May 1988

GRACEY RESOURCES INC.

SILVER PLATE CLAIM GROUP

Engineering Report

by D.Cukor, geologist, V.Cukor, P.Eng, NVC ENGINEERING Ltd. VANCOUVER, B.C.

TABLE OF CONTENTS

BIBLIOGRAPHY

APPENDIX 1 - DESCRIPTION OF ROCK SAMPLES

APPENDIX 2 - ASSAY CERTIFICATES

APPENDIX 3 - INSTRUMENTATION

ILLUSTRATIONS

GRACEY RESOURCES INC.

ST. ANTHONY, SILVER PLATE AND MONTE CASINO CLAIMS

VANCOUVER ISLAND, B.C.

1. INTRODUCTION

Gracey Resources Inc. contracted NVC Engineering Ltd. to carry out an exploration program on its Vancouver Island property. Although the general area has been explored to some detail, no previous work has been recorded on the claims and the work performed at this time was a grass root exploration attempt to locate any mineralization within the claim area.

The work carried out consisted of geological mapping, a geochemical soil survey, geophysical surveys and rock sampling. D. Cukor, geologist, was in charge of field programs under the overall supervision of V. Cukor, P.Eng. Line cutting and geochemical surveys were completed by November 1987 when extensive snow cover precluded further work. The remainder of the program was completed in April 1988.

All assays on geochemical and rock samples were conducted by General Testing Laboratories of Vancouver.

A total budget of about $80,000 was spent on this part of the program.

2. REVIEW

2.1 SUMMARY AND CONCLUSIONS

The Silver Plate Property is underlain in part by the Sicker Volcanic rocks which, elsewhere on Vancouver Island, host economically important precious metals and base metal deposits. Two grids, soil sampled, revealed small and scattered silver and copper geochemical anomalies. Very strong and extensive geochemical gold anomalies overlie the Sicker strata and their contacts with the Island Intrusives. On grid 1, the anomaly is also associated with a magnetic high anomaly and conductive EM zones.

Several rock samples collected within geochemical soil anomalies, returned significantly anomalous (although not economical) gold assays. Most of these samples also fall in the areas of poor rock exposures and proper evaluation, mapping and sampling of these showings has yet to be done. It should also be accompanied by power trenching.

2.2 RECOMMENDATIONS

The next stage of exploration should expand geological prospecting and sampling of the Sicker Group - Island Intrusive Contact Zone in the northern part of the St. Anthony Claim, snowbound during the described program. Very detailed mapping of the total area of geochemical gold anomalies, accompanied by extensive sampling should also be carried out. All areas with anomalous gold values in rock samples should be power trenched (using a backhoe or a bulldozer), mapped and sampled.

Fill in lines for better defining EM conductors are also necessary to better understand structure of the property.

If the next stage produces positive results, the showings should be diamond drill tested in the following stage of exploration.

2.3 COST ESTIMATE

1.	Geological mapping of NW part of claims, with sampling	
	- Geologist and Assistant - 21 days	$10,000
2.	Bulldozer trenching 200 hours @ $120	24,000
	- Mobilization, demobilization, road building	7,500
	- Geological supervision, mapping, sampling	5,000
3.	Fill in geophysical survey	
	- Line establishment	3,000
	- Surveys	5,000
	Assays compilation	8,000
	Data compilation, report	7,500
		$70,000
	Engineering and management fee	8,000
	Contingencies	7,500
	TOTAL BUDGET	**$85,500**

If encouraging results are encountered during this outlined stage, it is estimated that a budget of about $125,000 will be necessary for a diamond drill program in the following stage.

3. PROPERTY

3.1 LOCATION

Gracey Resources' property is located in the southern part of Vancouver Island, about 25 kilometres southeast of Port Alberni and 50 kilometres west of Duncan, B.C. The claims are on the NTS 92C 15/E. The property is centred at about north latitude 48° 585' and west latitude 124° 35'.

The eastern part of the property lies along the Nitinat River, it is within the MacMillan Bloedel Tree Licence and the company is required to obtain necessary permits for exploration activities.

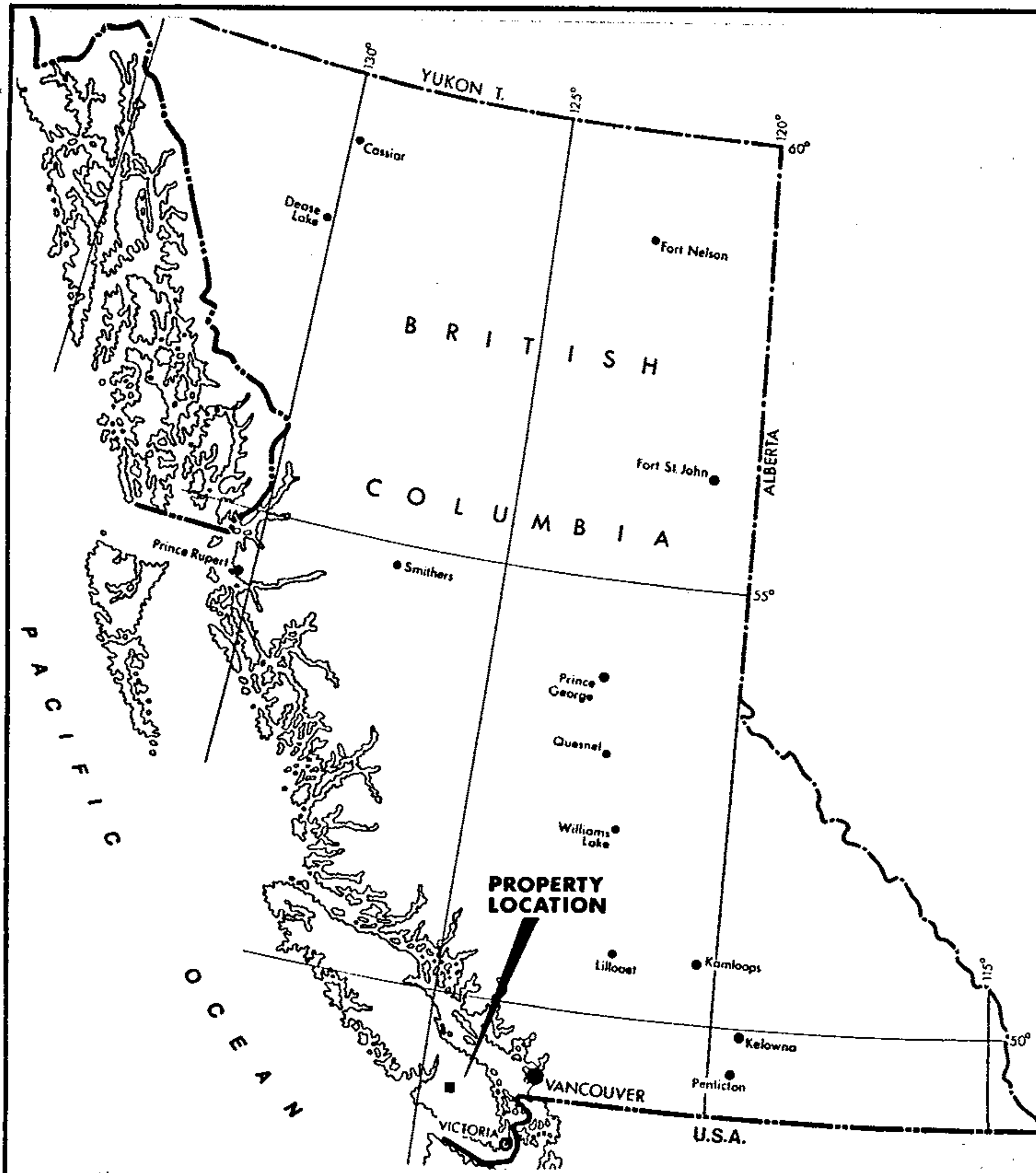
3.2 ACCESS

The property is readily accessible by the existing roads. The access to the property area is provided by a good quality, all weather gravel road from the lumber camp on Nitinat Lake and then following the Nitinat River Valley. From that road, various parts of the claims can be reached by a network of unused logging roads.

3.3 CLAIMS

Three contiguous mineral claims comprise the Silver Plate property. The claim names and corresponding record data are as follows:

Claim Name	No. Units	Record No.	Recording Date
St. Anthony	20	2009	August 5, 1987
Silver Plate	20	2001	August 21, 1987
Monte Casino	20	2002	August 24, 1987



Gracey Resources Inc.

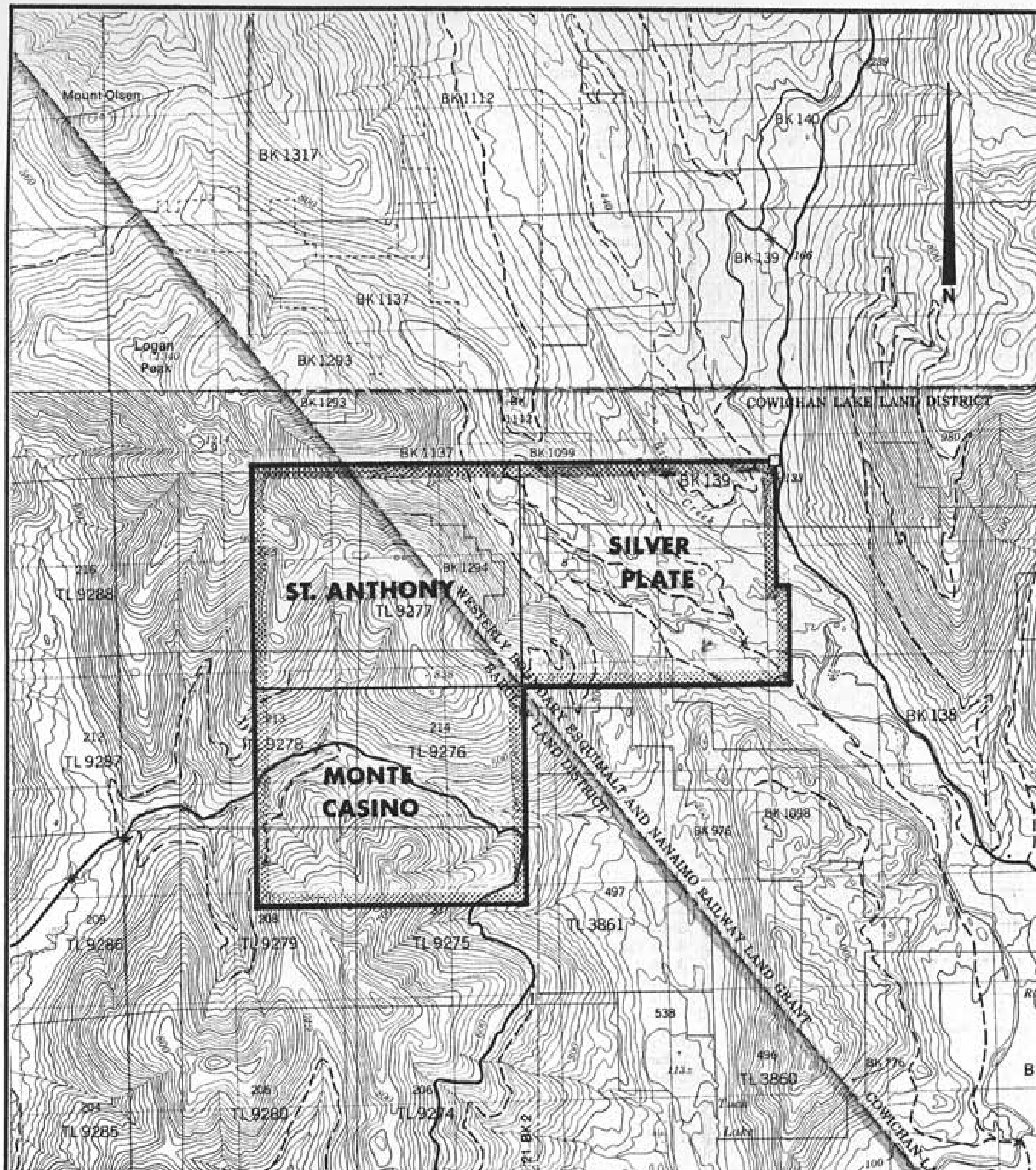
SILVER PLATE GROUP

LOCATION MAP

VICTORIA and ALBERNI M.D., B.C. NTS 92C/15E

V.CUKOR, P.Eng. - NVC ENGINEERING Ltd. - VANCOUVER, B.C.

DATE: May 1988	SCALE: 0 — 100 km	FIG. 1



Gracey Resources Inc.

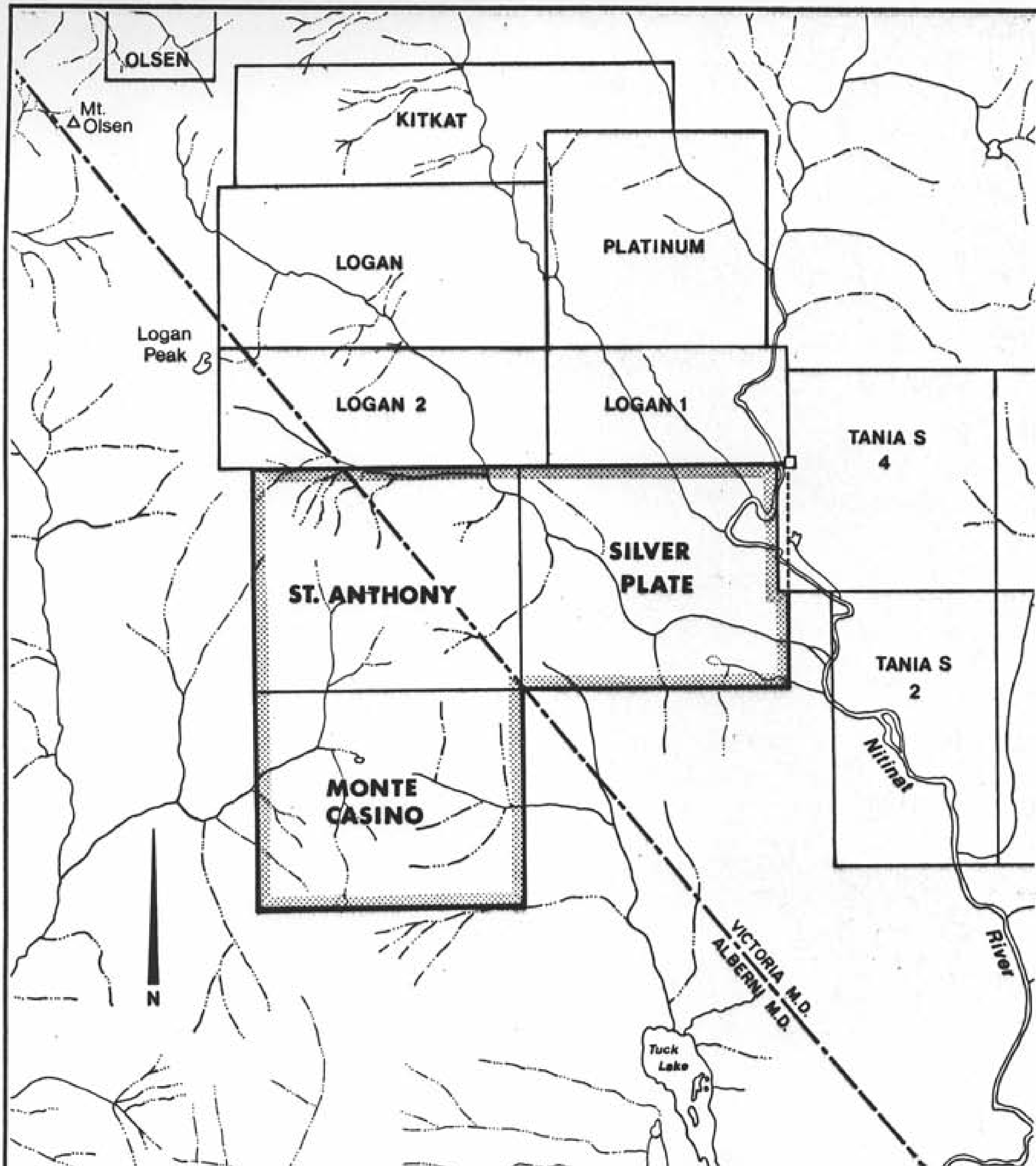
SILVER PLATE GROUP

CLAIMS AND TOPOGRAPHY

VICTORIA and ALBERNI M.D., B.C. — NTS 92C/15E

V.CUKOR, P.Eng. - NVC ENGINEERING Ltd. - VANCOUVER, B.C.

DATE:	May 1988	SCALE: 0 500 1000 meters	FIG. 2



Gracey Resources Inc.

SILVER PLATE GROUP

CLAIM MAP

VICTORIA and ALBERNI M.D., B.C. NTS 92C/15E

V.CUKOR, P.Eng. - NVC ENGINEERING Ltd. - VANCOUVER, B.C.

DATE: May 1988 | SCALE: 0 500 1000 meters | FIG. 3

Claims were located on the modified grid system by G. W. Batycki. Gracey Resources obtained, subsequently, 100% interest in all the claims.

The claims straddle the Victoria-Alberni Mining Division boundary, although all legal corner posts lie within the Victoria Mining Division.

3.4 TOPOGRAPHY AND CLIMATE

The St. Anthony property is located within the Insular Mountain Belt of Vancouver Island. It is between elevations of 100 to 1,140 metres above sea level. Total topographical relief is 1,040 metres. The Nitinat River valley on the east side of the claims forms the low part from where the terrain rises steeply in the easterly direction. The slopes are mostly steep to rugged, with the top fairly level. Streams form steep sided and deep canyons.

The climate of the area is typical for the west coast region with an abundance of atmospheric precipitation. Lower parts of the claims have mild winters, while the top parts are snow bound from October to late April.

The high humidity of the area enhances the rapid growth of the forest, which is generally intergrown with thick underbrush. This often hampers surface examinations and imposes extensive and costly line cutting.

4. GEOLOGY

4.1 REGIONAL GEOLOGY

General geological features of the area are shown on the GSC open file 821 map by J. E. Muller, 1973-1981, scale 1:125,000. The map produced by Fyles (1955) covers only the northeast corner of the claim area.

According to the published data available, the general area is underlain by Jurassic to Paleozoic strata, mainly of volcanic origin, which are intruded by Island Intrusions composed of granodiorite and quartz diorite (see fig. 4).

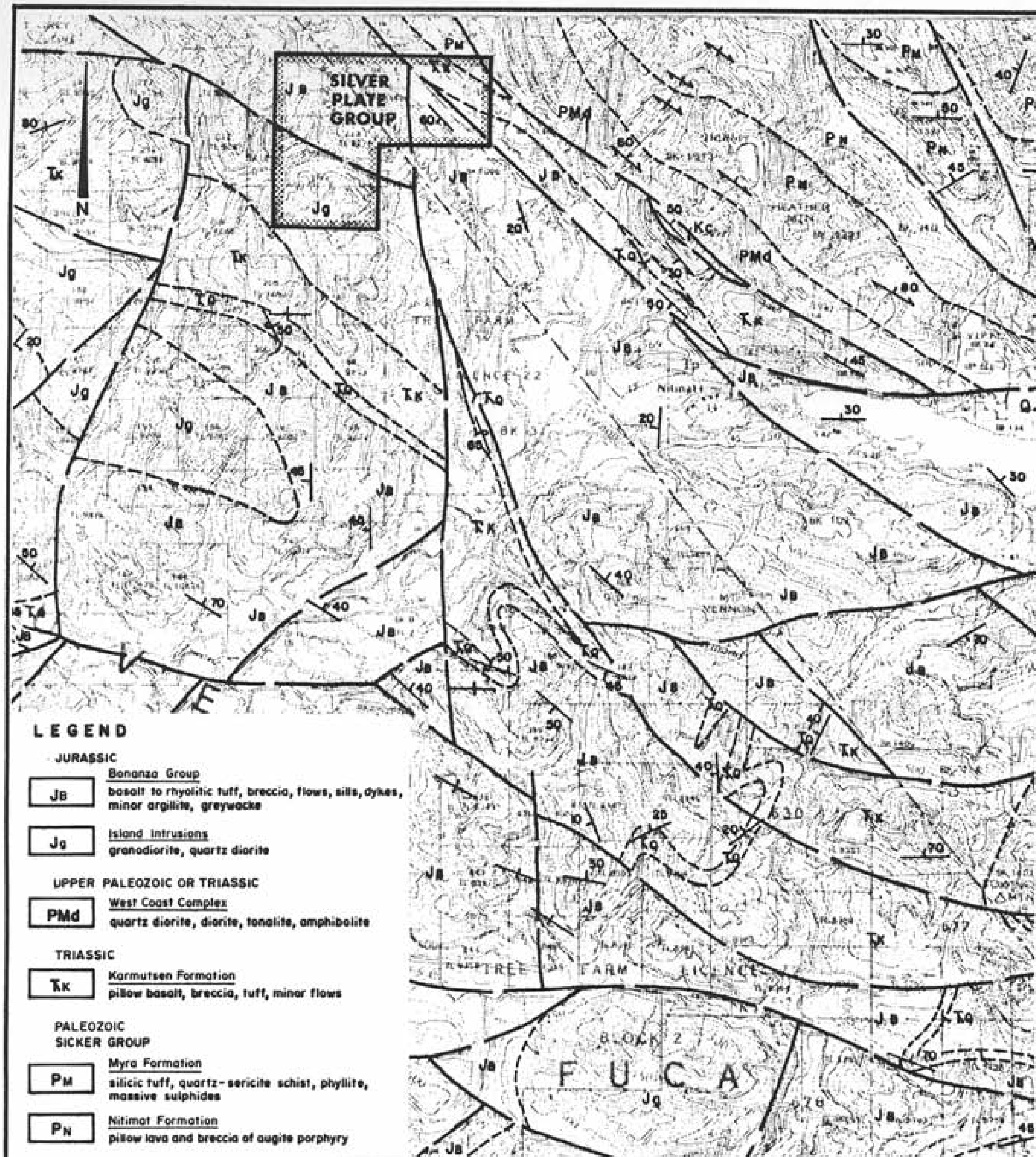
The geological formations show a general northwest alignment and the main structural trends follow the same direction. Regional deformation has obviously caused shallow folding along northwesterly axes, and is regularly associated with northwest trending faults and shear zones. These latest mostly form interformational contacts.

The most important feature is the presence of the Sicker group strata in the property area, since these units have an economical significance elsewhere in the area.

4.2 ECONOMIC GEOLOGY

The Sicker Volcanic Belt is host to several gold-silver and base metal deposits. The best known are Lara, Lynx-Myra (the announced 1979 reserves were: 15 million tons of 5.3% Zn, 2.2% Cu, 0.3% Pb, 1.1 oz/t Ag and 0.07 oz/t Au), Twin J. Mine (produced 300,000 tons averaging 6.12% Zn, 1.32% Cu, 0.6% Pb, 2.05 oz/t Ag and 0.075 oz/t Au).

The closest to the Silver Plate group are the gold showings on the Olsen Claims where extensive drilling and trenching



Geology by J.E.Muller, 1973-1981

Gracey Resources Inc.

SILVER PLATE GROUP

REGIONAL GEOLOGY

VICTORIA and ALBERNI M.D., B.C. NTS 92C/15E

V.CUKOR, P.Eng. - NVC ENGINEERING Ltd. - VANCOUVER, B.C.

DATE: May 1988	SCALE: 0 1 2 km	FIG. 4

reportedly returned gold values and assays up to 3 oz/t gold from the Canon Vein.

On the Kitkat and Platinum group claims (north of the Silver Plate group), grab samples assayed gold-silver-platinum values and samples from the Logan Claims (adjoining the Silver Plate to the north) also returned significant gold values.

The Carol and Heather Claims (east of the Silver Plate) were investigated to determine the economic significance of occurrences of massive sulfides accompanied by anomalous values in gold, silver and zinc. Mineralization of the same type as found on the Logan and Carol-Heather Claims is also found on the Silver Plate Claims.

4.3 LOCAL GEOLOGY

Detailed geological mapping of the outcrop on the Silver Plate group of claims revealed the presence of rocks of three main formations. To the east, on the Silver Plate Claim, rock outcrops mainly consist of alkali basalts and mafic flows of the Nitinat Formation. Part of these can possibly belong to the flows of the Jurassic Bonanza Group.

To the west, on the St. Anthony Claim, rock outcrops mostly consist of greywacke, argillite, felsic tuffs and mafic intrusives of the Myra Formation. Both the Nitinat and Myra formations are parts of the Paleozoic Sicker group.

On the western side, the strata of the Myra Formation are intruded by Island Intrusives consisting of light, greenish grey, medium to coarse alkali granite and fine equigranular diorite. These rocks cover the west part of the St. Anthony Claim and extend south, where they are exposed in road cuts over most of the Monte Casino Claim.

The contact between the Myra Formation rocks and intrusives is mainly abrupt - a fault zone. This is most likely part of the block faulting and shearing caused by the regional stress produced by the regional deformations.

The main types of alterations are silicification and chloritization, mainly related to shear zones and intrusive contacts.

4.4 MINERALIZATION

During the exploration of the Tania and Heather Claims, two interesting northwest trending structures were encountered, containing ankerite and grey quartz mineralized with pyrite and minor chalcopyrite. In one of these structures, dioritic rocks associated with the Jurassic intrusive invade sheared andesite. Abundant inclusions of Myra volcanics occur in the intrusive along the contact margins and are locally recrystalized to form hybrid intrusive phases similar to the dark green dioritic rocks that extend southward from the Logan Claims into the northeast part of the Silver Plate Claim.

There are several types of contact and shear related mineralization found on the Silver Plate group of claims that may be roughly subdivided as to mode of occurrence into the following:

1. Fine to medium grained disseminated sulphite (euhedral pyrite) in the fine siliceous matrix material of graphitic quartz veins containing subangular to rounded chloritized fragments of granitic intrusive.

2. Coarse irregular euhedral pyrite associated with shears in slightly retrograde chloritized granite.

3. Sheared quartz veins/stringers containing blebs and irregular dissemination of anhedral pyrite being replaced by variable amounts of bornite, chalcopyrite with occasional wispy stringers of tetrahedrite.

4. Massive sulphide in stringers (up to 20 cm width) consisting of coarse euhedral to subhedral pyrite with small amounts of gangue, small stringers of quartz with epidote.

5. Scarn type mineralization - magnetite with small irregular stringers of pyrite and chalcopyrite. Gangue consists of small irregular stringers of quartz and epidite.

6. Fine to medium massive euhedral pyrite and tetrahedrite in large (up to 0.5 metres thick) quartz veins, exposed every several metres, associated with the sheared contact between chloritized marginal dioritic intrusive and basaltic flows.

7. Fine to medium (some coarser fractions) disseminated euhedral pyrite associated with heavily chloritized gossanous shears in retrograded volcanic units and associated radiating silicified fractures.

The first two types of mineralization are considered low temperature and found in intrusive units, related to fractures and shears along the contact between Island Intrusives and mixed volcanics of the Myra Formation.

The next three types of occurrence (designated 3, 4 and 5) are higher temperature and similar in mineralogy. These types occur in the randomly oriented stringers associated with block faulting closely related to mafic intrusives in Myra volcanic and sedimentary units.

The last two types are also considered too low in temperature to be of major significance and associated with heavily retrograded volcanics in large post intrusive faults and shears.

One large fault on the St. Anthony claim is of some interest and consists of a zone approximately 20 metres in width that contains crushed gouge consisting of retrogressively altered volcanics, small silicified stringers and a crushed gouge consisting of clay kaolinite and oxidized gossanous sulphide (samples 1932-1940, however, did not produce positive results).

Although geochemical samples produced excellent values on both grids, rock samples so far returned only several significant precious metal values. These samples are:

Sample No.	oz/t Au	oz/t Ag
1904	0.055	0.16
1923	0.011	0.05
1924	0.025	0.06
1944	0.011	0.05
1945	0.012	0.05
1953	0.051	0.20

In addition, sample 1910 returned 0.007 oz/t Au and 0.2 oz/t Ag. These samples, although they did not produce economic values, are very significant since they occur within the structure which is overlain by a strong and extensive geochemical gold anomaly. In addition, the outcrop is fairly scarce in both areas and full extent of the mineralized outcrop remains, for now, unknown.

The gold bearing area present in the northeast corner of the Silver Plate claim is most likely the southeast extension of the gold structure discovered on the Logan claims.

Further work to evaluate the strength and size of the gold bearing area is warranted and should include more detailed geological mapping, sampling and bulldozer trenching.

The above listed samples representing only a small portion of the total number are just the ones with anomalous gold values. The total list of samples with the descriptions is at the end of the report in Appendix A; assay results are shown in Appendix B. All rock sample locations are shown on the Local Geology Map, fig. 5.

5. GEOCHEMICAL SURVEY

5.1 GENERAL DESCRIPTION OF SURVEY

In preparation for the surveys, two grids were cut. One, the lower and eastern most grid, grid 1, in the area where the mineralized zone from the Logan Claims is expected to extend, and the second, grid 2, at the high altitude, cut from the middle of the claim group westward.

During the field work, a total of 558 samples were collected along the grid lines, mostly at 50 metre intervals. Soil samples were taken, preferably from the "B" horizon and, on locations where not developed, any fine material was sampled. In the swampy areas with organic material, no samples were taken.

All samples were packaged in standard soil sample envelopes, dried in the field and shipped to General Testing's lab in Vancouver to be assayed for gold, silver and copper.

Separate procedures were used for gold-silver assay and copper assays. After oven drying samples, they were screened to -50 mesh. A 10 gram sample from the -50 mesh fraction was then fire assayed. The metallic bead produced was crushed, dissolved and processed for gold and silver by Atomic Absorption. A 1 gram sample was separated from the -50 mesh fraction and dissolved in hot aqua regia, and processed for copper by Atomic Absorption. Six geochemical plans were constructed to show an outline of anomalous areas.

5.2 DISCUSSION OF RESULTS

a. Gold

A statistical evaluation of the samples taken in the larger area (including surrounding properties) shows that the anomalous threshold is about 40 ppb Au and significantly anomalous values are over 60 ppb gold. On grid 1 (see fig. 6) a number of samples assayed extremely high values (13 samples run over 1,000 ppb gold), indicating a possible presence of free gold in the soil. On the northern part of the grid, high values tend to be spotty. On the lines 11, 12 and 13, however, such values are formed within a large zone and this area should be further investigated.

On the upper grid (grid 2 - see fig. 7), several areas of significantly anomalous gold values are outlined; the highest value is 740 ppb gold. The alignment of anomalous zones clearly prefers the northwest-southeast trend, which is also the strike of the major fault zone in the area. The upper grid definitely deserves to be enlarged and further explored in greater detail.

b. Silver

The statistical evaluation of the silver assay results indicated a fairly high anomalous threshold of 1.20 ppb Ag and significantly anomalous should be considered all values higher than 1.75 ppm Ag.

On grid 1 (see fig. 8), only several values reached the significantly anomalous level and these are scattered over the grid area. No significant coincidence between the gold anomalies and anomalous silver values is encountered.

On grid 2 (see fig. 9), anomalous zones also indicate the northwest trends, similar to the gold anomalies. Three parallel northwest-southeast trending anomalies are outlined, generally coinciding with the gold anomalies.

c. Copper

The statistical evaluation indicates an anomalous threshold of 80 ppm Cu; values over 120 ppb are significantly anomalous.

On grid 1, there are very few anomalies, mostly consisting of single samples (see fig. 10). Although these are scattered over the grid, all of the copper anomalies, except those on L7, L8 and L18, are related to gold anomalies. However, the copper anomalies are much more restricted in areal extent than the gold anomalies.

On grid 2 (see fig. 11), the anomalies are restricted to the southeast corner of the grid occurring much in the same area as the silver anomalies. Indeed the correlation between the copper anomalies and gold and silver anomalies is fairly good - all copper anomalies, wholly or partially, overlap gold and/or silver anomalies, though the shapes and sizes of anomalies do not correspond well.

6. GEOPHYSICAL SURVEYS

6.1 GENERAL DESCRIPTION

The geophysical surveys consisted of Ground Magnetic and VLF-EM. The Magnetic and VLF surveys were run simultaneously, both utilizing the Scintrex IGS-II system.

The part of the system dedicated to magnetics utilizes two console units, one set up as the base station, the other as the portable unit, and two similar proton precession sensors measuring total magnetic field. The base station and field unit are time synchronized so that the background field, diurnal variations and micro pulsations can be filtered from the data. The base station was programmed to measure the field and record the readings at five second intervals.

The VLF unit was set up to receive signals from two stations: NKL Seattle, Washington, 24.8 kHz and NPM, Lualualei, Hawaii, 23.4 kHz measuring the horizontal field strength and the in-phase or quadrature and out-of-phase components of the vertical field. The instrument uses a three coil system, one horizontal and two vertical coils, all at 90° angles to each other. The system is set to automatically adjust for topographical shadowing of signals.

6.2 GROUND MAGNETIC SURVEY

The ground magnetic survey was performed on both grids utilizing the IGS system. The base station was set up on two separate locations, one for each grid because of access reasons. Thus the two sets of data have separate magnetic bases.

Grid 1 gives a total magnetic relief of 1,836 gammas, a low of -34 gammas and a high of 1,802 gammas. The map, fig. 12, displays a strong signature - a high running SE-NW with a strong low to the north of it. The high corresponds closely with the outcrop pattern of the alkali basalts of the Sicker group (see fig. 5), and with the trend of the geological units in general.

Grid 2 shows a much weaker pattern. The general trends are NNW-SSE. The highs are generally linear and narrow. The highest and lowest values are part of a strong dipole. The dipole high, registering 785 gammas, is at L5, 675W and the low, -1,240 gammas is at L3, 600W.

6.3 VLF-EM SURVEY

The VLF-EM Survey displays several interesting anomalies on grid 1, see figs. 14 and 15. The Seattle survey shows several strong anomalies. Anomaly A is the strongest, running more than 1,000 metres in length. This parallels the magnetic signature. Anomaly B is in part coincident with anomalies 3 and 4 on the Hawaii plot. Anomaly C gives a very strong signature on lines L10, L11 and L13. Anomaly D is running at a small angle to the grid and is difficult to interpret, closer spaced lines are necessary. If indeed it runs as interpreted, it stretches nearly 1,500 metres.

On the Hawaii plot, the strongest anomaly is the one labeled 1. It occurs roughly in the area of Seattle, Anomaly A. Anomaly 2 has a corresponding anomaly on Seattle (unlabeled). Anomalies 3 and 4 have been mentioned earlier.

There are several other shorter, unlabeled anomalies in the area of Anomalies 2 and 3. These occur on both stations and in the area of high magnetics. On the north side, these anomalies are truncated by the Rift Creek Fault (see fig. 5).

Grid 2 contains comparably fewer anomalies. Anomaly A on Seattle stretches over a length of approximately 250 metres. Anomaly 1 on Hawaii, consisting of two parallel conductors separated by 75 metres, is over 300 metres in length and Anomaly B, also consisting of two parallel conductors, may be over 350 metres in length. Anomaly 2 may actually splay off Anomaly 1.

Respectfully Submitted

D. Cukor, Geologist

V. Cukor, P.Eng.
NVC ENGINEERING LTD.

May 1988

CERTIFICATE

I. VLADIMIR CUKOR, of 304 - 1720 Barclay Street in the City of Vancouver, Province of British Columbia, DO HEREBY CERTIFY that:

1. I am a Consulting Geological Engineer with NVC Engineering Ltd., with business address as above;

2. I graduated from the University of Zagreb, Yugoslavia in 1963 as a Graduated Geological Engineer;

3. I am a Registered Professional Engineer in the Geological Section of the Association of Professional engineers in the Province of British Columbia, Registration No. 7444;

4. I have practiced my profession as a Geological Engineer for the past 24 years in Europe, North America and South America in engineering geology, hydrogeology and exploration for base metals and precious metals;

5. I have supervised the work program on the St. Anthony, Silver Plate and Monte Casino claims;

6. I have no interest, direct or indirect, in the properties of Gracey Resources Inc;

7. I hereby consent to the use of this Report for the purpose of public financing.

V. Cukor, P.Eng.
NVC ENGINEERING LTD.

May 1988

CERTIFICATE

I, DAMIR CUKOR, of 6108 McKee Street, Burnaby, British Columbia, DO HEREBY CERTIFY that:

1. I graduated from the University of British Columbia in 1984 as a Bachelor of Science in Geology;

2. Since 1983, I have been employed as a geologist with NVC ENGINEERING LTD.;

3. I have worked in the field of exploration geology and geophysics for 12 seasons and have held positions of responsibility since 1982;

4. I performed and/or executed work as documented in this Report;

5. I have no interest, direct or indirect, in the properties of Gracey Resources Inc.;

6. I hereby consent to the use of this Report for the purpose of public financing.

D. Cukor
NVC ENGINEERING LTD.

May 1988

NVC engineering ltd.

304 - 1720 Barclay Street, Vancouver, B.C. V6G 1K4
Tel. (604) 688-7959

GRACEY RESOURCES INC.
Vancouver, B.C.

May 15, 1988
Invoice # 526

Geological, geochemical and geophysical program on the Silver Plate group of mineral claims, Vancouver Island.

Linecutting	$ 12,500.00
Geochemical soil sampling, 558 samples @ 12	6,696.00
Geological Mapping, rock sampling	9,700.00
VLF-EM survey	9,500.00
Magnetic survey	3,500.00
Assays	8,350.00
Equipment rental	7,800.00
Data correlation, drafting, report	12,000.00
Engineering, supervision, management	10,000.00
Total charges	$ 85,046.00

V. W

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Open File 1987-2:	Geology of the Cowichan Lake Area, Vancouver Island, B.C. Department of Mines.

APPENDIX 1

DESCRIPTION OF ROCK SAMPLES

DESCRIPTIONS OF ROCK SAMPLES

Sample No.		Description
1901	-	Irregular calc-silicate stringers in green silicified basalt with fine, euhedral disseminated pyrite.
	-	Rock chip sample.
1902	-	Irregular calc-silicate stringers in basalt with fine disseminated pyrite (5-10%).
	-	Rock chip sample.
1903	-	Silicified basalt with fine euhedral disseminated pyrite (10%).
	-	Rock chip sample.
1904	-	Silicified shear with quartz vein and occasional hematite in medium grained gabro.
	-	Rock chip sample.
1905	-	Similar to previous sample.
1906	-	Same as sample 1904.
1907	-	Silicified shear zone in chlorite-amphibolite sclist - no apparent mineralization.
	-	Character rock chip sample.
1908	-	Minor disseminated pyrite in fine grained basalt.
1909	-	Calc silicate vein 20-30 cm thick with fine disseminated pyrite-chalcopyrite (stained by malachite) in fine to medium grained basalt.
	-	Rock ship sample.

Sample No.		Description
1910	-	Sheared quartz vein with rolled sulphide stringers containing pyrite, chalcopyrite malachite and bornite, in light green, brecciated basalt.
	-	Chip sample of vein (10 cm).
1911	-	The same as 1910.
	-	Chip sample of silicified hangingwall material (1.0 metres).
1912	-	The same as 1910.
	-	Chip sample of silicified hangingwall material (1.0 metres).
1913	-	White quartz vein material with solution cavities containing druzy crystalline quartz.
	-	Coarse euhedral pyrite replaced by chalcopyrite.
	-	Grab sample of localized float.
1914	-	Fine euhedral disseminated pyrite in light greenish grey fine to medium grained siliceous diorite.
	-	Rock chip sample.
1915	-	Gossanous massive sulphide stringer (10-12 cm wide) in dark green fine chloritized volcanics.
	-	Rock chip sample.
1916	-	Fine fracture controlled pyrite parallel to retrograded shear in well fractured, dark green chloritized volcanics.
	-	Rock chip sample.

Sample No.	Description
1917	- Fine fracture controlled pyrite parallel to retrograded shear in well fractured, dark green chloritized volcanics. - Rock chip sample.
1918	- Fine fracture controlled pyrite parallel to retrograded shear in well fractured, dark green chloritized volcanics. - Rock chip sample.
1919	- White quartz vein material with stringers of chlorite and epidote. - Grab sample of float.
1920	- Well fractured dark green chloritized volcanics. - Rock chip sample.
1921	- Well fractured dark green chloritized volcanics with fine disseminated pyrite. - Rock chip sample.
1922	- Well fractured dark green chloritized volcanics, oxidized with fine disseminated pyrite. - Rock chip sample.
1923	- Light green fine silicified crystal tuff or marginal phase of intrusive diorite, well oxidized (gossanous) chloritized shear. - Hematite after pyrite. - Rock chip sample.

Sample No.		Description
1924	-	Graphitic quartz stringer (approx. 20 cm thick) containing subangular fragments of altered granite in granite.
	-	Medium to fine disseminated pyrite.
	-	Rock chip sample.
1925	-	Irregular silicified stringer containing epidote in light green chloritized basalt with fine to medium irregular fracture controlled pyrite, chalcopyrite with secondary bornite at fracture intersections.
	-	Rock chip sample.
1926	-	Similar to 1925 (fine to medium irregular fracture controlled pyrite, chalcopyrite with secondary bornite at fracture intersections).
	-	Rock chip sample.
1927	-	Similar to 1925, silicified stringer (fine to medium irregular fracture controlled pyrite, chalcopyrite with secondary bornite at fracture intersections).
	-	Rock chip sample.
1928	-	Small (3 cm) quartz vein and associated stringer containing coarse euhedral pyrite in dark green chloritized basalt.
	-	Rock chip sample.
1919	-	Malachite epidote in fractured chloritized basalt.
	-	Rock chip sample.
1930	-	Maclachite epidote in dark green fine chloritized basalt.
	-	Rock chip sample.

Sample No.		Description
1931-1939	-	Coarse sulphide silicified stringers, gossanous abundant fractures in large shear zone.
	-	Grab samples of gouge material.
1940-43	-	Irregular masses of coarse euhedral pyrite along sheared fractures in alkali granite.
	-	Rock chip sample.
1944	-	Massive sulphide, fine tetrahedrite with wispy stringers and irregular blebs of anhedral pyrite.
	-	Grab sample of float exposed in road bed.
1945	-	Light green medium to fine chloritized basalt, pyritized.
	-	Rock chip sample.
1946-1950	-	Large quartz vein approximately 50 cm wide, exposed for 10 metres in creek bed with fine disseminated pyrite and massive sulphide pyrite, tetrahedrite and chalcopyrite in chloritized diorite.
	-	Rock chip samples along veins.
1952	-	Sample from the silver showing.
1953	-	SP1 quartz bein containing pyrite.
1954	-	SP sample with abundant pyrite.
1955	-	St. Anthony 002 silicified oxydized rock.

APPENDIX 2

ASSAY CERTIFICATES

CERTIFICATE OF ASSAY

Date: May 3, 1988

File: 8804-2954

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
Ste. 304 - 1720 Barclay Street
Vancouver, B.C.
V6G 2Y1

We hereby certify that the following are the results of assays on: Ore

MARKED	GOLD oz/st	SILVER oz/st	xxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxx
1901	0.002	0.08						
1902	0.002	0.05						
1903	0.002	0.03						
1904	0.055	0.16						
1905	0.002	0.05						
1906	0.003	0.03						
1907	0.003	0.05						
1908	0.005	0.03						
1909	0.002	0.08						

NOTE REJECTS RETAINED ONE MONTH. PULPS RETAINED THREE MONTHS. ON REQUEST PULPS AND REJECTS WILL BE STORE FOR A MAXIMUM OF ONE YEAR.

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: May 12, 1988

File: 8805-1050

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
Ste. 304 - 1720 Barclay Street
Vancouver, B.C.
V6G 2Y1

We hereby certify that the following are the results of assays on: Ore

MARKED			GOLD	SILVER	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxxx
			oz/st							
JWSA	001	1910	0.007							
	002	1911	0.002							
	003	1912	0.002							
	004	1913	0.002							
	005	1914	0.002							
	006	1915	0.004							
	007	1916	0.002							
	008	1917	0.005							
	009	1918	0.002							
	010	1919	0.002							
	011	1920	0.002							
	012	1921	0.006							
	013	1922	0.004							
	014	1923	0.011							
	015	1924	0.025							
	016	1925	0.005							
	017	1926	0.002							
	018	1927	0.005							
	019	1928	0.002							
	020	1929	0.002							
	021	1930	0.002							
	023	1932	0.005							
	024	1933	0.004							
	025	1934	0.002							
	026	1935	0.002							
	027	1936	0.002							
	028	1927	0.002							
	029	1938	0.002							
	030	1939	0.004							
	031	1940	0.002							
	032	1941	0.002							
	033	1942	0.002							
	034	1943	0.002							
	035	1944	0.011							
	036	1945	0.012							
	037	1946	0.006							
	022	1931	0.002							

/ continued on page 2 ...

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: May 12, 1988

File: 8805-1050

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

(page 2)

We hereby certify that the following are the results of assays on: Ore

MARKED		GOLD oz/st	SILVER	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxx
JWSA 038	1947	0.002							
039	1948	0.002							
040	1949	0.002							
041	1950	0.002							
042	1951	0.002							

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: May 16, 1988

File: 8805-1050

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
Ste. 304 - 1720 Barclay Street
Vancouver, B.C.
V6G 2Y1

We hereby certify that the following are the results of assays on: Ore

MARKED	GOLD oz/st	SILVER oz/st	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxx
1910	0.006	0.20	note:	all gold	run as	rechecks		
1911	0.002	0.12						
1912	0.002	0.03						
1913	0.002	0.02						
1914	0.002	0.02						
1915	0.004	0.08						
1916	0.002	0.05						
1917	0.005	0.05						
1918	0.002	0.03						
1919	0.002	0.02						
1920	0.005	0.09						
1921	0.006	0.08						
1922	0.004	0.02						
1923	0.010	0.05						
1924	0.016	0.06						
1925	0.004	0.08						
1926	0.002	0.02						
1927	0.004	0.05						
1928	0.002	0.02						
1929	0.002	0.02						
1930	0.002	0.02						
1931	0.002	0.02						
1932	0.005	0.05						
1933	0.002	0.06						
1934	0.002	0.02						
1935	0.002	0.02						
1936	0.002	0.02						
1937	0.002	0.02						
1938	0.004	0.02						
1939	0.002	0.05						
1940	0.002	0.02						
1941	0.002	0.02						
1942	0.002	0.02						
1943	0.002	0.02						
1944	0.006	0.05						
1945	0.010	0.05						

COPY

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L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: May 16, 1988

File: 8805-1050

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

(page 2)

We hereby certify that the following are the results of assays on: Ore

MARKED	GOLD oz/st	SILVER oz/st	xxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxxx
1946	0.006	0.10		note:	all gold	run as	rechecks	
1947	0.002	0.02						
1948	0.002	0.02						
1949	0.002	0.02						
1950	0.002	0.02						
1951	0.002	0.02						

NOTE: REJECTS RETAINED ONE MONTH. PULPS RETAINED THREE MONTHS. ON REQUEST PULPS AND REJECTS WILL BE STORE FOR A MAXIMUM OF ONE YEAR.

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: MAY 17, 1988

File: 8805-1356

SGS
SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
Ste. 304 - 1720 Barclay Street
Vancouver, B.C.
V6G 2Y1

We hereby certify that the following are the results of assays on: Ore

4895

MARKED	GOLD oz/st	SILVER oz/st	xxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxxx
1952	0.005	0.05						
1953	0.051	0.20						
1954	0.003	0.02						
1955	0.002	0.02						

NOTE: REJECTS RETAINED ONE MONTH. PULPS RETAINED THREE MONTHS. ON REQUEST PULPS AND REJECTS WILL BE STORE FOR A MAXIMUM OF ONE YEAR.

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987
File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
304 - 1720 Barclay Street
Vancouver, B.C.
V6G 2Y1

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)					
G1-L#1	8+50 W	0.02	0.5	21					
	9+00	0.02	0.2	6					
	9+50	0.02	0.3	14					
	10+00	12.2	0.5	34					
G1-L#2	3+00 W	108.0	1.0	37					
	8+50	128.1	1.7	23					
	9+00	3.4	1.0	47					
	10+00	0.07	0.3	28					
G1-L#11	0+50 W	0.09	0.3	23					
	1+00	3.3	0.5	27					
	1+50	1.4	0.3	22					
	2+00	10.3	1.0	57					
	2+50	0.15	0.5	16					
	3+00	3.8	0.7	59					
	3+50	0.14	0.3	41					
	4+50	0.03	0.5	57					
	5+00	0.83	0.5	72					
	6+50	2.4	0.5	56					
	7+00	1.8	0.7	79					
	7+50	0.18	1.0	178					
	8+00	4.3	1.0	71					
	8+50	2.0	0.8	39					
	9+00	0.11	0.5	48					
	9+50	0.06	0.5	41					
	10+00	2.2	1.0	42					
G1-L#12	1+00 W	4.8	0.2	6					
	1+50	0.12	0.7	39					
	2+00	0.8	0.2	7					
	3+00	0.04	0.2	15					
	3+50	0.03	0.2	16					
	4+00	0.03	0.8	39					
	4+50	0.03	0.7	23					
	5+00	0.02	1,0	62					
	6+00	0.02	0.5	31					
	6+50	0.65	0.7	47					

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NOTE REJECTS RETAINED ONE MONTH PULPS RETAINED THREE MONTHS ON REQUEST PULPS AND REJECTS WILL BE STORE FOR A MAXIMUM OF ONE YEAR

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987

File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
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Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au(ppm)	SILVER Ag(ppm)	Copper Cu (ppm)					
G1-L#12	7+00 W	0.02	0.5	37					
	7+50	0.11	0.3	16					
	8+00	0.04	0.5	20					
	8+50	0.02	0.8	44					
	9+00	0.02	0.7	32					
	9+50	0.02	1.0	45					
	10+00	0.02	0.7	32					
G1-L#13	0+50 W	0.07	0.7	26					
	1+00	0.03	0.3	66					
	1+50	0.72	0.2	12					
	2+00	0.02	0.5	35					
	3+00	0.02	0.3	29					
	3+50	0.09	0.7	71					
	4+00	0.09	0.2	15					
	4+50	0.12	0.3	30					
	5+50	0.12	0.5	80					
	6+00	0.03	0.3	15					
	6+50	0.02	0.7	54					
	7+00	0.02	0.5	54					
	7+50	0.07	0.3	20					
	8+00	0.12	0.3	18					
	8+50	0.08	6.3	38					
	9+00	0.18	0.8	16					
	9+25	0.02	1.5	43					
G1-L#14	1+00 W	0.32	0.8	23					
	1+50	0.02	0.3	39					
	2+00	0.02	1.0	23					
	2+50	0.02	0.5	23					
	4+50	0.02	1.3	31					
	5+00	0.04	0.8	41					
	5+50	0.02	1.0	31					
	6+00	0.09	1.0	38					
	6+50	0.03	1.8	204					
	7+00	0.02	1.7	37					
	7+50	0.02	0.8	49					

continued on page 3 .....

L. Wong

PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987

File: 8711-2553

SGS

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
Ste. 304 - 1720 Barclay Street
Vancouver, B.C.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxx
G1-L#14	8+00 W	0.10	1.2	28					
	8+50	0.02	1.0	39					
	9+00	0.08	1.2	35					
	9+50	0.14	0.7	12					
	10+00	0.02	1.0	26					
G1-L#15	0+50 W	0.05	1.2	34					
	1+00	0.03	0.7	126					
	1+50	0.02	1.0	67					
	2+00	0.02	1.0	33					
	2+50	0.02	1.7	55					
	3+00	0.02	1.2	79					
	3+50	0.02	1.3	49					
	4+00	0.02	1.0	65					
	4+50	0.02	1.0	53					
	5+00	0.03	0.7	24					
	5+50	0.08	1.2	33					
	6+00	0.02	1.0	39					
	6+50	0.02	0.3	4					
	7+00	0.03	0.3	6					
	8+00	0.02	0.8	26					
	8+50	0.02	1.2	11					
	9+00	0.02	0.5	13					
	10+00	0.02	1.0	14					
G1-L#16	0+50 W	0.06	1.7	88					
	1+00	0.03	1.5	113					
	1+50	0.02	2.3	50					
	2+00	0.02	2.0	57					
	2+50	0.02	2.5	85					
	3+00	0.02	1.3	75					
	3+50	0.02	1.2	82					
	5+00	0.02	0.9	28					
	5+50	0.10	0.8	18					
	6+00	0.02	1.0	32					
	6+50	0.02	0.6	14					
	7+00	0.02	0.6	13					
	7+50	0.02	0.7	31					

/ continued on page 4 .....

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987

File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	
G1-L#16	8+00 W	0.02	0.1	9					
	8+50	0.12	0.4	21					
	9+00	0.02	0.2	26					
	9+50	0.02	0.8	43					
G1-L#17	0+50 W	0.04	0.6	75					
	2+00	0.09	1.1	72					
	2+50	0.02	0.7	80					
	3+00	0.03	0.6	55					
	3+50	0.02	0.7	32					
	4+00	0.02	0.2	13					
	4+50	0.03	0.1	2					
	5+00	0.02	0.6	16					
	5+50	0.03	0.7	29					
	6+00	0.03	0.4	12					
	6+50	0.02	0.6	38					
	7+00	0.02	0.7	30					
	8+50	0.13	0.6	14					
	9+00	0.05	0.9	25					
	9+50	0.04	0.8	58					
	10+00	0.02	1.0	52					
G1-L#18	0+50 W	0.03	0.9	124					
	1+00	0.05	0.9	50					
	1+50	0.04	0.6	49					
	2+00	0.04	0.7	32					
	2+50	0.02	0.7	27					
	3+00	0.02	0.8	10					
	3+50	0.02	1.0	179					
	4+00	0.02	0.8	25					
	4+50	0.02	0.2	37					
	5+00	0.02	0.4	15					
	5+50	0.02	1.1	30					
	6+00	0.02	0.7	9					
	8+50	0.02	0.6	21					
	9+00	0.03	0.7	27					
	9+50	0.04	0.3	43					
	10+00	0.03	0.7	64					

/ continued on page 5 ....

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987

File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au(ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	
G1-L#19	0+50 W	0.02	0.9	74					
	1+00	0.04	1.2	.48					
	1+50	0.02	0.4	28					
	2+00	0.16	0.3	12					
	2+50	0.02	0.3	31					
	3+00	0.16	0.6	40					
	3+50	0.04	0.1	9					
	4+00	0.03	1.0	13					
	4+50	0.04	1.5	19					
	5+00	0.04	1.2	26					
	5+50	0.04	-0.3	8					
	6+00	0.03	1.0	21					
	6+50	0.03	0.7	9					
	7+50	0.02	1.3	22					
	8+00	0.03	1.5	40					
	8+50	0.03	1.8	63					
	9+00	0.11	1.2	52					
	9+50	0.02	0.9	29					
	10+00	0.02	1.1	30					
G1-L#20	0+50 W	0.03	0.9	32					
	1+00	0.02	1.2	28					
	1+50	0.02	1.3	33					
	2+00	0,02	1.5	34					
	2+50	0.02	1.2	19					
	3+00	0.02	1.3	21					
	4+00	0.03	1.1	20					
	4+50	0.02	0.8	38					
	5+00	0.02	1.1	12					
	5+50	0.03	1.1	25					
	6+00	0.03	1.5	28					
	6+50	0.02	0.7	23					
	7+00	0.03	0.9	28					
	8+00	0.03	0.9	39					
	8+50	0.08	1.1	44					
	9+00	0.02	0.7	21					
	9+50	0.03	0.7	27					
	10+00 W	0.03	0.9	32					

/ continued page 6 ......

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987
File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	x
G2-L#2	0+50 W	0.04	0.7	42					
	1+00	0.02	0.8	76					
	1+50	0.02	0.5	113					
	2+00	0.03	1.5	181					
	4+00	0.02	0.5	96					
	4+50	0.03	1.3	247					
	5+00	0.02	0.5	96					
	6+00	0.04	0.4	76					
	7+00	0.04	0.9	202					
	7+50	0.02	0.3	71					
	8+00	0.02	0.3	37					
G2-L#3	0+50 W	0.02	0.8	188					
	2+00	0.06	0.5	94					
	3+00	0.03	1.1	382					
	3+50	0.02	0.8	134					
	4+00	0.32	0.3	48					
	4+50	0.03	0.9	159					
	5+00	0.02	0.7	117					
	6+00	0.02	0.8	102					
	6+50	0.03	0.9	219					
	7+00	0.03	0.7	7					
	7+50	0.03	1.6	14					
G2-L#4	1+00 W	0.03	2.1	50					
	1+50	0.02	1.2	29					
	2+00	0.02	1.1	30					
	3+50	0.02	1.7	22					
	6+00	0.02	1.3	27					
	6+50	0.02	1.5	18					
	7+00	0.03	0.8	15					
	7+50	0.02	0.5	8					
	8+50	0.02	1.1	21					
	9+50	0.02	1.3	9					
	10+50	0.02	0.3	6					

/ contined on page 7 .....

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987
File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au(ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxx
G2-L#5	0+50 W	0.04	1.5	46					
	1+00	0.04	1.9	42					
	1+50	0.02	2.0	167					
	2+50	0.02	1.1	66					
	3+00	0.02	0.9	25					
	3+50	0.10	1.3	26					
	4+00	0.02	0.9	34					
	5+00	0.18	1,5	253					
	5+50	0.07	0.9	30					
	6+00	0.03	1.9	59					
	6+50	0.05	1.1	25					
	7+00	0.03	0.4	8					
	8+00	0.02	1.6	49					
	8+50	0.02	1.2	41					
	9+00	0.02	0.3	5					
	9+50	0.02	0.5	11					
	10+50	0.02	1.3	9					
	11+00	0.12	1.1	25					
	11+50	0.05	0.5	6					
	12+00	0.02	0.3	6					
	12+50	0.02	0.4	4					
	13+00	0.02	0.3	3					
	13+50	0.02	0.1	3					
	14+00	0.02	0.3	4					
	14+50	0.02	0.5	10					
	15+00	0.03	0.4	4					
	15+50	0.02	1.2	8					
	16+00	0.05	0.5	9					
	17+00	0.02	0.5	5					
	17+50	0.02	0.4	3					
	18+00	0.02	0.4	3					
	18+50	0.02	0.4	3					
	19+00	0.02	0.3	4					
	19+50	0.02	0.3	4					
	20+00	0.02	0.3	6					
G2 L#6	1+00 W	0.06	1.2	42					
	1+50	0.04	0.9	33					

continued on page 8 ....

J. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987
File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxxxxxx	xxxxxx
G2-L#6	2+00 W	0.02	2.7	127					
	2+50	0.02	2.3	136					
	3+00	0.04	2.0	52					
	4+50	0.03	2.1	55					
	5+00	0.08	0.9	21					
	5+50	0.10	1.2	26					
	6+00	0.17	1.3	36					
	6+50	0.03	2.0	51					
	7+00	0.04	2.0	49					
	7+50	0.04	1.5	51					
	8+00	0.04	1.2	23					
	9+00	0.09	0.4	7					
	9+50	0.06	0.3	5					
	11+00	0.14	1.5	13					
	11+50	0.03	1.6	17					
	12+00	0.11	1.2	7					
	12+50	0.03	0.9	7					
	13+00	0.03	0.8	8					
	13+50	0.03	1.1	9					
	14+00	0.09	0.5	6					
	14+50	0.02	0.8	28					
G2 L#7	1+00 W	0.03	0.9	19					
	2+00	0.09	1.7	68					
	3+00	0.04	1.5	100					
	3+50	0.06	1.6	112					
	5+00	0.02	1.2	27					
	6+00	0.07	0.9	55					
	6+50	0.04	1.3	34					
	7+00	0.04	1.6	56					
	7+50	0.03	1.1	16					
	8+00	0.03	1.7	6					
	8+50	0.02	1.7	32					
	10+50	0.03	1.3	26					
	11+00	0.04	1.5	26					
	11+50	0.03	1.2	9					
	12+00	0.86	0.3	7					

/ contined on page 9 .....

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987
File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
(page 9)

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au(ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxx
G2 L#7	12+50 W	0.04	1.1	11					
	13+50	0.03	0.9	14					
	14+00	0.10	0.3	8					
	14+50	0.05	0.3	5					
	15+00	0.03	0.1	4					
	15+50	0.11	0.3	4					
	16+00	0.09	0.3	5					
	16+50	0.02	0.3	6					
	17+00	0.09	0.1	6					
	17+50	0.03	1.3	8					
	18+00	0.39	0.1	4					
	18+50	0.03	0.3	9					
	19+00	0.05	0.3	4					
	19+50	0.03	0.4	5					
	20+00	0.03	0.1	3					
G2 L#8	0+50 W	0.07	0.9	69					
	1+00	0.04	1.1	48					
	1+50	0.02	1.3	72					
	6+00	0.03	0.3	13					
	8+00	0.02	0.9	36					
	9+50	0.02	0.4	15					
	10+00	0.10	0.7	29					
	11+00	0.04	0.5	14					
	11+50	0.09	0.3	7					
	12+00	0.04	0.8	20					
	12+50	0.03	0.3	5					
	13+00	0.03	0.3	13					
	14+50	0.03	0.1	4					
	15+50	0.02	0.1	3					
	16+00	0.04	0.3	11					
	16+50	0.02	0.1	5					
	17+00	0.02	0.1	3					
	17+50	0.02	0.1	4					
	18+00	0.03	0.1	3					
	18+30	0.11	0.4	5					

/ continued on page 10 ......

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987

File: 8711-2553

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General Testing Laboratories Division
1001 East Pender Street,
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Telephone: (604) 254-1647
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TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED			GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxxxxx	xxxxxxxxx	xxxxxxxxxx	
G2 L#9	4+00 W		0.03	1.1	29				
	4+50		0.16	0.3	7				
	5+00		0.07	0.9	37				
	5+50		0.20	0.3	10				
	7+00	(A)	0.10	0.7	39				
	7+00	(B)	0.03	1.1	41				
	7+50		0.04	0.4	16				
	8+50		0.04	0.5	8				
	9+00		0.06	0.5	8				
	9+50		0.49	0.5	6				
	10+00		0.09	0.4	12				
	11+00		0.07	0.9	11				
	12+00		0.10	1.1	19				
	14+00		0.10	0.4	6				
	14+50		0.04	0.7	4				
	15+50		0.04	0.9	9				
	16+00		0.05	0.4	6				
G2 L#10	8+50		0.07	0.7	11				
	9+00		0.05	0.7	12				
	9+50		0.09	1.2	80				
	10+00		0.14	1.1	21				
	10+50		0.07	0.3	7				
	11+00		0.03	0.5	9				
	11+50		0.08	0.8	23				
	12+00		0.09	0.3	6				
	12+50		0.10	0.4	5				
	13+00		0.07	0.3	12				
	13+50		0.10	0.1	13				
	14+00		0.16	0.1	8				
	14+50		0.05	0.4	14				
	15+00		0.07	0.3	6				
	15+50		0.16	0.1	6				
	16+00		0.10	1.5	6				
	16+50		0.35	0.3	3				
	17+00		0.16	0.3	5				
	17+50		0.79	0.1	6				
	18+00		0.18	0.1	4				

/ continued on page 11 ....

L. Wong
PROVINCIAL ASSAYER

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Telephone: (604) 254-1647
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TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag (ppm)	Copper Cu (ppm)	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxx
G2 L#10	18+50 W	0.24	0.1	6					
	19+00	0.06	0.3	4					
	19+50	0.14	0.1	5					
	20+00	0.10	0.1	5					
G2 L#11	10+50 W	0.03	0.3	9					
	11+00	0.09	0.5	21					
	11+50	0.04	0.4	21					
	13+00	0.04	0.1	6					
	15+00	0.07	0.1	2					
	15+50	0.08	0.1	3					
	16+50	0.08	0.3	4					
	17+00	0.07	0.1	4					
	17+50	0.06	0.1	4					
	18+00	0.02	0.3	4					
	18+50	0.04	0.1	3					
	19+00	0.04	0.1	11					
	19+50	0.07	0.7	38					
G2 L#12	10+50	0.10	0.1	2					
	11+00	0.02	0.1	2					
	11+50	0.07	0.3	4					
	12+50	0.05	0.1	3					
	15+00	0.09	0.1	3					
	15+50	0.02	0.5	34					
	16+50	0.05	0.4	5					
	18+00	0.08	0.8	16					
	18+50	0.12	0.4	8					
	19+00	0.02	0.1	6					
	19+50	0.56	0.1	3					
	20+00	0.03	0.1	8					
BL G2	3+50 N	0.06	0.5	36					
	6+50	0.04	0.7	49					
	7+00	0.06	0.4	18					
	8+00	0.04	0.5	44					

/ continued on page 12 ....

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: December 23, 1987
File: 8711-2553

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

(page 12)

We hereby certify that the following are the results of assays on: soil samples

MARKED	GOLD	SILVER	Copper	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxx
	Au(ppm)	Ag(ppm)	Cu (ppm)					
R.S. N-7 01	0.02	0.4	8					
02	0.02	0.3	7					
03	0.03	0.4	7					
04	0.04	0.5	12					
05	0.03	0.7	11					
06	0.02	0.5	15					
07	0.02	0.5	10					
08	0.02	0.1	6					
09	0.07	0.1	6					
10	0.04	0.8	39					
11	0.04	0.9	32					
12	0.03	0.5	30					
13	0.03	0.7	51					
14	0.04	1.5	84					
15	0.04	0.5	11					
16	0.04	0.8	35					
30	0.04	0.9	15					
31	0.03	0.5	7					
32	0.04	0.4	7					
33	0.04	0.5	5					
34	0.04	0.4	6					
35	0.04	0.5	7					
38	0.03	0.7	12					
39 L.F.	0.04	0.7	10					
40 L.F.	0.03	0.5	9					
39 R.F.	0.03	0.7	10					
40 R.F.	0.02	0.4	5					
41 R.F.	0.02	0.3	3					
42 R.F.	0.03	0.5	5					

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: January 14, 1988
File: 8711-3051

SGS SUPERVISION SERVICES INC.
General Testing Laboratories Division
1001 East Pender Street,
Vancouver, B.C., Canada. V6A 1W2
Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.
Ste. 304 - 1720 Barclay Street
Vancouver, B.C.
V6G 2Y1

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxx
BL G2	1+50 S	0.06	0.7	135					
	2+00	0.03	1.0	58					
	2+50	0.05	1.2	112					
	3+00	0.02	1.1	66					
	3+50	0.02	1.3	49					
	4+50	0.02	1.1	50					
	5+50	0.02	0.7	76					
	6+50	0.05	0.9	43					
	7+50	0.02	0.6	20					
	8+50	0.03	0.6	14					
	9+50	0.05	0.8	120					
G1 L#1	00+00 W	0.05	0.8	114					
	1+00	0.02	1.0	31					
	1+50	0.02	1.2	51					
	2+00	0.05	1.0	124					
	2+50	0.04	1.1	100					
	3+00	0.02	0.7	20					
	3+50	0.02	0.6	26					
	4+00	0.02	0.8	16					
	4+50	0.02	0.9	42					
	5+00	0.03	1.1	62					
	5+50	0.03	0.2	8					
	6+00	0.03	0.8	61					
	6=50	0.02	0.7	24					
	7+00	0.02	0.4	22					
	7+50	0.02	0.2	5					
	8+00	0.02	1.0	59					
G1 L#2	0+50 W	0.02	0.4	59					
	2+00	0.02	0.6	14					
	2+50	0.02	0.6	15					
	3+50	0.03	0.9	70					
	4+50	0.02	0.3	59					
	5+00	0.02	0.4	7					
	5+50	0.02	0.8	14					
	6+00	0.02	0.4	50					

/ continued on page 2 .....

NOTE: REJECTS RETAINED ONE MONTH. PULPS RETAINED THREE MONTHS. ON REQUEST PULPS AND REJECTS WILL BE STORE FOR A MAXIMUM OF ONE YEAR.

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

Date: January 14, 1988
File: 8711-3051

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General Testing Laboratories Division
1001 East Pender Street,
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Telephone: (604) 254-1647
Telex: 04-507514

TO: N.V.C. ENGINEERING LTD.

We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxx
Gl L#2	6+50 W	0.02	0.8	58					
	7+00	0.02	0.3	40					
	7+50	0.02	1.3	7					
	8+00	0.02	0.8	26					
Gl L#3	0+50 W	0.02	0.7	13					
	1+50	0.02	0.8	59					
	2+00	0.02	0.7	34					
	2+50	0.02	0.9	66					
	3+00	0.02	0.8	58					
	3+50	0.02	0.8	53					
	4+00	0.02	0.7	32					
	4+50	0.03	0.7	11					
	5+00	0.02	0.6	76					
	5+50	0.03	0.9	18					
	6+00	0.03	0.7	11					
	6+50	0.04	0.7	19					
	7+00	0.02	0.9	54					
	7+50	0.02	0.8	33					
	8+00	0.02	1.0	51					
	8+50	0.02	0.9	78					
	9+00	0.02	0.7	50					
	9+50	0.02	1.1	69					
Gl L#4	0+00 W	0.02	1.2	53					
	0+50	0.02	0.4	73					
	1+00	0.02	0.6	33					
	1+50	0.03	0.7	57					
	2+00	0.02	1.1	57					
	2+50	0.03	0.8	68					
	3+00	0.03	0.9	62					
	4+00	0.03	0.9	67					
	4+50	0.03	1.3	37					
	5+00	0.06	1.2	91					
	5+50	0.03	1.0	68					
	6+00	0.03	1.2	50					
	6+50	0.03	0.9	53					
	7+00	0.03	1.3	48					

/ continued on page 3 ......

L. Wong
PROVINCIAL ASSAYER

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We hereby certify that the following are the results of assays on: soil samples

MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxx
G1 L#4	7+50 W	0.02	0.9	46					
	8+00	0.04	0.9	87					
	8+50	0.05	0.8	70					
	9+00	0.03	1.0	75					
G1 L#5	0+50 W	0.05	0.9	96					
	1+00	0.05	0.6	53					
	2+50	0.04	1.1	67					
	3+00	0.03	0.8	33					
	3+50	0.03	1.3	67					
	4+00	0.03	0.8	53					
	4+50	0.04	0.6	57					
	8+00	0.23	0.4	49					
	8+50	0.03	0.8	38					
	9+00	0.02	0.7	41					
	10+00	0.02	0.7	62					
G1 L#6	0+50 W	0.02	0.6	33					
	1+00	0.02	0.4	67					
	1+50	0.04	0.7	51					
	2+00	0.02	0.7	61					
	2+50	0.03	0.6	29					
	3+00	0.03	0.8	55					
	3+50	0.03	0.6	73					
	4+00	0.03	0.3	38					
	4+50	0.03	0.8	66					
	5+00	0.02	0.6	78					
	6+00	0.02	0.3	77					
	6+50	0.02	0.4	80					
	7+00	0.03	0.4	33					
	7+50	0.02	0.7	43					
	8+00	0.02	0.2	33					
	8+50	0.02	0.2	30					
	9+50	0.02	0.2	16					
G1 L#7	0+50	0.02	0.4	54					
	1+00	0.02	0.3	24					

/ continued on page 4 .....

L. Wong
PROVINCIAL ASSAYER

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MARKED		GOLD Au (ppm)	SILVER Ag(ppm)	Copper Cu (ppm)	xxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxx
G1L#7	1+50 W	0.02	0.4	35					
	2+00	0.02	0.1	13					
	2+50	0.02	0.3	35					
	3+00	0.02	0.7	84					
	3+50	0.03	0.6	76					
	4+00	0.03	0.2	46					
	4+50	0.03	0.3	55					
	5+50	0.22	0.2	51					
	6+00	0.02	0.2	34					
	6+50	0.02	0.2	7					
	8+00	0.02	0.4	6					
	10+00	0.02	0.3	11					
G1 L#8	0+50	0.02	0.4	17					
	1+00	0.02	0.5	52					
	2+00	0.02	0.2	58					
	2+50	0.02	0.2	11					
	3+00	0.02	0.1	13					
	3+50	0.02	0.1	12					
	4+00	0.02	0.1	14					
	4+50	0.02	0.3	25					
	5+00	0.02	0.4	101					
	5+50	0.02	0.1	11					
	7+50	0.02	0.8	42					
	8+00	0.02	0.6	34					
	9+00	0.02	0.7	52					
	9+50	0.03	0.3	7					
	10+00	0.03	0.4	8					
G1 L#9	0+50 W	0.02	0.7	16					
	1+00	0.02	0.2	22					
G1 L#5 B.L. 0+00W		0.02	0.2	17					
G1 L#9 B.L. 9+00S - 0+00 W		0.02	0.5	20					

/ continued on page 5 ....

NOTE REJECTS RETAINED ONE MONTH PULPS RETAINED THREE MONTHS ON REQUEST PULPS AND REJECTS WILL BE STORE FOR A MAXIMUM OF ONE YEAR

L. Wong
PROVINCIAL ASSAYER

CERTIFICATE OF ASSAY

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1001 East Pender Street,
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TO: N.V.C. ENGINEERING LTD.

(page 5)

We hereby certify that the following are the results of assays on: soil samples

MARKED	GOLD	SILVER	Copper	xxxxx	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	xxxx
	Au (ppm)	Ag(ppm)	Cu (ppm)					
G1 L#8 BL 8+00S 0+00 W	0.02	0.9	8					
G1 L#6 B.L. 0+00 W	0.02	0.5	65					
G1 L10 B.L. 10+00S 0+00 W	0.02	0.3	30					

L. Wong
PROVINCIAL ASSAYER

APPENDIX 3

INSTRUMENTATION

THE IGS-2 SYSTEM

1.0 INTRODUCTION

1.1 General Information

The IGS-2 Integrated Geophysical System is a portable microprocessor-based instrument which allows more than one type of survey measurement to be performed by a single operator during a survey.

The IGS-2 is a modular system which can easily be configured to suit different and changing survey requirements. Reconfiguring the system is easy and offers both operational flexibility and minimal redundancy with a minimum number of spare consoles and/or modules.

When configured with any of the available sensor options, the IGS-2 System Control Console becomes a method-specific instrument according to the sensor option(s) utilized. In addition, the IGS-2 Console is an electronic notebook into which geophysical, geological or other data may be manually entered and digitally stored.

Data is stored in the IGS-2 in an expandable, solid state memory and can be output in the field by connecting the instrument to a printer, tape recorder, modem or microcomputer.

The 32 character digital display uses full words in most cases, ensuring clear communication. Both present and previous data are displayed simultaneously, allowing comparisons to be made at a glance during a survey.

The IGS-2 records header information, data values, station number, line number, grid number and the time of each observation in its internal memory. Data are first sorted by grid number, then in order of increasing line number and, within each line, by increasing station number. In this way, the data are organized logically regardless of the sequence in which they were taken. Ancillary data can also be manually entered and recorded at a given station, along with the survey parameters.

The IGS-2 may appear complex because of the new microprocessor-based technology employed in its design. However, it does not perform any operation that is, in principle, unfamiliar to an experienced operator. Only the procedures have changed. For instance, data can now be recorded in the memory of the IGS-2 by a

Figure IGS:1
The IGS-2 as Worn by an Operator

series of simple keystrokes, rather than recording measurements by hand in a notebook. Likewise, an error spotted in the records, which would be corrected or erased by hand, is now corrected by means of the Edit function which allows the error to be removed from memory, corrected, and then refiled, or erased altogether.

1.2 Product Updates

At Scintrex we are continually working in improve our line of products. You may be notified as important changes occur to either the software or hardware of our products. We would appreciate hearing from you if you are interested in our latest developments. We would also value hearing from you about any successes, or problems you may have encountered so that we may advise you.

THE MP-3/4 MAGNETOMETER

1.0 INTRODUCTION

1.1 General Outline

This section of the manual describes in detail the proton magnetometer method.

A theoretical explanation of the magnetic method is given first. Then the table MAG SETUP MENUS is presented for reference. After this, the following topics are dealt with in detail:

1) method enabling procedures,
2) measuring procedures,
3) warning messages,
4) equipment setup procedures,
5) troubleshooting information,
6) specifications and
7) parts list.

1.2 The Magnetic Method

The magnetic method consists of measuring the magnetic field of the earth as influenced by rock formations having different magnetic properties and configurations. The measured field is the vector sum of induced and remanent magnetic effects. Thus, there are three factors, excluding geometrical factors, which determine the magnetic field. These are the strength of the earth's magnetic field, the magnetic susceptibilities of the rocks present and their remanent magnetism.

The earth's magnetic field is similar in form to that of a bar magnet's. The flux lines of the geomagnetic field are vertical at the north and south magnetic poles where the strength is approximately 60,000 nT. In the equatorial region, the field is horizontal and its strength is approximately 30,000 nT.

The primary geomagnetic field is, for the purposes of normal mineral exploration surveys, constant in space and time. Magnetic field measurements may, however, vary considerably due to short term external magnetic influences. The magnitude of these variations is unpredictable. In the case of sudden magnetic storms, it may reach several hundred gammas over a few minutes. It may be necessary, therefore, to take continuous readings of the geomagnetic field with a base station magnetometer while the magnetic survey is being done. An alternative field procedure is to make periodic repeat measurements at convenient traverse points, although this is a very unreliable method during active magnetic storms when it is important to have proper reference data.

The intensity of magnetization induced in rocks by the geomagnetic field F is given by:

$$I = kF$$

where I is the induced magnetization
k is the volume magnetic susceptibility
F is the strength of the geomagnetic field

For most materials, k is very much less than 1. If k is negative, the body is said to be diamagnetic. Examples are quartz, marble, graphite and rock salt. If k is a small positive value, the body is said to be paramagnetic, examples of which are gneiss ($k = 0.002$), pegmatite, dolomite and syenite. If k is a large positive value, the body is strongly magnetic and it is said to be ferromagnetic, for example, magnetite ($k = 0.3$), ilmenite and pyrrhotite.

The susceptibilities of rocks are determined primarily by their magnetite content since this mineral is so strongly magnetic and so widely distributed in the various rock types. (Of considerable importance, as well, is the pyrrhotite content.)

The remanent magnetization of rocks depends both on their composition and their previous history. Whereas the induced magnetization is nearly always parallel to the direction of the geomagnetic field, the natural remanent magnetization may bear no relation to the present direction and intensity of the earth's field. The remanent magnetization is related to the direction of the earth's field at the time the rocks were last magnetized. Movement of the body through folding, etc., and the chemical history since the previous magnetization are additional factors which affect the magnitude and direction of the remanent magnetic vector.

Thus, the resultant magnetization M of a rock is given by:

$$M = M_n + kF$$

where M_n is the natural remanent magnetization, and F is a vector which can be completely specified by its horizontal (H) and vertical (Z) components and by the declination (D) from true north. Similarly, M_n is specified when its magnitude and direction are known. Thus, considerable simplification results if $M_n = 0$, whereupon M merely reduces to kF. In the early days of magnetic prospecting, it was usually assumed that there was no remanent magnetization. However, it has now been established that both igneous and sedimentary rocks possess remanent magnetization, and that the phenomenon is a widespread one.

1.2 Theory of Operation

The Very Low Frequency (VLF) Electromagnetic Method measures variations in the components of the electromagnetic fields, set up by communication stations operating in the 15 to 30 kHz frequency range. These stations, located around the world, generate signals for the purposes of navigation and communication with submarines.

In far field, above uniform earth, the groundwave of the vertically polarized VLF radiowave has three field components:

1) a radial, horizontal electrical field,
2) a vertical electrical field, and
3) a tangential, horizontal magnetic field.

When these three fields meet conductive bodies in the ground, eddy currents are induced causing secondary fields to radiate outwards from these conductors. In the Magnetic Field mode, the IGS-2/VLF-4 measures the horizontal field and two components of the

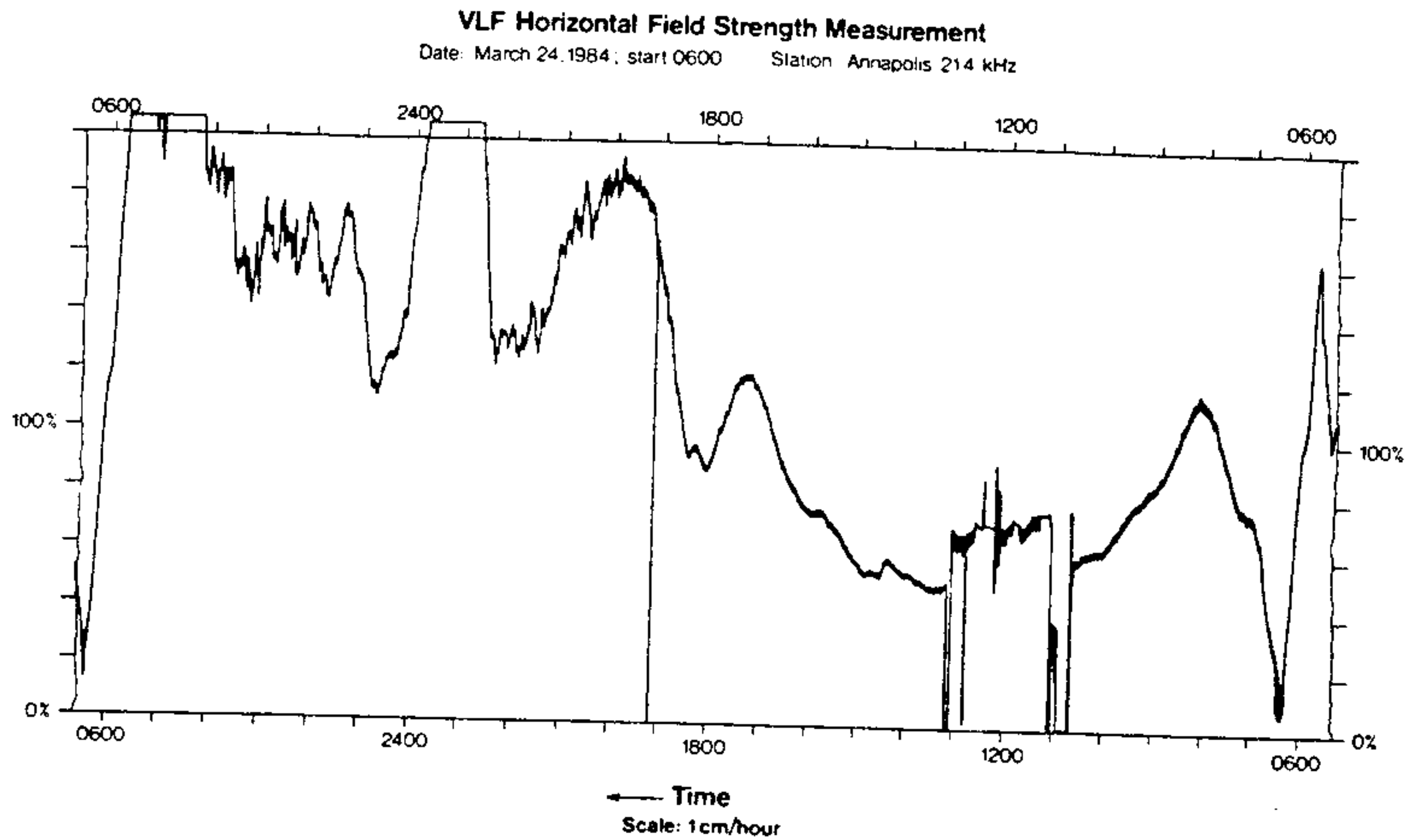


Figure VLF:1
Chart Recording of Primary Field Changing with Time

vertical field, normalized by the horizontal field measurement. In the Electrical Field mode, it measures the horizontal magnetic and electrical fields.

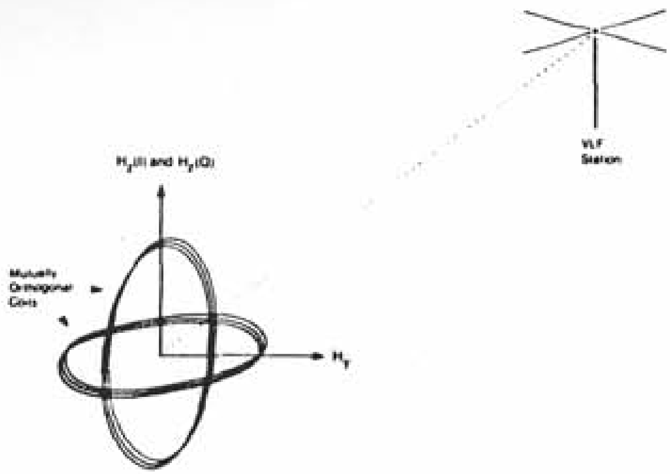
1.3 What the IGS-2/VLF-4 Measures

As its primary measurement, the IGS-2/VLF-4 employs two mutually orthogonal receive coils to determine three parameters of the VLF-magnetic field. These are: 1) the horizontal amplitude vector in a direction perpendicular to a line joining the operator to the station; 2) the amplitude of the component of the vertical field vector which is in phase with the horizontal vector; and 3) the amplitude of the component of the vertical field vector which is 90° out of phase with the horizontal vector. These three parameters, for the given VLF transmitter, are recorded simultaneously. Since the vertical components are expressed as a percentage of the horizontal vector, they are automatically normalized for any changes in the amplitude of the transmitted primary field.

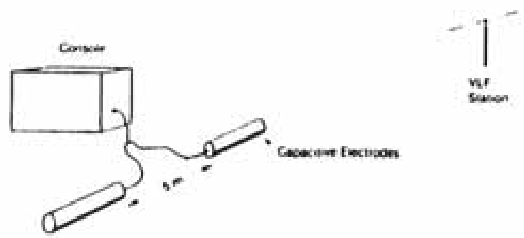
The primary field from a VLF station can in fact, vary considerably. Figure VLF:1 is a recording of the horizontal field strength from the Annapolis VLF station made in Toronto, Canada. For the most part, the field fluctuates moderately during the course of the day due to changes in atmospheric conditions. There are, however, more dramatic changes indicated on the recording. Towards evening there is a large upwards swing in the field strength, and at several points during the day, both partial and total drops in the field amplitude can be observed. In the light of these irregularities, the horizontal field data should always be considered with reservation as it is difficult to know whether changes are caused by conductors or by variations in the station's signal.

If the primary field strength is constant, changes in the amplitude of the horizontal magnetic field mainly reflect variations in the conductivity of the earth. Normally there will be no vertical magnetic field. However, near a conductor, a vertical field will be observed. The relative amplitudes of the in-phase and quadrature components may be used to interpret the conductivity-size characteristics of the conductor.

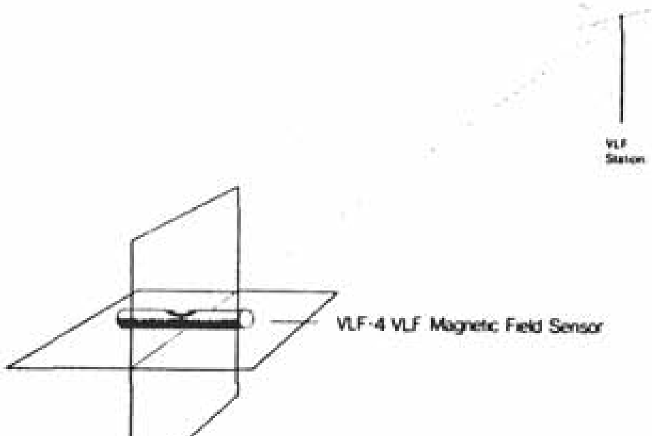
To permit measurement of the VLF-electric field, a dipole consisting of two cylindrical electrodes and 5 meters of wire is used. When this dipole is correctly laid out, the IGS-2/VLF-4 measures the in-phase and quadrature components of the horizontal electric field in the direction of the line joining the operator and the transmitter station. The phase reference is the horizontal magnetic field.



The VLF-magnetic field measurement comprises: 1) horizontal amplitude H_y, 2) the amplitude of H_z(I) (the vertical field component which is in-phase with H_y) and 3) the amplitude of H_z(Q) (the vertical field component which is 90° out-of-phase with H_y.



The VLF-4 is used to measure the in-phase E_x(I), and quadrature E_x(Q), components of the horizontal electric field, E_x, in the line joining the operator and the transmitter station. The phase is referenced to that of the horizontal magnetic field H_y. These components are not recorded but are used in the calculations of resistivity and phase made by the VLF-4.



An electronic level sensor on the axis of the horizontal vector receiver coil provides automatic side-to-side tilt compensation. The error in the vertical in-phase component is less than 1% for tilts up to 15° provided that the operator is facing the VLF station directly. Tilts in any other direction of up to 10° produce no significant error (1%) in the other components and, therefore, require no compensation.

Figure VLF:2
What the VLF-4 Measures

The IGS-2/VLF-4 uses the magnetic and electric field measurements to automatically calculate the apparent resistivity of the earth as well as the phase angle between the magnetic and electric field components. If the earth is uniform (not layered) within the depth of the VLF measurement, the phase angle between the horizontal magnetic and electric VLF fields will be 45 degrees. A non-uniform earth will give rise to other phase angles.

The following formulae are used for resistivity and phase calculations:

Apparent Resistivity Calculation:

$$\rho = \frac{1}{2\pi f \mu_o} \left| \frac{E_x}{H_y} \right|^2$$

where:

ρ = apparent resistivity in ohm-meters
E_x = horizontal electric amplitude, calculated
$E_x = (E_x(I)^2 + E_x(Q)^2)^{\frac{1}{2}}$
H_y = horizontal magnetic amplitude, measured
f = VLF station frequency in Hertz
μ_o = permeability of the ground in Henries/meter, a constant

The resistivity calculation has a range of 1 to 100,000 ohm-meters with a resolution of 1 ohm-meter.

Phase Angle Calculation

The phase angle ϕ is expressed as:

$$\phi = \text{arc tan} \frac{E_x(Q)}{E_x(I)}$$

where:

$E_x(Q)$ = horizontal quadrature VLF electric field.
$E_x(I)$ = horizontal in-phase VLF electric field, phase rferenced to the horizontal magnetic field, Hy.

The phase angle calculation has a range of -180° to +180° with a resolution of 1°. By definition the angle is positive when the electrical field leads the magnetic field.

9.0 SPECIFICATIONS

9.1 Standard Console Specifications

Digital Display	32 character, 2 line LCD display
Keyboard Input	14 keys for entering all commands, coordinates, header and ancillary information.
Languages	English plus French is standard.
Standard Memory	16K RAM. More than sufficient for a day's data in most applications.
Clock	Real time clock with day, month, year, hour, minute and second. One second resolution, ±1 second stability over 12 hours. Needs keyboard initialization only after battery replacement.
Digital Data Output	RS-232C serial interface for digital printer, modem, microcomputer or cassette tape recorder. Data outputs in 7 bit ASCII, no parity format. Baud rate is keyboard selectable at 110, 300, 600 and 1200 baud. Carriage return delay is keyboard selectable in increments of one from 0 through 999. Handshaking is done through X-ON/X-OFF protocol. Allows IGS-2 to act as a master for other instrumentation.
Analog Output	For a strip chart recorder. 0 to 999 mV full scale with keyboard selectable sensitivities of 10, 100 or 1000 units full scale.

Console Dimensions	240 x 90 x 240 mm includes mounted battery pack.
Weights	Console: 2.2 kg Console with Non-rechargeable Battery Pack; 3.2 kg. Console with Rechargeable Battery Pack: 3.6 kg.
Operating Temperature Range	-40°C to +50°C provided optional Display Heater is used below -20°C.
Power Requirements	Can be powered by external 12 V DC or one of the Battery Pack Options listed below.

9.2 Battery Pack Options

Battery Pack lifetime depends on which Battery Pack is selected, sensor(s) used, reading time and ambient temperature. Life expectancy would be 1 to 10, eight hour survey days.

Non-Rechargeable Battery Pack	Includes battery holder and 10 disposable 'C' cell batteries for installation on console. Used in low sensitivity total field magnetometry or VLF in temperatures above 0°C. Weight is 0.9 kg.
Rechargeable Battery Pack and Charger	Includes battery holder, 6 rechargeable, non-magnetic, sealed lead-acid batteries and charger for installation on console. Best for high sensitivity total field measurements, all gradient measurements and operation below 0°C. Pack weighs 1.3 kg. Charger specifications are: 140 x 95 x 65 mm, 115/230 V AC, 50/60 Hz, 20 VA, overload protected.

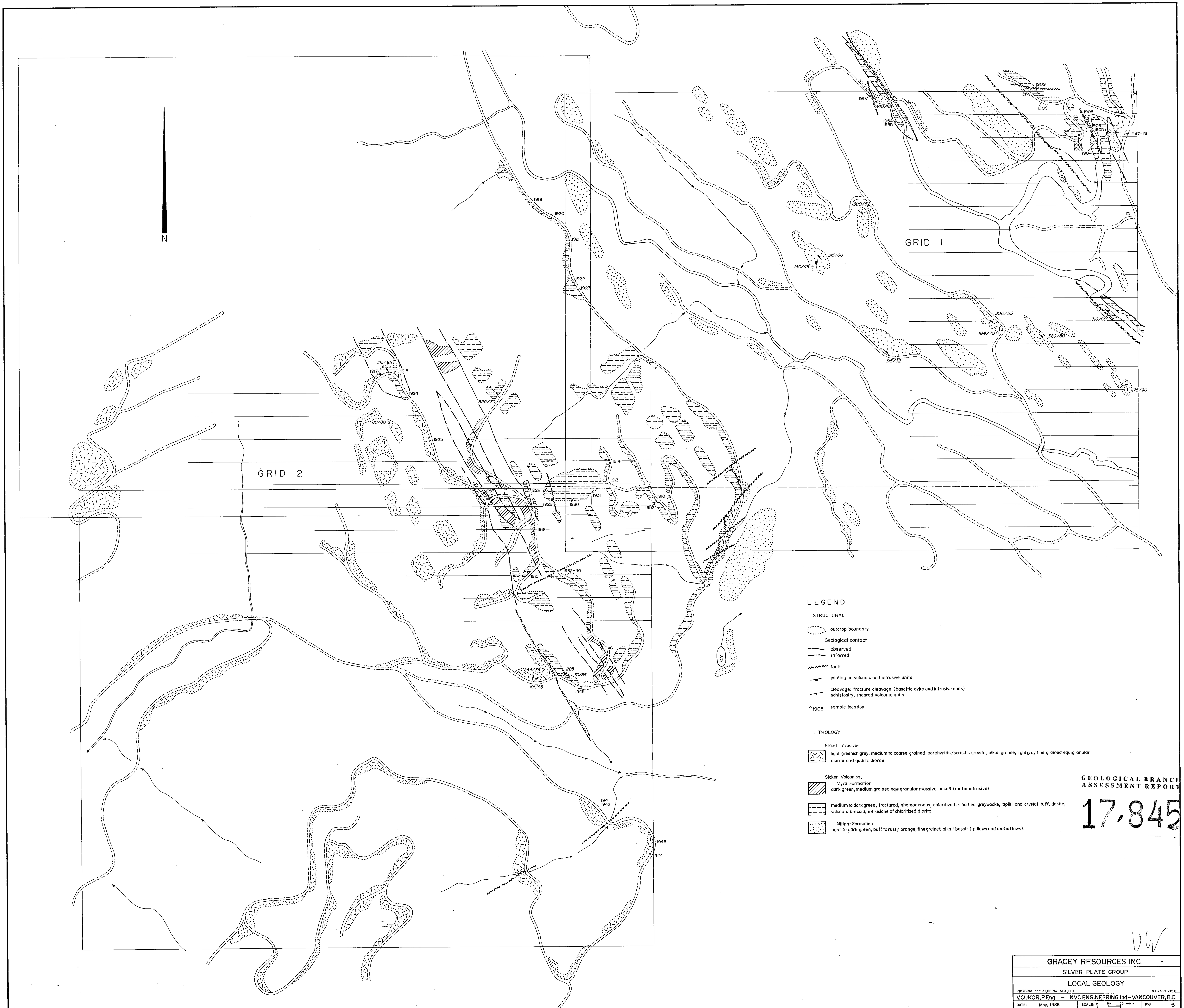
8.0 SPECIFICATIONS

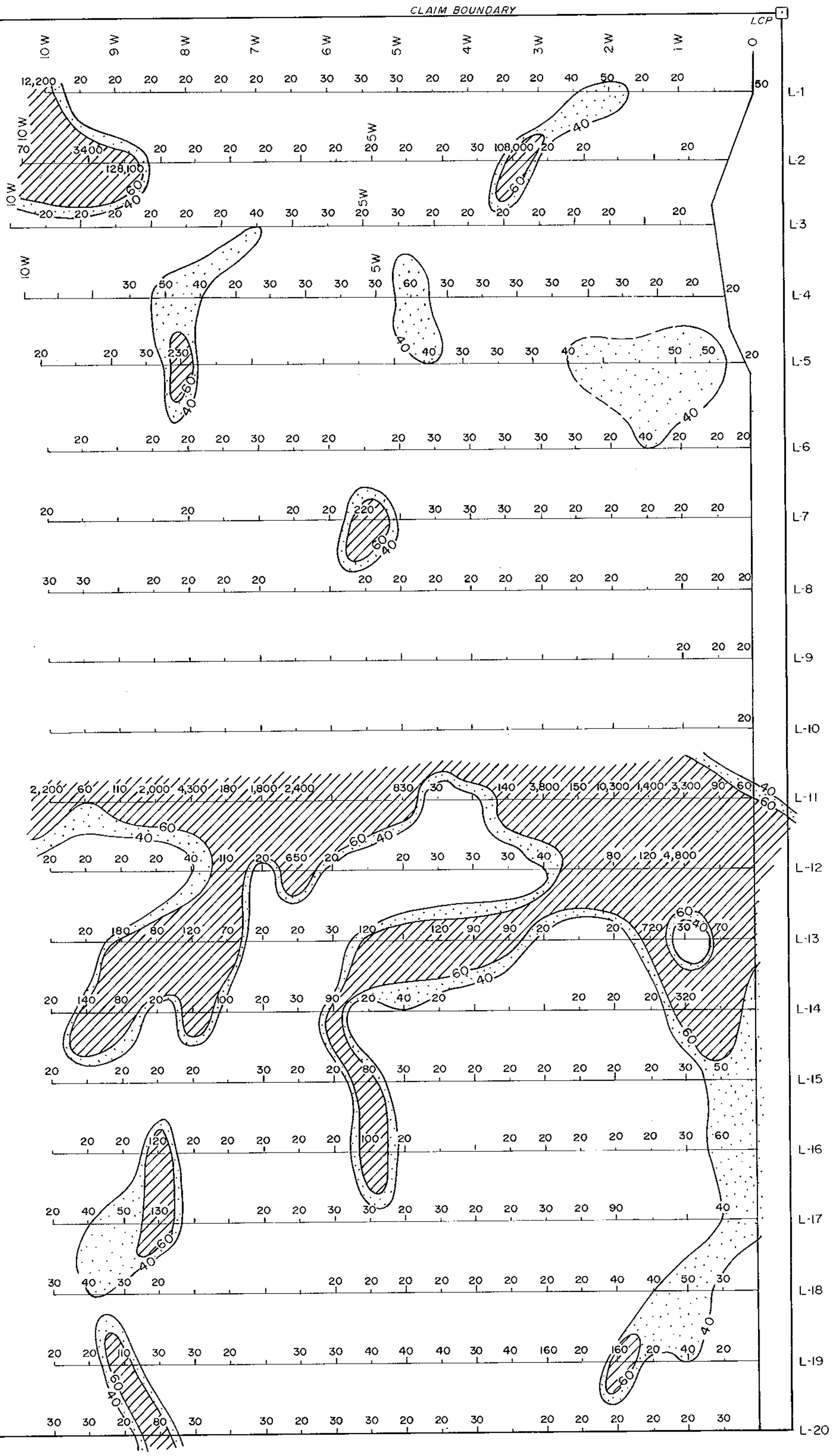
8.1 Magnetometry Specifications

Total Field Operating Range	20,000 to 100,000 nT (1 nT = 1 gamma).
Gradient Tolerance For Total Field:	±5000 nT/m.
Total Field Absolute Accuracy	±1 nT at 50,000 nT ±2 nT over total field operating and temperature range.
Resolution	0.1 nT.
Tuning	Fully solid-state. Manual or automatic mode is keyboard selectable.
Reading Time	2 seconds. For portable readings this is the time taken from the push of a button to the display of the measured value.
Continuous Cycle Times	Keyboard selectable in 1 second increments upwards from 2 seconds to 999 seconds.

9.0 SPECIFICATIONS

Frequency Tuning	Automatic digital tuning. Can be tuned to any frequency in the range 15.0 to 29.0 kHz with a bandwidth of 150 Hz. Up to three frequencies can be chosen by keyboard entry for sequential measurements.
Field Strength Range	Fields as low as 100 mA/m can be received. In practice, background noise may require fields up to 5-10 times this level. Maximum received field is 2 mA/metre. These values are specified for 20 kHz. For any other frequency, calculate the above limits by multiplying by the station frequency in kHz and dividing by 20.
Signal Filtering	Narrow bandpass, low pass and sharp cut-off high pass filters.
Measuring Time	0.5 seconds sample interval. As many as 2^{16} samples can be stacked to improve measurement accuracy.
VLF-Magnetic Field Components Measured	1) Horizontal amplitude, 2) vertical in-phase component, and 3) vertical quadrature components. Vertical components are displayed as a percentage of horizontal component and are related in phase to the horizontal component. Their range is ±120%; reading resolution 1%.
VLF-Magnetic Field Sensor	Two air-cored coils in a backpack mounted housing with an electronic level for automatic tilt compensation. The error in the vertical in-phase component is less than 1% for tilts up to ±15°.


N
GRID 1
GRID 2
LEGEND
STRUCTURAL
outcrop boundary
Geological contact:
observed
inferred
fault
jointing in volcanic and intrusive units
cleavage: fracture cleavage (basaltic dyke and intrusive units)
schistosity; sheared volcanic units
1905 sample location
LITHOLOGY
Island Intrusives
light greenish grey, medium to coarse grained porphyritic/sericitic granite, alkali granite, light grey fine grained equigranular diorite and quartz diorite
Sicker Volcanics;
Myra Formation
dark green, medium grained equigranular massive basalt (mafic intrusive)
medium to dark green, fractured, inhomogenous, chloritized, silicified greywacke, lapilli and crystal tuff, dacite, volcanic breccia, intrusions of chloritized diorite
Nitinat Formation
light to dark green, buff to rusty orange, fine grained alkali basalt (pillows and mafic flows).
GEOLOGICAL BRANCH
ASSESSMENT REPORT
17,845
GRACEY RESOURCES INC.
SILVER PLATE GROUP
LOCAL GEOLOGY
VICTORIA and ALBERNI M.D., B.C.
NTS 92C/15E
V.CUKOR, P.Eng. — NVC ENGINEERING Ltd.-VANCOUVER, B.C.
DATE: May, 1988
SCALE: 0 50 100 meters
FIG. 5



LEGEND

< 40 ppm...... Background

40 – 60 ppm..... Anomalous

> 60 ppm........ Significantly Anomalous

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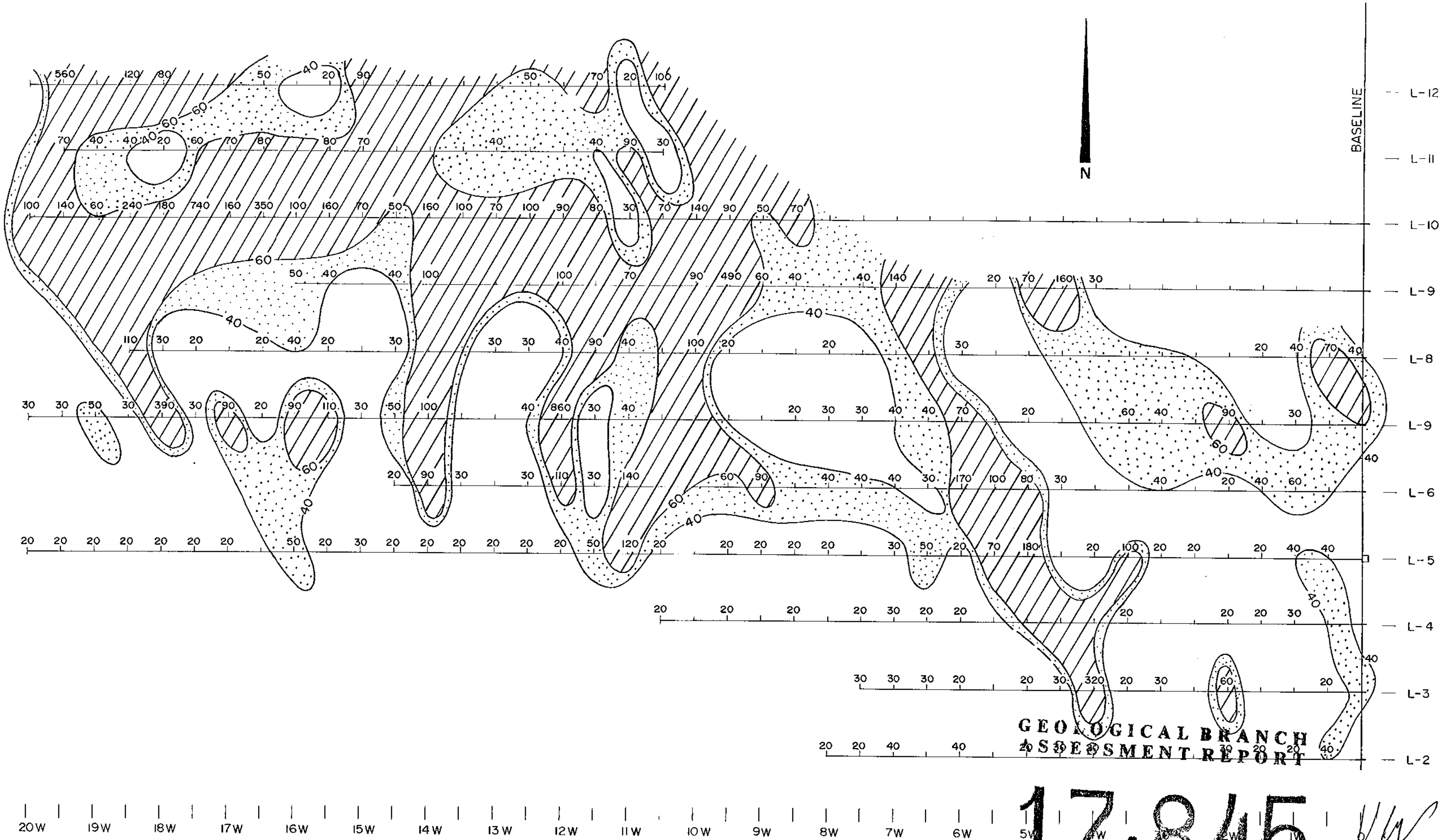
GEOCHEMICAL SURVEY PLAN
GOLD PLOT
GRID 1

VICTORIA M.D., B.C. NTS : 92

V. CUKOR, P.Eng. — NVC ENGINEERING LTD., VANCOUVER, B.C.

Date: May, 1988	Scale: 0 50 100 METRES	Fig. 6

Drawn by Ram's Drafting Services



> 60 ppm Au : Significantly Anomalous

40-60 ppm Au : Anomalous

< 40 ppm Au : Background

Drawn by Ram N. Gopal   Base Map drawn by Nada Cukor

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GEOCHEMICAL SURVEY PLAN

GOLD PLOT — GRID 2

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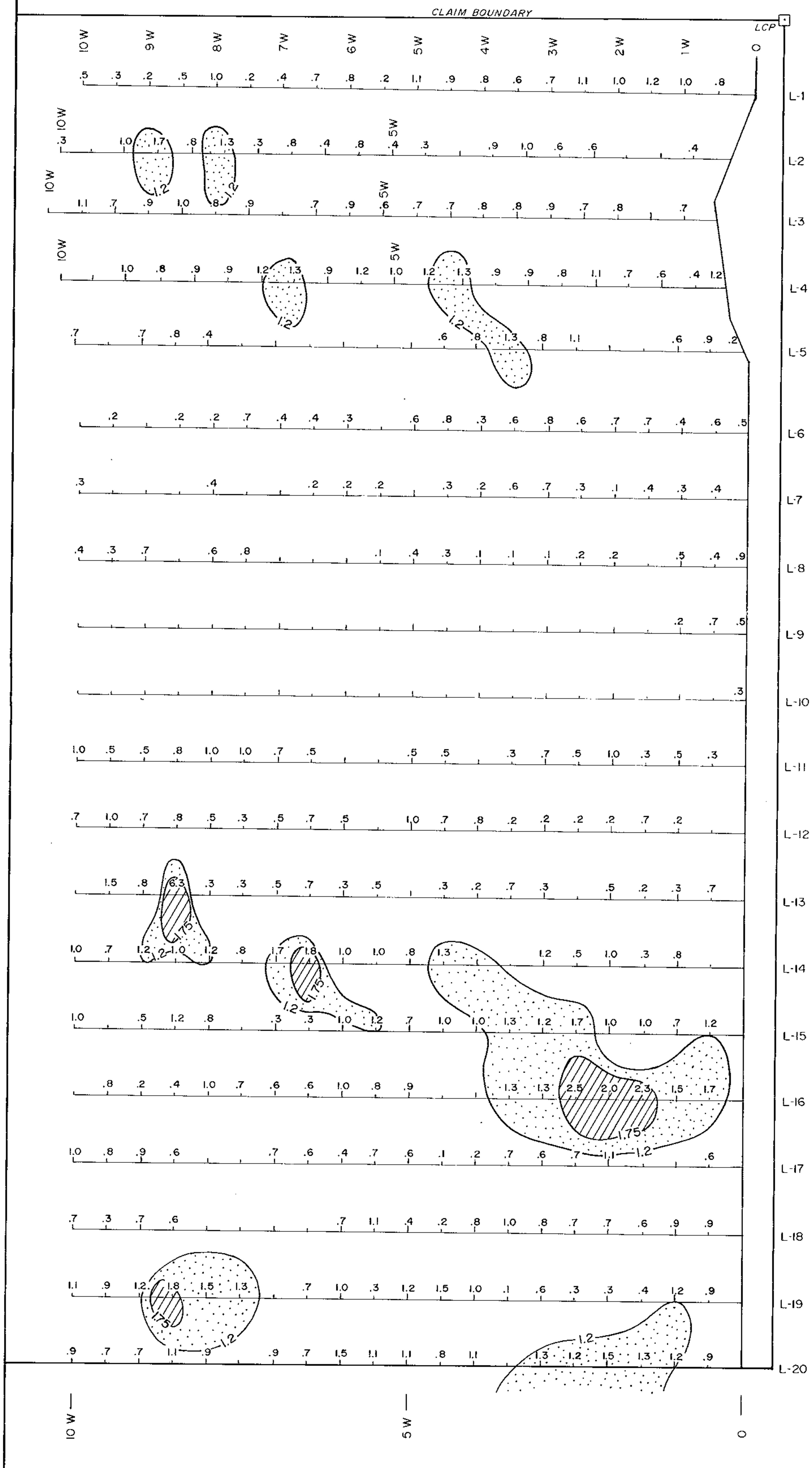
DATE: May, 1988	SCALE: 0 50 100 meters	FIG. 7



LEGEND

- > 1.75 ppm Ag : Significantly Anomalous
- 1.20–1.75ppm Ag : Anomalous
- < 1.20ppm Ag : Background

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GEOCHEMICAL SURVEY PLAN
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Date: MAY, 1988	Scale: 0 50 100 METRES	Fig. 8

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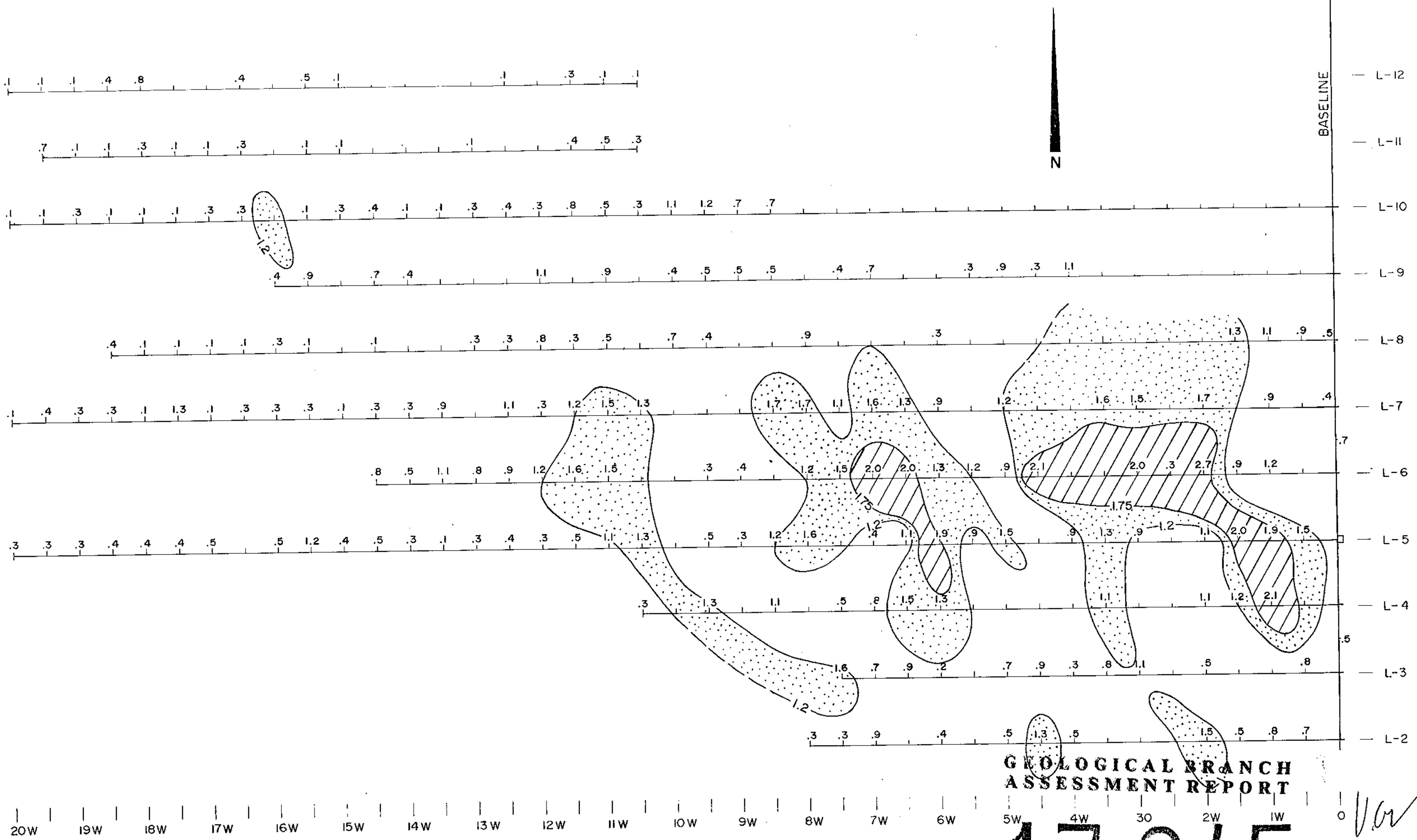

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ASSESSMENT REPORT

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(hatched)	>1.75 ppm Ag	: Significantly Anomalous
(stippled)	1.20-1.75 ppm Ag	: Anomalous
(blank)	<1.20 ppm Ag	: Background

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GEOCHEMICAL SURVEY PLAN

SILVER PLOT-GRID 2

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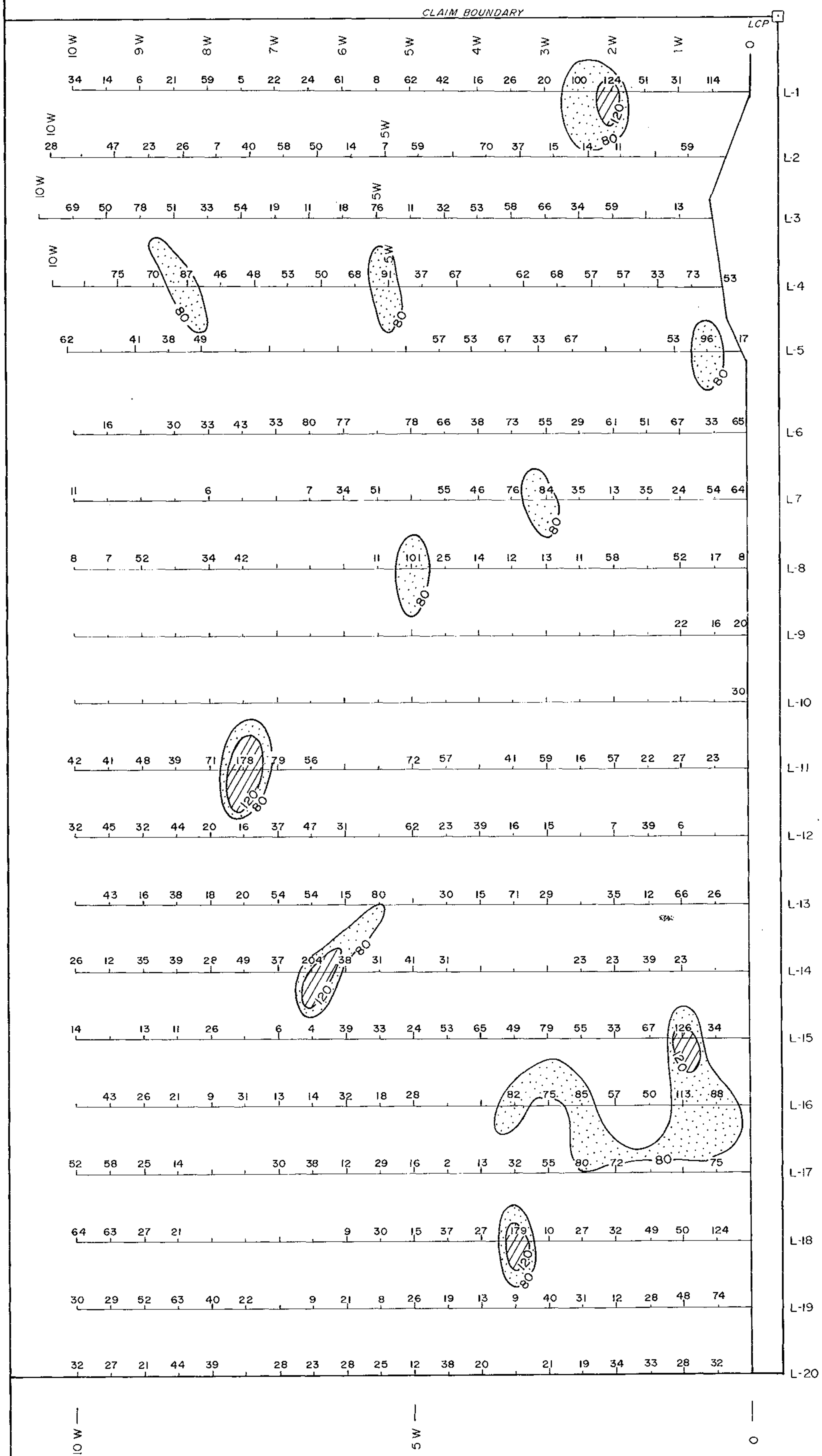
DATE: May, 1988 | SCALE: 0 50 100 meters | FIG. 9

Drafting : R.N. Gopal & N. Cukor



LEGEND

(hatched)	> 120 ppm Cu : Significantly Anomalous
(stippled)	80 — 120 ppm Cu : Anomalous
(blank)	< 80 ppm Cu : Background

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GEOCHEMICAL SURVEY PLAN
COPPER PLOT
GRID 1

VICTORIA M.D., B.C. NTS : 92

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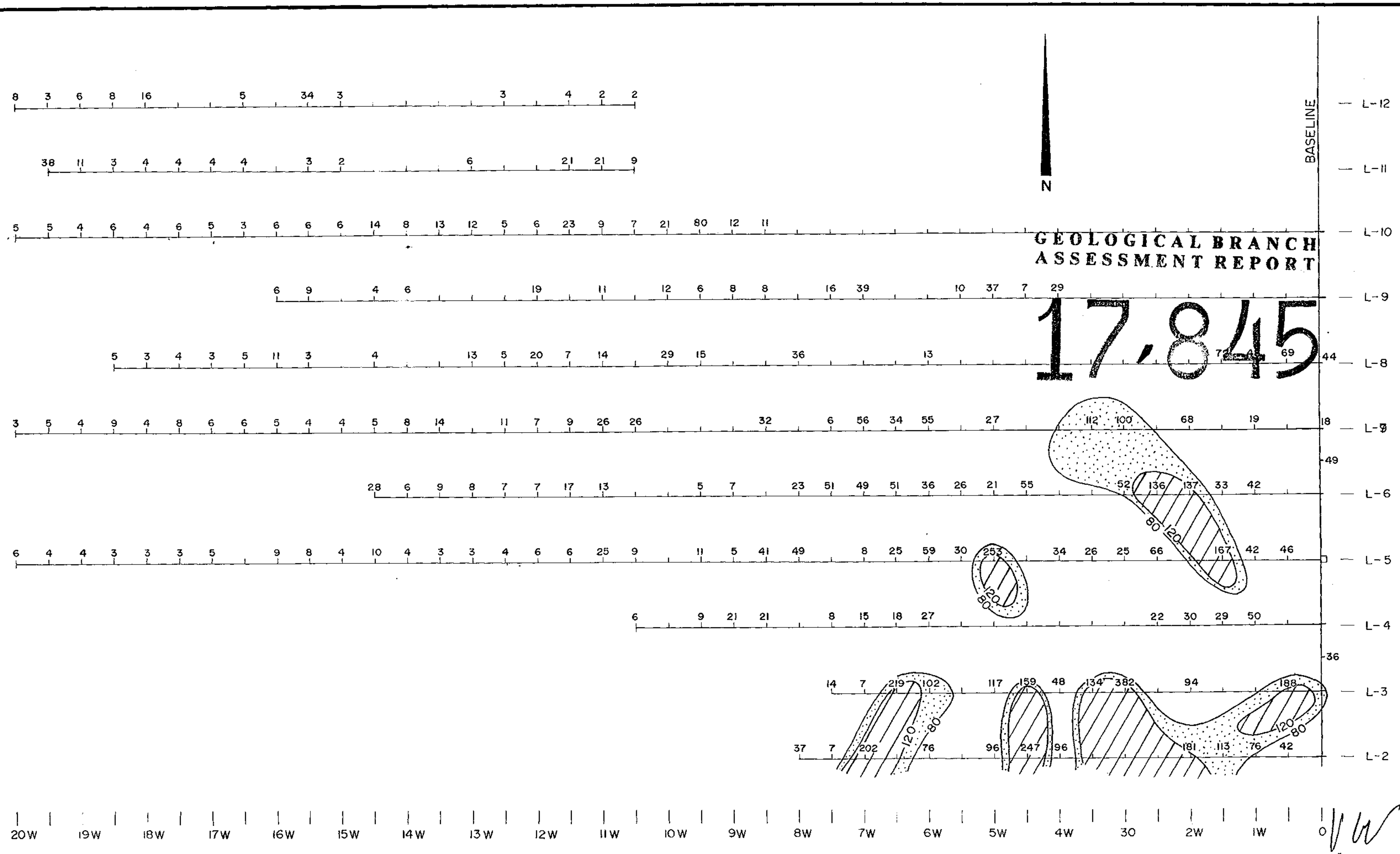
Date: MAY, 1988 | Scale: 0 50 100 METRES | Fig. 10

Drawn by Ram's Drafting Services



>120 ppm Cu : Significantly Anomalous

80-120 ppm Cu : Anomalous

<80 ppm Cu : Background

R.N.G. & N.C.

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GEOCHEMICAL SURVEY PLAN

COPPER PLOT — GRID 2

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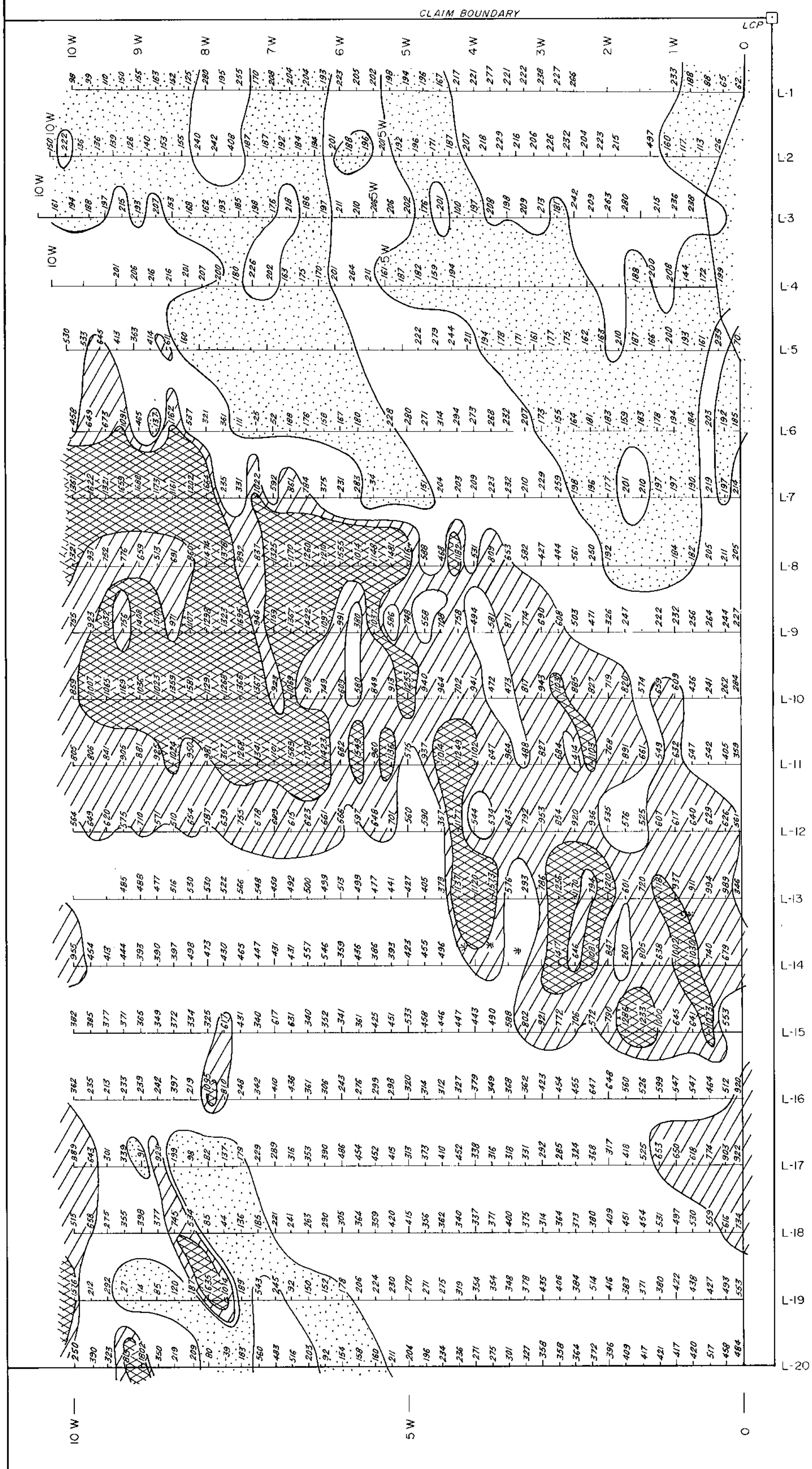
V. CUKOR, P. Eng. — NVC ENGINEERING Ltd. - VANCOUVER, B.C.

DATE: May, 1988	SCALE: 0 50 100 meters	FIG. 11	



Base Field 55600 gammas

- 200 gammas
- 600 — 1000 gammas
- 1000 gammas

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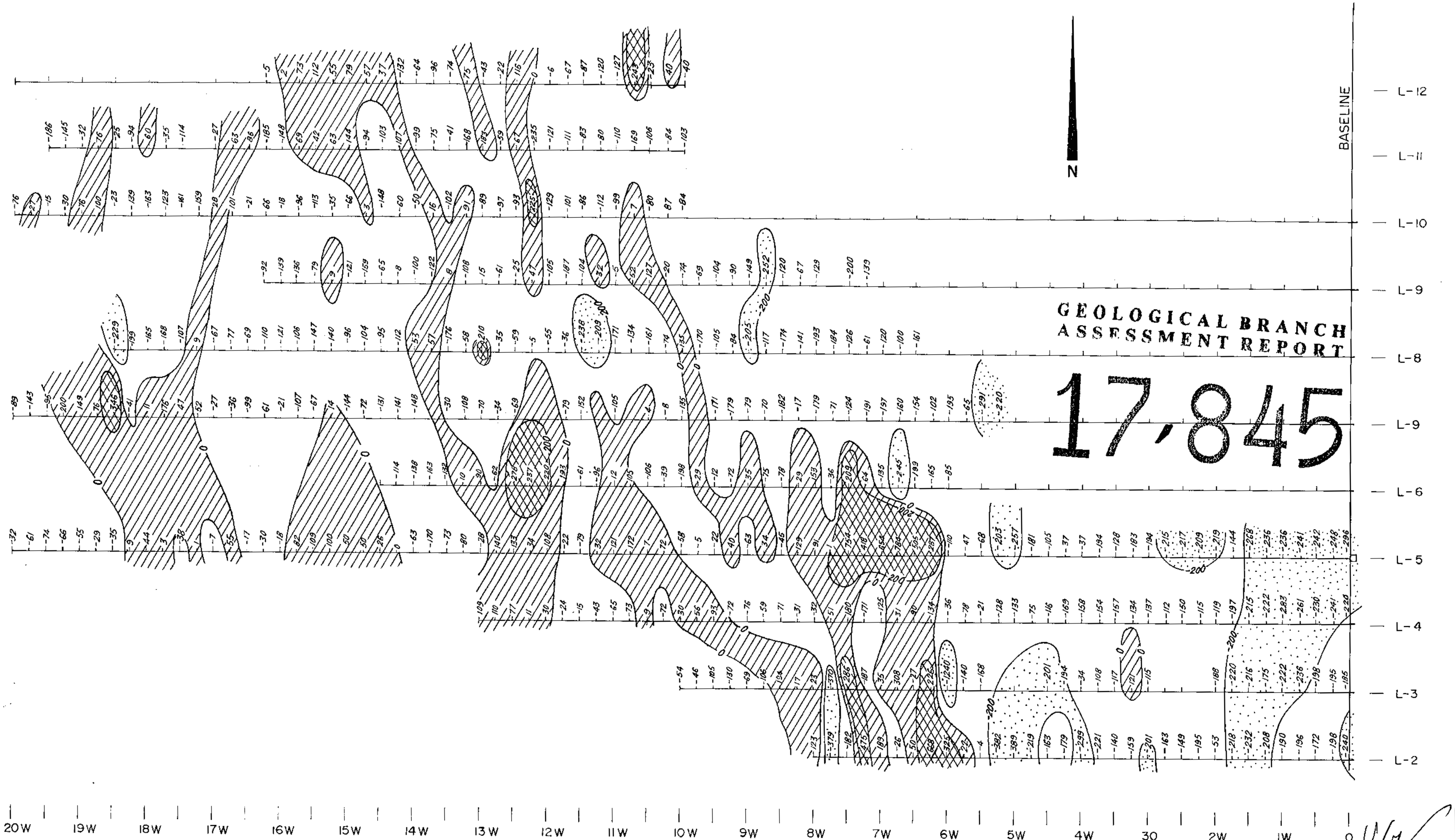
MAGNETIC SURVEY—GRID 1		
VICTORIA M.D., B.C. NTS : 92		
V. CUKOR, P.Eng. — NVC ENGINEERING LTD., VANCOUVER, B.C.		
Date: May, 1988	Scale: 0 50 100 METRES	Fig. 12



LEGEND

Values in gammas

200 gammas

0 – 200 gammas

–200 gammas

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MAGNETIC SURVEY – GRID 2

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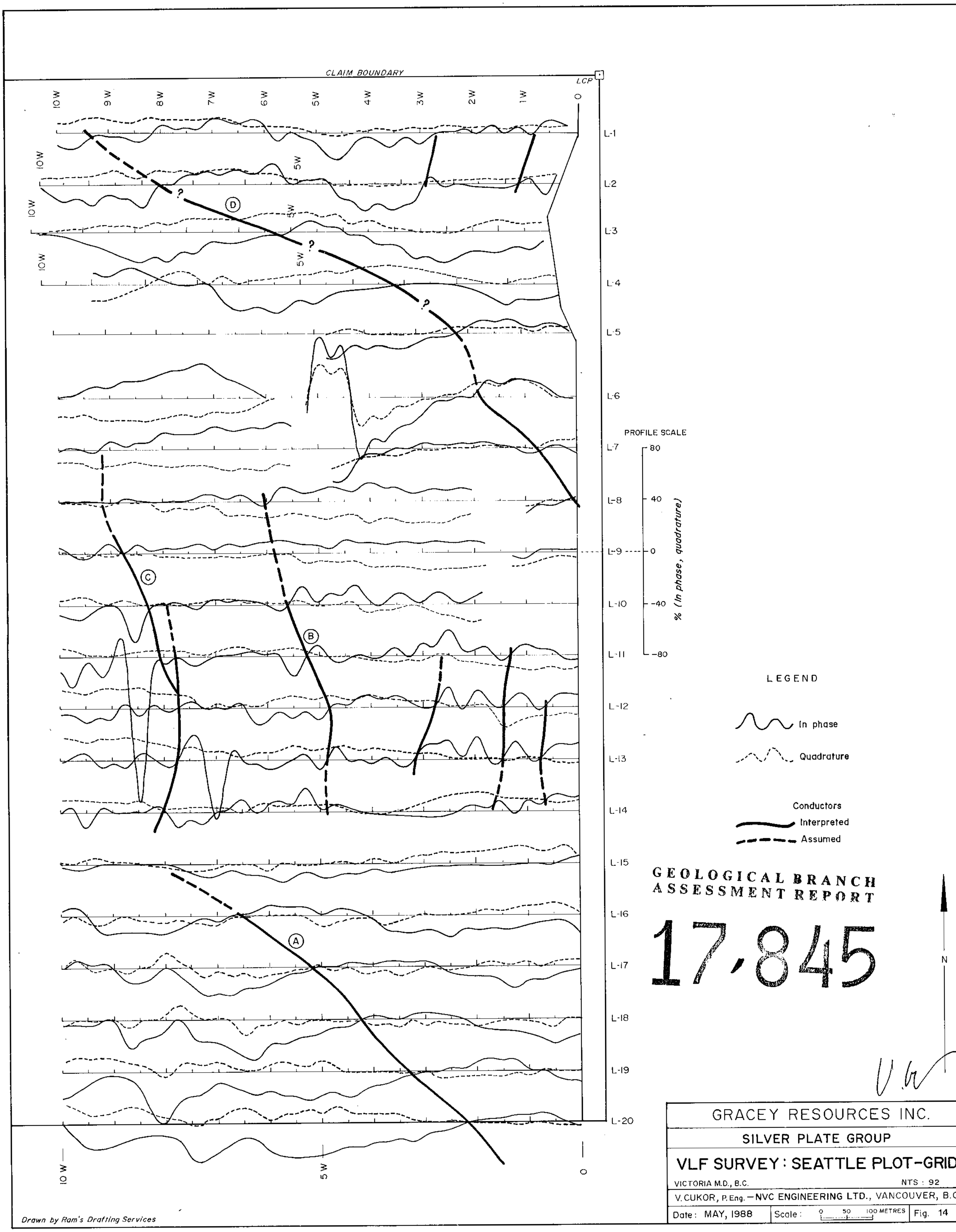
DATE: May, 1988 | SCALE: 0 50 100 meters | FIG. 13

Ram's Drafting Services



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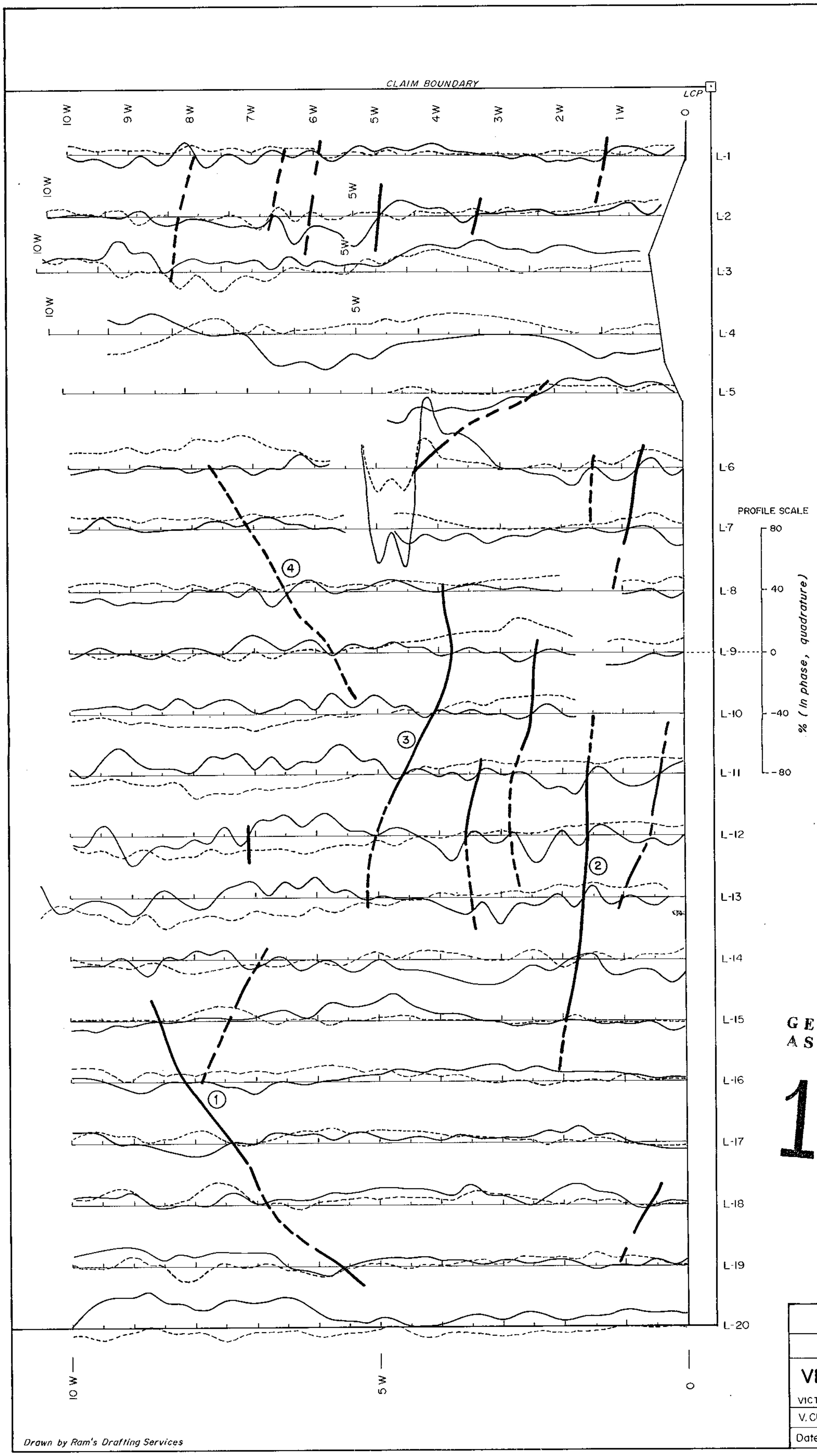
VLF SURVEY: SEATTLE PLOT-GRID 1

VICTORIA M.D., B.C.	NTS : 92
V. CUKOR, P.Eng. — NVC ENGINEERING LTD., VANCOUVER, B.C.	
Date: MAY, 1988	Scale: 0 50 100 METRES — Fig. 14



LEGEND

In phase

Quadrature

Conductors

Interpreted

Assumed

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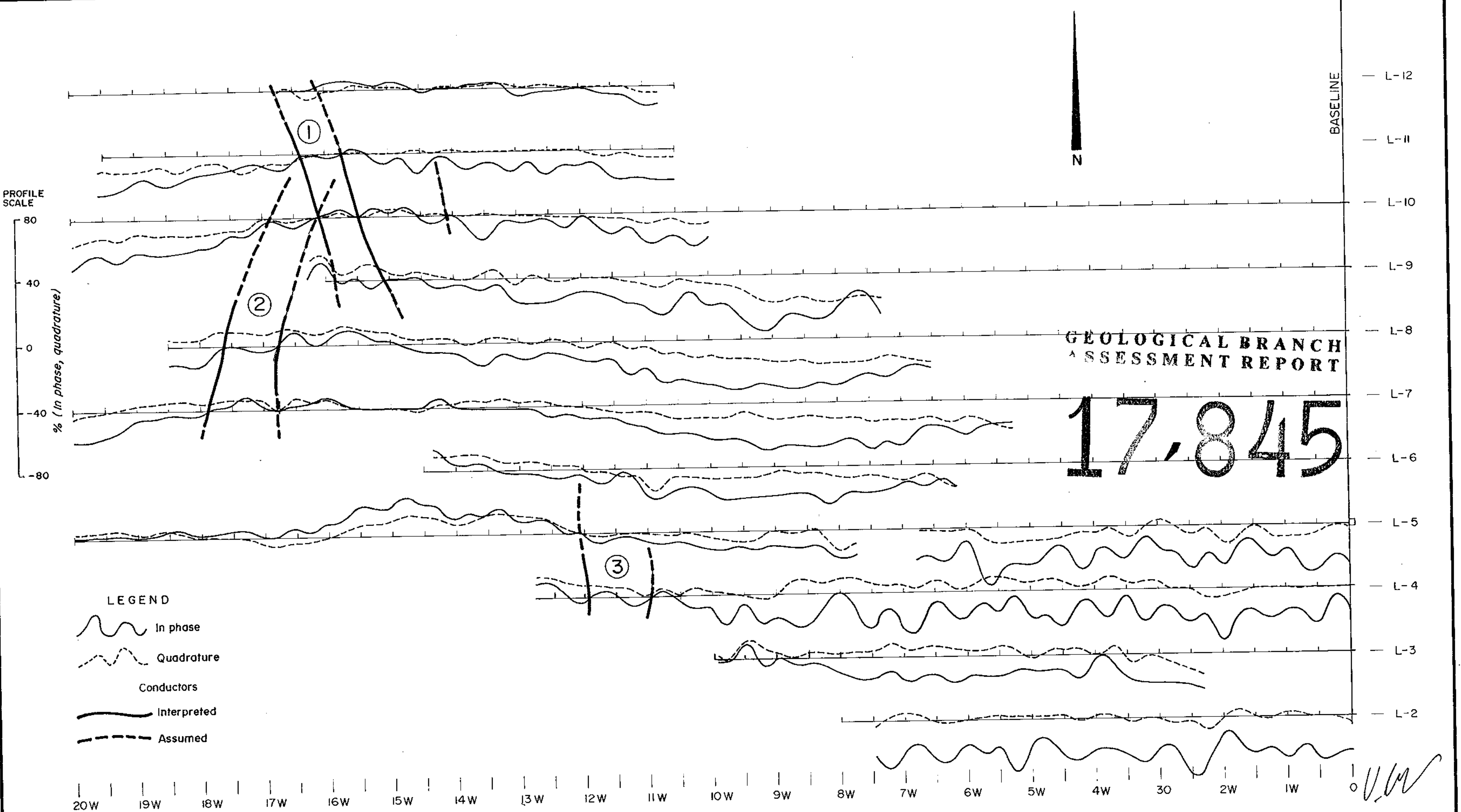
VLF SURVEY: HAWAII PLOT-GRID 1		
VICTORIA M.D., B.C. NTS : 92		
V. CUKOR, P.Eng.—NVC ENGINEERING LTD., VANCOUVER, B.C.		
Date: MAY, 1988	Scale: 0 50 100 METRES	Fig. 15



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VLF SURVEY - HAWAII PLOT - GRID 2

VICTORIA and ALBERNI M.D., B.C. NTS 92C/15E

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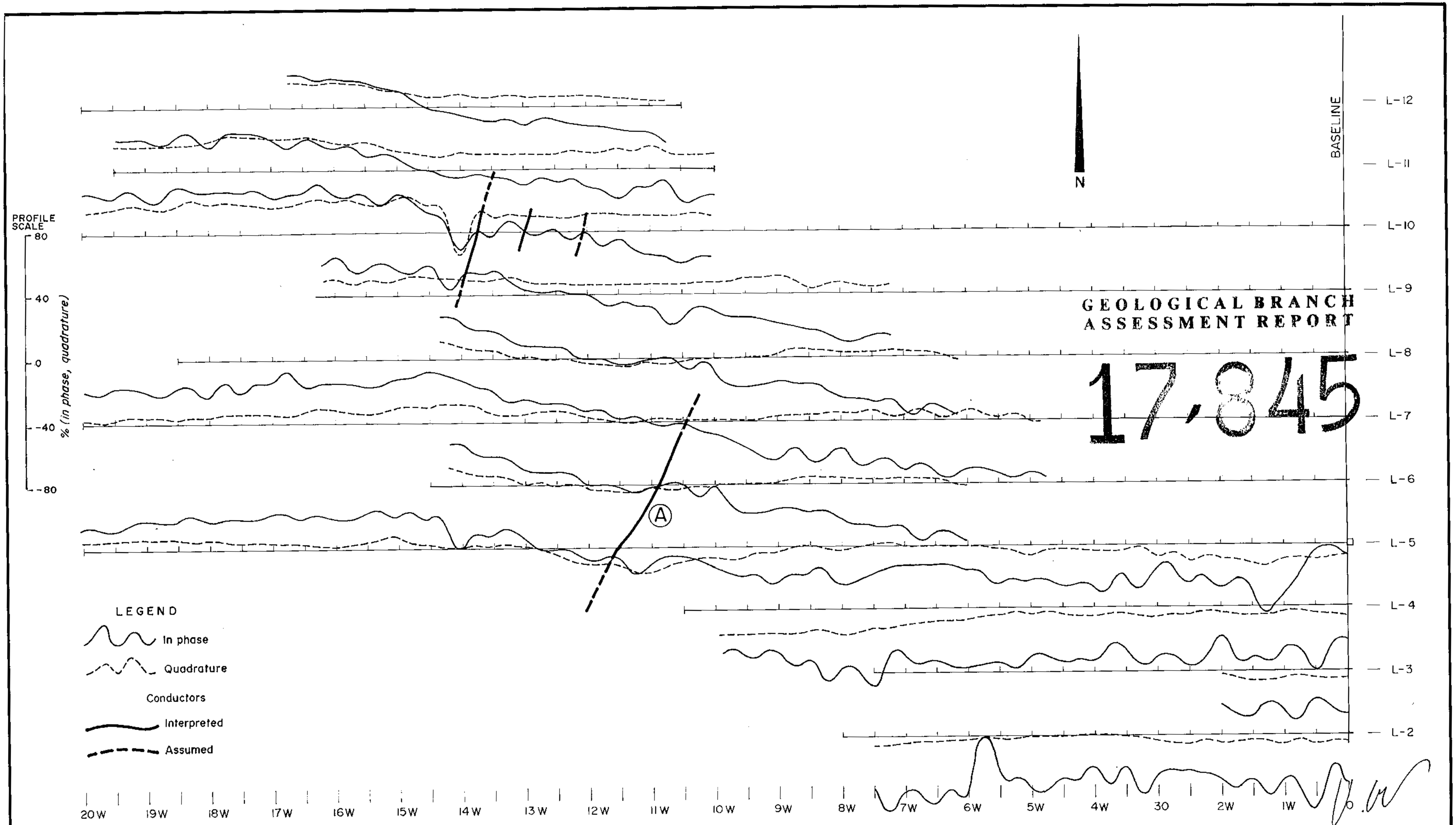
DATE: May, 1988 | SCALE: 0 50 100 meters | FIG. 16



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VLF SURVEY - SEATTLE PLOT - GRID 2

VICTORIA and ALBERNI M.D., B.C. NTS 92C/15E

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DATE: May, 1988	SCALE: 0 50 100 meters	FIG. 17