680578
92F/10

VANANDA GOLD LTD.

TEXADA ISLAND PROJECT

1991 PROGRESS REPORT

by

C.N.FORSTER

July, 1991

for

Vananda Gold Ltd.

705-475 Howe Street
Vancouver, B.C.
V6C 2B3

Phone (604) 688-0323

Fax (604) 688-4329

SUMMARY

Vananda Gold Ltd., since its inception in 1987, has spent or caused to be spent ca. $2 million in direct exploration expenses on their 6,000 acre, Texada Island property. Of this amount, Freeport-McMoRan Gold Co. spent $1.4 million during their two year option period in 1988 and 1989. The work has mainly focused on the Vananda Camp in the northern section and areas surrounding the Texada Iron Mine in the southern sector. To date, 34 diamond drill holes totalling 9,000 metres (29,000 feet) have been drilled with soil sampling, airborne geophysics, ground magnetics, VLF, induced polarization and geological mapping completed on 80% of the land package.

During 1991, Vananda Gold spent $200,000 on diamond drilling and induced polarization. In the Vananda Camp, at the Little Billie Mine area, 5 holes, totalling 1,300 metres, were drilled to extend and confirm the mineral inventory outlined by the mine in 1951 and by Freeport in 1989. In addition, 10 km. of induced polarization was re-surveyed on the Little Billie Grid and 4.5 km. of new data was collected over the LaFarge Quarry, southeast of the Little Billie grid. In the southern area, 29.5 km. of induced polarization was completed on the Eagle Grid and detailed, follow-up induced polarization was done on the Sandy Grid.

As a result of 1991 drilling at the Little Billie Mine, approximately 200,000 tons of copper-gold skarn grading 0.32 opt Au, 1.0 opt Ag and 2.05% Cu is now drill indicated. Induced polarization anomalies trending southeast for 500 metres from this resource, indicate a total potential for 1,000,000 tons of similar grade ore within 250 metres (800 feet) of surface.

In the southern sector, peripheral to the Texada iron, copper deposits, which produced 20 million tons of magnetite and copper ore with gold credits, chargeability anomalies from the induced polarization surveys on the Eagle and Sandy Grids indicate potential sulphide-rich skarns extending north from the mine workings.

On the Eagle grid, a 1,000 metre by 600 metre chargeability anomaly follows a north trending diorite body with chalcopyrite-bearing skarn along its western contact. The anomaly is also, in part, on strike to the north of copper ore that was mined underground along the flat lying, volcanic-marble contact on the northern extension of the Texada Mine. North of this anomaly, four smaller chargeability highs within areas of low magnetic relief, suggest the presence of pyrite, sphalerite mantos and chimneys similar to the Quarry Manto, 800 metres west of the grid, that grades 0.23 opt gold. Ranging in strike length from 200 metres to 300 metres with possible

thicknesses of ten to fifty metres and an indicated depth extent of up to 350 metres, the mantos represent significant targets.

On the Sandy Grid, an IP chargeability anomaly with dimensions of 700 metres by 500 metres, extends north from the Lake Deposit, a magnetite-pyrrhotite deposit, into an area of low magnetic relief more indicative of pyrite, chalcopyrite mineralization. Near the northern end of this anomaly, pyrite mineralization at surface in the Lake Fault returned a gold assay of 1.123 ounces per ton in a 0.6 metre chip sample. DDH 89-26, intersected 2.2 metres of 0.302 opt gold in silicified pyrite, 100 metres vertically below this surface mineralization.

The overall potential of the southern half of the property proximal to the Texada iron, copper deposits, as suggested by the chargeability anomalies and the thicknesses of the ore mined, is significant. Given the overall dimensions of the IP anomalies, the "room for potential" can be stated as:

1. Eagle anomaly:	24,000,000 tonnes;	Cu (Au) ore,
2. Manto anomalies:	24,000,000 tonnes;	Zn, Au ore,
3. Sandy anomaly:	22,000,000 tonnes;	Cu, Au ore.

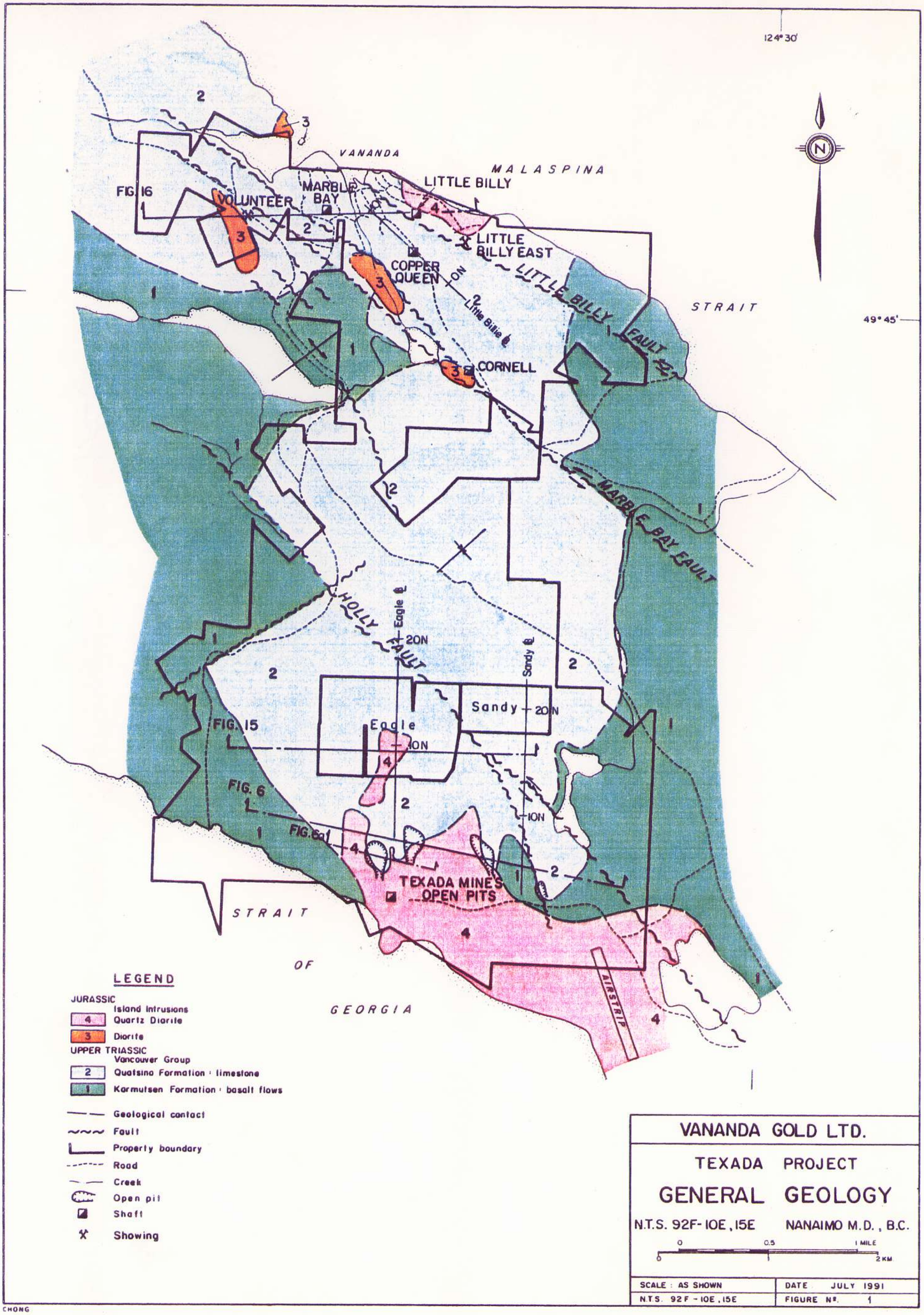
A phase 1 test of the IP anomalies in the southern sector is recommended. Diamond drilling totalling 4,050 metres with additional geophysics to help prioritize the targets, for a total cost of $360,000, should indicate the source of the anomalies. At the Little Billie, 2,500 metres of drilling and 10 days of IP are required to test the strike extension of the known deposit. Cost for this work would be $200,000.

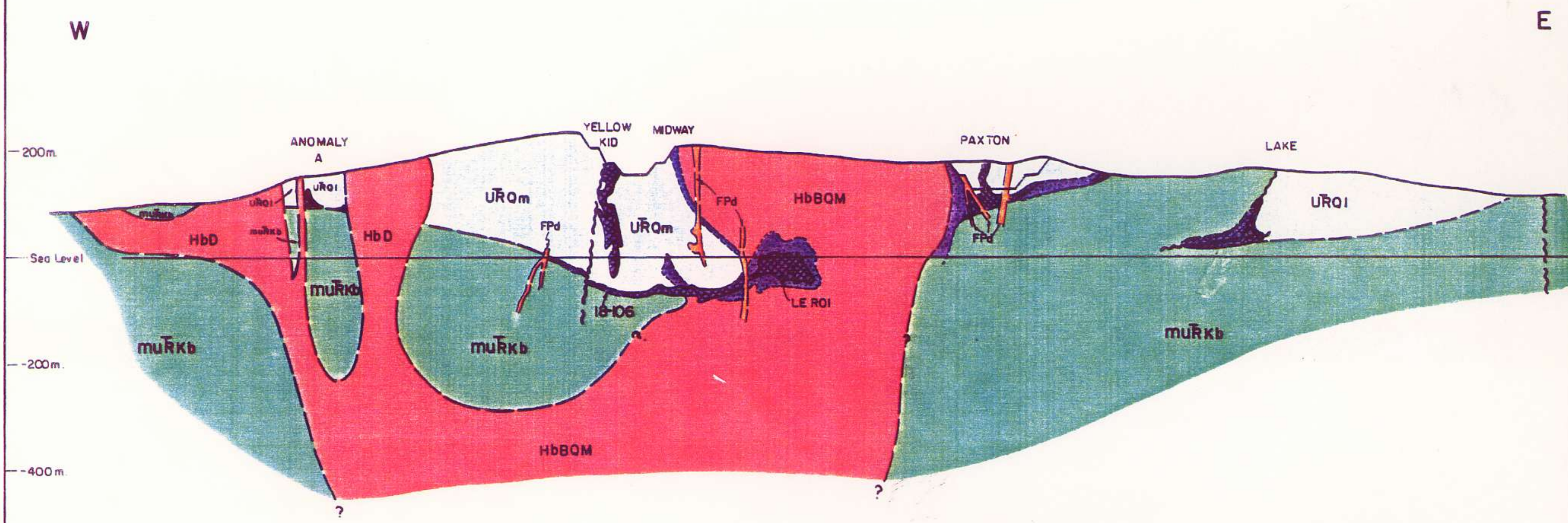
Assuming the anomalies are shown to have economic significance, phase 2 drilling would rapidly escalate into a 30,000 metre, multi-drill program, costing $1.75 million.

TABLE OF CONTENTS

List of Tables:

List of Figures:


124° 30'
49° 45'
N
VANANDA
MALASPINA
STRAIT
STRAIT
OF
GEORGIA
FIG 16
VOLUNTEER
MARBLE BAY
LITTLE BILLY
LITTLE BILLY EAST
COPPER QUEEN
10N
Little Billie ℄
CORNELL
LITTLE BILLY FAULT
MARBLE BAY FAULT
HOLLY FAULT
Eagle ℄
20N
Sandy ℄
Sandy
20N
Eagle
10N
FIG. 15
FIG. 6
FIG. 6a
TEXADA MINES OPEN PITS
AIRSTRIP
LEGEND
JURASSIC
Island Intrusions
4 Quartz Diorite
3 Diorite
UPPER TRIASSIC
Vancouver Group
2 Quatsino Formation : limestone
1 Karmutsen Formation : basalt flows
Geological contact
Fault
Property boundary
Road
Creek
Open pit
Shaft
Showing
VANANDA GOLD LTD.
TEXADA PROJECT
GENERAL GEOLOGY
N.T.S. 92F-10E, 15E
NANAIMO M.D., B.C.
0 0.5 1 MILE
0 1 2 KM
SCALE : AS SHOWN
DATE JULY 1991
N.T.S. 92F - 10E, 15E
FIGURE Nº. 1
CHONG



Mined ore

Potential ore

TEXADA MINES
E-W SECTION
LOOKING N.

0 200 400M.

FIG. 2

CHONG

Introduction:

The following report describes the work supervised by the writer for Vananda Gold in 1991 and encompasses information pertinent to the specific areas of interest. Intended only for Vananda Gold's internal use, it is not an Engineering Report for use in a Prospectus or Statement of Material Facts .

The report does not describe historical work on the claims, location, access, physiography, claim status and underlying property agreements as these are suitably covered in previous engineering reports. It should be noted, however, that the Eagle and Sandy Claim Blocks are recent additions to the land holdings subsequent to Vananda Gold's prospectus.

To assist in understanding the economic targets sought in the Eagle and Sandy grid areas, the writer has also included a description of the Texada Mine's deposits and the work by Freeport to evaluate their gold content.

Texada Iron Mines:

The iron, copper deposits in the southern portion of the claim block produced 20,000,000 tons of magnetite, chalcopyrite skarn ore developed in Quatsino Fm. marble and the Karmutsen basalt peripheral to the irregular, northwest margin of the Gillies Bay quartz monzonite stock. At the close of the mine in 1976, reserves were listed as 1,200,000 tons of 40% Fe and 0.42% Cu.

The mine initially consisted of large, steeply plunging magnetite pipes mined by open pit. When followed to depth with underground development, additional bodies of magnetite skarn within embayments in the quartz monzonite and thick, flat lying bodies of copper rich-skarn at the basal contact of the Quatsino limestones and the underlying Karmutsen volcanics were discovered. Figure 2 illustrates in cross section, the geometry of the various ore zones and their relationship to the granite and volcanics.

The basic structural control for the emplacement of the intrusives and the ore deposits is probably the northwest trending, left lateral Holly, Lake and Marble Bay fault zones (Figure 1), and a conjugate set of north-south faults now occupied by dykes. The vertical Prescott and Paxton ore pipes were both elongated to the northwest and the Yellow Kidd plunges steeply to the southeast. The Lake skarn has a northwesterly foliation developed in the skarn and follows the Lake Fault to the northwest. Embayments in the

Gillies Bay Stock also trend northwesterly controlling the Le Roi and South Yellow Kidd orebodies.

Copper production in the mine totalled 28,000 tons once a copper circuit was added to the mill, with gold credits of 31,200 ounces or 0.256 ounces of gold per ton of copper concentrate. Gold assays were not made on the copper ores, although historically, two small satellite deposits in the early 1900's, the Lake and Prescott, produced 186 ounces of gold from 1850 tons of ore.

To evaluate the possibility that significant gold enriched zones might have been overlooked in the mine, Freeport undertook a sampling program in the open pits and, as the underground workings were not easily accessible, selected samples from coarse rejects and drill core. Most of the areas in the mine, particularly the copper-rich zones, were sampled and analyzed for gold and 32 element ICP.

Three hundred samples were taken in the pits, with the majority from the Paxton. The zones with greater than 0.01 opt Au were averaged (Table 1), showing three to ten metre intervals of 0.02 to 0.08 opt Au; 0.4 to 1.0 opt Ag and 1% to 3% Cu. Averaging the intervals on the floor of the Paxton pit, the copper-rich zones average 0.028 opt Au, 0.50 opt Ag and 1.4% Cu.

The Boulder Nest Pit, immediately north of the Paxton pit yielded better gold results for the program with a five metre interval of chalcopyrite-rich skarn grading 0.074 opt Au, 0.86 opt Ag and 3.35% Cu.

In the Lake Pit, massive magnetite, pyrrhotite-rich skarn was sampled, returning negligible gold values. Drill core was unavailable, however composited coarse rejects from the mineralized intervals in the underground drill holes were available. Of the 102 samples submitted, 3 samples returned values over 1,000 ppb Au with the highest value being 1280 ppb Au, 40 ppm Ag and >10,000 ppm Cu. At the close of the mine in 1976, 460,000 long tons of 44% Fe and 0.15% Cu, remained in the underground workings.

Elsewhere in the underground mine workings, the best gold values, obtained from the coarse reject sampling, were 3,200 ppb Au, 33 ppm Ag and >10,000 ppm Cu from a 10 foot interval in the Le Roi. One 3.5 foot interval of core from a coarse calcite, chalcopyrite vein in the Midway deposit, returned a gold value of 0.37 opt Au. Finally, eight coarse reject composite samples from the copper-rich North Extension deposit, returned values of 65 ppb Au to 1100 ppb Au.

TABLE 1: SIGNIFICANT PAXTON ASSAY RESULTS—1988

	width (m)	oz/T Au	oz/T Ag	% Cu
Wall Sample:				
Pa 2	3	0.016	0.56	0.84
Pa 3	4	<.006		
Pa 4	1	0.017	0.47	1.12
Pa 5	3	0.038	0.76	2.26
Pa 6	2	0.018	0.39	0.81
Pa 7	4	0.019	0.41	1.10
Pa 8	4	0.030	0.65	n.a.
Pa 9	4	0.034	0.88	n.a.
Pa 10	6	0.070	0.34	0.92
Pa 11	3	0.024	0.55	1.07
Pa 12	3	0.065	0.12	3.11
11050N	9	0.032	0.76	n.a.
Floor Samples:				
Pf 1	5	0.017	0.48	0.92
Pf 2	5	0.082	1.36	3.14
Pf 3	4	0.036	0.61	1.75
Pf 4	9	0.010	0.24	0.78
Pf 5	1	0.018	0.48	1.07
Pf 6	1	0.030	0.04	1.25
Pf 7	20	0.021	0.44	1.70
Averages:	5	0.028	0.50	1.40

NB: n.a.= not assayed

Eagle Grid:

An induced polarization survey utilizing a gradient array was conducted over 29.5 line kilometres of cut line on the Eagle grid (Figure 1). Using an 1,800 m current electrode spacing (AB) and a 50 m pot spacing (MN), the approximate depth of penetration for the survey is 300 metres as determined by a factor of 0.165 times the AB spacing based upon the shallow, non-conductive overburden and the bedrock resistivities (pers.comm., Hendrickson, 1991).

The chargeability plotted and contoured in milliseconds on Figure 3, defines a broad anomaly of greater than 17 milliseconds between 2+00 N and 13+00 N and approximately 0+00 and 8+00 W (Figure 3a). The feature encompasses a NNE trending dioritic intrusive (Figure 7), that lies irregularly between 0+00 and 3+00 W. In 1962 and 1968, Texada Mines drilled eleven holes on six, 30 metre spaced fences, along the easterly dipping, western margin of the diorite. The most northerly hole, H-2, intersected disseminated to massive chalcopyrite grading up to 2.45 % over 3 metres in a 30 metre thick skarn coincident to the central axis of the chargeability high.

To locate the depth of the chargeability high, L 7+00 N was detailed by re-surveying using 4 different AB spacings; the original 1800 metre, a 1000 metre, a 500 metre and a 200 metre separation. This system was modelled after a similar survey in Albania (Langore et al, 1989) that located disseminated to massive sulphide mineralization at depths of 400 metres to 500 metres (See Appendix I for an extract of the paper). Using the 0.165 factor on the AB spacing to estimate the depth of penetration for the current, the chargeability is plotted as a depth profile on Figure 4, and clearly shows the anomalous chargeability is developed approximately 250 metres below surface in three distinct zones over a total width of 500 metres. With the exception of a narrow chargeability high at 2+25 W, coincident to the central axis of the anomaly, the two shallow arrays show no evidence of the chargeability anomaly in the deeper arrays.

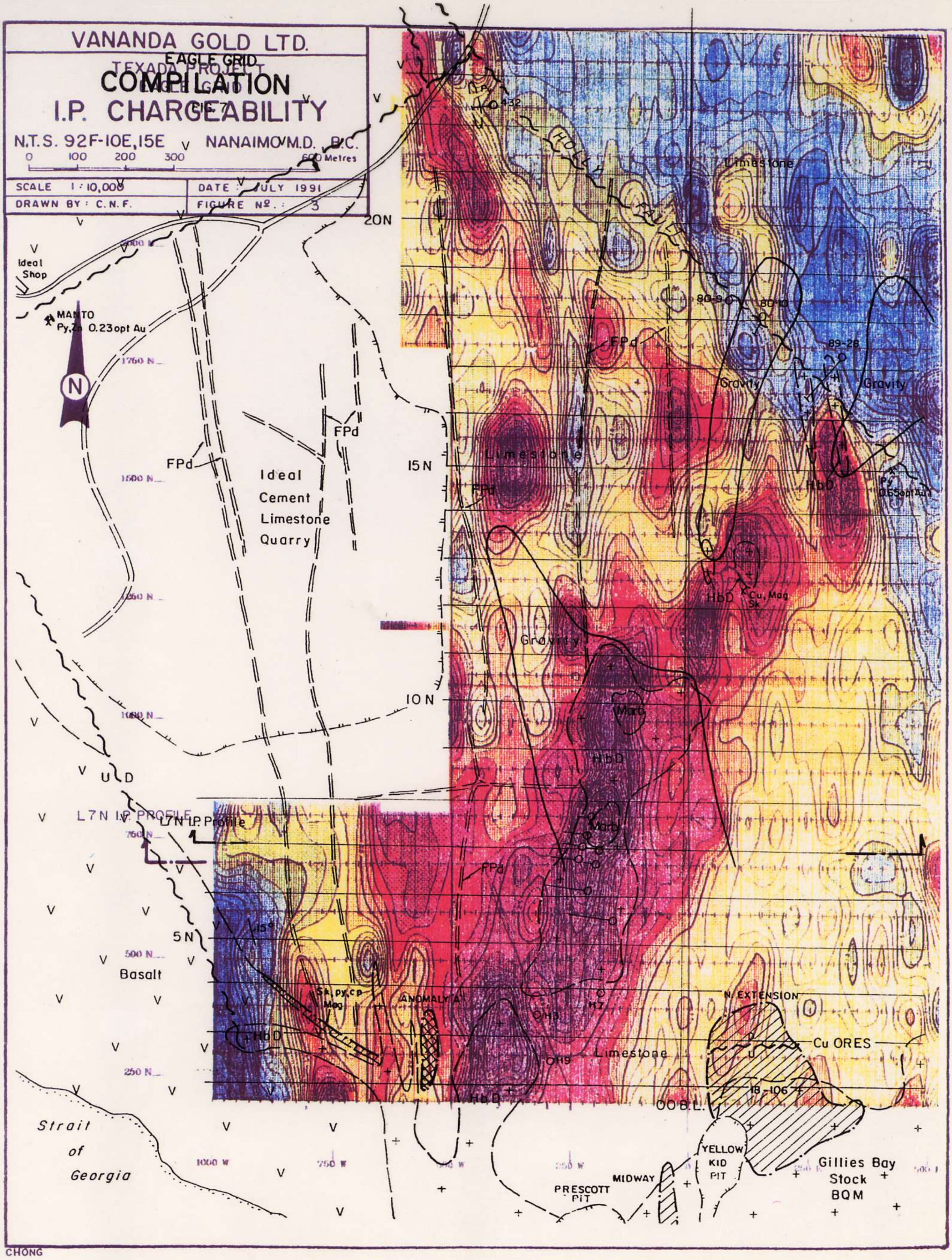
Figure 5, illustrates the projection of the gently dipping limestone, volcanic contact, host for the bulk of the copper-rich skarn in the mine (Figure 2), through the centres of the chargeability anomalies (Figure 4).

East of 2+00 W, the NW diorite, as defined from drill holes, has no chargeable response, but an apparent flat lying, sharp increase in chargeability is developing at the base of the section. This feature is on the projection of the deep 18-106 and North Extension ore bodies in Texada Mines (Figure 2), that were typically above 2% Cu with gold credits.

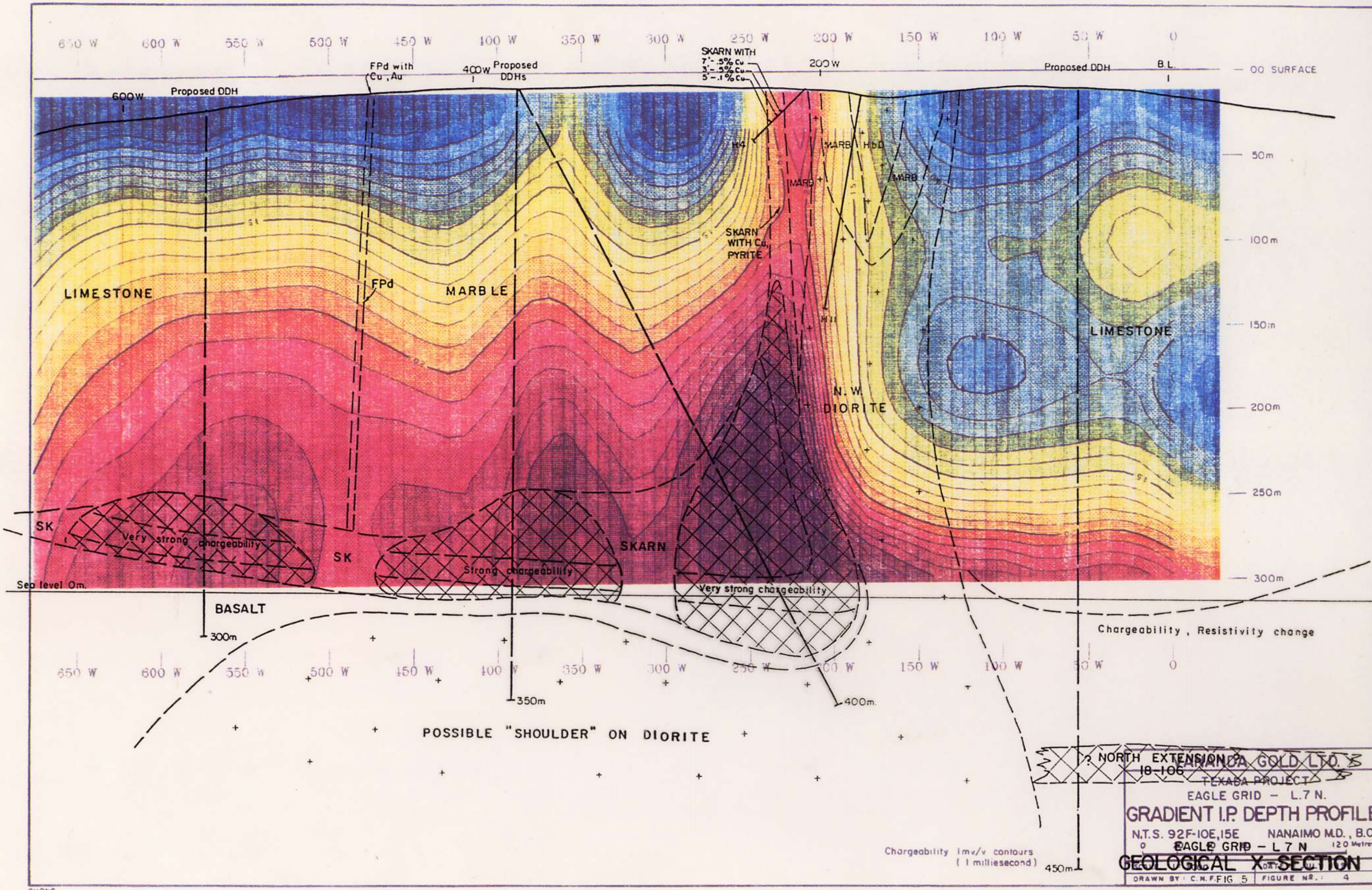
The total field, ground magnetics (Figure 6), highlites the magnetite bearing Northwest Diorite and the magnetite rich, amphibole skarns developed at the western contact. The magnetic contour map also reveals five northwest trending structures (Figure 7), cutting the diorite, parallel to the main, auriferous Holly structure. Flanking the diorite to the west, is a broad magnetic high or "shoulder" to the diorite, that is coincident to the broad IP chargeability anomaly. This feature could be indicating the presence of flat lying magnetite lenses in the skarn, analogous to Texada Mines, and/or a broad shoulder to the diorite, underlying the volcanic contact. Both scenarios would be favourable indications for the presence of a large skarn coincident to the IP anomaly.

Predicting the tonnage and grade potential of the anomaly without drill holes is intuitive at best. The flat lying copper ores in the mine varied from 10 feet to 100 feet in thickness with copper grades averaging from 1% to > 3%. As the mine was concerned with mining iron, copper was not developed unless closely associated with magnetite. During the life of the mine, gold values were not determined in the mine workings. However, the limited sampling carried out by the writer in 1988 on drill core and composite assay rejects, showed that gold values were depressed in the iron-rich skarns and from 0.02 opt to 0.08 opt in the copper-rich skarns.

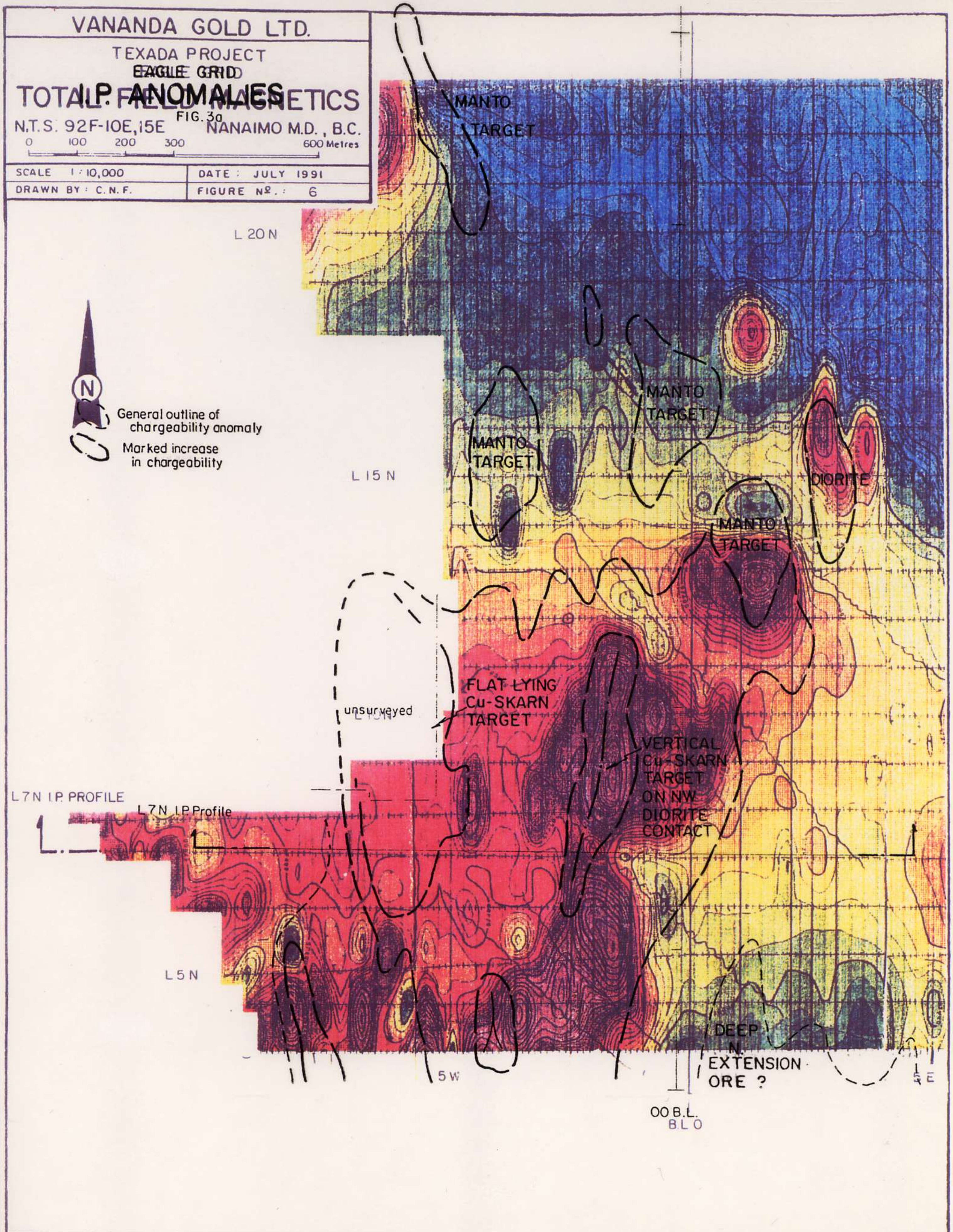
Given the above, the best estimate of grade and tonnage potential for the IP target assumes a strike of 1,000 metres times the width of 500 metres times a thickness of 15 metres and a specific gravity of 3.2 g/cc provides a figure of 24 million tonnes or converting by 1.1: 26.4 million tons. Assuming a grade of 2 % Cu and 2 grams of gold (0.058 opt), the contained metal content would be 1 billion pounds of copper and 1.5 million ounces of gold.



VANANDA GOLD LTD.
TEXADA PROJECT
EAGLE GRID
COMPILATION
I.P. CHARGEABILITY
N.T.S. 92F-10E,15E
NANAIMO M.D. B.C.
0 100 200 300 600 Metres
SCALE 1:10,000
DATE: JULY 1991
DRAWN BY: C.N.F.
FIGURE Nº.: 3
20N
15N
10N
5N
Ideal Shop
MANTO Py,Zn 0.23opt Au
FPd
Ideal Cement Limestone Quarry
HOLLY FAULT
Limestone
Gravity
HbD
Cu, Mag Sk
Marb
L7N I.P. PROFILE
L7N I.P. Profile
Basalt
Sk,py,cp Mag
ANOMALY A
N. EXTENSION
Cu ORES
18-106
00 B.L.
YELLOW KID PIT
MIDWAY
PRESCOTT PIT
Gillies Bay Stock BQM
Strait of Georgia
CHONG



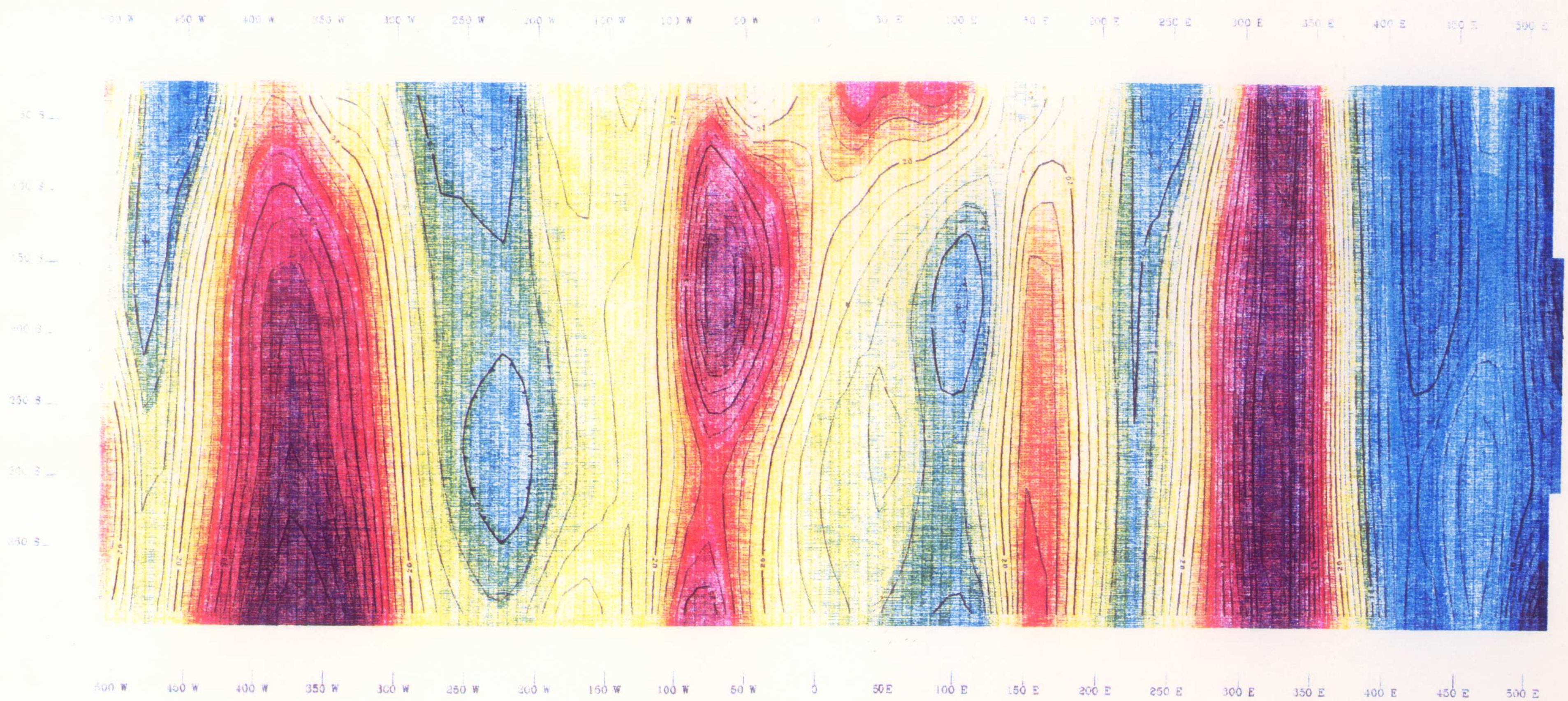
650 W
600 W
550 W
500 W
450 W
400 W
350 W
300 W
250 W
200 W
150 W
100 W
50 W
0
SKARN WITH
7'-.5% Cu
3'-.5% Cu
5'-.1% Cu
FPd with Cu, Au
400W
Proposed DDHs
200 W
Proposed DDH
B.L.
00 SURFACE
600W
Proposed DDH
H4
MARB
HbD
50m
100m
150m
200m
250m
300m
SKARN WITH Cu, PYRITE
LIMESTONE
FPd
MARBLE
H11
N.W. DIORITE
SK
Very strong chargeability
SK
Strong chargeability
SKARN
Very strong chargeability
Sea level 0m.
BASALT
300m
Chargeability, Resistivity change
350m
400m
POSSIBLE "SHOULDER" ON DIORITE
? NORTH EXTENSION ?
18-106
TEXADA PROJECT
EAGLE GRID – L.7 N.
GRADIENT I.P. DEPTH PROFILE
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
EAGLE GRID – L 7 N
120 Metres
GEOLOGICAL X-SECTION
Chargeability Imv/v contours
(1 milliesecond)
450m
DRAWN BY: C.N.F.
FIG 5
FIGURE Nº.: 4
CHONG


VANANDA GOLD LTD.
TEXADA PROJECT
EAGLE GRID
I.P. ANOMALIES
TOTAL FIELD MAGNETICS
FIG. 3a
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
0 100 200 300 600 Metres
SCALE 1:10,000
DATE: JULY 1991
DRAWN BY: C.N.F.
FIGURE Nº.: 6
N
General outline of chargeability anomaly
Marked increase in chargeability
L 20 N
L 15 N
L 5 N
L7N I.P. PROFILE
L7N I.P. Profile
MANTO TARGET
MANTO TARGET
MANTO TARGET
MANTO TARGET
DIORITE
FLAT LYING Cu-SKARN TARGET
VERTICAL Cu-SKARN TARGET ON NW DIORITE CONTACT
unsurveyed
DEEP N. EXTENSION ORE ?
5 W
5 E
00 B.L.
B.L 0
CHONG

Manto Targets; Eagle grid:

North of the above described chargeability anomaly, four distinct chargeability highs (Figure 3a), were located by the survey. These have low magnetic relief and show no response in the VLF profiles. Prospecting the lines indicates the presence of fine grained to sugary marble but no evidence of sulphide concentrations indicative of the chargeability highs. Soil geochemistry has anomalous zinc, cadmium, arsenic, copper and gold scattered around the IP highs suggesting substantial "leakage" could be occurring up vertical faults and dykes that both cut and flank the anomalies.

The IP indicates 200 to 300 metre strike lengths with widths of 20 to 50 metres. A depth profile of Line 15+00 N (Figure 8), shows the chargeability start within 50 metres of surface and continue to a depth of at least 350 metres. Assuming an average strike length of 250 metres, a width of 25 metres and 300 metres of depth extent a tonnage potential of 6 million tonnes, using an SG of 3.5, is possible for each anomaly. As the anomalies are not magnetic, nor conductive, mineralization similar to the sphalerite, pyrite-rich manto, located 800 metres west in the quarry (Figure 6), and grading 0.23 opt gold, is a model candidate for the source of these IP anomalies. Pyrite may also be possible and was encountered in Ideal Cement drill hole # 432 (Figure 7), on Line 23+00 N at the eastern edge of the northern most IP anomaly. Ideal's drill logs describe 25 metres of disseminated pyrite and goethite at the bottom of the hole, no assays were done for gold and base metals. As this appears to be flanking the anomaly it may be pyrite dispersed about a manto or chimney.



Chargeability lmv/v contours
(1 milliesecond)

VANANDA GOLD LTD.

TEXADA PROJECT
EAGLE GRID – L15N

GRADIENT I.P. DEPTH PROFILE

N.T.S. 92F-10E,15E NANAIMO M.D., B.C.

0 50 100 150 Metres

SCALE - AS SHOWN	DATE : JULY 1991
DRAWN BY : C.N.F.	FIGURE Nº. : 8

CHONG

Sandy Grid:

Gradient IP was conducted over the Sandy grid (Figure 1) in 1988 using a 2,400 metre current electrode or AB separation. A broad, NNW trending, subtle chargeability anomaly was delineated from L 12+00 N to L 20+00 N (Figure 9 & 9a), that when contoured averages 400 to 500 metres in width. Lying to the west of the Lake Fault, the chargeability high is developed northwest from a moderate magnetic high into an area of low magnetic relief (Figure 10).

In 1989 Freeport McMoRan Gold drilled nine holes (Figure 11), into the anomaly with seven holes bottoming in slightly pyritic volcanics, which are flat lying 20 to 80 metres below surface (Figure 12). Hole 89-26 (Figure 13), collared at 18+30 N; 3+00 W, located 2.2 metres of massive pyrite grading 0.302 opt gold, 100 metres below surface and vertically below a sulphide-rich shear zone, grading 1.123 opt gold over 0.6 metres. Hole 89-27, drilled below #26, did not locate the mineralization but bottomed in the basalt on the down thrown side of the Lake Fault.

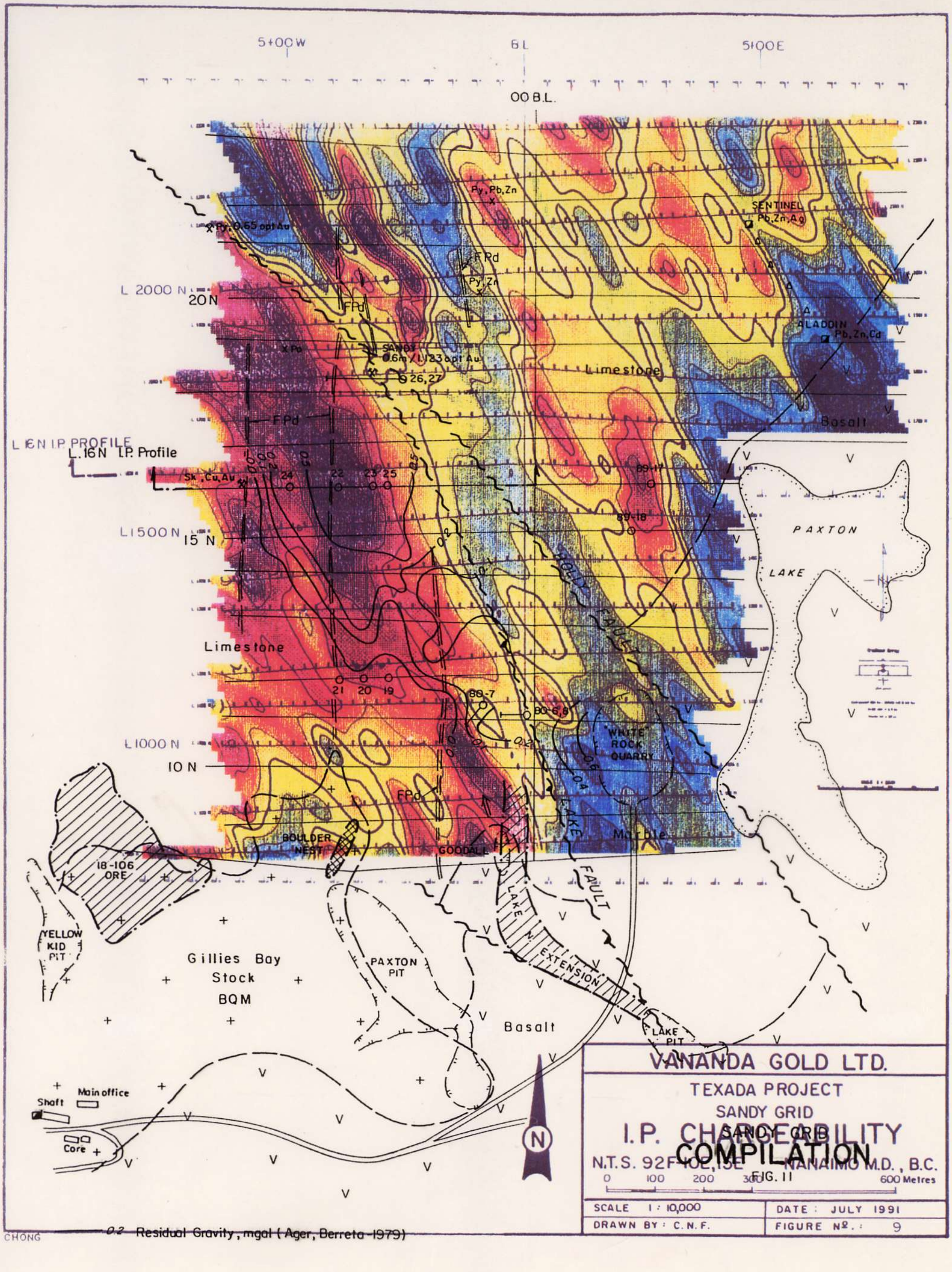
In 1991, it was suggested by Vananda Gold's geophysical consultant, Grant Hendrickson of Delta Geosciences, that the source of the IP was up to 350 metres deep and not the pyrite at the shallow volcanic contact in DDH's 22, 23, 24 & 25. To test this theory, Line 16+00 N was detailed using five current electrode (AB) separations with readings taken between the base line and 8+00 W. With chargeability plotted in profile (Figure 14), it is clear that the response is strongest between 300 to 350 metres below surface. As Line 16+00 N has four drill holes, 89-22 through 89-25 (Figure 15), the shallow, pyritic volcanic contact is defined and has only a modest increase in the chargeability. The main chargeability highs are another 100 metres beneath the deepest hole, 89-25. It is also noteworthy that a 1 metre section of +10,000 ppm Cu (> 1%) in hole 89-25 is coincident to the chargeability spike at 3+50 W in the shallow AB spacings.

To provide a geological explanation for the IP anomaly, the Lake deposit, 500 metres south (Figures 2 & 11), if projected north along the Lake Fault, would lie under the volcanies about 350 metres below surface as illustrated in Figure 15. The down thrown side of the volcanics, which would be the base of a potential ore deposit is already established from drill hole 89-27 (Figure 13), 230 metres north of section 16N. The ground magnetic survey (Figure 10), shows the marked difference between the magnetic response over the magnetite, pyrrhotite-rich Lake Deposit and the chargeability anomaly, which indicates the anomaly is derived from non-magnetic, chargeable material, such as pyrite and chalcopyrite.

Also significant is the presence of a residual gravity high of 0.5 milligals (Figure 11), coincident to the higher chargeability portion of the IP anomaly. Although initially suspected to be a density contrast between marble and limestone, the specific gravity of the marble has recently been determined to be 2.73 g/cc which is the same specific gravity for limestone as determined by Ager and Baretta in 1979. Consequently the residual gravity might well be reflecting a massive skarn and/or sulphide body coincident to the chargeability high.

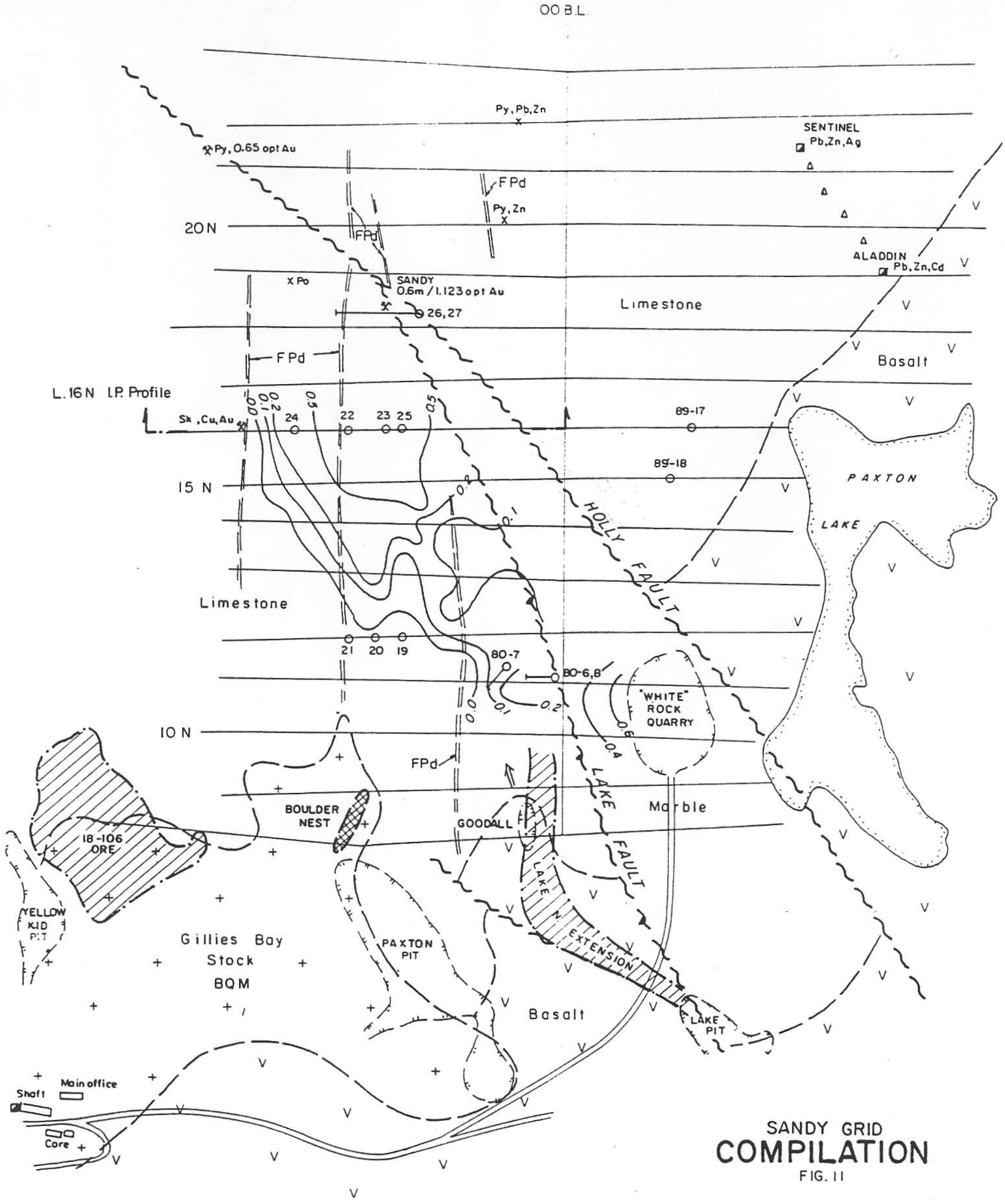
The western side of the IP profile (Figure 14), between 6+50 W and 8+00 W shows the chargeability high is probably developed at the limestone, volcanic contact on the western flank of the volcanic horst. This would be in a similar position to the flat lying, copper-rich skarn developed at the limestone-volcanic contact in the floor of the Paxton pit (Figure 11), 400 metres west of the Lake Fault.

Potential for the Sandy grid anomaly can be estimated using a strike length of 700 metres by a width of 500 metres and a thickness of 20 metres (typical thickness for the Lake and Paxton ore) times a specific gravity of 3.2 g/cc. to provide a "room for" potential of 22,400,000 tonnes or approximately 25,000,000 tons of sulphide-rich skarn. Only drilling can determine grade.



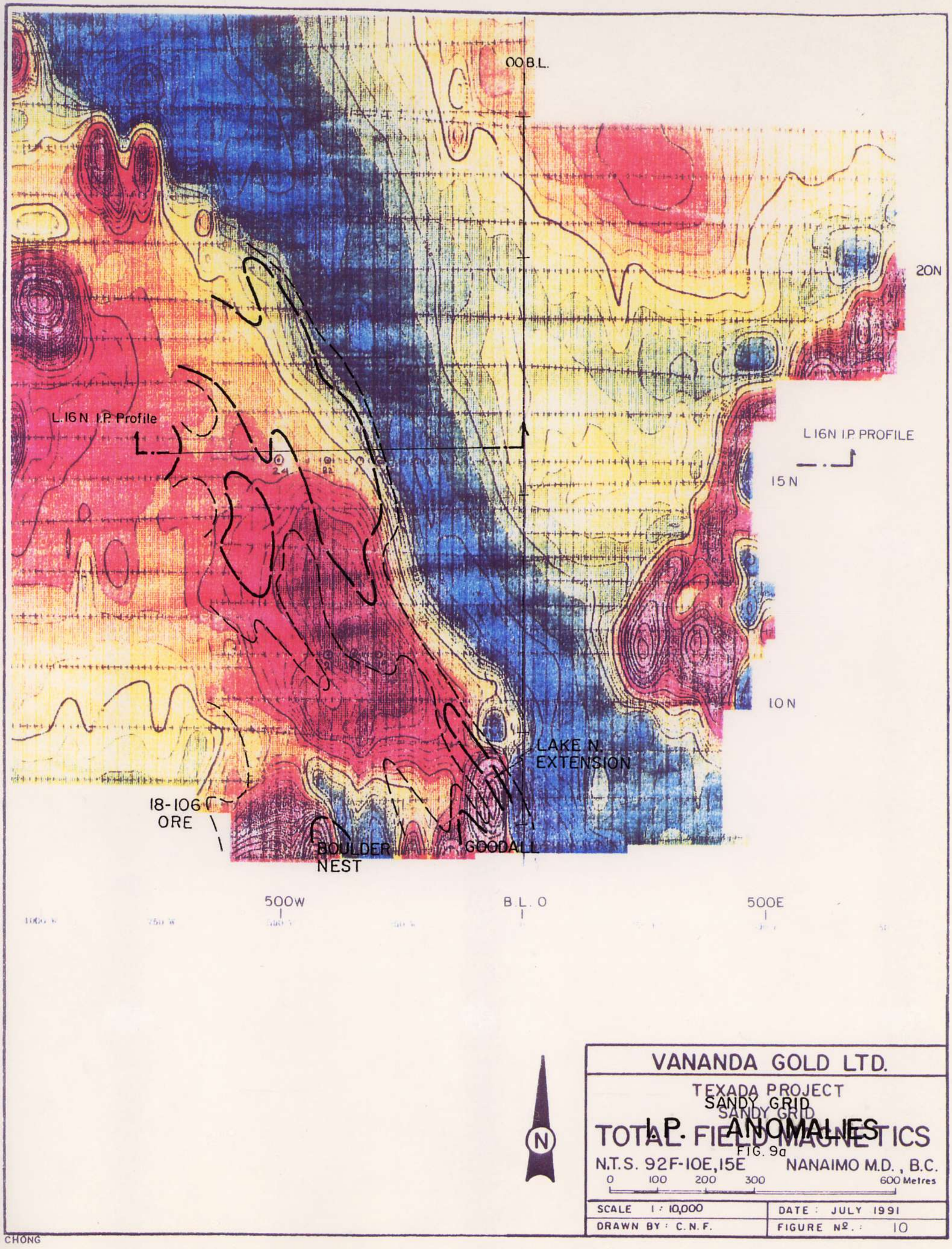
5+00W
BL
5+00E
00 B.L.
L 2000 N
20N
L1500N
15 N
L1000 N
10 N
L 16N I.P. PROFILE
L.16N I.P. Profile
Py, 0.65 opt Au
Py, Pb, Zn
SENTINEL
Pb, Zn, Ag
FPd
Py, Zn
ALADDIN
Pb, Zn, Cd
x Po
SANDY
0.6m / 1.123 opt Au
26,27
Limestone
Basalt
Sk, Cu, Au
24
22
23 25
89-17
89-18
PAXTON
LAKE
HOLLY
FAULT
Limestone
21
20
19
80-7
80-6,8
"WHITE" ROCK QUARRY
LAKE
Marble
BOULDER NEST
GOODALL
18-106 ORE
FAULT
LAKE
EXTENSION
YELLOW KID PIT
Gillies Bay
Stock
BQM
PAXTON PIT
Basalt
LAKE PIT
Main office
Shaft
Core
N
VANANDA GOLD LTD.
TEXADA PROJECT
SANDY GRID
I.P. CHARGEABILITY
SANDY GRID
COMPILATION
N.T.S. 92F 10E, 15E
NANAIMO M.D., B.C.
FIG. 11
0
100
200
300
600 Metres
SCALE 1 : 10,000
DATE : JULY 1991
DRAWN BY : C.N.F.
FIGURE No. : 9
0.2 Residual Gravity, mgal (Ager, Berreta-1979)

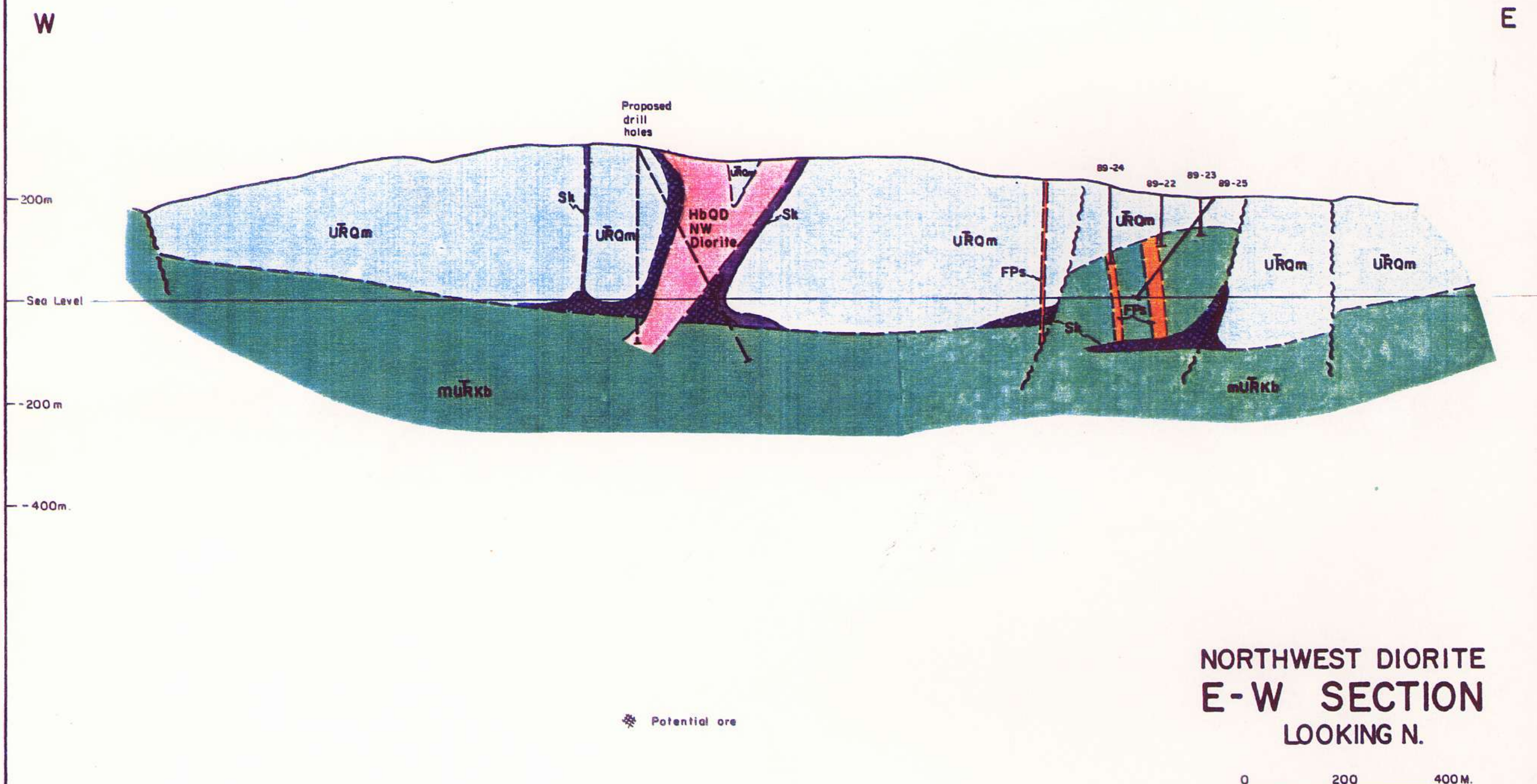
CHONG



SANDY GRID
COMPILATION
FIG. 11

0.2 Residual Gravity, mgal (Ager, Berreta - 1979)

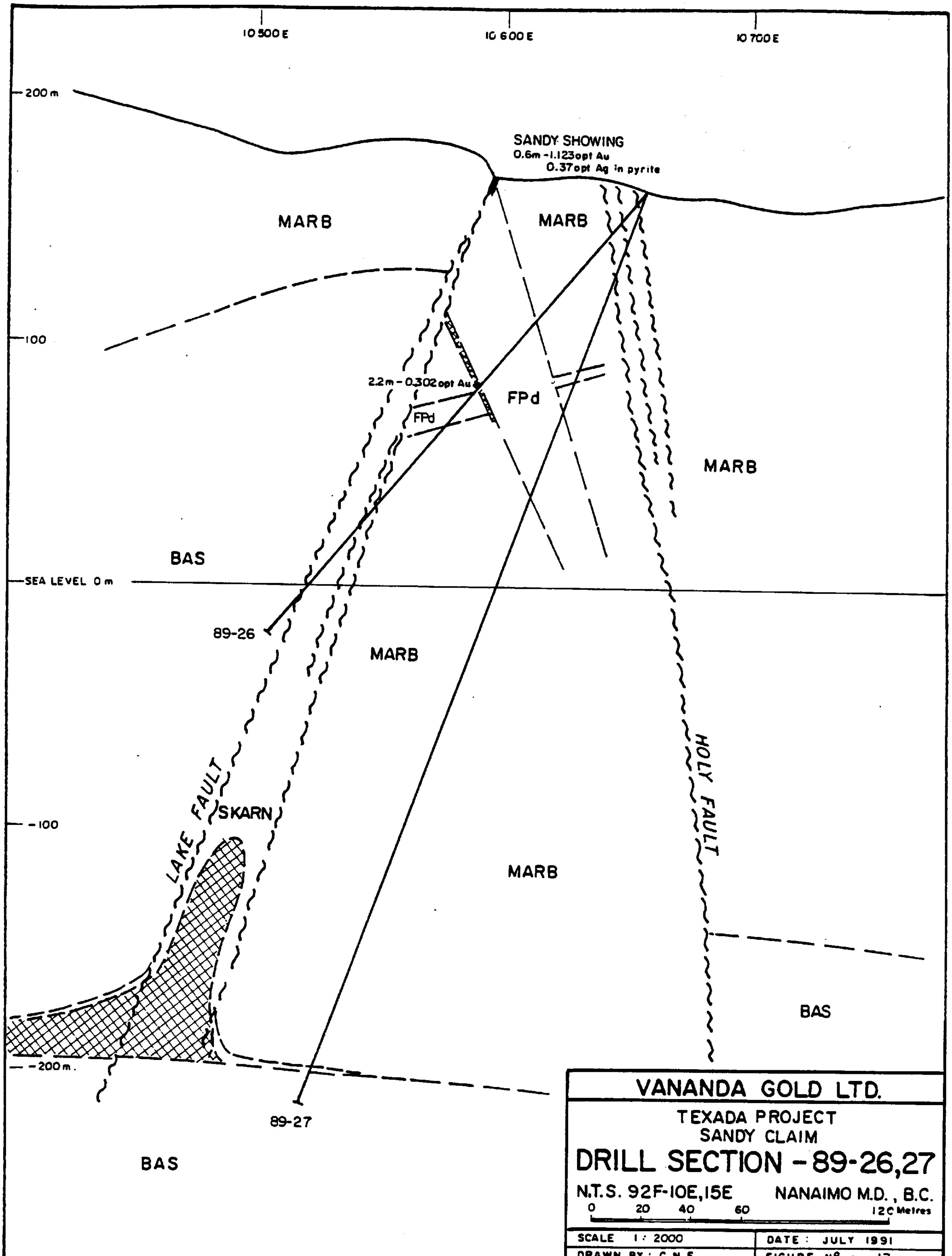

00 B.L.
20N
L.16N I.P. Profile
L16N I.P. PROFILE
15N
10N
LAKE N.
EXTENSION
18-106
ORE
BOULDER
NEST
GOODALL
500W
B.L. 0
500E
N
VANANDA GOLD LTD.
TEXADA PROJECT
SANDY GRID
SANDY GRID
I.P. ANOMALIES
TOTAL FIELD MAGNETICS
FIG. 9a
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
0 100 200 300 600 Metres
SCALE 1 : 10,000
DATE : JULY 1991
DRAWN BY : C.N.F.
FIGURE No. : 10
CHONG



NORTHWEST DIORITE
E-W SECTION
LOOKING N.

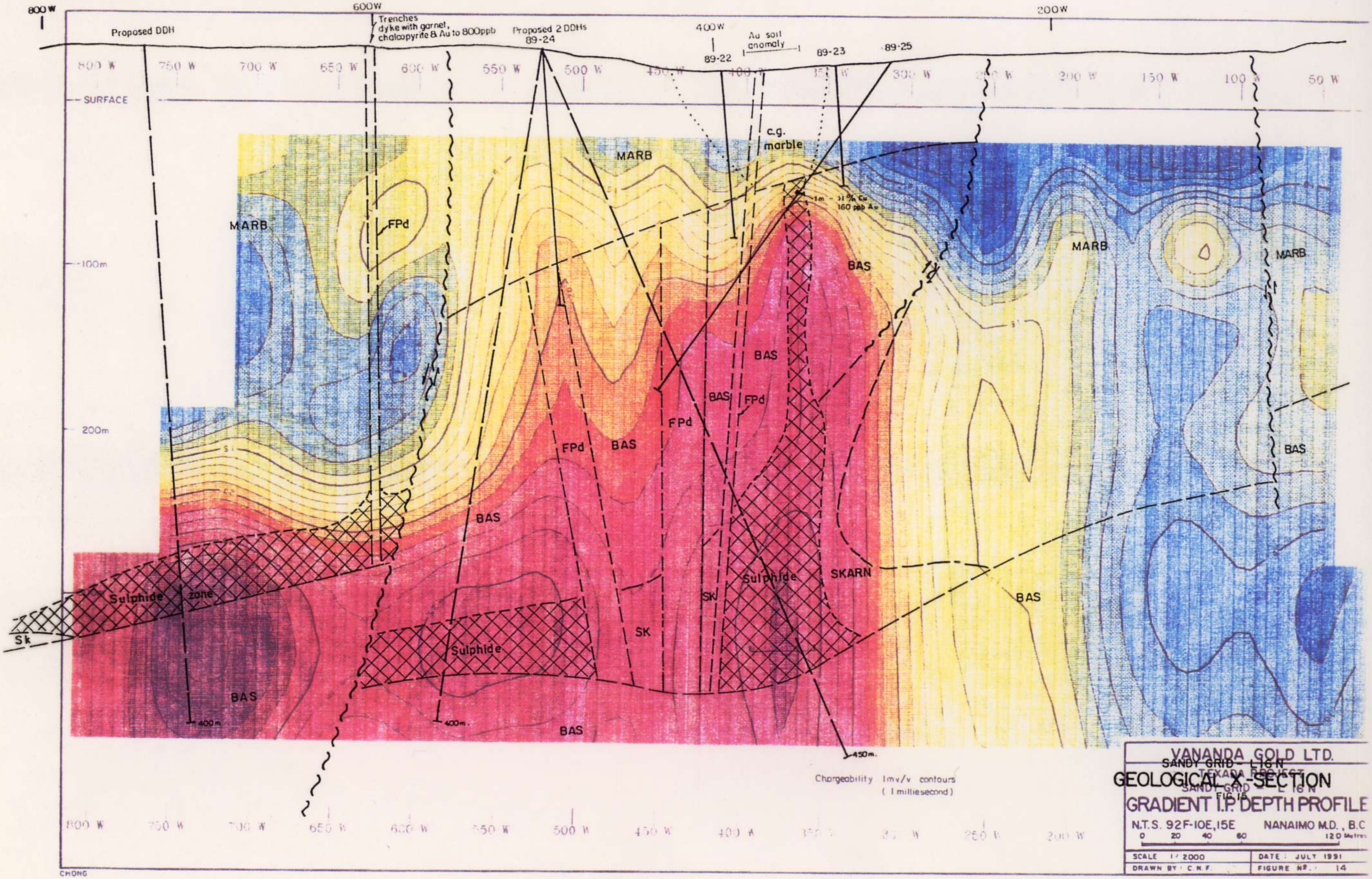
FIG. 12

CHONG



10 500 E
10 600 E
10 700 E
200 m
100
SEA LEVEL 0 m
-100
-200 m.
SANDY SHOWING
0.6m - 1.123 opt Au
0.37 opt Ag in pyrite
MARB
MARB
2.2m - 0.302 opt Au
FPd
FPd
MARB
BAS
89-26
MARB
LAKE FAULT
SKARN
HOLY FAULT
MARB
BAS
89-27
BAS
VANANDA GOLD LTD.
TEXADA PROJECT
SANDY CLAIM
DRILL SECTION - 89-26,27
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
0 20 40 60 120 Metres
SCALE 1 : 2000
DATE : JULY 1991
DRAWN BY : C.N.F.
FIGURE Nº. : 13

CHONG


800 W
600W
200W
400W
Proposed DDH
Trenches dyke with garnet, chalcopyrite & Au to 800ppb
Proposed 2 DDHs
89-24
Au soil anomaly
89-22
89-23
89-25
SURFACE
100m
200m
MARB
c.g. marble
FPd
BAS
SK
SKARN
Sulphide
Sulphide zone
Sk
1m - .31 % Cu 160 ppb Au
400m
450m
Chargeability 1mv/v contours (1 milliesecond)
CHONG
VANANDA GOLD LTD.
SANDY GRID - L16N
GEOLOGICAL X-SECTION
SANDY GRID - L16N
FIG 15
GRADIENT I.P. DEPTH PROFILE
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C
0 20 40 60 120 Metres
SCALE 1:2000
DATE: JULY 1991
DRAWN BY: C.N.F.
FIGURE №. 14

Little Billie:

The Little Billie Mine was first operated in the 1890's and continued intermittently to 1951 producing 70,000 tons of ore grading 0.18 opt gold, 0.6 opt silver and 1.3 % copper above the 600 foot level, the lowest working level in the mine. Diamond drilling in 1988, 1989 and 1991 has indicated and inferred approximately 195,000 tons grading 0.324 opt gold, 1.01 opt silver and 2.05 % copper in one continuous body below the 600 foot level (Figure 17).

In May of 1991, gradient array, induced polarization was once again carried out on the Little Billie grid (Figure 18). Previous surveys in 1988 and 1989 had defined a very strong chargeability high southeast of the Copper Queen Mine that was drill tested without success and was so strong that a subtle chargeability high, resistivity low extending off the southern end of the Little Billie mineralization was not considered significant.

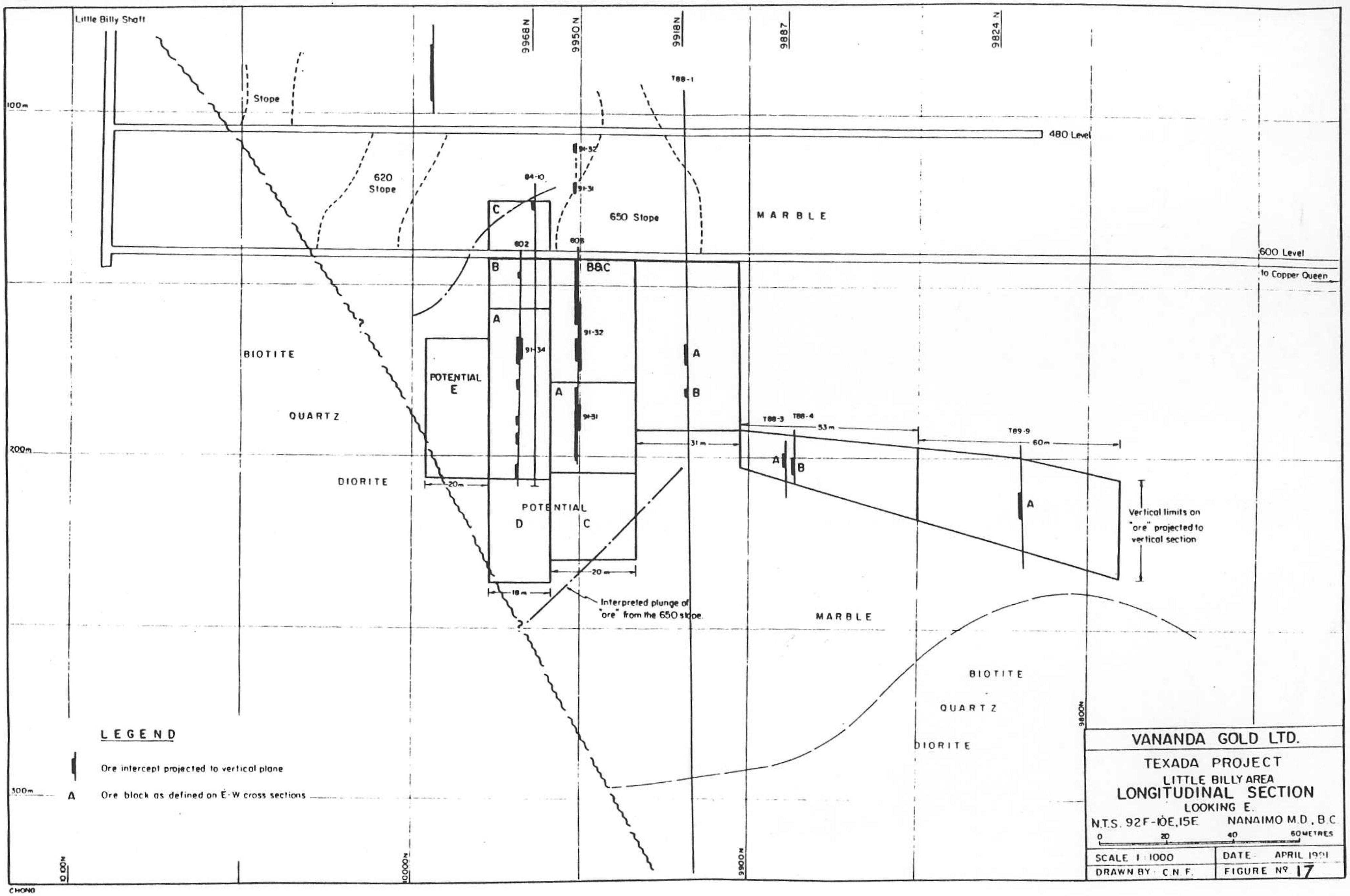
The recent gradient survey (Figure 18), using an AB spacing of 1125 metres, obtained a weak (5 millisecond) anomaly on Line 6 North between 6+75 E and 7+25 E, directly above the mineralized skurn in DDH 89-9. A very weak trend extends from this point to the north along the axis of the mineralization. Assuming the depth extent of the gradient IP is 0.165 times the AB spacing, the known ore is below focal point of this gradient block and would not produce a significant response. Because of the close proximity of the ocean to the Little Billie mineralization, it is not possible to increase the AB spacing sufficiently to focus on the mineralization.

Extending from the anomaly on Line 6 N directly over the mineralization, the chargeability increases in intensity along an arcuate trace to the south and east. The chargeability plan (figure 18), clearly shows four strongly anomalous zones developed along a 500 metre trend. The resistivity plan (Figure 19), defines this trend as a distinct resistivity low developed at the southern flank of a resistivity high, indicative of the Little Billie quartz diorite.

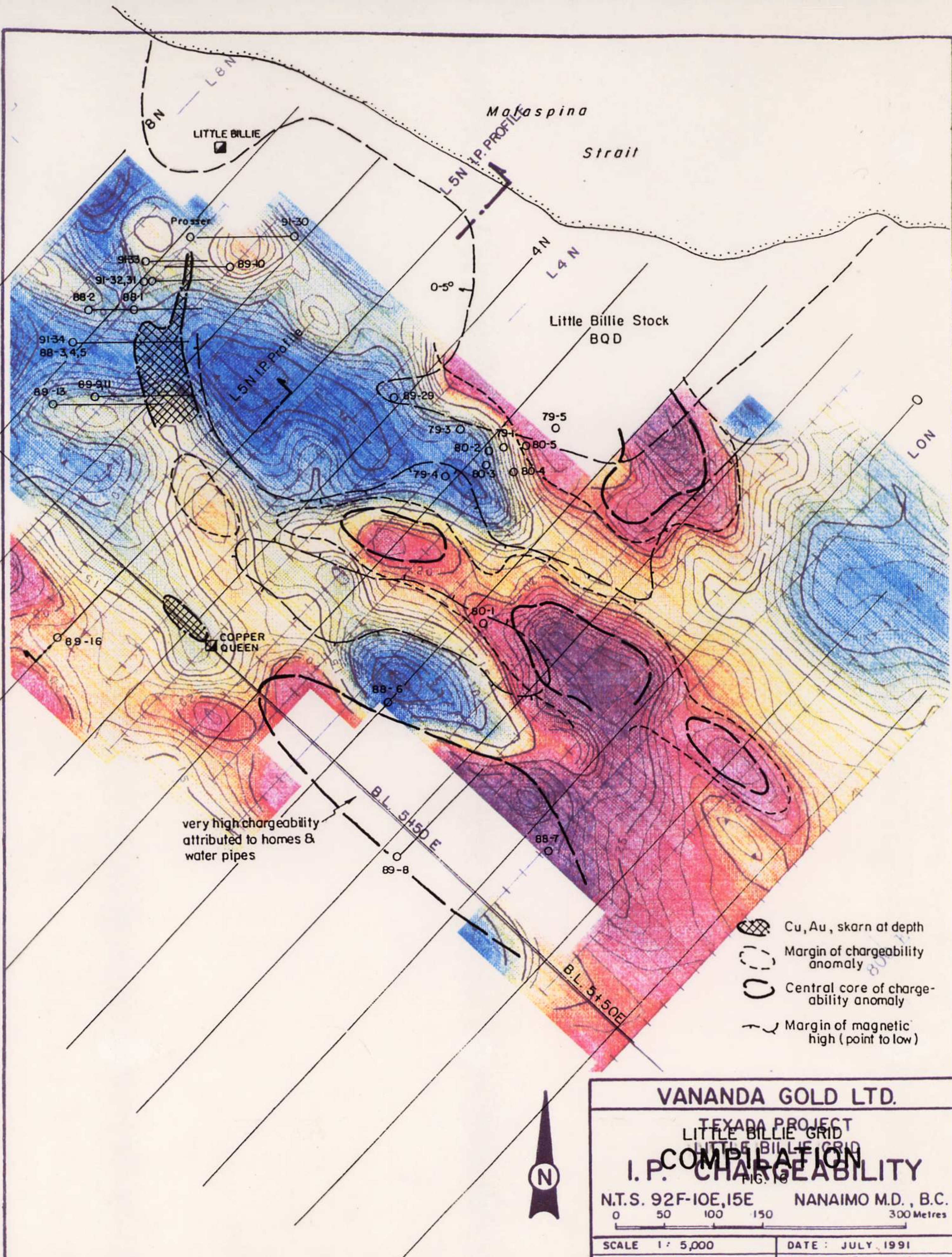
The magnetic plan (Figure 20), also defines the Little Billie stock as a magnetic high coincident to the resistivity high. A significant portion of the magnetics are caused by magnetite alteration developed along the margin of the quartz diorite and within a small copper-rich, magnetite skarn pod located in DDH 79-1 (Figure 16). In comparing the chargeability plan to the magnetic and resistivity plans, the chargeability anomaly is clearly developed along the indicated contact of the Little Billie Stock.

A Gradient IP profile along Line 6 N (Figure 21), shows the chargeability anomaly is a vertical feature, attenuating to depth and to surface, along the margin of a steeply dipping resistivity high indicative of the quartz diorite. The similarity to the present copper, gold skarns in the Little Billie is striking.

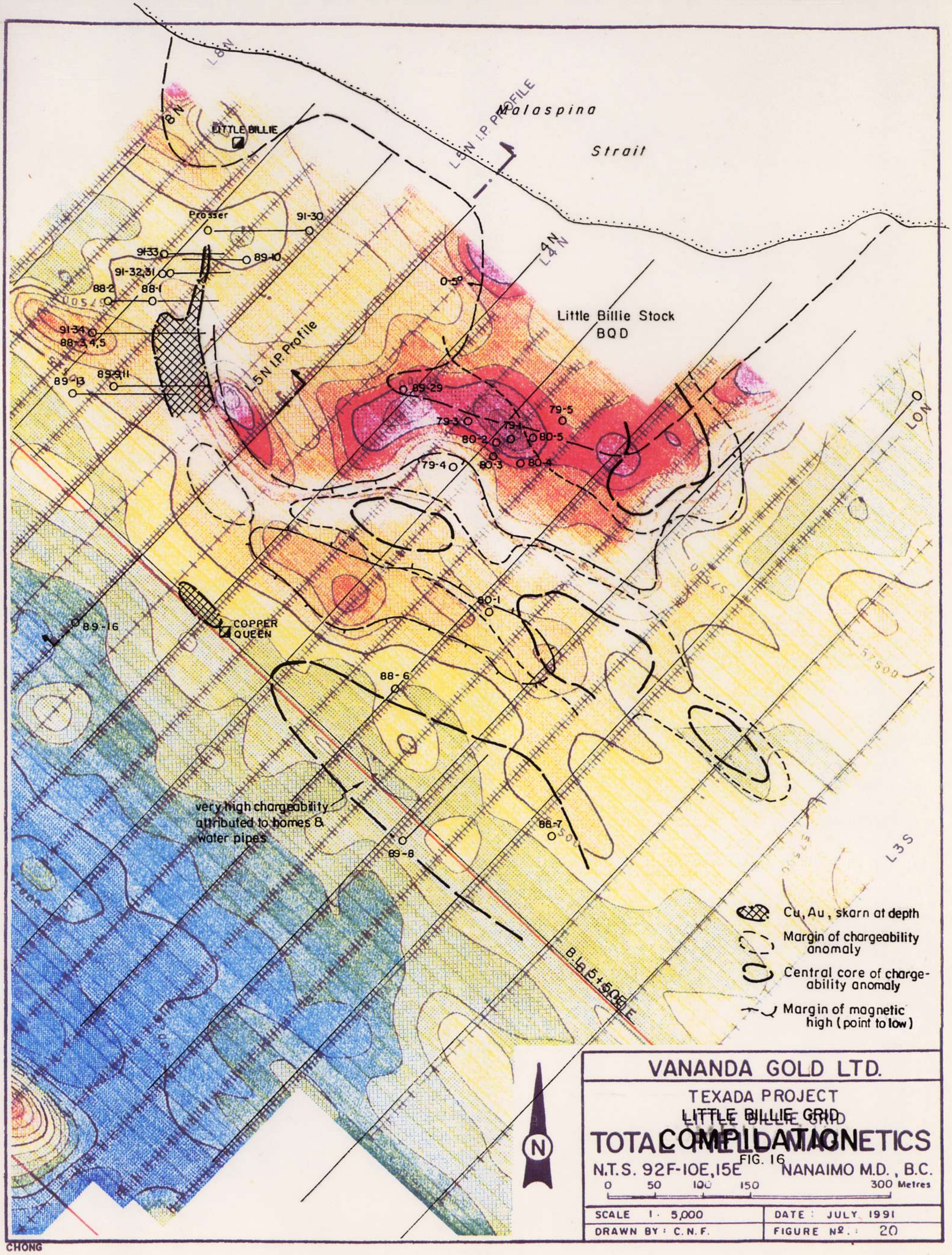
The potential for additional ore in the Little Billie is totally dependant upon the source of the chargeability anomalies. Assuming that the IP is responding to similar grade copper, gold skarn as already defined, the resource could increase by a factor of 5 times as indicated by the 500 metre strike extent of the chargeability high. It should also be noted that the present resource would have been significantly larger had not it been mined out above the 600 level.



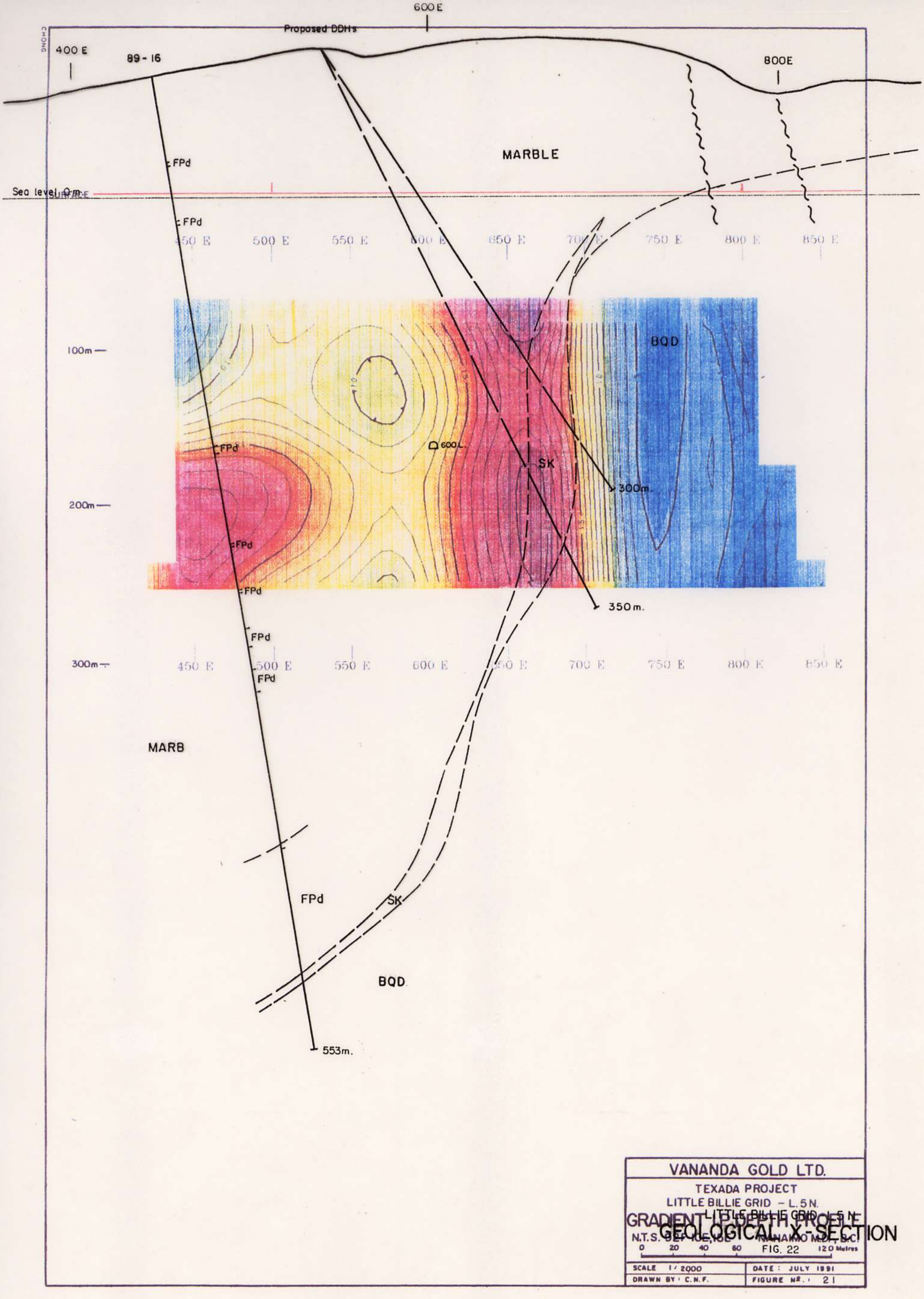
Little Billy Shaft
9968 N
9950 N
9918 N
9887
9824 N
100m
Stope
T88-1
480 Level
620 Stope
84-10
91-32
91-31
650 Stope
MARBLE
C
602
608
600 Level
to Copper Queen
B
B&C
A
91-32
91-34
BIOTITE
POTENTIAL E
A
A
B
QUARTZ
91-31
T88-3
T88-4
53 m
31 m
T89-9
60 m
200m
A
B
DIORITE
20m
POTENTIAL
D
C
A
Vertical limits on "ore" projected to vertical section
20
18 m
Interpreted plunge of "ore" from the 650 stope.
MARBLE
BIOTITE
QUARTZ
DIORITE
9800N
LEGEND
Ore intercept projected to vertical plane
A Ore block as defined on E-W cross sections
300m
10 000N
10000N
9900N
VANANDA GOLD LTD.
TEXADA PROJECT
LITTLE BILLY AREA
LONGITUDINAL SECTION
LOOKING E.
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
0 20 40 60METRES
SCALE 1:1000
DATE APRIL 1991
DRAWN BY C.N.F.
FIGURE Nº 17
CHONG


Malaspina
Strait
LITTLE BILLIE
8N
L8N
L5N I.P. PROFILE
L5N I.P. Profile
4N
L4N
L0N
0-5°
Little Billie Stock
BQD
Prosser
91-30
91-33
89-10
91-32,31
88-2
88-1
91-34
88-3,4,5
89-13
89-9,11
89-29
79-5
79-3
79-1
80-5
80-2
80-3
80-4
79-4
80-1
89-16
COPPER
QUEEN
88-6
88-7
89-8
B.L. 5+50E
very high chargeability
attributed to homes &
water pipes
Cu, Au, skarn at depth
Margin of chargeability
anomaly
Central core of charge-
ability anomaly
Margin of magnetic
high (point to low)
N
VANANDA GOLD LTD.
TEXADA PROJECT
LITTLE BILLIE GRID
LITTLE BILLIE GRID
COMPILATION
I.P. CHARGEABILITY
FIG. 16
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
0 50 100 150 300 Metres
SCALE 1: 5,000
DATE: JULY 1991
DRAWN BY: C.N.F.
FIGURE Nº: 18

CHONG



Malaspina
Strait
LITTLE BILLIE
L5N I.P. PROFILE
L8N
8N
Prosser
91-30
91-33
89-10
91-32,31
88-2
88-1
91-34
88-3,4,5
89-13
89-9,11
L5N I.P. Profile
4N
L4N
0-5°
Little Billie Stock
BQD
89-29
79-5
79-3
79-1
80-5
80-2
79-4
80-3
80-4
LON
80-1
89-16
COPPER QUEEN
88-6
57500
very high chargeability attributed to homes & water pipes
88-7
89-8
L3S
B.L. 5+50E
Cu, Au, skarn at depth
Margin of chargeability anomaly
Central core of chargeability anomaly
Margin of magnetic high (point to low)
N
VANANDA GOLD LTD.
TEXADA PROJECT
LITTLE BILLIE GRID
TOTAL FIELD MAGNETICS
COMPILATION
FIG. 16
N.T.S. 92F-10E,15E
NANAIMO M.D., B.C.
0 50 100 150 300 Metres
SCALE 1 : 5,000
DATE: JULY 1991
DRAWN BY: C.N.F.
FIGURE Nº.: 20
CHONG



600 E
Proposed DDH's
400 E
89 - 16
800E
MARBLE
FPd
Sea level 0m
SURFACE
450 E
500 E
550 E
600 E
650 E
700 E
750 E
800 E
850 E
100m
BQD
600L.
SK
300m.
200m
350m.
300m
MARB
FPd
SK
BQD.
553m.
VANANDA GOLD LTD.
TEXADA PROJECT
LITTLE BILLIE GRID – L.5N.
LITTLE BILLIE GRID L.5N
GRADIENT DEPTH PROFILE
GEOLOGICAL X-SECTION
NANAIMO M.D., B.C.
FIG. 22
0 20 40 60 120 Metres
SCALE 1:2000
DATE: JULY 1991
DRAWN BY: C.N.F.
FIGURE No.: 21

Overall Potential:

Skarns at Fortitude, Nevada and Hedley, B.C. have well defined zonation from copper-rich central cores to copper, gold and finally gold-rich skarns at the outer margins of their hydrothermal systems. On the Texada Property, this zoning is suggested by the surface mineralization distributed around the Texada mine.

On the Eagle grid, lines 8+00 N and 9+00 N at 4+00 W, which is central to the chargeability high, copper-rich skarn with gold values of 1640 ppb and 2130 ppb is developed along vertical dykes. On the more distal margins of the system, the sphalerite, pyrite manto in Ideal Cements' limestone quarry grades 0.23 opt Au and a 0.5 metre thick massive, silicified pyrite vein off the north end of the NW diorite grades 0.65 opt Au.

Within the Sandy grid, massive pyrite in the Lake shear assayed 1.123 opt gold and drill hole 89-26 intersected 2.2 metres of 0.302 opt gold in massive pyrite. At approximately 6+00 W on line 16+00 N, chalcopyrite skarn developed on the contact of a dyke graded 800 ppb gold.

Although the above does not provide a grade nor confirm the presence of a deeply buried skarn system, it does indicate a change in chemistry that might be reflected in the major targets.

These targets represent the following overall tonnage potential:

Northwest Diorite:	24,000,000 tonnes
Mantos: 4 @ 6 MM Tonnes:	24,000,000 tonnes
Sandy Grid:	22,000,000 tonnes
TOTALS:	70,000,000 TONNES

Grades for these should only be generalized until drill holes locate the sources of the anomalies. Suffice to say the writer would categorize them as follows:

Northwest Diorite:	Copper with gold credits
Mantos:	Zinc with ore grade gold
Sandy Grid:	Ore grade copper and/or gold

While the tonnage estimates assume large, regular bodies of ore, the IP contour plots, the depth profiles and the ore actually mined in the Texada deposits suggest that a number of smaller zones with varying thickness and grades should be expected and that areas of internal waste will exist as will zones of anomalous thickness and grade. Hopefully all will average out to the above approximations. However if only 25 % of the above actually turns out to be ore, the mine would still be a major deposit in Canada.

Recommendations and Budget:

A. Geophysics:

1. Eagle Grid: The gradient IP coverage should be expanded to cover Ideal Cement's quarry and extended to complete the northern end of the grid over the Lucky Jack showing. At least two additional gradient IP profiles should be done as well as deep penetrating EM over the main chargeability anomaly to define any conductive zones that could be construed as massive sulphide bodies.

2. Sandy Grid: Line 18 N should be profiled with the gradient IP to locate the northern extension of the IP anomaly with respect to DDH's 89-26 & 27. It is possible that 89-26 could be deepened to test the chargeability anomaly. Additionally down hole EM and IP should be done on DDH 89-27 to test for disseminated and/or massive sulphides in the fault zone immediately west of the drill hole on the bottom volcanic contact. As with the Eagle Grid, a deep penetrating EM survey should be conducted over the IP anomaly to test for possible conductive massive sulphides.

3. Little Billie: Additional lines over the chargeability high extending from the known mineralization should be done to control additional diamond drilling. Several of these lines should be extended to the southwest (grid west) to profile the Florence and Security areas as a weak chargeability feature was located in the original Walcott 2400 metre AB gradient IP work over these areas. Down-hole IP and EM should also be done on drill holes 89-8 & 12 as a final test for sulphides that could have been missed and as a further test of the large IP feature southeast of the Copper Queen.

B. Diamond Drilling:

1. Eagle Grid: 4 drill holes totalling 1,400 metres (4,600 feet) are proposed to test the four principal chargeability anomalies on Line 7 N.

2. Manto Targets: At least one 250 metre (800 foot) hole to test each of the four IP chargeability highs is required.

3. Sandy Grid: 3 drill holes totalling 1,250 metres (4,100 feet) to test the three chargeability highs on the Line 16 N profile and at least one 400 metre hole to test the IP anomaly west of the DDH 89-26 & 27 drill holes, 230 metres north of Line 16 N.

4. Little Billie: Drill 5 sections with 2 holes per section to test the southeasterly trend of the IP anomaly. Approximately 500 metres per section for a total of 2,500 metres (8,000 feet).

C. Estimated Cost:

Sandy and Eagle:

Geophysics: 8 days @ $1,500 (including helpers)	$12,000
Diamond Drilling: 4,050 m (13,500') @ $65/m	265,000
Geological and field support:	50,000
Management Fee @ 10 % (assumes JV)	33,000
Totals:	360,000

Little Billie:

Geophysics: 10 days @ $1500/ day	$15,000
Diamond Drilling: 2500 m @ $65/m	162,500
Geological and field support:	25,000
Totals: (assumes no JV for Little Billie)	$202,500

Statement of Qualifications

I, Charles N. Forster, B.Sc., F.G.A.C. declare that:

1. I was responsible for the field work carried out by Freeport-McMoRan Gold Co. on the property in 1988 and 1989.

2. I personally supervised the work for Vananda Gold in 1991, including the drilling of DDH's 91-30, 31, 32, 33 & 34 and the induced polarization survey performed by Delta Geoscience under the direction of Grant Hendrickson, owner of Delta Geoscience.

3. I am a graduate of the University of British Columbia with a B.Sc. in Majors Geology (1974) and that I attended the University in 1966-1970 and 1973-74.

4. I have practised my profession for 21 years since 1970 in Canada, the USA, South Africa, Namibia and Portugal.

5. I own shares of Vananda Gold Ltd. and I expect to receive additional shares through my continuing services to Vananda Gold Ltd.

6. I am Fellow of the Geological Association of Canada, # F1065.

Charles N. Forster, B.Sc. F.G.A.C.

Dated: July 17, 1991

Geophysical Prospecting 37, 975–991, 1989

ACHIEVEMENTS IN COPPER SULPHIDE EXPLORATION IN ALBANIA WITH IP AND EM METHODS[1]

L. LANGORE[2], P. ALIKAJ[3] and D. GJOVREKU[2]

ABSTRACT

LANGORE, L., ALIKAJ, P. and GJOVREKU, D. 1989. Achievements in copper sulphide exploration in Albania with IP and EM methods. *Geophysical Prospecting* 37, 975–991.

The copper sulphide exploration programme in Albania involves a number of geophysical methods. The most important ones are the Induced Polarization (IP) and the TURAM methods. This paper reports some recent achievements in increasing the depth of investigation and in discriminating sulphide ore textures by the IP, spectral IP and TURAM methods.

INTRODUCTION

Albania, a country in the Alpine ophiolitic belt, is rich in copper sulphide ore deposits. Many geophysical methods including IP, resistivity, SP, mise-à-la-masse, EM, gravity, magnetic and underground geophysical methods are used in Albania in the exploration for such ore deposits. Because of the geological environments and terrain conditions, the IP method plays a major role. The other methods mentioneed above provide additional information to make up for the disadvantages of IP investigation. Together with geological and geochemical surveys, they provide effective, integrated exploration surveys in the search for copper sulphide deposits. IP surveys are usually carried out with gradient arrays using electrode separations $AB = 600 - 1000$ m, $MN = 20 - 40$ m, and 100×20 m or 50×20 m survey grids.

We describe case histories of deep sulphide exploration by the IP method, some results of a time-domain spectral IP method for the discrimination of sulphide ore textures, and surface and drillhole TURAM surveys for massive copper sulphides.

[1] Received February 1988, revision accepted January 1989.
[2] Geophysical Enterprise, Tirana, Albania.
[3] Department of Geophysics, Faculty of Geology and Mines, Enver Hoxha University, Tirana, Albania.

The Induced Polarization Method

The IP method has been successfully used in the copper sulphide exploration in Albania since about 1963 (Lubonja and Frashëri 1965). The IP anomalies have been decisive in defining many copper ore deposits in the volcanogenic or volcano-sedimentary formations (Avxhiu 1979; Frashëri *et al.* 1986). But during the last decade, as in many other countries, two important problems of IP research have emerged: greater depth of exploration and attempts to distinguish textures of various sulphide ores.

Deeper copper exploration

The IP anomalies are related to shallow sulphide ore deposits, usually down to 100 m and occasionally to about 200 m, whereas deeper exploration is required by the Geological Service. The limits to the depth of investigation in electrical methods, in addition to the dimensions of the mineral deposits, are connected with the transmitted power, sensitivity of the receiver and the signal-to-noise ratio.

Since 1981, when a new, more powerful IP technique was introduced, the depth of investigation for copper exploration has increased markedly. The high power of the transmitter and improved sensitivity and stability of the receiver (IPC-7/15 kW, IPR-10 A, Scintrex) have permitted the use of long gradient arrays or deep vertical electrical soundings of induced polarization (VES-IP) with maximum separations of $AB = 4400$ m, $MN = 200$ m (Lubonja *et al.* 1985). There has also been improvement in data processing and interpretation.

The follow-up measurements are often carried out with lines of deep VES-IP or gradient arrays with different separations, e.g. $AB = 200$, 400, 600, 1000, 1500 or 2000 m. Chargeability or resistivity responses for every separation are plotted at points located at the approximate depth of investigation H_i. The geological data are plotted on the same section and terrain corrections for proper location of responses are also carried out. This type of representation was called a "real section" by Alikaj (1981). It should not be taken as an exact electrical section of the underlying medium; rather it is a convenient schematic plot of results, which has proved successful in many geological environments.

The depth of investigation H_i for a given region is determined experimentally over a known geological cross-section (prospect-by-prospect). In our experience $H_i \approx (0.125\text{–}0.2)\ \overline{AB}$ in different geological environments; this is compatible with theoretical studies of homogeneous media (Roy and Apparao 1971) or of heterogeneous media (Frashëri 1987).

The following two case histories of deep IP exploration for copper sulphide ores come from the Central Mirdita district.

The P 102 sulphide ore deposit. Figure 1 presents a cross-section of the P102 sulphide ore deposit in the Central Mirdita district. The ore bodies are located within a disseminated sulphide zone at about 300 m depth, on the south-east part of the cross-section (stations 100–130). The mineralized zone (pyrite 5–20%) occurs in the upper volcanogenic series, near the contact with the lower volcanogenic series.

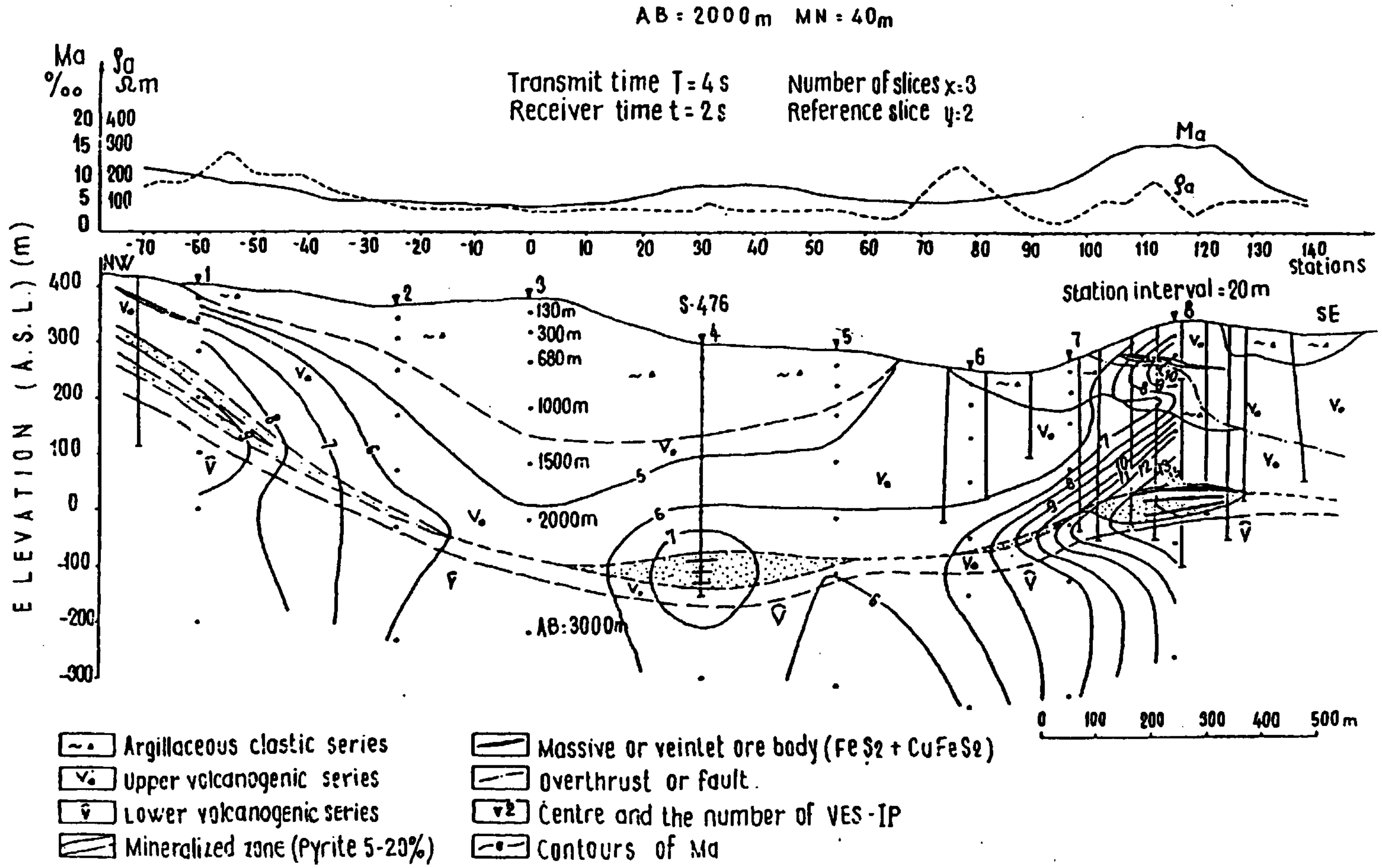


FIG. 1. Gradient array IP and ρ_a profiles and "real section" presentation of VES-IP chargeability over the P 102 sulphide ore deposit, Central Mirdita district.

Most of the upper part of the geological cross-section is covered by an argillaceous clastic series, 40–250 m thick. These sediments have a low electrical resistivity (30–80 Ωm) and present difficulties for IP measurements with low-power transmitters.

The ore bodies consist of pyrite and chalcopyrite of massive or veinlet texture. Between stations 116 and 126 a shallow (30–80 m depth) ore deposit occurs due to the overthrust of the volcanogenic rocks to the north-west. An IP survey using a gradient array with $AB = 2000$ m and $MN = 40$ m and a 20 m measurement interval was carried out. The transmitting time was $T = 4$ s, while the receiving time was $t = 2$ s. The number of slices (windows) of the decay curve was $x = 3$ and the reference slice was $y = 2$ (the middle one).

The IP survey profile contains three anomalous zones. The first one is related to the known ore deposits on the southeast part of the cross-section. Chargeability is rather high in magnitude ($M_a = 15$ mV/V or ‰) due to two levels of sulphides. The second zone ($M_a = 10.5$‰) lies on the north-west part of the cross-section (stations −70 to −40) and is related to the known weak disseminated sulphides. The third zone is centred between the stations 20 and 50 and its magnitude is $M_a = 8$‰ on a background of 4–5‰. The source of this anomaly was unknown. The low values of the resistivity parameter mainly reflect the thickness of argillaceous clastic sediments.

The follow-up of this cross-section was conducted by eight deep Schlumberger VES-IP with a maximum separation of $AB = 3000$ m. To plot the "real section", the approximate depth of investigation $H_i \approx 0.2\,\overline{AB}$ is determined over the known part of the ore deposit.

The "real section" shows a correlation between the shape of the chargeability contours and both levels of sulphides on the south-east part. The same feature was confirmed for the north-west part with known weak sulphides. Under the third anomalous zone of the IP gradient survey (between stations 20 and 50), a deep chargeability anomaly with $M_a = 8$‰ was obtained. This one was interpreted as related to a thick sulphide zone at an approximate depth of 375 m. The S-476 borehole, drilled to verify this anomaly, intersected a concentrated sulphide zone, about 60 m thick, precisely at a depth of 375 m. The sulphide content is very similar to that in the known ore deposit, but the texture is mainly disseminated and rarely veinlet.

The P 76 sulphide ore deposit. The cross-section in Fig. 2 presents the same geological environment as that in Fig. 1, but 1300 m south-west of the P 102 ore deposit. The known sulphide ore bodies occur within the disseminated zone between stations 116 and 154, at a depth of 220–280 m. The IP gradient anomaly, centred between stations 90 and 110, is due to both the most shallow part of the sulphide zone and the thinning out of the argillaceous clastic sediments in this sector. The chargeability is $M_a = 11$‰, on a background of 3–5‰.

The follow-up measurements (with six deep VES-IP) of this cross-section again showed a correlation between the shape of chargeability contours and the sulphide zone. Moreover, these contours present an interesting anomaly ($M_a = 9.5$‰) around stations 66–80 at a depth of 500–600 m. This one was not detected by the IP gradient survey because of the great depth of the zone.

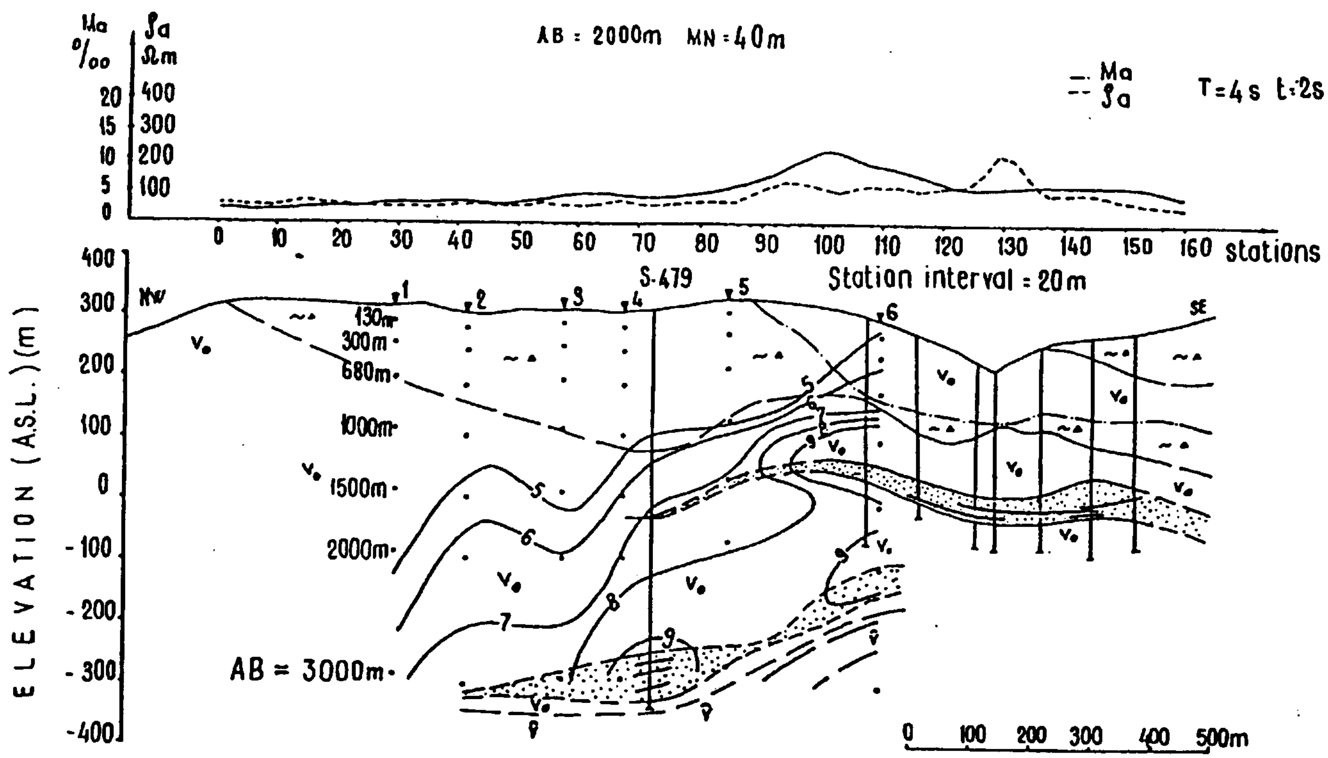


FIG. 2. Gradient array IP and ρ_a profiles and "real section" presentation of VES-IP chargeability over the P 76 sulphide ore deposit, Central Mirdita district.