# GEOCHEMICAL REPORT

ON THE

# PINE AND SNOW CLAIMS

22 MILES S.E. OF MERRIT, B.C. LAT. 50°00 N LONG. 120°20 W

92 H/ 16W 4 925/10



BY

# R. A. BUCKLEY P.E.

## DEKALB MINING CORPORATION

CALGARY, ALBERTA

WORK DONE BETWEEN JULY 20. 1970-SEPTEMBER 12. 1970



## DEKALB MINING CORPORATION



- PHOTO BY A. P. TIDDENS -

PARADISE LAKE, B.C.

# 2984

GEOCHEMICAL REPORT

PARADISE LAKE PROSPECT

for

#### DEKALB MINING CORPORATION

on the

PINE and SNOW CLAIMS

and the

RON FRACTIONAL CLAIMS

Lat. 50° 00' Long. 120° 20'

94H/16

Approximately 22 Miles S.E. of Merritt, B.C.

on Quilchena Creek

Nicola Mining Division, B.C.

February 1971

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R.A. Buckley, P. Eng.

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#### ILLUSTRATIONS

Panoramic View of Pine and Snow Claims, Coloured Photo

Figure 1 Claim Index Map

Figure 2 Arithmetic Plot All Copper Samples

Figure 3 Logarithmic Plot All Copper Samples

Figure 4 Cumulative Frequency Distribution Copper

Figure 5 Arithmetic Plot All Molybdenum Samples

Figure 6 Logarithmic Plot All Molybdenum Samples

Figure 7 Cumulative Frequency Distribution Molybdenum

Figure 8 Cloud Plot and Correlation Diagram

Figure 9 Confidence Limits Nomogram

Contour Map for Copper, Parts per Million (In Pocket)

The claim group consists of 32 Pine claims, 49 Snow claims and 6 Ron Fractions. Al Boettger recorded the staking of Pine 1-20 on May 26, 1969 and Pine 21-32 on June 16, 1969. These claims were optioned to DeKalb Mining Corporation as per an option agreement dated May 1, 1970. A Bill of Sale to DeKalb was recorded with the Mining Recorder at Merritt, B.C. on September 11, 1970.

At DcKalb's request, the Snow 1-29 were staked by Mr. Boettger and recorded on April 27, 1970. Snow 30-41 were recorded July 31, 1970. A Bill of Sale covering the Snow 1-29 was recorded with the Merritt, B.C. Recording Office on September 11, 1970. The staking of Snow 42 for DeKalb was recorded by Mr. Boettger on August 31, 1970; Snow 43-49 on September 14, 1970.

After a preliminary claim boundary check, the Ron Fractions were located to fill in possible open ground. Ron Fractions 1-6 were recorded for DeKalb on September 14, 1970.

A claim location map on page 3 shows the location of the claims.

Work began on the Snow-Pine group on July 20, 1970 when the geochemical and line cutting crews arrived on the property. Work on the property during the field season of 1970 consisted of geophysical and geochemical line cutting, soil sampling, an Induced Polarization survey, claim boundary mapping and a very preliminary geological reconnaissance survey.

The purpose of the exploration was to evaluate some Induced Polarization anomalies that had been mapped in a previous survey and to generally evaluate the Nelson Age granitic intrusion for possible low-grade high-tonnage copper-molybdenum mineralization.



#### CONCLUSIONS

Geochemical soil sampling has indicated the presence of copper and molybdenum in the soil in anomalous quantities. These anomalies coincide with previously mapped Induced Polarization anomalies. Geochemical soil sampling is an effective tool for exploration in this region if the data is processed statistically.

#### R E C O M M E N D A T I O N S

The areas outlined on the enclosed contour maps with contours greater than the threshold value (35 ppm copper, 2.4 ppm molybdenum) are areas in which additional exploration for an economic grade of copper and molybdenum mineralization should be undertaken.

To give more definition to the geochemical anomalies, additional soil sampling lines should be done along the following lines:

Line		<u>Westward</u> To	2	<u>Eastward To</u>
4600	N			40+00 E
3900	N			40+00 E
3500	N	52+00 W		
3200	N			40+00 E
2600	N	56 <del>+</del> 00 W		44 <del>+</del> 00 E
1200	N	56+00 W		44 <b>+</b> 00 E
1000	S	48 <del>1</del> 00 W		
1800	S			44+00 E
2400	S			44+00 E
2800	S			44+00 E
3400	S	30+00 W		44 <del>+</del> 00 E
		<del>- · · · · · · · · · · · · · · · · · · ·</del>		
		24,200'		38,400'
			TOTAL	62,600'
			Ċ	R 12 MILES

It is recommended that an Induced Polarization survey using 400, 600 and possibly 800 foot spacings, cross the five anomalous areas. The various electrode spacing will define the altitude of the mineralized zone and assist in locating the position and attitude of future exploratory diamond drill holes. For best results the Induced Polarization survey should be completed before June 1, 1971 to ensure moist ground conditions.

Line			Inte	rval			Footage
4600	S	10+00	E -	34+00	E		2400 <b>'</b>
3800	S	12+00	E -	24+00	Ε		1200'
2800	S(L11)	0	-	18+00	W		1800'
7		14+00	W -	12+00	E		2600'
		22+0 <b>0</b>	W -	42+00	W		2000'
2600	N	10+00	W -	38+00	W		2800'
3200	N	8+00	W -	40+00	W		3200'
				TOTAI			16,000'
						OR	3 MILES

I.P. lines should be run on the following cut line:

6 ·

Exploratory diamond drill holes should be located at:

Line	Location		Depth
4600 N	6+00 W		600'
Base L 3	3+00 N		600'
3	14+50		600'
5	8+00 W		600,
6	2+00		600 <b>'</b>
Base L 3	1+00 S		600 <b>'</b>
7	2+00 W		600'
2800 S	10+00 W		600'
3800 s	20+00 E		600 <b>'</b>
4600 S	25 <del>+</del> 00 E		600'
		TOTAL	6,000'

PROPERTY LOCATION AND ACCESS

Access to the prospect is by the Pennask Lake road, leaving Highway 5 one-half mile east of the Quilchena store. The western boundary of the property is near the junction of the Pennask Lake -Paradise Lake road, approximately 28 miles from the paved highway. The road into the property is rough and dusty but can be negotiated by an ordinary car if care is used.

#### TOPOGRAPHY

The claim group is in area of rolling topography. Vegetation consists of jack pine with scattered groves of tamarack with aspen groves near streams and swampy areas. The area has been burned over a number of times, giving rise to a dense second growth of small jack pine. Dead fall after the fire has created difficulty in travel and access. To the north, large open fields of grass and sage occur which provides a source of feed for the large cattle herds.

#### SOIL SAMPLING

Soil samples were collected at 200 foot intervals along previously located blazed and flagged lines. The soil profile consists of the normal "A" horizon with a thickness of 6 to 10 inches of dark brown sandy to silty soil.

The "B" horizon is a light grey, low density, very dusty silt and sandy silt. It was difficult to distinguish the difference between the "B" and "C" horizons as either the "B" is very thick (more than 100 feet) or the "C" is absent. Diamond drilling on the property has indicated that up to 241 feet of silt is present. This silt becomes extremely dusty on the roadways during the long, hot summer. To sample the soil, it was therefore necessary to penetrate the "A" horizon and collect a sample of the "B" at a depth of 1 to  $1\frac{1}{2}$  feet. Field data, such as sample location, topography, slope and direction of slope, vegetation and abrupt changes in vegetation, location of streams, roads, etc., were recorded in permanent field books.

Samples were bagged in regular kraft paper envelopes, labeled, dried and shipped to T.S.L. Laboratories in Vancouver for analysis. In total, 965 samples were collected and analysed for copper, silver and molybdenum.

#### GEOCHEMICAL SOIL ANALYSIS

The soil analysis was done by T.S.L. Laboratories under the direction of R.B. Fletcher. The samples were sieved, dried, and the metals extracted using the hot aqua regia method. Metal content was determined by atomic absorption. The Laboratory data was plotted on base maps and contoured. Conclusions and ideas gathered during the plotting and contouring stage were used to locate new claims and to direct the Induced Polarization crew.

Upon completion of the chemical analysis and plotting of the soil samples, the data was then treated statistically.

Since an isolated data point has little meaning in geochemistry, the Laboratory data must be evaluated statistically. The most meaningful geochemical maps may be constructed when the data has been derived from a high, homogeneous population. Trace elements in soils will disperse from the source according to fixed distribution laws (Gauss' Law of Lognormal Distribution, i.e., the bell-shaped curve). Therefore, sampling must be done over a large area in order that the whole population will be represented and so that the source of the trace elements may be recognized. This or any statistical study may be done using a computer, or if the number of samples is relatively few, they can be treated graphically. The less expensive and quicker graphical method has been chosen for this project.

#### FREQUENCY DISTRIBUTION

Graph 2 is a frequency distribution curve showing the number of samples plotted against the metal content (copper) in parts per million. The curve appears to be close to a lognormal distribution, indicating that the copper was derived from one population and one rock source. Graph 3 is the same data plotted on a semi-log plot. The "bell shape" curve indicates that the logarithms of these values are distributed following a normal law. The roughness of the curve could be improved if the samples were grouped in larger intervals.

Using these two curves, it can be seen that the most common (maximum occurrence) mineral concentration can be determined as well as a rough determination of the Standard Deviation.

Figure 5 and Figure 6 are similar graphs for molybdenum.

While the normal and lognormal distribution curves provide a quick check on sample distribution, the cumulative frequency distribution (Figure 4 for copper and Figure 7 for molybdenum) plot of the same data provides a check to see if the data fits a lognormal distribution curve. If the resultant curve is a lognormal distribution, then background, coefficients of deviation and threshold level may be determined. The threshold level is that value above which the data is anomalous. These parameters are then transferred to contour maps and colored.



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The Paradise Lake data in parts per million was plotted on a logarithmic scale against cumulated frequency percent on a probability scale. The data becomes to all practical purposes a straight line, demonstrating that the data comes from one source (one population) and that the source of the metal is from one rock type. To date, only granite has been mapped on this project. It would therefore appear that the copper and molybdenum will be found disseminated in the granite. Since the distribution follows a lognormal distribution pattern, as is the case when a phenomenon is subject to a proportioned effect, it can be assumed that a higher concentration of copper exists and will be mapped when the metal content of the soil samples rises above the threshold level. Contours outlining such areas are colored yellow for copper and orange for molybdenum on the contour maps in the pocket.



p.p.m.



## PARAMETERS DETERMINED FROM STATISTICAL PLOTS

#### BACKGROUND

The background, in a perfect frequency distribution curve, is the mode (most frequent) and the median (50% of the values above, 50% below) value and is the geometric mean of the data. The geometric mean is the most stable statistic (when compared to the arithmetic mean) and is less subject to change when new data or high values are introduced. The background is determined by the 50% ordinate on the Cumulative Frequency Plot.

#### THRESHOLD

By definition, 95% of the individual values fall between two Standard Deviations from background in the case of symmetrical distribution, either normal or lognormal. That is, 2.5% of the population exceeds the upper limit of two Standard Deviations. This upward limit is conventionally taken as the threshold level above which the data is considered as being anomalous.

Practically, background and threshold are read directly on the Cumulative Frequency graph. Figure 4 and Figure 7 shows these parameters for copper and molybdenum respectively. The contour maps are colored to emphasize these values and to map areas requiring detailed exploration.

#### CONFIDENCE LIMITS

The nomogram in Figure 9 is used to determine the validity or confidence limits to a given set of data. If the data curve had deviated outside the confidence limits (control points as circles),  $P_1 P_2$ , on Figure 4, then the conclusion would be that the curve would be less reliable to determine such parameters as Background and Threshold. The greater the number of data points, the closer the curve comes to expressing the true population and the nature of the population.

#### CORRELATION DIAGRAM

It has been noted that in the case of polymetallic mineralization with two or more elements lognormally distributed, that there is generally a positive correlation between them. In the case of copper-molybdenum in this part of British Columbia in a disseminated granite environment, the degree of dependency of the two metals would become a check on the validity of the metal in the soils, metal dispersion in the soils, and the metal content of the underlying granitic intrusive. Figure 8 shows a "cloud plot" or two-dimensional histogram of copper and molybdenum.

The diagram was constructed by plotting on log co-ordinates



# CONFIDENCE LIMITS NOMOGRAM

FIG. 9.



COPPER p.p.m.

each soil sample. The background for each metal as calculated from Figure 4 and Figure 7 was then plotted. The four quadrants so formed are then numbered in a clockwise direction 1, 2, 3 and 4.

A measure of the relationship between any two types of mineralization is called the coefficient of correlation and is the degree of dependency of one metal for the other or others. This coefficient expressed as /2 always falls between -1 and +1.

> > = 0 means complete independence between the two elements. >> 0 means the two elements vary in the same direction. >> < 0 means the two elements vary inversely.

∩ ∩ is expressed by the formula  $\mathcal{P} = \text{sine} \left( \frac{1}{2} \frac{N_1 - N_2}{N_1 + N_2} \right)$  $N_1 = N_1 + N_3$  the sum of the where points in the 1st & 3rd quandrant  $N_2 = N_2 + N_4$ the sum of points and in the 2nd & 4th quadrant substituting into the equation 160 + 381 Ν 541 = =. 253 + 153 Ν 406 and =

and solving the equation

 $\mathcal{P} = \sin(3.141 + 541 - 406)$   $= \sin(3.141 + 541 - 406)$   $= \sin(3.141 + 541 - 406)$   $= \sin(3.141 + 406)$ 

or rounding and applying the sign

p = +.2

From the value of ho it is seen that the two metals have a low correlation factor. Examining the contoured "cloudplot" (Figure 8) of this information, it is noted that the data contours into a sub-circular configuration. The positive sign for ho indicates that:

the plot has a positive slope.
the two metals vary in the same direction.

 the metals are dependent on one another although the correlation factor is low. DISCUSSION ON METAL OCCURRENCE

As stated earlier, the purpose of this project is to locate a mineral occurrence in the West Okanagan Lake Nelson Age pluton. Mineral occurrences in this pluton and in other plutons of similar age occur in fractures (Brenda deposit) and disseminated in areas of high fracture density (Highland Valley).

The foregoing report describes the occurrence of copper and molybdenum in the soil and graphically displays each metal and the mutual relationship of one metal with the other.

Using the graphical presentations and the contour maps and a few geological assumptions as to ore control, it is possible to interpret the type and location of metal concentrations in the underlying bedrock.

Several conditions could account for the poor correlation or dependence between copper and molybdenum. See Figure 9.

- The copper occurs as disseminated particles in the granite while the molybdenum is confined to fractures.
- The thick overburden, between 200 and 400 feet thick, masks the dispersion of the two metals.
  Dispersion of metal ions is proportional to the

concentration at the source and probably inversely proportional, raised to some power to the overburden thickness. In addition, copper ions will migrate (different coefficient of dispersion) and disperse from the source a greater distance than molybdenum ions.

3. Molybdenum mineralization could be of a different age than the copper mineralization and therefore not genetically related. If this is the case, then molybdenum would not occur in proportional quantities with copper. It would, however, be expected to occur in the same region since the pathway (fracturing) that allowed the copper to enter would still be available at a later time for the molybdenum.

## DISCUSSION AND LOCATION OF SOIL ANOMALIES

#### COPPER

The most prospective copper anomaly (nine times above background) occurs along a NNE trend of anomalous copper values, centered on Line 7 at 2+00 W. This anomaly is confirmed on three other adjacent survey lines, giving a total length to the anomaly of 2600 feet and a width of 500 feet.

Vertical diamond drill holes 600 feet deep are recommended on Line 7 at 4+00 W and on Line 6 at 2+00 W.

A follow-up drill hole of 600 feet on the south end of the anomaly should be spotted on Line 11 at 10+00 W.

The second most prospective anomaly (anomaly 2) is located on Line 3 and Line 3200 N at 14+00 W to 31+00 W. The initial evaluation of this anomaly should be by additional soil sampling with a new line being located at 2600 N. Drilling locations, subject to revision after additional soil sampling, should be on Line 3 at 14+50 W and on Base Line 3 at 3000 N. Each hole should be drilled to a total depth of 600 feet.

Number 3 anomaly is located near a swamp on Lines 3800 S

between 1800 - 2400 E and again on Line 4600 S at 1800 - 2600 E. Two diamond drill holes to a depth of 600 feet each will evaluate this anomaly at 20+00E (Line 3800 S) and at 25+00 E on Line 4600 S.

Two other smaller anomalies, anomaly 4 and anomaly 5, should be drilled upon evaluation by detailed Induced Polarization. Number 4 anomaly between Line 6 and Line 7 may be evaluated by drilling a 600 foot hole on Base Line 3 at 1400 S. Number 5 anomaly on Line 4600 N should be drilled to a depth of 600 feet at 6400 W.

#### INDUCED POLARIZATION & SOIL SAMPLING

Before drilling any of these anomalies they should be better defined. Additional soil sampling will better define the lateral extent of the anomalies while detailed I.P. will assist in determining the location and azimuth of the exploratory diamond drill holes.

#### MOLYBDENUM

Molybdenum soil anomaly Number 1 occurs on Line 5 at 6+00 W with a molybdenum content of 22.5 parts per million in the soil. This anomaly lies in an area that has above background values (blue color contour) and stretches from Line 11 in the south to Line 2200 N, a distance of approximately 1 mile, and approximately one half mile

wide. This anomaly should be drilled with a 600 foot hole at 8+00 W on Line 5.

Molybdenum anomaly number 2 is at 20+00 E on Line 3800 S with a value of 5.5 ppm. A vertical drill hole 600 feet deep at 20+00 E on Line 3800 S will evaluate this anomaly.

Other anomalies occur on the property and become important only when considered with copper.

#### SILVER

Silver content was also read by atomic absorption from the soil samples. Silver content was generally less than .5 ppm with no anomalous areas being mapped.

Respectfully Submitted,

R.A. Buckley, P. Eng.

#### REFERENCES

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#### QUALIFICATIONS

#### R.A. BUCKLEY

- A. I, Ronald A. Buckley, am by profession a Geologist, residing in the City of Calgary, in the Province of Alberta.
- B. I graduated in the year 1957 from Acadia University, Wolfville, Nova Scotia, with a Bachelor of Science Degree in Geology, with a minor in Chemistry and Physics.
- C. I graduated in the year 1959 from McGill University, Montreal, in the Province of Quebec, with a Master of Science Degree in Geology.
- D. Since graduation, I have been employed by a Mining Company, a Provincial Department of Mines, and three Oil Companies in the search for oil, gas and metallic minerals.
- E. I am a member:

The Alberta Association of Petroleum Geologists Mineralogical Association of Canada Society of Economic Geologists Society of The Sigma XI Canadian Institute of Mining and Metallurgy Association of Professional Engineers of Alberta Professional Engineers of British Columbia

M.Sc., P.Geol., P.Eng.

Expiry Date: March 25, 1972.

April 14, 1971 Calgary, Alberta

### APPENDIX

#### FIELD PERSONNEL

All work on this property was done by subcontract, supervised by the author.

The subcontractors were:

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Line Cutting -

Boettger All-Core Ltd.

Soil Sampling -

Boettger All-Core Ltd.

Induced Polarization -

Geofax Surveys Ltd.

Beaver Geophysical Services

## PARADISE LAKE PROJECT

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#### SUMMARY OF EXPENSES ABSTRACTED FROM ACCOUNTING VOUCHER

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Contract Line Cutting	\$ 1818
Contract Geochemical Charges	5521
Travel Expenses and DeKalb Project Supervision	1790
Overhead	970
Miscellaneous	860
Rental Equipment	320
Camp Costs	1290
Report Research and Writing	
12 days @ \$75.00/day	<del>9</del> 00
Drafting and Construction of Base Map	
11 man days @ \$50.00/day	550
Reproduction	125
Field Crew Supervision, A. Boettger	400
	\$14,544







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