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SUMMARY REPORT
PORPHYRY CREEK PROJECT
OMINECA MINING DIVISION, B. C.
FOR
TECK EXPLORATIONS LIMITED

Peter G. Folk, P.Eng.

Vancouver, B. C.
December, 1979

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MAPS AND FIGURES

INTRODUCTION

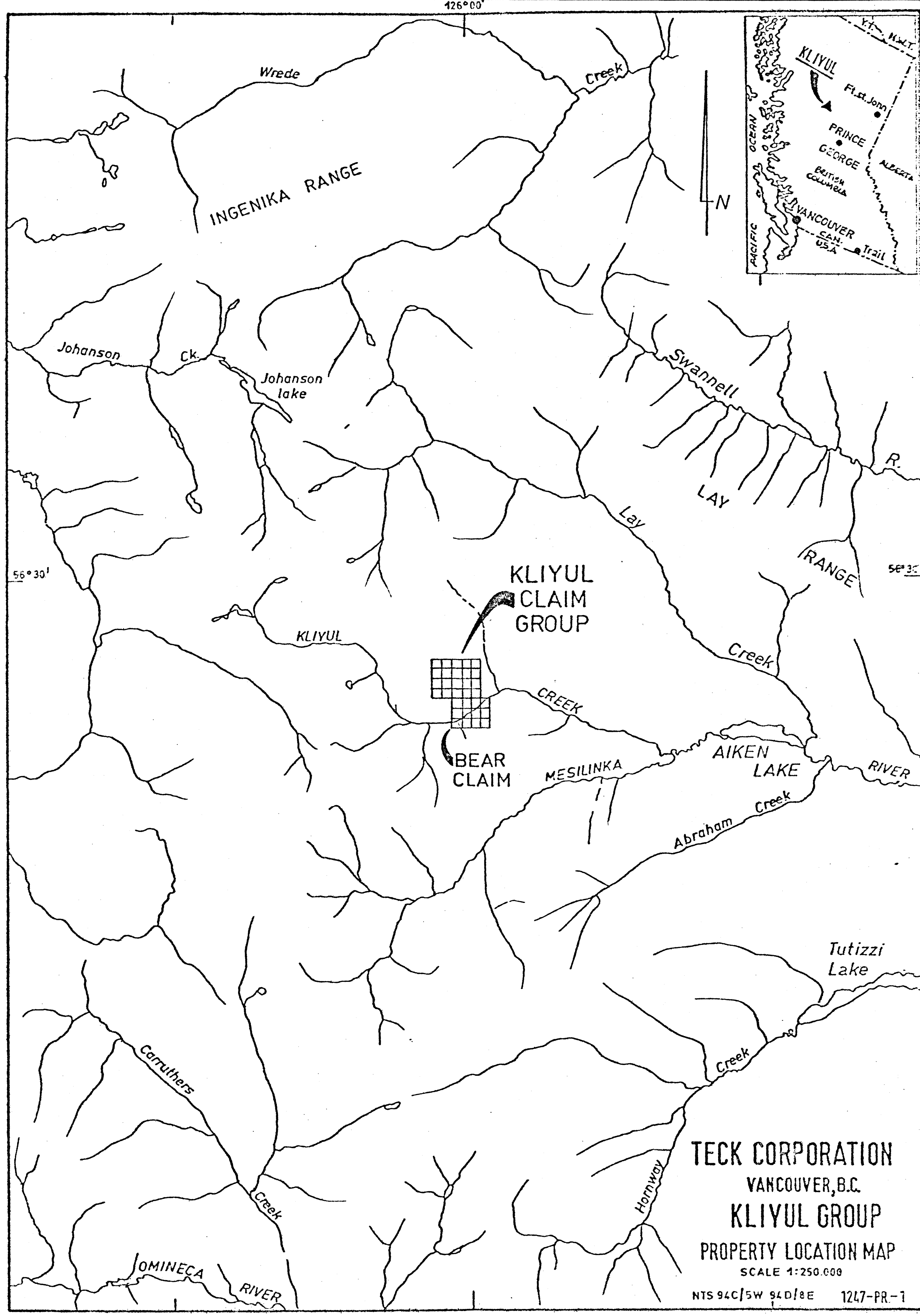
In December 1978 an employee of Teck Explorations Limited staked the KLIYUL claim of 20 units over an old Rio Tinto porphyry-molybdenum prospect found in 1963. Subsequently a soil grid was run over the area of interest as outlined by Rio Tinto and and another 12 units were staked. A drill program consisting of 2 holes aggregating 497.7 metres was completed in the latter part of October, 1979. The work, which is summarized in this report, was carried out by Teck Explorations Limited under an agreement with Chevron Minerals.

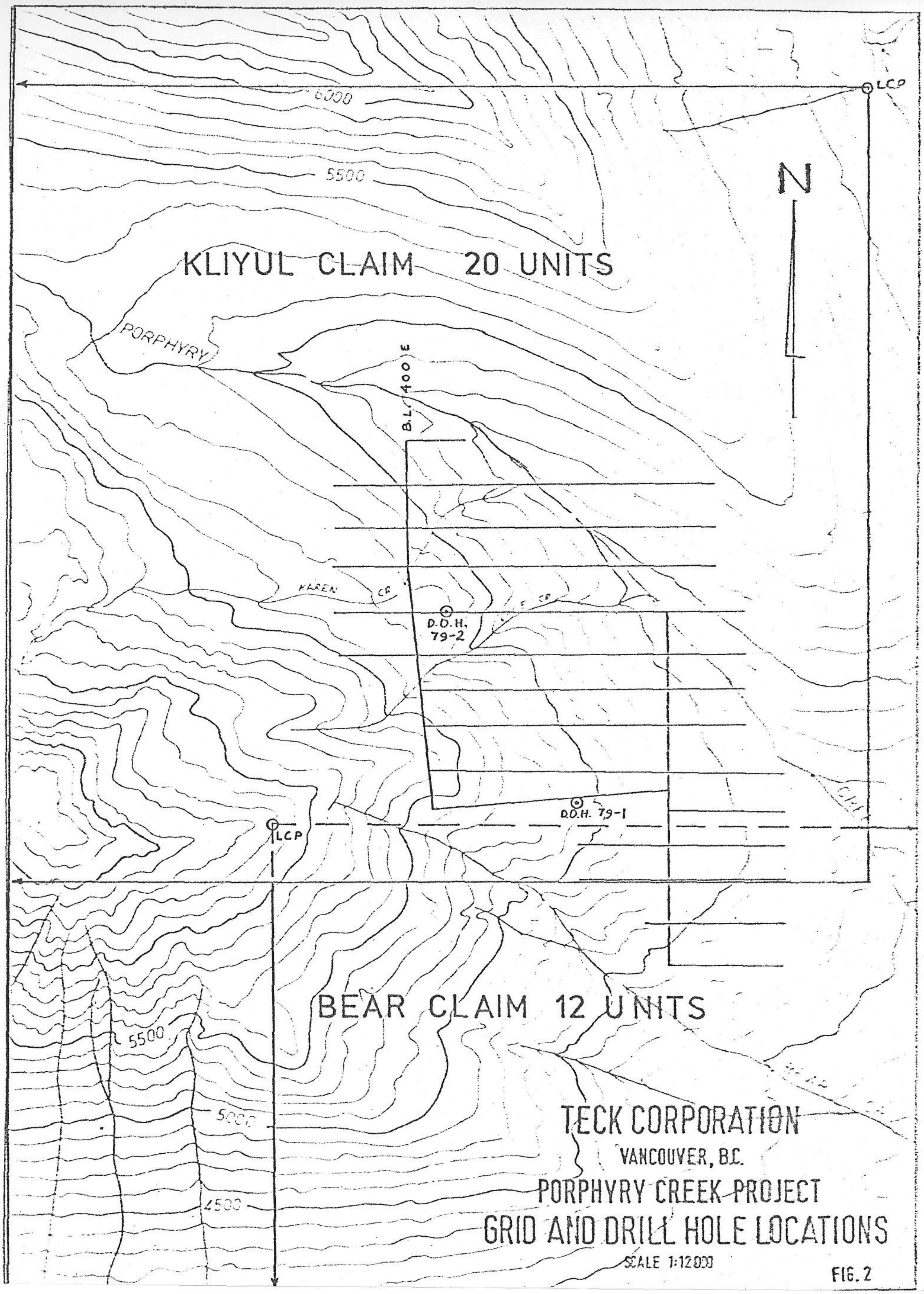
LOCATION AND ACCESS (Figure 1)

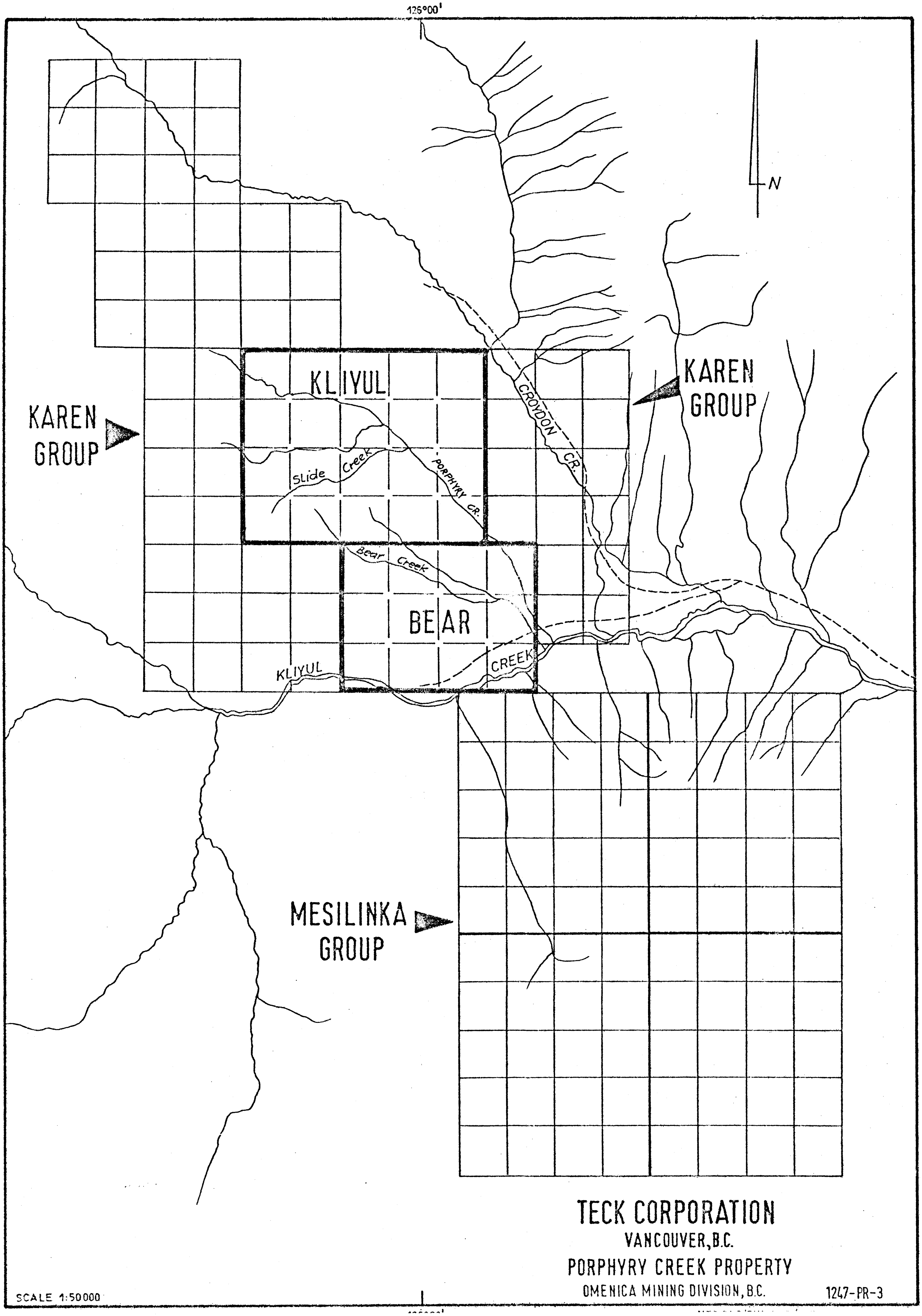
The Porphyry Creek property is located on the northeast flank of the Omineca Mountains about 340 km. northwest of Prince George. Access is by the Omineca mining road to Aiken Lake about 400 km (by road) from Fort St. James and then by helicopter about 15 km. up Kliyul Creek. Alternately, wheeled aircraft can land at Johanson Lake which is about 20 km by helicopter from the property.

CLAIMS (Figure 2 & 3)

The original Kliyul claim of 20 units which was recorded December 19, 1978 was supplemented by the Bear claim of 12 units on August 24, 1979 and by several other contiguous claims in October, 1979. In addition, an 80 unit group was staked south of Kliyul Creek and a 20 unit group was located 6 km. southwest of the Porphyry Creek property.


126°00'
Wrede
Creek
INGENIKA RANGE
N
KLIYUL
Ft.St.John
PRINCE GEORGE
ALBERTA
BRITISH COLUMBIA
OCEAN
PACIFIC
VANCOUVER
CAN.
U.S.A.
Trail
Y.T.
N.W.T.
Johanson
Ck.
Johanson lake
Swannell
R.
LAY
Lay
RANGE
56°30'
KLIYUL CLAIM GROUP
KLIYUL
CREEK
Creek
BEAR CLAIM
MESILINKA
AIKEN LAKE
RIVER
Abraham Creek
Tutizzi Lake
Creek
Carruthers
Creek
Hornway
OMINECA
RIVER
TECK CORPORATION
VANCOUVER, B.C.
KLIYUL GROUP
PROPERTY LOCATION MAP
SCALE 1:250.000
NTS 94C/5W 94D/8E
1247-PR-1


LCP
6000
5500
N
KLIYUL CLAIM 20 UNITS
PORPHYRY
B.L. 400 E
KAREN CR
D.D.H. 79-2
D.D.H. 79-1
LCP
BEAR CLAIM 12 UNITS
5500
5000
4500
TECK CORPORATION
VANCOUVER, B.C.
PORPHYRY CREEK PROJECT
GRID AND DRILL HOLE LOCATIONS
SCALE 1:12000
FIG. 2


125°00'
N
KLIYUL
KAREN
GROUP
KAREN
GROUP
CROYDON CR.
Slide Creek
PORPHYRY CR.
Bear Creek
BEAR
KLIYUL
CREEK
MESILINKA
GROUP
TECK CORPORATION
VANCOUVER, B.C.
PORPHYRY CREEK PROPERTY
OMENICA MINING DIVISION, B.C.
SCALE 1:50000
1247-PR-3

PHYSIOGRAPHY, CLIMATE

The area is typefied by mountainous, well-glaciated, fairly rugged terrain. Cirques are well-developed and some contain small alpine glaciers or rock glaciers. Glacial drift covers most valley floors. The soil grid straddles the treeline on a steep east-facing slope which is trisected by two steep canyons. There is very little flat land available for camps, drill sites, etc.

Climate is typical of the northern interior with long winters and short cold summers. At the treeline where the camp was located freezing termperatures were encountered in mid-September and towards mid-October below-freezing temperatures were the rule. By November access via the Omineca road is tentative. Annual precipitation is in the 100 to 125 cm. range falling mostly as snow.

HISTORY

The molybdenum potential of the area was recognized when Rio Tinto held the area in 1963-64. Two small diameter daimond drill holes were drilled close to the present DDH #79-2. The claims eventually lapsed. Other activity during the past was concentrated on some peripheral showings of Au, Cu, and Fe.

Gold bearing quartz veins were discovered by C.M. & S. on Croydon Creek in 1936. They operated a detailed exploration program until a forest fire wiped out the camp in 1938. Subsequent prospectors of the property were Cominco, 1944-1945; Bralorne, Noranda, Canadian Exploration, 1958; Riocanex, 1963.

The "Shell" copper-gold showings were discovered by Springer Sturgeon Gold Mines Ltd. in 1946. They have subsequently been trenched and drilled. Both of the above showings are now held by Teck Explorations Ltd. on claims which are contiguous to the original KLIYUL claim.

GEOLOGY

J. M. Newell in his exploration report, 1964, gives a very detailed and accurate description of the geology of the property and environs. His descriptions and geological map were used as a basis for the core logging and detailed mapping. Only a short summary of his thorough descriptions will be given here.

Rock Units

1. Acid Intrusives

   (a) Porphyritic Biotite Quartz Monzonite:
   A stock of this material forms the center of interest. It is medium to coarse-grained, white to pink, pyritized throughout, and has a granodiorite to quartz monzonite composition. Biotite is the only mafic mineral present, the rest of the major constituents being quartz, plagioclase and k-spar. Accessory minerals are zircon, apatite, and Ti-oxide. Complex plagioclase zonation suggested by hand lens examination was substantiated in thin section. The zonation indicates a complex magmatic history.

   (b) Acid Dyke Rocks:
   Narrow dykes of altered dacite, aplite, feldspar and quartz feldspar porphyry intrude into and are associated with the quartz monzonite stock.

The fine-grained altered dacite and aplites are associated with MoS_2, whereas the grade of mineralization in the porphyritic dykes is relatively weak. Acid dyke rocks are found more on the edges of the stock rather than in the central portions.

2. Intruded Rocks

(a) Altered Takla Volcanics:

The volcanics in the vicinity have been recrystallized and are no longer readily identifiable as volcanics. These fine-grained, chloritic, epidotized, dark green, somewhat dioritic looking members of the metamorphic series are classed as altered volcanics.

(b) Diorite:

Hornblende diorites are medium to coarse grained crystalline rocks which exhibit both gradational and intrusive relationships with the altered volcanics. They are "cleaner", coarser-grained and lighter colored than the volcanics and contain less than 60% hornblende.

(c) Hornblendite:

The hornblendites are medium to coarse-grained and consist of greater than 60% hornblende-chlorite. They are generally quite magnetic and in the Porphyry Creek area seem to be spatially related to the quartz monzonite stock.

(d) Appinites:

Appinites are crystalline hornblende rich rocks and contain 10-40% plagioclase. The classification is a hybrid type falling somewhere between diorite and hornblendite.

All of the intruded rocks have undergone regional thermal metamorphism resulting in recrystallization and the formation of epidote and chlorite. Relationships between all of the intruded rocks are complex and are thought to result more from the regional metamorphism than from simple igneous intrusion. The location of the hornblendites and appinites in the proximity to the quartz monzonite suggests that they represent a thermal aureole associated with intrusion by the stock. Magnetite content in the basic hornblende-rich material is fairly high causing a positive magnetic ring surrounding the stock. This suggests that magnetics could be useful as a prospecting tool.

Alteration

As well as having a thermal aureole which has caused the formation of medium to coarse grained hornblende rich rocks, the stock is associated with a suite of alteration minerals only some of which fall into a useful pattern.

(a) Pyrite:

A pyrite halo effect approximately 800 m. by 1000 m. or more is associated with the quartz monzonite stock and related acid dyke rocks. Shear zones and quartz veins away from the stock also contain pyrite.
On the west side of the faulted contact of the stock the amount of pyrite is greatly diminished. The disparity between the amounts of pyrite on both

sides of the fault indicates that the western faulted contact of the stock has suffered considerable movement.

(b) Quartz, K-spar, Bleaching:

Detailed mapping in the vicinity of DDH 79-1 has shown that a weak discontinuous aureole of quartz stringers extends a short distance outwards from some parts of the stock, Figure #4. As well, thin quartz selvages and k-spar stringers are found in varying degrees throughout the explored part of the stock. At least two and possibly three ages of quartz veinlets are present. Oversized quartz "eyes" and pervasive pink coloration are also evidence of quartz enrichment and potassioum metasomatism throughout the quartz monzonite. The pink coloration is partly k-spar alteration and partly a fine hematitic alteration of plagioclase which seems to be associated with the amount of shearing in the quartz monzonite. On a practical basis the amount of pink k-spar present does not significantly relate to the grade of molybdenite. The best quartz veining is in the vicinity of hole 79-1 where the bleached volcanics contain a criss-crossing network of mineralized quartz and k-spar stringers. Field relations suggest that the bleached material represents an alteration along shear zones since it seems to cross through various rock types. Thin sections, on the other hand, indicate an igneous (porphyritic dacite) origin. Probably both alteration and igneous activity have been in effect. Secondary biotite and sericite can be found in these areas.

(c) Biotite, Chlorite, Muscovite:

The stock contains an average of about 10% biotite which has been more or less altered to chlorite and sometimes muscovite. Some hand samples contain all degrees of Chlorite-muscovite alteration of the biotites and the same is apparent in thin section. The more k-spar rich regions contain mostly biotites which have been altered completely to chlorite with some muscovite.

Although some secondary biotite was recognized in thin sections from adjacent rocks, the biotite crystals within the stock are primary and no mappable aureole of secondary biotite has been identified.

(d) Sericite:

All plagioclase feldspars in the stock have been more or less affected by sericitic alteration. In hand samples the plagioclase takes on a light green color. This is most easily visible in the core in k-spar rich zones but can be detected elsewhere. Some quartz-pyrite-molybdenite veins on surface are associated with fine muscovite. This relationship was not seen in the drill core, but fine sericitic fractures were noted more or less at random throughout.

(e) Kaolin:

Minor kaolinization of the plagioclase feldspars was noted in the drill core but its extent was limited.

(f) Calcite, Gypsum:

Thin unmineralized calcite and clear gypsum selvages are dispersed throughout the core. They were the latest veinlets to form and were deposited on chloritic fracture planes.

(g) Surface Weathering:

Surface outcrops are highly oxidized and liberally stained with limonite and ferromolybdate. The depth of oxidation depends on fracturing but probably averages about 30 metres.

Detailed Mapping

Detailed maps of the areas around the drill holes were produced by the author and are attached (Figures 4 & 5). Drill hole sections in relation to the detailed maps are also reproduced (Figures 6 & 7). The mapping conformed generally to Newell's work with refinements in the alteration scheme and some disagreements in structural interpretation. Present mapping suggests that the stock may not be so extensive as originally thought and that displacements due to faulting may be significant.

Mineralization

Molybdenite is present with scheelite and traces of chalcopyrite and galena. It is concentrated in the stock and immediately adjacent intruded rocks. Two or possibly three sets of mineralized quartz selvages, a later set of "dry" molybdenite fractures and some disseminated material combine to produce a grade of .03% MoS_2 or better in the explored areas of the stock. Oxidized material to a depth of about 29 m. in hole 79-2 was leached and contained less than .01% MoS_2. In hole 79-1 the molybdenite values did not appreciably change at the bottom of the oxidized zone.

The best molybdenite in hole 79-1 was associated with hornfelsic material and an altered dacite dyke (?) from 108 to 120 metres which assayed over .07% MoS_2. Otherwise mineralization is related to fracturing and quartz veining. Assays for the entire 261 metres of hole #79-1 averaged .034% MoS_2 while the 203.5 metres of fresh material in hole #79-2 averaged .031% MoS_2. Previous small diameter drilling by Rio Tinto in 1964 indicated similar grades.

Very fine scheelite was found as a fine dusting on fractures in some of the hornblendites and appinites containing the quartz monzonite in Karen Creek and in similar rocks in the Rio Tinto drill core. No scheelite was located in any of the quartz monzonite. Rock geochemistry indicates that the best grade of scheelite to be expected is in the order of .05% WO_3.

A 10 cm wide quartz vein carrying argentiferous galena was located in the vicinity of the legal corner post for the BEAR claim. Also a few specks of fine galena were found in quartz monzonite float at 450E, 1500N. The lead-silver occurrences are of only academic interest. No significant gold or silver assays were returned from a dozen samples of drill core.

Chalcopyrite occurs as traces in the area of interest but is associated with significant gold values in the nearby veins of the "Shell" group.

Structure

Newell describes three sets of faulting on a regional basis.

(1) Steep NW trending shear faults;
(2) Steep northerly trending faults;
(3) Steep SW shears which are complementary to group (1).

He indicates that the northwest trending faults are an important structural control for mineralization especially at the intersection of the northerly trending tension faults. Detailed mapping bears out these ideas and indicates significant displacements on the NW trending shear faults.

In particular the fault bordering the quartz monzonite stock on the southwest contains a wide shear zone and may have had a horizontal displacement of perhaps 500 m. in the left-handed sense. One of the north trending faults mapped in Davie Creek may have a horizontal component of displacement in the 90 m. range, right-hand sense. In drill hole 79-1 the north trending fault-fracture zones are associated with a slight increase in molybdenite grade.

GEOCHEMISTRY

The purpose of the geochemical survey was to substantiate and define anomalous geochemistry located by Rio Tinto in 1963.

Four hundred and thirty-one soil samples were taken on 25 m. spacings on lines 100 m. apart. Samples were analyzed for Mo, Cu, Pb, Ag, W. Also, a series of 38 rock geochemical samples were taken at 25 m. intervals along the two creek canyons cutting the mineralized zone.

Samples were taken at an average depth of 20 cm in the "B" or "C" soil horizon. Depth and type of soil were noted and the material was placed in kraft paper bags. Bondar-Clegg and Company Ltd., analyzed the samples by standard atomic absorption methods.

The results are plotted on the attached maps (Figures 8-11). Two well defined Mo anomalies with irregular coincidental and peripheral zones of Cu and W enrichment became apparent. The southern molybdenum zone is about 250 m. square while the northern one is roughly 400 m. by 250 m. There is an area of weak Mo values between the two anomalies. Observations on the ground indicate:

1. Glacial till effectively terminates high results. Figure 12 is a compilation from the samplers' notebooks and shows areas containing significant depths of glacial till. The extent to which molybdenum mineralization extends below the till is unknown; the two anomalous zones could, in fact, be continuous.

2. A fault seen on the ground terminates the larger anomaly to the west and may, in fact, have separated the original zone into two distinct parts. A horizontal displacement of about 500 m. would have had to occur for this to be the case. If this is in fact true the area between the two zones may not be mineralized.

3. A good correspondence between the quartz monzonite stock and molybdenum in soils and rocks was observed.

4. Peripheral Cu and W enrichment was seen to occur in the intruded rocks.

DIAMOND DRILLING

Two widely spaced inclined drill holes were designed to test the central portions of the two molybdenum anomalies described above and also to confirm the results of the Rio Tinto drilling in 1964.

Between September 12 and October 24, 1979 497.7 m. of HQ and NQ diamond drilling in two holes was completed by a Connors Drilling crew under the supervision of Teck Explorations Limited employees. Since the property, which is about 340 km northwest of Prince George, is not accessible by road, the drill, crew, camp and supplies were all flown 15 km by helicopter to the site on the treeline.

The helicopter assisted program turned out to be very costly. Mechanical problems with the drill were aggravated by delays resulting from the remoteness of the location, generally poor flying weather, and tenuous communications. Mechanical difficulties caused many otherwise unnecessary flights to be chartered.

Both holes were drilled using mud in the more fractured ground and both were reduced from HQ to NQ for practical reasons. Core recovery was generally above 85% but some zones of intense fracturing were problematic and recovery dwindled. The reduction in size did not reduce the core recovery. All core was split and one-half was sent to Bondar-Clegg and Company for assay, the other half is stored on site.

Drill Hole Summary

	Location	Elevation	Azimuth	Angle	Depth	Reduced at
DDH 79-1	880N,790E	1533 m.	310^{o}	-51^{o}	261.2m.	163 m.
DDH 79-2	1400N,475E	1585 m.	East	-60^{o}	236.5m.	131.1 m.

Drill Results

The drill logs with assays are included in the Appendix. Hole #1 was collared in Takla Volcanics which have been altered to hornblendite. Small sections of altered volcanics, aplites and quartz feldspar porphyry were intersected but most of the hole was in quartz monzonite more or less affected by k-spar alteration. The approximate limit of oxidation was at 45 m. depth in hole #1. The molybdenite grade was not significantly increased below the oxidized zone. The average grade for the hole is .034% MoS_2.

Hole No. 2 was in quartz monzonite for its entire length. Below the limit of oxidation at about 33 m. depth molybdenite grades were improved from less than .01% MoS_2 to more than .01% MoS_2. Below the oxidation level the average grade is .031% MoS_2.

In both holes molybdenite is contained in thin quartz selvages and also on later quartz-free fractures.

SUMMARY

1. Geochemical and drill results obtained by Rio Tinto in 1963-64 were substantiated and the existence of a tungsten halo was shown.

2. Alteration haloes have been defined for the areas surrounding the quartz monzonite stock, but the internal alteration of the stock does not follow a discernable pattern.

3. A magnetic thermal aureole of hornblende rich rocks is associated with the stock.

4. The two best targets as outlined by geochemistry have been tested. The remaining areas are drift covered and have no well-defined geochemical expression.

5. The western part of the stock has been truncated by a NW trending post-mineral fault which may have displaced part of the stock and attendant mineralization through a horizontal distance up to 500 metres.

6. Because of the remote location, lack of road access, mechanical problems and poor weather the drill costs were excessive.

7. While the drill program was in progress several claims were located in the general area to include a number of old prospects.

EXPANDED PROGRAM

During October several claims aggregating 143 units were staked contiguous to the original KLIYUL and BEAR claims. also the "A" claim of 20 units was located 6 km southwest over an old molybdenum prospect.

The expanded claim group takes in the previously trenched and drilled copper-gold veins of the old "Shell" group, the auriferous quartz veins on Croydon Creek, and a large gossan south of Kliyul Creek. None of these showings have been examined in detail by the author.

Mesilinka Claims (80 units)

Newell in his 1964 summary report briefly describes the area across Kliyul Creek south from the Porphyry Creek property. A very large, prominent gossan yielded some anomalous geochemistry which was not readily explained. The present author did find small occurrences of molybdenite and chalcopyrite during a brief examination of a small part of the property, but mineralization was not sufficient to yield such widespread anomalous geochemistry. Some intense bleaching with sericite and a large pyritized zone in the Takla Volcanics are the major features of the area. The alteration is related to the edge of a granodiorite batholith and a diorite plug. Since the area is so large, geochemistry is the obvious tool for locating the best areas within the zone. Rock geochemistry is suitable because of the abundance of outcrop and talus slopes.

Shell Group

The "Shell" claims were staked in 1946 by Springer Sturgeon Gold Mines to cover a number of gold, silver, copper occurrences. El Paso did further work in 1970 resulting in a drill program in 1971(?). The area has now been restaked by Teck Explorations with claims which are contiguous with the Porphyry Creek group. It was not examined by the author.

According to Noel in his 1971 assessment report, two zones of interest were outlined:

1. A 250-foot zone with 1.43% Cu over 10.7 feet.
2. A 115-ft. section averaging 9.24% Cu over 4 feet.

Noel didn't report the Au results but previous samples by Springer Sturgeon were in the .25-.35 oz./ton range. Gatenby in 1963 reported .70 oz./ton Au, 8% Cu over widths of 1.5 to 4 feet. Details of the technical work are not available at this time but the "Shell" showings are more or less on strike with important structures in the Porphyry Creek molybdenum zone and may warrant further investigation.

Croydon Adits

Some auriferous quartz veins found by C.M. & S in 1936 have been explored by several different companies and are now held by Teck Corporation. The area is to the east of Porphyry Creek and has been drilled, mapped, etc. The showings were not examined but their possibilities have been pretty well exhausted by previous operators and are probably of minor interest. In his summary in 1963 Gatenby reports "Underground and surface work by Cominco on the gold quartz veins in Croydon Creek showed them to be lensey and irregular over a strike length of about 300 feet with average widths of around 2 feet and grade of about 0.3 oz. gold and 3% copper".

Magnetite Skarn (Soup Claims)

A magnetite skarn containing some copper and gold is located just off the Teck claims to the west. Part of the showings are held by E. A. White until August 1980. All technical data on the showings is not available at this time but K. C. McTaggart in 1965 reported that magnetite rich skarn beds from 10 to 100 feet thick contain 27,000 tons per vertical foot.

Two selected grab samples of the material assayed:

.080 oz./ton Au	1.07% Cu
.020 oz./ton Au	0.24% Cu

The skarn showings have limited economic interest unless more gold is found over significant widths.

"A" Claim (20 units)

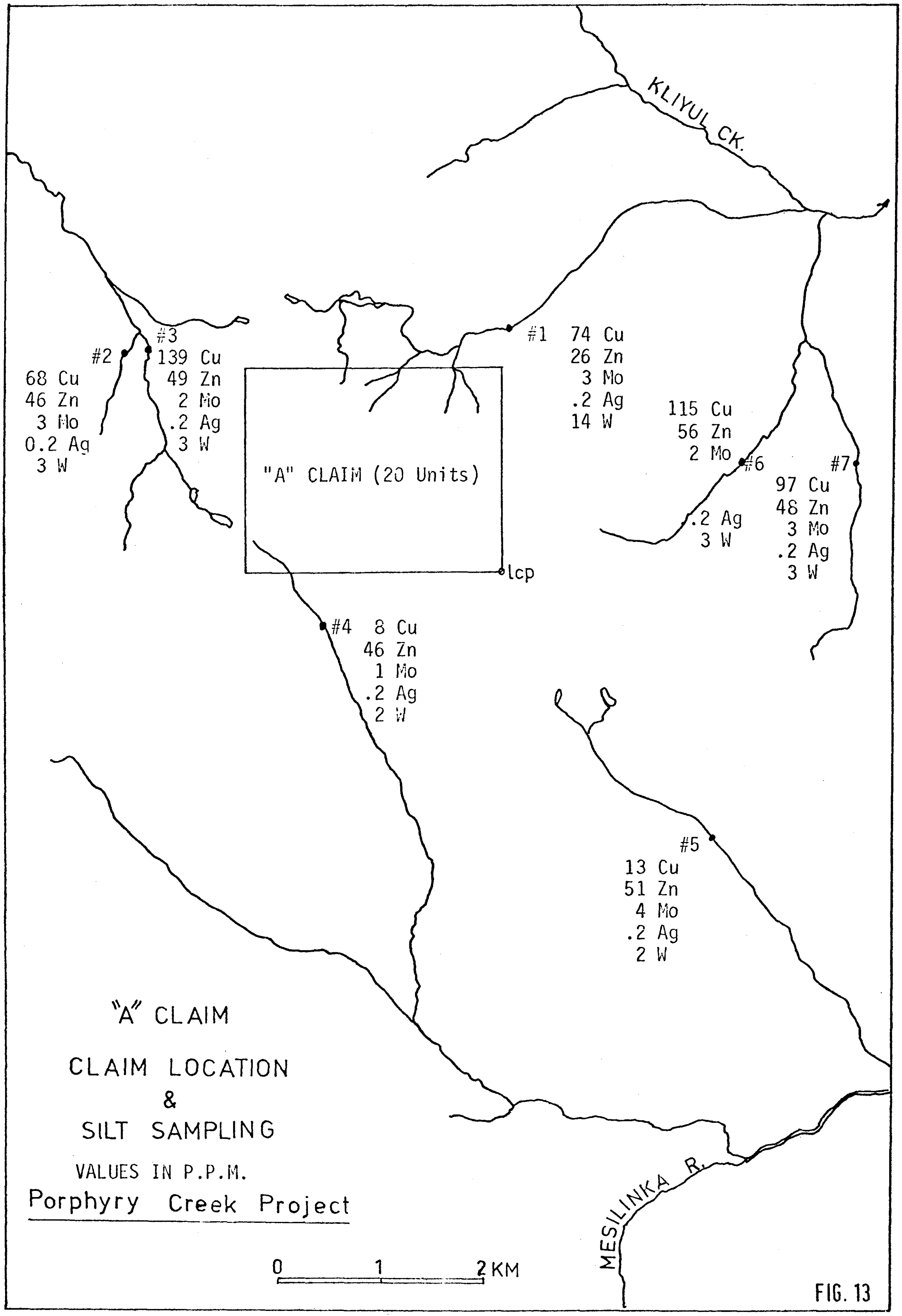
The "A" claim of 20 units (Figure 13) was staked over an old molybdenum showing described by D. L. Cooke in 1972 (Ringo Claims). He reported molybdenite in quartz pegmatite and felsite associated with a small ultrabasic intrusion. The area was not examined but some silt samples in the surrounding region yielded a maximum of only 4 ppm Mo. Assays of mineralized felsite were reported to have reached 1.51% Mo. An isolated silt assay of 14 ppm W directly below the claims indicates that tungsten, which has not been previously identified, may be present.

CONCLUSIONS AND RECOMMENDATIONS

1. Porphyry Creek Zone

   The most obvious targets on the Porphyry Creek zone have been drilled with only tolerable results. Substantial tonnages of .03% MoS_2 or slightly better can be expected in the quartz monzonite stock but unfortunately this is at least a factor of 3, too low to be economical at this time. On the other hand molybdenite was encountered along the entire length of both holes and a large portion of the property underlying the glacial till remains essentially unexplored. Principally the problem is that the extent of the quartz monzonite to the east of Davie Creek is unknown.

   Three methods are available to determine the extent of the quartz monzonite and hence the potential volume of mineralization.



"A" CLAIM

CLAIM LOCATION
&
SILT SAMPLING

VALUES IN P.P.M.

Porphyry Creek Project

FIG. 13

1. Trenching or road building,
2. Drilling,
3. Magnetic survey.

A magnetic survey done by Rio Tinto, although useful, was not very detailed and did not extend to the southeast along what is assumed to be the strike of the interesting zone. A magnetic survey the length and breadth of the Porphyry Creek valley from Karen Creek to Kliyul Creek would be useful as an indication of potential quartz monzonite terrain below the glacial drift.

The 15 or so kilometers of road work from Aiken Lake to Porphyry Creek plus another 5 km of road building and site preparation on the property would not encounter serious physical obstacles, virtually all of the work being over poorly forested glacial till. Road access to drill sites and camp would certainly be logistically worthwhile in support of any future drill programs. The main problem with roadwork is the acquisition of official permission for such a project.

Helicopter assisted drilling without road access has been shown to be inordinately expensive for the results gained. Also, without a bulldozer there are very few locations which are suitable for drilling sites. In the absence of any well-defined, specific, well-located drill targets, a helicopter assisted drill program is not recommended.

The recommendations then are for a magnetic survey followed by road work for access, stripping and drill site preparation, then drilling. A logical area to concentrate some effort is between drill holes 79-1 and 79-2 to see if the stock and attendant mineralization are continuous. Otherwise a hole near the bottom of Davie Creek to go through the contact and test attitude of the stock would be worthwhile.

2. Expanded Program

The claims staked during the program should have a more or less detailed evaluation.

(a) The gossan to the south of Kliyul Creek requires at least cursory geological and rock geochemical evaluation. A crew of three in a portable camp would take between 10 and 15 days to sample and explore the pyritic zone between Kliyul Creek and the Mesilinka River.

(b) The "Shell" gold-copper showings, Croydon Creek area, magnetite-gold skarn to the west and the molybdenum showings on the "A" claim should be examined to see if they have any value. Gaps in the data on file should be filled.

(c) Since the quartz monzonite stock is genetically related to a thermal aureole of pyritized coarse hornblende rich material and a tungsten halo, showings and zones of interest should be examined for evidence of similar effects. For example drill core on the "Shell" and Croydon Creek occurrences should be lamped and also the ultrabasic material on the "A" claim to the southwest. Any magnetic data should be examined for evidence of an annular magnetic high which might indicate a buried stock. A magnetometer survey over the Porphyry Creek zone, if flown, could be extended to the north and south to cover both the"Shell" area and the gossan which extends to the Mesilinka River

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Vancouver, B. C.
December, 1979

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L. B. Gatenby	Geological and Geochemical Report on Croydon Option, October, 1973.
D. L. Cooke	Geological and Geochemical Report on the Ringo Claim Group, September, 1972
K. C. McTaggart	Geology of the Soup Mineral Claims, August, 1965.
G. A. Noel	Geological--Geochemical Report on the Croy Mineral Claims, February, 1971.

APPENDIX I

DIAMOND DRILL LOGS

DDH 79-1, DDH 79-2

APPENDIX II

PETROGRAPHIC DESCRIPTIONS

Sample POR.CR.#1-103a   Porphyritic Granodiorite

phenocrysts	
plagioclase	10-15%
K-feldspar	2- 3
quartz	2- 3
biotite(chlorite)	2
groundmass	
quartz	25-30
plagioclase	20-25
K-feldspar	20-25
pyrite	1
muscovite	1
calcite	0.5
chlorite	minor
apatite	minor
Ti-oxide	trace
allanite?	trace

veins
1) quartz-muscovite-pyrite-(calcite)
2) pyrite-quartz
3) quartz-(calcite-pyrite)
4) pyrite
5) calcite

Plagioclase forms anhedral to subhedral phenocrysts up to 2 mm across. Some show coarse concentric zones with variable alteration as follows: core moderately to sericite, outer zone moderately to kaolinite?, rim slightly to sericite. Other grains are variably altered slightly to sericite and slightly to moderately to kaolinite.

K-feldspar forms anhedral phenocrysts up to 1 mm across and one subhedral phenocryst 1.5 mm in size. The latter is intergrown along its border with fine grained quartz of the groundmass.

Quartz forms scattered patches up to 3 mm across which may be phenocrysts or secondary segregations. Myrmekite forms one patch along the border of a plagioclase grain; quartz blebs are from 0.03 to 0.1 mm in size.

Biotite-chlorite forms a few subhedral phenocrysts up to 2 mm long. They are completely altered to chlorite with abundant needles of Ti-oxide along cleavage planes.

The groundmass has a very irregular texture, with patches and scattered grains averaging 0.2-0.5 mm across surrounded by more abundant finer grained (0.05-0.2 mm) patches. Quartz and feldspar grains are anhedral and slightly interlocking. Plagioclase is slightly to moderately altered to sericite, and possibly to kaolinite.

Pyrite forms scattered patches up to 1 mm across of anhedral grains. Muscovite forms laths up to 0.2 mm long, commonly associated with calcite and/or pyrite. Calcite forms very irregular patches averaging 0.05 mm in size. Chlorite forms ragged laths up to 0.5 mm in size, probably after biotite. Apatite forms subhedral to euhedral grains from 0.05 to 0.1 mm in size. Ti-oxide forms patches up to 0.4 mm across of very fine grains, commonly associated with minor calcite. Allanite?,as in Sample F and others, forms one anhedral grain 0.15 mm long.

The rock is cut by several types of veins. An early discontinuous vein up to 1 mm wide consists of medium grained quartz with scattered pyrite and muscovite and minor calcite. Pyrite is in part brecciated and healed by quartz. Pyrite-quartz veins probably are of the same age; in these pyrite forms angular fragments in an irregular groundmass of quartz. A very fine grained breccia vein has a groundmass of quartz-feldspar? with scattered patches of calcite up to 0.05 mm across and abundant rock fragments averaging 0.1-0.15 mm in size. A few irregular veinlets of very fine grained pyrite are present, and wispy, discontinuous calcite veinlets are common.

Sample 57-58 (Biotite)-Plagioclase Porphyritic Granodiorite

phenocrysts	
plagioclase	20-25%
biotite	5- 7
quartz	2- 3
K-feldspar	minor
groundmass	
quartz	25-30
plagioclase	20-25
K-feldspar	12-15
biotite	3- 5
muscovite	2
chlorite	1- 1½
apatite	0.5
opaque	minor
epidote	trace
zircon	trace

veins: quartz with minor K-feldspar, slightly more abundant sericite in halo.

Plagioclase forms subhedral to anhedral phenocrysts from 0.5 to 1.5 mm in size. Many are zoned, with an inner euhedral to subhedral crystal surrounded by an anhedral to subhedral rim. Both the core and the rim are zoned from more-calcic cores to more-sodic rims. The overgrowth has a higher An content than the outer pert of the core, producing a reversed zoning. Alteration is slight to moderate to dusty to very fine grained sericite and kaolinite, with alteration much more intense in Ca-rich parts of the phenocrysts.

Biotite forms scattered subhedral laths up to 1.5 mm across. They are fresh to completely altered to chlorite with minor Ti-oxide. Biotite is pleochroic from pale to medium brown, while chlorite is pleochroic from pale to light green.

Quartz forms a few rounded phenocrysts up to 1.5 mm across.

K-feldspar forms one anhedral phenocryst? 0.7 mm across; it contains minor perthitic plagioclase.

Plagioclase in the groundmass forms equant subhedral to anhedral grains from 0.15 to 0.5 mm in size; they generally are more altered in their cores than in their rims. Quartz forms equant anhedral grains averaging 0.05-0.25 mm in size. Some rounded grains averaging 0.1-0.15 mm in size are enclosed in poikilitic K-feldspar grains up to 0.8 mm across. These probably represent the final crystallization products of the magma. Other K-feldspar grains average 0.1-0.4 mm in grain size.

Biotite and chlorite form laths and patches with grain size 0.05-0.15 mm in size; chlorite is probably an alteration of biotite, and generally contains minor Ti-oxide. Muscovite forms scattered laths from 0.1-0.2 mm long, and a few patches of grains up to 0.4 mm across.

Apatite forms euhedral to subhedral grains from 0.05 to 0.2 mm in size, with a few elongate prismatic grains up to 0.5 mm long. Opaque forms one grain 0.5 mm across associated with muscovite along the quartz vein, and scattered anhedral grains 0.05-0.1 mm in size. Epidote forms irregular grains up to 0.05 mm in size with muscovite. Zircon forms one subhedral prismatic grain 0.1 mm long.

The rock is cut by a medium to coarse quartz vein with scattered grains and patches of grains of K-feldspar up to 0.5 mm across, and minor muscovite. Sericite and muscovite occur in a diffuse alteration halo up to 1 mm thick, where they are slightly more abundant than away from the vein.

Sample 21-22 Metadiorite - Meta Quartz Diorite

The rock has a metamorphic texture with abundant poikilitic grains, fine grained mosaic patches, and grains with numerous inclusions. The rock is cut by several sets of veins and veinlets.

plagioclase	35-40%
hornblende	35-40
biotite	10-12
quartz	10-12
epidote	5
sphene	1
opaque	0.5

veins:
1) quartz-plagioclase-opaque (pyrite-pyrrhotite)
2) quartz-(opaque), minor actinolite
3) opaque (not in section - see hand sample)

Plagioclase forms anhedral grains averaging 0.7-1.2 mm in size. They contain very abundant inclusions of hornblende from 0.05-0.1 mm long, and opaque from 0.01-0.02 mm across. Locally, plagioclase is slightly altered to sericite and several patches are strongly altered to very fine grained epidote.

Hornblende forms generally irregular, in part poikilitic grains up to 1.5 mm in size, averaging 0.5 mm. Pleochroism is from pale yellowish green to light bluish green. A few coarse grains are slightly zoned, with irregular cores with paler color. Poikilitic grains contain scattered to abundant inclusions of quartz averaging 0.02-0.03 mm in size.

Biotite forms clusters of grains averaging 0.15-0.3 mm in size. Patches are up to 1.2 mm across, and in part are intergrown with hornblende.

Quartz forms interstitial grains and patches with grains averaging 0.02-0.05 mm across.

Epidote forms irregular patches with opaque, and lesser with mafic minerals. A few replacement patches of very fine grained epidote occur in plagioclase.

Sphene forms anhedral patches of grains from 0.02 to 0.3 mm in size, commonly associated with hornblende.

Opaque forms scattered grains from 0.02 to 0.3 mm in size.

The rock is cut? by numerous patches of very fine grained mosaic quartz-plagioclase. Most of these are vein-like in shape, but are intergrown with the rock along their borders such that no vein contacts can be detected. Some of these vein-like zones contain coarser grained patches of opaque-epidote-hornblende.

Large veins consist of medium grained quartz (0.15-0.5 mm) with slightly interlocking grain borders. One contains abundant patches of hematite up to 0.3 mm across, probably after pyrite or pyrrhotite. The other contains minor opaque and a few actinolite needles, the latter in fine grained clusters.

Thin fractures in the hand sample are coated with massive iron sulfides. These are slightly magnetic, suggesting that some pyrrhotite is present.

Sample 33-36 — Porphyritic Dacite - Quartz Diorite, with abundant quartz veins and K-feldspar alteration veins

plagioclase	50-55%	
phenocrysts	15-20	
grains 0.1-0.5 mm	20-25	
grains 0.03-0.1 mm	10-15	
quartz	25-30	
K-feldspar	10-15	mostly secondary
biotite	3- 5	
muscovite	2- 3	
opaque	minor	
chlorite	minor	

veins
1) K-feldspar replacement
2) biotite
3) quartz
4) hematite-limonite

Plagioclase forms phenocrysts up to 1.5 mm in size. Most are subhedral to anhedral, with irregular borders against the groundmass. Alteration is slight to fine grained sericite and locally biotite, with possibly dusty kaolinite. Finer grained plagioclase (0.1-0.5 mm) forms anhedral grains in part intergrown with the groundmass. Quartz forms grains and patches of grains from 0.5 to 1.5 mm across. Quartz and plagioclase form an irregular very fine grained groundmass (0.03-0.1 mm) of equant anhedral grains. Some K-feldspar may be intergrown with the groundmass.

Most of the K-feldspar occurs in discrete vein-like zones (see stained block); in these K-feldspar replaces plagioclase grains in irregular patchy zones or in veins which cut sharply across the plagioclase grains.

Biotite forms scattered irregular laths and clusters of laths with grain size from 0.03 to 0.5 mm. Muscovite forms grains with similar texture to biotite. Chlorite occurs locally, in part with minor muscovite, and probably was formed by alteration of biotite.

Opaque forms anhedral rounded to irregular grains averaging 0.05-0.1 mm in size, with a few grains from 0.5-0.7 mm across. The latter have partial rims of muscovite. Some opaque grains are altered along their borders or completely to hematite.

K-feldspar forms replacement veins as described above.

One irregular biotite veinlet cuts the rock.

Quartz forms veins up to 1 mm across, with grain size ranging widely from 0.03 to 0.5 mm. The largest vein contains minor feldspars, opaque (in part altered to limonite), and muscovite.

The rock is cut by a few veins of hematite-limonite.

Ages of veins are: earliest K-feldspar, and possibly biotite
: younger than K-feldspar: quartz and hematite-limonite

Sample 42-43 Porphyritic Quartz Diorite (very fine grained groundmass; abundant veins)

phenocrysts

plagioclase	15-20%

groundmass

coarser plagioclase	10-15
finer plagioclase	25-30
quartz	25-30
biotite	10-15
epidote	1
apatite	1
chlorite	minor
opaque (pyrite)	0.5
muscovite	trace
hornblende	minor
Ti-oxide	trace
sphene	trace

Plagioclase forms phenocrysts from 0.7 to 2 mm in size. The commonly have subhedral to euhedral cores surrounded by thin overgrowths of fine grained plagioclase-quartz intergrowths. Grains are altered variably to very fine to fine grained sericite, commonly in patches. Some grains contain patches of epidote and scattered flakes of biotite.

Plagioclase also forms irregular grains from 0.2-0.5 mm in size, which are gradational between the phenocrysts and the groundmass plagioclase. Alteration is similar to that in the coarser phenocrysts.

The groundmass is dominated by very fine grained (0.03-0.15 mm) intergrowths of equant quartz and plagioclase grains.

Biotite forms laths and irregular grains from 0.05 to 0.15 mm in average size, and scattered clusters of similar grains up to 1 mm across. Pleochroism is from pale to medium brown. Some clusters contain anhedral opaque (pyrite?). Chlorite forms a few grains with minor muscovite, probably as replacements of biotite. Hornblende forms one patch of grains from 0.05 to 0.15 mm in grain size, intergrown with plagioclase, quartz, and biotite.

Epidote forms rounded to irregular patches up to 0.15 mm across, and commonly forms thin rims and overgrowths on opaque grains. Opaque forms scattered grains and clusters of grains averaging 0.05-0.1 mm in size, with one coarse patch 0.6 mm across surrounded by epidote and minor biotite.

Apatite forms subhedral to anhedral grains from 0.05-0.08 mm in size, with one coarser elongate grain 0.3 mm long.

Ti-oxide and sphene form scattered grains and patches up to 0.1 mm across.

The rock is cut by several sets of veins and veinlets, some of which are discontinuous.

1) wispy very fine grained biotite veinlet, discontinuous, 0.1 mm wide
2) wispy very fine grained chlorite veinlet, discontinuous, 0.1 mm wide, with parallel vein of fine grained K-feldspar.
3) abundant veins of K-feldspar-quartz with very variable grain size, mainly 0.02-0.1 mm, but with K-feldspar up to 1.5 mm.
4) later veins of quartz (0.05-0.2 mm grain size) up to 1.0 mm across, with local patches of pyrite and trains of K-feldspar.

Sample 70-71 Quartz-Biotite-Plagioclase Porphyritic Granodiorite

phenocrysts	
plagioclase	15-17%
biotite	5- 7
quartz	3- 5
groundmass	
quartz	30-35
plagioclase	20-25
K-feldspar	10-12
biotite	2- 3
opaque	1- 1½
epidote	0.5
Ti-oxide	0.5
muscovite	0.5
apatite	‹0.3
zircon	trace

veinlets
1) quartz-K-feldspar-calcite
2) calcite

Plagioclase forms equant to elongate subhedral phenocrysts from 0.5 to 4 mm in size. Many show concentric zones, with the coarsest grains showing the most abundant zones. Zones are variably altered to sericite; one zone near the rim is commonly the most intensely altered part of the crystals. A few coarse phenocrysts are strongly altered to coarser grained sericite as radiating fibrous aggregates up to 0.15 mm long, and patches of calcite from 0.2-0.5 mm in size. A few contain irregular fine patches of K-feldspar which appear to be concentrated in certain concentric zones. Adjacent to one coarse phenocryst is a patch of muscovite 0.3-0.5 mm in grain size, with lesser calcite and minor epidote and opaque.

Biotite forms subhedral phenocrysts up to 1.5 mm across. Many contain scattered opaque and apatite grains, and they are altered from slightly to completely to chlorite with Ti-oxide and in some calcite and sericite. A few clusters of chlorite-muscovite may represent recrystallized and altered biotite phenocrysts.

Quartz forms irregular to rounded phenocrysts averaging 0.5-1.5 mm in size, with a few up to 3 mm across.One coarse phenocryst has an irregular overgrowth up to 0.15 mm wide of quartz, with the original outline of the phenocryst marked by a thin train of inclusions of opaque and sericite.

The groundmass is medium to fine grained averaging 0.15-0.3 mm. Plagioclase forms subhedral zoned grains with cores commonly moderately to strongly altered to fine grained sericite and rims relatively fresh. Quartz and K-feldspar form anhedral grains of similar size to plagioclase, and interstitial to the plagioclase. Biotite and chlorite form grains and clusters of grains averaging 0.05-0.15 mm in grain size. Opaque forms equant anhedral grains averaging 0.03-0.07 mm. The rock is slightly magnetic, suggesting that some of the opaque grains are magnetite. Epidote forms irregular very fine to fine grained patches from 0.05 to 0.15 mm in size; some are associated with calcite or opaque. Muscovite forms scattered irregular to subhedral laths from 0.2 to 0.3 mm long; some are associated with chlorite. Ti-oxide occurs with chlorite and epidote as very fine grained patches. Apatite forms scattered anhedral to subhedral grains from 0.15-0.3 mm in size. Zircon forms a few subhedral grains averaging 0.1-0.15 mm long.

The rock is cut by a very fine grained irregular veinlet near one end of the section. It consists of quartz, K-feldspar, and locally calcite. Vein borders are not obvious in thin section.

The rock is also cut by a thin veinlet of calcite.

Sample 81-84   Quartz-Feldspar Porphyry (Quartz Monzonite)

phenocrysts		groundmass	
quartz	20-25%	microcline	15-20
microcline	15-20	quartz	15-20
plagioclase	10-15	plagioclase	5
biotite	2- 3	muscovite	3- 5
chlorite	1- 2	chlorite	1- 2
opaque	0.2	calcite	1- 2
apatite	minor	opaque	1
		zircon	trace

veinlet: gypsum?

Quartz forms euhedral or rounded, partly resorbed phenocrysts from 0.5 to 1 mm in average size.

Microcline forms subhedral to anhedral phenocrysts from 0.5 to 2 mm in size; most are intergrown along their borders with the groundmass, and most are moderately perthitic, with lenses and patches of exsolution? plagioclase.

Plagioclase forms one very coarse phenocryst composed of several intergrown grains, and subhedral grains averaging 0.5-1 mm in size. It is relatively fresh in outer layers, but is moderately altered to fine grained to very fine grained sericite in cores; alteration is irregularly distributed in grains and in the rock. Borders of grains commonly are intergrown with the groundmass.

Biotite forms equant laths from 0.5 to 1.2 mm in size; it is completely altered to chlorite with scattered to locally abundant Ti-oxide as acicular grains in cleavage planes. Chlorite forms numerous ragged laths from 0.15 to 0.3 mm in length, possibly after biotite, or possibly original chlorite. These also contain scattered Ti-oxide.

Opaque forms a few anhedral grains up to 0.8 mm across; they have partial rims of muscovite.

Apatite forms subhedral to euhedral grains up to 0.5 mm long.

The groundmass is dominated by irregular quartz grains averaging 0.02-0.04 mm in size intergrown with interstitial microcline grains of similar size, with a few grains up to 0.05 mm across. Plagioclase forms scattered grains of similar size. Muscovite forms irregular patches averaging 0.05 mm in size. Chlorite forms ragged laths similar to those described above, but of finer grain size. Calcite forms irregular patches averaging 0.02-0.03 mm across. Opaque forms disseminated grains averaging 0.02-0.05 mm in size. Zircon forms a few subhedral grains from 0.03 to 0.1 mm in size.

The rock is cut by a thin (0.02 mm wide) veinlet of gypsum?. The mineral has low relief with R.I. less than quartz, and low birefringence (0.005-0.010). No cleavage is prominent.The properties of the mineral are similar to those of gypsum in other samples, so this is considered the most probable mineral.

Sample 110-111   Brecciated Granodiorite

The sample is a medium to coarse grained granodiorite with an irregular texture. It is brecciated and intruded by a very fine grained granitic groundmass and by quartz veins and lenses. Alteration, possibly associated with at least one stage of brecciation produced muscovite and calcite as patches and veinlets.

plagioclase	45-50%
quartz	20-25
K-feldspar	15-20
biotite-chlorite	7-10
muscovite	1½-2
calcite	1½-2
opaque	1- 1½
apatite	0.5

Plagioclase forms anhedral irregular to equant grains averaging 0.5 to 1 mm in size, with a few phenocrysts up to 3 mm long. Some grains are fractured, with albite twins slightly offset or kinked along fractures. Alteration is variable, averaging slight to medium to sericite and kaolinite, with local flakes of coarser sericite up to 0.05 mm in size.

Quartz forms interstitial grains and patches up to 1 mm in size; extinction commonly is undulatory, especially in coarser grains.

K-feldspar forms a few slightly perthitic grains up to 1 mm across and more abundant interstitial grains averaging 0.1-0.2 mm in size. Perthite consists of irregular patches and lenses of altered plagioclase scattered through K-feldspar grains.

Biotite forms a few phenocrysts up to 1.5 mm across; they are moderately to completely altered to pseudomorphic chlorite and Ti-oxide, the latter as acicular grains along cleavage planes. Clusters of grains averaging 0.3-0.4 mm in length are altered to chlorite and muscovite. Numerous wispy irregular laths and aggregates of laths and irregular flakes of chlorite are present; some of these may be related in origin to the brecciation.

Muscovite forms scattered grains up to 0.25 mm in size, and numerous irregular flakes averaging 0.05-0.1 mm across.

Calcite forms very irregular patches and discontinuous veinlets throughout the rock.

Opaque forms anhedral grains and lenses averaging 0.05-0.1 mm in size, with a few grains up to 0.25 mm across.

Apatite forms corroded grains up to 0.7 mm long, commonly associated with opaque and/or chlorite. Subhedral to euhedral apatite grains averaging 0.05-0.1 mm in size occur with biotite-chlorite phenocrysts.

The rock is strongly brecciated in part, with a sparse to locally abundant breccia matrix composed of very fine grained intergrowths of quartz and K-feldspar averaging 0.01-0.03 mm in places, and 0.02-0.05 mm in others. Elsewhere the groundmass is very irregularly grained and appears to be recrystallized from very finely ground crystal fragments; this type of breccia contains abundant angular to subrounded fragments of quartz and feldspar up to 0.15 mm in size. Some fractures are partly filled with discontinuous calcite veinlets, and others contain minor chlorite and opaque.

The coarse quartz vein at one end of the sample contains dusty opaque in grains of quartz from 0.5 to a few mm across; many grains show strongly undulatory extinction. Minor chlorite is present.

Sample 119-120   Altered Dacite - Quartz Diorite

plagioclase	55-60%
quartz	25-30
muscovite	3- 5
calcite	2- 3
chlorite	1- 2
apatite	1- 2
opaque (pyrite)	1- 2
biotite	trace

veins

1) quartz
2) K-feldspar
3) calcite-(chlorite)
4) gypsum

Plagioclase and quartz form a very irregular intergrowth of grains ranging from very fine grained groundmass (0.03-0.25 mm) up to scattered phenocrysts of plagioclase up to 1.5 mm long, and patches of quartz up to 1 mm across. Some plagioclase grains are poikilitic with inclusions and patches of quartz. Plagioclase is slightly altered to dusty opaque and/or kaolinite, and scattered patches of muscovite up to 0.05 mm in size.

Muscovite forms scattered laths and aggregates up to 0.2 mm in grain size, commonly associated with opaque grains up to 0.3 mm across.

Calcite forms scattered patches and discontinuous veinlets through the sample. Chlorite forms clusters of irregular grains up to 0.5 mm across, and scattered laths associated with pyrite.

Apatite forms mainly anhedral grains from 0.05 to 0.1 mm in size, with a few grains up to 0.15 mm.

Biotite forms a few clusters similar to the chlorite clusters; probably chlorite formed as an alteration of biotite.

The rock is cut by several sets of veins and veinlets.

1) An early quartz vein with grain size 0.05-0.1 mm is offset by a later gypsum vein.
2) A broad K-feldspar "vein" consists partly of a very fine to medium grained aggregate of K-feldspar, and partly of plagioclase grains altered in part to K-feldspar.
3) Calcite with or without minor chlorite forms irregular veinlets.
4) Gypsum forms a very fine to medium grained breccia vein, with inclusions of angular fragments of quartz. This is probably the latest vein, and it offsets the first two types of veins.

Sample 139-140   Hornfelsed? Porphyritic Dacite

phenocrysts	
plagioclase	5%
groundmass	
plagioclase	35-40
biotite	20-25
quartz	15-20
calcite	3- 5
opaque	3- 5
apatite	2- 3
hornblende	1- 1½
sphene	trace

veins:
1) aplite
2) K-feldspar-(quartz)
3) calcite
4) chlorite or biotite
5) gypsum-(calcite-chlorite)

Plagioclase forms scattered phenocrysts averaging 1.5 mm, with one coarse grain 4 mm across. Phenocrysts are slightly altered to sericite, with scattered patches of fine to very fine grained epidote and scattered biotite flakes.

The groundmass is variable in composition, with local patches containing hornblende, while most of the rock contains biotite with some chlorite as the mafic mineral.

Plagioclase and quartz form a very fine grained (0.03-0.07 mm) anhedral aggregate of equant grains. Plagioclase is relatively fresh. Biotite forms irregular flakes and laths from 0.03 to 0.15 mm in size, with some clusters up to 1 mm across containing abundant biotite in random orientation, and intergrown very fine grained calcite. Calcite also forms patches from 0.05-0.1 mm across of very fine grained aggregates. Opaque forms scattered grains and patches of grains averaging 0.05-0.1 mm in size, with a few up to 0.5 mm across. Some are associated with biotite, and some are related to veins. Apatite forms subhedral to euhedral prismatic grains and cross sections averaging 0.03-0.15 mm in size, with one grain 0.8 mm long. Hornblende forms poikilitic grains averaging 0.1-0.2 mm across, and numerous very fine grains (0.03-0.05 mm) intergrown with mosaic quartz and plagioclase.Sphene forms a few grains averaging 0.03 mm in size.

The aplite vein is up to 3 mm wide, and consists of very fine grained (0.05 mm) quartz-plagioclase-K-feldspar with scattered grains of pyrite up to 0.5 mm. Chlorite occurs along part of the border as an alteration halo.

Several veins with diffuse borders consist of K-feldspar and lesser quartz; they commonly cut plagioclase phenocrysts, and form a few randomly oriented veins in the rock.

Calcite forms veinlets of at least two ages, one of which cuts and offsets the other. Some contain minor chlorite or halos of chlorite.

Chlorite and biotite veinlets probably are related in age to the calcite veinlets; chlorite commonly contains dusty opaque.

Gypsum forms late?, in part en echelon veinsup to 1 mm across. These commonly are discontinuous, and are composed of grains up to 0.5 mm across. Some contain calcite, and the veins are rimmed by chlorite halos; chlorite is most abundant adjacent to calcite.

Calcite veinlets cut the aplite vein.

Sample 173-174 Quartz-Plagioclase Porphyry Rhyodacite Intrusion

phenocrysts		
plagioclase	30%	
quartz	10-12	
biotite	5- 7	(some altered in part or whole to chlorite)
sphene	1- 1½	
zircon	0.2	
hornblende	minor	
apatite	1- 1½	
Mineral X	trace	

groundmass	50-55
K-feldspar	25-30
quartz	20-25
chlorite	3
plagioclase	2
calcite	1
apatite	1
muscovite	0.5
opaque(pyrite)	0.5
epidote	trace

veins

1) quartz-opaque-gypsum?
2) quartz-calcite-gypsum
3) gypsum-calcite

Plagioclase forms phenocrysts from 0.5 to 3 mm in size; they are slightly altered to sericite and slightly to moderately altered to kaolinite , with local patches of calcite. Quartz forms subhedral to rounded phenocrysts from 1 to 3 mm in size; some have partly resorbed borders against the groundmass. Some coarse patches of quartz consist of aggregates of medium to coarse slightly intergrown grains.

Biotite forms equant laths up to 1.5 mm across; pleochroism is from light straw to medium brown. Grains are altered along borders and cleavage to chlorite and minor Ti-oxide; some grains are completely altered. Many biotite phenocrysts show kink folds suggesting deformation before or during crystallization of the groundmass. Some patches consist of aggregates of irregular chlorite laths from 0.2 to 0.5 mm in size.

Sphene forms a few elongate to wedge shaped phenocrysts up to 1.2 mm long; coarser grains have inclusions of opaque up to 0.05 mm across. Zircon forms a few phenocrysts up to 0.4 mm in size associated with biotite. Apatite forms euhedral phenocrysts up to 0.25 mm across with biotite. Hornblende forms two phenocrysts 0.3-0.5 mm in size; pleochroism is light to medium green. Mineral X forms one ragged crystal 0.2 mm across with apatite. It has the properties: reddish brown color, moderate relief, anisotropic, one moderate cleavage with extinction of 15° to cleavage, interference color masked by mineral color.

The groundmass is dominated by rounded quartz grains 0.02 mm across set in interstitial K-feldspar of similar grain size. Chlorite forms patches from 0.1-0.3 mm in size commonly interstitial in part to quartz. Plagioclase forms scattered grains from 0.05 to 0.15 mm in size. Calcite forms irregular patches averaging 0.03-0.05 mm across. Apatite forms scattered subhedral to euhedral grains from 0.03-0.05 mm in size. Muscovite forms a few poikilitic grains up to 0.2 mm long. Opaque forms scattered grains and clusters of grains with chlorite. Epidote forms one patch 0.15 mm long.

The rock is cut by at least two ages of veins, with an earlier vein of fine to medium grained quartz with an irregular centerline with opaque and gypsum? cut by a later gypsum-calcite vein. The gypsum-calcite vein also appears to cut a finer grained gypsum-calcite-quartz vein.

Sample 191-192 Biotite-Plagioclase Porphyritic Granodiorite

phenocrysts	
plagioclase	20-22%
biotite	5- 7
K-feldspar	one grain
muscovite	minor
groundmass	
quartz	25-30
plagioclase	20-25
K-feldspar	10-12
muscovite	3- 5
biotite	3- 5
opaque	1½-2
chlorite	1½-2
apatite	1
epidote	1
calcite	1
Ti-oxide	0.5
zircon	trace

veins:
1) quartz-pyrite with K-feldspar halo
2) calcite with sericite-muscovite-rich halos

Plagioclase forms subhedral to anhedral phenocrysts from 0.5 to 2.5 mm in size; they are similar to those in samples 57-58 and 70-71. Some cores are strongly altered to very fine grained sericite and patches of calcite. A few are moderately to strongly altered to muscovite laths from 0.1-0.3 mm long; these may be part of an alteration related in origin to the calcite veinlets. Some plagioclase grains are zoned with thin zones near their rims strongly altered to sericite. One euhedral phenocryst has a rim of plagioclase intergrown with rounded quartz of the groundmass.

Biotite forms ragged to subhedral phenocrysts from 0.5 to 1.5 mm in size. Some are completely altered to chlorite with patches of Ti-oxide and minor epidote. A few are partly altered to muscovite along their borders. Muscovite laths from 0.5 to 0.7 mm in size may represent completely altered biotite.

K-feldspar forms one anhedral phenocryst 1.5 mm across; it contains abundant perthitic? patches 0.05 mm across of plagioclase.

In the groundmass, plagioclase forms anhedral to subhedral grains from 0.15 to 0.3 mm in size; these are slightly to moderately altered in their cores to fine sericite. Quartz and K-feldspar form anhedral, in part interstitial grains from 0.05 to 0.2 mm across, with a few up to 0.5 mm across. Biotite and muscovite form irregular anhedral to subhedral grains from 0.1 to 0.5 mm across. Chlorite forms patches up to 0.5 mm across, probably after biotite. Apatite forms subhedral to euhedral grains associated with biotite and chlorite up to 0.3 mm in size. Opaque forms anhedral grains averaging 0.15-0.2 mm in size. Some are rimmed by epidote, others by micas, and one by calcite. Apatite is commonly associated with opaque. Epidote occurs mainly as rims and patches with opaque, and locally with biotite and chlorite. Ti-oxide forms clusters of grains up to 0.5 mm across commonly with micas or chlorite. Calcite forms irregular patches scattered through the rock. Zircon forms a few euhedral grains up to 0.05 mm long.

The rock is cut by a fine to medium grained quartz vein up to 1 mm wide. Quartz forms slightly to strongly interlocking grains. Pyrite forms abundant cubes averaging 0.3 mm across. The vein is rimmed by a zone up to 0.5 mm wide of very fine grained strongly interlocking K-feldspar. Several thin calcite veinlets cut the rock, and have an irregular halo containing abundant sericite-muscovite.

Sample 258-261 Brecciated Porphyritic Quartz Diorite - Granodiorite

plagioclase	35-40%
quartz	40-45
K-feldspar	7-10
biotite (chlorite)	7
opaque	0.5
epidote	minor
muscovite	0.3
hornblende	trace
zircon	trace
calcite	minor

veins:
1) gypsum-(calcite) with minor pyrite, molybdenite? (see hand sample)

Plagioclase forms anhedral to subhedral grains up to 1.5 mm in size. They are moderately altered to sericite with possibly minor kaolinite, and a few patches of calcite.

Quartz forms coarse patches up to several mm across, and with lesser plagioclase and K-feldspar occurs in a very fine grained (0.05-0.25 mm) groundmass which forms irregular patches throughout the rock. Some of the coarse quartz may represent quartz veins.

K-feldspar forms scattered grains up to 1 mm across; coarser grains commonly are slightly perthitic, with irregular patches of plagioclase.

Biotite forms a few phenocrysts up to 1.5 mm in size and scattered finer grains. Biotite is completely altered to chlorite and Ti-oxide, with locally abundant very fine grained sericite. Chlorite forms pseudomorphs after biotite, with Ti-oxide forming very fine grained patches or fine grains up to 0.1 mm long oriented parallel to cleavage.

Opaque (mainly pyrite) forms scattered grains from 0.05 to 0.15 mm in size, in part associated with chlorite.

Muscovite forms scattered grains and patches of grains from 0.05 to 0.1 mm in size.

Epidote forms a few patches of fine grains from 0.05 to 0.15 mm in size. One patch contains an inclusion of opaque (pyrite).

Hornblende forms one grain 0.7 mm across; it appears slightly corroded, and is fractured. Pleochroism is from light to medium reddish green.

Calcite forms minor patches and veinlets, both of secondary origin.

Zircon forms a few grains with chlorite up to 0.03 mm in size, and one elongate prismatic grain 0.1 mm in length.

The rock was strongly fractured and brecciated, with fractures filled with veinlets and veins composed mainly of gypsum with locally abundant calcite. Gypsum ranges from extremely fine grained up to 0.2 mm in size, while calcite ranges up to 1 mm in size.

Sample: DYKE Quartz-Biotite-Plagioclase Porphyry (Granodiorite)

phenocrysts		
plagioclase	35-40%	
biotite	7-10	
quartz	5- 7	
apatite	minor	
(pyrite)	2- 3	(secondary?)
groundmass	40-45	
feldspar	33-37	
quartz	3- 5	
apatite	1	
biotite	minor	
chlorite	1- 2	
Ti-oxide	minor	
zircon	trace	
opaque	minor	

Plagioclase forms phenocrysts and clusters of phenocrysts with size from 0.5 to 2.5 mm. Some are euhedral and others are partly rounded. Many show concentric oscillatory to normal zoning; one composition determination gave a core of An_{40} grading out to a rim of An_{29}. A few angular fragments of phenocrysts are present. Plagioclase is varaibly altered from very slight to moderate to dusty sericite and locally to patches up to 0.3 mm across of fine grained sericite flakes. A few grains contain epidote patches up to 0.05 mm in size. A few contain inclusions of pyrite up to 0.1 mm across, and a few contain patches of calcite up to 0.1 mm across.

Biotite forms subhedral to euhedral phenocrysts from 0.5 to 1.5 mm in size. Pleochroism is from light straw to medium reddish brown. Biotite commonly has minor inclusions of apatite, opaque, and zircon. Alteration is present in some grains, with minor chlorite forming along grain borders and outwards from cleavage planes. Locally, biotite is replaced by fine grained sericite.. A few biotite phenocrysts show strong kinks. A few grains are strongly to completely altered to chlorite and Ti-oxide, and a few of these also contain calcite and opaque.

Quartz forms rounded, commonly resorbed phenocrysts up to 2 mm in size; some occur in clusters of a few grains.

Apatite forms a few grains up to 0.15 mm across.

Pyrite forms anhedral patches from 0.2 to 1 mm in size scattered through the rock.

The groundmass is dominated by an irregular intergrowth of feldspars with lesser quartz. Feldspars appear to form intimate intergrowths of two phases in grains from 0.02-0.15 mm in size. Quartz forms anhedral irregular grains from 0.02-0.05 mm in size, with local patches of grains up to 0.15 mm. Chlorite forms irregular patches up to 0.3 mm across, probably formed by replacement of the groundmass. Some are intimately intergrown along their borders with the groundmass. A few patches contain chlorite with epidote and/or quartz. Apatite forms euhedral prismatic crystals up to 0.15 mm long and abundant acicular grains up to 0.05 mm long. Biotite forms scattered slender laths up to 0.05 mm long. Ti-oxide forms a few patches up to 0.15 mm across of extremely fine grained aggregates. Zircon forms a few grains in biotite averaging 0.03 mm in size. Opaque, probably mainly pyrite, forms scattered grains up to 0.1 mm across.

(continued on next page)

Sample: DYKE (continued)

The sample contains an irregular inclusion a few mm across composed of major biotite, opaque, and actinolite, and lesser quartz, apatite, Ti-oxide, and zircon. Grain size averages 0.05-0.2 mm, with biotite forming a few grains up to 0.8 mm across.

The sample is cut by a few veinlets containing very fine grained quartz and scattered to locally abundant pyrite grains up to 0.05 mm across. Pyrite is mainly altered along borders or completely to very fine grained hematite.

Sample: Davie Creek   Biotite-Plagioclase Porphyritic Granodiorite to Quartz Diorite with three types of inclusions

phenocrysts	
plagioclase	15-17%
biotite	5- 7
quartz	5- 7
groundmass	
plagioclase	25-30
quartz	20-25
K-feldspar	7-10
chlorite	5- 7
muscovite	3- 5
biotite	2- 3
opaque	1- 1½
calcite	0.3
apatite	0.2
epidote	minor
allanite?	trace

Inclusions

1) quartz diorite
2) muscovite-rich quartz diorite porphyry
3) biotite-rich diorite

Plagioclase phenocrysts are subhedral to anhedral and range from 0.5 to 2.5 mm in size. Alteration is similar to that in 57-58 and 70-71. Zoning is not prominent, but most grains show concentric zones, with at least one major reversal in zoning to more-calcic plagioclase rimming more-sodic plagioclase. Alteration is very variable from grain to grain, with intensity from slight to moderately strong to very fine to fine grained sericite and local patches of calcite. More-calcic plagioclase is more strongly altered than more-sodic plagioclase.

Biotite forms numerous phenocrysts up to 0.7 mm in size, and a few up to 3 mm long. Many are partly to completely altered to chlorite and Ti-oxide, with common apatite inclusions throughout. In some parts of the rock biotite is altered to muscovite and Ti-oxide, with or without chlorite and/or calcite.

Quartz forms rounded to irregular patches up to 1.5 mm across, some of which resemble phenocrysts, and others which normally would be interpreted as late, possibly alteration patches. Grain size ranges from 0.5 to 1.5 mm, and borders are slightly interlocking.

In the groundmass, plagioclase forms subhedral to anhedral grains up to 0.5 mm in size. Most show vague zoning from more-calcic, more-altered cores to more-sodic, less-altered rims. Quartz amd K-feldspar form rounded to anhedral interstitial grains averaging 0.05-0.1 mm in size. Biotite, chlorite, and muscovite form patches of ragged grains from 0.05 to 0.3 mm in size; chlorite is probably an alteration of biotite, and contains minor Ti-oxide. Muscovite is in part an alteration of biotite, but in part is a secondary mineral formed during alteration. Opaque forms scattered grains from 0.05-0.1 mm in size, and clusters of anhedral grains up to 0.2 mm across, commonly associated with muscovite. Calcite forms irregular patches up to 0.1 mm across scattered through the rock as well as locally abundant alteration patches in plagioclase. Apatite forms subhedral to euhedral grains averaging 0.1 mm across, with a few up to 0.2 mm across. Epidote forms scattered irregular patches from 0.05 to 0.1 mm in size associated with opaque and mafic grains. Allanite? as in sample F? forms two grains, one 0.1 mm and the other 0.5 mm long. The larger grain has minor inclusions of quartz. Pleochroism is from light to medium-dark reddish-brown.

(continued on next page)

Sample: Davie Creek (continued)

Inclusions:

1) Quartz diorite

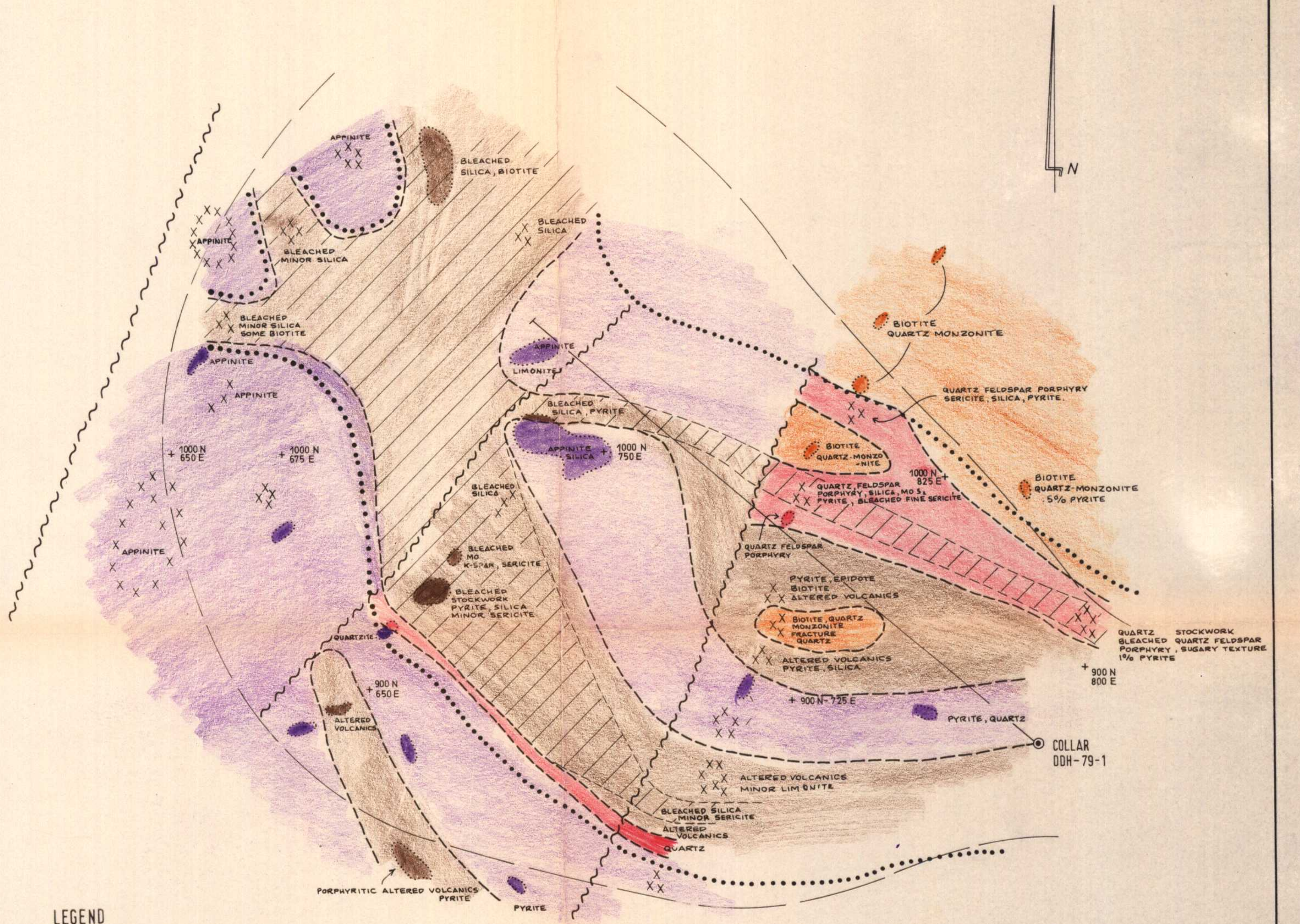
The inclusion is 7 mm across and consists mainly of medium to coarse grained plagioclasewhich generally is fresh to very slightly altered to sericite, with 15-20% interstitial medium grained quartz. Patches of muscovite (after biotite) with Ti-oxide are present, and one vein-like zone of opaque (pyrite?) with a rim of muscovite cuts the rock. One hornblende grain occurs in the rock; it is medium green in color and 0.15 mm across.

2) Muscovite-rich quartz diorite

This rock is very similar to the main rock, and the contact is not apparent. It contains plagioclase grains up to 0.8 mm long in a groundmass similar to that of the main rock. Mafic minerals are replaced by muscovite, and patches of opaque (pyrite) and apatite are common, with grain size 0.1-0.3 mm across.

3) Mafic diorite?

This inclusion is a few mm long, and consists mainly of fine grained biotite (0.05-0.25 mm long) in a random aggregate, with 2-3% apatite as grains 0.05-0.15 mm in size, 3-5% very fine grained opaque and semi-opaque, and 30% interstitial fine grained quartz and plagioclase.



PLAN

LEGEND

- OUTCROP
- GEOLOGICAL CONTACT
- ANGULAR FLOAT
- Mo SOIL ANOMALY 100 PPM
- OUTLINE OF SILICIFICATION (APPROXIMATE)
- ALTERED VOLCANICS, HORNFELS, FINE GRAINED OR PORPHYRITIC
- QUARTZ, FELDSPAR, PORPHYRY, FELDSPAR PORPHYRY
- BIOTITE QUARTZ MONZONITE
- BLEACHING, SILICIFICATION, SERICITE, QUARTZ STOCKWORK
- HORNBLENDITE AND APPINITE

inches
0 1
0 1 2
centimetres

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

TECK CORPORATION
VANCOUVER, B.C.

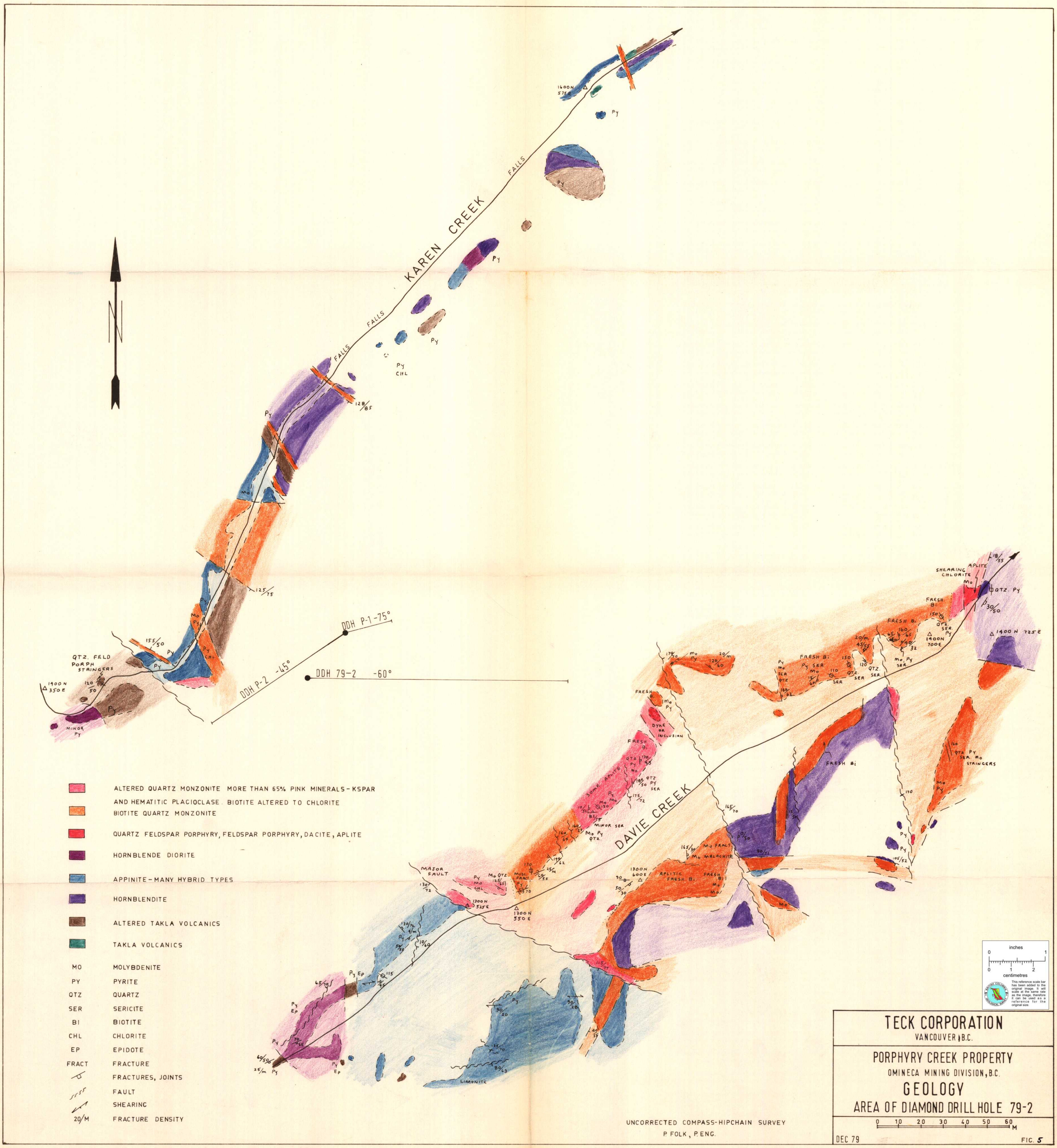
PORPHYRY CREEK PROPERTY
OMINECA MINING DIVISION, B.C.

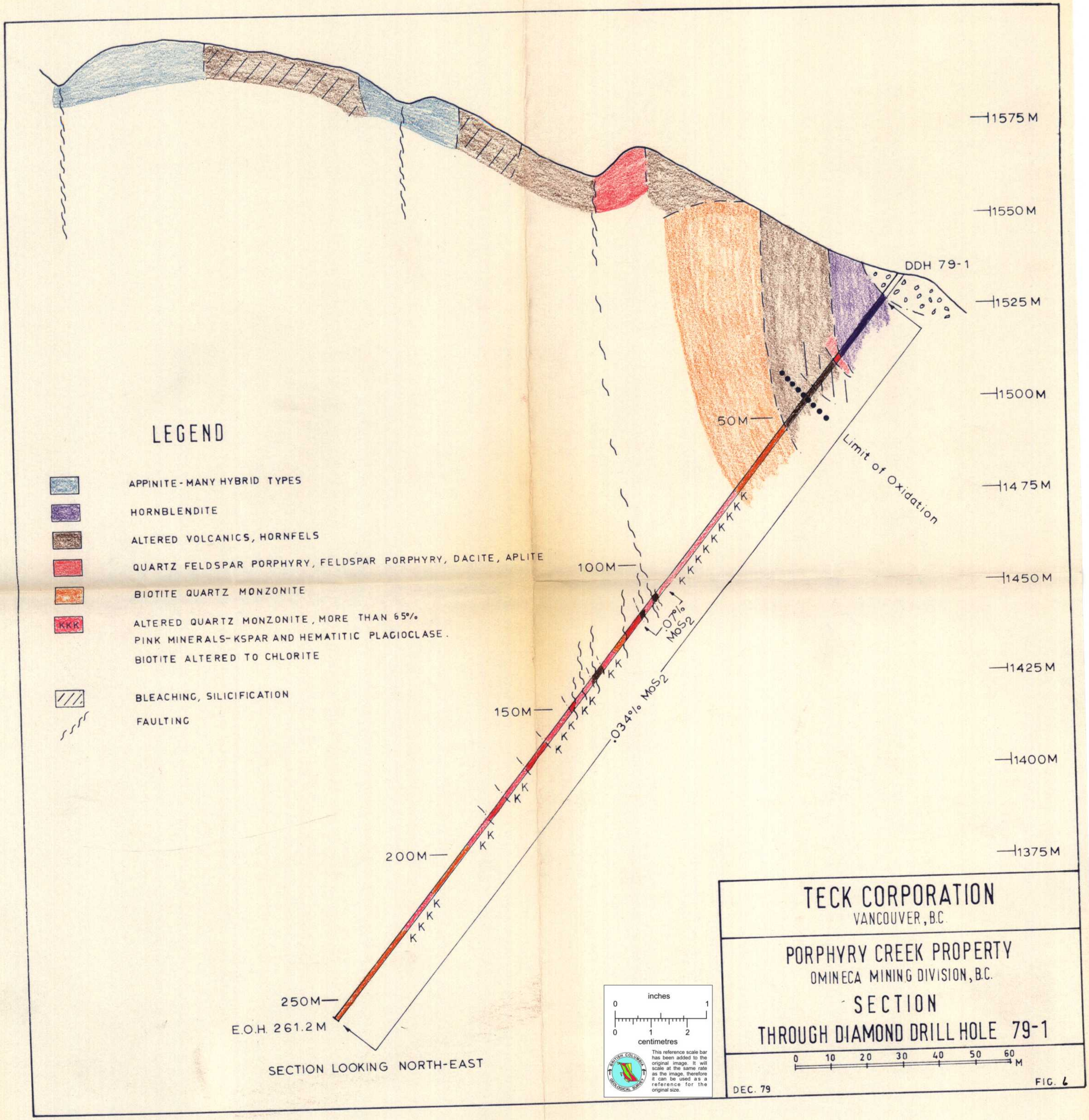
GEOLOGIC PLAN AREA OF DIAMOND DRILL HOLE 79-1

0 10 20 30 40 50 60 METERS

OCT. 1979

FIG. 4


KAREN CREEK
FALLS
DAVIE CREEK
N
DDH P-1 -75°
DDH P-2 -45°
DDH 79-2 -60°
1600N 575E
1400N 350E
1400N 700E
1400 N 725E
1300N 525E
1300N 550E
1300N 600E
QTZ. FELD PORPH STRINGERS
MINOR Py
SHEARING CHLORITE
APLITE
MAJOR FAULT
DYKE OR INCLUSION
SOME APLITE
MINOR SER
APLITIC FRESH Bi
Mo FRACT Mo MALACHITE
QTZ Py SER Mo STRINGERS
LIMONITE
ALTERED QUARTZ MONZONITE MORE THAN 65% PINK MINERALS - KSPAR AND HEMATITIC PLAGIOCLASE. BIOTITE ALTERED TO CHLORITE
BIOTITE QUARTZ MONZONITE
QUARTZ FELDSPAR PORPHYRY, FELDSPAR PORPHYRY, DACITE, APLITE
HORNBLENDE DIORITE
APPINITE - MANY HYBRID TYPES
HORNBLENDITE
ALTERED TAKLA VOLCANICS
TAKLA VOLCANICS
MO MOLYBDENITE
PY PYRITE
QTZ QUARTZ
SER SERICITE
BI BIOTITE
CHL CHLORITE
EP EPIDOTE
FRACT FRACTURE
FRACTURES, JOINTS
FAULT
SHEARING
20/M FRACTURE DENSITY
UNCORRECTED COMPASS-HIPCHAIN SURVEY
P FOLK, P.ENG.
TECK CORPORATION
VANCOUVER, B.C.
PORPHYRY CREEK PROPERTY
OMINECA MINING DIVISION, B.C.
GEOLOGY
AREA OF DIAMOND DRILL HOLE 79-2
0 10 20 30 40 50 60 M
DEC 79
FIG. 5
1cm = 1000


1575 M
1550 M
1525 M
1500 M
1475 M
1450 M
1425 M
1400 M
1375 M
DDH 79-1
Limit of Oxidation
50M
100M
150M
200M
250M
.07% MoS2
.034% MoS2
E.O.H. 261.2 M
SECTION LOOKING NORTH-EAST
LEGEND
APPINITE - MANY HYBRID TYPES
HORNBLENDITE
ALTERED VOLCANICS, HORNFELS
QUARTZ FELDSPAR PORPHYRY, FELDSPAR PORPHYRY, DACITE, APLITE
BIOTITE QUARTZ MONZONITE
KKK
ALTERED QUARTZ MONZONITE, MORE THAN 65%
PINK MINERALS - KSPAR AND HEMATITIC PLAGIOCLASE.
BIOTITE ALTERED TO CHLORITE
BLEACHING, SILICIFICATION
FAULTING
inches
0
1
0
1
2
centimetres
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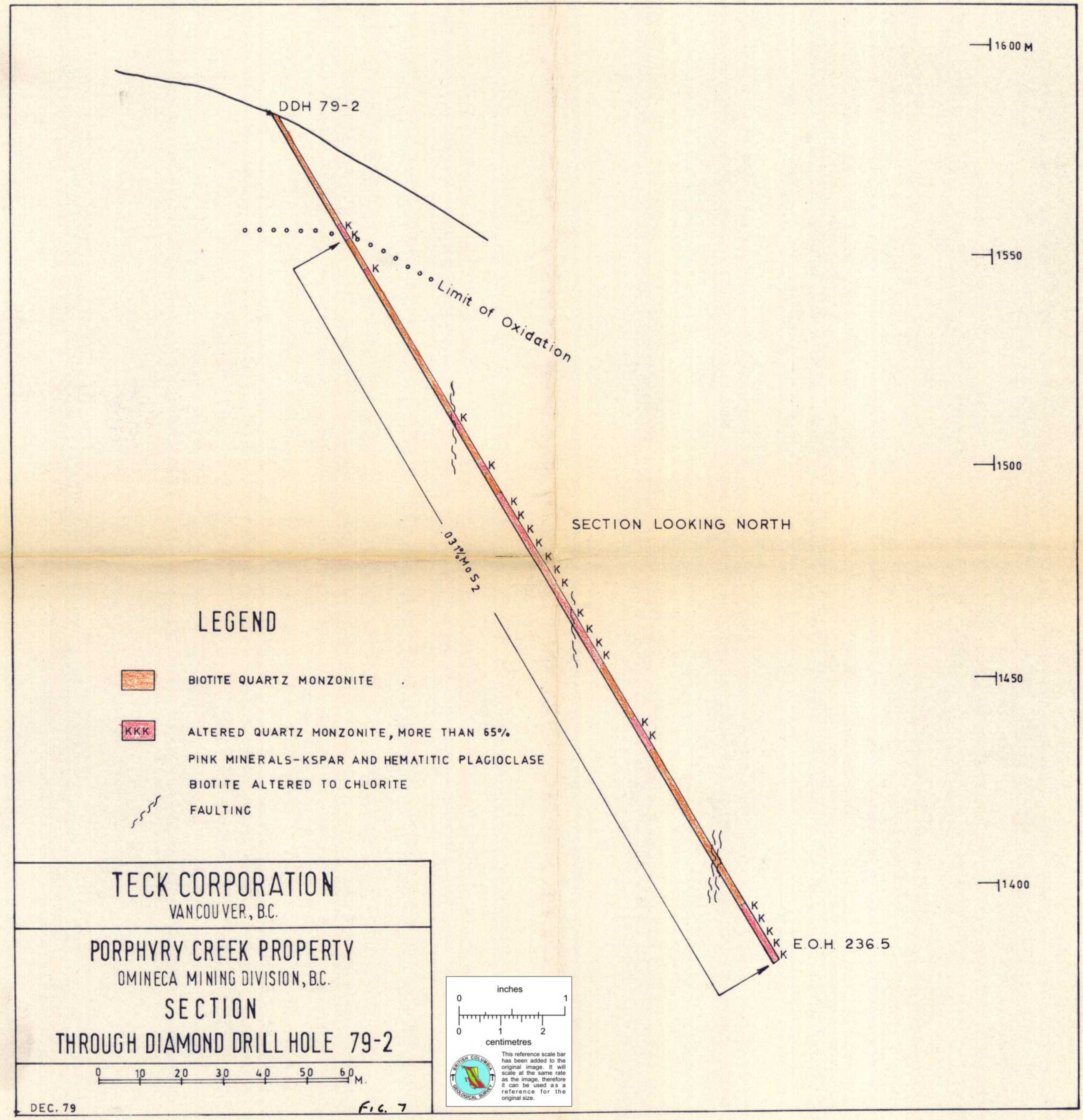
BRITISH COLUMBIA GEOLOGICAL SURVEY
TECK CORPORATION
VANCOUVER, B.C.
PORPHYRY CREEK PROPERTY
OMINECA MINING DIVISION, B.C.
SECTION
THROUGH DIAMOND DRILL HOLE 79-1
0 10 20 30 40 50 60 M
DEC. 79
FIG. 6



1600 M
1550
1500
1450
1400
DDH 79-2
Limit of Oxidation
.031% MoS2
SECTION LOOKING NORTH
E.O.H. 236.5
LEGEND
BIOTITE QUARTZ MONZONITE
KKK
ALTERED QUARTZ MONZONITE, MORE THAN 65%
PINK MINERALS-KSPAR AND HEMATITIC PLAGIOCLASE
BIOTITE ALTERED TO CHLORITE
FAULTING
TECK CORPORATION
VANCOUVER, B.C.
PORPHYRY CREEK PROPERTY
OMINECA MINING DIVISION, B.C.
SECTION
THROUGH DIAMOND DRILL HOLE 79-2
0 10 20 30 40 50 60 M.
DEC. 79
FIG. 7
inches
0 1
0 1 2
centimetres
This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.
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