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REPORT ON  
KIMBERLEY COPPER MINES  
PROPERTY  
KNUTSFORT-KAMLOOPS AREA

By: Velocity Surveys  
April, 1968

REPORT  
ON PROPERTY OF

KIMBERLEY COPPER MINES LIMITED (N.P.L.)

KNUTSFORT-KAMLOOPS AREA  
KAMLOOPS MINING DIVISION  
PROVINCE OF BRITISH COLUMBIA

VELOCITY SURVEYS LIMITED

APRIL

1968

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Property

The property under discussion consists of some thirty-six patented and unpatented mineral claims as follows:

Crown Granted Claims

Kimberley	Lot 1447
Charlotte	Lot 1448
Last Chance	Lot 1449
Morning Star	Lot 1450
Stem Winder	Lot 1451
Occidental	Lot 1452
Keystone Fr.	Lot 1453

Located Mineral Claims

Alf	1 - 6 inclusive	33470 - 33475 inclusive
Jeep	1 - 10 "	42730 - 42739 "
Jeep	13	67170
Dan	1 - 4 inclusive	43857 - 43860 inclusive
Kim	1 - 5 inclusive	62633 - 62637 inclusive
New 1		67115
New Fr.		67116
K102		67077

The above claims are located three and one half miles SW of the City of Kamloops, Kamloops Mining Division, Province of British Columbia.

### Location and Access

A point near the centre of the property occurs at 120° 21' 15" west longitude and 50° 37' 30" north latitude respectively. Facile access to the property is available by means of the Trans-Canada Highway and B.C. No. 5 Highway. An unimproved road accessible to vehicular traffic runs from the centre of the property to a point on B.C. No. 5 Highway two miles south of the Merrit turnoff on the Trans-Canada Highway. For most of the year the majority of the property is accessible by means of normal vehicular traffic. The city of Kamloops is serviced by C.N.R., C.P.R., and C.P.A. and has highway access in each quadrant i.e., north via the Yellowhead route, east to Calgary, west to Vancouver and south to Princeton.

### Topography and Vegetation

The ground surface presented by the property is generally rolling ranchland with minor copses of spruce and pine timber. The majority of the property surface is open grazing land typical of the inland valley area. Minor ponds and alkalai sloughs occur seasonally on the property and a water spring has been opened up by trenching yielding a limited supply of water.

Elevation of parts of the property vary from 2800 to 3500' ASL respectively. The hills are generally well rounded by glaciation and occasionally displaying characteristic "Roches-Moutonnee" outlines.

### History

Evidence of copper mineralization was noted in the area of the property prior to 1898. In the period 1898 to 1929 the original and successive holders of the ground conducted various exploration programmes consisting of exploration trenches, pits and an adit some tow hundred feet in length. These efforts were made in an attempt to find high grade copper mineralization similar to that on the Kamloops Copper property some two miles to the west. Failing metal prices in the post 1929 period discouraged further work on the property until 1959 when a Spontaneous Polarization and Magnetic Survey was carried out over the NW portion of the property now occupied by the Alf claims.

In 1964 the property namely the area of the crown granted mineral claims, was optioned by New Jersey Zinc Exploration (Canada) Ltd. and a Magnetic Survey conducted. Six short diamond drill holes (totalling 2067') of BX diameter were drilled. Only one of these holes drilled in the vicinity of the adit yielded results of any significance.

Mr. F. Senft conducted minor diamond drilling in 1965 to the NE of the adit yielding significant values, however, the core was lost in a fire and could not be examined.

Kimberley Copper Mines Limited (N.P.L.) acquired the property in 1966 and exploration work in the form of Geo-Chemical and Magnetic Surveys, Geological Mapping, Diamond Drilling and Percussion Drilling was carried out. The results of this work are summarized in a report by L. G. Phelan, P. Eng., March 17, 1967. A reconnaissance I.P. Survey was also carried out at this time primarily over the area of the crown granted mineral claims.

During the period 1959 - 1966 other areas within the Iron Mask Batholith received serious attention and with encouraging results. To the SW of the Kimberley property Cominco Ltd. outlined an ore body of some 10 million tons grading 0.50% copper. To the west drilling on the Galaxy property indicated a potential ore body of 10 - 14 million tons grading 0.54% copper. Also the Rolling Hills (Makao) property and Kamloops Copper property indicated small tonnages of copper ore grading 2.0% copper.

The autumn of 1967 and spring of 1968 saw further work in the form of additional Induced Polarization and detailed Magnetic surveys, bulldozer trenching,

percussion drilling and detailed mapping of all available outcrop.

### Geology

The area currently considered is underlain by a series of rocks consisting of monzonite, syenite, diorite, gabbro and peridotite, usually silica deficient and collectively form part of a large intensive mass locally termed Iron Mask Batholith. The Iron Mask Batholith is a member of the Coast Range Intrusive Series and presents itself as an elongate mass some twelve miles long and three miles wide with its long axis lying NW - SE. The property occurs near the SE end of the intrusive mass along the NE margin.

The diorite and gabbro members of the intrusive are usually dark coloured and variably altered yielding chlorite, epidote and exuded calcite. It would appear that these rocks form the outer rim of the intrusive mass and are also found sporadically near the mid portions of the intrusive, the latter probably representing remaining remnants of the intruded roof. The syenitic rock made up of feldspar, sericite and other felsic minerals with a strong tendency to kaolinization, represents a highly altered phase of diorite. Evidence of a subtle gradation from syenite to diorite has been observed in the west central part of the batholith. The central part of the intrusive mass is represented by monzonite, usually flesh pink in colour and thought



to be the central core of batholith denuded by erosion. Making entry along movement planes through the core of the batholith occur dyke-like masses of peridotite. This rock is frequently highly sheared and in spite of its peridotite lithologic character thin section studies have shown that genetically the term picrite basalt would be more correct.

To the north contact is made with the Nicola series consisting of volcanic basalts and andesites dipping gently to the NE. The Nicola rocks are in turn overlain by sedimentary rocks locally termed Tranquille Beds.

The Iron Mask Batholith has been subjected to syn- and post-genetic faulting. The most prominent directions are those classified as syngenetic faulting running WNW and NNE. Post genetic faulting is less prominent and tends toward a NNW direction. These faults are steep in attitude, varying from  $-70^{\circ}$  to vertical. Locally, shearing is intermittent and tends to a gentle southwesterly dip.

Along the NE Margin of the intrusive occurs a series of broad, dyke-like structures termed Cherry Creek Breccia. Recent work has indicated these structures to be auto-breccias consisting of discrete masses of monzonite set in a ground mass of similar

material and frequently containing foreign xenoliths i.e., Nicola volcanics. They owe their origin to a late stage gas action mechanism and would therefore be classified as a member of the Iron Mask Series.

#### Mineralization

Mineralization within the Iron Mask Batholith consists of sulphides such as pyrite, chalcopyrite and less frequently molybdenite and bornite, oxides such as magnetite and molybdic oxide and carbonates such as limonite, azurite and malachite.

The character of the mineralization observed is indicative of multiple or rather sequential generation. Pyrite occurs as sinuous veinlets and as well as disseminations through the rock mass and is thought to be syngenetic. Subsequently, solutions making entry along movement planes deposited copper and iron in the form of sulphides in the fracture voids along the planes of entry and in their immediate vicinity. These deposits were disturbed and offset by later movements and these later movement planes were again invaded by mineralized solutions. This sequence of disturbance, mineralization, disturbance and mineralization gives rise to an en echelon pattern with the individual members frequently joined by cross branches. These mineralized sheet like structures usually are steeply inclined, especially along the margins of the batholith. Subsequent

erosion and weathering have converted the near surface sulphides of iron, copper and molybdenum to oxides and carbonates of these metals i.e., molybdic oxide, limonite, malchite and azurite. Migration of these oxidized minerals from their source of origin has occurred, however, the extent of migration is thought to be slight. Currently these originally linear structures manifest themselves as crudely offset elongate masses.

The mineralized solutions traversing the marginal areas of the batholith were subjected to chemical control as well as structural control. The high degree of fracturing of the rocks would contribute to an environment of very great surface area which would be conducive to precipitation of metallic ions out of solution. Further, it has been observed that the Cherry Creek Breccia is seldom barren of chalcopyrite mineralization indicating a chemical composition amenable to precipitation of copper minerals out of solution.

#### Summary of Work to Date

##### Magnetic Survey

In October, 1966, a Magnetic Survey was carried out over the major portions of the property. The magnetic relief in general reflects the geological

environment. To the northeast the Nicola volcanics show a low to moderate background of 1000 gammas or less. As the contact between the Iron Mask Series and Nicola Volcanics is approached, the magnetic intensity increases to approximately 2000 gammas reflecting the gentle dip of the Iron Mask diorite under the Nicola volcanics.

Individual anomalies within the area of the intrusive reach intensities of 3000 to 8000 gammas. These anomalous areas are strongly linear in a NNE direction with a lesser tendency in a WNW direction. These two directions are coincident with structural lineations in the area. These anomalies are due to concentrations of magnetite within the intrusive rocks and for the first part are related to primary magnetite common to the area. Secondly, magnetite is an alteration product of the intrusive rocks so that concentrations of magnetite would be expected where alteration is intense, especially near structural lineations such as faults and joints. The relationship of concentrations of magnetite to areas of copper mineralization is not immediately known. Core drilling will clarify whether or not such a direct relationship exists.

A detailed Magnetic Survey has been carried out over the property with readings taken at fifty foot intervals over areas of particular interest.

Such a detailed survey would better define the various linear structures encountered and assist in correlation between geological and geophysical observations. This detailed study of magnetometrics on the property is not yet available.

#### Geo-Chemical Survey

The Geo-Chemical survey carried out over the property has indicated several areas of interest. Background or average values over "barren" ground are of the order of 50 ppm and readings in areas considered anomalous may approach 300 ppm. In general, the areas of high readings tend to be linear and parallel the margins of the Iron Mask Batholith. Of particular interest are three Geo-Chemically significant areas occurring on the east central portion of the Kimberley claim, the central portion of the Charlotte claim and the central portion of the Last Chance claim. The high contour outlines are shown on the detailed Geology Map appended to this report and it is to be noted that there is an obvious relationship to mineralization observed on the surface in these areas.

On the Kimberley and Charlotte claims correlation with observed near surface mineralization is excellent and the slight downslope migration of the Geo-Chemical contour outline is to be expected.

Other Geo-Chemical anomalies occurring on the property, in view of the excellent correlation with current geological information, would qualify as high priority targets for future examination. Such targets would include the areas along the south and east margins of the Stemwinder claim, the area to the northeast of the Last Chance claim and the southeast corner of the property.

#### Induced Polarization Survey

A reconnaissance Induced Polarization survey was executed by McPhar Geophysics Ltd. in late 1966 over selected areas of the property. Several sections of high chargeability along grid lines were indicated, however, the large interval between grid lines prevented effective delineation of anomalous zones. In the early part of 1968 additional I.P. work was carried out in order to delimit the anomalous areas previously indicated and to obtain detailed cross sections of these anomalous zones. Four substantial zones of high chargeability were outlined during the course of the latter survey by Seigel Associates Ltd. as well as lesser incompletely defined zones.

Direct correlation between mineralized areas currently available for observation and areas of high chargeability was not found to be possible. In the vicinity of currently known areas of cuprous mineralization there was an indirect flanking relationship

whereby areas of high chargeability paralleled mineralized zones but with a displacement at right angles to the strike of the zones. Drilling revealed such a relationship on the Galaxy Copper property to the NW where economic mineralization flanks high chargeability IP anomalies caused by concentrations of pyrite. Percussion drilling has indicated moderate concentrations of pyrite in areas of high chargeability, however, insufficient work has been done to come to any reasonable conclusion in this regard.

Drilling and Trenching

During the autumn of 1967 and the early part of 1968 a programme of bulldozer trenching was carried out. Some 7550 lineal feet of trench was cut yielding some 4500 lineal feet of bed rock surface. The purpose of the programme was to investigate some of the areas of interest resulting from previously conducted geophysical surveys and to expand the exposure of mineralized structures observed in previous trenching. Where ever possible, the trenches were ripped and cleaned to obtain samples and observe mineralization at as low a horizon as possible.

An assortment of selected specimens taken from the recent trenches yielded the following results:

<u>Sample No.</u>	<u>Cu.%</u>	<u>Sample No.</u>	<u>Cu.%</u>
101 - K-C-MZW-202	16.6	102 - K-C-MZW-204	0.58

<u>Sample No.</u>	<u>Cu.%</u>	<u>Sample No.</u>	<u>Cu.%</u>
103 -K-C-MZW-206	1.05	109 -K-C-MZW-218	2.77
104 -K-C-MZW-208	1.13	110 -K-C-MZW-220	2.90
105 -K-C-MZW-210	1.90	111 -K-C-MZW-222	3.08
106 -K-C-MZW-212	1.10	112 -K-C-MZW-224	1.10
107 -K-C-MZW-214	1.29	113 -K-C-MZW-226	1.10
108 -K-C-MZW-216	1.93	114 -K-C-MZW-228	1.13
		115 -K-C-MZW-230	2.58

The percussion drilling programme was suspended after drilling some 5700 feet. Due to the highly fractured condition of the rocks to depths of over one hundred feet the percussion drill had great difficulty in or found it impossible to penetrate depths of greater than two hundred and fifty feet, thus seriously impeding sub-surface investigations.

The current phase of the programme was directed to four zones, hereinafter referred to as the Southeast zone, East zone, North zone and Quarry zone (50' = 1" Plan of Workings). The Southeast zone consists of an elongate area some 400' long and of undetermined width with its long axis lying approximately WNW. This zone is made up of a composite of mineralized joints and fractures with their halo-like emanations. At the SE end of the indicated zone, sampling in Trench #8 TR-NW yielded a sixty foot section containing 0.34% Cu. A sub-parallel section in Trench # 7



TR-NW yielded a sixty foot section of 0.34% Cu to the NW of the above Trench # 2 TR-NE yielded a twenty foot section of 0.45% Cu. as well as substantial widths of sub-marginal grade i.e. 0.12 - 0.25% Cu. Drill hole # PC 13 collared at 21 + 25 S and 11 + 00 E inclined at -45° in a northerly direction intersected a hole width of one hundred and ten feet (40' - 150') grading 0.61% Cu. Trench # 4 TR-NE yielded two sections of forty feet and nine feet grading 0.435% and 0.60% Cu. respectively. Drill hole PC # 11 drilled at an inclination of -45° in a northerly direction yielded a section from 120' to 150' grading 0.35% Cu. It is to be noted that in this interval return water was temporarily lost due to cave conditions so that little credence can be lent to the sample obtained in the interval from 130' to 140'. A previously drilled hole No. PC 38 along the NW margin of Trench # 5 TR-NE yielded a forty foot vertical intersection grading 0.45% Cu. Two holes PC # 12 and PC # 20 inclined at -45° and drilled in a northerly direction at either end of the zone in question failed to intersect mineralization of any consequence, however, neither of these holes reached their original objectives of depth.

Trench No. 14 TR-NE yielded two sections, sixty feet and twenty-five feet grading 0.44% Cu. and 0.47% Cu. respectively. Drill hole No. PC 14 inclined

at  $-45^{\circ}$  and drilled in a northerly direction yielded two intersections of 20' and 10' of 0.42% Cu. and 0.37% Cu. respectively. P40, a vertical hole drilled during a previous exploration programme along the SW margin of the zone yielded three intersections of 15', 10' and 10' grading 0.48% Cu., 0.47% Cu., and 0.42% Cu. respectively. P1, a vertical hole, yielded a 24' intersection grading 0.50% Cu. Another vertical hole, P42, yielded two vertical intersections of 10' grading 0.51% Cu. and 0.38% Cu. respectively. This zone appears to consist of two or more structures lying en echelon with a northerly strike. This zone has not been delimited in length or in width to date. The relationship to the vertical hole P50 which yielded a vertical section of 66' grading 0.473% Cu. is not currently known.

The north zone appears to consist of three discreet structures striking WNW as defined by sampling carried out in trenches and in mineralized sections observed in the drill holes. The most southerly of these three structures was intersected by holes Nos. PC 18 and PC 21. PC18 yielded three intersections each 10' in length grading 0.30% Cu. PC 21 was mineralized throughout so that a calculated grade for the entire length would be .31% Cu. over 200' or alternately a grade of .452% Cu. over an intersection of 100'.

The second structure within the north zone consists of a steeply dipping fault striking approximately east-west which was observed and sampled in a drift underground. This drift yielded 0.406% Cu. over a length of 85'. This fault is visible in Trench No. 20 TR-NW, however, sloughing conditions precluded sampling at this point. Diamond Drill hole No. 2 drilled by New Jersey Zinc intersected this fault at a hole depth of 365' - 370' yielding a section grading 2.05% Cu. Furthermore, a section from 280' to 305' yielding a 25' section grading 0.405% Cu. This fault is also visible in Trench No. 20 TR-NW, and again, sloughing conditions precluded sampling at this point. This mineralized fault zone has not been delimited in length, however, it is thought to be limited in width. The most northerly structure of the north zone presents a strong surface presentation. Trench No. 19 TR-NW yields a forty foot section 0.497% Cu. Trench No. 21 TR-NE yields a 120' grading 0.52% Cu. The stripped area to the S.E. of Trench # 21 TR-NE yields a section of 54' in length grading 0.533% Cu. Trench # 23 TR-NW exhibits a section 12' in length carrying 0.52% Cu. Immediately below this surface mineralized zone occurs a section in the adit 15' in length running .65% Cu.

The area termed Quarry zone occurs on the east central portion of the Last Chance mineral

claim. Sampling along a previous excavation yielded a section 55' in length grading .50% Cu. A short diamond drill hole collared immediately to the North of the Quarry inclined at  $-45^{\circ}$  and drilled in a southerly direction yielded two sections from 20' to 55' and from 55' to 85' grading 0.25% Cu. and .51% Cu. respectively.

A vertical percussion hole No. P33 yielded a section from 30' to 80' grading 0.34% Cu. no effort has been made to delineate this zone and the area is of considerable interest due to the fact that immediately to the South at higher elevations occur geo-chemical and I.P. anomalies. The presence of the geo-chemical anomalies presents the possibility that either a parallel zone or simply an extension of the quarry zone to the South exists.

It is to be noted that due to the random orientation of all of the members of the composite zone the sampled sections do not necessarily represent true width of these mineralized masses.

An attempt was made to trace the continuity of the north zone to the SE by means of trenching, however, overburden of the order of 25' in depth was encountered and thus precluded delineation of the zone in that direction.

Conclusion

The drilling and trenching programme to date has indicated several drill hole intersections and sections in trenches of obvious ore grade material (viz 0.5% Cu.) and several areas of marginal to sub-marginal grade. Quite some difficulty has been encountered in delineating the individual mineralized structures i.e., mineralized faults and joints due to the frequency of the intersection and variable direction of these structures and due to the migration of the surface and near surface carbonate minerals. The mineralization having made entry along movement planes and being displaced by later movement, now, is represented by a staggered or ladder-type structure; permeation of sulphide material into the walls of the major movement planes and later oxidation of the sulphide material to carbonates presents a rather bulbous but sinuous outline in plan view. Further, minor migration of the carbonate minerals makes tracing of the original sulphide mineralization more difficult where it is not directly exposed.

Due to the heavy overburden in many areas, bulldozer trenching was necessarily curtailed so that the bed rock surface exposure of the mineralized zones could not be completely delineated. Also the highly fractured nature of the rock, especially in the mineralized areas, in many cases prevented completion

of the drill holes to their originally planned depth.

In several instances, especially with inclined holes, return water was lost while using the percussion drill, necessitating chemical grouting of the hole. By the same token, loss of return water prevents return of sample. Due to the above, it is thought that some of the mineralized sections encountered in the inclined holes might be appreciated using a coring technique. The technique of BQ wire line with mud circulation has been used in the area with excellent results, i.e., 95% + core recovery.

The presence of fairly strong Geo-Chemical anomalies not associated with known zones of mineralization, offer prospective targets of merit for future exploration. It would appear that the presence of Geo-Chemical anomalies is highly sensitive to depth of overburden so that areas of moderate to high copper content in the soil would afford reasonable access to bed rock surface by means of bulldozer trenching.

The relationship between the several areas of high chargeability on the property to the presence of cuprous mineralization is not currently known. An argument can be made for the existence of an indirect relationship. However, only critical sub-surface geological information can prove or disprove

the validity of this relationship. These strong IP anomalies will bear investigation by means of further surface sectioning using a ripper-equipped bulldozer and possibly investigation at depth by means of core drilling.

### Recommendations

In view of the encouraging results of the preceding programme of Geo-Chemical, Induced Polarization, trenching and percussion drilling, it is recommended that the exploration work be extended and continued without delay. To date, four strong zones of copper mineralization have been indicated - it is in order, therefore, to fully delimit these zones and to obtain critical sub-surface geological information to facilitate evaluation of the indicated copper mineralization. Further, the several areas indicated by Geo-Chemistry and Geophysical methods as anomalous should be further investigated and their economic potential assessed. A phased programme to accomplish these ends should proceed along the following lines:

#### Phase I

Purpose : To further evaluate the currently known zones of mineralization and to investigate areas indicated as anomalous by previous work.

a)	Diamond drilling using NQ and BQ equipment with mud circulation Minimum programme 7000' @ \$ 9.00/ft.	\$ 63,000.00
b)	Bulldozer trenching using HD25 or equivilant equipped with twin hydraulic rippers. 300 hrs. @ \$ 32.50/hr.	9,750.00
c)	Assays	2,800.00
d)	Engineering supervision and consulting	12,000.00
e)	Detailed Geophysics and Geo- Chemistry	10,000.00
f)	Contingency and misc. supplies	<u>10,000.00</u>
		107,550.00

Phase II is contingent upon the results of the Phase I programme.

Phase II

Purpose: To completely delimit the mineralized zones and to assess the economic potential of ore grade material present.

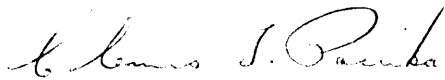
a)	Diamond drilling - BQ wire line equipment. 15,000' @ \$ 9.00 / ft.	135,000.00
b)	Bulldozer stripping and deep trenching to facilitate bulk sampling.	46,000.00
c)	Assays and metallurgical testing	25,000.00



d) Engineering supervision and consulting	\$ 30,000.00
e) Indemnity re surface rights	25,000.00
f) Contengency and misc. supplies	<u>26,000.00</u>
Total	287,000.00

The total expenditure for Phase I and Phase II would be \$ 394,550.00

Respectfully submitted,  
VELOCITY SURVEYS LIMITED,

  
Clemens T. Pasieka, B.Sc.,  
Geologist.

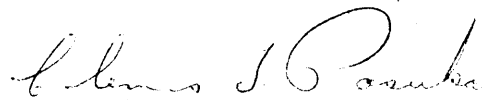
C E R T I F I C A T I O N

TO WHOM IT MAY CONCERN:

I, CLEMENS T. PASIEKA, of the City of Vancouver, Province of British Columbia, hereby certify:

1. THAT I am a geologist and reside at 1851 Haro Street, Vancouver 5, British Columbia.
2. THAT I am a graduate of University College, Dublin, Ireland, with a Bachelor of Science degree (Honours-Geology) and that I have been practising my profession as a geologist for five years.
3. THAT the report is based on personal examination of the property, results obtained from drilling, trenching and geological mapping carried out under my supervision, information derived from geological, geophysical and geochemical reports on the property and from government publications relevant to the area.
4. THAT I do not have, nor do I expect to receive, either directly or indirectly, any interest in the property discussed herein or in the securities of Kimberley Copper Mines Limited (N.P.L.)

DATED this twelveth day of April, 1968.



Clemens T. Pasieka, B.Sc.,  
Geologist.

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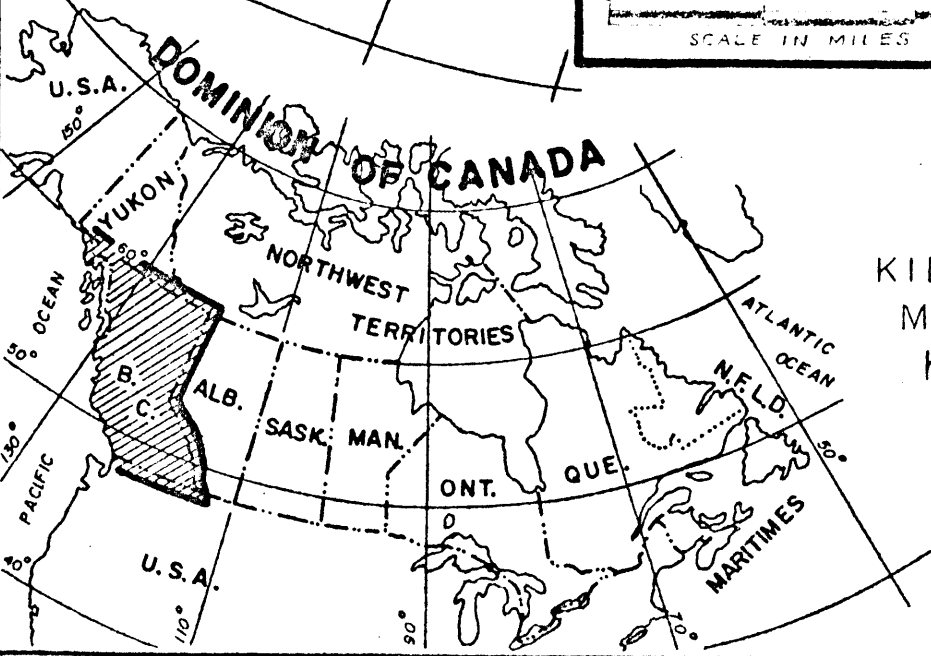
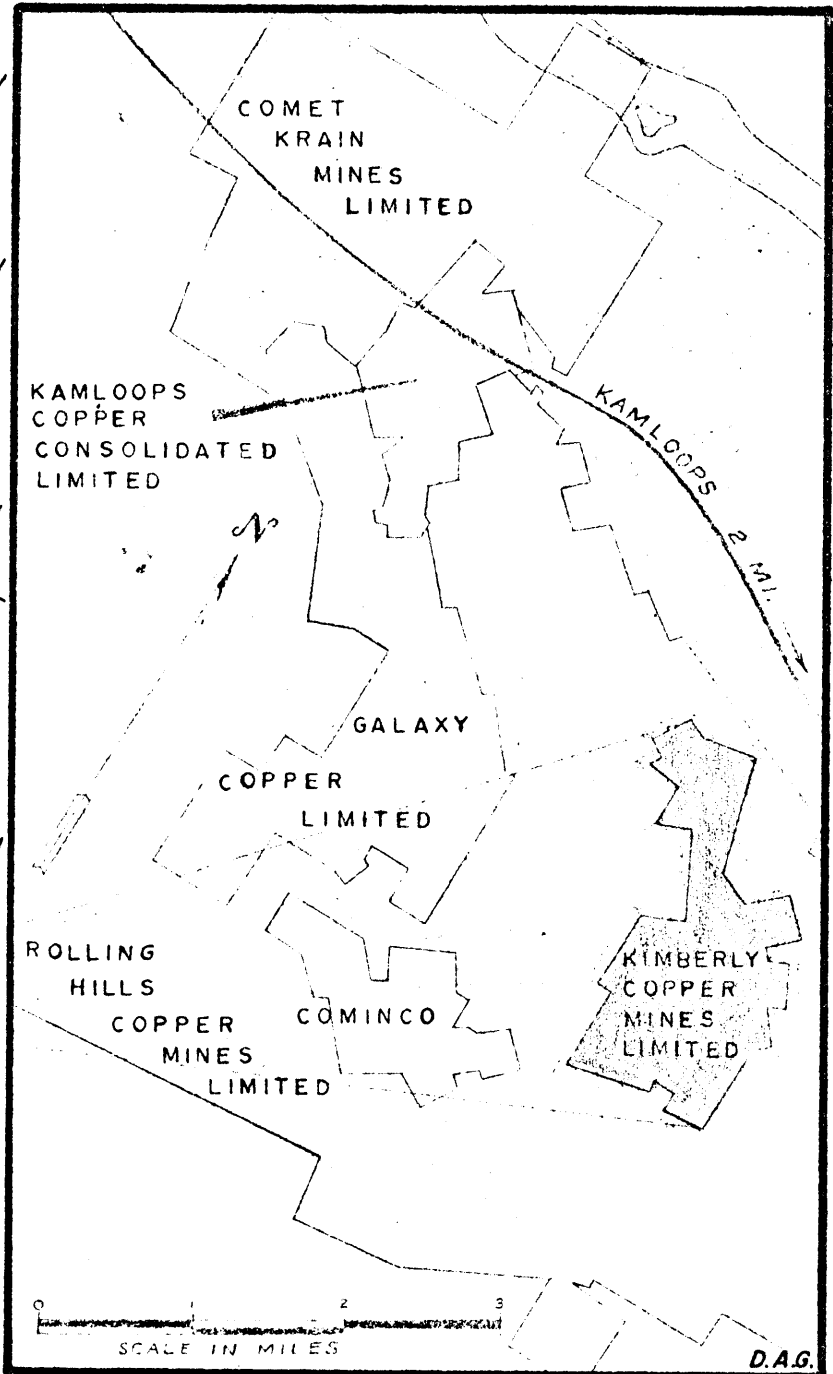
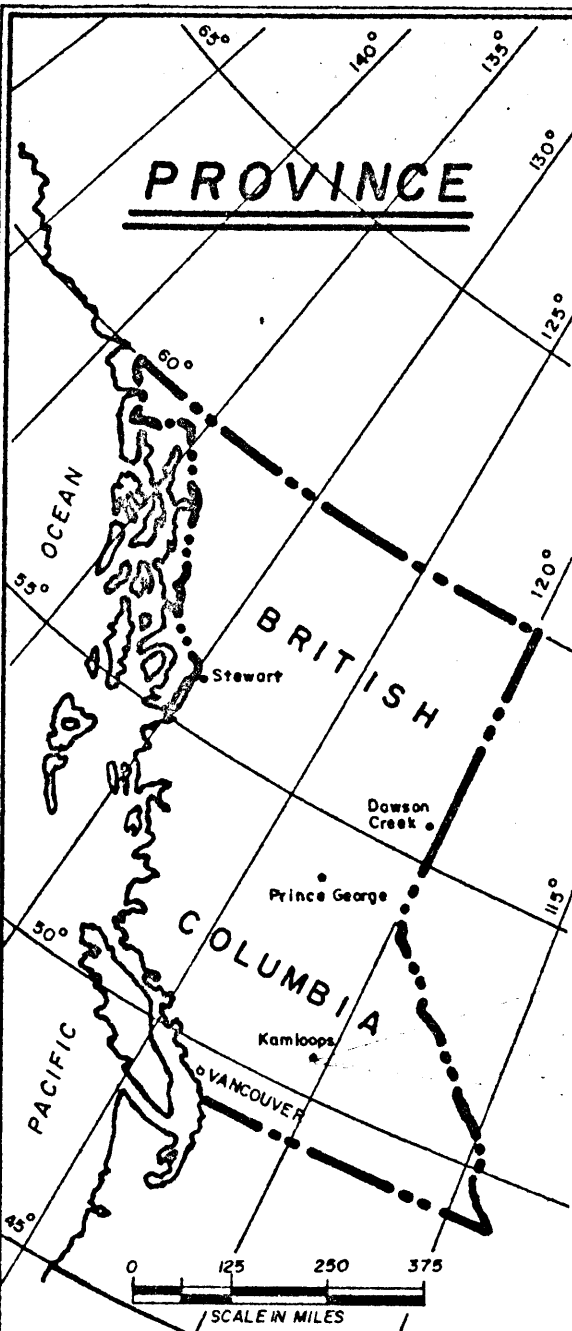
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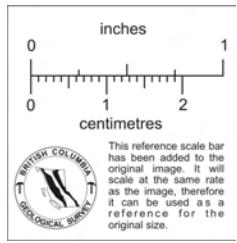
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PROPERTY LOCATION FOR

KIMBERLY COPPER MINES LIMITED  
KAMLOOPS, B.C.



*D. Rankin*