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Report to

Torwest Resources (1962) Ltd.

on

Geophysical and Geochemical Surveys

Conducted August 15 - October 7, 1969,

on Part of the

TOP Group of Mineral Claims

Belonging to Harry Merrell, on

Promontory Hills, near Merritt, B. C.

120° 57' West Longitude and

50° 17' North Latitude

Prepared by

Sherwin F. Kelly, P. Eng.

Geophysicist and Geologist

February 17, 1970

Report on the
TOP Groups of Claims
To Torwest Resources (1962) Ltd.

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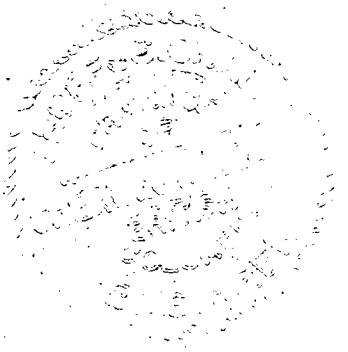

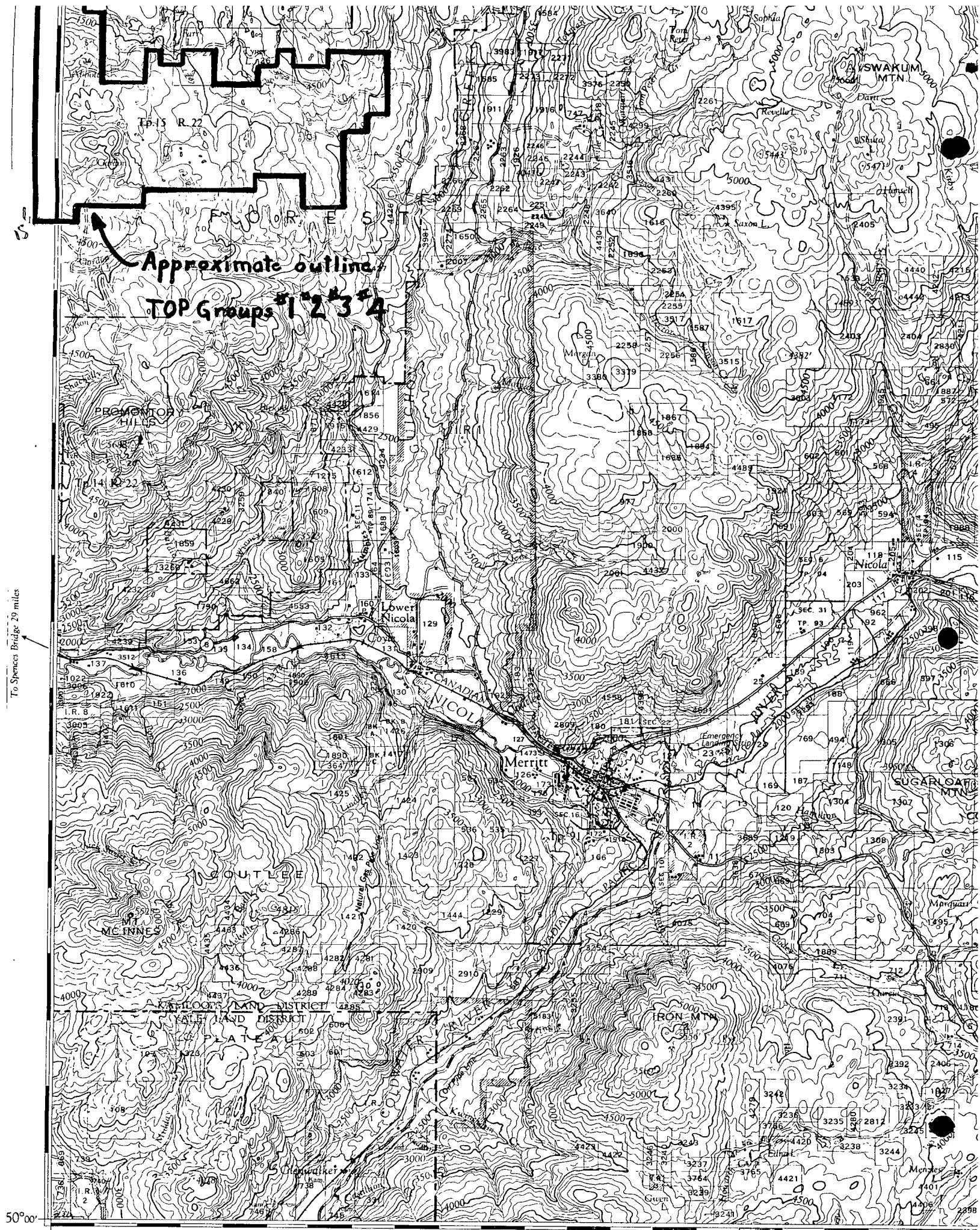

Fig. 1 Index Map

Report to
Torwest Resources (1962) Ltd.
on
Geophysical and Geochemical
Surveys on Part of the
TOP Group of Mineral Claims
near Merritt, B. C.

by

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Geophysicist and Geologist

INTRODUCTION

The geophysical and geochemical surveys herein reported, were carried out in the late summer and early fall of 1969, on a portion of the TOP group of mineral claims, lying twelve miles northwest of Merritt, B. C. (see Fig. 1). The claims are registered in the name of Harry Merrell, of Merritt, B. C. The work was conducted by Torwest Resources (1962) Ltd. (N.P.L.). The program was under the direction of Wm. Hainsworth, P. Eng., at that time and for several years previously the engineer for Torwest. The immediate supervision of the field work was exercised by Wm. Petrie, Field Supervisor for Torwest. The mapping was done by Wm. Petrie and Maurice Mathieu, former Field Supervisor for Torwest. All three men have been well-known to me for several years and I recognise them as conscientious, capable and competent men.

Affidavits of work were submitted in satisfaction of assessment requirements, by Wm. Hainsworth, P. Eng., on October 7, 1969, and filed in the office of the Mining Recorder in Vancouver. They included a total expenditure of $17,889.20 to apply to 160 claims. The claims involved are grouped in four blocks of 40 claims each (see Fig. 2). Some are in the Nicola Mining Division and some in the Kamloops Mining Division. One group straddles the boundary between the two Divisions.

FIG. 2

KEY MAP
TOP MINERAL CLAIMS

PROMONTORY HILLS
KAMLOOPS-NICOLA
MINING DIVISIONS B.C.

GROUP BOUNDARIES - - - - - - -

SCALE 1in.=3000ft. SEPT 1969

Claim locations, sizes and shapes are as depicted on Mining Recorder's maps and differ in places from claim outlines shown on figures accompanying this report.

NICOLA MINING DIVISION
KAMLOOPS MINING DIVISION

212	211	180																	
214	213	182	181																
216	215	184	183																
218	217	186	185			138		114	113				65			20	19	2	1
220	219	188	187			140	139	116	115			68	67	44	43	22	21	4	3
222	221	90	189	166	165	142	141	118	117	88	87	70	69	46	45	24	23	6	5
			GROUP		No 4										GROUP		No 1		
224	223	192	191	168	167	144	143	120	119	90	89	72	71	48	47	26	25	8	7
										GROUP		No 2							
226	225	194	193	170	169	146	145	122	121	92	91	74	73	50	49	28	27	10	
228	227	196	195	172	171	148	147	124	123	94	93	76	75	52	51	30	29		
		GROUP		No 3															
230	229	198	197	174	173	150	149	126	125	96	95	78	77	54	53	32	31		
232	231	200	199	176	175	152	151	128	127	98	97				55	34	33		
368	367	202	201	178	177										57	234	233		
370	369																		

Wm. Hainsworth, P. Eng., changed his employment before he could complete the report on the work. Torwest Resources requested me to review, interpret and report on the surveys. This report reviews, summarizes and interprets that work.

CLAIMS

There are 160 claims of the TOP Group of mineral claims on which the geochemical and geophysical surveys reported on herein, were conducted. They are grouped in four groups of 40 claims each: Group 1, Group 2, Group 3 and Group 4. The claims comprising each group, are as follows:-

	Claim Names	Record Nos.
GROUP 1		
Nicola Mining Division		
	TOP #1 - #8	37739/46
	TOP #10	37748
	TOP #19 - #34	37757/72
	TOP #43	37842
	TOP #45 - #55	37844/54
	TOP #57	37856
	TOP #233 - #234	38056/7
GROUP 2		
Nicola Mining Division		
	TOP #44	37843
	TOP #65	37864
	TOP #67 - #78	37866/77
	TOP #87 - #98	37886/97
	TOP #119 - #128	37906/15
Kamloops Mining Division		
	TOP #117 - #118	72085/86
	TOP #141	72097
	TOP #143	72099
GROUP 3		
Kamloops Mining Division		
	TOP #142	72098
	TOP #144 - #152	72100/08
	TOP #171 - #178	72127/34
	TOP #195 - #200	72151/6
	TOP #201 - #202	72843/4
	TOP #223 - #232	72865/74
	TOP #367 - #370	73190/3

	Claim Names	Record Number
GROUP 4 Kamloops Mining Division		
	TOP #113 - #116	72081/4
	TOP #138 - #140	72094/6
	TOP #165 - #170	72121/6
	TOP #180 - #194	72136/50
	TOP #211 - #222	72853/64

Expenditures were sworn in to the amount of $4,376.00 on Group 1; on Group 2, $239.00 was expended in the Kamloops Division and $5,140.60 in the Nicola Division for a total of $5,379.60; on Group 3 the sum was $4,115.50; and on Group 4 it was $4,018.10. The total sum recorded was then $17,889.20.

LOCATION AND ACCESS

The TOP group of mineral claims lies on the north spur of Promontory Hills, between the Craigmont Mine and Tyner Lake. The group is twelve miles northwest of Merritt, B. C. and may be reached either via Highway #5 to Spence's Bridge, or via the Aberdeen Road on the west side of Guichon Creek, which continues north past the Craigmont Mine, to the old Aberdeen Mine. Bush roads turn off both of these roads, giving access to a large portion of the southern part of the Highland Valley area, including these claims.

The TOP claim block lies in Tp. 15 R. 22 and the coordinates 120° 57' west longitude and 50° 17' north latitude, are near the middle of the group.

GEOLOGICAL SETTING

The TOP claims covered by the geochemical and geophysical surveys described in this report, are located near the southern end of the Guichon batholith. This intrusive formation is the one in which several impressive orebodies are being

developed, or are already producing, in the Highland Valley camp. It is an assemblage predominantly of granodiorites and quartz diorites, with a more basic hybrid margin where intruded Nicola volcanics and sediments were ingested.

The larger part of the TOP claims covered by the surveys, is underlain by the younger, moderately fine grained, feldspathic Witches Brook granodiorite and the slightly older, medium to coarse grained Chataway granodiorite. These form most of the bedrock of the northern three-quarters of TOP groups #1, #2, #3, and #4. The Chataway granodiorite lies to the east and the Witches Brook granodiorite to the west. The boundary between them is nearly north and south and lies close to the boundary between Group #2 on the east and Group #3 on the west.

Group 4 lies north of Group 3 and juts a mile and a half north from Abbott Lake. The northern two rows of claims in this group are probably underlain by the Skeena granodiorite, the principal host rock for the Highland Valley copper mineralization.

The southern portion of the survey area has the older, Guichon quartz diorite as bedrock. The boundary between the Guichon and the previously mentioned, younger Chataway and Witches Brook formations, runs practically east and west not far from the south boundary of the survey area. It swings northwesterly, however, at Gordon Lake. This is close to the boundary between Groups 2 and 3 and between the Chataway and Witches Brook intrusives.

The above description of the bedrock geology is derived from the map "Geology of the Guichon Creek Batholith, B. C." by K. Northcote.

GRID LAY-OUT

In preparation for the geochemical and geophysical surveys, a grid was laid out and lines cut and picketed. Four north-south base lines, varying from 4,000

ft. to 14,000 ft. in length, were run by compass and chain, and cleared. At intervals of 800 ft. east-west grid-lines were turned off from the base lines. They were blazed and slashed. Base lines and grid lines were flagged and marked by pickets every 100 ft. Lines, and observations along them, covered at least part of every claim in each claim group. Observations were made at 100 ft. intervals along the grid lines.

The base lines, picket lines and claim boundaries are shown on Figs. 3 to 10.

MAGNETIC SURVEY

The instrument used for the magnetic survey was the Sharpe fluxgate magnetometer model MF-1, with a sensitivity of 50 gammas per scale division on the three thousand gamma full scale deflection range. This was the range used for the survey. The instrument measures the vertical component of the magnetic field. Two such instruments were utilized, one belonging to Torwest Resources and the other rented from Coast Eldridge Professional Services Division of Warnock Hersey International Limited, Vancouver.

Magnetic readings were taken at 100 foot intervals along the grid lines described above. Eight base stations were established at various locations within the survey area and check readings were made three times each day at such base stations. The base check readings were made at the beginning of work in the morning, at noon and at the end of the work each day. From these readings the diurnal variations were obtained and applied as corrections to the readings taken during the day.

The readings corrected as above noted are entered on the magnetic maps, Figs. 3 to 6. The maps were drawn by Maurice Mathieu who also did the contouring.

The spacing of 800 ft. between observation lines is for reconnaissance surveys. Such a distance between lines of recorded readings results in some uncertainty in the correlation of values across the interval between the grid lines. Consequently, the contours used to define areas of differing values, must be considered as tentative only. The tendency is to make the contours cross the grid lines at nearly right angles, but with wide grid spacings it must be kept in mind that there may be alternative correlations. Wherever fill-in, detail work is carried out on intermediate lines, the correlations may be clarified.

The magnetic survey of the TOP claim groups, results of which are shown on Figs. 3 to 6, revealed only a moderate magnetic relief. The values generally lie in the range 4,500 to 6,500 gammas, with the overwhelming majority in the 5,000 to 6,000 gamma bracket. The values above or below the latter figures usually occur in small areas, which are few in number and widely scattered.

If the north-south elongation of the contoured areas is valid, this may be considered to reflect a similar orientation of some kind of structural or formational linearity in the underlying granodiorites. Such an hypothesis is re-enforced by the similar elongation of the lakes in this general area, as depicted on the topographic map of the Merritt area. It is evident in Gordon Lake, Tyner Lake, Farr Lake and, further north, in Dot Lake, Chataway Lake, Rosco Lake and others.

The magnetic lineation may or may not present a valid interpretation of the results. Detail work might show the magnetic ups and downs to represent, in actuality, merely a random distribution of weak highs and lows. Such random occurrence of magnetic highs and lows is typical of large, granitic intrusives.

If the north-south lineation is found to represent the true magnetic picture,

it could be due to concentrations of ferromagnesian minerals along flow lines, or zones of minor movement, in the intrusive magmas as the latter solidified. Doubt is cast on this interpretation, however, because the linearity is represented as uninterruptedly crossing the contact of the Chataway and Witches Brook intrusives with the older Guichon diorite to the south. This contact runs about east and west through the middle of Gordon Lake, at the south end of Fig. 5. No break is evident in the trend of the magnetic contours. Therefore, if this linearity is valid, it is more likely to represent a situation which arose subsequent to the solidification of the later intrusives and consequently affected them and the older rocks alike.

North-south fracture systems may have developed which affected all the formations mentioned. Solutions might have risen along these fractures and emplaced ferromagnesian minerals in the immediate wall rocks. These could then account for the weak, linear highs. Conversely, the solutions could have leached out pre-existing ferromagnesians, thus causing weak, linear lows.

The resolution of these alternative possibilities may have more than academic interest if it develops that ore minerals are found associated more frequently with magnetic highs or with magnetic lows. There seems to be no clear indication as yet, whether or not ore mineralization has any relationship to magnetic anomalies of either type.

It seems, however, that the magnetic relief is more pronounced in the western than in the eastern portion of the survey area. This is evident if the relief on Figs. 3 and 4 is compared with that shown on Figs. 5 and 6. The former relate to the area underlain by the older Chataway granodiorite whereas the area of Figs. 5 and 6 is underlain by the younger, Witches Brook granodiorites. The areas below

5,000 gammas and above 6,000 gammas, are larger and more numerous on Figs. 5 and 6 than they are on Figs. 3 and 4. The mafics in both Chataway and Witches Brook granodiorites are reported to average around 10% to 11%, so the content of these minerals in those rocks would not account for a difference in magnetic relief. Their distribution, however, may be sufficiently different to do so. In the Chataway rocks (Figs. 3 and 4) the mafics (hornblende and biotite) are said to be well separated and evenly distributed. In the Witches Brook (Figs. 5 and 6) however, they are reported to form irregular aggregates and to include some augite. Possibly such smaller aggregates also tend occasionally to cluster within larger volumes of rock. The Skeena granodiorite, underlying the north end of Map Area 4 (Fig. 6), has a lower mafic content of 5% to 10%, but with irregular distribution. The irregular distribution of ferromagnesian minerals plus differential enrichment or leaching along fracture systems, could explain the slightly different patterns in the two areas.

Since the ore minerals of the Highland Valley area show no distinctive magnetic characteristics, the results of a magnetic survey are not diagnostic of the occurrence or non-occurrence of the copper sulphides involved (chalcocite, bornite, chalcopyrite). The magnetic results can be of use, however, where they reveal structural or formational features of the bedrock. Such may well be the case here, but to make valid correlations, more data on bedrock characteristics and variations are needed in this immediate area, from detailed geological mapping, trenching and core drilling.

Some detail magnetic work should also be carried out on selected intermediate lines, to determine whether or not the apparent linearity of the magnetic contours is valid and if the trend directions are correctly depicted.

SOIL SAMPLING

Soil samples were taken at 100 ft. intervals along grid and base lines. The samples were obtained from the horizon immediately below the humus, the lower part of the A horizon. They consisted of two or three ounces of soil, placed in standard Kraft soil sample envelopes, marked and shipped to the laboratory of Barringer Research Ltd., in Vancouver, for analysis. The samples were dried and sieved by the Barringer laboratory and analysed for copper. Extraction was by hot perchloric acid extraction and measurement was by atomic absorption.

The results of the soil sampling and analysis are entered on the maps, Figs. 7 to 10, which show the grid lines and claim lines as well. The maps were drawn and the values contoured by Maurice Mathieu.

The background values of copper generally lie between 10 and 30 parts per million(ppm). The lowest contour used is 40 ppm, which may therefore be considered roughly twice background; values in this range can hardly be considered important. The strongest anomalies recorded went as high as 489 ppm. In the main, however, the highest contour used, "over 120 ppm." encloses values between 120 ppm and 250 ppm., or 6 to 12 times background. Such values are definitely of interest.

The soil value contours exhibit the same linearity and the same orientation, as do the magnetic ones. There is, however, no consistent relationship between either magnetic highs or lows, and the soil copper anomalies. These latter occur in areas of flat magnetic response as well as occasionally on highs or on lows.

As in the case of the magnetic reactions, there is a contrast between the results in two zones. At first glance, the copper contours seem to be fairly uniformly distributed, or even possibly more numerous on the eastern Group 1, Fig. 7, than on

those to the west, Figs. 8 to 10. Closer examination, however, reveals that the stronger anomalies, the significant ones of 80 ppm. and over, are broader and more persistent in the western area, Groups 3 and 4, shown on Figs. 9 and 10. This is the area underlain by the younger Witches Brook and Skeena granodiorites, and which showed a slightly stronger magnetic relief.

Especially noticeable is the strong anomaly near the north end of Group 4, Fig. 10. It appears to extend over a length of 3,000 ft. or more and to exhibit a maximum width of 400 ft. Values of soil copper within it, go as high as 245 ppm. Judging from the Northcote map, previously referred to, this anomaly should be close to the contact between the Skeena granodiorite to the north and the Witches Brook granodiorite on the south. This is a highly favorable geological situation for mineral deposition.

As in the case of the magnetic contours, the contours of the soil copper values must be considered approximate. The traverse lines at 800 ft. intervals, render uncertain the correlations from one line to the next. Hence, determining the true shapes, extents and orientations of the soil anomalies, must await detail observations made along selected, intermediate lines.

There is an interesting correlation of magnetic lows with the large copper anomaly just referred to. The copper anomaly is actually two, probably parallel ones en echelon. The south end of the east anomaly abuts a prominent, but not very strong, magnetic low. Another such low occurs west of the north end of that copper indication and on line with the other one of the anomaly pair, lying fourteen hundred feet to the south. Possibly two parallel fracture zones were invaded by magmatic solutions which, at some locations deposited metallic minerals as they leached ferromagnesians from other places.

Northwest of the big anomaly, near the west end of the northernmost grid line, there is a small but strong copper anomaly in a magnetic low. Far to the southeast, just west of the base line on grid lines 16N and 24N, there is a long, but narrow copper anomaly of moderate strength, which has a magnetic high at the north end and a magnetic low at the south end. It must be noted, however, that in this same general area, there are several strong copper anomalies not associated with either magnetic highs or lows. Conversely, there are magnetic lows without any copper anomalies. Evidently, any causal relationship between magnetic highs or lows and soil copper anomalies, remains to be established.

The most impressive soil copper anomalies are found in the area of Group 4, Fig. 10. The area of Group 3, Fig. 9, runs it a close second. These two areas deserve priority when it comes to scheduling detail observations by soil sampling and magnetic observations.

CONCLUSIONS

The geochemical and geophysical surveys on the four TOP groups of claims herein described, have yielded interesting and useful information. The magnetic results have indicated the possible existence of linear structural, or formational features that might have had a role in localizing mineral deposits. Further research is needed to clarify this possibility. The geochemical work has produced several copper soil anomalies that deserve further detailing and then testing by trenching and drilling.

As previously noted, these surveys were reconnaissance surveys, so the contoured areas are considered as being roughly outlined. There are a few places on the contour maps, where I would modify slightly the shapes of the contours. Since this

would make no material change in the picture, I have elected to let those contours stand as originally drawn. Where they might be important, the detail work will show their proper shapes.

COSTS AND DURATION OF SURVEYS

The line cutting, the magnetic survey and the soil sampling were carried out on the TOP mineral claim Groups 1, 2, 3, and 4, in the period August 15 to October 7, 1969. The costs were as follows.

Contract Line cutting

Gerald Bergeron, between September 17 and September 20, 1969, 30,000 ft. of line @ 1¢ per ft.	$ 300.00
H. C. Foley, September 17 and 18, 1969, 13,600 ft. of line @ 1¢ per ft.	$ 136.00
George Legendre, between September 1 and September 28, 1969, 164,500 ft. of line @ 1¢ per ft.	$1,645.00
Jean Venne, between September 1 and September 28, 1969, 151,600 ft. @ 1¢ per ft.	$1,516.00
	$3,597.00

Direct labor costs

Lorne McClelland, August 15 to October 7, 1969; 45 days. Foreman, magnetometer operator ($26.00/day plus overtime)	$1,538.25
Bud Johnston, August 15 to October 7, 1969; 41 days. Line cutter, magnetometer operator ($24.00/day plus overtime)	$1,149.15
Glen Urquhart, August 15 to October 3, 1969; 38 days. Line cutter, soil sampler ($22.80/day plus overtime)	$ 976.57
Rick Anheliger, August 15 to October 1, 1969; 28 days. Line cutter, soil sampler ($22.80/day plus overtime)	$ 711.77

Jean Venne, August 15 to September 1, 1969; 3 days.....$ 68.40
Line cutter, ($22.80/day)

Bob Burnett, August 15 to October 1, 1969; 22 days.....$ 522.26
Line cutter, soil sampler ($22.80/day plus overtime)

David Finlay, September 1 to October 1, 1969; 17 days.....$ 442.46
Line cutter, soil sampler ($22.80/day plus overtime)

Dennis Carey, September 1 to September 15, 1969; 8 days.....$ 201.63
Line cutter ($22.80/day plus overtime)

Andre Chenier, September 15 to October 1, 1969; 4 days.....$ 104.02
Soil sampler ($22.80/day plus overtime)

W. F. Petrie, August 15 to October 7, 1969; 32 days.....$1,312.50
Field Superintendant ($750/month)

$7,018.01

Rentals

Truck, from Tilden Rent-a-Truck Service.....$ 530.80

Truck, from Dave Finlay.....$ 40.00

Sharpe MF-1 magnetometer from
Eldridge Professional Services
Division, Warnock Hersey.....$ 300.00

$ 870.80

Laboratory fees

Testing of soil samples
Barringer Research.....$5,301.00

Consultation and Supervision

Wm. Hainsworth, P. Eng.....$1,100.00

Preparation of Report

Sherwin F. Kelly, P. Eng.....$ 400.00

Totals

Contract labor	$ 3,597.00
Direct labor costs	$ 7,018.01
Rentals	$ 870.80
Laboratory fees	$ 5,301.00
Consultation	$ 1,100.00
Report	$ 400.00
	$18,286.81

This figure is slightly higher than the total of $17,889.20 listed in the affidavits filed by Wm. Hainsworth, P. Eng., on October 7, 1969. This is probably due to some accounts not having been completed as of that date.

In his affidavit of October 7, 1969, Wm. Hainsworth, P. Eng., broke down the costs detailed above into categories of line cutting, surveying, etc. and applied them to the total area as follows.

Line cutting	$ 4,867.00
Magnetometer survey	$ 3,128.00
Soil sampling	$ 3,092.60
Soil analysis	$ 5,301.00
Supervision and Consultation	$ 1,100.00
Report	$ 400.00
	$17,888.60

The sixty-cent discrepancy between this figure and the one quoted, $17,889.20

on p. 3 from the affidavits, is due to a minor arithmetical error on the affidavit for Map Area #3.

The sums applicable to the individual areas (corrected for Map Area #3) were:-

Group #1 (Map Area #1)	$ 4,376.00
Group #2 (Map Area #2)	$ 5,379.60
Group #3 (Map Area #3)	$ 4,114.90
Group #4 (Map Area #4)	$ 4,018.10
	$17,888.60

The sum total actually applied to assessment requirements, however, was $4,000 for each group, making a total of $16,000.00.

(N.B. at the south end of Gordon Lake, Map Area 3, TOP claims #151, #152, #153 and #154 are shown on the Mining Recorder's maps as lying between TOP #128 on the east and #175 and #177 on the west. The ground was, of course, covered by the survey, although no stakes were found in that immediate area. To guard against the possibility that the ground had not been properly staked, Forwest restaked it. Short lengths of survey lines, 88S and 96S, between TOP #369 and Gordon Lake, just south of the group south boundary, served to define the shapes, continuities, extents and importance of several magnetic and soil copper anomalies, occurring immediately to the north, on the south edge of the group.)

Respectfully submitted,

Sherwin F. Kelly, P. Eng.,
Geophysicist & Geologist

P. O. Box 325
Merritt, B. C.
February 17, 1970

Certificate of Qualifications

I, Sherwin F. Kelly, P. Eng., residing at the Adelphi Hotel in Merritt, B. C., certify that:-

(1) I am a registered Professional Engineer in the Province of British Columbia.

(2) I received the degree of B. Sc. in Mining Engineering in 1917 at the University of Kansas.

(3) I pursued graduate work in geology and mineralogy at the Sorbonne, the Ecole des Mines and the Museum d'Histoire Naturelle in Paris, and at the University of Kansas and University of Toronto.

(4) I studied geophysics with Professor Conrad Schlumberger of the Ecole des Mines in Paris.

(5) I have practised as a geophysicist and geologist since 1920, in France, North Africa, Canada, the United States, Mexico, Central America, South America and the Caribbean.

Respectfully submitted,

Sherwin F. Kelly, P. Eng.,
Geophysicist and Geologist

Merritt, B. C.
February 17, 1970