

041001

80-1485

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DEPT. OF MINES

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PROGRESS REPORT

EXPLORATION LICENCE 1/63

FOR

SIX MONTHS ENDING

AUGUST 11, 1980.

300-79 Tudor

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80-1485

P.D. ELLIS
GEOLOGIST.

APPENDIX I

PETROGRAPHIC DESCRIPTION OF WASHINGTON HAY DRILL HOLE ROCK TYPES

041003

Central Mineralogical Services



39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5559

Mr. P.D. Ellis
Geologist
Cleveland Tin Ltd.
LUINA / TAS. 7321

20th May, 1980

REPORT CMS 80/5/24

YOUR REFERENCE: Letter dated 8.5.1980
DATE RECEIVED: 14th May, 1980
SAMPLE NOS.: DDH C 1510 - 28.1 m,
61.0 m,
81.5 m,
102.4 m,
106.7 m
SUBMITTED BY: P.D. Ellis
WORK REQUESTED: Petrology

H.W. Fander
H.W. Fander, M. Sc.

DDH C 1510

Five drill-core intersections were received for urgent petrological examination; results were available on 16.5.1980.

The samples were thin-sectioned, and were examined in hand specimen and thin-section; the offcuts were subjected to K-feldspar stain tests. Each sample is briefly described in the accompanying table.

Summary

The rocks include an ultramafic lava-breccia, an ultramafic extrusive or rapidly-chilled intrusive rock, and sediments. The ultramafic rocks are distinctive, and both contain chromite (or chromian spinel) which is fairly specific to ultramafics. Examination of contacts will probably determine whether the rock at 28.1 m was a lava or an intrusive.

The sediments include an impure tuff breccia, a fossiliferous impure chert, and a polymictic soft-pebble conglomerate; all three are tuffaceous in varying degrees, and are lithologically related to volcanism. The soft-pebble conglomerate provides evidence of unstable conditions in the environment of deposition; the inclusion of radiolarian chert, similar to 81.5 m, and of ultramafic rocks similar to 28.1 m, suggests that the intersection at 102.4 m is younger, and that therefore the sequence may be overturned (on the assumption that the drillhole is a downhole).

H.W. Fander, M. Sc.

APPENDIX II

WASHINGTON HAY DIAMOND DRILL HOLE LOGS

041007

HOLE No.: C1510

SAMPLE DATA

SHEET No. 1

LENS	SAMPLE No.	ROCK TYPE	Σ	INTERVAL		Length (L)	Assays (A)				Product (A x L)		
				From	To		% Snt	% Sns	% Cu	% Zn	g P-Sn Pb	P.P. Sns Ag	P.P. Cu Cd
	248149	SHALE/SILTSTONE		258.72	259.26	0.54	<0.01		0.01	0.01	40.10	45	410
	248150	MINERALIZED		259.26	260.34	1.08	0.07		0.03	2.70	2.10	70	100
	248151	CHERT/CARBONATE		260.34	261.19	0.84	0.02		0.01	0.75	0.45	20	60
	248152	CHERT		261.18	262.88	1.70	<0.01		<0.01	0.03	40.10	5	410
	248153	SHALE		277.48	278.07	0.59	<0.01		0.01	0.03	40.10	45	410
	248154	SANDSTONE		278.07	278.95	0.88	<0.01		<0.01	0.12	40.10	45	10
	248155	MINERALIZED		278.95	279.71	0.76	0.03		0.01	1.10	0.25	10	70
	248156	CLAY		279.71	280.10	0.39	0.01		<0.01	0.24	0.12	5	20
	248157	SANDSTONE		280.10	280.73	0.63	<0.01		<0.01	0.04	40.10	45	410
	248158	SHALE		280.73	281.43	0.70	<0.01		0.01	0.04	40.10	45	410
	248159	SANDSTONE		281.43	282.36	0.93	0.05		<0.01	0.22	0.95	30	20
	248160	MINERALIZED		282.36	283.00	0.64	0.07		0.01	1.50	5.50	180	110
	248161	SHALE		283.00	283.55	0.55	0.01		0.01	0.10	40.10	5	10
	248162	SHALE		283.55	284.90	1.35	0.02		0.01	0.10	40.10	5	10
	248163	SHALE/SANDSTONE		286.46	288.03	1.57	0.04		0.01	0.32	40.10	5	30

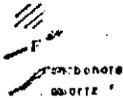
N.V.P.S.

Feature

Bedding
Foliation
Fragment
size & shape



Shearing
Fault
Vein



Mineralization

Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive > 60%

041008

01010

CORE RECD	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
Tri-coned - No Core	1	<p><u>Weathered Ultrabasic</u></p> <ul style="list-style-type: none"> - brown orange, broken - distorted. - harder and more greenish towards base - from 12.7m. 							
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
	13								
	14								
	15.00								
	15.00	<p><u>Ultrabasic</u> - dark green. - has dark inclusions</p> <ul style="list-style-type: none"> - top very broken - rest hard - distorted with flow structures - silicified in parts 							<p>minor cxb veining all angles main veins at 25°</p>
16									
16.90									
17									
18									
18.50									
19									
20									
20.00									
21									
22									
22.70									
23									
24									
25									
25.70									
26									
27									
28									
28.70									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
49.70									

Handwritten depth scale on the left margin, including values like 15.00, 16.90, 18.50, 20.00, 22.70, 25.70, 28.70, 30.70, 40.70, 49.70.

Very Broken

Broken

Broken

Broken

Broken

8° 45' Fl Broken

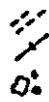
Broken

70° V3

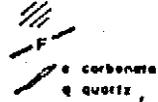
95, cxb.

Feature

Bedding
Foliation
Fragment
size & shape



Shearing
Fault
Vein



Mineralization

041012

Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive > 60%

5

CORE RECD	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	200								
	201	<i>Sandstone continued</i>							
	202	<i>some chaotic distorted zones</i>							
	203								
	204								
	205								<i>vis all angles - carb rich</i>
	206								
	207								
	208								
	209								
	210								
	211								
	212								
	213								
	214								
	215								
	216								
	217								
	218								
	219								
	220								
	221								
	222								
	223								
	224								
	225								
	226								
	227								
	228								
	229								
	230								
	231								
	232								
	233								
	234								
	235								
	236								
	237								
	238								
	239								
	240								
	241								
	242								
	243								
	244								
	245								
	246								
	247								
	248	<i>Sandstone fine grained becoming coarser downwards</i>							
	249	<i>- still some salt sized grains in parts</i>							
	250								

Dip - 35° Slean

*24 25 53mo carb, 49% sph
93.5 ph - mark 107, 115, 64.*



*Many calcite veins
at 35-40° mainly
at 70°*

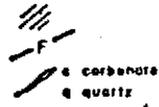
F1 45

Feature

Bedding
Foliation
Fragment
also @ shape



Shearing
Fault
Vein



Mineralization

041015

Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive > 60%

2

CORE RECD	DEPTH m 375m	GEOLOGY	VISUAL LOG	TRACE	COMPACT	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	316	<i>Sandstone continued</i>							
70	317	<i>ss/shale bands from 320.43 to 322.10m</i>						VI 5°	<i>carb, qtz, sph, py, po minor sph</i>
	318	<i>also shale bands at 329.0m</i>							
70	320	<i>Shale bands at 334.2 (20cm)</i>							
	321	<i>mainly light-green grey fine</i>							
70	322	<i>335.25 (25cm)</i>	<i>ss/sh bands</i>						
	323	<i>336.05 (10cm)</i>							
70	324	<i>336.45 (50cm)</i>							
	325	<i>mid grey shale at 358.1 (40cm)</i>							
70	326								
	327								
70	328		<i>shale</i>						
	329								
70	330		<i>shale</i>						
	331								
70	332							VI 15°	<i>carb, qtz</i>
	333								
70	334							VI 15°	<i>qtz, carb</i>
	335								
70	336								
	337								
70	338								
	339								
70	340							VI 15°	<i>qtz, sph, carb</i>
	341								
70	342								
	343								
70	344								
	345								
70	346								
	347								
70	348							VI 10-30°	<i>qtz, carb</i>
	349								
70	350								
	351								
70	352								
	353								
70	354								
	355								
70	356								
	357								
70	358								
	359								
70	360								
	361								
70	362								
	363								
70	364								
	365								

70° Fl

70° Fl

VI all angles 70°, 15°, 30°, 50° qtz, carb.

Bedding Shearing
 Foliation Fault
 Fragment size & shape Vein
 carbonates & quartz

MINERALIZATION
041016

trace 1-5 %
 Common 5-15%
 Abundant 15-60%
 Massive > 60%

CORE RECD	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	366	Sandstone continued							
	367-4							VI 45	carb, py
	369	Shale - mid grey						VI 70	carb, qb, py, minor Ca, sph
	370	- silty							
	371	- bedded.							
	372-04							VI 30	qb, carb, py, sph, ps.
	373	Sandstone - mid grey, fine grained, very fine at top							
	374	- massive							
	375	- carb cement							
	376	- minor shale bands at 375.3 and 376.0							
	377								
	378								
	379								
	380-03							VI 30	qb, carb.
	381	Siltstone/shale - mid grey, fine grained, chaotic							
	382-97								
	382	Sandstone - mid grey, fine grained - massive							
		END OF HOLE C1510 at 382.79m.							

HOLE No.: 1515

SAMPLE DATA

SHEET No.: 1 of 2

LENS	SAMPLE No.	ROCK TYPE	Σ	INTERVAL		Length (L)	Assays (A)				Product (A x L)		
				From	To		% Snt	% Sns	% Cu	% Zn	Pb % Pb	% Sns Ppm Pb	% Cu Ppm Cu
	248164	CLAY (FANCT)		157.57	157.88		<0.01		0.01	0.02	0.01	<5	10
	248165	SANDSTONE		157.88	159.22		<0.01		0.01	0.09	0.07	<5	10
	248166	MINERALIZED (SILICA)		159.22	159.41		0.06		0.05	3.4	1.36	80	250
	248167	SANDSTONE		159.41	159.75		0.01		<0.01	0.25	0.13	5	30
	248168	BRECCIA SANDSTONE		159.75	160.63		0.01		<0.01	0.36	0.16	5	40
	248169	SANDSTONE		160.63	161.82		<0.01		<0.01	0.04	0.03	<5	10
	248170	MINERALIZED SANDSTONE		161.82	162.35		0.02		0.01	0.40	0.33	10	40
	248171	VEN. SANDSTONE		162.35	165.11		<0.01		<0.01	0.01	0.03	<5	<10
							0						
	248172	VEN. (BRECCIA)		169.38	170.68		0.01		<0.01	0.33	0.15	<5	80
													R
	248173	SANDSTONE (BRECCIA)		172.48	173.08		<0.01		<0.01	0.01	0.01	<5	<10
	248174	SANDSTONE		173.08	175.00		<0.01		<0.01	0.02	0.02	<5	<10
	248175	SANDSTONE		175.00	175.97		<0.01		<0.01	0.03	0.04	<5	<10
	248176	MINERALIZED (VEN)		175.97	176.67		0.04		<0.01	0.85	0.27	10	70
	248177	SANDSTONE		176.67	177.80		<0.01		<0.01	0.20	0.10	<5	20
	248178	SANDSTONE		177.80	179.63		<0.01		<0.01	0.01	0.01	<5	<10

NWES

HOLE No.: 1515

SAMPLE DATA

SHEET No. 202

LENS	SAMPLE No.	ROCK TYPE	Σ	INTERVAL		Length (L)	Assays (A)				Product (A x L)		
				From	To		% Snt	% Sns	% Cu	% Zn	Snt % Pb	Sns % Mn	Pb % Cd
	248179	SILICIFIED SHALE		187.50	188.34		<0.01		<0.01	0.06	0.05	<5	10
	248180	SHALE/SANDSTONE		188.34	190.10		0.03		<0.01	0.14	0.15	10	10
	248181	MINERALIZED (Pb/Cu)		190.10	191.09		0.03		0.04	0.85	0.54	25	70
	248182	MINERALIZED (Pb/Cu)		191.09	191.82		0.02		0.02	0.43	1.00	40	50
	248183	SILICIFIED (SHALE)		191.82	193.66		<0.01		<0.01	0.04	0.03	<5	10
	248184	SANDSTONE (MINERAL)		193.66	194.32		<0.01		<0.01	0.06	0.06	<5	10
	248185	SANDSTONE (MINERAL)		196.55	196.74		<0.01		<0.01	0.22	0.21	10	20

Feature

Bedding

Foliation

Fragment
size & shape

Shearing

Fault

Vein

carbonate

quartz

Mineralization

Trace 1-5%

Common 5-15%

Abundant 15-60%

Massive > 60%

041021

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	100	Ultramafic continued	60° F1					100-101	gls, carb.
	101	Fault & veins from 108.11 to 108.36 - change at 121.2 to 121.45 changes to a very fine, light green ultramafic then changes to a dark green, black coarse ultramafic at 122.27 m then changes to light to mid green medium grained ultramafic at 126.4.	20 F1					101-102	gls, carb.
	102		50 F1					102-103	gls, carb., sph., ga., talc, ps, chl, tm minor py, cp
	103							103-104	
	104							104-105	
	106.50							106-107	
	107							107-108	
	108		65° F1					108-109	gls, carb.
	109							109-110	
	110							110-111	
	112							112-113	
	113		60° F1					113-114	gls, carb, talc
	114							114-115	
	115							115-116	
	116							116-117	
	117							117-118	carb, talc
	118							118-119	carb, talc, cp, sph., py.
	119							119-120	
	120							120-121	
	121		30° F1					121-122	carb in thin fault zones
	122							122-123	
	123							123-124	
	124							124-125	
	125		45° F1					125-126	
	126							126-127	
	127							127-128	
	128							128-129	
	129.93	Sharp lower contact						129-130	
	130	Silicified Silty Shale	30° F1					130-131	carb, gls.
	131	mid grey with some patches purplish and others greenish	30° F1					131-132	
	132	-hard						132-133	
	133	-finely banded and distorted.						133-134	
	134							134-135	
	135							135-136	
	136		20-30° F1					136-137	
	136.63							137-138	
	137	Ultramafic - mid green						137-138	fine carb.
	138	medium grained						138-139	
	139	- minor fault bands						139-140	
	139.93	many fine carb veins at 70°						140-141	
	140	Shale - mid greenish grey						140-141	
	141	- silicified down to 140.07 and	30° F1					141-142	carb 30° 70°
	142	horn 142.0 to base - both greenish	30° F1					142-143	
	143	- very fine grained	30° F1					143-144	
	144							144-145	
	145	Ultramafic						145-146	carb
	146	- very dark green						146-147	carb
	147							147-148	

Bedding
Foliation
Fragment
also in shape

Shearing
Fault
Vein

carbonate
 quartz

Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive > 60%

CORE RECD	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COPPER	ARSENIC	MANGANESE	DEPTH m	MINERALIZATION
	130								
	141	partially silicified shale continued							
	182	- light greenish grey - massive - many fine black joints							
	187.50								
	188	Silicified shale - light color bottom - bleached							
	188.2	- free py							
	189	Ultramafic - mid green							
	189	- sheared with many veins at 30°							W ³⁰ cob, gfs
	189	- fine pyrite							
	189	- malachite							
	189	- some Cu sulfs							
	191	Mineralized Breccia							
	191	Top is breccia with cob, gfs, py, gn, sph							
	191	Base is cob rich - ga, gfs, sph, py, cop							
	191.32	As, py							V ₄ ³⁰ gfs, cob, ga, sph, py, cop, As
	192	Ultramafic - fine grained							
	192	- greenish grey							
	192	sheared to 193.44							
	192	then very green - Cu sulfs - to 194.32							
	192	about cob veins							
	192	another green band at 195.55 to 196.74							
	192	and at 199.50 to 199.58							
	193								
	194								
	195								
	196								
	197								
	198								
	199								
	199.50								
	200								
	201								
	202								
	202.20								
	202.19	Breccia zone - chaotic shales & sandstones							
	202.19	- mainly oxidized shales							
	205	Sandstone - mid grey generally distorted							
	205.45	- minor shales							
	206	Shale - generally light greenish grey							
	207	- except for top 55cm rest chaotic							
	207.83	with chert, shale fragments							
	208	- partly silicified							
	209	Chert/silicified shale - light to mid grey, broken							
	210	Sandstone - mid grey							
	210.5	- fine grained							
	211	- massive							
	212	Shale - light greenish grey							
	212	- generally chaotic and distorted							

Feature

Bedding

Foliation

Fragment size & shape

Shearing

Fault

Vein

Mineralization

Trace 1-5%

Common 5-15%

Abundant 15-60%

Massive > 60%

041025

7

Carbonate
Quartz

CORE RECD	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	262	Sandstone continued							
	263	minor shale band at 266	10° Fz					v2 15° carb, qtz.	
	264	bedded at 30°							
	265	minor shales at 271-80m and 273.1m							
	266							v2 10° carb	
	267								
	268								
268.50	269		8th row						
	269		28° Fz					v1 25° carb	
	270		21° Fz					v1 25° carb, py, fcs, sph.	
270	271								
271.50	272								
	273								
	274								
274.30	275								
	276							v3 15° carb	
	276.50								
276.80	277	Shale and Siltstone - mid to dark green							
277.40	278	Sandstone - fine grained, massive, mid grey							
278	279	Shale - mid grey, distorted						v1 15-30° carb.	
278.50	280	Sandstone - fine grained, mid grey							
279	281	Shale - light to mid grey, distorted							
280.00	282	Dominantly Sandstone - very fine grained mid grey several shaly and siltstone bands - carb rich cement - composed of rock frags						v1 15° all rights carb	
282	283	Shale - light to mid grey - some greenish bands							
	284							v1 & v2 at 45° carb.	
286	285	gradational contact							
	286	Chocolate Shale - red brown minor light grey shale bands							minor v1 of carb at 40°
	287								
	288	gradational contact							
289.5	289	Shale - mid grey massive							
290	290								
290.50	291	Sandstone - mid grey, fine, massive							
	292	Shale - mid to dark grey, massive - some minor sandstone bands - conditions by H&S 11cm							
292		END OF HOLE C1515 at 292.50m.							

APPENDIX III

DIGHEM LTD'S REPORT ON THE DIGHEM SURVEY

1. SUMMARY
2. INTRODUCTION
 - A. PREVIOUS EXPLORATION
 - B. EXPLORATION OBJECTIVES
3. EXPLORATION AND DEVELOPMENT
 - A. WASHINGTON HAY AREA
 - (i) Completed Exploration
 - (ii) Future Work Recommended
 - B. EASTERN SEDIMENT SEQUENCE
 - (i) Completed Exploration
 - (ii) Future Work Recommended
 - C. "W" PROSPECT, WHYTE HILL AND MAGNET RANGE AREAS
 - (i) Completed Exploration
 - (ii) Future Work Recommended
 - D. GRANITE CONTACT ZONES
 - (i) Completed Exploration
 - (ii) Future Work Recommended
 - E. GENERAL WORK ON EXPLORATION LICENCE 1/63
4. EXPENDITURE
5. CONCLUSIONS
6. REFERENCES
7. APPENDICES
 - I Petrographic description of Washington Hay drill hole and rock types
 - II Washington Hay drill hole logs
 - III Dighem Ltd's report on the DIGHEM survey.

LIST OF PLANS

- Sheet WH-A/2 Washington Hay Area - Surface Fact and Interpretation.
Sheet WH-H/2 Washington Hay Area - RA4 Section and Profiles
Sheet WH-J/2 Washington Hay Area - RA6 Section and Profiles
D.S.-A & B Dighem Survey E.L.1/63 1980 - Electromagnetics and Resistivity
D.S.-C & D Dighem Survey E.L.1/63 1980 - Magnetics and Enhanced Magnetics.

1. SUMMARY.

Two holes were drilled in the Washington Hay area. The results were not very encouraging.

An analysis of a DIGHEM survey showed a promising anomaly in the eastern portion of the lease.

Work commenced in the northern portion of the lease with the cutting of grid lines.

Compilation of previous work indicated an area in which to drill a diamond drill hole to intersect the southern extension of Hall's Formation - the Cleveland Mine lode horizon.

Compilation of all previous data onto base sheets continued.

2. INTRODUCTION

The area in which exploration licence E.L. 1/63 is situated is the northwest of Tasmania, 98 kilometres from Burnie at latitude 41 degrees 28 minutes S and longitude 145 degrees 24 minutes E.

This exploration licence surrounding the Cleveland Tin Limited Mining Lease (M.L. 27M/71) was granted to Aberfoyle Tin Development Partnership in August 1963. It has been held by subsidiaries of the Aberfoyle Group of companies since 1963 and is presently held by Cleveland Tin Limited.

A. PREVIOUS EXPLORATION

The original reconnaissance geological mapping on E.L. 1/63 was undertaken by Cox (1967) and Glasson and Cox (1969). This work involved minor stream sediment sampling and analysing, ground magnetometer traverses and minor self potential evaluation. On completion of this preliminary work (from 1964 to 1968) Cox (1969) delineated 13 areas within E.L. 1/63 which required follow-up geological evaluation.

The presentation of geological interpretations with minor follow-up field reconnaissance trips continued until 1970. The exploration history of E.L. 1/63 from 1970 to 1979 has been outlined briefly in Ellis (1980).

B. EXPLORATION OBJECTIVES (This program)

The previous exploration delineated several areas which required follow-up evaluation in varying degrees of detail. These areas of work were as follows:

- (a) Washington Hay Area
- (b) Eastern Sediment Sequence
- (c) "W" Prospect, Whyte Hill and Magnet Range Areas
- (d) Granite Contact Zones (Eastern Area)
- (e) General Work on E.L. 1/63.

Details of the results of previous work and the proposed work for each of these areas are given in Ellis (1980). No further details will be given in this report.

3. EXPLORATION AND DEVELOPMENT

The exploration program outlined above was planned for the Aberfoyle parent company for 1980. Thus the period detailed in this report represents just one phase of the continuing exploration program. This report covers the exploration activity for the six month period ending on the 11th August, 1980 (this period). In this report "the next period" refers to the six month period ending on 11th February, 1981, while "the last period" refers to the six month period ending on 11th February, 1980.

A. WASHINGTON HAY AREA

(i) Completed Exploration

In the last period compilation and check field work between RA1 and RA2 (grid lines) defined a diamond drill hole target. In this period the access (including a small costean off the access road) to the proposed drill site was completed (Washington Hay Sheet WH-A/2) and the drilling of two cored diamond drill holes was undertaken (Hole Nos. C1510 and C1515). The drilling intersected dominantly chocolate shales, ultra basics and sandstones (Appendix I). Two brecciated fault zones were intersected in each of the holes (Appendix II). These zones were mineralised, mainly by a concentration of sulphide-rich veins within the fault zones. This mineralisation was sufficient to explain the geochemical anomalies observed in the soil samples. Similarly the weak I.P. anomaly can be explained by these weakly conducting mineralised fault zones. The fault zones were independent of rock types. In C1510 they occurred in the sandstones while in C1515 they were dominantly in the ultra-basics. This fact of faults being independent of rock types corresponded to the surface outcrop of the mineralised fault zones and their varying rock types.

Although mineralisation was encountered in both drill holes the mineralisation occurred only as narrow veins. The best grades sampled was for a sample interval of 0.64 metres in hole C1510 which had an analysis of:

Sn	0.07%
Cu	0.01%
Zn	1.50%
Pb	5.50%
Ag	180ppm

A study of vein minerals (Washington Hay Sheets WH-H/2 and WH-J/2) showed the dominant minerals of most veins to be quartz and carbonates. Sphalerite also occurred in most veins although it appeared to be less abundant in the upper portions of C1510 than elsewhere. Similarly galena occurred in most veins but in the lower mineralised zone of C1510 it tended to be absent from many of the veins. This variation in the relative abundances of galena and sphalerite in C1510 may suggest that a tin zone may occur at depth below C1510 according to the

mineral zoning concept. However, this is based only on very weak evidence in C1510. Furthermore, any such tin deposit at depth would only be a fault breccia infill and would thus be uneconomical.

On completion of the drilling program, further geological mapping was undertaken to the west of the diamond drill hole sites. This was an attempt to determine the stratigraphy in this area and help to locate the stratigraphy intersected in the drill holes into the Cleveland Mine Sequence. The field mapping showed the area to the west of the Washington Workings contained ultrabasics, chocolate shales, cherts and sandstones.

(ii) Future Work Recommended

The available geological, geochemical and geophysical data for the area covering grid lines RA12 to RA25 (to the south of the Washington Hay area of grid lines RA1 to RA12) should be compiled onto a series of 1:1000 base plans similar to those for the Washington Hay area. This data should then be interpreted. Any geological interpretations should be assisted by the location and following of outcropping chert horizons in the field.

On completion of this compilation of all existing data (which may require chain and compass surveying of the old grid lines) the I.P., magnetic, geochemical and geological traverses should be extended to cover any favourable trends or regions.

B. EASTERN SEDIMENT SEQUENCE

(i) Completed Exploration

In the last period the new forestry roads and skidways in the Eastern Ridge area of EL 1/63 were mapped. Part of this geological mapping has been completed onto the 1:1000 base sheets. The remainder will be included on these base sheets in the next period.

The samples of the Eastern Sediments despatched for petrological examination have not been returned. The results of the petrological studies will be included (with maps and sample locations) in the report for the next period.

(ii) Future Work Recommended

The mapping in the Fall's Creek/Eastern Ridge area has defined the location of the southern extension of Hall's Formation (the mine lode horizon). To test the stratigraphy at depth it is proposed to drill a diamond drill hole from the Eastern Sediment sequence through the Deep Creek Volcanics and Hall's Formation into the Crescent Spur Mica Sandstone. This drill hole will be in the vicinity of section line AX (on the Battery Reference Grid). The dozing of an access track to the drill site will commence early in the next period with the diamond drilling being completed by the end of that period.

C. "W" PROSPECT, WHYTE HILL AND MAGNET RANGE AREAS

(i) Completed Exploration

An investigation of old records has recently shown that the entire licence area of E.L. 1/63 was covered by cut lines with geochemical, geological and geophysical traverses. However, since consultant geologists to the Aberfoyle Group in 1971-72 criticised the original work most of the original investigations have been ignored. The criticisms, however, did not invalidate the original work.

Thus the original proposal of cutting 15 to 20 grid lines and a base line to cover the entire area of E.L. 1/63 north of the Whyte Hill area was split into two stages. The first stage of this program was to cut the baseline and four cross lines of the original proposed grid. The cross lines were to be spaced at 500 metre intervals. The five lines (4 cross lines and baseline) were then to be covered by a ground magnetometer traverse and soil geochemistry as well as geological mapping. The results of the first stage were then to be compared to the results of the earlier traverses (if the data can be located accurately).

If there were discrepancies between the old and new traverses then stage two would be implemented. Stage two would consist of cutting the intermediate cross lines at 100 to 125 metre intervals and then cover these lines with geological mapping, geophysical traverses and soil geochemical surveys.

In this period the base lines and four initial cross lines were cut.

(ii) Future Work Recommended

In the next period it is proposed to survey the cut lines by chain and compass and then complete stage one of the proposal by conducting ground magnetometer, soil geochemical and geological traverses. While this field work is in progress it is proposed that all the previous records will be fully investigated and compiled (with more recent data) onto a single series of base plans.

If a comparison of the old compilation and the new field data shows large discrepancies, then stage two of the proposal (above) will be completed. This would involve further line cutting and associated geological work. Most of this work should be completed in the next period.

Also in the next period the mapping of strike outcrops in the area between Whyte Hill and "W" Prospect will occur.

D. GRANITE CONTACT ZONES

(i) Completed Exploration

In conjunction with the Aberfoyle Exploration Department's

exploration of E.L. 16/78 the granite contact zones on the eastern side of E.L. 1/63-1 and within the eastern extensions E.L. 1/63-2 were investigated. This investigation was by means of an airborne DIGHEM geophysical survey the field work of which was carried out during the last period. The consultant's interpretation of the survey data was conducted in this period.

The accompanying report by Dighem Ltd. (Appendix III) covers all the DIGHEM work for the Aberfoyle Group in Tasmania. Only part of the area covered under the chapters on "Circular Feature" concerns the Cleveland Tin Ltd. Licence E.L. 1/63. The Aberfoyle Group geophysicist suggested that within E.L. 1/63 there is only one potentially good anomaly. This is anomaly 15A in the eastern extension of the licence in E.L. 1/63-2. It is thought that the anomaly has a bedrock source and shows up on the electromagnetics, resistivity, magnetics and enhanced magnetics. Preliminary field mapping (by the Aberfoyle Group) suggested that the line of the DIGHEM anomaly 15A coincides with the edge of a Tertiary basalt flow.

(ii) Future Work Recommended

The DIGHEM anomaly has to be explained. This will be done by cutting a series of grid lines (and a base line) across the anomaly. These grid lines will be mapped and then covered by geophysical and geochemical traverses.

This work is tentatively planned for the 1980-81 summer season.

E. GENERAL WORK ON EXPLORATION LICENCE 1/63

During this period the entire base area was covered by aerial photography. This work was the first stage in the production of a set of topographic plans of the lease area. Control targets in the lease area are in the process of being tied together by ground surveying. When this is completed photogrammetry can begin. The topographic plans will be completed in the next period and will be included in the next period report.

A start to the compilation of all existing data onto common base sheets was made during this six month period. This work will continue in the next period.

During this period it was found that much work has been done within E.L. 1/63 which has not been recorded in an easily retrievable form. Thus it is planned that in the next period an attempt will be made to compile all previous data into a single report (with accompanying plans).

4. EXPENDITURE

Expenditure for the period February 12th to August 11th, 1980,
was as follows:

Geology	\$ 18,445
Survey	1,860
Aerial Survey Estimate (quote)	8,388
Geophysics	4,345
Geochemistry	625
Drilling	40,833
Development and Costeaming	6,822
Line Cutting	4,062
Tenure	363
Petrology Estimate	260
Miscellaneous	413
Total:	\$ 86,416
	=====

5. CONCLUSIONS

Drilling in the Washington Hay area explained the anomalous soil geochemistry. Although minor mineralisation (Pb, Zn) in a fault zone was intersected in the drill core no indication of an economic Sn, Pb or Zn orebody was found. Further detailed work is required to the west and south of the Washington Hay Mine area. This will continue in the next period.

New roads and tracks to the south and east of the Cleveland Mine were mapped. This mapping showed a barren sequence of shales, volcanics and sandstones. The mapping was useful in planning a stratigraphic drill hole which is intended to intersect the southern extension of the Cleveland Mine Lode horizon (Hall's Formation). This drilling will be commenced in the following period.

Line cutting commenced in the northern part of the lease. Detailed mapping, geochemical and geophysical work will continue in this area in the next period.

The DIGHEM survey of the eastern portion of the lease showed one promising anomaly. This anomalous area will be investigated on the ground during the next period.

Further work continued on the production of a set of base plans containing all topographic, geological, geochemical and geophysical data for the lease. This work will continue in the next period.

The total expenditure for the six month period ending on the 11th of August 1980 was \$86,400.

6. REFERENCES

- Cox, R., 1969. Report of the Resident Geologist upon completion of initial exploration program (April 1964-December 1968) in the Cleveland-Magnet Area, Luina District, Tasmania. Unpub. Report of Aberfoyle Management Pty. Ltd.
- Ellis, P.D., 1980. Progress Report Exploration Licence 1/63 for six month period ending February 11, 1980. Unpub. Report of Cleveland Tin Limited.
- Glasson, K.R. and Cox, R., 1968. Preliminary Report, Magnet Mine, Waratah District, Tasmania. Unpub. Report of Aberfoyle Management Pty. Ltd.

7. APPENDICES

DIGHEM^{II} SURVEY

IN

EASTERN TASMANIA

FOR

ABERFOYLE EXPLORATION PTY. LTD.

BY

DIGHEM LIMITED

TORONTO, ONTARIO

MAY 30, 1980

D.C. FRASER

PRESIDENT

Z. DVORAK

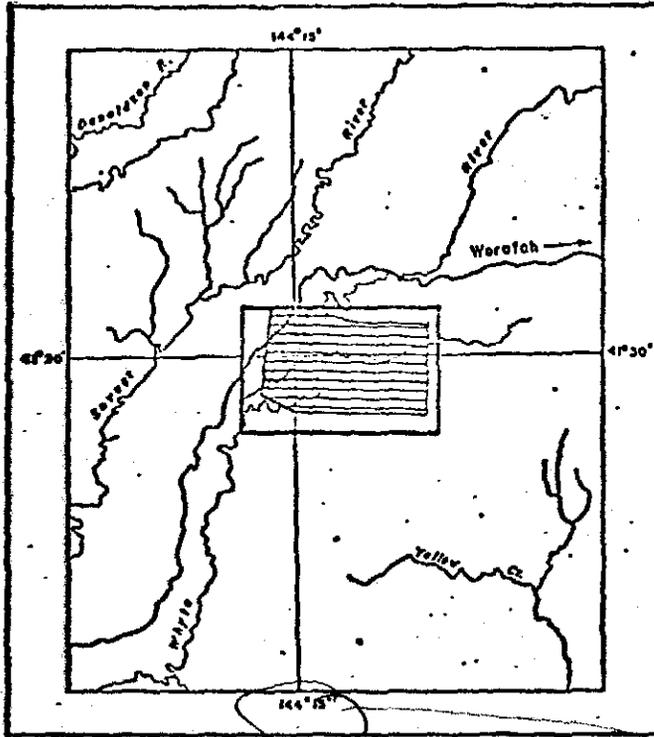
GEOPHYSICIST

.....
SUMMARY

DIGHEM^{II} airborne electromagnetic/resistivity/magnetic surveys totalling 345 line-km were flown in February and March, 1980, for Aberfoyle Exploration Pty. Ltd., over four areas in Tasmania.

The geologic environment within the survey areas varied from resistive to highly conductive. Several targets were located in the Contact Creek and St. Dizier areas which appear to warrant ground follow-up exploration. The Circular Feature and Zeehan areas yielded only a few EM anomalies which may have sources in the bedrock.

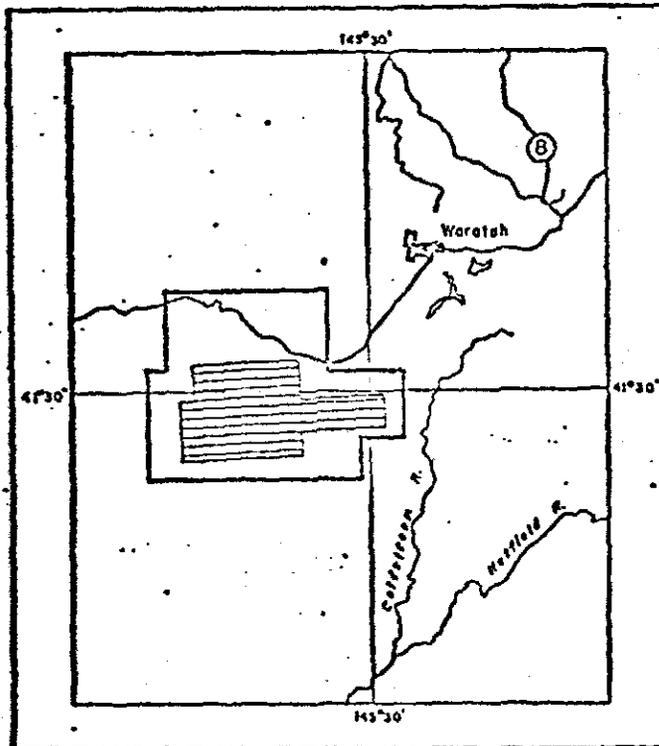
LOCATION MAP



1. Contact Creek

145°15'

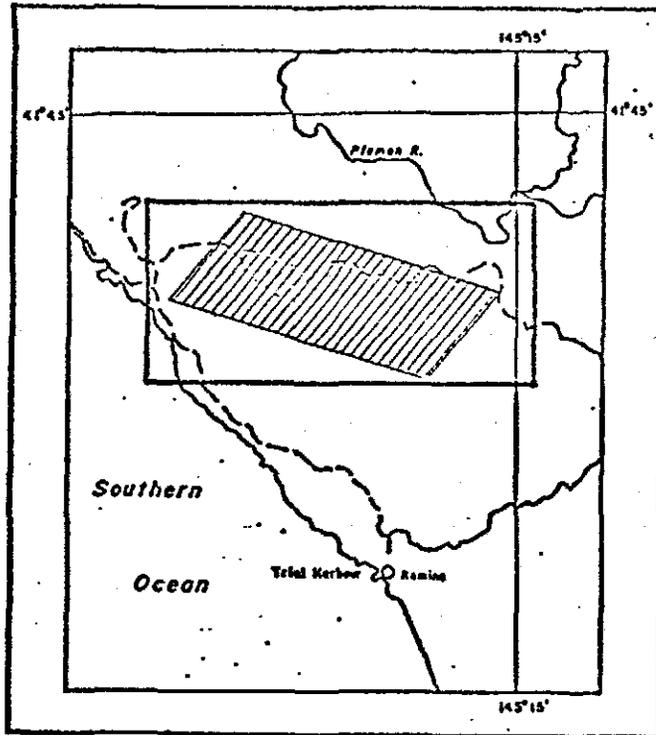
LOCATION MAP



2. Circular Feature

Figure 1. The Survey Areas

LOCATION MAP

3. St. Dizier

LOCATION MAP

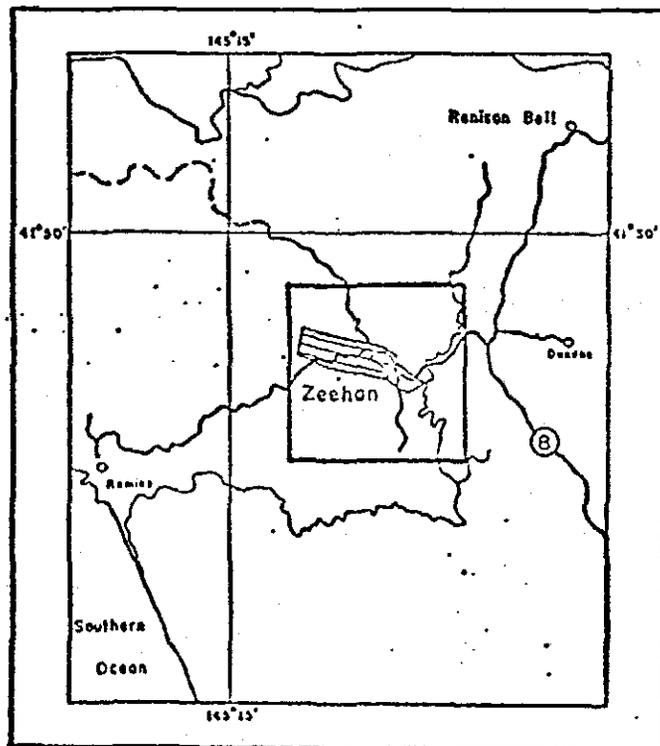
4. Zeehan

Figure 1. The survey areas

INTRODUCTION

DIGHEM^{II} surveys of 345 line-km were flown with line-spacings of 200 and 250 m for Aberfoyle Exploration Pty. Ltd. over four areas in Tasmania (Figure 1). The surveys were flown in the interval of February 11 to March 6, 1980. The Lama jet helicopter VH-PDU flew with an average airspeed of 115 km/h and EM bird height of 35 m. Ancillary equipment consisted of a Geometrics 803 magnetometer with its bird at an average height of 50 m, a Sperry radio altimeter, Geocam sequence camera, 50 Hz monitor, Barringer 8-channel hot pen analog recorder, and a Geometrics G-714 digital data acquisition system with a Kennedy 9700 9-track 800-bpi magnetic tape recorder. The analog equipment recorded six channels of EM data at approximately 900 Hz and one of magnetics and radio altitude. The digital equipment recorded the EM data with a sensitivity of 0.25 ppm/bit and the magnetic field to an accuracy of one gamma.

The Appendix provides details on the data channels, their respective noise levels, and the data reduction procedure. The quoted noise levels are generally valid for wind speeds up to 40 km/h. Higher winds may cause the system to be grounded because excessive bird swinging produces control difficulties in piloting the helicopter. The swinging results from the 5 m² of area which is presented by the bird to broad-side gusts. The DIGHEM system nevertheless can be flown under wind conditions that seriously degrade other AEM systems.

DATA PRESENTATION

DIGHEM electromagnetic responses fall into two general classes, discrete and broad. The discrete class consists of sharp well defined anomalies from discrete conductors such as sulfide lenses and steeply dipping sheets of graphite and sulfides. The broad class consists of wide anomalies from conductors having a large horizontal surface such as flatly dipping graphite or sulfide sheets, saline water-saturated sedimentary formations, conductive overburden and rock, and geothermal zones. A vertical conductive slab with a width of 200 m would straddle these two classes.

The vertical sheet (half plane) model is the most common model used for the analysis of discrete conductors. All anomalies plotted on the electromagnetic map are interpreted according to this model. The following section entitled Discrete conductor analysis describes this model in detail, including the effect of using it on anomalies caused by broad conductors such as conductive overburden.

The conductive earth (half space) model is the most suitable model for broad conductors. Resistivity contour maps result from the use of this model. Resistivity contour maps should be prepared when the EM responses predominantly are of the broad class. A later section entitled Resistivity mapping describes the method further, including the effect of using it on anomalies caused by discrete conductors such as sulfide bodies.

Discrete conductor analysis

The EM anomalies appearing on the electromagnetic map are interpreted by computer to give the conductance (i.e., conductivity-thickness product) in mhos of a vertical sheet model. DIGHEM anomalies are divided into six grades of conductance, as shown in Table I. The conductance in mhos is the reciprocal of resistance in ohms.

Table I. EM Anomaly Grades

<u>Anomaly Grade</u>	<u>Mho Range</u>
6	≥ 100
5	50 - 99
4	20 - 49
3	10 - 19
2	5 - 9
1	≤ 4

The mho value is a geological parameter because it is a characteristic of the conductor alone; it generally is independent of frequency, and of flying height or depth of burial apart from the averaging over a greater portion of the conductor as height increases.* Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger mho values.

* This statement is an approximation. DIGHEM, with its short coil separation, tends to yield larger and more accurate mho values than airborne systems having a larger coil separation.

Conductive overburden generally produces broad EM responses which are not plotted on the EM maps. However, patchy conductive overburden in otherwise resistive areas can yield discrete-like anomalies with a conductance grade (cf. Table I) of 1, or even of 2 for conducting clays which have resistivities as low as 50 ohm-m. In areas where ground resistivities can be as low as 1 ohm-m, anomalies caused by weathering variations and similar causes can have conductance grades as high as 4. The anomaly shapes from the multiple coils often allow such surface conductors to be recognized, and these are indicated by the letter S on the map. The remaining anomalies in such areas could be bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: DIGHEM's New Inco copper discovery (Noranda, Quebec, Canada) yielded a grade 4 anomaly, as did the neighbouring copper-zinc Magusi River ore body; Mattabi (copper-zinc, Sturgeon Lake, Ontario, Canada) and Whistle (nickel, Sudbury, Ontario, Canada) gave grade 5; and DIGHEM's Montcalm nickel-copper discovery (Timmins, Ontario, Canada) yielded a grade 6 anomaly. Graphite and sulfides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Strong conductors (i.e., grades 5 and 6) are characteristic of massive sulfides or graphite. Moderate conductors (grades 3 and 4) typically reflect sulfides of a less massive character

or graphite, while weak bedrock conductors (grades 1 and 2) can signify poorly connected graphite or heavily disseminated sulfides. Grade 1 conductors may not respond to ground EM equipment using frequencies less than 2000 Hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductances. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near Bathurst, New Brunswick, yielded a well defined grade 1 conductor. The 10 percent by volume of sphalerite occurs as a coating around the fine grained massive pyrite, thereby inhibiting electrical conduction.

On the electromagnetic map, the actual mho value and a letter are plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots, beside each anomaly symbol, indicate the anomaly amplitude of the flight record. The vertical column of dots gives the estimated depth. In areas where anomalies are crowded, the identifiers, dots and mho values may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductance calculation. Thus, a conductance value obtained from a large ppm anomaly (3 or 4 dots) will be accurate whereas one obtained from a small ppm anomaly (no dots) could be inaccurate.

The absence of amplitude dots indicates that the anomaly from the standard (coaxial maximum-coupled) coil is 5 ppm or less on both the inphase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface, or a stronger conductor at depth. The mho value and depth estimate will illustrate which of these possibilities best fits the recorded data. The depth estimate, however, can be erroneous. The anomaly from a near-surface conductor, which exists only to one side of a flight line, will yield a large depth estimate because the computer assumes that the conductor occurs directly beneath the flight line.

Flight line deviations occasionally yield cases where two anomalies, having similar mho values but dramatically different depth estimates, occur close together on the same conductor. Such examples illustrate the reliability of the conductance measurement while showing that the depth estimate can be unreliable. There are a number of factors which can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, overlying conductive overburden, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be deeper or to one side of the flight line, or because it has a shallow dip.

A further interpretation is presented on the EM map by means of the line-to-line correlation of anomalies. This provides conductor axes which may define the geological structure over portions of the survey area.

The majority of massive sulfide ore deposits have strike lengths of a hundred to a thousand metres. Consequently, it is important to recognize short conductors which may exist in close proximity to long conductive bands. The high resolution of the DIGHEM system, and the line-to-line correlation given on the EM map, are especially important for a proper strike length evaluation.

DIGHEM electromagnetic 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 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.

An EM anomaly list attached to each survey report provides a tabulation of anomalies in ppm, and in mhos and estimated depth for the vertical sheet model. The anomalies are listed from top to bottom of the map for each line.

The EM anomaly list also shows the conductance in mhos and the depth for a thin horizontal sheet (whole plane) model, but only the vertical sheet parameters appear on the EM map. The horizontal sheet model is suitable for a flatly dipping thin bedrock conductor such as a sulfide sheet having a thickness less than 15 m. The list also shows the resistivity and depth for a conductive earth (half space) model, which is suitable for thicker slabs such as thick conductive overburden. In the EM anomaly list, a depth value of zero for the conductive earth model, in an area of thick cover, warns that the anomaly may be caused by conductive overburden. Since discrete bodies normally are the targets of EM surveys, local base (or zero) levels are used to compute anomaly amplitudes rather than true zero levels. The use of local base levels may distort the horizontal sheet and conductive earth parameters. True zero levels, however, are used for resistivity mapping, discussed below.

Resistivity mapping

Areas of widespread conductivity have been encountered while surveying for base metals. In such areas, anomalies

can be generated by decreases of only 5 m in survey altitude, as well as by increases in conductivity. The typical flight record in conductive areas is characterized by inphase and quadrature channels which are continuously active; local peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity profiles and contour maps can aid the interpretation of the airborne data. The advantage of the resistivity parameter is that anomalies caused by altitude changes are virtually eliminated, so the resistivity data reflect those anomalies caused by conductivity changes. This helps the interpreter to differentiate between conductive trends in the bedrock and those patterns typical of conductive overburden. Discrete conductors will generally appear as narrow lows on the contour map and broad conductors will appear as wide lows.

Conductive overburden diminishes the ability of any EM system to effectively explore the bedrock. For example, the lower the resistivity of the cover, the more active the EM channels, and the less the likelihood of recognizing that a particular anomaly might be caused by a bedrock conductor. As a general rule of thumb, the effectiveness of most EM systems for base metal exploration is given in Table II.

Table II. Influence of Conductive Cover
On Base Metal Surveys.

Resistivity	Exploration effectiveness for most EM systems
> 300 ohm-m	excellent
100 to 300	good
30 to 100	moderate
< 30	poor

Apparent resistivity maps should always be constructed when the exploration effectiveness. (Table II) is moderate to poor. DIGHEM^{II} surveys yield apparent resistivity maps as a standard product.

Channel 40 (see Appendix) presents the apparent resistivity using the so-called pseudo-layer half space model defined in Fraser (1978)*. This model consists of a resistive layer overlying a conductive half space. Channel 41 (often not plotted) gives the apparent depth below surface of the conductive

* Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144-172.

material. The apparent depth therefore is simply the apparent thickness of the overlying resistive layer. The apparent depth (or thickness) parameter will be positive when the upper layer is more resistive than the underlying material, in which case the apparent depth may be quite close to the true depth.

The apparent depth will be negative when the upper layer is more conductive than the underlying material, and will be zero when a homogeneous half space exists. The apparent depth parameter must be interpreted cautiously because it will contain any errors which may exist in the measured altitude of the EM bird (e.g., as caused by a dense tree cover).

The apparent depth parameter is a useful indicator of simple layering in areas lacking a heavy tree cover. The DIGHEM^{II} system has been flown for the purpose of permafrost mapping, where positive apparent depths were used as a measure of permafrost thickness. However, little quantitative use has been made of negative apparent depths because the absolute value of the negative depth is not a measure of the thickness of the conductive upper layer and, therefore, is not meaningful physically. Thus, the apparent depth parameter is useful only in certain situations and so generally is not plotted.

X-type electromagnetic responses

DIGHEM^{II} maps contain x-type EM responses in addition to EM anomalies. An x-type response is below the noise threshold of 2 ppm, and reflects one of the following: a weak conductor near the surface, a strong conductor at depth (e.g., 100 to 120 m below surface), or noise. Those responses that have the appearance of valid bedrock anomalies on the flight profiles are mentioned in the report. The others should not be followed up unless their locations are of considerable geological interest.

The thickness parameter

DIGHEM^{II} can provide an indication of the thickness of a steeply dipping conductor. The ratio of the anomaly amplitude of channel 24/channel 22 generally increases as the apparent thickness increases, i.e., the thickness in the horizontal plane. This thickness is equal to the conductor width if the conductor dips at 90 degrees and strikes at right angles to the flight line. This report refers to a conductor as thin when the thickness is likely to be less than 3 m, and thick when in excess of 10 m. Thick conductors can be high priority targets because most massive sulfide ore bodies are thick, whereas non-economic bedrock conductors are usually thin. An estimate of thickness cannot be obtained when the strike of the conductor is subparallel to the flight line, when the conductor has a shallow dip, when the anomaly amplitudes are small, or when the resistivity of the environment is below 100 ohm-m.

Reduction of conductive overburden response

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The DIGEM^{II} system yields four channels which generally are free of the response of conductive overburden. These are the inphase difference channel 33, the quadrature difference channel 34, and the two anomaly recognition function channels 35 and 36. Channels 35 and 36 are used to trigger the conductance channel 37 which identifies discrete conductors. In highly conducting environments, channel 36 is not generated because it is subject to some corruption by highly conductive earth signals.

Discrete conductors usually occur in the bedrock, such as sulfides or graphite, rather than in the overburden, such as conductive clay. Only discrete conductors are plotted on the EM map. Broad (i.e., non-discrete) conductors are not plotted on this map, but are identified by lows on the resistivity contour map.

Reduction of magnetite response

Magnetite produces a form of geological noise on the inphase channels of all EM systems. Rocks containing as little as 1% magnetite can yield negative inphase anomalies. When magnetite is widely distributed throughout a survey area, the inphase EM channels may continuously rise and fall reflecting variations in the magnetite percentage, flying height, and overburden thickness. This can lead to difficulties in recognizing deeply buried bedrock conductors, particularly if conductive overburden also exists. However, the response of magnetite generally vanishes on the inphase differences channel 33. This feature can be a significant aid in the recognition of conductors which occur in rocks containing accessory magnetite.

MAGNETICS

The existence of a magnetic correlation with an EM anomaly is indicated directly on the EM map. An EM anomaly with magnetic correlation has a greater likelihood of being produced by sulfides than one that is non-magnetic. However, sulfide ore bodies may be non-magnetic (e.g., Kidd Creek near Timmins, Ontario, Canada) as well as magnetic (e.g., Mattabi).

The magnetometer data are digitally recorded in the aircraft to an accuracy of one gamma. The digital tape is processed by computer to yield a standard total field magnetic map contoured at 25 gamma intervals. The magnetic data also are treated mathematically to enhance the magnetic response of the near-surface geology, and an enhanced magnetic map is produced with a 100 gamma contour interval. The response of the enhancement operator in the frequency domain is shown in Figure 2. The 100 gamma contour interval is equivalent to a 5 gamma interval for the passband components of the airborne data. This is because these components are amplified 20 times by the operator of Figure 2.

The enhanced magnetic map bears a resemblance to a ground magnetic map. It therefore simplifies the recognition of trends in the rock strata and the interpretation of

AMPLITUDE

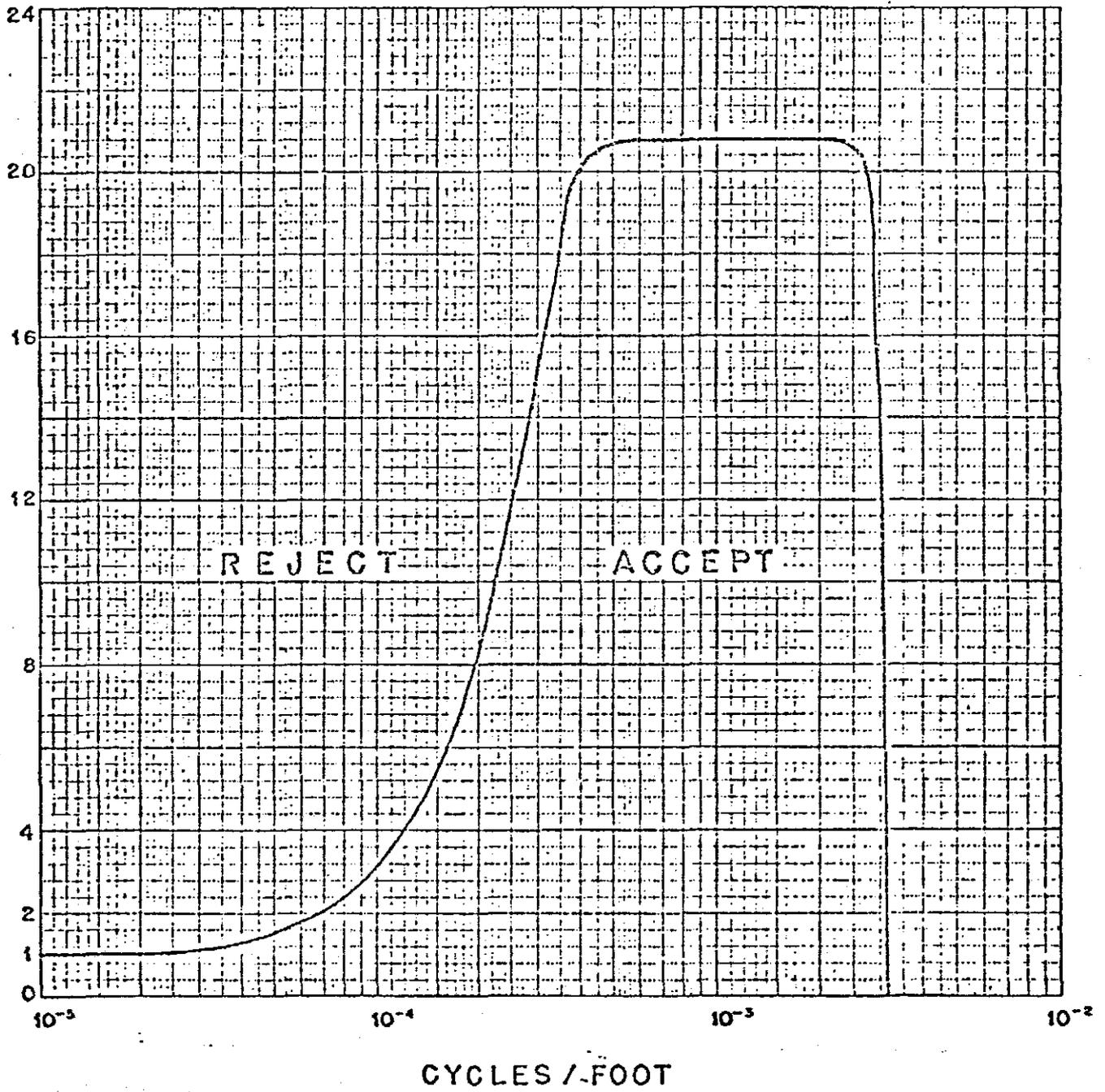


Figure 2

Frequency response of magnetic operator

geological structure. The contour interval of 100 gammas is suitable for defining the near-surface local geology while de-emphasizing deep-seated regional features.

Apart from the difference in the contour interval, the enhanced magnetic map and the standard magnetic map are identical when magnetic basement rocks underlie a thousand metres of non-magnetic cover. The difference between the two maps increase with the amount of magnetization of the near-surface geology.

The presence of a magnetic coincidence with an EM anomaly can result because the conductor is magnetic or because a magnetic body occurs in juxtaposition with the conductor. The majority of magnetic conductors represent sulfides containing pyrrhotite or magnetite. However, graphite and magnetite in close association can provide coinciding EM-magnetic anomalies. The truly magnetic conductors tend to follow closely the contoured magnetic highs. Such coincidence may be more evident on the enhanced magnetic map than on the standard magnetic map because of less disturbance from regional magnetic features. The enhancement, therefore, provides data maps which contribute to the evaluation of EM anomalies.

CONDUCTORS IN THE SURVEY AREA

The electromagnetic maps show the locations of conductors and their interpreted conductance (i.e., conductivity-thickness product) and depth. Their strike direction and length are also shown when the anomalies can be correlated from line to line. When studying the EM maps for followup planning, consult the anomaly listings appended to this report to ensure that none of the conductors are overlooked.

The EM maps indicate which anomalies are believed to be caused by cultural and surficial sources. Generally, such anomalies are not commented on below, as the discussions are directed to identifying bedrock conductors.

The apparent depth parameter (channel 41) usually aids in distinguishing between conductive overburden and broad bedrock conductors. The depth parameter is computed as the height of the EM bird above the conductor, less bird altitude. The dense tree cover caused the altimeter readings to be inaccurate. Consequently, the depth parameter did not contribute reliably to the interpretation.

Sheet 1, Contact Creek

The area of sheet 1 comprises 82 line-km of survey. Resistivities vary from in excess of 1000 ohm-m to less than 3 ohm-m. The area is quite active magnetically. The enhanced

magnetic map shows a number of features which are not evident on the standard total field magnetic map.

Group 1

The EM anomalies of this grouping reflect a long conductive zone which is generally non-magnetic. However, magnetic activity occurs locally within the zone, and one isolated EM anomaly (114B*) has a direct magnetic correlation of 30 gammas as can best be seen on the enhanced magnetic map. The conductive zone is quite broad and, therefore, is better defined on the resistivity map than on the EM map. A locally thick conductive section occurs at 103A.

Group 2 and 3

A number of weak responses occurs within these two groupings. The conductivity distributions are better defined on the resistivity map.

*This designation refers to anomaly B on line 114

Group 4

A very attractive conductive target is contained within Group 4. The conductor appears to consist of a broad mass of conductive material which is locally magnetic (102E) and has locally thick sections (104D). The resistivity map and both magnetic maps suggest that group 3 could represent a weak extension of group 4.

The northeast quadrant of the resistivity map illustrates that this portion of the survey area comprises widespread but weakly conductive materials. The difference channels (33, 34) show that some heterogeneity occurs within this area, i.e., the conductive material is not uniformly flat-lying conductive overburden. Thus, 109E and 114G are believed to be bedrock conductors. Much of the conductivity, however, probably reflects conductive surface material.

Sheet 2, Circular Feature

The area of sheet 2 consists of 90 line-km of survey.

Resistivities are generally in excess of 1000 ohm-m, with the lowest values of about 20 ohm-m occurring in the eastern

section. The area is quite active magnetically, but there appears to be no direct correlation between magnetic highs and resistivity lows.

The EM anomalies to the east (e.g., 8B-13xF, 12C, 12D, etc.), and the associated resistivity low, represent bedrock conductors. This is indicated by the large depth estimates of channel 41.

The areally large resistivity low to the west may be caused by surficial conductivity. The depth estimates of channel 41 are slightly positive, suggesting a bedrock source, but heavy tree cover could have produced this result.

The anomaly of 15A probably has a bedrock source. The resistivity map shows that this conductor extends southwards to the survey boundary.

Sheet 3, St. Dizier

The area of sheet 3 comprises 161 line-km of survey. The resistivity of the geologic environment is typically higher than 700 ohm-m, but values as low as 10 ohm-m occur due to locally conductive bedrock and overburden features. The area is active magnetically. The concentration of magnetite at the southwest end of lines 226 to 229 and 231 has produced a prominent, unusual magnetic anomaly of a dipolar character.

Group 1

The grade 1 to 5 anomalies of this grouping reflect a conductive zone which extends beyond the survey boundary. This zone appears to be quite broad. It is better portrayed by the resistivity map. Locally thick sections occur at 202C, 202D, and 203A.

Anomaly 201 I

A thin magnetic bedrock conductor is indicated by this grade 3 anomaly. The conductor may extend beyond the survey boundary.

Group 2

The grade 1 to 6 anomalies of this grouping reflect a system of mostly non-magnetic bedrock conductors. Conductor 215B appears to be thick.

Anomaly 219A-221A

A thin bedrock conductor is indicated by these grade 1 and 2 anomalies. The conductor may be magnetic.

Anomalies 220C, 221C

These grade 3 and 1 anomalies reflect a bedrock conductor or

conductors which may constitute a southeasterly extension of the group 2 conductors.

Group 3

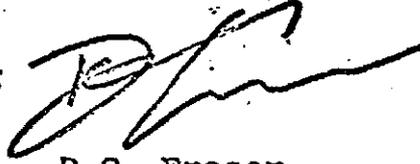
A system of thin, mostly magnetic conductors is indicated by the grade 1 to 3 anomalies of this grouping. It is of interest to note the influence of magnetite on EM inphase channels 22 and 24 at 227C and 228D. High concentration of magnetite resulted in negative EM responses and produced a strong magnetic feature of a bipolar character.

Sheet 4, Zeehan

The area of sheet 4 consists of 12 line-km of survey. The resistivity of the geologic environment varies from about 200 ohm-m to 1000 ohm-m. The low resistivity zone along the western part of line 401 correlates with a pair of weak conductors which may occur in the bedrock. Apart from these anomalies, no other EM responses were observed which would indicate the presence of bedrock conductors in the survey area.

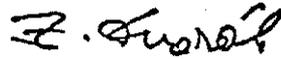
Respectfully submitted,

DIGHEM LIMITED



D.C. Fraser

President



Z. Dvorak

Geophysicist

Sixteen map sheets accompany this report:

Electromagnetics	4 map sheets
Resistivity	4 map sheets
Magnetics	4 map sheets
Enhanced magnetics	4 map sheets

A P P E N D I XTHE FLIGHT RECORD AND PATH RECOVERY

The flight record is a roll of chart paper containing the geophysical profiles. The profiles are generated by computer at a scale identical to the geophysical maps. The flight record contains up to 17 channels of information, as follows:

<u>Channel Number</u>	<u>Parameter</u>	<u>Scale units/mm</u>	<u>Noise</u>
20	magnetics	10 gamma	2 gamma
21	altitude	3 m	2 m
22	standard* coil-pair inphase	1 ppm	1-2 ppm
23	standard coil-pair quadrature	1 ppm	1-2 ppm
24	whaletail** coil-pair inphase	1 ppm	1-2 ppm
25	whaletail coil-pair quadrature	1 ppm	1-2 ppm
28	ambient noise monitor (standard receiver)	1 ppm	1-2 ppm
29	ambient noise monitor (whaletail receiver)	1 ppm	1-2 ppm
31	sums function inphase***	1 ppm	1-2 ppm
32	sums function quadrature***	1 ppm	1-2 ppm
33	difference function inphase	1 ppm	1-2 ppm
34	difference function quadrature	1 ppm	1-2 ppm
35	first anomaly recognition function	1 ppm	1-2 ppm
36	second anomaly recognition function	1 ppm	1-2 ppm
37	conductance	1 mho	
40	log resistivity	.03 decade	
41	apparent depth to conductive half space	3 m	

* coaxial

** horizontal coplanar

*** generally not plotted

The log resistivity scale of 0.03 decade/mm means that the resistivity changes by an order of magnitude in 33 mm. The resistivities at 0, 33, 67 and 100 mm up from the bottom of the chart are respectively 1, 10, 100 and 1000 ohm-m.

The fiducial marks on the flight record represent points on the ground which were recognized by the aircraft navigator. Continuous photographic coverage allowed accurate photo-path recovery locations for the fiducials, which were then plotted on the geophysical maps to provide the track of the aircraft.

The fiducial locations on both the flight records and flight path maps were examined by a computer for unusual helicopter speed changes. Such changes often denote an error in flight path recovery. The resulting flight path locations therefore reflect a more stringent checking than is provided by standard flight path recovery techniques.

The following brief description of DIGHEM^{II} illustrates the information content of the various profiles*.

The DIGHEM^{II} system has two transmitter coils which are mounted at right angles to each other. (The transmitted frequency is given in the Introduction.) Thus, the system provides two completely independent surveys at one pass. In addition, the flight chart profiles (generated by computer) include an inphase channel and a quadrature channel which essentially are free of the response of conductive overburden. Also, the EM channels may indicate whether the conductor is thin (e.g., less than 3 m), or has a substantial width (e.g., greater than 15 m). Further, the EM channels include a channel of resistivity and another of conductance. A minimum of 10 EM channels are provided. The DIGHEM^{II} system therefore gives information in one pass which cannot be obtained by any other airborne or ground EM technique.

*For a detailed description see D.C. Fraser; Geophysics, v.44, p.1367-1394.

Figure A1 shows a DIGHEM^{II} flight profile over the massive pyrrhotite ore body in Montcalm Township, Ontario. It will serve to identify the various channels.

The two upper channels (numbered 20 and 21) are respectively the magnetics and the radio altitude. Channels 22 and 23 are respectively the inphase and quadrature of the coaxial coil-pair, which is termed the standard coil-pair. This coil-pair is equivalent to the standard coil-pair of all inphase-quadrature airborne EM systems. Channels 24 and 25 are the inphase and quadrature of the additional coplanar coil-pair which is termed the whaletail coil-pair.

Channels 31 and 32 are inphase and quadrature sums functions of the standard and whaletail channels; they provide a condensed view of the four basic channels 22 to 25. The sums channels normally are not plotted.

Channels 33 and 34 are inphase and quadrature differences functions of the standard and whaletail channels. The differences channels are almost free from the response of conductive overburden. Channel 37 is the conductance. The conductance channel essentially is an automatic anomaly picker calibrated in conductance units of mhos; it is triggered by the anomaly recognition functions shown as channels 35 and 36.

Channel 40 is the resistivity, which is derived from the whaletail channels 24 and 25. The resistivity channel 40 yields data which can be contoured, and so the DIGHEM^{II} system yields a resistivity contour map in addition to an electromagnetic map, a magnetic contour map, and an enhanced magnetic contour map. The

enhanced magnetic contour map is similar to the filtered magnetic map discussed by Fraser.*

Figure A2 presents the DIGHEM^{II} results for a line flown perpendicularly to the Montcalm ore body. Channel 20 shows the 175 gamma magnetic anomaly caused by the massive pyrrhotite deposit. For the EM channels, the following points are of interest:

1. On channels 22-25 and 31-34, the ore body essentially yields only an inphase response. The quadrature response is almost completely caused by conductive overburden (which also gives a small inphase response). The hachures show the EM response from the overburden. The overburden response vanishes on the difference EM channels, as can be seen by comparing the quadrature channels 25 and 34. This is an important point to note because DIGHEM^{II} is the only EM system which provides an inphase channel and a quadrature channel which are essentially free of conductive overburden response.
2. The whaletail anomaly of channel 24 has a single peak. This shows that the conductor has a substantial width. If the width had been under 3 m, the conductor would have produced a weak m-shaped anomaly on channel 24.
3. The ore body yields a resistivity of 5 ohm-m in a background of about 200 ohm-m (cf. channel 40). A dipole-dipole ground resistivity survey with an a-spacing of 50 m showed a similar background, but the ore body gave a low of only 53 ohm-m

* Cdn. Inst. Mng., Bull., April 1974.

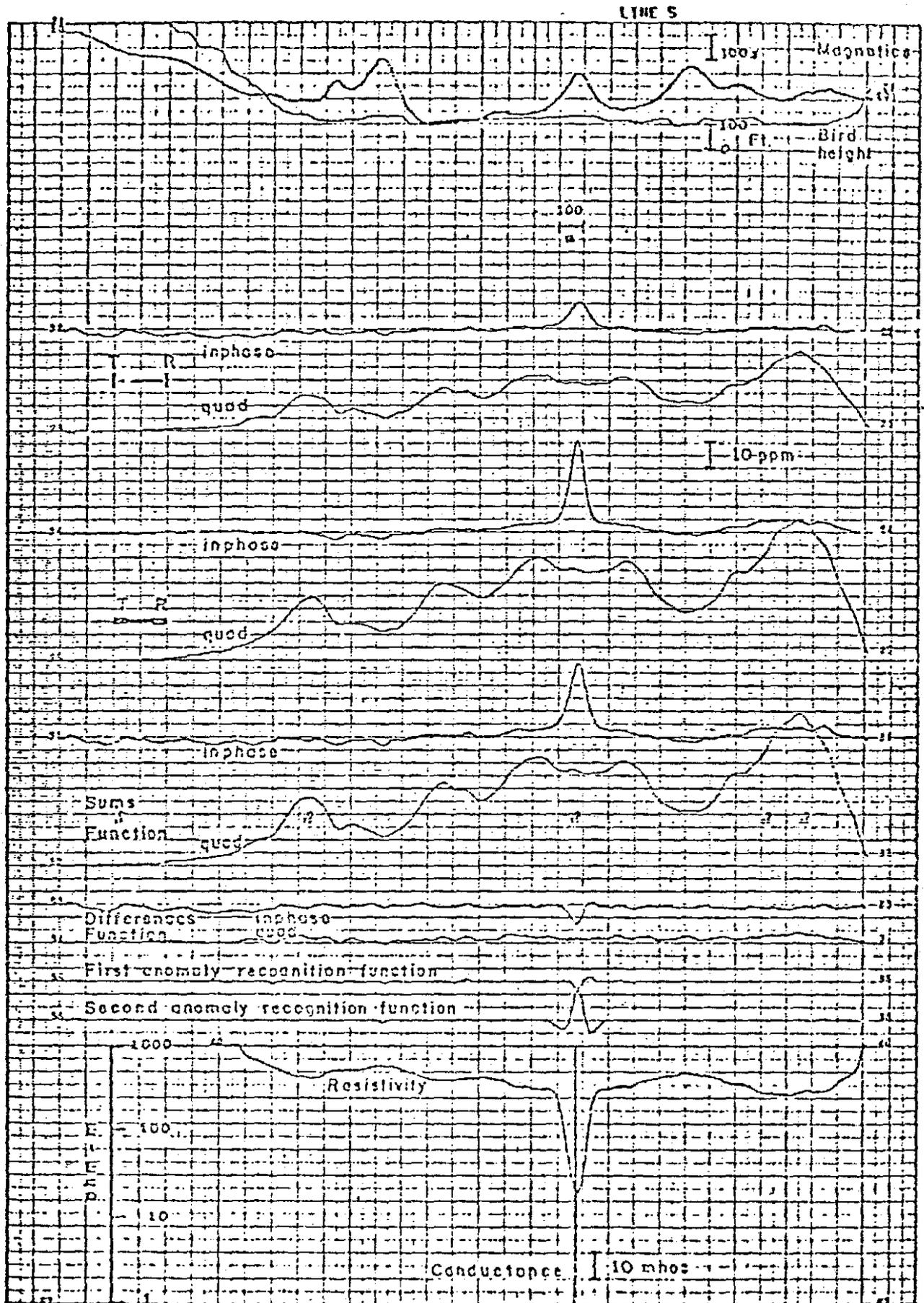


Fig. A1. Flight over Montcalm deposit, with line parallel to strike.

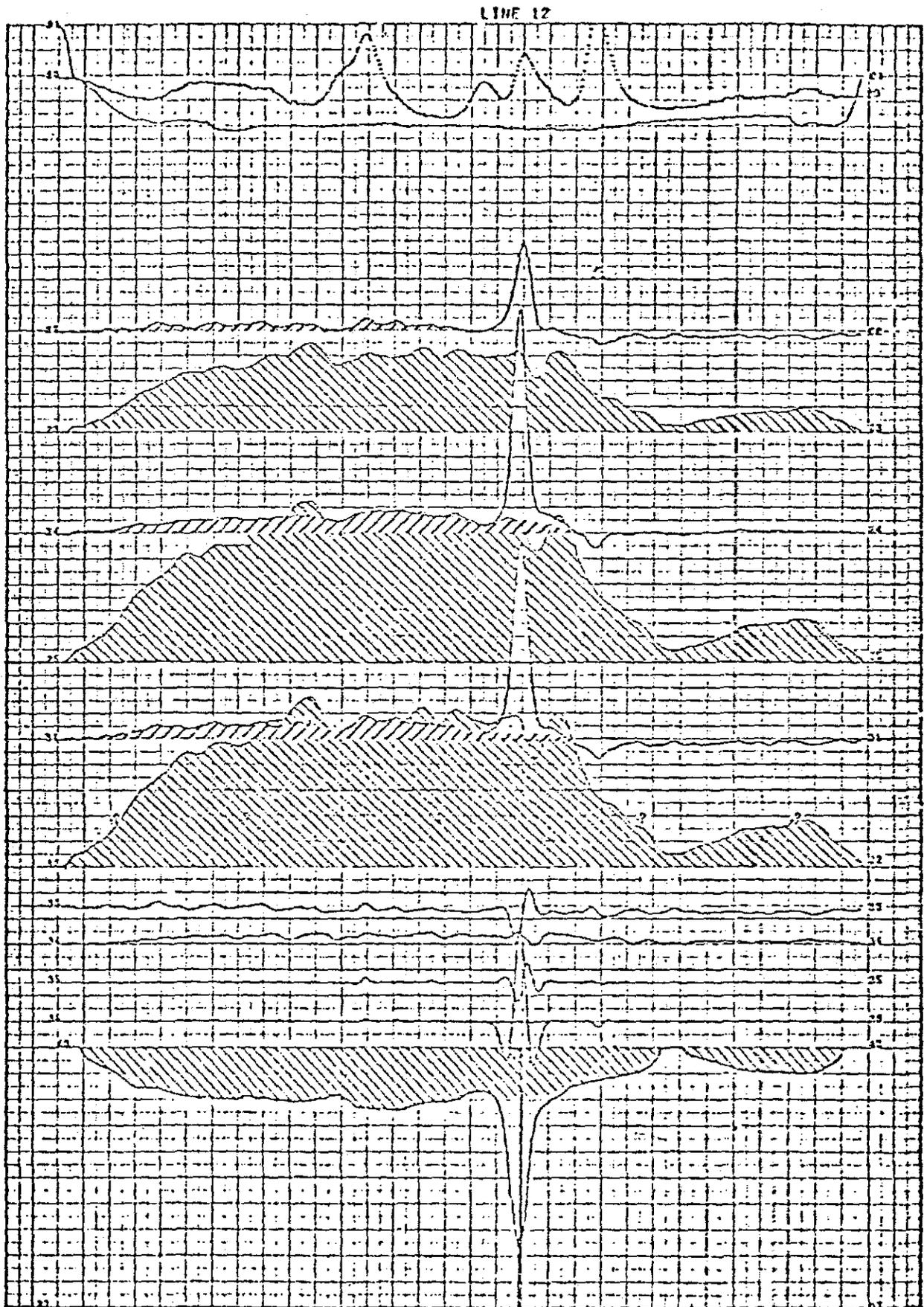


Fig. A2. Flight over Montcalm deposit, with line perpendicular to strike.

because of the averaging effect inherent in the ground technique.

4. The ore body has a conductance of 330 mhos according to its EM response on this particular flight line. The conductance channel 37 saturates at 100 mhos, and so the deposit is indicated by a 100-mho spike.

Figure A1 illustrates the DIGHEM^{II} results for a line flown subparallel to the ore body. The ore body anomaly is small on the standard coil-pair (channel 22) but shows up strongly on the whaletail coil-pair (channel 24).

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LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPT FEE
110C	2	2	3	2	8	179	2	610	55	45
112A	3	3	0	1	6	84	1	489	92	32
112B	2	4	3	3	4	174	1	503	138	31
112C	1	11	7	20	2	88	1	246	258	10
113A	0	5	1	2	1	9	1	375	1034	
113B	8	11	9	14	6	113	2	336	52	21
113C	4	3	4	4	8	176	2	521	48	39
113D	3	1	0	2	6	138	1	599	78	42
113E	3	3	2	3	5	234	1	589	94	41
114A	6	9	5	8	5	87	1	330	79	18
114B	4	4	5	3	9	115	2	464	40	33
114D	5	2	0	0	12	128	3	590	17	47
114E	3	3	2	5	3	185	1	493	156	30
114F	3	3	5	8	4	122	1	421	101	25
114G	8	16	20	33	5	55	1	225	60	11

* ESTIMATED 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 OVERBURDEN EFFECTS.

307-1 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPT FEE
101A	3	2	0	1	6	227	1	676	90	50
101B	11	8	17	8	17	111	4	375	12	29
102A	3	4	3	3	5	172	1	518	84	35
102B	11	7	13	10	14	173	3	440	16	35
102C	6	7	11	8	9	153	2	429	36	32
102D	17	18	46	30	16	137	4	328	12	25
102E	1	5	0	3	6	185	1	381	805	8
102F	3	5	2	5	3	93	1	377	167	19
102G	2	8	3	11	1	45	1	233	337	6
103A	12	14	22	21	9	64	2	273	27	18
103B	3	4	13	11	8	108	2	395	42	28
103D	14	14	23	18	12	131	3	347	20	26
103E	0	0	0	2	2	220	1	779	1034	0
104A	5	4	7	5	11	124	2	457	29	34
104C	1	3	9	6	6	204	1	532	76	37
104D	42	29	84	31	34	83	7	251	3	20
106A	3	5	3	5	3	156	1	432	165	25
107A	5	4	7	5	10	134	2	464	33	34
107B	1	5	4	5	2	141	1	418	226	22
109B	5	2	4	5	12	132	3	505	26	38
109E	3	11	6	15	2	84	1	271	181	13
109F	2	6	3	4	2	172	1	437	208	25
110A	1	6	1	4	1	94	1	340	568	10

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 LINE, OR BECAUSE OF A SHALLOW DIP OR OVERRURDEN EFFECTS.

307-2 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPT FEE
1B	5	4	0	2	6	191	2	553	71	40
2A	0	2	1	2	1	11	1	563	1034	0
2B	1	2	0	1	2	287	1	745	1016	23
3A	3	3	1	0	4	197	2	681	73	51
6A	2	3	1	4	2	116	1	443	219	232
8B	6	6	6	12	5	124	1	383	65	246
10A	1	0	2	0	39	380	1	771	82	592
10C	2	5	8	8	5	145	1	428	78	278
100	3	9	5	15	2	78	1	278	187	132
11A	5	3	9	6	15	174	3	506	17	406
12A	0	6	0	10	2	148	1	295	1034	0
12C	3	12	4	22	1	91	1	242	259	104
12D	8	15	24	39	6	104	2	276	49	169
12E	9	6	19	14	14	125	3	383	16	296
13A	1	5	1	9	1	73	1	281	536	82
14A	3	1	0	0	16	261	2	696	58	531
14C	0	7	0	12	1	84	1	247	1034	0
15A	3	2	3	7	5	90	1	421	92	255

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307-2 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
16A	0	5	0	5	1	108	1	344	1034	0

- * ESTIMATED 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 OVERRURDEN EFFECTS. .

307-3 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
201A	4	4	4	5	5	147	1	459	76	307
201B	2	2	2	1	6	289	2	781	63	614
201C	1	2	6	5	5	162	1	509	97	338
201D	3	1	3	3	8	112	2	540	46	393
201E	3	5	5	6	5	8	1	291	91	133
201F	15	11	41	19	24	0	5	194	6	131
201G	5	4	0	0	7	201	2	583	65	437
201H	7	1	1	1	8	86	7	545	5	468
201I	9	5	7	9	11	115	3	404	26	300
202A	3	4	8	7	6	77	2	388	63	248
202C	10	7	22	16	14	38	3	283	16	197
202D	16	5	33	9	56	92	10	333	2	282
202E	12	24	10	32	4	27	1	182	76	74
202F	0	3	0	0	1	87	1	577	1034	0
203A	7	25	15	53	3	45	1	172	115	68
203B	0	5	0	0	2	78	1	397	1034	0
205A	2	13	5	25	1	30	1	167	301	35
205B	0	5	0	0	1	1	1	446	1034	0
206A	3	5	0	1	6	124	1	469	162	277
208A	3	0	0	0	15	338	2	770	68	598
209A	2	2	0	3	5	246	1	614	168	401
209B	3	4	1	2	4	138	1	482	120	298
210A	2	4	0	0	6	182	1	498	377	244
211B	3	2	2	2	8	262	2	719	30	589

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 LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

307-3 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
211C	1	5	1	3	1	146	1	409	522	168
211D	6	4	4	6	8	168	2	483	40	364
212A	0	4	0	1	1	5	1	447	1034	0
212B	1	6	1	4	1	57	1	291	521	74
212C	5	3	7	4	13	213	3	563	22	453
212D	2	1	0	1	6	296	1	772	101	588
212E	8	3	10	1	50	215	9	545	3	483
213A	2	9	2	15	1	67	1	230	360	77
213C	2	3	0	2	3	229	1	530	294	307
213D	7	0	13	1	525	224	17	541	1	504
214A	4	2	0	2	8	211	2	632	53	482
214B	10	7	19	13	15	168	3	423	14	338
214C	4	3	1	2	6	224	1	588	73	438
214D	8	4	10	6	18	177	4	490	12	403
214E	2	4	1	4	2	162	1	450	241	253
215A	2	5	0	0	2	157	1	458	424	215
215B	6	5	12	9	11	141	2	430	27	325
215C	4	1	2	2	19	233	4	671	14	561
215D	2	3	1	2	3	183	1	512	220	299
215E	1	4	0	2	2	162	1	469	772	138
215F	2	8	0	5	1	101	1	305	560	106
216B	3	3	1	0	6	215	2	704	68	544
216D	5	10	5	13	3	104	1	317	113	174
216E	3	7	2	8	2	80	1	312	222	145
217A	1	10	1	13	1	62	1	196	835	28
217B	2	13	2	13	1	58	1	192	496	52
218A	3	2	1	1	5	169	2	628	71	466

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 OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT
 LINE, OR BECAUSE OF A SHALLOW DIP OR OVERRURDEN EFFECTS.

307-3 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
218B	5	8	3	10	4	91	1	325	109	174
218C	2	5	1	3	2	133	1	404	276	211
218D	3	14	4	19	1	17	1	164	288	26
219A	3	9	0	11	2	36	1	213	303	54
219C	1	12	2	20	1	28	1	128	732	0
219D	2	5	1	4	1	142	1	391	415	190
219E	3	5	2	7	3	137	1	393	189	218
219F	1	7	0	4	1	61	1	288	632	63
220A	14	24	16	45	5	0	1	134	58	33
220C	100	142	159	216	14	46	4	138	9	87
220D	2	10	2	7	1	67	1	259	334	92
220E	3	4	2	6	3	154	1	434	184	249
220F	2	7	3	16	1	116	1	299	321	138
220G	2	5	1	2	2	187	1	502	276	294
221A	7	15	15	22	5	60	1	246	65	128
221B	5	19	4	17	2	12	1	162	202	32
221C	12	43	5	43	2	0	1	104	120	6
221D	4	7	0	3	3	128	1	392	166	217
221E	2	8	1	7	1	59	1	250	418	76
222A	1	8	1	9	1	60	1	236	817	39
222B	4	35	6	47	1	20	1	111	247	15
222C	62	99	64	116	9	41	3	146	17	82
222D	21	71	44	111	5	10	1	111	49	37
222E	77	78	56	73	15	53	4	177	10	121
222G	4	0	1	1	16	230	3	688	21	568
222I	1	11	1	10	1	42	1	189	674	32
223A	21	40	12	37	5	42	2	181	51	88
223B	11	23	4	19	3	60	1	223	97	108
223C	1	11	0	0	1	25	1	223	718	11

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 OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT
 LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

307-3 ABERFOYLE TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
224A	11	29	11	37	3	24	1	161	97	58
224B	1	7	1	8	1	50	1	251	629	49
225A	0	4	1	5	1	53	1	387	1034	0
225B	14	28	8	32	4	21	1	170	77	65
2250	5	0	0	0	15	199	4	653	13	544
226A	18	48	22	64	4	30	1	148	63	62
226B	1	2	0	0	3	192	1	666	516	271
227C	4	73	14	76	1	0	1	36	191	0
227D	3	4	0	0	6	156	1	516	139	313
228D	16	99	28	136	2	9	1	83	83	12
228E	4	2	1	1	6	132	2	630	29	501
230A	1	18	2	22	1	22	1	94	727	0
231A	0	4	0	2	2	171	1	478	1034	0
240A	2	10	1	8	1	27	1	179	549	23
240B	1	11	1	10	1	40	1	183	772	17

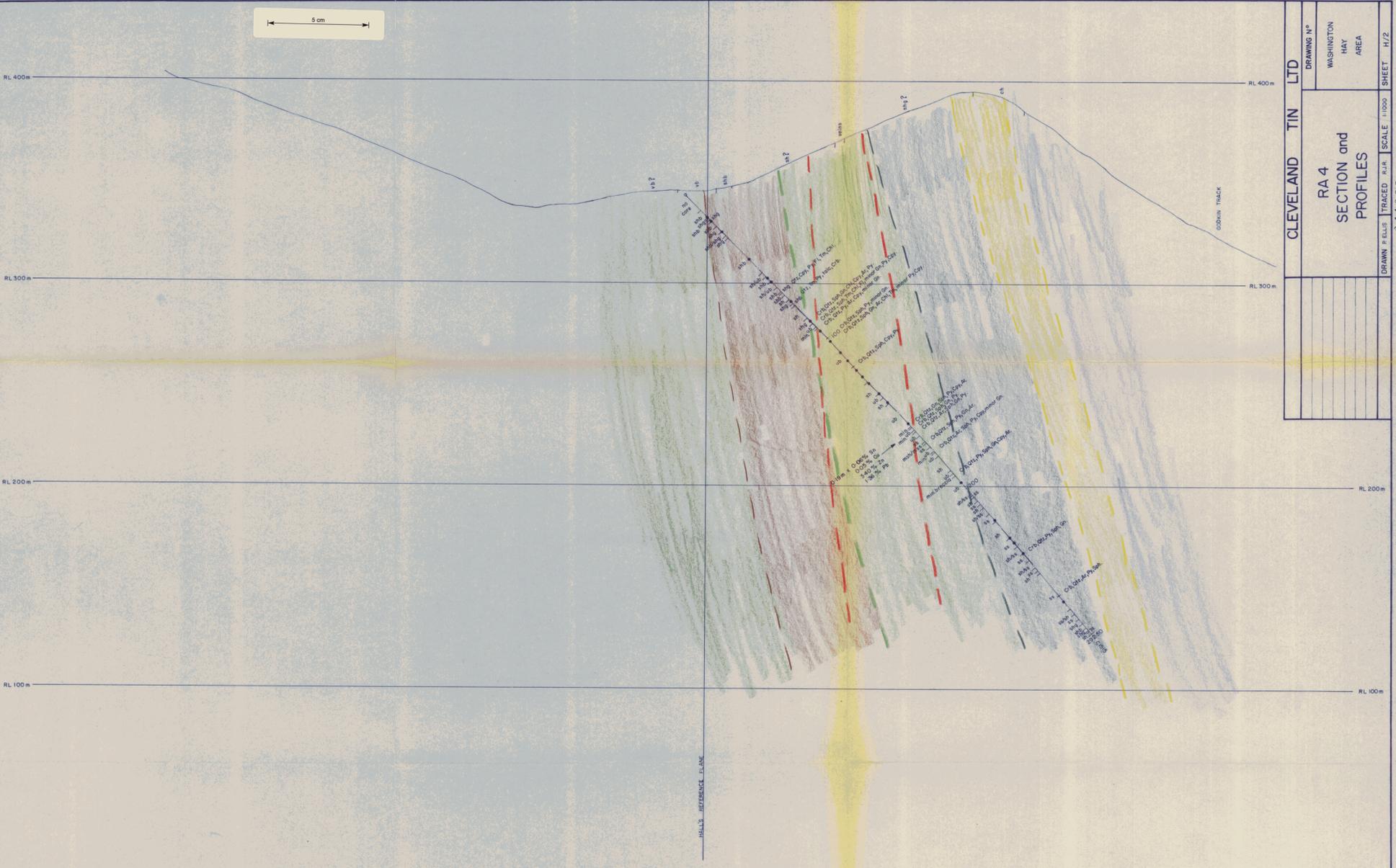
* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART
 OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT
 LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

307-4 ABERFOYLE, TASMANIA APR/80

LINE & ANOMALY	STANDARD COIL		WHALETAIL COIL		VERTICAL DIKE		HORIZONTAL SHEET		CONDUCTIVE EARTH	
	REAL PPM	QUAD PPM	REAL PPM	QUAD PPM	COND MHOS	DEPTH* FEET	COND MHOS	DEPTH FEET	RESIS OHM-M	DEPTH FEET
401A	2	13	8	26	2	0	1	142	216	9
401B	6	19	10	37	2	13	1	156	135	40
401C	2	5	2	6	2	56	1	315	303	127
404A	8	7	6	7	9	38	2	318	34	211
405A	6	8	1	4	4	70	1	326	108	168

- * ESTIMATED 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 OVERBURDEN EFFECTS.

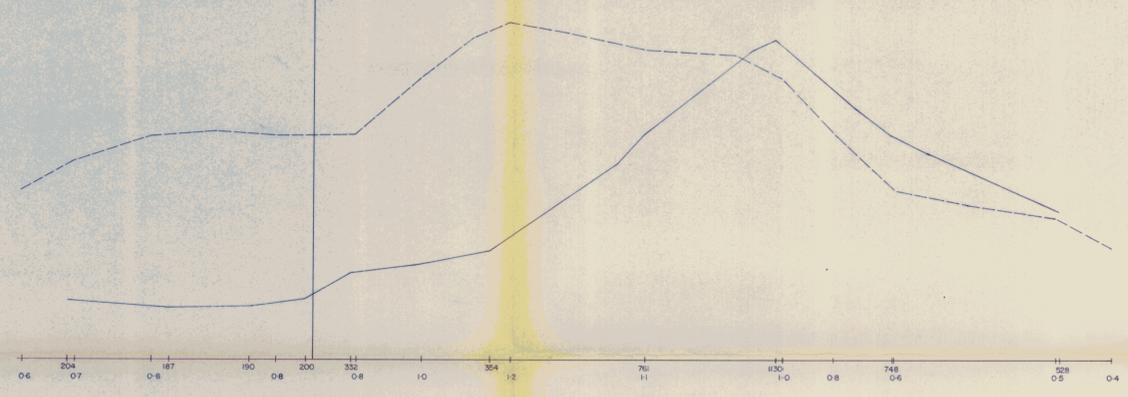
5 cm



CLEVELAND TIN LTD	
DRAWING N°	WASHINGTON HAY AREA
RA 4 SECTION and PROFILES	
DRAWN BY	FILED
TRACED BY	SCALE
PLA	1:1000
SC	1:15,85
SHEET	H/2

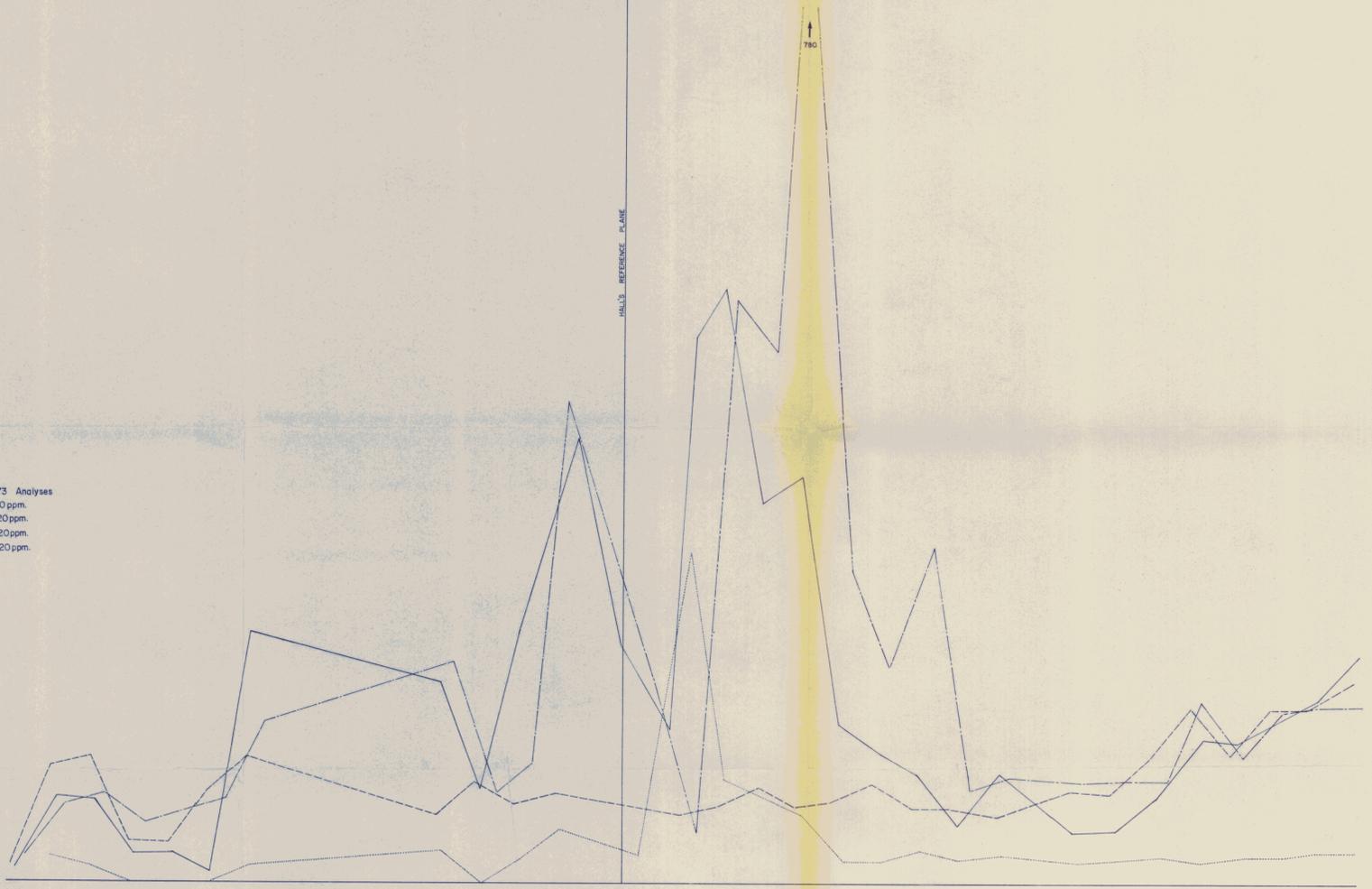
TOPOGRAPHY

— 204 - Apparent Resistivity - 1cm. = 100 Ohm-m.
 - - - 0.2 - Frequency Effect - 1cm. = 0.1 %



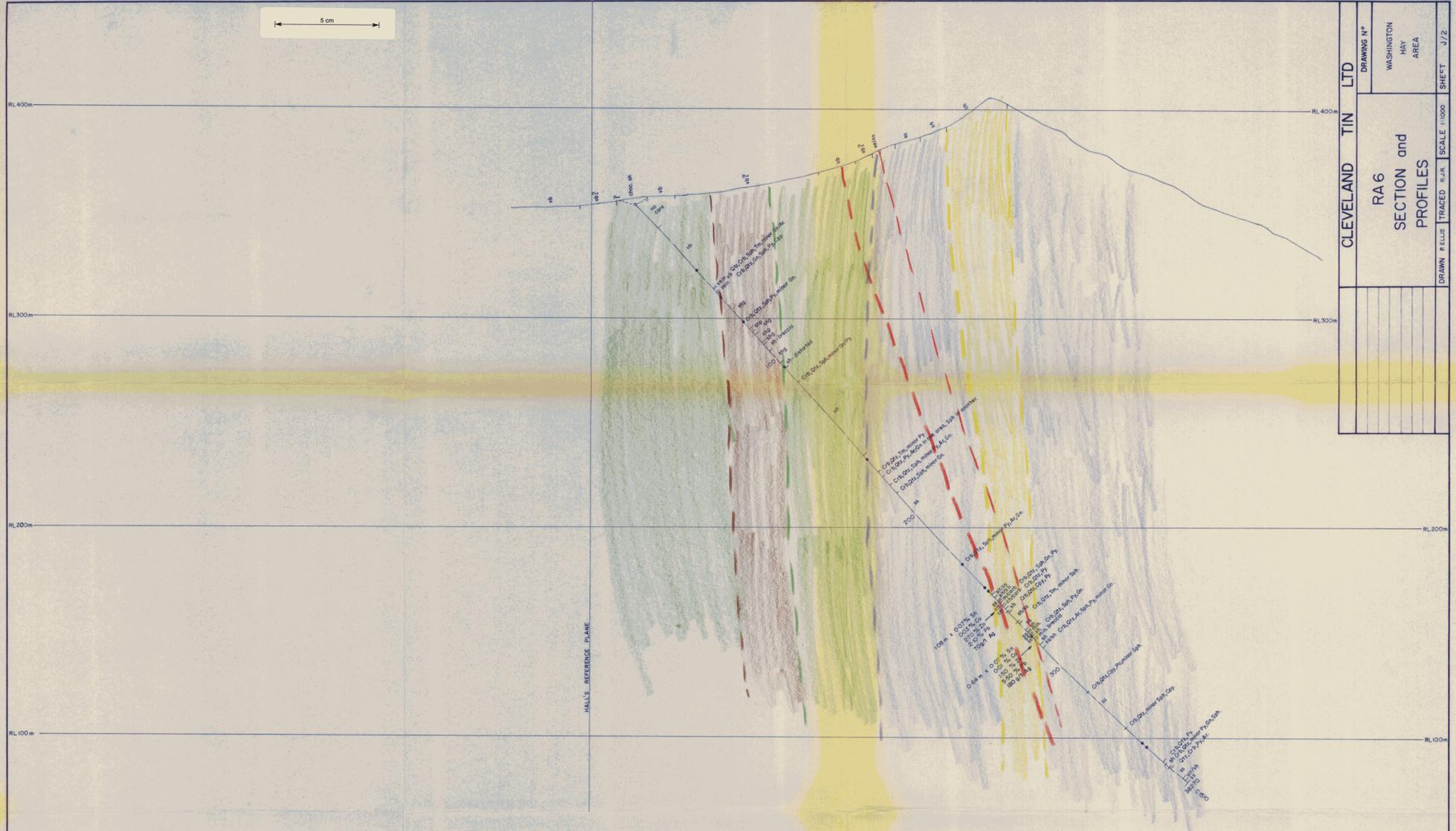
GEOPHYSICAL I.P.

Data = Pre 1973 Analyses
 Sn = 1cm. - 10 ppm.
 Cu = 1cm. - 20 ppm.
 Zn = 1cm. - 20 ppm.
 Pb = 1cm. - 20 ppm.



SOIL GEOCHEMISTRY

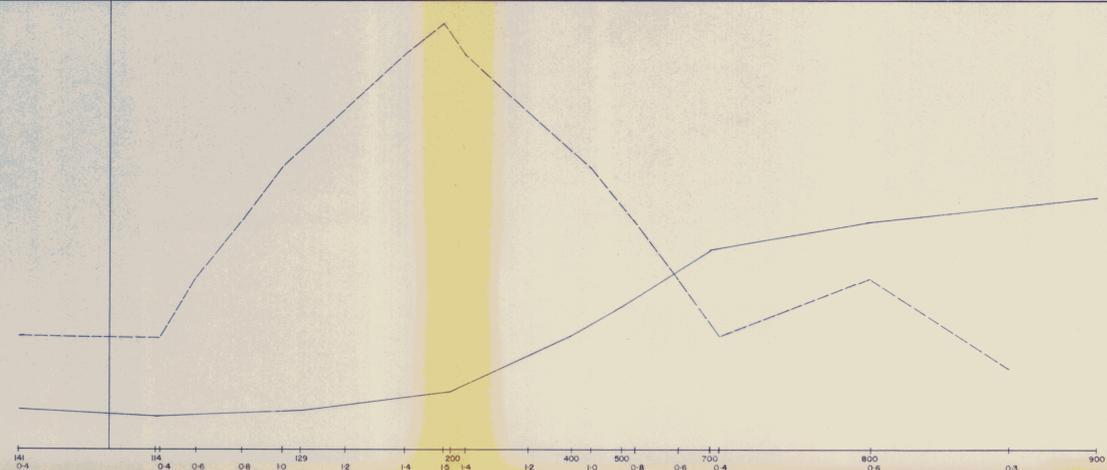
5 cm



CLEVELAND TIN LTD	
DRAWING N°	WASHINGTON HAY AREA
SECTION and PROFILES	
DRAWN BY	FILED
TRACED BY	SCALE
1:1000	1:1000
SHEET	3/2

TOPOGRAPHY

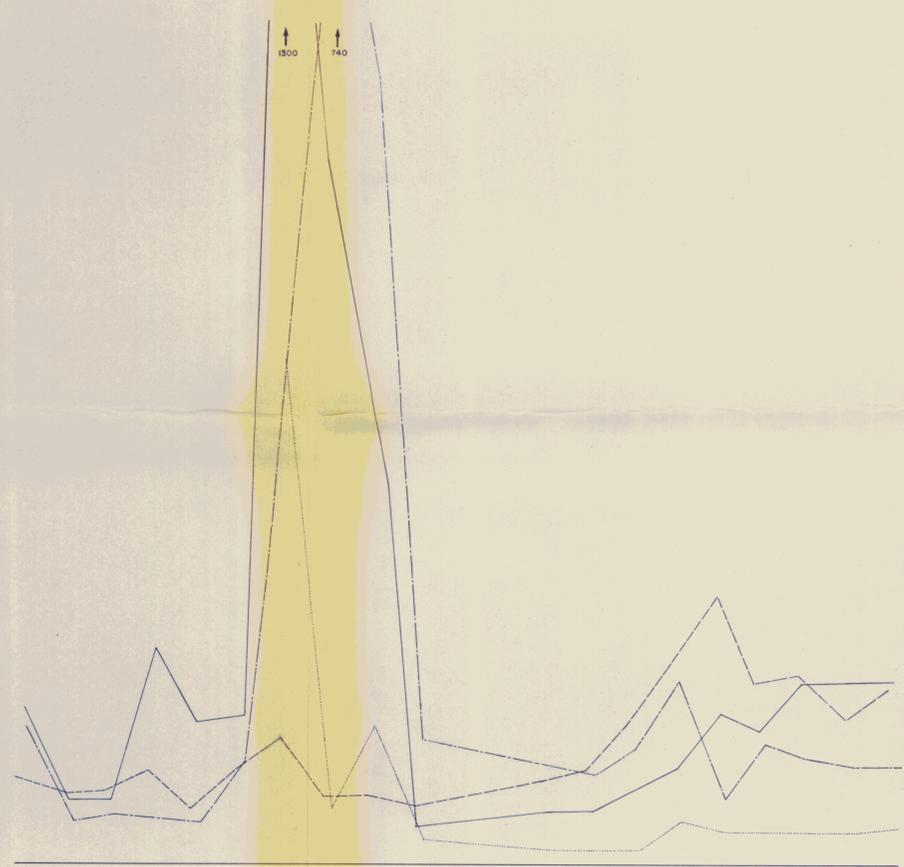
— 200 Apparent Resistivity - lcm = 100 Ohm-m
 - - - 0.2 Frequency Effect - lcm = 0.1%



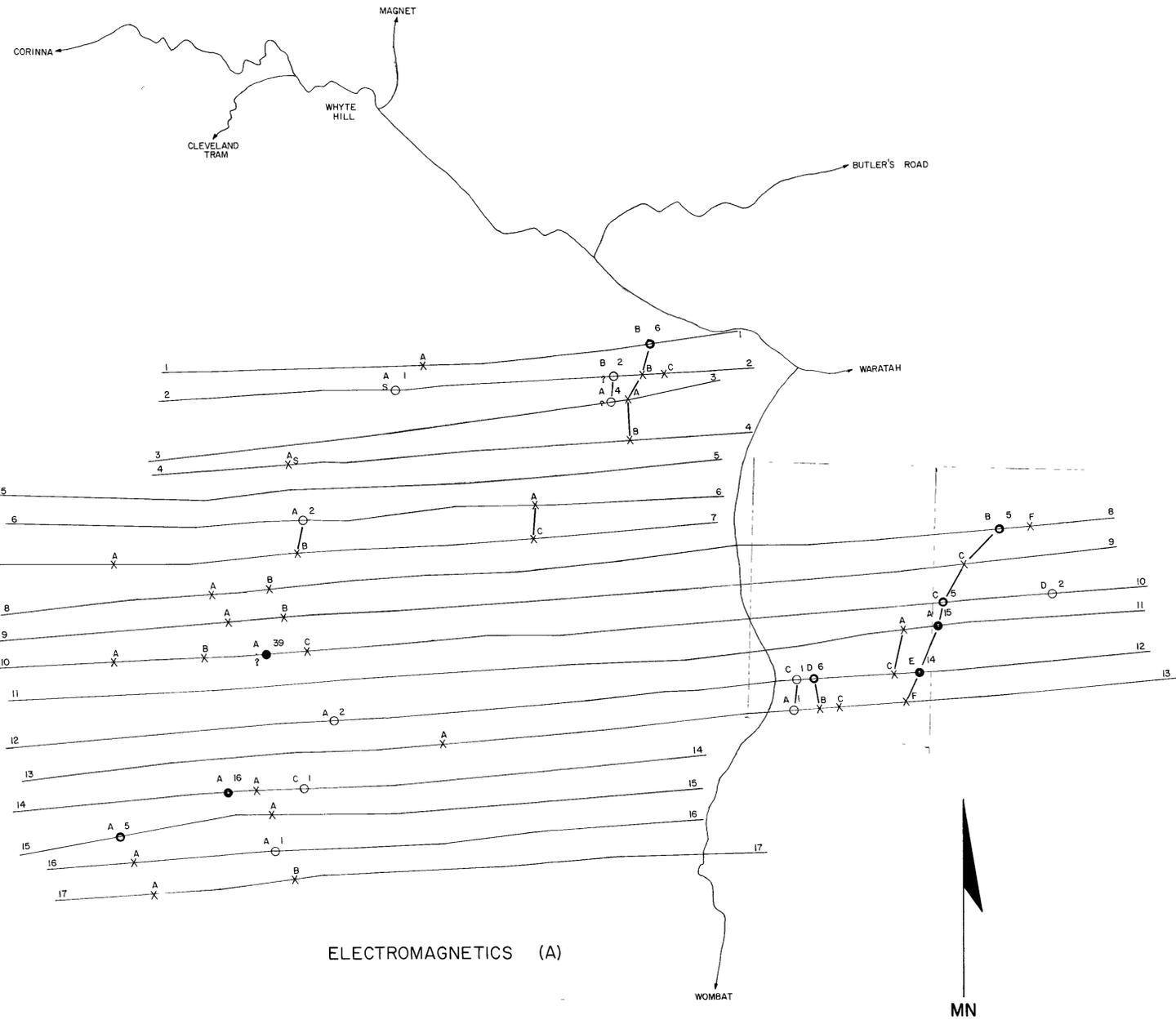
GEOPHYSICAL I.P.

HALL'S REFERENCE PLANE

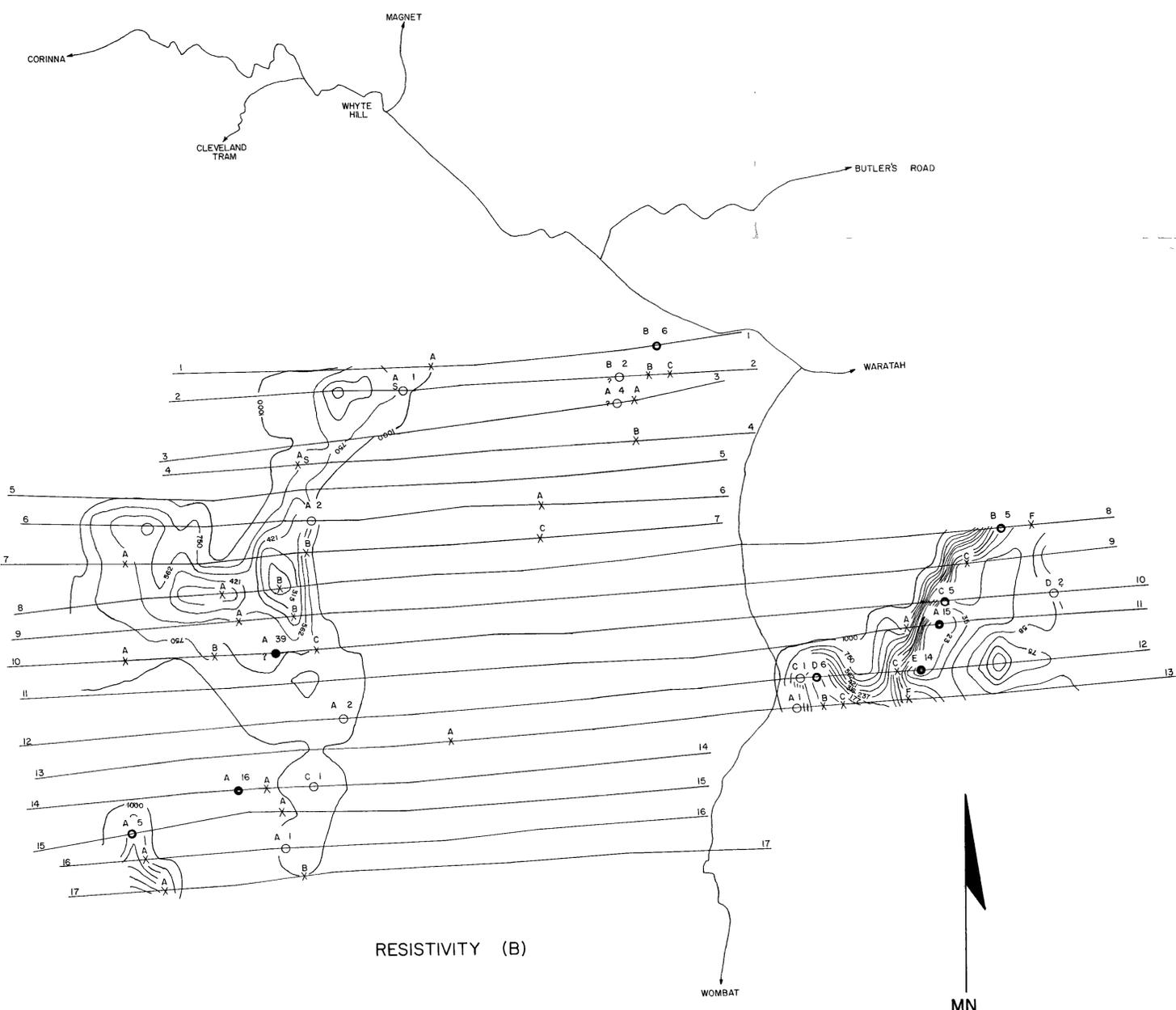
Data = Pre 1973 Analyses
 Sn = lcm = 10ppm
 - - - - - Cu = lcm = 20ppm
 ——— Zn = lcm = 20ppm
 ——— Pb = lcm = 20ppm



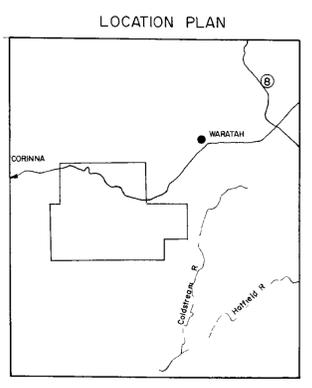
SOIL GEOCHEMISTRY



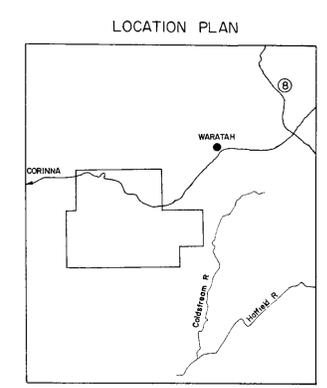
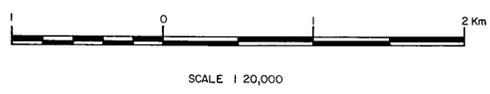
ELECTROMAGNETICS (A)



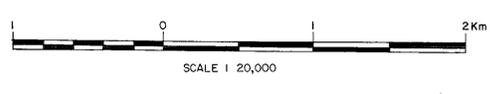
RESISTIVITY (B)



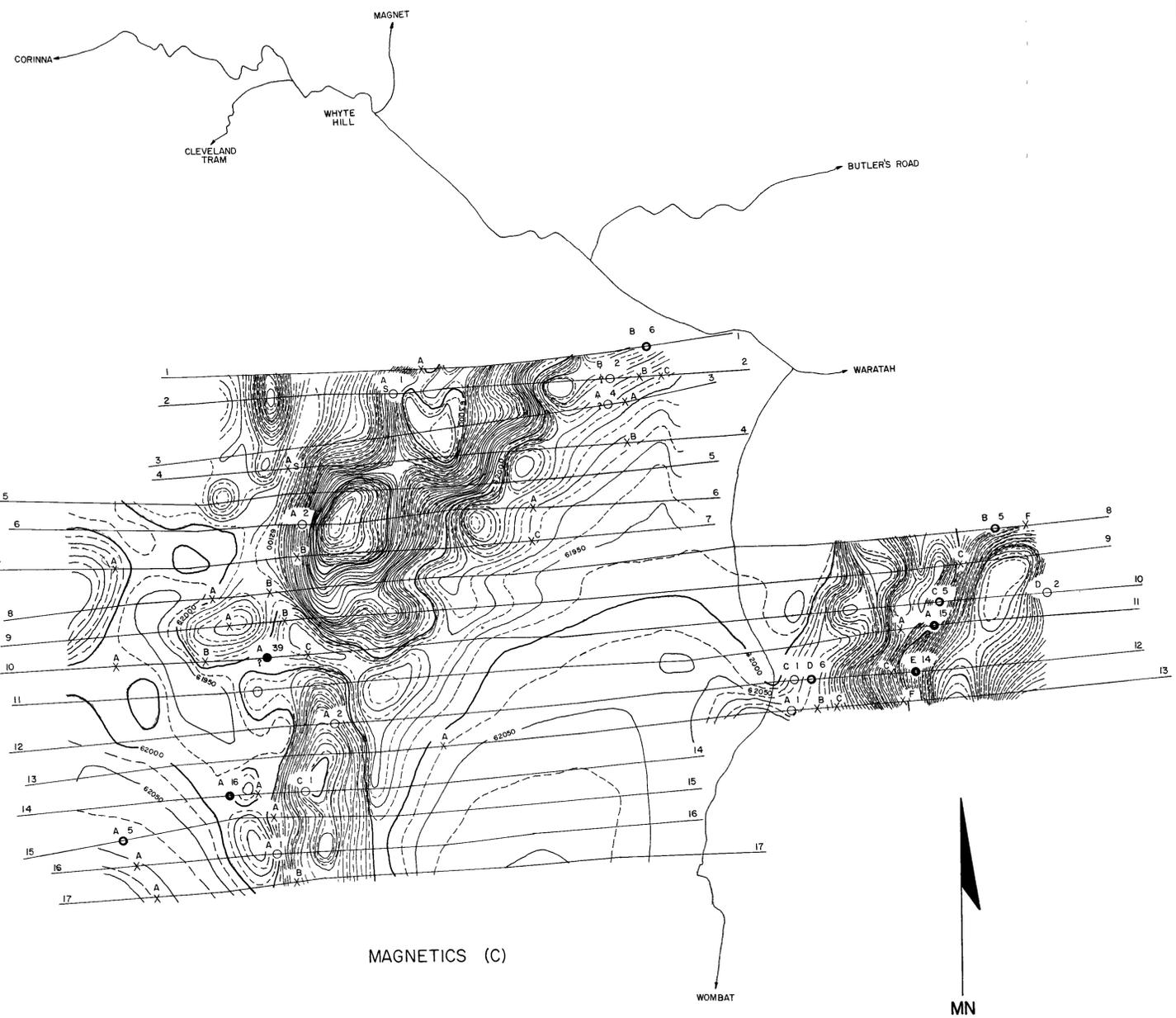
LEGEND			
ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE	INPHASE AND QUADRATURE OF STANDARD COIL
4	●	20 - 49	5 ppm
3	●	10 - 19	10 ppm
2	○	5 - 9	15 ppm
1	○	< 4	20 ppm
	X	Possible Conductor	
SYMBOL	DEPTH, GREATER THAN		
	50 feet	Conductor Axis	
	100 feet	S Surface Response	
	150 feet		
	200 feet	? Questionable Anomaly	
EXAMPLE			
Identifier	→ C	38 MHO value	→ Inphase
Depth	→ 100	→ Quadrature	(of standard coil)



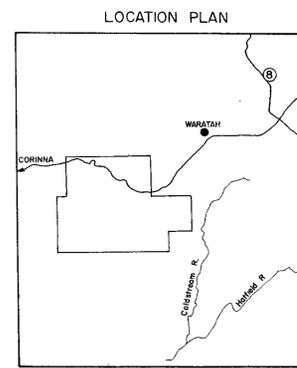
LEGEND			
ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE	INPHASE AND QUADRATURE OF STANDARD COIL
4	●	20 - 49	5 ppm
3	●	10 - 19	10 ppm
2	○	5 - 9	15 ppm
1	○	< 4	20 ppm
	X	Possible Conductor	
SYMBOL	DEPTH, GREATER THAN		
	50 feet	S Surface Response	
	100 feet	? Questionable Anomaly	
	150 feet		
	200 feet	CONTOURS	
		100	—
		75	—
		56	—
		42	—
		31	—
		23	—
		13	—
		10	—
NOTES			
Contours in ohm-m at eight intervals per decade			
The numbers face in the direction of increasing value			



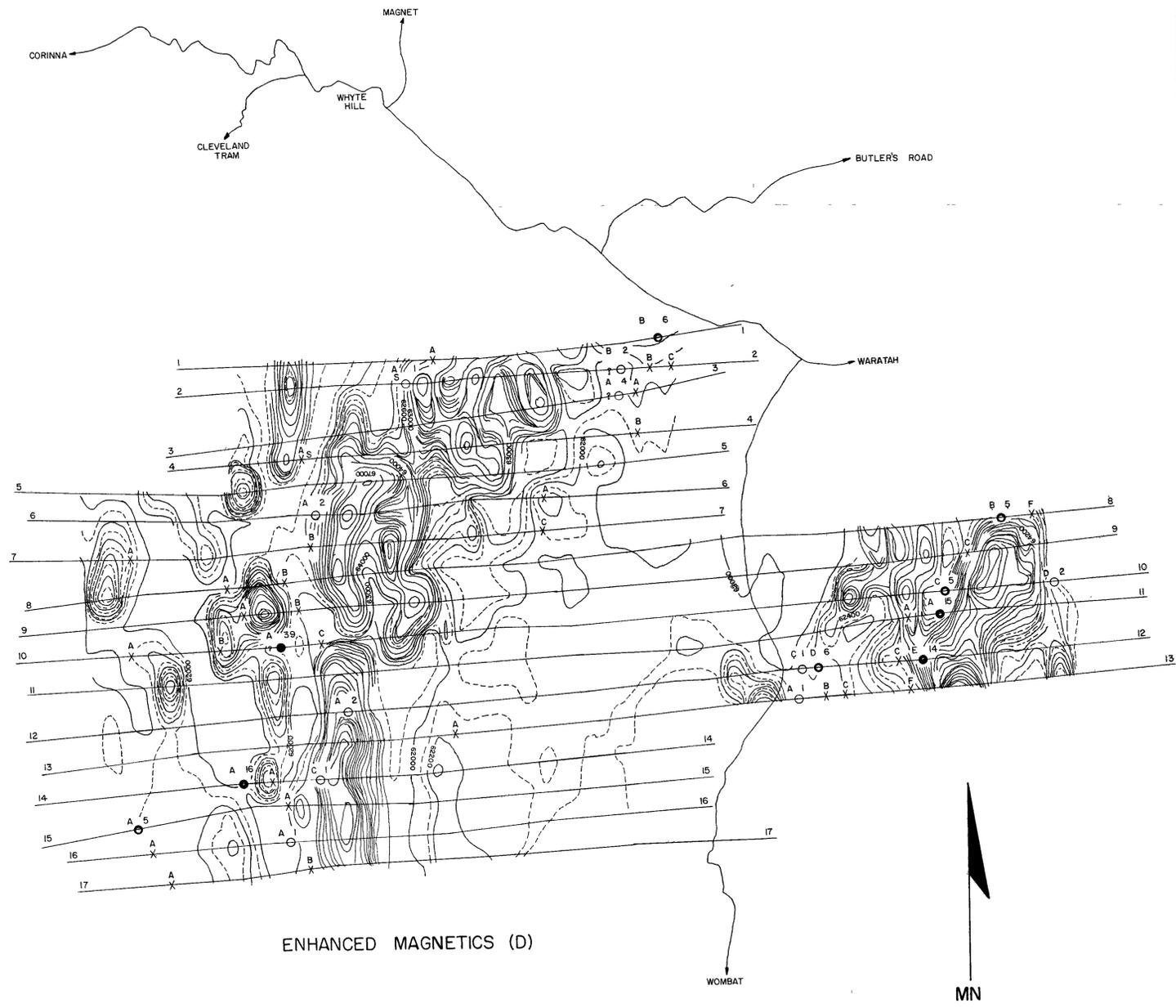
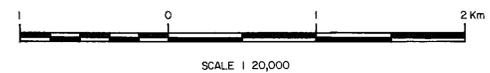
DRAWN RJR		TRACED	SCALE 1 20 000	SHEET 05-A-B-B
CLEVELAND TIN LTD				DRAWING N°
DIGHEM SURVEY				
EL 1/63 1980				



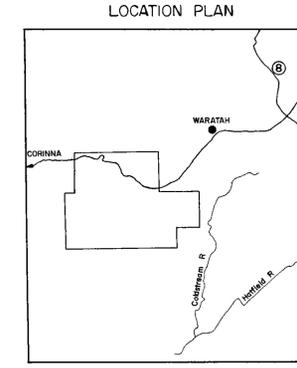
MAGNETICS (C)



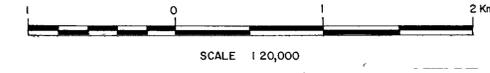
LEGEND			
ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE	INPHASE AND QUADRATURE OF STANDARD COIL
4	●	20-49	5 ppm
3	●	10-19	10 ppm
2	○	5-9	15 ppm
1	○	< 4	20 ppm
	X	Possible Conductor	
	S	Surface Response	
	?	Questionable Anomaly	
		ISOMAGNETIC LINES	
		5000	1000 gammas
		1000	100 gammas
		500	50 gammas
		200	25 gammas



ENHANCED MAGNETICS (D)



LEGEND			
ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE	INPHASE AND QUADRATURE OF STANDARD COIL
4	●	20-49	5 ppm
3	●	10-19	10 ppm
2	○	5-9	15 ppm
1	○	< 4	20 ppm
	X	Possible Conductor	
	S	Surface Response	
	?	Questionable Anomaly	
		ISOMAGNETIC LINES	
		5000	1000 gammas
		1000	100 gammas
		500	50 gammas
		200	25 gammas



DRAWING NO		CLEVELAND TIN LTD	
		DIGHEM SURVEY	
SCALE 1:20,000		EL 1/63 1980	
		041085	
DRAWN RJR	TRACED	SCALE 1:20,000	SHEET DS-C&D