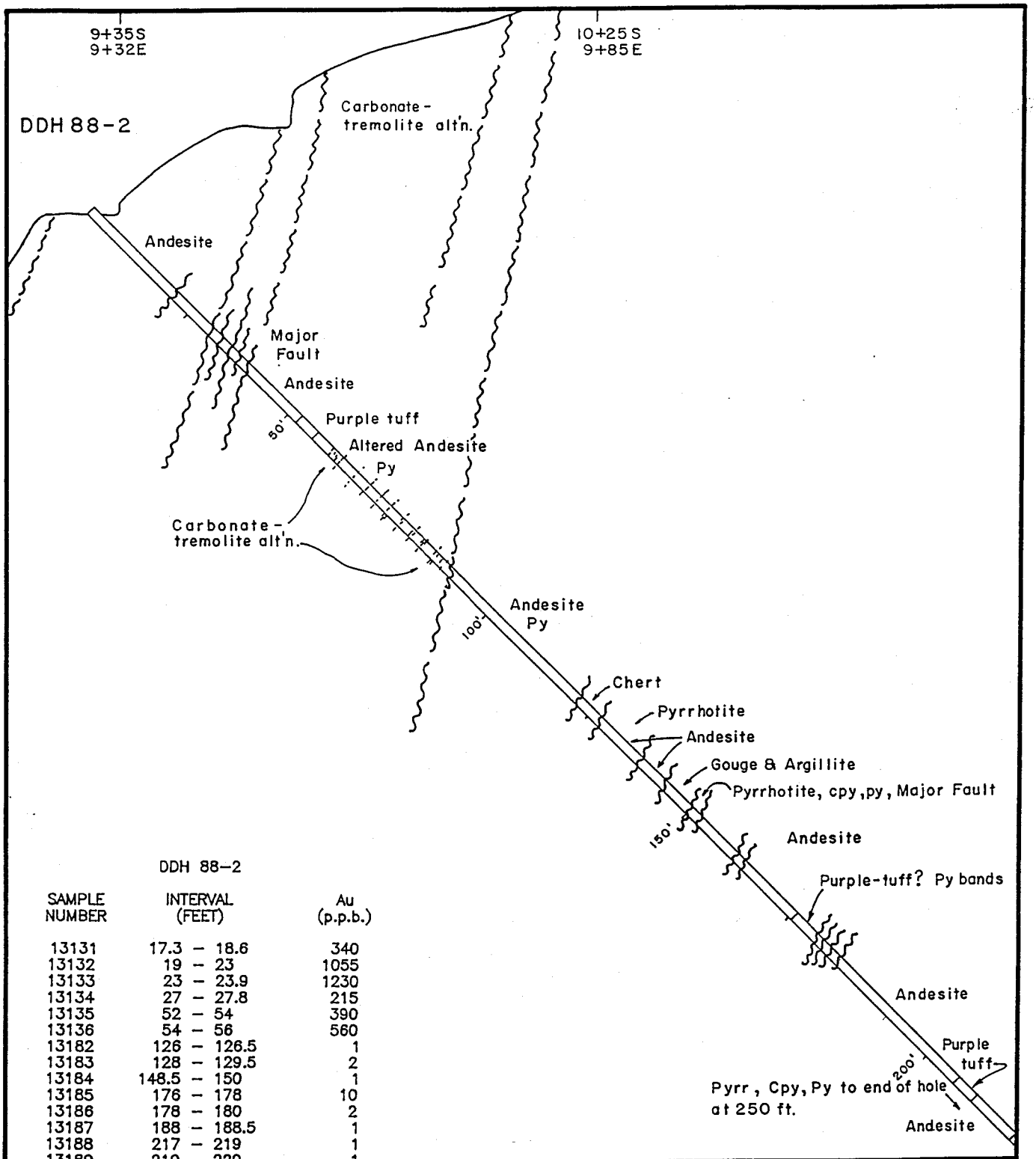
DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

CROSS SECTION
DDH 88 – 1
(FACING NORTH)

M. DENSKY

DATE: MARCH, 1989 FIGURE: 19



DDH 88–2

SAMPLE NUMBER	INTERVAL (FEET)	Au (p.p.b.)
13131	17.3 – 18.6	340
13132	19 – 23	1055
13133	23 – 23.9	1230
13134	27 – 27.8	215
13135	52 – 54	390
13136	54 – 56	560
13182	126 – 126.5	1
13183	128 – 129.5	2
13184	148.5 – 150	1
13185	176 – 178	10
13186	178 – 180	2
13187	188 – 188.5	1
13188	217 – 219	1
13189	219 – 220	1
13190	223 – 225	2
13191	233 – 234	1

0 10 20 30 40 50 Ft.

DUKE MINERALS LTD.

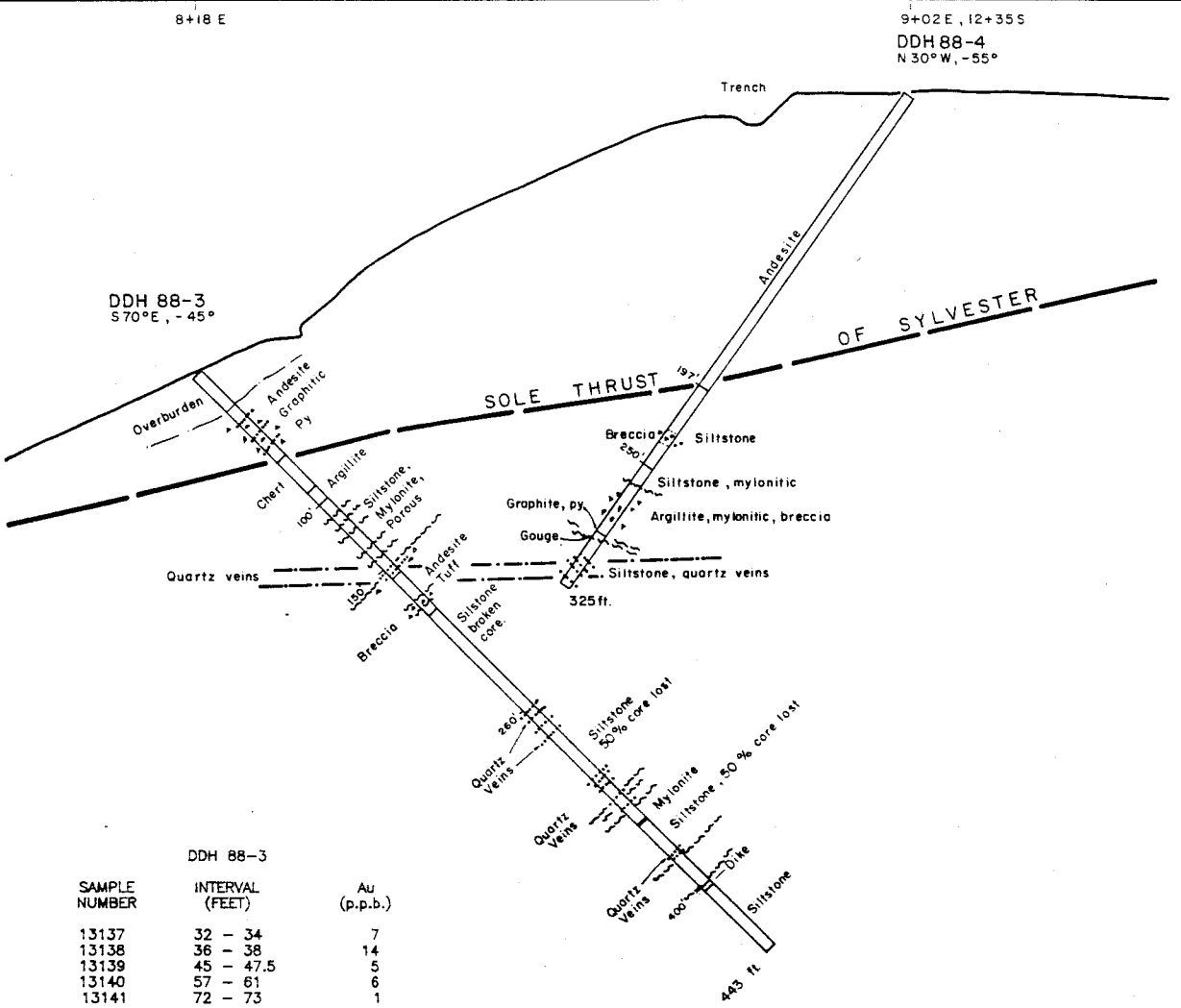
MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

CROSS SECTION
DDH 88 – 2

(FACING NORTHEAST)

M. DENSKY

DATE: MARCH, 1989 FIGURE: 20



DDH 88-3

SAMPLE NUMBER	INTERVAL (FEET)	Au (p.p.b.)
13137	32 – 34	7
13138	36 – 38	14
13139	45 – 47.5	5
13140	57 – 61	6
13141	72 – 73	1
13142	104.5 – 106.5	1
13143	106.5 – 108	4
13144	108.5 – 109	4
13145	330 – 331	18
13146	350 – 351	5
13147	351.5 – 354.5	1
13149	355.5 – 357	1
13150	365.5 – 366	
13156	366 – 368	
13157	368 – 370	
13158	388 – 390	
13159	390 – 392	
13160	392 – 394	
13161	394 – 396	

LOST SAMPLES

DDH 88-4

SAMPLE NUMBER	INTERVAL (FEET)	Au (p.p.b.)
13148	66.8 – 67	1
13162	77 – 78	
13163	94.5 – 95.5	
13164	119 – 121	
13165	127 – 128.5	
13166	132 – 134	
13167	140 – 141	
13168	141 – 142.5	
13169	151 – 152	1
13170	223 – 225	2
13171	231 – 233	2
13172	233 – 235	1
13173	235 – 237	1
13174	237 – 239	1
13175	239 – 241	2
13176	241 – 243	2
13177	243 – 245	2
13178	245 – 247	2
13179	247 – 249	8
13180	249 – 251	3
13181	264.5 – 266.5	6

LOST SAMPLES

0 50 100 200 Feet
0 10 20 30 40 50 Metres

DUKE MINERALS LTD.

MUSTANG CLAIM
LIARD MINING DIVISION, B.C.

VERTICAL CROSS SECTION
DDH 3 & 4
(FACING NE)

F. HOLCAPEK

DATE: MARCH, 1989 FIGURE: 21

DDH 88 - 3: (Figure 21) Location: 8+20E, 11+70S, Depth: 443 ft
Bearing: S70°E, Dip: -45°

Purpose: To test the northern part of geochemical anomaly 3 E and an associated electro-magnetic anomaly. Part of the core assays were lost making the assay data incomplete.

The drill hole intersected andesites - argillite, Sylvester Allochthon, from surface to 36 ft. At 36 ft to 52 ft a fault - breccia zone cutting graphitic siltstones, the Lower Thrust fault, was intersected. The balance of the hole was in clastic sediments, Earn Group, with wide fault sections, graphite, quartz-carbonate veinlets and thin pyrite bands. Chalcopyrite and sphalerite have been identified.

DDH 88 - 4: (Figure 21) Location: 9+00E, 12+30S, Depth: 325 ft
Bearing: N30°W, Dip: -55°

Purpose: To test the central part of geochemical anomaly 3 E and associated electro-magnetic anomaly. Part of the core assays were lost.

The drill hole was collared in andesites and intersected the Thrust Fault at 197 ft. The balance was clastic sediments as above.

9-00 ECONOMIC GEOLOGY:

9-10 SYLVESTER ALLOCHTHON:

GOLD QUARTZ CARBONATE VEINS:

Work completed on the Mustang claim group was not successful in locating economic auriferous quartz carbonate veins. Regional geological data suggests that the rockunits outcropping on the claim group are to close to the Lower Thrust giving a geological environment not conducive to Cassiar type gold deposits.

The alteration zone located along the Danny Fault and other areas consist of a greenschist facies mineral assemblage enriched in gold and arsenic in areas.

These zones are interpreted as conduits along which the mineralizing hydrothermal solution circulated, but the depositional condition ie. temperature, pressure, eH and pH were not favourable for gold deposits.

The sudden termination of the alteration zone at the thrust fault suggest that:

1. The hydrothermal alteration pre-dates the Lower Thrust ie. Gold mineralization originated at the depositional site of the andesite-argillite assemblage. The veins were emplaced into structurally favourable localities and changed serpentinite to listwanite. The Lower thrust moved the Sylvester Allochthon into its present position.

2. The hydrothermal alteration originated after the formation of the original thrust sheet and later movement displaced the roots. A late movement along the upper thrust is indicated at the Taurus Mine.

In either case the mineralization is displaced from its original place of origin.

The best area to prospect for Cassiar type gold-quartz-carbonate zones is to the east of the area investigated, towards the synclinal axis assuring that a maximum thickness of the favourable andesite-argillite assemblage has been preserved.

SYLVESTER ALLOCHTHON - MASSIVE SULPHIDE POTENTIAL:

At Lang Creek, just to the northwest of the Mustang Claims a stratabound massive copper-gold deposit is interbedded with argillites and andesites overlaying the Lower Thrust. The geological setting is similar to Besshi Type deposits. In several other locations within the Sylvester Allochthon occur massive sulphide pods.

The potential for Besshi Type massive sulphide deposits is indicated. On the Mustang claims a large area is underlain by the basal section of the Allochthon. This area is a prime target for exploration.

9-20 EARN GROUP:

The Earn Group clastic sediments are known for the wide spread occurence of exhalative bedded sulphides and barite deposits. The western part of the Mustang Claim Group is underlain by Earn Group clastic sediments.

Five drill core samples from DDH 88-3 and DDH 88 were submitted to Bob Lane, MSc canditate at UBC, for polished section study. The results are given below.

Sample #1 SLATELY MUDSTONE

Hand Sample: Diamond drill core
Textures: Sulphides are concentrated in whispy laminations parallel to the slatey fabric of the rock
Minerals: Pyrite, primary/syngenetic

POLISHED SECTION

Minerals: Pyrite 1%, yellowish white, anhedral
Comment: Pyrite was the only sulphide mineral observed. It displays a total lack of weathering and/or alteration. It occurs concentrated in bands that parallel the fabric ot the rock. The bands are at most 5 mm thick. The pyrite in this speciment is deemed to be syngenetic. Pyrite is also found to encapsulate carbonate grains suggesting minor sulphide remobilization.

Sample #2 MUDDY QUARTZ SANDSTONE

Hand Sample: Diamond drill core
Textures: Disseminated finely
Minerals: Pyrite

POLISHED SECTION

Minerals: Pyrite 1%, yellowish white, subhedral to euhedral cubic, also occupies <.1 mm fractures
Comment: Grain size ranges from <.05 mm to .9mm in diameter

Sample #3 PHYLLITIC SANDY MUDSTONE

Hand Sample: Diamond drill core
Textures: Pyrite occurs in whispy layers that parallel the overall fabric of the host rock
Structures: Quartz-carbonate veinlets host abundant sulphide but are a minor component of the rock
Minerals: Pyrite, sphalerite, chalcopyrite

POLISHED SECTION

Minerals: Pyrite - 1%, yellowish white, anhedral
Chalcopyrite - trace, yellow, anhedral
Sphalerite - trace, medium grey, anhedral
Mineral Association: Chalcopyrite is commonly intergrown with and rarely contained in pyrite.
Sphalerite is associated with pyrite and pyrite/ chalcopyrite intergrowths
Comment: Pyrite is both syngenetic and epigenetic, while chalcopyrite and sphalerite are epigenetic

Sample #4 SLATEY SANDY MUDSTONE

Hand Sample: Diamond drill core
Textures: Anhedral to subhedral pyrite, subhedral sphalerite
Minerals: Pyrite (1-2%), sphalerite (trace)

POLISHED SECTION

Minerals: Pyrite - 6%, yellowish white, anhedral, rarely euhedral
Chalcopyrite - trace, yellow, anhedral
Sphalerite - trace, medium grey, anhedral, red irredesence
Mineral Association: Chalcopyrite occurs intergrown with pyrite and as isolated anhedral grains
Sphalerite in equilibrium with pyrite
Comment: Again Pyrite is both a primary and epigenetic mineral, and was precipitated in equilibrium with sphalerite and chalcopyrite

The Mustang claim group has not been explored for syngenetic base metal deposits known to be associated with certain stratigraphic sections of the Earn Group.

9 - 30 SANDPILE - McDAME GROUP:

In the western part of the claim group the Earn Group is in fault contact with Atan Group carbonate rocks. These carbonates have potential for manto type base metal deposits. A zinc geochem anomaly and sphalerite mineralization as replacement and fracture filling was found within the carbonates. The showing has not been explored and warrants more detailed investigation.

March 25, 1989
Richmond B.C.

Fred Holcapek, P.Eng.
Consulting Geologist.

48 A

COST STATEMENT

Total Drilling (see invoice attached)	$39,098.00
Accomodation Services	
- 2 Drillers - room & board (14 days x 60.00)	1,680.00
- 2 Drillers - meals (14 days x 30.00)	840.00
- 1 Geologist - room & board (14 days x 60.00)	840.00
- 1 Consultant - room & board (10 days x 60.00)	600.00
- Guilford Brett - room & board (4 days x 60.00)	240.00
Sub Total	4,200.00
Rentals	
- 4 x 4 truck , 1 month @ $900.00/month	900.00
- Honda WB 1500 Waterpump, 1 month @ $300.00/month	300.00
- Honda ATC, 1 month @ $400.00/month	400.00
- Kawasaki 100 Trail bike, 1 month @ $200.00/month	200.00
Sub total	1,800.00
Other	
- Fuel, gas	400.00
- Mob Demob van to/from Cassiar, meals, etc.	500.00
- Report Prep. (i.e. drafting, writing)	5,000.00
- Management Fee	7,000.00
Sub total	12,900.00
DRILLING PROJECT TOTAL	$57,998.00

48 B

D.J. DRILLING COMPANY LTD.

2115 - 129th St.
WHITE ROCK, B.C. V4A 8H6
Phone 531-4134

INVOICE

September 6, 1988

Duke Minerals Ltd.
510 - 700 W. Pender Street
Vancouver, B.C., V6C 1G8

Re: Surface Drilling (Cassiar Job)
Augusut 18 - 31, 1988

DRILL HYDRA 38

Hole #DDH 88-1			
NW Casing	0' - 20' = 20' @ $30.00 -	$ 600.00	
NQ Core Drilling	20' - 229' = 209" @ $23.00 -	4,807.00	$ 5,507.00
Hole #DDH 88-2			
NW Casing	0' - 10' = 10' @ $39.00 -	$ 300.00	
NQ Core Drilling	10' - 250' = 240' @ $23.00 -	5,520.00	5,820.00
Hole #DDH 88-3			
NW Casing	0' - 20' = 20' @ $30.00 -	$ 600.00	
NQ Core Drilling	20' - 444' = 424' @ $23.00 -	9,752.00	10,352.00
Hole #DDH 88-4			
NW Casing	0' - 30' = 30' @ $30.00 -	$ 900.00	
NQ Core Drilling	30' - 325' = 295' @ $23.00 -	6,785.00	7,685.00
Consumables			
24 Bags of Drilling Mud @ $16.50 -		$ 396.00	
9 Pails of Liquid Mud @ $166.00 -		1,494.00	1,890.00
Cat Hours D6C #1 - 42 Hours @ $75.00 Per Hour (See attached invoice)			3,150.00
Core Boxes and Lids (See attached invoice)			
60 NQ Core Boxes @ $9.35 =		$ 561.00	
20 NQ Lids @ $3.15 =		63.00	624.00
Mobilization and Demobilization			
Mob. (Truck) 4 Hours @ $82.50 =		$ 330.00	
Demob. (Truck) 4 Hours @ $82.50 =		330.00	660.00

PAID
CHEQUE NO. 92
DATE SEP 29 1988

Labour Rate

Aug. 18 - 16 Man Hours		Aug. 24 - 12 Man Hours			
" 19 - 28 " "		" 28 - 16 " "			
" 21 - 4 " "		" 30 - 8 " "			
" 22 - 10 " "		" 31 - 36 " "			
		130 Man Hours @ $27.00			3,510.00
		TOTAL			$39,098.00

Ralph J. Braden, Manager Ralph J Braden

48B

RE: DUKE #1

DJ DRILLING CO LTD

~~JEDWAY ENTERPRISES LTD.~~

2115 - 129th Street
White Rock, B.C.
V4A 8K5

~~13135 - 20th Avenue~~
~~SURREY, B.C. V4A 1Z1~~
Phone 531-4134

TO DUKE MINERALS DATE Aug 18 to 31/88

18/88	4 Hr.	UNLOAD DRILL EQUIPMENT FROM DRILL TO SITE
19/88	8 Hr.	MAKE ROAD TO SITE + SITE - HAULED DRILL + ALL EQUIPMENT INTO SITE SET UP.
22/88	6 Hr.	SITE #2 AND MOVE & PAD FOR BACKHOE.
24/88	6 Hr.	SITE & MOVE # DDH 88-3.
26/88	3 Hr.	MOV
27/88	4 Hr.	SITE # DDH 88-4.
28/88	5 Hr.	MOVE # DDH 88-4.
31/88	6 Hr.	DEMOBILIZATION
	42 Total Hours	@ 75.00 PER HOUR = $3150.00

Thank You

Don

BIBLIOGRAPHY:

Beaton, Al: 1984. **The Erikson Mine Story** in Canadian Mining Journal. Nov. 1984, p. 41 - 46.

Boyle, R.W.: 1979. **The Geochemistry of Gold and Its Deposits.** GSC Bulletin 280.

Colvine, A.C. editor: 1983. **The Geology of Gold in Ontario.** Ontario Geol. Survey Miscell. Paper 110.

Coney, Peter J.: 1972. **Cordilleran Tectonics and North America Plate Motion** in American Journal of Science, Vol 272, p. 603-628.

Coney, Peter J., Jones, David L., Monger, James W.H.: 1980. **Cordilleran Suspect Terranes** in Nature Vol. 288, p. 329 - 333.

Coveney, Raymond M.: 1981. **Gold Quartz Veins and Auriferous Granite, Oriental Mine, Alleghany District, California** in Economic Geology Vol. 76, p.2176-2199.

Dawson, Kenneth M., Orchard, Michael J.: 1982. **Regional Metallogeny of the Northern Cordillera: Biostratigraphy, Correlation and Metallogenic Significance of Bedded Barite occurrences in Eastern Yukon and Western District of Mackenzie** in Current Research, Part C, GSC, Paper 82-1C, p.31-38.

Diakow, L.J.; Panteleyev, A.: 1981. **Cassiar Gold Deposits McDame Map Area (104P/4,5).** BC Dept. of Mines Geological Fieldwork, p. 55-62.

Dussell, Eric: 1986. **Listwanites and Their Relationship to Gold Mineralization at Erickson Mine, BC, Canada.** Master's Thesis Western Washington University.

Ferguson, Henry, G., Gannett, Roger, W.: 1932. **Gold Quartz Veins of the Alleghany District California,** USGS, Professional Paper 1972.

Gabrielse, H: 1954. **Map 1110A Geology McDame Cassiar District, BC, (104P)** To accompany GSC Memoir 319

Gabrielse, H., Doddsm C.J.: 1982. **Faulting and Plutonism in Northwestern Cry Lake and Adjacent Map Areas, BC;** in Current Research, Part A, GSC, Paper 82-1A p. 321-323,1982.

Gabrielse, H., Mansy, J.L.: 1978. **Structure Style in Northeast Cry Lake Map Area, North -Central BC;** in Current Research, Part A, GSC, Paper 78-1A,p.33-34.

Gordey, S.P., Abbott, J.G., Orchard, M.J.: 1982 **Devono-Mississippian (Earn Group) and Younger Strata in East-central Yukon;** in Current Research, Part B, GSC, Paper 82-1B, p.93-100, 1982.

Gordey, S.P., Gabrielse, H., Orchard, M.J.: 1982. **Stratigraphy and Structure of Sylvester Allochthon, Southwest McDame Map Area, Northern BC;** in Current Research, Part B, GSC, Paper 82-1B, p.101-106.

Gunning, M.H.: 1988. **Gold Distribution in the Taurus Mine Quartz Veins.** BC Dept. of Mines Geological Fieldwork 1988, p. B95 - B105.

Groves, W.D.: 1988. **Report on Mustang-Jackpine and Tang 1 & 2 Claims, Exploration Work 1987-1988.** For Duke Minerals Ltd.

Holcapek, F.: 1988,**Preliminary Report on the Jackpine Claims,** in house.

Julihn, C.E., Horton, F.W.: 1938. **Mines of the Southern Mother Lode Region, Part I Calaveras County,** USGS Bulletin 413.

Kistler, R.W., Dodge, F.C.W., Silberman, M.L.: 1983. **Isotopic Studies of Mariposite-Bearing Rocks From the South-central Mother Lode California;** in California Geology, September 1983, p. 201-203.

Knopf, Adolph: 1929. **The Mother Lode System of California.** USGS, Professional Paper 157.

Lane, Robert: 1988. **Thin Section Study for Duke Minerals Ltd.** Jackpine Property; in house report.

1988. **Polished Section Study for Duke Minerals Ltd.** Jackpine Property; in house report.

MacIntyre, D.G.: 1983. **A Comparison of the Geologic Setting of Stratiform Massive Sulphide Deposits of the Gataga District With the Midway and Windy-Craggy Deposits, Northern BC;** in BC Dept. Mines, Geol. Fieldwork 1982, p. 149-170.

1982. **Midway Occurrence** (1040/16W); in BC Dept. of Mines, Geological Fieldwork, Paper 1982-1, p. 162-166.

McClay, K.R., Insley, M.W., Way, N.A., Anderton, R.: 1987. **Stratigraphy and Tectonics of the Gataga Area Northeastern BC;** in BC Dept. Mines, Geological Fieldwork, 1986, Paper 1987-1.

Monger, J.W.H: 1977. **Upper Paleozoic Rocks of the Western Canadian Cordillera and Their Bearing on Cordilleran Evolution;** Can. J. Earth Sci.14, p.1832-1859.

Monger, J.W.H., Souther, J.G., Gabrielse, H.: 1972. **Evolution of the Canadian Cordillera: A Plate-Tectonic Model;** in America Journal of Science, Vol.272, Jummer, 1972, p.577-602.

Nelson, JoAnne, Bradford, John: 1987. **Geology of the Area Around the Midway Deposit Northern BC;** in BC Dept. Mines, Geol. Fieldwork, 1986, Paper 1987-1.

Nelson, JoAnne, Bradford, John: 1987. **Geology of the Area Around the Midway Deposit Northern BC**; in BC Dept. Mines, Geol. Fieldwork, 1986, Paper 1987-1.

Open File 610: 1978. Geology of Cry Lake (104I) Map Area

Open File 707: 1977. Geology of Dease Lake (104J) Map Area

Orchard, M.J., Irwin, S.: 1988. **Conodont Biostratigraphy, Midway Property, Northern BC**; in BC Dept. Mines, Geol. Fieldwork, 1987, Paper 1988-1.

Panteleyev, A.: 1980. **Cassiar Map Area (104/P)**; in BC Dept. Mines, Geol. Fieldwork, Paper 1980-1, p. 80-87, 1979.

Cassiar Map Area (104/P); in BC Dept. Mines, Geol. Fieldwork, Paper 1979-1, p. 51-60.

Panteleyev, A., Diakow, L.J.: 1982. **Cassiar Gold Deposits McDame Map Area (104P/4, 5)**; in BC Dept. of Mines, Geol. Fieldwork, Paper 1982-1, p. 156-161.

Sketchley, D.A., Sinclair, A.J.: 1987. **Multi-Element Lithogeochemistry of Alteration Associated with Gold-Quartz Veins of the Erickson Mine, Cassiar District**; in BC Dept. Mines, Geol. Fieldwork, 1986, Paper 1987-1.

Souther, J.G.: 1969. **Cordilleran Volcanic Study, 1969; Telegraph Creek, BC**; in BC Dept. Mines, Annual Report 1969, p. 50-53.

CERTIFICATION

I, Ferdinand Holcapek of 319 - 3851 Francis Road Richmond, British Columbia certify that:

1. I am a graduate of the University of British Columbia with a B.Sc. degree in Geology 1969.

2. I am a member of the Association of Professional Engineers of British Columbia, registration # 8962.

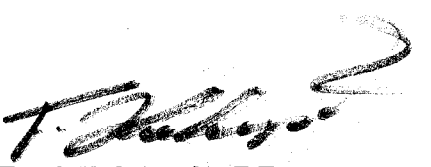
3. I have practiced my profession, since graduation, in Canada, United States of America, Australia, Africa, Mexico and Central America.

4. I have visited the Mustang Claim Goup in July 25 to August 3, and September 11 to 13, 1988. I was engaged in exploration in the Dease Lake - Cassiar area during 1961 to 1975 with Cassiar Asbestos Co., ALRAE Engineering Ltd, Agilis Engineering Ltd, and Holcapek Engineering Ltd in 1983.

5. This report is based on results obtained during the 1987 - 88 exploration program, on geological mapping conducted by the writer, past experience within the district, and literature research.

6. I hereby give my consent to the inclusion of this report in a statement of material facts and prospectus of Duke Minerals Ltd.

7. No portion or summary of this report may be used without the written approval of Pace Geoex Services Ltd or the writer.



March 25, 1989
Richmond, B.C.

Fred Holcapek, P.Eng.
Consulting Geologist

APPENDIX

THIN SECTIONS AND POLISHED SECTION STUDY

DDH 88 - 3 AND DDH 88 - 4

MUSTANG - JACKPINE CLAIM GROUP

CASSIAR MAP AREA, NTS MAP SHEET 104 P

LIARD MINING DIVISION, BRITISH COLUMBIA

BY BOB LANE MSc CANDITATE, U.B.C.

March 25, 1989
Richmond, B.C.

Fred Holcapek P.Eng
Consultant Geologist

Sample 1: SLATEY MUDSTONE

Handsample: Diamond Drill Core.

Colour: Ligth to Dark Grey banded;
Texture: Thinly bedded to laminated, lensoid, fissile, slatey
Structure: Primary (?) layering or foliation
Minerals: Graphite, Pyrite, Quartz, Micas, Clay

Thin Section:

Matrix: 98% of total
55% clay, very fine grained
15-20% quartz, very fine grained, pressure shadows and overgrowths
15-20% carbonate, very fine grained, pervasive
10% graphite, thin wispy partings to laminations
2% muscovite, fine grained, mostly altered to clay minerals
1% sulphides, concentrated in whispy laminations
Grains/Crystals/Fragments: 2% of total.
1% Quartz: Augen-like grains or composite grains that range up to 2.1 mm in length; common sutured grain boundary; weak undulose extinction
1% Calcite: Rhomb or lense shaped grains that reach a maximum size of 3.1mm
Tr. Muscovite: Rare rectangular grains ranging up to 2 mm in length; mostly altered to clay minerals
Alteration: Muscovite to clay
Textures: Sulphides are concentrated in whispy laminations parallel to the slatey fabric of the rock
Minerals: Pyrite, primary/syngenetic

POLISHED SECTION

Minerals: Pyrite 1%, yellowish white, anhedral

Comment: Pyrite was the only sulphide mineral observed. It displays a total lack of weathering and/or alteration. It occurs concentrated in bands that parallel the fabric ot the rock. The bands are at most 5 mm thick. The pyrite inthis speciment is deemed to be syngenetic. Pyrite is also found to encapsulate carbonate grains suggesting minor sulphide remobilization.

Sample 2: MUDDY QUARTZ SANDSTONE

Handsample: Diamond Drill Core.

Colour: Medium grey
Texture: Vuggy (solution) cavities, brecciated fine-grained layered
Structure: Minor fractures, 50 deg to core axis
Minerals: Quartz, clay, carbonate, pyrite, carbonaceous material
Thin Section:

Matrix: 100%
70-75% Quartz: <0.1 mm-0.8 mm in size, display quartz overgrowths, recrystallization textures and weak undulose extinction
10-15% Carbonate: Very fine grained, pervasive
10-15% Clay: Pervasive
3-5% Carbonaceous Material:
Tr Sulphides: Subhedral to euhedral pyrite cubes up to .2 mm on edge
Tr Muscovite: Very fine grained to fine grained, anhedral to subhedral

Alteration: Muscovite to clay

Textures: Disseminated finely
Minerals: Pyrite

POLISHED SECTION

Minerals: Pyrite 1%, yellowish white, subhedral to euhedral cubic, also occupies <0.1mm fractures
Comment: Grain size ranges from <0.05 mm to 0.9mm in diameter

Sample 3: PHYLLITIC SANDY MUDSTONE

Handsample: Diamond Drill Core.
Colour: Medium grey
Texture: Layered, aligned lensoidal 'clasts', minor crosscutting carbonate veinlets
Structure: Fractures,cross cutting carbonate fractures
Minerals: Quartz, graphite, carbonate, pyrite, clay

Thin Section:

Matrix: 100%
45-50% Clay: Very fine grained, also forms lense or disc-shaped features
30-35% Quartz: Modal size is .1 mm, moderately well rounded grains
10-15% Graphite: Pervasive, forms distinct laminae
3-5% Calcite: Fine to medium grained matrix component
3% Muscovite: Fine to medium grained
1% Chlorite: Very fine grained laths
1% Sulphide: .05-2 mm void and fracture fillings

Grains/Xtals/Frags: Abundant QZ overgrowths - grow parallel to foliation. Fine grained Muscovite laths also are aligned parallel to the fabric. Quartz grains with overgrowths commonly contain Muscovite laths. Sutured contacts between Quartz grains are common.
Alteration: Secondary Muscovite

Hand Sample: Diamond drill core
Textures: Pyrite occurs in whispy layers that parallel the overall fabric of the host rock.
Structures: Quartz-carbonate veinlets host abundant sulphide but are a minor component of the rock.
Minerals: Pyrite, sphalerite, chalcopyrite.

POLISHED SECTION
Minerals: Pyrite - 1%, yellowish white, anhedral Chalcopyrite - trace, yellow, anhedral Sphalerite - trace, medium grey, anhedral

Mineral Association: Chalcopyrite is commonly intergrown with and rarely contained in pyrite. Sphalerite is associated with pyrite and pyrite/chalcopyrite intergrowths.

Comment: Pyrite is both syngenetic and epigenetic, while chalcopyrite and sphalerite are epigenetic.

Sample 4: SLATEY SANDY MUDSTONE

Handsample: Diamond Drill Core.

Colour: Grey
Texture: Finely laminated
Structure: Cross cutting Quartz - Carbonate - Sulphide veins
Minerals: Quartz, carbonate, graphite, carbonaceous material, chlorite (?), pyrite, sphalerite

Thin Section:

Matrix: 100%

45-50% Clay: Very fine grained
15% Quartz: Primary and recrystallized grains
20% Carbonaceous material:
5-10% Muscovite: Abundant fine to medium grained laths
10% Chlorite: Abundant fine grained laths
1-2% Sulphides:

Alteration: Secondary Muscovite

Hand Sample:

Textures: Anhedral to subhedral pyrite, subhedral sphalerite
Minerals: Pyrite (1-2%), sphalerite (trace)

POLISHED SECTION

Minerals: Pyrite - 6%, yellowish white, anhedral, rarely euhedral
Chalcopyrite - trace, yellow, anhedral
Sphalerite - trace, medium grey, anhedral, red irredesence

Mineral Association: Chalcopyrite occurs intergrown with pyrite and as isolated anhedral grains Sphalerite in equilibrium with pyrite.

Comment: Again Pyrite is both a primary and epigenetic mineral, and was precipitated in equilibrium with sphalerite and chalcopyrite.

Sample 5: FINE CALCAREOUS SANDSTONE OR FINE CALCARENITE

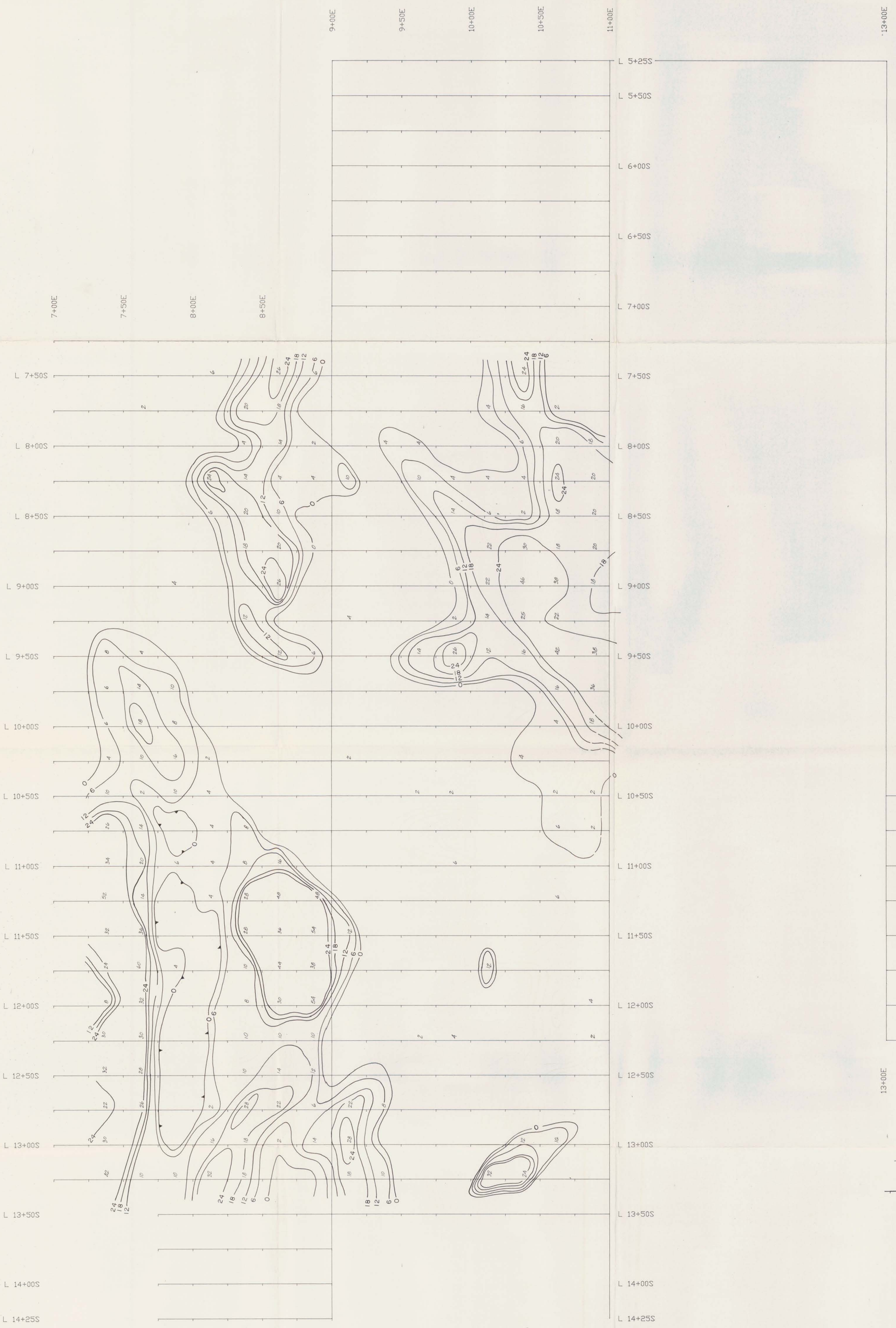
Handsample: Diamond Drill Core.

Colour:	Light grey
Texture:	Massive
Structure:	Graphitic partings, Quartz - Carbonate Veinlets
Minerals:	Quartz, calcite, carbonaceous material - graphite

Thin Section:

Matrix: 100%

45-50% Calcite:	Including grains and the abundant carbonate cement
30-35% Quartz:	Strong undulose extinction, medium sand size particles
15-20% Clay:	Recrystallized cement
3-5% Graphite:	Finely disseminated elongate parallel to foliation
1% Muscovite:	Fine grained
Tr Sulphides:	Very fine grained and sparsely disseminated, pyrite



LEGEND:

N — FRASER FILTER VALUE

ONLY VALUES 0 ARE PLOTTED

INSTRUMENT: SABRE MODEL 27 VLF-EM

STATION READINGS: SEATTLE

CONTOUR INTERVAL 0, 6, 12, 18, 24

DUKE MINERALS LIMITED

MUSTANG CLAIM

LIARD MINING DIVISION B.C.

VLF-EM SURVEY

FRASER FILTER CONTOUR MAP

0 25 50 75 100

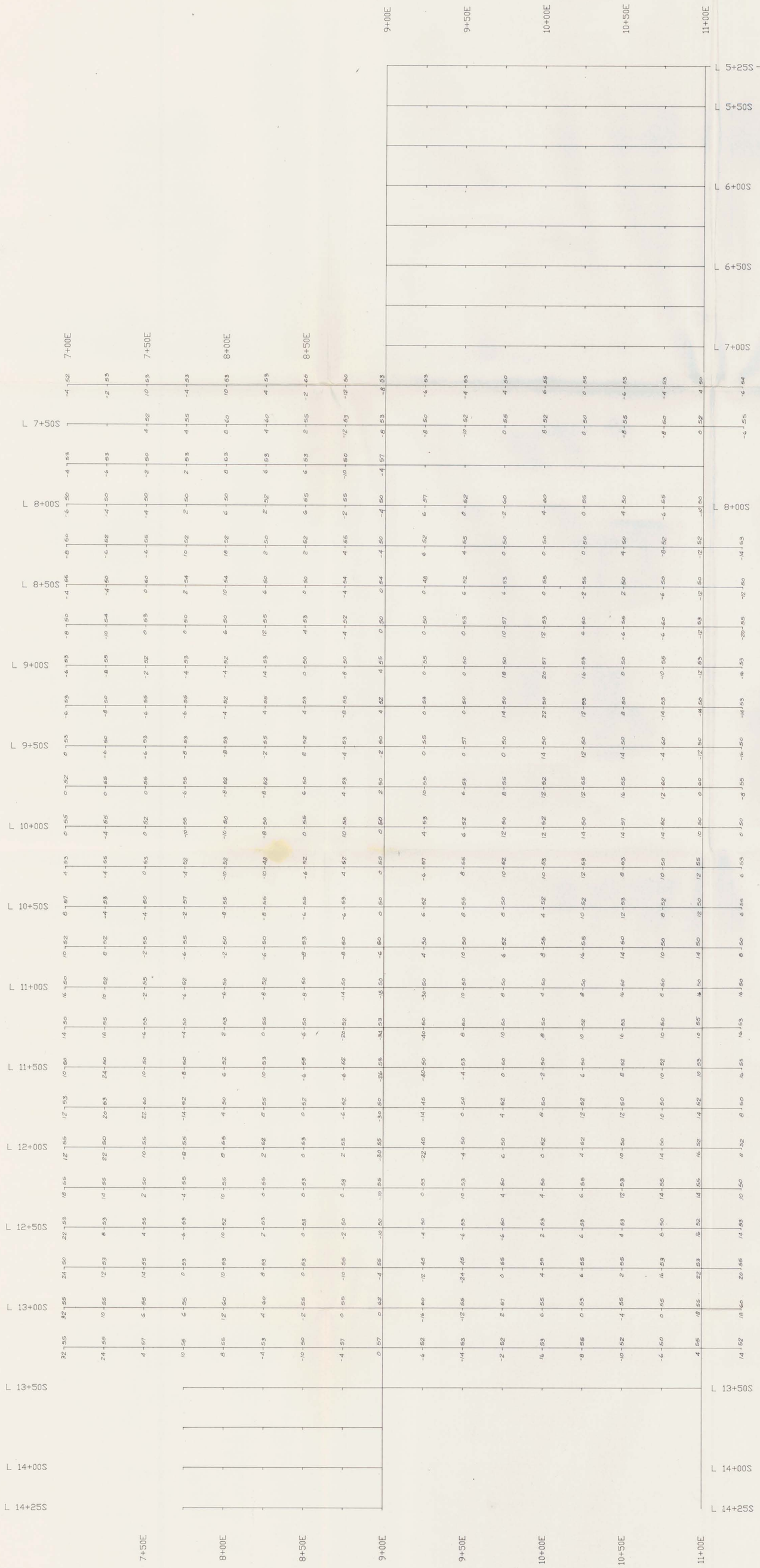
SCALE 1:1250

DATE: FEBRUARY, 1989

BY:

FIGURE No. 2

Prepared by: RWR MINERAL GRAPHICS LTD.



LEGEND:

8 ← FIELD STRENGTH (%)

8 ← DIP ANGLE (°)

INSTRUMENT: SABRE MODEL 27 VLF-EM

STATION READINGS: SEATTLE

DUKE MINERALS LIMITED

MUSTANG CLAIM

LIARD MINING DIVISION B.C.

VLF-EM SURVEY

(QUADRATURE & INPHASE READINGS)

0 25 50 75 100

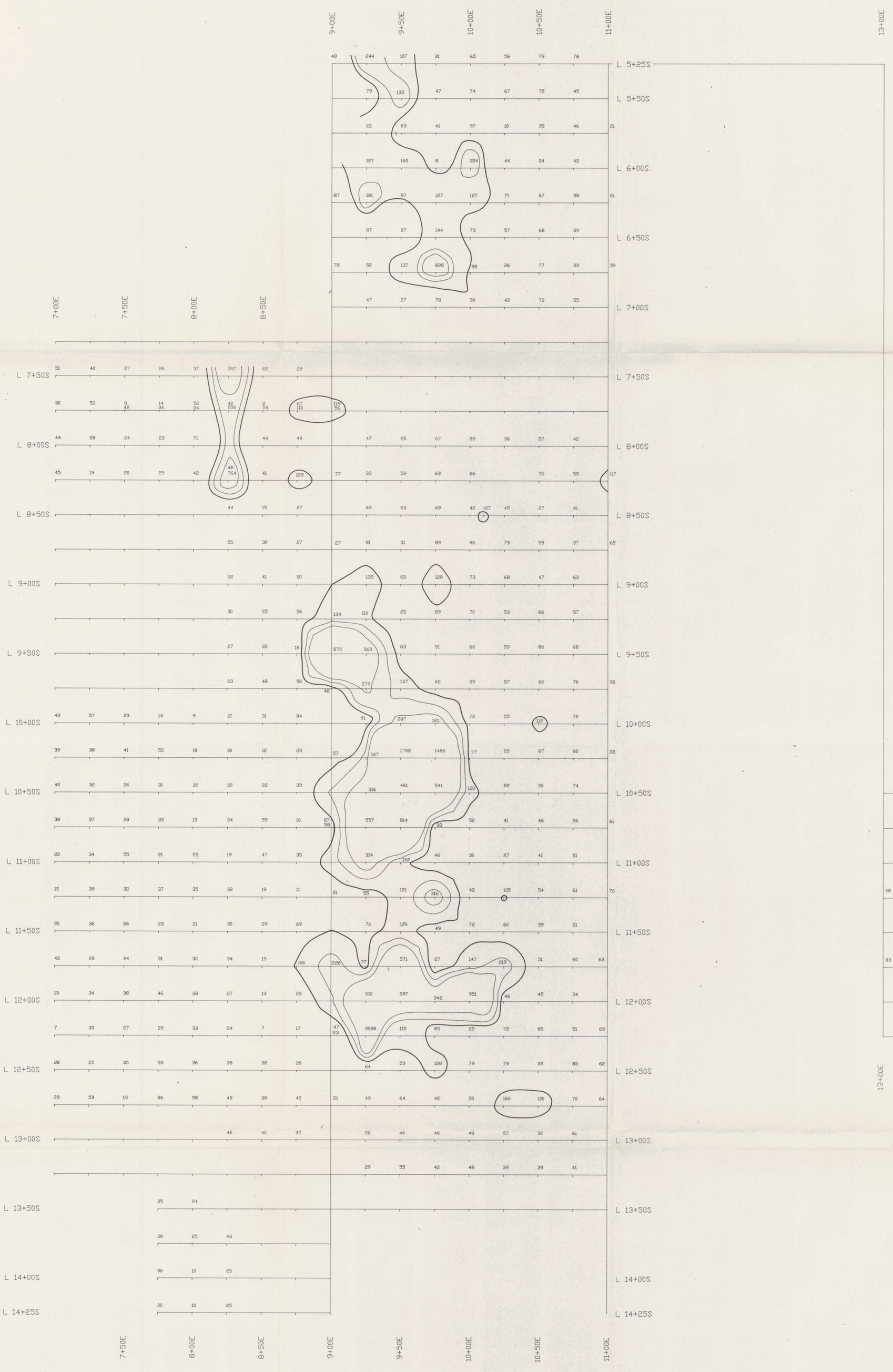
SCALE 1:1250

DATE: FEBRUARY, 1989

BY:

FIGURE No. IV

Prepared by: RWR MINERAL GRAPHICS LTD.



GEOLOGICAL BRANCH
ASSESSMENT REPORT

18,787

LEGEND:

1486 As VALUE IN p.p.m.

CONTOUR INTERVALS: 100, 175, 250 p.p.m.

DUKE MINERALS LIMITED

MUSTANG CLAIM
LIARD MINING DIVISION B.C.

GEOCHEMISTRY SURVEY
As RESULTS

0 25 50 75 100
SCALE 1:1250

DATE: MARCH, 1989
BY:
FIGURE No. 4

Prepared by: RWR MINERAL GRAPHICS LTD.

2600 Au VALUE IN p.p.b.

CONTOUR LEVELS: 65, 135, 185 p.p.b.

DUKE MINERALS LIMITED

MUSTANG CLAIM
LIARD MINING DIVISION B.C.

GEOCHEMISTRY SURVEY
Au RESULTS

0 25 50 75 100
SCALE 1:1250

DATE: MARCH, 1989
BY:

FIGURE No. II

Prepared by: RWR MINERAL GRAPHICS LTD.

ANDESITE RIDGE

GREY - GREEN ARGILLITE

CUSAC ROAD

TILL & SWAMP

CRASHED PLANE

BARREN QUARTZ VEIN, CHERTY ARGILLITE

DIABASE / DIORITE INTRUSIVE

EAST BRANCH CAMP CREEK

ARGILLITES DARK

CALCITE VEIN

ARGILLITE BLACK SHEARED

GREENSTONE

DDH 88-1 -45°

DDH 88-2 -45°

DDH 88-3 -45°

DDH 88-4 -55°

SLOPE

DIP

FAULT

CHLORITIC ZONE

PYRITIC

Tr. 1

Tr. 2

Tr. 3

Tr. 4

Tr. 5

Tr. 6

Tr. 7

Tr. 8

Tr. 9

ROAD

Dike

ANDESITE CHLORITIC MASSIVE

ANDESITE FLOAT

SILTSTONE

VERY RUSTY ANDESITE, PYRITIC, BROKEN

ARGILLITE BLACK

ARGILLITE CHERTY TUFFS

ANDESITE BROKEN

ANDESITE MASSIVE

MINOR CARBONATES ALONG SHEAR, GRAPHITIC, ANDESITE THROUGHLY FRACTURED

ALTERED ANDESITE c.gr py diss.

ARGILLITE BLUFF (DARK TO GREEN)

L 5+25S
L 5+50S
L 6+00S
L 6+50S
L 7+00S
L 7+50S
L 8+00S
L 8+50S
L 9+00S
L 9+50S
L 10+00S
L 10+50S
L 11+00S
L 11+50S
L 12+00S
L 12+50S
L 13+00S
L 13+50S
L 14+00S

7+00E
7+50E
8+00E
8+50E
9+00E
9+50E
10+00E
10+50E
11+00E
13+00E
15+00E

LEGEND:

LAMPROPHYRE DYKE
- QUARTZ VEINS, CARBONATE, TREMOLITE, GRAPHITE
- CARBONATE – SILICEOUS TREMOLITE ALTERATION, ANOMALOUS GOLD

SILVESTER ALLOCHTHON: LOWER THRUST PLATE
- DIORITE – Co VOLCANIC (?)
- ANDESITE – GREENSTONE
- ARGILLITES, BLACK TO GREY

EARNS GROUP
- BLACK SILTSTONE, SILTY SANDSTONE, ARGILLITES

STRIKE, DIP
FAULT, STRIKE, DIP
DIRECTION OF MOVEMENT
THRUST PLANE – QUARTZ VEIN
DIAMOND DRILL HOLE
TRENCHES
CREEKS
SWAMPS
ROADS
LINE OF OUTCROP ALONG SLOPE

DUKE MINERALS LIMITED

MUSTANG CLAIM

LIARD MINING DIVISION B.C.

GEOLOGY MAP

0 25 50 75 100
SCALE 1:1250

DATE: FEBRUARY, 1989
BY: F. HOLCAPEK
FIGURE No. 1

Prepared by: RWR MINERAL GRAPHICS LTD.