'83-563-11447
9W/84

GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,447

ASSESSMENT REPORT

ON THE

VLF-EM AND SELF POTENTIAL

PROGRAMMES

ON THE

LOMOND GROUP,

NELWAY, B.C.

LATITUDE: 49° 0' N

LONGITUDE: 117° 20' W

N.T.S: 82F/3W

FOR

OWNER: J. W. MACLEOD

OPERATOR: CARMAC RESOURCES LTD.

September 29, 1983

D. W. Rennie, P.Eng.

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SUMMARY

A preliminary geophysical survey was carried out over the geochemical anomalies on the Lomond Property, near Salmo, B.C. This survey employed VLF-EM and Self Potential methods in order to determine their effectiveness in exploring for lead-zinc mineralization in the Salmo area. The VLF-EM survey detected a weak anomaly which parallels known geological and geochemical trends. The Self Potential survey detected several strong anomalies, but the significance of these anomalies is not known.

This report describes the survey procedures and discusses the significance of the data collected.

INTRODUCTION

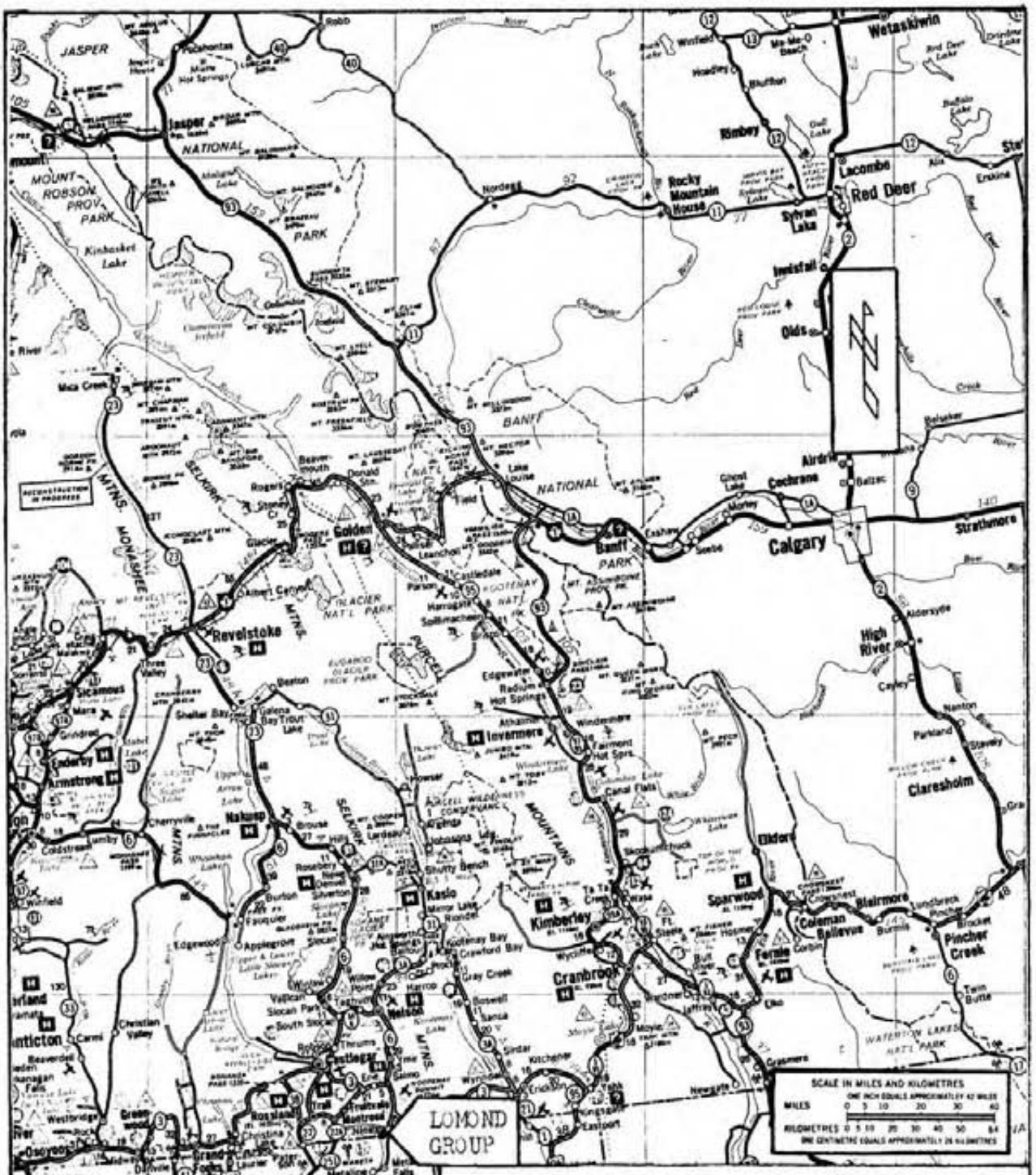
In 1976, J. W. MacLeod acquired the Lomond property which is located near Salmo, B.C. This group of claims, consisting of 14 reverted Crown-granted mineral claims, is situated in an area known to be geologically favourable for dolomite-hosted strata-bound lead-zinc deposits.

Geological and geochemical surveys, conducted in 1977 and 1978, discovered several zones of rusty alteration, but little or no sulphide mineralization. These gossanous zones are thought to be derived from weathering sulphides at depth, and geophysics may be useful in more accurately defining drill targets.

Two survey methods were tested over the property, VLF-EM and Self Potential. No definite anomalies were detected with either method, although the VLF-EM was successful in detecting the gossanous zones.

LOCATION AND ACCESS

The Lomond Property is located in the Nelson Mining Division at latitude 49° 0' N and longitude 117° 19' W on N.T.S. sheet 82F/3W (Figure 1). It is on the international border, approximately 2.7 km west of the Nelway border crossing. Access to the property is gained via the Reeves MacDonald mine road which leaves Highway 6 at Nelway (Figure 2).



ANGINEL RESOURCES LTD.

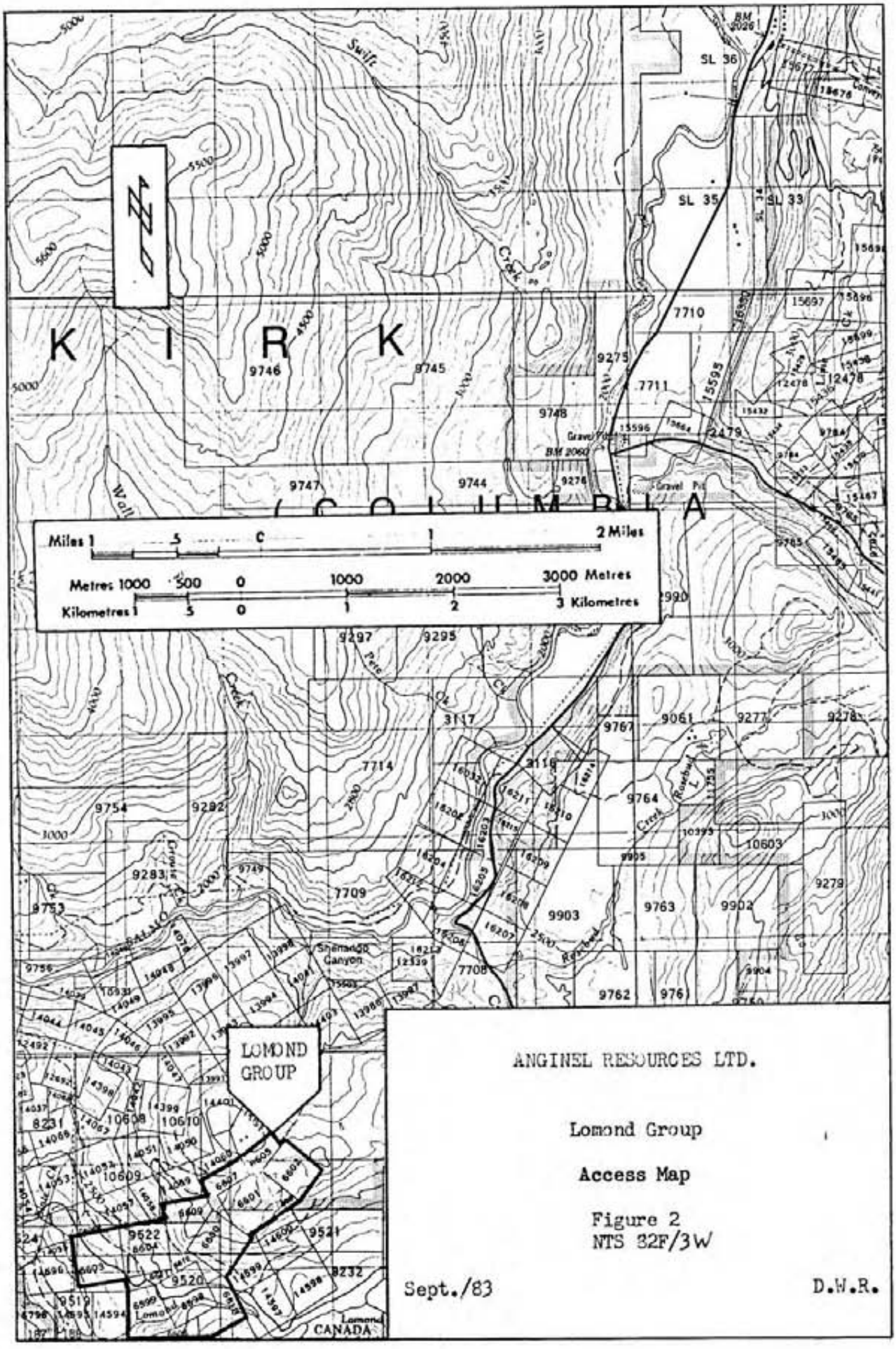
Lomond Group

Location Map

Figure 1

Sept./83

D.W.R.



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Access Map

Figure 2
NTS 82F/3W

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CLAIMS

The Lomond Claim Group is located on Mineral Titles Reference Map M82F/3W (Figure 3) and consists of 14 reverted Crown-granted mineral claims. Originally, there were 15 Crown-granted claims, but the Golden Rod and Pioneer No.1 Fr. have since been combined under one record number. Pertinent claim data are listed below:

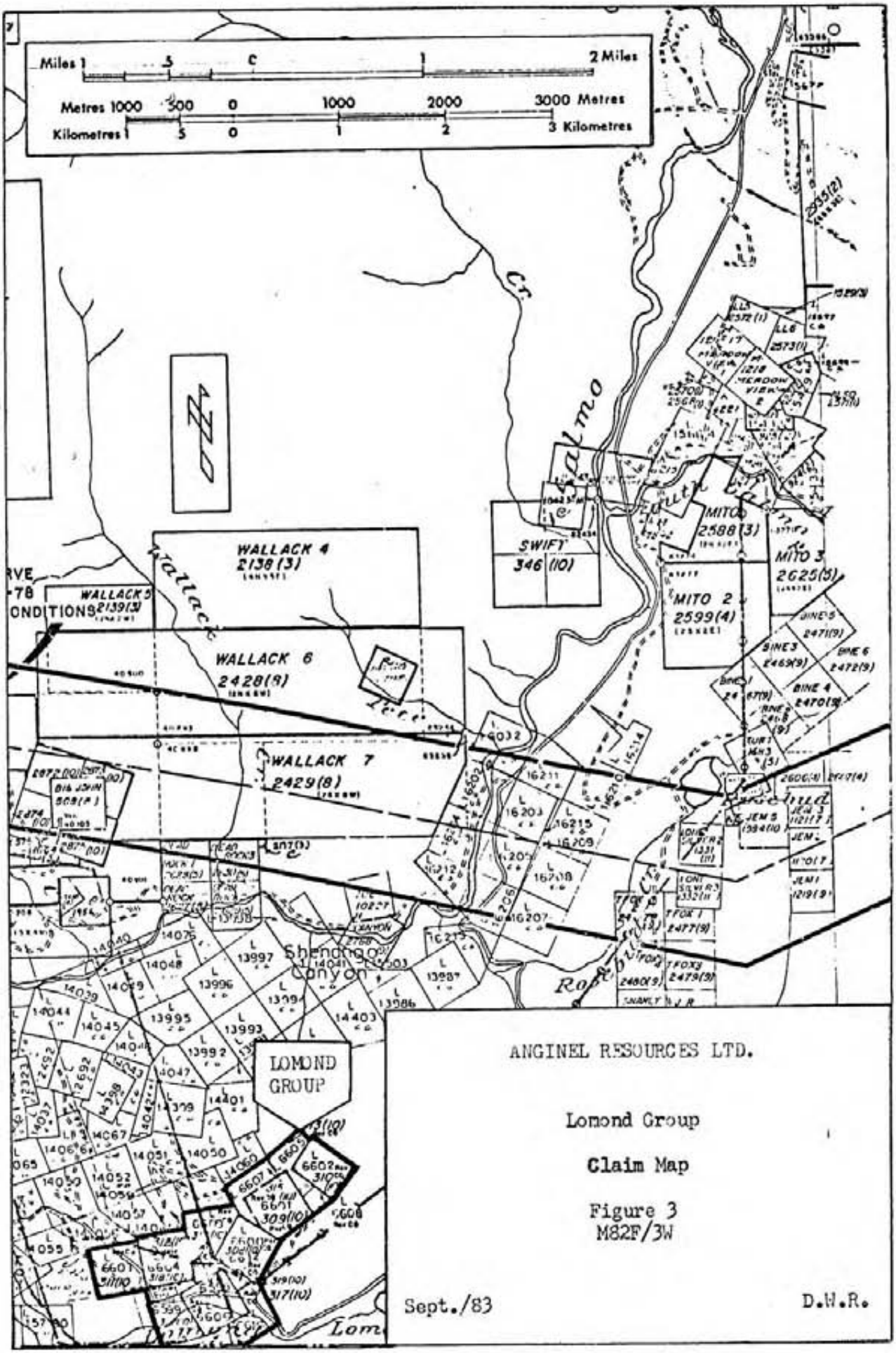
Claim Name	Record No.	Units	Anniversary Date
Hastings	306	1	October 1, 1984
Glasgow	307	1	October 1, 1984
Salmo	308	1	October 1, 1984
Pioneer	309	1	October 1, 1984
Lake View	310	1	October 1, 1984
Medoc	311	1	October 1, 1984
Renfrew	312	1	October 1, 1984
Golden Rod * Pioneer No.1 Fr	313	1	October 1, 1984
International	314	1	October 1, 1984
Golden Fleece	315	1	October 1, 1984
Renfrew No.1	316	1	October 1, 1984
International No.1	317	1	October 1, 1984
Glasgow No.1 Fr.	318	1	October 1, 1984
Salmo No.1 Fr.	319	1	October 1, 1984

*Adjoining reverted Crown-grants which do not collectively exceed 61.78 acres are combined to form one recorded claim.

The above information conforms with the records of the Mining Recorder at Nelson.

PROPERTY HISTORY

The claims were first Crown-granted in 1913 to H. H. Shallenberger, of Spokane. No work is recorded until 1946 when Sheep Creek Gold Mines Limited optioned the property and carried out a diamond drilling programme which totalled 816 feet.



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Claim Map

Figure 3
M82F/3W

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Between 1948 and 1950, lessees shipped 7292 tons of iron oxide from the property to the Lehigh Cement Company at Metaline Falls, Washington. Also at this time, 19 tons of lead ore were shipped to the smelter at Trail. This material graded 2.00 oz silver/ton, 25.5% lead and 2.5% zinc.

In 1951, the property was purchased by International Lead and Zinc Mines Ltd., which held it until 1976, when the Crown-grants were allowed to lapse. At this time, J. W. MacLeod acquired the property and optioned it to Carmac Resources Ltd.

Carmac Resources Ltd. conducted soil geochemical and geological surveys over the claims during 1977 and 1978.

REGIONAL GEOLOGY

The Lomond Property is situated in the Kootenay Arc, which is an arcuate belt of highly folded and faulted rocks stretching from east-central Washington state to north of Revelstoke, B.C. These rocks consist mainly of Proterozoic to Mid-Paleozoic miogeosynclinal facies and Upper Paleozoic and Mesozoic eugeosynclinal units (Yates, 1970; Fyles and Hewlett, 1959; Little, 1960).

Within the Kootenay Arc are several formations which are known to host lead-zinc mineralization. The most notable of these are the Slocan Group, the Nelway (Metaline) formation and the Reeves and Badshot members of the Laib formation. The Lomond Property lies in the middle, or dolomite member of the Nelway formation (Figure 4). This rock unit is known in the Metaline district of Washington State as the Metaline Limestone (Dings and Whitebread, 1965).

The Nelway formation is a thick sequence of calcareous rocks of Middle Cambrian age which have been divided into three members, the upper, middle and lower. The upper member is a fine-grained grey massive limestone which outcrops most commonly south of the border, the middle member is a massive or banded light and dark grey fine-grained dolomite, and the lower member is comprised of dark blue-grey fine-grained limestone and argillaceous limestone (Fyles and Hewlett, 1959).

LEGEND

ORDOVICIAN

- 9 — ACTIVE FORMATION: mainly black argillite but including:
  - *9a* - grey limestone and argillaceous limestone
  - *9b* - dolomite, dolomite breccia, and limestone
  - *9c* - silicified and silicated argillite and limestone

CAMBRIAN

- 8 — NELWAY FORMATION: limestone and dolomite
  - *8c* - upper grey limestone
  - *8b* - dark and light grey dolomite
  - *8a* - lower limestone and argillaceous limestone

LAIB FORMATION

- 7 — UPPER LAIB UNDIVIDED: phyllite, schist, micaceous quartzite, and minor limestone
- EMERALD MEMBER: black phyllite and argillite
- 5 — REEVES MEMBER: grey limestone, minor dolomite
- 4 — TRUMAN MEMBER: phyllite and argillite with lenses of limestone
- 3 — RENO FORMATION: grey blocky and grey micaceous quartzite

QUARTZITE RANGE FORMATION

- 2 — NAVADA MEMBER: white quartzite and brown micaceous quartzite
- 1 — NUGGET MEMBER: white quartzite

Scale 1000 0 1000 2000 3000 4000 5000 Feet

Contour interval 200 feet

RED ROCK · Wallace · SALMO R. · Shengago Canyon · RAINBOW · Black Bluff · Black Bluff Fault · Rosebud Lake · Rosebud Cr. · Creggan · DH40 · MINES · REEVES MACDONALD MINE · MACDONALD · REEVES · ODH5 · ODH6 · ODH8 · ODH3 · DH2 · Redbird Cr. · RED BIRD · HECLA MINING CO · Argillite Fault · Slate Cr. · SM · RED D'OREILLE RIVER · DIEM MINES · Russian Cr. · CALVAR · LOMOND GROUP · INTERNATIONAL LEAD AND ZINC MINES · INTERNATIONAL · Lomond Cr. · Lomond Lake · NELWAY · 188A · 188 · 187 · 186 · 185

49°00 · 117°20'

To accompany B.C. Department of Mines Bulletin 41, "Stratigraphy and Structure of the Salmo Lead-Zinc Area." 1959

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Lomond Group

Property Geology

Figure 4

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PROPERTY GEOLOGY

The claims are underlain by the middle member of the Nelway formation (Fyles and Hewlett, 1959; Potter, 1977). In the vicinity of the property, these rocks consist of blue-grey fine- to medium-grained and black carbonaceous dolomites (Potter, 1977). Potter (1977) also observed outcrops of dense fine-grained light grey limestone on the northeastern part of the claims.

The overall strike of these rocks is east-west with moderate southerly dips (Potter, 1977). No major structural features such as folds or faults are evident on the property.

There are several occurrences of limonite scattered throughout the property as evidenced by several rusty outcrops and gossanous zones in some of the trenches. This limonite occurs as pods and fracture-fillings as well as in layers in the dolomite. Sulphide minerals are not commonly observed.

EXPLORATION APPROACH

The Kootenay Arc of eastern British Columbia and Washington State is known to host many lead-zinc-silver deposits. On the Canadian side, most of the ore mined has come from deposits hosted by the Slocan Group and the Laib formation (Fyles and Hewlett, 1959; Little, 1960; Cairnes, 1935). However, almost all of the lead and zinc ore produced in the Metaline district was from the dolomite member of the Metaline, or Nelway, formation. To 1956, this production totalled 8,284,053 tons from which was won 221,266,498 lbs. of lead, 459,259,528 lbs. of zinc and 355,763 oz. of silver (Dings and Whitebread, 1965).

The ore deposits of the Salmo-Metaline area are, typically, dolomite-hosted replacement deposits consisting of galena and sphalerite with pyrite and pyrrhotite as gangue minerals. The structure of these deposits are broadly classed by Weissenborn, et al, (1970) as Metaline, Salmo (Remac) and Bluebell type.

Ore deposits of the Nelway formation are almost exclusively the Metaline type. These deposits consist of replacements in dolomitized limestone situated near crests and flanks of broad, open anticlines (Weissenborn, et al, 1970). They are stratabound deposits, very similar to Mississippi Valley type lead-zinc ore bodies.

In 1977 and 1978, Carmac Resources Ltd. conducted geochemical and geological surveys over the Lomond Group. Many lead and zinc geochem-

ical anomalies were located in the course of this work and trenching of these anomalies revealed the presence of limonite in the country-rock dolomite. This limonite occurs in nearly vertical fracture zones in east-west striking southerly dipping dolomite (MacLeod, 1977).

The limonite contains lead and zinc in significant quantities, in the order of one to two per cent combined. Although much less than ore grade, this limonite may indicate the presence of sulphide mineralization at depth. According to the Metaline model, an ore body would most likely lie along the dolomite bedding, down dip from the limonite showings. The location of any ore bodies may, therefore, be far removed from its surface expression (ie geochemical anomalies).

A geophysical technique could probably be employed to direct a diamond drilling programme. Two geophysical survey methods, VLF-EM and Self Potential, were tested over some of the Lomond showings to determine their usefulness in future exploration programmes.

Both surveys were conducted along compass lines bearing due north and flagged at 25 metre intervals over known limonite showings. Four lines were run for each survey method and the results were plotted on 1:2500 scale profiles (Figures 5, 6, 7 and 8) and plans (Figures 9 and 10).

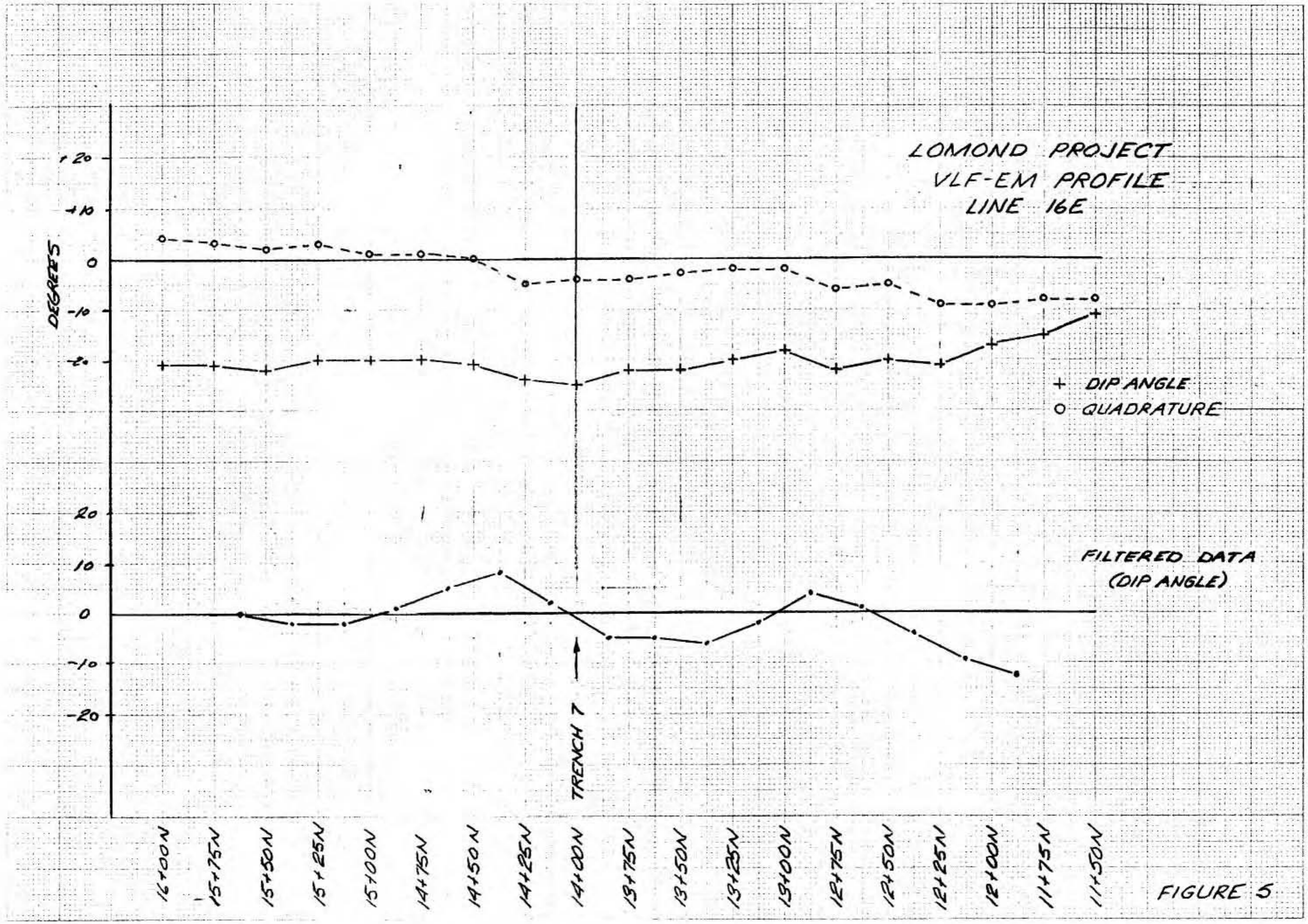
DISCUSSIONS OF RESULTS

The VLF-EM survey was conducted using the transmitter located at Seattle, Washington. The bearing from the property to the transmitter is 243° which is good for detecting east-west striking conductors. Despite the favourable orientation of the survey, however, only a small anomaly was defined.

The results were plotted on profiles (Figures 5, 6, 7 and 8) and the filtered results were plotted on a plan map and contoured (Figure 9). A weak anomaly is evident over the trenches, but this is thought to be due to a poor near-surface conductor (Reader, personal communication).

The profiles depicted in Figures 5 to 8 are, characteristically, very flat, with one exception. This is on the south end of line 18+50E and the cause of the anomaly is a buried telephone cable. This survey line was carried to the southern extreme of the property to determine how the B.C. Hydro power lines affect the instrument readings. The telephone cable was discovered by accident, and it appears as though any future surveys will have to stay at least 100 metres away from the main road.

Trends which are thought to be due to natural conductors can be seen on lines 18+50E and 20+50E, at 14+75N and 15+75N, respectively (Reader, personal communication). The size of the anomaly is small, however, and is difficult to interpret. It may be due to a shallow, weak conductor or, perhaps, a contact between rock units of differing conductivities.



LOMOND PROJECT
VLF-EM PROFILE
LINE 16E
DEGREES
+20
+10
0
-10
-20
+ DIP ANGLE
o QUADRATURE
20
10
0
-10
-20
FILTERED DATA
(DIP ANGLE)
TRENCH 7
16+00N
15+75N
15+50N
15+25N
15+00N
14+75N
14+50N
14+25N
14+00N
13+75N
13+50N
13+25N
13+00N
12+75N
12+50N
12+25N
12+00N
11+75N
11+50N

FIGURE 5

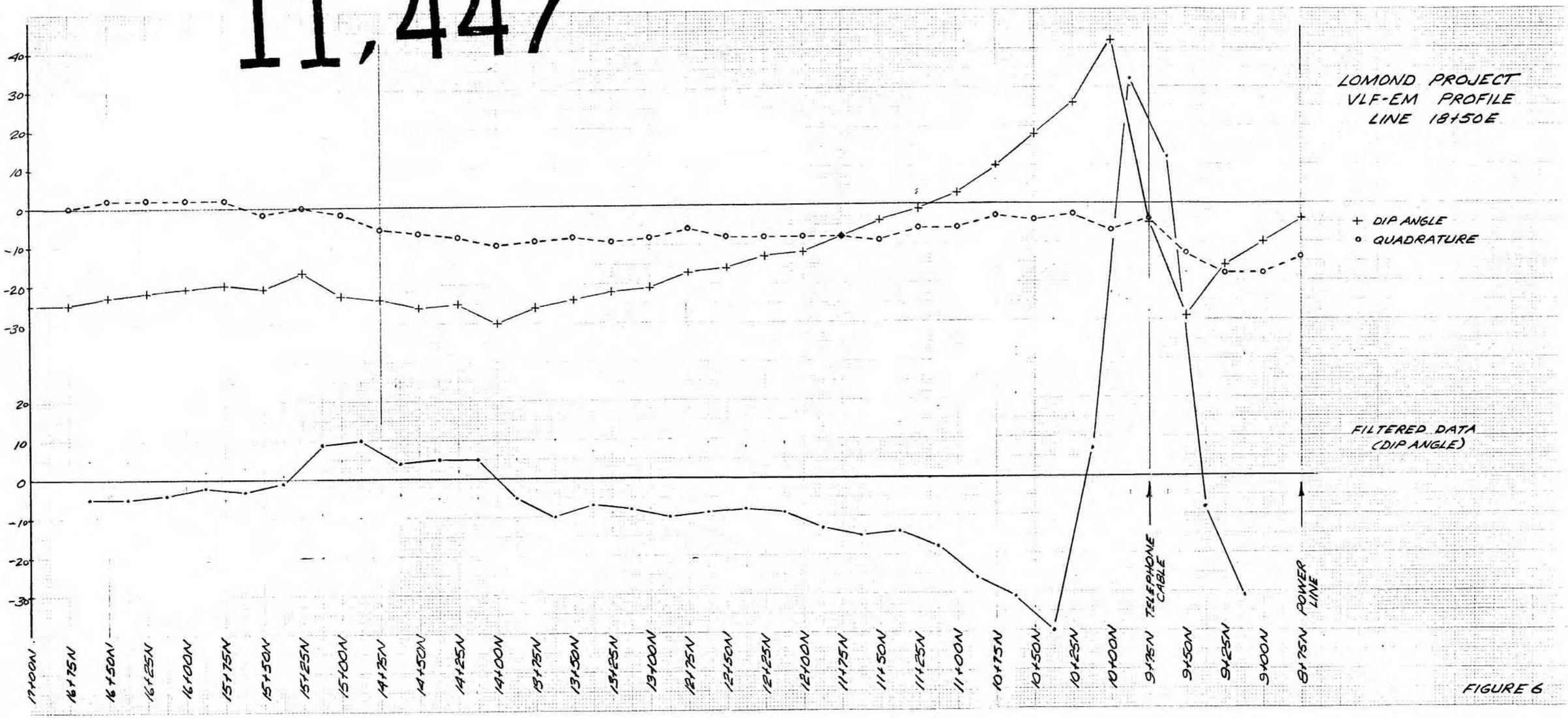


FIGURE 6

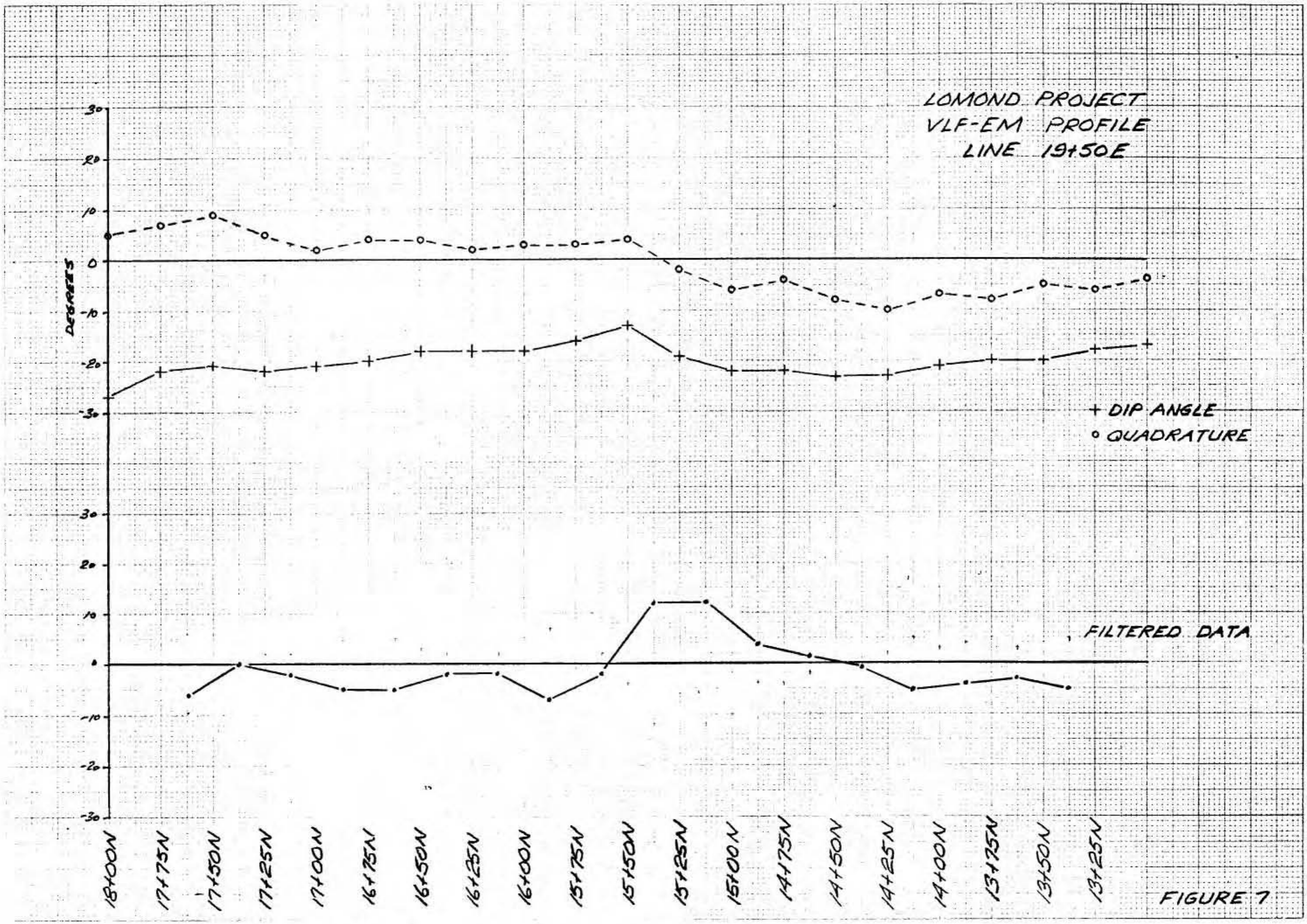

LOMOND PROJECT
VLF-EM PROFILE
LINE 19+50E
DEGREES
+ DIP ANGLE
o QUADRATURE
FILTERED DATA
30
20
10
0
-10
-20
-30
18+00N
17+75N
17+50N
17+25N
17+00N
16+75N
16+50N
16+25N
16+00N
15+75N
15+50N
15+25N
15+00N
14+75N
14+50N
14+25N
14+00N
13+75N
13+50N
13+25N

FIGURE 7

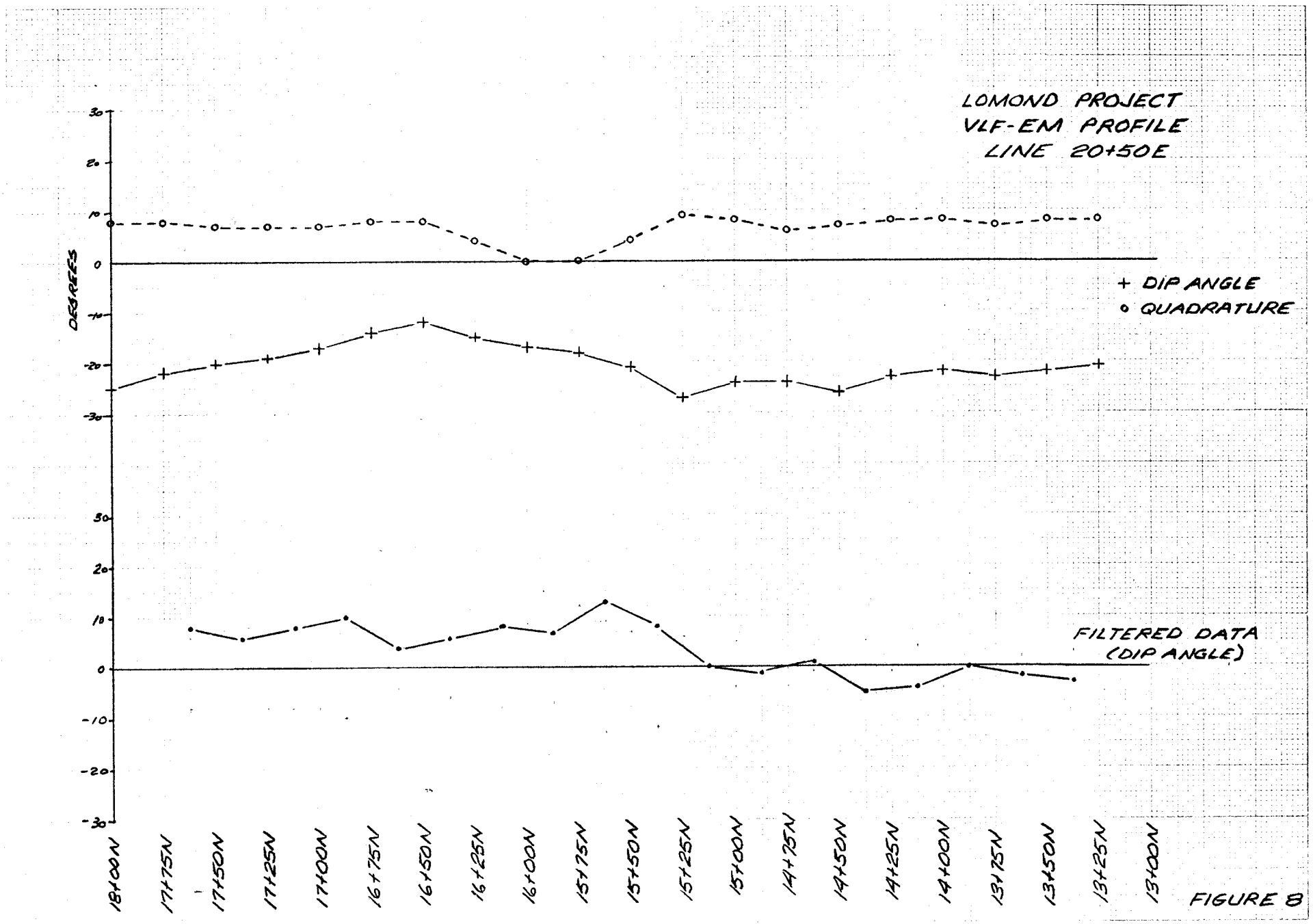

LOMOND PROJECT
VLF-EM PROFILE
LINE 20+50E
DEGREES
30
20
10
0
-10
-20
-30
+ DIP ANGLE
o QUADRATURE
50
20
10
0
-10
-20
-30
FILTERED DATA
(DIP ANGLE)
18+00N
17+75N
17+50N
17+25N
17+00N
16+75N
16+50N
16+25N
16+00N
15+75N
15+50N
15+25N
15+00N
14+75N
14+50N
14+25N
14+00N
13+75N
13+50N
13+25N
13+00N

FIGURE 8

The dip angle data was filtered using the Fraser method (Fraser, 1969) and then plotted on the plan (Figure 9). Anomalies in filtered data manifest themselves as positive "peaks", and a trend can be observed coinciding with a zone of limonitic rocks. This trend strikes approximately parallel with the underlying dolomites.

The Self Potential survey was run over almost the same area as the VLF-EM. Station 16+00E/13+50N was arbitrarily selected as the zero point for the survey and the method of "leapfrogging" pots was used. In this method, a length of wire, 25 metres in length is used with two electrodes. The potential difference between the first two stations is measured, then the hindmost electrode is carried forward 50 metres to the next station. A measurement is then taken, and this voltage is added to the first reading in order to determine the potential difference between the present station and the point of origin. This procedure is repeated and the successive readings are cumulated to give the total voltage for each station. These data are are plotted in Figure 10.

All readings are in millivolts, and an anomaly is considered to be a reading in the order of minus 100 to minus 200 millivolts (Telford, et al, 1976). Anomalies in this range were obtained in several places along line 20+50E.

These anomalies trend, however, in a direction which is almost perpendicular to the geology, geochemistry and VLF-EM. The results

are very difficult to interpret and the most that can be deduced is that there are areas of differing electric potential on the property, the causes of which are unknown.

CONCLUSIONS

1) The VLF-EM survey conducted over the Lomond property detected a weakly conductive zone coincident with limonitic outcrops and geochemical anomalies.

2) VLF-EM could probably be successfully employed on the Lomond property. Greater depth penetration and more conclusive results would be obtained from an Induced Polarization or Horizontal Loop EM survey, although at greater cost.

3) The Self Potential survey detected several anomalies, but the results were inconclusive, and further work is required to determine its usefulness as an exploration tool on the Lomond property.

4) The presence of power lines and telephone cables should not be a problem for future surveys if a distance of 100 metres is kept from their known locations.

Respectfully submitted:

D. W. Rennie, P.Eng.

DWR:mfl

STATEMENT OF COSTS

Wages:

P.J. Santos - 1 day @ $400.00/day	$ 400.00	
D.W. Rennie - 8 days @ 210.00/day	1,680.00	
Assistant - 2 days @ 90.00/day	180.00	
Subtotal	$2,260.00	$ 2,260.00
Vehicle - 3 days @ $40.00/day		120.00
Geophysicist - ½ day @ $210.00/day		105.00

Miscellaneous

Equipment Rental	75.00
Reproduction and Office Costs	298.50
Total	$ 2,858.50

Dates of Work: Sept. 9, 1983
Sept. 12, 1983 - Sept. 15, 1983
Sept. 20, 1983 - Sept. 23, 1983
Sept. 24, 1983 - Sept. 28, 1983

Respectfully submitted:

D. W. Rennie, P.Eng.

DWR:mfl

REFERENCES

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2) Dings, M. G. and Whitebread, D. H., 1965, Geology and Ore Deposits of the Metaline Zinc-Lead District Pend Oreille County, Washington, U.S.G.S. Professional Paper No. 489.

3) Fraser, D. C., 1969, Contouring of VLF-EM Data, Geophysics, Vol. 34, No.6, pp. 958 - 967.

4) Fyles, J. T. and Hewlett, C. G., 1959, Stratigraphy and Structure of the Salmo Lead-Zinc Area, B.C. Dept. of Mines Bulletin No.41.

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6) MacLeod, J. W., Geological and Geochemical Report on the Lomond Claim Group for Carmac Resources Ltd., 1978.

7) Potter, R. G., Geological and Geochemical Report on the Lomond Claim Group for Carmac Resources Ltd., 1977.

8) Telford, W. M., Geldart, L. B., Sheriff, R. F., and Keys, D. A., 1976, Applied Geophysics, Cambridge University Press, 860p.

9) Weissenborn, A. F., Armstrong, F. C. and Fyles, J. T. (editors) 1970 Lead-Zinc Deposits in the Kootenay Arc, State of Washington Department of Natural Resources Bulletin No. 61.

STATEMENT OF QUALIFICATIONS

I, David W. Rennie, hereby certify:

1) That I am a geological engineer residing at 313 - 505 Second Street, Nelson, B.C.

2) That I am a registered Professional Engineer in the Province of British Columbia (1982).

3) That I am a graduate of the University of British Columbia and hold a Bachelor of Applied Science degree in Geological Engineering (1979).

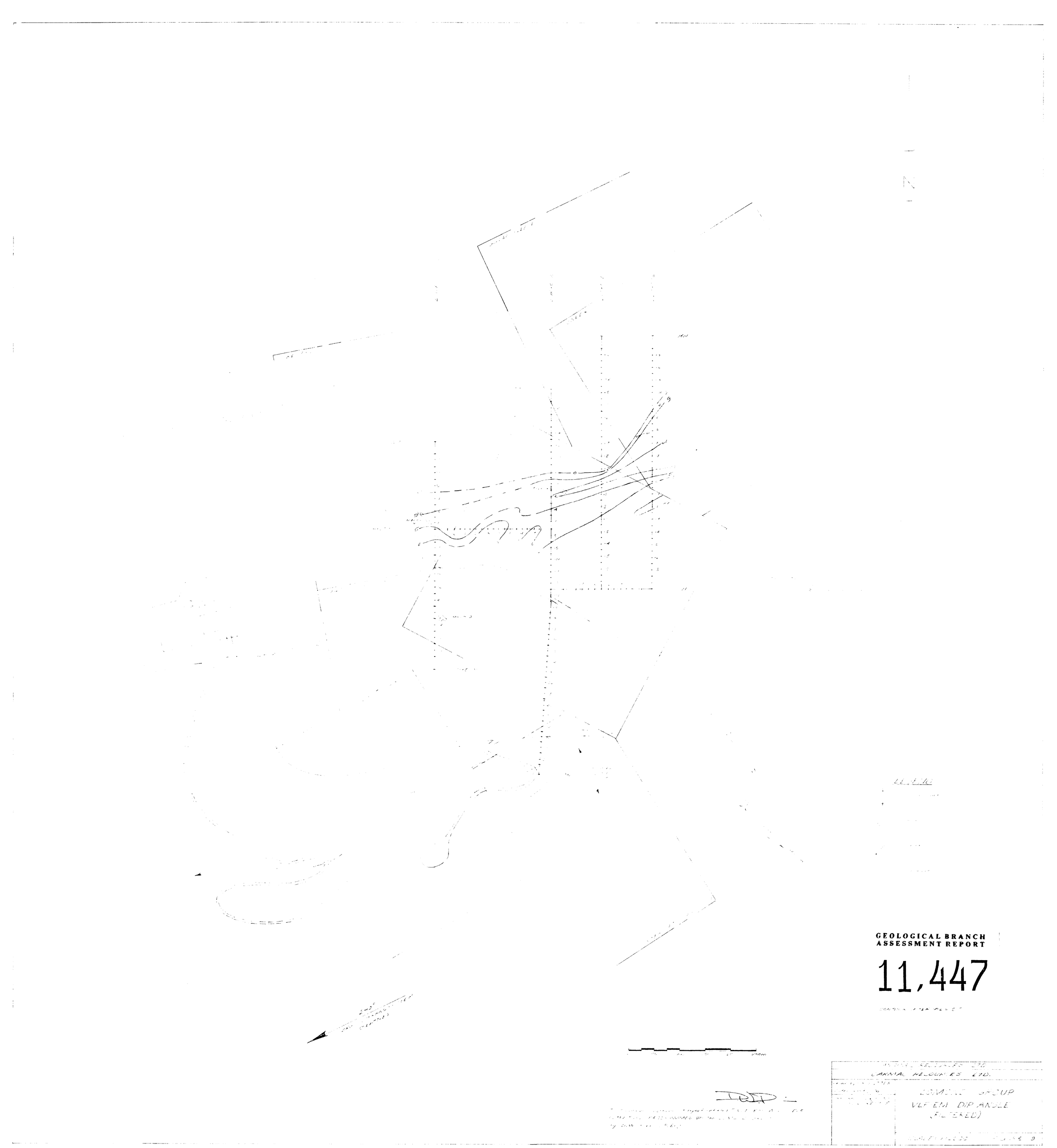
4) That I have practiced my profession continuously since graduation.

5) That I do not own, nor do I expect to receive, any interest, direct or indirect, in the Lomond Property.

6) That I, personally, carried out the field work and prepared this report on the request of Mr. J. W. MacLeod, P.Eng.

D. W. Rennie, P.Eng.

DWR:mfl



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COMPILE GROUP
VLF EM DIP ANGLE
(FILTERED)

FIGURE 9

+ES Readings in millivolts