DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

ELECTROMAGNETICS

FOR

C.S.R. LIMITED

619451

SCALE 1:10,000

1/2 0 1/2 Kilometres

1/4 0 1/4 1/2 Miles

SHEET 1

83 - 1928

D.C. FRASER
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

Flight line

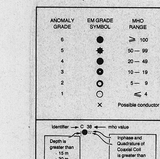
1524

Fiducials and numbers

1584

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

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



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

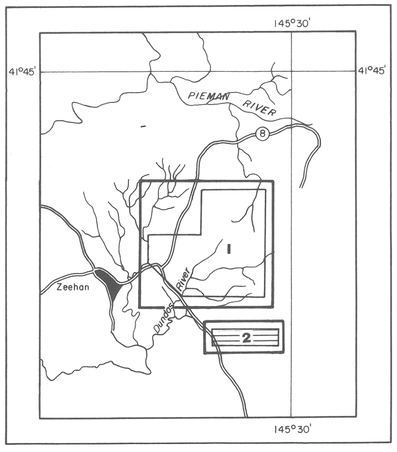
S	Conductor axis
	Surface response (usually conductive overburden, but includes conductive response from broad expanse of weathered and unweathered rocks, and from geologic contacts adjacent from conductive ground)
S?	Possible surface response
L	Culture (usually a line such as a fence, power or telephone line, but also includes buildings, etc.)
L?	Possible culture
?	Questionable anomaly
40	Apparent thickness > 10m
	Dip direction
100	Direct magnetic correlation of 100 gammas

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

JOB	DATE	DRAWN BY	CHECKED BY
355	APRIL 82		



LOCATION MAP



Scale 1:250,000





DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

ELECTROMAGNETICS

FOR

5 cm

619452.

C.S.R. LIMITED

SCALE 1:10,000

1/2 0 1/2 1 Kilometres

1/4 0 1/4 1/2 Miles

SHEET 2

83-1929 7h

Flight line

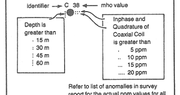
1252

Fiducials and numbers

1256

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

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



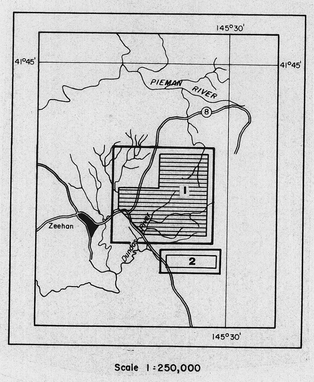
The actual mho value is plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record, and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may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

	Conductor axis
S	Surface response (usually conductive overburden, but includes conductive response from broad expanse of weathered and unweathered rocks, and from culture which gathers current from conductive ground).
S?	Possible surface response
L	Culture (usually a line such as a fence, power or telephone line, but also includes buildings, etc.).
L?	Possible culture
?	Questionable anomaly
	Apparent thickness > 10m
	Dip direction
100%	Direct magnetic correlation of 100 gammas

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

JOB	DATE	DRAWN BY	CHECKED BY
355	APRIL 82	DW.	

LOCATION MAP



Scale 1:250,000



DIGHEM[II] SURVEY

ZEEHAN REGION, TASMANIA

ENHANCED MAGNETICS

FOR

5 cm

C.S.R. LIMITED

619453

SCALE 1:10,000

1/2 0 1/2 Kilometres

1/4 0 1/4 1/2 Miles

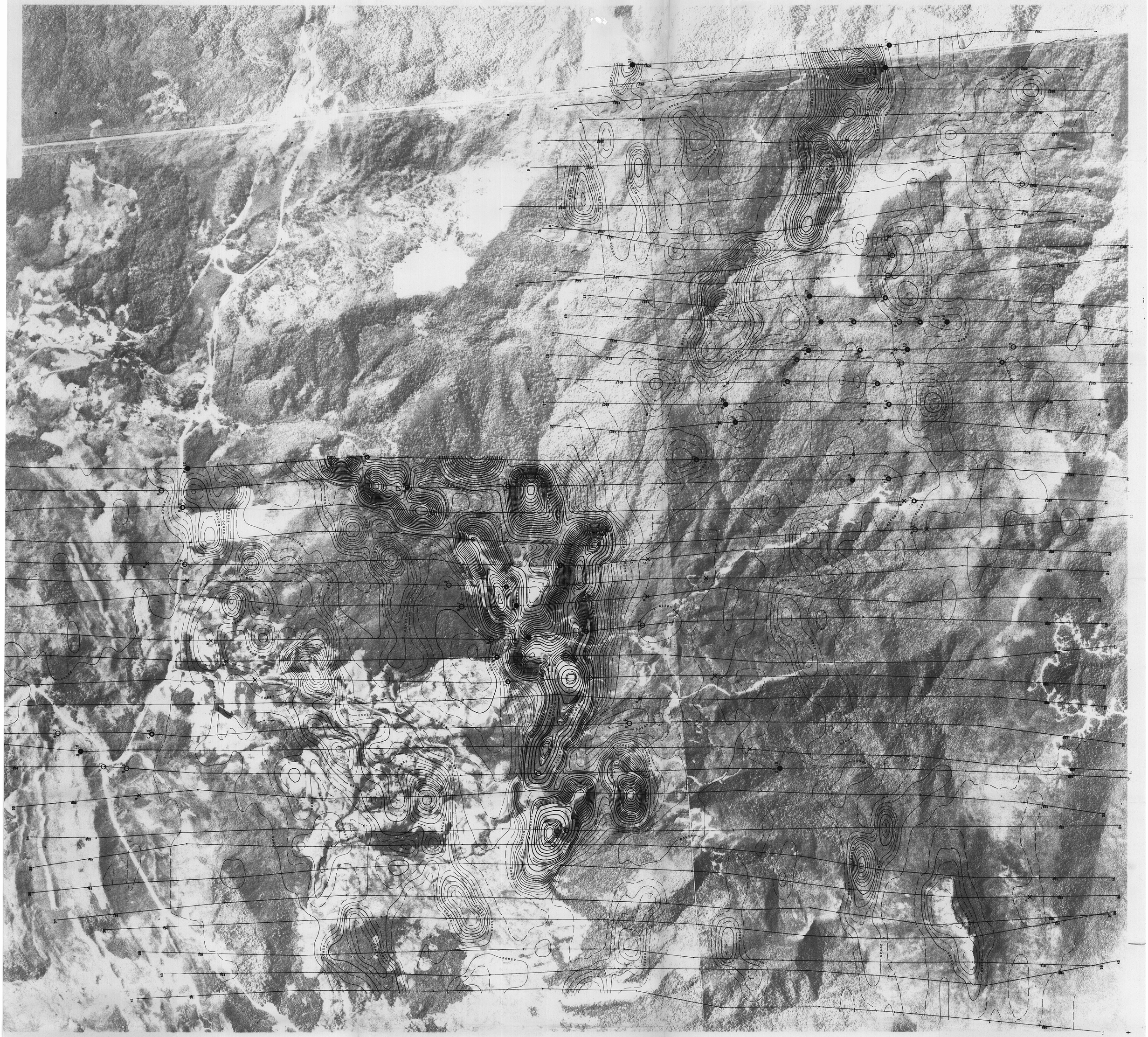
1237.

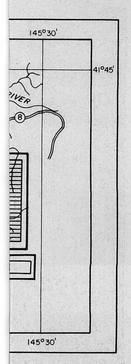
SHEET 1

83-1928 7/1

Flight line

Fiducials and numbers







REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

ENHANCED MAGNETICS

FOR

5 cm

C.S.R. LIMITED

619453

SCALE 1:10,000

1/2 0 1/2 1 Kilometres

1/4 0 1/4 1/2 Miles

1237.

SHEET 1 · 83-1929 7/1

Flight line

Fiducials and numbers

ISOMAGNETIC LINES

(enhanced field)

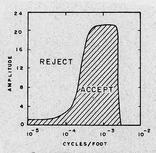
5000 ..... 5000 gammas

1000 ..... 1000 gammas

200 ..... 200 gammas

100 ..... 100 gammas

..... magnetic depression



Frequency response of magnetic operator

JOB	DATE	DRAWN BY	CHECKED BY
355	APRIL 82		

DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

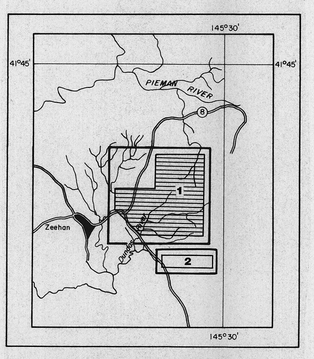
RESISTIVITY

FOR

C.S.R. LIMITED

619454

LOCATION MAP



Scale 1:250,000



SCALE 1:10,000

1/2 0 1/2 Kilometres

1/4 0 1/4 1/2 Miles

5 cm

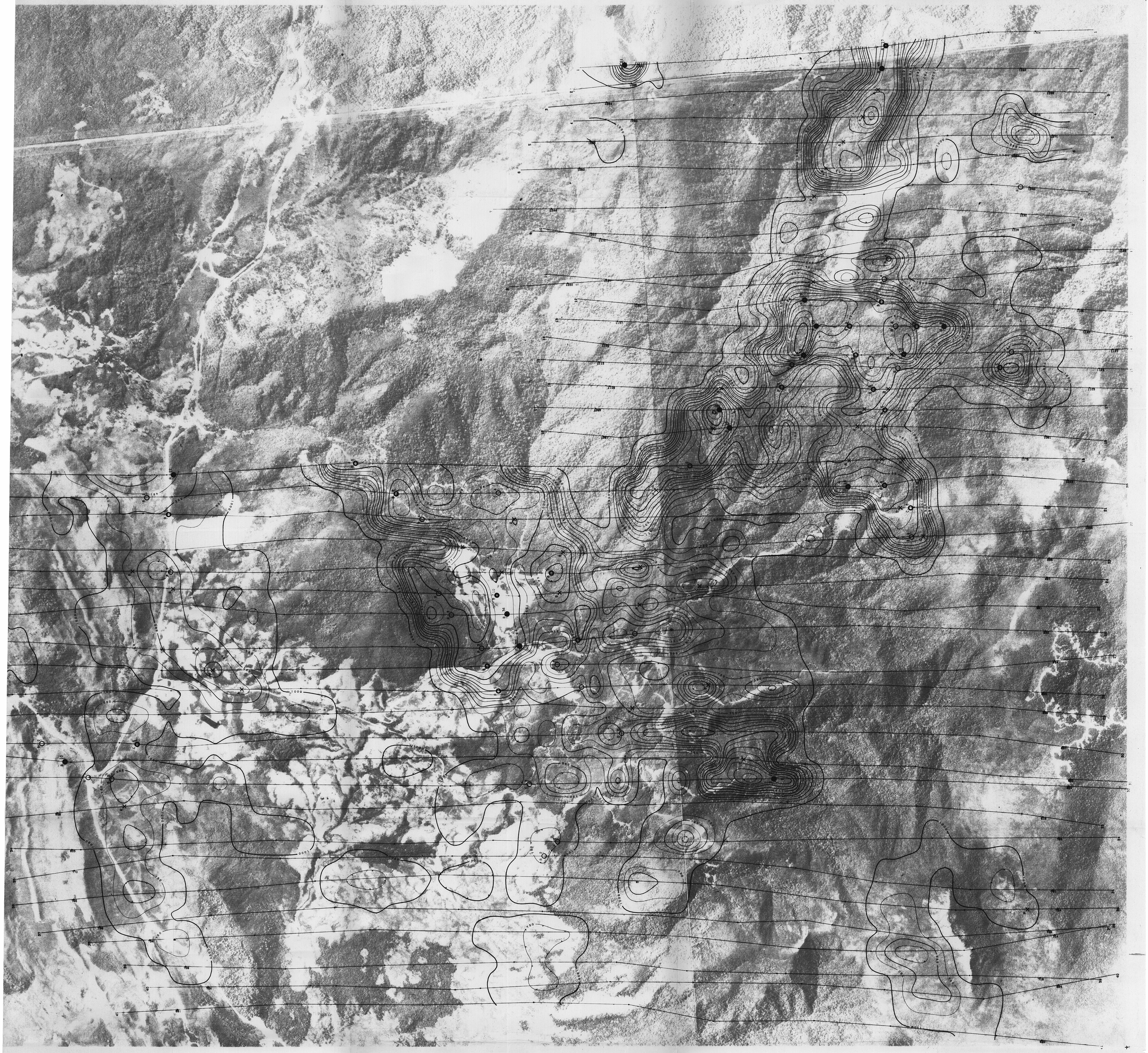
1235

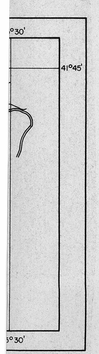
SHEET 1

93-1928 7/7

Flight line

Fiducials and numbers









DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

RESISTIVITY

FOR

5 cm

C.S.R. LIMITED

619454

SCALE 1:10,000

1/2 0 1/2 Kilometres

1/4 0 1/4 1/2 Miles

1235

SHEET 1

83-1928 7/1

Flight line

Fiducials and numbers

LEGEND

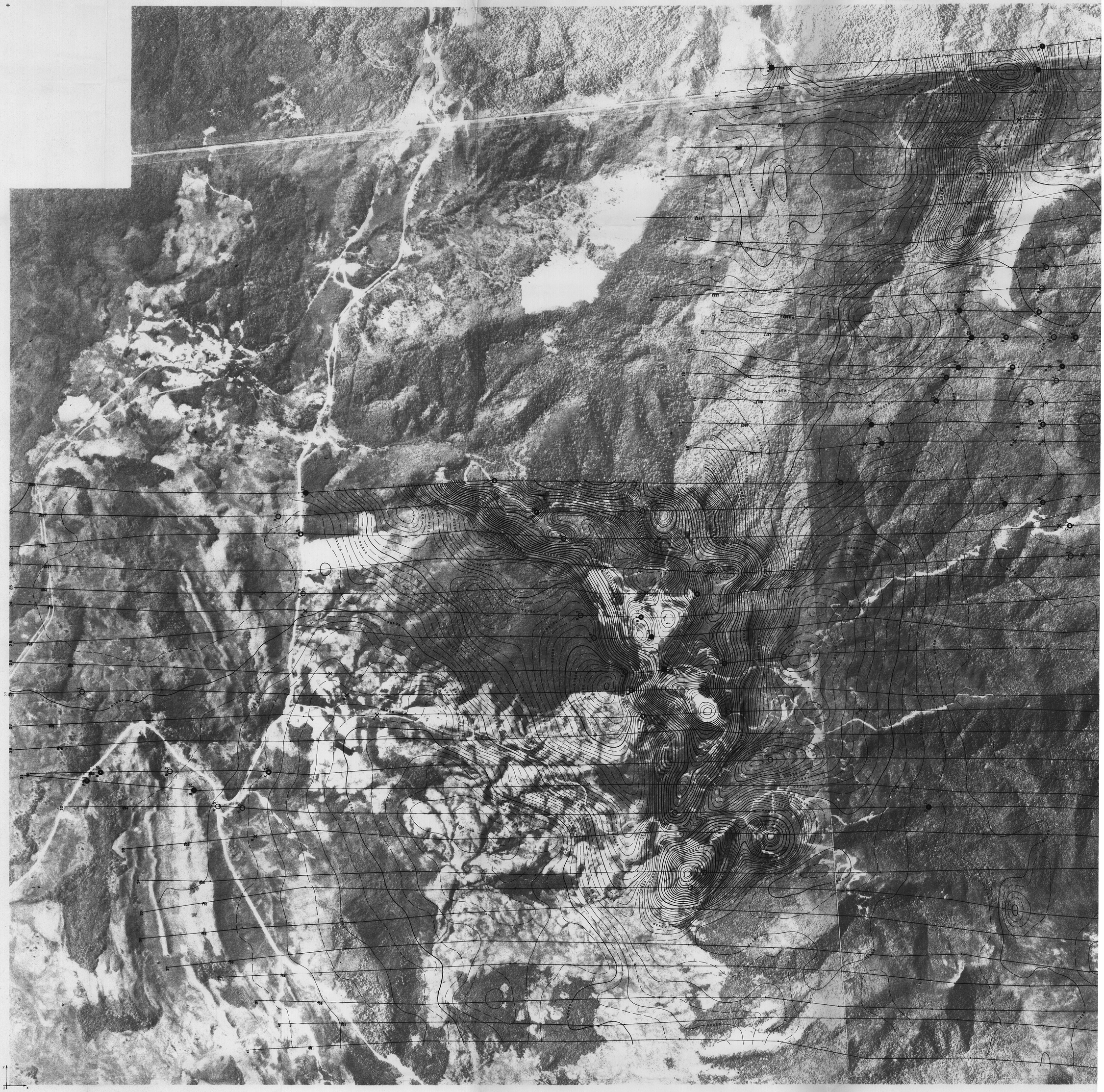
Contours in ohm – m
at eight intervals per decade

100
75
56
42
31
23
17
13
10

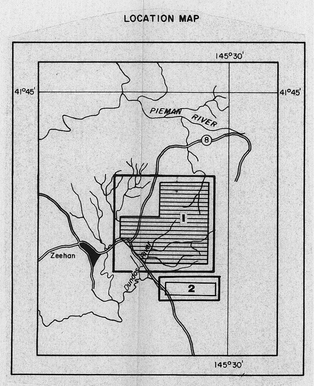
Note

The numbers face in the direction of increasing value.

JOB	DATE	DRAWN BY	CHECKED BY
355	APRIL 82		



LOCATION MAP



Scale 1:250,000



DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

MAGNETICS

FOR

619455

C.S.R. LIMITED

5 cm

SCALE 1:10,000

1/2 0 1/2 1 Kilometres

1/4 0 1/4 1/2 Miles

1236

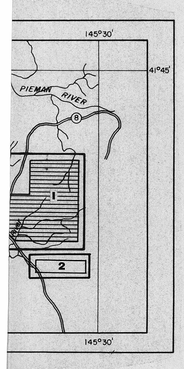
SHEET 1

83-1928 7/7

Flight line

Fiducials and numbers

ATION MAP



e 1:250,000



DIGHEM^{II} SURVEY

ZEEHAN REGION, TASMANIA

MAGNETICS

FOR

619455

C.S.R. LIMITED

5 cm

SCALE 1:10,000

1/2 0 1/2 1 Kilometres

1/4 0 1/4 1/2 Miles

1236

SHEET 1

83-1928 7/7

Flight line

Fiducials and numbers

ISOMAGNETIC LINES

(total field)

1000 ..... 1000 gammas

200 ..... 200 gammas

50 ..... 50 gammas

..... 25 gammas

..... magnetic depression

Magnetic Inclination within the survey area: 72°

JOB	DATE	DRAWN BY	CHECKED BY
355	APRIL 82		

APPENDIX X

ANALYSIS OF DIGHEM RESULTS

619457 → P 2713. (Hobart MD)

CSR

Minerals and Chemicals Division

MEMO TO Mr. P. Macnamara REF. WJL/amr/602

FROM W. J. Langron DATE 5th March 1982

DIGHEM Survey, E.L.15/76 (Dundas), Tasmania

Our discussion with David Closier (DIGHEM), in Queenstown on 24th February. Main points were:-

- flying of our area (CSR plus E.Z./Getty J.V.) had been completed that day.

- all flight paths had been recovered and plotted into the DIGHEM mosaic (scale approx. 1:10,000 - the final survey will be at scale 1:10,000).

- picks of E.M. and magnetics had been made for the purpose of our discussion. A mosaic scale approx. 1:20,000 with the principal results plotted, was provided for preliminary follow-up of anomalies if desired.

- John Bishop of Mitre Geophysics, Burnie was engaged by E.Z./Getty, to supervise quality control of their portion of the work. He contacted me earlier in the day to ask if CSR would grant him permission to look at all the analog data if necessary so that he could cover the E.Z./Getty portion (the CSR and E.Z./Getty data being on the same flight line in 50% of cases). I said we did not want E.Z./Getty to see any of our data but we must rely on his integrity in those cases where our data continued from the J.V. area. I asked Closier to stick to this ruling as closely as possible and he says he has done so.

- Closier said we could expect preliminary computer plots (profiles, including a calculated resistivity plot and magnetic contours at scale 1:20,000) about mid-end March. Final data(transparencies) and interpretive report a couple of months later.

Results

The following seem to be the principal features from a quick scan of the analog charts:-

- only a few prominent E.M. anomalies are present though some of the smaller indications may be enhanced with

.../

computer treatment. Most of the better - looking anomalies appear to be genuine and not related to extreme variation of bird height, for example.

- some of the best E.M. response is in the J.V. area. Isolated anomalies occur in the north-central portion of our area but some are close to the J.V. and E.L. boundaries. Some anomalies here may be due to black shales.

- a conductor on 3-4 lines (approx. 600m) just east of the Burnie Road and approx. ¾km north from the Burnie Road - Queenstown Road junction.

- a similar looking anomaly group just south of this road junction and actually striking across the highway near Misery Hill. This falls in the Amoco J.V. area; it was inspected on the ground and proposed to Phil Jones that we run a couple of lines of VLF-EM across it.

- no E.M. response was obtained on the two scout lines in the Howards Road area and it is likely that E.M. response is limited to the northern portion of the E.L. in any instance. However, two expected magnetic trends were defined.

- a S-E trending zone of magnetic highs is related to serpentinite about Razorback and probably continues further south. Some negative E.M. response here indicates high concetration of magnetite. A weak rather poorly conducting (high quadrature) E.M. anomaly occurs along the western margin of this zone of magnetic highs.

- other negative E.M. response coinciding with magnetic highs indicate spot concentrations of magnetite elsewhere in the E.L.

- there are only a few coincident positive E.M. and magnetic anomalies and these would appear to be the ones of particular interest, e.g. the possibility of being associated with pyrrhotite. E.M. anomalies without associated magnetic response and in particular the reverse situation, seem to be more common.

- the magnetic anomalies on the two lines in the Howard's Road area appear to indicate zones of ultra basics and/or geological contacts. This magnetic response was anticipated from the results of previous INPUT and ground magnetic work.

.../

- Closier said he believed several of the broader, albeit low, amplitude anomalies are due to surface sources and that others, which look similar to me, are due to deep sources. As you point out, the anomaly widths may be increased because of a swing in strike (e.g. in the central-eastern part of the E.L.) in which cases, the flight lines are along strike and not across it.

- noise level in extremely low and data quality is good although I would have expected a greater number of E.M. anomalies on the analog charts.

W.J. Langron

c.c. PGM
Peter Ellis
PRG
DJC/File

Minerals Division

TO Mr. P.D. Ellis REFERENCE WJL/sgl/602

FROM W.J. Langron DATE July 2, 1982

DIGHEM DATA, EL 15/76 (DUNDAS) TASMANIA

I have examined the DIGHEM results from this survey and have drawn up a classification of anomalies for ground follow-up. I have based this classification mainly on physical response and the need to examine some even poor-looking anomalies in a variety of environments.

Some responses commented upon in the DIGHEM report are omitted from my list; on the other hand, some responses I consider worthy of follow-up are omitted from the DIGHEM list. What I am trying to do in the first instance is to get a "feel" from the response of the system over a variety of geological conditions. Eventually, all the anomalies noted by DIGHEM in their report should be examined on the ground. I feel that even minor responses may be significant, but this requires to be shown.

Attachment A contains a full list for follow-up within the E.L. Attachment B contains such a list of anomalies for CSR follow-up outside the J.V. areas.

The most promising results are in the north-central and N-E portions of the tenement and, in particular, on the northernmost flight line. The most impressive single response is over Pine Hill (Renison ground). Other promising responses in the N-E (Montezuma J.V.) portion of the tenement persist into our ground and appear to be bedrock conductors although it is suspected that some of these are graphitic shales. There is little of interest on the records for flight lines south of Line 35 (possibly south of Line 32).

Attachment B contains about 2 dozen anomalies for follow-up. From these, 8-10 anomalies are within the "Razorback" lease, which means that only about 15 anomalies are left for examination in our area. Again I stress that any one of these, even a minor response, may be significant and we have to establish this aspect.

I have discussed the results briefly with Mr. Macnamara and from his comments and using the geological overlay it seems that some anomalies are:

- on (or on the continuation of) fault zones (e.g. Anom. D, Line 32)
- on the edge of serpentinite (e.g. Anom. C on Line 19)
- on serpentinite and/or crocoite workings (e.g. Anom. A on Lines 34, 35)

- within the Razorback/Comet Mine area and extensions (e.g. Lines 24-26).

I do not have the soil/stream geochemical assays but these data along with the geology, would provide an initial step in examining the DIGHEM results. You would also need to establish which anomalies fall within the Razorback/Comet lease area. From then on it is a systematic examination of responses as listed.

I plan to go over all the data with you later this month and perhaps discuss preliminary thoughts with EZI on their interpretation of anomalies within our J.V. area.

W.J. Langron

cc - MDL
- PGM
- PMM
- PRG
- DJC/file

Encl.

ATTACHMENT A

CLASSIFICATION OF DIGHEM ANOMALIES

E.L. 15/76 (DUNDAS)

Line	***	**	*	Rinks
1	A	B		
2		A		
3	-	-	-	
4	-	-	?A	
5			fid. 1269.5	(DIGHEM "pick" at 1270.7)
6	-	-	-	
7			A,AX	
8	-	-	-	
9			AX	
10			A	
11			A	
12			A,B, ?C	
13		A	B,C,D, ?fid. 1140.7	
14			A,B,C,D	
15		B	A,C	
16			A,B, ?fid. 1103.7	
17			A,B	
18			A	
19		C	B	
20			B,AX,D,E	
21			C, fid. 1031.8	
22			B	
23	-	-	-	
24			A	)
25			A,B,AX	) Razorback/Comet
26			A,B,C,D	)
27			B,C	
28			AX,A,BX	
29	-	-	-	
30			D	
31			CX	
32			D	
33	-	-	-	
34			A	Magnetite Anom.
35			A	" "
36	-	-	-	
37	-	-	-	
38			?fid. 726.6	
39	-	-	-	
40	-	-	-	
41	-	-	-	
42	-	-	-	
43	-	-	-	

ATTACHMENT B

CLASSIFICATION OF DIGHEM ANOMALIES

E.L. 15/76 (DUNDAS) - CSR FOLLOW-UP ONLY

Line	***	**	*	Rinks
17			A	
18			A	
19		C	B	
20			B,AX	
21			fid. 1031.8	
24			A	)
25			A,B,AX	) Razorback/Comet
26			A,B,C,D	)
27			B,C	
28			AX,A,BX	
30			D	
31			CX	
32			D	
34			A	Magnetite Anom.
35			A	" "

619464

Minerals Division
Exploration Group

CSR

TO File 602 REF. WJL/sgl/602

FROM W.J. Langron DATE November 26, 1982

DIGHEM RESULTS, E.L. 15/76 (DUNDAS), TASMANIA

I refer to my memo of 2nd July, 1982 to Mr. P. Ellis re the preliminary assessment of data, with particular reference to Attachment B.

On 24th November, Mr. Ellis and I examined these anomaly locations in relation to his recently completed compilation of previous geophysical, geochemical and drilling results (this compilation does not include most of Mr. Macnamara's work which is not yet committed to plan).

Much of the E.L. was surveyed by Turair (Rio Tinto program). Few Turair's anomalies occur in the northern part of the E.L.; most anomalies were located about the Amber Creek grid in the southern portion of the E.L. Hence it is not possible to make a comparison between Turair and DIGHEM results (although there is a Turair anomaly"D" over Blackjacks which was barely covered by DIGHEM).

A preliminary copy of the remapped ZEEHAN sheet was also useful in assessing some anomaly locations. An uncoloured version of this sheet will be available before the end of the year.

The following notes refer to those anomalies in Attachment B (of the earlier memo) which require assessment by CSR only. Ground checking should use VLF-EM, magnetics and soil geochemistry if required.

Anomalies 19C, 20AX

- on Geophoto Carbine West grid
- soil geochemistry - Cu, Pb, Zn, Ni, Co, Ag.
- some VLF-EM response, no magnetic response, probably no anomalous Pb.
- appears to be on line between two mapped faults (only half the anomaly trend is in our E.L.; other half is in Renison ground).

Action - should be checked on the ground.

Anomalies 19B, 20B, 21B and 22A

- located along the Razorback-Grand Prize road.
- covered by Intermediate grid of BMR and also by Renison.
- approx. coincident with BMR Anomalies "D" (strong Turam, strong magnetics) and "F" (strong-weak Turam).
- Anomaly "D" has been drilled:
  DDH4 (only serpentine)
  DDH5 (" ")
  DDH7 (serpentine with magnetite bands)
- Renison conducted magnetics, IP, SP and soil geochemistry for Sn, Cu, Pb, As.
- strong magnetic response along serpentinite contact (concentration of magnetite) following the road.
- several coincident IP and SP anomalies approx. parallel to the magnetic axis and distant from it. These were drilled and indicated only layered serpentinite with asbestos and some Ni.

Action - no follow-up recommended.

Anomalies 24A, 25A, 26A, 27B, 28A

- near the ridge top of Mt. Razorback.
- could be pyrite in the pre-Cambrian mudstones here (Mines Department).
- fall on the edge of the BMR Razorback grid and coincides with medium-weak Turam Anomaly "C" (untested).
- no magnetic response.

Action - suspect this series of anomalies.

Anomalies 25AX, 26D

- Comstaff IP anomalies, sections and some geochemical plots, no written report.
- F.E. anomalies look promising. Two anomaly trends at an angle to our DIGHEM trend.
- only one IP anomaly trend supported by some geochemical response.
- no recorded drilling and Comstaff dropped the area soon after.
- also in Geophoto North Comet grid.
- falls within zone of VLF-EM and SP response, no magnetic response.
- soil geochemistry - Cu, Pb, Zn, Ni, Cu, Ag, Cr, Sn, Mn. Little response.
- drilled two holes (Nth Comet 1, Nth Comet 2) on VLF-EM response. Only minor mineralisation.
- these holes did not test our response which is approx. 1 km W of the holes. But no geochemical response here.
- probable that Geophoto looked at the area pretty thoroughly, including geochemistry for Sn.
- although DIGHEM anomaly not explained, Mines Dept. report pyrite in pre-Cambrian mudstones.

Action - no follow-up recommended.

Anomalies 26C, 23B, 24BX

- on the edge of the Geophoto grid (similar to previous group).
- a magnetic high but no VLF-EM response.
- Renison data also on magnetic high - IP, SP and magnetics but soil geochemistry produced nothing of interest.
- Comstaff did IP and geochemistry - located only a high Zn kick.
- IP looks poor-good.

Action - should be inspected on the ground.

Anomaly 27C

- covered by Comstaff and Geophoto grids.
- slightly offset VLF-EM anomaly and just off the IP grid - the IP seems to contain some fair F.E. response.
- lack of geochemical response as above.
- no SP response.
- close to the edge of the lease area and may be a cultural feature.

Action - can be checked easily.

Anomaly 28BX

- on Geophoto, Comet/Kosminski grid.
- no response on VLF-EM, SP or magnetics.
- just off the end of a Comstaff line.

Action - no follow-up recommended.

Anomalies 28AX, 27AX, 26AX

- no previous work has been done.
- located on a road.
- may be cultural (anomaly is in open country).

Action - can be checked easily.

Anomalies 30D, 29BX

- on the Oonah/Serpentinite contact (new mapping).
- on the Geophoto Pratt-Kosminski-Comet grid.
- VLF-EM and SP anomalies and magnetic high.
- right over Comet-Maestries workings.
- Geophoto drilled Comet 1 and Comet 2 - little disseminated chalcopyrite near the surface, minor Pb, Zn (sidesite).
- Mines Dept. probably drilled also.

Action - no follow-up recommended.

Anomaly 31CX

- in Ainslie grid of Geophoto.
- soil geochemistry for Cu, Pb, Zn, Ni, Ag. Rock chips for Mo.
- no VLF-EM, magnetic or geochemical response.
- possibly in a fault.
- Geophoto drilled one hole to the south.

Action - no follow-up recommended.

Anomaly 32D

- similar area and remarks as for Anomaly 31CX.

Action - no follow-up recommended.

Anomalies 34A, 35A

- on Geophoto Adelaide/Red Lead/Bonanza grid.
- on a magnetic high. No VLF-EM or SP anomalies.
- Cu, Pb, Zn, Ni, Co, Ag, Cr soil geochemistry.
- 7 drill holes all east of the DIGHEM anomaly, testing the better geochemistry. No worthwhile results.
- DIGHEM anomaly coincides with the Adelaide-Red Lead shear.

Action - no follow-up recommended.

Thus 5 anomaly groups are recommended for ground inspection in the first instance.

W.J. Langron

cc - JHR
- MDL
- PRG
- PDE
- PRG
- DJC/File