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REPORT ON  
 CONDUCTIVITY, SUSCEPTIBILITY, CHARGEABILITY  
 AND RESISTIVITY TESTS OF DIAMOND DRILL CORE  
 ON BEHALF OF  
 THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

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PRIVATE AND CONFIDENTIAL

REPORT ON  
CONDUCTIVITY, SUSCEPTIBILITY, CHARGEABILITY  
AND RESISTIVITY TESTS OF DIAMOND DRILL CORE  
ON BEHALF OF  
THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED.

BY

A. W. HOWLAND-ROSE  
M. Sc., DIC, AMAusIMM, FGS.  
GEOPHYSICIST

SYDNEY, N.S.W.

NOVEMBER, 1972

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S U M M A R Y

Diamond drill core samples were tested for conductivity and susceptibility from both the Selina and Cape Horn areas at Mt. Lyell. With one exception, significant conductivity width products were obtained only where significant copper mineralisation was recorded. However, not all significant copper intersections gave good conductivity width products.

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INTRODUCTION

At the request of Mr. K. Read, Chief Geologist, of The Mount Lyell Mining and Railway Company Limited, Seigel Associates Australasia Pty. Ltd., undertook conductivity and susceptibility tests on some 277 core samples and DC resistivity and chargeability tests on some 8 samples. These tests were executed by Mr. B. Turesson of the staff of Seigel Associates Australasia Pty. Ltd. on the 30th and 31st October, 1972, using a Scintrex CTU-2 core test unit.

The object of the survey was to ascertain the geophysical properties of selected host rock and ore samples from the Mt. Lyell orebodies in order that electrical and magnetic geophysical methods can be meaningfully employed in the search for extensions and duplications of these deposits, both in the immediate mine vicinity and in similar environments elsewhere.

The methods used are briefly described in Appendix 'CT'.

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DISCUSSION OF RESULTS

Table I presents the electromagnetic conductivity and susceptibility data together with an estimate of the total magnetite content in % by volume.

Some comments on the significance of the order of magnitude of the results are required at this stage. Normal rock types devoid of sulphide content show negligible conductivity. Background conductivities of the order of 0.1 to 0.6 mhos/meter can be considered to be high as a background, but very low as far as electromagnetic conductivities are concerned. Conductivities of 10 mhos/meter are normally considered high and conductivities above 100 mhos/meter are extremely rare. In the present circumstances any value above 5 to 10 mhos/meter can be considered significant. The response parameter in electromagnetics is the conductivity of the unit times the width of this conductor, (referred to as the conductivity width product). The conductor requires depth and strike extent in addition to a high conductivity width product in order to give rise to a surface response of significance. As with all methods, contrast with background is of course important.

*— in case of a surface*

The results are described below by areas and drill hole.

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A - CAPE HORN OREBODY

CH71: (No detailed geological log available). Unfortunately no conductivity measurements were possible of this core due to the large diameter. Minor amounts of magnetite were recorded at intervals throughout the core.

CH86: (No detailed geological log available). Very weak conductivities of less than 0.6 mhos/meter down to 0.1 mhos/meter. There is generally a decrease in conductivity down hole. Minor amounts of magnetite were observed from 691 feet to 740 feet and 915 feet to 920 feet.

CH64: Generally low background conductivities as for CH86. Pyrite-chalcopyrite mineralisation at 305 feet and 325 feet yielded a significant increase in conductivity to 1.6 mhos/meter. At 360 feet good conductivity of 31 mhos/meter was recorded with approximately 0.6% magnetite. This hole is generally conductive and shows increased conductivity in the vicinity of the known mineralisation, but not as significant as over a similar intersection in hole CH76 discussed below.

CH80: The background conductivity in this hole is weak and is somewhat less than in the previous holes, being from 0.1 mhos/meter to 0.28 mhos/meter. The higher conductivity reading indicates minor increased conductivity. Negligible

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magnetite was recorded throughout. There is no increase in conductivity through the ore zone between 135 feet and 160 feet, nor was there any significant magnetite content.

CH76: Background conductivities averaged 0.25 to 0.35 mhos/meter over the interval sampled. Strong conductivities were recorded between 80 feet and 105 feet together with an estimated magnetite content ranging from 0.5 to 1.4%, which lies within the ore zone. This zone would exhibit surface Turam or Turair anomalies having a conductivity width product of the order of 300 mhos which can be considered to be high by normal standards. It should be noted that the conductivity is 100 times as great over the 25 feet above, and that the cut-off is remarkably sharp considering the gradual change in copper and iron sulphide assays through this zone.

A very high pyrite content of 7.8% at 170 feet produced a very low conductivity value of only 0.14 mhos/meter, where the chalcopyrite content was  $\frac{1}{2}\%$ , whereas 190 feet where the chalcopyrite reaches 1.2% and the pyrite falls to 2.7%, the conductivity reaches just under 30 mhos/meter, a 100 fold increase. A true width of some 5 meters of this conductivity would give a high surface conductivity width product of 150 mhos.

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B - SELINA

LS-3: The rocks intersected in this hole show no conductivity background. This rock is highly resistive. Only between 740 feet and 780 feet was any material conduction recorded. The conductivities of 3 to 6 mhos/meter over the 12 meters would yield a surface conductivity width product of the order of 60 mhos. An estimated  $\frac{1}{4}$  to  $\frac{1}{2}$ % magnetite was also recorded over this zone. As no assay figures are available from this zone it is suggested that it be carefully re-examined for the presence of sulphides.

The very weak mineralisation in this hole yielded no material conduction, not even at 270 feet to 290 feet where 1 - 2% pyrite was recorded.

No. 4: Very low to negligible background conductivity values were recorded in this hole. Excellent conductivity values were recorded at 440 feet and 480 feet, with good conductivity at 460 feet, 520 feet and perhaps 500 feet. The magnetite content over this zone ranged between trace amounts to over 3% at 480 feet. At surface these conductivity values would yield a Turam and Turair conductor having a conductivity width product of the order of 40 mhos or so. Only minor copper mineralisation was recorded over this zone. It is interesting to note that very high pyrite contents of 5 to 20% recorded between 660 feet and 980 feet show negligible to low conductivity throughout. This is a most

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unexpected result and must indicate that the pyrite grains are insulated by non-conductive minerals and the zone is therefore not electrically continuous.

At 1020 feet and 1040 feet, a 100 fold increase in conductivity occurred together with an increase in susceptibility to as high as  $1500 \times 10^{-6}$ . The latter infers a magnetite content of  $\frac{1}{4}\%$  to  $\frac{2}{3}\%$  by volume between 1000 feet and 1040 feet.

The conductivity cut-off is sharp. The assay of 1025 feet shows an increase in copper at this point. This zone would give a surface conductor having a conductivity width of the order of 40 to 80 mhos.

Table II presents the data from the DC resistivity and chargeability tests on drill hole CH86. As no detailed geological log is available, no comments can be made in detail. However, the high DC resistivity values should be noted. In addition, all chargeability results are anomalous.

It should be noted that the chargeability (induced polarization) response is related to the total area of the sulphides rather than the total volume. Finely disseminated material will give a much greater response by volume than a similar

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volume of coarse grained or massive sulphides. These results should be viewed in this light.

CONCLUSIONS

1. The conductivity tests of Cape Horn and Selina diamond drill core show that the former has a low conductivity background and the latter a more normal non-conductive background.
2. With the exception of Selina LS-3, all zones which would cause a significant response on the surface are associated with weak to strong copper mineralisation in the core.
3. Conduction does not appear to be directly related with either the chlorite or sericite at Cape Horn.
4. Even very high pyrite contents from 5% to 20% show practically no conduction whatsoever.
5. Copper mineralisation often appears to be accompanied by magnetite content.

In summary, the results suggest that the extensive pyrite development to even high concentrations of 5 to 20% does

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not produce significant conductivity, if any at all. However, the presence of significant copper mineralisation does produce very significant conduction. The prime example encountered is of course the 25 foot section between 80 feet and 105 feet in CH76 at Cape Horn compared with the response from high concentrations of pyrite over 300 feet in Selina No. 4.

*- sharp at  
in anom.?  
not in grade?*

What does appear certain however, is that there cannot be any direct relationship between total sulphide content and copper mineralisation as such, but the presence of significant copper does appear to cause electrical continuity. This section study should indicate the reason for this. It is suggested that the pyrite always occurs in disseminated, isolated form, and the chalcopyrite, where present, in effect causes electrical continuity by acting as conductor between the pyrite grains. The apparent material difference in characteristics indicates that the pyrite and chalcopyrite mineralisation probably took place at different stages. The fact that the chalcopyrite is rarely, if ever, found without the presence of pyrite is probably due to the host rocks being suitable for passage of the mineralising solutions.

RECOMMENDATIONS

1. Quite clearly, should the mineralisation located in CH76 between 80 feet and 105 feet be the type sought, a Turair-Turan method is, without a doubt, the ideal approach.

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However, a similar intersection in hole CH64 was not as conductive.

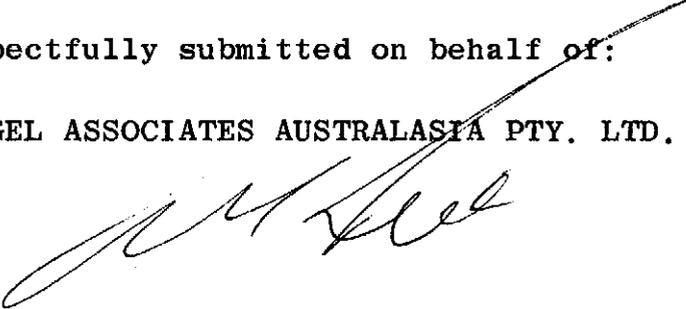
2. Should the mineralisation being sought be in the range of  $\frac{1}{4}\%$  to 1% chalcopyrite, it would appear that an electromagnetic approach is not justified.
  3. The recommended ground approach is to use a rapid reconnaissance, large spaced, three array induced polarization method, to define the areas carrying pyrite. As there is no correlation between the absolute pyrite content and the absolute chalcopyrite content, chargeable areas should then be surveyed using a Turam method without regard to the absolute values of chargeability. Thus the relatively narrow conductive zones characteristic of the chalcopyrite-carrying orebodies at Cape Horn can be resolved. It should perhaps be noted here that the electromagnetic method locates 'conductive areas' while induced polarization defined "disseminated volume". Thus Turam will define narrow conductive zones which will not be resolved by reconnaissance induced polarization.
- note - dipole why 2.22*

I look forward to being able to discuss these results in the near future.

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Respectfully submitted on behalf of:

SEIGEL ASSOCIATES AUSTRALASIA PTY. LTD.

  
A.W. HOWLAND-ROSE, M.Sc., DIC, AMAusIMM, FGS.

GEOPHYSICIST

TABLE I

## Notes:

∅ = negligible

# = less than 0.1%

Magnetite in % by volume

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE
<u>Drill Hole No. CH71</u>			
323'		34.1	#
333'		24.5	∅
343'	CORE SIZE TOO LARGE FOR CONDUCTIVITY MEASUREMENTS	29	∅
353'		19.5	∅
364'		115	#
375'		68	#
385'		10	∅
396'		10	∅
408.5'		58	#
418'		19	∅
427'		24.5	∅

%Cu %S<sub>2</sub>

N.A.

0-05 9.50

N.A.

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TABLE I

%blu %Gsz

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE
435.5'		24.5	Ø
448'		14.5	Ø
453.5'		29	Ø
463.5'		29	Ø
474'	CORE SIZE TOO LARGE FOR CONDUCTIVITY MEASUREMENTS	14.5	Ø
485'		24.5	Ø
494'		19.5	Ø
504'		330	0.23%
514'		39	#
524'		18	Ø
533'		15	Ø
543'		15	Ø
553'		245	0.18%
565'		135	0.11%
574'		74	#
585'		34	#
595'		49	#
605'		44	#
615'		10	Ø
625'		39	#
635'		44	#
644'		40	#
654'		34	#

N.A

0.18

0.11

4.05

4.29

6.57

3.21

2.45

2.45

0.98

0.59

1.35

1.15

TABLE I

%Cu %S<sub>2</sub>

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE		
Drill Hole No. CH86					
691'	0.20	<u>150</u>	0.12%	0.06	1.30
705'	0.31	24.5	∅	0.06	2.30
715'	0.47	19.5	∅	0.16	3.60
720'	0.38	19.5	∅	0.10	4.90
725'	0.38	30	#	0.96	10.50
730'	0.25	14.5	∅	0.20	7.90
734'	0.52	10	∅	0.12	8.80
740'	0.68	49	#	0.15	9.70
745'	0.35	5	∅	0.10	3.60
755'	0.41	5	∅	0.05	4.70
765'	0.25	5	∅	0.08	4.30
775'	0.57	8	∅	0.05	3.40
780'	0.59	5	∅	0.03	5.60
785'	0.41	5	∅	0.03	5.60
790'	0.47	∅	∅	0.02	6.20
800'	0.38	10	∅	0.06	9.40
810'	0.47	∅	∅	0.13	12.40
820'	0.59	∅	∅	0.06	4.50
830'	0.42	15	∅	0.23	4.70
840'	0.52	10	∅	0.07	3.90
850'	0.47	10	∅	0.18	8.80
855'	0.35	10	∅	0.02	3.40
858'	0.37	10	∅	0.10	3.00

TABLE I

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE	% Cu	% FeS <sub>2</sub>
870'	0.49	19.5	Ø	0.11	7.70
875'	0.15	19.5	Ø	0.22	5.80
880'	0.24	15	Ø	0.45	5.60
890'	0.37	10	Ø	0.28	10.30
900'	0.19	5	Ø	0.70	4.50
906'	0.25	10	Ø	0.71	7.10
909'	0.24	19.5	Ø	0.71	7.90
915'	0.19	29	Ø	<u>1.01</u>	8.80
920'	0.13	39	#	0.83	6.20
925'	0.21	10	Ø	0.39	2.60
<u>Drill Hole No. CH64</u>					
140'	0.3	10	Ø	0.30	10.30
150'	0.11	10	Ø	0.05	14.80
160'	0.18	24.5	Ø	0.03	NIL
170'	0.18	34	#	0.07	2.30
180'	0.25	10	Ø	0.15	2.50
190'	0.28	5	Ø	0.13	1.30
200'	0.14	Ø	Ø	0.06	3.60
210'	0.35	18	Ø	0.10	1.10
220'	0.31	10	Ø	0.08	NIL
230'	0.16	5	Ø	0.16	NIL
240'	0.13	24.5	Ø	0.10	8.4

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TABLE I

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE		
				% Cu	% Fe <sub>2</sub>
250'	0.28	10	Ø	0.08	3.20
260'	0.11	20.5	Ø	0.05	1.90
270'	0.23	29	#	0.08	NIL
280'	0.14	19.5	Ø	0.08	4.10
290'	0.16	11	Ø	0.92	1.70
300'	0.16	19.5	Ø	0.77	1.90
305'	1.6	15	Ø	2.43	1.70
310'	0.25	10	Ø	3.05	10.70
315'	0.25	10	Ø	4.23	NIL
320'	0.51	12	Ø	3.91	5.80
325'	1.13	8	Ø	3.80	7.90
330'	0.34	15	Ø	4.97	3.00
335'	0.23	34	#	3.44	5.40
340'	0.34	24.5	Ø	2.80	3.20
350'	0.09	5	Ø	0.16	NIL
360'	31.2	1000	0.58%	0.40	5.80
370'	0.16	205	0.16%	0.37	3.90
380'	0.71	5	Ø	0.56	6.60
385'	0.25	70	#	0.42	4.30
390'	0.13	5	Ø	0.58	8.60
400'	0.095	Ø	Ø	0.54	2.40
410'	0.16	5	Ø	0.19	9.40
420'	0.13	15	Ø	0.22	4.30

%Cu %FeS<sub>2</sub>

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE
430'	0.09	5	∅
440'	0.34	31.5	#
450'	∅	10	∅
460'	0.34	15	∅
470'	∅	10	∅
480'	0.34	19.5	∅
490'	0.58	<u>990</u>	0.58%
495'	0.46	39	#
500'	0.42	<u>730</u>	0.46%
505'	0.34	10	∅
516'	∅	5	∅
<u>Drill Hole No. CH80</u>			
5'	0.11	19.5	∅
10'	0.09	10	∅
15'	0.45	19.5	∅
20'	1.98	64	#
25'	0.16	15	∅
30'	0.13	19.5	∅
35'	0.16	31.5	#
40'	0.18	11	∅
45'	0.28	5	∅
50'	0.13	19.5	∅
55'	0.13	15	∅

0-05 4-30

N.A.

N.A.

0-05 4-50

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TABLE I

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE		
				% Cu	% FeS <sub>2</sub>
60'	0.16	5	Ø	0.05	2.30
65'	Ø	10	Ø	0.16	3.60
70'	Ø	59	#	<u>1.02</u>	5.80
75'	0.13	34	#	0.34	0.90
85'	0.10	29	Ø	0.81	0.40
95'	Ø	10	Ø	0.87	2.60
100'	Ø	5	Ø	0.41	6.70
106'	0.10	10	Ø	0.20	6.50
117'	0.16	29	Ø	0.65	1.90
126'	0.16	39	#	0.27	0.06
135'	0.10	10	Ø	0.99	3.50
145'	Ø	10	Ø	<u>1.66</u>	0.60
150'	0.23	10	Ø	<u>1.66</u>	3.80
160'	0.20	10	Ø	<u>1.40</u>	1.60
170'	0.18	19.5	Ø	<u>1.41</u>	6.40
180'	2	10	Ø	0.75	8.50
190'	0.13	15	Ø	0.46	6.30
200'	0.10	15	Ø	0.07	0.90
210'	0.10	10	Ø		N.A
219'	Ø	5	Ø		
<u>Drill Hole No. CH76</u>					
20'	0.16	15	Ø		
30'	0.13	275	0.2%		N.A.

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TABLE I

% Cu % S<sub>2</sub>

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE		
40'	0.34	78	#		
50'	0.38	19.5	Ø		
60'	Ø	29	Ø	0.15	1.90
65'	0.06	5	Ø	0.28	1.20
70'	0.16	94	#	3.38	0.50
75'	0.23	49	#	5.18	3.90
80'	35.4	940	0.56%	5.47	2.60
85'	28.3	770	0.48%	5.49	1.20
90'	36.8	1400	0.78%	4.94	2.30
95'	38.2	1550	0.84%	5.39	NIL
100'	29.7	890	0.52%	4.82	1.20
105'	?	2900	1.4%	5.09	1.50
110'	0.2	69	#	6.10	1.60
115'	0.31	15	Ø	6.89	4.30
125'	0.38	29	Ø	4.79	4.60
130'	0.23	29	Ø	6.57	NIL
140'	0.34	34	#	0.31	1.70
150'	0.37	10	Ø	1.61	7.60
160'	0.24	10	Ø	0.70	3.30
170'	0.14	Ø	Ø	0.48	7.80
180'	0.31	5	Ø	1.09	1.20
185'	0.37	10	Ø	0.88	1.80
190'	29.7	1550	0.84%	1.20	2.70

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TABLE I

% Cu % FeS<sub>2</sub>

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE
195'	0.37	29	Ø
200'	0.31	54	#
210'	0.23	44	#
220'	0.20	39	#
230'	<u>36.8</u>	74	#
235'	0.25	10	Ø
240'	0.31	19.5	Ø
250'	0.37	5	Ø
260'	0.23	5	Ø
270'	0.20	Ø	Ø
280'	0.40	Ø	Ø
290'	0.13	Ø	Ø
300'	0.20	5	Ø
310'	0.20	54	#
320'	0.25	19.5	Ø
330'	0.18	19.5	Ø
340'	0.25	19.5	Ø
<u>Drill Hole No. Selina (LS3)</u>			
45'	Ø	10	Ø
60'	Ø	10	Ø
80'	Ø	80	#
90'	Ø	280	0.2%
100'	Ø	170	0.13%

1.30 3.40  
 0.41 2.30  
 1.01 5.05  
 0.62 0.62  
 0.50 1.23  
 1.04 3.42  
 0.63 16.76  
 0.33 7.84  
 0.36 19.05  
 0.38 10.44  
 0.05 2.71  
 0.26 8.32  
 1.33 13.76  
 0.97 15.62

N.A.

N.A.

TABLE I

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE		
110'	∅	12	∅		
120'	∅	8	∅		
140'	∅	19.5	∅		N.A.
160'	∅	39	#		
180'	∅	10	∅		
200'	∅	30	#		
220'	∅	49	#	0.03	0.75
240'	∅	24.5	∅	0.06	1.87
260'	∅	15	∅	0.04	0.37
280'	∅	24.5	∅	<u>0.74</u>	1.12
300'	∅	49	#	0.02	0.19
320'	∅	59	#	0.04	0.19
340'	∅	39	#	0.04	1.12
366'	∅	24.5	∅	0.09	2.25
380'	∅	<u>680</u>	0.42%	0.08	0.75
390'	∅	70	#	0.05	0.37
400'	0.11	24.5	∅	0.08	0.55
420'	∅	29	∅	<u>0.10</u>	0.55
440'	∅	19.5	∅	0.02	0.19
460'	∅	54	#	0.01	0.75
480'	∅	<u>600</u>	0.38%	0.02	0.55
500'	1.7	<u>940</u>	0.54%	<u>0.11</u>	0.37
520'	?	<u>6200</u>	2.6%		N.A.

TABLE I

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( $\times 10^{-6}$ )	MAGNETITE
540'	15.6	1400	0.78%
560'	1.8	1600	0.86%
580'	Ø	370	0.25%
600'	Ø	360	0.25%
620'	Ø	15	Ø
640'	Ø	250	0.19%
660'	Ø	720	0.44%
680'	Ø	15	Ø
700'	Ø	110	#
720'	Ø	54	#
740'	3.1	320	0.23%
760'	5.8	850	0.52%
780'	5.4	800	0.48%
800'	Ø	19.5	Ø
820'	Ø	19.5	Ø
840'	Ø	15	Ø
860'	0.09	24.5	Ø
880'	Ø	11	Ø
900'	Ø	19.5	Ø
920'	Ø	10	Ø
<u>Drill Hole No. Selina 4</u>			
280'	0.19	44	#
300'	0.22	8	Ø

N.A.

N.A.

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TABLE I

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE
320'	0.06	75	#
340'	0.09	12	Ø
360'	0.06	60	#
380'	0.07	39	#
400'	Ø	21.5	Ø
410'	Ø	10	Ø
415'	0.06	65	#
420'	2	5	Ø
430'	0.39	10	Ø
440'	16.8	160	0.13
460'	2.34	29.5	Ø
480'	16.8	7000	3%
500'	?	1120	0.64%
520'	2.7	3900	1.8%
530'	1.12	15	Ø
540'	0.93	10	Ø
560'	0.54	5	Ø
580'	0.17	5	Ø
600'	0.60	39	#
620'	0.20	18	Ø
640'	0.06	15	Ø
660'	0.07	5	Ø
680'	0.06	29	Ø

%Cu %FeS<sub>2</sub>

N.A.

0.06 14.4

0.06 21.9

0.05 16.4

0.02 20.9

0.03 17.8

0.05 8.4

0.05 6.8

0.05 19.3

0.05 24.1

0.05 24.5

0.02 8.9

0.03 21.6

0.04 21.3

0.05 25.5

0.05 15.4

0.12 14.30.13 9.8

SAMPLE (Depth)	CONDUCTIVITY (mhos/meter)	SUSCEPTIBILITY ( x 10 <sup>-6</sup> )	MAGNETITE	% Cu	% FeS <sub>2</sub>
700'	∅	10	∅	0.03	9.70
720'	∅	10	∅	0.06	4.00
740'	0.06	24.5	∅	0.06	8.30
760'	0.11	29	∅	0.10	21.69
780'	0.13	31	#	0.09	5.43
800'	0.06	49.5	#	0.04	11.88
820'	0.24	15	∅	0.04	13.62
840'	0.09	90	#	0.05	10.53
860'	0.07	480	0.34%	0.14	13.75
880'	0.60	10	∅	0.03	14.87
900'	0.17	260	0.19%	0.05	6.20
920'	0.19	10	∅	0.04	13.50
940'	0.16	10	∅	0.05	12.40
960'	?	10	∅	0.10	15.30
980'	∅	19.5	∅	0.17	7.20
1000'	3.4	400	0.27%	0.09	20.30
1020'	12.6	1300	0.72%	0.10	2.90
1040'	18.2	580	0.37%		N.A.
1059'	0.06	15	∅		

Notes: ∅ = negligible # less than 0.1%

Magnetite in % by volume

027

338028

TABLE II

%Cu %S<sub>2</sub>

SAMPLE (Depth)	RESISTIVITY (ohm/meters)	CHARGEABILITY (milliseconds)	L/M		
<u>Drill Hole No. CH86</u>					
875'	420	40.8	0.88	0.22	5.80
906'	2046	16.4	1.57	0.71	7.10
909'	808	68	0.97	0.71	7.10
911.5'	345	84	0.99	<u>1.01</u>	8.80
915'	<u>224</u>	130.5	0.58	<u>1.01</u>	8.80
920'	1605	25.2	1.4	0.83	6.20
925'	1191	17.2	1.6	0.39	2.60

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**SEIGEL ASSOCIATES AUSTRALASIA PTY. LTD.**

APPENDIX 'CT'

## CTU-2

CORE TESTING UNITINTRODUCTION

The portable core testing unit has been designed to fulfill the field and laboratory requirements in the measurements of:

(a) Conductivity for EM Surveys

An inductive method of measuring the conductivity is utilised and the range of conductivities covered is of particular interest in EM surveys. The measurement is made by direct meter reading without the necessity of bridge balancing.

(b) Susceptibility for Magnetometer Surveys

The dimensions of the sensing head are such that only a small volume of the sample is tested. The head frequency is sufficiently low that the measurement is essentially unaffected by normal conductivities. Because of the design of the head and the small sampling volume, there is no need to remove core from the core boxes. This results in very rapid core logging.

(c) Resistivity

The resistivity can be calculated knowing the areal cross section of the core, the current and primary voltage.

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(c) Chargeability

This is obtained by direct reading after a state of equilibrium has been obtained.

The absolute accuracy of the unit is better than 10% with a resolution of 3% for comparative measurements. This should be more than adequate for field work, considering the errors involved in sampling.

Experience with the instrument in Canada has already demonstrated that it can be of great value in the examination of drill core. Subtle changes in the nature of the core, which are sometimes difficult to recognize by eye, can often clearly be demonstrated by a change in a physical property of the core.

THEORY OF OPERATION

Conductivity

The general theory of the response of a cylinder in a thin concentric exciting loop is well known.

Examination of this curve shows that the out-of-phase response,  $\Delta R$  is linear when the in-phase response,  $\Delta L$ , is small. If a high Q search coil is used,  $\Delta Q$  is also linear. Use is made of this property to have a meter reading which

031

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is proportional to the conductivity. Two ranges of conductivity are selected by making measurements at two frequencies, 100 kHz (conductivity 2) and 2.5 MHz (conductivity 3).

For low conductivities, the instrument's range is limited by the lowest response at the highest frequency. For high conductivities the range is limited by the maximum response at the lowest frequency. If the range of conductivity is in the region of the maximum  $\Delta R$  response, ambiguity in the conductivity measurement can arise.

A third range of conductivity (conductivity 1) is included to resolve the ambiguity in the measurement of high conductivity samples. This range measures the in-phase response,  $\Delta L$ , at 100 kHz in a manner comparable to that used in susceptibility measurement.

The calibration of these ranges was established from the computed response for a thin coil concentric to a long cylindrical sample. The measuring circuits were then adjusted to the theoretically predicted response.

#### Susceptibility

An inductive AC system is used in the measurement of susceptibility. The search coil used is wound onto a

U32

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semi-circular powdered iron core with the ends of the core being in close proximity to the sample. The size of the coil is such that only a small volume of the rock is sampled for the measurements. Measurements can be made on cores, hand specimens or on outcrops.

The introduction of a susceptible sample to the ends of the core results in an increase of the search coil circuit. This is an in-phase response and if the measuring frequency is low and the scale is small, the conductivity can be neglected within practical limits. The change in inductance of the search coil tank circuit results in a change in frequency which is detected and can be measured as a change in voltage by the meter.

The unit was calibrated using samples of known susceptibility. The calibration is linear for most of the useful range of measurement.

Induced Polarization and Resistivity

The same principles are involved for core testing as for normal field surveying.

FIELD OPERATIONS

Conductivity

The instrument is operated in the field on the appropriate

J33  
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frequencies for the samples and the  $\sigma d^4$  in<sup>4</sup>m value is obtained from the applicable graph. As the core diameter is known, the conductivity in mhos/meter can be calculated.

#### Susceptibility

This is similarly obtained and an estimate of the magnetite or magnetite equivalent, made.

#### Induced Polarization and Resistivity

A core is mounted in the sample holder and an appropriate low density current is passed through the samples via copper sulphate pads at the coil extremities, while potential electrodes recorded the potential gradient. From an observation of the current, potential drop, cross section and potential spacing, the resistivity can be calculated.

Both readings of chargeability (M) and curve factor (L) are recorded. The L/M ratio will give some indication of the stability of the sample. Ideally only cores containing their original core fluid should be analysed.

**SEIGEL ASSOCIATES AUSTRALASIA PTY. LTD.**

6 Tramore Place, Killarney Heights, N.S.W. 2087

Phone: 451.5367 452.2072

16th November, 1972

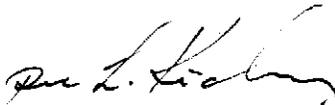
Mr. K. Read,  
The Mount Lyell Mining & Railway Co. Ltd.,  
Queenstown Tas. 7467.

Dear Sir;

Please find enclosed one (1) copy of the final report on conductivity, susceptibility, chargeability and resistivity tests on diamond drill hole core carried out on your behalf.

One copy of the report has been sent to Mr. R. Shakesby of New Consolidated Goldfields and I will deliver the third copy while I am in Tasmania, late this week or early next week.

Yours faithfully,



A.W. HOWLAND-ROSE  
MANAGING DIRECTOR

AWHR:LK