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PROSPECT 7605

CSR LIMITED

MINERALS EXPLORATION AND DEVELOPMENT GROUP

EXPLORATION LICENCE 31/82

MT. LINDSAY, TASMANIA

FINAL REPORT - 1986

EMR 62/86

HOBART
MAY 1986

P.D. ELLIS

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KEYWORDS

TASMANIA	TIN
EL 31/82	GOSSANS
MT. LINDSAY	DIAMOND DRILLING
SK 55-03	

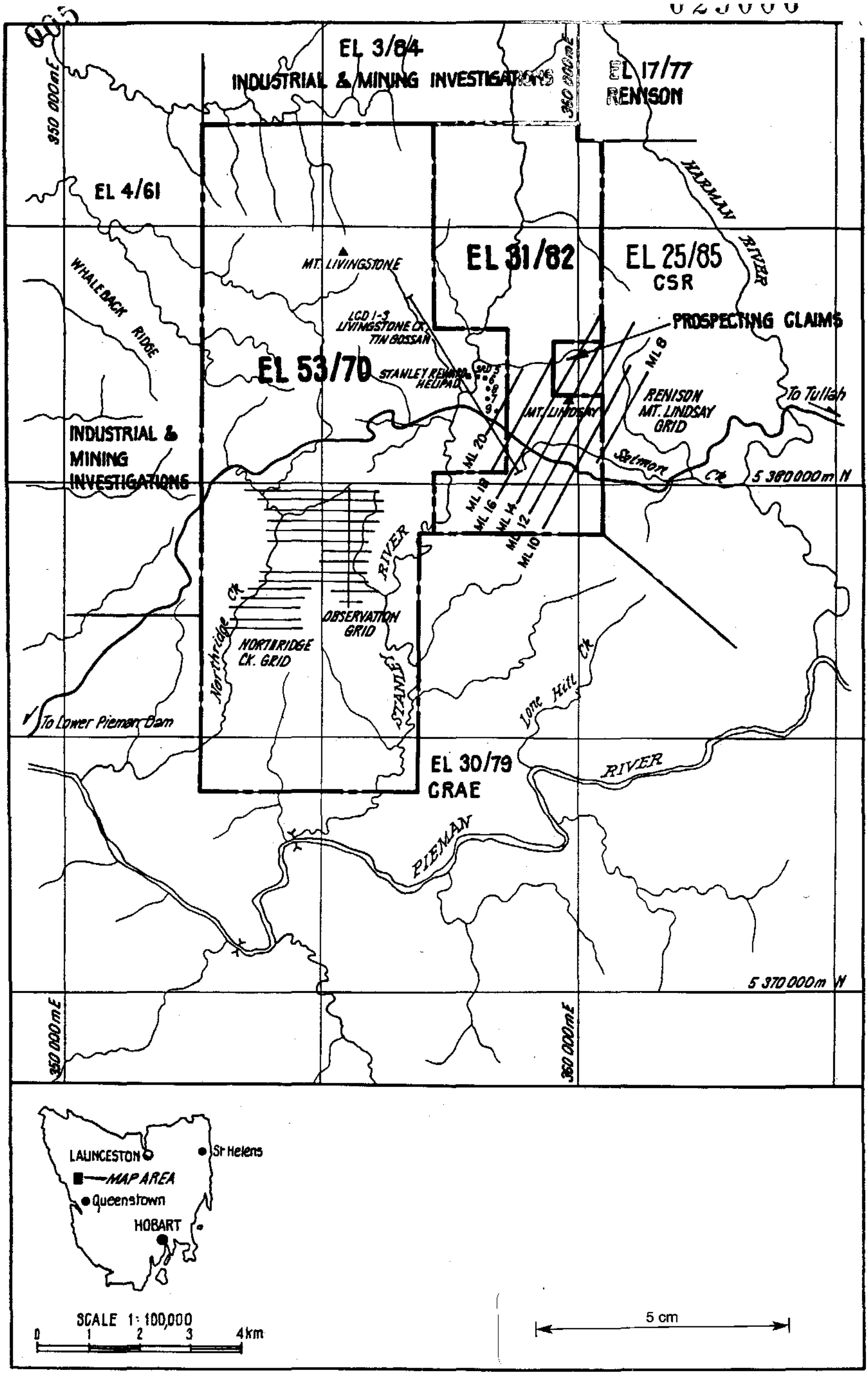

FIG. 1. LOCATION MAP EL 53/70 STANLEY RIVER & EL 31/82 MT. LINDSAY TAS.

1. INTRODUCTION

Exploration Licence 31/82 (EL 31/82) was granted to CSR Limited on 6th June, 1983. The Licence covers an area of 20 km^2 situated immediately east of CSR's former EL 53/70 (Stanley River) and to the west of CSR's EL 25/85 (Parsons Hood) on the west coast of Tasmania (Figure 1).

The area has potential for Renison-style carbonate replacement and/or skarn tin/tungsten mineralisation in a continuation of the dolomitic Success Creek Group sediments known within EL 53/70. These sediments have been intruded by the tin-bearing Devonian Meredith Granite.

Between 1895 (when tin was discovered at the nearby Stanley Reward) and September 1982 (when CSR applied for EL 31/82), the area was intermittently and intensely prospected by several companies and individuals, and was also investigated by government researchers.

This report summarises the investigations completed in the third 12 month term of the Licence.

2. SUMMARY

Results of drilling of the best geophysical, geochemical and geological anomaly were very disappointing with only minor pyrrhotite and chalcopyrite, and little tin or tungsten indicated.

Further evaluation of the data showed no other untested anomalies to have as much potential as those anomalies already tested. No further drill testing will be undertaken.

Although the pyrrhotite/chalcopyrite mineralisation is similar to that at Renison, the degree of hornfelsing suggested the temperature of mineralisation was too high in this area for the deposition of significant concentrations of cassiterite. Thus, CSR have decided to relinquish the area.

3. LOCATION AND ACCESS

EL 31/82 is centred 18 km north of Zeehan and 25 km west of Tullah on the West Coast of Tasmania. It is adjacent to the eastern boundary of CSR's former Stanley River EL 53/70 and adjacent to the western boundary of CSR's Parsons Hood EL 25/85. The EL measures approximately 3 km from east to west and 8 km from north to south (Figure 1).

Until recently the only ground access was from Renison Bell by vehicle track to the Pieman River cable car crossing and then by foot track to the Mt. Lindsay area. In 1975, Renison upgraded to 4-WD standard, the access from the Pieman River crossing to the Mt. Lindsay area. This track was recently flooded by the Lower Pieman dam. However, this route had been replaced by the HEC Lower Pieman dam site sealed access road from Tullah in the 1978-80 period. The EL is 32 km by this road from the Murchison Highway. This HEC road runs east-west through the EL about 2 km north of the southern boundary.

The southern 6 km^2 of the EL is underlain by mudstones, siltstones and lithic sandstones of the Precambrian Oonah Formation. These rocks support easily traversed, low button grass scrub with ti-tree/sword grass/bauera scrub in the deep gullies. The central 5 km^2 is underlain by the Eo-Cambrian Success Creek Group sediments and Crimson Creek Formation, while the northern 10 km^2 is underlain by the Devonian Meredith Granite. These areas are covered by thick, almost impenetrable, horizontal scrub and rainforest.

EL 31/82 covers portions of two drainage basins, both of which flow into the Pieman River. Most of the EL is drained by the Stanley River. The eastern edge and central portion are drained by tributaries of the Wilson River. The rivers and streams are deeply incised resulting in a steep, hilly topography ranging in elevation from 150 to 900 m above sea level.

4. PREVIOUS EXPLORATION

After tin was discovered at the Stanley Reward in 1895, many prospectors explored the Stanley River area. Tin was discovered at Mt. Lindsay in 1901. T. MacDonald started working the Mt. Lindsay deposit in 1909 and during the 1916-21 period won 2156 "bags" of tin concentrate containing 68-71% tin from alluvial/eluvial deposits. The leases expired in the mid-1920s.

In the 1956-61 period, Rio Tinto explored northwest Tasmania (SPL 302), completing airborne EM and magnetic surveys over most of the prospective zone. No other Rio Tinto work is recorded.

Aberfoyle obtained two leases over the Mt. Lindsay workings in 1961-62. These were later included in Aberfoyle's EL 2/63 which covered the area from Stanley Reward to the Huskisson River. Between 1962 and 1967, most work within EL 2/63 was confined to the Mt. Lindsay workings. This included limited mapping and 23 drill holes. In the 1967-69 period, two prospects (Mt. Lindsay and Camp 30) were investigated by air magnetics and drilling. Semi-regional mapping of the Mt. Lindsay-Stanley River area was undertaken in 1970-71, followed by SP surveys along existing grids in 1972. Most of this Aberfoyle exploration was in areas outside CSR's EL 31/82.

EL 2/63 was joint ventured to Renison-Consolidated Goldfields in 1973. However, the JV excluded the EL 31/82 area as this had been relinquished by Aberfoyle in 1972, and included as part of EL 18/70 (Valley Exploration). Renison obtained the EL 31/82 area as EL 18/73 in 1973. After an initial airborne EM (turair) and magnetic survey, and photogeological interpretation, all Renison exploration was confined to the Mt. Lindsay anomalies and the Misty Valley grid (along the Success Creek sediments). These areas were covered with ground mapping, IP, magnetic and soil geochemistry surveys. Six holes were drilled, generally with poor results. Renison relinquished the area in early September, 1982, although the adjacent ground (EL 2/63) was retained under JV. This adjacent area was relinquished in early 1985.

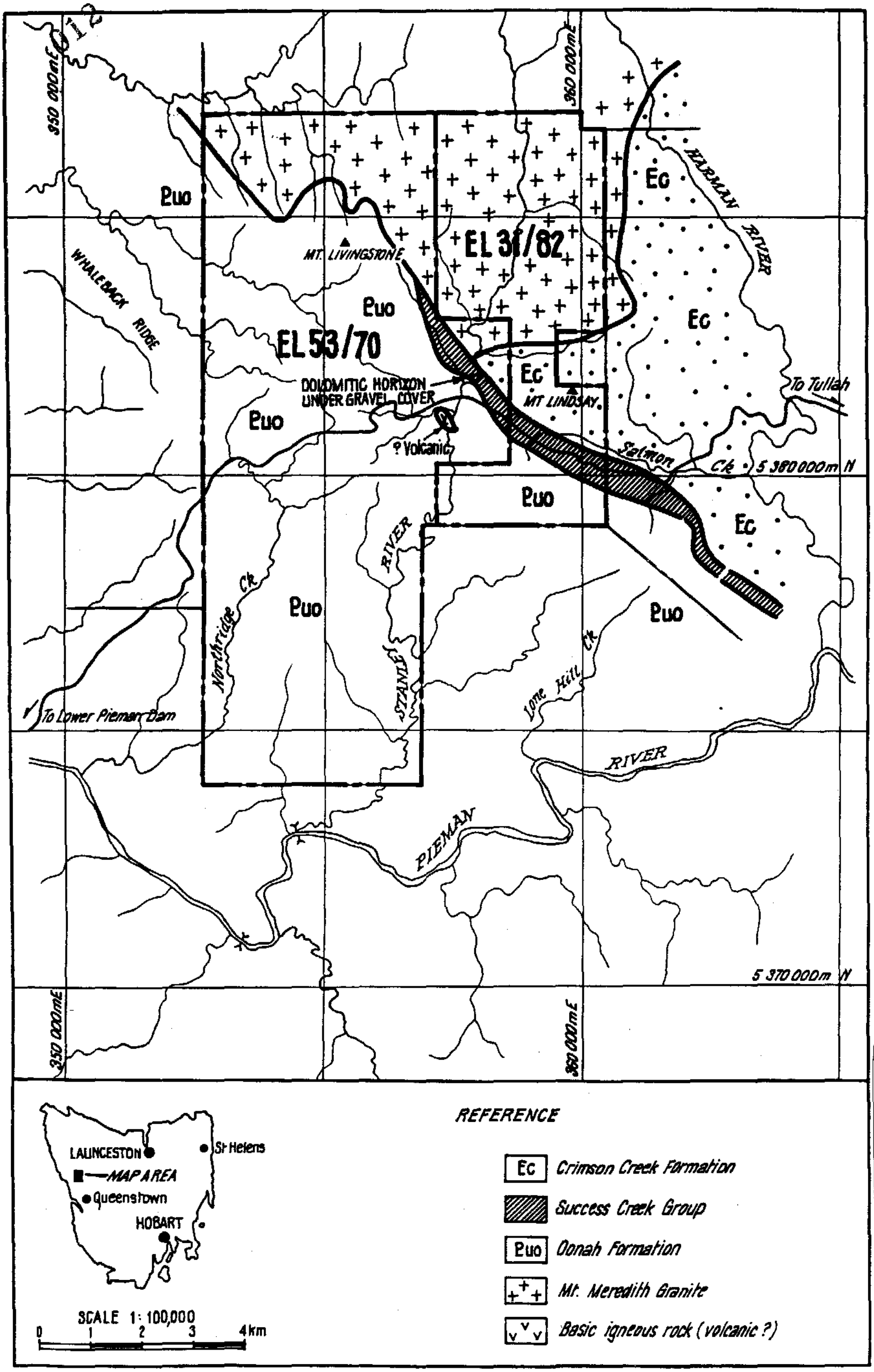

FIG.2. GEOLOGICAL SUMMARY, STANLEY RIVER & MT. LINDSAY, TASMANIA

5. GEOLOGY

5.1 Regional

The oldest rocks in the EL are those of the relatively unmetamorphosed Precambrian Oonah Formation (Figure 2). These interbedded fine-grained, lithic, siliceous siltstones with laminated and slumped phyllitic mudstones, siltstones and coarse saccharoidal lithic sandstones underlie the southwestern quarter of the Licence.

Unconformably overlying the Oonah sediments, and with a possible faulted contact, are the Eo-Cambrian Success Creek Group sediments. These consist of thinly bedded, siliceous siltstones and dolomitic siltstones, equated with the chert/carbonate Renison Mine sequence rocks.

Volcaniclastic, lithic wackes with interbedded siltstones, mudstones, tuffs, minor cherts and carbonates of the Eo-Cambrian Crimson Creek Formation (pers. comm. - A. Crawford) disconformably overlie the Success Creek sediments in the central portion of the EL. The cherts and carbonates occur up to about 2000 m stratigraphically above the base of the Crimson Creek Formation. The upper carbonates are correlated with the Cleveland Mine sequence, and at Mt. Lindsay host minor tin/tungsten skarn mineralisation.

The region has been intruded by the Devonian-Lower Carboniferous Meredith Granite which outcrops in the northern half of the EL. Fluids associated with this multiphase adamellite intrusion are believed to be responsible for mineralisation at Mt. Bischoff, Cleveland, Mt. Lindsay, Mt. Razorback, Stanley Reward, Livingstone Creek, Renison Bell and Queen Hill.

Minor recent glacial and fluvioglacial sediments cap older rocks. These occur as ridge caps or valley floor alluvial-type deposits and contain anomalous tin and gold concentrations.

Detailed geology is shown on DRG No. 7605-1.

5.2 Structural

The Oonah Formation sediments form a series of anticlinoria to the west of EL 31/82 with the Success Creek Group sediments being preserved in the intervening synclinoria.

Locally, the Oonah Formation sediments exhibit highly refolded isoclinal folding. The refolded folds have then been subjected to large-scale regional deformation which produced the anticlinorial structures (Brown, 1980). A further phase of deformation in the Devonian produced open folds in the Success Creek Group sediments. This was followed by regional block faulting and granite emplacement.

The dominant regional structure within EL 31/82 is the Huskisson Syncline which is reflected by the steeply dipping Oonah and Success Creek successions. It has been suggested that the Success Creek sediments have east facings within the EL (Brown, 1980).

6. EXPLORATION

6.1 Alluvial Cassiterite

Alluvial workings occur in Tertiary gravel deposits along the Stanley River. The main deposits were at the confluence of the Stanley River and Livingstone Creek. The gravels by themselves are not considered commercially viable. However, they may be significant if economic lode tin/copper deposits were located in the region.

6.2 Lode Tin

Three primary cassiterite deposits are known in the Mt. Lindsay-Stanley River area, viz, the Mt. Lindsay skarn and the Stanley Reward and Livingstone Creek gossanous deposits. These were worked by adits and/or shafts, reputedly to depths of up to 150 m.

Tin grades within the lode outcops (up to 10 m wide) tended to be sporadic with values up to 3.15% Sn. Geophysics and drilling indicated that the lodes extend to depth below the surface outcrops.

The Stanley Reward and Livingstone Creek gossans are probably related to skarn-type mineralisation associated with the contact of the Meredith Granite with the dolomitic units of the Success Creek sediments. The Mt. Lindsay lode is similarly skarn-type mineralisation associated with the alteration of the Crimson Creek dolomitic units. These deposits are all close to the granite margins.

More distal replacement-type tin deposits (similar to the Renison lode), if present, are more likely to occur in the dolomitic horizons of the Success Creek

Group and basal Crimson Creek rocks within EL 31/82. These rocks (Renison Mine Sequence) extend for 2-3 km across the EL area (and further) and are between, and 4 km from, known granite (outcrop). Faults (potential channel ways) for mineralising fluid movement are common in the area.

7. CURRENT EXPLORATION

7.1 Techniques

EL 31/82 was acquired to cover the continuation of the Success Creek dolomitic sequence extending southeast from the Stanley Reward area (EL 53/70). A review of all previous exploration data showed only Renison had examined the extension of the Success Creek sediments. Renison's mapping and drainage anomalies were checked during CSR's initial regional drainage sampling and mapping (Ellis, 1984).

During 1984-85, repeatable drainage anomalies, located in 1983-84 (Ellis, 1984) were further investigated. The only geologically significant anomaly (Ellis, 1985) was in the area of Success Creek sediments investigated earlier by Renison. Renison data were confirmed by traverses along lines ML12 and ML17 and then all Renison data were re-evaluated for the Success Creek sediment anomalous zone (Ellis, 1985). A drill target was defined on Line ML17 and tested by a single inclined diamond drill hole to 449.8 m.

After logging the drill hole and locating minor zones of pyrrhotite/chalcopyrite mineralisation, samples were taken for geochemical analysis (Sn, As, Ba, W, Sb, Cu, Pb, Ni, Co, Bi, Zn, Cd, G, F) and petrological descriptions. On receipt of the results of these analyses, all the Renison data were re-evaluated in the light of the drill hole information.

7.2 Results

The diamond drill hole DDH-ML1 was sited to test the strongest part of the magnetic/IP anomaly defined by Renison and CSR data on line ML17 (DRG No. 7605-8).

Collar co-ordinates were 415mN on ML17, and the hole was drilled at -50^{o} to grid south to a total depth of 449.8 m. The hole was targetted to intersect the magnetic anomaly at a hole depth of 350 m, about 100 m below the surface.

A brief log of the hole is:

0 -138.5 m	Hornfelsed siltstones and claystones with cherts
138.5-146.2 m	Fault Zone - pyritic
146.2-156.7 m	Limestone - altered to a complex dolomitic calc-silicate
156.7-259.4 m	Hornfelsed sandstones, siltstones and claystones with cherts
259.4-259.7 m	Basic igneous basaltic intrusion
259.7-449.8 m	Hornfelsed sandstones, siltstones and claystones with cherts

Pyrrhotite occurs throughout, but particularly in the calc-silicate unit, and it is associated with chalcopyrite. Traces of galena and sphalerite were also observed. A detailed log is shown in Appendix I. Appendix II contains thin section descriptions.

The geochemical analyses of samples taken from the drill hole were very disappointing showing no anomalous Sn values (Appendix III). One sample from the calc-silicate unit had highly anomalous As (230 ppm), while several other samples had slightly anomalous Cu (to 90 ppm) and/or Zn (to 450 ppm).

A susceptibility log of the drill core (20 cm reading intervals) showed a strongly magnetic zone from 190 to 335 m with a secondary anomalous zone from 395 to 445 m (Appendix IV, DRG No. 7605-10). This log shows that the ground magnetic anomaly can be explained by the

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TABLE 1

QUALITY CONTROL ANALYSES

Standard No.	Sample	Sn	As	Ba	W	Sb	Cu	Pb	Zn	Ni	Co	Bi	Cd	Li	F (%)
6	Quoted	-	7	-	-	9	185	15	140	-	-	29	-	-	-
	Past	12	12	345	87	7	178	22	130	55	-	24	-	-	-
	A161353	10	20	370	35	16	90	16	120	60	12	18	1	26	0.10
10	Quoted	36.8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Past	32	4	15	10	x	2	8	4	x	-	8	-	x	x
	A161358	34	4	15	x	x	4	x	2	6	x	4	x	7	0.02
13	Quoted	505	-	-	-	-	-	-	-	-	-	-	-	-	-
	Past	505	x	x	x	x	3	5	2	4	-	4	-	x	0.01
	A161363	430	x	x	x	x	6	4	2	6	x	x	x	4	x
15	Quoted	2950	-	-	-	-	-	-	-	-	-	-	-	-	-
	Past	2650	x	x	x	x	2	6	2	x	-	6	-	x	0.01
	A161368	2350	x	x	15	x	x	4	2	10	x	8	x	4	x

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observed down hole magnetic responses (Appendix V). Similarly, the presence of sulphides (pyrrhotite, pyrite, chalcopyrite and minor arsenopyrite) observed in hand specimens and thin sections of the core are sufficient to explain the IP responses.

7.3 Quality Control

As a check on the precision of the analytical work done by the customer laboratory, Comlabs, 4 standard samples were submitted for analysis for a range of elements. Generally, the analyses were in close agreement with the quoted values (Table 1). The only major discrepancy was with Standard 6 where the quoted Cu value is 185 ppm, but the actual value analysed was 90 ppm. This discrepancy has not been explained.

8. CONCLUSIONS

DDH-ML1 showed the surface magnetic anomaly was due to magnetite and pyrrhotite in a zone of hornfelsing associated with the intrusion of the Meredith Granite. Minor sulphide mineralisation was responsible for the IP responses and the surface soil geochemical anomaly.

Renison data indicate these magnetic and IP features extend southeast through EL 31/82 but tend to become deeper. Renison's hole ML34 intersected the same sequence 500-600 m further east. This zone needs no further testing.

Drainage geochemistry shows that this zone of Success Creek/Crimson Creek stratigraphy is the only area of anomalous values.

No indications of economic mineralisation has been obtained from geochemical, geophysical, geological or drilling evaluation of EL 31/82 and thus it is recommended that the area be relinquished.

9. REFERENCES

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ELLIS, P.D. (1985)
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CSR Limited Report No. EMR 56/85 (unpubl.)

PDE/SGL
May 1986

APPENDIX I

DDH-ML1 - GEOLOGICAL LOG

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AREA: MT LINDSAY	PROJECT NUMBER: 605	DATE STARTED: 15 03 85	CO-ORDINATES N/S:	COLLAR R.L.:	AREA OF INFLUENCE:	HOLE NUMBER: DDH-46-1	PAGE 1 OF 9
STATE: TAS	INCLINATION: -50	DATE COMPLETED: 26 04 85	E/W:	DEPTH: 449.8	DRILL TYPE: L38	HOLE SIZE & ASSAY TYPE: HQ TO 101.5; NQ TO 449.8; TO	
LOCATION:	AZIMUTH GRID: 180	CONTRACTOR: LONGYEAR	LOGGED BY: P.D. Ellis	DATE OF LOGGING: 26/5/85			
		DRILLER: W. ANDREWS					

% CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	LOG SCALE	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE INTERVAL	SAMPLE NUMBER	MIN. TYPE	ACCEPTED ASSAY
0	5.4	0 – 16.4m HORNFELSED GREYWACKE										
1.3	6.6											
0.3	6.4	Partially weathered particularly on										
1.0	7.4	joints @ 30° to core axis										
0.4	8.5	- dark grey spotted,										
0.3	9.0	weathered to khaki brown										
0.5	9.8	Badly broken 6.0 – 6.4										
0.2	10.0	8.5 – 12.0										
0.6	10.4	12.4 – 13.8										
1.1	11.4	14.8 – 15.3										
0.3	12.7	Some thin (<5mm) qtz chl veins // joints										
0.4	13.6											
0.3	13.8											
0.8	15.0											
0.4	15.4											
0.5	16.4	16.4 – 35.2m WEATHERED GREYWACKE										
0.5	17.4											
1.3	19.6	Orange brown, soft - clayey in parts										
0.5	20.3	Hornfelsed at 27.6 – 27.9										
1.0	21.4	29.9 – 30.2										
1.0	23.5	31.9 – 32.5										
1.0	24.4	32.7 – 33.2										
1.0	26.0	33.5 – 33.6										
0.8	27.5	34.1 – 34.3										
0.5	28.1	Qtz veins at 18.5 (15mm)										
0.8	29.7	21.4 (100mm) - brecciated fault										
0.6	31.2	Veins & joints @ 70° to core axis										
0.7	32.5											
0.6	33.2											
0.7	34.0											
0.6	35.1											
0.3	35.7	35.2 – 46.0m HORNFELSED GREYWACKE										
1.0	36.5											
0.3	36.8	Partially weathered at joints										
[illegible]	37.9	Joints @ 20° and 70° to axis										
[illegible]	[illegible]	Minor qtz veins (<5mm)										
[illegible]	[illegible]	[illegible] qtz @ 42.2m										
[illegible]	[illegible]	Broken @ 39.4 – 39.6m										
[illegible]	[illegible]	40.1 – 40.9 (Fault)										
0.0	41.6	41.8 – 43.0										
0.4	42.7	42.6										
0.6	43.6	45.0 – 45.6										
~~0.6~~	44.4											
0.5	45.5											

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C LIM D—D ILE DILL [redacted]

AREA		PROJECT NUMBER	
STATE		LOCATION	
INCLINATION		AZIMUTH T/M/GRID	
DATE STARTED		DATE COMPLETED	
CONTRACTOR		DRILLER	
CO-ORDINATES N/S		E/W	
COLLAR R.L.		DEPTH	
AREA OF INFLUENCE		DRILL TYPE	
LOGGED BY		DATE OF LOGGING	
HOLE NUMBER	PDH-ML-1	PAGE	2 OF 8
HOLE SIZE & ASSAY TYPE	___ TO ___		

CORE RECOVERY	METRES	SUMMARY DESCRIPTION
0.5	46.7	46.0 – 66.1 m PARTIALLY WEATHERED HORNFELSED
0.2	46.9	GREYWACKE
0.7	47.6	
0.2	47.7	light brown grey – extremely broken
0.3	48.1	Joints 20° and 70° to core axis
0.6	48.8	Clay zones @ 50.2 – 50.3
0.2	49.4	59.0 – 59.2
0.1	49.6	Less broken @ 53.0 – 57.6
0.3	49.9	
0.5	50.4	
1.1	51.7	
0.3	52.6	
0.4	53.0	
0.6	53.9	
0.4	54.5	
0.2	55.3	
0.2	55.6	
0.3	56.1	
0.6	56.6	
0.3	57.1	
0.2	57.5	
0.4	58.4	
0.1	59.7	
0.3	60.6	
0.3	61.1	
0.3	61.8	
0.3	62.4	
0.3	62.8	
0.2	63.6	
0.4	64.1	
0.6	65.0	
0.6	65.7	
0.2	66.1	
0.3	66.6	66.1 – 67.8 m HORNFELSED GREYWACKE
[illegible]	[illegible]	
[illegible]	[illegible]	Dark grey – weathered on joints to brown clay
[illegible]	[illegible]	
[illegible]	[illegible]	joints ∠ core 20° & 70° with some 45°
[illegible]	[illegible]	67.8 – 69.1 m VEINED HORNFELSED GREYWACKE
0.7	70.[illegible]	Dark grey with veins composing 25%
0.5	71.7	Veins up to 15 mm wide with qtz (75%) chl (15%) py (5%)
0.2	71.8	po (5%) tm (5%)
0.3	72.1	
0.7	72.[illegible]	69.1 – 80.4 m HORNFELSED GREYWACKE

VISUAL LOG | LOG SCALE | ROCK TYPE | S.G. | START DEPTH | FINISH DEPTH | SAMPLE INTERVAL | SAMPLE NUMBER | MIN. | ACCEPTED ASSAY

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[redacted]

AREA		PROJECT NUMBER		DATE STARTED		CO-ORDINATES N/S		COLLAR R.L.		AREA OF INFLUENCE		HOLE NUMBER	D.DH-ML-1
STATE		INCLINATION		DATE COMPLETED		E/W		DEPTH		DRILL TYPE		PAGE	3 OF 8
LOCATION		AZIMUTH T/M/GRID		CONTRACTOR		LOGGED BY		DATE OF LOGGING		HOLE SIZE	TO	ASSAY TYPE	TO
				DRILLER									

% CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE NUMBER	ACCEPTED ASSAY
0.8	73.6	Dark grey but weathered on joints							
0.1	73.7	Core ⊄ joints 20° and 70°							
0.8	74.8	Sheared veins (Fault) @ 70.0 – 71.7							
0.1	74.4	Solid and unbroken 72.9 – 73.7							
0.2	75.2	Sheared @ 89.2 – 89.4m							
0.1	76.3								
0.1	76.7								
0.3	77.2								
0.4	79.2								
0.3	79.4								
0.2	79.6								
0.4	80.2								
0.3	80.4								
0.2	80.7								
0.2	81.05								
0.4	82.4								
0.1	84.0								
0	85.4								
0.1	86.6								
0.2	87.1								
0.3	88.0								
0.3	89.4	89.4 – 95.6m HORNFELSED SILTSTONE							
0.3	90.5								
0.7	92.0	Hard black fine grained.							
0.3	92.6	Badly weathered @ 90.0 – 90.5							
0.6	94.2	Veined qtz (<5mm) at 30° to core axis throughout							
0.3	95.6								
0.5	97.4	95.6 – 100.0m WEATHERED CLAY							
0.5	100.0								
0.1	100.5	Orange brown clay.							
0	101.5	100.0 – 108.0 LAMINATED SHALE/CHERT/SANDSTONE							
0.2	103.0								
0.4	105.5	Thinly bedded black shale, pale brown chert and whitish							
0.7	106.2	brown fine sandstone – beds from 0.5mm → 10mm				106.9		161372	THIN SECTION
0.5	106.7	C⊄B 20°							
0.7	108.1	Partially weathered and broken @ 100 – 105m							
0.3	108.4	108.0 – 108.5m CHERT							
0.1	108.6	Pale brown with weathering stains							
0.6	109.3	badly broken							
0.3	109.6	C⊄B 20° // joints							
1.4	111.0	108.5 – 113.3m HORNFELSED GREYWACKE							
0.4	111.55	Dark grey with brown joints				111.0		161373	THIN SECTION
0.4	112.8	Partially weathered on joint faces @ 30° and 70°							
0.5	113.3	Minor py throughout.							

020027

[redacted]

AREA	PROJECT NUMBER	DATE STARTED	CO-ORDINATES N/S	COLLAR R.L.	AREA OF INFLUENCE	HOLE NUMBER
						DDH-ML-1

STATE | LOCATION | INCLINATION | AZIMUTH T/M/GRID | DATE COMPLETED | CONTRACTOR | DRILLER | E/W | DEPTH | DRILL TYPE | LOGGED BY | DATE OF LOGGING | PAGE 4 OF 8 | HOLE SIZE & ASSAY TYPE ___ TO ___

CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE NUMBER	ACCEPTED ASSAY
0.3	114.2	113.3 – 115.0 m HORNFELSED GREYWACKE							
0.5	115.0								
0.5	115.7	Dark grey massive, monotonous							
0.2	116.1	Fine py throughout with py veins to 3mm				116.6		161374	THIN SECTION
0.4	116.6	@ 113.6 – 113.7							
0.3	117.5	114.25							
0.7	118.2	114.4 – 115.0							
0.3	118.7	115.0 – 115.6 FAULT py, chl, act.							
0.5	119.2								
0.4	120.0	115.6 – 133.8m HORNFELSED GREYWACKE							
0.3	120.4								
0.4	120.8	Dark grey massive monotonous							
0.6	121.5	Fine py throughout but concentrated on joints							
1.0	122.5	py veins @ 115.6 – 116.4							
1.1	123.6	Broken @ 115.6 – 120.4							
0.7	124.4	123.5 – 126.0							
0.7	125.1	126.3 – 126.5							
0.1	125.5	Minor chert @ 125.7 – 125.8							
0.5	126.0	Py @ 125.0							
0.3	126.3	126.4							
0.5	126.8	126.8							
0.5	127.3	128.2							
1.2	128.5	130.9							
0.3	129.0	131.1 – 131.3							
0.4	129.4	Broken @ 128.8 – 129.5 (with py @ 10° to core)							
1.0	130.4	131.7 – 132.6							
0.6	131.5	Fault at 129.2 and poss @ 127.0 @ 45°							
0.3	132.1	Minor chert banding @ 130.1 – 130.4 with py							
0.6	133.0	132.7 – 133.1							
0.6	133.4					133.0		161375	THIN SECTION
0.3	133.9	133.8 – 138.0m CHERT LAMINATED							
1.0	135.2	CAB 60°							
0.4	135.8	Banded light / mid grey				145.3		161376	THIN SECTION
0.4	136.8	Chert is light grey with coarser bands being darker				147.9		161377	THIN SECTION
0.5	137.4	Minor hornfelsing in bands				148.6		161378	THIN SECTION
[illegible]	[illegible]	Fine py throughout concentrated in coarse bands				150.2		161379	THIN SECTION
[illegible]	[illegible]	138.0 – 138.2m SILTSTONE				150.5		161380	THIN SECTION
[illegible]	[illegible]	Black – very fine – finely banded				151.8		161381	THIN SECTION
[illegible]	[illegible]	CAB 50°				153.0		161382	THIN SECTION
[illegible]	147.0	138.5 – 146.2 m FAULT – light grey clay zone				153.7		161383	THIN SECTION
3.1	150.1	At 145.0 zone of coarse fragmental rock cemented				154.6		161384	THIN SECTION
3.1	153.2	by py pyh.				156.4		161385	THIN SECTION
2.6	155.8	146.2 – 156.7m LIMESTONE				156.7		161386	THIN SECTION
2.1	158.0	Banded grey and pale brownish limestone				157.8		161387	THIN SECTION

020028

[redacted]

AREA		PROJECT NUMBER		DATE STARTED		CO-ORDINATES N/S
STATE		INCLINATION		DATE COMPLETED		E/W
LOCATION		AZIMUTH T/M/GRID		CONTRACTOR		LOGGED BY
				DRILLER		

COLLAR R.L. · DEPTH · DATE OF LOGGING · AREA OF INFLUENCE · DRILL TYPE · HOLE NUMBER DDH-M6-1 · PAGE 5 OF 9 · HOLE SIZE & ASSAY TYPE — TO — TO — TO

% CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE INTERVAL	SAMPLE NUMBER	ACCEPTED ASSAY
2.1	164.1	pyh extending along joints								
1.4	166.0	Main replacement in 150-151m with 20% Sulphides								
2.3	168.3	comprising 90% pyh, 10% cpy				166.3			161388	THIN SECTION
1.2	169.6	Strong shearing to 147.2 m								
2.4	172.0	Pale green intrusive from 151.7-152.0 m.								
1.1	173.2	156.7-158.7m CHERT pale greenish purple green								
0.5	173.8	minor shale bands - hornfelsed on joints, minor py.								
3.2	177.0	158.7-182.1m HORNFELSED GREYWACKE								
0.4	177.4	Black monotonous, massive								
1.6	179.5	veins of tm, qtz, chl with minor py, pyh, cpy								
0.5	180.0	@ 166.3, 160.5, 161.5-162.0				180.7			161389	THIN SECTION
2.2	182.5	Chert at 170.5-171.0								
1.8	184.3	180.5-182.1 distorted and brecciated with minor cpy								
0.6	184.4	pyh, py in qtz tm, chl veins								
3.0	187.4	pyh, py in qtz tm, chl vein @ 179.0								
3.1	191.0	182.1-183.7m CHERT - fault @ 182.4 @ 53° to [illegible]								
2.0	193.0	183.7-191.4m HORNFELSED GREYWACKE?				192.2			161390	THIN SECTION
3.0	196.0	191.4-193.7m TUFFACEOUS GREYWACKE								
3.0	199.0	fine py in patches, rhod on joints								
3.0	202.0	193.7-195.95 HORNFELSED GREYWACKE								
3.0	205.0	minor qtz carb veining								
2.1	207.1	195.95-196.7 TUFFACEOUS GREYWACKE								
3.1	210.2	196.7-200.1 HORNFELSED GREYWACKE								
3.1	213.3	200.1-202.8 TUFFACEOUS GREYWACKE				212.5			161391	THIN SECTION
2.6	216.0									
3.1	219.1	202.8-221.0 HORNFELSED GREYWACKE								
3.1	222.2	intraformational brecciation & slumping								
3.1	225.3	thin (<5mm) qtz, chl, tm, act veins with minor pyh, cpy, py								
3.1	228.4	@ 211.5m - vug with epidote, qtz, tm, chl, rhod, calc								
3.1	231.5	@ 212.5m - vein @ 30° with " " " " pyh, py								
3.1	234.6	221.0-221.8m CHERT hard black								
3.1	237.7	221.8-259.4 m HORNFELSED GREYWACKE as above.								
2.2	239.9									
3.1	243.0	qtz vein @ 222.8m (100mm thick)								
0.4	243.4	227-227.7 epi, qtz, chl, tm veins with minor pyh, py, cpy								
3.0	247.0	228.5m rhod, chl, epi, qtz veins @ 20								
1.3	248.3	229.7 qtz epi carb, rhod, chl with minor py								
0.4	248.7	236.6 " " with later carb, qtz, chl & py								
0.7	249.4	247.3m & 254.4m sheared with qtz, chl, rhod ± py								
3.1	252.5	257.0 fine pyh, cpy veins ± py ± chl, tm, act, qtz.								
2.6	255.1									
1.6	256.7									
0.5	257.2									
0.7	257.9									

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[redacted] LIM [redacted] D [redacted] ILE [redacted] ILL [redacted]

AREA | PROJECT NUMBER | DATE STARTED | CO-ORDINATES N/S | COLLAR R.L. | AREA OF INFLUENCE | HOLE NUMBER DDH-ML-1

DATE COMPLETED | E/W | DEPTH | DRILL TYPE | PAGE 6 OF 8

STATE | LOCATION | INCLINATION | AZIMUTH T/M/GRID | CONTRACTOR | DRILLER | LOGGED BY | DATE OF LOGGING | HOLE SIZE & ASSAY TYPE ___ TO ___

% CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE NUMBER	ACCEPTED ASSAY
0.2	258.6	259.4-259.7m INTRUSIVE - greenish							
0.1	258.9								
1.6	260.5	259.7-265.6m HORNFELSED GREYWACKE							
0.8	261.3	as above							
1.0	262.3	265.6-269.0m CHERT							
1.0	263.3	pyh, cpy, qtz veins throughout C&B 30°							
1.5	264.8	dissem py, pyh, cpy							
1.1	265.9					266.9		161392	THIN SECTION
1.3	267.2	269.0-283.3m HORNFELSED GREYWACKE				267.5		161393	THIN SECTION
3.1	270.3	generally slumped							
3.1	273.4	minor weak dissem py with pyh, cpy.							
3.1	276.5	py, pyh, cpy, chl, tm veins throughout.							
3.1	279.6	@ 272.0m 10cm vein @ 70° with chl, ep, qtz, carb							
1.6	281.3	py, pyh, cpy veins @ 276.6, 275.4, 282.4, 283.4				281.4		161394	THIN SECTION
3.1	284.4	283.3-291.5m CONTORTED HORNFELS							
2.4	287.3	purple to purple green grey							
3.1	290.4	minor qtz, chl, rhod ± py @ 10° C&B throughout.							
3.1	293.5	291.5-292.0m CHERT - black, minor py veins &							
3.1	296.6	disseminated							
3.1	299.7	292.0-340.5m HORNFELSED GREYWACKE							
3.1	302.8	@ 293.4 vein with qtz, chl, act, rhod, py, pyh							
3.1	305.9	@ 295.4 " py, pyh, cpy				301.5		161395	THIN SECTION
3.1	309.0	@ 300.2 " qtz carb							
3.0	312.0	301.6 " epi, chl, qtz ± py, pyh							
2.3	314.3	302. dissem py							
1.7	316.0	303.6 - sheared.							
3.0	319.0	303.8-305.9 single vein with qtz, tm, chl, py, cpy							
3.0	322.0	pyh.							
1.3	323.3	308.0 & 308.4 & 310.2 qtz, chl, carb, tm veins				323.0		161396	THIN SECTION
0.2	323.5	311.3 qtz, epi, tm/chl veins							
[illegible]	324.4	323.0 qtz carb, chl, tm, epi veins							
0.5	324.9	323.2-324.2 shearing							
3.6	327.8								
[illegible]	[illegible]								
[illegible]	[illegible]								
[illegible]	[illegible]								
[illegible]	[illegible]								
[illegible]	[illegible]								
3.1	[illegible]	340.5-342.0m CHERT - black with fine py dissem							
3.1	[illegible]	342.0-366.1m HORNFELSED GREYWACKE							
3.1	347.3	shearing @ 346.8 & 347.0							
3.0	350.5	qtz chl, py vein @ 349.0 m							
3.1	353.6	350.4 intrusive - greenish med grained.				353.9		161397	THIN SECTION
3.1	356.7	352.4 qtz chl, tm, pyh, py, cpy vein							

020030

[redacted]

AREA | PROJECT NUMBER | DATE STARTED | CO-ORDINATES N/S | COLLAR R.L. | AREA OF INFLUENCE | HOLE NUMBER DDH-ML-1

STATE | LOCATION | INCLINATION | AZIMUTH T/M/GRID | DATE COMPLETED | CONTRACTOR | DRILLER | E/W | DEPTH | DRILL TYPE | LOGGED BY | DATE OF LOGGING

PAGE 7 OF 8

HOLE SIZE ____ TO ____ & ASSAY TYPE ____ TO ____

% CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE INTERVAL	SAMPLE NUMBER	ACCEPTED ASSAY
3.1	362.7	366.1 - 368.2m CHERT bluish grey - finely veined								
2.6	365.3									
3.0	368.3	368.2 - 392.6m HORNFELSED GREYWACKE								
1.7	370.0	374.5m shear								
3.0	373.0	3[illegible].4 qtz chl epi vein								
3.0	376.0	390.7 shear with py								
1.0	377.0	3[illegible].0 - 392.5 shear with py								
3.1	381.1	393.6 qtz, chl, tm, py veins								
3.1	384.2									
1.7	385.9									
3.1	389.0									
1.6	390.6									
1.6	392.0	392.6 - 394.9m CHERT - dark purple								
0.5	392.5	393.6m qtz, chl, py vein @ 50°								
2.2	394.7					393.6			161348	THIN SECTION
1.6	396.1	394.9 - 449.8m HORNFELSED GREYWACKE								
0.6	396.7									
1.7	398.4	398.3m epi, tm, chl, qtz ± py, pyh vein								
2.2	400.6	400.3 - 400.5 chl, tm, qtz veins								
2.6	403.0	405.2 - 405.7 qtz, py veins								
0.5	403.5	405.2 - 407.2 brecciated								
1.8	405.2	408 py + qtz chl vein								
0.5	405.7									
2.6	408.1	418.2 - 418.6 & 421.4 qtz chl sheared veins								
1.2	409.3									
2.7	412.0	Poss worm tubes with pyh, cpy, py, chl, qtz								
1.7	413.7	at 420.0m.								
3.1	416.8	421.6, 424.4, 426.2 qtz, chl, tm, py veins								
1.0	417.8									
0.4	418.2	Shear 431.0 - 431.5 with qtz carb								
0.7	418.9									
0.6	419.5	Contorted 432.6 - 433.8m								
2.1	421.6									
3.1	424.7	Minor py 442 - 444.0								
[illegible]	[illegible]									
[illegible]	[illegible]	[illegible] 447.4 - 448.5								
[illegible]	[illegible]									
[illegible]	[illegible]	44[illegible] qtz chl carb ± pyh vein								
[illegible]	[illegible]									
1.4	[illegible]									
3.1	43[illegible]									
3.1	434.0					448.0			161349	THIN SECTION
3.0	44[illegible]					449.0			161400	THIN SECTION
2.[illegible]	44[illegible]									

029031

[redacted] C[redacted]LIM[redacted]—D[redacted]LE[redacted]ILL[redacted]

AREA		PROJECT NUMBER	
STATE		LOCATION	
INCLINATION		AZIMUTH T/M/GRID	
DATE STARTED		DATE COMPLETED	
CONTRACTOR		DRILLER	
CO-ORDINATES N/S		E/W	
COLLAR R.L.		DEPTH	
AREA OF INFLUENCE		DRILL TYPE	
LOGGED BY		DATE OF LOGGING	
HOLE NUMBER	DDH-ML-1	PAGE	8 OF 8
HOLE SIZE & ASSAY TYPE	TO / TO / TO		

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% CORE RECOVERY	METRES	SUMMARY DESCRIPTION	VISUAL LOG	LOG SCALE	ROCK TYPE	S.G.	START DEPTH	FINISH DEPTH	SAMPLE INTERVAL	SAMPLE NUMBER	SAM. TYPE	ACCEPTED ASSAY
1.0	448.0											
0.7	448.7											
1.1	449.8											
		E O H 449.8m										
							117.0	119.0		161351		
							132.5	142.5		161352		
							142.5	145.0		161354		
							145.0	146.2		161355		
							146.2	147.3		161356		
							147.3	148.4		161357		
							148.4	149.3		161359		
							149.3	150.4		161360		
							150.4	151.7		161361		
							151.7	152.0		161362		
							152.0	153.2		161364		
							153.2	154.3		161365		
							155.4	156.7		161367		
							156.7	158.7		161368		
							158.7	160.5		161370		
							154.3	155.4		161366		

DOWN HOLE SURVEYS

DEPTH	AZIMUTH (magnetic)	ANGLE
0	190	-50°
108	191	-47
138	201	-48
201	188	-46
228	192	-44.5
249	191	-44
300	196	-43
348	194	-41
447	195	-37

029032

APPENDIX II

DDH-ML1 - THIN SECTION DESCRIPTIONS

CSR Limited
Minerals Division 033

Correspondence to: THE CHIEF GEOLOGIST BOX 483 GPO
SYDNEY NSW 2001 TELEPHONE (02) 237 5111

FIELD SAMPLE DESPATCH SHEET

13084

State: TASMANIA Project: MT LINDSAY Prospect No.: 605 Locality: DDH-ML 1

CSR Order No.: W1593 Date Sampled: APRIL 85 Sampler: PDE/SM

Date Despatched: 8/5/85 Despatcher: PDE Despatched per: ANSETT

Type of Sample: ROCK - DRILL CORE - THIN SECTIONS

Lab. Name: COMLABS / IAN PONTIFEX

Sample Number Co-ordinates	From E/W	To N/S	Chemical Analyses (ppm or %)					Remarks
A161372	106.9m							Rock Type ?
A161373	111.0m							" "
A161374	116.4m							A161351 Analysis-Mineralisation ?
A161375	133.0m							" Style ?
A161376	145.3m							A161355 " " , Fault ?
A161377	147.9m							A161357 " Replacement ?
A161378	148.6m							A161359 "
A161379	150.2m							A161360 "
A161380	150.5m							A161361 " Mineralisation ↔ Faults ?
A161381	151.8m							A161362 " Rock type ↔ Mineralisation
A161382	153.0m							A161364 "
A161383	153.7m							A161365 " " " ↔ "
A161384	154.6m							A161366 " Formation ↔ Mineralisation
A161385	156.4m							A161367 "
A161386	156.7m							Rock type - Mineralisation ?
A161387	157.8m							A161369 " " "
A161388	166.3m							Vein mineralisation ?
A161389	180.7m							Contortions ?
A161390	192.2m							Rock "
A161391	212.5m							"
A161392	266.9m							Relationship to A161393/394 ?
A161393	267.5m							"
A161394	281.4m							"
A161395	301.5m							
A161396	323.0m							Mineralisation ?
A161397	353.9m							"
A161398	393.6m							"
A161399	440.0m							Rock ?
A161400	449.0m							Mineralisation

Instructions to Analyst: PREPARE THIN SECTIONS OF DRILL CORE / [illegible] Descriptions of each with particular reference to the relationship of mineralisation

Results to: P.D. ELLIS CSR LTD 35 EAST DERWENT HIGHWAY LINDISFARNE TAS 7015

DISBURSEMENT Pink — To Chief Geologist Sydney White — To Assay Lab with Order Green — Despatch with Samples
Yellow — Field Copy

Pontifex & Associates Pty. Ltd. 029035

034

TEL. 332 6744
A.H. 31 3816

26 KENSINGTON ROAD, ROSE PARK
SOUTH AUSTRALIA

P.O. BOX 91, NORWOOD
SOUTH AUSTRALIA 5067

MINERALOGICAL REPORT NO. 4565

by A.C. Purvis PhD

17th June, 1985

TO:	The Managing Director Comlabs Pty. Ltd., 305 South Road, MILE END SOUTH S.A. 5031
FOR :	Mr. Peter Ellis, C.S.R. Ltd. 35 East Derwent Highway LINDISFARNE Tas 7015
YOUR REFERENCE:	CSR Field Sample Despatch Sheet No. 13084 CSR Order No. 41593
MATERIAL:	Drill core samples (29), Mt. Lindsay Western Tasmania
IDENTIFICATION:	A161372 to A161400
WORK REQUESTED:	Thin and polished thin sections as appropriate, descriptions and comments as requested.
SAMPLES & SECTIONS:	Returned to Comlabs with two copies of this report.

PONTIFEX & ASSOCIATES PTY. LTD.

INTRODUCTION

Twenty nine drill core samples, A161372 to A161400 were submitted and examined in 27 polished-thin sections and 4 normal thin sections, to study the various combinations of opaque and translucent phases, throughout the suite as requested.

The depths marked on the bags are recorded in the descriptions, and are from 106.9m (A161372) to 449m (A161400).

SUMMARY OF MAJOR UNITS IN SEQUENCE

The sequence in this drill hole as represented by the samples described in this report is as follows:

(1) 106.9m to 147m : layered (hornfelsed) siltstones and claystones

(2) 147 - 151m : a complex dolomite-calc silicate unit

(3) 157 m to about 170 m : calc-pelites

(4) 170m to the bottom at about 450m : a sequence of weakly hornfelsed pelitic and minor sandy facies, commonly with relict sedimentary slump structures (?or tectonic melange) and minor calc-pelite and calc-silicate veins and/or layers.

(5) 265 to 270m : basic igneous "basaltic" body, probably a dyke.

The upper pelitic unit contains andalusite $\pm$ biotite and the lower unit commonly has cordierite and/or biotite with or without alkali felspar.

Complex calc-silicate assemblages occur in the dolomite-calc silicate unit and in the calc-pelites.

Trace to accessory chalcopyrite is fairly widespread throughout the sequence, generally closely associated with pyrrhotite (in calc-silicate layers/lenses), also associated with pyrite in the metapelitic facies. Trace sphalerite and rare-trace galena also occur in several samples, but these have a much sparser and more sporadic representation than chalcopyrite. Detailed examination was made in reflected and transmitted light for tin minerals, but none were found.

037

COMMENTS ON METAMORPHIC, METASOMATIC CHARACTERISTICS AND GENESIS

Many of the features in these rocks relate to the different kinds of fluid-rock interactions possible between variously reactive/ non-reactive, or porous/permeable/impervious strata, with heated fluids probably driven in a convective system by the adjacent Meredith Granite. The metamorphic grade in the pelitic hornfelses cannot be determined precisely, but it is possibly relatively low in the hornblende-hornfels facies, in the unit overlying the carbonate horizon.

A high grade can be proven only for A161399 which has the assemblage cordierite-alkali felspar, and this can be related to the assemblage andalusite-phlogopite in No. A161375, by the reaction

2phlogopite + 6 andalusite + 9 quartz = 3 cordierite + 2 orthoclase + 2 water

The temperatures represented by the calc-silicate assemblages in the carbonate horizon may therefore be somewhat higher than those in the adjacent less permeable pelitic facies, probably as a result of the hot pyrrhotite forming metamorphic fluids being channelled along these horizons.

The veins and layer-veins in the lower pelitic (melange) sequence also appear to represent lower temperatures than the assemblages in the above metacarbonates, and accordingly have deposited pyrite rather than pyrrhotite. An exception is A161397B, in which veins carry pyrrhotite rather than pyrite.

The general comment is made that, recent work on the metamorphism of interbedded pelitic and calcareous rocks in North America, has indicated that the carbonate horizons act as "aquifers", channelling the hot reactive metamorphic fluids. The less permeable pelites have fluids formed mainly by dehydration reactions within these layers and locally channelled into fractures and fault planes.

The meta-carbonate unit in the sequence is represented by planar or block-like residual masses of very compact fine crystalline dolomite ± calcite ± olivine, but which contain conformable to discordant (A161379 and 84 particularly), lenses, layers and vein-like bodies. Most of the calc-silicate masses (except A161381, and 84) contain iron sulphides (mostly pyrrhotite), as minor to major (A161379) constituents. The lenses and discordant bodies of the calc-silicates are interpreted as being of replacement origin, and include the components calcite + clinopyroxene ± iron-sulphides ± olivine. An intermediate zone of calcite ± olivine ± serpentine ± minor very fine magnetite occurs between the residual dolomitic bodies and the calc-silicate. This zone is texturally part of the residual lenses and blocks rather than part of the calc-silicate masses or veins.

In the pelitic to psammitic rocks, there appear to be more discrete veins, with however, some diffuse or zoned metasomatic envelopes, and some metasomatised layers which may in some cases have been calcareous initially. Most of the metasomatism is superimposed on a pelitic (per aluminous) composition however. In zone samples (A161391, 398, 400) a combination of brecciation and metasomatism is present.

The basalts (A161392-3) show intermediate characteristics with disseminated pyrrhotite (and Fe-Ti oxides) in A161392; and a discrete vein An alteration envelope in A161393 carries coarse pyrrhotite partly altered to pyrite.

Transitional metasomatic activity is represented by pyrite-depositing fluids at the base of the calcareous unit (A161385-6), and by pyrrhotite-bearing veins in some of the pelitic rocks (A161397B; A161400) deeper in the drill hole. The reasonably high metamorphic temperatures suggested by A161397B are consistent with early hot fluids contemporaneous with the formation of the cordierite-alkali felspar assemblage in A161399, but with possibly later, cooler fluids in A161400.

SUMMARY OF METAMORPHIC/METASOMATIC GENESIS

The history of the sequence in the drill hole sample described in this report includes contact metamorphism accompanied by hot metamorphic (?metasomatic) fluid initially channelled along faults and some fractures, (e.g. in A161397B), and along the reactive carbonate horizon between 146 and 157 metres, to form calc-silicate assemblages and pyrrhotite. Later cooler fluids formed different calc-silicates (epidote, actinolite etc) and pyrite, with retrograde chloritic clays and/or prehnite. Retrograde prehnite and/or zeolite and thin veins of adularia and/or calcite ± pyrite marcasite filaments, represent the latest and lowest temperature fluids recorded by these rocks.

This history has some similarities with that of the Renison Bell deposit (Newnham 1975, in C.C. Knight, ed: Economic Geology of Australia and Papua New Guinea, 1 : Metals : A.I.M.M. 1975, pp. 581 - 583), but not to the Cleveland or Mt. Bischoff deposits, at least as interpreted in the volume mentioned above. (A similar deposit at Queen Hill was studied by W. Lutley, unpublished M.Sc Thesis University of Adelaide).

INDIVIDUAL DESCRIPTIONS

A161372 : 106.9m : interbedded fine sandstone and pelitic siltstone; weathered, minor veins of quartz-clay-limonite and manganese oxides.

This is a bedded rock with layers 1 - 5 mm thick basically of pelitic siltstone, and fine sandstone with a grain size of 0.1 mm. It is weathered, and the fine angular detrital quartz grains, now occur in a matrix of fine quartz and probable kaolinite which has a layer-parallel orientation.

The layering is interrupted by irregular, patchy veins of quartz, + patchy manganese oxides, diffuse limonite and fibrous clays, 2 - 10 mm wide. The fibrous clays and limonite extend along the bedding for varying distances. Examination of the Mn and Fe oxides in reflected light indicate that they are basically of supergene origin, with some colloform and spherulitic textures, without any indication that they represent former sulphides in-situ. Trace minute inclusions of pyrrhotite and pyrite do occur in the vein quartz however.

A161373 :   111.0m : hornflesed sandy siltstone, with andalusite partly altered to white mica; minor 'spots' possibly after cordierite.

This is a massive rock with fine detrital quartz grains to 0.1 mm in size, dispersed through a finer grained matrix of quartz and clays, and accessory minute crystals of rutile.

Subhedral to skeletal porphyroblasts of andalusite (10%) are irregularly scattered, these are about 1 mm in size, with a pale envelope outlined by limonite. Partial to complete alteration to white mica affects some of these porphyroblasts, with the basal plane of the mica parallel to the base of the andalusite crystals.

Also there are scattered spots which may be retrogressed cordierite porphyroblasts, and a blotchy limonite staining which emphasises the overall porphyroblastic texture of the rock.

A fracture cutting the rock has a bleached alteration envelope and a partial lining of white mica.

A161374 : 116.4m : graphitic, pelitic, and very fine sandy siltstone; veins and stringers of variably quartz-chlorite, clay ± sericite, and pyrite; most pyrite is primary, some is after pyrrhotite, and filamentous pyrite is also present.

This is a fairly homogeneous, vaguely bedded siltstone, with quartz grains to 0.1 mm in size, in a matrix of finer quartz-clay-graphite. Patches of microcrystalline carbonaceous material, fine pyrite and leucoxene are scattered, and irregular sericite lenses to 1 mm long may be derived from porphyroblasts.

Thin, parallel sided stringers and coarser irregular veins are either chlorite-rich, with minor quartz and pyrite, or are quartz-rich, with coarser pyrite and minor chlorite and/or minor sericite. The widest veins are quartz rich with minor chlorite, pyrite and sericite.

Apparently later stringers of clay also contain minor pyrite, and have a contorted internal lamination. The pyrite is subhedral crystalline, but porous pyrite after pyrrhotite, and thin late stage threads of filamentous pyrite are present.

A161375 : 133m : hornfelsed sandy siltstone, including minor andalusite, phlogopite, and pyrite (some of which is after pyrrhotite), rare chalcopyrite.

This is a strongly layered rock with lenticular layers 1 - 10 mm wide, either sericite rich with small clay rich "spots" (?retrogressed cordierite grains) or quartz rich. Porphyroblasts of andalusite (10 - 12%) to 1.5 mm long, and of phlogopite (5 - 7%), about 1 mm in size, are scattered, most commonly in pyrite-rich layers and lenses 2 - 10 mm wide.

Some of the andalusite is replaced by sericite and a sericite-lined fracture is present. Patches of filamentous pyrite are scattered and are commonly elongate parallel to the layering.

The pyrite which is mostly in conformable layers, consists mostly of fine granular, irregular patches of "primary" subhedral crystals locally vaguely atoll-textured. Minor secondary very fine porous pyrite after pyrrhotite has a similar distribution. Even less pyrite occurs in thin cross cutting veins with quartz, andalusite andphlogopite. Trace small grains of chalcopyrite are present.

A161376 : 145.3m : massive very fine grained and heterogeneous aggregate of clay-sericite, tremolite, pyrite-marcasite, including a zoned vein of pyrite-marcasite (?meta pyritic-pelitic-dolomite).

About 50% of this rock consists of very fine crystals of pyrite-marcasite, variably in loose clusters, also in fine scale polygonal aggregates and in small spherulites.

A vein made up of zones of relatively concentrated, very fine crystalline, pyrite-marcasite, is incorporated within these masses of fine iron sulphide.

The other half of the rock consists of diffuse heterogeneous masses of extremely fine clay-sericite and tremolite. Ultrafine iron-sulphide commonly occurs along intergranular boundaries.

The overall irregular patchy nature of this rock suggests a breccia, possibly developed within a metamorphosed, pyritic-pelitic-dolomite.

A161377 : 147.9 m : layered marble/calc-silicate rock with lenses rich in clinopyroxene, olivine and pyrrhotite; trace secondary magnetite associated with altered olivine and altered pyrrhotite.

About 80% of this rock is a fine grained (0.05 mm) calcite marble, with sparse disseminated clinopyroxene and olivine grains. Several lenticular layers up to 4 mm thick are rich in clinopyroxene with minor olivine. The pyroxene is prismatic, but the olivine is anhedral to poikiloblastic. The silicates in these lenses have grains 1 - 3 mm in size. The olivine is partly to completely altered to serpentine plus rare, extremely fine magnetite. Grains and lenses of sulphide are common to abundant, forming an integral part of the silicate lenses, i.e. with an essentially conformable mode of occurrence.

The main sulphide is pyrrhotite with very minor secondary porous pyrite. Some of the pyrrhotite grains very rarely show marginal alteration to magnetite.

A161378 : 148.6 m : layered dolomite/olivine-calcite/diopside rock with accessory pyrrhotite in the calc-silicate layers or veins; trace magnetite.

The offcut of this rock stained for carbonate reveals an interesting pattern of different carbonates which is also seen in samples described below, even though this sample is layered, and some of the samples are more irregularly veined and brecciated.

In this rock, residual areas of fine granular dolomite are veined and rimmed by calcite, with minor fresh to serpentinised olivine, adjacent to layers 2 - 10 mm wide of prismatic diopside with minor calcite. The diopside is commonly acicular, like tremolite, and occurs as grains up to 3 mm long. Minor pyrrhotite (5 - 7% of the whole rock) accompanies the calc-silicate minerals, and trace extremely fine magnetite accompanies the serpentine. One or two of the pyrrhotite grains is veined by magnetite.

A161379 : 150.2 m : brecciated microcrystalline dolomite, with alteration-reaction rims against a pyrrhotite-calc-silicate vein network system; rare chalcopyrite.

This sample consists of large zoned fragments of microcrystalline carbonate set in a complex "matrix" or net-vein sulphide-calcite-clinopyroxene with minor phlogopite. The fragments are 5 mm to several cm in size with cores of fine granular dolomite, veined and rimmed by calcite. Minor olivine, largely altered to serpentine, is scattered through the dolomite and occurs in some of the calcite veins. A thin outer rim or layer of serpentine, phlogopite, fine grained diopside and calcite separates the fragments from the matrix-fill material between the fragments. The outermost rim is green phlogopite.

The matrix is a heterogeneous aggregate of pyrrhotite diopside and colourless to pale green phlogopite. A division into diopside-rich lenses and pyrrhotite-rich interstitial areas is possible with a diffuse boundary between the two areas. The diopside is granular to prismatic but is finer grained than in the preceding sample.

Rare chalcopyrite accompanies the pyrrhotite and alteration to pyrite occurs along some of the thin late stage veins.

A161380 : 150.5m : layered (dolomite)-olivine-calcite-phlogopite-diopside rock with fine pyrrhotite mainly in the calc silicate layers adjacent to a calcite-pyrrhotite vein;
rare chalcopyrite, trace magnetite.

In this section there is no residual dolomite although the unsectioned core slice shows a layered arrangement of lithologies similar to that in A161378.

In thin section layers of granular calcite, with minor partly serpentined olivine and fine grained phlogopite, alternate with diopside-rich layers with minor calcite, partly serpentinised olivine and phlogpite. Individual layers are 1 - 5 mm thick, with some microfracturing, and pyrrhotite occur along the calc-silicate layers in the vicinity of a cross cutting, zoned sulphide-calcite vein, with a sulphide lens adjacent to the host rock. The larger core section shows some dolomitic cores tc the calcite-rich layers.

Traces of chalcopyrite accompany pyrrhotite, in the sulphide zones in the sulphide calcite vein, and trace amounts of extremely small secondary pyrite-magnetite patches also accompany rare pyrrhotite.

A161381 : 151.8m : layered, fine to coarse granular diopside rock;
minor calcite veins, minor phlogopite, only trace sulphides (pyrrhotite).

This is essentially a vaguely layered to massive, diopside rock, with a thin layer rich in phlogopite, cut by calcite veins. The diopside is granular with grains 0.5 - 1.5 mm long and minor interstitial calcite. Traces of interstitial clays are present.

The phlogopite layer has a decussate texture and includes accessory very small grains of pyrrhotite.

The calcite veins include planar and complex stylolite like veins, and the larger veins incorporate minor diopside.

A161382 : 153m : layered dolomite/olivine and/or serpentine calcite rock, with minor fine pyrrhotite mainly in diopside lenses, rare very fine secondary magnetite.

This sample shows a disrupted layering on a scale of 10 - 15 mm with very limited development of diopside. Disrupted layers of (residual) fine granular mixed dolomite and calcite are common, with very minor scattered pyrrhotite olivine and rare fine magnetite. These are separated by minor much thinner layers of fine granular calcite-olivine (or serpentine) ± rare magnetite, and are cut by calcite veins with olivine, serpentine and/or pyrrhotite. The wider veins contain diopside and minor phlogopite with minor pyrrhotite.

Two diopside-rich lenses occur in the thin section and extend into larger lenses in adjacent parts of the core. These contain minor calcite, pyrrhotite and phlogopite as well as granular to prismatic diopside, and pass laterally into relatively coarse pyrrhotite-bearing calcite veins. Minor serpentine occurs in and adjacent to these lenses and veins.

A161383 : 153.7m : layered, dolomite-calcite/serpentine-(olivine)/olivine-diopside-rock;
minor pyrrhotite, rare chalcopyrite sphalerite and magnetite also with more or less layered distribution.

This sample is layered on a scale of 5 - 20 mm with thicker dolomite-calcite layers, containing minor opaque oxides and serpentine, and thinner calc-silicate layers. The calc-silicate layers are connected by veins of calcite and fresh to serpentinised olivine.

The calc-silicate layers have margins composed of serpentine with some residual olivine, and these persist where the core is dominantly calcite rather than calc-silicates. The calc-silicate layers are dominatec by granular to prismatic diopside, with minor olivine and very minor phlogopite. Fine pyrrhotite occur in some of the calc-silicate layers and in some of the serpentine layers, in variable abundance from 2 - 3% to about 7%.

Traces of chalcopyrite, sphalerite, and magnetite locally occur with the pyrrhotite.

<u>A161384</u> : 154.6m : breccia (disrupted layer) of altered dolomite, in a matrix of calcite and siopside; very minor extremely fine magnetite.

This is a similar sample to A161379, except that is has very little residual dolomite and no sulphides. It has carbonate rich fragments up to 20 mm long, apparently as a disrupted layer, within a calcite-siopside matrix.

These fragments consist of fine grained calcite with minor serpentine or saponite and rare extremely fine magnetite, and traces of phlogopite with rare residual dolomite cores, and than but persistent serpentine rims. They commonly contain threads of extremely fine grained magnetite.

The matrix contains slightly more diopside than calcite, and has a granular texture and a grain size of 0.2 - 1 mm. Phlogopite occurs in accessory amounts usually in small clusters of unoriented flakes.

A161385 : 151.8m : layered calcite and marble with diopside calcite layers, bifurcating veinlets of diopside and/or calcite + pyrite cut by later prehnite veinlets; "syngenetic", accessory sphalerite and skeletal pyrite in some layers.

This is a fine grained calcite marble with layers, 2 - 20 mm thick, containing variously, 5 to 50% fine grained diopside. Accessory, very fine grains of pyrite occur in rather diffuse veinlets of diopside, or in more clearly defined calcite veinlets. Both of these vein types are cut by later barren veinlets of prehnite, with some en-echelon offsetting.

Accessory, small "grains" of pyrite and sphalerite have a vaguely layered distribution through some marble layers, the pyrite is 'intergranular' to produce a skeletal shape.

A161386 : 156.7m : vaguely layered diopside-garnet-calcite rock, minor skeletal/intergranular pyrite, minor calcite-prehnite veins;
trace chalcopyrite.

This sample is dominated by calc-silicate minerals but has lenses and disseminations of calcite. The largest calcite area contains disseminations and veins of diopside.

The calc-silicate areas contain dominant granular garnet and diopside with minor calcite, locally as poikilitic grains enclosing small garnet and pyroxene grains. The grainsize is from 0.1 to 1 mm. Rare sulphides occur in calcite veins, and in and adjacent to prehnite-bearing calcite-veins. The prehnite-bearing veins have an en-echelon arrangement.

The sulphide is dominantly pyrite as variably as massive, skeletal and filamentous patches to 6 mm in length. A trace of chalcopyrite is present.

A161387 : 157.8m : disrupted calc-pelite with composite calc-silicate and carbonate veins, including prehnite-bearing veins and prehnitised plagioclase: trace base-metal sulphides and pyrite.

This is a complex layered rock with microfaulted lenses 2 - 10 mm thick, and a cross-cutting complex vein 5 - 10 mm wide. Most of the rock has grains 1 - 10 microns in size, difficult to resolve or identify, but the major components appear to be diopside, actinolite, felspar, with minor, dispersed, extremely fine titaniferous material and rarer pyrite, in lenses and in alteration envelopes around veins.

Actinolite is for example, present in alteration envelopes around thin actinolite veins, and as an outer envelope around the main complex vein. The minor envelope is too fine grained to identify.

The main vein contains tremolite-actinolite, diopside, also plagioclase (partly to completely altered to prehnite). Traces of chalcopyrite, sphene, pyrite, galena and sphalerite, are also present.

The smaller veins comprise three suites:

(1) diopside

(2) actinolite and

(3) later veins with calcite, albite, prehnite and clays.

Prehnitisation of felspar is most strongly developed adjacent to these last veins (no.3).

A161388 : 166.3m : layered calc-pelite including a complex calc-silicate layer, with accessory very fine base metal sulphides, and sphene.

This sample has massive to finely laminated calc-pelite layers of micro to almost cryptocrystalline "matrix" minerals separated by a layer (or concordant vein?) of calc-silicate minerals with minor very fine calcite and sulphides. It is also cut by veins of adularia-calcite and actinolite. The actinolite rich vein was stained blue by the carbonate-stain reagents, acidified alizarin red + potassium ferri-cyanide, as was much of the "matrix", this suggests that much of the microcrystalline matrix in the calc-pelite layers is ferroan carbonate, though some calcite and epidote are also present. Some lenses are also sericitic

The concordant layer or vein has zones as follows:

(1) decussate actinolite with sphene and traces of chalcopyrite

(2) a bulbous layer of coarse actinolite with calcite, minor garnet also accessory loose clusters of extremely fine chalcopyrite galena and sphalerite

(3) garnet with minor actinolite

(4) very fine poikiloblastic calcite with actinolite and garnet, including some poikiloblastic actinolite

(5) lenses of decussate actinolite

(6) coarse actinolite with calcite, alkali felspar and very fine sulphides (pyrite, minor chalcopyrite, galena, trace sphalerite).

Veinlets cutting this zoned layer/vein contain carbonate where they cut the layer/vein, and adularia against the calc-pelite. Small pyrite-marcasite lenses occur in the calcite portions of these veins. The actinolite vein cutting the calc-pelite has a sericitised alteration envelope. Sphene is abundant in the calc-silicate layer adding evidence to the genesis of metasomatised sediment rather than a vein.

A161389 : 180.7m : layered, compact and extremely fine, heterogeneous, biotite-rich hornfels, with anthophyllite and fibrous amphibole; minor fine pyrite, trace chalcopyrite.

The layering in this sample has a complex lensoidal and locally disconformable character, it appears to mostly represent a sedimentary structure, but possibly modified by tectonic influences. The layers, 1 - 10 mm thick, are composed of compact extremely fine biotite or biotite plus a microcrystalline mosaic of quartz and/or felspar, and fine opaque oxide grains.

Two concordant quartz veins are present. One contains minor anthophyllite in the vein and its selvedge. The other thicker vein contains lenses of fibrous monoclinic amphibole, or of biotite, and minor felspar and opaque grains and a lensoidal felspathic selvedge. The amphibole may be tremolite or cummingtonite but its identity is not clear. Minor pyrite and a trace of chalcopyrite are present in the amphibole lens. Some of the pyrite is replacing a bladed mineral.

A161390 : 192.2m : silty and pelitic fine lithic sandstone, hornfelsed to schistose biotite-rich rock with abundant fine magnetite, with microfaults, amphibole lenses, and adularia veins; localised small lens of quartz-tourmaline.

This sample has fairly thick beds with some tectonic (microfaulted) contacts and some conformable contacts. It consists mostly of a matrix of compact hornfelsic biotite crowded with extremely fine magnetite, (7 - 10%) but also crowded with fine sand size detritus of quartz grains, grains of plagioclase and indefinite lithic material (0.9 to 0.3 mm in size to 0.2 to 0.5 mm).

A siltstone lens, about 4 mm thick, is similar to the sandstone but has smaller (<0.05 mm) less abundant quartz grains.

Clay rich shear zones are common, the main one being along the microfaulted contact between the finer grained and coarser grained sandstones. Adjacent to this shear there are, i n the coarse sandstone, lenses of fibrous amphibole (tremolite or cummingtcnite) 1 - 2 mm wide. Thin adularia veins with minor carbonate cut across the rock.

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A161391 : 212.5m : this rock is macroscopically different over its length, thus two sections were examined from it, arbitrarily labelled A & B.

A161391A : hornfelsed, tectonically disrupted or slumped extremely fine shale-siltstone sequence, with biotite, accessory tourmaline, small scattered cordierite porphyroblasts; minor small lenses of fine magnetite.

Part of this sample represents a thin bedded shale, siltstone and rare sandstone, in lenses up to 10 mm x 3 mm probably juxtaposed by tectonic processes or by original slumping. The remainder is a layer of massive to finely and/or irregularly layered claystone with lenses and layers rich in fine grianed magnetite. This layer is cut by a microfault possibly generated by dewatering.

The main (metamorphic) minerals are biotite, sericite and quartz, with scattered cordierite porphyroblasts 0.3 - 0.8 mm in size in the more biotite-rich areas, including the massive to laminated claystone.

Some of the minor sandstone lenses are quartzofelspathic, and may be tuffaceous with angular grains 0.2 mm in size in a biotite-rich matrix. Extremely fine magnetite occurs along original bedding laminations.

Irregular quartz veins and lenses with biotite, magnetite and/or tourmaline are present and there are thin late stage veinlets of adularia. Traces of chalcopyrite and rare pyrite occur with the magnetite.

A161391B : laminated pelitic biotitic hornfels with minor calcareous lenses, layers and veins, of carbonate-amphibole-epidote composition, very fine magnetite occurs along bedding laminations, pyrite occurs in small concordant lenses, trace chalcopyrite.

Part of this rock is a disrupted layered and laminated very fine biotite-rich metaclaystone, similar to that in A161391A, but with patches and lenses of pyrite scattered through the layers; with lesser fine layered magnetite than in 161391A; and without cordierite. This passes into a disturbed and complex calcareous lithology in layers or veins containing, variously, quartz, fresh to sericitised plagioclase, epidote, actinolite, chlorite and calcite.

Pyrite grains and aggregates along the layering and, adjacent to these carbonate areas and as decorations on thin veins filled by calcite quartz adularia and pyrite.

Common associations are: actinolite-sericitised plagioclase, and epidote-calcite-chlorite. One lens has partly chloritised diopside grains.

Trace chalcopyrite is present.

A161392 : 266.9m : metamorphosed brecciated basalt, fairly abundant, disseminated, very fine pyrrhotite, Fe-Ti oxides, rare pyrite and chalcopyrite.

This metabasalt is heterogeneous and brecciated. Although discrete fragments are not clearly defined, there are some possible fragments about 7 - 15 mm in size, and some areas of the rock have a ladder-vein arrangement of hornblende or actinolite-filled tension gashes, terminating against narrow fracture zones.

Plagioclase phenocrysts about 1 mm in length have an irregular distribution, locally concentrated into almost doleritic fragments. Green amphibole, felspar, opaque oxides and fine sulphides occupy most of the remainder with some amphibole-filled vesicles. Sulphides and quartz occur in some vesicles as well as amphibole., and the ladder veins are filled by amphibole. The opaque minerals are mostly pyrrhotite and magnetite, with minor ilmenite and chalcopyrite, and traces of pyrite.

An anastomosing network of crush zones is rich in fine secondary Fe-Ti oxides, amphibole and felspar fragments.

A161393 : metabasalt with disseminated fine Fe-Ti oxides and pyrrhotite, incorporating a calc silicate vein carrying pyrrhotite, pyrrhotite altered to pyrite and accessory fine chalcopyrite.

This is a more homogeneous metabasalt than A161392. Plagioclase phenocrysts about 2 mm in length occur in a groundmass of felspar laths to 1 mm long together with fibrous to granular actinolite or hornblende, and very fine disseminated pyrrhotite and Fe-Ti oxides. Trace chalcopyrite is present.

A complex vein 1 - 5 mm wide has an alteration envelope in which the felspar is completely sericitised. This envelope is asymmetrical being 3 mm wide on one side of the vein and up to 7 mm on the other side, where there are rare epidote-amphibole-pyrrhotite pods.

The vein has a narrow rim of clinopyroxene followed by coarse prismatic amphibole with rare alkali felspar: its core consists of pyrrhotite and secondary pyrite, calcite and clays and very minor chalcopyrite. There are lenses of fine amphibole with minor allanite and sphene where this core is absent.

A161394 : 281.4 m : pelitic hornfels, with bleached zones against clay-quartz-epidote veins;
minor pyrite mostly after pyrrhotite and trace chalcopyrite.

The original rock type in this sample is a layered shale or claystone with some silty lenses, metamorphosed to a very fine grained biotite-quartz-felspar (?) hornfels with a layer-parallel schistosity.

A complex network of veins up to 3 mm wide contains abundant chloritic clays, minor quartz, pyrite, lamellar-form pyrite after pyrrhotite, trace chalcopyrite and scattered grains of epidote. A zoned alteration envelope up to 4 mm wide, on either side of the veins has lenses of poikilitic epidote adjacent to the veins, and a bleached quartz-chlorite zone with minor epidote and sphene.

Scattered prisms of colourless ? zoisite occur adjacent to and within the biotite hornfels. Rare pyrite grains occur in the bleached zone as coarse lenses. Extremely fine ilmenite is scattered through the hornfels, but the bleached alteration zones contain sphene.

A161395 : 301.5m : layered rock, including a contact between lenticular-layered pelitic to fine psammitic hornfels; and a layered sequence of epidote-calcite with minor tremolite and clays representing a meta calcareous sediment; extremely fine Fe-Ti oxides are disseminated and vaguely bedded through the meta-clay-silt facies.

Part of this rock is a very fine grained phlogopite-quartz - felspar (?) hornfels with a lenticular layering on a scale of 1 - 10 mm.

This hornfels includes some fine sandy (psammitic) layers with quartz and felspar grains to 0.2 mm in size, and rare chert grains to 0.6 mm. Most of the hornfels has formed however from the siltstone claystone facies.

Fine grained (0.015 mm) opaque Fe-Ti oxides (7 - 10%) occur throughout this hornfelsed meta clay-siltstone sequence except in the very finest grained layers. These oxides are coarser in the sandier lenses and may be detrital (derived from a basic igneous source?)

The metasediment passes rapidly into a conformable layer (bed) of fine grained massive epidote cut by thin veins containing calcite and prehnite. This in turn grades into a layered sequence of granular to prismatic epidote set in interstitial chloritic clays, an epidote-calcite assemblage with minor tremolite, and clays; and finally into a rock composed of coarse calcite grains enclosing numerous epidote grains and minor actinolite. A fine scale layering is present inthe more epidote rich part of this rock.

A161396 : 323.0m : fine and coarse grained layered rock, composed variously of epidote, calcite, quartz and chloritic clays; minor pyrite, some after pyrrhotite in coarser assemblage and in carbonate veins;
accessory magnetite in finer layer;
trace chalcopyrite.

This rock is divided into two parts. The finer grained part (0.05 to 0.2 mm consists essentially of epidote and chloritic clays, with minor calcite, quartz and rare very small magnetite grains. This may represent a metamorphosed and possibly metasomatised, pelitic, country rock.

The coarser lithology has large poikilitic grains of calcite up to 20 mm in size enclosing euhedral crystals of quartz and epidote about 3 mm long. Large lenses of chloritic clays, and small needles of actinolite, are scattered. This may be a metasomatic/ metamorphic assemblage, or it may represent a vein. It also contains several aggregates up to 5 mm in diameter of pyrite, and scattered sphene crystals.

Minor pyrite also occurs in carbonate veins close to the contact between the fine and coarse lithologies and in the finer grained areas. Some of the pyrite is after pyrrhotite. Trace chalcopyrite is present.

A161397 : 353.9m : two polished thin sections were examined to cover macro differences, these are arbitrarily labelled A & B which compare respectively with A161391A and B.

A161397A : hornfelsed essentially pelitic sediment, slumped and with primary sedimentary disruption structures, with a bleached amphibole-rich zone; minor extremely fine Fe-Ti oxides, also pyrite disseminated; lesser chalcopyrite, pyrrhotite, sphalerite (cf. A161391A)

This rock is basically a slumped and disrupted aggregate of claystone, siltstone and rarer sandy siltstone, as fragments and lenses from 0.5 to 6 mm thick and up to 10 mm long, all very similar to A161391A. Laminae in these sedimentary clasts and lenses are defined by extremely fine opaque oxides, and more irregularly disseminated pyrite. The mineralogy is basically extremely fine biotite ± quartz ± felspar with detrital quartz in the coarser lenses up to 0.2 mm in size. Incipient porphyroblasts (?cordierite) are present in some of these lenses. Some of thepyrite occurs in biotite veins but most are disseminated. Rare very fine pyrrhotite, chalcopyrite and sphalerite are scattered.

This rock passes gradually into a bleached amphibole-bearing altered equivalent, via a biotite-?cumjingtonite bearing zone, into a cummingtonite-hornblende-quartz-(felspar?)-zone with disseminated extremely fine magnetite and coarser pyrite.

The bleached zone also contains extremely fine ilmenite, partly to completely replaced by sphene. Minor very fine pyrrhotite, and chalcopyrite are present. A lens of fine chalcopyrite occurs in the most highly bleached area, with minor sphalerite, and traces of pyrrhotite and pyrite.

A161398 : 393.6m : fine pelitic hornfels with quartz-clay-carbonate layer-veins including granular pyrite, lesser chalcopyrite.

This sample has layers or lenses of extremely fine hornfelsic biotite, - metasediment, passing into zones of schistose chloritic clays and chloritic clay pseudomorphs after fibrous crystals (?amphibole), and into laminae of schistose sericitic and chloritic clays.

These lithologies are cut by or occur as screens between layer-veins of quartz, sulphide and clay minerals, and minor carbonate, with thicker veins dominated by coarse carbonate. Minor clays and sulphides occur in the carbonate veins.

The sulphides are mostly irregular aggregates of euhedral pyrite and some brecciated and filamentous pyrite, with minor fine grained and filamentous chalcopyrite quite widespread throughout the pyrite.

A161400 : 449 m : lensoidal-layered metasediment with accessory disseminated very fine pyrrhotite and Fe-Ti oxides;
in contact with a quartz, lesser epidote calcite actinolite, carrying aggregates of fine granular, pyrite-marcasite, trace chalcopyrite.

This sample contains a bleached amphibole-bearing facies of the lensoidal layered claystone-siltstone rock type recorded above in A161399, 397 and elsewhere with minor very fine tremolite, felspar, disseminated pyrrhotite, Fe-Ti oxides. Minor detrital quartz and felspar sand grains to 0.4 mm in size occur in relatively sandy lenses which are up to 10 x 4 mm and contain detrital opaque oxides.

This rock is cut by thin quartz-actinolite veins, and by quartz-clay shear veins which offset a lenticular epidote-sericite-(alkali felspar)-rich selvedge around the main vein.

The main vein is a heterogeneous aggregate of quartz, calcite, epidote, clays and pyrite-marcasite clusters, similar to that in A161396 but richer in quartz and poorer in calcite.
It is cut by thin quartz-albite stringers, some with a chlorite-clay selvedge.

APPENDIX III

DDH-ML1 - GEOCHEMICAL RESULTS

070

DDH-ML1 - DRILL CORE ANALYSES

SAMPLE NO.	SAMPLE INTERVAL (m)	Sn	As	Ba	W	Sb	Cu	Pb	Zn	Ni	Co	Bi	Cd	Li	F (%)
A161351	117.0-119.0	8	9	290	x	x	80	36	50	22	4	8	1	36	0.16
352	138.5-142.5	x	7	240	x	26	70	60	135	70	50	4	x	70	0.11
354	142.5-145.0	10	40	100	x	30	90	44	450	160	70	x	x	60	0.11
355	145.0-146.2	x	65	155	x	10	60	36	190	46	28	x	x	38	0.12
356	146.2-147.3	6	8	35	x	x	18	16	75	6	4	x	x	8	0.08
357	147.3-148.4	8	7	30	x	x	16	12	42	10	4	x	x	7	0.02
359	148.4-149.3	4	9	15	x	x	16	12	24	10	4	12	x	8	0.02
360	149.3-150.4	x	6	45	x	12	32	12	40	12	4	x	x	8	0.03
361	150.4-151.7	x	10	70	x	6	60	14	90	12	8	x	x	12	0.04
362	151.7-152.0	10	42	15	x	12	20	30	100	6	4	x	x	36	0.02
364	152.0-153.2	14	10	370	x	10	34	14	95	14	6	x	x	10	0.03
365	153.2-154.3	x	12	55	x	10	50	40	85	14	4	x	x	14	0.03
366	154.3-155.4	22	230	15	10	x	14	8	55	12	28	8	x	10	0.02
367	155.4-156.7	16	18	15	x	x	16	18	75	8	4	x	x	10	0.01
369	156.7-158.7	18	24	165	x	10	24	18	48	42	20	x	x	34	0.05
A161370	158.7-160.5	8	12	250	x	x	38	30	115	55	34	x	x	55	0.06

All values in ppm except F (in %)

Analyses by Comlabs using the following methods:

Sn, W, As, Sb, Ba	by XRF-1
Cu, Pb, Zn, Ni, Bi, Co, Cd	by AAS-1
Li	by AAS-6
F	by SIE-3

x is below detection limit

APPENDIX IV

DDH-ML1 - SUSCEPTIBILITY LOG

072

029073

CSIR

Aluminium, Minerals And Chemicals Division

TO Mr P Gidley **REFERENCE** PDE/ /605

FROM P D Ellis **DATE** 11 Jun 85

MT LINDSAY

Please find attached the susceptibility measurements for the Mt Lindsay diamond drill hole (core) on line ML17 (PDH-ML1). The hole collar is at 415mN on line ML17 (see Plan 7605-8 in Report EMR 56/85). The geophysics on this line is shown on Plans 7605-8 and 7605-7.

A brief log of the hole is:

0- 66.1m	Weathered or partially weathered Hornfelsed greywacke
66.1- 89.4m	Hornfelsed greywacke
89.4- 95.6m	Hornfelsed siltstone
95.6-100.0m	Clay
100.0-108.0m	Laminated siltstone/sandstone
108.0-108.5	Chert
108.5-115.0m	Hornfelsed greywacke with fine pyrite throughout
115.0-115.6m	Fault - pyrite, chlorite, actinolite
115.6-133.8m	Hornfelsed greywacke - fine pyrite throughout, pyrite on joints
133.8-138.0m	Chert - pyrite in bands
138.0-138.5m	Siltstone
138.5-146.2m	Fault - clay zone with pyrite/pyrrhotite
146.2-156.7m	Limestone - partially replaced by pyrrhotite with chalcopyrite - main replacement at 150-151m with 20% sulphides
156.7-158.7m	Chert

158.7-182.1m	Hornfelsed greywacke - some pyrile, pyrrhotite, chalcopyrite
182.1-183.7m	Chert
183.7-221.0m	Hornfelsed greywacke - fine pyrite with pyrrhotite/chalcopyrite
221.0-221.8m	Chert
221.8-259.4m	Hornfelsed greywacke - with pyrite, pyrrhotite/chalcopyrite in parts
259.4-259.7m	Intrusive?
259.7-265.6m	hornfelsed greywacke - with fine pyrite
265.6-269.0m	Chert
269.0-291.5m	Hornfelsed greywacke - minor fine pyrite and pyrrhotite/chalcopyrite
291.5-292.0m	Chert
292.0-340.5m	Hornfelsed greywacke - minor pyrite and pyrrhotite/chalcopyrite
340.5-342.0m	Chert - fine pyrite
342.0-366.1m	Hornfelsed greywacke - minor pyrite and pyrrhotite
366.1-368.2m	Chert
368.2-392.6m	Hornfelsed greywacke - pyrite
392.6-394.9m	Chert
394.9-449.8m	Hornfelsed greywacke - pyrite minor with some pyrrhotite/chalcopyrite
449.8m	EOH

Can the geophysical data be examined by relating the hole magnetic data to the surface geophysics?

Geochemical and petrological data should be available by 14th June.

Also can the remainder of the geophysical data (surface) be examined to determine if other unexplained geophysical anomalies exist. This data (airborne magnetics, EM and ground line traverses) will be forwarded as soon as available.

for
P D Ellis

075

DRILL HOLE NO. DDH ML1

COLLAR CO-ORDS: 5381500mN 359225mE

COLLAR R.L.:

TOTAL DEPTH: 449.8m

ANGLE: 49°

AZIMUTH: 194°

DOWN HOLE SURVEY DATA								
Survey Pt. Downhole	108m	138m	201m	228m	249m	300m	348m	447m
Angle	47°	48°	46°	44.5°	44°	43°	41°	37°
Azimuth (Magnetic)	191°	201°	188°	192°	191°	196°	194°	195°
Azimuth (Grid)								
DOWN HOLE CALCULATIONS								
Instrument Station								
Forward Station								
Grid Bearing								
Vertical Angle								
Slope Distance								
Horizontal Distance								
LATITUDE N								
S								
DEPARTURE E								
W								
TOTAL LATITUDE								
TOTAL DEPARTURE								
VERTICAL DISTANCE								
R.L. OF FORWARD STATION								

EXPLANATION FOR SUSCEPTABILITY MEASUREMENTS

Readings taken at 0.2m intervals except where ground was broken.

If there is no depth or reading value then the ground was broken over long intervals. Similarly if there is a depth with - as value then the ground was broken over short distances.

Depth	Suscept
183.4	0
↓	↓
185.0	0

means that all readings at 0.2m intervals between 183.4 and 185.0 inclusive were 0 magnetic susceptability.

All measurements 0 to 101.4m were measured on HQ core of 2-1/2" diameter.

Below 101.4m all measurements were on NQ core of 1-7/8" diameter.

None of the values have been corrected (susceptability meter values recorded).

029078

077

MT.LINDSAY DOWNHOLE MAGNETIC SUSCEPTIBILTY
HOLE MDH-1

56.8	0.0
57.0	0.0
57.2	0.0
57.4	0.0
59.0	0.0
59.2	0.0
62.8	0.0
66.2	0.0
66.4	0.0
66.6	0.0
66.8	0.0
67.0	0.0
67.2	0.1
67.8	0.1
68.0	0.0
68.4	0.0
68.6	0.0
69.2	0.1
70.4	0.0
70.8	0.0
71.0	0.1
72.2	0.0
73.0	0.0
73.2	0.0
73.4	0.0
73.[illegible]	0.0
74.8	0.0
7[illegible].[illegible]	[illegible].[illegible]
79.8	0.0
[illegible]	[illegible]
89.2	0.0
[illegible]	[illegible]
90.8	0.0
[illegible]	[illegible]
92.6	0.0
94.0	0.0
95.8	0.0
99.9	0.1
105.4	0.0
105.6	0.0
105.8	0.0
106.2	0.0
106.4	0.0
106.8	0.0
107.8	0.0
108.6	0.0
108.8	0.0
109.8	0.0
110.0	0.0
110.2	0.0
110.4	0.0
110.6	0.0
110.8	0.0

111.0	0.0
111.2	0.0
111.4	0.0
111.6	0.0
111.8	0.0
112.0	0.0
112.2	0.0
112.4	0.0
112.6	0.0
113.2	0.0
113.8	0.0
114.4	0.0
114.6	0.0
115.2	0.0
115.6	0.0
116.2	0.0
116.4	0.0
117.0	0.0
117.4	0.0
118.0	0.0
119.2	0.0
119.4	0.0
120.0	0.0
120.4	0.0
120.6	0.0
120.8	0.0
121.4	0.0
121.6	0.0
121.8	0.0
122.0	0.0
122.2	0.0
122.4	0.0
122.6	0.0
122.8	0.0
123.0	[illegible]
123.2	0.1
123.4	0.0
124.0	0.0
124.[illegible]	0.0
124.8	0.0
125.4	0.0
125.8	0.0
126.0	0.0
126.6	0.1
126.8	0.0
127.2	0.0
127.4	0.0
127.6	0.0
127.8	0.0
128.2	0.0
128.6	0.0
129.6	0.0
129.8	0.0
130.0	0.0
130.2	0.0
130.4	0.0
130.8	0.0
131.0	0.0

029080

131.2	0.0
131.6	0.0
132.6	0.0
132.8	0.0
133.0	0.0
133.2	0.0
133.4	0.0
133.6	0.0
134.2	0.0
134.4	0.0
134.6	0.0
135.2	0.0
135.6	0.0
136.6	0.0
137.6	0.1
137.8	0.0
142.2	0.0
145.0	0.0
146.2	0.2
146.4	0.2
147.4	0.3
147.6	0.4
147.8	0.4
148.0	0.5
148.2	0.4
148.4	0.8
148.6	0.1
148.8	0.2
149.0	0.1
149.2	0.4
149.4	1.6
149.6	0.4
149.8	1.4
150.0	0.5
150.2	1.7
150.4	1.1
150.6	1.6
150.8	0.3
151.0	1.8
151.2	1.8
151.4	0.8
151.6	3.8
151.8	0.0
152.0	3.2
152.2	1.7
152.4	3.0
152.6	1.7
152.8	1.6
153.0	1.6
153.2	0.7
153.4	0.9
153.6	0.7
153.8	0.5
154.0	0.0
154.2	0.2
154.4	0.0
154.6	0.0
154.8	0.3

155.0	0.2
155.2	0.0
155.4	0.0
155.6	0.0
155.8	0.0
156.0	0.0
156.2	0.0
156.4	0.0
156.6	0.0
156.8	0.0
157.0	0.0
157.2	0.0
157.4	0.0
157.6	0.0
157.8	0.0
158.0	0.0
158.2	0.0
158.4	0.0
158.6	0.0
158.8	0.0
159.0	0.0
159.2	0.0
159.4	0.0
159.6	0.0
159.8	0.0
160.0	0.0
160.2	0.0
178.4	0.0
178.6	0.4
178.8	0.0
179.0	0.4
179.4	0.2
[illegible]	[illegible]
179.8	0.1
180.0	0.0
180.2	0.1
180.4	[illegible]
180.6	0.0
[illegible]	[illegible]
181.8	0.0
182.0	[illegible]
182.2	0.0
182.4	0.0
182.6	0.3
182.8	0.3
183.0	0.4
183.2	0.3
183.4	0.0
185.0	0.0
185.2	0.2
185.4	0.0
191.6	0.0
191.8	4.9
192.0	6.6
192.2	3.2
192.4	4.9
192.6	8.1
192.8	4.6

081

029082

193.0	0.1
193.2	0.7
193.4	0.8
193.6	0.1
193.8	0.2
194.0	0.2
194.2	0.2
194.4	0.2
194.6	0.2
194.8	0.2
195.0	2.4
195.2	0.1
195.4	0.1
195.6	0.0
195.8	0.0
196.0	0.0
198.8	0.0
199.0	2.8
199.2	0.0
199.8	0.0
200.0	4.2
200.2	8.0
200.4	7.0
200.6	6.0
200.8	9.0
201.0	6.6
201.2	4.7
201.4	6.3
201.6	5.5
201.8	5.1
202.0	[illegible]
202.2	4.6
202.4	[illegible]
202.6	2.5
202.8	0.0
207.8	0.0
208.0	0.4
208.2	0.0
208.4	[illegible]
208.6	0.7
208.8	4.1
209.0	7.1
209.2	4.1
209.4	4.8
209.6	4.2
209.8	8.1
210.0	13.0
210.2	4.1
210.4	16.0
210.6	16.0
210.8	10.8
211.0	14.0
211.2	9.2
211.4	14.0
211.6	16.0
211.8	9.1
212.0	7.2
212.2	13.0

082

029083

212.4	14.5
212.6	6.8
212.8	3.7
213.0	3.2
213.2	8.4
213.4	3.2
213.6	2.4
213.8	3.8
214.0	0.3
214.2	0.3
214.4	7.9
214.6	2.4
214.8	3.3
215.0	2.4
215.2	3.2
215.4	0.6
215.6	2.5
215.8	12.0
216.0	6.8
216.2	8.8
216.4	8.5
216.6	4.8
216.8	4.6
217.0	6.9
217.2	3.7
217.4	2.1
217.6	6.8
217.8	7.4
218.0	7.6
218.2	16.0
[illegible]	7.7
219.8	3.6
220.0	3.7
220.0	7.1
220.4	[illegible]
220.6	16.0
220.8	7.4
221.0	15.0
[illegible]	[illegible]
221.4	3.9
221.6	16.0
221.8	6.7
222.0	13.0
222.2	12.0
222.4	15.0
222.6	4.9
222.8	0.0
223.0	2.2
223.2	3.5
223.4	9.0
223.6	11.0
223.8	2.3
224.0	0.4
224.2	0.1
224.4	0.7
224.6	0.2
224.8	2.3
225.0	3.0

083

029084

225.2	7.3
225.4	7.0
225.6	7.3
225.8	8.0
226.0	6.8
226.2	4.5
226.4	0.6
226.6	4.5
226.8	4.8
227.0	10.4
227.2	9.0
227.4	6.1
227.6	7.6
227.8	4.8
228.0	4.8
228.2	8.8
228.4	5.5
228.6	0.4
228.8	3.2
229.0	4.7
229.2	6.7
229.4	7.0
229.6	0.4
229.8	21.5
230.0	7.0
230.2	6.7
230.4	3.2
230.6	28.0
230.8	7.7
231.0	7.8
231.2	11.0
231.4	6.8
231.6	[illegible]
231.8	16.0
232.0	[illegible]
232.2	12.0
232.4	[illegible]
232.6	5.4
232.8	5.4
233.0	14.0
233.2	5.4
233.4	5.7
233.6	4.8
233.8	2.9
234.0	2.4
234.2	2.6
234.4	4.8
234.6	6.4
234.8	5.7
235.0	0.0
235.2	0.5
235.4	0.6
235.6	2.4
235.8	4.8
236.0	4.8
236.2	4.9
236.4	4.8
236.6	6.3

236.8	8.2
237.0	8.4
237.2	0.9
237.4	13.0
237.6	7.0
237.8	8.2
238.0	7.4
238.2	3.6
238.4	1.7
238.6	7.1
238.8	3.9
239.0	7.0
239.2	6.8
239.4	8.6
239.6	9.2
239.8	7.2
240.0	8.0
240.2	8.4
240.4	12.0
240.8	13.0
241.0	0.7
241.2	7.8
241.4	7.2
241.6	5.5
241.8	5.5
242.0	7.9
242.2	0.5
242.4	8.3
242.6	3.3
242.8	5.4
243.1	4.5
243.2	5.9
243.4	[illegible]
243.6	9.6
243.8	[illegible]
244.1	0.4
244.2	0.7
244.4	0.8
244.6	[illegible]
244.8	6.4
245.0	1.3
245.2	0.9
245.4	6.0
245.6	11.0
245.8	5.8
246.0	3.4
246.2	0.7
246.4	1.6
246.6	0.8
246.8	1.6
247.0	0.8
247.2	3.8
247.4	2.1
247.6	0.2
247.8	0.7
248.0	0.1
248.2	0.4
248.4	0.0

085

248.6	0.0
248.8	0.0
249.0	0.9
249.2	0.9
249.4	0.9
249.6	3.4
249.8	2.5
250.0	0.3
250.2	5.9
250.4	6.5
250.6	5.6
250.8	6.9
251.0	6.8
251.2	9.0
251.4	12.0
251.6	8.2
251.8	8.9
252.0	8.9
252.2	9.5
252.4	6.4
252.6	11.0
252.8	9.0
253.0	7.9
253.2	9.9
253.4	10.0
253.6	8.8
253.8	8.2
254.0	10.0
254.2	7.8
254.4	9.1
254.6	9.0
254.8	8.5
255.0	7.6
255.2	9.7
255.4	7.7
255.6	9.5
255.8	10.0
256.0	8.0
256.2	6.8
256.4	4.1
256.6	4.5
256.8	3.0
257.0	2.6
257.2	3.3
257.4	3.4
257.6	1.6
257.8	2.1
258.0	3.1
258.2	2.9
258.4	2.3
258.6	4.5
258.8	4.9
259.0	12.0
259.2	3.2
259.4	0.0
259.6	0.3
259.8	0.0
260.0	1.6

260.2	1.6
260.4	0.5
260.6	0.5
260.8	0.2
261.0	8.2
261.2	11.5
261.4	8.9
261.6	9.0
261.8	10.5
262.0	8.8
262.2	6.1
262.4	2.8
262.6	7.0
262.8	6.1
263.0	6.2
263.2	7.6
263.4	10.5
263.6	9.3
263.8	8.0
264.0	8.1
264.2	4.2
264.4	4.2
264.6	13.4
264.8	4.6
265.0	6.1
265.2	5.9
265.4	5.0
265.6	0.2
265.8	0.0
266.0	0.2
266.2	0.1
266.4	0.3
266.6	1.5
266.8	3.6
267.0	2.4
267.2	0.6
267.4	0.0
267.6	0.2
267.8	0.4
268.0	0.2
268.2	0.1
268.4	0.4
268.6	0.2
268.8	4.1
269.0	5.7
269.2	5.5
269.4	3.7
269.6	6.6
269.8	8.0
270.0	10.5
270.2	4.5
270.4	8.1
270.6	8.5
270.8	8.7
271.0	8.5
271.2	6.2
271.4	4.6
271.6	5.0

271.8	31.0
272.0	18.0
272.2	10.0
272.4	12.0
272.6	6.8
272.8	6.2
273.0	8.2
273.2	7.7
273.4	6.9
273.6	5.6
273.8	6.1
274.0	5.2
274.2	6.0
274.4	6.0
274.6	7.6
274.8	7.2
275.0	6.0
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280.2	0.2
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281.2	0.0
281.4	0.0
281.6	0.0
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282.0	0.1
282.2	0.1
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282.8	0.1
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088

029089

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292.6	6.2
292.8	8.0
293.0	3.8
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293.6	3.4
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294.6	1.8
294.8	5.2

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302.8	1.6
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304.6	6.9
304.8	0.4
305.0	5.8
305.2	4.7
305.4	0.4
305.6	3.7
305.8	0.3
306.0	3.7
306.2	3.9
306.4	6.0

306.6	3.5
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310.8	9.3
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314.4	6.5
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316.2	9.9
316.4	9.9
316.6	10.1
316.8	10.3
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317.2	10.1
317.4	9.1
317.6	7.6
317.8	4.3
318.0	7.3

318.2	3.9
318.4	12.0
318.6	9.2
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319.2	10.3
319.4	7.6
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320.0	6.3
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320.4	10.3
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320.8	2.9
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321.4	8.4
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321.8	4.8
322.0	4.9
322.2	3.4
322.4	3.1
322.6	3.8
322.8	0.3
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326.4	3.2
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326.8	6.9
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327.2	8.3
327.4	9.5
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327.8	8.4
328.0	8.6
328.2	8.3
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329.4	8.6
329.6	7.9

092

029093

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352.8	0.1

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397.6	8.7
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406.6	3.6
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407.8	6.6
408.0	9.2
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408.4	5.4
408.6	3.0
408.8	4.8
409.0	5.0
409.2	6.2
409.4	4.4
409.6	3.4
409.8	5.6
410.0	3.8
410.2	6.9
410.4	5.4
410.6	6.0
410.8	5.2
411.0	0.7
411.2	4.5
411.4	7.0
411.6	6.1
411.8	5.1
412.0	4.2
412.2	5.1
412.4	3.8
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412.8	3.8
413.0	3.6
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414.8	4.2
415.0	4.7
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416.8	7.1

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422.8	4.8
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423.2	4.5
423.4	3.8
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096

029097

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433.0	5.0
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441.0	5.2
441.2	6.1
441.4	7.1
441.6	6.3
441.8	4.9
442.0	5.7
442.2	5.4
442.4	8.1
442.6	6.0
442.8	9.8
443.0	8.5
443.2	9.2
443.4	6.9
443.6	10.1
443.8	6.8
444.0	8.4
444.2	3.5
444.4	4.2
444.6	0.9
444.8	0.0
449.8	0.0

098

029099

APPENDIX V

REVIEW OF GEOPHYSICAL DATA

099

029100

CSR

Minerals Division

TO P D ELLIS

REFERENCE PRG/BW28.65:7605

FROM P R GIDLEY

DATE 7 FEBRUARY, 1986

re MT LINDSAY GEOPHYSICS/DRILLING RESULTS

PREVIOUS EXPLORATION

A detailed presentation of previous exploration within the Mt Lindsay area is summarised in your report EMR 56/85. Geophysically the most relevant coverage of the Mt Lindsay area includes the aeromagnetic coverage by Aberfoyle and Partners in 1965 (see Figure 1). The airborne magnetic pattern is quite distinctive showing limited contact metamorphism of the Cambrian Crimson Creek sediments away from the granite, producing a localised magnetic aureole in the vicinity of the Mt Lindsay deposit. The deposit itself comprises less than 200,000 tonnes of low grade cassiterite, massive pyrrhotite and magnetite. Shales and basaltic mudstones flanking the deposit are also magnetic, due to detrital magnetite (Webster, 1984).

The magnetic sediments, skarn mineralisation and granite have been subjected to petrophysical examination and show strong remanent magnetic components in both normal and reversed directions. Such effects (listed in Table 1, after Webster, 1984) are thought to be caused by the high temperatures and multiple intrusion of late phases of the Meredith granite. The presence of multiple intrusions is supported by reverse polarity in the direction of remanent sectors (pers. comm. Webster).

TABLE 1

Susceptibility and remnant magnetism of rocks at Mt Lindsay Prospect, Tasmania

Site No	Susceptibility (μc.g.s.)	Koenigsberger ratio	Petrological Description
1	9450	0.63	massive Po & magnetite
2	430	2.0	massive pyrrhotite (Po)
3	125	0.15	massive pyrrhotite
4	330	10.4	*CCF (basaltic mudstone)
5	200	197.0	*CCF (cherty mudstone)
6	27510	2.47	weathered magnetite skarn
7	22410	8.5	*skarn after limy mudstone
8	7500	6.9	*basaltic silty mudstone
9	9270	0.36	*basaltic mudstone

*CCF = Crimson Creek Formation

During follow-up exploration by Renison-Consolidated Goldfields in the relevant Mt Lindsay area, airborne EM (Turair), ground magnetics (total field) and gradient array IP work was undertaken.

The Turair data proved successful in defining a broad zone adjacent to the Meredith granite but poor flight path recovery prevented accurate follow-up of this data.

Conventional total field magnetics was acquired along the gridded lines at 10m intervals. This data detailed a number of magnetically active units which can be correlated from one line to the next indicating north-west strike. Some evidence of unit offset, and faulting is noted. This too has been confirmed by ground mapping.

The gradient array IP work was conducted along all gridlines to coincide with the magnetic coverage. IP coverage was at 50m intervals with a 50m dipole. This configuration was inadequate to resolve many of the anomalies defined by the magnetics which indicated sources having considerably less thickness than 50 metres.

CSR Geophysical Exploration

Following the previous geophysical work carried out by Aberfoyle and Renison it was not felt warranted to undertake extensive geophysical investigations but rather check the existence of the defined anomalies and detail those features of interest highlighted by earlier work.

VLF-EM and ground magnetics was undertaken along established grid lines as described in EMR45/84. Coincidence of these techniques with a resistivity and chargeability anomaly (defined by Renison work) along Line ML-17 prompted the drilling of DDH-ML1 at 425mN on ML17. A combined presentation of the various techniques and the drilled hole is presented in Figure 2. Results of the drillhole are described elsewhere (EMR56/85), however the core from this hole was logged for magnetic susceptibility and the results are shown on Figure 3. Based on this log a prismatic model with magnetic susceptibility of 4000×10^{-6}cgs, width 20m and top depth of 80m was used to match the observed ground profile along line ML-17. This work (see Figure 4) strongly suggests the pyrrhotite content intersected in hole ML-1 accounts for the observed surface response. Additionally the chalcopyrite, pyrite and minor arsenopyrite evidenced occurs with volume sufficient to produce the measured IP effects. The observations made with the VLF-EM technique are surprisingly strong for the amount of mineralisation defined. The absence of significant response of quadrature however suggests a possible topographic effect may be influencing the observed amplitude of the in-phase response, which is likely to be responding to conductivity lows shallower than that associated with mineralisation within ML-1.

Should geochemistry assays or geological encouragement be forthcoming from the results of ML-1 then it is not recommended additional geophysics be applied in this area. The geophysical grid coverage extending south from ML-17 suggests the intersected mineralisation continues, but deepens until by ML-10 it has attenuated to only 150nT amplitude. Renison IP coverage supports this interpretation and does not provide sufficient additional targets for further drilling.

P R Gidley

cc RJF
DJC/File
REW

References

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WEBSTER, S.S. - 1984
A Magnetic signature for Tin Deposits in South-East Australia
Explor. Geophys. of Aust. V15 pp 15-31

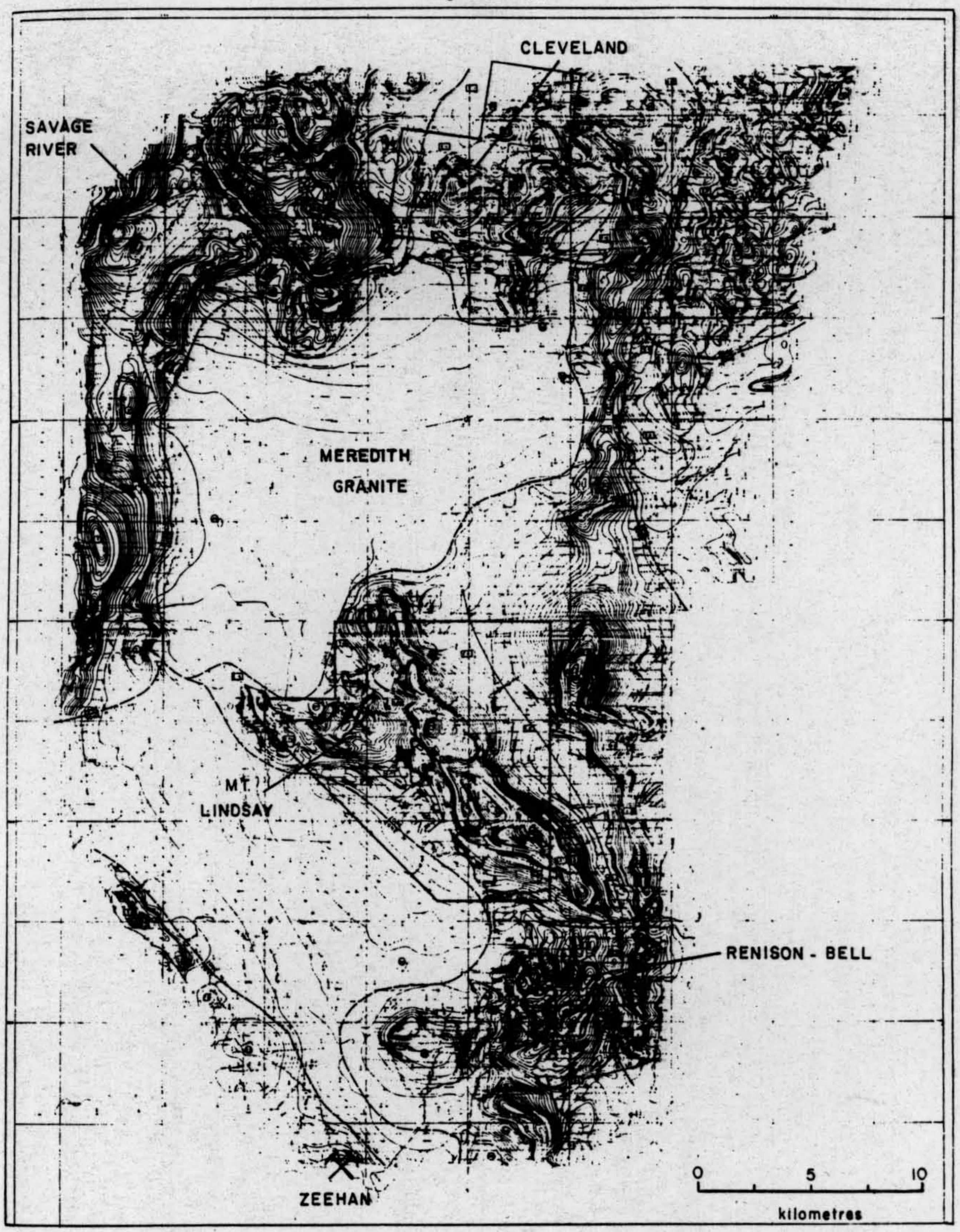


FIGURE 1
Aeromagnetic contours in north-west Tasmania. (This survey by the Aberfoyle Development Tin Partnership in 1965.)

029105

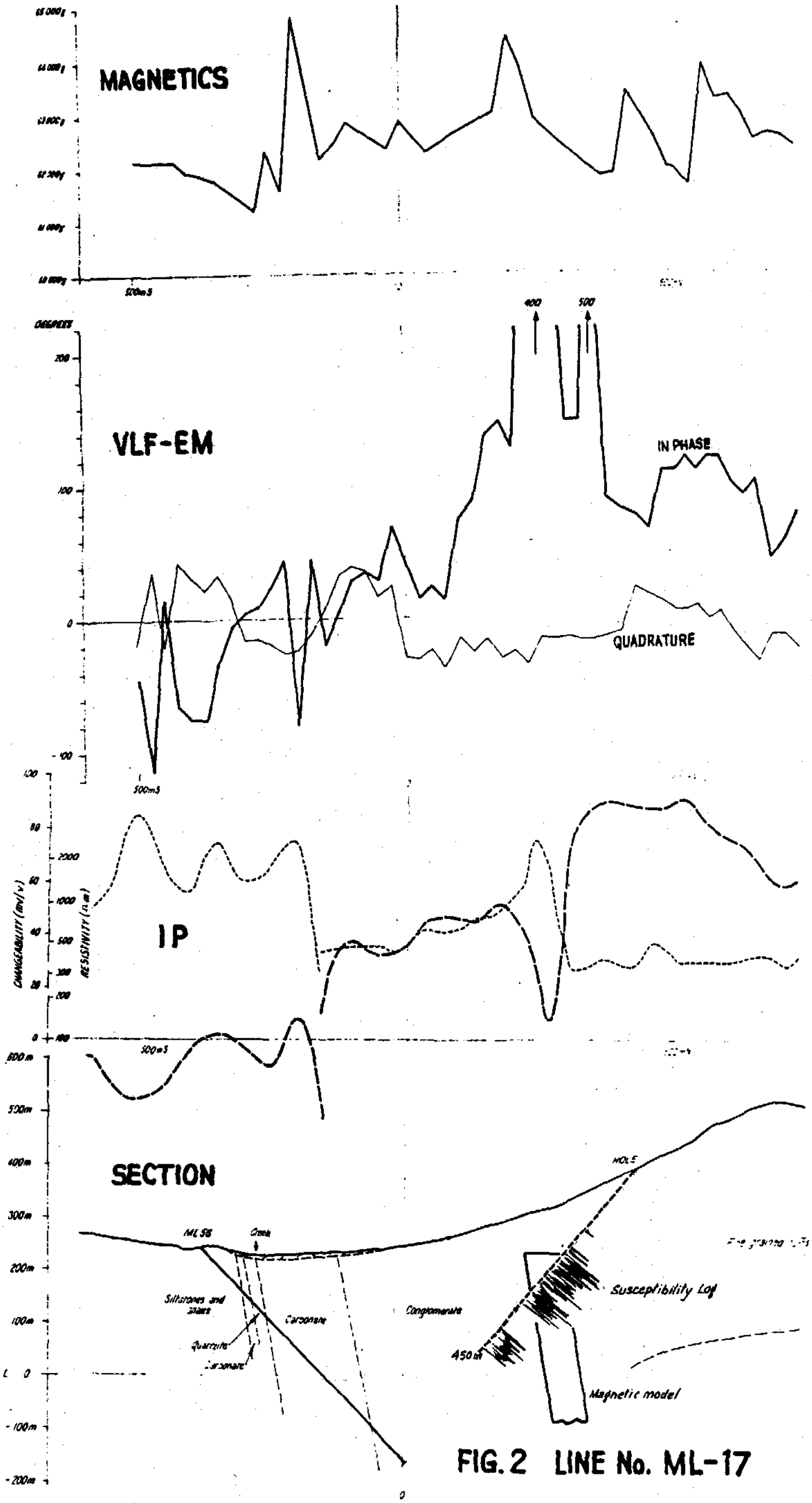
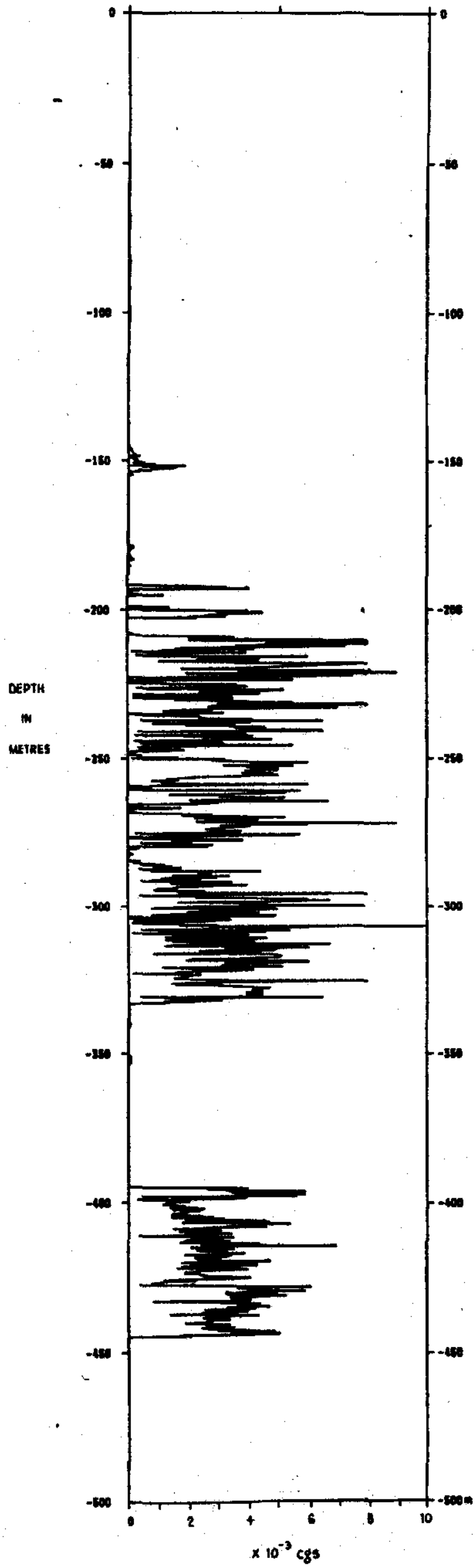


FIG. 2 LINE No. ML-17

105

029106



NOTE : SAMPLES AT 0·2 METRE INTERVALS
SUSCEPTIBILITY IN UNITS 1 x 10^{-3} cgs/cm

CSR LIMITED

DDH - ML1
SUSCEPTIBILITY LOG

E.L. 31/82 MT. LINDSAY TAS.

SCALE	
DRAWN	
DATE	
REVISED	

Fig 3

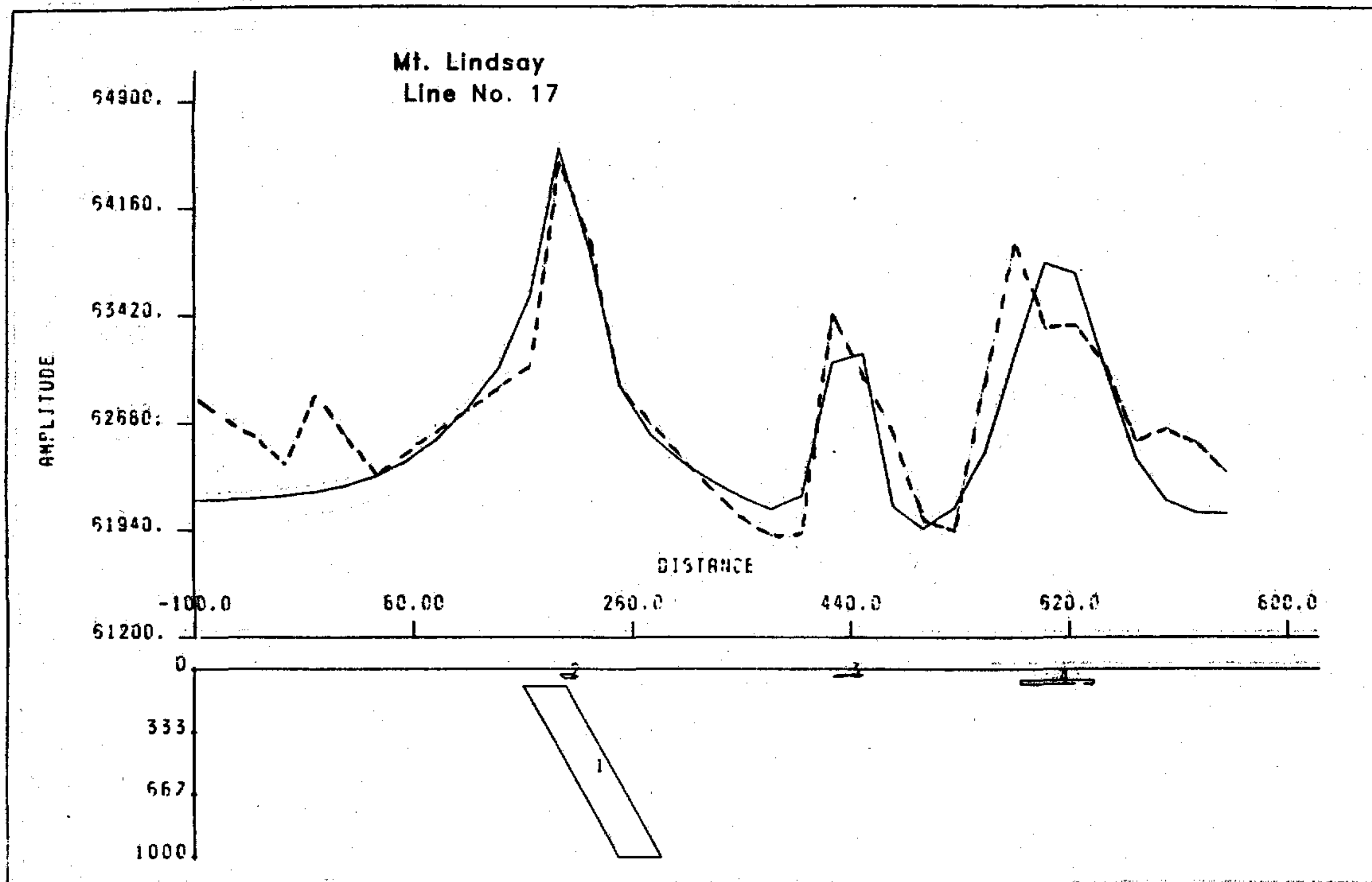


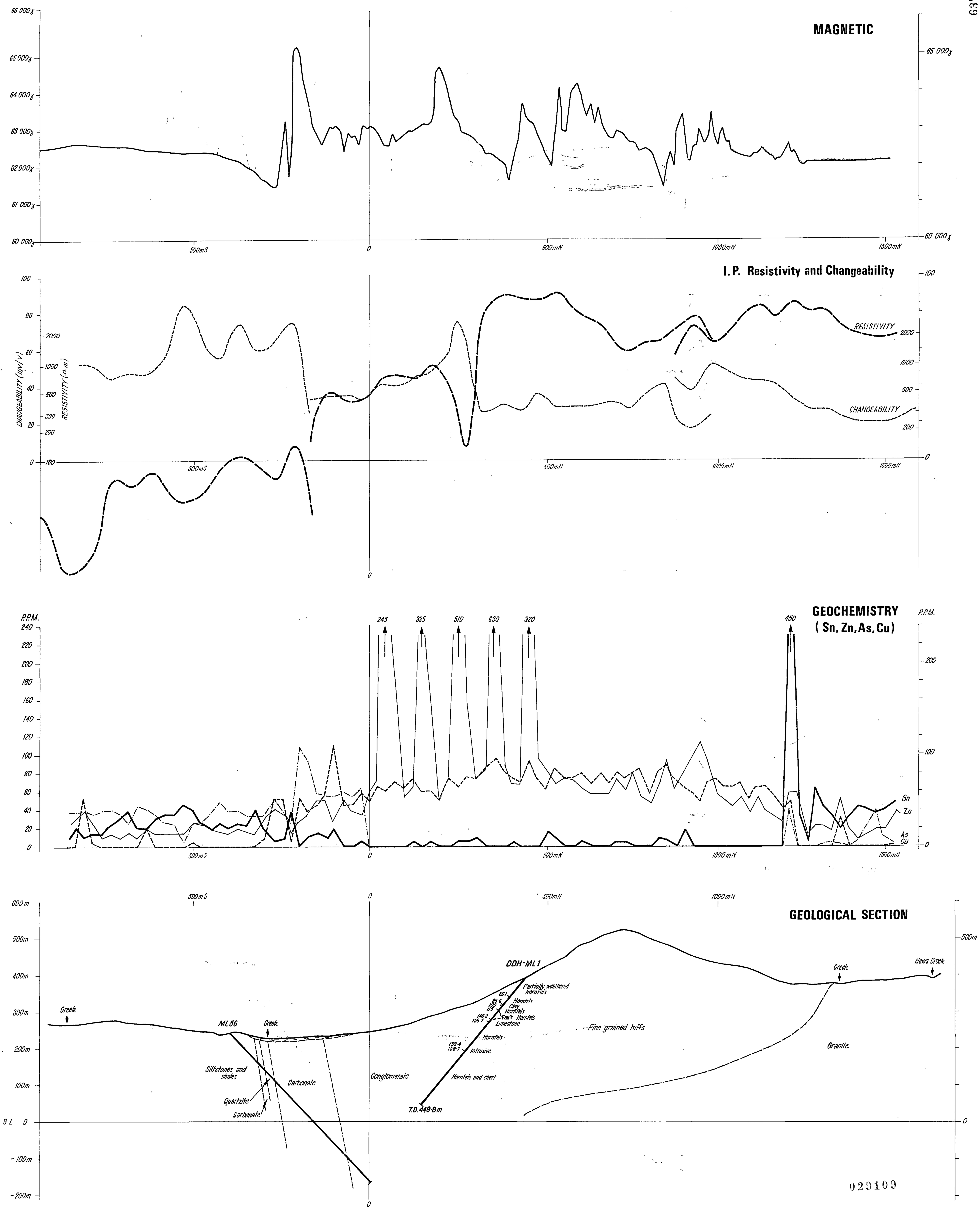
FIG 4.

0291107

6376
REFERENCE
Watercourse
Road, track
E.L. boundary
Dyke
Geological boundary
Trend of bedding
Fault
Gossan
QUATERNARY
Qs Swamp
Qra Alluvials
Qg Gravel
CAMBRIAN
SUCCESS CREEK GROUP
Ꞓcl Lower chert
Ꞓs Siltstones
Ꞓcu Upper chert
Ꞓm Fine clastic sediments, some tuffs
CRIMSON CREEK FORMATION
Ꞓg Mainly tuffs, some fine clastic sediments
Ꞓ Undifferentiated
Ꞓh Hornfels
PROTEROZOIC
OONAH FORMATION
Ꝑq Massive quartzite
Ꝑs Siltstones
Ꝑsh Shales, often graphitic and slumped
Ꝑm Mudstones, siltstones
IGNEOUS ROCKS
DEVONIAN
Dg1 Coarse - very coarse adamellite
Dg2 Quartz porphyry and fine grained porphyritic granite (Qtz - Tin alteration)
Dgm Micro granite
CAMBRIAN
Ꞓu Ultramafic
Drill hole
Renison grid lines
E.L. 3/84 INDUSTRIAL MINING & INVESTIGATIONS
E.L. 17/77 RENISON
E.L. 53/70 CSR
E.L. 25/85 CSR
E.L. 31/82 CSR
E.L. 30/79 GRAE
STANLEY RIVER
News Creek
Salmon Creek
To Lower Pieman Dam
To Tullah
Dgm dyke
P.L. R. RUDDLE
P.L. J. & A. SMYTHE
P.L. G. BRAMPTON
P.L. T. BRAMPTON
MT. LINDSAY
DDH ML1
H.E.C. QUARRY
RENISON - STANLEY R. WALKING TRACK
RENISON - STANLEY R. TRACK
RENISON - STANLEY RIVER WALKING TRACK
ML 20
ML 19
ML 18
ML 17
ML 16
ML 15
ML 14
ML 14.5
ML 13
ML 13.5
ML 12
ML 12.5
ML 11
ML 11.5
ML 10
ML 10.5
ML 9
ML 9.5
ML 8
ML 8.5
ML 7
5 386 000 mN
5 384 000 mN
5 382 000 mN
5 380 000 mN
5 378 000 mN
358 000 mE
360 000 mE
362 000 mE
0
500
1000 m
CSR LIMITED - MEDG
E.L. 31/82 MT. LINDSAY, TASMANIA
RENISON PHOTOGEOLOGY
029108
5 cm
SCALE 1:10,000
DRAWN P.D.E / P.R.
DATE May '84
REVISED May '85
DRG. No.
7605-1

86-2550

6377



029109

5 cm

REFERENCE

NOTE : RENISON ML LINE IS IN METRES SOUTH & NORTH OF THE RENISON – STANLEY RIVER WALKING TRACK (0m)

HORIZONTAL SCALE MEASURED IN SLOPE DISTANCES AND PROJECTED

FOR LOCATION REFER DRG. No. 7605-1

CSR LIMITED

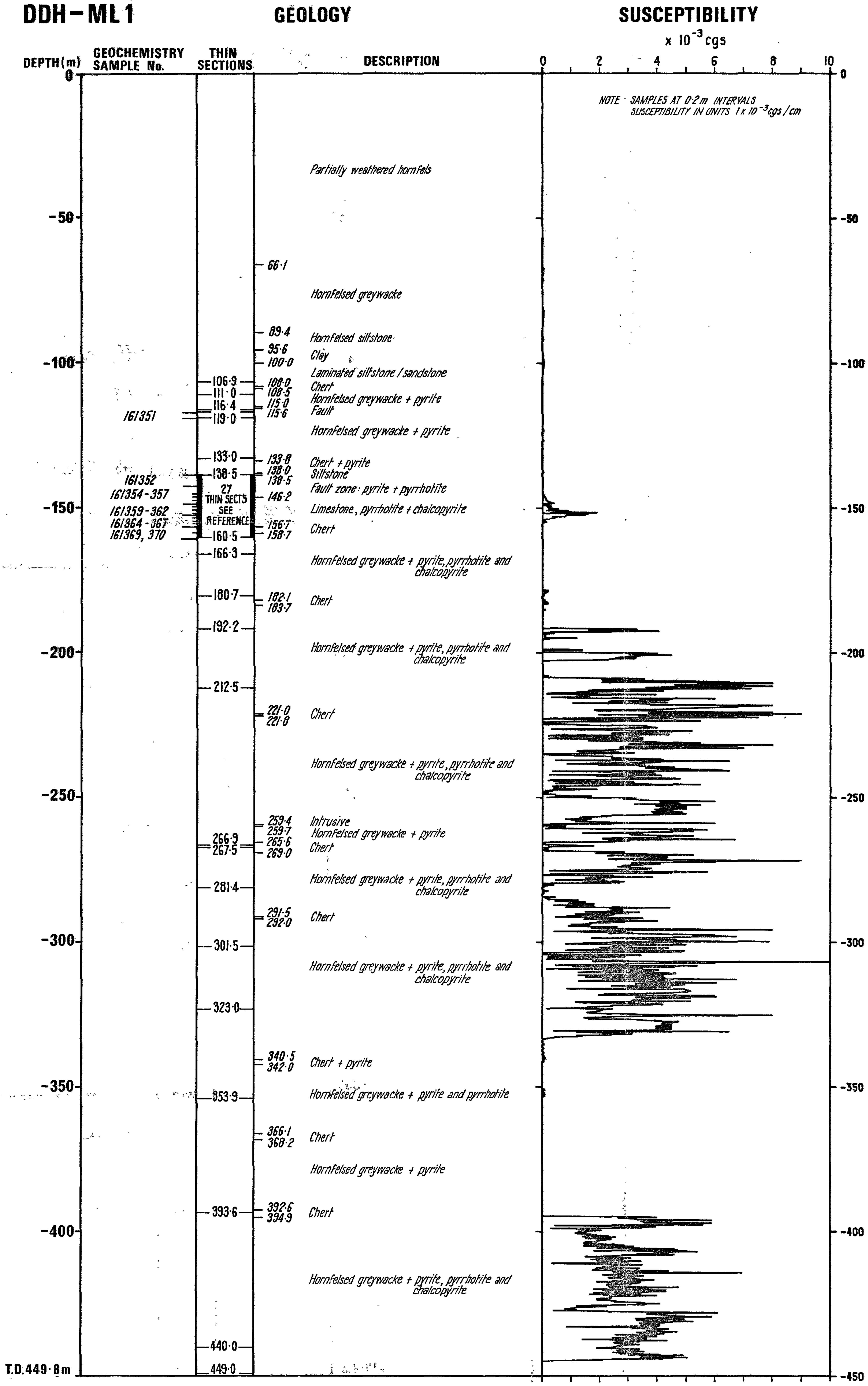
E.L.31 82 MT. LINDSAY, TASMANIA

LINE ML17

RENISON GEOPHYSICAL, GEOCHEMICAL AND GEOLOGICAL DATA

SCALE	:	1:5000 (Horizontal)	DRG. No.
DRAWN	:	P.D.E./P.R.	7605 – 8
DATE	:	May '85	
REVISED	:	May '86	

86-2550



029110

5 cm

REFERENCE

THIN SECTION SAMPLES (27) Depth (m): 138·5, 142·5, 145·0, 145·3, 146·2, 147·3, 147·9, 148·4, 148·6, 149·3, 150·2, 150·4, 150·5, 151·7, 151·8, 152·0, 153·0, 153·2, 153·7, 154·3, 154·6, 155·4, 156·4, 156·7, 157·8, 158·7, 160·5

CSR LIMITED-MEDG

E.L. 31/82 MT. LINDSAY, TAS.

D.D.H.-ML1 SUSCEPTIBILITY LOG

6378

SCALE	:	1: 1000 (v)	DRG. No.
DRAWN	:	P.D.E / P.R.G.	7605-10
DATE	:	May '86	
REVISED	:		

86-2550