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COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

REPORT D-71

GEOPHYSICAL REPORT

VINE MINERAL CLAIMS

82G/5W

Fort Steele Mining Division

by

DIGHEM LIMITED

Toronto, Ontario

January 7, 1977

Report Compiled by:

G.L. WEBBER

Cominco Ltd.
Kootenay Exploration
2450 Cranbrook Street
Cranbrook, B.C.

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D71

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CHEQUE
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Invoice No. 77-2
October 13, 1976

OCT 27 1976

Cominco Limited,
Kootenay Exploration Division,
2450 Cranbrooke Street,
CRANBROOKE, B.C.

In Account With

DIGHEM LIMITED

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Dighem flying of agreement
dated October 11, 1976

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DIGHEM LIMITED

D. C. Fraser
President

DCF/ap
Job D71

W76-80

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D.W Heddle [illegible] 702-91-2000

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REPORT No. D71

DIGHEM SURVEY

OF

CRANBROOK AREA, BRITISH COLUMBIA

FOR

COMINCO LIMITED

BY

DIGHEM LIMITED

TORONTO, ONTARIO
JANUARY 7, 1977

D. C. FRASER
PRESIDENT

S U M M A R Y

A DIGHEM airborne electromagnetic/magnetic survey of 861 line-miles was flown for Cominco Mines Limited in October and November, 1976, in the Cranbrook area of British Columbia. A total of 150 EM anomalies were obtained, the majority of which are of the lowest conductance grade, and probably reflect conductive overburden. A few anomalies are believed to reflect bedrock conductors.

LOCATION MAP

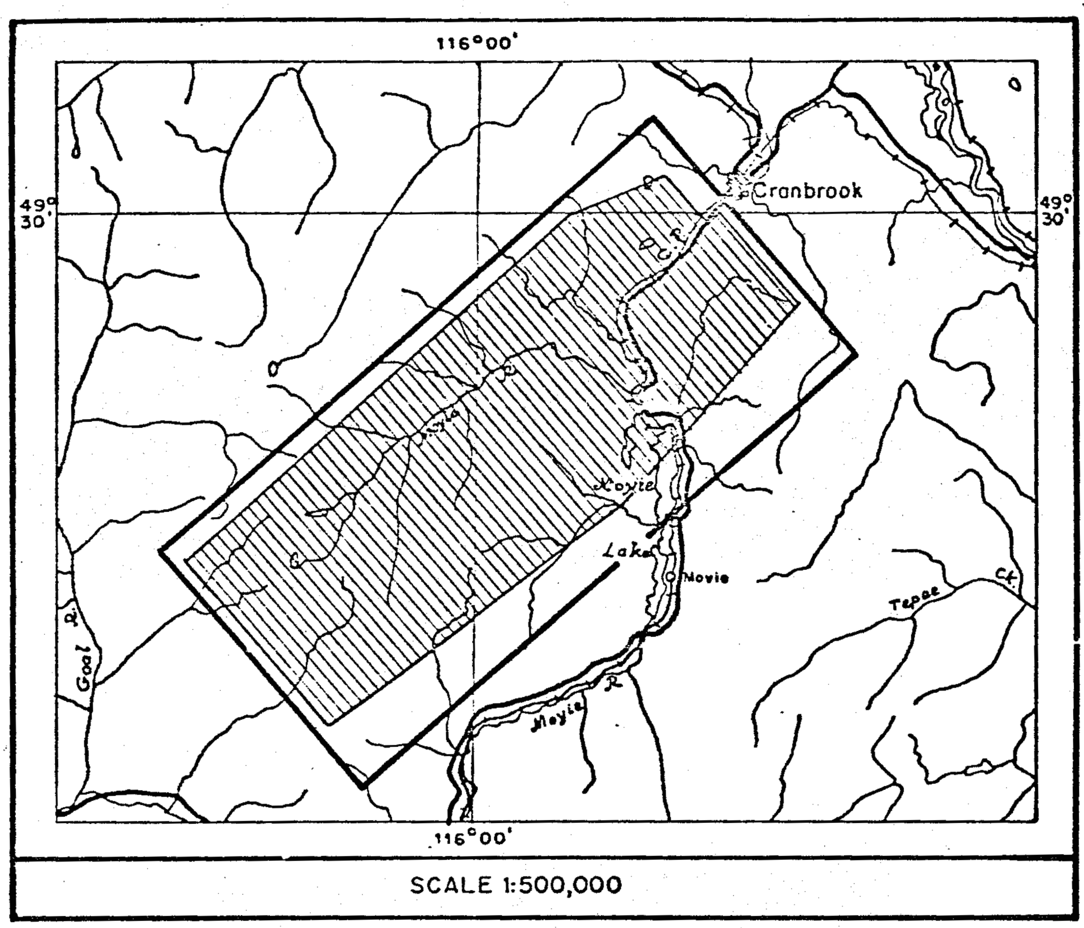

FIGURE 1. The survey area.

INTRODUCTION

A DIGHEM survey of 861 line-miles was flown with a 1320-foot line-spacing for Cominco Limited in the interval from October 10th to November 7th, 1976, in the Cranbrook area of British Columbia (Figure 1). The Lama jet helicopter N65185 flew with an average airspeed of 60 mph and EM bird height of 160 feet. Ancillary equipment consisted of a Barringer Research AM-104 magnetometer with its bird at an average height of 210 feet, a Bonzer radaraltimeter, Geocam sequence camera, 60 hz monitor, MFE 8-channel hot pen analog recorder, and a Geometrics G-704 digital data acquisition system with a Facit 4070 punch paper tape recorder. The analog equipment recorded six channels of EM data at 918 hz, and one of magnetics and radaraltitude. The digital equipment recorded the magnetic field to an accuracy of one gamma.

The Appendix provides details on the analog data channels, their respective noise levels, and the data reduction procedure. The quoted noise levels are generally valid for wind speeds up to 20 mph. Higher winds may cause the system to be grounded because excessive bird swinging produces control difficulties in piloting the helicopter. The swinging results from the 50 square feet of area which is presented by the bird to broadside gusts. The DIGHEM system nevertheless can be flown under wind conditions that seriously degrade other AEM systems.

DATA PRESENTATION

The Three Conductor Models

DIGHEM anomalies are interpreted according to three conductor models, as follows:

1. Vertical dike (half plane)

   The vertical dike is the most suitable representation of steeply-dipping bedrock conductors. All anomalies plotted on the DIGHEM map are interpreted according to this model. The three receiver coils of DIGHEM allow correction for the response when the flight line crosses a conductor at an oblique angle. The following section entitled, "Electromagnetics; vertical dike interpretation", describes this model in detail, including the effect of using it on anomalies caused by conductive overburden.

2. Horizontal sheet (whole plane)

   The horizontal sheet is suitable for flatly dipping thin bedrock conductors and thin layers of conductive clay or lake silt. The conductance and depth values are given in the anomaly list appended to the rear of this report, but do not appear on the DIGHEM map. These values should be viewed with caution unless it is known that a horizontal sheet is a fair representation of the conductors. It is a highly specialized model with a limited application.

3. Conductive earth (half space)

The conductive earth model is suitable for flatly dipping thick bedrock conductors, saline water-saturated sedimentary formations, thick conductive overburden, and geothermal zones. The resistivity and depth values are given in the anomaly list, but do not appear on the DIGHEM map. A depth value of approximately zero in an area of deep cover is evidence that the anomaly is caused by conductive overburden. The minimum and maximum values of resistivity which can be recognized are 1 and approximately 1000 ohm-meters, respectively.

Electromagnetics; vertical dike interpretation

The EM anomalies appearing on a DIGHEM map are interpreted by computer according to the conductivity-thickness product in mhos of an oblique-striking vertical dike model. DIGHEM anomalies are divided into six grades of conductivity-thickness product, as shown in Table I. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geological parameter. Most swamps yield grade 1 anomalies but highly conducting clays can give grade 2 anomalies. The three-dimensional anomaly shapes often allow surface conductors to be recognized, and these are indicated by the letter S on the map. The remaining grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: the ore bodies of the Magusi River camp (Noranda, Quebec) yield grade 4 anomalies, while Mattabi (Sturgeon Lake, Ontario) and Whistle (Sudbury, Ontario) give grade 5. Graphite and sulfides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Table 1. EM Anomaly Grades

Anomaly Grade	Mho Range
6	≥ 100
5	50 - 99
4	20 - 49
3	10 - 19
2	5 - 9
1	≤ 4

Strong conductors (i.e., grades 5 and 6) are characteristic of massive sulfides or graphite. Moderate conductors (grades 3 and 4) typically reflect sulfides of a less massive character or graphite, while weak bedrock conductors (grades 1 and 2) can signify poorly connected graphite or heavily disseminated sulfides. Grade 1 conductors may not respond to ground EM equipment using frequencies less than 2000 hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductivity-thickness products. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near

Bathurst, New Brunswick, yielded a well-defined grade 1 conductor. The 10 percent by volume of sphalerite occurs as a coating around the fine-grained massive pyrite, thereby inhibiting electrical conduction.

The mho value is a geological parameter because it is a characteristic of the conductor alone. It generally is independent of frequency, and of flying height or depth of burial apart from the averaging over a greater portion of the conductor as height increases. Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger mho values.

On the DIGHEM map, the actual mho value and a letter are plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots, beside each anomly symbol, indicate anomaly amplitude on the flight record. The vertical column of dots gives the estimated depth. In areas where anomalies are crowded, the identifiers, dots and mho values may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductivity-thickness calculation. Thus, a conductivity-thickness value obtained from a large ppm anomaly (3 or 4 dots) will be accurate whereas one obtained from a small ppm anomaly (no dots) could be inaccurate.

The absence of amplitude dots indicates that the anomaly from the standard (maximum-coupled) coil is 5 ppm or less on both the inphase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface, or a stronger conductor at depth. The mho value and depth estimate will illustrate which of these possibilities best fits the recorded data. The depth estimate, however, can be erroneous. The anomaly from a near-surface conductor, which exists only to one side of a flight line, will yield a large depth estimate because the computer assumes that the conductor occurs directly beneath the flight line.

Flight line deviations occasionally yield cases where two anomalies, having similar mho values but dramatically different depth estimates, occur close together on the same conductor. Such examples confirm that the mho value measurement of conductance is quite reliable whereas the depth estimate can be unreliable. There are a number of factors which can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, conductive overburden responses, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be deeper or to one side of the flight line, or because it has a shallow dip.

A further interpretation is presented on the EM map by means of the line-to-line correlation of anomalies. This provides conductor axes which may define the geological structure over portions of the survey area.

The majority of massive sulfide ore deposits have strike lengths of a few hundred to a few thousand feet. Consequently, it is important to recognize short conductors which may exist in close proximity to long conductive bands. The high resolution of the DIGHEM system, and the line-to-line correlation given on the data maps, are especially important for a proper strike length evaluation.

DIGHEM maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a followup program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of conductors in terms of length, strike direction, conductance and depth. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.

The attached EM anomaly list provides a tabulation of all anomalies in ppm, and in mhos and estimated depth for the vertical dike model. The anomalies are listed from top to bottom of the map for each line. The list also includes an interpretation according to the horizontal sheet and conductive earth models, as described earlier.

Resistivity mapping

Areas of widespread conductivity have been encountered while surveying for base metals with DIGHEM. Under such conditions, anomalies can be generated by changes of only 20 feet in survey altitude, as well as by changes in conductivity. The typical flight record in conductive areas is characterized by inphase and quadrature channels which are continuously active; local peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity maps should be produced from the airborne data. The advantage of the contoured maps is that anomalies caused by altitude changes are eliminated, and the contours reflect only those anomalies caused by conductivity changes. In areas of widespread conductivity, the conventional EM map may be practically useless. Contoured apparent resistivity maps improve the interpreter's ability to differentiate between conductive trends in the bedrock and those patterns typical of conductive overburden.

Conductive overburden diminishes the ability to an EM system to effectively explore the bedrock. The lower the resistivity of the cover, the more active the EM channels and the poorer the exploration. As a general rule of thumb, the effectiveness of the DIGHEM system for base metal exploration is given in Table II.

Table II. Influence of Conductive Cover On Base Metal Surveys.

Resistivity	Exploration effectiveness at 900 hz
> 300 ohm-m	excellent
100 to 300	good
30 to 100	moderate
< 30	poor

Apparent resistivity maps should be constructed when the exploration effectiveness (Table II) is moderate to poor, because the contour patterns can be helpful in differentiating between bedrock and overburden conductors.

Magnetics

The existence of a magnetic correlation with an EM anomaly is indicated directly on the EM photomosaic. An

EM anomaly with magnetic correlation has a greater likelihood of being produced by sulfides than one that is non-magnetic. However, sulfide ore bodies may be non-magnetic (e.g., Kidd Creek near Timmins, Ontario) as well as magnetic (e.g., Mattabi).

The magnetometer data are digitally recorded in the aircraft to an accuracy of one gamma. The digital tape is processed by computer to yield a standard total field magnetic map contoured at 25 gamma intervals. The magnetic data also are treated mathematically to enhance the magnetic response of the near-surface geology, and an enhanced magnetic map is produced with a 100 gamma contour interval. The response of the enhancement operator in the frequency domain is shown in Figure 2.

The enhanced magnetic map bears a resemblance to a ground magnetic map. It therefore simplifies the recognition of trends in the rock strata and the interpretation of geological structure. The contour interval of 100 gammas is suitable for defining the near-surface local geology while de-emphasizing deep-seated regional features.

Apart from the difference in the contour interval, the enhanced magnetic map and the standard magnetic map are identical when magnetic basement rocks underlie several thousand feet of non-magnetic cover. The difference between the two maps increases with the amount of magnetization of the near-surface geology.

Conform in St. Joe

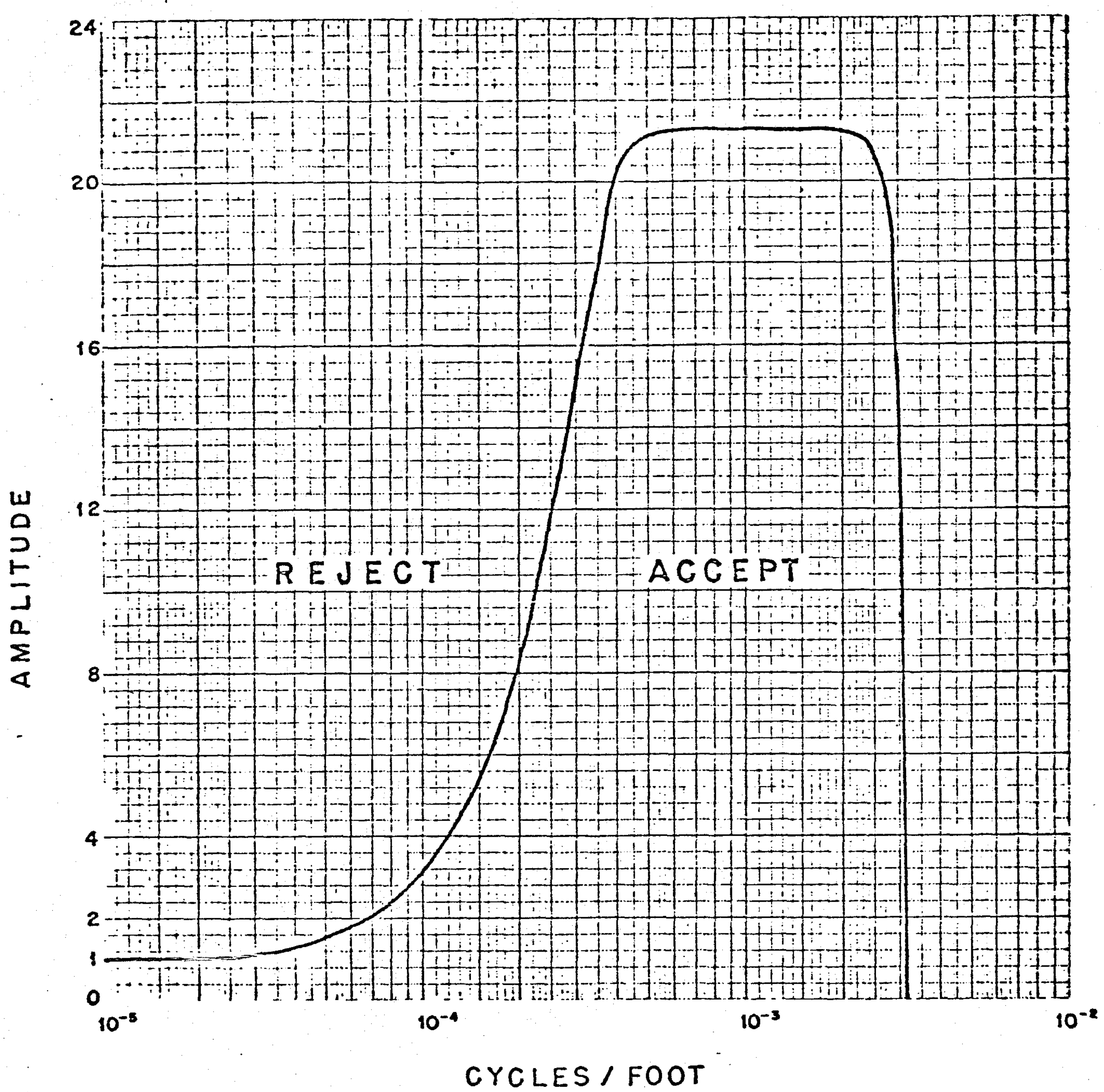

Figure 2 Frequency response of magnetic operator

The presence of a magnetic coincidence with an EM anomaly can result because the conductor is magnetic or because a magnetic body occurs in juxtaposition with the conductor. The majority of magnetic conductors represent sulfides containing pyrrhotite or magnetite. However, graphite and magnetite in close association can provide coinciding EM-magnetic anomalies. The truly magnetic conductors tend to follow closely the contoured magnetic highs. Such coincidence may be more evident on the enhanced magnetic map than on the standard magnetic map because of less disturbance from regional magnetic features. The enhancement, therefore, provides data maps which contribute to the evaluation of EM anomalies.

CONDUCTORS IN THE SURVEY AREA

The DIGHEM map provides an interpretation of conductors, as to their length, strike direction, depth, and conductance quality or conductivity-thickness product in mhos. There remains only to correlate these conductors with the known geology to provide the next step in the exploration program.

When studying the EM map for followup planning, consult the anomaly listings appended to this report to ensure that none of the conductors are overlooked. Conversely, the original map may be printed with topography burned out, leaving only the anomalies which then will be clearly visible.

The survey area was fairly inactive. The resistivity of the environment generally was greater than 100 ohm-m so there was no reason to prepare a resistivity map.

The survey area yielded a total of 150 EM anomalies, as shown in Table III, of which 116 are of the first (or lowest) conductance grade. Many of the latter are likely to be surface effects. The EM map indicates which anomalies are believed to be caused by cultural and surficial sources. Generally, such anomalies are not commented on below, as the discussions are directed to identifying bedrock conductors.

Table III. Distribution of EM Anomalies in all Areas

Anomaly Grade	Number of Anomalies
6	0
5	1
4	4
3	10
2	19
1	116
Total	150

The field followup should not completely ignore anomalies interpreted to be of a cultural source. If the followup shows that culture does not exist near such an anomaly, then the conductor probably occurs in the bedrock.

15B	This weak single-line conductor yielded a fishtail response, suggesting that it could reflect a bedrock feature.
16A	A 30 gamma magnetic anomaly correlates closely with this single-line grade 1 conductor.
18A-19C	This two-line grade 2 anomaly is in an area of culture, but it might indicate a bedrock conductor.
22B-23B, 24A-25A	There is no magnetic correlation with these questionable two-line grade 1 conductors.
30C	This single-line grade 1 anomaly could be a bedrock conductor or, possibly, culture.
31A-32A	This two-line grade 3 anomaly is very weak. It has a 30 gamma correlation which, however, may be of no consequence.
39E	There is no magnetic correlation with this single-line grade 2 bedrock conductor.

49A	This single-line grade 2 anomaly could indicate a bedrock conductor.
51B, 51C-52A, 53B	These grade 1 anomalies could reflect bedrock conduction. There is a 20 gamma correlation with 51B. 53B may belong to the same conductor as 51C-52A.
60A	This may be a bedrock conductor, although the EM signal levels are very low. The 50 gamma correlation probably is merely happenstance.
67A, 67B	These two single-line grade 1 anomalies may reflect a single non-magnetic bedrock conductor. The associated weak fishtail anomaly can be interpreted to suggest that the conductor strikes subparallel to the flight line.
88A-92A	This four-line grade 1 non-magnetic anomaly represents weak EM signals, and [illegible] be regarded as questionable.
93B, 93C	A 60 gamma magnetic response correlates directly with the single-line grade 1 anomaly 93B. Both this and the single-line grade 2 anomaly 93C are very weak.

1020A-105A

A weak magnetic correlation (see enhanced magnetic map) exists with this four-line grade 1 conductor. The conductor is somewhat questionable except for the definite bedrock-like response of 105A.

Respectfully submitted,

D. C. Fraser
President

Toronto, Ontario
January 7, 1977
/ap

Three maps accompany this report:

Electromagnetics	1 map sheet
Magnetics	1 map sheet
Enhanced magnetics	1 map sheet

	STANDARD COIL		NULL-COILS FISH WHALE		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
LINE & ANOMALY	REAL PPM	QUAD PPM	QUAD PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
15A	7	2	5	1	30	72	7	343	4	269
15B	1	6	6	2	1	0	1	0	462	0
16A	0	3	0	2	1	0	1	222	456	0
16B	10	2	0	5	58	75	12	312	1	265
17A	2	1	1	2	7	198	2	561	728	0
17B	4	2	0	3	10	65	3	372	217	0
18A	4	3	-3	3	7	16	2	234	36	129
19A	7	3	0	3	23	122	6	381	6	302
19B	7	7	0	2	7	86	2	301	37	194
19C	5	4	0	2	6	104	2	356	44	237
20A	6	3	2	3	18	41	5	270	8	197
22A	0	6	0	4	1	0	1	115	539	0
22B	1	9	0	2	1	0	1	80	451	0
22C	2	0	0	2	12	0	3	245	80	0
22D	2	2	3	3	7	176	2	521	592	0
23A	5	4	-3	4	10	12	3	236	21	139
23B	3	15	0	3	1	0	1	68	266	0
23C	0	6	0	2	1	0	1	127	561	0
23D	1	5	0	3	1	0	1	172	507	0
24A	4	6	3	6	3	55	1	248	90	102
24B	2	6	0	1	1	0	1	144	344	0
24C	4	5	0	3	4	81	1	317	78	166
24D	3	5	0	2	3	81	1	309	107	144
24E	0	6	0	3	1	0	1	68	554	0
24F	0	10	0	4	1	0	1	30	676	0
25A	1	6	0	2	1	0	1	118	547	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	NULL-COILS FISH QUAD PPM	NULL-COILS WHALE QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH FEET
26A	2	2	-2	3	6	0	2	205	52	79
27A	0	9	0	4	1	0	1	95	649	0
27B	3	16	3	6	1	0	1	98	291	0
27C	0	4	1	0	1	0	1	249	683	0
28A	0	4	2	2	1	0	1	167	538	0
28B	0	5	0	3	1	0	1	179	523	0
28C	0	7	0	1	1	0	1	39	582	0
29A	0	5	0	2	1	0	1	189	523	2
29B	0	5	0	2	1	0	1	150	523	0
29C	0	3	-2	3	1	0	1	253	546	0
30A	9	12	-3	6	5	34	2	202	41	93
30B	5	3	2	3	12	113	3	356	15	263
30C	0	3	2	0	1	0	1	225	495	29
31A	3	0	0	0	16	182	4	549	521	0
31B	10	7	-3	5	12	21	3	225	15	139
31C	4	4	-2	4	6	133	2	398	418	0
32A	2	0	0	1	9	259	2	656	992	0
32B	13	17	-6	11	6	0	2	101	32	5
32C	6	11	0	5	3	33	1	196	85	65
32D	0	5	0	1	1	0	1	167	523	0
33A	8	11	4	4	6	41	2	210	39	103
33B	3	5	3	7	4	81	1	291	80	145
33C	2	1	0	1	9	249	2	606	933	0
34A	3	2	3	3	11	155	3	479	[illegible]	0
34B	2	8	0	4	1	5	1	153	302	0
34C	0	9	0	2	1	0	1	51	649	0
34D	2	1	0	3	9	148	2	506	493	0
35A	0	4	0	3	1	0	1	214	480	14

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

LINE & ANOMALY	STANDARD COIL REAL PPM	STANDARD COIL QUAD PPM	NULL-COILS FISH WHALE QUAD PPM	NULL-COILS FISH WHALE QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* FEET	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH FEET	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH FEET
36A	2	27	3	5	1	0	1	43	430	0
36B	2	11	4	4	1	1	1	122	288	0
37A	0	5	0	2	1	0	1	237	507	45
38A	2	14	0	4	1	0	1	51	417	0
38B	2	21	0	5	1	0	1	37	355	0
38C	2	5	0	3	2	21	1	229	187	52
39A	0	3	2	3	1	0	1	310	927	0
39B	3	13	0	6	1	0	1	109	230	0
39C	3	11	-4	4	1	0	1	92	205	0
39D	5	8	0	3	4	49	1	237	79	98
39E	3	3	2	2	5	153	2	440	534	0
40A	0	19	0	5	1	0	1	49	857	0
40B	1	13	0	6	1	0	1	39	747	0
40C	5	4	-4	3	12	0	4	191	13	110
41A	5	5	0	2	6	43	2	286	46	167
41B	0	4	-3	3	1	0	1	152	558	0
42A	1	22	0	6	1	0	1	9	913	0
42B	1	4	4	3	1	0	1	132	296	0
42C	3	38	0	9	1	0	1	11	413	0
43A	0	8	0	2	1	0	1	131	614	0
43B	5	7	0	3	4	91	1	288	76	147
43C	2	2	0	2	4	0	1	312	212	0
43D	4	2	0	3	11	49	3	364	192	0
43E	0	3	-4	3	1	0	1	55	660	0
43F	0	4	0	2	1	0	1	233	560	0
43G	3	12	0	4	1	9	1	135	267	0
45A	2	1	0	2	7	199	2	602	755	0
46A	0	8	0	4	1	0	1	85	626	0
46B	7	3	0	2	21	172	5	442	8	358

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

	STANDARD COIL		NULL-COILS FISH WHALE		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
LINE & ANOMALY	REAL PPM	QUAD PPM	QUAD PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
48A	1	2	0	2	2	134	1	411	760	0
48B	1	3	0	3	1	130	1	350	1007	0
49A	4	4	-1	2	5	132	2	395	444	0
49B	2	3	0	3	3	83	1	344	432	0
51A	0	8	0	2	1	0	1	87	614	0
51B	3	13	0	4	1	0	1	116	215	0
51C	3	8	-3	4	2	0	1	130	181	0
51D	1	9	2	2	1	0	1	109	447	0
51E	0	7	0	2	1	0	1	46	595	0
52A	5	35	0	7	1	0	1	0	219	0
52B	1	7	2	4	1	0	1	130	582	0
53A	0	12	0	3	1	0	1	48	734	0
53B	1	3	4	3	2	0	1	117	142	0
54A	0	11	0	2	1	0	1	79	691	0
54B	4	20	0	3	1	0	1	44	217	0
54C	2	8	0	2	1	0	1	143	248	0
55A	0	19	0	4	1	0	1	0	870	0
55B	1	17	0	5	1	0	1	0	587	0
55C	2	2	1	2	3	178	1	490	863	0
56A	0	7	0	4	1	0	1	102	602	0
56B	0	5	0	2	1	0	1	153	523	0
56C	0	6	0	3	1	0	1	141	554	0
56D	0	5	0	3	1	0	1	152	515	0
57A	0	12	0	3	1	0	1	38	725	0
57B	0	5	0	3	1	0	1	162	507	0
57C	0	4	0	3	1	0	1	268	750	0
57D	0	3	0	3	1	0	1	244	546	0
58A	0	6	1	2	1	0	1	106	554	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

	STANDARD COIL		NULL-COILS FISH WHALE		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
LINE & ANOMALY	REAL PPM	QUAD PPM	QUAD PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
59A	0	5	0	2	1	0	1	135	498	0
60A	2	2	2	4	5	158	1	492	624	0
61A	0	4	0	2	1	0	1	193	446	0
61B	2	7	0	2	1	9	1	179	273	11
61C	0	5	0	3	1	0	1	61	531	0
62A	0	3	2	6	1	0	1	173	507	0
62B	0	5	0	6	1	0	1	189	515	0
62C	0	3	0	3	1	0	1	329	999	0
63A	0	5	0	2	1	0	1	235	507	44
63B	0	5	0	2	1	0	1	186	531	2
63C	0	5	0	2	1	0	1	144	523	0
64A	0	5	0	2	1	0	1	262	498	68
64B	0	4	0	3	1	0	1	311	1007	0
65A	0	3	0	3	1	0	1	311	940	0
66A	0	7	0	3	1	0	1	146	582	0
67A	3	6	-3	2	2	23	1	200	140	48
67B	3	7	0	5	2	13	1	187	186	30
67C	0	8	0	4	1	0	1	152	608	0
69A	0	3	0	4	1	38	1	451	1007	0
72A	0	2	0	4	1	0	1	390	764	0
75A	0	3	0	2	1	0	1	310	927	0
75B	0	4	0	2	1	0	1	185	489	0
76A	0	7	2	3	1	0	1	128	595	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

	STANDARD COIL		NULL-COILS FISH	WHALE	VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
LINE & ANOMALY	REAL PPM	QUAD PPM	QUAD PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
77A	0	1	0	2	1	16	1	610	1007	0
82A	0	2	0	2	1	32	1	491	1007	0
88A	1	3	0	2	1	75	1	309	688	0
88B	3	0	0	3	25	155	6	493	395	0
89A	1	2	-2	2	2	11	1	296	468	0
90A	0	3	0	4	1	0	1	336	1007	0
92A	0	4	2	3	1	0	1	279	839	0
92B	0	3	0	2	1	0	1	369	1007	0
93A	0	5	0	4	1	0	1	198	515	9
93B	2	2	0	4	3	227	1	512	1007	0
93C	3	3	0	5	6	189	2	485	693	0
94A	0	4	0	2	1	0	1	272	782	0
1020A	0	2	-4	2	1	0	1	503	1007	0
104A	1	3	-3	2	2	61	1	264	171	92
105A	2	5	-2	3	2	0	1	162	187	0
105B	0	3	0	2	1	0	1	312	645	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

STATEMENT OF QUALIFICATIONS

I, Jan Klein, with business address in Vancouver, B.C., and residential address in Richmond, B.C., hereby certify that

1. I am a Geophysicist
2. I am a graduate of the Technological University, Delft, Netherland, with a M.Sc in 1965
3. I am a member of the Associations of Professional Engineers of British Columbia, number 9796, and Ontario, number 2693000.
4. I personally supervised the airborne geophysical work and have assessed and reviewed the data resulting from this work.

Respectfully submitted

Jan Klein

J. Klein, M.Sc, P.Eng.

EXHIBIT "A"

STATEMENT OF EXPENDITURES

VINE CLAIMS

Dighem Survey:

Digehm Limited - Invoice No. 77-8.	$ 45,551.50
Dighem Limited - Invoice No. 77-2.	5,998.50

Salaries:

Supervision: J. Klein, MSc, P. Eng . . . . 4 days @ $150/day.	600.00
Report Preparation: G.L. Webber. . . . . 3 days @ $100/day.	300.00
TOTAL EXPENDITURES .	$ 50,450.00

SIGNED: G L Webber
G.L. WEBBER

This is Exhibit "A" to the Statutory Declaration of G.L. Webber declared before me this 28 day of SEPTEMBER, 1977.

[signature]

6498 Part 1 of 5

COMINCO LTD.

EXPLORATION DIVISION

WESTERN DISTRICT

DIGHEM SURVEY

REPORT NO. D-71

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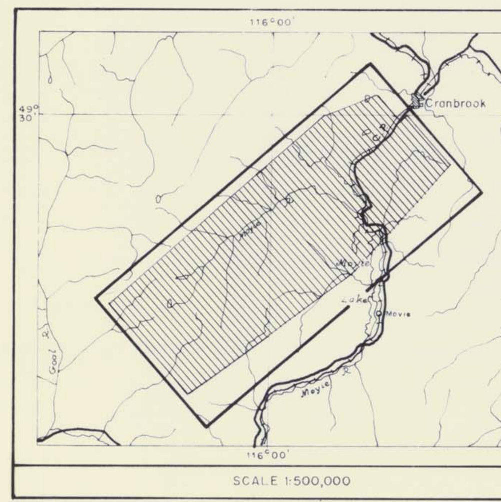
LOCATION MAP



SCALE 1:500,000

DIGHEM SURVEY

CRANBROOK AREA, BRITISH COLUMBIA

ELECTROMAGNETICS

FOR

COMINCO LIMITED

MILES

■■■■■■ APPROXIMATE LOCATION OF THE VINE CLAIM BOUNDARY

Flight line

1252

Fiducials and numbers

1256

Part 1 of 5

ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE
6	●	≥ 100
5	✸	50 — 99
4	●	20 — 49
3	◉	10 — 19
2	○	5 — 9
1	○	≤ 4

DIGHEM anomalies are divided into six grades of conductivity – thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geologic parameter. Most swamps yield Grade 1 anomalies but highly conducting clays can give Grade 2 anomalies. The 3-dimensional anomaly shapes often allow surface conductors to be recognized, and these are indicated by the letter S on this map. The remaining Grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: The ore bodies of the Magusi River camp yield Grade 4 anomalies, while Mattabi and Whistle give Grade 5. Graphite and sulphides can span all grades but, in this survey area, field work may show that the different grades indicate different types of conductors.

identifier → c 38 ← mho value

Depth is greater than
50 feet
100 feet
150 feet
200 feet

Inphase and Quadrature of max-coupled coil is greater than
5 ppm
10 ppm
15 ppm
20 ppm

Refer to list of anomalies in survey report for the actual ppm values for all coils, and for conductor depths.

The actual mho value is plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record, and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or conductive overburden effects.

—	Conductor axis
S	Probable surface response
S?	Possible surface response
L	Probable line (power, telephone, pipe, or fence)
L?	Possible line
?	Questionable anomaly
100γ	Direct magnetic correlation of 100 gammas
100γ N	Conductor is on the flank of a 100 gamma magnetic anomaly located to the north

DIGHEM maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a followup program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of all conductors in terms of length, strike direction, conductance and depth. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.

M = man-made conductor carrying power

IN THE MATTER OF THE

B.C. MINERAL ACT

AND

IN THE MATTER OF A DIGHEM SURVEY

CARRIED OUT ON THE VINE MINERAL CLAIMS AND

ADJACENT AREA

in the Fort Steele Mining Division of the

Province of British Columbia

More Particularly N.T.S. 82G/5W

A F F I D A V I T

I, G.L. WEBBER, of the City of Kimberley in the Province of British Columbia, make Oath and say:

1. That I am employed as a Geologist by Cominco Ltd. and as such, have a personal knowledge of the facts to which I hereinafter depose;

2. That annexed hereto and marked as Exhibit "A" to this my Affidavit is a true copy of expenditures incurred on a Dighem Survey, on the Vine mineral claims.

3. That the said expenditures were incurred between the 27th day of October, 1976 to the 23rd day of September 1977, for the purpose of mineral exploration on the above noted claims.

Sworn Before Me at CRANBROOK)
in the Province of British Columbia, this)
28 day of SEPTEMBER ,1977)

G L Webber
G.L. WEBBER

[signature]
A Commissioner for taking Affidavits in the)
Province of British Columbia.)

CONCLUDING STATEMENT

Jan Klein, M.Sc. P.Eng., of Cominco Ltd. personally supervised the Dighem airborne geophysical work and assessed and reviewed the data resulting from this work.

Material Compiled by: G.L. WEBBER

Endorsed by: J. KLEIN, P.Eng.
Chief Geophysicist

Approved for Release by: G. HARDEN, Manager
Exploration
Western District

Distribution:

Mining Recorder (2)
Vancouver (1)

Dighem Limited

SUITE 4900 TORONTO-DOMINION CENTRE TORONTO, CANADA M5K 1E8
TEL. (416) 362-3878 TELEX 06-219566

D71-2

Invoice No. 77-8
December 10, 1976

Cominco Limited,
Kootenay Exploration Division,
2450 Cranbrooke Street,
CRANBROOKE, B.C.

In Account With

DIGHEM LIMITED

TO:

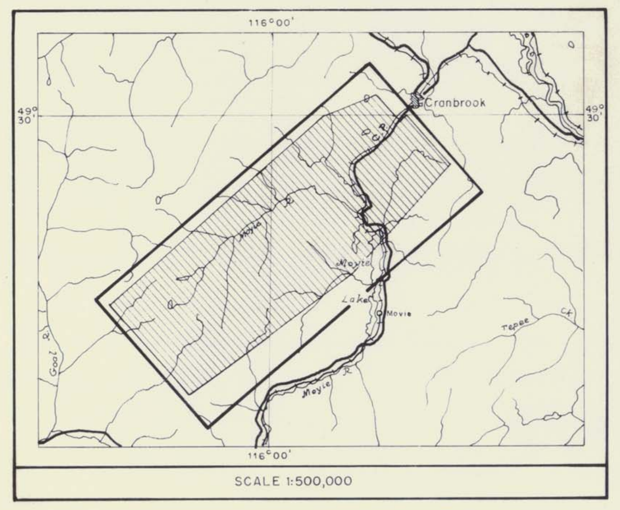
Dighem flying of agreement dated October 11, 1976	
850 line-miles at $55.00 per line-mile	$ 46,750.00
80% of ferry and mobilization quotation	2,800.00
Less interim payment	-5,998.50
Net, this invoice	$ 43,551.50

DIGHEM LIMITED

D. C. Fraser
President

DCF/ap
Job D71

LOCATION MAP



SCALE 1:500,000

DIGHEM SURVEY

CRANBROOK AREA, BRITISH COLUMBIA

MAGNETICS

FOR

COMINCO LIMITED

APPROXIMATE LOCATION OF THE VINE CLAIM BOUNDARY

Flight line

Fiducials and numbers

ISOMAGNETIC LINES

(total field)

1000 .... 1000 gammas

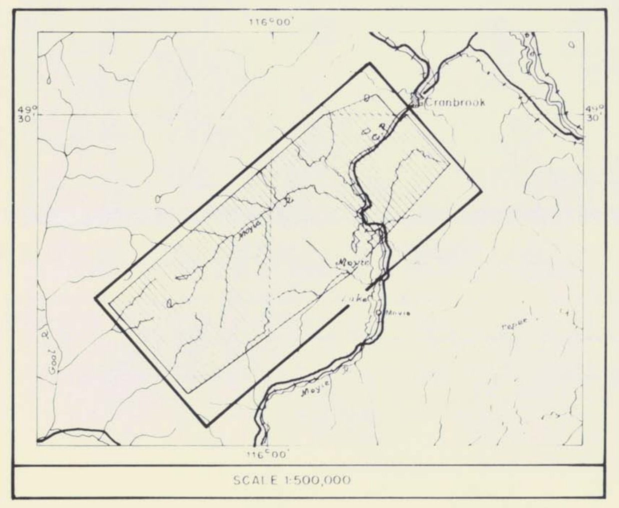
200 .... 200 gammas

.... 50 gammas

.... 25 gammas

.... magnetic depression

Part 1 of 5



DIGHEM SURVEY

CRANBROOK AREA, BRITISH COLUMBIA

ENHANCED MAGNETICS

FOR

COMINCO LIMITED

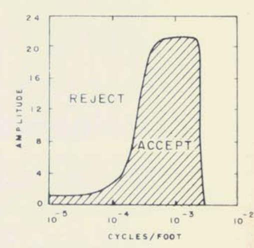
Flight line

Fiducials and numbers

ISOMAGNETIC LINES
(enhanced field)

5000 gammas
1000 gammas
200 gammas
100 gammas
magnetic depression

APPROXIMATE LOCATION OF THE VINE CLAIM BOUNDARY



Frequency response of magnetic operator

Part 1 of 5