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Mineral Industry Report
1976
Yukon Territory
EGS 1977-1

J. A. Morin
W. D. Sinclair
D. B. Craig
M. Marchand



MINERAL INDUSTRY REPORT

1976

YUKON TERRITORY

BY

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YUKON TERRITORY MINING DISTRICTS

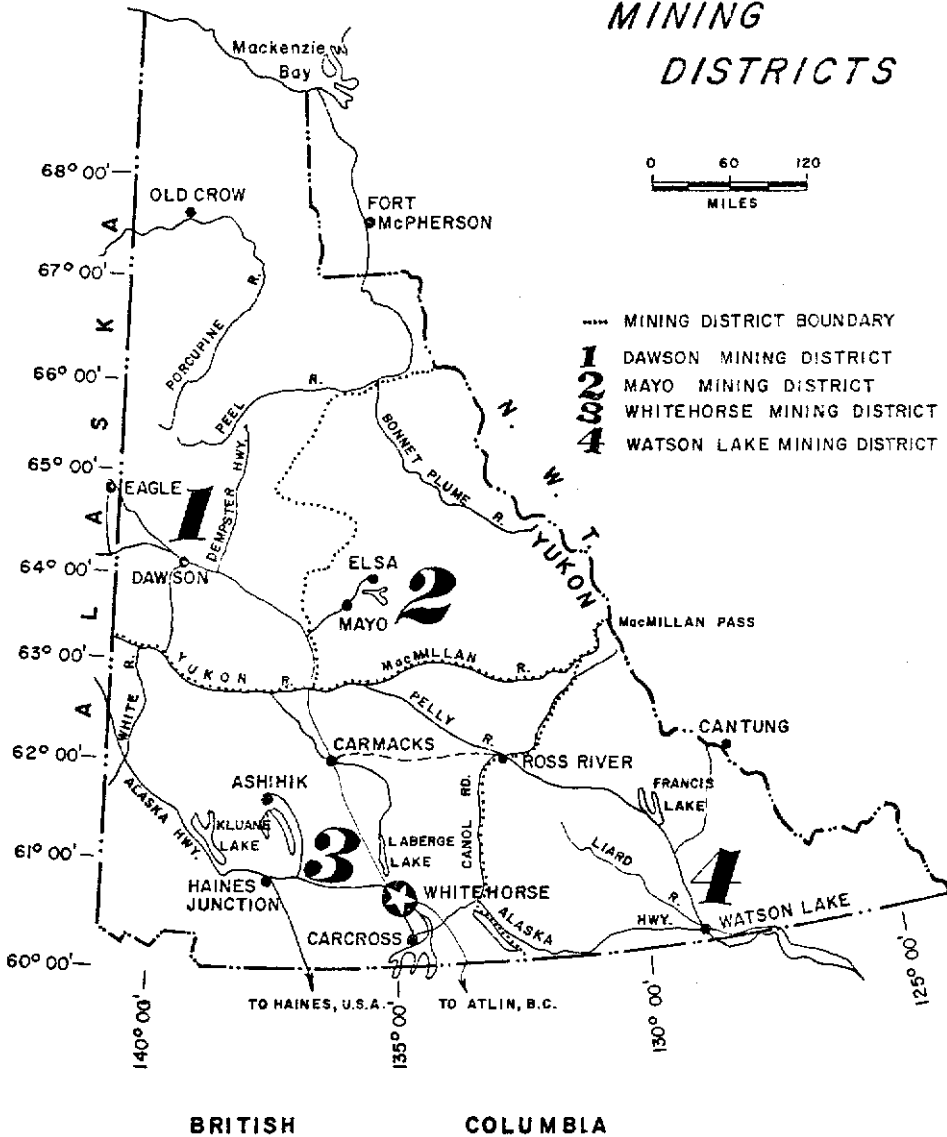


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INTRODUCTION

This report is a review of the Yukon mineral industry for 1976 by officers of the Geology section, Northern Natural Resources and Environment Branch, Department of Indian and Northern Affairs. It includes descriptions of work conducted on mineral claims by individuals and mineral exploration companies and operating summaries of the several producing mines in the Yukon. Earlier records of mineral industry activities are presented in the Annual and Summary Reports of the Geological Survey of Canada (1898 to 1933), Memoirs of the Geological Survey of Canada (1934 to 1940), Papers of the Geological Survey of Canada (1960 to 1968) and Mineral Industry Reports of the Department of Indian and Northern Affairs (1969 to 1975).

Information in this report was obtained from visits to mineral properties, from personal communication with individuals and from technical reports, trade journals, newspapers, publications of the Geological Survey of Canada and the monthly reports of the District Mining Recorders. Considerable information was provided by exploration companies in completing and returning the questionnaires on each of the properties on which work was conducted. The cooperation of industry in this regard is gratefully acknowledged. A great deal of valuable information is contained in the geological, geochemical and geophysical reports accepted for credit as assessment work by the Department of Indian and Northern Affairs. A list of assessment reports, both confidential and those available for inspection, are included in the list of Technical Reports prepared by the Canada Center for Geoscience Data for the Department. These reports are listed by NTS locations and are produced annually in February of each year. The assessment reports are currently released for public inspection six months after the claims (on which the work was carried out) have lapsed.

In this report, activities of the mineral industry are divided into lode mining and exploration, coal mining and exploration and placer mining. Each of these sections are further subdivided into the separate mining districts in the Yukon (see the frontispiece). Individual properties in the various mining districts are then listed in order of their occurrence based on the National Topographic System. The location of each property is given by its National Topographic System designation of the 1:50,000 map-sheet in which the property lies and by the latitude and longitude of the centre of the property. In cases where a property involves a large number of claims or covers more than one NTS sheet, several latitudes and longitudes and more than one NTS designation are given. The name or names given to a property are generally the names of the claims that constitute the property. However, if there is a name by which a property was originally or formerly known and which is commonly used at present, then this name takes precedence. Company addresses have been consolidated and placed in a section at the end of this publication.

During the 1976 field season, J.A. Morin visited lode mining and exploration properties in the Mayo and Watson Lake Mining Districts and carried out field investigations in the Macmillan Pass area and in the Moosehorn Range area in the Whitehorse Mining District. In addition, he carried out laboratory investigations of breccia bodies from the Wernecke Mountains and Mississippi volcanic rocks in the Seagull Creek area south of Ross River. W.D. Sinclair visited lode mining and exploration properties in the Whitehorse Mining District and carried out field work in the Mount Freegold area. He left this department in June 1977 to join the staff of the Geological Survey of Canada, Ottawa. M. Marchand visited properties in the Anvil area of the Whitehorse Mining District and started a project on rock geochemistry of the Anvil orebody in conjunction with Cyprus Anvil Mining Corporation. In addi-

ion, he organized and co-ordinated the production of this volume. D.B. Craig visited placer mining properties in the Yukon Territory and lode mining and exploration properties in the Dawson Mining District. In addition to the above, R.C. Carne carried out detailed investigations of lead-zinc-barite properties in the eastern Selwyn Basin. The results of this work are embodied in DIAND Open File EGS 1976-16. S.W. Campbell summarized her field and laboratory investigations of the nickel-copper sulphide deposits in the Kluane Ranges within DIAND Open File EGS 1976-10.

Facilities of the Geological Section

The Geology Office sells topographical, geological, aeronautical, and land-use maps, as well as Geological Survey of Canada publications, covering the Yukon and some adjacent parts of B.C. and the N.W.T. A library of G.S.C., B.C. Dept. of Mines, Alaska Bureau of Mines, U.S.G.S. Alaska publications, and other geological books and journals is available for consultation. Some open file reports on the Yukon are also available for viewing. A sizeable collection (25,000) of air photos covering the Yukon from Latitude 60° to 65° is available for use in the office as is the latest catalogue of Yukon Air Photos from the National Air Photo Library. An updated computer list of 'good' quality photos of the 1972-1976 satellite [LANDSAT] imagery of the Yukon is included in the Air Photo catalogue. We also have a LANDSAT mosaic of the cordillera on display and a nearly complete collection of colour LANDSAT photos of the Yukon.

The H.S. Bostock Core Library, situated across the street from the Geology Office, contains drill core from various Yukon mining properties, some available for inspection and the remainder confidential. The core library also contains working quarters equipped with diamond saws, a core splitter, a vibrating polisher, rock staining facilities and fume hood. A petrographic microscope, with capabilities for both transmitted and reflected light, and a binocular microscope are also situated in the core library. The Geology Office recently acquired the McPhar Spectra 44, a four channel gamma-ray spectrometer and a new UV light. The equipment and instruments are available for use by industry personnel on arrangement with one of the geologists.

The office is staffed by four geologists who welcome visits by exploration personnel when they are in town. The office is situated at 200 Range Rd. in the Takhini sub-division, about halfway between downtown Whitehorse and the airport, at the top of "Two Mile Hill". The staff and their telephone extensions are listed below:

Doug Craig, Regional Geologist 136; Jim Morin, District Geologist 138;
Michael Marchand, Staff Geologist 136; Beth Phillips, Clerk & Map Sales 140.

Telephone - 403-668-5151

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Whitehorse, Yukon
Y1A 3V1

MINERAL PRODUCTION OF YUKON

The value of mineral production in the Yukon fell from \$228,840,396 in 1975 to \$130,469,000 in 1976, a decrease of 43.0%. Copper and cadmium production were up while all others were down. Only the value of copper and asbestos production went up.

The cause of this was due primarily to lengthy strikes at Cyprus Anvil, United Keno Hill Mines and Whitehorse Copper Mines.

TABLE I

Mineral Production, Yukon Territory

	1975	1976
Gold \$	5,255,077	3,910,000
grams	997 986	965 000
ounces	32,086	31,000
Silver \$	28,531,397	13,446,000
grams	196 943 109	97 634 000
ounces	6,331,868	3,139,000
Lead \$	54,888,680	19,104,000
kg	122 863 634	38 254 000
lb	270,867,945	84,335,000
Zinc \$	95,400,540	42,898,000
kg	115 394 553	51 723 000
lb	254,401,441	114,029,000
Cadmium \$	15,423	12,000
kg	2 050	3 000
lb	4,519	5,000
Copper \$	11,928,559	16,639,000
kg	8 487 245	11 039 000
lb	18,711,172	24,336,000
Asbestos \$	32,820,720	34,460,000
tonnes	103 725	103 000
short tons	114,348	113,000
Coal		
short tons	25,712	29,974

Mineral Exploration Highlights, Yukon Territory, 1976

The number of quartz claims staked in 1976 in Yukon increased by 20.9% to 10,357 while the claims in good standing declined to 32,985. Exploration expenditures were estimated at \$16.5 million, a slight decrease over the \$18.5 million spent in 1975.

TABLE II

Mineral Claims Staked, Yukon Territory

Mining District	1973	1974	1975	1976
Dawson	1,168	1,504	1,695	1,555
Mayo	2,587	6,038	1,609	4,390
Watson Lake	2,509	1,325	1,801	2,478
Whitehorse	3,119	4,867	3,454	1,934
Totals	9,383	13,734	8,559	10,357

The most exciting of recent developments is the discovery of copper-uranium mineralization in the Quartet Lakes-Bond Creek area by Archer, Cathro and Associates. The uranium mineralization occurs mainly in breccia bodies and adjacent country rocks of Lower Proterozoic age. Some diamond drilling was carried out on several occurrences in 1976, but the potential for commercial deposits is still relatively unknown.

Another interesting development is the recognition of volcanogenic massive sulphides in the Seagull Creek area, Pelly Mountains. On the MM property owned by Cyprus Anvil, diamond drilling carried out over the past few years has intersected massive sulphide lenses containing lead, zinc and silver. The massive sulphides are stratigraphically overlain by bedded barite and occur within a sequence of intermediate to felsic metavolcanics of Mississippian age. Lead-zinc-silver mineralization also occurs at several other localities in the Seagull Creek area.

Exploration for carbonate-hosted zinc-lead deposits in the Mackenzie Mountains decreased significantly in 1976 relative to the previous two years. The Goz Creek property of Barrier Reef, which stimulated much of the initial activity in the Bonnet Plume River area, was inactive in 1976 although there were a number of diamond drilling programs on other properties in the Mackenzie, Richardson and Ogilvie Mountains.

Much exploration in 1976 was focussed toward shale-hosted lead-zinc and lead-zinc-barite deposits in the Selwyn Basin. Diamond drilling was carried out by Canex Placer on their Howards Pass deposit and indications are that this deposit has the potential to be one of the world's major zinc-lead deposits.

In the MacMillan Pass area, diamond drilling on the JASON claims by Ogilvie Joint Venture has outlined a mineralized zone similar to the neighbouring TOM deposit owned by Hudson Bay Exploration and Development. These deposits consist of stratiform lead-zinc sulphides with appreciable amounts of silver and associated bedded barite of Devono-Mississippian age. Numerous companies and exploration syndicates were active in the MacMillan Pass area in 1976. In addition to the lead-zinc-silver-barite deposits, there are a number of occurrences within the Devono-Mississippian sequence of bedded barite characterized by a virtual absence of sulphides. One of these, the TEA

property, is presently being developed by Yukon Barite Company. This property, about 23 miles southwest of MacMillan Pass, has surface indications of several million tons of drilling mud grade barite, much of which is pure enough that no beneficiation is required. Plans are currently underway to construct a mill in Ross River capable of producing roughly 20,000 tons per year.

The Anvil Range area continued to be active in 1976 with a number of companies carrying out drilling programs. Cyprus Anvil intersected a significant section of lead-zinc-silver mineralization on their DY claims roughly 12 miles southeast of the main Faro deposit. The mineralization is similar to that found in the GRUM deposit and was encountered at depths of 1,700 to 2,200 feet below surface. Further work is planned in 1977. On the GRUM deposit, the initial stage of surface and underground exploration and development has been completed and feasibility studies are currently underway. Reserves for the GRUM deposit are reported as 28.6 million tons of proven and probable ore, with an additional 10-12 million tons of potential ore indicated by drilling. The higher grade sections of the deposit carry up to 14 per cent combined lead and zinc and 2.6 ounces silver per ton.

In the Dawson Range, the level of exploration activity was relatively low although there were several drilling programs testing for porphyry copper-molybdenum deposits. These deposits are generally associated with Tertiary feldspar porphyry dykes and plugs and consist of disseminated and fracture-controlled sulphides in the altered intrusives and host rocks. Lead-zinc and gold-silver mineralization are often associated with these deposits. Gold-silver mineralization in particular appears to be localized along north-south trending fault zones. Results of a feasibility study carried out on the Minto copper deposit, 12 miles west of Minto, generally do not favour production in the near future. This deposit, which contains 8 1/2 million tons of 1.7 per cent copper, may become economic if the price of copper increases substantially.

Elsewhere in the Yukon, Claymore Resources recovered significant amounts of gold from their placer operation in the Moosehorn Range and are anticipating further work in 1977. Harman Management shipped roughly 100 tons of high grade silver-lead ore from the Plata property in the Hess Mountains. Noranda Exploration carried out further work on the McMillan property north-east of Watson Lake and Union Carbide carried out a reconnaissance exploration program for tungsten in eastern Selwyn Basin.

THE GOZ CREEK ZINC DEPOSIT,
YUKON TERRITORY

By
Albert F. Reeve*

INTRODUCTION

In June 1973, abundant dolostone rubble and stream debris mineralized with sphalerite was found in several tributaries of Goz Creek in a remote part of the eastern Yukon near the headwaters of the Bonnet Plume River. Sediment from these streams also contained concentrations of up to 7,700 ppm zinc and 360 ppm lead. These indications were subsequently traced to extensively mineralized outcrops of carbonate strata on east trending ridges about six miles in length (64°30'N, Latitude, 132°30'W Longitude). Twenty closely spaced diamond drill holes were bored in the general vicinity of the most promising outcrops in 1974 to determine the continuity and form of the richest mineralized zones. In 1975 a further thirty-five holes were bored on a wider spaced pattern to provide an estimate of the tonnage potential and overall distribution of the mineralization. The total length of the fifty-five drill holes is 20,448 feet. The Goz Creek prospect, owned by Barrier Reef Resources Limited, became conspicuous because of spectacular high grade outcrops which were easily examined by many geologists who visited the area. Also, the presence of large amounts of silica and smithsonite were considered unusual relative to other known carbonate-hosted zinc and lead deposits in western and northern Canada.

REGIONAL GEOLOGY

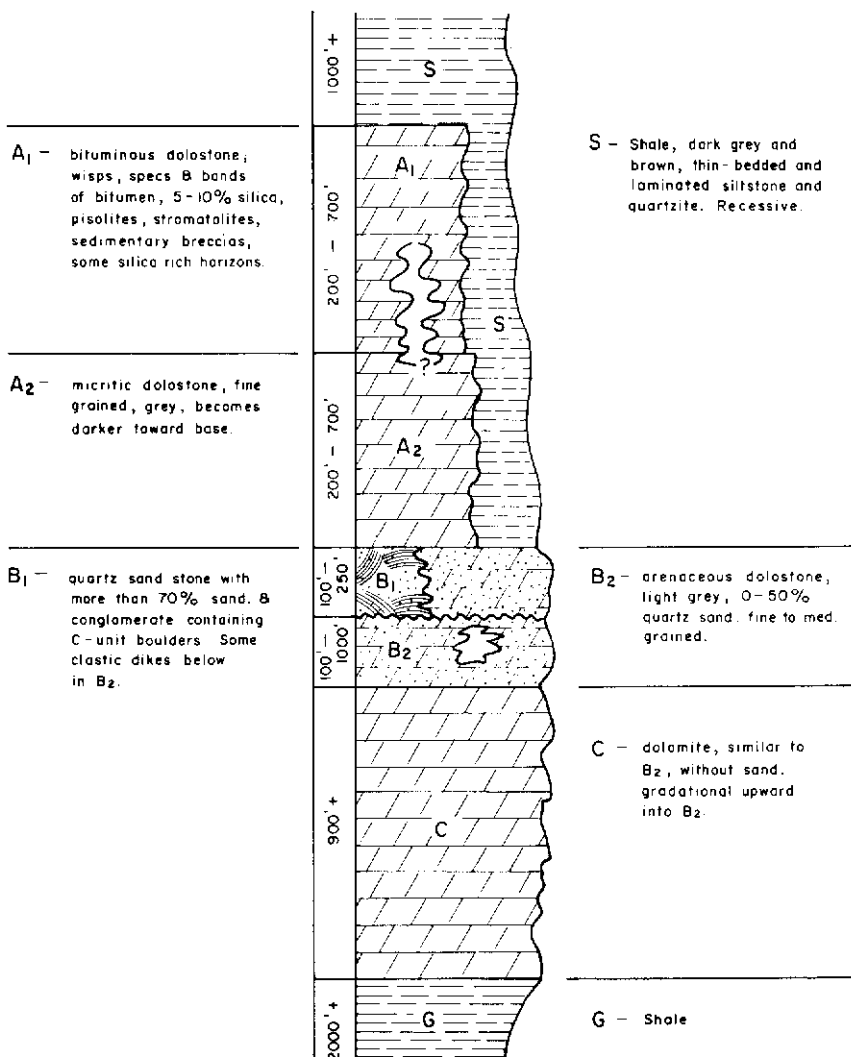
Goz Creek is situated on the southwest flank of the MacKenzie Mountains, which are composed of northwest trending folded and faulted Paleozoic and Proterozoic sedimentary strata. The Geological Survey of Canada published Preliminary Geological Maps of the region in 1953 and 1974 based upon reconnaissance mapping carried out by Wheeler in 1952, and by Blusson in the late 1960's and early 1970's.

Mature topographic development and typical trellis drainage patterns characterize the area. Local elevations range from about 3,500' to 6,500' ASL and glaciation appears to have been restricted to valleys below the 4,800' elevation in the immediate vicinity of Goz Creek.

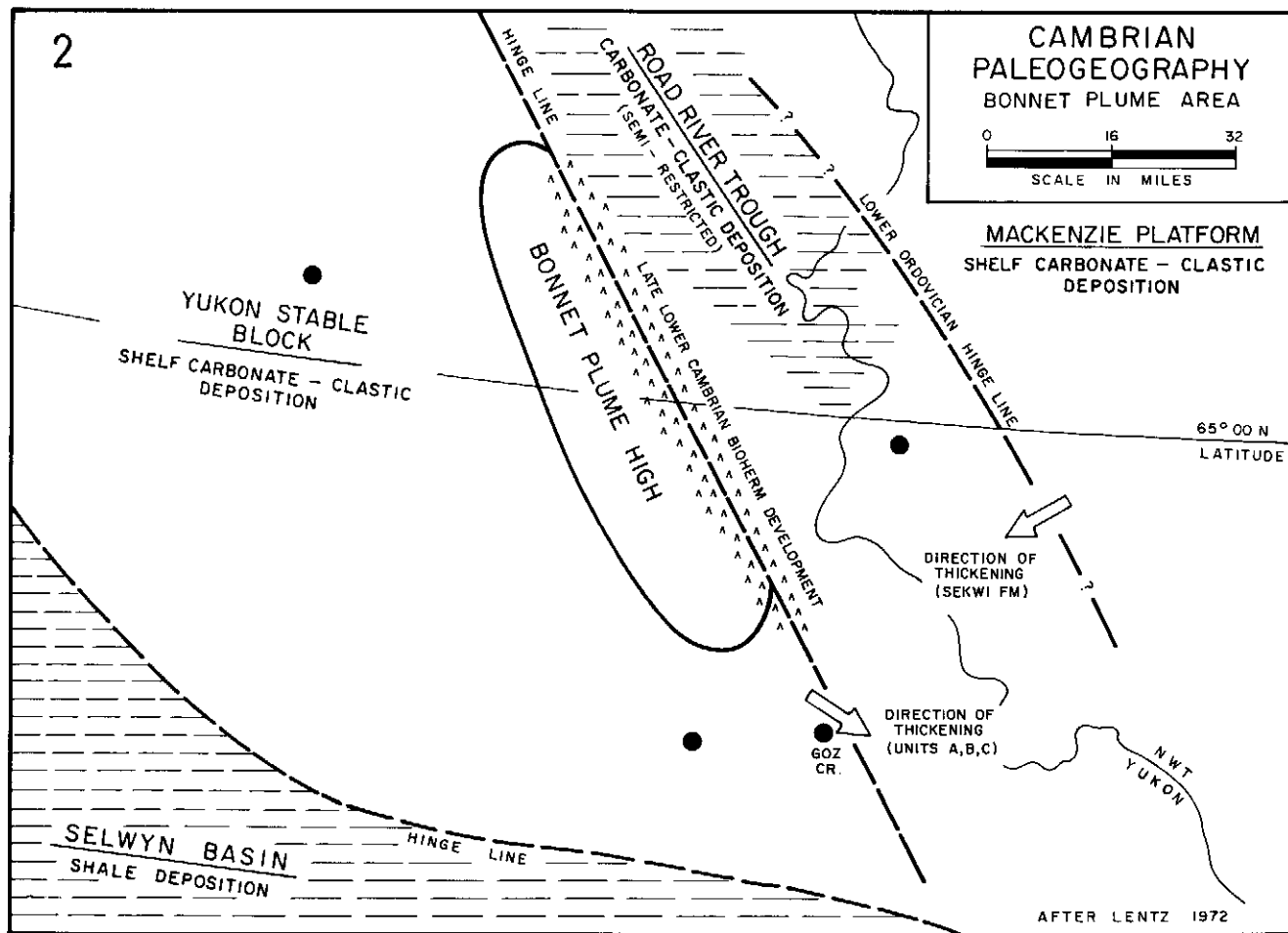
The mineralized carbonate sequence is part of the Lower Cambrian Sekwi or Backbone Formation overlain by a shale unit which is also believed to be of Lower Cambrian age. These rocks occupy a gently arched, triangular shaped structural block of about seventy square miles with its eastward trending south boundary along the valleys of Goz and Duo Creeks. The north and west boundaries of this area are marked by faults and the south by an apparent abrupt facies change from Lower Cambrian shelf carbonates southward into time-equivalent basinal shales. These Cambrian rocks are underlain by Proterozoic sediments which outcrop extensively to the south and southwest and are partially covered by younger Paleozoic sediments to the north.

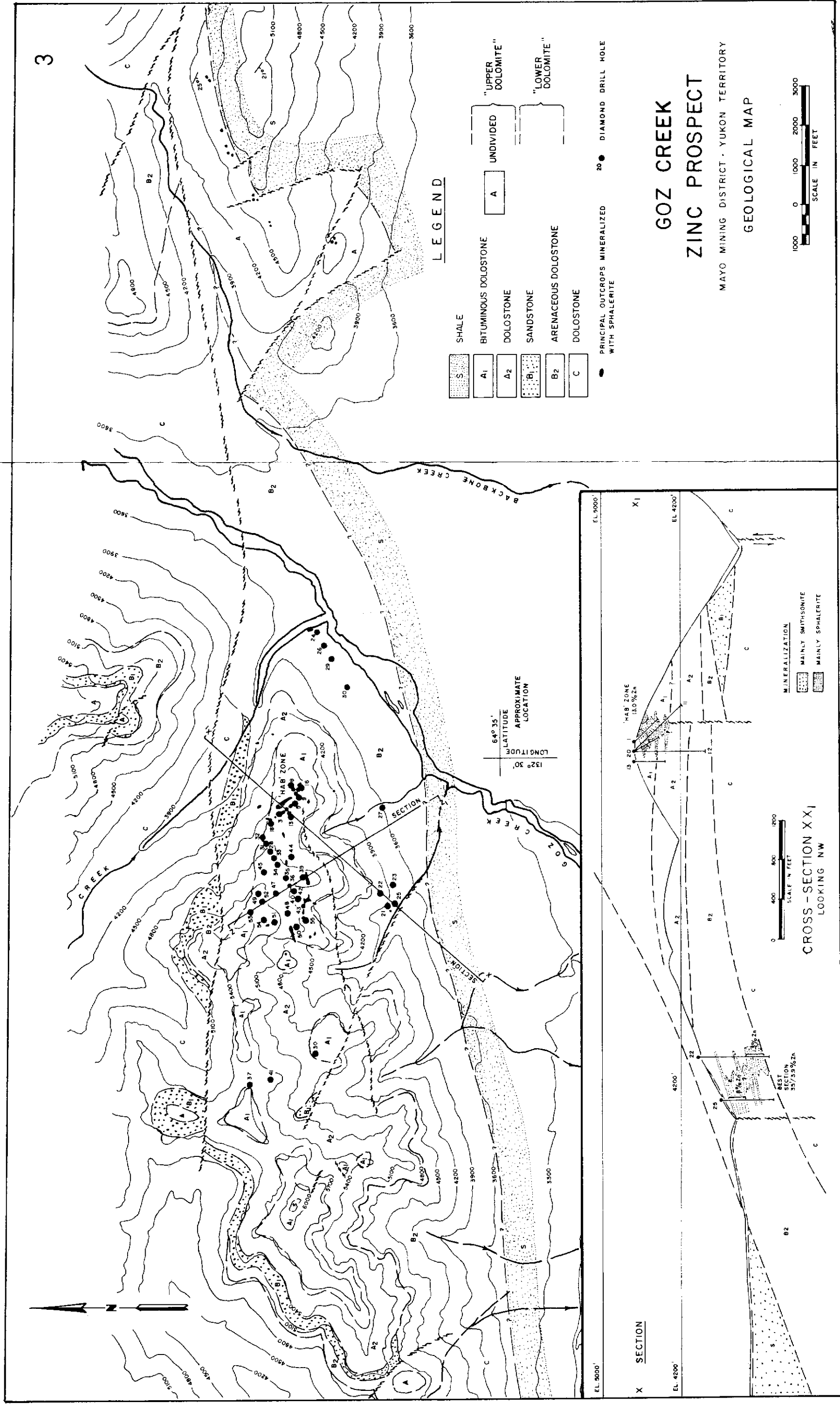
*Geologist, 904-675 West Hastings Street
Vancouver, B.C.

GENERALIZED STRATIGRAPHIC SECTION GOZ CREEK ZINC PROSPECT YUKON TERRITORY



— BRECCIAS & MANTOS MINERALIZED WITH SPHALERITE.





STRATIGRAPHY AND DEVELOPMENT OF THE HOST CARBONATE SEQUENCE

At Goz Creek more than 2,000 feet of carbonate strata were deposited in a shallow water marine environment near the southern extremity of the Bonnet Plume High (Lenz, 1972), an active structural feature which formed part of the shelf between the Sewlyn shale basin and the Road River Trough when they began to develop in Cambrian Time (see Figures 1 and 2).

The Goz Creek carbonates also occur on the southeastward projection of a hinge-line along the southwest edge of the Road River Trough.

The carbonate sequence at Goz Creek (Units A, B and C as shown on the stratigraphic column, Fig. 1) rapidly becomes thinner as it extends northwestward toward the interior of the Bonnet Plume shelf.

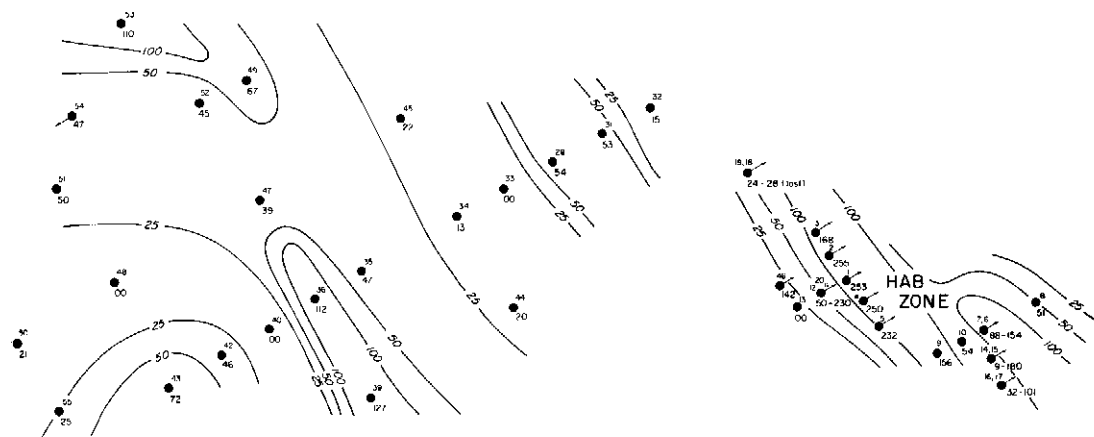
Initial subsidence of the shelf and deposition of the "C" and "B" carbonates was followed by a period of uplift and subaerial exposure marked by the sandy and conglomeratic "B₁" horizon. During this time diagenesis and dolomitization began, followed by the development of low displacement, near vertical faults: an east-trending group parallel to the hinge-line of the Selwyn Basin to the south and a northwest-trending group parallel to the hinge-line along the west side of the Road River Trough. The fractures and breccias which host the zinc mineralization in the "B₂" horizon appear to have formed along the northwest trending hinge-line faults by solution, slump and collapse in a paleokarst system beneath the unconformity at the top of the "B" horizon.

The "A" horizon carbonates were deposited as subsidence of the Bonnet Plume shelf resumed. This unit appears, at Goz Creek, to be a more seaward or frontal shelf facies closer to its basinal shale equivalent than the "B" or "C" units below. The "A" carbonates lack important quantities of sand and contain relic textures which are enhanced by the presence in some areas by wisps, bands, and blebs of pyrobitumen. Stromatolitic structures, slump talus and abundant pisolitic textures are present in the "A" horizon. An interpretation of the relationship between the "S" shale and "A" carbonates is shown on Cross Section XX, (Fig. 3) and assumes an abrupt southward shale out of the carbonate into "S" basinal shales.

Hinge-line faults were again active after the deposition of the "A" carbonates and acted as loci for the development of breccia systems and secondary fractures which were subsequently mineralized with sphalerite, silica and sparry dolomite. While specific evidence of an unconformity beneath which the "A" horizon breccias may have developed by a paleokarst process is lacking, it seems unlikely that such breccias could have developed in any other way considering the relatively passive structural environment.

Following carbonate deposition, dolomitization and preparation of openings in the "A₁" bituminous dolostone unit, subsidence of the Bonnet Plume shelf again resumed and the Goz Creek carbonate sequence was buried by basinal shales of the "S" unit.

The introduction of sphalerite, silica and sparry dolomite into fractures, vugs and breccias is believed to have occurred in a complex paragenetic process after shallow burial by the "S" shales. The exposure of mineralized outcrops by erosion and gentle arching of the host beds probably occurred during regional Larimide uplift. A lack of glacial activity above the 4,800 foot elevation since that time (Sangster, 1975; Hairsine, et al, 1975) allowed deep chemical weathering, up to 250 feet, of the upper "A₁" carbonates, resulting in large areas of leached, finely porous dolostone and the development of smithsonite on the flanks and tops of zones mineralized with sphalerite.



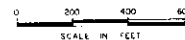
LEGEND

- 100 — HOLE NUMBER
- — DIAMOND DRILL HOLE LOCATION
- 50 — TOTAL LENGTH OF DRILL CORE CONTAINING MORE THAN 1/2% ZINC

THICKNESS DIAGRAM 'A' HORIZON ZINC MINERALIZATION

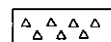
SHOWING THE TOTAL
LENGTH OF DRILL CORE
SECTIONS CONTAINING
MORE THAN 1/2% ZINC
IN EACH HOLE

GOZ CREEK
ZINC PROSPECT
MAYO MINING DISTRICT
YUKON TERRITORY



SCHEMATIC DIAGRAM OF GOZ CREEK MINERALIZATION

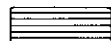
5



BRECCIAS 5% - 30% Zn (SILICEOUS)



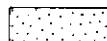
SPHALERITE SAND 30% Zn (SILICEOUS)



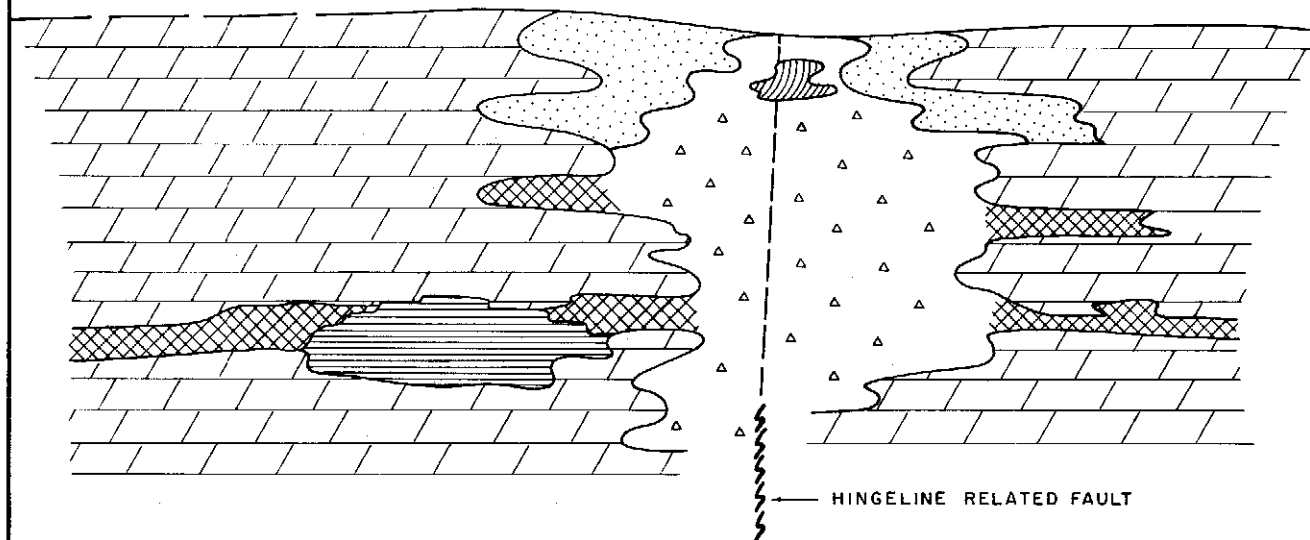
BANDED SPHALERITE 8% Zn (SILICEOUS)

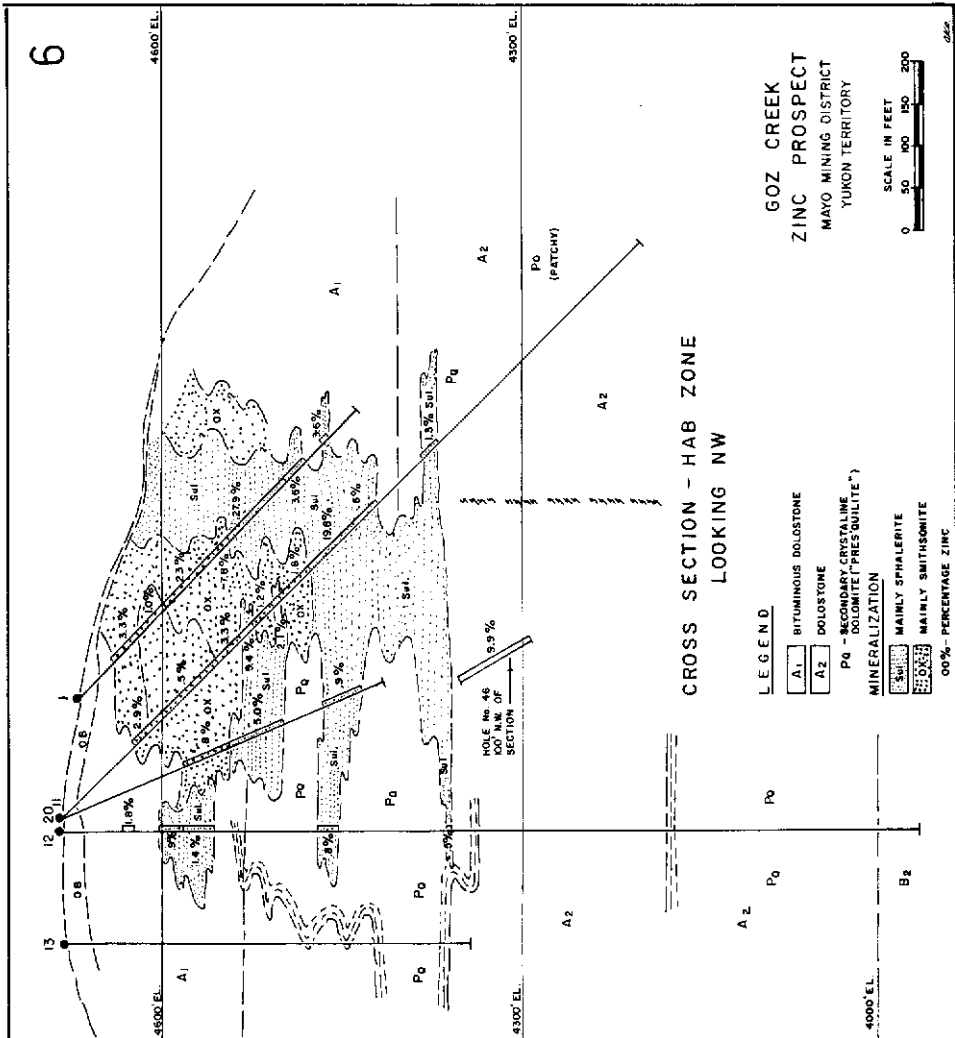


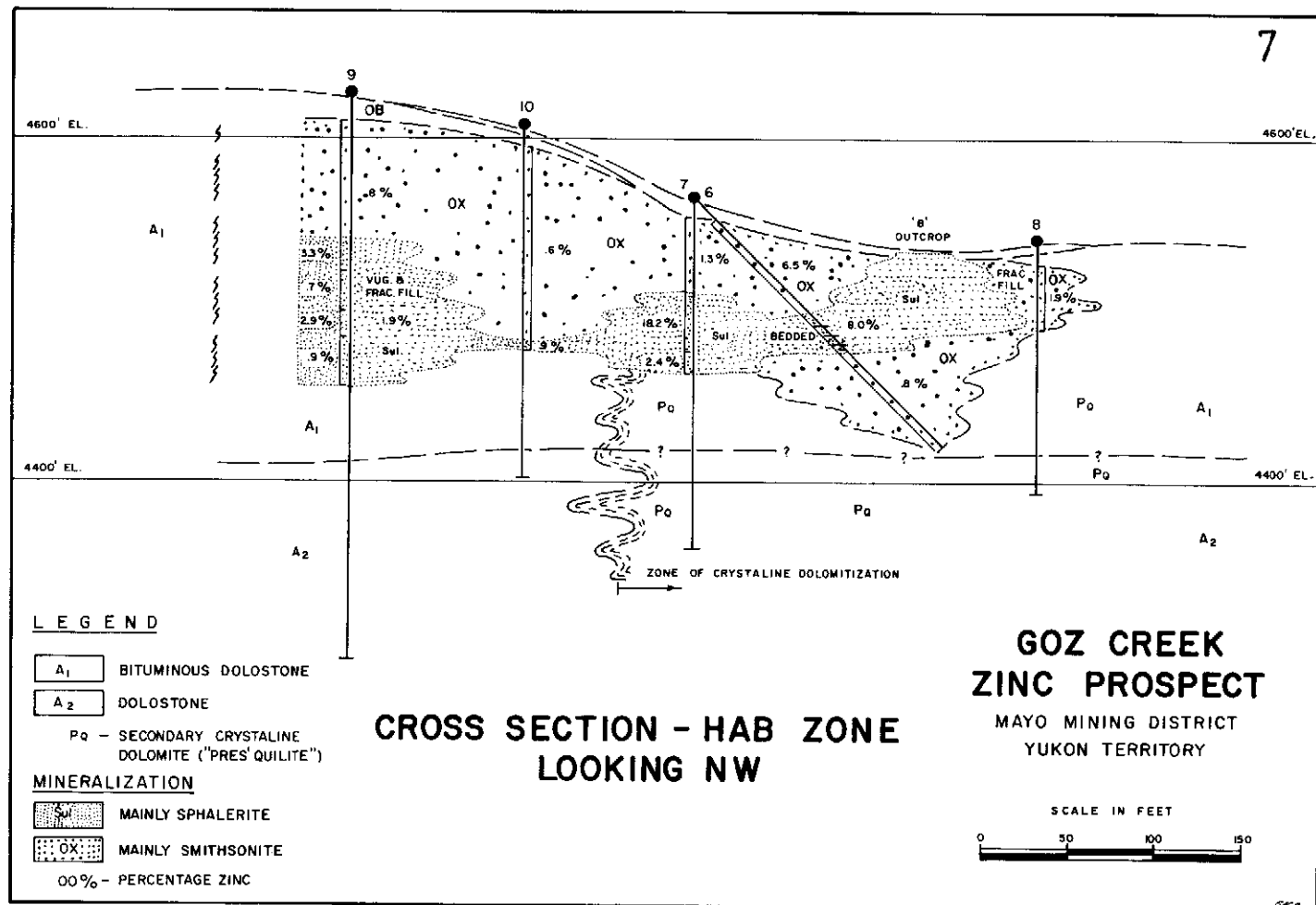
MANTOS, VUGS & FRACTURE
FILLINGS. 1-5% Zn.
(NON - SILICEOUS)

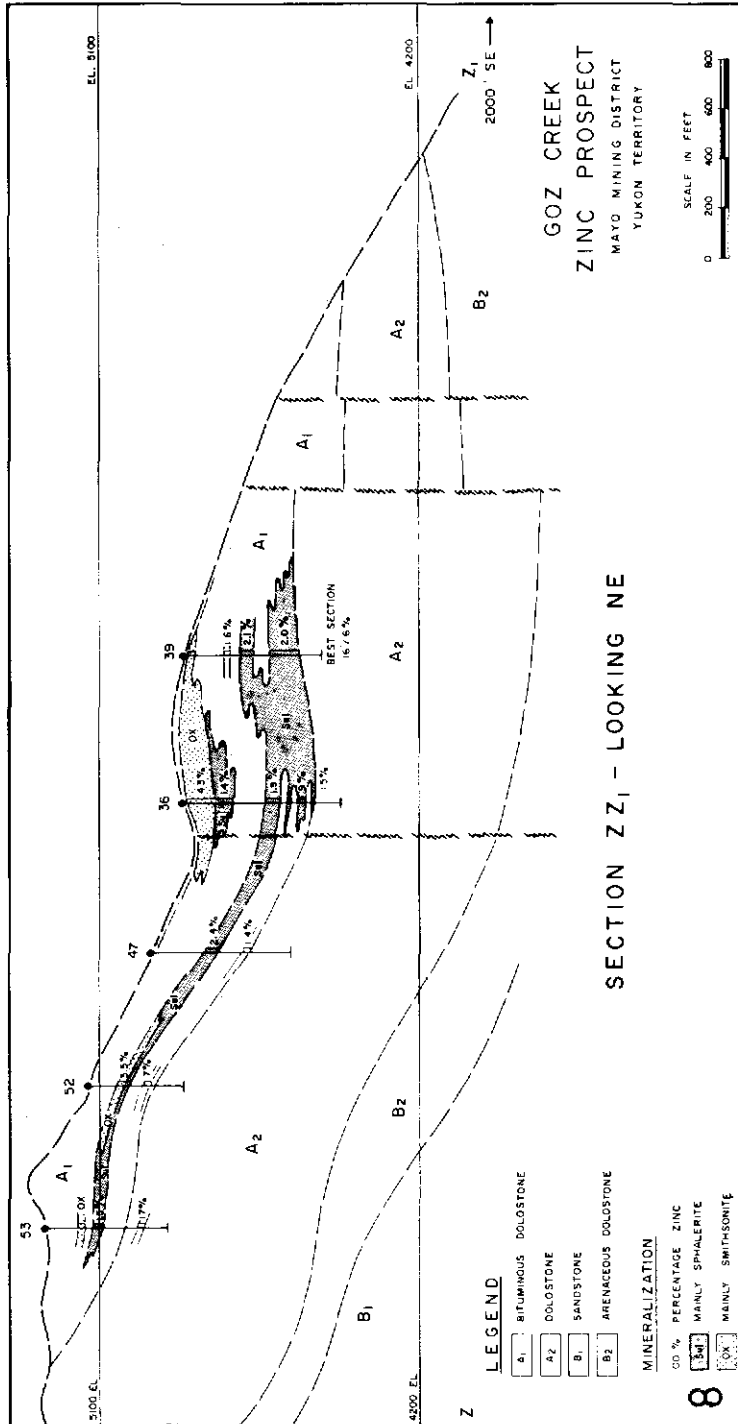


SMITHSONITE 2-10% Zn.









MINERALIZATION

(see Figures 4 and 5)

Breccias

Northwest trending, elongate, siliceous breccia zones are heavily mineralized with red, brown, yellow and light green sphalerite as well as very minor amounts of galena, pyrite and boulangerite. This material carries less than 0.5 ounces per ton silver and about 0.04 per cent cadmium. The sphalerite is iron poor with the red varieties containing variable amounts of manganese, indicated by pulverulent black residues on weathered surfaces. The breccias contain 5 to 30 per cent zinc, and have ragged terminations which extend laterally along apparent horizontal bedding planes as lean mantos or crude sheets.

These zones have a variety of cross-sectional shapes; for example, the HAB breccia zone, which is about 1,600 feet long, where it is cut by drill holes No. 1, 11, 12 and 20 (Fig. 6), has the shape of a truncated Christmas tree with a height of 360 feet and a maximum width of about 300 feet. The downward extent of the breccia on this section has not been determined and there is some possibility that it breaks through the "A₂" micritic dolomite unit to the "B₂" arenaceous dolomite and is related to known mantos in that horizon. Four hundred feet southeastward at the section cut by drill holes No. 6, 7, 8 and 9 (Fig. 7), the breccia zone is more stratiform, having an apparent horizontal dimension of 300 feet and a maximum height of 50 feet.

On their edges, the breccia matrices are filled with sphalerite, dolomite spar and quartz. As the high grade core is approached, sphalerite becomes dominant and replaces most of the breccia fragments and matrix constituents. Minor late stage fillings of white vitreous quartz accompanied by red sphalerite are present and the unreplaced breccia fragments are frequently completely silicified. Sphalerite occurs as coarsely crystalline aggregates, colloform and botryoidal growths and as floating crystals which occasionally form "snow-on-roof" textures.

Mantos

This type of mineralization consists of fracture fillings, disseminations and crystalline vug fillings of sphalerite that is mainly red in colour. It forms lean, irregular concordant zones several tens of feet in thickness that generally contain less than 5 per cent zinc, and in contrast to the higher grade breccia, is not particularly siliceous. A series of these mantos were intersected along Section ZZ₁ (Fig. 8), for a distance of 2,000 feet, where they average approximately 40 feet in thickness and contain 2 per cent zinc. They appear to have formed as weak fracture systems or crackle breccias along selected beds outward from the walls of the heavily mineralized collapse breccia.

The mantos generally occur in areas of vuggy secondary dolomitization which are characteristically porous. However, the dolomitization is far more extensive than the mineralized mantos.

Bedded Sphalerite

Finely disseminated sphalerite is contained in dense, rhythmically banded light and dark layers of silica which appear to have been precipitated as a gel. This type of mineralization occurs within and adjacent to the HAB breccia and about 2,000 feet to the west where the presence of a similar

breccia is suspected. This type of material was encountered in drill hole No. 6 (Fig. 7) where it is 16 feet thick and contains 8 per cent zinc. It has a restricted lateral extent and is believed to have been deposited in a quiet aqueous environment on the bottom of an open cavern more or less contemporaneously with the filling of vugs, fractures and breccia matrices, elsewhere in the local paleokarst environment.

The presence of finely layered sphalerite and silica with well developed primary bedding features raises the possibility that it was deposited syngenetically with the enclosing carbonate strata. However, an open space filling mode of deposition is more likely because it explains other, more abundant types of mineralization on the property in particular, and many other carbonate-hosted zinc deposits in general. In addition, it seems unlikely that such a delicate sediment would co-exist with the nearby pisolitic dolostones which seem to have been deposited in a shallow environment subject to considerable wave action.

A second type of bedded mineralization is composed of rounded, detrital sphalerite grains of sand size that are cemented by silica. It is hard, cross bedded, vaguely banded, and has a conchoidal fracture. One small outcrop of this material containing more than 30 per cent zinc was found in the upper part of the HAB zone. It is believed to have been formed by the erosion of pre-existing breccia mineralization and redeposited close to its source in the channel of an active underground stream.

Weathered Zones

The products of active chemical weathering extend to depths of up to 250 feet above 4,600 feet elevation, as evidenced by the occurrence of smithsonite and leached dolostone in drill core. During exploration the presence of zinc in both carbonate (smithsonite) and sulphide (sphalerite) form was recognized as an important metallurgical factor requiring special procedures in assaying 1,200 drill core samples. In addition to reporting the total zinc content in each case, the smithsonite component was leached from the sample by a weak acid solution and determined separately. Where more than 50 per cent of the zinc content is reported as soluble due to smithsonite content, the material represented by that sample has been classified as "oxidized". The oxidized parts of the deposits generally contain 1 to 10 per cent zinc and have well defined boundaries with limited transition zones of mixed smithsonite and sphalerite. The soft, friable character of the oxidized material prevented the production of reliably representative core samples.

Smithsonite zones occur on the upper flanks of the HAB highgrade breccia. This material is porous, light brown in colour and contains scattered plates and chips of vitreous white quartz. The quartz fragments are the only visible remnants of the original submassive mineralization and appear to have been substantially rearranged as a result of the breakdown of sphalerite to smithsonite, producing a potato chip texture that has been called "fluxo-breccia".

Lean fracture fillings and disseminations of smithsonite ($\pm$ 1 per cent zinc) are widespread in the upper parts of the mineralized "A" horizon. These seem to be partly the result of weathered mantos as well as the redistribution of smithsonite by meteoric water during the breakdown of zinc sulphides.

A third deep weathering phenomenon results in soft, porous, leached, buff coloured dolostone which occupies about one-half of the "A₁" bituminous carbonate unit in the area of the drilling grid. It is composed of pulverulent, light brown dolomite and silica. It was encountered above the 4,600 foot elevation in ten drill holes and has an average thickness of 110 feet below the surface. Sections of this material are mineralized with smithsonite and sphalerite in six holes. The origin of the leaching and its relationship to the zinc mineralization are uncertain; however, original, lean concentrations of pyrite may have provided sufficient acid to account for the partial breakdown and discolouration of the dolostone by meteoric waters.

CONCLUSION

At Goz Creek, simple aggregates of sphalerite, silica and dolomite have been deposited in open spaces, which have formed in a shelf carbonate strata under relatively passive structural conditions, remote from any intrusive or volcanic event. For these reasons, the mineralization is classed as "Mississippi Valley" type, notwithstanding the presence of an unusually large proportion of silica and its relationship to a fault system. In summary, the important geological elements and events to which the Goz Creek mineralization is related are as follows:

1. Carbonate strata were deposited in a shallow marine environment on an active northwest trending basin-edge, hinge-line during at least two cycles of subsidence and uplift.
2. Low displacement, hinge-line-related faults were re-activated periodically during the deposition and diagenetic processes and formed the loci of paleokarst openings during two periods of uplift and subaerial exposure.
3. Zinc sulphide, silica and dolomite were introduced into the paleokarst openings during or following burial of the host carbonate sequence.
4. Exposure occurred during Larimide uplift and secondary zinc carbonates were subsequently formed and preserved due to the absence of glaciation above an elevation of 4,800 feet.

Any theory concerning the source and means of conduction of mineralizing fluids into the deposition sites is very speculative; however, two well known concepts bear some consideration:

Jackson and Beales (1967) have suggested with respect to the Pine Point ore field, that the metal source is stratigraphically equivalent basinal shale and that during compaction the metals migrated in connate brines into porous reefs peripheral to the basin and were deposited as sulphides in secondary openings such as collapse breccias. This idea is currently popular because it accommodates some recent thoughts on the volcanogenic deposition of base metal deposits in shale basin environments.

An earlier Pine Point concept, proposed by Campbell in 1966, is that hinge-line faults may have been conduits for the delivery of mineralizing solutions from a deep source as well as being important controls with respect to the development of reefal shelf carbonate strata and the preparation of open spaces in which the sulphides were deposited.

ACKNOWLEDGMENTS

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GEOLOGY OF THE MACMILLAN TUNGSTEN DEPOSIT

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INTRODUCTION

MacMillan Tungsten is a contact metasomatic deposit in gently dipping Lower Paleozoic limestone and limestone breccia adjacent to a Cretaceous quartz monzonite stock. Four tabular tungsten skarn horizons contain total geological reserves of 30 million tons grading 0.9% WO_3 .

LOCATION AND ACCESS

MacMillan Tungsten is located on the border of Yukon and Northwest Territories at a latitude of $63^{\circ}17'$ and altitude of 1,800 m above sea level. The deposit lies within the Selwyn Mountains 10 km from the Canol Road and 660 km by road from Whitehorse.

HISTORY

The property was discovered and staked in September 1962 by J.F. Allan for Southwest Potash Corporation to cover the source of scheelite-bearing skarn float found in the headwaters of Cirque Lake Valley. Eighty-nine claims comprise the Yukon portion of the property, forming the following claim groups: PAT, BETTY, BORDER, PAR, PIT, DONNA, GULL.

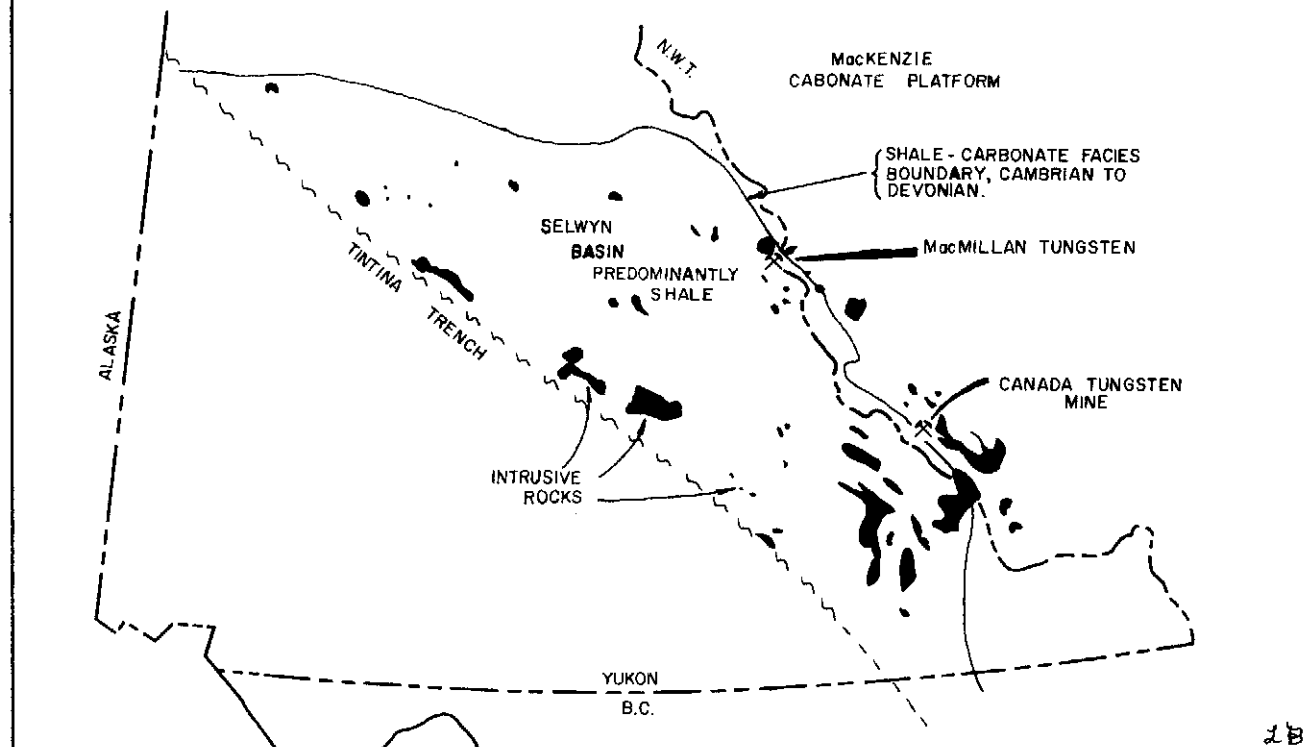
Exploration work on the property conducted mainly between 1968 and 1973, includes geological mapping, 10,500 m of diamond drilling in 73 holes, and 735 m of underground exploration. Mill tests were carried out on a 300 ton bulk sample obtained underground. Preliminary feasibility studies, collection of weather data and a variety of environmental studies have been carried out since 1973.

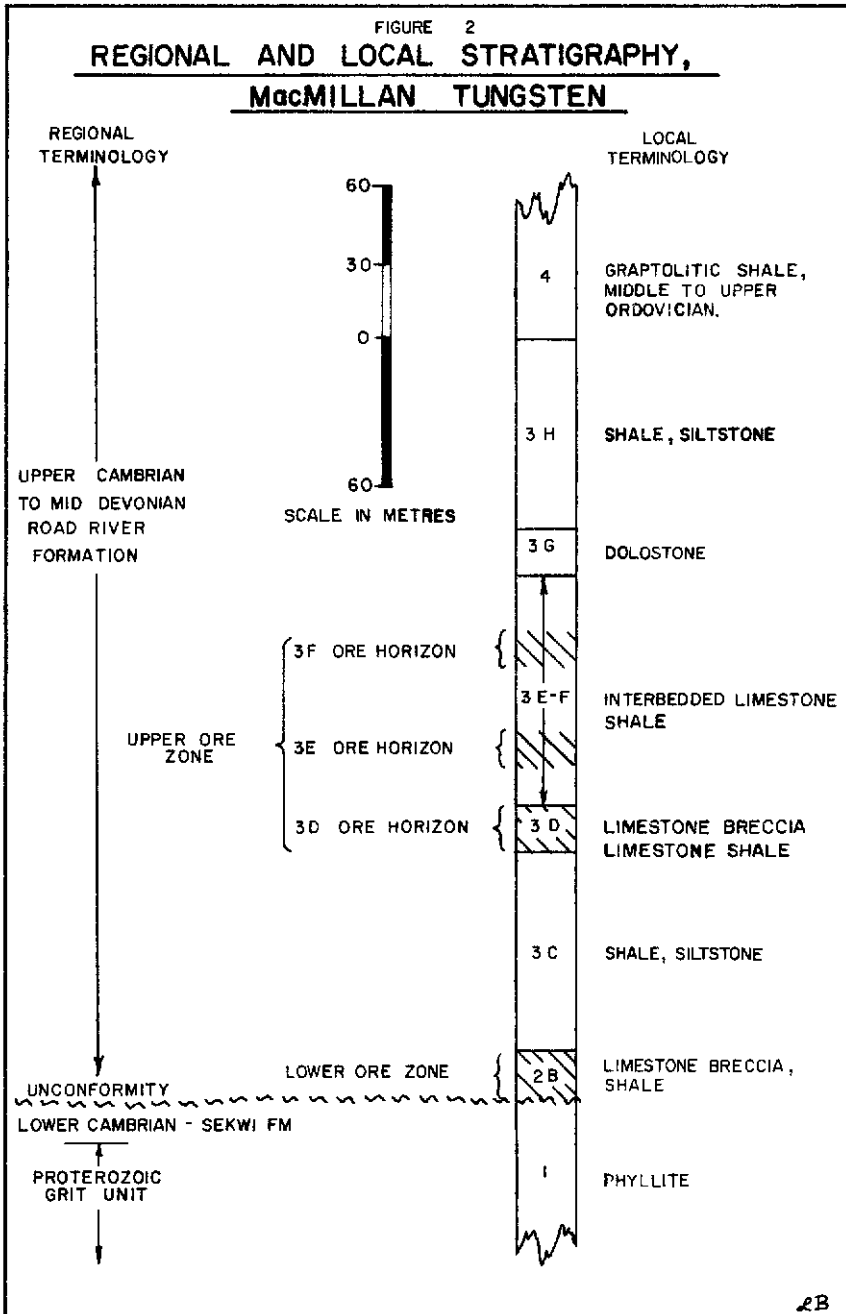
REGIONAL GEOLOGICAL SETTING

Regionally, Late Proterozoic and Paleozoic miogeosynclinal strata are intruded by stocks of Cretaceous quartz monzonite. The miogeosynclinal strata were deposited in two distinct structural environments: the Mackenzie Platform to the northeast, where the predominant rock type is carbonate, and the Selwyn Basin to the southwest, where the predominant rock type is shale (Fig. 1). MacMillan Tungsten is situated in a zone of mixed shale and carbonate near the facies boundary separating these two environments.

Regional stratigraphic divisions which correlate with rocks at the MacMillan Tungsten deposit are: The Grit Unit, the Sekwi Formation and the Road River Formation (Fig. 2). The Upper Proterozoic Grit Unit, correlated with Unit 1 on the property, consists of shale and siltstone west of the carbonate-shale facies boundary shown in Fig. 1, but contains minor limestone east of this boundary. The Lower Cambrian Sekwi Formation, which lies conformably on the Grit Unit, consists of dolomite and dolomitic limestone on the Mackenzie Platform. This formation thins to the west and is not present west of the facies boundary shown in Fig. 1. At MacMillan Tungsten the Sekwi Formation may be absent or may be correlative with Unit 2B on the property. Mid-Cambrian to Mid-Devonian Road River Formation consists of shaly limestone in the Selwyn Basin and is time equivalent to formations of dolostone and

FIGURE 1
LOCATION AND REGIONAL GEOLOGY OF MacMILLAN TUNGSTEN





limestone on the Mackenzie Platform. Units 2, 3, 4 at MacMillan Tungsten are correlated with the Road River Formation.

Cretaceous intrusive rocks occur mainly within the Selwyn Basin, although tungsten deposits and prospects associated with these intrusions are concentrated along the eastern margin of the Basin where carbonate rocks are present. This region contains the Canada Tungsten Mine, the MacMillan Tungsten deposit and numerous skarn and vein tungsten occurrences.

LOCAL GEOLOGY

General Statement

At MacMillan Tungsten, phyllite is unconformably overlain by gently dipping limestone breccia, shale and carbonate. All rocks have been intruded by a quartz monzonite stock (Cirque Lake Stock) which altered shale to argillite or hornfels and carbonate to skarn. Property geology is shown in plan on Fig. 3 and in section on Fig. 4 and 5.

There are two ore zones: the Lower Ore Zone is a single scheelite skarn horizon, whereas the Upper Ore Zone contains three separate scheelite skarn horizons. Numerous quartz-scheelite and calcite veins occur in and near the ore zones. Zoning is indicated in the Lower Ore Zone by the distribution of skarn types and tungsten grade.

Stratigraphy

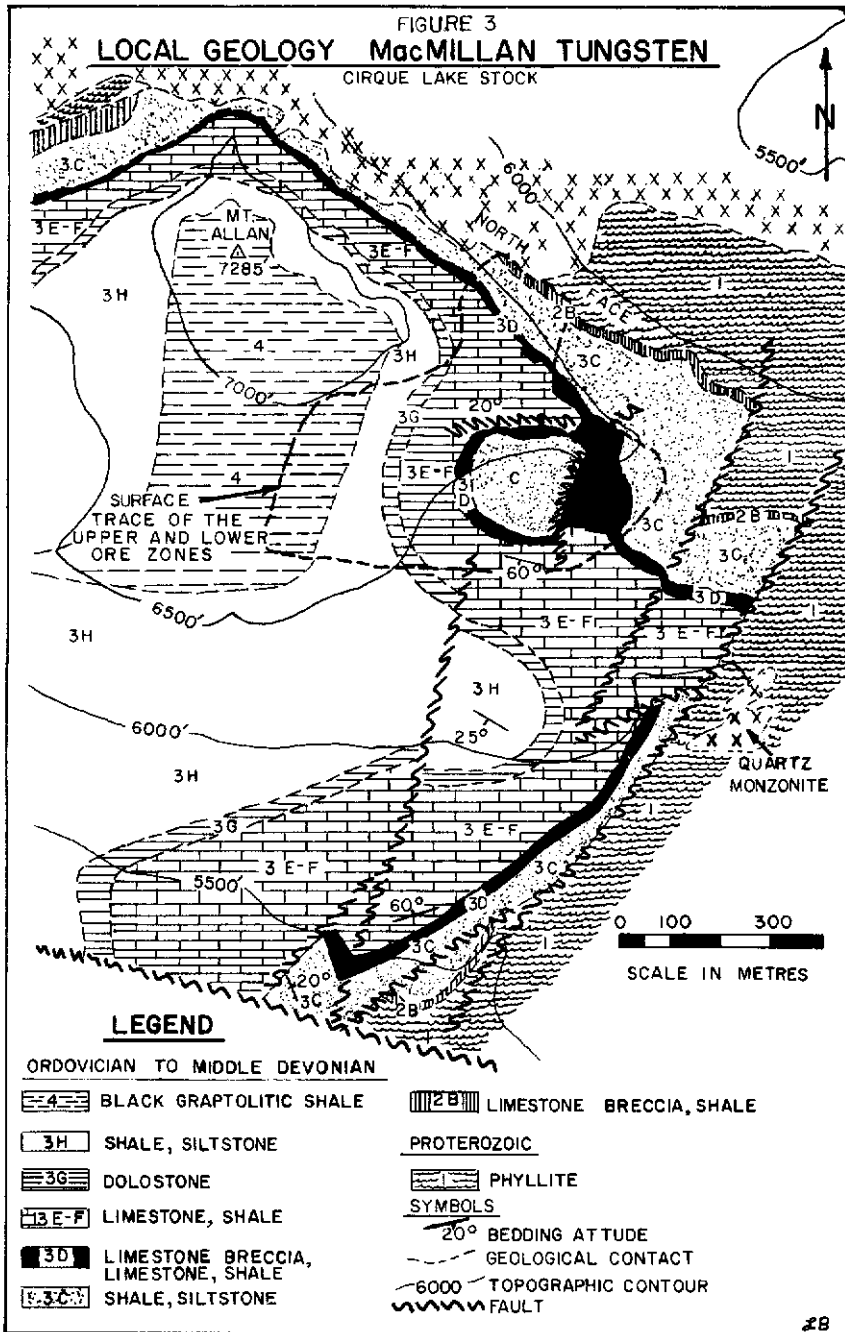
Unit 1 - Upper Proterozoic Unit 1, which is at least 750 m thick is thought to be equivalent to the Grit Unit. It is a grey mica phyllite composed of quartz, muscovite, biotite, chlorite and altered andalusite porphyroblasts. The contact between Units 1 and 2 is sharp and thought to be a Lower Cambrian unconformity.

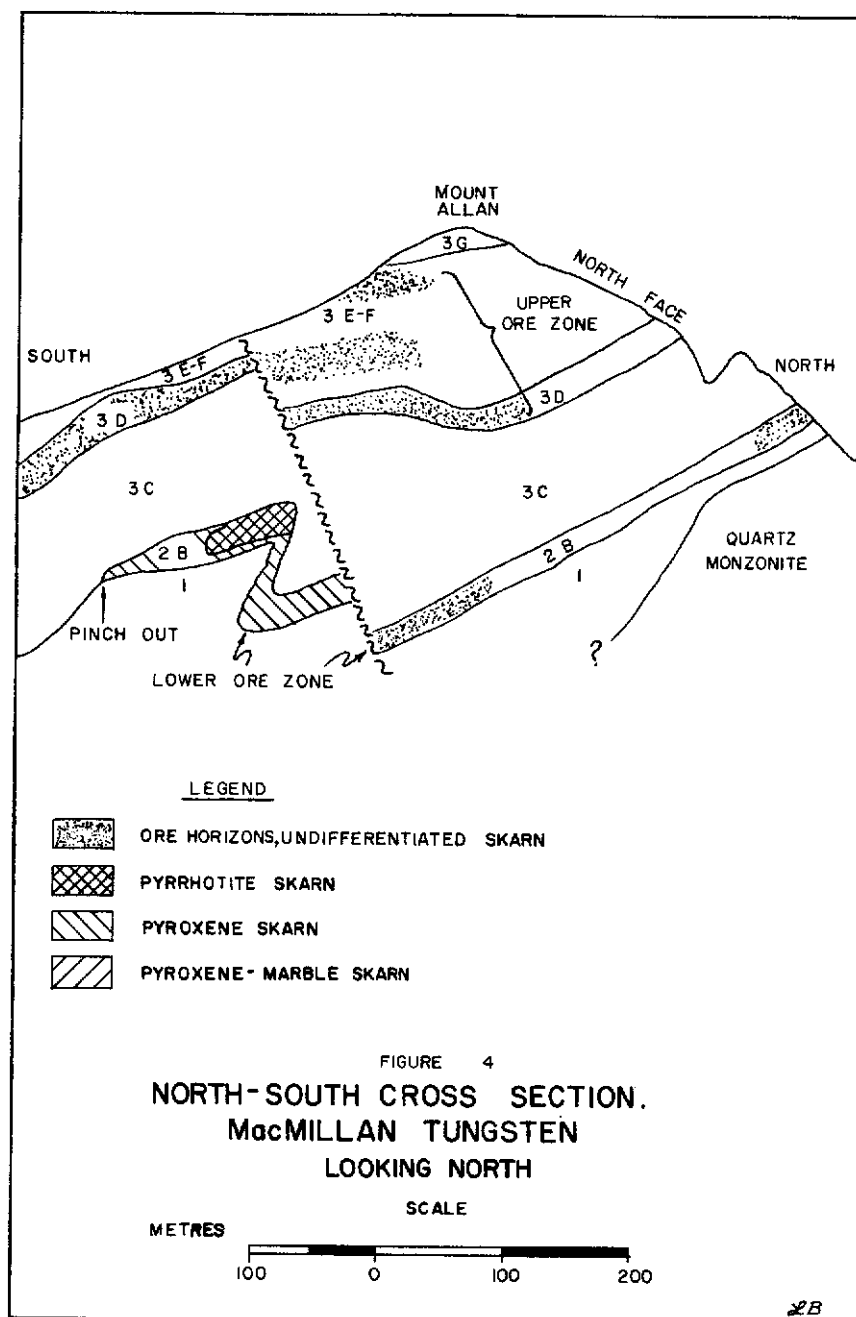
Unit 1 is recrystallized to a spotted biotite hornfels near the contact with skarned Unit 2B. This recrystallized zone ranges from 0 to 24 metres thick, averaging 3.6 m. It consists of fine-grained brown hornfels with 4 mm wide clots of fine-grained biotite concentrated in layers 12 mm thick. Unit 1 is tourmalinized near the Cirque Lake Stock. Locally acicular black tourmaline crystals 2.5 cm long constitute 50 per cent of the rock.

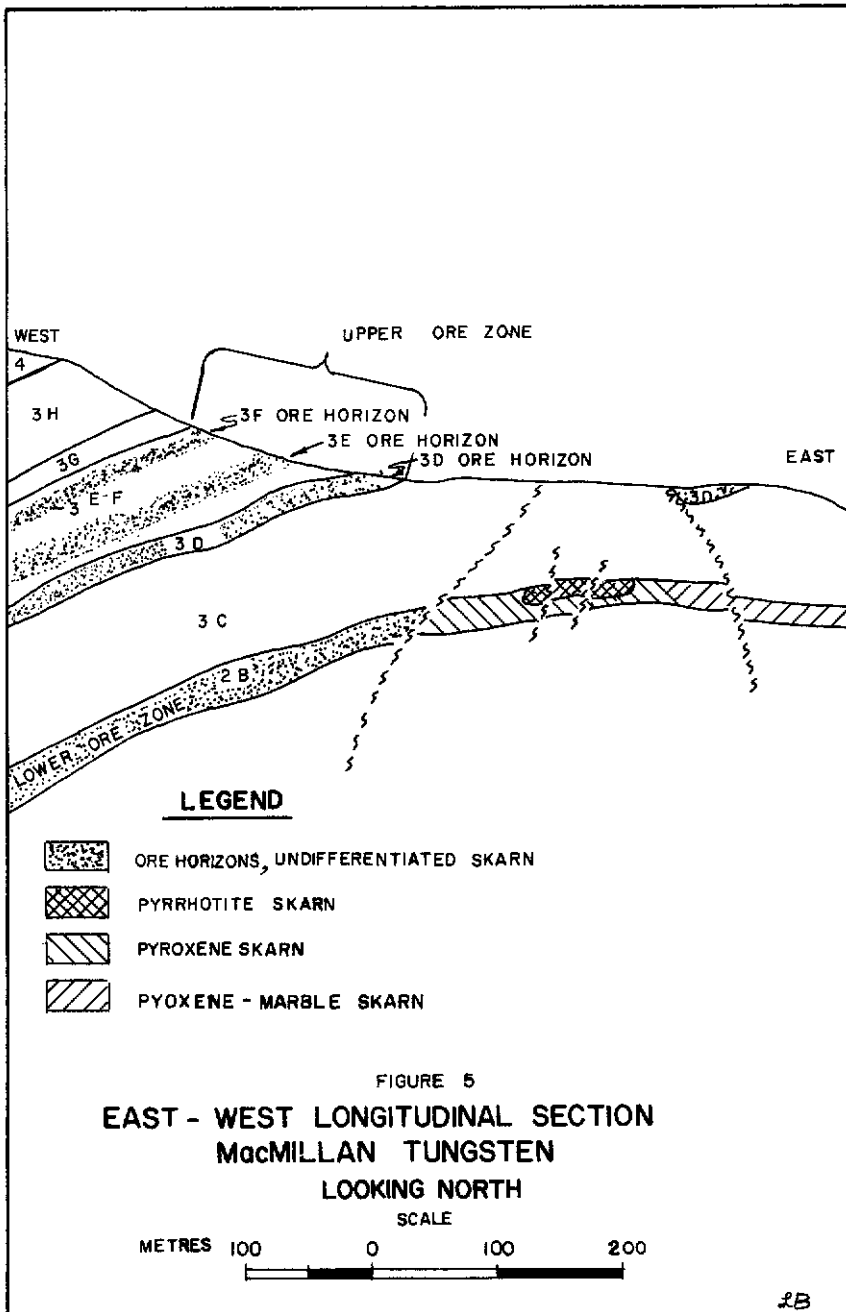
Unit 2B is a limestone-shale slump breccia developed on the Precambrian basement. It is thought to represent the base of the Road River Formation but may be correlative with the Sekwi Formation. An 18 m section of unaltered Unit 2B, 300 m east of the mineralized zone, consists of limestone breccia with minor shale beds up to 1 m thick. The limestone breccia contains black shale fragments up to 10 cm across in a grey limestone matrix.

The sharp lower contact between Units 2B and 1 is considered to be an unconformity because of the abrupt change from foliated rock of Unit 1 to non-foliated rocks of the overlying units. The upper contact of Unit 2B is sharp and conformable.

Near the Cirque Lake Stock Unit 2B has been altered to scheelite skarn and forms the Lower Ore Zone. In the skarned area 2B is from 0 to 35 m thick, averaging 9.5 m. From its exposure on the North Face of Mount Allan (Fig. 4) Unit 2B dips 20° south for 210 m, is contorted into a recumbent fold and finally pinches out 360 m south of the North Face. This abrupt pinchout is considered to be either an original sedimentary feature or a large scale boudinage structure.







Since underground exploration has been confined to skarned 2B (the Lower Ore Zone) this unit has been mapped in the most detail and has been subdivided into five skarn types. Pyroxene-marble skarn, pyroxene skarn and pyrrhotite skarn form a continuous series in terms of increasing degree of metasomatic alteration and increasing amount of scheelite. Minor cherty skarn and chlorite skarn occur with the three main skarn types.

Pyroxene-marble skarn is found at the eastern portion of skarned Unit 2B where it comprises approximately 20% of the unit (Fig. 5). It is composed of grey marble and cherty skarn fragments, in a matrix of pyroxene-tremolite skarn. Scheelite is low grade and restricted to the matrix.

Pyroxene skarn is the dominant skarn type (approximately 70%) in Unit 2B (Figs. 4 and 5). The major minerals are pyroxene and quartz, with minor amounts of pyrrhotite (less than 15%), scheelite, chalcopyrite, garnet and carbonate, and trace amounts of wollastonite, tremolite and sphene. Grossularite-rich pyroxene skarn occurs as small pods (up to 1.5 m) within pyroxene skarn and may represent metasomatized fragments of pelitic sediments. Pyroxene skarn contains approximately 15% cherty skarn fragments, thought to be altered shale, and rare fragments of spotty biotite hornfels derived from Unit 1. Scheelite is disseminated through the pyroxene skarn and is concentrated along bedding planes and fragment margins. Garnet-rich patches, cherty skarn fragments and hornfels fragments within the pyroxene skarn contain only traces of scheelite.

Pyrrhotite skarn makes up approximately 10% of the total skarn in Unit 2B and forms the high grade core of the Lower Ore Zone (Figs. 4 and 5). Contacts between pyrrhotite and pyroxene skarn are arbitrarily placed where pyrrhotite exceeds 15%. Pyrrhotite skarn is fine- to medium-grained and consists of quartz, pyrrhotite (15 to 50%), pyroxene, scheelite and minor chalcopyrite (up to 1.5%). Although pyrrhotite skarn appears massive, the distribution of scheelite outlines relict banding and breccia fragments.

Cherty skarn occurs as fragments and rare bands within the three main skarn types. It is hard aphanitic light green rock composed of quartz, pyroxene, and minor garnet, pyrrhotite, and scheelite.

Chlorite skarn is a soft, incompetent rock which occurs in minor amounts in and near post-mineral faults. It is superimposed on all other skarn types.

In going from one of the main skarn types to chlorite skarn the mafic minerals are altered to chlorite, pyrrhotite is altered to pyrite but the scheelite content remains constant.

Unit 3C consists of thinly bedded, fissile black shale and siltstone with rare lenses and beds of limestone which occur in the upper and lower portions of this 60 to 90 m thick unit. The 3C-2B contact is sharp and conformable while the 3C-3D contact is gradational and conformable.

Within the alteration zone, Unit 3C consists of irregular zones and wedges of massive black argillite within brown hornfels. Black argillite, the weakly hornfelsed equivalent of shale and siltstone, has a weak conchoidal fracture and contains pyrite and pyrrhotite as disseminations or concretions. Bands in the argillite contain 1 to 2 mm rectangular pseudomorphs of white mica after andalusite (?). The more intensely altered brown hornfels is composed of quartz, plagioclase, biotite, muscovite, pyrrhotite and chalcopyrite. Brown hornfels contains light grey lenses thought to be siltstone boudins. Limestone beds and lenses with Unit 3C are skarned but are too small to be of economic value.

Unit 3D ranges from 10 to 27 m thick and is characterized by limestone-shale breccia beds intercalated with well bedded grey limestone and black shale. Limestone-shale breccia beds are from 2.5 cm to 1 m thick, make up an estimated 25% of Unit 3D and are composed of subangular to subrounded shale fragments in a grey limestone matrix. The upper and lower contacts of Unit 3D are gradational and are respectively placed at the topmost and lowermost breccia bed.

Near the Cirque Lake Stock, Unit 3D is the lower ore horizon of the Upper Ore Zone. Altered Unit 3D rock types in this zone are: skarned breccia, interbanded cherty skarn and pyroxene skarn, light coloured hornfels and black argillite. Skarned breccia consists of fragments of cherty skarn, hornfels, and rare vein quartz in a matrix of pyroxene skarn. Scheelite is evenly disseminated in skarned breccia and pyroxene skarn.

Unit 3E-F was originally separated into Unit 3E and Unit 3F but it is now recognized as a single unit of interbedded limestone and shale, averaging 90 m thick. An ideal section from bottom to top contains 18 m of black shale with rare limestone beds, 24 m of interbedded black shale and limestone, 18 m of black shale with rare limestone, 27 m of interbedded limestone and black shale, and 3 m of pyritiferous black shale. The Upper 3E-F contact is sharp and conformable whereas the lower contact is gradational.

Near the Cirque Lake Stock the two limestone-rich sections of Unit 3E-F are the two upper ore horizons of the Upper Ore Zone. Within these horizons, limestone beds up to 25 cm thick are altered to dark green pyroxene skarn with disseminated scheelite while intervening black shale is altered to black argillite or light grey hornfels.

Unit 3G is a resistant 18 m thick bed of black to grey dolostone with sharp, conformable upper and lower contacts. Within the skarn zone Unit 3G is a grey quartz-talc-tremolite hornfels with only a trace of pyroxene and scheelite.

Unit 3H, with an average thickness of 74 m, is comprised of thinly bedded pyritiferous black shale, siltstone and rare lenses of grey limestone. The upper contact is gradational but the lower contact is sharp.

Hornfelsed Unit 3H is generally black argillite which contains 2 mm wide white spots of fine-grained muscovite. Light grey to brown hornfels represents more intensely altered Unit 3H.

Unit 4 is a thinly bedded graptolitic black shale which forms the peak of Mount Allan. This unit contains no limestone and is not altered. Middle to Upper Ordovician graptolites from this unit have been identified by the Geological Survey of Canada.

Intrusive Rocks

The Cirque Lake quartz monzonite stock and related dykes cut all sedimentary rocks on the property.

The Cirque Lake Stock measures 2.4 km by 1.2 km with its long axis striking east. A potassium-argon date of 89 m.y. has been determined by the G.S.C. on biotite from the stock. On the north facing slope of Mount Allan the intrusive contact parallels bedding. The only drill hole intersection of the Cirque Lake Stock at depth is located 150 m south of the North Face of Mount Allan and indicates that the contact is approximately parallel to bedding. The deepest drill hole stopped 90 m below Unit 2B and although it penetrated

numerous quartz monzonite dykes it did not reach the stock. The attitude and depth of the intrusive contact beneath the ore zones is therefore unknown.

Two phases of quartz monzonite are recognized in the Cirque Lake Stock; a sub-porphyritic variety which predominates, and a younger medium-grained massive phase. Sub-porphyritic quartz monzonite contains 10% orthoclase perthite phenocrysts 10 mm long and 3% quartz phenocrysts 5 mm across. The medium-grained phase and matrix of the porphyritic phase are similar, with a massive granitic texture, 2-5 mm grain size and a modal composition of potassium feldspar (35%), plagioclase (24%), quartz (33%), biotite and chlorite (5%) and accessory amounts of apatite, fluorite, zircon, muscovite, allanite and scheelite.

A few porphyritic or medium-grained massive quartz monzonite dykes, mineralogically similar to the Cirque Lake Stock, cut all units. They are most abundant in Unit 1 beneath the ore zones.

Structure

Sedimentary strata and the conformable ore horizons have an average strike and dip of N55°W, 20°S. Strata in the mineralized zone are deformed by one recumbent fold and steeply dipping normal faults.

The recumbent fold, identified only in the Lower Ore Zone, has an axis which strikes N80°E and plunges 10°W (Figs. 4 and 5). This fold has elevated the southern limb 60 m above the northern limb; its central limb is only one metre thick at its thinnest point.

Small folds and crenulations throughout the property strike northeast and plunge 5 to 10° southwest.

The pinchout of the Lower Ore Zone is coincident with an abrupt steepening in the dip of the beds from 20°S to 50°S (Fig. 4). The beds flatten to 20°S again further south.

The skarned area is broken into numerous blocks by northeast, northwest and easterly striking normal faults. The faults postdate skarning and displace contacts from 1 to 45 m (Figs. 4 and 5).

Ore Zones

The orebody contains geological reserves of 30 million tons at 0.9% WO_3 and is comprised of the Lower Ore Zone of one horizon and the Upper Ore Zone of three horizons. The Lower Ore Zone is separated from the Upper by an average of 78 m of barren hornfels (Unit 3C).

The Lower Ore Zone, with geological reserves of 7 million tons at 1.48% WO_3 and 0.25% Cu is defined on three sides but is open to the west (Figs. 4 and 5). The upper and lower boundaries of the ore zone are sharp and coincident with contacts of Unit 2B.

Zoning of skarn types and scheelite grade is evident in the Lower Ore Zone. High grade pyrrhotite skarn is located at the apex of a dome in the Lower Ore Zone. Pyrrhotite skarn is surrounded by intermediate grade pyroxene skarn, which in turn is bounded by low grade pyroxene marble skarn to the east (Figs. 4 and 5). Western limits of the Lower Ore Zone have not been defined so it is not known if the zoning will be reflected to the west.

The Upper Ore Zone consists of three separate skarn horizons. The 18 m thick Unit 3D forms the lowest horizon, while two limestone-rich sections of Unit 3E-F with thicknesses of 24 m and 27 m form the middle and upper horizons, respectively. Each ore horizon is separated by 18 m of barren argillite and hornfels.

In the Unit 3D ore horizon, scheelite is disseminated in skarned limestone breccia beds up to 1 m thick and in skarned limestone beds up to 25 cm thick.

The two upper ore horizons are similar in that scheelite-bearing pyroxene skarn is in layers up to 25 cm thick separated by barren hornfels or low grade cherty skarn.

Veins

Quartz, calcite and zeolite veins, which may contain scheelite, pyrrhotite, tourmaline, chalcopyrite, molybdenite or pyrite, cut all altered rocks and the Cirque Lake Stock but are most abundant above and below the Lower Ore Zone (up to 36 per m) and within the Upper Ore Zone. Although many veins contain scheelite they contribute little to the grade of the deposit because of their small volume relative to the skarn. Details of vein type are tabulated (Table 1). General observations are listed below.

1. The mineralogy of a vein is generally similar to the mineralogy of the host rock. Most calcite veins are in skarn and most quartz veins are in pelitic hornfels.
2. Calcite veins and chloritized skarn are frequently in fault zones up to 4.5 m wide.
3. There are at least two and probably more ages of quartz veins. The oldest veins are parallel to bedding and have been folded and offset by faulting. They are cut by quartz veins that are typically wider, more continuous and more steeply dipping.

ORIGIN

MacMillan Tungsten is a contact metasomatic skarn deposit formed by the interaction of magmatic hydrothermal fluids and limy sedimentary rock.

Three factors were important in the formation of this deposit: a tungsten-rich stock, carbonate rocks in contact with the stock which localized the precipitation of tungsten-rich fluids, and a plumbing system through which solutions were transported from the stock to the carbonates.

In a study of the primary distribution of trace elements in plutons, R.G. Garrett (1970) sampled 74 felsic plutons in the Selwyn Mountains. Fifty-three samples from the Cirque Lake Stock ranged from 1.0 to 80.0 ppm W with a mean value of 3.5 (sixth highest of the 74 plutons) indicating that the Cirque Lake Stock contains an above average amount of tungsten. The 3-5 ppm mean value represents the residue in the stock, after removal of the tungsten-rich hydrothermal solutions.

The host rock must be permeable so that tungsten-rich solutions from the stock can be transported to a large volume of carbonate rock. At MacMillan Tungsten this permeability was accomplished by faults, fractures, bedding planes and porous limestone breccia. Fracturing of the host rocks was im-

TABLE 1. Vein Data, MacMillan Tungsten

Type	Width	Unit(s) Where most Abundant	Accessory Minerals	Relative age	Peripheral Alteration
Quartz	1-300 mm	3C,1,3E-F	Calcite, dolomite, pyrrhotite, tourmaline, scheelite	At least 2 ages	A. Pyroxene skarn rims (4-100 mm wide) are best developed in limestone B. Light brown horn- fels rims are devel- oped in argillite C. Spotted biotite hornfels rims are developed in brown hornfels
Calcite	2 mm to 1 m	2B	Pyrite, chlorite	Younger than quartz veins	Chlorite and pyrite
Zeolite (Chabazite & natrolite)	1-4 mm	3C,3E,-F	Carbonate	Younger than quartz and calcite veins	None
Quartz- tourmaline	2-4 mm	Throughout the Cirque Lake Stock	50% contain up to 10% scheelite	?	A few have rims of coarse-grained mus- covite and pyrite up to 25 cm wide
Quartz- molybdenum	2-50 mm	Margin of the Cirque Lake Stock	-	?	None

proved by the numerous shale beds, intercalated with the carbonates, which deformed in a brittle manner leaving open fractures.

The following sequence of events is thought to have taken place at MacMillan Tungsten.

1) The Cirque Lake quartz monzonite stock intruded phyllite, black shale and carbonate rocks. The intrusion caused the sedimentary strata to be folded, faulted, fractured and thermally metamorphosed.

2) The margin of the stock crystallized and tungsten was concentrated in residual hydrothermal solutions.

3) Tungsten-rich hydrothermal solutions escaped from the partially crystallized stock and penetrated the sedimentary rocks along fractures, faults, bedding planes, and porous sedimentary strata. Within Unit 2B these solutions migrated through carbonate-shale breccia and were concentrated at the apex of a dome where they formed high grade pyrrhotite skarn.

4) With waning temperatures, zeolite crystallized along fractures. Steeply dipping faults disrupted the skarn and chlorite, calcite and pyrite were developed along some of these late structures.

ACKNOWLEDGMENTS

J.F. Allan, A.R. Findlay, T.J.R. Godfrey and W. Lodder were all directly involved with the project during the exploration stage and contributed to the present understanding of the geology. C.J. Hodgson and H.W. Sellmer edited the report and offered many helpful suggestions.

The writer wishes to thank AMAX Minerals Exploration for permission to publish these results.

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GEOLOGY, LODE AND PLACER GOLD MINERALIZATION OF
THE MOOSEHORN RANGE, 115 N 2

By
J.A. Morin

INTRODUCTION

In 1974, the discovery of visible gold in quartz veins from the Moosehorn Range sparked interest in the area, both for lode vein and placer gold potential. During the spring and summer of 1975, follow-up geochemical and geophysical surveys, trenching and diamond drill programs were carried out on the discovery area by Great Bear Mining Company Limited and Claymore Resources Limited. Along with the bedrock exploration, evaluation of the placer potential was conducted by Claymore and to a lesser extent by Great Bear.

The present geological report summarizes results gathered from six days of field work in late September 1975 and one week in summer 1976.

LOCATION AND ACCESS

The report area is located in the western half of the Ladue River area, 115 N 2, east of the Alaska-Yukon border, approximately bounded by latitudes 63°00'N - 63°15'N and 140°40'W - 141°00'W. The Great Bear and Claymore Resources showings are situated in the southwest corner of this area, approximately at 140°55'W and 63°00'N. Access to the area is provided by fixed-wing aircraft from Whitehorse, 405 km to the southeast to a private airstrip owned by Claymore Resources on the west side of the Moosehorn Range. A 65 km winter tote road connects the property to Scottie Creek on the Alaska Highway in Alaska. Float-based, fixed-wing aircraft may land at Wienerwurst Lake (local name) about 14 km southwest of the main showing areas. Loads may be slung by helicopter the remaining distance to the camps.

PHYSIOGRAPHY

The Ladue River area consists of gently rolling flat-topped hills and ridges - a mesa and butte topography. Two ridges dominate the landscape: the Moosehorn Range to the west, trending N-NW and up to 4,439 feet in elevation and an unnamed range west of Seven Mile Creek up to 5,231 feet in elevation, trending north, and bifurcating with one branch to the N-NW.

The area has not suffered continental glaciation, and as a result, many of the surface rock outcrops are eroded into small pinnacles termed tors. Ridge tops are covered by large angular, blocky, frost-heaved boulders collectively termed felsenmeer. The boulders in felsenmeer are almost *in situ* and their distribution can be used for geological mapping. Pre-glacial erosion and weathering has resulted in the accumulation of a residual soil which has been transported to the lower slopes of the ridges by the combined processes of sheet runoff and solifluction. This residual soil is widespread and concentrated between the ridge tops and the stream valleys.

Above an elevation of 4,000 feet, vegetation is sparse and consists of lichen, moss and small shrubs. Between 3,500 to 4,000 feet, vegetation consists of waist-high brush (buckbrush) with sparse spruce. Thick poplar, spruce and alders dominate the vegetation between the stream banks (2,000 feet) and 3,500 feet. The stream banks of Ladue River and Claymore Creek (local name for stream immediately east of Moosehorn Range) are heavily populated with spruce, clumpy mosses and grass.

Drainage in the area is provided by the Ladue River which flows south-easterly into the White River, a major river of Yukon Territory. The Ladue River is a meandering stream with well developed sand and point bars and numerous oxbow lakes. Meander wavelength and amplitude are in the order of 1 kilometre and 0.5 to 1 kilometre respectively. The channel is flat bottomed and varies from 1 to 1.3 km in width, whereas the stream is about 30 to 60 metres wide. The river appears to migrate from one side of the channel to the other, with a wavelength in the order of ten kilometres.

The main local tributary to the Ladue River is a northerly trending creek immediately east of the Moosehorn Range, here referred to as Claymore Creek. The creek is about 22 km long and has a poorly developed meander throughout most of its length. Its width is usually less than 10 metres, whereas its meander wavelength and amplitude are on the order of 100 to 300 metres and 100 to 200 metres respectively. The creek channel is about 1 km wide and in the last 13 km of its length, the creek runs adjacent to the east bank of the channel. As with the Ladue River, vegetation is common in the creek channel. Elevations along the creek from head to mouth are 2,160 feet and 1,400 feet respectively, yielding a gradient of 10.4 m/km or 56 ft/mile.

The local topography on the Moosehorn Range can be subdivided into four topographic regimes:

- 1) Ridge Crests - These form the backbone of the Range and occur above an elevation of 3,800 feet. They consist of extensive felsenmeer and tors with sparse grass vegetation.
- 2) Intermediate slope - These areas occur between an elevation of approximately 3,800 feet to 3,400 feet and have an extensive buckbrush cover. Intermittent streams of high energy are developed in this slope which commonly hosts the headwater streams of the local drainage system. On the Claymore property, the headwater spurs for Kenyon Creek occur on this slope, and a well developed residual soil found here.
- 3) Lower slope - This is the laterally most extensive portion of the topographic profile and extends from about 3,400 feet to 2,500 feet. Creek gradients decrease sharply at the top of this slope. The slopes have a relatively low grade, are lobate in plan and at right angles to the Range. Vegetation consists of extensive buckbrush and alders with poplars developed on the south facing side and spruce on the north facing side. The margins of solifluction lobes (?) on the slope are marked by narrow strips of spruce running transverse to the long axis of the lobes. This lower slope consists of residual soil overlain by gravels of probable solifluction origin. It may be the old base level of the area prior to its most recent uplift.
- 4) Stream valley - The stream valleys are flat bottomed (not V-shaped like the creeks) and straight, though the courses of the streams are commonly meandering. Muskeg and spruce are abundant and consequently the streams provide very poor drainage.

Previous Work

Geological mapping of the area has been done by W.E. Cockfield (1921, north of Ladue River only) and D.J. Tempelman-Kluit (1974). Tempelman-Kluit's work involved reconnaissance scale geological mapping (1:250,000) of the Aishihik Lake, Snag and western portion of the Stewart River map area.



Photograph of west side of Moosehorn Range, Kenyon Creek in middle and north fork of Swamp Creek at extreme right. Placer workings in centre. Note ridge top, intermediate slope and lower slope.

General Geology

The geology of the area consists of metasedimentary rocks intruded by rocks of the Klotassin Batholith and locally overlain by volcanic flows of the Carmacks Group.

Metasedimentary Rocks

Sedimentary rocks in the area are metamorphosed to the amphibolite facies. Rock types include biotite-quartz-feldspar schist and amphibolite, and visually estimated representative modes are presented in Table I.

The Klotassin Batholith is in contact with the metasedimentary rocks in the northern portion of the area, but nowhere is the contact visible. Inclusions of metasedimentary rocks are common in the early hornblende granodiorite of the Klotassin Batholith.

Klotassin Batholith

The Klotassin Batholith is a northwest trending mass of granitic rocks extending over 300 kilometres. It is heterogeneous both structurally and compositionally and has been described by Tempelman-Kluit (1974). Within the Ladue River area, the Batholith consists of several phases:

- 1) an early foliated hornblende ($\pm$ biotite) granodiorite to quartz diorite;
- 2) massive equigranular to porphyritic plutons of biotite-hornblende granodiorite and of quartz monzonite;
- 3) late granodiorite and quartz-diorite porphyry dykes and plugs.

Relations between the above three rock types have not been observed in outcrop but are inferred from their position in felsenmeer float.

Early Hornblende Granodiorite

The hornblende granodiorite-diorite occurs throughout most of the Klotassin Batholith and is regarded by Tempelman-Kluit (1974) as the most widespread and earliest phase of plutonic activity within the Batholith. Throughout the Ladue River area, this unit is extensively foliated with coarse-grained plagioclase, hornblende and biotite grains lineated in the plane of foliation. The rock weathers to a drab greyish-brown and commonly shows parting parallel to the plane of foliation.

Mineralogically, it consists of 50 per cent coarse-grained white plagioclase grains (0.5-1 cm) which are commonly bent or broken (see Table II). Secondary albite-twinning with wedge-shaped curved lamellae are common and in some rocks, normal and normal oscillatory zoning are common. K-feldspar ranges from nil to 20 per cent and consists of interstitial, subhedral to anhedral, medium-grained and locally poikilitic microcline perthite. Quartz ranges from 5 to 35 per cent in abundance and occurs as coarse-grained lenticular aggregates of foam-textured grains aligned parallel to the foliation. The mafic minerals (10 to 40 per cent) consist of coarse green subhedral hornblende and lepidoblastic medium-grained brown biotite, some of which shows kink banding. Minor chloritic alteration of biotite is present and the common accessory minerals include magnetite, sphene, epidote and apatite.

Seven Mile Creek Stock

An elliptically-shaped stock of porphyritic quartz monzonite occurs immediately west of Seven Mile Creek. The stock is about 5 by 3 miles in size and is compositionally heterogeneous. The core consists of massive, coarse-grained, equigranular to porphyritic grey hornblende-biotite quartz monzonite with an average matrix grain size of 2 to 5 mm. K-feldspar occurs as white euhedral coarse-grained phenocrysts of orthoclase microperthite ranging from 1 to 2 cm in size and 20 to 50 per cent in abundance (see Table III). They are commonly twinned according to the Carlsbad law and are poikilitic with inclusions of hornblende, quartz, plagioclase and biotite. Myrmekite is developed at some of the contacts between K-feldspar and plagioclase. Plagioclase (30 to 50 per cent) is present as white, medium-grained, subhedral blocky shaped grains with trace to minor sericitization and moderately developed normal zoning. Quartz forms about 10 per cent of the rock and occurs as equant medium- to coarse-grained aggregates of anhedral, unstrained fine to medium sized grains with sutured boundaries. Mafic minerals include subhedral poikilitic green hornblende and brown partially chloritized medium-grained biotite. Accessory minerals include magnetite, apatite, epidote and sphene.

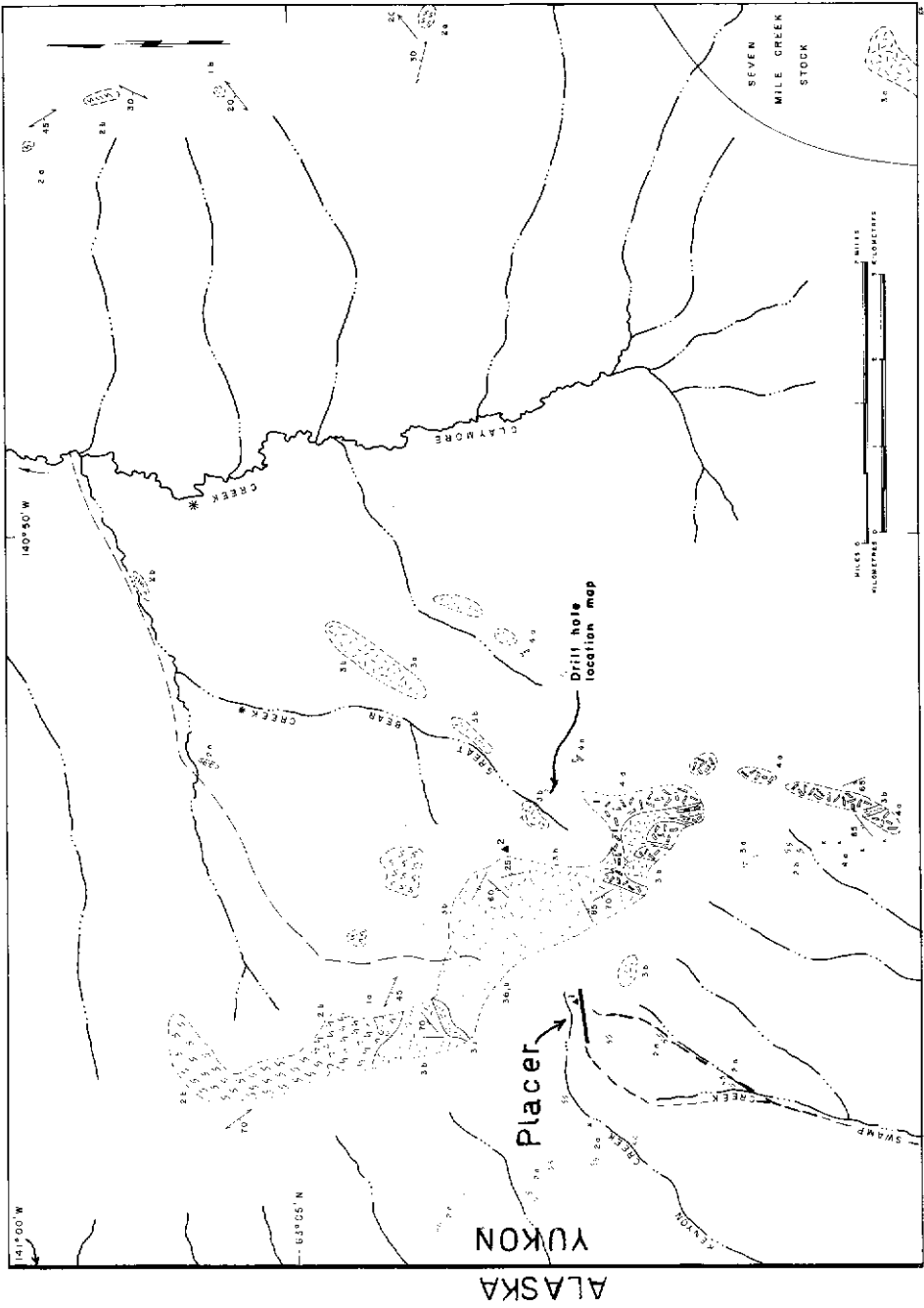
As the contact with the country rocks is approached, the rock becomes progressively foliated and lineated and mafic inclusions are deformed into disc shapes. An increase in total feldspar, the amount of mafic inclusions and number of thin white veins of graphically intergrown quartz and feldspar is also noted towards the contact. Situated between the porphyritic quartz monzonite and the foliated hornblende granodiorite country rock is a zone or halo about 150 feet wide of pale orange to rusty brown, massive equigranular, medium-grained granite. This halo was noted at both localities where the stock-country rock contact was traversed, and is due to the breakdown of brown biotite to orthoclase and magnetite accompanied by the subsequent oxidation of magnetite to hematite.

Moosehorn Range Granodiorite

A pluton of undefined outline (see geological map) occurs in the Moosehorn Range. It consists of massive medium- to coarse-grained equigranular biotite-hornblende granodiorite which weathers white and is composed of 5-30 per cent quartz, 20-40 per cent biotite and hornblende in varying proportions, with the remainder consisting of white feldspar (see Table IV). Plagioclase is the dominant feldspar and ranges from 40-50 per cent in abundance. It occurs as medium- to coarse-grained, euhedral to subhedral, strongly zoned grains. The zoning is normal to normal oscillatory and convolute patterns and resorption features are common. Sericitization is present in trace to moderate amounts. Quartz is an abundant constituent and occurs as coarse-grained (up to 1.5 cm) interstitial lensoid aggregates of medium-sized unstrained grains with sutured interlocking boundaries. K-feldspar is present as medium- to coarse-grained, subhedral to anhedral microcline perthite, mainly of an interstitial habit. Hornblende and biotite contents range from 10 to 20 per cent. The hornblende consists of subhedral stubby poikilitic green grains ranging up to 1 cm in size. Biotite is present as subhedral medium-grained laths, commonly chloritized. Accessory minerals include fine-grained epidote, magnetite, apatite and sphene.

Inclusions of amphibolite are locally common within the granite and where they occur, the granite is enriched in hornblende, thus suggesting that some if not all of the hornblende-rich phases of the granite may be due to assimilation.

2



GEOLOGY OF THE MOOSEHORN RANGE, 115 N-2

LEGEND



- 4 Porphyritic Dyke Rocks
a Quartz diorite, granodiorite porphyry

INTRUSIVE TO GRADATIONAL CONTACT



- 3 Massive Equigranular to Porphyritic Stock Rocks
a Hornblende biotite granodiorite
b Biotite granodiorite, quartz monzonite
c Porphyritic quartz monzonite

GRADATIONAL CONTACT



- 2 Foliated Granitic Rocks
a Hornblende biotite granodioritic, diorite
b Biotite granodiorite

INTRUSIVE CONTACT



- 1 Yukon Group
a Quartzite
b Biotite quartz feldspar schist

SYMBOLS



Rock outcrop, mainly felsenmeer



Lineation



Foliation, inclined, vertical



Joint, inclined, vertical



Geological contact, assumed



Tote Road



Camp Location, 1 - Claymore
2 - Great Bear



Airstrip



Local creek name

Geology by J. Marin, 1976

RE

Granodiorite-Quartz Diorite Porphyry

Porphyritic granitic rocks are common in the southern portion of the Moosehorn Range. Their field relations are not obvious, but they are probably intrusive dykes into the granodiorite. However, the porphyritic phase does appear to grade into equigranular hornblende granodiorite over short distances locally. In addition, rounded xenoliths of porphyritic andesite occur within the porphyry locally, suggesting that the intrusions are hypabyssal.

The porphyries weather to a dark grey, are massive and consist of coarse-grained hornblende and white feldspar phenocrysts (0.5-1.5 cm) set within a fine- to medium-grained matrix of feldspar, biotite and quartz (see Table V). The phenocrysts are dominated by strongly zoned euhedral crystals of plagioclase ranging from 1 to 8 mm in size, with the average about 2 to 4 mm. More than 80 zoning shells were observed in a plagioclase phenocryst from sample K-047. K-feldspar phenocrysts are rare, but where present consist of coarse euhedral grains of microcline perthite. Biotite forms stubby equant medium-grained brown phenocrysts with ragged borders. Commonly, the biotite is partially altered to chlorite and magnetite and the stubby medium- to coarse-grained phenocrysts of green hornblende are locally altered to felted masses of actinolite. Quartz is present as fractured, equant, euhedral grains ranging from 1 to 8 mm in diameter. Accessory fine-grained magnetite, apatite and sphene are commonly associated with the mafic phenocrysts and to a minor extent, are disseminated within the matrix. The matrix is very fine-grained and consists of varying amounts of anhedral plagioclase, K-feldspar, quartz and biotite.

Discussion of Relationships Between Granitic Rocks

Several features of the granitic rocks suggest that the early deformed phases are related to the massive and porphyritic phases:

- similar zoning habit of plagioclase grains and phenocrysts;
- similar habit of hornblende grains;
- gradational contacts;
- chemical composition.

Zoned plagioclase is characteristic of the Moosehorn granodiorite and phenocrysts in the porphyritic dykes and plugs. In addition, similar looking plagioclase is present within the foliated hornblende-biotite granodiorite. Likewise, hornblende occurs as stubby green grains of similar habit within each rock type. Contacts between the Moosehorn granodiorite and foliated hornblende-biotite granodiorite are gradational and consist of a progressive increase in deformation and foliation intensity from the former to the latter. Similarly, the porphyritic granitic rocks locally grade into the Moosehorn granodiorite.

Chemical analyses of seven granitic rocks show a calc-alkaline trend on the AFM diagram. Harker variation diagrams demonstrate that the porphyritic, equigranular and foliated phases may all be related by a common differentiation trend line, with the exception of the porphyritic quartz monzonite of Seven Mile Creek Stock, which plots aberrantly for K_2O , CaO , FeO , Fe_2O_3 and Al_2O_3 .

The granodiorite porphyry (K-44) and the Moosehorn granodiorite (K-71) have a remarkable similarity in composition (see Table I of chemical analyses), thus suggesting that texture is the main difference between them and that they have the same source magma. The samples of the deformed hornblende granodiorite (K-23, K-41) are very similar in composition. This may reflect a

very limited compositional range in this rock type, especially considering that the sample sites are 50 km apart.

The two samples from the Moosehorn Stock (K-71, GB-08) have a relatively wide compositional range, suggesting a fair amount of internal compositional differentiation within the stock.

The similarities and gradational contacts between the foliated, massive and porphyritic granodiorite suggests that they may have had a common magma source and that consequently, they differ only in texture and structure.

TABLE I
CHEMICAL ANALYSES OF GRANITIC ROCKS, MOOSEHORN RANGE

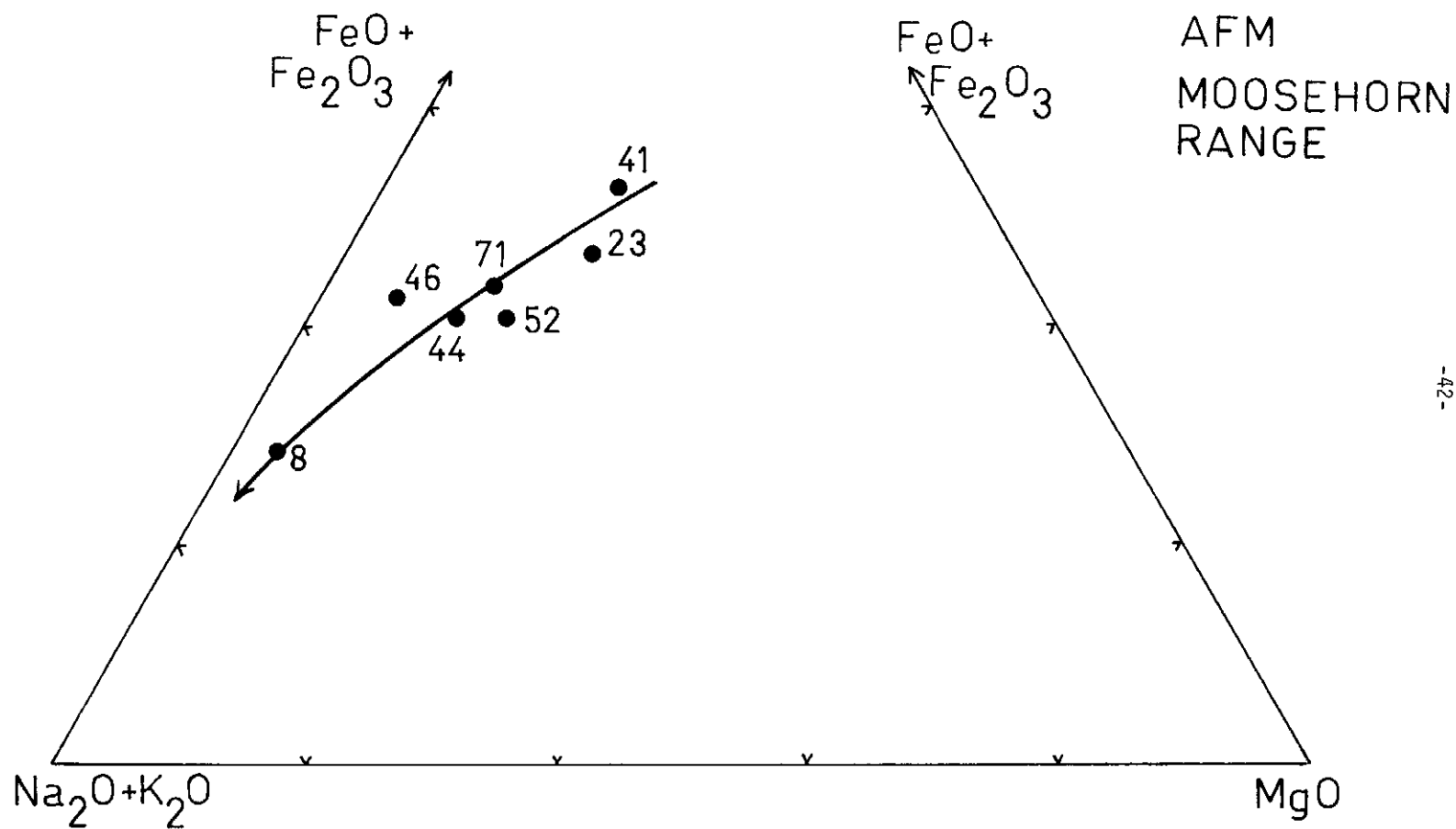
	K-23	K-41	K-44	K-46	K-52	K-71	GB-8
SiO ₂	60.2	59.5	65.7	70.4	61.5	66.1	72.7
Al ₂ O ₃	17.5	17.6	16.8	14.8	16.2	16.4	14.5
Fe ₂ O ₃	3.27	3.81	1.93	1.09	3.96	2.46	1.03
FeO	3.91	3.96	2.96	3.85	2.68	2.81	1.84
MgO	3.00	2.80	1.42	0.70	2.52	1.58	0.35
CaO	5.20	5.70	4.50	2.40	4.70	4.65	1.90
Na ₂ O	3.00	2.70	3.20	2.85	3.40	2.70	3.05
K ₂ O	2.20	1.57	2.50	3.10	3.70	2.46	3.75
TiO ₂	0.66	0.71	0.37	0.25	0.54	0.37	0.14
MnO	0.13	0.12	0.06	0.06	0.10	0.10	0.04
P ₂ O ₅	0.21	0.20	0.14	0.11	0.35	0.16	0.57
L.O.I.	<u>0.51</u>	<u>1.08</u>	<u>0.66</u>	<u>0.01</u>	<u>0.69</u>	<u>0.36</u>	<u>0.13</u>
Total	99.79	99.75	100.24	99.62	100.34	100.15	100.00

Note: K-23, 41 - Early hornblende granodiorite; K-44, 46 - granodiorite porphyry; K-52 - porphyritic quartz monzonite, Seven Mile Creek Stock; K-71, GB-8 - Moosehorn Range Granodiorite

Analysts: Bondar-Clegg and Company Limited, Vancouver, B.C.

Carmacks Group

Volcanic rocks of the Eocene (?) Carmacks Group occur in the southern portion of the study area. The rocks weather pale brown, are black on the fresh surface and are intensely jointed and fractured. The one locality visited consists of porphyritic fine-grained andesite with medium-grained phenocrysts of plagioclase, augite, biotite and K-feldspar within a fine-grained quartzofeldspathic matrix. The plagioclase phenocrysts (25 per cent) are euhedral, poikilitic and range in size from 1 to 3 mm. They exhibit trace to extensive alteration to sericite and patchy carbonate, are commonly fractured with tourmaline locally along fractures and show minor zoning. Augite (5 per cent) occurs as subhedral medium sized grains largely altered to fine-grained assemblages of biotite, chlorite and actinolite. Biotite (10 per cent) is present as 1 mm brown grains which are commonly bleached and accompanied by substantial amounts of fine-grained magnetite disseminated within the biotite or along its edges. K-feldspar (5 per cent) forms euhedral highly fractured poikilitic grains up to 3 mm in size that have been subject to minor carbonate and sericite alteration. The matrix (55 per cent) is fine-grained and appears to be quartzofeldspathic in composition with abundant disseminated fine-grained magnetite.



Structure

The main structural features in the area are foliation (schistosity, gneissosity), lineation (mineral, mullion), jointing andmiarolitic cavities.

Foliation is present in the metasedimentary rocks and in the early hornblende granodiorite phase of the Klotassin Batholith. In the metasediments the foliation is an alignment of micas and hornblende to produce schistosity and gneissosity. In one sample of biotite-quartz feldspar gneiss (K-021), two transecting foliations of biotite are evident. In the hornblende granodiorite, foliation and lineation consist of aligned hornblende, biotite and quartz grains. The foliation ranges from east-west to north trending, with consistently shallow dips, mainly to the west. The lineations vary from NE to NW at shallow plunges of 20 to 30°, and in addition to mineral lineations, some mullion are present in the hornblende granodiorite.

Lineation is also present in the porphyritic quartz monzonite stock west of Seven Mile Creek. The lineation occurs near the margin of the stock and consists of aligned K-feldspar grains. No outcrop occurs near the margin of the stock, but probably the lineation is parallel to the dip of the contact with the surrounding country rocks.

Jointing is common in the massive granodiorite of the Moosehorn Range and occurs to a lesser extent in the other rock types. The quartz vein-bearing joints commonly trend about 165 to 175° with shallow dips to the east. This trend is coincident with the aeromagnetic anomaly trend over the Moosehorn Range.

Cavities occur within the quartz veins in the Moosehorn Range granodiorite. They are not common and are up to several centimetres long and about one centimetre wide. Quartz crystals typically line the cavities along with minor sulphide minerals.

A narrow (10 m) approximately N-S trending zone of mylonite occurs within the seven Mile Creek Stock. In addition, a prominent hillside lineament in line with Claymore Creek (local name) occurs just west of the stock. This lineament coupled with the linear nature of Claymore Creek may indicate a N-S trending fault through Claymore Creek.

Aeromagnetic response from the rocks of the area is varied. The foliated hornblende granodiorite corresponds with generally low values of 57,340 to 57,460 gammas. The schists and gneisses in contact with the Klotassin Batholith to the north have generally higher average values with several anomalous areas up to 57,720 gammas, trending NW. The Seven Mile Creek Stock is represented by a roughly elliptical-shaped anomaly with values ranging from 57,330 to 57,720. Over the Moosehorn Range Stock a N-NW trending elongate elliptical anomaly coincides with the pluton and the trend of the Range. The values vary from 57,340 to 57,580 gammas.

Economic Geology

History

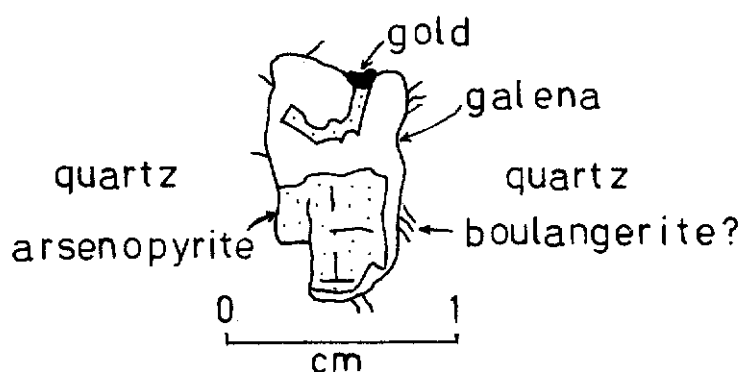
Gold mineralization in the Moosehorn Range was first found by float prospecting in 1970 by Quintana Minerals with the discovery of galena-sphalerite bearing boulders of vein quartz carrying visible gold. The area was staked as the SIL claims, but was allowed to lapse and was subsequently restaked by A. Harman in 1972 and transferred to Great Bear Mining Company Limited (DEA 1-42) in 1974. In summer 1974, geologist M. Kenyon prospected

part of the Moosehorn Range and discovered visible gold southwest of the DEA claims. Later, in January 1975, this ground was staked by Claymore Resources as the LORI (1-58) group adjoining the DEA group to the west and south.

Mineralization

Mineralization in the Ladue River area is restricted (so far as known) to auriferous quartz veins in the Moosehorn Range granodiorite. The only mineralized veins found to date are on the DEA claim group of Great Bear Mining Company Limited and the LORI group of Claymore Resources. Milky white quartz veins of variable thickness (5 cm-0.5 metres) occur mainly along N-NW trending joints with shallow dips of 20 to 40°.

The sulphides occur as coarse-grained crystals, lenses and as streaky fine-grained bands within the quartz veins. Gold occurs as coarse euhedral grains up to 2 mm in size, commonly associated with galena, arsenopyrite and sphalerite. The general paragenetic sulphide sequence consists of early, subhedral to euhedral arsenopyrite crystals followed by galena, boulangerite and sphalerite. Locally, galena rims the arsenopyrite and is surrounded in turn by acicular crystals of boulangerite. Sphalerite is encrusted on boulangerite locally in quartz vugs. Quartz crystallized before, during and after sulphide deposition, and has formed crystal-lined vugs.



Sketch showing paragenetic relations between sulphide minerals and gold.

Wall Rock Alteration

Narrow zones of alteration are present in the granodiorite adjacent to the quartz veins. They range in width from a few centimetres to half a metre and are not proportional to the widths of the quartz veins themselves. The altered granodiorite is pale green and consists of sericite, quartz, carbonate, arsenopyrite and magnetite. Blocky shaped brown, pale green and white pseudomorphs after feldspar occur within the altered wall rock. They consist of the following:

- 1) greyish brown, very fine-grained carbonate masses with minor sericite;
- 2) pale green pseudomorphs made up of ribbon-like interfingering masses of sericite and carbonate with minor disseminated very fine-grained magnetite;
- 3) pale green and white pseudomorphs consisting entirely of felted masses of fine-grained sericite.

The alteration zone grades into the unaltered fresh host rock through a thin zone in which the sericite and carbonate alteration is less intense and portions of the original unaltered feldspar grains are still present.

Current Work and Results

In 1974-75, Great Bear conducted geological mapping, grid soil geochemical and geophysical surveys. More than one thousand soil samples were collected on a 51,000 foot by 2,700 foot area and analyzed for Pb, Zn, Ag and As. Coincident silver-lead anomalies were determined which corresponded to the known veins. In addition, anomalous linear trends for silver corresponded with the strike of known veins, float trains, magnetic, and to a lesser degree, electromagnetic anomalies. The ground magnetometer survey determined several linear trends which were interpreted as faults (see 'I' and 'A' zone, drill hole location map). Several of the magnetic trends indicated faults intersect in regions of coincident geochemical anomalies and mineralized quartz veins. An electromagnetic survey (EM-16) was also conducted and moderate to moderately strong conductors were determined which coincided with the magnetic linear trends, geochemical anomalies and strikes of the mineralized veins. An extensive area (30 m x 600 m) on the northeast side of the hill was stripped with a D-7E bulldozer. Several trenches have been cut on the property and three main quartz veins carrying gold mineralization have been discovered, referred to as the 'D', 'B' and 'C' zones (see drill hole location map).

During summer 1975, 19 diamond drill holes with a total footage of 2,284 feet were drilled on the DEA claim group. In most instances, the quartz veins were intersected at depths less than 40 feet and the veins were narrow with low gold values. The best values obtained from the drilling are presented below:

<u>Zone</u>	<u>DDH</u>	<u>Au oz/ton</u>	<u>Ag oz/ton</u>	<u>Width</u>
B	16	7.49	1.16	6 in.
C	5	3.62	8.75	6.5 in.
D	2	1.6	12.4	3 in.

Several high grade bulk samples were taken from the D zone and B zone:

<u>Description</u>	<u>Width</u> (ft)	<u>Length</u> (ft)	<u>Thickness</u> (ft)	<u>Au oz/ton</u>	<u>Ag oz/ton</u>
81 lb sample of vein from B zone	0.4	5.0	0.7	9.25	2.06
261 lb sample of lower vein adjacent to footwall from D zone	0.35 avg.	4.0	1.5 avg.	20.01	12.67

In summer 1975, Claymore Resources conducted geological mapping, soil geochemical and minor geophysical programs on the LORI group. Using the claim lines as control about 300 soil samples were collected with a 300 foot spacing and analyzed for Pb, Zn, Ag. No anomalies were found to be associated with the known mineralized veins and very few anomalies were determined for lead and zinc. However, two silver anomalies were determined along the intermediate slope which may reflect subcropping mineralized veins. Induced polarization, self potential, EM 16 and magnetometer tests were conducted over the M vein but no meaningful responses were obtained and further testing was abandoned.

A diamond drilling program was undertaken and a total of 2,050 feet of BQ wireline drilling was completed (Greig, 1975). A 450 foot section along the M vein was tested by holes 1 to 15 and the A vein was tested by holes 16 to 18. The drilling revealed that the M vein (see Figure) was structurally erratic along strike and locally pinched out at depth. The single discrete vein appeared to split locally and form a series of parallel quartz veins. The best intersections on the M vein are in holes 2, 3 and 8 where gold values averaged approximately 0.15 oz Au/ton over a 4 foot mining width. In general, the values intersected are erratic and much lower in grade than expected on the basis of surface assays. The three holes drilled along the A vein encountered only one minor intersection with a gold bearing quartz vein.

Placer Claims

Placer potential in the area first recieved attention when it was discovered by M. Kenyon of Claymore Resources that the upper reaches of a nearby southerly flowing creek (Kenyon Creek, formerly called Discovery Creek) contained abundant easy-to-pan coarse gold. Following this discovery, several placer leases were staked by both companies on streams in the area, including Claymore Creek, Great Bear Creek, Kenyon Creek, West Swamp Creek, Scottie Creek and Seven Mile Creek.

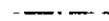
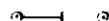
Kenyon Creek

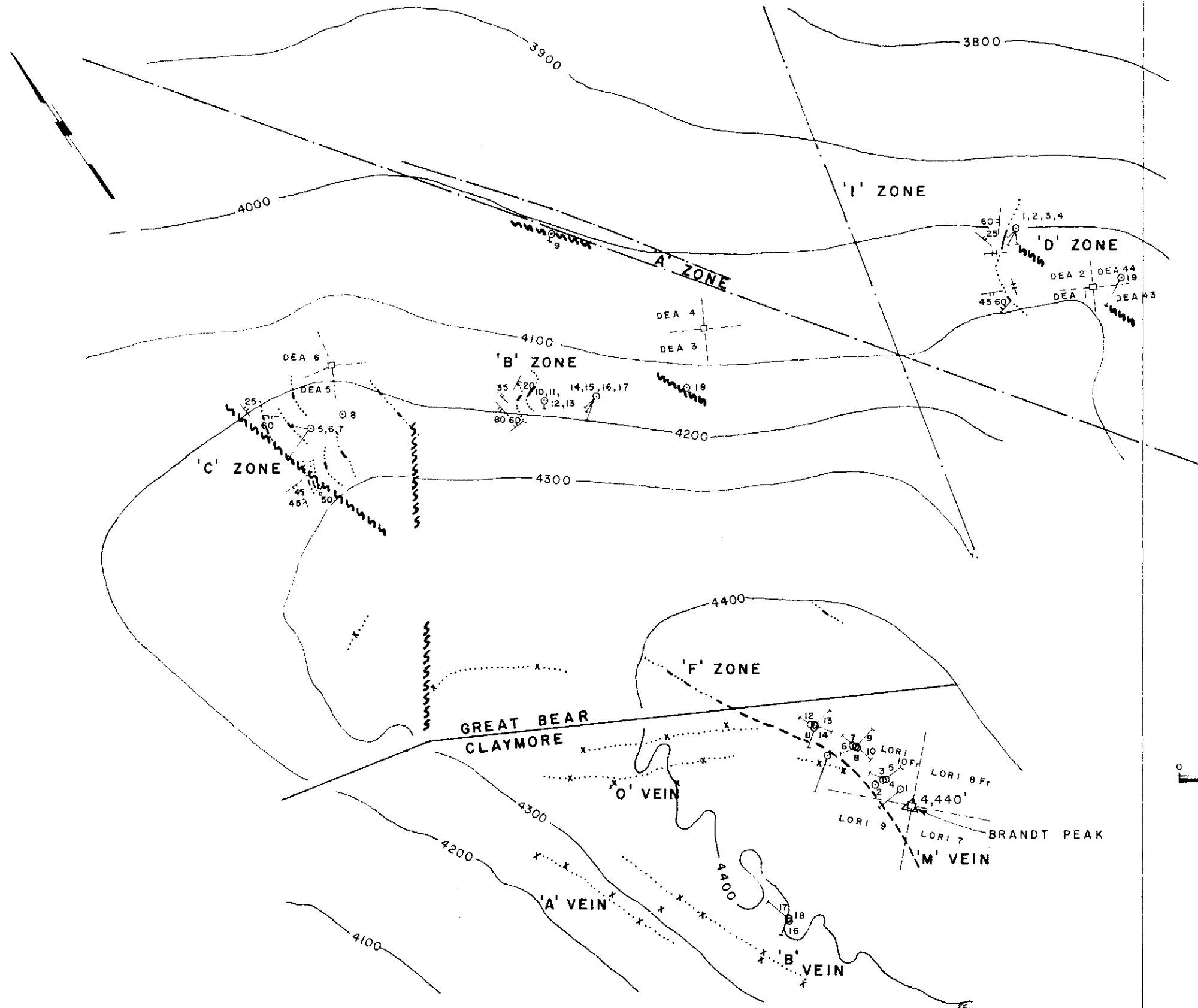
Evaluation work has concentrated on Kenyon Creek, where Claymore holds the following placer claims: BUFF 1-9, JUL 1-7, RUPE 1-12, JESS 1-6. In summer 1975, pit samples were obtained along the creek a distance of more than 4,000 feet with none of the samples assaying less than 1/2 oz Au/cubic yard. Later in November and December 1975, a rotary drilling program was conducted on Kenyon Creek (Sinclair et al, 1976) and the area of gold bearing gravels was extended. In 1976, 23 large sample trenches were dug with a bulldozer and the exposed sections were sampled. All but one of the trenches were in frozen gravels, the thickness of which was noted to increase substantially downstream, especially below the transition from the upper to the lower slope.

QUARTZ VEIN AND DRILL HOLE LOCATION MAP, MOOSEHORN RANGE

Modified after D. Waugh (1975) and J. Greig (1975)
Map area shown on geological map of
Moosehorn Range

LEGEND

-  Fault
-  EM-16 indicated fault
-  Mineralized quartz vein; inferred
-  Quartz vein felsenmeer, inferred vein
-  Diamond drill hole; inclined, vertical
-  Joint (dip known, dip unknown)
-  Claim post



The sampled sections proved to be gold bearing and company geologists recommended sampling by close space drilling of the lower slope portion of the creek.

A pilot plant operation was initiated and conducted on the upper reaches of Kenyon Creek from early June to the end of September, 1976, and twelve thousand cubic yards of gravel was processed. In the operation, gravel was dumped by a front-end loader onto a six inch grizzly mounted above a hopper which fed into two parallel sluice boxes with removable ladder-type riffles (see Plate). A one inch mesh screen was located between the hopper and sluice and oversize material was removed from the screen by waterhose onto a conveyor which then removed it 20 feet from the operation site. A tailings pond was constructed 200 feet below the sluice and a storage dam was built 500 feet upstream. A recycling pump in the tailings pond returned water to the operation.

The placer working area is located at the junction of two intermittent streams which form the headwaters of Kenyon Creek. At this site, the material that is processed consists mainly of alluvially reworked residual gravel and soil derived from a triangular-shaped drainage source area on the west side of the Moosehorn Range, the triangle base extending along the top of the ridge for 6,500 feet. In this area, residual soil directly overlies bedrock and attains thicknesses of several feet to more than 30 feet. Alluvial gravel overlies the residual soil in the creek area but on the slopes between the creeks, a solifluction origin gravel overlies the residual soil.

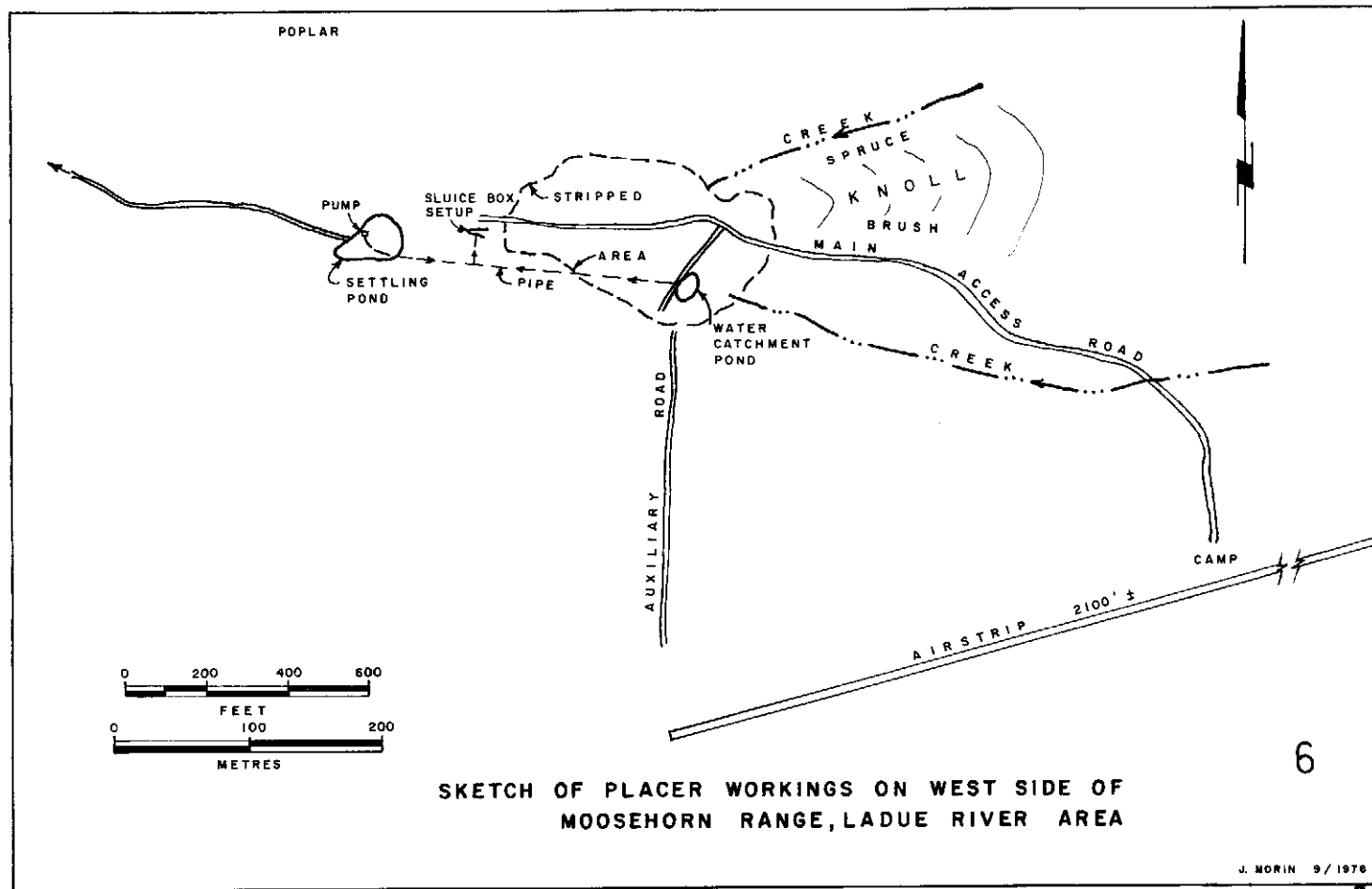
In the pilot plant operation, the top organic soil horizon (1 to 2 feet) was stripped off by bulldozer and piled along the edge of the working area. Material processed through the sluice consisted of grey sandy alluvial gravel (commonly about five feet thick) and the uppermost foot of the underlying residual soil. The residual soil below the creek gravels directly overlies bedrock and attains thicknesses of several feet to more than 30 feet. The recovered gold is porous, frothy looking and greyish in colour with jagged, angular edges and total production in 1976 amounted to 1,895 ounces of raw gold (about 70 per cent pure) and 40 ounces of jewelry gold.

Swamp Creek

Claymore holds the following placer claims on Swamp Creek: RED 1-12, DEER 1-12, SOYA 1-7, BEEF 1,2. In 1976, 5 large trenches were bulldozed on the north fork of Swamp Creek, all in the order of 60 feet by 25 feet by 7 feet deep. The trenched material consisted of unsorted coarse gravel of probable solifluction origin. The recovered gold was both coarse and fine, unsorted and was distributed fairly uniform throughout the section.

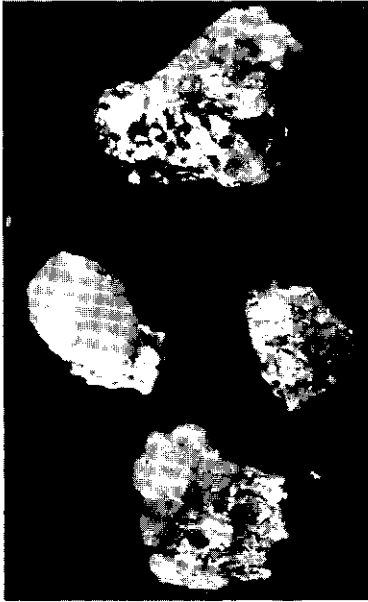
Great Bear Creek and Claymore Creek

Claymore holds the following placer claims on these creeks: AUG 1-16, GBM 1-18, RICH 3-86 and FISH 1-5. In 1976, 5 large trenches were bulldozed along Great Bear Creek, commonly about 40 to 50 feet away from the creek. The gravels from both creeks are well rounded and sorted, except in the upper reaches of Great Bear Creek. In the upper portion of Great Bear creek, both unsorted coarse and fine gold with very little settling was recovered. In the lower portion of the creek, the gravel is much thicker and in the top section sampled, only fine gold was recovered. A placer drilling program was recommended by company geologists for both creeks.





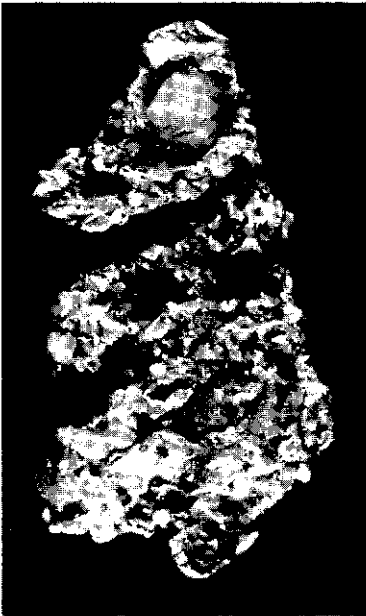
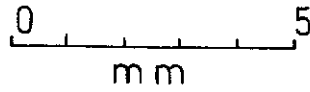
Panorama view of working area of pilot plant operation, Kenyon Creek, September 1976. View is looking east up the south fork of headwaters of Kenyon Creek; bulldozer at left centre and sluice box set up in foreground.



a



b

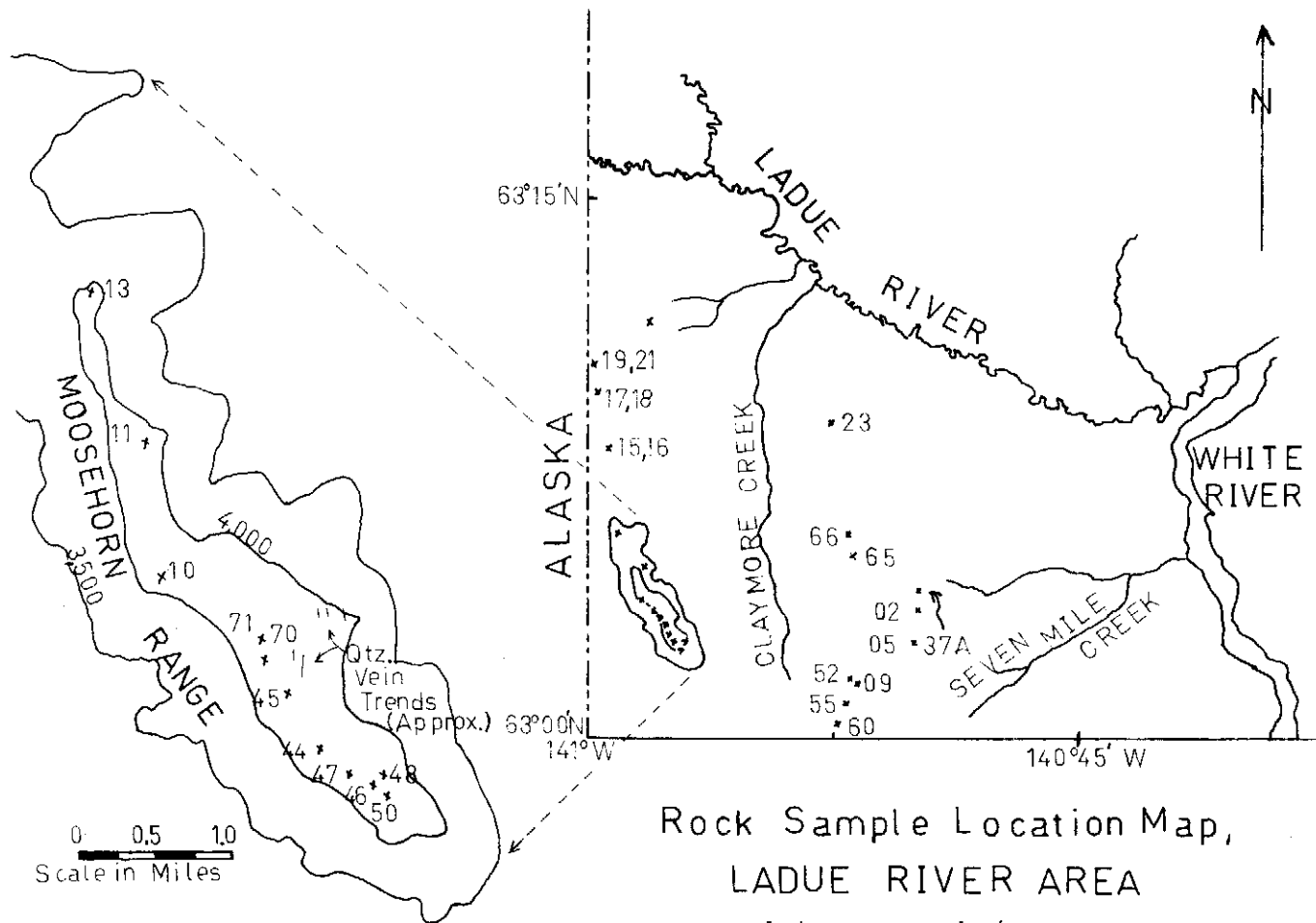


c

Placer gold nuggets from Kenyon Creek:

- a) equant, rounded, porous gold nuggets with attached quartz grains;
- b) nuggets with well developed crystal form;
- c) relatively large nugget with attached quartz grains.

(Photomicrographs by J. Payne,
Vancouver Petrographics,
Vancouver, B.C.)



Rock Sample Location Map,
LADUE RIVER AREA

* Sample 041, Lat. 62°42' N, Long. 140°45' W.

ACKNOWLEDGMENTS

The author would like to thank both Claymore Resources and Great Bear Mining for the hospitality extended him and for the stimulating discussions held with the representatives of both companies.

APPENDIX

The following Tables comprise lists of rock modes derived by visual estimate from a combination of K-feldspar stained thin sections and rock slabs.

TABLE I.

Metasedimentary Rocks of the Yukon Group in the Ladue River Area

	<u>K-016</u>	<u>K-017</u>	<u>K-018</u>	<u>K-019</u>	<u>K-021</u>	<u>K-037A</u>	<u>K-065</u>
Plagioclase	10	30	50	35	60	45	30
K-feldspar	50	25	20	12	-	-	20
Quartz	35	35	20	45	30	-	35
Biotite	1	9	5	2	8	-	8
Muscovite	3	1	-	2	-	-	Tr
Hornblende	-	-	-	-	-	53	-
Magnetite	Tr	Tr	Tr	2	Tr	Tr	1
Apatite	Tr	Tr	Tr	Tr	Tr	Tr	Tr
Chlorite	Tr	-	Tr	-	Tr	Tr	-
Allanite	-	Tr	Tr	Tr	Tr	-	-
Epidote	Tr	Tr	Tr	Tr	Tr	Tr	-
Garnet	-	-	-	-	-	-	1
Sphene	-	-	-	-	-	-	-

Location and Samples:

K-016, microcline-quartz-plagioclase-muscovite gneiss,
K-017, porphyroblastic microcline-plagioclase-quartz-biotite gneiss,
K-018, plagioclase-microcline-quartz-biotite-muscovite gneiss,
K-019, quartz-plagioclase-microcline-magnetite gneiss, and
K-021, plagioclase-quartz-biotite gneiss, Moosehorn Range;
K-037A, amphibolite, and
K-065, quartz-plagioclase-orthoclase-biotite-garnet gneiss, east of
Moosehorn Range

TABLE II

Foliated Granodiorite-Quartz Diorite of Ladue River Area

	<u>K-002</u>	<u>K-011</u>	<u>K-013</u>	<u>K-015</u>	<u>K-023</u>	<u>K-041</u>	<u>K-060</u>	<u>K-066</u>
Plagioclase	60	50	50	75	35	35	50	60
K-feldspar	-	20	15	-	10	-	10	1
Quartz	5	20	25	10	30	35	5	10
Biotite	10	10	8	13	10	10	15	10
Hornblende	25	-	1	-10	20	20	20	20
Muscovite	-	Tr	-	Tr	-	-	-	-
Magnetite	Tr	Tr	1	Tr	1	Tr	Tr	Tr
Apatite	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr
Chlorite	Tr	Tr	Tr	Tr	Tr	Tr	-	Tr
Epidote	-	Tr	Tr	Tr	Tr	Tr	-	1
Sphene	Tr	Tr	Tr	2	1	Tr	2	1

TABLE III

Seven Mile Creek Stock

	<u>K-005</u>	<u>K-009</u>	<u>K-052</u>	<u>K-055</u>
Plagioclase	35	35	50	30
K-feldspar	40	40	20	50
Quartz	10	10	10	10
Hornblende	11	10	15	8
Biotite	4	4	5	2
Apatite	Tr	Tr	Tr	Tr
Chlorite	Tr	Tr	Tr	-
Epidote	-	-	Tr	-
Sphene	Tr	1	2	Tr
Magnetite	Tr	Tr	Tr	Tr

TABLE IV

Moosehorn Range Granodiorite

	<u>K-010</u>	<u>K-045</u>	<u>K-048</u>	<u>K-070</u>	<u>K-071A</u>	<u>K-071B</u>
Plagioclase	45	40	50	50	45	55
K-feldspar	10	25	20	10	10	-
Quartz	25	25	20	30	25	5
Biotite	12	5	5	5	10	20
Hornblende	8	1	5	5	10	20
Magnetite	Tr	2	Tr	Tr	Tr	Tr
Apatite	Tr	Tr	Tr	Tr	Tr	Tr
Chlorite	Tr	-	1	Tr	Tr	2
Epidote	Tr	Tr	Tr	Tr	Tr	Tr
Sphene	Tr	-	Tr	Tr	Tr	Tr

TABLE V

Granodiorite-Quartz Diorite Porphyries of Moosehorn Range,
Ladue River Area

	<u>K-044</u>	<u>K-046</u>	<u>K-047</u>	<u>K-050</u>
<u>Phenocrysts:</u>	(60)	(50)	(70)	(65)
Plagioclase	35	25	50	25
K-feldspar	-	-	-	3
Quartz	5	20	-	30
Biotite	10	5	10	3
Hornblende	10	1	10	-
Magnetite	Tr	Tr	1	Tr
Apatite	Tr	Tr	Tr	Tr
Sphene	Tr	-	-	-
Allanite	-	-	-	Tr
<u>Matrix:</u>	(40)	(50)	(30)	(35)
Plagioclase	15	15	8	9
K-feldspar	6	20	12	15
Quartz	13	12	4	15
Biotite	6	3	6	3

GEOLOGY OF THE WELLGREEN PROPERTY

by

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INTRODUCTION

The Wellgreen Mine is 3.2 kilometers west of the junction of Quill and Nickel Creeks in the Quill Creek area of the Kluane Ranges (Figure 1). A geologic property map at a scale of 1:4800 (Campbell, 1977) covers an area of 3.8 square kilometers with the mine situated near the eastern border. A 13 kilometer gravel road which joins the Alaska Highway near Km. Post 1778 provides access to the mine site.

The Kluane Ranges have long been noted for numerous nickel-copper sulphide showings associated with mafic and ultramafic rocks. Wellgreen Mine is the only past producer of Ni-Cu in the area.

This report is a progress report on the petrological and structural features of the Quill Creek mafic-ultramafic complex and the mineralogy of its associated nickel-copper sulphide deposits. A genetic interpretation of the mineralized complex is outlined.

GEOLOGICAL SETTING

An intensely folded and faulted sequence of Permo-Pennsylvanian, Triassic and Jurassic volcanic and sedimentary rocks, with Cretaceous and Tertiary granitic intrusions, is exposed along the length of the Kluane Ranges (Figure 1). The stratigraphy has been correlated with that found to the northwest in the Taku-Skolai Terrane (Read and Monger, 1976). The Kluane Range part of this Terrane forms a fault-bounded, elongate wedge. Shikwak Fault separates this wedge from granitic and metamorphic rocks of both the Coast Crystalline Complex and Yukon Crystalline Terrane to the east; Duke River Fault marks the western boundary with Alexander Terrane granitic and Paleozoic metamorphic rocks of the the St. Elias Mountains.

Horizontally to doubly plunging, inclined, tight to isoclinal folds trending northwest at 30° to the Shikwak Trench are characteristic of the Kluane Permo-Triassic section. These folds are clearly traceable between White River and Burwash Creek, but are obscured to the south by numerous later dip-slip faults trending subparallel to fold axial traces. These faults commonly follow lithologic contacts. A secondary, younger group of strike-slip faults trend roughly perpendicular to Shikwak Trench. Deformation was accompanied by low grade regional metamorphism.

A 260 square kilometer section of the Kluane Ranges is shown in Figure 1. Major map units within this area include the volcanoclastic rocks of the Lower Permian Station Creek Formation; argillites, shales, and limestones of the Lower Permian Hasen Creek Formation; basaltic flows of the Upper Triassic Nikolai Greenstone; and Permo-Triassic mafic and ultramafic rocks. A lithologic description of the Permo-Triassic section is given in Campbell (1977).

Mafic and ultramafic rocks, intruding the Taku-Skolai Terrane, are most numerous in the Quill Creek area and farther south along the Kluane Ranges. Ultramafites intrude concordantly near the Permian volcanic-sedimentary gradational contact and within the Hasen Creek Formation. Mafic rocks occur in three distinct settings: (1) concordantly along the lower or upper contact of an ultramafite; (2) as concordant bodies near the Permo-Triassic discon-

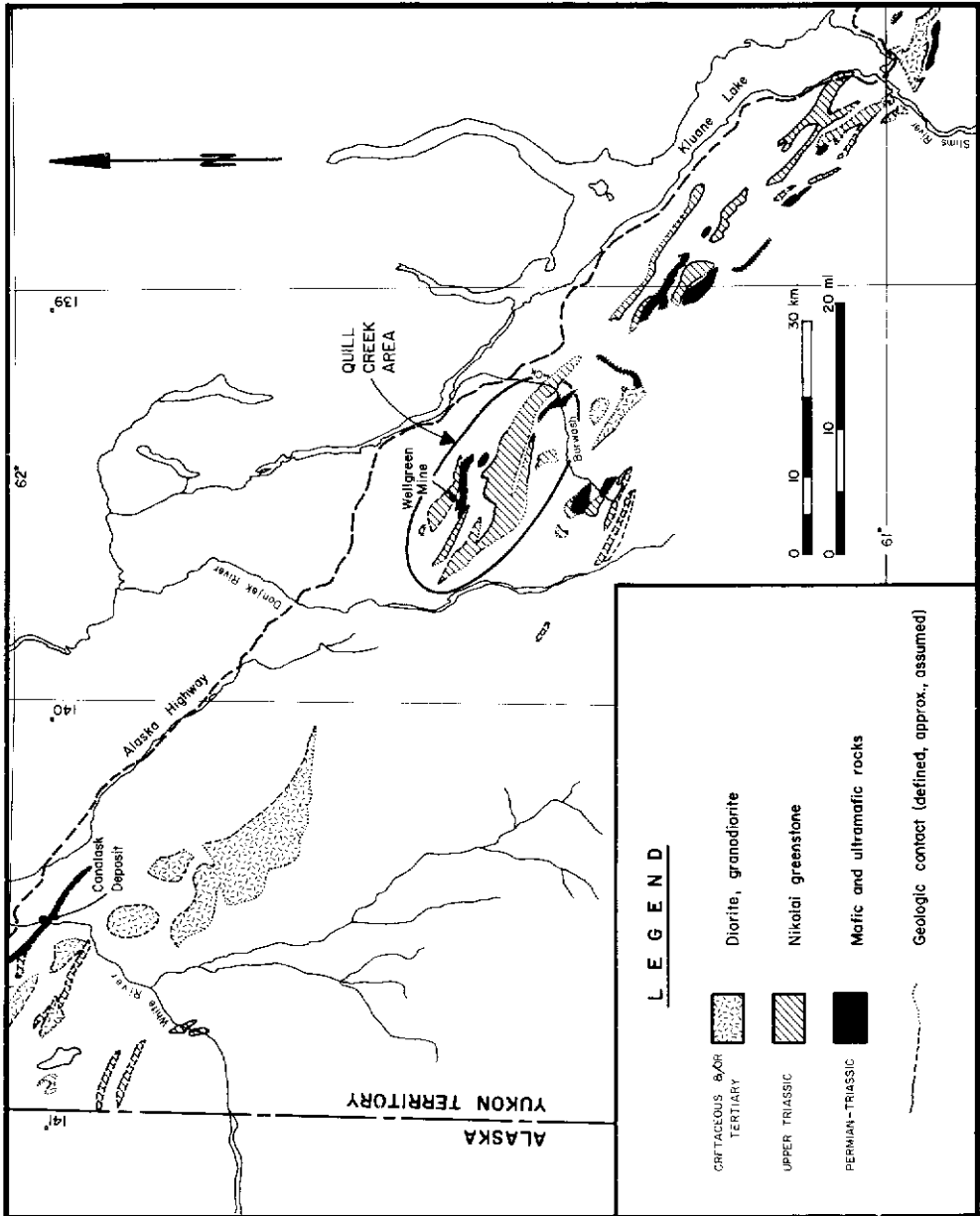


Figure 1. Location map.

formity; and (3) as small discordant bodies within the Nikolai Greenstone. The Quill Creek mafic-ultramafic complex is the largest intrusion of its kind in the area studied, measuring 7.6 kilometers in length and 900 meters in apparent thickness (the latter dimension is believed to be exaggerated by folding and faulting). These mafic and ultramafic bodies are hosts to nickel-copper sulphides.

LOCAL GEOLOGY

General Statement:

The Wellgreen Property lies on the southwest limb of a doubly-plunging, inclined syncline southeast of its point of depression. Attitude of the axial plane is $108^{\circ}/68^{\circ}$ SW and the axes plunge at 30° to the southeast and to the northwest. Lower Permian volcanoclastic rocks (Station Creek Formation) and sedimentary rocks (Hasen Creek Formation), and Upper Triassic amygdaloidal basalts (Nikolai Greenstone) constitute the fold. The area surrounding Wellgreen Mine is centered on the northwestern extremity of the Quill Creek mafic-ultramafic complex (Figure 2). This complex sits approximately 27 meters below the gradational contact between Station Creek andesitic tuffs and Hasen Creek pale to medium grey cherty argillites and shales. The tuffs are interbedded with abundant discontinuous limestone and cherty and shaly argillite near the contact. Primary bedding planes have a variable strike of 070° to 120° and a dip of 50° SE through 90° to 50° SW. The foliation is $105^{\circ}/60^{\circ}$ to 70° SW. The Quill Creek complex parallels the stratigraphy and separates into three subparallel fingers (as a result of folding and shearing) at its northwestern extremity. Basal section of the sill is in fault contact with Nikolai volcanic flows to the southwest. Numerous small felsic dykes crosscut the mafic-ultramafic complex and surrounding country rocks. These dykes are noticeably absent in other mafic and ultramafic bodies.

Quill Creek Complex:

Petrology:

The ultramafic part of the complex is intensely sheared, highly altered, medium-grained, and pale to dark green and greenish-black. Layering is apparent with a 190-meter basal section of dunite topped by 610 meters of peridotite grading upward from harzburgite to werhlite.

Dunite is pale to medium-green on the weathered surface and forms very rubbly outcrops surrounded by talus. Fresh surfaces of dunite are dark greenish-black and show no obvious textural features, whereas weathering brings out the well developed cumulate texture, which may or may not be sheared parallel to layering. Dunite is composed of 95 per cent (by volume) olivine, which occurs as idiomorphic crystals 1 to 2 mm across.

The peridotite section of the sill is dark green to greenish-black and forms severely sheared outcrops that are commonly reduced to a slippery talus. Textures are best seen in thin section and vary with vertical position in the peridotite. Harzburgite at the base shows cumulate idiomorphic olivine crystals from 1 to 1.5 mm across with intercumulus xenomorphic orthopyroxene from 0.5 to 1 mm across. Lherzolite has a poorly developed cumulate texture with interstitial to intergranular orthopyroxene and poikilitic clinopyroxene plates containing olivine. The top of the peridotite section contains werhlite with a massive, fine-grained crystalline texture showing poikilitic clinopyroxene in detail. The orthopyroxene is believed to be enstatite, although identification is difficult due to extensive alteration. Diopside is the allotriomorphic clinopyroxene measuring 1.5 to 3.0 mm across. Poikilitic to

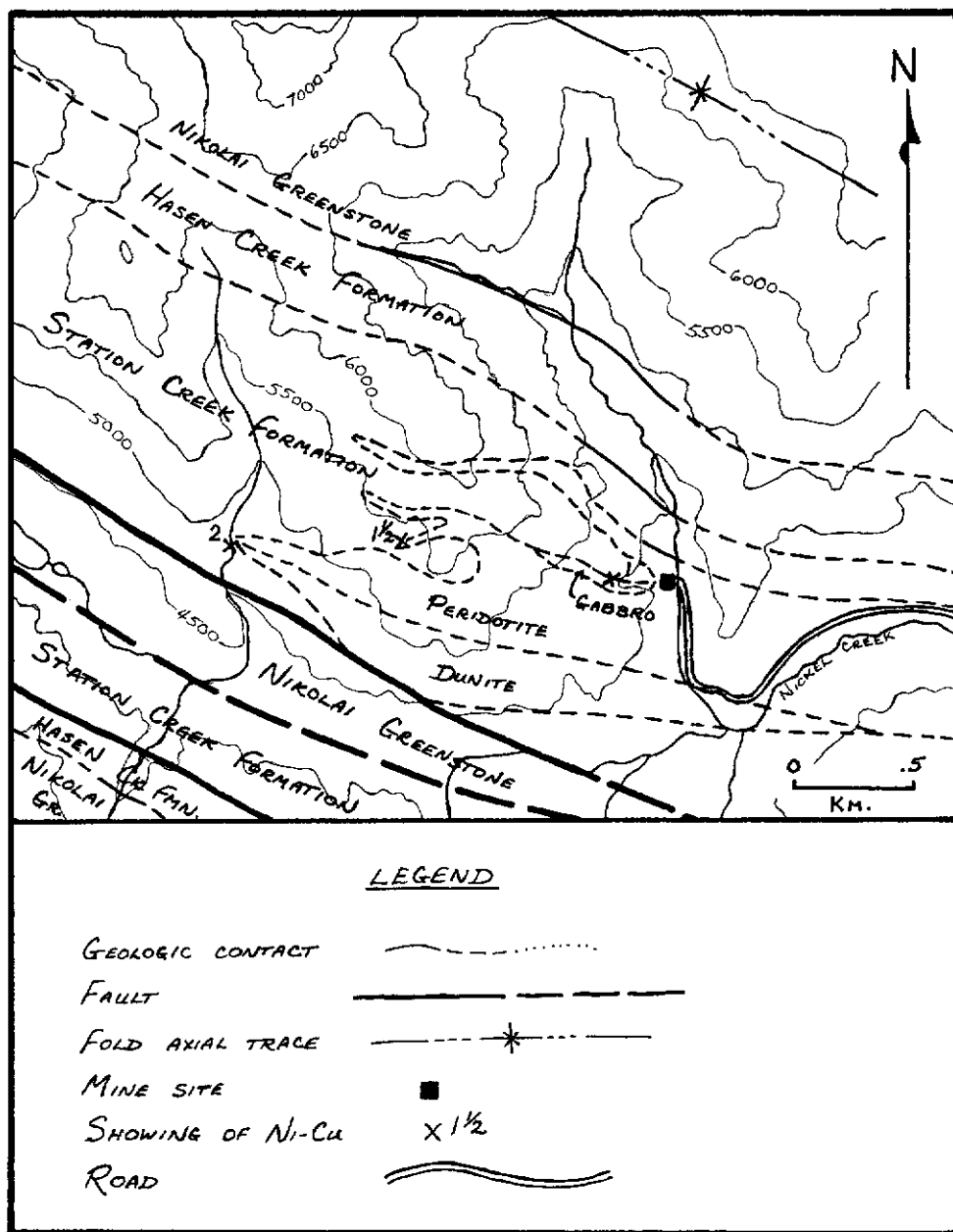


Figure 2. Geologic sketch of the Wellgreen Property and immediate surroundings.

intergranular pale brown phlogopitic biotite accounts for an average of 1 per cent by volume. Interstitial pyrrhotite-chalcopyrite grains are present in small amounts throughout the peridotite and will be discussed later.

Mafic parts of the Quill Creek complex are limited to only a few surface outcrops. Weathered surfaces are greenish-grey to brown, whereas fresh surfaces are dark green. The dominant texture is massive allotriomorphic granular. Poikilitic clinopyroxene contains scattered idiomorphic plagioclase laths. Orthopyroxene is present in amounts up to 15 volume per cent. Diallage, measuring 1.5 to 2.5 mm across, is the clinopyroxene and it represents 40 to 60 per cent by volume of the gabbro. Composition of the plagioclase ranges from An_{50} to An_{70} . Plagioclase crystals are typically twinned and commonly show zoning from an andesine rim to a bytownite core. Accessory minerals include minor intergranular quartz and biotite. Interstitial pyrrhotite and chalcopyrite account for 5 to 25 per cent of the rock in surface showings. Underground gabbro samples contain net texture sulphides amounting to more than 30 per cent by volume.

Alteration:

Both the mafic and ultramafic parts of the Quill Creek complex have been extensively altered. More than 95 per cent of the dunite layer has been serpentinized. Antigorite, magnetite, and traces of talc are pseudomorphic after olivine with magnetite outlining the original olivine crystal shape and antigorite occurring both in the center and as a 'skirt' around the magnetite rims. All original olivine has been serpentinized. Fifty to 100 per cent of the interstitial to intergranular orthopyroxene is altered to antigorite $\pm$ chlorite. Diallage is up to 50 per cent altered to uralite and chlorite. Biotite displays slight alteration to chlorite. Sulphide minerals are partially rimmed by magnetite. Magnetite grains are scattered throughout the ultramafic rocks as a result of serpentinization. Slip-fibre chrysotile veins $\pm$ chlorite commonly run along olivine grain boundaries subparallel to cumulate layering and may or may not show continuity. Some serpentine stringers crosscut olivine pseudomorphs, pyroxene, and sulphide mineral grains. Magnetite veinlets are also found in peridotite samples. One thin section shows pyrrhotite grains associated with carbonate in chrysotile veinlets. Most fractures and shears are filled with alteration stringers. Extensively altered peridotite has very apparent alternating layers of magnetite and silicates. Gabbro intruding the peridotite has been subjected to severe alteration. Orthopyroxene is completely altered to chlorite and epidote. Fifteen per cent and rarely as much as 50 per cent of the clinopyroxene content is altered to chlorite $\pm$ uralite $\pm$ carbonate. Minor amounts of epidote may be associated with this assemblage. Sericite and more commonly saussurite are formed at the expense of most of the plagioclase. Sulphide grains are rimmed by magnetite and in one particular thin section show rims of carbonate + quartz $\pm$ talc.

A pattern to the serpentinization and alteration of the gabbro, either lengthwise along the complex or vertically, is not apparent.

Structure:

Contact features of the Quill Creek complex are not well exposed. Outcrops of the complex and of the surrounding country rocks are most often separated by talus. Edges of ultramafic outcrops show serpentine-covered shear surfaces with one or more sets of slickensides. Only one location defines a sharp intrusive contact between peridotite and bleached massive andesitic tuff. The contact strikes 109° and dips 53° to the southwest. Although intrusive contacts of ultramafite into Permian country rocks are rare

on the Wellgreen Property, they are found where the Quill Creek complex crosses Linda Creek and elsewhere in the study area. Contacts between gabbro and peridotite are sharp with the former intrusive into the latter. Xenoliths of peridotite are typical and penetrate 0.5 meters into the gabbro body. Contacts between gabbro and country rock are uncertain. A striking feature of the Permian tuffs and argillites on the Wellgreen Property is an irregular cream-white zone of alteration up to 60 meters wide at the contact with peridotite. The alteration is carbonatization and its intensity decreases away from the ultramafite.

Internally the complex is intensely sheared. Five main shear directions characterize the northwest end of the Quill Creek complex: (1) 085°/80° NW to 80° SE; (2) 114°/80° SW to 60° NE; (3) 075°/64° SE; (4) 152°/70° SW; and (5) 073°/26° SE. Most shear surfaces show two or more sets of slickensides, but the dominant lineations are: (1) 47°/280°; (2) 07°/229°; and (3) 12°/ 183° - that is, essentially in the southwest quadrant. On a microscopic scale minute shears are accompanied by mortar texture and shearing is commonly parallel to cumulate layering.

Nickel-Copper Sulphide Deposits:

Types of Occurrence:

Wellgreen Property has three surface showings of nickel-copper sulphide minerals; going from southeast to northwest they are the No. 1, 1 1/2 and 2 Showings. Types of sulphide mineral occurrence include:

- | | |
|---|--------------|
| (1) Massive, fine-grained sulphides with or without abundant magnetite | No. 1 |
| (2) Breccia sulphides with inclusions of tuff, argillite, gabbro and peridotite | No. 1 |
| (3) Net texture sulphides in gabbro | No. 1, 2 |
| (4) Heavily disseminated sulphides in gabbro | No. 1, 1½, 2 |
| (5) Weakly disseminated sulphides in peridotite | No. 1, 1½, 2 |
| (6) Disseminated and stringer sulphides in cherty argillite and altered tuff | No. 1, 1½ |

The massive pods of nickel-copper are 3 to 18 meters in width with sharp contacts and sit at the gabbro/country rock contact. They pinch and swell along the contact, forming ribs that plunge to the west (Vincent, 1972). A black border zone is present in gabbro at the massive sulphide/gabbro contact (Eckstrand, written communication). A thin section shows this zone to be a pyroxene hornfels. Maximum grades in the massive sulphide pods are 6 per cent Ni and 2 to 3 per cent Cu. These grades yield Cu/(Cu + Ni) values of 0.3 for massive ore and 0.6 for disseminated ore in gabbro.

Mineralography:

Sulphide minerals in the Wellgreen deposits include (in relative order of abundance): pyrrhotite, pentlandite and chalcopyrite. Pyrite is absent. Pyrrhotite forms 50 to 90 per cent of the total sulphide content, pentlandite averages 10 to 25 per cent, and chalcopyrite ranges from 15 to 30 per cent.

Pyrrhotite is allotriomorphic granular and forms irregularly shaped masses. Pentlandite occurs as feathery exsolution flames in pyrrhotite masses, as xenomorphic patches between pyrrhotite grains (rim texture), as small regularly shaped grains scattered along pyrrhotite grain boundaries (also rim texture), and as coarse, well defined grains showing octahedral cleavage. Chalcopyrite occurs as small irregularly shaped blebs in pyrrhotite masses (usually at grain boundaries), as patches along the boundary between pyrrhotite and silicates, and as tongues and scattered masses along fractures within the silicates.

Certain textures of the sulphide minerals are indicative of a magmatic origin as an immiscible sulphide melt. Pyrrhotite-chalcopyrite patches are intercumulus to olivine crystals in peridotite. They also occur with olivine in poikilitic clinopyroxene. Small oval-shaped blebs of sulphides sit along the cleavage traces in clinopyroxene. Olivine crystals and other silicate grains are incorporated into masses of pyrrhotite. Net texture sulphides in gabbro are also indicative of a magmatic origin.

Numerous textures of the different types of sulphide occurrence show deformation and/or remobilization. Foliation of the sulphide masses is slight to well developed. This foliation may be due to alternating bands of pyrrhotite-pentlandite and chalcopyrite-silicates. The silicate inclusions are scattered into aggregates of rounded particles that are strung out and aligned subparallel to each other. These silicate aggregates are often augen-shaped and boudinaged with foliated sulphide minerals wrapping around them. Locally the aggregates are rolled. Some polished sections show the silicates to be strung out, folded, sheared, broken and rolled. Most silicate inclusions are mottled around their borders. Chalcopyrite intrudes silicate masses as veinlets, stringers and irregular patches along fractures. These veinlets start in the pyrrhotite mass and crosscut both it and the silicates. Pyrrhotite forms its own veins although they are not as common as those of chalcopyrite. Chalcopyrite and pyrrhotite rarely occur together in the same veinlet. These stringers are generally perpendicular to foliation and may or may not contain wisps of serpentine and chlorite arranged parallel to the veinlet walls. One polished section shows a tension gash of serpentine and chlorite with accompanying sulphide grains.

Effects of Alteration:

The serpentinization process and combined chloritization and carbonatization have affected textures of the sulphides in peridotites and gabbros, respectively. Magnetite partially surrounds some sulphide grains. Serpentine stringers crosscut sulphide minerals as well as the silicates. Disseminated sulphide masses have ragged, embayed edges with smaller bits of sulphide around the main mass. Alteration halos of magnetite zoning outward through carbonate $\pm$ chlorite to quartz are common in heavily disseminated gabbro sulphides. Halos of talc and minor epidote are less common. Some polished sections show needles or blades of serpentine interfingering with sulphide masses along their borders. These sulphide patches may be reduced to concentrated aggregates of serpentine and sulphide blades.

Structure:

Structural relationships are important in determining positions of the massive sulphide bodies and their genetic link to the mafic-ultramafic complex. Available underground information for the Wellgreen Property is limited. The massive sulphide body exposed at No. 1 Showing has sharp contacts with footwall cherty argillite and hangingwall gabbro. The sulphide/cherty argillite contact is roughly parallel to bedding and chalcopyrite veins and string-

ers penetrate the sedimentary rock along fractures both mega- and microscopically. The sulphide/country rock contact is locally a fault (Vincent, 1972). Contact between gabbro and massive sulphide pods is a fault at the surface and is evidently faulted underground (R. Cherlet, pers. comm., 1975). The massive sulphide bodies pinch and swell in complementary fashion relative to the gabbro (D.P. Price, company report). Price suggests the ore contacts are most commonly defined by faults and joints striking northwest and dipping subparallel to the gabbro. Slickensides plunge at a low to moderate angle to the west. The most significant ore zones occur as erratic, discontinuous pods that pinch and swell, forming west to northwest plunging rolls. Overall dip of the gabbro/cherty argillite contact is 60° to 65° SW with local abrupt changes where step-like features create flat spots (Vincent, 1972). Figure 3 illustrates the underground structural setting of the massive sulphide bodies as interpreted from available information and modified after Vincent (1972).

GENETIC INTERPRETATION

General Statement:

Three broad areas of the Yukon Territory are characterized by mafic to ultramafic rocks. Both Shakwak and Tintina Faults have spatially associated mafic and ultramafic bodies scattered along their lengths. A third area is southeast and east of Whitehorse - the northern extension of the Cassiar ultramafic belt of British Columbia. Nickel-copper sulphide showings in the Yukon appear to be restricted to the Kluane Range mafic and ultramafic rocks along the southwest side of the Shakwak Trench between Slims River and White River.

The Quill Creek complex and its associated nickel-copper sulphide deposits is a good example with which to consider genesis because of: (1) large size of the layered complex; (2) completeness of the layered cross section; (3) occurrence of the largest Ni-Cu deposits known in the area; (4) availability of some underground information; and (5) ease of access. Difficulties do exist that obscure the genesis, such as extensive serpentinization and deformation (folding, shearing and major faulting).

Origin of the Quill Creek Complex:

Mafic and ultramafic rocks have been classified according to various parameters. Naldrett (1973) groups these rocks in terms of tectonic setting. The late magmatic history of such complexes is used by Thayer (1971) to delineate authigenic, polygenic and allogenic bodies. Wyllie's (1969) classification of mafic and ultramafic rocks is based on field associations and tectonic environment.

The Quill Creek complex and other mafic-ultramafic rocks along the Kluane Ranges are believed to be differentiated sills, possibly an early phase (Late Permian or Early Triassic) of an extensive period of Late Triassic magmatism that gave rise to the Nikolai Greenstone.

Major features of the Quill Creek body include:

- (1) Elongate shape generally concordant to enclosing Permian strata.
- (2) Fingering of the complex at both extremities, suggesting folding and faulting along with Permian strata.
- (3) Locally unfaulted contacts that are sharp with stringers of ultramafite extending into the country rocks.

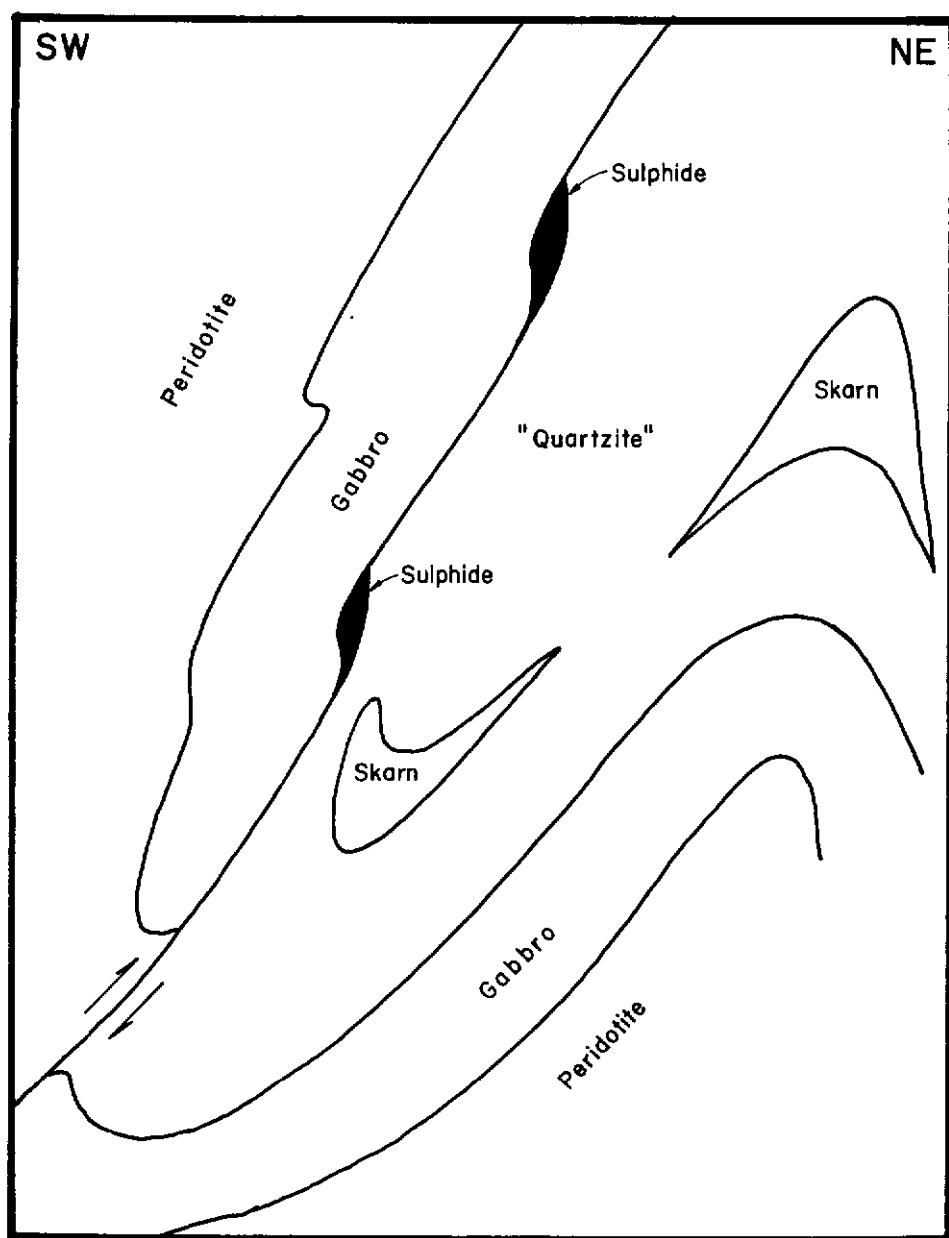


Figure 3. Schematic interpretation of the cross-sectional structural setting of the massive Ni-Cu 'pods'.

- (4) Rock types within the complex are layered parallel to contacts and stratigraphy and include a basal section of dunite overlain by a thicker section of peridotite.
- (5) Gabbro is elongate and parallel to the ultramafic portion and is at least locally intrusive along the upper contact of peridotite.
- (6) Cumulate texture is dominant in dunite and in the lower portion of the peridotite section.

These features are suggestive of a differentiated sill.

Besides sills and lenses other documented types of mafic-ultramafic bodies occurring in orogenic belts are classed as alpine and Alaskan zones. Irvine and Findlay (1972) list characteristics of alpine ultramafites. Some of these criteria are met by the Quill Creek body, such as: (1) mode of occurrence; (2) inconspicuous contact metamorphism; and (3) primary minerals - olivine, orthopyroxene and clinopyroxene. However, (1) remnant sharp intrusive contacts; (2) lack of tectonic layering; (3) absence of chromite; and (4) presence of intercumulus nickel-copper sulphides separates the Quill Creek complex from the alpine category. Features of Alaskan type ultramafites are well documented by Irvine (1974) and Rucknick and Noble (1959). The lack of outward concentric zoning of rock types from an inner core of dunite automatically precludes the Quill Creek complex from the Alaskan category.

Spatial relationship between the Quill Creek ultramafite (and other ultramafites in the area), gabbros, and Upper Triassic basaltic flows, suggests the possibility of a temporal and genetic relationship. Gabbroic rocks are associated spatially with the ultramafites and also occur within the volcanics. Petrographic comparison between the Quill Creek gabbro and discordant gabbros in the basalt flows shows an increase in modal per cent plagioclase, decrease in per cent clinopyroxene, lower An content of plagioclase, and extreme decrease in per cent interstitial sulphides for the discordant gabbros in Triassic volcanic rocks. Gabbros in the Nikolai sequence are also magnetite-bearing and are fresher and have a coarser-grained equivalent of diabasic texture, compared to the highly altered, allotriomorphic granular Quill Creek gabbro.

It is suggested that prior to Upper Triassic volcanism the Quill Creek complex was emplaced as a crystal mush that differentiated in situ. Olivine is the only cumulus mineral in the Quill Creek body; pyroxenes are poikilitic; sulphides, minor biotite and hornblende are intercumulus. Wager and Brown (1967) suggest that crystal accumulation plays a minor role in differentiation of a sill and that it is confined to early stages of crystallization involving olivine.

An alternative hypothesis to differentiation as a sill is to consider the Quill Creek and other complexes as remnants of the original magma chamber, which have been faulted into their present positions. Many contacts of the Quill Creek body are sheared or faulted and this suggests some degree of movement during the major deformational period. However, the absence of rhythmic layering and igneous lamination (both features essential characteristics of layered intrusions) rules out this possibility.

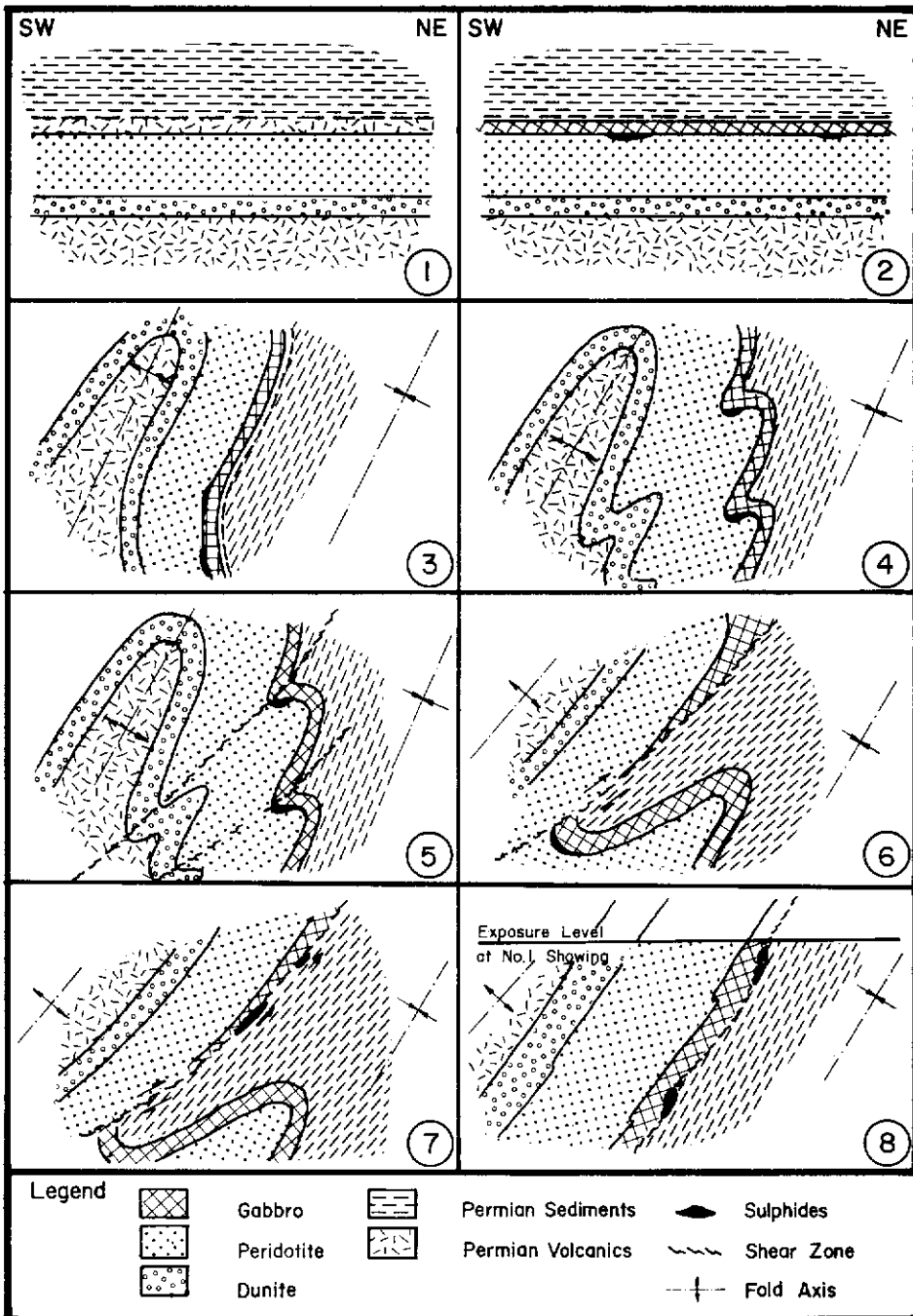


Figure 4. Schematic diagram of interpreted genetic sequence for the Quill Creek complex and Ni-Cu deposits.

Origin of Nickel-Copper Sulphides:

Genesis of nickel-copper sulphides associated with mafic and ultramafic rocks has long been a prominent topic. Naldrett and Cabri (1976), Naldrett (1973), and Naldrett and Gasparrini (1971) discuss and classify various types of nickel-copper sulphide occurrences. Kilburn *et al* (1969) and Wilson *et al* (1969) outline the major features and geochemistry of some Canadian nickel sulphide ores.

Small sulphide blebs in silicate grains in both peridotite and gabbro, intercumulus nature of disseminated pyrrhotite-chalcopyrite in peridotite, and interstitial to net texture sulphide minerals in gabbro of the Quill Creek body suggest that these sulphides are primary and represent solidified trapped immiscible sulphide liquid. Genesis of the massive nickel-copper sulphide pods is less easily delineated. These pods are faulted into their present positions, such that they sit stratigraphically above the gabbro. Available underground information and surface examination show a poorly developed trend going from net texture sulphides near the gabbro/peridotite contact to heavily disseminated sulphides away from this contact. This suggests, in accordance with the 'billiard ball' model (Naldrett, 1973), that the massive sulphide bodies were originally located at the base of the gabbro. Figure 4 is a schematic diagram suggesting how the sulphide bodies may have been remobilized and transported to their present positions.

It is suggested that the massive nickel-copper pods at Wellgreen Mine were formed as a result of separation and subsequent sinking of an immiscible sulphide liquid. Factors favoring separation of such a melt (Haughton *et al*, 1974) existed at an intermediate stage of crystallization of the differentiating Quill Creek sill. This intermediate stage would represent post crystal accumulation of the ultramafic section and before the intrusion and crystallization of the sulphide-rich gabbro. Cu/(Cu + Ni) ratios of greater than or equal to 0.3 and Ni/Cu ratios of less than or equal to 3 for the massive sulphide pods suggest genetic relationship to the mafic rather than ultramafic sections of the Quill Creek complex (Naldrett, 1973; MacLean and Shimazaki, 1976).

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GEOLOGY AND MINERAL DEPOSITS OF THE MINTO AREA,
YUKON TERRITORY

by
W.D. Sinclair

INTRODUCTION

The area covered in this report is approximately 120 square miles (300 square km) centered at latitude 62°38'N, and longitude 137°11'W (Figure 1). The centre of the area is two miles (3.2 km) southwest of the Yukon River, 9.5 miles (15.5 km) west-northwest of the abandoned station of Minto and 48 miles (78 km) north-northwest of Carmacks. Access to the area is by boat along the Yukon River or by helicopter from Minto or Carmacks. A tote trail constructed in 1974 from Carmacks is currently suitable for winter travel only.

In 1973 a significant copper deposit was discovered 12 miles (19.2 km) west of Minto. This report summarizes the results of six weeks of field work carried out in 1974 and 1975 to investigate the nature and distribution of the copper deposits in the area. The deposits are similar to the Williams Creek deposit, a brief description of which is included.

HISTORY AND PREVIOUS WORK

The Minto area is part of the Carmacks sheet which was mapped by Bostock (1936) and recently revised by Tempelman-Kluit (1974a).

Prospecting in the area began in the early 1900's following the rush to the Klondike gold fields. The earliest recorded activity was the discovery of a copper showing which was staked as the HARLUCK claims in 1902 (currently covered by the COIN claims). From then on until the 1970's, little work appears to have been done in the area. In the early 1970's interest in the area was stimulated by the discovery of the Casino copper-molybdenum deposit to the west in 1969 and the Williams Creek copper deposit to the south in 1970. Silver Standard Mines Limited, in a joint venture agreement with American Smelting and Refining Company (ASARCO), encountered anomalously high copper in a stream sediment sample in the area in 1970 and, after subsequent prospecting, staked the MINTO claims in 1971. Shortly after the MINTO claims were staked, United Keno Hill Mines Limited discovered malachite-stained outcrops of granodiorite to the north of the MINTO group and staked the DEF claims under an exploration agreement which included Falconbridge Nickel Mines Limited and Canadian Superior Exploration Limited as partners. In 1971 and 1972 Silver Standard outlined several zones of low grade copper on the MINTO claims (Craig and Milner, 1975). The main mineralized zone of the Minto deposit, which straddles the boundary between the MINTO and DEF claim groups, was discovered by United Keno in 1973 (Sinclair and Gilbert, 1975).

PHYSIOGRAPHY

The Minto area is part of the Dawson Range, which lies within the Klondike Plateau, an old uplifted erosion surface dissected by narrow valleys (Bostock, 1966a). The topography is gently rolling with relief up to 2,000 feet (600 m).

The Klondike Plateau is characterized by a general lack of glaciation. Reid glaciation probably advanced no further than the southwest side of the Yukon River in the Minto area (Bostock 1966b). Isolated gravel terraces in the western part of the Minto area are considered by Bostock (1966b) to be part of the Klaza advance.

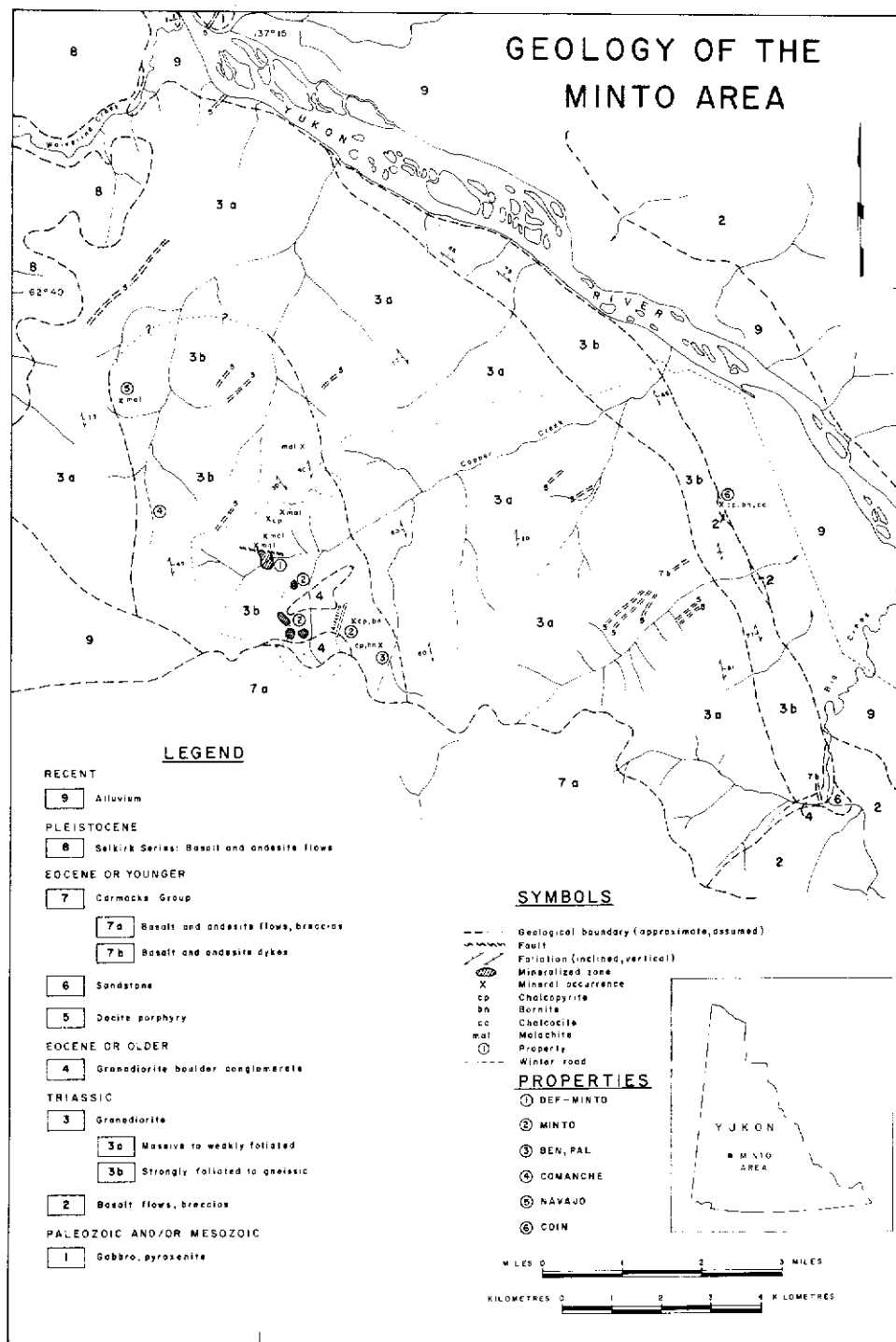


Figure 1. General geology of the Minto area.

Due to the lack of glaciation, bedrock exposure is poor and generally limited to the tops of ridges where it forms blocky, castellated outcrops.

GENERAL GEOLOGY

The Minto area lies within the Yukon Crystalline Terrane. It is underlain mainly by Mesozoic plutonic rocks which have been intruded and overlain by Tertiary volcanic rocks. The general geology of the area is shown in Figure 1.

Gabbro and pyroxenite (Unit 1) occur in a small stock exposed on both sides of the Yukon River at the northern edge of the Minto area. The rocks are dark green, coarse-grained and consist mainly of chloritized hornblende and pyroxene. Altered feldspar is a minor constituent and disseminated magnetite is abundant locally. The gabbro and pyroxenite appear similar to gabbro in the southwest Snag map-area described by Tempelman-Kluit (1974b) and assigned a late Paleozoic age.

The eastern part of the area is underlain by volcanic rocks, mainly massive basalt flows, flow-breccias and tuffs (Unit 2). These rocks are typically dark green and highly epidotized. The contact with granodiorite is steeply dipping and probably a fault. The age of these volcanics is uncertain, but Tempelman-Kluit (1974b) has tentatively assigned similar rocks in the Aishihik Lake map-area a Triassic age.

A large part of the Minto area is underlain by granodiorite of the Klotassin Batholith (Unit 3a) which occurs extensively in the Snag map-area to the west (Tempelman-Kluit, 1974b). The granodiorite is medium- to coarse-grained, massive to weakly foliated and varies from equigranular to porphyritic. Strongly foliated to gneissic zones of similar composition (Unit 3b) occur within massive granodiorite in the west-central part of the area and along the eastern contact with Triassic volcanics. Aplitic and pegmatitic phases of the granodiorite occur as west- to northwest-trending dykes ranging from a few centimetres up to one metre across.

Modal analyses of the granodiorite indicate a compositional range from quartz diorite to quartz monzonite (Figure 2). Oligoclase (An_{24-27}) is the main constituent and makes up 40 to 65 per cent of the rock. Quartz content varies from 10 to 25 per cent and potash feldspar content from 5 to 20 per cent. In the porphyritic granodiorite, potash feldspar occurs as pink orthoclase phenocrysts up to 2 cm long. Mafic minerals, mainly biotite with varying amounts of hornblende and epidote, constitute 5 to 15 per cent of the rock. Hornblende occurs as stubby, subhedral crystals commonly replaced by biotite and epidote. Sphene, apatite and zircon are common accessories; allanite is rare. The granodiorite is usually fresh except for surficial weathering and local sericitization of plagioclase which gives the rock a greenish cast.

Foliated zones in the Klotassin granodiorite (Unit 3b) are caused by the alignment of mafics, particularly biotite. A subtle tendency of orthoclase phenocrysts to be aligned with the foliation occurs locally. The degree of foliation varies from weak foliation characterized by subparallel recrystallization of biotite to strong foliation marked by strong alignment of the mafics and gneissic, compositional banding. The strongly foliated zones are generally similar to the massive granodiorite in modal composition (Unit 2) although high concentrations of mafics, mainly biotite, occur locally. There are also siliceous sections with a very low mafic content. Almandine* common-

*Identified by X-Ray Diffraction Laboratory, Geological Survey of Canada

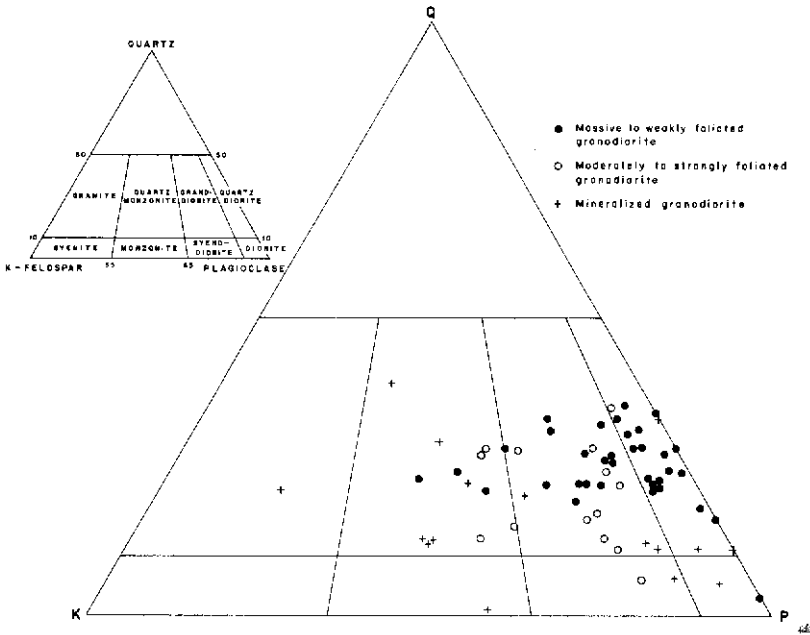


Figure 2. Modal analyses of granodiorites from the Minto area.

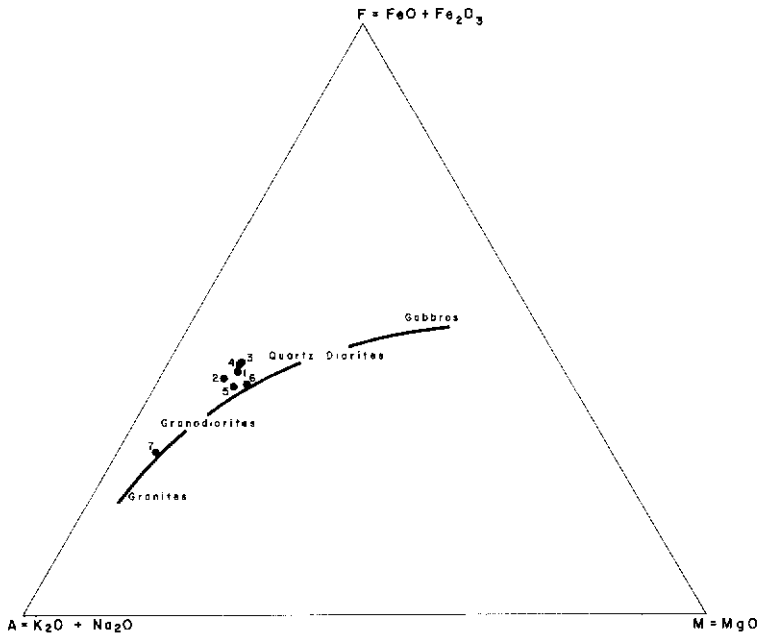


Figure 3. AFM plot of igneous rocks from the Minto area. Numbers refer to samples from Table 1. Solid line represents AFM plot of typical rocks, Lower California batholith (after Larsen, 1948 in Carmichael *et al.*, 1974, p. 568).

ly occurs in strongly foliated, biotite-rich zones. Magnetite is common, occurring as disseminated grains and in bands up to 2 cm wide. Ilmenite is associated with magnetite locally.

The strongly foliated zones occur mainly in the west-central part of the area in a belt approximately 4 km wide trending slightly west of north (Figure 1). The nature of the foliated zones within the belt has been observed mainly from diamond drill core. Zones of strong foliation vary from less than 1 m up to 60 m wide. Contacts with massive or weakly foliated granodiorite are often gradational although sharp contacts have been observed in places. The zones are discontinuous laterally and interfinger with massive to weakly foliated granodiorite.

Foliated zones in the belt trend approximately 330° and define a broadly synclinal structure. On a gross scale, foliation dips are flat-lying to gently-dipping along a central axis and gradually steepen, dipping 60° to 70° towards the axis along the margins of the belt. In detail, the structure appears to be much more complex as foliation angles in drill core from the central part of the belt vary from 0° to 90° over relatively short intervals and isoclinally folded foliation occurs locally. Analysis of poles to the foliation indicates the synclinal structure plunges 10° to the northwest, where the foliated zones interfinger with or grade into massive granodiorite. To the southeast, the foliated zones are covered by Carmacks Group volcanics.

An area of strongly foliated granodiorite lacking gneissic or compositional banding occurs along the eastern margin of the granodiorite (Figure 1). The foliation in this area is steeply-dipping and is characterized by cataclastic features such as streaking of the mafics and straining and fracturing of quartz grains, probably related to differential movement between the granodiorite and the Triassic volcanics to the east.

Chemical analyses for six samples of different phases of the granodiorite are given in Table 1. The analyses are remarkably similar except for sample 5 which is lower in SiO_2 and higher in CaO . The chemical similarity of the different phases is also reflected in the AFM diagram shown in Figure 3. All the samples have typical values for granodiorite to quartz diorite.

The age of the granodiorite is probably Late Triassic. A single determination on biotite from foliated biotite granodiorite in the Minto area yielded a K-Ar age of 174 million years but this is thought to be the result of a thermal event superimposed on the granodiorite 160-170 million years ago (Tempelman-Kluit and Wanless, 1975). Determinations from similar rocks elsewhere in the Dawson Range have yielded ages up to 223 million years (Tempelman-Kluit and Wanless, 1975).

Table 1. CHEMICAL ANALYSES OF GRANITIC ROCKS, MINTO AREA¹

Sample*	1	2	3	4	5	6	7
SiO ₂	64.60	65.90	65.50	64.50	58.60	65.00	69.30
Al ₂ O ₃	17.30	16.00	16.80	16.50	16.80	16.70	15.70
Fe ₂ O ₃	2.54	2.64	1.80	2.06	3.93	0.61	1.14
FeO	2.79	2.70	3.65	4.19	2.51	4.34	1.80
MgO	1.40	1.30	1.39	1.58	1.93	1.67	0.60
CaO	4.50	4.30	3.80	2.85	6.00	3.10	3.20
Na ₂ O	4.40	3.60	4.00	3.10	4.20	3.70	4.40
K ₂ O	1.75	3.10	2.00	3.75	4.00	2.35	2.65
TiO ₂	0.35	0.32	0.36	0.37	0.50	0.35	0.21
P ₂ O ₅	0.22	0.22	0.25	0.27	0.27	0.29	0.11
MnO	0.10	0.09	0.06	0.68	0.12	0.06	0.04
L.O.I.	0.34	0.14	0.69	0.35	0.76	1.69	0.18
Total	100.29	100.31	100.30	100.20	99.62	99.86	99.33

*Samples:

1. Quartz diorite, non-foliated, from west-central belt of foliated rocks.
2. Biotite hornblende granodiorite, non-foliated, from central part of map-area.
3. Quartz monzonite, foliated, from west-central belt of foliated rocks.
4. Biotite garnet gneiss, from west-central belt of foliated rocks.
5. Hornblende granodiorite, foliated, from eastern belt of sheared granodiorite.
6. Biotite granodiorite, foliated, mineralized, from MINTO-DEF deposit.
7. Dacite porphyry, from dyke in western part of area.

¹Analyzed by Bondar-Clegg & Company Limited, Vancouver.

Granodiorite boulder conglomerate (Unit 4) overlies granodiorite in the southeast part of the map area on the west side of Big Creek and south of the airstrip on the MINTO property and up to 60 m was encountered in drill holes immediately northwest of the airstrip. The conglomerate is composed of poorly sorted, subrounded pebbles, cobbles and boulders of locally derived granodiorite, including both massive and foliated varieties, in a sandy, reddish-brown, hematitic matrix. Pebbles of dark green, massive, fine-grained basalt were noted in a few places. The contact with the underlying granodiorite varies from sharp to gradational suggesting that it formed, at least in part, by *in situ* weathering of the granodiorite. The conglomerate is overlain locally by Carmacks Group volcanics, indicating an Eocene or older age.

Dacite porphyry (Unit 5) occurs as northeast-trending dykes ranging from 15 to 80 m across. The dacite porphyry consists of approximately 60 per cent subhedral to euhedral plagioclase phenocrysts ranging from 2 mm to 1 cm across. Euhedral biotite, subhedral hornblende and anhedral quartz-eye phenocrysts each make up about 5 per cent and range from 1 to 5 mm in size. The matrix consists of a fine-grained to aphanitic mixture of quartz, K-feldspar and biotite and is typically grey in colour. The dacite porphyry intrudes Klotassin granodiorite and, locally, gabbro and pyroxenite. It is probably equivalent to the feldspar porphyry dyke swarms in eastern Snag and western Aishihik Lake map-areas which have been dated as Eocene in age (Tempelman-Kluit and Wanless, 1975). An analysis of the dacite porphyry is included in Table 1. On the AFM diagram in Figure 3, dacite porphyry plots in the granite to granodiorite range.

Sandstone (Unit 6) is exposed in a section on the west side of Big Creek in the southeast corner of the Minto area. The section is 25 m thick and dips 20° to the southeast. The lower part of the exposed section consists of poorly indurated, brown-weathering, coarse-grained, locally cross-bedded sandstone and grades, over approximately 0.1 m, into orange-weathering, fine-grained tuffs and finely laminated sandstone which contains a few plant fragments. Similar grey tuffaceous sediments containing carbonaceous fragments were encountered in a drill hole south of the airstrip on the MINTO property. The sediments here appear to be underlain by granodiorite boulder conglomerate to the north and overlain by Carmacks Group basalt and andesite flows to the south. This unit is probably correlative with other immature clastic sediments overlain by Carmacks Group volcanics described elsewhere in the Dawson Range (Tempelman-Kluit, 1974b) and is likely Eocene or younger in age.

In the southern part of Minto area, Klotassin granodiorite and Triassic volcanic rocks are unconformably overlain mainly by Carmacks Group basalt and andesite flows and flow-breccias which dip approximately 10° to the south. The flow rocks are massive and fine-grained with few small phenocrysts of chloritized pyroxene. They are dark green to brown on a fresh surface and weather to a reddish-brown. The flow-breccia consists of angular fragments of andesite and basalt in a matrix of similar composition. Narrow (0.1 to 1 m), north to north-east trending dykes of fine-grained andesite and basalt (Unit 7b) which intrude Triassic granodiorite are probably related to feeders for the Carmacks flows. The age of the Carmacks Group volcanics is thought to be Eocene or younger (Tempelman-Kluit, 1974b).

Massive basalt and andesite flows of the Selkirk Series (Unit 8) unconformably overlie Triassic granodiorite in the northwestern part of the Minto area. The flows in this area are fresh, dark grey, fine- to medium-grained and commonly vesicular. Similar rocks north and west of the Minto area are described in detail by Bostock (1936), who has presented evidence of a Pleistocene age for these flows.

Recent alluvium (Unit 9) related to the most recent glaciation occurs mainly as a thick blanket in the Yukon River valley in the Minto area. Isolated gravel terraces occur in the western part of the area. Fine, white volcanic ash, known as White River ash, occurs locally throughout the area as a thin (up to 2 cm) bed at the surface or beneath a few centimetres of soil. The nature and distribution of this 1,500 year old ash are described by Lerbekmo and Campbell (1969).

MINERAL DEPOSITS

One subeconomic copper deposit and several significant mineralized zones occur in the Minto area apparently lying conformably within strongly foliated Triassic granodiorite. The following is a description of these occurrences and a discussion of their possible origins and controls.

Minto Copper Deposit:

The Minto copper deposit is situated 5 miles (8 km) southwest of the Yukon River near the headwaters of a small creek referred to locally as Copper Creek (Figure 1). The southern portion of the deposit is covered by the MINTO claims and the northern portion by the DEF claim group. During the period 1971 to 1974, Silver Standard Mines Limited and American Smelting and Refining Company carried out geological, geochemical, magnetic, electromagnetic and induced polarization surveys, bulldozer trenching and over 91,000 feet (28,000 m) of drilling in 139 holes on the MINTO claims. On the DEF claims, United

Keno Hill Mines Limited, Falconbridge Nickel Mines Limited and Canadian Superior Exploration Limited conducted geological, geochemical, magnetic, electromagnetic and induced polarization surveys, bulldozer trenching and drilled 93 holes totalling more than 52,000 feet (16,000 m). Work on the MINTO and DEF properties is summarized by Sinclair et al (1975, pp. 96-100). A joint feasibility study on the deposit completed in 1976 indicated that production would be uneconomic under current economic conditions and, consequently, the property is presently inactive.

Diamond drill core from the DEF and MINTO properties was examined and logged by the author and used to construct the plan and representative cross-sections shown in Figure 4.

The Minto deposit occurs in the central part of the west-central belt of strongly foliated granodiorite (Figure 1). The host granodiorite ranges in composition from quartz diorite to quartz monzonite (Figure 2) and is marked by varying degrees of foliation. Massive to weakly foliated granodiorite is characterized by a total lack or only a slight tendency of mafic minerals, principally biotite, to be aligned. In weakly to moderately foliated granodiorite, biotite exhibits a distinct subparallel alignment and orthoclase phenocrysts may display a subtle alignment. Moderately to strongly foliated granodiorite contains mafic-rich bands in which biotite grains are oriented subparallel to parallel. Strongly foliated to gneissic granodiorite is marked by gneissic, compositional layering, and includes bands of quartzo-feldspathic gneiss and biotite-garnet gneiss. Zones of strong foliation vary from less than 1 m up to 100 m wide and commonly grade into weakly foliated to massive granodiorite, although gneissic zones tend to have sharp contacts.

Mineralization in the Minto deposit consists mainly of disseminated and blebby sulphides in zones of moderate to strong foliation and in gneissic zones, commonly with a high proportion of biotite although locally sulphides are concentrated in quartzo-feldspathic gneiss. Weakly disseminated sulphides occur in weakly foliated to massive granodiorite in places. On a gross scale, zones of disseminated sulphides are conformable with the foliation of the host rocks. They appear to be continuous in drill intersections although core angles on the foliation commonly range from 0° to 90° suggesting more complex internal structures.

The main mineralized zone of the Minto deposit is irregular, flat-lying, north to north-west trending and measures approximately 1,600 feet (500 m) long, up to 800 feet (240 m) wide and 50 feet (15 m) to 200 feet (60 m) thick. It is more-or-less continuous although sulphide-deficient lenses of foliated and massive granodiorite occur within it and zones of low grade mineralization appear to be separated from it. The main zone tends to pinch out and grade into weakly foliated to massive granodiorite except to the north, where it is truncated by a fault striking 100° and dipping 60° to the north. The displacement on this fault is not known and the extension of the main zone north of this fault has not yet been discovered. At its southern end, the main zone subcrops beneath 250 feet (78 m) of overburden. To the north, the zone is overlain by up to 200 feet (60 m) of bedrock.

Published reserves are 7,221,000 short tons grading 1.86 per cent copper, 0.2 ounces per ton silver and 0.015 ounces per ton gold (F.A. Godfrey, remarks to 30th Annual Meeting of United Keno Hill Mines Limited, April 6, 1977). Copper content is highest in the west-central portion of the deposit and falls off gradually towards the margins of the mineralized zone except along the northwest margin where it decreases more abruptly. Silver content ranges from 0.1 to 0.7 ounces per ton and gold content from 0.005 to 0.06

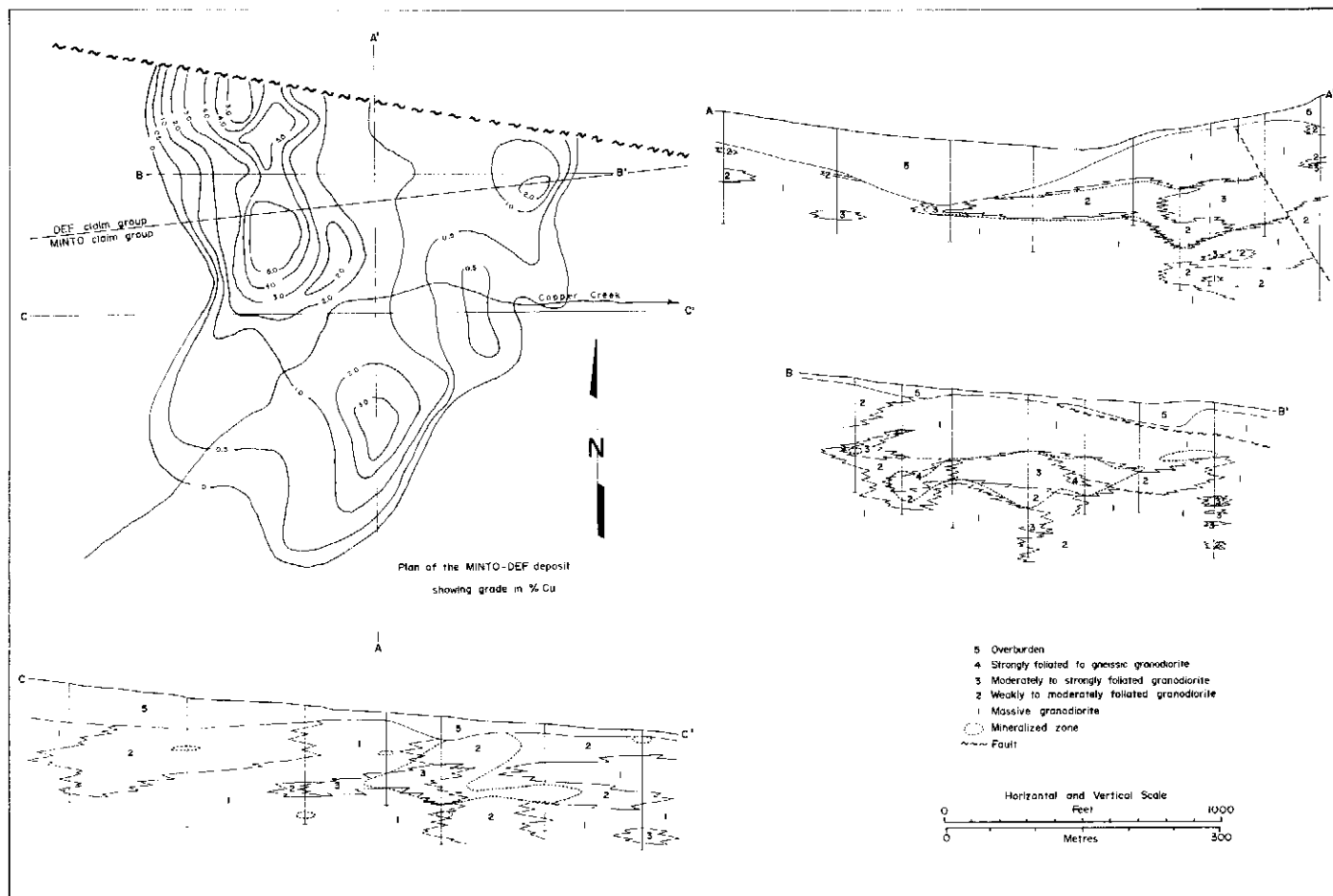


Figure 4. Plan and cross-sections of the Minto copper deposit.

ounces per ton (Northern Miner, November 22, 1973, p. 24). High gold and silver contents correspond closely with high copper content.

The mineralogy of the Minto deposit is relatively simple. Chalcopyrite and bornite are the main ore minerals and occur typically as irregular disseminated grains averaging 0.5 to 1 mm in size although locally they form irregular, coalescing masses up to 3 cm long parallel with the foliation of the host rock. Bornite is most abundant in the west-central, high-grade portion of the deposit where it is associated with chalcopyrite and varying amounts of magnetite. Outward from this central zone, bornite is minor or absent and chalcopyrite is the dominant sulphide. Up to several per cent disseminated pyrite occurs around the fringes of the deposit. Hessite (Ag_2Te) and native gold have been identified in the high-grade portion of the deposit as microscopic inclusions in bornite (Pearson and Clark, 1977). Secondary minerals occur locally at the southern end of the deposit where it subcrops beneath overburden and they include malachite, azurite, chalcocite and native copper.

Various types of alteration have been recognized in the Minto deposit. Argillic and sericitic alteration are well-developed locally in mineralized zones but their distribution is erratic and apparently not extensive. Minor potassic alteration consisting of secondary potash feldspar also occurs locally. The most striking alteration is zeolitic alteration consisting of replacement of plagioclase by laumontite*, and alteration of mafic minerals to chlorite and hematite. In places, the host rock is completely altered to a mixture of fine, crystalline laumontite, typically light pink in colour, and earthy, brown hematite in which the original texture of the rock is totally destroyed. This alteration is best developed locally in rocks immediately adjacent to the fault truncating the north end of the deposit and gradually dies out within 15 m from the fault. Thus the zeolitization appears to be fault-controlled and not related to the mineralized zones.

Geochemical and geophysical surveys conducted over the Minto deposit were relatively unsuccessful in outlining the main mineralized zone. Except for the southern end which is covered by up to 78 m of overburden, the main zone does not outcrop and has no expression in soil geochemistry. Induced polarization surveys have had some success in outlining mineralized zones, but the sulphide content is too low to give an electromagnetic response and there is insufficient magnetite associated with the deposit to allow magnetic surveys to distinguish the mineralized zones from magnetite-bearing host rocks.

MINTO Claims:

The MINTO claims, which contain part of the Minto copper deposit described in the foregoing section, also contain additional mineralized zones of low grade copper which occur south to southeast of the Minto deposit (Figure 1). Four zones were explored by Silver Standard Mines who carried out bulldozer trenching and nearly 10,000 feet (3,000 m) of diamond drilling distributed over 20 holes during 1971 and 1972 (Craig and Milner, 1975, pp. 65-66). These zones have been estimated to contain approximately 2.5 million tons of 1.5 per cent copper (Northern Miner, September 20, 1973, p. 6). Mineralization consists of disseminated chalcopyrite and bornite confined mainly to gneissic zones in granodiorite. The gneissic zones trend 330° and have an average dip of 45° to the northeast. A zone of low grade mineralization is also exposed in trenches east of the airstrip on the MINTO property. Malachite staining, along with a local high grade, massive pod of chalcopyrite and bornite up to 1 foot (0.3 m) thick, occurs here in strongly foliated granodiorite trending 330° and dipping 30° to 45° to the southwest.

*Identified by X-Ray Diffraction Laboratory, Geological Survey of Canada

Additional mineralized zones of good grade copper were discovered on the MINTO claims by Asarco during exploratory drilling carried out on the property in 1974 (Northern Miner, August 15, 1974, p. 11). Hole No. 125, drilled 3,000 feet (900 m) east of the south end of the main zone of the Minto deposit, cut 33 feet (10 m) of 2.10 per cent copper from 608 to 641 feet (185 to 195 m), or 63 feet (19 m) of 1.36 per cent copper from 578 to 641 feet (176 to 195 m). Hole 108, 2,000 feet (610 m) southeast of the main zone and adjacent to the northernmost zone outlined by Silver Standard, intersected 50 feet (15 m) of 1.71 per cent copper from 656 to 706 feet (200 to 215 m) and 130 feet (40 m) of 1.08 per cent copper from 746 to 876 feet (227 to 267 m), or 220 feet (67 m) of 1.03 per cent copper from 656 to 876 feet (200 to 267 m).

BEN, PAL Claims:

This property, which adjoins the eastern boundary of the MINTO group, was staked in September 1971 by G. Wing of Whitehorse and subsequently optioned to Dawson Range Joint Venture. Soil sampling in 1972 outlined a copper anomaly in an area of visible malachite staining and bulldozer trenching in 1973 across the anomaly exposed two low grade mineralized zones, one of which assayed 0.32 per cent copper over 20 feet (6.1 m).

Four holes totalling 2,250 feet (686 m) were drilled on the property in 1974. Hole B-1, drilled 1,000 feet (305 m) east of the mineralized zones to test an EM-16 anomaly, encountered mainly porphyritic granodiorite, only weakly foliated and non-mineralized. Holes B-2, 3 and 4 were drilled beneath the mineralized zones and encountered several zones of low grade copper (Sinclair *et al*, 1975, pp. 100-101).

The mineralized zones consist of disseminated chalcopyrite, bornite, magnetite and pyrite in addition to secondary malachite, azurite and chalcocite. The zones occur in strongly foliated to gneissic granodiorite trending 330° and dipping 45° to 80° to the southwest.

COMANCHE Claims:

These claims were staked in 1971 on the western side of the MINTO claims and are currently owned by Pinnacle Mines Limited and Yukon Gold Placers Limited. Work on the property includes bulldozer trenching in 1972 and five holes totalling 2,793 feet (851 m) of diamond drilling in 1974 (Sinclair *et al*, 1975, pp. 101-102). The trenching exposed minor malachite staining in granodiorite and the drilling intersected a zone of disseminated chalcopyrite in gneissic granodiorite which assayed 0.48 per cent copper over 1.8 feet (0.5 m).

NAVAJO Claims:

The NAVAJO claims are adjacent to the southwest and northwest boundaries of the DEF claim group. The claims were staked in 1973 and subsequently acquired by Black Giant Mines Limited.

A ground magnetic survey carried out in 1974 outlined a north- to north-west-trending anomaly coincident with a copper anomaly. Bulldozer trenching across the anomalous zone exposed weakly mineralized zones in strongly foliated to gneissic granodiorite. These zones were tested in 1974 by five diamond drill holes totalling 2,685 feet (818 m) but only trace amounts of copper were encountered (Sinclair *et al*, 1975, pp. 102-103).

The mineralized zones consist of minor amounts of malachite and azurite found in fractures and as small grains disseminated along foliation planes. Magnetite and almandine are abundant locally. The zones vary from 1 to 30 feet (0.3 to 9 m) wide, striking approximately north-south and dipping 60° to 70° to the east.

COIN Claims:

Copper was discovered on this property in 1902 and staked as the HARDLUCK claims. Work at that time included a short adit. In 1907, the property was restaked as the COPPER COIN group but subsequently lapsed and was allowed to remain dormant until 1970 when it was restaked as the COIN claims. The property lapsed and was restaked again in 1971 as the COIN claims by Taseko Mines Limited, the current owners. Subsequent work by Taseko included trenching and 988 feet (301 m) of diamond drilling in three holes (Sinclair *et al.*, 1975, p. 110). The trenching exposed a mineralized zone which assayed 0.27 per cent copper, 0.06 ounces per ton silver and traces of gold over 45 feet (13.7 m). Two grab samples from the vicinity of the old adit assayed 6.77 per cent copper, 1.28 ounces per ton silver and less than 0.003 ounces per ton gold; and 4.40 per cent copper, 0.99 ounces per ton silver and 0.011 ounces per ton gold respectively. The drilling encountered only irregularly distributed, low grade mineralization.

The copper showings on the COIN claims occur in highly chloritized and epidotized massive green volcanic rocks of Unit 2. The volcanics are close to the contact with strongly foliated granodiorite and are intruded by dykes or sills of granodiorite porphyry. Bornite and chalcopyrite with minor covellite, chalcocite and native copper occur as disseminated grains and irregular stringers in the altered volcanics but their distribution is local and erratic.

Possible Origin of the Minto Deposits:

There is little agreement concerning the origin of the Minto deposit. Kirkham (1974) has suggested that it may be a highly metamorphosed and remobilized stratiform deposit in metasedimentary rocks despite the potassic nature of the host rocks and relatively high gold content. Tempelman-Kluit (1975) considered the deposit to have been hydrothermally emplaced in schlieren or screens of poorly digested Pelly Gneiss in Klotassin granodiorite during the late stages of formation of granodiorite from the Pelly Gneiss. According to Gale (1976), the deposit formed primarily by segregation and concentration of sulphides within an igneous melt as the granodiorite crystallized. Pearson and Clark (1977) stated that the mineralization pre-dates the metamorphism which produced the foliation and is possibly hydrothermal or sedimentary in origin. The following features of the copper deposits and occurrences of the Minto area are considered pertinent to any discussion of their origin:

- 1) All of the known occurrences, with the exception of the COIN showing which is in Triassic volcanic rocks, are restricted to a belt of moderately to strongly foliated granodiorite. The belt is in the form of a broad, open, synclinal structure with the Minto deposit in flat-lying foliated rocks along the central axis and other mineralized zones in moderately to steeply-dipping foliated rocks along the limbs of the syncline.
- 2) Mineralized zones appear to be conformable to foliated zones in the granodiorite and are preferentially concentrated in both biotite-rich and quartzo-feldspathic bands.

- 3) The foliated and mineralized host rocks are generally similar both chemically and mineralogically to the massive, non-mineralized granodiorite except that some of the gneissic bands contain almandine, which does not occur in the massive granodiorite.
- 4) The main deposit shows distinct zoning from a high grade central zone characterized by abundant bornite and chalcopyrite to a lower grade outer zone consisting of chalcopyrite with increasing pyrite toward the fringes of the deposit.
- 5) There is a lack of extensive alteration associated with the deposits.

These features are consistent with a pre-metamorphic origin for the mineralized zones. Migmatitic relationships between Yukon Metamorphic Complex or equivalent rocks and Klotassin granodiorite have been described over wide areas in the Yukon Crystalline Terrane (Bostock, 1936; Tempelman-Kluit, 1974b) and the foliated zones in the Minto area are thought to be poorly digested, migmatized remnants of Yukon Complex rocks within the granodiorite. The mineralized zones probably had the same general distribution and zoning pattern prior to migmatization as they now display because there is little alteration to suggest any major hydrothermal introduction or remobilization of sulphides during, or subsequent to, migmatization.

The nature of the original host rocks and origin of the related mineralization are highly speculative. Almandine and biotite are typically formed by low-grade metamorphism of pelitic rocks (Winkler, 1974) and a sedimentary origin for the host rocks is favoured. However, the chemical and mineralogical data presented here are inconclusive and a volcanic origin cannot be ruled out. Copper, along with gold and silver, may have been introduced at the time the sediments, or volcanics, were formed but could also have been hydrothermally emplaced prior to metamorphism.

The Williams Creek Deposit:

The Minto deposit is similar in many respects to the Williams Creek deposit which occurs 25 miles (40 km) to the south-southeast. The following description is taken from Craig and Milner (1975) and from A.R. Archer (pers. comm.).

The Williams Creek property is underlain mainly by biotite-hornblende granodiorite of the Klotassin Batholith. Strongly foliated to gneissic zones occur within the granodiorite and at least thirteen are mineralized, of which the most important is the No. 1 Zone. This zone is a hornblende-biotite-quartz-feldspar gneiss containing disseminated mineralization. It is a north-northwest trending tabular body approximately 100 feet (30.5 m) thick, 1,600 feet (490 m) long and dipping 70° to the east. To the north, the zone grades into massive, non-mineralized granodiorite; to the south, it is terminated by a fault.

Chalcopyrite and bornite are the primary sulphide minerals and occur as small (0.1 to 0.2 mm) interstitial grains typically in zones parallel with the foliation and concentrated in biotite-rich bands, also parallel with the foliation. Bornite is most abundant in the northern end and in the upper part of the deposit. The bornite zone gives way to the south and with depth to a zone of bornite and chalcopyrite, which, in turn, gives way to a zone of chalcopyrite and pyrite. The deposit is extensively oxidized and secondary minerals are present to a depth of 800 feet (240 m). Oxide minerals are mainly malachite and azurite in an amorphous mixture of copper and iron oxides

referred to as "pitch copper" or "pitch limonite" (Abbott, 1971). Geological reserves in the Williams Creek deposit, including the oxidized zone, are approximately 16 million tons of 1 per cent copper (A.R. Archer, pers. comm.).

The Williams Creek deposit is comparable to the Minto deposit in both the type of host rock and nature and distribution of the mineralization and a similar origin is inferred. However, Archer (pers. comm.) believes the gneissic zones originated as xenoliths of Triassic massive volcanics which were incorporated in and partially digested by the granodiorite.

Exploration for Minto-type Deposits:

The uncertainty of the origin of the Minto and Williams Creek deposits makes formulation of exploration guidelines rather tentative. If rocks of the Yukon Metamorphic Complex are indeed the source of these deposits, then similar, or equivalent, deposits may occur within them. Although mineral occurrences are relatively scarce in the Yukon Metamorphic Complex, there is at least one, the Lucky Joe prospect south of Dawson, which may be equivalent. This occurrence consists of chalcopryite, pyrite and minor molybdenite which occur as disseminations and in fractures parallel to foliation in biotite and quartz-muscovite schists (Sinclair et al, 1976, pp. 80-81). Therefore, although the Yukon Metamorphic Complex is poorly understood and associated mineral deposits scarce, its potential for hosting Minto-type deposits should not be overlooked.

The deposits of the Minto area occur within a belt of foliated granodiorite which trends south-southeast towards the Williams Creek deposit. The area between these two groups of occurrences may be part of a continuous belt and is an obvious area warranting further exploration. Belts of foliated rocks occur elsewhere in Klotassin granodiorite and these, too, are obvious areas to prospect.

Visual prospecting and geochemical techniques have been used to locate nearly all of the known zones of mineralization. Detailed induced polarization surveys have been successful in outlining some mineralized zones. Magnetic surveys have been used to locate magnetite-rich areas within the foliated zones but, as on the NAVAJO claims, these do not necessarily indicate the presence of copper.

ACKNOWLEDGMENTS

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Ag-Pb-Zn Mineralization in the MM Deposit and Associated
Mississippian Felsic Volcanic Rocks in the St. Cyr Range,
Pelly Mountains

by J.A. Morin

Introduction

A sequence of Mississippian felsic volcanic rocks up to 600 m thick occurs in the St. Cyr Range of the Pelly Mountains. In the past few years, exploration work on an Ag-Pb-Zn prospect near Seagull Creek, the MM deposit, has sparked interest in the volcanic belt as a potential host for stratabound volcanogenic massive sulphide mineralization. This preliminary report is in response to this interest which will probably be expressed in summer 1977 by a relatively high level of mineral exploration.

Location and Access

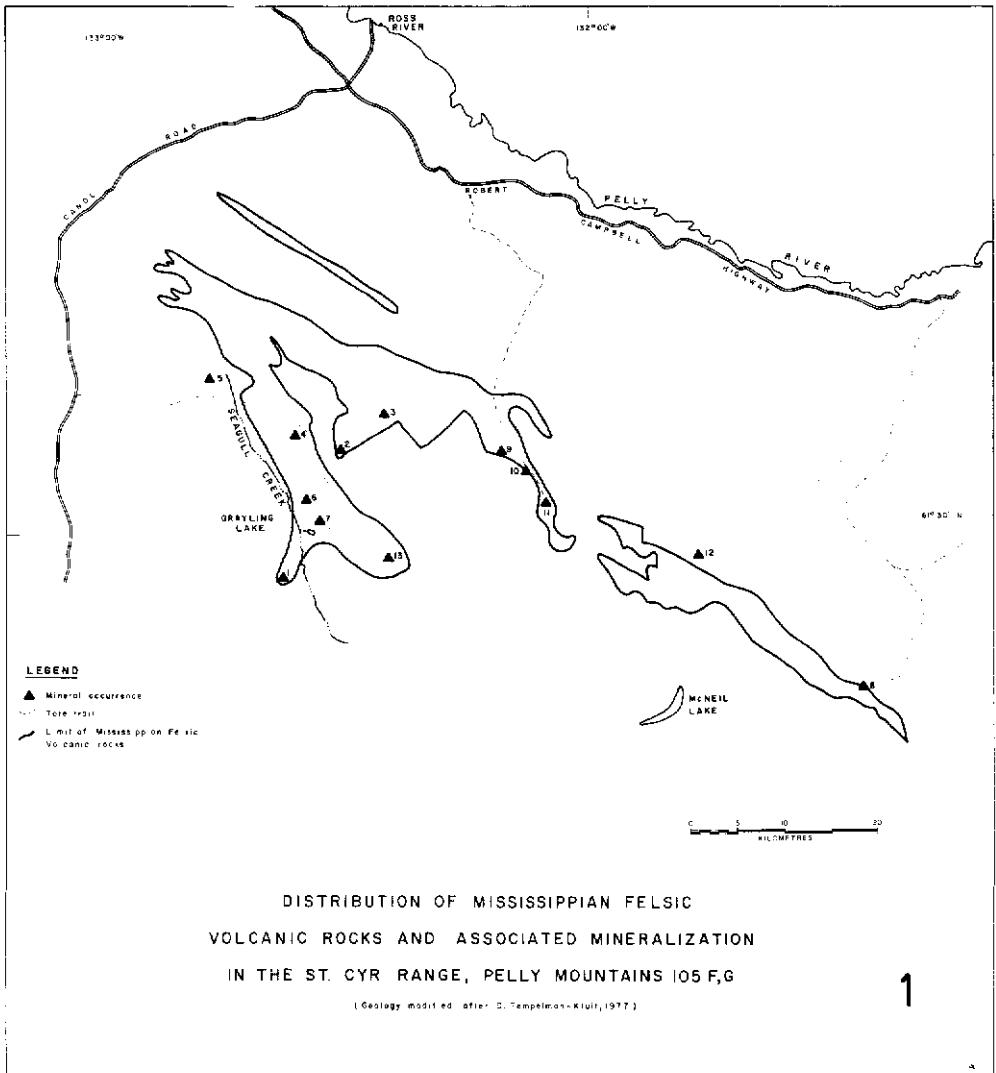
The volcanic rocks occur in a belt 80 km long and up to 25 km wide that is located about 35 km south of Ross River and the Robert Campbell Highway and east of the South Canol Road. Access is provided by float equipped aircraft to a few small lakes in the area: Grayling Lake, near the south end of Seagull Creek, 25 km east of the Canol Road and McNeil Lake, 65 km east of the Canol Road and 50 km south of the Robert Campbell Highway. In addition, a fixed wing airstrip is located beside the Ketza River, about 50 km south of Ross River. Three tote trails also provide access to the area. A tote trail suitable for four-wheel drive vehicles follows Groundhog Creek from the Canol Road to Seagull Creek, then south to Grayling Lake and north beside the McConnell River to near the COOT property (#4 on map). Another tote trail extends south from the Robert Campbell Highway to the HOO property and further south to the JOE property, 20 km east of McNeil Lake. In addition, a tote trail extends south from the Robert Campbell Highway along the Ketza River to the vicinity of the KEY and KETZA properties (#9, 10, 11 on map).

List of Showings

- 1 - MM
- 2 - BNOB
- 3 - CHZERPNOUGH
- 4 - COOT
- 5 - Canol Mines Ltd. - Groundhog Creek
- 6 - MAT
- 7 - GULL
- 8 - JOE (F.H.)
- 9 - KEY
- 10 - F-2, F-3
- 11 - A-1
- 12 - BELL
- 13 - CPA

Previous Work

Early geological mapping of the area was conducted by the Geological Survey of Canada in the late 1950's (Wheeler *et al*, 1960a, b) at a scale of 1:250,000. Subsequent mapping has been performed by D.J. Tempelman-Kluit, of the G.S.C. during 1973 to 1976 at the same same scale and Preliminary Series maps of 105 F, G are due to be released as Open File reports in the latter half of 1977.



Geology

A 600 m thick section through the volcanic belt east of McConnell River shows that it can be sub-divided into the following lithofacies arranged in order of abundance: 1) volcanoclastics, 2) siltstone, 3) lava flows, 4) syenite plugs and 5) exhalites.

The volcanoclastic rocks consist of poorly layered to massive beds of tuff, lapilli tuff and breccia tuff. Lithic fragments are commonly trachyte, tuff, argillite and chert and are usually rounded and lenticular to blocky in shape. Phenoclasts of K-feldspar and perthite also occur. The matrix is largely made up of fine-grained hematite, feldspar and siderite.

The siltstone ranges from grey to black to buff in colour and is usually finely layered. Constituent minerals are feldspar with minor quartz, opaques, sericite, biotite and carbonate.

Trachyte lava flows occur as thin blocky weathering, creamy grey, fine-to coarse-grained rocks up to several metres thick intercalated with the volcanoclastic and sedimentary rocks. They consist of subparallel masses of elongate Carlsbad-twinning K-feldspar grains varying in length from 0.1 mm to greater than 1 cm. Minor conformable lenticles of hematite and siderite and orange-brown siderite amygdulæ are present. Porphyritic varieties with perthite phenocrysts also occur.

Coarse-grained syenite plugs with rounded outlines are intrusive to the volcanic belt. Locally, the contacts between the trachyte flows and syenite are gradational and indicate that the syenite plugs are hypabyssal in nature and probably represent former volcanic centres. Perthite, biotite, stilpnomelane, magnetite and relict hornblende and clinopyroxene constitute the syenite, along with very minor accessory magnetite and fluorite.

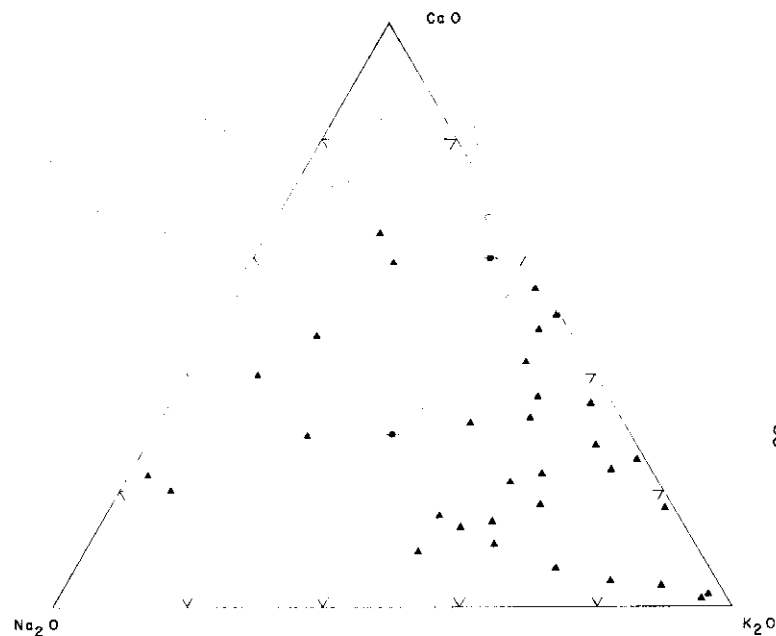
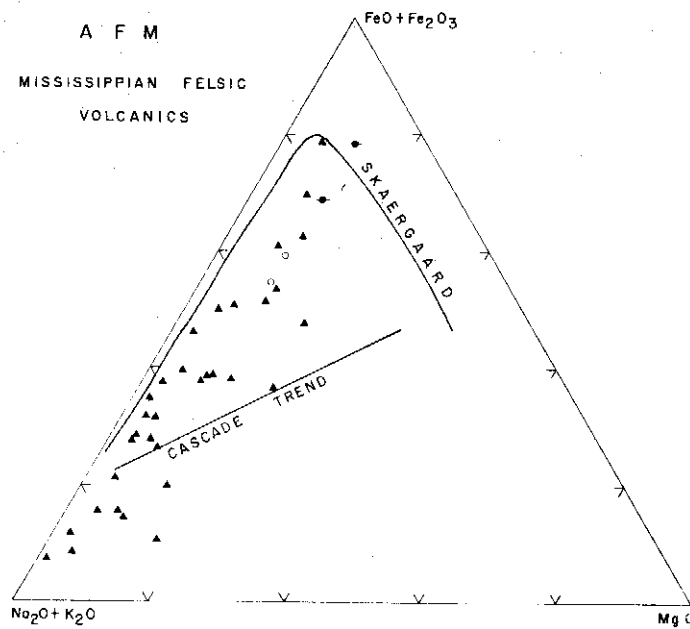
Several types of exhalites occur within the volcanic belt. Pyritic chert is the most common and it forms extensive gossans upon weathering. Much more restricted in extent are the barite horizons and pyritic iron formations. Locally, disseminated, layered and massive sulphide mineralization is associated with the exhalites.

Structure

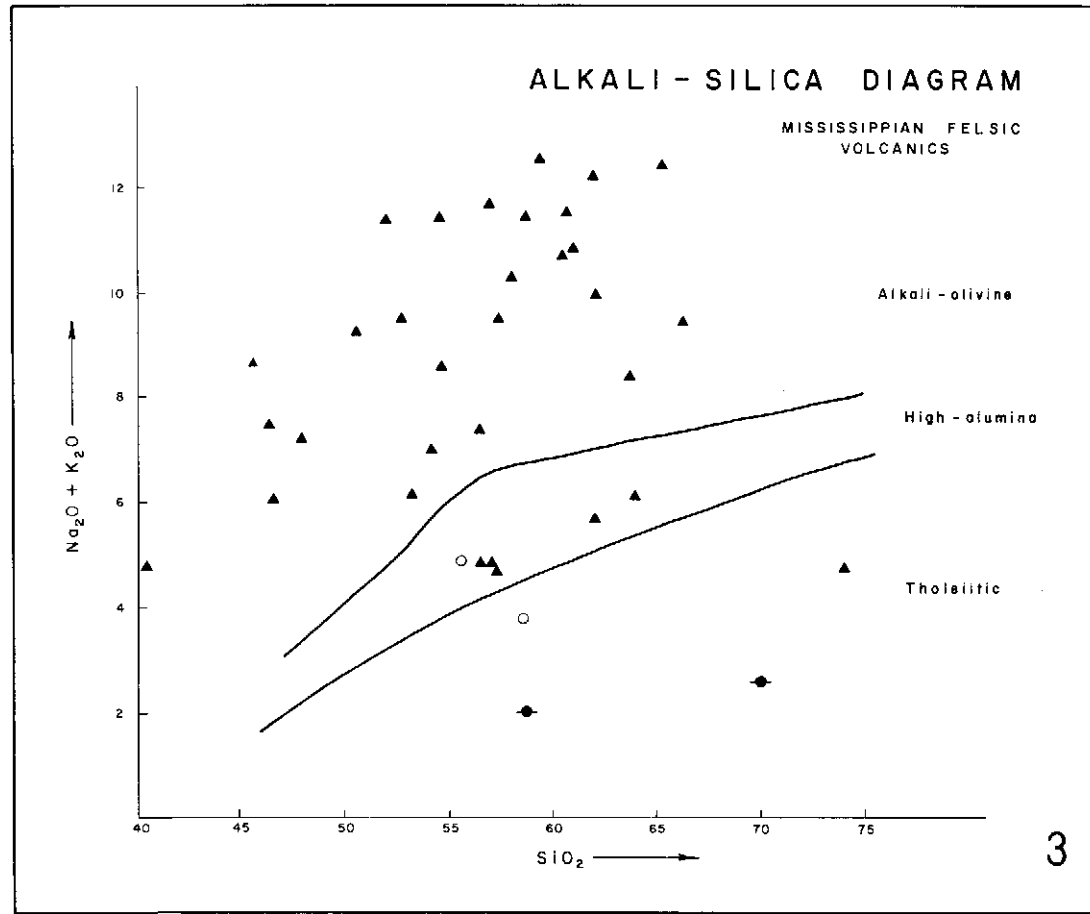
The volcanic belt lies within the Pelly-Cassiar Platform which is bounded to the southwest by the Yukon Crystalline Terrane and to the northeast by the Selwyn Basin (D.J. Tempelman-Kluit, 1977a). Thrust faults have affected all the rocks to a major degree and the Mississippian volcanics are bottomed, internally sliced and topped by thrust faults. Traces of the thrusts are not easy to determine and accordingly, the real thickness of the volcanic pile is unknown and the 600 m thickness only an approximation.

Geochemistry

Chemical analyses indicate that most of the volcanic rocks of the Seagull Creek volcanic belt are alkali rich and potassic. The analyses plot in the alkalic region on the alkali-silica diagram and follow the tholeiitic trend toward alkali enrichment on the AFM diagram. However, rocks of calc-alkaline affinity such as rhyolite have been described from the southwestern portion of the belt (F. Marshall Smith, 1977, Personal Communication).



AFM and CaO-Na₂O-K₂O diagrams for Mississippian felsic volcanics and associated hypabyssal rocks (▲) and rocks from the MM deposit felsic hangingwall (○) and intermediate footwall (●)



Barium, uranium, thorium and fluorine were also determined. The barium content of 34 samples is significantly high and averaged out to 1,813 ppm. The high barium contents in the volcanic rocks suggests that they may be the barium source for the widespread barite horizons in the Besa River Formation to the east. Uranium values are low (average <0.6 ppm) and probably reflect surface leaching by water (32 samples). However, the values for thorium are relatively high (average 31 ppm) and suggest that the associated uranium values were higher prior to exposure of the rocks to aqueous leaching agencies. Fluorine is characteristically high and averaged out at 1,643 ppm with a range from 285 to 6,300 ppm (34 samples).

Mineralization

Silver, lead and zinc in the form of argentiferous galena and sphalerite and barium in barite constitute most of the mineralization associated with the volcanic rocks. Two main styles of mineralization occur: stratabound-type and vein-type.

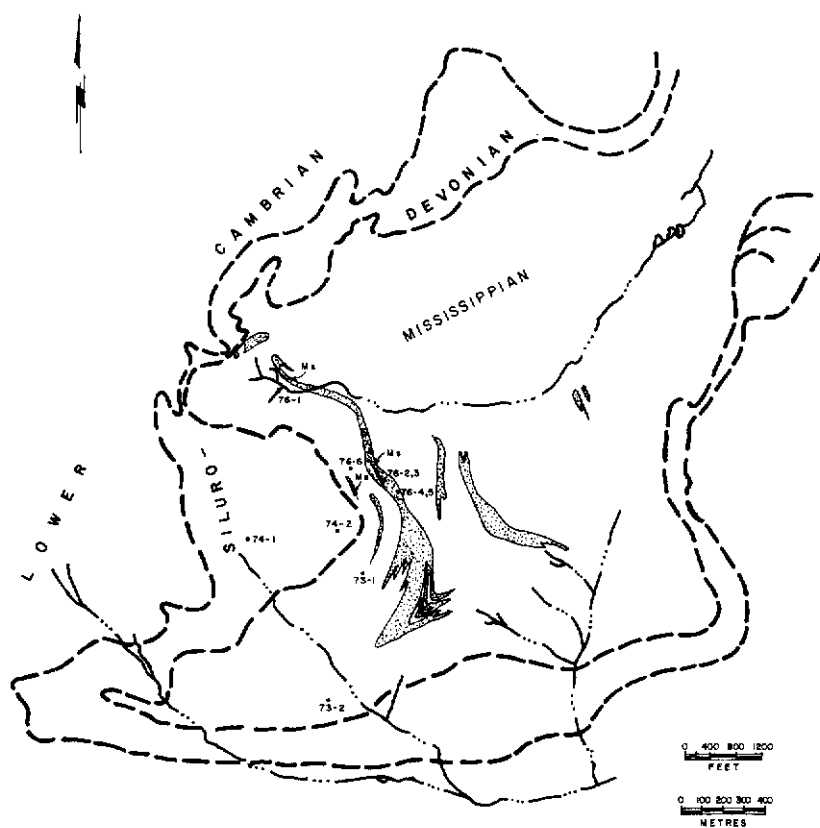
Stratabound-type

The stratabound type is best exemplified by the MM deposit of Cyprus Anvil. The MM deposit occurs in a pyritic quartzite bed that is situated between intermediate and felsic metavolcanic rocks. The deposit consists of three separate mineralized lenses, each in the order of a hundred metres long and several tens of metres thick. These lenses have suffered extensive deformation and folding and probably coalesce at depth to form one horizon. At least three distinct periods of folding have taken place and much of the stratigraphic sequence is isoclinally folded and overturned. In addition, the terrane bounds the north end of the Big Salmon Complex and metamorphism has changed the mineral assemblage to that of the amphibolite facies. A good portion of the following information presented here is derived from examination of diamond drill core, mainly DDH 76-06.

Host Rocks

Metavolcanic rocks of intermediate to felsic composition host the deposit. The footwall consists of mainly dark grey to green, feldspar-quartz-actinolite-biotite $\pm$ garnet schist and gneiss. Commonly, dark mafic layers 1 to 10 mm thick alternate with light grey quartzo-feldspathic layers of similar thickness. Red garnet is present as thin lenses or layers within the gneiss and generally associated with the garnet and other mafic minerals is fine- to medium-grained shreddy pyrrhotite, in the order of 2 to 5 mm long. Pyrrhotite occurs as thin layers, veinlets and as disseminated grains. It makes up less than 5 per cent of the rock, but locally, as in the few feet below the mineralized horizon, it increases to about 20 per cent. Pyrite is present in very minor amounts throughout the rock as thin veinlets, rare euhedral porphyroblasts and layers of colloform material. Chalcopyrite is present as rare fine anhedral patchy grains within thin chloritic veinlets. Throughout the rock, minor siliceous veinlets of quartzo-feldspathic composition are present lying both conformable with and transverse to the foliation.

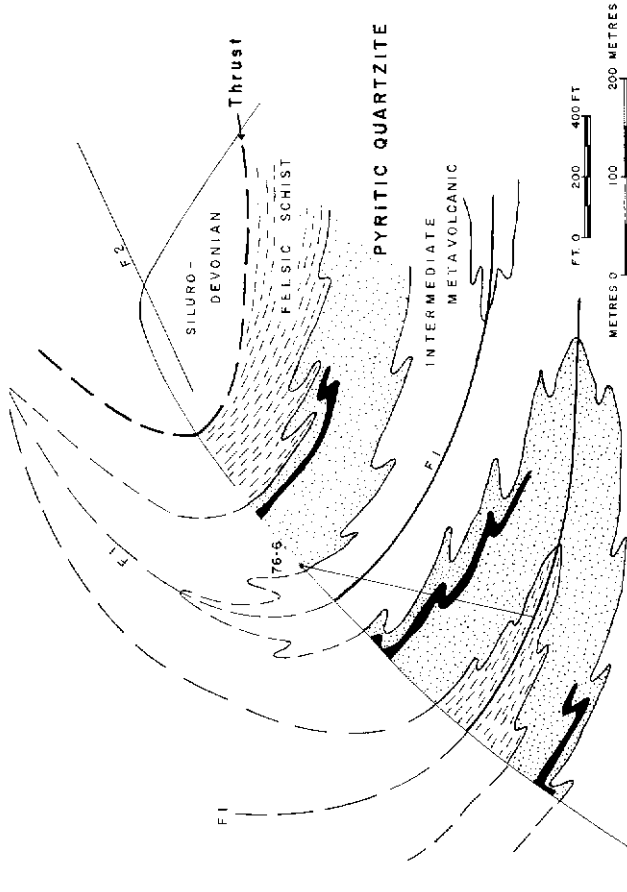
The hangingwall consists of pale greenish grey, quartz-feldspar-muscovite-calcite-zoisite-biotite-schist with minor locally disseminated, fine- to medium-grained pyrite and pyrrhotite. In outcrop, the schist retains enough primary features to show that in part, it is a felsic breccia with lensoid clasts of creamy white porphyritic felsic volcanics enclosed within a matrix of sericite-chlorite-quartz schist.



STRUCTURE AND GEOLOGY OF THE PYRITIC QUARTZITE HORIZON, M M GROUP, SEAGULL CREEK AREA, 105F-7 (Modified after D. Jennings 1976)

LEGEND

-  Pyritic quartzite horizon
-  Massive sulphide horizon
-  76-6 Diamond drill hole collar
-  Creek
-  Geological contact



M M DEPOSIT

SCHEMATIC STRUCTURAL INTERPRETATION

(Profile looking S.E. and perpendicular to F2 axial plane; Modified after map by company geologists)

CHEMICAL ANALYSES OF ROCKS FROM THE MM DEPOSIT

	Footwall		Quartzite	Massive Sulphide	Barite Horizon	Hangingwall	
	1	2	3	4	5	6	7
SiO ₂	70.0	58.9	60.4	14.0	0.4	58.6	55.6
Al ₂ O ₃	10.9	9.9	18.5	6.9	0.2	12.0	17.2
Fe ₂ O ₃	1.3	1.1	7.3	22.7	4.6	0.4	1.4
FeO	7.6	13.9	0.5	5.8	0.3	7.1	6.3
MgO	1.4	2.1	1.0	1.1	0.1	1.3	1.5
CaO	1.1	3.0	0.4	3.3	0.1	7.5	5.5
Na ₂ O	1.3	0.3	0.20	0.65	0.10	0.3	0.65
K ₂ O	1.3	1.75	5.4	1.25	0.2	3.5	4.25
TiO ₂	0.50	0.44	0.25	0.50	0.02	0.35	0.54
MnO	0.26	0.24	0.01	0.15	<0.01	0.21	0.17
P ₂ O ₅	0.02	0.01	0.03	0.02	0.01	0.07	0.09
L.O.I. @ 950°C	1.9	3.1	5.4	17.1	2.8	4.3	2.0
S	0.3	4.6	4.9	28.7	15.8	2.2	1.6
Sub-Total	97.88	99.34	104.29	102.17	24.64	97.83	96.80
Cu	n.d.	n.d.	16 ppm	490 ppm	38 ppm	n.d.	n.d.
Pb	n.d.	n.d.	260 ppm	3.2%	0.40%	n.d.	n.d.
Zn	n.d.	n.d.	23 ppm	6.4%	0.37%	n.d.	n.d.
Cd	n.d.	n.d.	1 ppm	370 ppm	14 ppm	n.d.	n.d.
Bi	n.d.	n.d.	<5 ppm	<5 ppm	<5 ppm	n.d.	n.d.
Ba	n.d.	n.d.	1.21%	1.66%	53.8%	n.d.	n.d.
Hg	n.d.	n.d.	170 ppm	475 ppm	500 ppm	n.d.	n.d.
Te	n.d.	n.d.	<0.5 ppm	2.5 ppm	0.5 ppm	n.d.	n.d.
Au	n.d.	n.d.	5 ppm	40 ppm	95 ppm	n.d.	n.d.
Ag	n.d.	n.d.	1.3 ppm	36 ppm	22 ppm	n.d.	n.d.

Note: n.d. - not determined

#1 - MZ-5, split core sample of footwall, DDH 76-6, 480.5 ft. to 481.0 ft.

2 - MZ-6, split core sample of footwall, DDH 76-6, 467.7 ft to 468 ft.

3 - MZ-3, grab sample of pyritic quartzite, cliff showing area

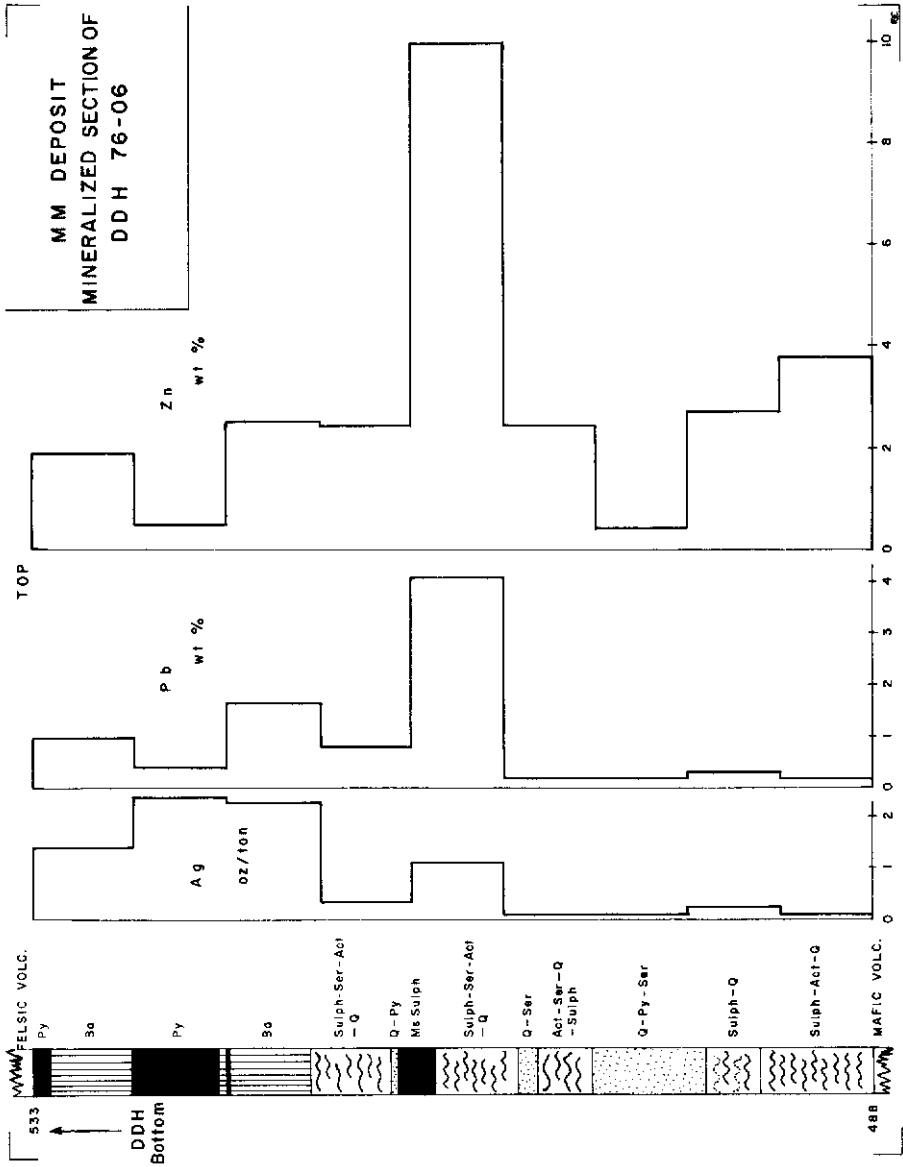
4 - MZ-1, grab sample of massive sulphide from cliff showing

5 - MZ-2, grab sample of barite horizon, cliff showing area

6 - MZ-7, split core sample of hangingwall, DDH 76-6, 541.5 ft. to 541.75 ft.

7 - MZ-4, split core sample of hangingwall, DDH 76-6, 536 ft. to 536.5 ft.

Analysts - Bondar-Clegg and Company Limited, Vancouver, B.C.



Mineralized Zone

Lithology

The portion of the mineralized zone studied is 13.5 metres thick. It consists of sulphide-silicate gneiss, quartzite, massive sulphide, barite and massive pyrite units.

The sulphide-silicate gneiss consists of alternating layers of sulphides (varying amounts of sphalerite-pyrrhotite-pyrite with rare chalcopyrite) and silicates (varying amounts of quartz, actinolite, sericite). It accounts for about half of the mineralized zone and occurs intermittently throughout the lower 2/3 of the zone.

The quartzite consists of layers of quartz, pyrite, rare sphalerite and galena alternating with quartz and sericite and locally, it contains no sulphides at all.

The 0.6 metre thick massive sulphide unit occurs in the middle of the mineralized zone and it consists of massive to poorly layered, fine- to medium-grained sulphides forming up to 90 per cent of the rock, the remainder being andalusite (blocky shaped porphyroblasts), quartz and sericite.

Two barite units occur in the upper portion of the mineralized zone. They are each about 1.5 metres thick and they consist of fine-grained, poorly layered, sucrose-textured pale grey barite in layers about 5 mm thick alternating with thinner pyrite-rich layers which form from 10 to 40 per cent of the rock. Locally, the barite is massive and contains disseminated pyrite. Galena occurs as very minor thin layers and as disseminated grains throughout the units.

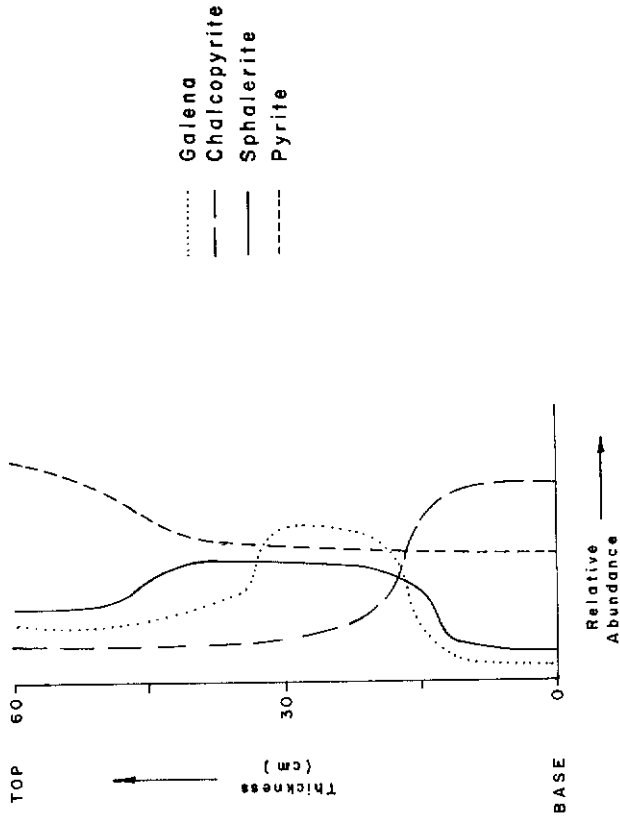
The massive pyrite units alternate with the barite in the upper portion of the mineralized zone and are the topmost unit in which sulphides are concentrated. They consist of fine-grained, massive to poorly layered pyrite with dark grey, coarsely crystalline irregular inclusions of calcite 3 mm to more than 10 cm in size and ranging from 7 to 30 per cent in abundance.

Metal Zonation

The 5 foot assay intervals correspond closely to the different rock units and enable comparisons to be made between lithology and metal content.

Silver and lead maintain low concentrations in the lower half of the deposit and sharply increase in concentration with the onset of the massive sulphide zone to 1.2 oz/ton and 4.2 wt%. This high concentration is reduced in the overlying sulphide-silicate gneiss and quartz-pyrite beds. In the upper portion of the mineralized zone, silver and lead are concentrated in the two barite-rich units. The silver/lead ratio undergoes a drastic change in the massive pyrite between the two barite units, lead low and silver high, indicating that the galena is locally richer in silver, and/or that a large portion of the silver is included in pyrite or that an undetected silver-bearing mineral is present.

Zinc maintains a relatively constant concentration in the sulphide-silicate gneiss units and barite units ranging from 1.9 to 3.8 wt%. Copper is very low in these units, averaging about 0.05 wt%, and is only moderately higher in the basal sulphide-silicate gneiss at 0.17 wt%. Concentrations of 10 wt% zinc and 0.4 wt% copper are attained in the assay interval that includes the massive sulphide zone. Both zinc and copper are at their lowest



MM Deposit: Schematic graph of mineral zonation in massive sulphide unit

concentration in the barite enclosed massive pyrite unit, 0.51 wt% and 0.03 wt% respectively.

Barium is concentrated as barite in the upper portion of the deposit and occurs in negligible amounts throughout the middle and lower portions. Iron maintains a moderate concentration throughout most of the section and has a sharp increase in concentration in the massive sulphide and pyrite units in the middle to upper portion. Sulphur is similarly low to moderate throughout most of the section, but shows a sharp increase in the upper half where it forms massive sulphides and sulphates. Silicon is concentrated in moderate amounts in the lower to middle portion of the section as silicates and is sharply enriched in the quartzite units and almost completely absent in the upper portion.

Extreme metal zonation occurs within the massive sulphide zone itself. The lower 15 cm are copper-rich, the next 15 cm lead-rich and the upper 30 cm iron-rich, with zinc high throughout.

ORIGIN

Using the premetamorphic lithology as a guide to the formation of deposit, a progressive sequence of several similar cycles was discerned:

BASE - Intermediate metavolcanic with thin quartz vein stockwork

- 1) sulphide-bearing felsic tuff to pyritic chert
- 2) sulphide-bearing felsic tuff to chert
- 3) sulphide-bearing felsic tuff to sulphide facies iron formation (metal enriched) to pyritic chert
- 4) sulphide-bearing felsic tuff to baritic exhalite
- 5) pyritic iron formation to baritic exhalite
- 6) pyritic iron formation

TOP - Felsic tuff, breccia.

A volcanogenic origin is indicated by the following features:

- The stratabound nature of the mineralized zones occurring as lenses within a volcanic sequence
- Stratiform character of the mineralized zone interlayered with felsic tuff and exhalative sediments
- presence of relict colloform pyrite in footwall intermediate tuff
- metal and mineral zonation within the mineralized zone itself and also within the thinner massive sulphide interval
- presence of quartz veining in the footwall rocks, i.e. probable siliceous alteration
- distinct compositional difference between the intermediate footwall and felsic hangingwall rocks
- similar mineralized exhalative horizons throughout the rest of the volcanic belt
- the presence of barium enriched volcanic rocks that provide a barium source for the exhalative barite horizons

A model of origin for the deposit is necessarily speculative, but at this preliminary stage, two classes of stratiform mineralization are proposed for this area, both related to exhalative centres. The first type is local (proximal) and consists of more massive and thicker layered sulphide units interbedded with the regional clastic and exhalite horizons. The second type of mineralization is regional (distal) in extent and consists of barite and chert horizons with minor to negligible amounts of disseminated and/or thinly layered sulphide (mainly pyrite).

Other Stratabound showings

The BNOB (#2) and CHZERPNOUGH (#3) claims cover two other stratabound showings, each consisting of a barite unit within which layered galena and pyrite occur. Possibly, the barite horizon at these two showings is correlative to the one at the MM deposit.

The MAT claims (#6) cover ground formerly held under the M.C. claims by the Quiet Lake Syndicate in 1966. In turn, the ground had previously been held by Conwest Explorations as the BOX group. To date, only limited trenching and geochemical soil sampling has been done. The main showing consists of a five foot section of massive galena within a sequence of graphitic slate and quartz-eye tuff. Surrounding the galena is a zone of pyrite which occurs as fine-grained disseminations and as semi-massive lenses. In addition, scattered veinlets of medium- to coarse-grained galena occur within an area about 75 feet long along the creek walls (see MAT claims, this publication). Botryoidal pyrite is reported to occur near the showing and this suggests that at least some of the mineralization is syngenetic and probably stratabound.

The GULL claims (#7) adjoin the MAT claims to the south and mineralization on the property consists of galena and minor sphalerite in veinlets and clots within reddish-brown felsic volcanics. A grab sample was reported to assay 6.2% Pb, 0.70% Zn, and 1.8 oz Ag/ton (Sinclair *et al*, 1976).

The CPA claims (#13) are 8 km east of the MM deposit and cover three large gossans in felsic metavolcanic rocks. The gossans appear to be stratabound and are due to oxidation of minor pyrite (Craig and Milner, 1975).

The JOE claims (#8) are located 20 km east of McNeil Lake on ground formerly staked as the FH group. Mineralization consists of a conformable lens of massive sulphides, mainly pyrite and pyrrhotite enclosed within a quartzite horizon (Archer-Cathro N.C.M.I.). The lens is up to 4 feet wide and has been traced for a distance of 3,700 feet. A grab sample assayed 7.3% Zn, 3% Pb, 1.1% Ag and trace Au.

Vein Showings

Vein type mineralization that may be related to hypabyssal syenite plugs occurs in Mississippian and older rocks in the area. The COOT claims (#4) cover ground formerly held as the CONE claims by Pelly Mountains Syndicate (Green and Godwin, 1964). The main showing consists of massive pyrrhotite, pyrite and galena described by A. Aho in Green and Godwin, 1964 p. 42 as "a sheet or lens-like mass that is up to 10 feet thick and possibly as much as 80 feet long". A grab sample assayed 0.02 oz Au/ton, 26.7 Ag/ton, 79.0 % Pb and 0.2% Zn. In addition, A. Aho reported four other showings of much smaller size and similar mineralogy in the nearby area. From the vague description of this property, it is difficult to determine whether the mineralization is stratabound or not, but the very high lead assay suggests a vein-type occurrence.

The Canol Mines Limited property (#5) is 4 km west of Seagull Creek and consists of veins of quartz, siderite and galena in dolomite, graphitic and phyllitic sedimentary rocks (Findlay, 1969). The host rocks are assigned by D. Tempelman-Kluit (1977) to a platformal carbonate facies of the Road River Formation and are Silurian in age.

Properties # 9, 10 and 11 are located west of the Ketz River and consist of argentiferous galena in veins and stratabound bodies within Mississippian volcanics and Lower Paleozoic carbonates and shale (Findlay, 1969).

The KEY showings (#9) on Cache Creek consist of both vein and stratabound types (Findlay, 1967, pp. 56-58). The veins are reported to consist of quartz and siderite with variable amounts of galena, pyrite and sphalerite and are emplaced within quartzite, quartzitic schists and phyllites and argillaceous rocks containing graphitic layers of probable Mississippian or earlier age. Stratabound mineralization has been described as thin, discontinuous stringers and disseminations of pyrite, pyrrhotite and galena conformable to schistosity and bedding planes.

The F-2 and F-3 showings (#10) are 0.8 km apart and consist of vein type quartz-pyrite-galena mineralization (Findlay, 1967, pp. 56-58) emplaced within quartzite, graphitic argillite and argillaceous schists.

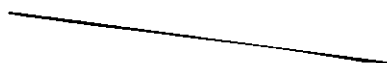
The A-1 showing (#11) consists of a vein of galena and siderite emplaced within limestone, sericitic phyllite and graphitic argillite containing local quartz bands and lenses (Findlay, 1969, pp. 75-76).

The copper showing on the BELL Group (now lapsed) (#12) were formerly considered to be within the Mississippian volcanics. However, recent mapping by D. Tempelman-Kluit (1977) has shown the host rocks to be Cambro-Ordovician mafic volcanics. The mineralization consists of veinlets of bornite, chalcocite, covellite and chalcopyrite and calcite reported to be associated with shear zones (Ogilvy and Tredger, 1970).

ACKNOWLEDGMENTS

The author wishes to acknowledge the cooperation of Cyprus Anvil Mining Corporation, especially P. Dean for providing access to confidential company data and drill core. In addition, D. Tempelman-Kluit of the Geological Survey of Canada provided rock specimens and informative discussions.

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MAYO MINING DISTRICT

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Uranium-Copper Mineralization and Associated Breccia Bodies
in the Wind-Bonnet Plume River Area, Yukon

by J.A. Morin

INTRODUCTION

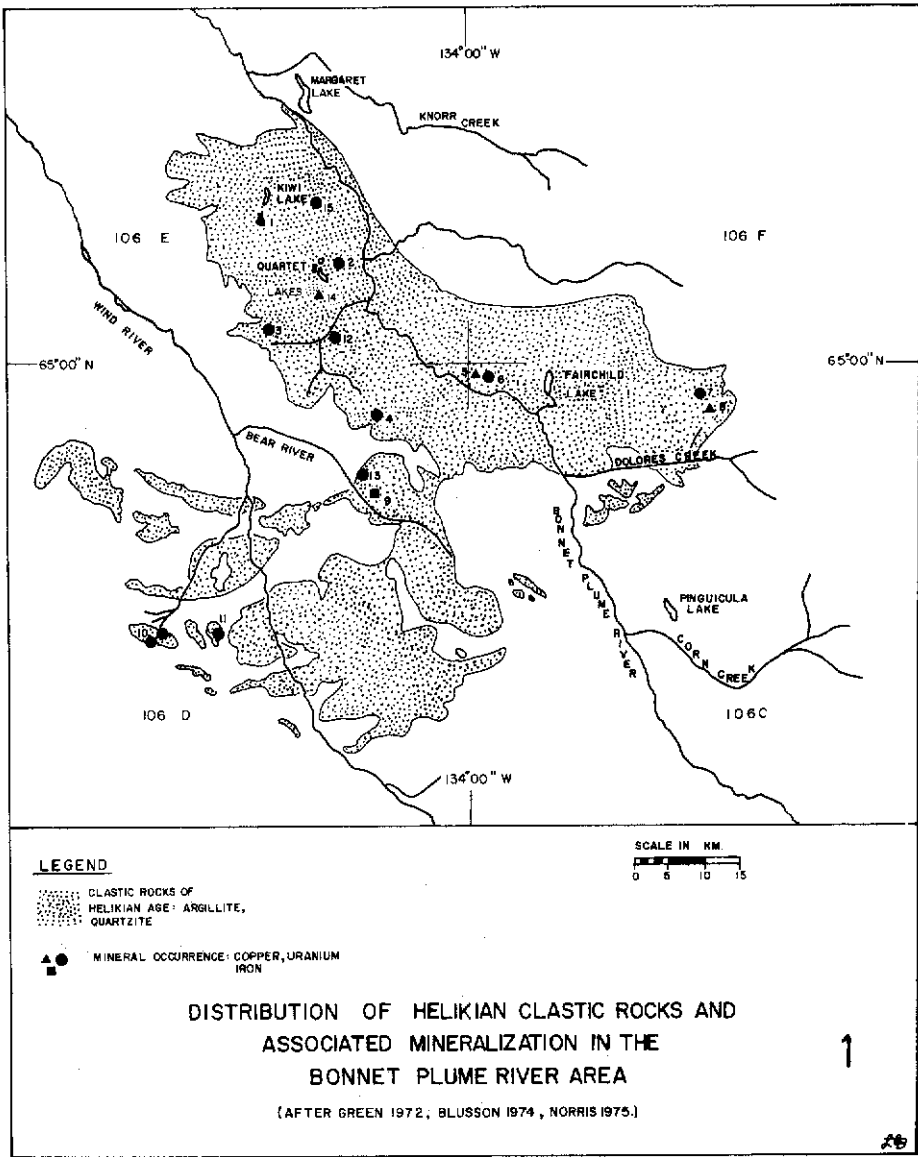
During the summer of 1976, prospecting and mining exploration activity in the Wind-Bonnet Plume River area was concentrated on uranium-copper mineralization associated with breccia bodies in Lower Proterozoic rocks. The uranium mineralization was first noticed by Archer-Cathro geologists in 1974 on the IGOR property which had been staked for copper. During the following summer, Archer-Cathro's Wernecke Joint Venture conducted a low profile intensive prospecting program for uranium mineralization.

In January 1976, a short information release concerning uranium mineralization in the Wind River area was published in the G.S.C. Report of Activities (Blusson, 1976). This release essentially marked the moment at which uranium mineralization in northern Yukon became public knowledge. During summer 1976, programs of exploration and prospecting for uranium were maintained by the following companies in the Wind-Bonnet Plume River area: Archer-Cathro, Mountaineer Mines, Urangesellschaft, Noranda, Prism Resources. Archer-Cathro's Wernecke Joint Venture optioned their uranium properties to Eldorado Nuclear and in addition to detailed property work conducted diamond drilling on the BOND, PTERD and MST claim groups.

In addition, the Geological Survey of Canada sponsored several projects in the area. A geochemical survey was undertaken over several sub-areas within the Wind-Bonnet Plume River area: 106 E 2, 106 E 4, 106 D 14, 15, 106 D 10, 106 D 13. Water, stream sediment and rock samples were taken and analytical results for U, F and pH in stream waters were released in G.S.C. Open File Report 388 (Goodfellow and Jonasson, 1976). The analytical results outlined some of the known uranium occurrences and they were further reported on in G.S.C. Report of Activities (Goodfellow et al, 1976, pp. 237-240). S.L. Blusson re-evaluated the regional geology and stratigraphy of the Ogilvie Mountains and R.T. Bell and G. Delaney studied the stratigraphy of the Proterozoic rocks with special reference to the uranium occurrences (Bell and Delaney, 1977). Also, P. Laznicka and two students from the University of Manitoba studied the stratigraphy and economic geology of the Lower Proterozoic in the area of the Dolores Creek copper-cobalt occurrences (Laznicka, 1977).

REGIONAL GEOLOGY

Portions of the Lower Proterozoic in the Wind-Bonnet Plume River area have been mapped by several geologists of the Geological Survey of Canada, notably Norris (1975), Blusson (1974) and Green (1972). The mapping has shown the distribution of Lower Proterozoic or Helikian rocks to trend in an east-west direction in the Dawson and Larsen Creek areas and north-south in the Nash Creek-Bonnet Plume River-Wind River area (see accompanying map). They are locally overlain by Hadrynian clastics and carbonates of the 'Grit Unit' or by Cambrian carbonates and their base is not exposed. The lower portion of these rocks has been termed Unit 1 by Green (1972), Unit H0 by Norris (1975) and Unit Hs, Hsc by Blusson (1974). It consists of "dark shale and argillite, with some siltstone to fine-grained quartzite, and very minor limestone" (Green, 1972, p. 14). Minor metavolcanic rocks are also present.



MINERAL OCCURRENCES

- 1) GREMLIN - Cu - chalcopyrite and pyrite as clumps in breccia matrix and as disseminated grains in chert;
- 2) WERNECKE - U - disseminated brannerite within felsic volcanics;
- 3) IGOR - Cu, U - chalcopyrite, hematite, magnetite and barite in pods within bleached siltstone adjacent to intrusive breccia (Sinclair et al, 1976);
- 4) GNUCKLE, Slats Creek - U - brannerite locally concentrated in fractures and shear zones in intrusive breccia;
- 5) Slab Mountain - Cu, U - minor chalcopyrite and uranium mineralization locally disseminated within intrusive breccia (Sinclair and Gilbert, 1975; Bell and Delaney, 1977);
- 6) BROMADROSIS - U - widely disseminated brannerite within pink siliceous calc silicate country rock peripheral to the intrusive breccia at Slab Mountain;
- 7) PTERD - U - pitchblende with minor pyrite and chalcopyrite surrounding and filling micro-fractures in breccia clasts;
- 8) Bonnet Plume River Mines Ltd.- Cu - chalcopyrite and cobaltite within veinlets and pods and disseminated in altered country rock peripheral to syenite stock and intrusive breccia (Laznicka, 1977);
- 9) Pacific Giant Steel Ores Ltd. - Fe - hematite as breccia matrix and pods within breccia and adjacent country rocks (Green, 1972);
- 10) BOND - U - uranium mineralization and minor magnetite locally disseminated within intrusive breccia and also in veins associated with siderite-quartz-barite-chalcopyrite-pyrite-pyrrhotite;
- 11) BOZO - U - uranium mineralization with associated pyrite, marcasite, magnetite, barite and chalcopyrite disseminated in brecciated volcanics (Sinclair et al, 1976);
- 12) OTIS - U - brannerite locally disseminated within fault breccia zone and associated fractures in metavolcanic country rocks intruded by breccia bodies;
- 13) FACE - U - brannerite concentrated along fractures within a siliceous border phase of an intrusive breccia;
- 14) TET - Cu - chalcopyrite, bornite, hematite and magnetite locally disseminated within quartzite and minor shale;
- 15) LOON.- U - brannerite (?) locally disseminated within bleached siltstone.

Overlying the lower argillite and quartzite is a thick succession of orange weathering dolomite referred to as Unit 2 by Green (1972), H1 by Norris (1975) and Hc by Blusson (1974). To date, most of the U-Cu mineralization discovered is restricted to the lower argillite-quartzite succession, though studies presently being undertaken by Blusson, Bell, Delaney and Laznicka will no doubt modify this preliminary stratigraphy.

GEOLOGY OF BRECCIA BODIES

In most cases, the Cu-U mineralization occurs within or nearby certain types of breccia bodies in Helikian rocks. They can be subdivided on the basis of their dominant clast material into chaotic polymictic breccias characterized by either clasts of sedimentary rocks or of volcanic rocks. These breccias have a common origin and the differences between them is mainly a function of the different country rocks that they have intruded.

Chaotic polymictic breccia of sedimentary material is common to the following localities: Kiwi Lake, Slab Mountain, Quartet Mountain, Slats Creek. Most of the breccias discovered to date are in the Wind-Bonnet Plume River area, though Blusson has noted occurrences of them as far west as the Coal Creek Dome area, north of Dawson (Personal Communication, 1976).

Morphology

They occur as pipelike necks with lateral apophyses and as mushroom shaped bodies in the order of several hundred metres to several kilometres in areal and vertical extent. They are restricted mainly to the lowermost Helikian rocks exposed which consist of argillite, quartzite and metavolcanic rocks (Unit 1 of Green, 1972), though they have also been described by S.L. Blusson (Personal Communication, 1976) from the upper Helikian orange dolomite (Unit 2 of Green, 1972). Some of the breccias, especially those with a high carbonate content, weather out into spires or pinnacles several tens of metres high which form imposing hoodoo-like topographic features that are easy to recognize from a distance.

Composition

The breccias are massive and lithologically complex. Clasts range in size from a centimetre to several tens of metres and are made up of several sedimentary rock types, but dominantly argillite and siltstone. The lithology of the immediate country rock is reflected by the lithology of the clasts, which are typically angular and set within a fine grained matrix made up of comminuted clast material $\pm$ carbonate, $\pm$ feldspar, $\pm$ iron oxides, $\pm$ quartz, $\pm$ sericite.

Volcanic clasts in breccia are commonly angular fragments of felsic volcanics, argillite and tuff enclosed within a fine grained felsic matrix. Breccia with this type of clast material occurs at Bond Creek and north of Dolores Creek. Thin beds of banded hematite-jasper iron formation and argillite or tuff also occur in association with the breccias.

At Bond Creek, the breccia is intrusive into a sequence of argillite, and within the breccia, veinlets of siderite, barite and quartz, minor chalcopryrite and locally minor uranium mineralization occur in fractures.

Alteration

Extensive alteration is one of the main characteristics of the breccia bodies. It includes hematization, chloritization and carbonatization.

Iron oxides (hematite, magnetite) are widely disseminated throughout the breccias in minor amounts. Within the breccias and nearby country rocks, irregular podlike zones of pink to red felsic rock occur which are commonly brecciated, infilled with a coarser grained matrix and laced with irregular veinlets. In thin section, the pink clasts are seen to consist of very fine grained granoblastic quartzo-feldspathic material with rare epidote and variable amounts of evenly disseminated magnetite (partially altered to hematite) or just hematite distributed within the clast as a thin film along intergranular surfaces. Locally, 1 mm porphyroblast of euhedral carbonates such as calcite, siderite and ankerite are disseminated within the clasts. Commonly, the clasts are surrounded by a thin rind of hematite and chlorite.

The matrix typically consists of medium to coarse grained hypidiomorphic equigranular quartz, plagioclase and calcite with minor chlorite and muscovite. Also within the matrix, fine to coarse grained anhedral irregular clumps of iron and copper oxides and sulphides are present, sometimes with associated minor uranium mineralization.

The veinlets in the alteration zones transect both the matrix and clasts and consist of iron oxides or of quartz-feldspar-carbonate.

The above alteration minerals locally occur in much greater concentration as veins or pods up to several metres wide and several tens of metres long. These occurrences provide spectacular monominerallic showings such as those of coarsely crystalline pyrite, siderite and chalcopyrite on the GREMLIN property and barite and hematite on the IGOR property. To date, nowhere in this area have monominerallic uranium mineral showings equal to those of iron, copper and barium been discovered.

Contact Metamorphism

At some localities, the country rock that is host to the breccia is metamorphosed to a spotted hornfels with chloritoid porphyroblasts and/or biotite schist. The aureole of spotted hornfels at Kiwi Lake on the GREMLIN claim group extends about one hundred feet within the argillite. Prismatic porphyroblasts of chloritoid up to 2 cm in length occur randomly oriented throughout the meta-argillite. Chloritoid also forms at the contact of a breccia body with argillite on Slats Creek (GNUCKLES). According to Winkler (1974), the formation of chloritoid indicates temperatures in the order of 500°C.

Limited areas of diorite occur associated with the breccia bodies, e.g. Slats Creek, Bear River, Dolores Creek, Slab Mountain. Commonly the diorite is medium grained equigranular and extensively altered to hematite, chlorite and epidote. At the Slats Creek occurrence, a 5 m wide body of diorite is bounded on either side by a 1 m wide alteration fringe of chlorite which separates the diorite from the breccia. This relationship suggests that the breccia may be igneous in origin and part of a diorite diatrema. However, the body of diorite has alternatively been interpreted by others as a clast within the breccia and by Laznicka in the Dolores Creek area, as contemporary to slightly earlier intrusive dykes (Laznicka, 1977).

Bleaching is an important type of contact metamorphism that occurs locally in country rock peripheral to the breccia on the PTERD and IGOR

properties and probably on most others. It consists of iron depletion and silica enrichment and is most noticeable in Unit 1 quartzite. In this process, thinly layered grey siltstone with minor disseminated magnetite (5-10%) and major quartz-feldspar-sericite is transformed in proximity of the breccia to a creamy white or pale yellowish green thinly layered siliceous rock consisting of alternating layers of flaky sericite and clastic grains of quartz and feldspar with tiny pseudomorphic relics of limonite after magnetite. Bleached siltstone has a very close resemblance to flow banded rhyolite.

URANIUM MINERALIZATION

The mode of uranium mineralization is varied and difficult to accurately describe. However, the showings known to the author can be broken up into two basic types:

- 1) disseminated
- 2) fracture filling

The first type consists of fine euhedral grains of brannerite with minor thorite and uranothorite locally disseminated throughout pods of patchy red feldspathic alteration in the host rock, commonly quartzite. Pale to brick red hematite haloes about 1 cm in diameter surround the brannerite grains. This type occurs on the LOON and WERNECKE claim groups in the Quartet Lakes area. In thin section, the haloes consist of dusty hairlike stringers of hematite disseminated within the fine grained quartzofeldspathic matrix around grains of sphene and brannerite that are enclosed in thin veinlets of quartz-feldspar. Some of the hematite and brannerite (?) is distributed in a dendritic pattern adjacent to the narrow felsic veinlets. In addition, at some localities, uranium mineralization occurs disseminated within the chaotic breccias - both matrix and clast, commonly in association with coarsely crystalline chalcopyrite, barite, siderite, pyrite and hematite-magnetite, e.g. the URSUS and IGOR claim groups. On the GREMLIN claim group, a similar mineral assemblage occurs with substantially more copper but no uranium.

The second type of mineralization consists of pitchblende with minor brannerite along thin fractures and shear zones, primarily in the volcanic breccias. Secondary minerals such as green torbernite (?), yellow autunite (?) (both visual identification) and iriginite, and orange vandendriesscheite are also developed. Examples of this type are present on the PTERD and BOND claim groups.

GEOCHEMISTRY

The uranium-breccia association is characterized by an anomalous concentration of many elements. From consideration of mineral assemblages and spectrographic analyses of uranium mineralized rocks, it is evident that the following elements maintain consistent high concentrations: U, Pb, Mn, Ti, C, Fe, S and Si. In addition, the following elements occur in sporadically high concentrations: Au, Ba, Th, Co, Cu, Nb, RE, As, Mo, Ni and Zr. One interesting feature is the absence of Th in the breccias of volcanic material and its presence in the chaotic breccias of sedimentary material. The presence of brannerite accounts for the high Ti and RE content. Sulphur is present as sulphide combined with Fe, Cu, Co, As, Mo, Ni and/or as sulphate with Ba. C is present as carbonate and Si with silica. The Pb can be accounted for by radioactive disintegration of U and Th. Iron and manganese are accounted for by the presence of siderite and ankerite.

Barite is important in prospecting because it indicates that sulphates are present and stable in the environment. For example, a gossan may develop over a U-Ba mineralized zone and result in the surface leaching of U, whereas radium would probably not migrate far and would become fixed with Ba in radio-barite, (Ba, Ra) SO₄. Thus, the presence of a poorly mineralized radioactive gossan associated with barite indicates the possibility of uranium enrichment below the zone of leaching and oxidation.

In his text on exploration geochemistry, Levinson (1974) mentions the following elements as common pathfinders for vein type uranium deposits: Cu, Bi, As, Co, Mo, Ni. However, rock, soil and stream sediment geochemical exploration for the breccia type of uranium occurrence should be guided by its own peculiar mineralogy and potential pathfinder elements selected in this way include: Ba, Mn, Ti, Pb, Mo and Cu.

ORIGIN

Any speculation regarding the origin of the breccia bodies and associated mineralization has to consider the following criteria:

- 1) Spatial association of copper, cobalt mineralization with uranium in some of the breccia bodies and their host rocks;
- 2) alteration mineral assemblages indicate temperatures up to about 500° C;
- 3) bleaching of country rocks around some of the breccia bodies involving addition of silica and iron depletion;
- 4) textures indicative of closely contemporaneous crystallization of chalcopyrite, pyrite, calcite, siderite;
- 5) breccia fragments are commonly not too far removed from their original stratigraphic level;
- 6) high carbonate, silica, iron and sulphur content in breccia matrix;
- 7) uranium-copper mineralization associated with all types of breccia, independent of the country rock and clast material;
- 8) Lack of major and accessory igneous minerals;
- 9) presence of comminuted clast material in matrix;

SUGGESTIONS TO PROSPECTORS

All of the breccia associated uranium mineralization discovered to date lies within Helikian rocks, where obviously, any further prospecting should concentrate. It is perhaps ironical that the first mineralization discovered to be associated with these breccia bodies was specular hematite on the old Pacific Giant Steel Dues Ltd. property situated just north of the Bear River (Green, 1972).

Prospecting guides for this type of mineralization in the area are several: 1) anomalous concentrations of magnetite-hematite, chalcopyrite, barite, siderite-ankerite, pyrite; 2) areas of alteration such as hematite, malachite, limonite, bleaching; 3) areas of anomalous radioactivity.

ACKNOWLEDGMENTS

Many of the ideas developed in this report were first discussed in the field with the government and exploration geologists working in the area, notably A. Archer, R.T. Bell, S.L. Blusson and C. Riley.

United Keno Hill Mines Limited

Silver, Lead, Zinc,
Cadmium
105 M 13, 14
(about 63°55'N, 135°29'W)

Selected References: Boyle (1957; 1965; 1968); Green and McTaggart (1960); Green (1966, pp. 10-17) Gleeson (1966; 1967); Findlay (1967, pp. 18-21; 1969a, pp. 20-24; 1969b, pp. 10-12); Tempelman-Kluit (1970); Craig and Laporte (1972, pp. 11-13); Craig and Milner (1975, pp. 28-29); Sinclair and Gilbert (1975, pp. 9-11); Sinclair et al (1975, pp. 10-12; 1976, pp. 23-25).

Claims: 493 claims

Location and Access:

The properties situated mainly on Keno Hill and Galena Hill, are readily accessible by an all-weather road from Mayo, 52 km to the south. Ore concentrates are trucked 477 km to Whitehorse, then transferred to the White Pass and Yukon Route and shipped by rail to Skagway.

History:

Silver-bearing galena was first discovered on Galena Creek in 1906 and small tonnages of high-grade ore were shipped from 1913 to 1919. Following the discovery of the No. 9 vein by Louis Beauvette in 1919, which resulted in a stampede, numerous important prospects were located. Since then there has been almost continuous production from veins in the area, except for the period 1942 to 1946.

Description:

The area is underlain by graphitic and sericitic schist, phyllite and quartzite which have been divided into three units: a lower schist, a central quartzite, and an upper schist (Units 1, 2 and 3, Boyle, 1965). Formerly considered to be part of the Precambrian Yukon Group metasediments, the lower schist and central quartzite are now considered to be Jurassic and Lower Cretaceous respectively, based on stratigraphic correlations (Tempelman-Kluit, 1970). The age of the upper schist is uncertain. Metadiorite and metagabbro, locally referred to as "greenstone", occurs as conformable lenses and sills in the lower schist and central quartzite. Granitic stocks of Cretaceous age outcrop northwest and southeast of Galena and Keno Hills and related quartz-feldspar porphyry dikes are present locally throughout the area.

The metasediments form the southern limb of a large, open anticline and dip gently to the southeast. There are two systems of steeply-dipping faults, one trending northeast and the other northwest.

The ore deposits consist of veins developed in dilatant zones in north-east-trending faults cutting thick-bedded quartzite and greenstone. The principal ore minerals are galena, sphalerite and freibergite. Gangue minerals include siderite and pyrite.

Current Work and Results:

In 1976, United Keno Hill Mines Limited operated five mines in the Keno-Galena Hills area with a total production of 75,515 tons of ore averaging 35.49 ounces silver per ton, 4.02 per cent lead and 1.17 per cent zinc. Development work for 1976 is summarized below:

	<u>Elsa</u>	<u>Husky</u>	<u>No Cash</u>	<u>Dixie</u>	<u>Keno</u>	<u>Total</u>
Production (tons)	8,745	34,333	10,604	1,933	14,890	70,505
Drifts & crosscuts (ft)	153	1,148	324	179	593	2,397
Raises (ft)	255	305	93	8	221	882
Sub drifts (ft)	186	127	333	-	62	708
Diamond drilling (ft)	-	3,175	1,590	-	-	4,765
Longhole drilling (ft)	344	2,040	1,032	60	426	3,902

At the Elsa Mine, a raise was driven above the 200 level on the No. 2 vein in response to high grade values determined by the overburden drilling exploration program. A potential block was determined whose lower extensions were further investigated in early 1977. In addition, a drift on the 400 level driven to explore test hole values encountered ore for a length of 52 feet.

At the Husky Mine, a cross cut on the 375 level intersected ore over 11.2 feet and a raise was driven from the 225 level for access and for exploration. High grade material was encountered over a length of 68 feet.

A raise was driven from the 225 level at the No Cash Mine for six lifts and ore grade material was encountered over a distance of 42 feet. Another raise in the mine encountered high grade material over a length of 49 feet. No additional ore shoots were developed at the Dixie Mine. At the Keno Mine, two raises were driven along the 18 vein which encountered ore over lengths of 133 feet and 112 feet.

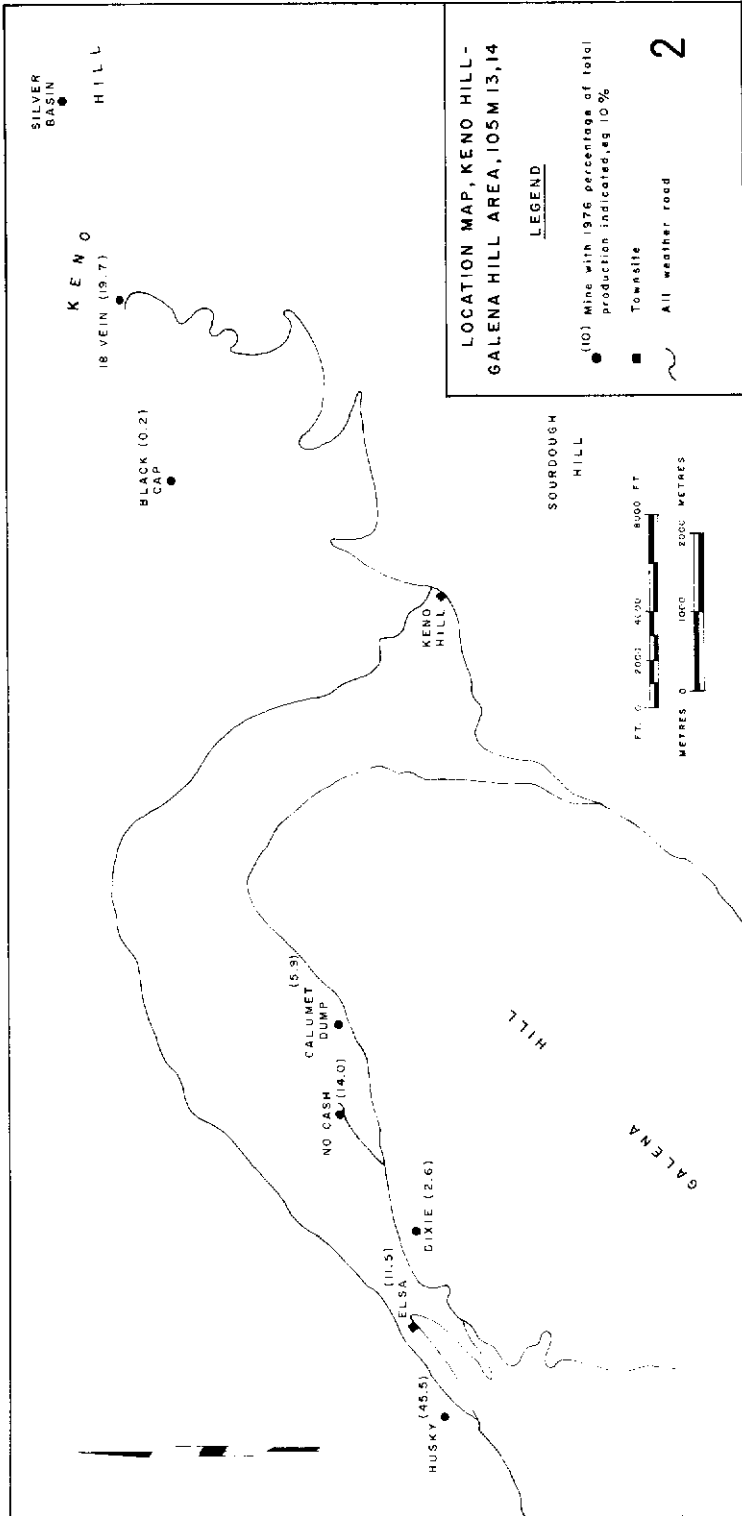
In addition, 138 tons of ore were produced from the Black Cap Mine, 4,455 tons from the Calumet dump and 417 tons from the Silver King tailings.

No significant ore veins were disclosed by the overburden drilling program on Galena, Keno and Sourdough Hills. Prospecting and some overburden drilling were completed in the Silver Basin area on the east flank of Keno Hill. Drilling on the KPO-LEO option was curtailed by depth of overburden beyond the capability of the drill.

The following summary of operations in 1974, 1975 and 1976 is taken from annual reports of the company:

	<u>1976</u>	<u>1975</u>	<u>1974</u>
Tons Milled	75,515	90,860	93,232
Daily Average (tons)	239*	249	255.4
Mill Heads:			
Silver (oz/ton)	35.49	34.96	37.93
Lead (%)	4.02	4.03	4.22
Zinc (%)	1.17	1.15	1.15
Metal Production:			
Silver (oz/ton)	2,369,770	2,917,920	3,237,205
Lead (lb)	4,909,101	6,407,368	6,737,719
Zinc (lb)	621,945	620,763	545,357
Cadmium (lb)	8,394	8,758	7,330
Metal Sales:	\$12,070,299	\$15,696,435	\$17,480,540
Ore Reserves (tons)	100,977	121,737	105,632
Silver (oz/tons)	41.2	39.3	44.0
Lead (%)	4.8	4.7	4.9
Zinc (%)	1.3	1.1	1.2

*Adjusted for strike of 49 calendar days.



PLATA
Cyprus Anvil Mining Corporation

Silver, Lead, Zinc
105 N 9, 105 O 12
(63°35'N, 132°02'W)

References: Blusson and Tempelman-Kluit (1970, pp. 29-32); Blusson (1974a); Sinclair and Gilbert (1975, pp. 17-19); Sinclair et al (1975).

Claims: PLATA 1-232, 241-258, 267-288; INCA 1-44

Location and Access:

The claim groups are situated in the Bostock Range of the Hess Mountains roughly halfway between the Rogue and Hess Rivers. Access is provided by fixed wing aircraft from Ross River, 174 km to the south, to an airstrip 10 km south of the property. A tote road between the airstrip and the property is unserviceable during the summer months due to its swampy location.

History:

The claims were staked in August and September 1972 and July 1974. The property was first examined late in 1972 by a program of hand trenching, geochemical and geophysical surveys and diamond drilling (six holes for a total footage of 1,315 feet). Work in 1973 and 1974 consisted mainly of bulldozer trenching.

Geochemical soil sampling was also carried out on the PLATA and INCA claims in 1974 and the samples were analyzed for silver and lead. Silver-lead anomalies were found to coincide very closely with known areas of near-surface mineralization and at least two additional zones of potential interest were outlined on the PLATA claims.

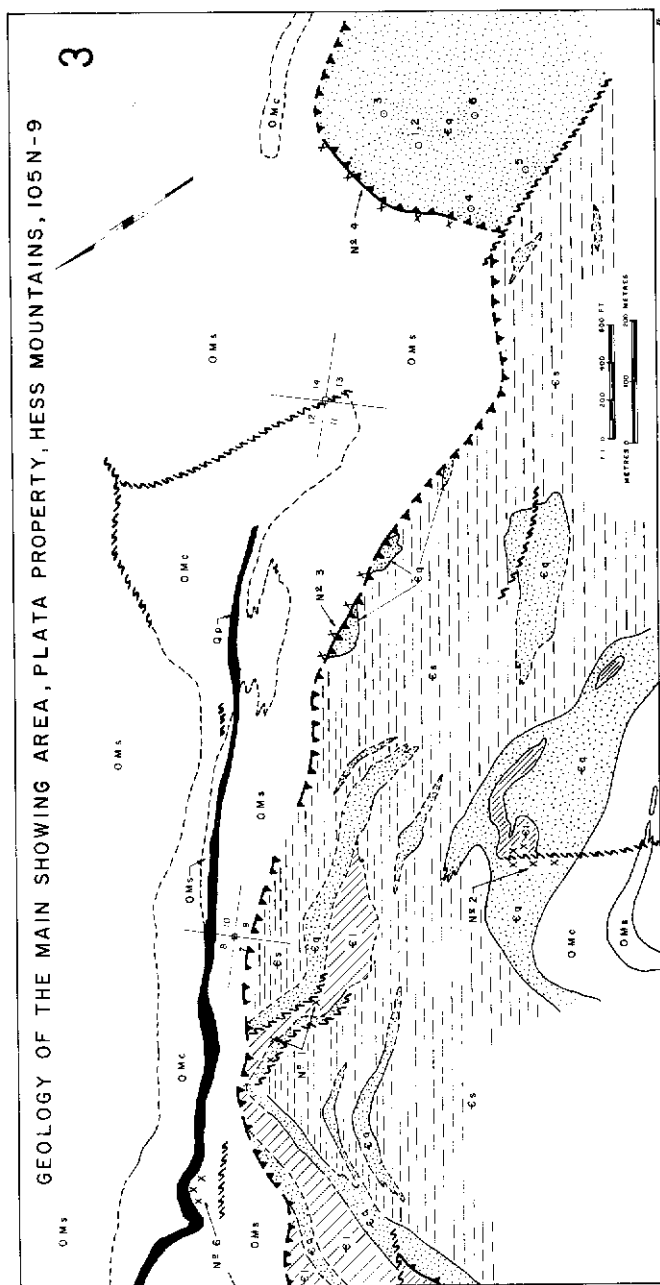
Description:

The property is underlain by interbedded shale and chert of Ordovician to Mississippian age unconformably overlying or in fault contact with Proterozoic maroon and green slate, quartzite and limestone (see accompanying map). A quartz porphyry dyke trending east-west is the only intrusive on the property. The sediments strike west to west-northwest and are isoclinally folded. The units are cut by a set of conjugate faults trending roughly northeast and northwest and displaced by a major thrust fault. The thrust fault contains low gold and silver values associated with a quartz gangue. Veins of high-grade argentiferous galena occur with siderite in northeast- and northwest-trending faults. In all, 42 separate showings have been discovered to date.

Current Work and Results:

During summer 1976, a bulk sampling program was undertaken by A. Harman and F. Lavoie to evaluate the profitability of small scale mining from this remote location. Approximately 100 tons of high-grade material was obtained by open cut methods from three vein zones (see accompanying map) and shipped to the smelter.

<u>ZONE</u>	<u>BULK SAMPLE</u>	<u>APPROXIMATE GRADE</u>
1	60 tons	280 oz Ag/ton, 70% Pb
2	25 tons	160 oz Ag/ton, 70% Pb
6	15 tons	200 oz Ag/ton, 70% Pb



LEGEND

TERTIARY	QP	Pale orange weathering, fine to medium grained, light tan quartz porphyry to aplite
ORDOVICIAN - MISSISSIPPIAN	OMs	Dark grey to black weathering, predominantly black, carbonaceous shale with minor graphitic chert, argillite and barite lenses
	OMc	Dark grey weathering, pale grey to black massive chert with minor intervals of shale
	Unconformity	
CAMBRIAN	Es	Pale green and maroon phyllitic shale and slate
AND	Eq	Pale brown to grey quartzite
OLDER	El	Pale grey to dark bluish grey limestone

	Geological contact, defined, assumed
	Fault or shear zone
	Thrust fault, defined, assumed
X X X	Pb-Zn-Ag mineralization
o [†]	Diamond drill hole

Geology after W. J. Roberts 1973

In Zone 1, the major mineralization consists of a lens of foliated galena-tetrahedrite measuring 15 m in length by a maximum thickness of 1.3 m. The lens is situated within a fault zone trending 015° and dipping 25° to the west that separates massive brown quartzite from overlying maroon and green slate.

Zone 2 is made up of two sections traced over a distance of 103 metres. The northern section is mainly siderite gangue with blebs and pods of galena and sphalerite replacing Proterozoic limestone and the southern section is largely fine- to medium-grained foliated galena and tetrahedrite as bands in siderite gangue within a shear zone. The southern section is 52 m long and contains 795 tons per vertical metre grading 35 per cent Pb and 84 oz Ag/ton. Further south, the zone disappears as the fault structure passes into overlying black chert and shale.

Zone 6 consists of massive blocks of high-grade galena-tetrahedrite float and galena-siderite-jarosite bearing fractures in highly sheared footwall black shale and chert.

Transportation played a crucial role in the economics of the operation, accounting for almost half the project cost. Mineralized material was transported by cat sloop to the PLATA airstrip prior to thawing winter road conditions and by helicopter (800 lb or 360 kg loads) later during the summer. It was then flown in 2,000 lb (850 kg) lots in a fixed wing aircraft to the Twin Creeks airstrip on the North Canal Road. The sample bags were then trucked in 8 ton (6.6 metric ton) loads, 500 km to Whitehorse. From Whitehorse, the sample bags were shipped by rail and ship to Vancouver and then by rail to the Asarco Smelting and Refining plant in East Helena, Montana.

Bulk sampling of the PLATA property was difficult due to several factors: the extremely short exploration season, the precipitous and unstable slopes, the impassable access road between the airstrip and camp and the cost of flying bulk samples from the PLATA airstrip to Twin Creeks. However, the venture did turn out to be economically profitable and further bulk sampling (excess of 300 tons) was recommended for the No. 2 zone to determine the economic feasibility of direct shipping lower grade galena-tetrahedrite mineralization.

JASON
Ogilvie Joint Venture

Zinc, Lead, Barite
105 0 1
($63^{\circ}10'N$, $130^{\circ}10'W$)

Reference: Blusson (1974a); Carne (1976).

Claims: JASON 1-82, 84, 85-136, 138-176, MIKE 1-2

Location and access:

The claims are located about 16 km southwest of Macmillan Pass, about 209 km east of Ross River along the North Canal Road. Access is by vehicle along the Canal Road or by wheeled fixed-wing aircraft to an airstrip immediately north of the claim group.

History:

The claims JASON 1-44 were recorded in August 1974 by Ogilvie Joint Venture, a consortium of Brinex, Mitsubishi and Ventures West. In July 1975, JASON 45-48 were recorded, as were also JASON 49-82, 84, 85-134, 141-160 in August 1975. JASON 135-136, 138-140 were recorded in March 1976; 161-176 in

November 1975 and MIKE 1-2 in June 1976. Property work conducted in 1975 led to exploratory diamond drilling of seven holes for a total of 2,100 feet in October 1975 (Carne, 1976).

Description:

The property is underlain by argillite of the Ordovician-Silurian Road River Formation and argillite, conglomerate, black shale and siltstone of Devonian-Mississippian age. A horizon consisting of bedded and spotty barite with associated lead-zinc mineralization occurs within the black shale unit at the same stratigraphic horizon as on the adjacent TOM property to the east. A more detailed account of the geology and mineralization is given in Carne (1976).

Current Work and Results:

During summer 1976, detailed geological mapping (1 inch = 400 feet), geochemical soil sampling, geophysical and diamond drilling programs were conducted on the property. Soil samples were collected at 100 foot intervals along 24.7 miles of grid lines spaced 250 or 500 feet apart and analyzed for Pb, Zn, Ba. In addition, I.P., gravity and EM geophysical surveys were conducted. The diamond drilling program consisted of 6 holes with BQ core for a total footage of 2,885 feet. 8 holes with NQ core for a total footage of 3,810 feet and 1 hole with HQ core for a footage of 400 feet.

GARY
Ogilvie Joint Venture

Barite
105 0 1
(63°04'N, 130°13'W)

References: Blusson (1974a); Carne (1976).

Claims: GARY 1-38, 58, 63-75

Location and Access:

The claims straddle the North Canal Road about 24 km south-southwest of Macmillan Pass. Access is provided by vehicle on the North canal Road.

History:

The GARY 1-38 claims were staked in August 1974 to cover the probable extension of bedded barite that outcrops on the MOOSE claims. In 1974, a geochemical soil sampling program turned up some zinc anomalies. These anomalies were more accurately defined in 1975 by further soil sampling and a gravity survey. Additional prospecting located bedded barite on the north end of the property and claims GARY 58, 63-75 were staked and recorded in July 1975.

Description:

The area is largely covered by overburden, but the exposed outcrop indicates that clastic sedimentary rocks of the Road River and Besa River Formations underlie it. Carne (1976) provides a more detailed account of Besa River lithology. Stocks of Cretaceous granodiorite also occur in the area.

Mineralization consists of shale hosted bedded barite exposed in two showings (Gargantua and South Gargantua) in the northern part of the claim group. The barite bed is reported to range from 3 m to 18 m in thickness and is folded into a series of minor east-west folds such that the bed is exposed

several times along the dip slope. The barite is light grey in colour, finely interlaminated with argillite and apparently devoid of lead and zinc. Estimated tonnage of exposed barite is reported to be three million tons.

Current Work and Results:

During summer 1976, the claims were geologically mapped at a scale of 400 feet = 1 inch and geochemically soil sampled.

PETE
Ogilvie Joint Venture

105 0 1
(63°00'N, 130°05'W)

Reference: Blusson (1974a).

Claims: PETE 1-32

Location and Access:

The property is located 166 km northeast of Ross River and 27 km south of Macmillan Pass. During summer 1976, access was provided by helicopter from the Macpass airstrip adjacent to the Canol Road, 21 km to the north.

History:

The claims were recorded in August, 1975.

Description:

The property is largely overburden covered, but on strike to the west, outcrops of bedded barite with minor amounts of lead and zinc mineralization occur.

Current Work and Results:

During summer 1976, gravity and geochemical soil sampling surveys were conducted over a grid of 10 line miles. Gravity measurements and soil samples were taken at 100 foot intervals along lines spaced either 500 or 1,000 feet apart. Coincident barium-zinc and gravity anomalies were determined in the northwest portion of the grid and diamond drilling was recommended for further work.

TEA
Welcome North Mines Limited

Barite
105 0 2
(63°01'N, 130°36'W)

References: Blusson (1974a); Sinclair et al (1976); Carne (1976).

Claims: TEA 1-100

Location and Access:

The property is located 11 km west of Jeff Lake and is accessible by vehicle along a 12.5 km road leading north from Milepost 253.6 on the North Canol Road.

History:

The claims were recorded in August 1975 by Welcome North Mines Limited. They were subsequently optioned by J. Dodge and later transferred to Yukon

Barite Company Limited. In 1975, the property was geologically mapped and bulk sampled.

Description:

The property is underlain by the Besa River Formation of Upper Devonian age and the stratigraphic succession from base upwards consists of chert pebble conglomerate, siliceous pyritic shale, bedded barite, carbonaceous shale and quartzite. A much more detailed account is available in Carne (1976). The barite-rich horizon consists mainly of bedded barite with accessory interbeds of baritic limestone, witherite, limestone, chert and shale.

Current Work and Results:

During summer 1976, the TEA claims were subjected to further bulk sampling, geologically mapped at a scale of 1 inch = 200 feet and about 10,000 metric tons were stripped by bulldozer. A one lane truck haul road with turnouts was completed for 12.5 km from Milepost 253.6 on the North Canal Road to the property.

CATHY, LORRAINE, CHAS, KAM,
LES, WALT, FAT, CITY
Baroid of Canada Limited

Barite
105 0 7
(63°16'N, 130°34'W-
39'W)

Reference: Blusson (1974a); Sinclair et al (1976).

Claims: CATHY 1-10, LORRAINE 1-6. CHAS 1-5, KAM 1-6, LES, WALT, FAT and CITY

Location and Access:

The property is located about 170 km northeast of Ross River and 19 km miles west of the Yukon-NWT border. Access is provided by helicopter.

History:

The claims CATHY 1-6 and LORRAINE 1-6 were staked in February 1975 and KAM 1-2 LES, WALT FAT and CITY in July 1975. The following were recorded in August 1976: CATHY 7-10, KAM 3-6, CHAS 2-5. During 1975, preliminary geological and geochemical work were conducted.

Description:

The property is underlain by the Besa River Formation of Upper Devonian age which consists of black, noncalcareous shale interbedded with siltstone, limestone, chert pebble conglomerate and barite.

Current Work and Results:

During summer 1976, detailed geological mapping on the CATHY and CHAS claims and further sampling and metallurgical work was conducted.

PR
Welcome North Mines
(Arctic Red Joint Venture)

106 B 5
(64°28'N, 131°52'W)

Reference: Blusson (1974a).

Claims: PR 1-24

Location and Access:

The property is located near the Yukon-N.W.T. border, 16 km north of Bonnet Plume Lake. Access is provided by float equipped fixed-wing aircraft to an unnamed lake near the headwaters of the Snake River, just south of the claim group.

History:

The claims were recorded in September 1976.

Description:

The property is underlain by shale of the Besa River Formation. Zinc-lead-barite mineralized float and smithsonite cappings occur associated with several ground water seeps.

Current Work and Results:

During summer 1976, the property was subjected to reconnaissance geological mapping (1 in = 1/2 mile) and geochemical soil, silt and rock sampling. An area about 850 m x 600 m was determined to have an anomalously high geochemical response.

TARA
McIntyre Mines Limited

Zinc, Lead
106 C 2, 6, 7
(64°15'N, 132°55'W)

Reference: Blusson (1974a).

Claims: TARA 1-250

Location and Access:

The property is located on the east flank of Nadaleen Mountain, 12 miles south of the Bonnet Plume River. Access is provided by float plane from Mayo, 160 km to the southwest of Tara Lake (local name), a small lake on the east side of Nadaleen Mountain.

History:

TARA claims 1-24 were staked in June, 1975 as a result of follow-up prospecting and stream sampling after the discovery of an anomalous zinc stream sediment sample determined in a reconnaissance stream sediment geochemical program. The claim group was enlarged by the staking of TARA 25-250 in August 1975.

Description:

The property is underlain by carbonate and clastic rocks of Hadrynian to Devonian age. Stratigraphically lowermost is the Hadrynian "Grit Unit" which

is overlain by dolomite of the Hd unit (Blusson, 1974a). The Hd rocks have a conformable and gradual contact with overlying green and red shale of the "Sheepbed Formation". Overlying these units is a major unconformity capped by massive carbonates and minor interbedded shale of Ordovician to Devonian age.

The rocks are gently folded into a shallow dipping southwest plunging syncline. Attitudes near the fold axis are horizontal but gentle to moderate dips are encountered on the limbs of the syncline. Steeply dipping block faults form horst-graben type structures along the upper Hd contact with overlying shale. The faults terminate at the unconformity above the Sheepbed Formation and may have some relation to the occurrence of lead-zinc mineralization.

Three major mineralized showing areas occur within the Hd unit and one within the Hls1 unit. Coarse-grained galena mineralization locally occurs near the upper contact of grey white weathering crystalline dolomite of the Hd unit. In addition, pyrite, sphalerite and galena occur at lower levels of the Hd unit associated with zones of zebra breccia. Here, the host rock is fractured, dark grey black weathering dolomite. Within the lower Hls1 unit, coarse-grained galena and sphalerite occur in fractures and vugs in dolomitized and silicified intramicrite. Significant pyrite mineralization occurs within the Hd unit associated with zebra breccia dolomite.

Current Work and Results:

During summer 1975, detailed soil geochemical, geological mapping and diamond drilling programs were conducted. Over 1,500 soil samples were collected over 51 line miles of grid and analyzed for Cu, Pb, Zn, Ag. Grid lines were surveyed in by compass and chain and flagged at 100 foot stations. Geological mapping of the claim group was conducted at a scale of 1 inch = 1,000 feet with a larger scale in the showing areas. The diamond drilling program was conducted late in the season and consisted of 2,436 feet of BQWL core in three "BBS 1" holes and 243 feet of EXT core in five "Winkie" holes. Results of work on the property were considered encouraging by company geologists.

KIDD
McIntyre Mines Limited

106 C 3, 105 N 14
(64°00'N, 133°10'W)

Reference: Blusson (1974a,b).

Claims: KIDD 1-36

Location and Access:

The property is located on the north bank of the Stewart River. Access is by helicopter from Mayo, 120 km to the west.

History:

The claims were staked to cover a gossan zone that was initially located from the air and gave an anomalously high geochemical zinc value. KIDD claims 1-4 were recorded in July 1975 and KIDD 5-36 in September 1975.

Description:

Rocks on the property are poorly exposed. They consist of Hadrynian "Grit Unit" which are unconformably overlain by silver weathering black carbonaceous shale of Devonian-Mississippian age (Canol Formation?).

To date, no base metal sulphide mineralization has been observed on the property. However, a large gossan and limonite-siderite tufa occurs in the centre of KIDD #1 claim deposit and one grab sample of the tufa material assayed 17.5 per cent zinc.

Current Work and Results:

During summer 1976, detailed geological mapping, and geochemical soil, stream and seep silt sampling programs were conducted. Forty-five soil samples were collected on a grid with 500 foot line spacing (200 feet over gossan) at 200 foot intervals and analyzed for Pb, Zn, Ag, Cu. Stream silts and limonite-rich silt from seeps were collected and analyzed in total heavy metal field kits. A Winkie diamond drill hole was attempted but no core was recovered. The zinc anomalies determined were ascribed by company geologists to hydromorphic concentrations and not to underlying zinc-enriched bedrock. Further work consisting of detailed geological mapping, soil and stream geochemistry was recommended by a company geologist.

REP
Welcome North Mines Limited
(Arctic Red Joint Venture)

Zinc, Lead
106 C 8
(64°28'N, 132°05'W)

Reference: Blusson (1974a).

Claims: REP 1-48

Location and Access:

The property is located 3 km south of Duo Lake in the Bonnet plume Range of the Wernecke Mountains. Access is provided by float equipped fixed-wing aircraft from Mayo, 216 km to the southwest.

History:

The claims were recorded in August 1976.

Description:

The property is underlain by shale and calcareous argillite of the Road River Formation which immediately overlie carbonate breccia of the Franklin Mountain Formation. Zinc-lead mineralization is reported to occur in the Road River shale with both a stratiform and fracture controlled habit.

Current Work and Results:

During summer 1976, the property was subjected to reconnaissance (1 inch = 1/2 mile) and detailed (1 inch = 50 feet - REP 19, 5, 40) geological mapping, and geochemical soil and rock sampling. Several geochemical targets were outlined for future work, in addition to 3 areas of outcrop with mineralization.

GYR, ADD, ETC
Harman Syndicate

Zinc, Lead
106 C 10
(64°40'N, 132°40'W)

Reference: Blusson (1974b); Sinclair et al (1976).

Claims: GYR 1-26; ADD 1-32; ETC 1-12

Location and Access:

The claims are located about 217 km northeast of Mayo. Access is by helicopter from Goz Lake, about 24 km southeast of the property.

History:

The GYR claims were staked in July 1974, and the ADD and ETC claims in August 1974. In 1974 and 1975, the property was subjected to geological mapping, prospecting and sampling.

Description:

The property is underlain mainly by Siluro-Devonian limestone with windows of Ordovician Road River Formation shale. The rocks are relatively flat lying and are in contact with a partially overthrust block of the Sheep-bed Formation along a northwest trending thrust fault dipping gently to the east.

Mineralization consisting of yellow sphalerite and minor galena occurs within a fossiliferous and conglomeratic facies of the Siluro-Devonian limestone. The sphalerite is present along with white sparry calcite as a conglomerate matrix filling, as thin veinlets and as sphalerite pseudomorphs after fossil fragments. The abundant fossil fragments, rounded limestone clasts and locally discordant attitude of the fossiliferous and conglomeratic facies suggests a possible paleoenvironment for the accumulation of reef breccia. The main mineralized zone is approximately 300 m by 60 m in size.

Current Work and Results:

In summer 1976, a trenching and rock sampling program was conducted on the property. Typical assay values from the rock chip sampling program are presented below:

<u>Sampling interval (ft)</u>	<u>Lead (wt %)</u>	<u>Zinc (wt %)</u>
5	0.44	3.47
10	0.01	3.26

Two trenches were excavated and a grab sample from the bottom of one trench assayed 3.65 % lead, 10.3 % zinc and 0.04 oz/ton silver. Further work consisting of trenching with the use of explosives and a geochemical soil sampling program for lead and zinc was recommended.

PING
Bow River Resources Limited
Highhawk Mines Limited
Cominco Limited

Lead, Zinc
106 C 11
(64°37'N, 133°15'W)

References: Blusson (1974b); Sinclair et al (1976).

Claims: PING 1-26, HW 1-40, CAN 1-24

Location and Access:

The property is located 173 km northeast of Mayo and is accessible by float plane to Pinguicula Lake and from there by helicopter, 8 km to the southeast.

History:

Most of the claims (PING 1-24) were staked in January 1974. In addition, PING 25 and 26 were staked in September 1974. Claims CAN 1-24 were recorded in March 1974 and HW 1-40 in April 1974. Property work in 1975 included geological mapping, IP survey and diamond drilling (Sinclair et al, 1976).

Description:

The property is underlain by rocks of Hadrynian to Ordovician-Silurian in age. Mineralization consists of galena and sphalerite associated with zebra dolomite breccia in dolomite of the Keele Formation. A much more descriptive account with accompanying map is available in the 1975 MIR, (Sinclair et al, 1976, pp. 51-54).

Current Work and Results:

During summer 1976, the PING claims were subjected to detailed geological mapping (1:12,000), IP and VLF geophysical surveys, hand trenching and diamond drilling programs. Four holes were drilled on the PING claims with 1,500 feet of BQ core recovered. However, no significant increase in size potential over 1975 estimates was found.

BROMADROSIS
Wernecke Joint Venture

Uranium
106 C 13
(64°59'N, 133°57'W)

Reference: Blusson (1974a).

Claims: BROMADROSIS 1-6

Location and Access:

The property is located 187 km northeast of Mayo about 3 km east of the Bonnet Plume River. Access was provided by helicopter from Fairchild Lake, 9 km east of the property.

History:

The claims were staked in September 1975 by Wernecke Joint Venture to cover an occurrence of uraniferous float.

Description:

The property is underlain by grey weathering, pink to white calc-silicate rocks of Lower Proterozoic age. They are interpreted as altered country rock peripheral to a major intrusive polymictic breccia body about two miles to the west, centred over Slab Mountain.

Mineralization consists of small amounts of widely disseminated brannerite within a pink siliceous phase of the calc-silicate which locally has a clastic appearance. Haloes of red hematite alteration surround the brannerite.

Current Work and Results:

During summer 1976, the property was subjected to a program of detailed ground radiometric prospecting and the excavation of two trenches.

CORD
Rio Tinto

Zinc, Lead
106 C 13, D 16
(64°52'N, 134°00'W)

References: Blusson (1974b); Green (1972).

Claims: CORD 1-72

Location and Access:

The property is located 164 km northeast of Mayo and 8 km north of Gillespie Lake. Access in 1976 was by helicopter from Fairchild Lake, 18 km northeast of the property.

History:

The claims were staked in June 1975 on the basis of high lead-zinc geochemical results from reconnaissance stream sediment samples in 1974.

Description:

The area is underlain by clastic and carbonate rocks of Helikian age (Units 1, 2 of Green, 1972). Black shale, dark grey siltstone and interbedded dark green andesite of Unit 1 are in contact with a thick sequence of orange weathering, stromatolitic dolomite (Unit 2) that is interbedded with thin dark brown argillaceous siltstone and black shale. Both units are intensely deformed by both folding and faulting. No significant lead or zinc mineralization was discovered, though several pyrite-rich shale and argillite beds were found on the property. Rare narrow sphalerite and galena bearing quartz veinlets occur in the vicinity of these beds. Immediately west of the property, minor chalcopyrite occurs in felsic Tertiary dykes.

Current Work and Results:

During summer 1976, the property was subjected to a detailed stream sediment sampling and reconnaissance soil sampling program for Ag, Co, Cu, Pb, Zn and Ni. In addition, reconnaissance geological mapping and limited rock chip sampling was carried out. Numerous Pb-Zn anomalies were determined by the stream sediment and soil sampling program and rock chip samples from 15 cm thick and 3 m thick pyritic shale beds assayed 7.5 per cent and 0.94 per cent zinc respectively. Further work was recommended to consist of more detailed soil sampling and geological mapping.

PTERD
Archer, Cathro and Associates Limited

Uranium
106 C 14
(64°57'N, 133°18'W)

Reference: Blusson (1974a); Sinclair et al (1976).

Claims: PTERD 1-10, 11 Fr., 12 Fr., 13, 14; PNERD 1-4; PTOES 1-22; SKIN 1-4; KNIT ; -26, 9-22

Location and Access:

The property is located about 21 km east of Fairchild Lake and 193 km northeast of Mayo. Access in 1976 was provided by float equipped fixed-wing aircraft to Fairchild Lake and then by helicopter to the property. In addition, some use was made of an airstrip located 3 km south of the property, near the junction of Tetrahedrite and Cobalt creeks.

History:

The PTERD 1-10 claims were staked in July 1975, PNERD 1-4 in August and KNIT 1-8, PTOES 1-8 and SKIN 1-4 in September 1975. The additional claims were all staked in July 1976: KNIT 9-22, PTOES 9-22, PTERD 11 Fr, 12 Fr, 13, 14. Initial staking of the property resulted from the discovery by Wernecke Joint Venture of a train of radioactive float lying on a stagnating alpine glacier. During summer 1975, geological mapping and a radiometric survey were conducted and in spring 1976, the property was optioned to Eldorado Nuclear Limited.

Description:

The property is underlain by fine-grained metavolcanic rocks of Helikian age with siltstone interbeds that are folded and deformed by intrusive explosive gas vent breccias. Subangular to subrounded fragments of pink and flesh coloured chert, carbonate, dark green volcanics and brown siltstone in a carbonate matrix form the polymict breccia. The surrounding country rocks are commonly bleached in colour from dark green to pale green, leached of iron and altered to dolomite. A major north-south fault with associated tectonic breccia cuts across the property and separates stratigraphically lower meta-volcanics on the east from higher argillite and carbonate on the west.

Current Work and Results:

During summer 1976, five diamond drill holes (BQ core) for a total of 1,544 feet were drilled on the PTERD 7 and KNIT 9 claims. No significant mineralization was encountered.

BOND
Archer-Cathro and Associates Limited

Uranium
106 D 10
(64°40'N, 134°57'W)

Reference: Green (1972); Sinclair et al (1976).

Claims: BOND 1-96

Location and Access:

The claims are located about 128 km northeast of Mayo in the vicinity of the headwaters of Bond Creek. Access was provided by float equipped fixed-wing aircraft to Hart Lake, 120 km north of Mayo and then by helicopter to the

property 6 km to the northeast.

History:

The claims were staked in June and September, 1975. During 1975, detailed geological mapping, geochemical soil sampling and a radiometric survey were conducted. The property was optioned to Eldorado Nuclear Limited in 1976.

Description:

The property is underlain by a window of Proterozoic rocks which are surrounded by Ordovician and Silurian limestone and dolomite. Siltstone with minor interbedded metavolcanics form the Lower Proterozoic rocks. The sequence has been complexly folded and the rocks are foliated in an east-west direction.

Two areas of uranium mineralization have been located. The first (BOND I) consists of a vein occurrence of siderite-quartz ($\pm$) barite with accompanying minor chalcopryrite, pyrite and pyrrhotite and the second (BOND II) consists of several radioactive, iron and manganese stained, lenseoid zones in foliated and brecciated metavolcanics.

Current Work and Results:

During summer 1976, three diamond drill holes (1 AX core) for a total of 391.5 feet were drilled. One drill hole tested the BOND I showing with negative results. Two drill holes tested the BOND II showing and both intersected uranium mineralization.

GNUCKLE
Eldorado Nuclear Limited

Uranium
106 D 16
(64°56'N, 134°18'W)

References: Green (1972);

Claims: GNUCKLE 1-8

Location and Access:

The property is located at the headwaters of Slats Creek, approximately 175 km northeast of Mayo. Access to the property was provided by helicopter from Fairchild Lake, 29 km to the east.

History:

The claims were staked in late July, 1976 over a uranium occurrence found through follow-up of radioactive float located by Wernecke Joint Venture in 1975. The 1976 program was carried out by Eldorado Nuclear Limited under an option agreement with Wernecke Joint Venture; the program was managed by Archer, Cathro and Associates Limited.

Description:

The property is underlain by argillite and quartzite of Helikian age (Unit 1, Green, 1972) that have been intruded by a breccia body. A major fault that cuts through the centre of the claim group is marked by bleaching, silicification and numerous quartz veins.

No mineralization was located in outcrop. However, brannerite occurs in

local accumulations widely spaced throughout the breccia.

Current Work and Results:

During summer 1976, the property was subjected to grid soil geochemical and radiometric survey programs. Soil samples and radiometric measurements were taken at 30 m intervals along lines spaced 50 m apart for a total line length of 5 km.

FACE
Eldorado Nuclear Limited

Uranium
106 D 16
(64°52'N, 134°20'W)

Reference: Green (1972).

Claims: FACE 1-8

Location and Access:

The property is located on the north side of the Bear River, 176 km northeast of Mayo. Access was provided by helicopter from Fairchild Lake, 31 km to the northeast.

History:

The claims were staked in July 1976 to cover an occurrence of uranium float discovered by Eldorado Nuclear Limited during regional exploration with Wernecke Joint Venture (managed by Archer, Cathro and Associates).

Description:

The property is underlain by argillite and quartzitic argillite of Helikian age (Unit 1, Green, 1972) that have been intruded by a breccia body. Both the breccia and some of the surrounding argillite have been highly carbonatized.

Mineralization consists of brannerite along fractures within a siliceous border phase of the breccia.

Current Work and Results:

During summer 1976, the property was subjected to detailed prospecting, radiometric survey and geochemical soil sampling programs (Cu, Mo, U). Soil samples were collected and radiometric measurements were taken at 30 m intervals along lines spaced 30 m apart for a total line length of 2,000 metres.

OTIS
Eldorado Nuclear Limited

Uranium
106 E 1
(65°02'N, 134°24'W)

References: Norris (1975); Sinclair et al (1976).

Claims: OTIS 1-64

Location and Access:

The claims are located about 193 km northeast of Mayo and are accessible by helicopter from Kiwi Lake, 23 km to the northwest.

History:

The claims were staked in June 1975 by Wernecke Joint Venture managed by Archer, Cathro and Associates Limited. During summer 1975, geological mapping (1 inch = 1/2 mile), soil geochemistry and radiometric survey programs were conducted and the property was optioned to Eldorado Nuclear Limited in 1976.

Description:

The area is underlain by rocks of Helikian age (Unit H0, Norris, 1975), and the property is mostly underlain by green metasedimentary rocks with meta-volcanic interbeds. This unit is in fault contact with a younger grey to black pyritic phyllite and argillite and both units have been intruded by a polymictic breccia containing fragments of chert, volcanic rocks, argillite and carbonate rocks set in a carbonate-rich matrix. Locally, some of the country rock has been altered to a grey-green to reddish calc-silicate. Two major faults (north trending and northwest trending) crosscut the property and along them, zones of brecciated country rocks occur that are cemented by quartz and chert with minor hematite and chlorite.

Mineralization consists of locally disseminated brannerite within the fault breccia zone and in small fractures associated with the fault. One to four inch brick red haloes of hematite alteration commonly surround the brannerite.

Current Work and Results:

During summer 1976, prospecting, minor trenching and detailed radiometric survey programs were conducted.

SLATS
Norcen Energy Resources

106 E 1
(65°02'N, 134°27'W)

Reference: Norris (1975).

Claims: SLATS 1-18

Location and Access:

The claims are located on Slats Creek, 11 km from the mouth of Slats Creek, where it enters the Bonnet Plume River, 180 km northeast of Mayo. Access is provided by helicopter from Margaret Lake, 35 km north, or from Mayo.

History:

The claims were staked in June 1975 for Great Plains Development Company (now Norcen Energy Resources).

Description:

The property is underlain by breccia, argillite and metavolcanics of Helikian age (Unit H0, Norris, 1975). Mineralization consists of specularite and hematite in pods near the contact of the breccia with argillite and also of malachite and chalcopyrite-bornite in float boulders.

Current Work and Results:

During summer 1975, the property was subjected to preliminary geological mapping and geochemical silt sampling for zinc, lead and cadmium.

MAR
Mark V Petroleum and Mines Limited

106 E 1, 2
(65°05'N, 134°30'W)

Reference: Norris (1975).

Claims: MAR 1-48

Location and Access:

The property is located immediately west of Quartet Lakes in the Bonnet Plume River area. Access is provided by float plane to Quartet Lakes, 185 km northeast of Mayo and the property can be easily reached by a short walk from any of the four lakes.

History:

The claims were recorded in January 1976.

Description:

The property is underlain by clastic sedimentary rocks of Helikian age, mainly interbedded quartzite and argillite which dip moderately to the northwest.

Current Work and Results:

During summer 1976, a geochemical soil sampling survey was conducted. A total of 293 soil samples was collected at 200 foot intervals along lines spaced 400 feet apart. Several anomalous areas were determined and further prospecting was recommended.

THOR
Great Bear Mining Limited

Uranium, Copper
106 E 1
(65°03'N, 134°25'W)

Reference: Norris (1975).

Claims: THOR 1-32

Location and Access:

The property is located 8.1 km south of Quartet Lakes in the Bonnet Plume River area. Access is provided by float plane to Quartet Lakes, 185 km northeast of Mayo, and then by foot or helicopter to the property.

History:

The claims were recorded in February 1976. They were staked by A. Harman to cover rock units favourable to copper and uranium mineralization and were subsequently acquired by Great Bear Mining Limited.

Description:

The property is underlain by rocks of Unit H0 (Norris, 1975), i.e. dark grey, grey green and black thin-bedded argillite, slate and phyllite, minor grey quartzite, orange weathering dolomite and conglomerate. The rocks are isoclinally folded about a northeast striking axial plane dipping 52° to the northwest. In addition, an intrusive breccia body trends in a southwesterly direction across the south end of the property. The breccia body is approx-

imately 31 m thick and has been traced for a minimum length of 465 m. Breccia fragments are angular to rounded and consist of thinly laminated carbonate, jasperoidal chert, mudstone and argillite. The matrix is sparry calcite with some specular hematite and particle size ranges from microscopic to one foot in diameter.

Mineralization consists of pods of brannerite and specular hematite within chloritized and feldspathized fractured argillite in contact with the breccia body (THOR 11, 13, 14). The degree of fracturing and the grade of mineralization increases near the contact. Two rock chip samples assayed 0.80 and 1.14 lb U_3O_8 /ton. A grab sample from a piece of mineralized breccia float assayed 0.96 lb U_3O_8 /ton. In addition, chalcopyrite locally occurs in quartz veins within argillite (THOR 2) and malachite occurs along bedding planes within argillite (THOR 27, 29).

Current Work and Results:

During summer 1976, the property was subjected to preliminary prospecting, geological mapping and geochemical stream sediment sampling. Seven stream sediment samples were collected and analyzed for uranium. Further work consisting of geochemical soil sampling, ground radiometric survey and detailed geological mapping and prospecting was recommended.

TET
Thor Explorations Limited

Copper, Uranium
106 E 1
(65°05'N, 134°30')

Reference: Norris (1975).

Claims: TET 1-54

Location and Access:

The property is located 5 km southwest of Quartet Lakes and 8 km west of the Bonnet Plume River. Access is provided by float equipped aircraft to Quartet Lakes, 185 km north of Mayo and thence by foot, 5 km south to the property.

History:

The claims were recorded in February 1976. They were staked by A. Harman to cover rock units potentially favourable to copper and uranium mineralization. The ground was subsequently acquired by Thor Explorations Limited.

Description:

The property is underlain by rocks of the Lower Proterozoic unit H0 of Norris, 1975, mainly dark grey, grey green and black, thin-bedded argillite, slate and phyllite and minor grey quartzite, orange weathering dolomite and conglomerate.

Three main mineralized showings occur on the property. The north showing (TET 21, 22) consists of chalcopyrite and minor bornite in fractures and as discrete grains in a thick bedded, rusty weathering, fine-grained quartzite unit. The unit has a minimum thickness of 12 metres, of which the lowermost 3 to 5 metres is reported to be mineralized over an exposed strike length of 12 metres. Locally, up to 95 per cent of the rock is hematite and magnetite. A rock chip sample over a 3.3 m area assayed 1.92 per cent copper. In addition, copper mineralized quartzite float occurs elsewhere on the property.

The west showing (TET 54) occurs on the south side of a steep-sided westerly trending ridge. There, similar stratigraphically controlled mineralization occurs within an 8 metre thick sequence of quartzite, shale and carbonates. The uppermost bed in the mineralized sequence is a 0.9 metre thick, fine-grained white quartzite in which chalcopryrite, malachite and azurite occur in fractures, vugs and disseminated throughout the rock. A continuous rock chip sample across the 0.9 metre thick bed assayed 10.4 per cent copper. Below the quartzite bed, a 1.8 metre thick, thin-bedded, light green shale unit occurs with thick coatings of malachite and azurite on bedding surfaces and in fractures. A continuous rock chip sample across the 1.8 metre thick bed assayed 4.50 per cent copper. Below the shale unit, a sparsely mineralized carbonate bed occurs that is about 3 to 5 metres thick. The three units are reported to be mineralized for approximately 120 metres of strike length.

The southeast showing (TET 2) occurs on the north side of a northeasterly flowing stream in the southeastern side of the property. Chalcopryrite and malachite occur with quartz veins in argillite and fractured quartzite bands over a strike length of 6 metres. In addition, stringers of brannerite occur in a 0.9 metre wide breccia zone made up of argillite breccia fragments in a quartz-carbonate matrix. A grab sample from a small area of radioactive argillite assayed 0.077 per cent U_3O_8 .

Current Work and Results:

During summer 1976, a detailed geochemical soil sampling program was conducted over the northern portion of the claims. A total of 284 soil samples were collected at 200 foot intervals along lines spaced 400 feet apart and analyzed for Cu-U. Three large coincident Cu-U anomalies were determined, two of which were explained as being due to the chalcopryrite-hematite bearing quartzite unit. Further work was recommended to consist of detailed geologic mapping, further geochemical soil sampling, magnetic and radiometric surveys.

WERNECKE
Wernecke Joint Venture

Uranium
106 E 1
(65°08'N, 134°23'W)

Reference: Norris (1975); Sinclair et al (1976).

Claims: WERNECKE 1-82

Location and Access:

The property is located on Quartet Mountain about 193 km northeast of Mayo and access is provided by helicopter from Kiwi Lake, 13 km to the northwest.

History:

The claims were staked in June (1-42) and September (43-82) 1975 by Wernecke Joint Venture (Standard Oil Company of B.C. Limited, Aquitaine Company of Canada Limited). During summer 1975, the property was subjected to programs of geological mapping, soil geochemistry, and airborne and ground radiometric surveys. In 1976, the property was optioned to Eldorado Nuclear Limited.

Description:

The property is underlain by Lower Proterozoic argillite, quartzite and metavolcanics (Unit H0, Norris, 1975).

Intrusive to the sequence is a polymictic breccia body which occurs locally as a pipe or as pods and discontinuous lenses. Clast material consists of pale grey to cream chert, dark volcanics and argillite with minor jasper and carbonate. The matrix is fine grained, grey, calcareous and occasionally pitted with rhomb shaped vugs, probably after siderite. Toward the margins of the body, the matrix commonly is dark brown and cherty. Within the country rock and margin of the breccia bodies, a dolomite alteration consisting of abundant magnetite and some biotite is common. The altered rock is pale grey to cream and weathers to a deep red-brown colour. The entire sequence is intruded by lamprophyre and other dykes of mafic affinities.

Mineralization is exposed in felsenmeer only and consists of widely disseminated fine- to coarse-grained brannerite (and possibly some uraninite).

Current Work and Results:

During summer 1976, the property was subjected to detailed geological mapping (1:3,000), and ground radiometric prospecting.

MTR
New Minex Resources

106 E 1
(65°09'N, 134°21'W)

Reference: Norris (1975).

Claims: MTR 9-16, 25-32, 39-48

Location and Access:

The property is located 6.5 km northeast of and immediately west of the Bonnet Plume River. Access is provided to Quartet Lakes by float plane from Mayo, 185 km to the southwest and then by helicopter to the property.

History:

The claims were recorded in February 1976. They were staked by A. Harman and Associates on the basis of proximity to the WERNECKE claim group where uranium mineralization is known to occur. Subsequently in August 1976, the property was acquired by New Minex Resources Limited.

Description:

The property is underlain by Helikian clastic sedimentary rocks of Unit H0 (Norris, 1975).

Current Work and Results:

During summer 1976, a geochemical soil sampling program was conducted. A total of 167 soil samples were collected at 200 foot intervals along lines spaced 1,500 feet apart and analyzed for copper-uranium. Two areas of weakly anomalous uranium values and one coincident copper-uranium anomaly were determined. Further work consisting of follow-up prospecting, fill-in geochemical soil sampling and a ground radiometric survey was recommended.

GREMLIN
Cyprus Anvil Mining Corporation

Copper
106 E 2
(65°11'N, 134°38'W)

Reference: Norris (1975).

Claims: GREMLIN 1-12

Location and Access:

The property is located 16 km west of the Bonnet Plume River and 16 km south of Margaret Lake, about 193 km north of Mayo. Access is provided by float plane to Kiwi Lake, about 1.5 km to the north.

History:

The claims were staked during August 1975, as a follow-up on a Cu geochemical anomaly determined by a regional stream sediment geochemical program. In 1975, the property was subjected to preliminary geochemical soil sampling.

Description:

The area is underlain by a series of argillite and volcanic rocks of Helikian age, Unit H0 of Norris (1975) that have been intruded by a concordant breccia body. Further mapping by company geologists has subdivided Unit H0 into three subunits in the vicinity of the GREMLIN claims:

- Lower Volcanic Unit - consists of several hundred metres of slaty, grey-green tuff overlain by approximately 120 m of breccia. The breccia consists of abundant angular blocky clasts of volcanics and jasper with hematite and carbonate forming the matrix and has locally contact metamorphosed the tuff into a chloritoid schist with prominent chloritoid porphyroblasts.
- Argillite Unit - overlies the Lower Volcanic Unit and consists predominantly of dark brown to black shale, about 450 m to 680 m thick. Within the Unit, two 15 m horizons of dark grey, chocolate brown weathering, coarsely crystalline dolomite occur, each capped by a few feet of light grey, pyritic chert.
- Upper Volcanic Unit - overlies the Argillite Unit and consists of several hundred feet of medium green chlorite-sericite schist, the base being a 30 m thick bed of pale pink chert.

Mineralization is exposed along the walls of a narrow canyon and consists of the following associations:

- 1) pyrite and chalcopyrite as disseminated grains within the thin chert horizons, possibly parallel to bedding;
- 2) as siderite-quartz-pyrite-chalcopyrite (rare cobaltite) veins in the dolomite and uncommonly in the underlying shale;
- 3) as azurite and malachite within black shale both above and below the chert horizons;
- 4) pyrite and chalcopyrite as irregular coarse clumps in the breccia matrix and disseminated within the clasts.

Current Work and Results:

The area around the property was geologically mapped (1 inch = 1/2 mile) and soil sampled (Cu, Pb, Zn) along elevation contours during summer 1976. The property itself was subjected to detailed geological mapping (1 inch = 400 feet) and geochemical soil and silt sampling for Cu, Pb, Zn. Soil samples were collected at 135 foot intervals along the 2,900 foot and 2,500 foot elevation contours, but no significant new anomalies were determined. Recommended further work includes geological mapping at a more detailed scale, ground magnetic survey and hand trenching.

MST
Ogilvie Joint Venture
Archer, Cathro and Associates Limited

Lead, Zinc
106 E 3
(65°09'N, 135°04'W)

Reference: Norris (1975).

Claims: MST 1-40

Location and Access:

The property is located between the Wind River and Illyd Creek, about 176 km north of Mayo. Access is by float plane from Mayo to Kiwi Lake and then by helicopter, 23 km to the southwest.

History:

The claims were staked in June 1974 to cover a lead-zinc occurrence found by the Ogilvie Joint Venture. Reconnaissance geological mapping and soil sampling were conducted in 1974 and detailed geological mapping, grid soil sampling and a radiometric survey were conducted over part of the property in 1975.

Description:

The property is underlain by a sequence of Lower Cambrian sedimentary rocks which consists of a thick section of shale, grit, conglomerate, clastic limestone and dolomite unconformably overlying Proterozoic quartzite.

Lead-zinc mineralization is present as galena and sphalerite cementing thin discontinuous horizons of coarse sandstone near the eastern limit of the Lower Cambrian conglomerate. In addition, minor occurrences of radioactivity have been located in a brecciated dolomite overlying the clastic sequence.

Current Work and Results:

During summer 1975, a ground radiometric survey was conducted over a 2,600 by 1,400 metre grid at 50 metre intervals along lines 100 metres apart. A weakly anomalous area was determined. No specific radioactive mineral has been identified.

LAURA
Norcen Energy Resources

Zinc
106 F 2
(65°05'N, 132°50'W)

Reference: Norris (1975).

Claims: LAURA 1-22

Location and Access:

The property is located on a large tributary of the Snake River, 83 km east-southeast of Margaret Lake and 225 km northeast of Mayo. Access is provided by helicopter from Margaret Lake or several other lakes in proximity.

History:

The claims were staked during July, 1975.

Description:

The property is underlain by Rapitan mudstone and limestone which are thrust over Lower Cambrian sedimentary rocks. Locally, the geology consists of zebra-breccia dolomite, calcareous shale and calcareous chert-quartz-pebble conglomerate which generally have a northeasterly strike and gentle dip to the east. Float mineralization consisting of pyrite and sphalerite has been detected along the river bank and in addition, an area of hydrozincite weathering was noted in some of the dolomite.

Current Work and Results:

During summer 1975, the property was subjected to detailed geological mapping (1 inch = 400 feet) and a soil geochemical survey for lead, zinc and cadmium. Soil samples were taken on grid lines 200 feet apart at 200 foot intervals for a total line length of 13,000 feet. Three short X-ray diamond drill holes were drilled for a total of 260 feet. Results were inconclusive.

BUH
Norcen Energy Resources

Lead, Zinc
106 F 2
(65°06'N, 132°57'W)

Reference: Norris (1975).

Claims: BUH 1-10

Location and Access:

The property is located 80 km east-southeast of Margaret Lake near the Snake River and 225 km northeast of Mayo. Access is provided by helicopter from Margaret Lake.

History:

The claims were staked in July, 1975.

Description:

The property is underlain by Hadrynian dolomite and clastics which have an east-west trend and dip gently to the south. Mineralization consists of sphalerite and galena as vug and fracture fillings in dolomite. The highest

assay was determined from a 1.5 m chip sample across one mineralized horizon: 8.6 per cent zinc, 2.8 per cent lead and 300 ppm cadmium.

Current Work and Results:

During summer 1975, the property was subjected to programs of geochemical soil sampling for lead, zinc and cadmium and detailed geological mapping. Soil samples were collected at 200 foot intervals along lines spaced 200 feet apart for a total line length of 14,400 feet. Further work consisting of several short diamond drill holes were recommended by a company geologist.

PAT, CAL
Sumitomo Metal Mining Canada Limited

116 A 7
(64°30'N, 136°35'W)

Reference: Green (1972).

Claims: CAL 1-10; PAT 1-6

Location and Access:

The property is located 108 km north-northwest of Mayo in the Ogilvie Mountains. Access is provided by helicopter from Mayo or the Dempster Highway, 74 km to the west.

History:

The claims were staked in July, 1975 on the basis of anomalous stream sediment zinc values.

Description:

The CAL claims are underlain by Precambrian and/or Cambrian shale, chert and limestone (Unit 3, Green, 1972) situated between two major westerly trending and southerly dipping diorite sills. The PAT claims are underlain by chert and cherty shale of Unit 3 which are overlain by a thrust sheet of Ordovician and Silurian limestone and minor siliceous limestone. No mineralization has been found on the property.

Current Work and Results:

During July, 1976, the properties were subjected to soil geochemical surveys for lead, zinc and cadmium performed by UMEX. One hundred seventy-five samples were collected at 200 foot intervals along lines spaced 400 feet apart. Only minor anomalies were determined and no further work was recommended.

LAST
Union Miniere Explorations and
Mining Corporation

116 A 15
(64°51'N, 136°38'W)

Reference: Green (1972).

Claims: LAST 1-8

Location and Access:

The property is located in the Wernecke Mountains, 20 km east of the junction of Hart River and Rae Creek. Access is by helicopter from Mayo or Dawson, both about 153 km to the south.

History:

The claims were recorded in August 1975 and staked as part of the UMAX-Shell 'Blackstone Project' joint venture.

Description:

The claims are underlain by clastic rocks of the Lower Proterozoic (Unit 1, Green, 1972). Unit 1 consists of mainly dark grey, grey-green and black, thin-bedded argillite, slate and phyllite with minor grey quartzite, orange-weathering dolomite and conglomerate.

Current Work and Results:

During summer 1976, the property was subjected to geological mapping (1 inch = 1,000 feet) and geochemical soil sampling which outlined two Cu-Co-Ag anomalies.

DAWSON MINING DISTRICT

WON
Kerr Addison Mines Limited

Copper, Molybdenum
115 I 13
(62°52'N, 137°56'W)

References: Tempelman-Kluit (1974a); Sinclair et al (1976, p. 80).

Claims: WON 1-24, 79-90, 101-118

Location and Access:

The claims straddle an east-flowing tributary of Black Creek, roughly 33 km west-northwest of Fort Selkirk in the Dawson Range. Access in 1976 was by helicopter.

History:

The original WON claims were staked in October 1973 and June 1974. The current WON 1-24 claims were staked in August 1975 to cover ground which had been staked earlier but which had lapsed. Surface exploration including some test pitting was carried out in 1974.

Description:

Regional mapping has indicated that the property is generally underlain to the east by Triassic volcanics which include altered andesite and basalt and related pyroclastics. To the west, the volcanics are intruded by Triassic granodiorite, locally foliated due to alignment of mafic minerals.

Current Work and Results:

An additional I.P. survey on the WON claims outlined three anomalous zones. In addition, a resistivity sounding technique was successfully used in determining overburden depths.

SAM, MAC, FOX, RAY, OX, RT
Andac Resources Limited

115 O 11
(63°31'N to 63°42'N,
139°11'W to 139°12'W)

Reference: Bostock (1942).

Claims: SAM 1-24; MAC 67-70, 126-138; FOX 1-14; RAY 1, 2, 4, 6, 8, 10, 12, 14;
OX 1-32; RT 1-32

Location and Access:

The claims are situated about 56.3 km south of Dawson straddling the Indian River.

History:

The claims were staked in April 1975.

Description:

Tertiary and recent stream deposits underlie the northern half of McKinnon Creek area. Tertiary conglomerates and andesites are mapped in the remainder of the area except for some ultrabasic rocks which outcrop in the eastern portion of the McKinnon Creek area and gneissic rocks which are exposed in the northeast corner of Montana Creek area.

Current Work and Results:

A helicopter-borne magnetic survey was conducted. Lines were flown at a spacing of 200 m with a mean terrain clearance of 45.7 m. A total of 545 line-kilometres were flown.

LUCKY JOE
Rio Tinto Canadian Exploration Limited

Copper, Molybdenum
115 0 11, 12
(63°35'N, 139°30'W)

References: Bostock (1942); Sinclair et al (1975, pp. 80-81).

Claims: B 1-16; SUNEP 1-14, 18-34; BJB 1-17; ASH 1-44; PAX 1-10

Location and Access:

The property lies near the headwaters of Lucky Joe Creek, 6 miles (10 km) east of the Yukon River and roughly 30 miles (50 km) south of Dawson. Access in 1976 was by helicopter from Dawson. In addition, a 22-mile (35 km) long winter road extends from the mouth of Quartz Creek south to the centre of the property.

History:

The B claims were staked in the summer of 1970 by Silver Standard Mines Limited who carried out soil sampling, geological mapping and trenching during the same year. In 1971 Silver Standard drilled three diamond drill holes totalling 140 m. In 1975 the property was optioned by Rio Tinto Canadian Exploration Limited who staked additional claims, the SUNEP, BJB, ASH and PAX groups, peripheral to the B claims. Rio Tinto carried out geological mapping, soil sampling and geophysical surveys and drilled two holes totalling 425 m.

Description:

The property is underlain by Klondike Schist of the Yukon Metamorphic Complex, mapped as Unit E by Bostock (1942). Rocks exposed on the property consist of biotite schist, quartz-muscovite schist and biotite quartz gneiss. The metasediments are enclosed to the east and west by bodies of gneissic granite (Unit A, op. cit.) which is exposed on the west and northwest portions of the claims groups. Chalcopyrite and pyrite with minor amounts of molybdenite occur in fractures in biotite and quartz-muscovite schists.

Current Work and Results:

In 1976 Rio Tinto drilled five holes totalling 1,219 m on claims B 1 and B 2.

MIKE, CAN
Canalta Resources Limited

Gold, Silver
116 A 5
(64°15'N, 137°55'W)

References: Cockfield (1920); Green (1972).

Claims: MIKE 1-24; CAN 1-30, 45

Location and Access:

The property is located approximately 74 km north-northeast of Dawson and 27.4 km east of the Dempster Highway. Access is by helicopter from Dawson or the Dempster Highway.

History:

The claims were staked in June 1975 and this assessment work done in 1975.

Description:

The claims are underlain by quartzite, chert and argillites (Unit 3, Green, 1972) which are intruded by syenite (Unit 21b, Green, 1972). Mineralization consists of auriferous quartz-arsenopyrite veins occurring near sediment-syenite contacts.

Current Work and Results:

Mineralization occurs in two zones trending easterly with steep dips. The south zone is an average of 1.2 m wide and has been traced for a distance of 300 m. Surface trenching of this zone gave gold values from 0.01 to 1.548 oz/ton. Diamond drilling (3 holes for a total of 189 m) shows the vein mineralization to be continuous at depth. The north zone was sampled and trenched for a distance of 483.5 m. The main vein is steeply dipping to the south with a maximum width of 6.1 m. All sulphides found were oxidized and further work was recommended to establish the grade of fresh sulphides.

TING, NOTING, PROSPECTING
Archer, Cathro and Associates Limited
(Ukon Joint Venture)

Uranium
116 B 7
(64°23'N, 138°36'W)

References: Cockfield (1920); Tempelman-Kluit (1970); Green (1972).

Claims: TING 1-50; NOTING 51-76; PROSPECTING 77-84

Location and Access:

The claims are located 49 km northeast of Dawson. Access in 1976 was by helicopter from a camp at Mile 45 (Km 72) of the Dempster Highway.

History:

The claims were staked in the spring and summer of 1976 for the Ukon Joint Venture managed by Archer, Cathro and Associates Limited.

Description:

The TING, NOTING and PPROSPECTING claims are located on the Tombstone Stock. The stock is composed of coarse-grained alkaline plutonic rocks of Lower Cretaceous age, ranging from alkali syenite, tinguaitite, nepheline syenite and monzonite to silica-saturated rocks of granodioritic and quartz dioritic composition. The major minerals observed are orthoclase, plagioclase, nepheline, cancrinite, calcite, biotite, hornblende, pyroxene and quartz. Accessory minerals identified so far include sphene, zircon, apatite, melanite, garnet, fluorite, apatite and opaques. Trachytic dykes are found in the area of the stocks cutting the country rocks. Radioactivity is associated with the tinguaitite and dykes at the eastern margin of the stock near Mt. Monolith. The stock is intrusive into orthoquartzite, (Keno Hill Quartzite) and diabase and xenoliths of the country rocks are common in the stock.

Current Work and Results:

Helicopter-borne radiometric surveys near the area outlined numerous anomalies associated with the intrusive rocks. The spectrometer was operated on the total count mode for the surveys but anomalies were checked spectrally on U, Th and K channels. Mineralization seems to be associated with the pseudoleucite tinguaitite as primary uranium minerals disseminated in the rock. Secondary yellow uranium mineralization is found on fractures. In addition to a scintillometer survey, soil, silt, water and rock samples near the showing were analyzed for uranium and thorium.

NEBULOUS
Archer, Cathro and Associates Limited
(Ukon Joint Venture)

Uranium
116 B 7
(64°28'N, 138°46'W)

References: Cockfield (1920); Lambert (1966); Tempelman-Kluit (1970); Green (1972).

Claims: NEBULOUS 1-33

Location and Access:

The claims are located 49 km northeast of Dawson in the Cloudy Range between the Chandindu and Blackstone Rivers. Access in 1976 was by helicopter from a camp at Mile 45 (Km 72) of the Dempster Highway.

History:

The claims were staked in the summer of 1976 for the Ukon Joint Venture.

Description:

The claims are located on the Lower Cretaceous Mt. Brenner stock which has a core of porphyritic quartz monzonite and is concentrically zoned successively by porphyritic hornblende monzonite, monzonite porphyry, a thin band of pyroxenite and augite-biotite porphyry (Lambert, 1966). The stock is surrounded mainly by a Lower Cretaceous orthoquartzite (Keno Hill quartzite) and diabase.

Current Work and Results:

A helicopter-borne radiometric survey was conducted over the stock with the instrument in the total count mode. Spectral checks for U, Th and K were made on anomalies. The highest zone of radioactivity was associated with a crescent shaped zone of monzonite porphyry, but most is likely due to a high thorium content. Soils, silts, waters and rock chips and whole rocks were analyzed for uranium. Uranium mineralization is visible mostly as a yellow coating on joints and as fracture fillings in two zones.

C
Chevron Standard Limited

Uranium
116 B 8
(64°17'N, 139°13'W)

References: Cockfield (1920); Tempelman-Kluit (1970); Green (1972).

Claims: C 1-69

Location and Access:

The property is located on Antimony Mountain 61 km east-northeast of Dawson. Access in 1976 was by helicopter from Dawson.

History:

The claims were staked in 1975. In the past, interest has been shown in the stock for gold, copper and antimony mineralization.

Description:

The claim group is underlain by unit 21b (Green, 1972) which is an intrusive stock of Cretaceous age named the "Antimony Stock". The stock consists of hornblende and hornblende/biotite syenite.

Current Work and Results:

A ground radiometric survey using total-count scintillometers, was carried out on grid lines. A uranium soil and stream silt geochemical survey was also conducted. No significant anomalies were indicated though certain phases of the intrusive have a higher background. Further work was recommended.

A.J., UP
Cons Acheron Mines Limited

Gold, Silver
116 B 8
(64°17'N, 138°10'W)

References: Cockfield (1920); Tempelman-Kluit (1970); Green (1972).

Claims: A.J. 1-42; UP 1-12

Location and Access:

The property is located on Antimony Mountain 53 km west-northwest of Dawson. Access is by helicopter from Dawson or from the Dempster Highway.

History:

The claims A.J. 3-6, 15-16, were optioned from Conwest Exploration Company Ltd. and the remaining claims were staked in the first week of August 1975 to cover the surrounding ground. The A.J. claims were originally staked in 1966 following discovery of gold-bearing arsenopyrite veins. During that year surface trenching, prospecting and diamond drilling of four short holes was completed by Conwest Exploration Company Ltd. In 1975, Acheron Mines Limited (name changed to Cons Acheron Mines Limited in April 1976) optioned the property and had this assessment work done.

Description:

The claims are underlain by quartzite (Unit 3, Green, 1972) and syenite and diorite (Unit 21b, Green, 1972). Auriferous arsenopyrite mineralization is associated with shears and fracture zones in the quartzites.

Current Work and Results:

Two zones of mineralization were outlined on the property by trenches and 3 diamond drill holes. Three veins, 0.6 to 2.1 m wide and assaying .003 to 5.328 oz/ton gold and less than 1 oz/ton silver were located in the south zone. Work on the North zone delineated three veins 0.3 to 1.5 m wide assaying 0.112 to 8.712 oz/ton gold and 0.21 to 1.72 oz/ton silver. A soil geochemical survey for arsenic and zinc was inconclusive. Further diamond drilling was recommended in order to outline the vein systems adequately.

A, B, AB
Chevron Standard Limited

Uranium
116 B 11
(64°32'N, 139°07'W)

References: Cockfield (1920); Tempelman-Kluit (1970); Green (1972).

Claims: A 1-16; B 1-4, AB 1-76; WAD 1-16

Location and Access:

The property is located near Deadman's Gulch about 56.3 km north of Dawson. Access in 1976 was by helicopter from Dawson.

History:

The claims were staked in 1975.

Description:

The claim groups are underlain by unit 21b of Green (1972) which is an intrusive stock of Cretaceous age. The intrusive, which is called the 'Deadman Stock', is a multiphase pluton in which the three main phases are; (1) pink and grey equigranular hornblende biotite syenite, (2) pseudolucite-tinguaite, and (3) quartz monzonite. Uranium and thorium mineralization is found associated with the intrusive.

Current Work and Results:

A ground radiometric survey with total count scintillometers over a grid was carried out in conjunction with a soil geochemical survey. The claims were also mapped geologically and further work was recommended.

ID, OD, DAS, LALA
Union Miniere Explorations and Mining
Corporation Limited
Shell Canada Resources Limited

Copper, Lead, Zinc
116 B 13, 14
(64°49'N to 64°55'N,
139°15'W to 139°45'W)

Reference: Green (1972).

Claims: ID 11-16; OD 19-34; DAS 1-42; LALA 1-60

Location and Access:

The claims are situated within 15-30 km north of Mount Harper. Access to the claims was by helicopter from a base camp at Mile 68 on the Dempster Highway, distances of about 48-72 km.

History:

All claims were staked in 1975 as part of the Blackstone Project - a UMEX-Shell joint venture.

Description:

The ID, DAS and LALA claims are underlain by a sequence of Proterozoic clastic sediments. The OD claims are underlain by limestone and stromatolitic dolomites. The LALA claims also contain some Cambro-Ordovician carbonates. The clastic rocks consist of maroon shale and siltstone, maroon pebble-conglomerate, pink cherty dolomite, black shales, sandy dolomite and quartzite.

Current Work and Results:

A soil geochemical survey was conducted on the various claim groups and seven Co-Cu soil anomalies were found on the DAS claims and several on the LALA group; Pb-Zn anomalies were detected on the OD group. The ID group was mapped geologically and copper mineralization was found within a major fault zone.

RG
Cons Acheron Mines Limited

Asbestos
116 C 7
(64°25'N, 140°40'W)

References: Green (1972).

Claims: RG 1-8

Location and Access:

The claims are located 4.8 km southeast of the Clinton Creek Mine and lie approximately 1 km north of the main highway from Dawson to Clinton Creek.

History:

In 1971-72 surface exploration and diamond drilling and in 1974 surface exploration was conducted on the property.

Description:

The claims are underlain by metamorphic rocks of the Nasina series (Unit A, Green, 1972) with some occurrences of asbestos-bearing ultramafic rocks.

Current Work and Results:

There was a limited amount (86 m³) of trenching done.

RIO, NATE, CARB
Rio Alto Exploration Limited

116 K 8, 9
(66°30'N, 140°20'W)

Reference: Norris (1976, p. 461).

Claims: RIO 1-60; NATE 3-14; CARB 3-16; YETI 1-12

Location and Access:

The claims are located about 29 km east of the Alaska border approximately 280 km north of Dawson City and 112 km south of Old Crow. Access is by helicopter from either Dawson or Old Crow.

History:

The claims were staked in September 1975.

Description:

The claims are in unglaciated terrain. The exposed sedimentary section is a maximum of 18,750 m thick and spans the Proterozoic to the lower Cretaceous. The Proterozoic is composed mainly of clastics with a small amount of carbonates. The Lower Paleozoic unconformably overlies the Proterozoic rocks and consists of Cambrian to Devonian dolomite. The Upper Paleozoic consists of Upper Devonian and Mississippian shales, Mississippian and Pennsylvanian carbonates, and Pennsylvanian and Permian shales. Mesozoic clastics of Triassic, Jurassic and Lower Cretaceous age unconformably overlie the Upper Paleozoic. The Laramide orogeny appears to have been the dominant cause of the folding and faulting in the area.

Current Work and Results:

The area was mapped at a reconnaissance scale and a soil geochemical survey was conducted on the claims. A dark bluish-black massive oolitic iron formation, 366 m in outcrop length and 46 m thick, grades 52-55 per cent Fe and is conservatively estimated to contain 30 million tons averaging 55 per cent Fe. There are also several showings of sphalerite, smithsonite, aurichalcite, tetrahedrite, malachite, azurite and pyrite in middle Devonian dolomites. Several shallow trenches were dug along a scree slope to outline an occurrence of smithsonite and aurichalcite float which was consistently found at depths of 15-25 cm below surface.

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WHITEHORSE MINING DISTRICT

SM
Exploram Minerals Limited

Lead, Zinc
105 C 13
(60°58'N, 133°46'W)

References: Mulligan (1963); Sinclair et al (1976, p. 96).

Claims: SM 1-8

Location and Access:

The claims are situated between Slate and Red Mountain creeks, 48 miles (79 km) east-northeast of Whitehorse. Access in 1976 was by helicopter from Whitehorse.

History:

The property was originally staked in 1935 and has been restaked several times since. The current SM claims were staked in 1974. In 1975 El Paso Mining and Milling Company carried out geological mapping, soil and rock geochemical surveys and a VLF-EM survey.

Description:

Galena and sphalerite occur as blebs, stringers and disseminations in brecciated graphitic slate and phyllite assigned to the Big Salmon Complex of Mississippian age or earlier (Unit 1, Mulligan, 1963).

Current Work and Results:

Three diamond drill holes totalling 1,000 feet (300 m) were drilled in 1976. The drilling encountered mainly graphitic slate and phyllite containing minor mineralization in brecciated zones. The mineralization consisted of 1) disseminated galena and sphalerite associated with up to 5 per cent pyrite; 2) galena and sphalerite blebs coating rims of quartz-rich breccia fragments; and 3) galena and sphalerite stringers associated with quartz-carbonate veinlets. The mineralization was considered sub-economic by company geologists.

MURPHY
Archer-Cathro (Ukon Joint Venture)

Uranium
105 C 13, F 4
(61°00'N, 133°35'W)

Reference: Mulligan (1963).

Claims: MURPHY 1-24

Location and Access:

The claims are located 85 km northeast of Whitehorse. Access was by helicopter from Whitehorse or from camps on the South Canal Road.

History:

The claims were staked in 1975 for the Ukon Joint Venture, managed by Archer-Cathro and Associates Limited.

Description:

The claims straddle the contact between the Big Salmon Complex of metamorphic rocks and granite and granodiorite of the Coast and Cassiar intrusions. The intrusive rocks are commonly medium- to coarse-grained, with porphyritic plagioclase, orthoclase, smoky quartz and considerable ferromagnesian minerals, mainly biotite and hornblende.

Current Work and Results:

A Scintrex GAM-1 spectrometer with a 1853 cm³ NaI(Tl) crystal and a strip chart recorder was used in a helicopter flown at 100 km/hr with a terrain clearance of 50-75 m. Total count mode with a time constant of 3 sec. was utilized. The airborne survey outlined the claim group area as one of slightly abnormal radioactivity.

A Scintrex BGS-ISL broadband scintillometer was used for a ground reconnaissance survey. This outlined two adjacent zones of anomalous radioactivity. The uranium appears to be mainly in the form of secondary yellow and green oxides coating leached cavities. In addition, soil, silt and rock samples were analyzed for uranium. The uranium mineralization is associated with the intrusive but no clear geochemical pattern within the intrusive is evident.

BECKER-COCHRAN PROPERTY
Con-Am Resources Limited

Antimony
105 D 3
(60°11'N, 135°13'W)

References: Cairnes (1910, p. 48; 1916, p. 45); Bostock (1941, p. 35); Wheeler (1961, p. 132); Green (1965, p. 42; 1966, pp. 52-55); Findlay (1967, p. 43; 1969a, p. 57); Sinclair et al (1975, pp. 147-148).

Claims: POP 1-14; DIANE 1-8; CARBON 1-4

Location and Access:

The property is situated west of Becker Creek on the northeast side of Carbon Hill at elevations above 5,000 feet. Access is presently by helicopter from Whitehorse, 61 km to the north. A 40 km gravel road via Annie Lake connects the property with the Carcross Road but there are no bridges at present across the Wheaton River, which can only be forded when the water is low.

History:

The property is an old one, originally discovered in 1893 and explored intermittently since then. The POP claims were staked in 1973 and re-examined briefly in 1974.

Description:

Granitic rocks of the Coast Intrusions (Unit 8, Wheeler, 1961) underlie most of the property. Antimony occurs in a five-foot wide shear zone, trending 130° and dipping 75° southwest in a small body of altered acidic volcanic rocks (Unit A, op. cit.) contained within the granitic rocks. Fine-grained stibnite and pyrite, and massive knots of coarse stibnite crystals occur with quartz gangue as irregular patches and lenses within the shear zone.

Current Work and Results:

Work on the property in 1976 consisted of geological mapping and a VLF-EM survey.

FLEMING GODDELL PROPERTIES
Con-Am Resources Limited

Antimony
105 D 3
(60°11'N, 135°17'W)

References: Cairnes (1912, pp. 126-128; 1916, pp. 47-48); Cockfield and Bell (1944, p. 17); Bostock (1941, pp. 35, 37-38); Wheeler (1961, pp. 133-135); Green (1966, pp. 52-55).

Claims: DIANE 1-8; CARBON 1-4

Location and Access:

The properties consist of two adjacent claim groups situated on the northwest face of Carbon Hill, on the south side of the Wheaton River. The principal showings occur at elevations of 4,000 to 5,000 feet. Access is normally by helicopter from Whitehorse or from the gravel road which leads to the Becker-Cochran property.

History:

The claims cover showings which have been explored intermittently since the early 1900's. The DIANE claims cover showings previously staked as the Porter or Fleming group and the CARBON claims cover ground referred to as Goddell's claims (Wheeler, 1961, pp. 133-134). The properties were re-examined in the 1960's by Yukon Antimony Corporation Limited (Green, 1966, pp. 52-55).

Description:

Stibnite-rich quartz veins occur in east- to northeast-trending, vertical to steeply north-dipping shear zones cutting granodioritic rocks of the Coast Range intrusions (Unit 8, Wheeler, 1961).

Current Work and Results:

Geological mapping and a VLF-EM survey were carried out on the DIANE claims in 1976.

Whitehorse Copper Mines Limited

Copper, Silver, Gold
105 D 10, 11
(60°33'N to 60°45'N,
134°53'W to 135°10'W)

References: Kindle (1964); Green and Godwin (1964, pp. 33-39); Green (1965, pp. 40-41; 1966, pp. 50-51); Findlay (1967, pp. 41-43; 1969a, pp. 49-54); Hilker (1967); Craig and Laporte (1972, pp. 110-111); Sinclair and Gilbert (1975, pp. 74-76); Sinclair et al (1975, pp. 142-143); Sinclair et al (1976, pp. 99-101).

Claims: Approximately 700 claims in the Whitehorse Copper Belt

Location and Access:

The properties are located along a north- to northwest-trending belt, up to four miles (7 km) wide and 20 miles (35 km) long, lying west of Whitehorse. Access to the property is provided by various mine roads connected to the Alaska Highway. Copper concentrates are shipped by rail to Skagway.

History:

Copper showings in the Whitehorse area were known at least as early as 1897 and most of the known occurrences were staked in the period 1898 to 1899 by miners enroute to the Klondike. Some production took place up to 1920 and subsequent exploration on the Copper Belt included diamond drilling by Richmond Yukon Company Limited in 1927 and Noranda Exploration Company Limited in 1947 and 1948.

In 1955, Imperial Mines and Metals commenced exploration in the area and started drilling on the Best Chance prospect in 1956. In 1957, the company was renamed New Imperial Mines Limited. By 1965, the company had outlined roughly 4.6 million tons of ore grading 1.17 per cent copper and milling began in 1967. Since then, there has been production from six open pits: Little Chief, Arctic Chief East and West, Black Cub, Keewenaw and War Eagle.

Production was suspended in June 1971 due to low metal prices and was resumed in December 1972 from underground mining of the Little Chief ore body. The company was renamed Whitehorse Copper Mines Limited in September 1971.

Description:

Copper occurrences of the Whitehorse Copper Belt are in calc-silicate-magnetite skarns developed along the irregular contact between Triassic Lewes River sediments (Unit 3c, Wheeler, 1961) and Cretaceous granodioritic to dioritic intrusions of the Coast Intrusions (Unit 8, op. cit.). The skarns are best developed in massive limestone of the Lewes River Group and consist of varying amounts of diopside, epidote, tremolite-actinolite, garnet, serpentine, magnetite and/or hematite and, occasionally, asbestos. The primary ore minerals are bornite and chalcopyrite with minor amounts of chalcocite and native copper. Valleriite, a relatively rare copper sulphide, is locally abundant but mill recovery is poor because of its physical properties.

Current Work and Results:

Production in 1976 was 800,836 tons grading 1.69 per cent copper, mainly from the Little Chief ore body. The ore also contained an average of 0.3 ounces of silver per ton and 0.025 ounces of gold per ton.

OPERATING SUMMARY, 1974-1976

	1976	1975	1974
Tons Milled	800,836	737,062	626,541
Rates (tons/day)	2,780	2,030	1,745
Grade (%Cu)	1.69	1.52	1.84
Reserves (tons)	2,700,648	3,054,897	3,567,980

Surface exploration in 1976 was carried out on the North Star and Arctic Chief properties in the Copper Belt. Two holes totalling 1,901 feet (580 m) were drilled on the North Star property. Both holes intersected calc-silicate-magnetite skarn similar to that found in the Little Chief ore body but only traces of copper sulphides were encountered. One diamond drill hole 697 feet long (220 m) was drilled south of the Arctic Chief East pit. Skarn was encountered over more than 500 feet (150 m) but only traces of chalcopyrite were encountered locally.

KREFT-TAKACS PROPERTY
Whitehorse Copper Mines Limited

Copper
105 D 11
(60°41'N, 135°22'W)

References: Wheeler (1961); Craig and Milner (1975, p. 52);
Sinclair *et al* (1975, pp. 143-144; 1976, pp. 101-104).

Claims: GROUSE 1-16; ROY 1-8; WOLF 1-6; LUNAR 1-8; APEX 17-18, 23-24;
PANTHER 1; GEAR 1-6; JAKE 1,2

Location and Access:

The property is located on the north side of Jackson Creek roughly 11 miles (18 km) west of Whitehorse. Elevations range from 3,200 to nearly 5,500 feet. Access is via a summer tote road from the Fish Lake-Jackson Creek road.

History:

The property was staked in 1969 by S. Takacs and E. Kreft. The property was optioned by New Jersey Zinc Corporation who drilled six holes totalling 1,500 feet (450 m) in 1972. In 1974 the property was optioned by Whitehorse Copper Mines Limited who drilled six holes totalling 1,401 feet (427 m) in 1975.

Description:

The property is underlain by Upper Triassic Lewes River Group sediments (Unit 3, Wheeler, 1961) to the northeast intruded to the southwest by granitic rocks of the Coast Intrusions (Unit 8, *op. cit.*). Skarn assemblages of actinolite, diopside, magnetite, and calcite with minor wollastonite, serpentine, chlorite and epidote occur in massive limestone and limy clastics of the Lewes River Group at their contact with hornblende granodiorite. Disseminated and patchy chalcopyrite associated with secondary malachite, azurite and chrysocolla occur in actinolite-magnetite skarn.

Current Work and Results:

In 1976, four holes totalling 1,550 feet (470 m) were drilled in the vicinity of the holes drilled in 1975. One hole, 100 feet northwest of the 1975 hole which intersected 20 feet of 5.60 per cent copper and 7.93 ounces per ton silver, encountered very low grade copper mineralization. A hole 200 feet southeast of this hole intersected 1.3 feet of 2.55 ounces per ton gold and 5.8 per cent bismuth. The other two holes encountered no mineralization. The option was subsequently dropped.

AU, BRIE
Utah Mines Limited

Lead, Zinc, Copper
105 F 14
(61°51'N, 133°14'W)

Reference: Gabrielse (1963); Sinclair et al (1976, pp. 112-113);
Tempelman-Kluit et al (1977); Norman et al (1977).

Claims: AU 1-6; BRIE 1-128

Location and Access:

The AU and BRIE lie within the St. Cyr Range of the Pelly Mountains on the south side of Fox Creek, roughly 26 miles (41.6 km) southwest of Ross River. The area is characterized by high relief with elevations on the property ranging from 4,000 to 7,000 feet. Access to the claims is by helicopter from Ross River, or from the Canol Road, 9 miles (14 km) to the east. The claims can also be reached by foot from a cat trail on the north side of Fox Creek.

History:

The property was originally staked as the TUB claims by P. Risby in 1971. Arrow Inter-America Corporation optioned the claims and carried out prospecting and geochemical surveys in 1972. The property was restaked as the AU claims by Mr. Risby in 1975 and subsequently optioned to Utah Mines Limited who carried out some prospecting and geochemical surveys later in the year.

Description:

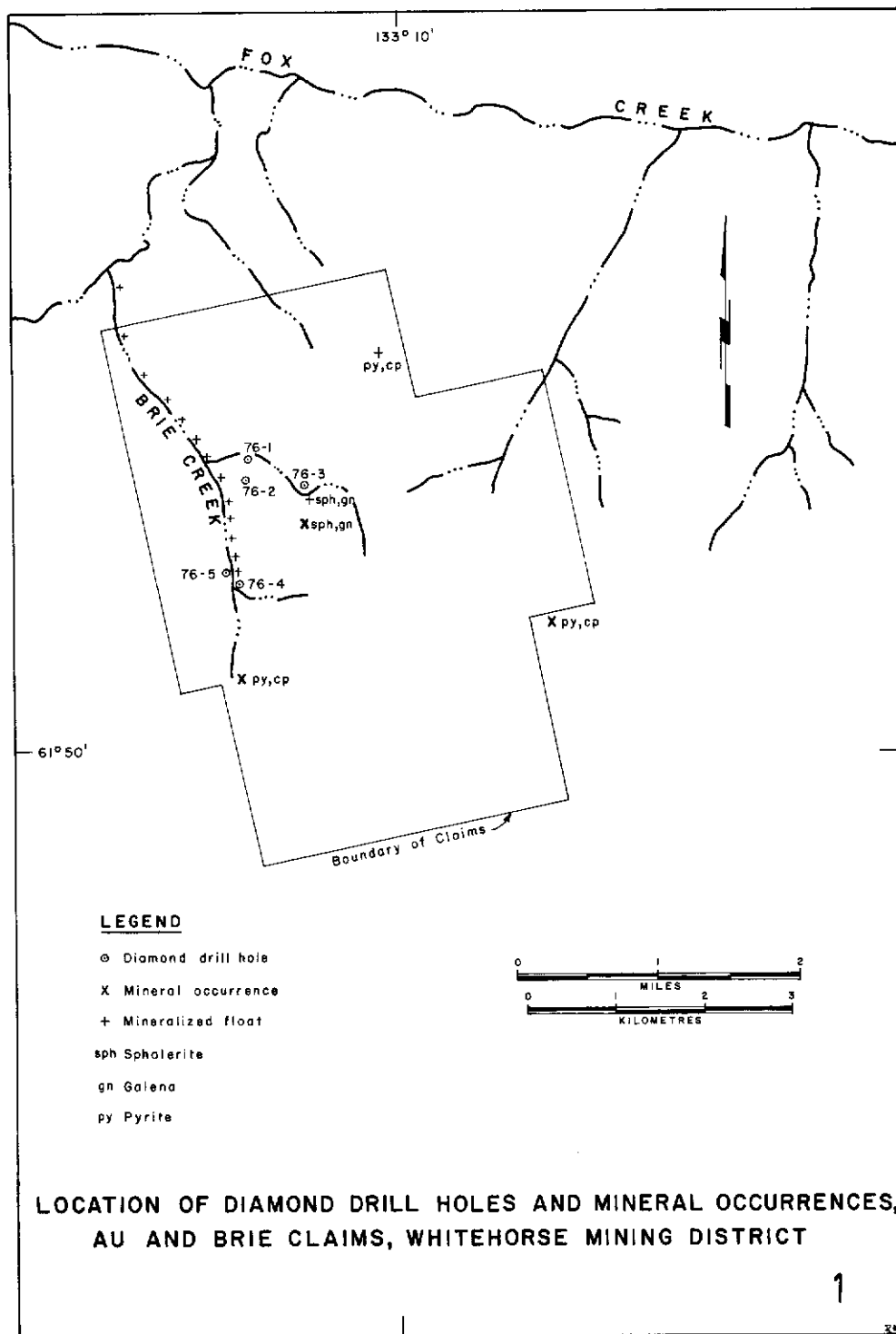
The property lies within a miogeoclinal succession of shale, sandstone, carbonate and volcanic rocks ranging from Proterozoic to Triassic in age (Tempelman-Kluit et al, 1977). This succession is cut by post-Triassic imbricate thrust faults directed to the northeast and intruded by mid-Cretaceous granitic batholiths.

According to Norman et al (1977), the property is underlain mainly by up to one thousand metres of Cambro-Ordovician strata equivalent to the Kechika Group of Gabrielse (1963). They consist of calcareous, orange-weathering phyllite with numerous volcanic tuff lenses. Phyllitic limestone and thin beds of dolomite also occur within the phyllite. A thin unit comprised of argillite, dolomitic siltstone and tuff of Lower to Middle Silurian age conformably overlies Kechika Group phyllite on the northern part of the property.

Intrusive rocks on the property consist of hornblende diorite and andesite dykes. The dykes generally trend 020° and vary from one to 5 m in width. They are probably related to mid-Cretaceous hornblende granodiorite which outcrops south of the property.

The phyllitic rocks are structurally complex and at least three phases of deformation have been recognized. The best developed deformation fabric is a crenulation foliation (F_2) which strikes northwest and dips 20-30° to the north. The crenulation foliation is superimposed on transposed bedding (F_1) which appears to have a random orientation. Foliation has also been observed striking north and dipping steeply to the east (F_3).

Mineralization was originally discovered in boulders in Brie Creek, a northflowing tributary of Fox Creek on the western side of the property. Mineralized boulders were subsequently found in Brie Creek from the 4,700-foot



elevation down to Fox Creek, size and angularity of the boulders increasing upstream. Two types of mineralized boulders are present:

- 1) Dark brown limonitic boulders composed mainly of quartz with minor carbonate. Mineralization consists of pyrite and minor chalcocopyrite occurring in bands and in cross-cutting fractures.
- 2) White siliceous boulders containing banded sphalerite and traces of galena.

The best mineralization in outcrop occurs south of a west-flowing tributary of Brie Creek. It consists of galena, sphalerite and hydrozincite in a siliceous lens in phyllite, three to four feet thick and dipping 50° north. Small showings of pyrite and chalcocopyrite also occur in siliceous lenses in phyllite and tuff. The sulphides are typically concentrated in the noses of small folds.

Current Work and Results:

Work by Utah Mines in 1976 consisted of geological mapping, geochemical and geophysical surveys and five diamond drill holes totalling 2,104 feet (640 m).

The geochemical surveys included soil and silt sampling and analysis for lead, zinc, silver and copper. Six zones with anomalous metal concentrations were outlined by soil sampling and two by silt sampling.

Geophysical surveys consisted of an electromagnetic survey, a gravity survey and a magnetometer survey. The electromagnetic survey outlined a large conductor in the central portion of the property. The gravity survey failed to locate any positive anomalies on the property. The magnetic survey indicated very little magnetic relief on the property.

Diamond drilling was carried out in the vicinity of Brie Creek and one of its tributaries to test the bedrock near the possible source of the mineralized boulders in Brie Creek, and to test the electromagnetic anomaly. The drilling failed to intersect any significant sulphide mineralization. The electromagnetic anomaly was caused by graphitic phyllite.

CIVI
Mackir Mining Limited

105 K 2
(62°13'N, 132°56'W)

References: Tempelman-Kluit (1972); Sinclair et al (1975, p. 135).

Claims: CIVI 1-11

Location and Access:

The claims are situated 19.3 km east of Faro. Access in 1976 was by helicopter from Faro.

History:

The claims were mapped and soil sampled in 1974 (Sinclair et al, 1975) by Cream Silver Mines who optioned the property to Mackir Mining Limited in 1976.

Description:

Immediately south of the CIVI claims are outcrops of quartz-mica schist, phyllite and graphitic schist, with lenses of meta-tuff and green banded

chert. This sequence dips north at 15° to 20° beneath the CIVI group and is considered to be the same sequence as the Cambrian-Ordovician phyllites which host the zinc-lead ore deposits of the area (Unit 3, Tempelman-Kluit, 1972).

Current Work and Results:

A gravity survey over 17.7 line-kilometres at a station spacing of 30.5 m was conducted on the claims. Terrain corrections were not made to the data. Several gravity anomalies were outlined and further gravity surveying was recommended.

ANVIL MINE
Cyprus Anvil Mining Corporation

Lead, Zinc, Silver
105 K 2, 3, 6
(62°21'N, 133°22'W)

References: Chisholm (1957); Roddick and Green (1961a); Green and Godwin (1964, pp. 31-32); Green (1965, pp. 36-37; 1966, pp. 47-50); Findlay (1967, pp. 35-39; 1969a, pp. 43-45; 1969b, pp. 29-30); Tempelman-Kluit (1972); Craig and Laporte (1972, pp. 94-96); Brock (1973); Sinclair and Gilbert (1975, pp. 50-52); Sinclair et al (1975, pp. 128-129); Sinclair et al (1976, pp. 115-116).

Claims: FARO, GAL, ED, SUN, RICH, DY, GALE, DEA, LEA, PEA, SEA, SB, DP, KAY, MOR, SINK, LO, TIE, ROCK, BILL: approximately 1,600 claims

Location and Access:

The Anvil Mine is situated 230 km northeast of Whitehorse in the Anvil Range. Ore concentrates are trucked to Whitehorse via roughly 402 km of all-weather roads and then transferred to the White Pass and Yukon Route for shipment by rail to Skagway.

History:

The mine was brought into production late in 1969 and, except for brief shutdowns due to labour problems, has been in continuous production since. In 1975, Anvil merged with Dynasty Explorations Limited to form Cyprus Anvil Mining Corporation.

Description:

The host rocks on the property consist of pelitic schist which are overlain by calc-silicate phyllite (Unit 2, Tempelman-Kluit, 1972). The regional trend of the schist and phyllite is to the northwest, with dips averaging 20° to the southwest. Locally, the structure is complex, with at least five stages of deformation recognized by company geologists. The ore occurs in a series of massive sulphide zones along a 6,600 foot strike length. The ore zones are tabular in longitudinal section and lenticular in cross section and are generally conformable to the enclosing schist and phyllite host rocks. Galena and sphalerite, associated with pyrite and pyrrhotite, are the principal sulphide minerals.

Current Work and Results:

Additional gravity and Turam surveys were conducted and some of the claims were geologically mapped on scales of 1 inch = 200 feet and 1 inch = 1,000 feet. A new geological map for the Anvil Range was completed for company use.

The 1976 diamond drilling program consisted of 25 holes totalling 25,000 feet (7,620 m). On the DY claims a 200-foot section of banded and massive sulphides, identical to rock types found on the edge of the GRUM deposit, was encountered at a depth of 2,000 feet (610 m). Assays were not of economic grade but further drilling is planned. Immediately northeast of the Anvil Mine drilling failed to produce additional reserves, but low grade lead-zinc sulphides were intersected on the SB group under Swim Lake.

OPERATING SUMMARY - 1973-1976

	1976	1975	1974	1973
Tons Milled	1,675,381	3,225,083	2,925,359	2,899,124
Daily rate (tons)		8,983	8,865	7,942
Mill Heads:				
Lead (%)	2.66	9.44)	10.11)	11.25)
Zinc (%)	5.48	combined)	combined)	combined)
Silver (oz/ton)	1	1	1	1
Ore reserves (tons)	44,700,000	46,400,000	49,674,000	52,599,000

Annual Report 1976.

VANGORDA OPTION

Canadian Natural Resources Limited

Vangorda Mines Limited

Lead, Zinc, Silver

105 K 3

(62°12'N, 133°15'W)

References: Tempelman-Kluit (1972); Sinclair et al (1974, p. 130; 1975, p. 122).

Claims: WYNNE 6-8; ALICE 1-8; ROCKY 1,3,5,7,8; JACK 1-5; CHAMP 1-8; ELLE MAY 3,4; BIZ 2-3; HIW 1-4 fr; HANK 2-3 fr; SALLY: a total of 38 claims

Location and Access:

The claims are located 9.7 km north of Faro and access is by gravel road that leads from the Anvil Mine road to the GRUM deposit.

History:

The claims were staked in the early 1950's at the time of the Vangorda Creek sulphide discovery. They are located just south of the GRUM deposit and are being explored as part of the intensive exploration around the deposit.

Description:

The area is underlain mainly by greenish-grey, chlorite-muscovite-quartz phyllite, locally graphitic and of probable Cambrian age (Unit 3, Tempelman-Kluit, 1972).

Current Work and Results:

Seven BQ diamond drill holes were sunk, for a total footage of 5,113 feet on the CHAMP 1, 2, 7; ROCKY 8; and ALICE 1 claims. No significant mineralization was found. The claims were mapped geologically at a scale of 1 inch = 400 feet and Turam and gravity surveys were run over some of the claims.

LOWER ANVIL CREEK
Cyprus Anvil Mining Corporation
Preussag Canada Limited

105 K 5
(62°27'N, 133°48'W)

References: Roddick and Green (1961a); Tempelman-Kluit (1972); Sinclair and Gilbert (1975, p. 56).

Claims: LORNA 1-40; ARO 1-40 50, 59; GRAN 1-6, 13-24; ROTO 17-50

Location and Access:

The claims are located along Lower Anvil Creek about 24 km northwest of Faro. Access is by helicopter from Faro.

History:

The claims were staked in 1970 following airborne magnetic and EM surveys. The claims have been mapped and one 576 foot hole was drilled.

Description:

The claims are situated in the same stratigraphic package that contains the Faro-Vangorda deposits. In particular, the claims are underlain by calcareous phyllite and calc-silicate unit rocks with some graphitic conductors indicated.

Current Work and Results:

Gravity and Turam surveys were conducted on the ROTO, LORNA and ARO groups. A number of weak coincident Turam and gravity anomalies were located.

EVA, MABLE, WYNNE, IRENE
Welcome North Mines Limited
Getty Mining Pacific

105 K 5, 6
(62°23'N, 133°02'W to
(62°28'N, 133°48'W)

References: Roddick and Green (1961a); Tempelman-Kluit (1972); Sinclair et al (1976, p. 116).

Claims: EVA 1-47; MABLE 1-48; WYNNE 1-42; IRENE 1-56

Location and Access:

The claims are situated in separate blocks in the Anvil Range within a northwest trending strip roughly 40 miles long. Access to the WYNNE group was by helicopter and by a cat road from the Anvil Mine site to the other groups.

History:

The greater portion of claims were staked early in 1975; the rest were staked during the following summer.

Description:

The claim groups are all considered to be underlain by schist and phyllite mapped as Unit 3 by Tempelman-Kluit (1972). Locally, the schist and phyllite are intruded by granodiorite of Cretaceous age. No sulphide mineral occurrences have been reported.

Current Work and Results:

A program of diamond drilling, geological, geochemical and geophysical surveys were conducted on the claims. Soil geochemical surveys were carried out on the MABLE and WYNNE claim groups, as was geological mapping at a scale of 1 inch = 400 feet. Gravity surveys were conducted on the MABLE, IRENE and WYNNE groups. In addition, a Turam survey was conducted on the WYNNE group. No significant mineralization was encountered in the diamond drilling, though the favourable host horizons were identified by company geologists in all the holes.

Summary of diamond drilling:

<u>Claim</u>	<u>No. of Holes</u>	<u>Total Footage</u>	<u>Size</u>
MABLE 29, 43, 45	3	2,819	BQ
EVA 13, 18, 20	3	2,740	BQ
IRENE 33, 39	2	1,293	BQ
WYNNE 3, 42	2	1,557	BQ
GRUM			Lead, Zinc, Silver
Kerr Addison Mines Limited			105 K 6
Canadian Natural Resources			(62°15'N, 133°10'W)

References: Chisholm (1957); Green and Godwin (1964, p. 31); Tempelman-Kluit (1972); Sinclair et al (1975, pp. 130-131; 1976, pp. 122-123).

Claims: GRUM 1-3, 5; CHUCK 1, 2, 6-8; HANK 4-6; FIRTH 6,8

Location and Access:

The property lies roughly five miles northeast of Faro and straddles the Vangorda-Swim Lakes Road which provides ready access.

History:

The property was originally staked and explored in the period 1953-55 at which time two small sulphide zones designated the Champ and Firth were discovered west of the Vangorda deposit. In 1973, AEX Minerals Corporation optioned the property and drilled four holes, one of which intersected a section of massive sulphides carrying lead and zinc. In 1974, Kerr Addison drilled 60 holes totalling 55,784 feet, outlining a massive sulphide zone containing a minimum of roughly 30 million tons of 10 per cent combined lead-zinc and nearly 2 ounces of silver per ton. Late in 1974, AEX Minerals Corporation merged with 79902 Resources to form Canadian Natural Resources.

Description:

Although outcrop in the immediate area of the deposit is lacking, the property is generally underlain by chlorite-muscovite schist and phyllite assigned to Unit 3 of probable Cambrian age by Tempelman-Kluit (1972). Detailed mapping by Cyprus Anvil geologists in the area of the Faro ore body indicates that the host rocks for the massive sulphides belong to Unit 2 of Cambrian age or older.

The host rocks of the GRUM deposit consist of black, graphitic phyllite and white, sericite-quartz phyllite. The latter has a tendency to form haloes around sulphide zones. These rocks are overlain by green, chlorite-

sericite-quartz phyllite and grey, sericite-quartz phyllite which form the hanging wall of the deposit. The footwall rocks consist of biotite-muscovite phyllite, probably in fault contact with underlying garnet-biotite-staurolite schist. The host rocks are characterized by complex internal deformation dominated by pervasive foliation trending northwest and dipping 20° to the southwest.

The deposit is roughly elliptical in shape with a gently northwest-plunging axis over 5,000 feet long and a gently southwest-dipping axis of 1,200 feet. In gross aspect, the deposit appears to be generally conformable to the dominant foliation of the host rocks. The ore zones consist of a series of massive sulphide lenses and mineralized phyllite separated by weakly to non-mineralized host rocks. Individual ore zones vary from a few feet up to 300 feet thick.

The principal ore minerals are sphalerite and galena with minor chalcopyrite, generally associated with pyrite. Minor amounts of pyrrhotite, magnetite and arsenopyrite are present in massive sulphide sections. White barite is in sections of rich ore and appears to increase to the northwest. The massive sulphides tend to be finely banded and very fine-grained, although texture and grain size are variable.

Current Work and Results:

The program of underground drilling and drifting was completed. A preliminary feasibility study by G.M. Hogg and Associates on behalf of Canadian Natural Resources indicates that as of November 29, 1976 there was 29,705,000 tons grading 4.34 per cent lead, 6.76 per cent zinc and 1.91 ounces per ton silver in the main deposit. In addition, 8,818,000 tons are estimated to the west of the 29,705,000 ton section. The total reserves are therefore calculated to be 38,523,000 tons. Additional engineering, metallurgical and feasibility studies are expected to be completed by the end of 1977.

RAZ
Welcome North Mines Limited
Getty Mining Pacific

Zinc, Lead, Silver
105 K 6
(62°19'N, 133°02'W)

References: Roddick and Green (1961a); Tempelman-Kluit (1972); Sinclair et al (1976, p. 116).

Claims: RAZ 1-20

Location and Access:

The claims are located 19 km northeast of Faro at an elevation of 5,500 feet and 1.6 km northeast of Mt. Mye. Access to the claims is by helicopter from Faro or Ross River.

History:

The claims were staked in 1975.

Description:

The claim group is probably underlain by schists and phyllites mapped as Unit 3 by Tempelman-Kluit (1972). Granodiorite of the Anvil Batholith is also found on the property. The only sulphide discovered so far is in mineralized float.

Current Work and Results:

A geochemical survey for copper, lead, zinc, cadmium and silver was conducted on the outflow areas of deeply circulating groundwaters. Rock geochemistry was utilized in some anomalous areas.

KO
Mackir Mining Limited

Lead, Zinc
105 K 6
(62°20'N, 133°20'W)

References: Findlay (1967, pp. 40-41); Tempelman-Kluit (1972); Sinclair and Gilbert (1975, pp. 52-53).

Claims: KO 1-36

Location and Access:

The property is situated 17.7 km northwest of Faro and 3.2 km southeast of the Anvil Mine. Access is via an 18.4 km tote road to the southwest corner of the property from the Faro road.

History:

The property was first staked as the A and KEN claims by Tay River Mines following the discovery of the Faro deposit. Geochemical, geological and ground magnetic and electromagnetic surveys were carried out, but the results were not encouraging and claims were allowed to lapse in 1973 when they were restaked as the KO group.

In 1976 Mackir Mining Limited optioned the property from Cream Silver Mines Limited.

Description:

The underlying rocks consist of Precambrian and (?) Cambrian calc-silicate skarn, biotite schist and muscovite-chlorite phyllitic schist (Unit 11, Tempelman-Kluit, 1972). Aside from minor pyrite and pyrrhotite, no significant mineral occurrences were located.

Current Work and Results:

Five gravity lines with 30.5 m station spacings were completed. No anomalies of interest were outlined but it was recommended that the remainder of the claim group be surveyed.

MING
Mackir Mining Limited

105 K 6
(62°25'N, 133°04'W)

References: Craig and Laporte (1972, pp. 96-97); Tempelman-Kluit (1972); Sinclair et al (1975, p. 129).

Claims: MING 1-16

Location and Access:

The claims are situated 22.5 km northeast of Faro and 54.7 km northwest of Ross River. Access in 1976 was by helicopter from Faro.

History:

Geological mapping and soil sampling were carried out on the property in 1974 (Sinclair et al, 1975) and no geochemical anomalies were found.

Description:

Outcrops in the west-central part of the claims consist of meta-tuffs and meta-andesites of Cambrian-Ordovician (?) age (Unit 3, Tempelman-Kluit, 1972). These rocks occur in the same sequence as the phyllitic rocks which host the zinc-lead deposits of the area. To the north, these rocks are overlain by basaltic flows of Pennsylvanian to Permian age (Unit 8, Tempelman-Kluit, 1972). No occurrences of sulphides have been observed on the property.

Current Work and Results:

A reconnaissance gravity line was run over the claims. The line was 1070 m long with a station spacing of 30.5 m. This survey was primarily designed as a preview to a more extensive survey in 1977.

NORTH ANVIL RANGE	Lead, Zinc, Silver
Cyprus Anvil Mining Corporation	105 K 6, 7
Metallgesellschaft Canada Limited	(62°20'N, 133°00'W)

Reference: Tempelman-Kluit (1972).

Claims: AM, FAT, FIN, JET, LISA, MX, SARK, TAF, TIM, ZAN: A total of 400 claims

Location and Access:

The claims are situated north of the Anvil Batholith about 13 km from the Anvil Mine. Access is by helicopter from Faro.

Description:

The claims are underlain by a variety of rock types which include, from oldest to youngest, a high grade metamorphic schist of siliceous to pelitic composition lying adjacent to the Anvil Batholith, the Faro sequence, a calc-silicate unit, and pelitic phyllites with marked graphitic horizons. Overlying this sequence of rocks is the KD volcanic package of rocks.

Current Work and Results:

Gravity and Turam surveys were conducted on the claims.

CAT	105 K 7
Preussag Canada Limited	(62°15'N, 133°00'W)

Reference: Tempelman-Kluit (1972).

Claims: CAT 1-64

Location and Access:

The claims are located on Blind Creek about 14.5 km above its confluence with the Pelly River. Access is by helicopter from Faro, 19 km to the west.

History:

In the 1964-65 staking rush in the Anvil District the area of the CAT claims was covered by the LUK group. Airborne magnetic and EM surveys were carried out in 1966. The present claims were staked in 1974 for Norex Developments Limited (NPL) and limited line-cutting and trenching was carried out in 1975. In 1975 the claims were optioned to Afrex Gas and Oil Limited who re-optioned the claims to Preussag Canada Limited.

Description:

Glacially-derived material covers most of the claim block except for some ridges and steep hillsides. The claims are underlain by the Anvil series of schists and phyllites with the contact between the biotite schist unit and chlorite phyllite unit transecting the claim group. The valley of Blind Creek follows the trace of a normal fault.

Current Work and Results:

Work on the property consisted of line cutting, geological mapping, a magnetometer and Turam EM survey, and a soil geochemical survey for Pb, Zn, and Cu. Further work was recommended.

A,B
Swim Lake Mines Limited
Canadian Natural Resources Limited

105 L 9
(62°10'N, 134°05'W)

Reference: Campbell (1967); Sinclair et al (1975, p. 12).

Claims: A 1-32; B 1-16

Location and Access:

The claims are located on the western flanks of Tay Mountain at the headwaters of Fishhook Creek. Access is by helicopter from Faro, 64 km to the southeast.

History:

The A claims were staked in June 1975 and the B group in November 1975. The claims were optioned to Canadian Natural Resources Limited in 1976.

Description:

The claim group is underlain by a recumbently-folded sequence of black graphitic phyllite; a grey-green quartz-muscovite biotite schist; a chlorite ± biotite ± andalusite schist; a green-speckled amphibolite associated with a meta-tuff unit; and a black and white limestone unit ± calc-silicate minerals. On Tay Mountain these units have been intruded by a medium-grained granite. The rocks are metamorphosed by the granite and cordierite and andalusite isograds are present in the phyllite and biotite schist unit. The limestone unit shows development of the calc-silicate minerals garnet, idocrase, diopside, tremolite and wollastonite close to the granite.

Current Work and Results:

The property was mapped in detail at a scale of 1 inch = 400 feet with a detailed structural interpretation that showed the presence of three phases of folding. A soil geochemical survey for Pb and Zn was conducted. A zone of

Pb-Zn anomalies parallels the south-arm of Fishhook Creek overlying the black graphitic phyllite unit and coincident with a residual gravity anomaly. It has been recommended that this anomaly be drilled to some depth as the gravity interpretation suggests the source of the anomaly to be at a depth of about 540 feet (162 m).

SUE
MacMillan Joint Venture

105 L 10, 14, 15
(62°48'N, 135°00'W)

References: Campbell (1967); Findaly (1967, p. 34); Sinclair et al (1976).

Claims: SUE - a total of 955 claims

Location and Access:

The claims form a single west-northwest trending block between the Pelly and MacMillan rivers, centred roughly 38.6 km east of their junction. Access in 1976 was by fixed wing aircraft to Oz Lake from Whitehorse, 238 km to the south, or from Mayo, 96.5 km to the northwest. During the winter, supplies may be hauled in over a winter tote road from Pelly Crossing. This road, originally constructed in 1966 to Detour Lakes, was extended in 1975 to the main base camp at Oz Lake in the north central part of the claim group.

History:

Parts of the current property were staked by Conwest Exploration Company Limited in 1966 following the Anvil discovery. Work in 1966-1967 consisted of airborne magnetic and electromagnetic surveys followed up by ground magnetic and electromagnetic surveys and some diamond drilling. The property was restaked by Conwest in August 1974 as the SUE claims. The claims are currently held by the MacMillan Joint Venture, a consortium between Conwest and Essex Minerals Company Limited.

Description:

Outcrop on the property is scarce and geological data is generally lacking. According to Campbell (1967) the property straddles the Tintina Fault which strikes roughly northwest. Northeast of the fault the property is underlain by volcanics and sediments of the Proterozoic to Paleozoic Anvil Range Group (Unit 15, Campbell, 1967). Silurian (?) and Devonian (?) sediments (Unit 15, op. cit.) occur southwest of the fault on the southwestern boundary of the property. Although occurrences of copper mineralization have been reported from the general area, no showings have been described on the property itself.

Current Work and Results:

A detailed gravity survey consisting of 54 line-kilometres with stations at 30.5 m intervals was completed during 1976. Twelve gravity anomalies were outlined.

PICKHANDLE
Western Mines Limited

Copper
115 F 16
(61°53'N, 140°20'W)

Reference: Muller (1967); Sinclair et al (1976, pp. 130-131).

Claims: M 1-14, 19-61

Location and Access:

The claims are situated two to three miles south of Pickhandle Lake on the northeast slope of the Kluane Ranges between elevations of 2,250 and 4,500 feet. Access is by helicopter, by a winter road from Mile 1151 (KM 1852) of the Alaska Highway or by boat along the Koidern River to small lakes near the northern corner of the property.

History:

The property was originally staked as the MM and GG claims by P. Verslucce in 1968. In 1973 these claims lapsed and a portion of them were restaked as the M claims by Mr. Verslucce, who carried out trenching in 1973 and 1974. In 1975 Brascan Resources Limited optioned the claims and carried out geological mapping, prospecting and bulldozer trenching. In 1976 Brascan acquired control of Western Mines Limited, to whom all exploration properties were subsequently transferred.

Description:

The property lies immediately southwest of the Shakkwak Trench and is underlain by volcanics and related sediments of the Permian Cache Creek Group (Unit 10, Muller, 1967). Detailed mapping by Western Mines has outlined seven units of Permian age, which in ascending stratigraphic sequence consists of: (1) cherty to limy argillite, black shale and fine-grained, andesitic tuff; (2) fine-grained, crystalline limestone and cherty limestone; (3) vesicular to amygdaloidal, locally pillowed andesite; (4) thinly-bedded, shaly argillite, chert and cherty argillite; (5) limestone with interbedded cherty layers and lenses; (6) coarse-grained andesitic and dacite tuffs; and (7) a thick sequence of dacite to andesitic agglomerate and breccia with interbedded chert and shaly argillite. An eighth map unit consists of an aphanitic to fine-grained felsic volcanic rock which may either overlie or intrude the andesitic and dacitic tuffs. Unit 9 is a serpentinized peridotite sill averaging 100 feet (30 m) wide which intrudes the upper part of the volcanics and is believed to be Triassic in age.

Structure of the rocks underlying the property is dominated by isoclinal folding which trends northwest and is inclined to the southwest. Small scale isoclinal folds and subparallel faults have resulted in repetition of rock units within the property boundaries.

Regional metamorphism to low-grade greenschist facies has resulted in schistosity and shearing roughly parallel to bedding. Veins and stringers of quartz ± calcite ± epidote occur along fractures and shear planes at high angles to the foliation are believed to be related to hydrothermal activity which caused serpentinization of the peridotite.

Copper showings on the property are mainly vein sulphide occurrences consisting of chalcopyrite associated with varying amounts of pyrite, pyrrhotite, quartz, calcite and epidote. The veins occur in narrow shear zones and fractures cutting Permian volcanics and sediments and are especially prominent

in a mineralized zone within a lower andesite flow and an upper coarse-grained andesitic tuff.

Current Work and Results:

Field work in 1976 consisted of detailed geological mapping and a magnetic survey. At the end of July 1976, Western terminated their option agreement on the M claims.

ML
Mitsubishi Metal Corporation

Copper, Molybdenum,
Uranium
115 H 7
(61°18'N, 136°55'W)

References: Cairnes (1909, in Bostock, 1957, pp. 281-282); Findlay (1969, p. 28); Tempelman-Kluit (1974b, pp. 73-74).

Claims: ML 1-15

Location and Access:

The claims lie roughly one-half mile (800 m) east of the Aishihik Lake road, immediately northeast of Hopkins Lake. Elevations on the claims range from 3,500 to 4,500 feet.

History:

Copper occurrences on the property were known at least as early as 1907 (Cairnes, 1909). In 1968, Mitsubishi Metal Corporation staked the property as the AD claims and carried out airborne geophysical surveys, soil sampling surveys and detailed geological and prospecting programs. The property was restaked by Mitsubishi as the ML claims in 1975.

Description:

The property is underlain by schist, gneiss, quartzite, slate and limestone of the Yukon Group which have been intruded by granitic and granodioritic rocks of Triassic (?) age, and andesitic and porphyritic dykes of probable Tertiary age.

Mineral occurrences on the property consist of 1) chalcopryite in epidote and garnet skarn developed at the contact of granodioritic rocks and limestone bands in the Yukon Group; 2) locally disseminated molybdenite in granodioritic rocks; and 3) chalcopryite associated with quartz and carbonate at the contact between Yukon Group and granodioritic rocks.

Current Work and Results:

In October, 1975 a sample of a pegmatitic phase of the granodiorite was taken which assayed 0.124 per cent U_3O_8 . In 1976, a reconnaissance survey consisting of a scintillometer survey and a rock geochemical survey failed to outline any areas of anomalous uranium content. The results of the scintillometer survey indicated no anomalous radioactivity, total counts per second all falling in the range 80-180. Thirty-nine rock samples collected from the property all assayed less than 0.001 per cent U_3O_8 .

BUN
Archer-Cathro (Ukon Joint Venture)

Uranium
115 H 8
(61°20'N, 136°28'W)

Reference: Tempelman-Kluit (1974b).

Claims: BUN 1-24

Location and Access:

The claims are located about 104 km northwest of Whitehorse, 13 km east of Long Lake. Access was by helicopter from Whitehorse or Haines Junction.

History:

The claims were staked in May and June 1976 for Ukon Joint Venture, managed by Archer-Cathro and Associates Limited.

Description:

The claim group is underlain by a large Triassic quartz monzonite stock on which is developed a regolith. The regolith is capped by Eocene volcanic flows. Radioactive zones are associated with the regolith-volcanic contact where some yellow coatings that may be secondary uranium minerals have been observed.

Current Work and Results:

A scintillometer survey was carried out using a Scintrex BGS-1SL broad band scintillometer. In addition, soil, silt, rock and water samples were analyzed for uranium.

HUESTIS MINE
Mount Nansen Mines Limited

Gold, Silver, Lead, Zinc
115 I 3
(62°03'N, 137°09'W)

References: Bostock (1936a); Green and Godwin (1963, pp. 23-24; 1964, pp. 26-28); Green (1965, pp. 32-34; 1966, pp. 34-38); Campbell (1965; 1966); Findlay (1967, pp. 30-31; 1969a, pp. 35-38; 1969b, pp. 23-25); Craig and Laporte, (1972, pp. 88-89); Tempelman-Kluit (1974a) Sinclair et al (1976, pp. 131-132).

Claims: Approximately 300 claims in the Mount Nansen area

Location and Access:

The Huestis Mine is situated 9.6 km southeast of Mount Nansen, roughly 48 km west of Carmacks and 116 miles northwest of Whitehorse. Access is via a 64 km gravel road which leaves the Carmacks-Freegold Road about one mile west of the Nordenskiöld River bridge west of Carmacks.

History:

The Huestis veins were first staked by H.H. Huestis in 1947. Surface exploration was carried out between 1962 and 1964 by the Mount Nansen Exploration Syndicate and its successor, Mount Nansen Mines Limited. In 1965, an adit was collared at the 4,295 foot level and extensive underground exploration was carried out in 1965 and 1966. In 1967, a second adit was driven on the 4,100 foot level. From September 1968 until April 1969, the Huestis and

Webber veins were mined at an initial production of 70 tons per day and later 100 tons per day. Operations ceased largely as a result of the inability of the mill to obtain adequate gold recoveries without installation of a cyanide circuit. The mine was reopened in 1975 for rehabilitation and re-evaluation of the ore body.

Description:

Gold-silver vein structures up to 4 feet wide and dipping 85° to the northeast cut Proterozoic and/or Paleozoic schist and gneiss and highly altered feldspar porphyry plugs of Eocene age (Tempelman-Kluit, 1974a). The veins consist of quartz lenses containing arsenopyrite, pyrite, sphalerite, galena, stibnite and native gold. In addition, various silver-bearing minerals including freieslebenite, acanthite, native silver, andorite and argenterous tetrahedrite have been identified (Green, 1966, p. 36).

Current Work and Results:

During 1976, the mine operated for ten months, producing a total of 8,196 tons at a rate of 28 tons per day. Underground developemnt work carried out on the 4,100 foot level consisted of 462 feet of drifting and 952 feet of raising. The mill was started up in June and operated for five months at a daily rate of 65 tons. A total of 6,429 tons were milled grading approximately 0.3 ounces per ton gold, 7 ounces per ton silver, 1 per cent lead and 1 per cent zinc. Operations at both the mine and the mill were terminated in October.

MALONEY CREEK
Amax Potash Limited

Copper, Molybdenum
115 I 4
(62°01'N, 137°54'W)

References: Bostock (1936); Lodder and Godfrey (1970); Craig and Laporte (1972, pp. 76-78); Tempelman-Kluit (1974a,b); Tempelman-Kluit and Wanless (1975).

Claims: POT 1-48

Location and Access:

The property is situated on a west-flowing tributary of Maloney Creek in the southern part of the Dawson Range at elevations ranging from 3,000 to 4,100 feet. Access to the property is by helicopter from Carmacks, 88.5 km to the east.

History:

The area was probably prospected for placer gold in the early 1900's as evidenced by old cabins found along Maloney Creek by Bostock (1936). Bostock (op. cit.) also noted the presence of pipe and other steam-thawing equipment in a cabin on the nearby west fork of Schist Creek, although apparently little work had been done. In 1969 Amax Exploration discovered disseminated chalcopryrite and molybdenite in an area of anomalous geochemistry and staked the POT claims. Amax subsequently conducted detailed geological, geochemical and geophysical surveys and carried out a limited amount of packsack drilling in 1970. No further work was carried out on the property until 1976, when the property was optioned by Western Mines Limited.

Description:

As is common in the unglaciated Dawson Range, the Maloney Creek property is obscured by up to 95 per cent overburden and much of the underlying bedrock is represented only by float. The property appears to be underlain mainly by schist and gneiss of the Yukon Metamorphic Complex which have been intruded by granodioritic to dioritic rocks of Mesozoic age and by a complex sequence of extrusive and subvolcanic rocks of Tertiary age. These rocks have been described in detail by Lodder and Godfrey (1970). Their distribution is shown on the accompanying map, which has been modified after Lodder and Godfrey (op. cit.).

Rocks of the Yukon Metamorphic Complex (Unit 1) consist mainly of quartz-mica schist, quartzite and gneiss. Gneissic texture or schistosity is generally well-developed and trends to the west to northwest. Aphanitic green chert and white massive recrystallized limestone are minor constituents of the Yukon Complex and banded epidote-garnet-diopside skarns are developed locally. The age of the Yukon Complex is uncertain but is considered by Tempelman-Kluit (1974b) to be Paleozoic or older.

In the southwestern corner of the property, Yukon Complex rocks are intruded by massive, equigranular granodiorite to diorite (Unit 2). The granodiorite is coarse-grained and contains biotite crystals up to 1 cm across. This unit is probably related to the Nisling Range granodiorite which is characterized by large euhedral biotite crystals (Tempelman-Kluit, 1974b). The Nisling Range granodiorite is Cretaceous according to K-Ar ages determined by Tempelman-Kluit and Wanless (1975).

Intermediate to acid volcanic and subvolcanic rocks (Unit 3) occur in the central and western parts of the property, mainly as small irregular stocks and dykes and, locally, as extrusive equivalents. These rocks vary considerably in texture and composition but are generally characterized by the presence of feldspar phenocrysts. Based on the detailed descriptions by Lodder and Godfrey (1970), they have been grouped into the five subdivisions shown on the accompanying map.

Unit 3e is fine-grained, dark green and commonly amygdaloidal. It is characterized by fine crystalline hornblende and feldspar and, locally, blue quartz eye phenocrysts up to 3 mm in diameter. It occurs as ring-shaped bodies and as northwest-trending dykes.

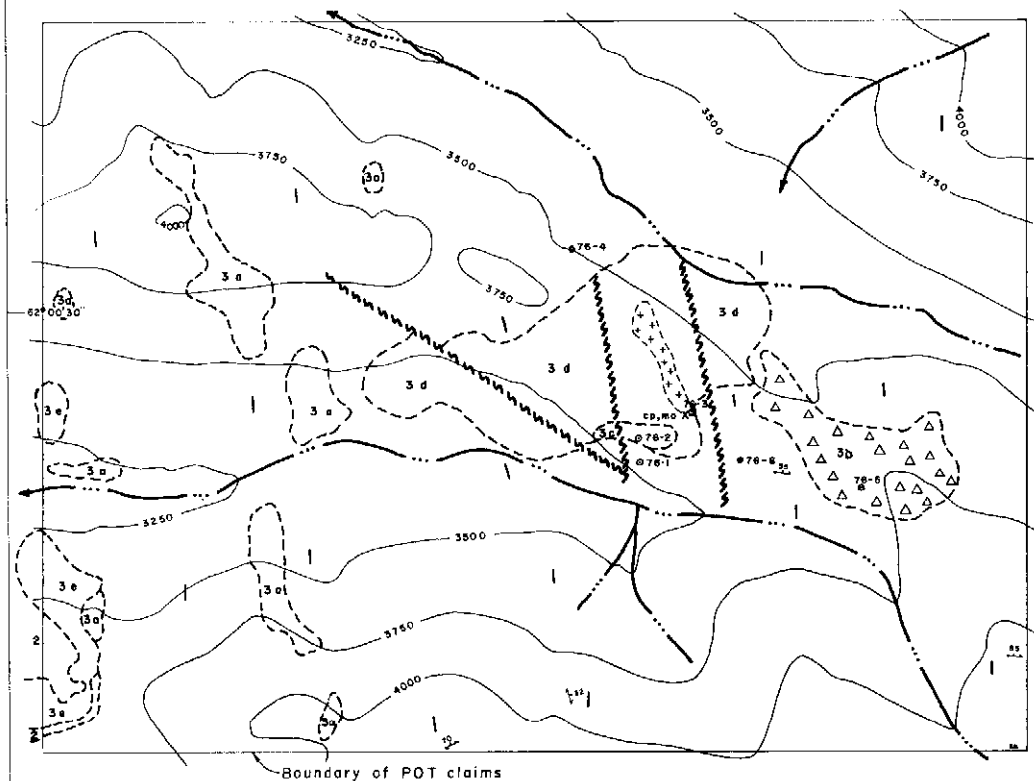
Porphyritic quartz diorite (Unit 3d) occurs in an elongated plug 1,500 by 600 m and trending roughly east-west in the centre of the property. The quartz diorite is characterized by coarse feldspar phenocrysts up to 1.5 cm long in a grey fine-grained matrix of quartz and feldspar. Biotite and amphibole phenocrysts averaging 4 mm in size constitute 5 to 15 per cent of the rocks. Quartz eyes up to 7 mm in diameter occur locally. Inclusions of Yukon Complex rocks are common in the quartz diorite.

A poorly exposed and poorly defined intrusive body of quartz porphyry (Unit 3c) occurs along the southern contact of the quartz diorite. Fresh specimens of the quartz porphyry consist of round quartz phenocrysts up to 3 mm in diameter set in a fine-grained, granular, chalky white quartzo-feldspathic groundmass. Normally, the quartz porphyry is strongly altered and leached and small vugs lined with jarosite and/or limonite are common.

Quartz porphyry breccia (Unit 3b) intrudes Yukon Complex rocks in an irregular shaped body east of the quartz diorite. The quartz porphyry breccia consists of broken quartz phenocrysts up to 1 cm in diameter and feldspar

GEOLOGY OF THE MALONEY CREEK PROPERTY

(Modified after Lodder and Godfrey, 1970)



LEGEND

TERTIARY

EOCENE

- 3 Feldspar Porphyry
- 3a Quartz feldspar porphyry
- 3b Quartz porphyry breccia
- 3c Quartz porphyry
- 3d Quartz diorite
- 3e Andesite

MESOZOIC

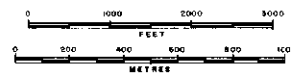
CRETACEOUS

- 2 Granodiorite, diorite

PALEOZOIC AND/OR MESOZOIC

- 1 Yukon Metamorphic Complex

- Geological boundary (approximate)
- - - Fault
- X Mineral showing
- cp Chalcopyrite
- mo Molybdenite
- Area of scattered mineralization
- o Diamond drill hole
- 70° Foliation
- Contours (in feet)



2

phenocrysts up to 1.5 cm long in a grey, fine-grained quartzo-feldspathic groundmass. Angular fragments of Yukon Complex rocks up to 1 m across and small angular quartz fragments occur locally in the quartz porphyry matrix. Some large blocks of the Yukon Complex rocks occur within the breccia and results of the diamond drilling indicate that Yukon Complex rocks underlie a greater portion of the area than shown.

Quartz feldspar porphyry (Unit 3a) with a typical orange colour occurs in a north-south trending belt on the western half of the property. This unit is massive, with distinct, doubly-terminated quartz crystals and K-feldspar phenocrysts set in a very fine-grained groundmass.

The feldspar porphyry (Unit 3) is considered to be equivalent to the feldspar porphyry described by Tempelman-Kluit (1974b) which occurs in north-trending dyke swarms throughout much of the Dawson Range. The age of these rocks is Eocene according to age determinations by Tempelman-Kluit and Wanless (1975).

A number of dykes intrude the different units on the property but are not shown on the accompanying map. The dyke rocks are generally fine-grained and range from rhyolitic to andesitic or basaltic in composition.

Structure on the property is dominated by two sets of faults or lineaments, one trending northwest and the other approximately north-south. The first set is indicated by the regional drainage pattern, by west- to north-west-trending folds and small faults in the Yukon Metamorphic Complex and by a northwest-trending fault. The second set is indicated by the north-trending belt of quartz feldspar porphyry (Unit 3a) and by two north-trending faults. The intersection of these two structural trends on the property may have affected the localization of the feldspar porphyry stocks.

Mineralized rocks on the property include quartz diorite, quartz porphyry, quartz porphyry breccia and adjacent Yukon Complex rocks. On surface, the best mineral showings occur near the southern edge of the quartz diorite and in a narrow zone of scattered exposures north of the main showing. Primary mineralization consists of chalcopyrite and molybdenite associated with pyrite and magnetite. However, most surface showings are strongly oxidized and leached and commonly consist of limonite and/or jarosite with malachite and azurite staining. Argillization of the feldspars and intense silicification are associated with the mineralization and well-developed quartz vein stockworks are developed locally. Potassic alteration consisting of K-feldspar envelopes along quartz veins occurs locally. Minor amounts of tourmaline and scheelite occur in a zone peripheral to the copper-molybdenum mineralization. Pyrite (up to 10 per cent) is best developed along the southern edge of the quartz diorite and up to 25 per cent magnetite occurs in quartz veins along the northern contact of the quartz diorite.

Quartz and molybdenite in hairline fractures and small amounts of disseminated pyrite and molybdenite occur locally in quartz porphyry breccia.

Numerous occurrences of jarosite and/or limonite found in quartz porphyry are the only evidence of the former existence of sulphides.

Mineral showings in Yukon Complex rocks consists mainly of quartz veins containing pyrite and locally chalcopyrite and/or molybdenite. Skarns in the Yukon Metamorphic Complex contain up to 10 per cent disseminated pyrite with minor amounts of chalcopyrite and/or molybdenite.

Supergene oxidation consisting mainly of jarosite and/or limonite is extensive and occurs to depths of 150 to 300 feet in bedrock. Small amounts of malachite, azurite and ferrimolybdate occur locally. Leaching, however, is limited as pyrite is present in the zone of oxidation. Results of the drilling carried out in 1976 failed to find any evidence for a zone of copper enrichment beneath the zone of oxidation.

Current Work and Results:

In 1976, Western Mines Limited drilled six holes totalling 2,427 feet (740 m). The drilling encountered copper-molybdenum mineralization of only sub-economic grades (less than 0.1 per cent combined copper and molybdenum) and Western subsequently terminated their option agreement with Amax.

ROC, JEN, SKUNK
Klotassin Joint Venture

Tungsten, Fluorite,
Copper
115 I 5, 6
(62°22'N, 137°25'W)

References: Craig and Laporte (1972, pp. 83-84, 87-88); Tempelman-Kluit (1974a); Sinclair et al (1976, pp. 136-137); Cathro (1976).

Claims: ROC 1-125; JEN 1-12; SKUNK 1-75

Location and Access:

The claims form a northwest-trending belt 16 km long and three km wide along the valley of Big Creek. The southeast end of the claims adjoins the Revenue Copper property 10 km northwest of Mount Freegold. Access in 1976 was by helicopter from Carmacks.

History:

The ROC claims were staked in December 1974, the JEN claims in January 1975 and the SKUNK claims in December 1975 for Klotassin Joint Venture, a consortium composed of Newconex Canadian Exploration Limited, Marietta Resources International Limited and Molycorp, Inc. Molycorp subsequently dropped out of the Joint Venture.

The ROC claims on the southeast end of the belt cover a portion of the lapsed COM claims, staked in September 1969 by Cominco, which carried out soil sampling and geological mapping in 1970. The SKUNK claims were staked to cover some lapsed KLAZAN claims, which were staked in 1965 by Coranex Limited and optioned to Atlas Explorations Limited in 1969. In 1970, Atlas carried out geochemical and geophysical surveys and drilled five holes totalling 670 m. In 1975, Klotassin Joint Venture conducted geological, geochemical and geophysical surveys on the ROC and JEN claims.

Description:

The geology of the ROC and JEN claims is described in Sinclair et al (1976). The only known mineral occurrences on these claims consist of minor banded and disseminated fluorite in quartz-rich schist on the south side of Big Creek, angular float from a gravel bar on Big Creek containing coarse grains of scheelite associated with quartz and minor fluorite and traces of malachite in schist exposed in trenches on the southeast end of the property.

According to Cathro (1976), the SKUNK claims are underlain mainly by a northwest-trending, lensoid body of feldspar porphyry up to 4,000 m long and

1,500 m wide. The feldspar porphyry is characterized by varying proportions of phenocrysts of quartz, feldspar, biotite and hornblende, with the quartz- and feldspar-rich varieties predominating. The feldspar porphyry is considered equivalent to the Feldspar Porphyry unit described by Tempelman-Kluit (1974a) which is Eocene in age.

Syenite, hornblende granodiorite and hornblende biotite granodiorite of the Mesozoic Klotassin Batholith occur around and, locally, within the feldspar porphyry. A small area within the feldspar porphyry is underlain by micaceous quartzite of the Yukon Metamorphic Complex.

Mount Nansen Group volcanics of Eocene age (Tempelman-Kluit, 1974a) consisting mainly of dark-coloured tuff and tuff breccia form a 25 m high terrace which extends for 1,500 m along the south side of Big Creek. The Mount Nansen Group volcanics are not common elsewhere on the SKUNK claims.

No mineral showings are known to occur on the SKUNK claims. Tourmaline occurs in feldspar porphyry float in one locality and some chlorite and clay alteration is developed in the feldspar porphyry although it is uncertain whether this alteration is of hypogene or supergene origin.

Current Work and Results:

Geological mapping, soil sampling and a magnetic survey were carried out by Klotassin Joint Venture on the SKUNK claims in 1976.

A number of copper-molybdenum and lead-zinc anomalies were outlined by the soil sampling but interpretation of these anomalies is rendered difficult because of thick overburden which covers a large portion of the property.

The magnetic survey helped to outline structure within the bedrock geology. A number of lineaments interpreted as faults were defined, including the Big Creek Lineament, a major lineament which trends northwest along the Big Creek Valley.

HI	Copper
United Keno Hill Mines Limited	115 I 6
Falconbridge Nickel Mines Limited	(62°29'N, 137°04'W)

Reference: Tempelman-Kluit (1974a).

Claims: HI 1-70, 71-78 Fr.

Location and Access:

The HI claims are situated on the west side of Big Creek roughly 9 miles (15 km) southwest of Minto. Elevations on the property range from 2,500 to 3,500 feet. Access in 1976 was by helicopter from Minto.

History:

The claims were staked in August 1976.

Description:

The property is underlain primarily by granodiorite to quartz monzonite of the Triassic Klotassin Batholith (Tempelman-Kluit, 1974a). Locally, these rocks exhibit foliation due to the alignment of mafic minerals, hornblende and

biotite. Narrow dykes of aplite and pegmatite intrude the Klotassin rocks. To the northwest of the property, the granodiorite is overlain by Eocene Carmacks Group volcanics.

Mineralization on the property consists of minor amounts of malachite restricted to a few narrow gneissic zones within granodiorite.

Current Work and Results:

Geological mapping and soil sampling were carried out on the property in 1976.

TINTA HILL
Tinta Hill Mines Limited

Zinc, Lead, Silver,
Gold, Copper
115 I 7
(62°17'N, 137°00'W)

References: Bostock (1941, p. 26); Skinner (1961, pp. 35-36); Findlay (1969a, p. 34); Craig and Laporte (1972, p. 85); Tempelman-Kluit (1974a, b); Sinclair and Gilbert (1975, pp. 37-38); Sinclair et al (1975, pp. 121-122).

Claims: TINTA 1-26, 50-53, 55-56

Location and Access:

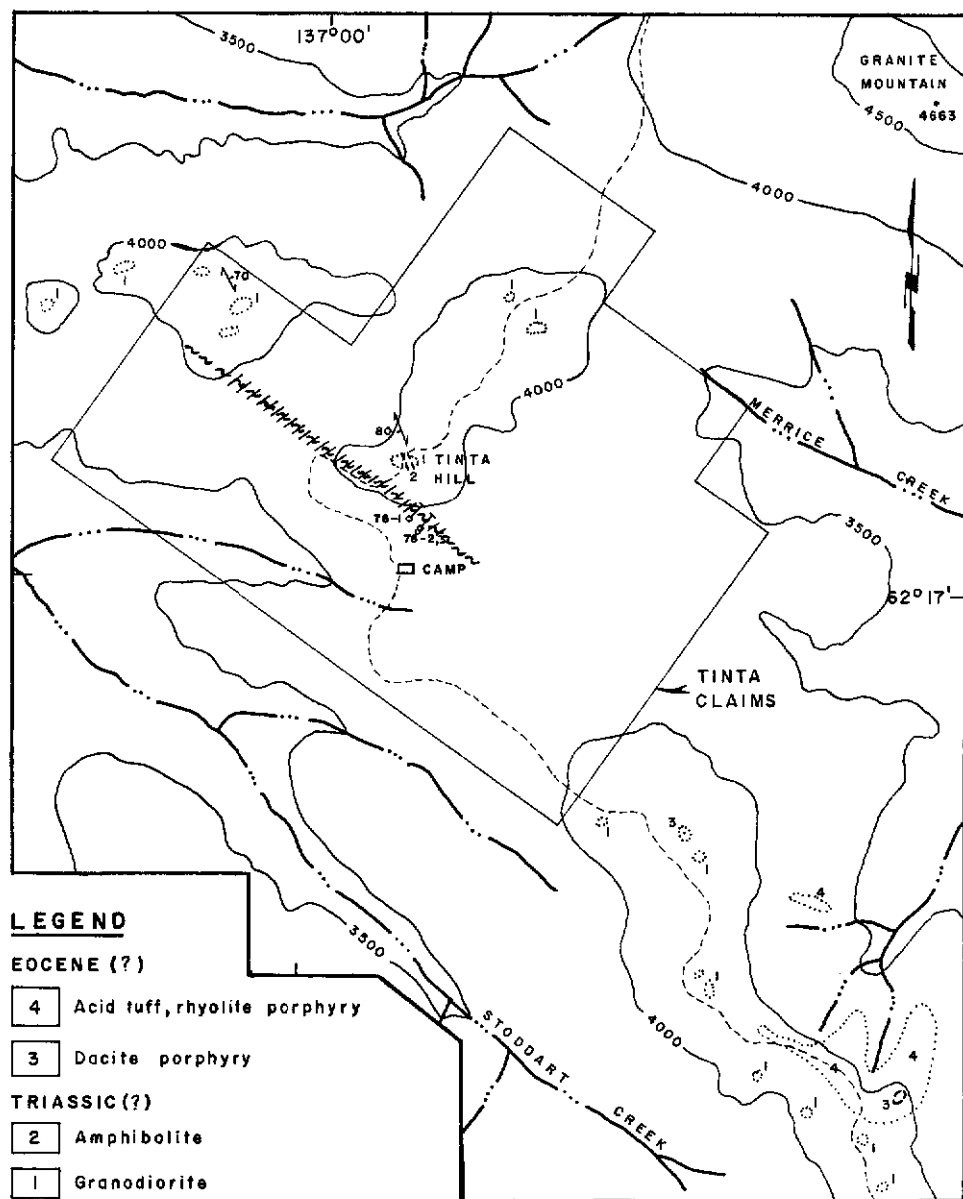
The property lies roughly 26 miles (42 km) northwest of Carmacks at the headwaters of Stoddart and Merrice creeks on the southern slope of Granite Mountain. The relief is gentle to moderate and elevations range from 3,300 to 4,100 feet (1,000 to 1,250 m). The property can be easily reached via a 7-mile (11-km) tote road which leaves the Mount Freegold Road at approximately Mile 33 (Km 52).

History:

The property was originally staked in 1930 to cover a mineralized quartz vein and was subsequently explored by trenching, shallow shafts and at least one adit which intersected a 22-foot (7-metre) vein (Bostock, 1941, p. 26). Conwest Exploration Company Limited staked the showing in 1959 and drilled 5 diamond drill holes totalling 1,349 feet (410 m) in 1960. Canex Aerial Exploration staked the property in 1966 and carried out an E.M. survey and a soil geochemical survey. The property was optioned in 1968 by Silgold Mines Limited who sampled the veins. Coin Canyon Mines acquired an interest in the claims in 1969 and conducted some soil sampling. The claims were returned to the original owner (renamed Canex Placer Limited in 1972) in 1973 and were subsequently optioned by Exeter Mines Limited who drilled 4 holes totalling 1,126 feet (340 m) late in 1973. Exeter drilled 21 holes totalling 4,041 feet (1,250 m) in 1974 and carried out a geochemical survey in 1975. In May 1975 Exeter Mines Limited was renamed Tinta Hill Mines Limited.

Description:

The general geology of the property and surrounding area is shown on the accompanying figure. The property lies within the unglaciated portion of the Dawson Range and bedrock is poorly exposed except along ridge tops. The principal rock type exposed on the property, shown as Unit 1, is granodiorite to quartz diorite of the Triassic (?) Klotassin Batholith (Tempelman-Kluit, 1974a). This rock is composed of 20 to 25 per cent quartz, 10 to 15 per cent K-feldspar, 40 to 50 per cent plagioclase and 10 to 15 per cent biotite and



LEGEND

EOCENE (?)

4 Acid tuff, rhyolite porphyry

3 Dacite porphyry

TRIASSIC (?)

2 Amphibolite

1 Granodiorite

○ Area of outcrop

- - - Geological boundary (approximate)

~ ~ ~ Foliation

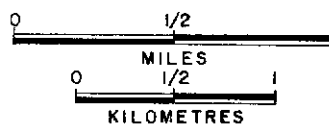
~ ~ ~ Shear zone

//// Mineralized zone

⊙ Diamond drill hole

- - - Access road

-4000- Contours (in feet)



**GEOLOGY OF THE TINTA HILL AREA,
WHITEHORSE MINING DISTRICT**

hornblende with abundant epidote and magnetite as accessories. It is medium- to coarse-grained and locally porphyritic due to the presence of K-feldspar phenocrysts up to 2 cm long. Foliation is commonly exhibited due to the subparallel alignment of mafic minerals trending roughly 330° and dipping steeply to vertically.

Unit 2 is medium- to fine-grained, gneissic amphibolite occurring as conformable bands up to 40 feet (12 m) thick within the granodiorite. The amphibolite consists of 60 to 70 per cent hornblende and 30 to 40 per cent plagioclase. Feldspar-rich bands 2 to 5 mm across occur at intervals of 2 cm or more. Unit 2 is prominent in outcrop at the top of Tinta Hill, immediately north of the main showing area.

Units 3 and 4 are volcanic rocks of Eocene (?) age exposed along ridge tops southeast of the property. Unit 3 consists of dacite to andesite porphyry which forms two small stocks up to several hundred feet across. One of these stocks, located one-half mile (0.8 km) east of the southernmost corner of the TINTA claim group, is composed of 5 per cent hornblende and biotite and 10 per cent plagioclase occurring as phenocrysts up to 2 mm long in an aphanitic, light-grey, feldspathic matrix. The second stock, one mile (1.6 km) to the southeast, is darker in appearance. The age of these stocks is uncertain, but they may be related to Mount Nansen volcanics of Eocene (?) age.

Unit 4 consists of rhyolite porphyry and vitric crystal tuff which are exposed in near-bedrock felsenmeer and scree along the southeast-trending ridge southeast of the property. The rhyolite porphyry is buff-weathering, chalky white and contains varying amounts of miarolitic cavities. It consists of quartz and plagioclase phenocrysts up to 2 mm across in an aphanitic white matrix. Trace amounts of disseminated pyrite are present. The tuff varies from white to purplish in colour. It contains crystal fragments of quartz, white, altered feldspar, and euhedral biotite up to 1 mm across in a very fine-grained and finely laminated matrix. This tuff is similar in appearance to the varicoloured acid tuff described by Tempelman-Kluit (1974b) in the Aishihik Lake area which have been assigned an Eocene or younger age.

Mineralization on the property occurs in quartz-carbonate veins confined to a 100-foot (30-metre) wide shear zone trending 335° and dipping vertically or steeply to the north in granodiorite and amphibolite. The quartz-carbonate veins have well-defined walls and vary from two to ten feet (0.5 to 3 m) wide. Mineralization occurs mainly in poorly defined zones as disseminated to heavily disseminated sulphides and, locally, irregular massive patches. The principal minerals are galena and sphalerite with minor amounts of chalcopryrite, tetrahedrite and pyrite. Minor amounts of chalcopryrite and pyrite are also disseminated in the wall rocks on both sides of the veins. Malachite and azurite occur in the oxidized portions of the veins. Alteration of the granodiorite in the vicinity of the veins is primarily sericitization and chloritization and, to a lesser degree, potash feldspathization and silicification.

Diamond drilling in 1973 and 1974 by Exeter Mines was conducted over a strike length of 4,000 feet (1,200 m) along the shear zone. The results indicated a mineralized zone roughly 3,500 feet (1,000 m) long containing 1,875 tons per foot grading 0.075 ounces per ton gold, 5.35 ounces per ton silver, 4.71 per cent lead, 6.03 per cent zinc, 0.37 per cent copper and 0.049 per cent cadmium. Electromagnetic surveys indicated that the shear zone extends for over 11,000 feet (3,300 m). Additional parallel and sub-parallel shear zones were also indicated.

Current Work and Results:

Three holes totalling 1,029 feet (310 m) were drilled in 1976 to test the vein at depth. Hole 76-1, drilled at -45° to the northeast encountered 9 feet (2.7 m) of heavy to disseminated mineralization from 396 to 405 feet (121.0 to 123.7 m). Hole 76-2 was abandoned at 80 feet (24 m) due to water loss and hole 76-3, collared 100 feet (30 m) southwest of 76-2 and drilled at -45° to the northeast, encountered 40 feet (12 m) of low-grade mineralization.

FED	Copper
United Keno Hill Mines Limited	115 I 11
Falconbridge Nickel Mines Limited	(62°35'N, 137°05'W)
Canadian Superior Exploration Limited	

References: Sinclair and Gilbert (1975, p. 43); Sinclair et al (1975, p. 104).

Claims: FED 1-228

Location and Access:

The claims are situated on the west side of the Yukon River roughly 7 miles (11 km) west of Minto. Access in 1976 was by helicopter from Minto.

History:

The claims were staked in July 1973. Geological mapping and geochemical sampling were carried out in 1973 and 1974.

Description:

Minor malachite staining occurs along fractures in foliated granodiorite to quartz monzonite of the Triassic Klotassin Batholith.

Current Work and Results:

In 1976 an I.P. survey was conducted over a portion of the claim group immediately east of the adjacent COIN claims. A narrow linear anomaly was outlined parallel to the steep escarpment on the west side of the Yukon River valley. Company geologists attribute the anomaly to a clay layer in the deep alluvium in the area.

MINTO COPPER DEPOSIT	Copper, Gold, Silver
United Keno Hill Mines Limited	115 I 11
American Smelting and Refining Company	(62°38'N, 137°15'W)
Silver Standard Mines Limited	
Falconbridge Nickel Mines Limited	
Canadian Superior Exploration Limited	

References: Tempelman-Kluit (1974a,b); Craig and Milner (1975, pp. 65-66); Sinclair and Gilbert (1975, pp. 39-42); Sinclair et al (1975, pp. 96-100).

Claims: MINTO 1-73, 75-97; DEF 1-89, 1379

Location and Access:

The adjoining MINTO and DEF claim groups are centred approximately 11.5 miles (18.5 km) west of the abandoned station of Minto and 48 miles (78 km)

north-northwest of Carmacks. Access is by boat along the Yukon River or by helicopter from Minto or Carmacks. A tote trail constructed in 1974 from Carmacks is currently suitable for winter travel only.

History:

The MINTO claims were staked by Silver Standard Mines Limited during the summer of 1971 to cover a copper anomaly in stream sediments. The DEF claims were staked shortly after by United Keno Hill Mines Limited who had discovered copper-stained outcrops to the north of the MINTO group. Until the end of 1974, work was carried out separately on the two properties. On the MINTO claims, Silver Standard and American Smelting and Refining Company (Asarco) carried out over 91,000 feet (28,000 m) of drilling in 139 holes and on the DEF claims, United Keno, Falconbridge and Canadian Superior drilled over 52,000 feet (16,000 m) distributed over 93 holes. The drilling outlined a mineralized zone containing approximately 7 million tons of 1.86 per cent copper and minor gold and silver which straddles the boundary between the MINTO and DEF properties.

Description:

The Minto copper deposit occurs within foliated granodiorite of Triassic age (Tempelman-Kluit, 1974b). The main mineralized zone is relatively flat-lying, 50 to 200 feet (15 to 60 m) thick and 200 to 400 feet (60 to 120 m) below surface. It is approximately elliptical in plan, measuring 1,200 feet (240 m) east-west. The mineralized zone generally tends to pinch out and interfinger with massive and porphyritic granodiorite except to the north where it is truncated by a fault striking 100° and dipping 60° to the north.

The primary ore minerals are chalcopyrite and bornite which occur as small veinlets and disseminated grains and irregular blebs interstitial to and replacing gangue minerals, particularly biotite. Pyrite is not abundant and occurs mainly on the fringes of the main mineralized zone. Magnetite is associated with chalcopyrite and bornite in varying amounts.

Current Work and Results:

In 1976 a feasibility study was carried out on the combined MINTO and DEF properties. The study determined reserves on the combined property to be 7,221,000 short tons grading 1.86 per cent copper, 0.20 ounces per ton silver and 0.015 ounces per ton gold but concluded that production would be uneconomic under current economic conditions (F.A. Godfrey, remarks to 30th Annual Meeting of United Keno Hill Mines Limited).

SAM	Copper, Gold
Anglo American Corporation	115 J 9
of Canada Exploration, Limited	(62°39'N, 138°05'W)

References: Bostock (1944); Tempelman-Kluit (1974b); Sinclair et al (1975, pp. 95-96).

Claims: SAM 1-98

Location and Access:

The claims are situated in the Dawson Range 65 miles (105 km) northwest of Carmacks. They are bordered by Hayes Creek to the north and east and by Butterworth Gulch to the south. Elevations on the property range from 2,000 to 3,500 feet. Access to the property is normally by helicopter.

History:

Placer gold was discovered in Klines Gulch as early as 1898 and placer mining has been carried out intermittently since then. Quartz veins were discovered around Klines Gulch in 1899 and an 80-foot adit was driven in the early 1900's. The area was staked as the HAYES claims in 1965 by Coranex Limited and subsequently as the DP claims in 1969 by Dawson Range Joint Venture and the NADA claims by D.C. Syndicate in 1974. Anglo American Corporation of Canada Exploration, Limited staked the SAM claims in October 1975.

Description:

The property is underlain primarily by metamorphic rocks of the Yukon Group which are intruded to the southwest by Triassic granodiorite of the Klotassin Batholith (Tempelman-Kluit, 1974b). Trace amounts of chalcopryrite and molybdenite are associated with disseminated pyrite and pyrrhotite in a small quartz monzonite stock intruding Yukon Group rocks. Traces of chalcopryrite and molybdenite also occur with disseminated pyrite in the bleached, quartz-veined contact zone within the Yukon Group rocks.

Current Work and Results:

During 1976, Anglo American carried out a geochemical soil survey on the property.

PATT
Amoco Canada Petroleum Company Limited

Copper, Molybdenum
115 J 10
(62°32'N, 138°38'W)

References: Tempelman-Kluit (1974b); Sinclair et al (1975, p. 94; 1976, pp. 146-147).

Claims: PATT 1-48

Location and Access:

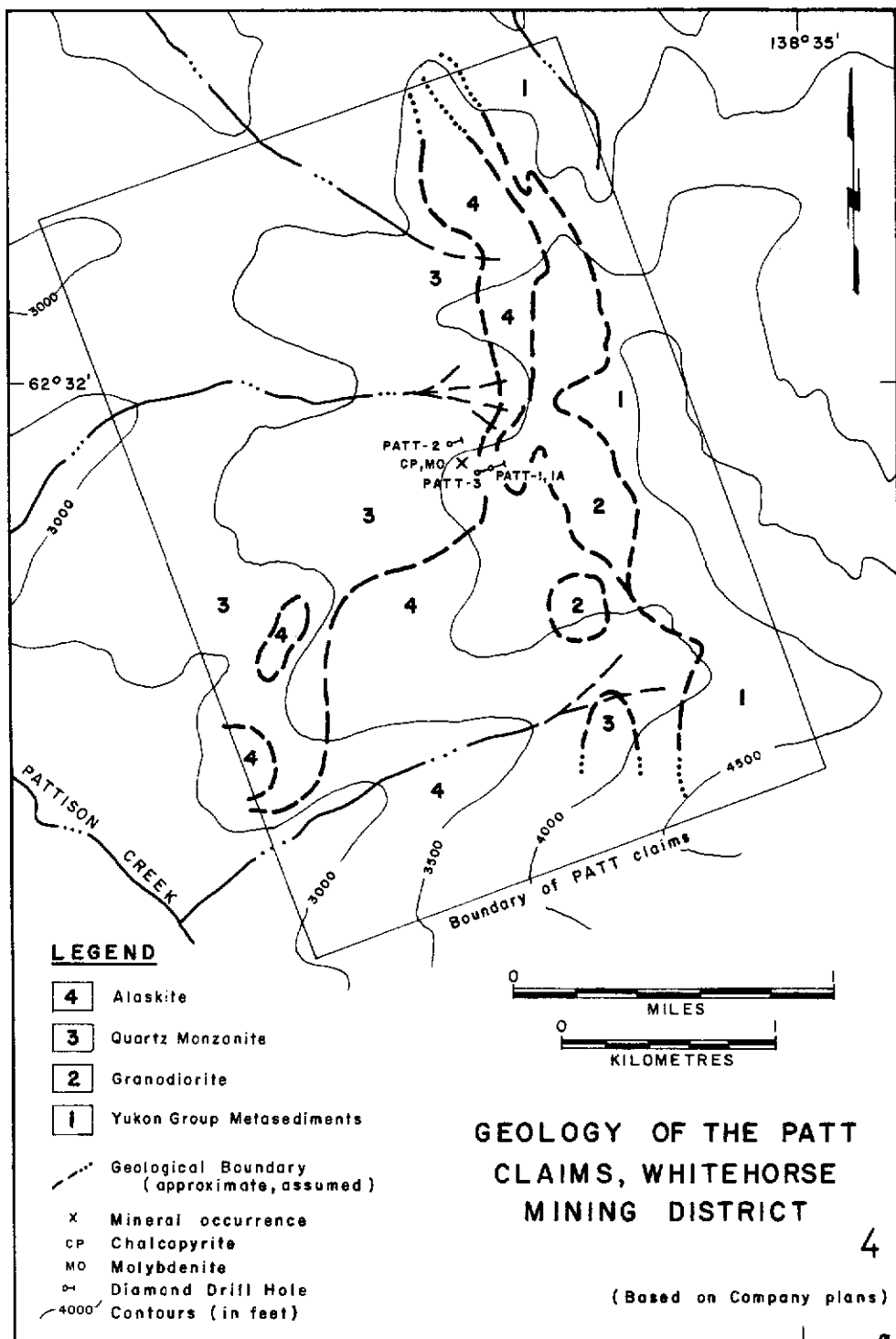
The claims are roughly four miles (6.5 km) north of Mount Pattison, near the headwaters of Pattison Creek. Elevations on the property range from 3,000 to over 4,500 feet. Access in 1976 was by helicopter from Carmacks, 80 miles (130 km) to the east-southeast.

History:

The claims were staked in 1974 at which time geological mapping and soil sampling were carried out. An induced polarization survey was performed in 1975 and several areas of anomalous chargeability were outlined.

Description:

The eastern part of the property is underlain by Nasina Quartzite of the Yukon Metamorphic Complex (Tempelman-Kluit, 1974b). The Nasina quartzite is generally a dark, graphitic and micaceous quartzite with interfoliated graphitic biotite-muscovite schist. To the west, the Nasina Quartzite is intruded by biotite hornblende granodiorite to quartz diorite of the Triassic (?) Klotassin Batholith. This rock is medium- to coarse-grained and equigranular. Biotite and hornblende typically comprise 10-15 per cent of the rock. The granodiorite is intruded by quartz monzonite and alaskite. The quartz monzonite consists of quartz and feldspar phenocrysts in a grey, fine- to medium-grained quartzo-feldspathic groundmass. The alaskite is a leucocratic,



medium-grained, equigranular rock characterized by argillic alteration of the feldspars. The quartz monzonite and alaskite are probably both related to the Eocene feldspar porphyry unit described by Tempelman-Kluit (1974b).

Minor amounts of chalcopyrite and molybdenite occur in narrow quartz veins cutting quartz monzonite rubble near the centre of the property.

Current Work and Results:

Four holes totalling 1,853 feet (560 m) were drilled in 1976. The drilling encountered mainly quartz monzonite and alaskite. Minor amounts of chalcopyrite and molybdenite were encountered in quartz veins up to 1 cm across cutting quartz monzonite and traces of disseminated molybdenite were found in altered alaskite. The results of the drilling are summarized as follows:

Hole No.	Dip	Length of Intersection (feet)	Cu (%)	MoS ₂ (%)
PATT-1	-90°	173	0.01	0.059
PATT-1A	-45°E	540	0.01	0.015
PATT-2	-45°E	545	0.01	0.004
PATT-3	-45°E	528	0.01	0.037

DOYLE
Amoco Canada Petroleum Company Limited

Copper, Molybdenum
115 J 11
(62°39'N, 139°13'W)

References: Tempelman-Kluit (1974b); Sinclair et al (1975, pp. 93-94; 1976, p. 147).

Claims: DOYLE 1-40

Location and Access:

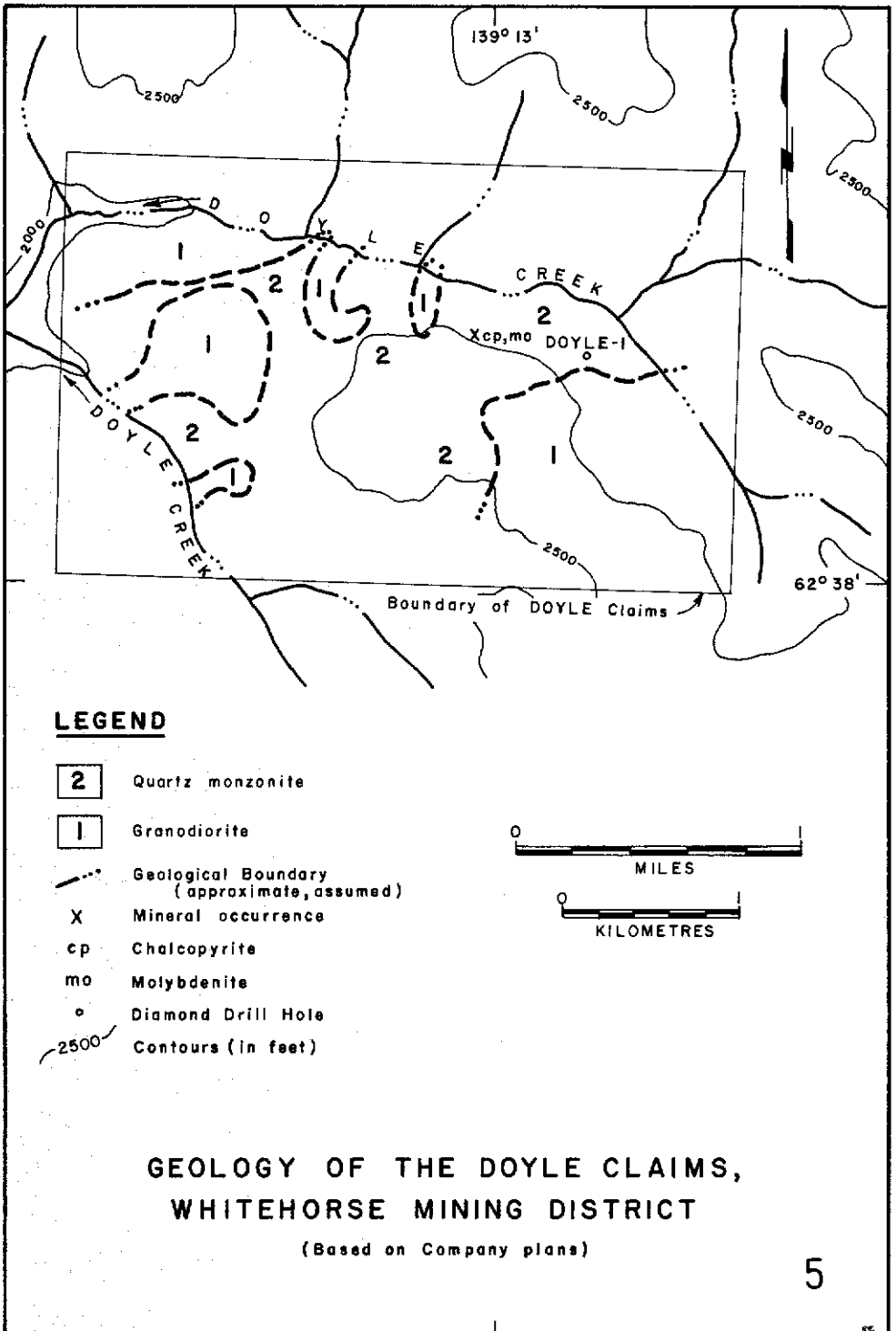
The claims are situated near the headwaters of Doyle Creek, 12 miles (19 km) southwest of the Casino copper-molybdenum property. Elevations on the property range from 2,000 to slightly more than 2,500 feet. Access in 1976 was by helicopter.

History:

The claims were staked in 1974 following a regional geochemical and geological reconnaissance program. Detailed geological mapping and soil sampling were carried out in 1974 and an induced polarization survey was conducted in 1975.

Description:

Outcrop is not well exposed on the property and the distribution of rock types has been determined mainly from rubble. The property is underlain mainly by biotite hornblende granodiorite of the Triassic (?) Klotassin Batholith (Templeman-Kluit, 1974b). The granodiorite is intruded by quartz monzonite which may be related to the feldspar porphyry of Eocene age described by Tempelman-Kluit (1974b). Minor amounts of disseminated pyrite, molybdenite and chalcopyrite and molybdenite in quartz veins were found in locally altered quartz monzonite.



Current Work and Results:

One diamond drill hole of 501 feet (150 m) was drilled in 1976 to test a subtle induced polarization anomaly coincident with a molybdenum geochemical anomaly. The hole encountered altered quartz monzonite and granodiorite with trace amounts of chalcopyrite and molybdenite which assayed 0.01 per cent Cu and 0.002 per cent MoS_2 over 460 feet.

CC
Amoco Canada Petroleum Company Limited

Copper, Molybdenum
115 J 11
(62°41'N, 139°09'W)

References: Tempelman-Kluit (1974b); Sinclair et al (1975, p. 93; 1976, pp. 147-148).

Claims: CC 1-36

Location and Access:

The claims are situated near the headwaters of a tributary of Coffee Creek, 10 miles (16 km) southwest of the Casino copper-molybdenum property. Elevations range from 2,600 to 4,000 feet. Access in 1976 was by helicopter.

History:

The claims were staked in 1974 following a regional geochemical survey. Geological mapping and detailed soil sampling were carried out in 1974 and an induced polarization survey was conducted in 1975.

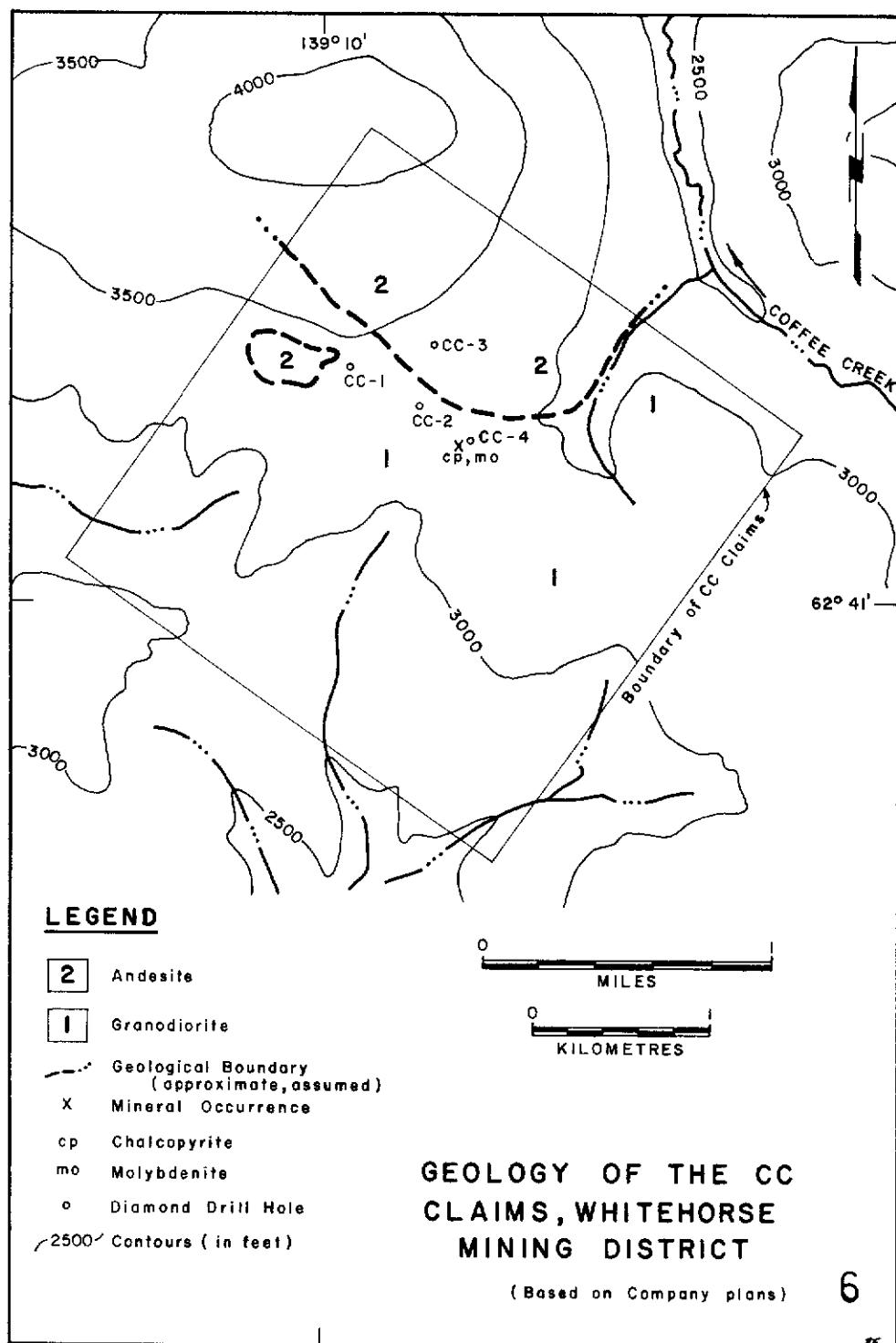
Description:

Although there is virtually no outcrop within the area of the CC claims, the distribution of rock types has been determined by Amoco geologists from float and rock chips in the residual soils of the area. The property is underlain mainly by biotite hornblende granodiorite of the Klotassin Batholith of Triassic (?) age (Tempelman-Kluit, 1974b). The granodiorite is medium- to coarse-grained and equigranular. It typically contains 10-15 per cent biotite and hornblende and 25 per cent quartz. To the north, the granodiorite is overlain by fine-grained, dark green andesite which Tempelman-Kluit (1974b) correlates with the Casino volcanics of Eocene age. Minor amounts of disseminated chalcopyrite and molybdenite in granodiorite occur in float near the centre of the property.

Current Work and Results:

Four holes totalling 1,961 feet (600 m) were drilled on the CC claims in 1976. The holes intersected mainly granodiorite carrying trace amounts of chalcopyrite and molybdenite in quartz veinlets and locally disseminated. Hole CC-3, collared in andesite, encountered 108 feet of andesite rubble before intersecting granodiorite cut by alaskite dykes. The results of the drilling are summarized as follows:

Hole No.	Dip	Length of Intersection (feet)	Cu (%)	MoS_2 (%)
CC-1	-90°	488	0.02	0.004
CC-2	-90°	507	0.02	0.005
CC-3	-90°	328	0.01	0.001
CC-4	-90°	449	0.01	0.002



HUE
Sproatt Silver Mines Limited

115 N 2
(63°05'N, 140°55'W)

Reference: Tempelman-Kluit (1974a); Sinclair et al (1976, p. 152).

Claims: HUE 1-18

Location and Access:

The claims are situated in the Moosehorn Range, 93 km north of Beaver Creek and about 128 km southwest of Dawson. Access is provided by helicopter from Beaver Creek to the property.

History:

The claims were staked in January 1974 and abut on to the northwest border of the LORI group of Claymore Resources.

Description:

The property is underlain by foliated hornblende biotite granodiorite of the Klotassin Batholith.

Current Work and Results:

During summer 1975, a geochemical soil survey was conducted for Pb, Ag, Au. Soil samples were collected at 200 foot intervals along northeast trending lines spaced 400 feet apart. No significant geochemical anomalies were determined, though a minor gold anomaly was located in the southern portion of the claim group. No work was performed in 1976 and the claims were returned to A. Harman.

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WATSON LAKE MINING DISTRICT

McMillan Property
Noranda Exploration Company Limited

Lead, Zinc, Silver
95 D 12
(60°31'N, 127°56'W)

References: Gabrielse and Blusson (1969); Sinclair et al (1976).

Claims: STRAT 1-79, 81-96; QTZ 1-8

Location and Access:

The property is located 64 km northeast of Watson Lake and immediately south and west of Quartz Lake. Access is by means of helicopter or float plane from Watson Lake.

History:

The McMillan showing was known to prospectors as early as 1892 and has been worked on by several interests. In 1975, Noranda Exploration undertook exploration on the property and staked the STRAT group. Their program consisted of detailed rock and soil geochemical surveys, electromagnetic and gravity surveys and 27 diamond drill holes totalling 8,400 feet (Sinclair et al, 1976).

Description:

The property is underlain by Hadrynian sedimentary rocks consisting of maroon and green argillite with intercalated quartzite and limestone (Unit 1, Gabrielse and Blusson, 1969). They have a general northwest trend and dip gently to the northeast and are cut by a number of steeply-dipping, north-trending faults and by thrust faults dipping gently to the east.

The McMillan deposit is a zone of massive sulphides up to 15 metres thick that is generally conformable with the enclosing calcareous argillite and limestone host rocks. Mineralization consists mainly of pyrite with galena, sphalerite and minor arsenopyrite, boulangerite, tetrahedrite and chalcopyrite. A more detailed description is available in the 1975 M.I.R. (Sinclair et al, 1976).

Current Work and Results:

During summer 1976, geochemical soil sampling, CEM, VLF and gravity survey programs were conducted over a large portion of the claim group. Soil samples were collected at 200 foot intervals along lines 800-900 feet apart and were analyzed for copper, lead, zinc, cadmium and molybdenum. Sporadic local anomalies were determined, especially in swampy areas. Only a few weakly positive anomalies were determined by the gravity survey. The CEM survey indicated a conductor extending north of the known mineralized zone and further work consisting of diamond drilling the north extension was recommended.

BAR
D.C. Syndicate

Barite, Lead
105 C 8, 9
(60°30'N, 132°14'W)

Reference: Mulligan (1963).

Claims: BAR 1-20

Location and Access:

The property is located east of Wolf River, 45 km northwest of Teslin. Access to the property is by helicopter from Teslin or by a 56 km winter road from Hays Creek at Km 1272 on the Alaska Highway.

History:

The BAR 1-8 claims were recorded in June 1976 and BAR 9-20 in September 1976. Portions of the property had been staked in the past as the following claim groups: SMEG (1971), KEY (1969), SUPERIOR (1957) and as RED TOP and AMBER SPRING (1956).

Description:

The property is underlain by northerly trending clastic and carbonate rocks of probable Devon-Mississippian age (Units 2, 3, of Mulligan, 1963). A barite horizon is situated between a unit of grey chert pebble conglomerate and a unit of grey green chert. It is made up of massive to disseminated white barite with a considerable amount of associated white quartz. Major amounts of pyrite as fine disseminations, streaks and small lenses and very minor fine-grained galena as fracture fillings are reported to occur within the barite horizon. Mineralized float consisting of poorly banded massive pyrite in grey green chert was also found on the property. Several spring produced limonite deposits also occur. They are associated with ground seeps and consist of gravel, talus and organic matter enclosed in limonite.

Current Work and Results:

During summer 1976, detailed geological mapping (1 inch = 200 feet), geochemical soil sampling and induced polarization survey programs were conducted on the property. A total of 553 soil samples were collected at 200 foot intervals along grid lines spaced 200 or 400 feet apart and analyzed for Cu, Pb, Zn, Ag. In general, lead and silver anomalies coincided with the barite horizon. No copper anomalies were determined and the zinc anomalies were attributed to secondary hydromorphic concentrations.

A series of pits were dug on several of the sinter deposits and sampled at narrow intervals. Several isolated anomalously high values in zinc and lead were determined, which suggest that some of the sources for the sinters may be lead, zinc and silver rich. Several induced polarization anomalies were determined over the known barite-pyrite mineralization and also over possible extensions of the mineralized zone. Further work consisting of detailed geological mapping, geochemical soil sampling and a ground magnetometer survey was recommended by a consulting geophysicist.

WEASEL
Archer-Cathro and Associates Limited

Molybdenum, Uranium
105 F 1
(61°11'N, 132°25'W)

References: Wheeler et al (1960); Tempelman-Kluit (1977).

Claims: WEASEL 1-16

Location and Access:

The claims are located about 153 km northeast of Whitehorse and 225 km northwest of Watson Lake. Access is by helicopter from the Canol Road, 40 km to the west or from Moss Lake, 10 km to the northeast.

History:

The claims were staked in June 1975 to cover a molybdenum showing previously owned by Conwest Exploration Limited (MOLLY claims). During 1963, Conwest carried out an extensive surface sampling program of geological mapping, trenching and diamond drilling (15 holes totalling 1,482 feet).

Description:

The property is underlain by Middle Devonian limestone and limy argillite which are locally altered to skarn and rusty hornfels near the contact with porphyritic granodiorite of the Cretaceous Weasel Batholith. The main zone is made up of a mineralized skarn which consists of erratic patches of coarse-grained molybdenite accompanied by pyrrhotite, lesser amounts of chalcopyrite and purple fluorite, traces of scheelite and an unidentified uranium mineral. An additional zone on the property (Saddle or North Zone) consists of disseminated molybdenite in a siliceous zone developed within hybrid granite along the intrusive contact.

Current Work and Results:

During summer 1975, the property was subjected to detailed radiometric prospecting and random silt sampling for Cu, Mo, U and W. No specific zone of strong radioactivity was located although a substantial range was present in the rock types exposed.

NOKLUIT
Archer, Cathro and Associates Limited

Rare Earths
105 F 8
(61°29'N, 132°11'W)

Reference: Wheeler et al (1960).

Claims: NOKLUIT 1-8

Location and Access:

The claims are located immediately south of the headwaters of the Ketza River, 58 km south of Ross River. Access is provided by helicopter from Ross River or Whitehorse (176 km to the southwest) or from the South Canol Road. In addition, a tote road follows the Ketza River valley to within 6.5 km of the property.

History:

The claims NOKLUIT 1-8 were recorded in August 1976. They were staked by Ukon Joint Venture managed by Archer, Cathro and Associates Limited, following the investigation of some radioactive anomalies determined during a reconnaissance airborne radiometric survey.

Description:

The property is underlain by Cambrian carbonates, volcanic, volcani-clastic and clastic rocks of Mississippian age. Mineralization consists of radioactive rare-earth enriched zones associated with purple fluorite, siliceous veining and a chert-quartzite unit.

Current Work and Results:

During summer 1976, the area was geologically mapped (1 inch = 400 feet), prospected and subjected to airborne and limited ground radiometric surveys. Only a few regional geochemical samples (silt and water) were taken and none of these returned anomalous values in uranium. Recommended further work consists of detailed geological mapping and geochemical sampling programs.

KET
Noranda Exploration Company Limited

Lead, Zinc
105 F 8, 9
(61°30'N, 132°08'W)

Reference: Wheeler et al (1960a).

Claims: KET 1-24

Location and Access:

The property is located 58 km south of Ross River at the headwaters of the Ketz River. Access is provided by helicopter from Ross River.

History:

The claims were recorded in August 1976.

Description:

The property is underlain by Cambro-Ordovician phyllite. Mineralization consists of galena and sphalerite in quartz-carbonate veins and breccias.

Current Work and Results:

During summer 1976, the property was subjected to geological mapping (1 inch = 400 feet) and geochemical soil sampling programs. Weak, vaguely coincident Pb-Zn soil anomalies were obtained and prospecting, geology and a minor VLF-EM survey returned discouraging results.

GUANO, GUAYES
Archer, Cathro and Associates Limited

Uranium, Rare Earths
105 F 8, 9
(61°30'N, 132°25'W)

Reference: Wheeler et al (1960).

Claims: GUANO 1-22; GUAYES 23-30

Location and Access:

The property is located 58 km south of Ross River and 5 km east of McConnell River. Access is provided by helicopter from Whitehorse (171 km to the southwest), Ross River or camps on the South Canal Road. A tote road along Groundhog and Seagull Creeks extends from the South Canal Road to Grayling Lake, 10 km west of the property.

History:

The radioactive showings were found by Ukon Joint Venture managed by Archer, Cathro and Associates Limited.

Claims GUANO 1-14 were recorded in July 1976, GUANO 15-18 in August and 19-22 in September 1976. A further eight claims, GUAYES 23-30 were recorded in September 1976. The claims were initially staked following the discovery of radioactive skarn found by a ground prospecting follow-up on an airborne radiometric anomaly.

Description:

The property is underlain by a hypabyssal syenite stock of Mississippian (?) age (Wheeler et al 1960) that is intrusive into a Lower Paleozoic sequence of carbonates and clastic rocks overlain by Mississippian felsic volcaniclastic rocks and black slate. Radioactive skarn occurs in several places where the syenite is in contact with carbonate rocks. The skarn consists of serpentine, actinolite, tremolite, idocrase, magnetite and radioactive and rare earth minerals.

Current Work and Results:

During the 1976 field season, preliminary geological mapping, prospecting and preliminary geochemical soil, silt, water, rock chip and whole rock sampling was undertaken. About 200 geochemical samples were collected and several scattered anomalies were determined. Further work was recommended to consist of detailed geological mapping, a grid radiometric survey and geochemical soil and rock sampling.

CHZERPNOUGH
Cyprus Anvil Mining Corporation Limited

Lead, Zinc, Barite
105 F 9
(61°36'N, 132°26'W)

Reference: Wheeler et al (1960).

Claims: CHZERPNOUGH 1-16

Location and Access:

The property is located at the head of Cloutier Creek, immediately south of Peak 7001. Access is by helicopter from Ross River 48 km to the north.

History:

Claims CHZERPNOUGH 1-16 were recorded in August 1976. The claim group covers showings which were discovered during a regional prospecting program carried out by the Pelly Project, a joint venture exploration program undertaken during 1976 by Cyprus Anvil Mining Corporation and Hudson Bay Oil and Gas.

Description:

The property is underlain by felsic volcanoclastic rocks of Mississippian age. A lapilli tuff with abundant carbonate in the matrix is the most common rock unit and the one which hosts the mineralized showings. Mineralization consists of talus occurrences of a sugary textured barite unit with disseminated sphalerite, galena and fluorite.

Current Work and Results:

During summer 1976, geochemical soil sampling and detailed prospecting were carried out. Soil samples (318) were collected at 200 foot intervals along grid lines spaced 400 feet apart and analyzed for Cu, Pb, Zn. A large area of anomalous Pb-Zn response was determined which partially coincided with the known showings. Further work was recommended by a company geologist to consist of detailed geological mapping, hand trenching, magnetic and electromagnetic surveys.

MAT
Welcome North Mines Limited
M. Sherman

Lead, Silver, Gold, Zinc
105 F 10
(61°32'N, 132°35'W)

Reference: Wheeler et al (1960).

Claims: MAT 1-16, 18-24

Location and Access:

The property is located on the east side of Seagull Creek about 40 km south of Ross River and 26 km east of the Canol Road. Access to the property is by helicopter from Ross River.

History:

MAT claims 1-4 were recorded in August, 1974 and MAT 5-16, 18-24 in September, 1975. The ground was first staked in 1963 by Conwest Exploration and since then it has been dropped and restaked several times, the exploration work mainly consisting of geological mapping and trenching.

Description:

The area is underlain by volcanic, volcanoclastic and associated sedimentary rocks of Mississippian to Permian age that are intruded by hypabyssal plugs of syenite. The volcanic sequence is underlain by 500 metres of Devonian-Mississippian black siliceous slate and minor wacke and is overlain by several hundred metres of laminated strongly bioturbated shale and siltstone which are in turn overlain by 500 metres of Middle to Upper Triassic silty sandy medium grey, thin-bedded limestone.

The main showing occurs within a sequence of graphitic slate and foliated quartz-eye tuff and consists of a 1.5 metre section of massive galena exposed on the bottom of a north-northwesterly flowing creek (MAT # 3). Surrounding the galena is a zone of pyrite which occurs as fine grained disseminations and as semi-massive lenses. In addition, scattered veinlets of medium to coarse-grained galena occur within an area about 23 m long along the creek walls.

The following table presents assayed grab samples from the main showing area.

<u>Description</u>	<u>Zn wt%</u>	<u>Pb wt%</u>	<u>Au oz/ton</u>	<u>Ag oz/ton</u>
Massive banded pyrite with some botryoidal texture and flow structure	0.05	2.06	0.07	11.12
Massive bedded coarse grained pyrite	0.02	1.72	0.03	6.54
Botryoidal (?) pyrite with galena matrix	0.25	21.0	0.03	46.22
Massive fine grained pyrite	0.05	0.68	0.09	1.25
Massive coarse grained pyrite	0.03	0.25	0.04	0.24

About 120 m west of the main showing, a parallel gossan zone occurs which can be traced intermittently over a strike length of 360 metres. The gossan consists of green to greenish grey felsic volcanics with very minor pyrite and pyrrhotite.

Current Work and Results:

In 1976, preliminary geological and geochemical soil sampling programs were conducted in the area of the main showing. Soil samples were analyzed for Cu, Pb, Zn and collected along lines spaced 400 feet apart at intervals of 200 feet for a total line length of 11,000 feet. Several anomalies were determined, one of which was considered to reflect an extension of the sulphide mineralization in the main showing area. Further work was recommended to consist of detailed geological mapping, geochemical soil sampling and bulldozer trenching.

BNOB
Cyprus Anvil Mining Corporation

Lead, Barite
105 F 10
(61°35'N, 132°30'W)

Reference: Wheeler et al (1960).

Claims: BNOB 1-24

Location and Access:

The property is located in the valley of the McConnell River, 48 km south of Ross River. Access is provided by helicopter from Ross River.

History:

Claims BNOB 1-16 were recorded in July 1976 and BNOB 17-24 in September 1976. The claim group was staked as a result of a regional prospecting program carried out by the Pelly Project, a joint venture exploration program carried out by Cyprus Anvil Mining Corporation and Hudson Bay Oil and Gas.

Description:

The property is underlain by Mississippian volcanic and volcaniclastic rocks of felsic composition. A 9 m thick bed of sugary white barite outcrops for a length of 45 m and is traceable in talus float for an additional 300 metres. The geology appears to be structurally complex with probably at least two phases of folding. Trace amounts of galena occur within the barite bed and high concentrations of pyrite occur within the associated felsic volcanic breccias.

Current Work and Results:

During 1976, geochemical soil sampling and detailed prospecting were carried out. Soil samples (216) were collected at 200 foot intervals along lines spaced 400 feet apart and analyzed for Cu, Pb, Zn. A 900 metre Pb-Zn anomaly was determined which conformed to the arcuate outcrop pattern of the barite unit. Further work consisting of geological mapping, magnetic and electromagnetic surveys were recommended by a company geologist.

SUN, DM
Welcome North Mines

105 F 10
(61°35'N, 132°40'W)

References: Wheeler et al (1960).

Claims: SUN 1-16; DM 1-12

Location and Access:

The property is located 45 km south of Ross River and 23 km east of the Canol Road. Access to the property is by helicopter from Ross River or by four wheel drive vehicle from the Canol Road via the Groundhog Creek tote trail to Seagull Creek.

History:

The claims were recorded in October, 1975.

Description:

The property is underlain by Mississippian volcanic and associated volcaniclastic and sedimentary rocks (Units 6a, c of Wheeler et al, 1960). Locally, the lithology consists of two main types: greyish-green quartz-chlorite-sericite phyllite with minor interbedded porphyritic andesite and grey sericite phyllite. A pyritic facies of the sericite phyllite, wavy-banded limestone and argillite with minor interbedded quartz pebble conglomerate appear to be in fault contact with quartz sericite phyllite at the northeast end of the DM claims.

Current Work and Results:

During September, 1976, a geochemical soil sampling program for Cu, Pb, Zn was conducted over a portion of the property. Samples were collected at 200 foot intervals along grid lines spaced 1,000 feet apart for a total line length of about 44,000 feet. The survey resulted in the delineation of three anomalous zones and further work was recommended to consist of more detailed geochemical soil sampling and detailed magnetic and electromagnetic surveys over the anomalous zones.

PASS PEAK
Noranda Exploration Company Limited

Zinc
105 F 10
(61°37'N, 132°48'W)

Reference: Wheeler et al (1960).

Claims: PEAK 1-8

Location and Access:

The claims are situated 6.5 km north of Pass Peak at elevations ranging from 5,000 to 6,000 feet. Access in 1976 was by helicopter from Ross River, 45 km to the north-northeast, or from the Canol Road, 18 km to the west.

History:

The claims were staked in August 1976 following a reconnaissance geochemical survey in the area.

Description:

The property is underlain by phyllite of Cambrian age (Unit 2, Wheeler et al, 1960) which is overlain by Devonian dolomite (Unit 4, op. cit.). Minor amounts of sphalerite are reported to occur in the Devonian dolomite.

Current Work and Results:

In 1976 Noranda carried out reconnaissance geological mapping on the property in addition to soil and silt sampling and an EM survey. The soil sampling outlined minor zinc anomalies which appear to company geologists to reflect minor sphalerite mineralization in the Devonian dolomite. The EM results appear to reflect bedrock lithology.

ANISE
Cyprus Anvil Mining Corporation Limited

105 F 10
(61°40'N, 132°45'W)

Reference: Wheeler et al (1960).

Claims: ANISE 1-64

Location and Access:

The property is located in Seagull Creek Valley immediately south of Seagull Lakes. Access is provided by helicopter or float plane from Ross River, 48 km to the north. A tote road passable by 4 wheel-drive vehicles passes through the claim group and connects it with the South Canol Road at Groundhog Creek, 19 km to the west.

History:

ANISE claims 1-48 were recorded in July 1976 and 49-64 in August 1976. The claims were staked to cover geochemical anomalies and float occurrences of galena, sphalerite and pyrrhotite found as a result of a regional prospecting program by the Pelly Project, a joint venture exploration program carried out by Cyprus Anvil Mining Corporation and Hudson Bay Oil and Gas.

Description:

The property lies in an overburden covered valley bottom area and little bedrock is exposed. Those rocks which do outcrop are black, pyritic shale and schistose greyish-green volcanics of intermediate composition and probable Mississippian age. The linear nature of the valley suggests that it marks the site of a NW-SE trending fault, the "Seagull Fault". West of Seagull Valley, shale and limestone of the Kechika Formation of Cambrian to Ordovician age occur whereas east of the Valley, Mississippian volcanic rocks of intermediate composition occur.

Current Work and Results:

During summer 1976, geochemical soil sampling and prospecting programs were carried out. Soil samples (626) were collected at 200 foot intervals along grid lines spaced 800 feet apart and analyzed for Cu, Pb and Zn. The soil sampling determined numerous isolated and erratic anomalies, but no well defined anomalous zones. Further work consisting of magnetic and electromagnetic surveys was recommended by a company geologist.

SU, HIGH, WAY, CALGAL
Welcome North Mines Limited
Silver Standard Mines Limited

105 F 16
(61°51'N, 132°12'W)

References: Wheeler et al (1960); Tempelman-Kluit (1977).

Claims: HIGH 1-10; WAY 1-10; SU 1-38; CALGAL 1-16

Location and Access:

The property is located north of the Robert Campbell Highway and Bruce Lake. Access is by road from Ross River, 40 km to the north.

History:

The CALGAL, HIGH and WAY claims were staked in August 1975 for Welcome North and Mackir Mines Limited and the SU claims were staked by Silver Standard Mines Limited in September 1974. In November 1975, an agreement was entered into such that Welcome North, Mackir Mines and Malabar Silver Mines could acquire interest in the SU claims by completion of certain work commitments.

Description:

The claims are underlain by Precambrian phyllitic rocks which are locally altered to sericite and limonite.

Current Work and Results:

In summer 1975, a gravity anomaly was determined on the Welcome North-Mackir CALGAL property adjacent to the SU No. 7 mineral claim. The anomaly was tested by a 548 foot diamond drill hole in November and December, 1975 on the SU No. 7 claim, but no mineralization was encountered.

BOW
Hudson Bay Exploration and
Development Company Limited

105 G 3
(61°00'N, 131°25'W)

Reference: Wheeler et al (1960b).

Claims: BOW 1-48, 49-66, 67-70, 71-79, 80-109, 110-118, 119-128, 129-143,
144-175, 176-281, 282-288

Location and Access:

The property consists of eleven different claim groups situated near the north end of the Liard River Valley, about 130 km southeast of Ross River. Access is provided by helicopter from Ross River or by fixed-wing aircraft to the Tintina Silver airstrip (115 km southeast of Ross River) and then by helicopter to the property.

History:

The claims were recorded in December 1975.

Description:

The property is covered by overburden, but the few outcrop exposures present indicate the area is underlain by siltstone and dolomite (Unit 4 and 5, Wheeler et al, 1960b) of probable Silurian age with minor limestone and shale. In the eastern section of the area, phyllite and limestone (Units 1 and 2, Wheeler et al, 1960b) underlie the Silurian rocks.

Current Work and Results:

During 1975, an airborne EM survey was carried out over the area of the claim groups. Follow-up ground EM and minor magnetic surveys, geological mapping (1 inch = 400 feet) and minor geochemical soil sampling were carried out on most of the claim blocks in 1976.

EAGLE
Tintina Silver Mines Limited

Silver, Lead, Zinc
105 G 3
(61°08'N, 131°10'W)

References: Wheeler et al (1960); Skinner (1962, pp. 37-39); Green and Godwin (1963, pp. 26-29); Sinclair et al (1975, pp. 156-158; 1976, pp. 164-165).

Claims: EAGLE 1-58, 66, 73, 74, 77, 78, 81-85, 115-138

Location and Access:

The EAGLE claim group is situated in southern St. Cyr Mountains, 7 km west of the Ings River and 112 km south-southeast of Ross River. The terrain in the area of the property is rugged and the main showings occur in a north-trending cirque-valley at elevations of over 1,500 metres. Access to the property in 1976 was by fixed wing from Ross River to an airstrip 8 km south-west of the property and then by helicopter to the property itself, or by helicopter directly from Ross River. A 171 km winter road to the property from Mile 790 (Km 1272) on the Alaska Highway was constructed in 1961.

History:

The EAGLE claims along with the RAM, EL and IT groups were originally staked in 1961 by Conwest Exploration Company Limited following the discovery of silver-lead-zinc showings by Nels Hals, a prospector working for Conwest. During August and September 1961, Conwest trenched, packsack drilled and sampled eight of nine showings discovered in the cirque area and discovered and prospected six other showings to the northwest. In December 1961, the property was acquired by Tintina Silver Mines Limited.

In February 1962, an adit was collared at about the 5,375 foot level and roughly 1,830 feet of underground development and 3,201 feet of underground diamond drilling in 22 holes were carried out. Additional work in 1962 included 625 feet of surface drilling in six holes, an electromagnetic survey and detailed geological mapping. Results of the 1962 work proved disappointing and no further work was undertaken until 1968, when a geochemical survey was carried out on the property. The property was dormant until 1974 when almost 12,000 feet of diamond drilling was carried out. The following are some of the more favourable intersections:

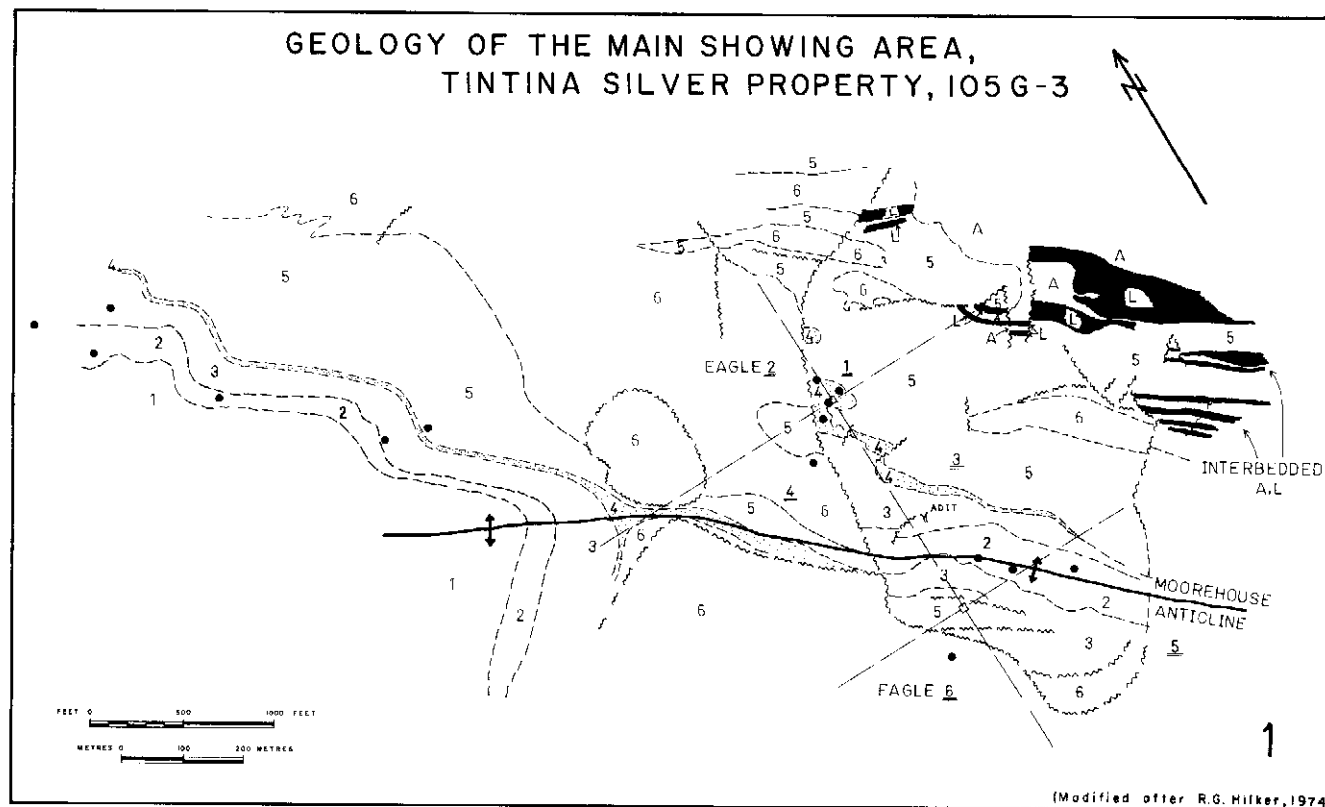
<u>Drill Hole</u>	<u>Interval</u>	<u>Ag oz/ton</u>	<u>Pb (wt%)</u>	<u>(Zn (wt%))</u>
A-8	25-40 ft	79.27	0.83	6.20
A-41	13.6-25.3 ft	127.28	11.44	19.60
A-41	58.7-65.7 ft	6.77	1.76	8.46

However results of the 1974 work were inconclusive and in 1975, the surface exploration program consisted of geological mapping, soil sampling and geophysical surveys. This surface work was designed to define the stratigraphy over the central part of the property, to locate known showings relative to this stratigraphy and to determine the mineralization potential of limestone along strike from the adit area. This work resulted in the planning of a drilling program for 1976. Since 1974, work on the property has been under the management of R.G. Hilker Limited.

LEGEND

C A M B R I A N		Argillaceous limestone, lime phyllite, hornfels
		Black argillite, hornfels
		Upper limestone
		Middle argillite, hornfels
		Lower limestone
		Lower argillite, hornfels
		Argillite, undifferentiated
		Limestone-undifferentiated
		Sulphide surface showing
		Geological contact, inferred
		Fault
		Anticlinal axis
		EAGLE claim number
		Claim post
		Adit

GEOLOGY OF THE MAIN SHOWING AREA, TINTINA SILVER PROPERTY, 105 G-3



Description:

Regional mapping shows the property to be underlain by Lower Cambrian limestone (Unit 1c, Wheeler *et al.*, 1960b) and Middle to Upper Cambrian phyllite (Unit 2, *op. cit.*). On the northeast part of the property these rocks are intruded by Jurassic and/or Cretaceous granodiorite (Unit 9, *op. cit.*). At the contact of the granodiorite, the sediments have been altered to hornfels for distances up to three kilometres. Garnet-diopside-epidote skarn has been developed in limy sediments adjacent to the granodiorite contact.

Host rocks for the silver-lead-zinc showings on the property are Lower Cambrian sediments which have been separated into six distinct units, consisting of lower argillite overlain successively by lower limestone, middle argillite, upper limestone, black argillite and argillaceous limestone (see map). The lower argillite is a massive, brown to purplish-brown argillite with minor disseminated pyrrhotite. This unit is at least 90 metres thick but has been encountered only in drilling and its total thickness is unknown. The lower limestone is commonly mottled or streaky in appearance and locally argillaceous. Log-shaped boudins of limestone within argillaceous limestone are indicative of the deformation within this unit. White rings and cylindrical bodies resemble fossils of Lower Cambrian age. Thickness of the unit varies from 8 to 75 metres. The middle argillite unit is a strongly foliated, grey- to brown-coloured rock rich in pyrrhotite, pyrite and locally arsenopyrite. It varies from 15 to 45 metres thick and contains massive, siliceous bands up to one metre thick with a tuffaceous appearance. The upper limestone unit consists of grey to light grey limestone with only minor argillite content. It has a mottled appearance due to the presence of secondary stringers and patches of calcite and quartz, and appears to be the most favourable host for silver-lead-zinc mineralization. Its thickness is variable but averages 9 to 15 metres. The black argillite is a distinctive, black, carbonaceous, sulphide-rich argillite that is rusty weathering in outcrop and contains up to ten per cent pyrite and pyrrhotite. It has been the locus of thrust faulting and its thickness and spatial distribution are quite irregular. The argillaceous limestone is a thick unit of bedded, strongly sheared and folded argillaceous limestone.

Structure consists of a northwest-plunging anticline which is complicated by minor drag folds and abundant small-scale thrust and cross faults.

The silver-lead-zinc occurrences on the EAGLE claims (see map) have been divided into four separate groups. The first, and most important to date, consists of massive to disseminated sphalerite, galena and freibergite emplaced within the upper limestone. These occurrences are best developed in the crests of small anticlinal folds and notably at, or close to, the contact of the overlying graphitic, black argillite. The second group consists of disseminated sphalerite emplaced within the lower limestone. These occurrences are similar to those in the upper limestone but are less continuous and apparently less extensive. The third group is associated with thrust faults at the base of the argillaceous limestone and consists of pods and discontinuous lenses of massive galena, with minor sphalerite associated with secondary calcite and quartz veins. A fourth and less significant type of occurrence consists of minor chalcopyrite in quartz veins cutting mainly argillaceous limestone.

Current Work and Results:

During summer 1976, eleven diamond drill holes (BQ core) were drilled for a total footage of 4,036 feet. The drill program checked areas where electromagnetic conductors occurred near surface sulphide mineralization within the upper and lower limestone units. No mineralization of economic significance was encountered, though further surface exploration work and diamond drilling were recommended.

NMT
Noranda Exploration Company Limited

Zinc
105 G 5
(61°29'N, 131°53'W)

Reference: Wheeler et al (1960b).

Claims: NMT 1-16

Location and Access:

The property is located 15 km north of McNeil Lake in the St. Cyr Range. Access is by helicopter from Ross River, 80 km to the northwest.

History:

The claims were recorded in September 1976.

Description:

The property is underlain by Road River (?) shale and Cambro-Ordovician phyllite and volcanic rocks. Mineralization consists of hydrozincite and minor sphalerite in the shale.

Current Work and Results:

During summer 1976, the property was subjected to reconnaissance geological mapping and geochemical silt and soil sampling. Anomalous zinc response in the silt samples was attributed to minor zinc mineralization in the shale.

PELLY
Sovereign Metals Corporation

Lead, Zinc
105 G 6
(61°28'N, 131°20'W)

References: Wheeler et al (1960); 1975 M.I.R., Sinclair et al (1976).

Claims: PELLY 1-32

Location and Access:

The property is located 50 miles southeast of Ross River in the Pelly Mountains. Access is by helicopter from Ross River or by fixed wing to a bush air strip located 16 km northwest of the property in the Hoole River Valley. A 40 km winter tote road connects the property with the Robert Campbell Highway at Mink Creek.

History:

Airborne surveys (HEM) and stream silt analysis led to the staking of the EL claims in 1966 which were subsequently explored by soil sampling with

bulldozer trenching in areas of anomalous geochemical response. Sulphide mineralization was located in one such trench and four diamond drill holes were completed during 1967. A six foot intersection from hole N-1 gave the highest assay, 0.28 ounces silver per ton, 0.82 per cent lead and 2.49 per cent zinc. The EL claims lapsed and the area was restaked as the PELLY claims in June 1974 and March and June 1975. Soil sampling carried out in 1975 confirmed and extended the geochemical anomaly found by earlier work.

Description:

The area is underlain mainly by schistose rocks of probably Proterozoic age (Unit A, Wheeler *et al*, 1960). The principal rock types exposed on the property consist of chlorite-graphite schist, feldspar augen schist and quartz-sericite schist. Dunite of probably Paleozoic age (Unit D, *op. cit.*) is exposed northwest of the property. The regional strike of the schistosity is to the northwest, with gentle dips to the southwest. More complex structural relationships are represented locally by two or more directions of strong foliation.

Mineral occurrences on the property consist of blebs and disseminations of galena, sphalerite and pyrite within conformable bands in feldspar augen schist at or near the contact with overlying chlorite-graphite schist.

Current Work and Results:

During summer 1976, a reconnaissance geochemical soil sampling program for lead and zinc was conducted by St. Joseph Exploration Company. Survey lines were extended 700 metres down slope from the main showing and anomalous values in zinc were determined within 200 metres of the showing.

TIL
Mountaineer Mines Limited

Zinc
105 G 9
(61°42'N, 130°05'W)

Reference: Wheeler *et al* (1960b).

Claims: TIL 1-24

Location and Access:

The property is located 13 km south of McEvoy Lake and 10 km north of the Campbell Highway. Access is provided by helicopter from the Campbell Highway.

History:

The claims were staked in March 1975 by R. Darney and A. Harman and subsequently acquired by Mountaineer Mines in August 1976.

Description:

The property is underlain by shale, argillite and limestone of Lower Paleozoic age that have been intruded by a granodiorite stock. Mineralization consists of minor secondary zinc (hydrozincite?) disseminated along fractures in limestone.

Current Work and Results:

During summer 1976, the property was subjected to preliminary geological mapping and geochemical soil sampling programs. A total of 59 samples were collected at 500 foot intervals along lines spaced 700 feet apart and analyzed for Pb, Zn. A large anomalous area of coincident high Pb-Zn values overlying limestone was determined in the south central portion of the claim group. Further work was recommended by a consulting geologist to consist of detailed geochemical soil sampling, prospecting, geological mapping and a ground EM survey over the anomalous area.

BEV
Hudson Bay Exploration and
Development Company Limited

105 G 11
(61°29'N, to 61°42'N,
130°57'W to 131°22'W)

References: Wheeler et al (1960b); Sinclair et al (1976).

Claims: BEV 1-338

Location and Access:

The claims are situated in ten separate groups lying up to several kilometres apart south of the Robert Campbell Highway. Access in 1976 was by float equipped fixed wing aircraft and helicopter from Ross River.

History:

The claims were staked during the fall of 1974. Airborne surveys conducted in 1974 outlined a number of electromagnetic anomalies and in 1975, ground magnetic and EM-17 surveys were carried out on all claim groups and 2,359 feet of diamond drilling in 7 holes were drilled. The drilling is reported to have intersected mainly flat lying graphitic schists with minor disseminated pyrite. One of the holes, drilled on a magnetic anomaly, encountered serpentinite with minor pyrite.

Description:

Outcrop exposure on all the claim groups is very poor although the regional mapping indicates the area is likely underlain by metamorphic rocks of probable Lower Paleozoic age consisting of biotite and chlorite schists (Unit A, Wheeler et al, 1960). In the eastern part of the area these rocks are intruded by granitic rocks of Jurassic and/or Cretaceous age (Unit 9, op. cit.). No mineral occurrences have been reported although the underlying rocks are thought to be generally correlative to the schists and phyllites which host the massive lead-zinc deposits of the Anvil Range to the northwest.

Current Work and Results:

During summer 1976, minor trenching was conducted by a D-7 cat on the BEV 33-88 group and five diamond drill holes (BQ core) were drilled for a total of 1,956 feet. The drilling was performed on BEV 182-197, 192-253 and 254-302 groups and is reported to have similar results to the 1975 program.

GEM, BB
Yukon Revenue Mines Limited

105 G 13, 14
(61°50'N, 131°30'W)

References: Wheeler et al (1960b); Tempelman-Kluit (1977).

Claims: GEM 1-17; BB 1-68; WATER 1-20; LAKE 1-17; JADE 1-12

Location and Access:

The property is located 55 km east of Ross River and 16 km north of the Robert Campbell Highway. Access is provided by helicopter or by foot from the highway.

History:

All the claims were recorded in 1976: GEM 1-16 in July, GEM 17 in August, BB in September and WATER, LAKE and JADE in November.

Description:

The property is underlain by phyllite, graphitic shale and greenstone of uncertain age. The former two have been tentatively assigned an Upper Devonian age by Tempelman-Kluit (Unit DCK, Tempelman-Kluit, 1977), though their age is masked by regional metamorphism and they may be correlative with the older Road River Formation.

A leached boxwork within quartz-graphite shale and phyllite has been interpreted as being residual after sphalerite, chalcopyrite and galena.

Current Work and Results:

During summer 1976, portions of the property were subjected to geological mapping, geochemical soil sampling, a reconnaissance magnetic survey and trenching. Reconnaissance scale geological mapping was conducted over the GEM 1-8 and BB 1-10 claims (1 inch = 500 feet, 1:50,000). Soil samples were collected along reconnaissance and detailed grid lines on GEM 3-8 and analyzed for Cu, Pb, Zn. A magnetometer investigation was made on a reconnaissance scale but response was poor and not deemed useful. Hand dug pits on GEM 4 and 6 totalled 40 cu. yd. in volume and further work consisting of diamond drilling was recommended.

IRENE
Mountaineer Mines Limited

Zinc
105 G 16
(61°41'N, 130°15'W)

Reference: Wheeler et al (1960b).

Claims: IRENE 1-24

Location and Access:

The property is located two miles south of McEvoy Lake and 16 km north of the Robert Campbell Highway. Access is provided by float plane to McEvoy Lake from Ross River, 153 km to the southeast.

History:

The claims were staked in August 1972, by A. Harman who outlined several zones geochemically anomalous in copper and zinc. Vestor Explorations acquired the property in spring 1973 and in an evaluation program report, recommended a program of detailed geochemical sampling. Mountaineer Mines Limited acquired the claims in August, 1976.

Description:

The property is underlain by a sequence of Middle to Upper Cambrian phyllite, argillite, dolomite, quartzite and minor greenstone which has been intruded by a granodiorite stock. Along the southern portion of the claim group, an irregular band of hornfels has developed where the sedimentary rocks are in contact with the granodiorite intrusion. Mineralization consists of traces of sphalerite and secondary zinc minerals within a buff weathering white limestone in the southeast portion of the claim group.

Current Work and Results:

During summer 1976, a geochemical soil sampling program was conducted in the north central portion of the claim group. A total of 63 soil samples was collected at 400 foot intervals along lines 500 feet apart and analyzed for Pb and Zn. Combined with earlier Vestor data, the geochemical survey determined an east-west trending coincident Pb-Zn anomaly in the central portion of the claim group. The anomaly is over one kilometre long and over 330 m wide. Further work consisting of detailed geochemical soil sampling was recommended.

SUZANNE
Dual Resources Limited

Lead, Zinc
105 H 2
(61°14'N, 128°43'W)

Reference: Blusson (1966).

Claims: SUZANNE 1-16

Location and Access:

The property is located about 136 km north of Watson Lake and can be reached by the following road system: 77 km up the Cantung Road, west for 25 km on the Conglomerate Creek Road and then southwesterly by pack trail for 4.8 km to the property.

History:

The claims were staked in March 1974.

Description:

The property is underlain by Cambrian or older schist and gneiss which are overlain by Devonian and (?) Mississippian metasedimentary rocks. Mineralization consists of minor pyrrhotite and chalcopyrite in hornfels and several areas of galena-sphalerite mineralization with accessory pyrite, pyrrhotite and chalcopyrite in a limestone skarn. The best sample from the skarn assayed 0.01 per cent copper, 12.75 per cent zinc, 11.55 per cent lead, 0.004 ounces gold per ton and 0.45 ounces silver per ton.

Current Work and Results:

During 1976, preliminary geological mapping was carried out and grab samples were taken.

KING, ARCTIC
Arctic Jade Limited

Jade
105 H 3
(61°07'N, 129°26'W)

Reference: Roots *et al* (1966).

Claims: KING 5, 6; ARCTIC 1-3, Fr

Location and Access:

The property is located 5 km west of Milepost 85 on the Robert Campbell Highway, north of Watson Lake. Access to the property is by road to the base of the mountain slope from approximately Mile 87 on the highway and then a 680 m climb along a 5 km trail or by helicopter from Watson Lake, 120 km to the south.

History:

The claims were staked during July and September 1973, September 1975 and 1976.

Description:

The area is underlain by Mississippian-Devonian sedimentary rocks which are separated by an angular unconformity from underlying Cambrian and Pre-cambrian sedimentary rocks and intruded by numerous irregular to sill-like ultramafic bodies. On the KING property, the ultramafic body is completely serpentized, strongly sheared and contains numerous large inclusions of recrystallized limestone and other sedimentary rocks. Margins of some, but not all the inclusions are altered to light green diopside, granular pink grossularite garnet, tremolite, nephrite, chlorite, epidote and probably clinozoisite. The irregular or lenticular masses of nephrite jade separate dark, tremolitized serpentine from alteration assemblages and silicified metasedimentary rocks which resemble ribbon chert.

The main jade occurrence consists of a series of jade lenses on KING 5 claim trending northerly down a steep slope and dipping northeasterly under a shallow capping of diopside and siliceous to phyllitic metasediments. In addition, several other outcrop and float occurrences of jade have been located on the property.

Current Work and Results:

During summer 1976, the property was subjected to preliminary geological mapping and several hundred feet of short hole diamond drilling in 102 holes averaging 2-3 feet in depth. Examination of the core showed the jade to vary from poor to medium in quality with much of it somewhat opaque, talcose and softer than desired for good quality gem grade. No further drilling was recommended, though the potential high tonnage of lower grade jade was recognized.

GREEN STUFF
Petra Gem Exploration of Canada Limited

105 H 5
(61°16'N, 129°46'W)

Reference: Roots *et al* (1966).

Claims: GREEN STUFF 1-6

Location and Access:

The claims are located 13 km west of kilometre 160 on the Robert Campbell Highway, 160 km northwest of Watson Lake. Access is provided by helicopter from Watson Lake or by cat road from the Highway.

History:

The claims were recorded in March 1976 to cover ground earlier held as the SOWDEN claims and are now owned by G. Bouchard, Kelowna B.C.

Description:

The property is underlain by chlorite-quartz, quartz-mica, and tremolite schists of Mississippian age which trend in a southeast direction and dip moderately to the southwest. Dykes of porphyritic monzonite and syeno-gabbro and lenses of serpentinitized ultramafic rocks intrude the schists. Alteration pods in the serpentine consist of massive diopside with minor garnet and vesuvianite. Jade bearing float occurs on the property, however, no jade was reported to occur *in situ*.

Current Work and Results:

During summer 1976, the claims were geologically mapped and prospected. A consulting geologist recommended no further work on the property.

SUSAN
Union Carbide Canada Mining Limited

Tungsten
105 H 8
(61°26'N, 128°20'W)

References: Blusson (1966).

Claims: SUSAN 1-38

Location and Access:

The property is located 8 km west of Mile 61 on the Cantung Road along Flood Creek. Access is provided by helicopter from Watson Lake, 161 km to the south.

History:

The claims were staked in June and August, 1975, the northwest portion adjoining onto the former MONTSE claims.

Description:

The claims are underlain by a biotite quartz monzonite batholith which is in contact with metasedimentary rocks to the east. The metasedimentary rocks consist of marble interbedded with pyrrhotite-rich micaceous quartzite, calc-silicate and a series of schists and quartzites.

Mineralization consists of pyrrhotite-rich skarn with very minor pyrite, sphalerite, scheelite and rare galena.

Current Work and Results:

During summer 1975, the property was subjected to EM-16 and magnetometer surveys along 12,000 feet of grid lines spaced 500 to 1,000 feet apart and detailed geological mapping (1 inch = 100 feet). Overlapping magnetic and electromagnetic anomalies were determined subparallel to a monzonite-meta-sediment contact and two diamond drill holes (257 feet and 235 feet) were collared to intersect the anomalous conductor. Both holes intersected low grade Fe-Zn-Pb sulphide mineralization and graphite. In addition, very low grade scheelite mineralization was encountered near the bottom of one hole.

During 1976, the geophysical coverage was expanded to further trace and define the magnetic conductor. One additional diamond drill hole (150 feet) was collared to intersect a scheelite geochemical anomaly above the geophysical anomaly and hand trenching and blasting exposed a near surface sub-outcrop of the massive pyrrhotite skarn. Both the drill hole and the trench encountered only weakly disseminated scheelite mineralization.

REA
Mountaineer Mines Limited

Copper, Zinc, Lead
105 H 10
(61°40'N, 128°42'W)

Reference: Blusson (1966).

Claims: REA 1-16

Location and Access:

The property is located in the Logan Mountains, 8.1 km east of Anderson Lake and 19.3 km west of the Cantung Road. Access is provided by float plane to Anderson Lake from Watson Lake, 171 km to the south, and then by foot or helicopter to the property. Alternatively, access is provided by road to Mile 60 on the Cantung Road and then by helicopter to the property.

History:

Lead-zinc-copper mineralization in the area was discovered by prospector Hugo Brodell. The property was optioned in 1966 by Atlas Explorations, who did some preliminary exploration in 1967. The claims were allowed to lapse, were restaked by T. Brock in February 1975 as the REA group and subsequently acquired by Mountaineer Mines.

Description:

The property is underlain by metasediments of Proterozoic age that have been intruded by a granodiorite batholith. The metasediments consist of biotite-hornblende schist and gneiss with minor sandstone and quartzite, locally calcareous. Intrusive sills and dykes and associated silicification become more prominent as the granodiorite contact is approached.

Mineralization consists of erratically distributed zones of pyrrhotite, minor chalcopyrite, sphalerite and galena within the silicified portions of some metasedimentary units. Several of the small local fold crests contain silicified and oxidized zones of pyrrhotite.

Current Work and Results:

During summer 1976, the property was subjected to detailed prospecting and preliminary geological mapping. The showings were shown to be small in size and no further work was recommended by a consulting geologist.

Shannon Creek
Noranda Exploration Company Limited

Lead, Zinc, Tungsten
105 H 14, 15
(61°52'N, 128°59'W)

References: Roots et al (1966); Findlay (1969).

Claims: LOG 1-28

Location and Access:

The property is located 43 km west of Tungsten, N.W.T. Access is provided by helicopter.

History:

The claims were recorded in September 1976 over ground formerly held as the ZEUS claims by Spartan Explorations Limited in 1967 (Findlay, 1969).

Description:

The property is underlain by sedimentary rocks of Hadrynian age that are contact metamorphosed by a Cretaceous granodiorite stock. Mineralization consists of minor sphalerite, galena, chalcopyrite and scheelite.

Current Work and Results:

During summer 1976, the property was subjected to geological mapping (1 inch = 400 feet), detailed prospecting, geochemical soil sampling and a VLF-EM survey. Several weakly mineralized skarn zones were located by prospecting and several soil anomalies were outlined.

HOWARDS PASS
Canex Placer Limited
United States Steel Corporation

Lead, Zinc
105 I 6, 11, 12
(62°27'N, 129°11'W)

References: Green et al (1967); Blusson (1968); Gabrielse et al (1973); Craig and Milner (1975, p. 124); Sinclair and Gilbert (1975, pp. 85-90); Ludvigsen (1975); Sinclair et al (1975, pp. 159-160, 1976, pp. 168-169).

Claims: DON; OP; R; X; Y; ANNIV: total of 444 claims

Location and Access:

The property is situated in the Selwyn Mountains along the Yukon-Northwest Territories border, 161 km east-northeast of Ross River and 260 km north of Watson Lake. The main showings on the property are at elevations of 1,500 to 1,800 metres. Access in 1975 was primarily by fixed wing aircraft from either Ross River or Watson Lake to an 545 metre airstrip on the property. Heavy equipment can be brought to the property via a winter tote road which leaves the Nahanni Range Road at Mile 101 (Km 162.5).

History:

High grade showings of lead and zinc were discovered by Canex Placer following geochemical surveys carried out in 1968 and 1971. From 1973 to 1975, the company carried out extensive surface exploration including 52 diamond drill holes totalling over 33,000 feet.

Description:

The property is underlain by Paleozoic sediments consisting of, from oldest to youngest: Upper Cambrian and (?) Ordovician limestone, locally referred to as the "wavy-banded" limestone, (Unit 7b, Green *et al.*, 1967); up to 300 metres of black, graphitic and graptolitic shales of the Ordovician Road River Formation (Unit 10, *op. cit.*); and over 900 metres of siliceous shale, sandstone and chert-pebble conglomerate of Devono-Mississippian age (Unit 18, *op. cit.*). Extremely fine-grained galena and sphalerite occur in thin, conformable laminae in a black, graphitic horizon in the Road River Formation, roughly 60 metres above the lower contacts with the "wavy-banded" limestone. Secondary lead-zinc minerals such as smithsonite, cerussite and particularly hydrozincite have been observed in surface showings.

Current Work and Results:

In 1976, the program on the property included detailed geological mapping, trenching and the following diamond drilling: 20,479 feet in 37 drill holes on the XY, 10,693 feet in 30 holes on the ANNIV and 820 feet in 2 holes on the OP claim group.

TANG
Ogilvie Joint Venture

105 I 12
(62°37'N, 129°45'W)

Reference: G.S.C. Map 8-1967.

Claims: TANG 3-16

Location and Access:

The claims are located in the Selwyn Mountains about 161 km east-north-east of Ross River, 10 km west of the Yukon-Northwest Territories border. Access is provided by helicopter from Ross River.

History:

The claims were recorded in August 1975.

Description:

The property is underlain by argillite of the Ordovician Road River Formation and Devono-Mississippian argillite, conglomerate and sandstone. The units are broadly folded into a northwesterly-trending syncline. A bedded barite horizon occurs at the base of the Devono-Mississippian argillite and extends onto the adjacent ORO property.

Current Work and Results:

During summer 1976, the property was geologically mapped at a scale of 1 inch = 1/2 mile and reconnaissance geochemical silt samples were taken from several creeks west of the barite horizon. Several high zinc values were obtained and a program of detailed soil sampling and geological mapping was recommended.

SEL
Trident Resources Inc.

Gold, Silver, Copper
Zinc
105 I 13
(62°51'N, 129°53'W)

References: Green et al (1967); Sinclair and Gilbert (1975).

Claims: SEL 1-34, 69-98, 102, 104, 106, 108, 180, 182, 184, 186, 188,
190, 192, 194, 196, 198, 200, 202, 204

Location and Access:

The property is located 177 km northeast of Ross River in the Itsi Range of the Selwyn Mountains. Access is provided by helicopter from Ross River.

History:

Most of the claims were staked in late summer, 1973, following the discovery of gold-bearing quartz veins and a total heavy metal geochemical anomaly during the course of prospecting and regional soil and silt sampling. In 1974, the western part of the property was geologically mapped and soil sampled for lead and zinc. Several zinc anomalies were outlined along the base of a ridge in the central part of the property. In late summer 1976, SEL 1-34, 180, 182 and 186 were staked and added to the group.

Description:

The property is underlain by clastic and chemical sedimentary rocks of Lower Paleozoic age;

- brown weathering shale with minor pyrite
- silvery weathering shale
- brown to rusty shale, sandy near the base with numerous quartz stringers locally
- black shaly chert and massive chert

In addition, fragments of pebble conglomerate and banded barite interbedded with black chert and sandstone occur within the talus between the brown shale and the chert unit. The rocks are intensely folded and form the eastern limb of a northwesterly plunging anticline.

Mineralization consists of arsenopyrite, pyrite and chalcopyrite within several zones (one up to 6 m wide) of narrow quartz veinlets in the black shale unit. The best mineralized sample assayed 1.35 oz Ag/ton, 0.480 oz Au/ton and 2.30 % Cu. In addition, several large gossans derived from pyritic shale and chert contained low values of zinc.

Current Work and Results:

During summer 1976, the property was subjected to programs of geological mapping; geochemical soil sampling and trenching (11 trenches). The geochemical work consisted mainly of total heavy metal determinations in the field supplemented by some laboratory analyses. Results of work on the gossans were not encouraging and any further work was recommended to be directed toward trenching and sampling of the quartz vein zones.

PIG
Cyprus Anvil Mining Corporation

105 J 2
(62°14'N, 130°36'W)

Reference: Roddick and Green (1961).

Claims: PIG 1-50

Location and Access:

The claim group is located 18 km northwest of Traffic Mountain and adjoins the KATE group to the west. Access is provided by helicopter from Ross River, 97 km to the southwest or by a combination of helicopter and float equipped fixed wing from Pelly Lakes, 29 km southeast of the property.

History:

The claims were recorded in July 1976 and were staked to cover an area with anomalously high stream geochemical lead values.

Description:

The property is underlain by interbedded black to grey chert, black shale and minor carbonates of Ordovician to Silurian age that occur along the eastern margin of the Pelly-Cassiar platform. No mineralization has been observed on the property.

Current Work and Results:

During summer 1976, a geochemical soil sampling program was conducted on the property. A total of 750 soil samples were collected at 200 foot intervals along grid lines spaced 400 and 800 feet apart and analyzed for Cu, Pb, Zn. Two east-west trending irregular lead anomalous zones were determined at the western boundary of the claim group. Sporadically high zinc values occur throughout the anomalous zones. The anomalies are sub-parallel to bedding and may reflect stratiform lead mineralization in black shale. Further work consisting of more geochemical soil sampling, detailed geologic mapping, prospecting, and electromagnetic surveys were recommended by a company geologist.

Itsi Lake
Abacorn Syndicate

Zinc, Lead
105 J 9, 16
(62°43'N, 130°15'W)

Reference: Blusson (1974a).

Claims: ITSI 1-48; PRE 1-24; VOST 1-24; RIVER 1-24

Location and Access:

The property is located about 32 km east of Mount Sheldon on the Canol Road and 8 km south of Itsi Lake. Access is provided by helicopter from Ross River, 193 km to the southwest or by helicopter from Jeff Lake on the Canol Road (32 km to the north).

History: "

The ITSI and VOST claims were staked in July 1975, the PRE claims in August 1975 and the RIVER claims in September 1975.

Description:

The property is underlain by Cambrian and Ordovician shale and limestone that have been subdivided into the following sequence:

Ordovician:	<u>Road River Formation</u>
	Upper siliceous shale
	Clay flake mudstone
	Chert unit with limy and shaly horizons
	Lower shale unit
	Transitional limestone
Cambrian:	Wavy banded limestone

In general, the units trend westerly and dip steeply to the south.

Mineralization of several types has been noted: 1) fine grained pyrite as layers and disseminated grains in the lower and upper siliceous shale units; 2) pyrite as coarse nodules or balls within the wavy banded limestone and thin bedded black shale; 3) pyrite layers in black chert with very minor sphalerite (?) and galena; 4) smithsonite and hydrozincite as fracture cleavage fillings and bands up to 1.3 cm thick parallel to the bedding in chert; 5) horizontally layered surficial deposit of zinc-bearing travertine located with V-shaped valleys or along steep slopes.

Current Work and Results:

During summer 1976, preliminary geological mapping (1 inch = 400 feet) was carried out on the property. Soil, water and rock samples were tested with a total heavy metal geochemical kit and where results were positive, soil geochemical sampling on a grid was also carried out. All the samples were analyzed for zinc and some for lead. Several anomalous areas were determined and further work consisting of detailed geological mapping, grid geochemical soil sampling, trenching and diamond drilling was recommended.

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COAL REPORTS

TANTALUS BUTTE MINE
Cyprus Anvil Mining Corporation

Coal
115 I 1
(62°08'N, 136°16'W)

References: Bostock (1936, pp. 59-62); Green (1966, pp. 121-124); Findlay (1967, p. 88; 1969a, p. 15; 1969b, pp. 66-67); Craig and Laporte (1972, pp. 155-156); Sinclair and Gilbert (1975, pp. 121-122); Sinclair et al (1975, p. 168; 1976, p. 172).

Lots and Leases: Leases 2949-2955, 2959, 2963-2980; Lots 23, 24, 10, 11

Location and Access:

The mine is situated on the north bank of the Yukon River, 6.4 km north of Carmacks and 1 km from the Whitehorse-Mayo Road.

History:

The Tantalus Butte Mine began operation in 1923, supplying coal to Carmacks and Dawson and later the mill at United Keno Hill Mines, Elsa, until 1967. In 1969, the mine began supplying coal to the Anvil Mine where it is used for plant heating and concentrate drying.

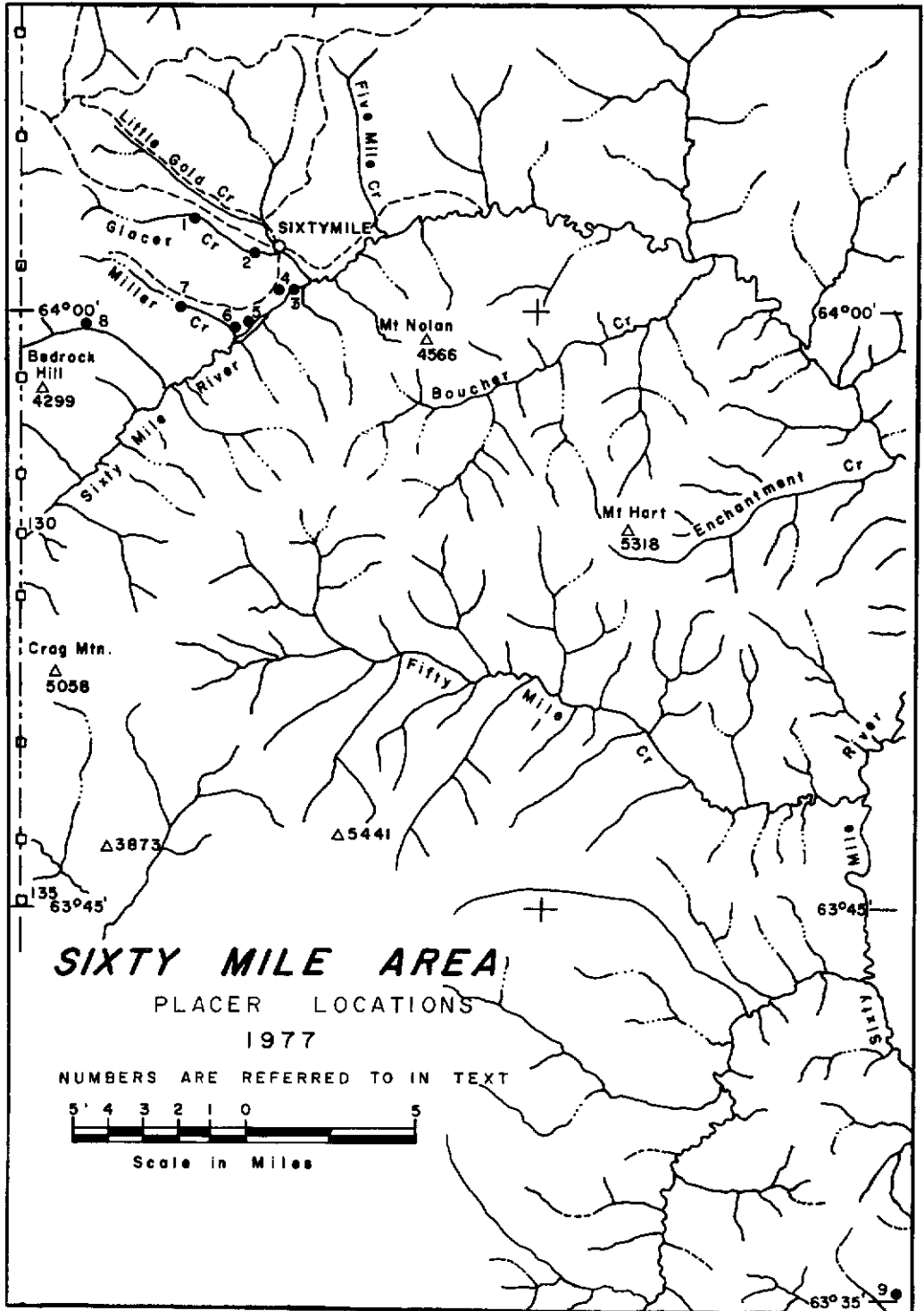
Description:

The coal occurs in the Tantalus Formation of Upper Jurassic (?) and Lower Cretaceous age, consisting of conglomerate with lesser amounts of sandstone, shale and a few coal seams. The main seam ranges from 0 to 14 feet thick, strikes north and dips 45° to 70° west. The seam is displaced by steeply-dipping, northeast- to northwest-trending faults. Although fault displacement is only on the order of a few feet or more, mining is rendered difficult. The coal is a high volatile, bituminous coal with calorific value ranging from 11,000 to 12,700 BTU. Samples are agglomerating with a swelling index of 1 (ASTM) and are not suitable for metallurgical grade coke (Green, 1966, p. 124). There is also another coal horizon near the top of the Laberge Group (Lower to Middle Jurassic).

Current Work and Results:

Exploration work in 1976 consisted of geological mapping, bulldozer trenching and the drilling of 16 diamond drill holes of HQ size for a total footage of 10,070 feet (3,069 m). Production was 9,974 tons underground and 20,000 tons open pit.

PLACER REPORTS



SIXTYMILE AREA

- (1) J. Lynch 116 C 2
Glacier Creek (64°02'N, 140°53'W)

Reference: Sinclair et al (1976, p. 174).

J. Lynch continued mining as in 1975 with one employee, a 2,500 gpm pump, monitor and two D-7 bulldozers. Some 11,000 bedrock square feet were mined on Grimard Discovery Claim from a right limit cut 175 feet long by 75 feet wide. As before, the method was to strip overburden, pile the 8 feet of pay gravels and upper 2 feet of quartz mica schist bedrock in front of the sluice box, wash with monitor to remove fines and then push the material into the box. Production was 300 crude ounces of gold.

- (2) Glacier Creek Placers 116 C 2
Glacier Creek (64°02'N, 140° 49'W)

Reference: Sinclair et al (1976, p. 174).

L. Grimard and E. Faucher with 2 other hired men continued mining their Glacier Creek property, putting in 7 left limit cuts each 100 by 125 feet, immediately upstream from the 1975 workings. Stripping of the 25 to 30 feet of fine, grey, uniform silt was done with a D-8 bulldozer. Eight feet of gravel and a foot of bedrock is mined using 2 D-6's.

- (3) Cogasa Mining Corporation Limited 116 C 2
Sixtymile River (64°01'N, 140°42'W)

Reference: Sinclair et al (1976, p. 174).

This large operator holds 44 miles of placer leases on the Sixtymile River and other leases in the area (see Sinclair et al, 1976). During the 1976 season an area 500 feet by 600 feet on the left limit of the river was mined. The gravel section is 8 to 9 feet thick; 2 to 3 feet of muck having been stripped in 1975. Three TD-25 bulldozers were used to feed a conveyor washing plant with screens over the dump box for rejection of coarse material. Rubber tired front end loaders (a 5 yard Hough 80 model and a 4 yard Hough 60) were used to stack tailings.

- (4) Fellhawk Placers 116 C 2
J. and W. Fellers (60°01'N, 140°41'W)
Sixtymile River

Reference: Sinclair et al (1976, p. 176).

Mr. and Mrs. Fellers mined on the left limit bench of the Sixtymile River immediately upstream from the mouth of Glacier Creek. The bench is roughly 30 feet above the Sixtymile River and about 600 feet from the river. They used two D-7's and one D-8, each machine operating part time.

The section consists of a few feet of muck followed downward by 20 feet of gravel to a dark grey to purple andesite bedrock which is in part decomposed in part fresh and blocky. The bottom 6 feet of gravel and top foot of andesite is sluiced. They mined some 850 feet of the bench from near the downstream end of a one mile lease in a series of 4 cuts up to 200 feet wide. Water is largely that filtering through gravels from upstream operations which is ponded and pumped to the sluice box.

- (5) Adrian Brisboise
Sixtymile River

115 N 15
(63°59'N, 140°49'W)

Reference: Sinclair et al (1976, p. 176).

Working on Sixtymile Bench Discovery Claim Mr. Brisboise put in one cut 300 feet long by 100 feet wide by 50 feet deep on this left limit bench. The gravel section is rather uniform in size of cobbles, there being little very coarse material. The lowest 6 feet is sluiced. Equipment used was a D-9 bulldozer.

- (6) Alphonse Brisboise
Sixtymile River

115 N 15
(63°59'N, 140°50'W)

Reference: Sinclair et al (1976, p. 176).

Mr. Brisboise put in one cut on the left limit Sixtymile bench immediately below the mouth of Miller Creek, 30 feet wide, 350 feet long and up to 40 feet deep, the lower 6 feet of which is sluiced. A second cut of 30 feet further into the bank was much less productive. Total output was 430 crude ounces of gold. Equipment used was a D-8 and a rubber tired front end loader.

- (7) Sixtymile Enterprises
Sixtymile River

115 N 15
(63°59'N, 140°47'W)

Reference: Sinclair et al (1976, p. 176).

W. Yaremcio mined claim 10 Above Discovery on Miller Creek, putting in a left limit bench cut about 100 feet wide by 300 feet long and to 50 feet deep using 2 D-7 bulldozers. Some 10 feet of muck, increasing to 20 to 30 feet at the deeper end, overlies the gravels. The muck here is characterized by abundant roots and trees.

This ground has been drifted several times during the placer mining history of the area. Hand mining was done there at the turn of the century; O. Medby sank a shaft and drifted prior to 1963. The most recent testing was done by F. Chudy and W. Yaremcio in 1969 when they put a shaft down 45 feet to bedrock, using a steam boiler, then drifted some 30 feet on a pay streak.

- (8) S. Prohaszka
Bedrock Creek

115 N 15
(63°59'N, 140°55'W)

Reference: Sinclair et al (1975, p. 177).

S. Prohaszka worked on Bedrock Creek, doing minor stripping and putting in one bench cut 100 feet by 100 feet, sluicing 4 feet of gravel and broken bedrock. Equipment used was a D-7 bulldozer.

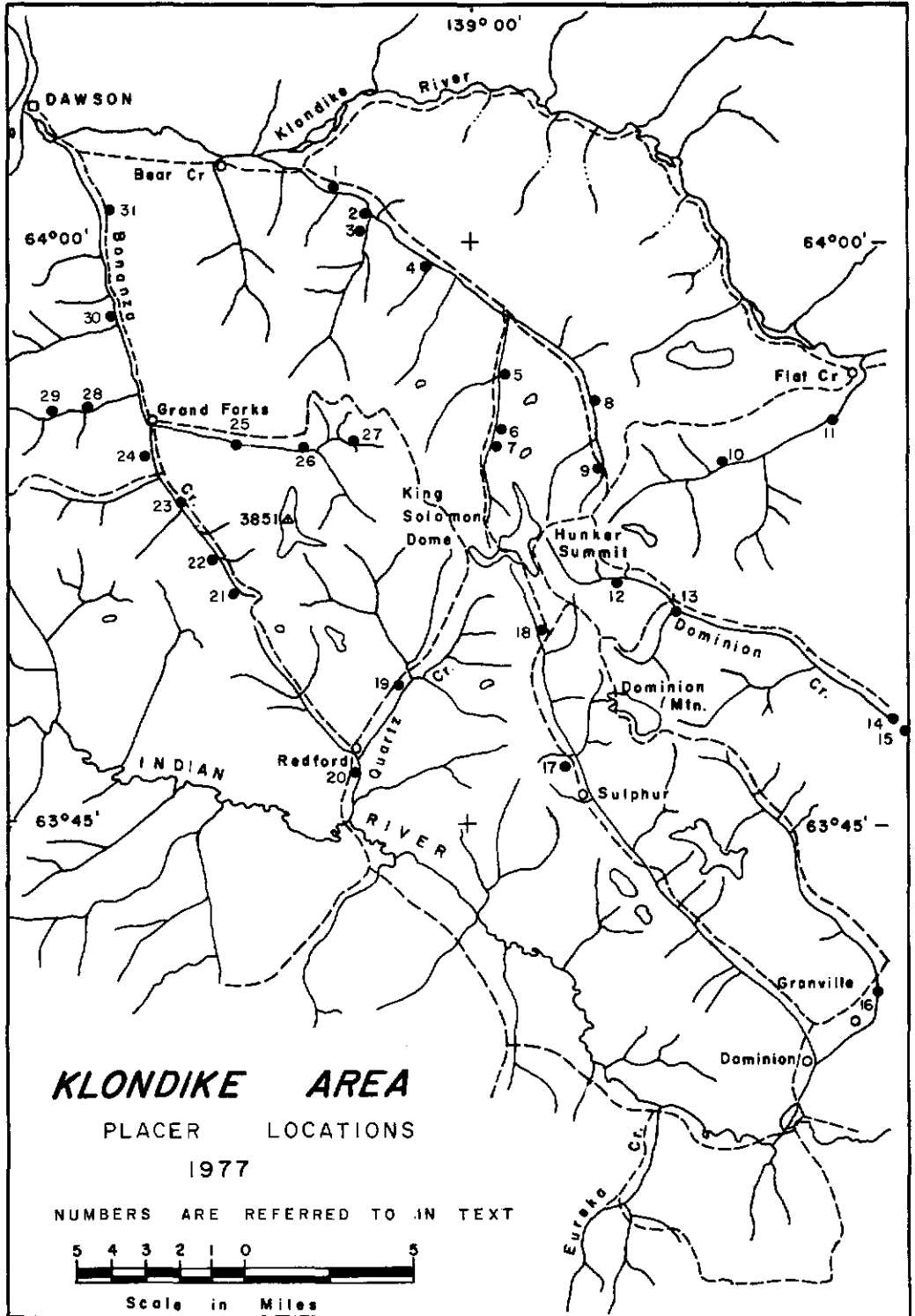
(9) Oak Bay Manor-Ten Mile Mining
Ten Mile Creek

115 N 8
(63°35'N, 140°05'W)

Reference: Sinclair et al (1976, p. 176).

This company continued mining its holdings on Ten Mile Creek about two miles upstream from the junction with the Sixtymile River. During the season the company put in a series of 8 right limit cuts on Claims 2 to 6 inclusive, mining an area 500 feet wide by 1,500 feet long. The total section here is about 25 feet thick with 6 to 8 feet of muck and 5 to 8 feet of barren gravel being stripped and the pay zone, averaging 10 feet, being sluiced. The bedrock is a blocky marble with much gold being caught in cracks. Unlike the soft schist bedrock at many other properties, this marble makes mining of the upper two feet or so of bedrock difficult.

They operated part of the season with 2 D-8 bulldozers, adding a third D-8 and a 980-B 5 1/2 yard front end loader in July of 1976. Fuel and heavy equipment was brought up the Yukon by barge to the mouth of the Sixtymile and from there to the property over an access tote road. Light servicing during the mining season was done by helicopter from Dawson City.



KLONDIKE AREA

- (1) K. and J. Tatlow
Hunker Creek

116 B 3
(64°01'N, 139°09'W)

Reference: Sinclair et al (1976, p. 177).

The Tatlows mined on lower Hunker Creek putting in one cut of 11,000 bedrock square feet on the extreme right limit (Claim 24) and cuts totalling 21,000 bedrock square feet on the left limit (Claims 14 and 16). The left limit section consists of up to 50 feet of muck - an ice rich silt containing some ice lenses to 20 feet thick, with 1 to 2 feet of pay gravel at the base. On the right limit an average of 12 feet, locally to 20 feet, of overburden rests on 3 feet of pay gravels. Equipment was one D-8 bulldozer.

- (2) Miben Mining Limited
Hunker Creek

116 B 3
(64°00'N, 139°06'W)

Reference: Sinclair et al (1976, p. 177).

M. Stutter and B. Warnsby continued mining their bench claims on Dago Hill on the left limit of Hunker Creek. Water is pumped 340 feet up the hill and delivered to the monitors at a 160-foot head. The 500 h.p. vertical turbine pump delivers 4,200 gpm at this pressure. They mined 200,000 cubic yards of White Channels gravels, sluicing the entire section which, in places is greater than 100 feet thick. Moving of pipe and bulldozing of some of the gravels is done by one D-6, one D-7 and one 824 Caterpillar rubber-tired bulldozer. The company uses two sluice-boxes with an effective overhead manifold system of directing water into the boxes. Beyond the sluice-boxes, steel flumes, one 250 feet long, the other 400 feet long in 1976 carried the tailings to the edge of the hill. Riffles placed in these flumes during the current season recovered fine gold far down the tailings flumes.

- (3) I. and G. Bremner
Last Chance Creek

116 B 3
(64°00'N, 139°07'W)

Reference: Sinclair et al (1976, p. 177).

The couple mined on Bryan Bench of Discovery Hill on the left limit of Last Chance Creek about 300 feet above the creek. They operate with a gravity system conveying the water by means of a ditch 5 miles long to a pipeline and monitor. The section consists of White Channel gravels to 50 feet thick. At the base is a blue clay, a decomposition product from the underlying volcanic bedrock. 8,000 bedrock square feet were mined in a season of chronic water shortage.

- (4) A. Kosuta
Eighty Pup

116 B 3
(64°00.5'N, 139°05'W)

Reference: Sinclair et al (1976, p. 177).

Mr. Kosuta, using a monitor, stripped black muck containing some bones and ivory from Claim 1 on Eighty Pup, a left limit tributary, of Hunker Creek. The cut is 125 feet long by 50 feet wide. The silt, 40 feet deep, overlies 4 feet of pay gravels which rest on andesite bedrock. Also during the 1976 season he sluiced a bench on Creek Claim of Independence Creek, making a cut 100 feet long by 60 feet wide and 6 feet deep using a D-6 bulldozer and monitor.

- (5) O. and M. Lunde 115 0 15
Gold Bottom Creek (63°57'N, 138°59'W)

Reference: Sinclair et al (1976, p. 178).

This couple mined on Claim 14 above the mouth on Gold Bottom Creek, completing a centre cut of 20,000 bedrock square feet and a left limit cut of 22,000 bedrock square feet. They sluice the bottom 4 feet of a gravel section which averages 9 feet thick. They used a D-7 bulldozer until mid-August and completed the season with a TD-15.

- (6) M. and D. Crockett 115 0 15
Gold Bottom Creek (63°55'N, 138°59'W)

Reference: Sinclair et al (1976, p. 178).

The Crocketts put in 4 full width cuts across Gold Bottom Creek on Claims 36 and 37, each 140 feet wide by 110 feet long, using a D-8 bulldozer. The gravel and silt section totals 12 feet of which the bottom 4 feet are sluiced.

- (7) O. Juuso 115 0 15
Gold Bottom Creek (63°54'N, 138°59'W)

Mr. Juuso holds 5 claims above Crockett on Gold Bottom Creek. Starting in 1976 he worked 3 months, partly with a 2 1/4 yard front end loader and partly with a D-8 bulldozer. He sluiced the bottom 2 feet of a cut 200 feet long by 100 feet wide on his second claim up the creek.

- (8) J. Erickson, H. Liedtke 115 0 15
Hunker Creek (63°54'N, 138°53'W)

These men mined on Claim 2 Above Discovery on Hunker Creek, working both sides of the creek and sluicing one cut 200 feet long by 50 feet wide using a D-8 bulldozer and pump driven monitor. The section ranges from 9 feet in the creek to 40 feet at the lateral limit. The bottom 6 feet is gravel, the remainder black silt muck.

- (9) P. Erickson, D. Gritzka 115 0 15
Hunker Creek (63°54'N, 138°53'W)

Reference: Sinclair et al (1976, p. 178).

These operators mine on Claim 26 Above Discovery in the narrow Right Fork of Hunker Creek. During the 1976 season, working with a D-4 traxcavator and part time use of a D-8, 2 cuts were put in - one of 4,000 bedrock square feet and one of 3,000 bedrock square feet. The mined area ranges from 30 to 60 feet in width.

- (10) J. Stewart 115 0 15
Allgold Creek (63°54'N, 138°45'W)

This operator, starting in 1975, mined about 35,000 bedrock square feet that year and a further 35,000 bedrock square feet in 1976. Workings are on a left limit bench 125 feet above the creek. Water for sluicing is pumped from the creek.

- (11) K. and S. Placers 115 0 15
Allgold Creek (63°56'N, 138°37'W)

Reference: Sinclair et al (1976, p. 181).

Kinakins, working on claims 7 and 8 above the mouth on Allgold Creek mined a strip on the right limit bank 30 feet wide by 800 feet long, the gravel section here is 9 feet thick, all of which is sluiced. Equipment used was 2 D-7 bulldozers.

- (12) Ian Hamilton 115 0 15
Dominion Creek (63°52'N, 138°52'W)

Mr. Hamilton holds claims on the upper part of Dominion Creek near Discovery Pup. Starting in 1973 he put in a drain and further preparatory work including stripping during 1974 and 1975. During 1976 he did further stripping and a minor amount of sluicing.

- (13) A. and N. Burgelman 115 0 15
Dominion Creek (63°50'N, 138°49'W)

Reference: Sinclair et al (1976, p. 179).

Operations were largely stripping at the mouth of Caribou Creek a right limit tributary of Dominion Creek.

- (14) A. and N. Sailer 115 0 15
Dominion Creek (63°48'N, 138°36'W)

Reference:

Mr. and Mrs. Sailer continued to mine on the left limit bench of lower Dominion Creek downstream from the mouth of Nevada Creek. Working part of the time with a D-8 and the rest with a D-6 they mined 40,000 bedrock square feet on the Nazareno Claim (opposite Creek Claim 81) where the section consists of 8 to 10 feet of muck and 10 to 12 feet of gravel. A monitor is mounted on the sluice box to break up and help wash the gravel. Stripping of muck and sand from 40,000 bedrock square feet of Claims 85 and 86 was done in preparation for the 1977 season.

- (15) G.A. and L.W. Gatenby
Dominion Creek (63°46'N, 138°35'W)

During 1976 the Gatenbys, working partly by hand and partly using a one-half yard front end loader, sluiced approximately 500 cubic yards of high grade gravels on Claims PAT 8, 9 and 10 on Dominion Creek just above the mouth of Hunter Creek. Mining is on a low left limit bench, formerly mined by dredge. The pay gravels form a remnant ridge which had constituted the dyke which retained the dredge pond.

- (16) D. Rintoul 115 0 15
Dominion Creek (63°45'N, 138°31'W)

Reference: Sinclair et al (1976, p. 179).

Mr. Rintoul mined part of the season on lower Dominion Creek using a system of draglines to mine below water level. One dragline moved gravels directly into the dump box, the other was used to stack tailings.

In preparation for future mining on his 2 mile lease on upper Gold Run Creek, a right limit tributary of Dominion Creek, Mr. Rintoul stripped by monitor 2.5 feet of overburden from an area 100 feet by 80 feet. He sank a shaft on this prospect during October and November. The section, from the base up, consists of broken chlorite quartz schist rubble from the bedrock, 6 feet of gravel and 15 feet of silty muck.

- (17) R. and B. Gibson 115 0 15
Sulphur Creek (63°47'N, 138°54'W)

Reference: Sinclair et al (1976, p. 179).

Mr. and Mrs. Gibson hold 16 claims down Sulphur Creek from the mouth of Friday Gulch and a total of 21 claims in the area. During 1976 they mined 20,000 bedrock square feet (200 feet by 100 feet) from the Sulphur Bench at Friday Gulch on the Lucky Lady claim. About 10 feet of grey brown silt is stripped. The lower few feet of gravel and upper 2 feet of slabby quartz-muscovite schist bedrock is sluiced.

- (18) K. Djukestein 115 0 15
Sulphur Creek (63°50'N, 138°55'W)

Reference: Sinclair et al (1976, p. 179).

As in 1975, Mr. Djukestein operated with two 12 yard highway scrapers, a D-7 and a D-8 bulldozer. During 1976, with 2 hired men he mined 100,000 bedrock square feet in a cut 500 feet long by 200 feet wide. The ground was that originally prepared for dredging in the late 1950's and early 1960's. The bottom 6 to 10 feet of the present 18 feet of section is sluiced. 1976 production was 816 crude ounces gold.

- (19) R. and L. Mining Company 115 0 14
Quartz Creek (63°48'N, 139°04'W)

Reference: Sinclair et al (1976, p. 180).

W. Rasmusson and J. Lacross continued mining on Quartz Creek on Claim 5 Below Amax Discovery. They completed two centre cuts below the forks, one of 45,000 bedrock square feet, the other of 50,000 bedrock square feet. They stripped 25 feet of black muck overburden from 150,000 square feet on the left limit of Quartz Creek in preparation for 1977 mining. They used intermittently two D-8 and two D-9 bulldozers and a 1 3/4 yard dragline.

- (20) Ballarat Mines Limited 115 0 14
Quartz Creek (63°47'N, 139°06'W)

Reference: Sinclair et al (1976, p. 180).

The Schmidt operation was similar to that in 1975, mining on the right limit of Quartz Creek on Claims 20 and 21. A cut 500 feet long by 150 feet wide was made in uniform gravels to 50 feet deep of which the lower 15 feet is sluiced. Two D-8 bulldozers are used in moving gravels to a D-8 powered elevator conveyor system which provides for removal of gravels from the mining area and a high tailings discharge. Water is pumped from Quartz Creek and re-circulated.

- (21) J. Lamontagne
Eldorado Creek

115 0 14
(63°51'N, 139°15'W)

Reference: Sinclair et al (1976, p. 180).

Mr. Lamontagne prepared ground during the 1976 season at the junction of Eldorado Creek and Chief Gulch using a D-6 bulldozer. He stripped some 30 feet of organic muck containing much woody material from a left limit cut 500 feet long by 100 feet wide below the junction of the two creeks. On Eldorado Creek above the junction 15 to 20 feet were stripped from an area 400 feet by 100 feet in which sand and gravel lenses are present within the muck section. Bedrock is a fissile chlorite schist.

- (22) D. Johnson
Eldorado Creek

115 0 14
(63°52'N, 139°16'W)

D. Johnson holds a total of 10 claims on Eldorado, Gay Gulch and Oro Gulch. He started on the creeks in 1973 doing hand mining and testing. In 1975 he began mining with a 920 Series rubber-tired, front end loader having 1 3/4 yards capacity. During the two season, 1975 and 1976, he put in a cut 200 feet long by 100 feet wide on Eldorado just below the mouth of Gay Gulch. Normally he strips 10 feet of overburden and sluices the lower 8 to 15 feet, although the pay is strongly concentrated at bedrock. The bedrock is a muscovite-chlorite schist with abundant quartz veins. Production was approximately 300 crude ounces gold in each of 1975 and 1976.

- (23) E. Gilmer
E. Vandehey
Eldorado Creek

115 0 14
(63°53'N, 139°18'W)

These operators hold by lease and ownership Claims 27, 27A and 28 on Eldorado Creek and the first claim on Nugget Gulch. They started testing in 1975 using a 4 inch diameter suction dredge and mined in 1976 with two Allis Chalmers tractors (D-4 equivalent), one as a bulldozer, the other as a front end loader. During the mining season they stripped roughly 10,000 cubic yards of waste and sluiced about 4,000 cubic yards, producing 160 crude ounces gold from gravels grading \$7.50 per cubic yard.

Mining is on a left limit bench a few feet above the creek bed. The section consists of 4 to 5 feet of moss and peat underlain by about 20 feet of muck, then 2 to 4 feet of pay gravel. They rip the top foot of bedrock and recover most of the coarse gold from there.

- (24) R. and B. Johnson
Eldorado Creek

115 0 14
(63°53'N, 139°20'W)

Reference: Sinclair et al (1976, p. 180).

R. and B. Johnson continued working the left limit bench at No. 11 Eldorado. During 1976 they worked part time, largely stripping with monitor and a D-6 bulldozer. The bedrock of the bench is about 140 feet above creek level. The grey, decomposed schist is overlain by 5 feet of white quartz and schist fragments in which the gold grains are thick. Above this is a reddish brown dirt and gravel section 20 feet thick which carries a small amount of gold.

- (25) B. Bryant
Upper Bonanza Creek

115 0 14
(63°55'N, 139°16'W)

Reference: Sinclair et al (1976, p. 18).

Mr. Bryant holds Claims 19, 20 and 21 on Upper Bonanza Creek at the mouth of Gauvin Gulch, 3 bench claims on the right limit of Gauvin Gulch and approximately 2 miles in claims and leases on the gulch itself. The principal mining target is the White Channel gravel deposit which forms a bench on the gulch 150 feet above Upper Bonanza Creek. 1976 operations were plagued by equipment breakdowns, especially of the pump which was to deliver water from the creek to the bench, but to the two D-8 bulldozers as well, reducing sluicing to 8 hours on Gauvin Gulch and 22 hours on Upper Bonanza Creek.

- (26) F. Perret
Bonanza Creek

115 0 14
(63°55'N, 139°13'W)

Reference: Sinclair et al (1976, p. 181).

Mr. Perret, who has mined for several years on upper Bonanza down from the mouth of Victoria Gulch, did not sluice during the 1976 season, but did prepare some ground for future mining.

- (27) D. Coombs
Bonanza Creek

115 0 14
(63°48'N, 139°08'W)

Reference: Sinclair et al (1976, p. 180).

Mr. Coombs during 1976 mined Upper Bonanza Creek on the second claim below the mouth of Ready Bullion Creek, putting in a cut 150 feet long by about 50 feet deep, the full width of the narrow valley. He mines a section 10 feet deep, consisting of 2 feet of platy muscovite-chlorite-quartz schist, 3 to 4 feet of angular schist and gneiss fragments and 5 feet of brown, silty soil with slide rock fragments. Coombs mines by pushing the gravels, slide rock and broken bedrock to the elevated, wooden sluice box. A 3/4 yard dragline moves the material to the dump box of the sluice. The gold, rough and coarse, is caught in the punch plate of the dump box and in the upper few riffles of the sluice. Water is pumped to the sluice and recirculated from the settling pond.

- (28) H. Yoder
Adams Gulch

115 0 14
(63°55'N, 139°23'W)

Mr. Yoder mined on Claims 8, 9 and 11 on Adams Gulch for about one month during 1976, using a front end loader and sluicing a small amount of gravel.

- (29) G. Caley
Adams Gulch

115 0 14
(63°55'N, 139°24'W)

Mr. Caley has mined on Adams Gulch, a left limit tributary of Bonanza Creek, since 1975, holding Claims 6 and 12 to 19 inclusive. Using a D-7 bulldozer he put in a series of centre cuts on Claims 13, 14 and 15, mining about 750 feet of the creek in 1975 and the same in 1976. Each cut, 50 to 80 feet wide is about half the width of the narrow gulch and 175 feet long. He strips about 17 feet of muck. The gravel section of about 3 feet has been thoroughly hand mined and essentially all the gold recovered is from the top foot of broken bedrock.

- (30) J. and R. Archibald
Bonanza Creek

115 0 14
(63°58'N, 139°20'W)

Reference: Sinclair et al (1975, p. 169).

J. and R. Archibald continued mining on Bonanza where they have operated since 1966, putting in a cut 250 feet long by 150 feet wide at the south end of their 3 bench claims. The bench, on the right limit of Bonanza, is here 150 feet above the creek. The section consists of 8 to 10 feet of fine muck and 20 feet of gravel. The slabby quartz-chlorite schist bedrock with steeply dipping foliation has trapped the gold and 4 to 6 feet of bedrock is successfully mined. Equipment used is 2 D-6 bulldozers and pump.

- (31) C. Nicholson
Lovett Hill

116 B 3
(64°02'N, 139°23'W)

Mr. Nicholson during 1976 completed the cut worked on in 1974 and 1975 on Lovett Hill in largely White Channel gravels on Lovett Discovery Claim. The cut totals approximately 13,000 bedrock square feet, some 9,000 of which was mined during 1976. Equipment used was a D-6 bulldozer for stripping and a 920 series 2 yard front end loader for feeding the grizzly mounted sluice. Water is pumped in two stages from Bonanza Creek. The first lift is 200 feet to a clay lined holding pond; the second a further 40 feet to the sluice. Tailings water filters through tailings back to the pond and is recirculated. The back side of the cut is roughly 30 feet high. The lower 5 feet of chloritic quartzite bedrock is sluiced. The bedrock surface is irregular with the best pay here being on a bedrock high.

- (32) Territorial Gold Placers Limited
Black Hills Creek
& Henderson Creek

115 0 6, 7
(63°27'N, 138°50'W)
(63°24'N, 139°07'W)

Reference: Sinclair et al (1976, p. 183).

The 1976 operations of this company on Black Hills Creek were just upstream from the mouth of Larsen Creek. Six cuts in the middle of the valley, and on the left limit, a total area 300 by 350 feet, were mined. The section consists of some 4 to 6 feet of gravel overlain by 6 to 8 feet of black muck and peat. In addition to the above, two side-by-side cuts were mined on the right limit just above the mouth of Dome Creek; the area being 300 feet long by 225 feet wide. Bedrock in this part of the Black Hills Creek valley is a flaggy quartzite schist. Production for the 1976 Black Hills operation was 1,955 troy ounces of crude gold averaging 760 fine, from 61,200 yards of gravel sluiced.

On Henderson Creek mining was at and upstream from Golden Gate Creek. Mining the complete valley bottom, the company put in seven cuts totalling 53,000 cubic yards of gravel from an area 200 to 250 feet wide by 1200 feet long. The section consists of about 5 feet of gravel overlain by 6 to 8 feet of organic muck. Bedrock here is also a quartz rich schist. Production from Henderson Creek for 1976 was 2,216 ounces crude gold, averaging 720 fine.

An area 5 miles downstream from the 1976 working was stripped in preparation for 1977 mining.

Du Pont of Canada Exploration Limited
Hunker Creek

116 B 3
(64°01'N, 139°12'W)

Reference: Sinclair and Gilbert (1975, p. 129).

Claims: BBDU 1, 2, 3

Prospecting Leases: PL 3830, 3831

Location and Access:

The claims and leases are situated at the Junction of the Dawson-Stewart Crossing Highway and the Hunker Creek road.

Description:

The prospecting leases cover undredged terraces with placer potential between Bear Creek and Arlington at the mouth of Hunker Creek.

Current Work and Results:

A topographic reconnaissance survey at a scale of 1:10,000 was conducted on the leases and claims. Seven holes were drilled by a 11.4 cm (ID) Becker churn drill on the leases and BBDU-3.

MAYO-McQUESTEN AREA

- (1) Bardusan Placers Limited
Thunder Gulch

105 M 14
(63°55'N, 135°15'W)

Reference: Sinclair et al (1976, p. 184).

H. Barchan holds 3 miles on Lightning Creek from just above Keno City and miles of Thunder Gulch up from the mouth. During 1976 he mined on Claim 7 above the mouth of Thunder Gulch, putting in one cut 300 feet long, 50 feet wide and up to 45 feet deep, (approximately 25,000 cubic yards) using a D-7 bulldozer and a 3 cubic yard capacity rubber tired front end loader. There is a change in bedrock type from quartzite to an increasing proportion of schist farther up the creek. The gravels thicken upstream, resulting in a significant increase in the thickness of the section mined.

- (2) W. Malicky and M. Alexander
Duncan Creek

105 M 14
(63°52'N, 135°15'W)

These men mined for two weeks on Upper Duncan Creek during the 1976 season in the canyon one mile above the mouth, using a D-8 bulldozer and a John Deere front end loader, sluicing 6 feet of gravel and 2 to 3 feet of bedrock. The ground, heavily hand mined earlier, as indicated by numerous old workings, contains remanant pockets of high grade gravels.

- (3) F. Taylor and J. Brooks
Duncan Creek

105 M 14
(63°52'N, 135°27'W)

Reference: Sinclair et al (1976, p. 184).

During 1976 these operators continued mining on Duncan Creek, working through a narrow section of the creek valley on the upper part of Claim 2 and lower part of Claim 3. Left limit cuts 60 to 120 feet wide averaging 7 feet deep totalling 600 feet along the creek were made. A 3 1/2 cubic yard capacity rubber tired front end loader was used to feed gravels to the sluice with a grizzly above to reject large boulders. Still larger boulders are simply moved aside by the loader.

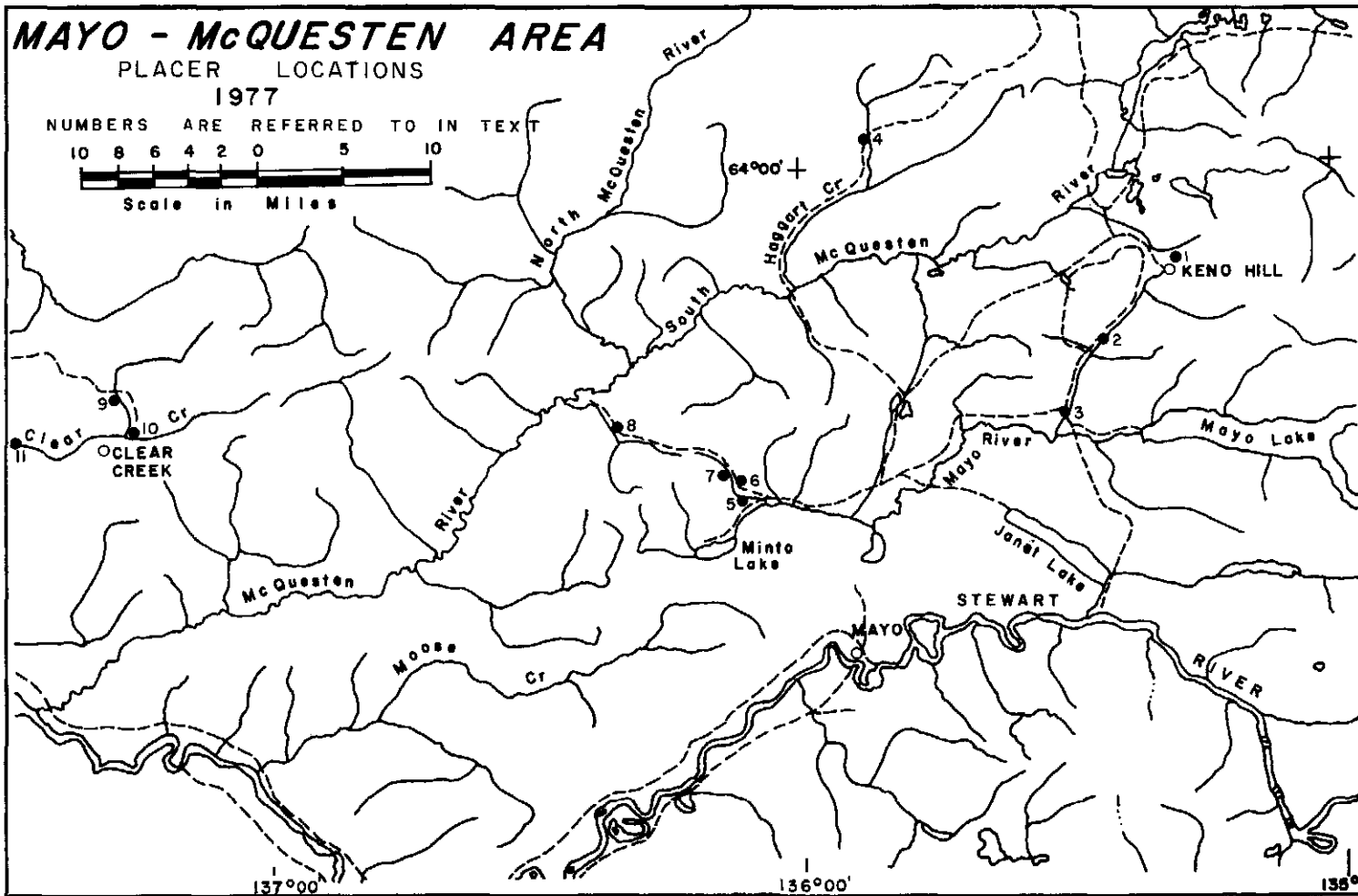
- (4) Darron Placers
Dublin Gulch

106 D 4
(64°02'N, 135°50'W)

Reference: Sinclair et al (1976, p. 185).

During 1976 R. Holway and D. Duensing with a crew of 4 hired men put in one cut of 16,000 cubic yards on the extreme left limit of Dublin Gulch at the upper end of Claim 3, sluicing up to 40 feet of gravel. A second cut of 27,000 cubic yards was made 500 feet downstream of the first on Claim 2. Using both bulldozers and a monitor they strip up to 70 feet of silt with abundant ice on the bank side of the cuts. They used the same mining equipment as in 1975.

During the season a major effort was made to recover the abundant fine scheelite. A drop box was placed at the lower end of the main sluice, conveying the fines into a second sluice box. The concentrate from this, containing fine gold and scheelite was stored in 45 gallon drums for further processing.



- (5) E. and L. Bleiler
Hight Creek

115 P 16
(63°44'N, 136°08'W)

Reference: Sinclair et al (1976, p. 184).

These men mined along the left limit of the creek, the center having been worked thoroughly by earlier miners, ending about 500 feet below McRae Creek, putting in 6 cuts, each an average of 140 feet long and 80 to 100 feet wide. Of the gravel section, 20 feet deep, roughly half is stripped and half sluiced; the amount sluiced during the season being 55,000 cubic yards. Equipment consists of a D-8, a 1 3/4 cubic yard tracked front end loader and a 4 cubic yard front end loader.

- (6) W. Gordon and W. Tuck
Rudolf Gulch

115 P 16
(63°46'N, 136°09'W)

Reference: Sinclair et al (1976, p. 185).

These men prospected the creek in 1975, staking a 1 mile lease on Rudolf Gulch and 2,000 feet on Hight Creek immediately below Rudolf. Mining immediately up from the mouth of Rudolf Gulch, these operators put in one cut 50 feet by 100 feet long and one 50 feet long taking in the full width of the gulch. The unconsolidated section is some 15 feet thick consisting of about 4 feet of unsorted stream gravel containing granitic boulders to 3 feet in diameter followed upwards by 3 feet of limonite cemented, angular, quartz-muscovite schist slide rock. Above this is 3 feet of manganese stained and cemented slide rock with minor quartz pebbles with the remainder of the section being uncemented, largely slide rock material. The pay is erratic but concentrated adjacent to the large granite boulders. Scheelite is present at the mouth where Rudolf joins Hight Creek.

Water is provided by a ditch, 200 feet of 10 inch pipe and a 3 inch diameter monitor, used largely for stripping the slide rock. Gravel is moved to the sluice and tailings stacked by two small front end loaders - a rubber tired 1 1/2 yard and a small tracked loader.

- (7) F. Erl
Hight Creek

115 P 9
(63°45'N, 136°09'W)

Reference: Sinclair et al (1976, p. 184).

Mr. Erl holds a total of 16 claims on the upper part of Hight Creek. During 1976 he mined on the lowest of these, immediately upstream from the mouth of Rudolf Gulch. Here a series of right limit benches contain small amounts of gravel and abundant sericite phyllite and schist slide rock. Mr. Erl worked the second bench, approximately 100 feet above the creek, putting in one small cut 40 feet by 50 feet. He strips about 10 feet with a D-8 bulldozer and moves the remaining 8 feet plus a foot or so of the soft bedrock to the grizzly equipped sluice with a tracked 1 1/2 yard front end loader. Water is supplied to the workings by means of a 1 mile ditch and 200 feet of 6 inch diameter pipe allowing the use of a low pressure monitor.

- (8) C. and H. Klippert
Johnson Creek

115 P 15
(63°47'N, 136°21'W)

Klipperts own 10 claims on Johnson Creek, downstream from the mouth of Sabbath Creek, on the west side of Scheelite Dome. Starting on the 4th claim from the downstream end of the property, they did 2 weeks of stripping of black muck with a TD-25 bulldozer and a rubber tired front end loader and a few hours of test sluicing.

- (9) W. Genier and T. Thompson
Clear Creek

115 P 14
(63°51'N, 137°10'W)

Reference: Sinclair et al (1976, p. 185).

These operators hold 4 miles of Clear Creek; during 1976 they mined 2,000 feet downstream from Lewis Gulch, mining the full width of the creek gravels, 200 feet. They mined 500 feet along the creek giving a total of approximately 100,000 bedrock square feet. The gravel section is 10 to 12 feet thick of which the bottom 6 to 7 feet is sluiced. Boulders up to 4 feet in diameter complicate the mining. The lower control on the mining is a blue grey clay, the decomposition product of the graphitic phyllite bedrock.

- (10) Clear Creek Gold Mines
Clear Creek

115 P 14
(63°48'N, 137°16'W)

Reference: Sinclair et al (1976, p. 185).

W. Scott and L. Logie with a crew of 4 hired men mined on Barney Gulch, a left limit tributary of Clear Creek, making a full width cut 100 feet wide up the gulch. They work with one D-8 and one D-6 bulldozer.

- (11) G. Regimbald
Clear Creek

115 P 13
(63°45'N, 137°38'W)

G. Regimbald holds 4 miles of leases on Clear Creek up from the mouth of Barlow Creek. During the 1976 season he did 5 weeks of preparatory stripping with a D-7 bulldozer and test pitting on the second and third miles up from Barlow Creek. A small, 4 inch suction dredge was used in the testing and found to be effective where the gravels were fine and uniform.

Fourth of July Creek
Dupont of Canada Exploration Limited

115 G 1
(61°10'N, 138°03'W)

Reference: Muller (1967).

Claims: Placer Leases 3089 and 3354

Location and Access:

The leases are located in the Ruby Mountain Range about 53.1 km northwest of Haines Junction on the Fourth of July Creek. Access to the property is by air to a small airstrip on the south end of the property. There is also a 48.3 km tote road to the property from the Alaska Highway via Cultus Creek.

History:

Recent work has consisted of building the airstrip and tote roads up the creeks and also some trenching. Some shafts were sunk and production attained in the period 1910-1914.

Description:

The area of the property is underlain by the Yukon Schist Complex. Overlying this is a boulder till which is in turn overlain by recent gravels.

Current Work and Results:

A refraction seismic survey using a 12-channel seismic refraction system with 331 m spreads and explosives was used. Bedrock was determined on only two lines because of permafrost and/or too great a depth to bedrock. Depth to bedrock on these lines varied from 45.7 m to 122 m. No buried stream channels were identified. Stream and bank material were sampled for gold and heavy mineral content.

KLUANE AREA

Burwash Mining Company Limited
Burwash Creek

115 G 6
(61°23'N, 139°17'W)

Reference: Sinclair et al (1976, p. 186).

H. Besner, with 2 hired men, mined the first claim on the downstream end of his Burwash Creek holdings, putting in a cut 150 feet wide by 200 feet long and 20 feet deep in bouldery gravel. Equipment used was that of previous years - two D-8 bulldozers and a 3/4 yard power shovel.

W. Jones
Burwash Creek

115 G 6
(61°23'N, 139°19'W)

Mr. and Mrs. Jones mine on the upper 2 claims of H. Besner on Burwash Creek above the mouth of Tetamagouche Creek, starting in 1975. In 1976, operating with a D-8 bulldozer and a rubber tired front end loader they put in one right limit cut 100 by 200 feet and stripped the overlying muck and some gravel from a second area 200 feet by 300 feet.

LIVINGSTONE CREEK

Constellation Mines
Livingstone Creek

105 E 8
(61°22'N, 134°20'W)

Reference: Sinclair et al (1976, p. 187).

M. Furstner holds 36 creek claims and 3 bench claims on Livingstone Creek. During 1976, Furstner, R. Miller and G. McCully mined on Discovery Claim, leased from B. Mosby, sluicing roughly 10,000 cubic yards of gravel. The gravel section is irregular, but up to 40 feet thick, all of which is sluiced. Water is conveyed by ditch and a 1,300-foot pipeline, reduced in diameter from 12 inches through 10 inches to 8 inches and available at the monitor with a head of 300 feet.

R. Asuchak, J. Nakamura, G. Asuchak
Moose Creek

105 E 8
(61°17'N, 134°20'W)

Reference: Sinclair et al (1976, p. 187).

These men hold 4 claims up from the mouth of Moose Creek, a left limit tributary of Big Salmon River. Mrs. G. Asuchak holds a two mile lease on Big Salmon downstream from Moose Creek. The operators sluiced for a week in early August and made repairs to the airstrip built in 1975. Moose Creek emerges from a narrow canyon for 600 feet before flowing into the Big Salmon River. Work to date has been on this lower portion of the Creek. Boulders to 6 feet in diameter are present in a gravel section up to 20 feet thick over irregular bedrock.

G. Asuchak also worked on nearby Lake Creek in the spring, stripping with a monitor.

DAWSON RANGE AREA

H. Larsen
Nansen Creek

115 I 3
(62°04'N, 137°13'W)

H. Larsen holds a one mile lease on Nansen Creek and a one mile lease on Discovery Creek, starting from the mouths. He did some stripping and test mining with a D-8 bulldozer. Angular gravels are 6 to 10 feet thick.

J. Yaklin
Nansen Creek

115 I 6
(62°06'N, 137°10'W)

Reference: Sinclair et al (1976, p. 190).

Mr. Yaklin continued mining on Nansen Creek, working claims No. 7 and 8 Above the mouth. He monitored one cut 14 feet wide by 200 feet long to 12 feet deep without reaching bedrock. A second cut, 75 feet long, 45 feet wide and 10-12 feet deep was put in. Pay is in the bottom 1 1/2 feet of this cut immediately above a clay horizon.

G. Van Bibber and A. McDiarmid
Sonora Gulch, Hayes Creek

115 J 9
(62°40'N, 138°03'W)

These men hold a one mile lease on Sonora Gulch, a left limit tributary of Hayes Creek. Starting in 1975, they continued preparations for mining in 1976, doing largely stripping but some sluicing as well. Equipment used was a Caterpillar 920 rubber tired front end loader and a John Deere tracked front end loader.

Silgo Mines Limited
Canadian Creek

115 J 15
(62°45'N, 138°50'W)

Mr. R. MacKamey mined for about 10 days on Canadian Creek 600 feet above the confluence of Patton Gulch and Canadian Creek, on claims held by R. Carlson. Equipment used was a TD-25 bulldozer and a 4 yard rubber tired Michigan front end loader. As well as a small amount of gold roughly one-half ton of tungsten concentrate was recovered. Operations were seriously held up by a shortage of water and equipment problems.

CORE STORED IN LIBRARY

COMPANY	PROPERTY	N.T.S.	No. of HOLES	REMARKS
Sovereign Metals Ltd.	Mel	95-D-6	8	C
Archer Cathro Hyland Joint Venture	Porker Claims	95-D-5, 12	4	C
Archer Cathro	Nite Claims	105-B-7	6	C
Boswell River Mines	Boswell River	105-C-13	spilled	C
Arctic Gold & Silver Mines Limited	Arctic Mine	105-D-2	15	C
International Mine Services	Peerless Claims Arctic Mine Area	105-D-2	14	C
Venus Mines	Montana Mt.	105-D-2	64	C
M. Nichiporich	Sekulman	105-D-9	11	C
Whitehorse Copper	Valerie	105-D-10, 11	1	C
United Keno Hill	King Lake	105-D-14	1	C
Joe Lindsay	Quiet Lake	105-F-3	3	C
Canalask Nickel Syndicate	Micro	105-F-15, 16	1	C
Finalyson Joint Venture-Archer Cathro	Fetish	105-G-8	4	C
Cyprus Explorations	Lyn	105-K-3	4	
Cyprus Anvil	Rose Creek	105-K-6	11	C
Northern Homestake	Hal Claims	105-K-11	2	C
Ogilvie Joint Venture	Jason	105-O-1	20	C
Hudson Bay	Tom	105-O-8	61	C
McIntyre Mines	Tom	106-B-4	1	C
Norcen Energy Res. (Great Plains)	Harrison Creek	106-C-7	3	C
Archer Cathro Ogilvie Joint Venture	Pterd	106-C-14	5	C
Archer Cathro	Bond	106-D-10	3	C

COMPANY	PROPERTY	N.T.S.	No. of HOLES	REMARKS
Archer Cathro Ogilvie Joint Venture	Flunk	106-E-2	3	C
Archer Cathro Ogilvie Joint Venture	M.S.T.	106-E-3	3	C
Canex Placer	Panther Claims B.C.	114	6	C
Jackpot Copper	Tatshenshini	115-A-3	4	C
Phelps Dodge	Green Eagle, Joy	115-A-8	1	
Hudson Bay	Quill Creek	115-G-5	52	C
Hudson-Yukon Mining Company Limited	Wellgreen	115-G-5	65	C
Imperial Oil	Cork	115-G-6	10	C
Teslin Expl. Ltd.	Teslin	115-H-8	1	C
Arjay Kirker Resources Ltd. (Archer Cathro)	Division Mtn.	115-H-8	6	C
Arsenault/Versluce	Mack's Copper	115-H-9	1	C
Tantalus Butte Mine Anvil Mining Corp.	Tantalus Butte	115-I-1	5	C
Cyprus Explorations	Mt. Nansen	115-I-3	10	C
Area Explorations	Mt. Nansen	115-I-3	2	C
Cyprus Explorations	Mt. Nansen	115-I-3	3	C
Kangaroo (Cyprus)	Mt. Nansen	115-I-3	5	C
Archer Cathro	Cash (Fox, Bear, Car)	115-I-5	20	C
Rayrock Mines	Laforma Property	115-I-6	2	C
Dawson Range Joint Venture (Archer Cathro)	Williams Creek (Boy)	115-I-7	5	C
Canex Aerial Expl.	March (Granite Mtn.)	115-I-7	10	C
United Keno Hill	Minto	115-I-11	1	C
Kerr Addison	Won	115-I-13	6	C
Occidental Petroleum	Pelly & Dary Claims	115-I-14	3	C
Beach Gold Mines	Ura	115-P-13, 14	4	C

C in Remarks indicates that core is confidential and permission of company is required for viewing.

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