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SML 524

LAKE TORRENS

PROGRESS AND FINAL REPORTS TO LICENCE SURRENDER FOR THE PERIOD 17/12/1970 TO 16/9/1971

Submitted by
Carpentaria Exploration Co. Pty Ltd
1971

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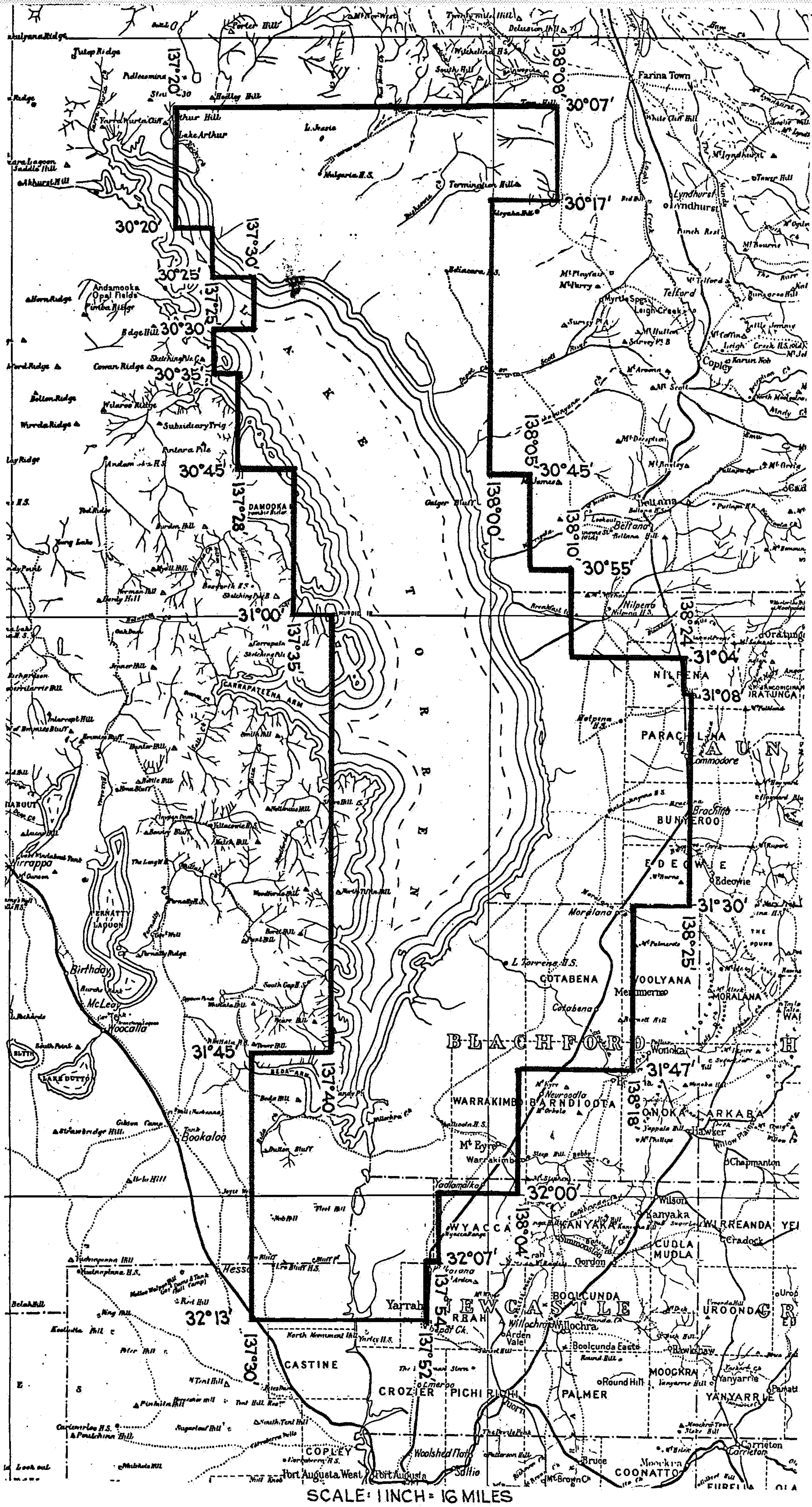
Government of South Australia
Primary Industries and Resources SA



SCALE: 1 INCH = 16 MILES

CARPENTARIA EXPLORATION CO. PTY. LTD.

DOCKET D.M. 1171/70 AREA 5250 SQ MILES

1:250000 PLANS . ANDAMOOKA COPLEY .

. TORRENS PARACHILNA .

. PORT AUGUSTA ~~ORROROO~~ .

LOCALITY .

S.M.L. No. 524 EXPIRY DATE 16.12.71 .

CONTENTS ENVELOPE 1559

TENEMENT: S.M.L. 524 - Lake Torrens

TENEMENT HOLDER: Carpentaria Exploration Pty. Ltd.

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Env. 1559

S.M.L. 524 Lake Torrens Area

Quarterly Report to 17th March, 1971.

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S.M.L. 524 Lake Torrens Area

Quarterly Report to 17th March, 1971.

The airborne AFMAG - KEM survey, which was scheduled to be flown by McPhar Geophysics sometime during late January or February, was cancelled late in February due to a sudden drop in the AFMAG fields. This was most disappointing as our exploration hypothesis was based upon control of mineralisation by contemporaneous faulting. As virtually the whole area is masked by Cainozoic sediments the only hope of locating these structures at a reasonable cost was by the AFMAG survey. The exploration programme for this lease is now under review and it is hoped that the B.M.R. aeromagnetic survey and the recently completed regional gravity survey of the area will be helpful. These surveys are currently being studied in detail by our Company geophysicists.

Unfortunately the AFMAG - KEM survey was at an advanced stage of preparation when the fields suddenly dropped. We had authorised the equipment to be airfreighted from Canada and installed in the survey aircraft. Installation, testing and stand by at Port Augusta covered a period of three to four weeks, consequently we have been involved in heavy expenditure for no return whatsoever. At this stage we do not know the exact cost of this abortive survey but it will be reported in the next Quarterly Report. McPhar Geophysics are currently preparing a report for us and this will be forwarded together with the Quarterly Report.

Other work carried out on the lease during the last quarter is reported below:-

Preparation of base maps

A base map at a scale of 1:250,000 has been prepared of this lease and the adjacent S.M.L.'s 353 and 525. This map was prepared primarily for plotting the final interpretation of the A.F.M.A.G. and KEM surveys by McPhar Geophysics. It will also be used for plotting contours on magnetic basement, regional gravity, seismic results and the final geophysical interpretation. The 1:50,000 base maps of the area were obtained from the Department of Mines and the 10,000 yd. Tranverse Mercator Grid drafted on them. This grid is also shown on the 1:250,000 map and will be used for location description. Transparancies of the 1:50,000 series of base maps were given to McPhar Geophysics to record the flight line paths and computer processed data from the AFMAG survey. Copies of all these maps will be forwarded to the Department when they have been completed.

Preparation of aerial photographs for AFMAG survey

Aerial photographs of the lease area were obtained and assembled in a fashion suitable for use for navigation ready for the airborne survey. Lease boundaries were plotted on them and east-west flight lines drawn at five inch intervals.

Wilkatana core

A programme of geological inspection and chip sampling of the Wilkatana core has nearly been completed. The drilling at Wilkatana, approximately 17 miles north of Port Augusta, was carried out by Santos in the 1950's during the course of oil exploration. Core from hole Wilkatana No. 1 and same from holes 2, 3 and 4 are in the core storage section of the Department of Mines. This core has been sampled by

Mines Exploration and revealed minor, but interesting base metal contents near the base of the L. Cambrian dolomite sequence. Because of the relevance of this to our exploration programme it was decided to inspect the rest of the core from the Wilkatana drilling - a total of approximately 3,000 ft. in six remaining holes. This core was found at Wilkatana. Unfortunately the shelving on which it had been stored has collapsed and the core is in complete disarray.

Most of this core has been split and visually inspected for mineralisation. Chip samples of interesting sections were taken and submitted for assay for copper, lead and zinc. To date all base metal contents have been extremely low and uninteresting and we have found nothing to support the generally held view that the L. Cambrian dolomites are higher than average in base metal content.

A full description of this work will be submitted in the next Quarterly Report when it has been completed.

Geochemical drainage survey

Geochemical sampling of creeks draining the flat lying Marinoan Tent Hill Formation on the southern and western flanks of L. Torrens has just been started. It is hoped that the disconformable contact between the (?) Willouran Pandurra Formation and the Tent Hill Formation may be exposed somewhere in the area. This is the contact which is mineralised at Mt. Gunson and it is possible that, if it is exposed, it may be mineralised. If so the drainage geochemistry should locate it.

Water sampling

All information on water bores and wells within the lease area has been obtained from the Department of Mines. Sampling of the bores will start early in April.

P. J. BINKS. 22-3-71

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SML 524 LAKE TORRENS AREA

Quarterly Report to 17th June, 1971.

S.M.L. 524 - LAKE TORRENS AREA

QUARTERLY REPORT TO 17TH JUNE, 1971

During the last quarter the following work has been carried out:

Geochemical drainage survey

Stream sediment samples have been collected from Marinoan rocks in the south-west of the lease area. A full description of this work and assay results is given in Appendix I.

Geophysics

The Company's supervising geophysicist has carried out a study of the published aeromagnetic surveys of the lease area in conjunction with the regional gravity surveys undertaken by the Department of Mines in 1967 and the B.M.R. in 1970/71. His report on this study is given in Appendix II. This report recommended detailed gravity traverses to be carried out at three places within the Lake Torrens region (only one of these is within this lease, the others being within S.M.L. 353). These surveys have been completed but terrain corrections are still being applied to one of the traverses and the report has not yet been finalised. This report will be submitted with the next Quarterly Report.

The traverse carried out on S.M.L. 524 was a six mile line over the Nankabunyana negative anomaly (see Appendix II). The provisional results of this survey indicate that this broad, regional anomaly can be explained by a gradual thickening of clays and sands in the order of 700-1000 ft. No major fault similar to the Ediacara Fault was found. As the most likely age of the clays and sands is Cainozoic no drill hole will be put down on this negative anomaly. The survey indicated that at the eastern end of the traverse "basement" (Adelaidean or Cambrian rocks) is within 200-400 ft. of the surface. A drill hole may be sited here after the drilling has finished ~~and~~ in the Ediacara area.

The report on the abortive AFMAG-KEM survey has still not been received from McPhar Geophysics.

Water Sampling

Most water bores in the south of the lease have been sampled. A diagram is currently being prepared showing the metal contents of these waters and also those on S.M.L. 353. In general copper and lead contents are low throughout the area but zinc contents are higher in the central part of S.M.L. 353, particularly in the Ediacara area.

Wilkatana core

A report on the geological inspection and chip sampling of this core by R. Okill is presented in Appendix III. This work clearly shows the low copper, lead and zinc contents of the L. Cambrian dolomites in the Wilkatana area. It is worth noting that these cores are from an area remote from known mineralisation and the values obtained in this survey probably represent the best background contents of base metals in L. Cambrian dolomites in the Adelaide geosyncline . It is possible that the high metal contents of L. Cambrian beds found elsewhere are due to supergene effects and "trapping" of the metals in a favourable chemical environment. Also the typical outcrop pattern of the L. Cambrian sequence, where the basal shales and arkoses form strike valleys, would favour the channelling of which supergene waters along this favourable zone. In other areas, particularly Ediacara, favourable permeable beds at the base of the Cambrian have been mineralised by epigenetic processes. Thus it is suggested that the 1, generally held view that the basal Cambrian beds are higher than average in base metal contents is questionable.

P. BINKS

APPENDIX I

STREAM SEDIMENT SAMPLING
SOUTH - WEST S.M.L. 524

STREAM SEDIMENT SAMPLING, SOUTH-WEST S.M.L. 524

INTRODUCTION

Copper mineralization is known to be localized at Mt. Gunson, west of Lake Torrens, on the unconformity between the (?) Torrensian-Willourian Pandurra Formation (the host to mineralization) and the Marinoan Wilpena Group Equivalent. The subhorizontal Marinoan rocks outcrop within S.M.L. 524 on the western edge of Lake Torrens (Fig. I). The underlying Pandurra Formation may be sufficiently near the surface to be exposed within drainage channels which dissect the mesa-type outcrop. A stream sediment survey should therefore detect any local mineralization which may occur on the exposed or near- surface unconformity. Such a survey, in accordance with this Company's aim to test for base metal mineralization within S.M.L. 524, was commenced in March-April, 1971.

METHODS

A total of four weeks have to date been spent in the field, stream sediment sampling the south-western area of outcrop. A total of 242 samples were collected at an average density of 1 per square mile overall, or approximately 4 per square mile over territory suitable for sampling. (that is, excluding flat hill-tops not cut by streams and streams on Cainozoic cover). All samples were submitted to AMDEL for A.A.S. assay for copper, lead, zinc.

ROCK TYPES SAMPLED

The Tent Hill Formation caps the flat-topped hills in the area and overlies the extensive Corraberra Sandstone Member. The underlying Tregolana Shale Member outcrops on the flanks of Uro Bluff, in the south, and Beda Hill, in the north. A white, poorly sorted, conglomeratic sandstone which outcrops in the north-west of the area, near Dutton Bluff, probably represents the Whyalla Sandstone Member which immediately uncomformably overlies the Pandurra Formation, but the latter itself was not seen.

Yellow coarse friable Tertiary (?) sandstone occurs locally (177184) and gypsum beds with sandstone lenses outcrop on the southern shore of Lake Torrens.

RESULTS

Locations of samples together with assay results are depicted in Fig. I. The results are uniformly low, and summarized as follows:

Element	Range (ppm.)	Mean (ppm.)
Cu	5-25	10.7
Pb	5-30	14.2
Zn	5-90	41.9

DISCUSSION OF RESULTS

The assay results give no indication of mineralization within the area sampled. Therefore, either the Pandurra Formation does not approach the surface, or the unconformity is not mineralized, or both. Probably, in the north-western part of the sample area at least, where the Whyalla Sandstone Member outcrops, the Pandurra Formation is not far below the surface. Assay results for this particular area, however, offer little encouragement.

CONCLUSIONS AND RECOMMENDATIONS

No mineralization has been detected by a stream sediment survey of Marinoan outcrop south-west of Lake Torrens within S.M.L. 524.

It is recommended that no further work be done on the area which is the subject of this report, but that stream sediment sampling be continued, at a similar density, north of Beda Arm within S.M.L. 524.

for, R. Okill.

APPENDIX II

GEOPHYSICAL STUDY S.M.L. 524

SUPERVISING GEOPHYSICIST

MANAGER

PARTY LEADER, ADELAIDE

29th March, 1971.

MJS:SF

TORRENS HINGE ZONE
S.M.L.'s 524, 353

1. INTRODUCTION

Following the failure of the Afmag survey earlier this year, a re-appraisal of the exploration program is required. Further work must now be based on geology, magnetics and gravity. The magnetic and gravity results combined have proved to be quite interesting and with a little more detailed work will provide drilling targets.

2. GENERAL APPRAISAL

2.1. Magnetics

The regional airborne magnetics show a distinct change of character across a line running generally down the western side of Lake Torrens. This is believed to be the Lake Torrens fault with downthrow on the eastern side.

Some quite severe irregularities occur on this line in the region east of Andamooka Island. These are due to either transverse faulting or basic intrusives resulting in relatively shallow basement in that area. Support from the gravity results indicates that this is an area of some interest.

A further point is that the Ediacara Fault is marked by a deep seated magnetic anomaly which is believed to result from a basic intrusive sheet.

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2.2. Gravity

On a broad scale the gravity results show a somewhat surprising result. Lake Torrens is marked in a general sense by an irregular gravity high. In ordinary circumstances, a low would have been expected corresponding with the accumulation of sediment in the lake.

However, Lake Torrens is believed to coincide with a hinge zone which may be the locus of deep seated basic intrusives, which could explain the gravity high.

On a more restricted scale there are individual gravity highs coinciding with magnetic highs in the area east of Andamooka Island. These add strength to the idea of upfaulted basement or relatively shallow basic intrusives there. The most interesting point is that between two of these highs there is a distinct gravity low which could possibly indicate a restricted sedimentary basin.

A small gravity high to the east indicates a possible complete closure of the basin. For the purposes of identification, this ? gravity low will be named the Nankabunyana anomaly after a nearby creek.

Other interesting features include a very strong linear gravity low more or less coinciding with the Nor'West fault; and a small gravity high over the Ediacara fault. The latter is very similar to the small high east of the Nankabunyana anomaly and offers some hope that conditions in both areas might be similar.

3. AREAS OF INTEREST

3.1. Ediacara Fault

Peter Binks will be proposing holes in this area. Drilling targets are already available by virtue of known geology and

3.1. Ediacara Fault (Cont.)

mineralization and the previously reported seismic results.

3.2. The Nankabunyana Anomaly

In this area there is a strong indication of an enclosed sedimentary basin adjacent to an area of major faulting (the Torrens Hinge Zone). This must be considered a prime target for a syngenetic type body. Unfortunately, most of the area of interest lies on Lake Torrens but the basin does extend to the eastern shore where a drill hole could be sited.

A drill proposal would be assisted by a single detailed gravity traverse across the eastern high to obtain a firm depth estimate of that feature. Following this, a drill hole of 1,000 to 1,500 feet would be required to determine what kind of sediments were involved. If no Cambrian sediments were intersected in that depth, the area would have to be abandoned.

A detailed gravity traverse across the Ediacara Fault should also be done for purposes of comparison.

3.3. The Nor'West Fault

The very intense gravity low more or less coinciding with the Nor'West Fault offers some hope of a solution trap orebody such as already proposed by Jock Smith.

Part of the area around a diapir at Ideyaka Hill has already been tested geochemically with mercury and base metal assays. The results were negative. However, Peter Binks believes that further to the south east where Cambrian Limestones lie against the fault, the potential should be much higher.

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3.3. The Nor'West Fault (Cont.)

Again a detailed gravity traverse across the feature should be completed, to allow more accurate correlation with geology.

4. CONCLUSIONS

4.1. Apart from the Ediacara mineralized zone, two other areas of prime interest are indicated.

4.2. Station spacing on the regional gravity survey is too broad to allow detailed interpretation. This difficulty could be overcome by carrying out selected detailed traverses involving about three weeks' field work.

5. RECOMMENDATIONS

5.1. Carry out detailed gravity traverses in the following areas :

(i) Across the Ediacara Fault.

(ii) Across the small gravity high east of the Nankabunyana anomaly.

(iii) Across the S.E. end of the Nor'West Fault gravity low.

5.2. Station spacing of about 500 feet would be required and traverses would need to be four to five miles long.

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5.3. Ground magnetic readings should be taken at the same time as the gravity readings.

5.4. Drill holes of 1,000 to 1,500 feet should be proposed on the basis of these results.

ORIGINAL SIGNED
M. J. SHALLEY

....
M.J. Shalley

c.c. Party Leader, Adelaide
File/Technical 2266

APPENDIX III

WILKATANA DRILL CORE
EXAMINATION AND SAMPLING

EXAMINATION AND CHIP-SAMPLING OF WILKATANA CORE

INTRODUCTION

Base metal mineralization within Lower Cambrian dolomites occurs at several localities in the Lake Torrens region, notably at Ediacara. At Wilkatana, approximately 26 miles north of Port Augusta (see Fig. I) a Lower Cambrian basin was penetrated by a drilling programme conducted by Santos Ltd. in the 1950's. Core from selected holes (1, 2, 3 and 4) is held by the S.A. Dept. of Mines and has been examined by Mines Exploration Pty. Ltd. who recorded up to 1200 ppm copper over twenty feet in Hole 1, and 5200 ppm copper, 2000 ppm lead and 148 ppm zinc in a single spot sample from Hole 4. (Mines Exploration Pty. Ltd., Tech. Report, SR Env. 660, 1966) These results being relevant to this Company's exploration for base metal mineralization in Lower Cambrian strata within S.M.L.524, it was proposed to sample the core drilled by Santos at Wilkatana not held by the S.A. Mines Dept. This core was found at the old Santos campsite at Wilkatana (see Fig. 2). Two adjacent core dumps were located, consisting of approximately 3800 ft. of diamond drill core, of which approximately 3000 ft. comprised Cambrian sediments, the remainder being Marinoan purple and green shales and a small quantity of Tertiary core. The core is partly buried by sand and in a state of disarray.

It was proposed to rock-chip sample the core at Wilkatana for copper-lead-zinc analysis and to submit interesting sections to M.I.M. Tech. Services Sect. for mineragraphic examination to determine the

FIG. 1
Locality map : Wilkatana

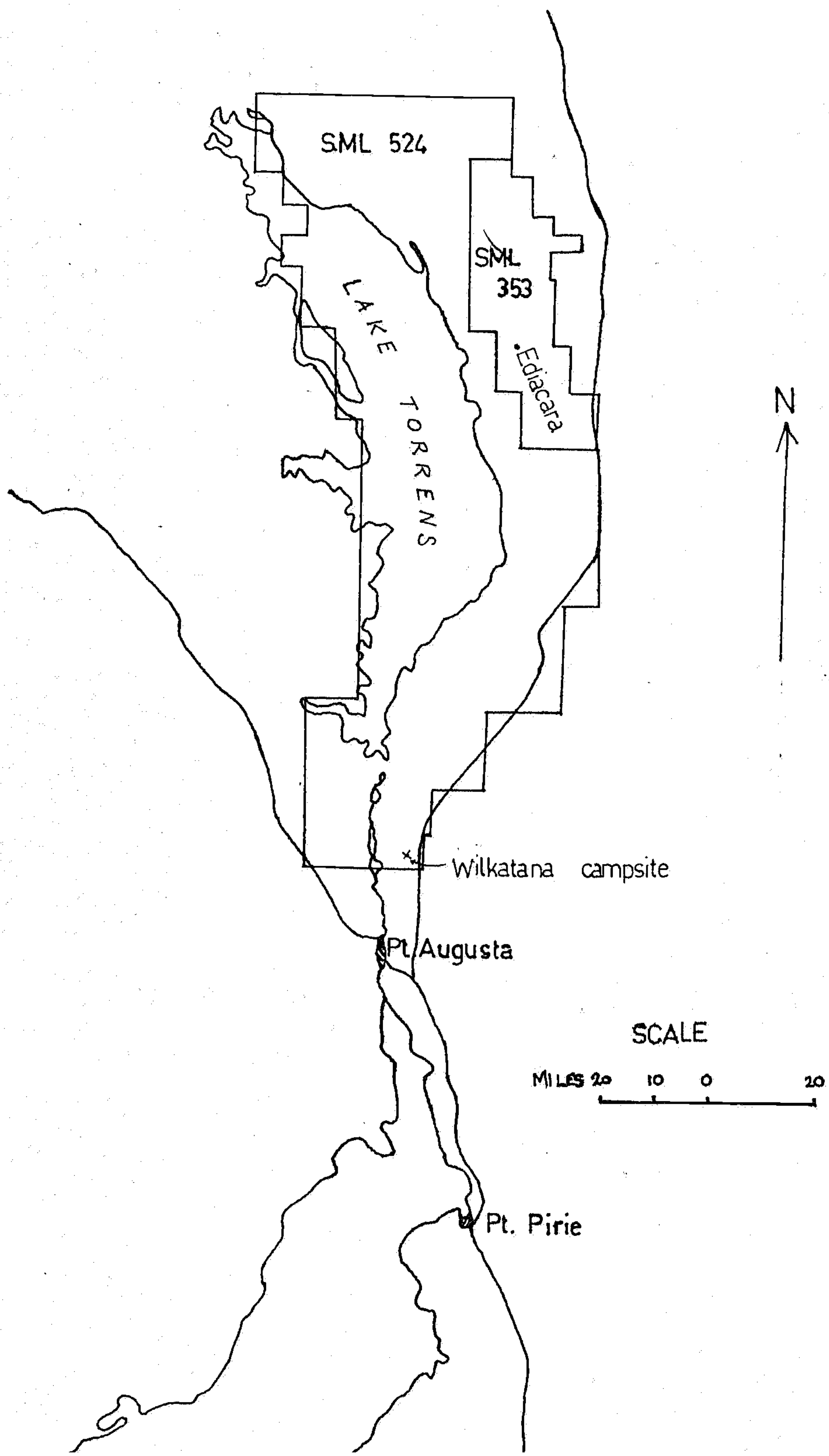
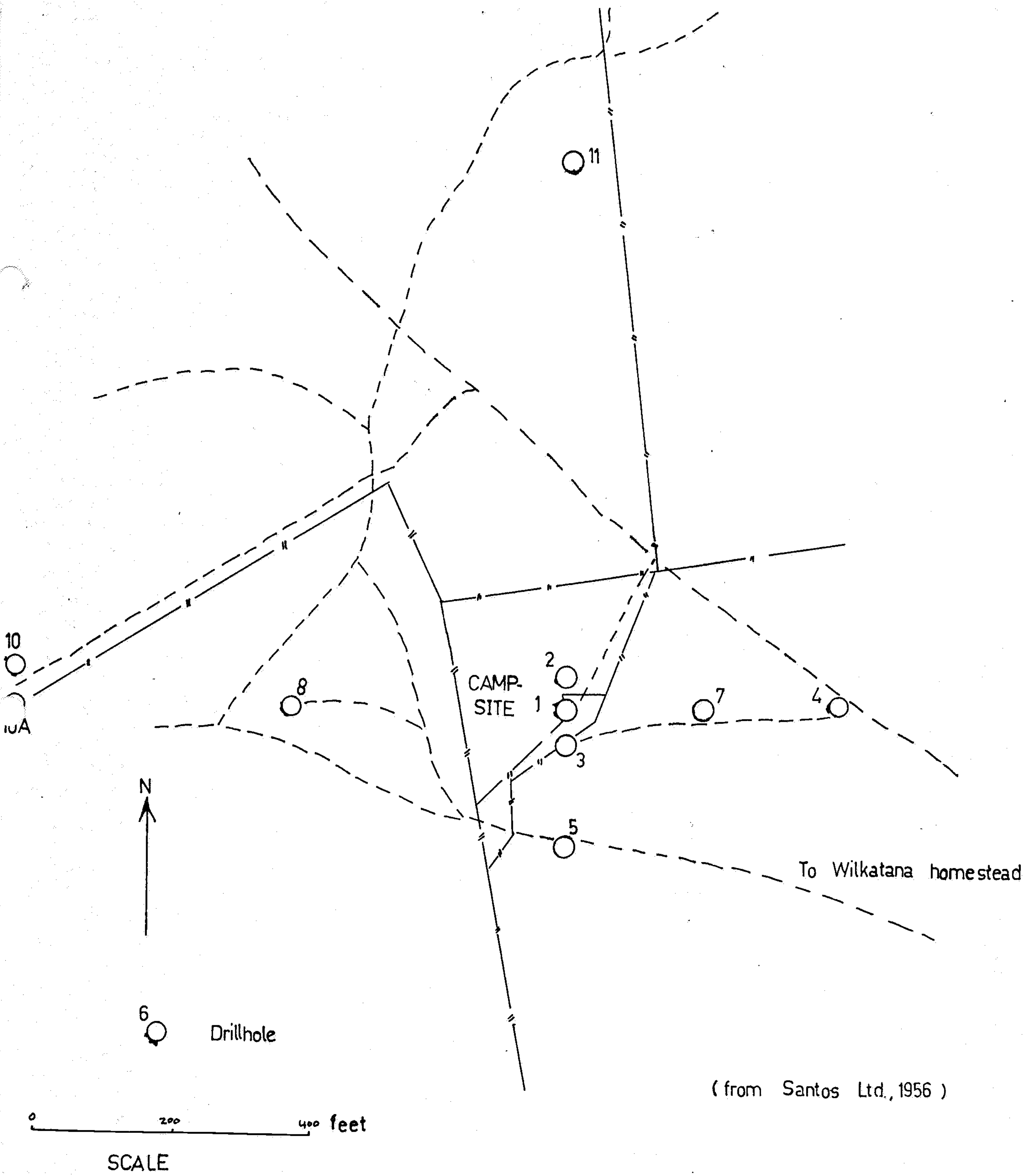


FIG. 2
Plan of campsite at Wilkatana.



(from Santos Ltd., 1956)

nature of mineralization.

METHODS.

Examination of the core was undertaken in the field between December 1970 and late March 1971. Each core dump was sampled by chip sampling core sections greater than six inches in length every four to six inches. Because of the broken and chaotic nature of the core as found, the average core section was only 9½ inches. In this way approximately 50% of the total core was sampled. Initial analysis results proved uniformly very low and subsequently only samples which by visual inspection appeared of interest, were analysed. At the completion of sampling a further 221 random samples were analysed to cover the possibility of microscopic mineralization. In all, 1262 samples were taken, of which 374 samples were analysed at AMDEL by AAS methods.

The core was split, logged and sampled, then numbered with aniline dye and stacked in sequence on the ground adjacent to the original respective core dumps. Core from the larger dump was prefixed "A" and that from the smaller dump prefixed "B". After sampling 1000 ft. of core in this manner, with disappointing analysis results, the remainder of the core from dump "A" was split and only visually interesting core was sampled.

RESULTS.

The Cambrian core comprises dolomite (and silicified limestone?) gradational in colour from cream to dark grey, and minor sooty black limestone. Much of the dolomite appears to be silicified. Archeocyathinae is fairly common and worm burrows abundant in some sandy (basal?) dolomite. The Cambrian succession is comparable to that described at Ediacara (Nixon, L.G., 1963: The Ediacara Mineral Field, Proc. Aust. Inst. Min. Met. No. 206, 93-112).

The dolomite is generally massive, sometimes vuggy; bedded and oolitic dolomite and intraformational dolomite breccia, with occasional black chert fragments, are also present. Bedding is often slumped. Carbonaceous laminae are common, especially in grey dolomite, and chlorite is fairly abundant in cream dolomite.

Pyrite and traces of chalcopyrite (?) occur mainly on joints, or on carbonaceous laminae or breccia fragment boundaries. Occasional fluorite occurs in grey dolomite.

Analysis results of rock-chip samples are recorded in Appendix A. In view of these results no mineragraphic work has been attempted.

The means and standard deviations for the analysis results are tabulated below (Table 1). Values of Cu >80 ppm (viz. values of 100, 120, 130, 200, 550, 600, 1500 ppm Cu) and Zn >300 ppm (viz. 330, 350, 410, 410, 510, 540 ppm Zn), which are clearly anomalous, are not included in the above calculations.

TABLE 1.

Element	Mean (ppm.)	Standard Deviation	Range (ppm.)
Cu	13	12	<5 - 75
Pb	14	6	<5 - 55
Zn	46	46	<5 - 290

Anomalous analyses together with core descriptions are given in Table 2.

TABLE 2.

Summary of Anomalous Analyses (Cu > 80ppm, Zn, > 300 ppm)
and Core Descriptions.

ELEMENT (ppm)			DESCRIPTION OF CORE.
Cu	Pb	Zn	
120	10	410	dark grey dolomite with abundant carbonaceous laminae; specks of sulphide in carbonaceous layers (8½")
130	10	15	light grey siliceous dolomite breccia with chert fragments; few specks of disseminated sulphide (30")
200	25	15	massive grey siliceous dolomite; pyrite(?) on joints. (7")
1550	5	75	massive dark grey dolomite; film of pyrite (?) and ferruginous clots on joint (10")
550	5	25	massive grey dolomite; trace sulphide on carbonaceous laminae and joint (7")
100	20	100	massive grey dolomite; no sulphide apparent (12")
600	10	25	siliceous grey dolomite; pod-like patch of sulphide grains delineated by Mn-stains (7")
5	10	510	light grey chloritic dolomite with disseminated sulphide (13½")
10	10	330	grey oolitic dolomite; no sulphide apparent (8")
5	10	410	massive grey dolomite; no sulphide apparent (8")
20	10	350	grey oolitic dolomite; no sulphide apparent (7½")
10	10	540	grey dolomite; no sulphide apparent (10½")

DISCUSSION OF RESULTS

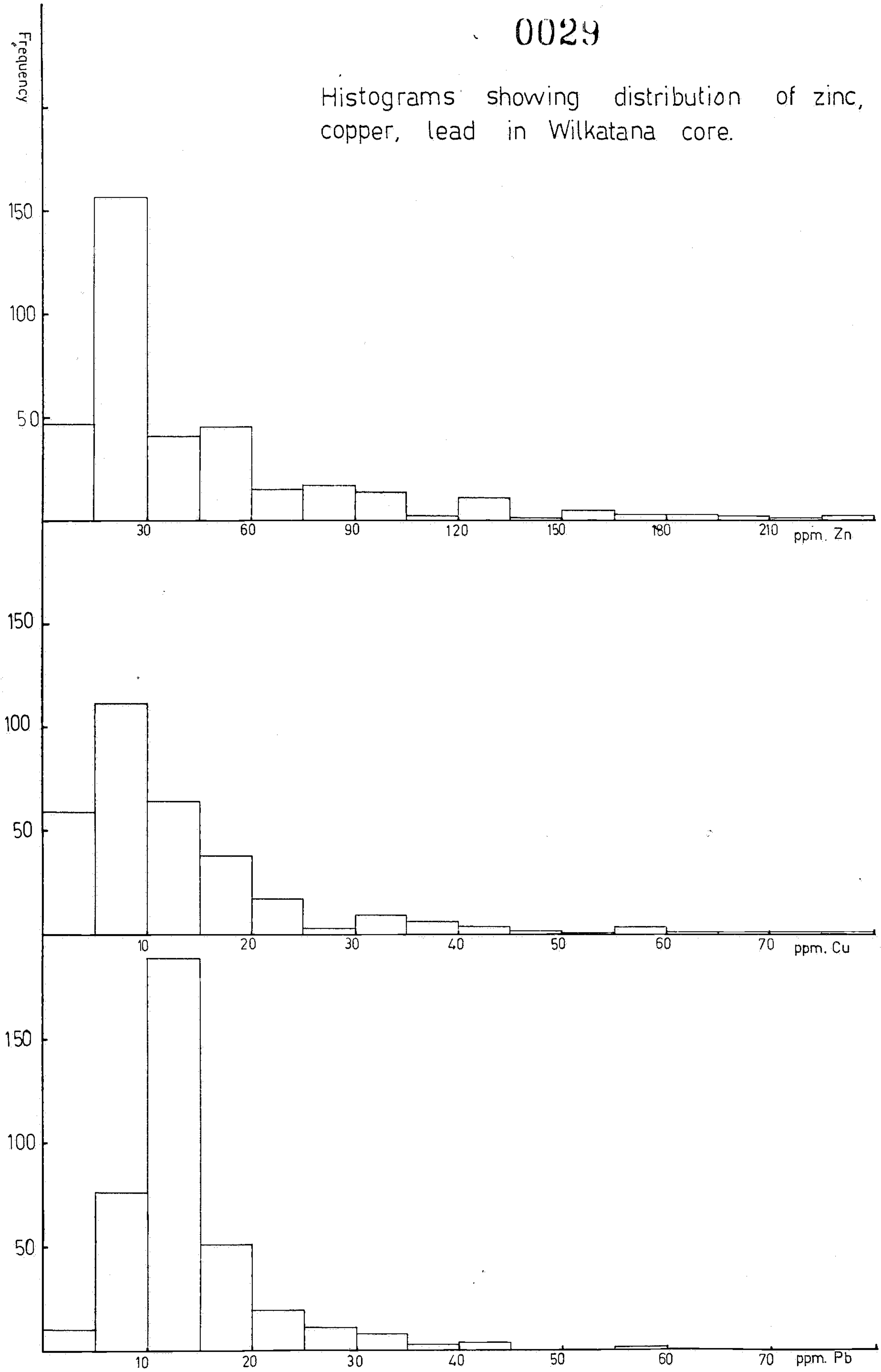
Excepting perhaps a single copper analysis of 1550 ppm over 10", the results give no indication of significant base metal mineralization. Zinc values are variable and apparently unrelated to copper and lead values (suggesting different distribution controls). Lead analyses are monotonously low and uniform.

CONCLUSIONS AND RECOMMENDATIONS

No significant base metal mineralization is indicated within the Cambrian succession at Wilkatana and no further work on the Wilkatana core is recommended.

fr R. Okill.

Histograms showing distribution of zinc, copper, lead in Wilkatana core.



FORM 12 JOB 2800/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 1

TT	Sample No.			Cu	Pb	Zn		
1	176691			<5	5	15		
2	2			<5	5	30		
3	3			<5	5	20		
4	4			<5	10	25		
5	STD 51							
6	5			<5	5	15		
7	6			<5	5	20		
8	7			<5	5	75		
9	8			<5	5	15		
10	9			<5	5	15		
11	700			[illegible]	5	150		
12	1			<5	5	80		
13	2			<5	5	70		
14	3x			<5	5	20		
15	4			<5	5	25		
16	5			<5	10	30		
17	6			<5	5	40		
18	7			<5	10	25		
19	176708			<5	10	510		
20	3x							

FORM 12 JOB 2800/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 2

TT	Sample No.			Cu	Pb	Zn		
1	176709			<5	10	15		
2	10			<5	5	15		
3	11			<5	5	25		
4	12			<5	5	95		
5	13x			5	10	120		
6	14			5	10	15		
7	15			<5	15	25		
8	16			<5	10	75		
9	17			<5	5	20		
10	18			5	5	40		
11	19			<5	5	15		
12	20			<5	5	130		
13	1			51	10	170		
14	STD 51							
15	2			<5	10	5		
16	3			<5	10	25		
17	4			<5	10	15		
18	5			<5	10	20		
19	176726			<5	10	50		
20	13x							

FORM 12 JOB 2800/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 3

TT	Sample No.			Cu	Pb	Zn		
1	176727			<5	15	30		
2	8			<5	10	20		
3	9			<5	10	210		
4	30			<5	10	40		
5	1			<5	10	15		
6	2			<5	10	15		
7	3			<5	10	15		
8	4			<5	10	65		
9	5x			<5	10	15		
10	6			<5	10	25		
11	7			<5	10	80		
12	8			<5	10	15		
13	9			5	10	75		
14	40			<5	10	50		
15	1			<5	10	25		
16	2			<5	10	10		
17	STD 51							
18	3			5	5	5		
19	176744			<5	5	20		
20	5x							

AMDEL GEOCHEMICAL SERVICE

JOB 2800/71 BATCH NO. 4

FORM 12

TT	Sample No.			Cu	Pb	Zn		
1	176745			<5	10	20		
2	Blank.							
3								
4								
5								
6								
7						Code 9C1		
8						Results in pp		
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

STD 51		RESULTS	FOR	SML 5	24		
176 746			5	15	20		
7			35	10	25		
8			5	10	80		
9			5	10	20		
50			5	15	20		
1			5	15	30		
2			10	10	15		
3x			5	10	20		
4			5	20	85		
5			5	10	20		
6			5	10	50		
7			<5	10	20		
176 758			10	10	50		
3x							

S.M.L. 5

FORM 12 JOB 3025/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 5

TT	Sample No.			Cu	Pb	Zn		
1	176759			10	10	20		
2	60			15	10	15		
3	1			10	10	15		
4	2			10	10	25		
5	3			5	10	15		
6	4x			10	10	15		
7	5			5	10	15		
8	6			5	10	10		
9	7			5	10	50		
10	8			65	10	15		
11	9			10	15	10		
12	70			15	15	10		
13	1			15	15	50		
14	2			10	10	50		
15	176773	not rec'd		—	—	—		
16	STD S1							
17	4			10	10	15		
18	5			10	15	10		
19	176776			120	10	410		
20	4x							

 S.M.L. 52F

FORM 12 JOB 3025/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 6

TT	Sample No.			Cu	Pb	Zn		
1	176 777			35	10	60		
2	8			10	30	15		
3	79A	2 samples ~~recd~~ marked		5	10	10		
4	79B	A+B by us.		20	15	15		
5	80			10	10	10		
6	1			10	10	90		
7	2			5	10	140		
8	STD 51							
9	3			55	15	20		
10	4			10	10	15		
11	5			5	10	15		
12	6			5	10	15		
13	7			5	10	15		
14	8			5	10	15		
15	9			25	10	15		
16	90			130	10	15		
17	1			10	10	15		
18	2			20	10	190		
19	176 793			10	10	30		
20	Blank			—	—	—		

[illegible signature]

FORM 12 JOB 3127/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 1

TT	Sample No.		Cu		Pb		Zn	
1	176794		70		20		15	
2	5		15		20		15	
3	6		20		20		15	
4	7		15		20		15	
5	8		15		20		15	
6	Std 51							
7	9		15		20		15	
8	800		15		20		15	
9	1		200		25		15	
10	2		15		20		25	
11	3 x		30		30		15	
12	4		50		25		15	
13	5		5		30		35	
14	6		15		30		25	
15	7		5		30		15	
16	8		15		20		20	
17	176809		5		40		55	
18	3 x							
19	[illegible]		—		[illegible]		—	
20					[illegible]			

FORM 12 JOB 3C 81/11 AMDEL GEOCHEMICAL SERVICE BATCH NO. /

TT	Sample No.			Cu	Pb	Zn		
1	176 810			15	5	15		
2	11			5	<5	35		
3	12			15	<5	15		
4	13			15	<5	10		
5	STD 51							
6	14			35	<5	30		
7	15			15	<5	10		
8	16			10	10	20		
9	17			10	5	10		
10	18x			20	<5	10		
11	19			15	<5	15		
12	20			10	<5	80		
13	1			10	5	15		
14	2			20	<5	50		
15	3			25	5	20		
16	176824			35	10	60		
17	18x			-				
18	Blank			—	—	—	Checked	
19							Bradley	
20								

FORM 12 JOB 3888/71 AMDEL GEOCHEMICAL SERVICE BATCH NO.

TT	Sample No.		Cu	Pb	Zn			
1	176825		20	40	15			
2	6		20	20	65			
3	7A	2 SAMPLES RECEIVED	600	10	25			
4	7B	MARKED 176827	15	10	15			
5	8		35	10	10			
6	9		30	10	20			
7	STD LM2							
8	30		25	30	30			
9	1		25	25	60			
10	2		15	40	20			
11	3		20	5	20			
12	4		30	25	30			
13	5		10	10	45			
14	36 ×		10	15	20			
15	7		45	10	25			
16	8		5	5	45			
17	9		5	5	85			
18	40		5	5	25			
19	176841		5	5	95			
20	36 ×							

FORM 12 JOB 3668/71 AMDEL GEOCHEMICAL SERVICE BATCH NO. 2

TT	Sample No.		Cu	Pb	Zn			
1	176842		60	10	15			
2	BLK							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Code C1
Results in ppm
GW

3

FORM 6 JOB 393[illegible]/11

AMDEL ANALYTICAL SERVICE

BATCH NO. 1

TT	Sample No.		Cu	Pb	Zn			
1	176843		<5	10	15			
2	4		<5	10	70			
3	5		5	10	15			
4	6		<5	10	240			
5	STD 403							
6	7		5	10	100			
7	8		5	10	45			
8	9		5	10	15			
9	50		5	20	10			
10	1		5	10	35			
[illegible]	2		5	10	5			
12	3		5	10	10			
13	4		5	10	80			
14	55x		5	10	5			
15	6		5	10	5			
16	7		5	15	15			
17	8		5	10	20			
18	9		5	10	25			
19	176860		5	15	20			
20	55x							

FORM 6 JOB 5933|[illegible]

AMDEL ANALYTICAL SERVICE

BATCH NO. 2

TT	Sample No.		Cu	Pb	Zn			
1	176861		20	25	15			
2	2		5	15	15			
3	3		5	10	15			
4	4		15	10	95			
5	5		10	15	5			
6	66x		30	15	5			
7	7		10	15	5			
8	8		10	15	5			
9	9		10	15	5			
10	70		20	25	5			
11	1		20	10	25			
12	2		15	20	15			
13	3		15	10	190			
14	4		10	15	15			
15	STD 51 | 1							
16	5		10	10				
17	6		55	20	20			
18	7		10	20	5			
19	176878		10	10	5			
20	66x							

FORM 6 JOB [illegible]

AMDEL ANALYTICAL SERVICE

BATCH NO. 5

TT	Sample No.		Cu	Pb	Zn			
1	176879		5	5	15			
2	80		30	10	45			
3	1		5	5	25			
4	2		10	5	35			
5	STD 403							
6	3		5	10	5			
7	4		10	55	45			
8	5		20	15	15			
9	6		5	15	110			
10	7		5	10	5			
11	8		15	5	5			
12	9		10	5	5			
13	90 x		5	10	5			
14	1		5	<5	45			
15	2		5	10	10			
16	3		10	5	20			
17	4		10	10	15			
18	5		5	5	15			
19	176896		5	5	120			
20	90 x							

FORM 6 JOB [illegible]

AMDEL ANALYTICAL SERVICE

BATCH NO. [illegible]

TT	Sample No.		Cu	Pb	Zn			
1	176897		10	15	5			
2	8		<5	5	35			
3	9		5	10	15			
4	900		5	10	5			
5	1		<5	10	5			
6	STD 51/1							
7	2		5	10	5			
8	3		20	10	10			
9	4		10	10	5			
10	5		5	5	5			
11	6		<5	5	35			
12	7		<5	10	20			
13	8		15	5	15			
14	9		15	5	15			
15	10		10	5	10			
16	11 ×		40	30	15			
17	12		5	10	75			
18	13		5	5	15			
19	176914		15	5	15			
20	11X							

FORM 6 JOB [illegible]/71

AMDEL ANALYTICAL SERVICE

BATCH NO.

TT	Sample No.		Cu	Pb	Zn			
1	176915		10	5	15			
2	16		5	5	10			
3	17		5	10	10			
4	18		10	10	15			
5	19		5	10	15			
6	20 x		5	15	15			
7	1		5	5	55			
8	2		5	5	15			
9	3		10	10	15			
10	4		5	10	10			
11	5	*	1550	5	75	*		
12	6		15	5	15			
13	7		10	5	200			
14	STD 403							
15	8		15	10	35			
16	9		10	5	20			
17	30		10	10	15			
18	1		10	10	20			
19	176932		10	10	45			
20	20 x							

AMDEL ANALYTICAL SERVICE

FORM 6 JOB [illegible]

BATCH NO.

TT	Sample No.		Cu	Pb	Zn			
1	176233		5	10	5			
2	4		30	15	20			
3	5		20	15	20			
4	6		5	10	25			
5	7		55	10	5			
6	8		15	5	10			
7	9		5	5	25			
8	STD 51/1							
9	40		5	10	45			
10	1		5	10	15			
11	2		5	10	15			
12	3		5	10	85			
13	4		5	10	120			
14	5		10	10	330			
15	46x		5	10	100			
16	7		5	10	35			
17	8		20	25	45			
18	9		20	10	55			
19	176950		5	10	55			
20	46x							

FORM 6 JOB [illegible]

AMDEL ANALYTICAL SERVICE

BATCH NO. 7

TT	Sample No.		Cu	Pb	Zn			
1	176951		5	5	35			
2	2		5	10	15			
3	3		10	10	25			
4	4		20	5	45			
5	55 X		5	5	120			
6	6		65	5	45			
7	7		10	5	160			
8	8		15	5	70			
9	9		10	5	150			
10	60		35	20	290			
11	1		20	10	20			
12	2		20	15	35			
13	3		10	15	60			
14	STD 403							
15	4		20	25	25			
16	5		5	15	55			
17	6		15	10	160			
18	7		5	10	35			
19	176968		35	15	70			
20	55x							

AMDEL ANALYTICAL SERVICE

FORM 6 JOB [illegible] BATCH NO.

TT	Sample No.		[illegible]	[illegible]	[illegible]			
1	176969		10	10	20			
2	70		10	10	100			
3	1		10	10	25			
4	STD 52/12							
5	2		10	10	120			
6	3		5	5	35			
7	4		5	5	20			
8	5		15	15	35			
9	6	*	550	5	25	*		
10	7		10	10	25			
11	8		15	15	55			
12	9		75	10	110			
13	80		40	10	45			
14	1		10	15	25			
15	2		10	15	65			
16	83 X		<5	10	25			
17	4		<5	10	20			
18	5		100	20	100			
19	176986		10	10	230			
20	83 X							

FORM 6 JOB [illegible]

AMDEL ANALYTICAL SERVICE

BATCH NO. [illegible]

TT	Sample No.		Cu	Pb	Zn			
1	176987		15	10	55			
2	8		10	10	60			
3	9		20	10	30			
4	90		10	10	130			
5	177031		10	10	85			
6	STD 403							
7	2		5	5	35			
8	3		15	10	120			
9	4		10	15	35			
10	5		5	10	40			
11	6		5	10	25			
12	7		5	10	45			
13	8		5	10	25			
14	9		5	10	25			
15	40x		5	5	25			
16	1		5	10	45			
17	2		5	5	45			
18	3		5	35	20			
19	177044		5	5	15			
20	40X							

~~[illegible]~~ 50

AMDEL ANALYTICAL SERVICE

FORM 6 JOB [illegible] BATCH NO. [illegible]

TT	Sample No.		Cu	Pb	Zn			
1	177045		5	10	30			
2	6		15	20	20			
3	7		5	10	410			
4	STD 52 J2							
5	8		15	10	15			
6	9		5	10	90			
7	50		5	10	55			
8	1		15	5	35			
9	2		5	10	35			
10	3		5	10	35			
11	4		10	10	120			
12	5		5	5	25			
13	6		5	10	35			
14	57X		5	10	25			
15	8		10	15	25			
16	9		5	15	170			
17	60		5	15	55			
18	1		10	35	20			
19	177062		10	15	65			
20	57X							

AMDEL ANAIYTICAI SERVICE

FORM 6 JOB [illegible] / 11 BATCH NO. 11

TT	Sample No.		Cu	[illegible]	Zn			
1	177063		5	15	45			
2	4		55	15	15			
3	5		10	20	55			
4	6		5	15	20			
5	67 x		10	10	85			
6	8		10	15	100			
7	9		15	15	65			
8	70		5	15	15			
9	1		5	25	90			
10	2		10	10	85			
11	3		10	10	120			
12	4		5	10	200			
13	5		5	15	75			
14	6		10	15	100			
15	7		15	15	45			
16	8		5	5	25			
17	STD 403							
18	9		5	10	160			
19	177080		<5	25	35			
20	67 x							

FORM 6 JOB [illegible]

AMDEL ANALYTICAL SERVICE

BATCH NO. [illegible]

TT	Sample No.		Cu	Pb	Zn			
1	177081		20	10	350			
2	2		10	30	60			
3	3		15	25	55			
4	4		10	10	15			
5	5		5	10	30			
6	6		5	5	280			
7	STD 92 J2							
8	7		5	15	55			
9	8		5	15	55			
10	9		10	10	35			
11	90		10	10	20			
12	1		5	10	15			
13	2		5	10	190			
14	3		15	10	30			
15	94 x		10	10	170			
16	5		10	10	540			
17	6		5	10	120			
18	7		10	10	80			
19	177098		15	10	55			
20	94 x							

0053

AMDEL ANALYTICAL SERVICE

JOB [illegible] BATCH NO.

FORM 6

TT	Sample No.		Cu	Pb	Zn			
1	177099		10	15	40			
2	100 x		5	15	35			
3	1		5	15	45			
4	STD 403							
5	2		35	15	25			
6	177103		10	15	100			
7	100 x							
8	BLK		—	—	—			
9								
10								
11						Code C1		
12						Results in ppm		
13								
14								
15								
16								
17								
18								
19								
20								

0054

REPORT ON AIRBORNE AFMAG-KEM
ELECTROMAGNETIC SURVEY FLOWN
OVER
LAKE TORRENS (SML-524)
FOR
CARPENTARIA EXPLORATION COMPANY PTY. LTD.

McPHAR GEOPHYSICS PTY. LTD.

REPORT ON AIRBORNE AFMAG-KEM

ELECTROMAGNETIC SURVEY FLOWN

OVER

LAKE TORRENS (SML-524)

FOR

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

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1. INTRODUCTION

A combined airborne AFMAG and "KEM" VLF electromagnetic survey was conducted for Carpentaria Exploration Company Pty. Ltd. to trace the Ediacara fault and the Norwest fault near Lake Torrens, S.A. These faults had previously been detected using ground AFMAG (1) and Seismic methods. Any other faults detected using the airborne AFMAG and KEM electromagnetic systems were to be mapped.

The survey was conducted during February 1971 by McPhar Geophysics Pty. Ltd. The instruments were installed in a Cessna 182 with the crew consisting of a pilot and an operator/navigator. The proposed survey comprised 28 flight lines varying in length from 22 to 56 miles giving a total of 1200 line miles. The flight lines were spaced at 5 mile intervals with the western end of each line extending across Lake Torrens. The position of the three ground AFMAG traverses was noted and these lines were to be repeated using the airborne installation as phase I of the survey. Once these faults had been detected satisfactorily, the main phase of the survey was to trace anomalous indications to the north and south of their known position.

Note: (1) See references at end of text.

..2/

2. METHODS AND EQUIPMENT

a) AFMAG:

The AFMAG method employs naturally occuring electromagnetic fields in the audio frequency range. The primary source of AFMAG fields is atmospheric electrical discharges (i.e. lightning strokes) that occur throughout the world. Most of this energy arises in major thunderstorm areas located near the equator, thus AFMAG fields are generally strongest near the equator and diminish towards the poles (2).

The AFMAG fields may be described as a series of rapidly occuring, short duration pulses that contain all frequencies in the audio spectrum. In the absence of any conductors the propagation direction of the individual pulses is random and the magnetic field is horizontally polarised. As a single conductor is approached, the propagation direction of the pulses becomes less random and more of the magnetic field is orientated perpendicular to the conductor. At the same time, the plane of polarization of the magnetic field is tilted out of the horizontal. In exploration, this tilt of the plane of polarization of the audio frequency magnetic field is used to locate subsurface conductors.

In the current airborne AFMAG apparatus, a measurement is made of the tilt angle in the direction of flight. This is done by comparing the signal amplitude of two mutually perpendicular coils with their axes at 45 degrees to the horizontal. These coils are mounted in a towed bird which is flown on 200 feet of cable. When the field is horizontal, (in the absence of conductors) the voltages in the two coils are equal; this is recorded as zero tilt or dip angle. Any departure from the horizontal results in a positive or negative dip angle which is recorded above or below a centre line on an analog recorder. The dip angle trace must be regarded as the primary information

..3/

trace of the system, although it is customary to also record the amplitude variation of the AFMAG field. However, because of the time variation of the AFMAG fields, clear indications of increases in amplitude of the signal are not always obtained over conductors.

The airborne AFMAG receiver has been designed to accept a wide variation in the AFMAG field strength. It is fitted with two variable attenuators which are used to reduce the signal strength to a level suitable for recording. The first attentuator has fixed levels while the second is variable within each level. The fixed attenuator has four settings which correspond to the following field strengths.

18 dB - (maximum attenuation), the AFMAG fields are extremely high and ideal for survey.
12 dB - AFMAG fields average for survey.
6 dB - AFMAG fields low but sometimes useable.
0 dB - (no attenuation), the AFMAG fields very low and normally not useable.

b) "KEM" VLF:

The McPhar airborne KEM (Kilocycle Electro Magnetic) system employs VLF radio transmissions in the 15 to 30 Kilo-hertz frequency band as a primary field. In the absence of conductors the electromagnetic field is horizontal and usually constant in amplitude. A conductor will distort the horizontal field and often increase the amplitude of the field strength.

The McPhar KEM system continuously measures the tilt or dip angle of the resultant field in degrees and may be regarded as a vertical loop system with the transmitter located at infinity. To measure the tilt angle of the VLF field, two mutually perpendicular coils similar to the AFMAG coils are used.

..4/

The tilt angle is measured by comparing the voltages in the two coils.

Unlike the erratic AFMAG sources the signal from a VLF radio station is usually relatively constant. Consequently the measurement of the relative amplitude (i.e. field strength) has more interpretational value. Over a vertical conductor, striking perpendicular to the incident electromagnetic field, a definite increase in the amplitude of the total signal is expected.

The most satisfactory flight direction for the "KEM" system is perpendicular to the geologic strike and tangential to circles concentric on the transmitting stations. (See diagram 1.). Since there are VLF radio stations available in North America, Japan and Australia it is nearly always possible to find a station which is compatible with the strike of the local geology.

Because of the higher frequencies used, many unimportant anomalies, associated with changes in surface conductivity, are encountered with the "KEM" system compared with standard low frequency electromagnetic or AFMAG methods. This phenomenon is due to the shallow penetration of the VLF fields compared with AFMAG fields as discussed below.

McPhar has found from test surveys, and our experience in Australia, that the choice of transmitting station and flight direction is very critical, thus for accurate results it is necessary to have the geological strike within 35 degrees of a radius drawn to the VLF transmitting station. Also McPhar has found that if the flight line direction is greater than 25 degrees from the normal drawn to the radius from the transmitting station, the tilt angle results can be very noisy due to poor coupling with the transmitting station.

..5/

As the general strike direction of the Ediacara fault is north-south, and the strike of the Norwest fault is 38 degrees west of north, (322 deg.) it was not considered practical to use N.W.G. (North West Cape W.A., 22.3 KHz) as the transmitter station for this survey. The only transmitter station which was amenable to the strike of the area was N.D.T. (17.4 KHz) in Japan. (The position of these two stations is shown in diagram 2.) N.D.T. Japan is thus ideal for a north-south geological strike in this locality. The disadvantage of using this transmitting station is its distance from Australia and its low signal strength, (500 KW compared to 1000KW for N.W.C.).

To compare depth penetration capabilities of the two (AFMAG and VLF) electromagnetic systems the skin depth at these frequencies can be calculated from the formula given below.

$$\delta = (f\mu\rho)^{-\frac{1}{2}}$$

where δ = skin depth (m)
f = frequency (Hz)
μ = 4πx 10-7 Henry/M
ρ = conductivity (mho/m)

A plot of the skin depth versus resistivity for various frequencies is shown in diagram 3. The horizontal axis skin depth is shown in metres and feet. Along the vertical axis is indicated the approximate resistivity that would be expected for typical rock types in the survey area.

3) AFMAG FIELDS DURING THE SURVEY

AFMAG fields which are subject to seasonal and diurnal variations have to be monitored closely, as good results are very dependent upon the field strength. In Australia over the past few years the fields have increased during the summer months, and subsided during the winter months.

..6/

At present in Australia there are three permanent AFMAG recording stations, one in Darwin (B.M.R.), one in Perth (B.M.R.) and one in Adelaide (McPhar). Records from the B.M.R. AFMAG field stations are publically available but after approximately 2 months delay. Thus the field recorder in Adelaide is used as the main indication of the field strength. This unit receives two AFMAG frequencies (130 Hz and 470 Hz) which are recorded on a time share basis. The records from the Adelaide recording station showed that the fields rose during December, 1970 and exhibited their characteristic diurnal variation with minor fluctuations. Ground tests using the airborne AFMAG receiver and recorder supported these observations.

4. SURVEY PROGRAM

3rd. Feb. A field check was made on the equipment in an area to the east of Adelaide. This test showed that the field strength was sufficiently high for survey work and that the equipment was worling satisfactorily.

4th. Feb. Ferry to Leigh Creek. J. Slade flew with the aircraft while A. Baird drove to the area with ancilliary and spare equipment. During the evening a base station AFMAG recorder was set up to monitor the AFMAG fields. This recorder was placed approximately $\frac{3}{4}$ mile to the west of the road between Leigh Creek and Copley.

5th. Feb. Equipment was set up on the ground at Leigh Creek airport. The AFMAG fields were checked and the field strength was found to be high and the field angle was stable. The KEM unit was tested by rotating the aircraft on the ground to check the local VLF field strengths. The wing tip was removed and tilted to calibrate the field angle measurement.

6th. Feb. An early morning test flight was made to test the equipment and establish whether the AFMAG would detect the Norwest fault. Line 5, which was situated due west of Leigh Creek was chosen as a test line as it passed over Myrtle Springs homestead where the Norwest fault had been detected using ground AFMAG. Line 5 was flown with the AFMAG field strength attenuator set at 12 dB.

Air speed checks carried out showed that there was a small variation in the received signal strength due to fluctuations in aircraft speed. This noise was generated by bird and cable turbulence.

The remainder of the day was spent checking the instruments and correcting the wind noise. The field strengths were monitored using the AFMAG receiver on the aircraft.

7th. Feb. An early morning flight was made testing both the KEM and AFMAG. The attenuation on the AFMAG receiver was set on 6 dB. The results of both the KEM and AFMAG were inconclusive. During the afternoon a further test flight was flown. These results showed that the AFMAG fields were unuseable due to the field angle being unstable at all altitudes.

8th. Feb. The fields were monitored during the morning. A test flight was carried out during the afternoon but the fields were still low and the field angles were erratic.

9th. Feb. Dust storms were blowing all day with visibility reduced to less than 1 mile. The field strengths were high but weather stopped any flight tests.

Up to this stage the AFMAG fields had shown a repeatable characteristic, increasing in intensity about mid-day and falling off around mid-night. There was a small secondary increase about 2 a.m. lasting for 1 hour.

10th. Feb. The high winds from the previous night had uncovered a small section of cable joining the receiver and the recorder.

..8/

This section of cable was shielded from the wind, thus reducing the noise level in the receiver signal. The ground AFMAG field receiver was checked against the AFMAG receiver in the aircraft to ensure that the low field strengths being recorded by the field receiver were substantiated by the receiver in the aircraft. This was shown to be the case as the receiver in the aircraft required o dB attenuation to make an accurate measurement of the field angle and field strength.

Instrument calibrations were made by tilting the AFMAG and KEM receivers.

11th. Feb. The AFMAG fields were monitored using the field recorder and the receiver in the aircraft. The fields were too low for survey.

12th. Feb. The AFMAG fields were monitored using the base recorder and the receiver in the aircraft and were found to be too low for survey. The AFMAG receiver was fully checked as per the AFMAG equipment manual.

13th. Feb. The base recorder failed and was repaired. The AFMAG fields were monitored with the base recorder and the receiver in the aircraft. The fields were too low for survey. As a double check of the field strength a test flight was made at 5000 feet altitude where there should be no influence from the ground. This test also showed that the fields were too low for accurate survey.

14th. Feb. The AFMAG fields were monitored using the base recorder and the receiver in the aircraft. The fields were too low for survey.

15th. Feb. A "KEM" VLF test flight was made using Line 5 as a test line. This line was flown at three different altitudes, 1000 feet, 500 feet, and 250 feet. On the third traverse the line was extended to pass over Andamooka. Line 10 was flown in an easterly direction at 500 feet to see if it was possible to locate the Ediacara fault. This test failed to locate the Ediacara fault.

During the afternoon a further test flight was made to locate some questionable KEM anomalies using both the KEM and AFMAG. This flight was abandoned due to the aircraft overheating.

16th. Feb. A similar test was carried out during the morning to locate the KEM anomalies with the KEM and AFMAG.

The survey was then abandoned and the remainder of the day was spent travelling to Adelaide.

5. DISCUSSION OF RESULTS

Flight 1. A copy of the results over the Norwest fault are shown in attached Appendex 1.
The three traces are:-

2)	Low Frequency Field Strength	L.F.F.S.
3)	High Frequency Field Angle	H.F.F.A.
5)	Low Frequency Field Angle	L.F.F.A.

In each case the position of the fault is indicated on the trace. The very steady field strength and low frequency field angle is characteristic of wind noise. There was neither a positive indication of an AFMAG field angle cross-over nor an increase in field strength for any of the traverses.

During this flight the AFMAG base recorder did indicate that the fields were reasonable and this was borne out by the fact that the attenuator setting used was 12 dB., although part of this amplitude was due to wind noise.

By comparing the two westerly traverses (1 and 3) it can be seen that there is no correspondence between the

..10/

H.F.F.A. traces. This case also applies for the two easterly traverses (2 and 4).

The conclusion arrived at from this data, was that there was turbulence noise in the system which had to be removed before being able to record with optimum sensitivities.

These lines were extended out beyond the eastern lake shore and there were no definite anomalies observed.

Flight 2. The results of the four traverse lines flown over the fault are shown in attached Appendix 2.
The six traces are:-

1) Altimeter.
2) AFMAG L.F.F.S. (Low Frequency Field Strength).
3) AFMAG H.F.F.A. (High Frequency Field Angle).
4) "KEM" F.A. (Field Angle).
5) AFMAG L.F.F.A. (Low Frequency Field Angle).
6) "KEM" F.S. (Field Stength).

In each case the position of the fault is indicated on the trace.

a) The altimeter trace shows that a constant altitude was maintained.

b) The AFMAG field strength attenuator was set at 6 dB and tests showed that all the wind noise had been removed.

c) There was no indication of a field angle cross-over for the KEM or the AFMAG.

d) The KEM F.S. was very noisy showing some of the characteristic variation observed in the AFMAG field strength.

Traverse 5 and 6 showed no indication of the fault at an altitude of 1000 feet. Traverse 7 and 8 also failed to detect any anomalies at 700 feet.

..11/

A section of the data from traverse 7 shows that when the KEM F.S. is low, as it was during this flight, some of the noise on this trace can be associated with AFMAG bursts.

In all cases the AFMAG and KEM did not detect the Norwest fault.

GROUND TEST

Before flight 3 some ground tests were made with the aircraft parked and the bird 100 feet from the aircraft. A section of these test traces is shown in attached Appendix 3. With the bird stationary, both the AFMAG field angle records were unstable, whereas previously these measurements had been stable while carrying out a similar test. The problem was possibly due to local thunderstorms which were visible to the east of Leigh Creek later in the evening.

Flight 3. This flight was designed to test whether the noisy AFMAG field angle traces recorded on the ground were evident while flying. Two traverses were flown, one at 6000 feet flying west, and the second at 1000 feet flying east. The traces showed clearly that the AFMAG field angle was changing rapidly, by as much as 30 degrees, and that this change was independent of altitude. At 6000 feet field angle cross-overs were recorded at approximately 15 second intervals. These anomalies were not supported by the KEM, and were recorded over an area where we previously had not detected any variation in the field angle.

It was concluded from this flight that it was worthless continuing the flying tests while the ground tests indicated a noisy field angle.

Flight 4. Two traverses were made over the fault and there was no indication of an anomaly. During this flight the fields were too low to record accurate measurements.

..12/

Flight 5. Two lines were flown, one at 7800 feet to check for wind noise, which was not apparent, and the second at 1000 feet over line 5. This test also failed to detect any anomalies. The AFMAG fields were so low, that with no attenuation (0 dB.), there was barely sufficient signal to operate the instrument. With this low field strength the field angles were noisy.

During a ground test at the end of this flight the KEM detected two buried power lines under the runway. These power lines were for the runway landing lights and were not in operation at the time. It was concluded that the KEM was operating correctly. The KEM F.A. curve shows the ideal cross-over with an increase in the F.S. reaching a maximum at the point where the F.A. is zero, see Appendix 4.

Flight 6. The aim of this flight was to check if, by changing the altitude, we would detect any anomalies using the KEM only. For this test line 5 was flown three times at 1000 feet, 500 feet and 250 feet. One "anomaly" was detected at 1000 feet and is shown in Appendix 5. The two "anomalies" detected at 500 feet are shown on traverse 12a and 12b. Two "anomalies" were recorded at 250 feet, as shown by traverse 13a and 13b.

To check the instruments line 5, at 250 feet, was extended to Andamooka where a power line was detected flying both east and west traverses. These traces are shown in the Appendix 5. The power line was detected as a field angle cross-over with an associated increase in field strength. Note the difference between this power line anomaly which was detected flying east and west, and the earlier "anomalies". Although the Andamooka anomaly is very narrow the field angle has the ideal shape and there is an associated rise in field strength, reaching a maximum when the field angle is zero. These traces are similar to the traces recorded over the power lines, under the runways, at Leigh Creek airport. Compare these traces with the five earlier "anomalies" recorded during this flight. The field angle dips in one direction only and is always associated with a sharp increase in field strength. The two traces then appear to decay back to their background level.

When the "anomalies" recorded earlier on this flight are plotted on their respective flight lines it becomes evident that they cannot be true geophysical anomalies. These anomalies are shown on attached Flight Path Plots. The "anomaly" detected at 1000 feet was not evident at 500 feet or 250 feet. The two "anomalies" recorded at 500 feet do not correspond to any anomalies recorded at 1000 feet or 250 feet. The same is true for the two "anomalies" detected at 250 feet. For this reason they have to be disregarded as geophysical anomalies and interpreted as random noise associated with the VLF fields.

The KEM flight over line 10 failed to detect any trace of the Ediacara fault.

Flight 7. To check the position of these KEM "anomalies" a test flight was made using both the KEM and AFMAG. Unfortunately this flight was terminated due to over heating of the aircraft. The AFMAG fields were very low and we failed to detect any of the "anomalies" recorded earlier.

Flight 8. This was a repeat of flight 7. The AFMAG fields were still low and very noisy (see Appendix 6) and failed to detect any anomalies.

6. CONCLUSION

The aim of the survey was to locate the Norwest and Ediacara faults with the AFMAG and KEM. Once these structures were located they were to be traced north and south, along with any other similar structures.

. . . . /14

The AFMAG field strengths were of reasonable intensity for the first few days but dropped to a level far too low to trace the deep structure we were looking for. It was not possible to positively identify any AFMAG or KEM anomalies which could be associated with the Norwest fault or the Ediacara fault.

The failure of the KEM was not unexpected as the depth of penetration of the VLF field is approximately an order of magnitude less than the AFMAG fields.

A number of KEM VLF electromagnetic system "anomalies" were recorded which did not repeat when the line was reflown. These were discounted as anomalies as they appeared to be due to random noise in the VLF fields.

When the AFMAG field strength decreased to a very low level, and showed no signs of increasing during the next week, it was decided that the extra expense of waiting in Leigh Creek was not warranted.

REFERENCES

E. Burnside. "Report on AFMAG Tests on Northern Flinders Ranges, S.A.", for Carpentaria Exploration Company Pty. Ltd. McPhar Geophysics Pty. Ltd., February, 1970.

S.H. Ward. "The Electromagnetic Methods" Mining Geophysics, Volume 2, Pages 249 - 253.

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J. Slade
Airborne Division

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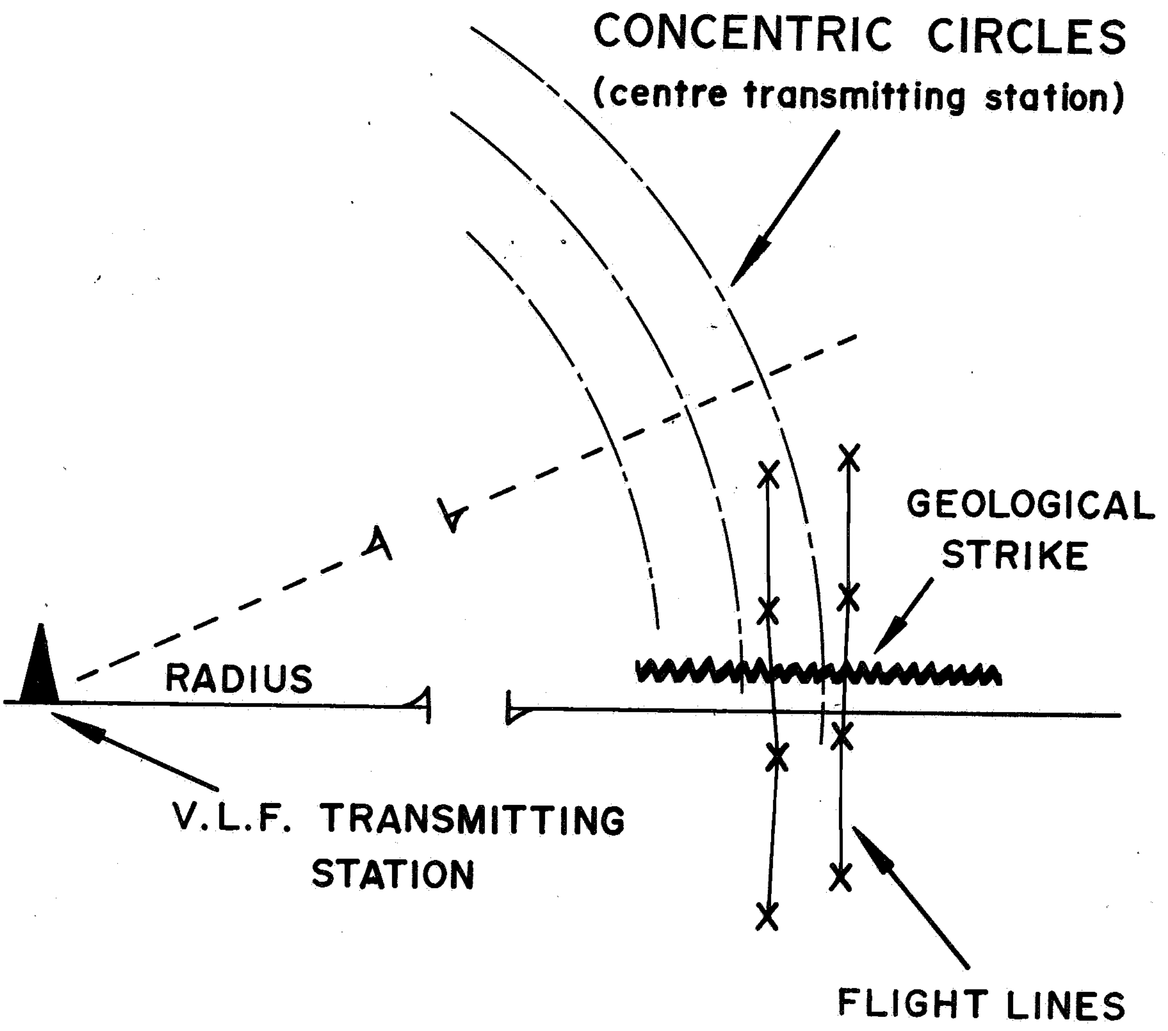

DIAGRAM I : Configuration for maximum coupling between V.L.F. Transmitting Stations and Geological Strike.

DRAWN : MAY 1971

DWG : PR 71/054

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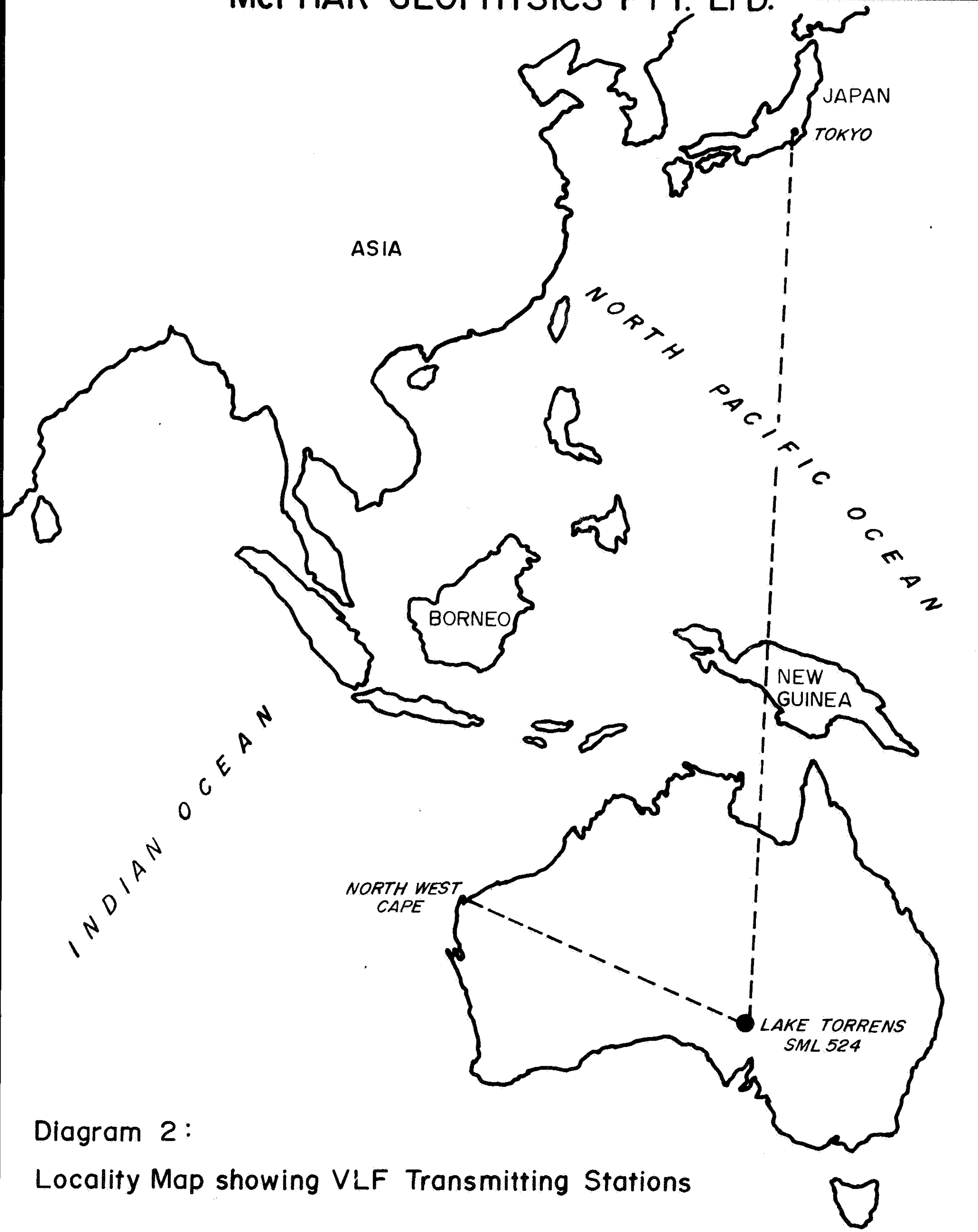

Diagram 2:

Locality Map showing VLF Transmitting Stations

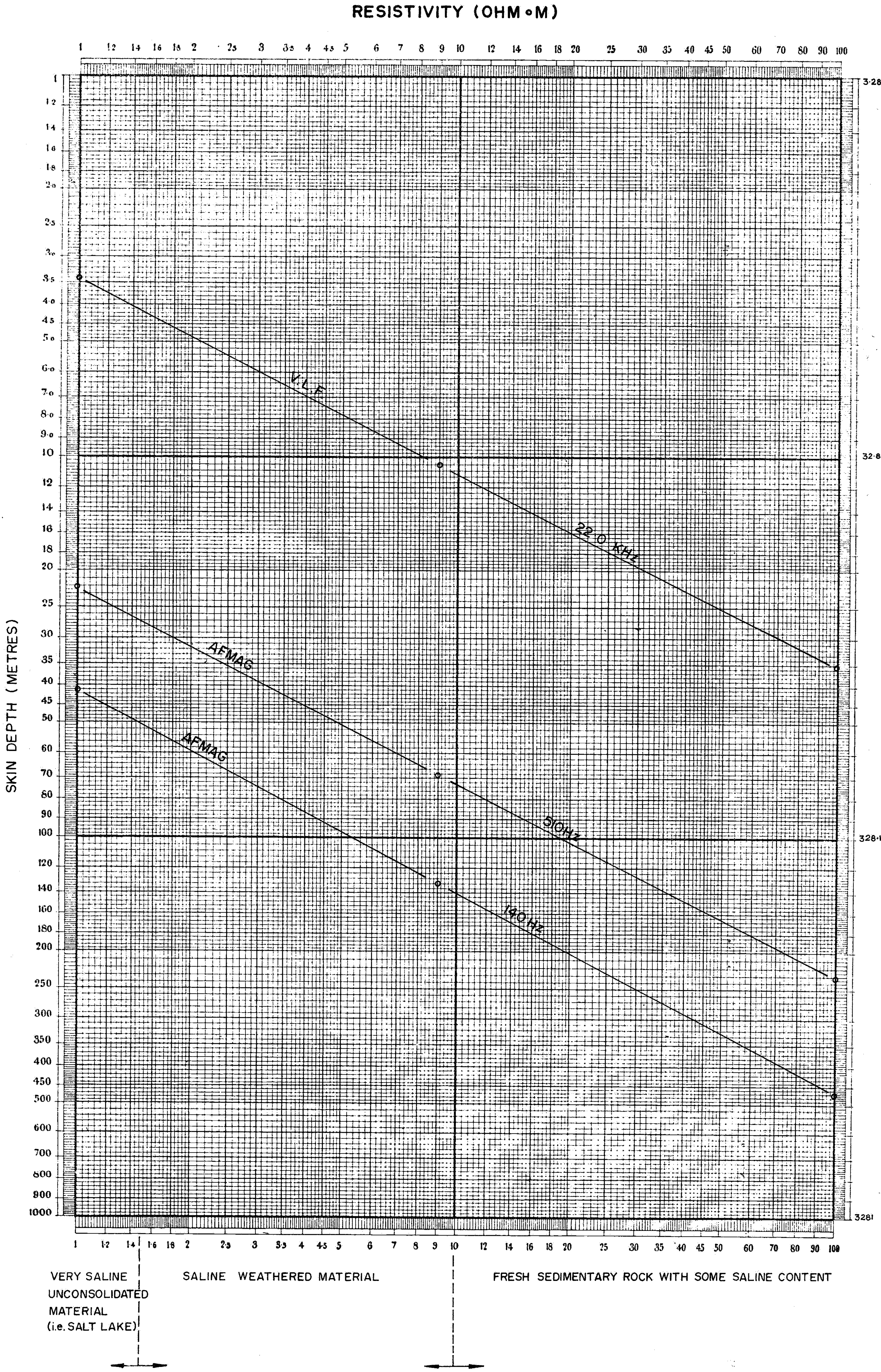

DIAGRAM 3: Plot showing Skin Depth vs Resistivity for various frequencies

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APPENDIX /

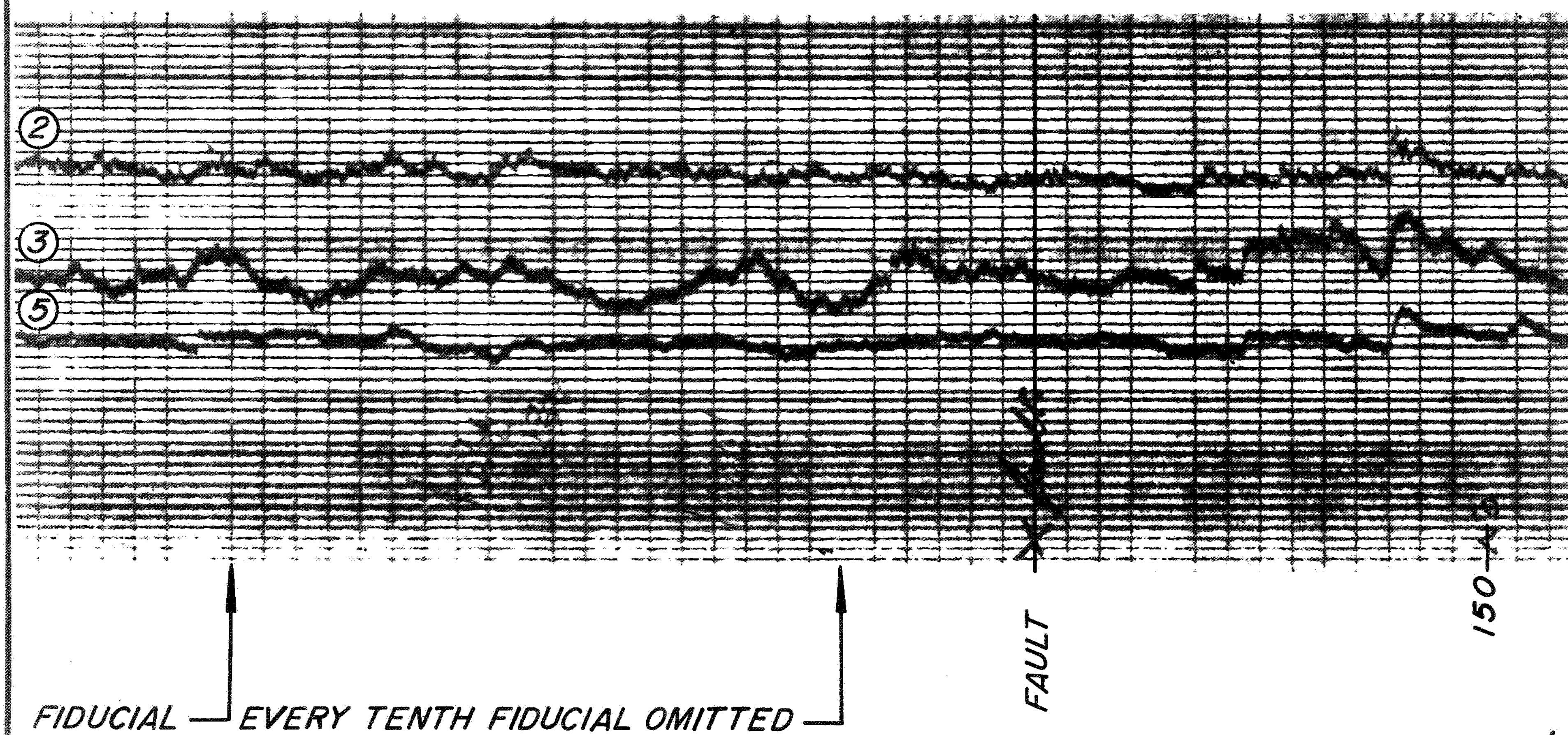
FLIGHT /   DATE 6·2·71

LINE 5   TRAVERSE /   DIRECTION WEST

AFMAG ONLY

TRACE IDENTIFICATION

1. Altimeter 1000 feet
2. Low Frequency Field Strength. (12 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX /

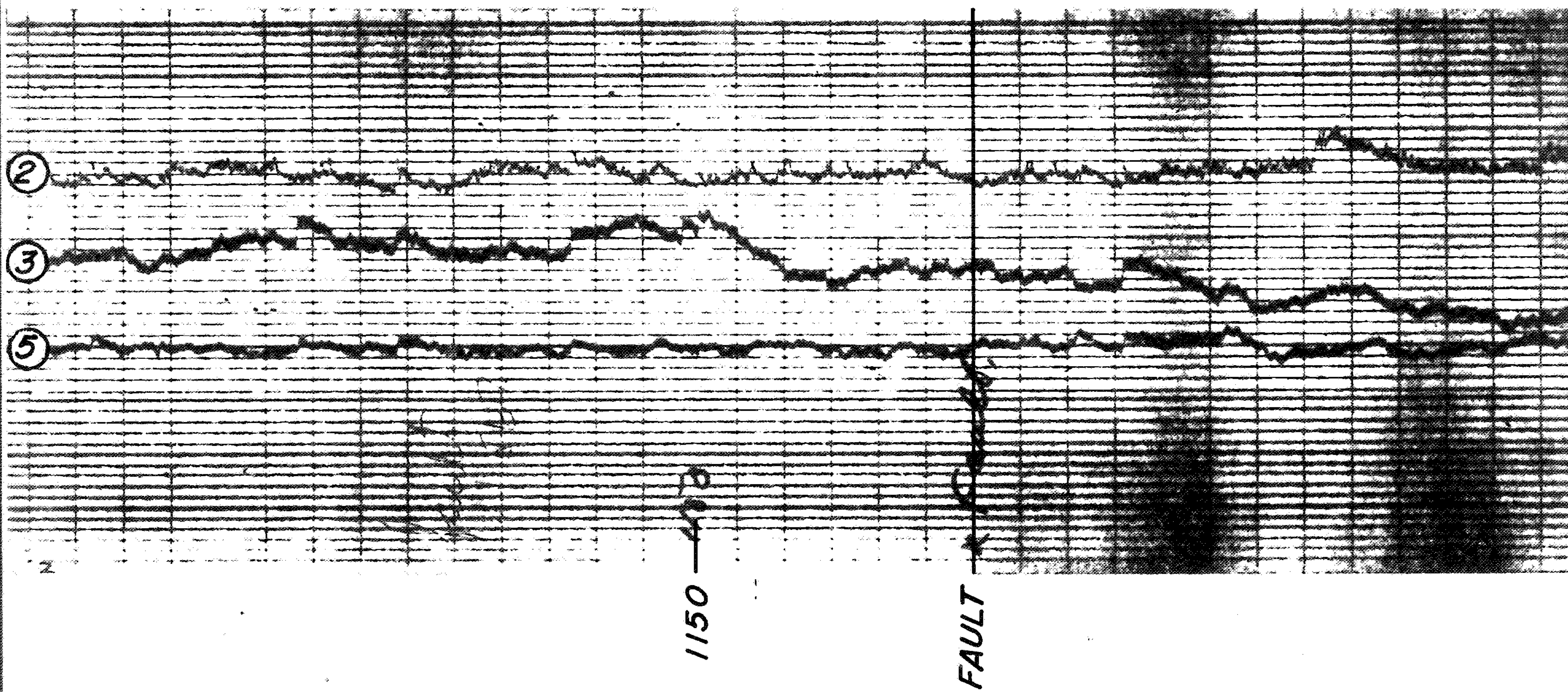
FLIGHT /   DATE 6·2·71

LINE 5   TRAVERSE 2   DIRECTION EAST

AFMAG ONLY

TRACE IDENTIFICATION

1. Altimeter 1000 feet
2. Low Frequency Field Strength. (12 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6 KEM Field Strength.



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APPENDIX /

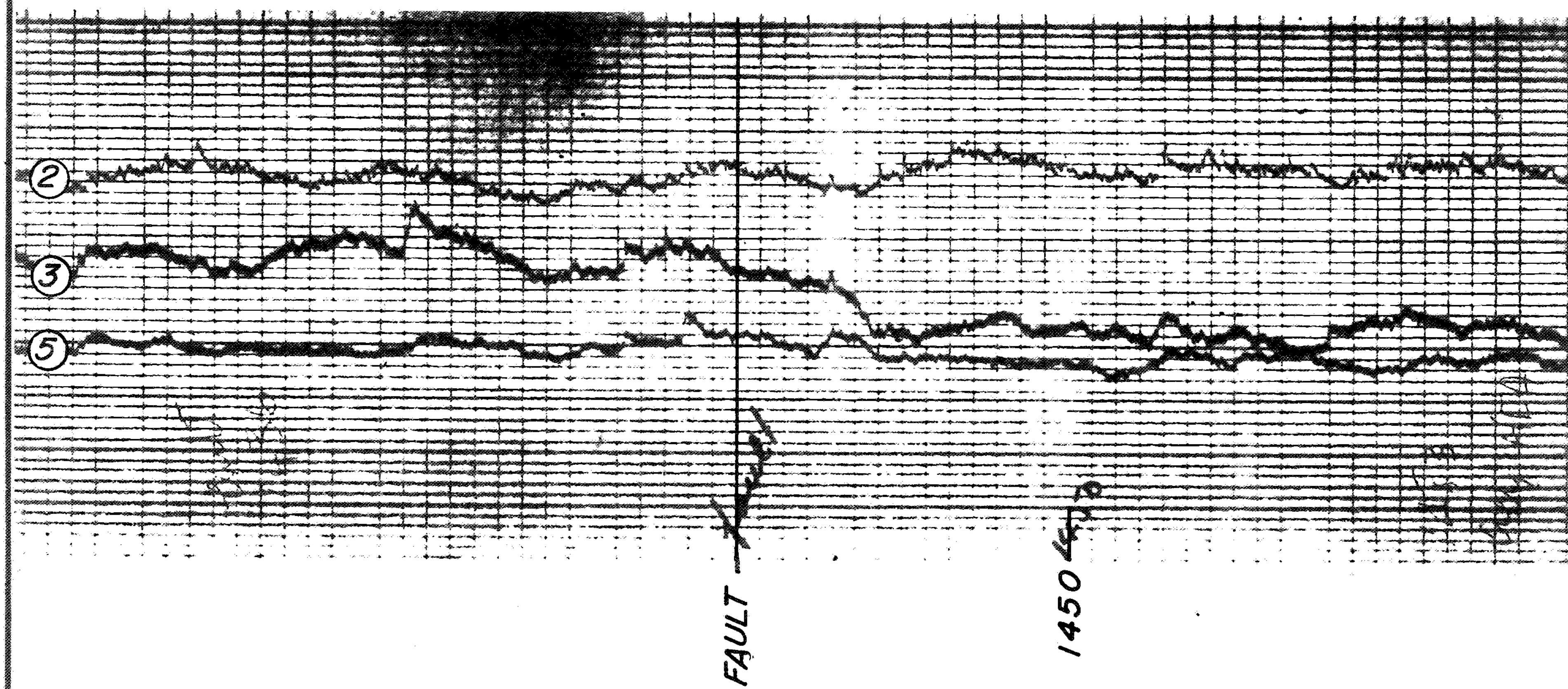
FLIGHT / DATE 6·2·71

LINE 5 TRAVERSE 4 DIRECTION EAST

AFMAG ONLY

TRACE IDENTIFICATION

1. Altimeter 700 feet
2. Low Frequency Field Strength. (12 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6 KEM Field Strength.



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APPENDIX 1

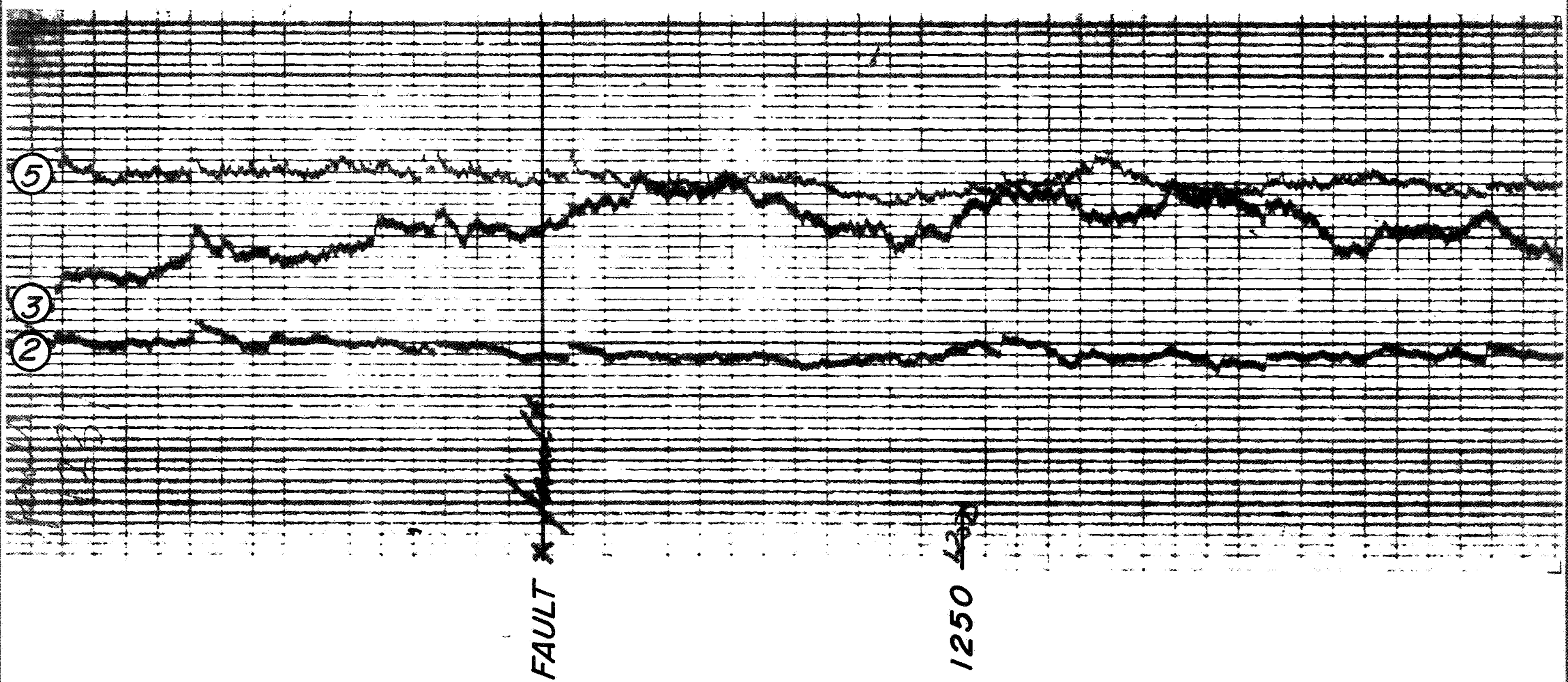
FLIGHT 1 DATE 6·2·71

LINE 5 TRAVERSE 3 DIRECTION WEST

AFMAG ONLY

TRACE IDENTIFICATION

1. Altimeter 700 feet
2. Low Frequency Field Strength. (12 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 2

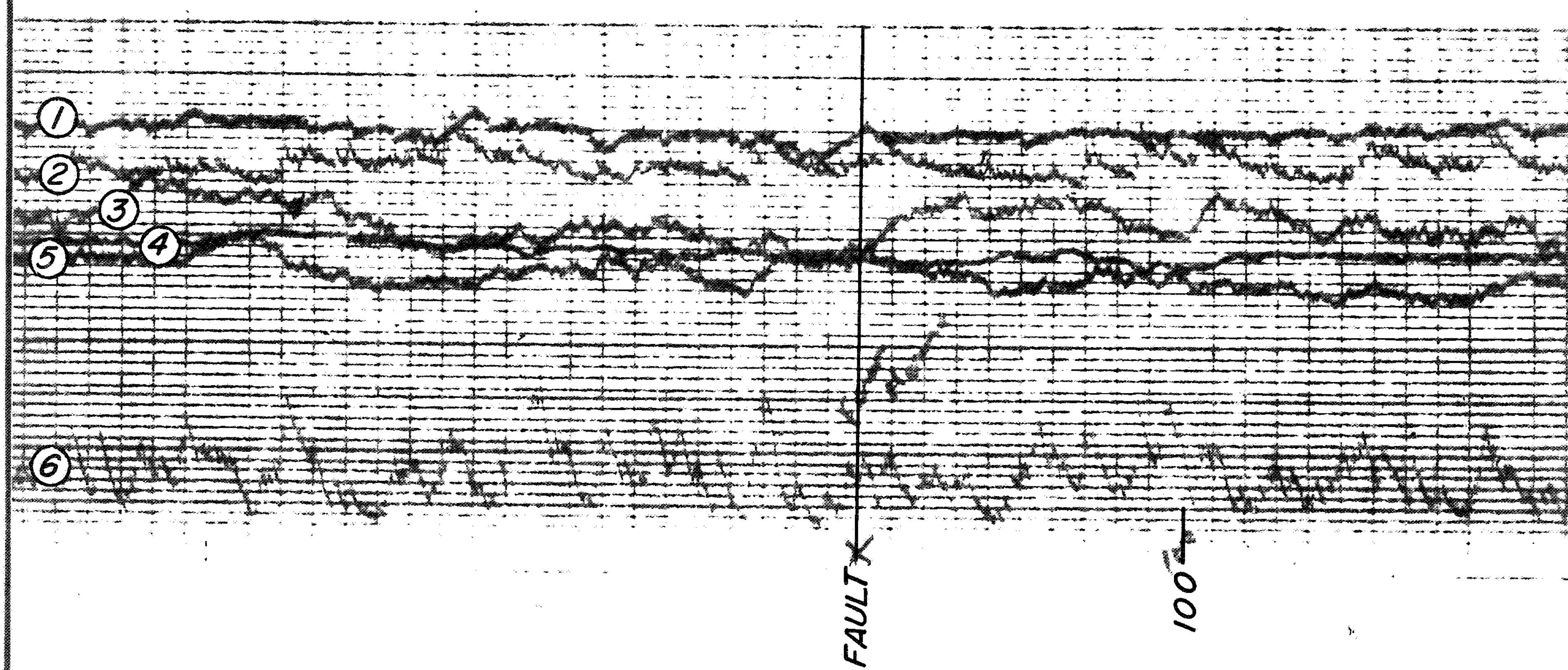
FLIGHT 2   DATE 7·2·71

LINE 5   TRAVERSE 5   DIRECTION WEST

AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 1000 feet
2. Low Frequency Field Strength. (6 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 2

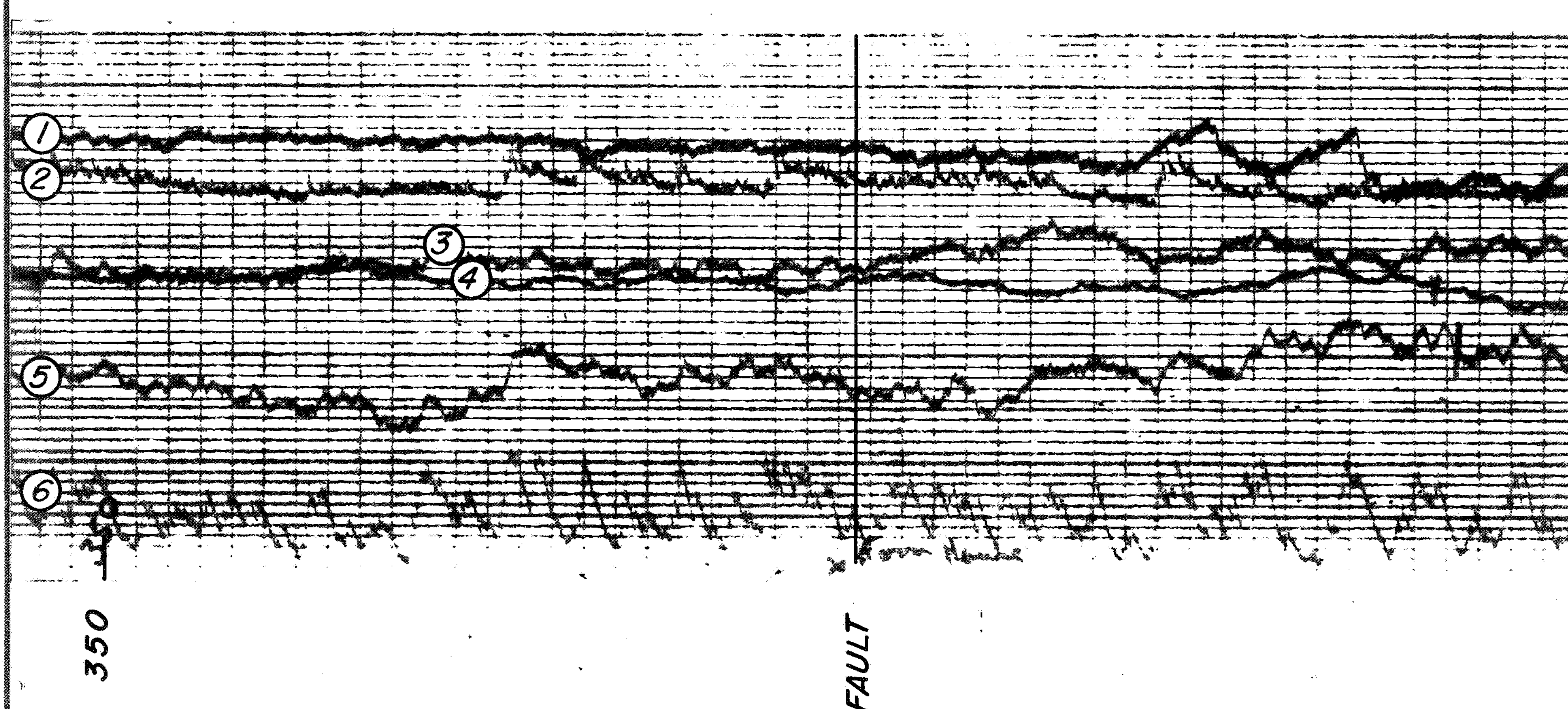
FLIGHT 2 DATE 7·2·71

LINE 5 TRAVERSE 6 DIRECTION EAST

AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 1000 feet
2. Low Frequency Field Strength. (6 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 2

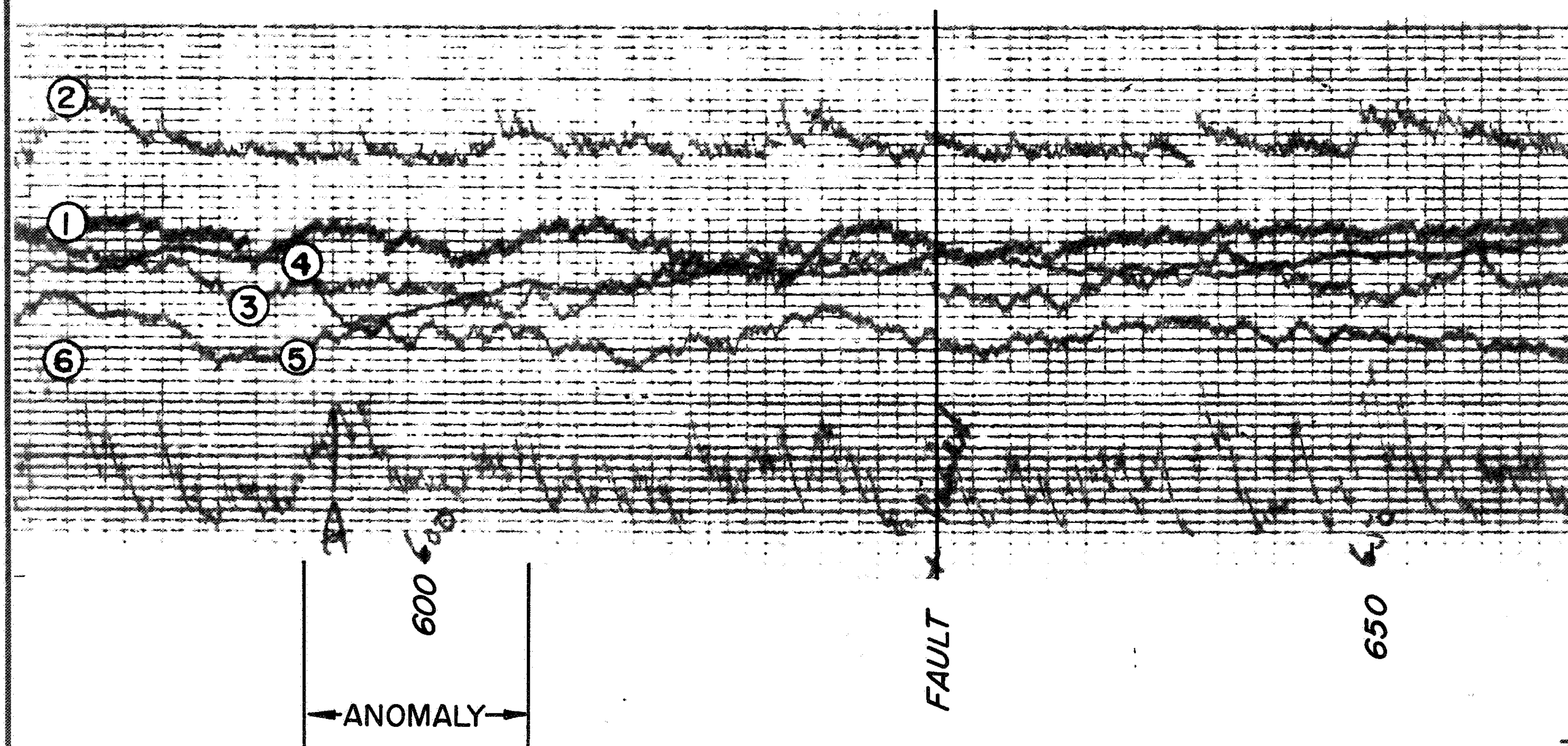
FLIGHT 2 DATE 7·2·71

LINE 5 TRAVERSE 7 DIRECTION WEST

AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 700 feet
2. Low Frequency Field Strength. (6 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 2

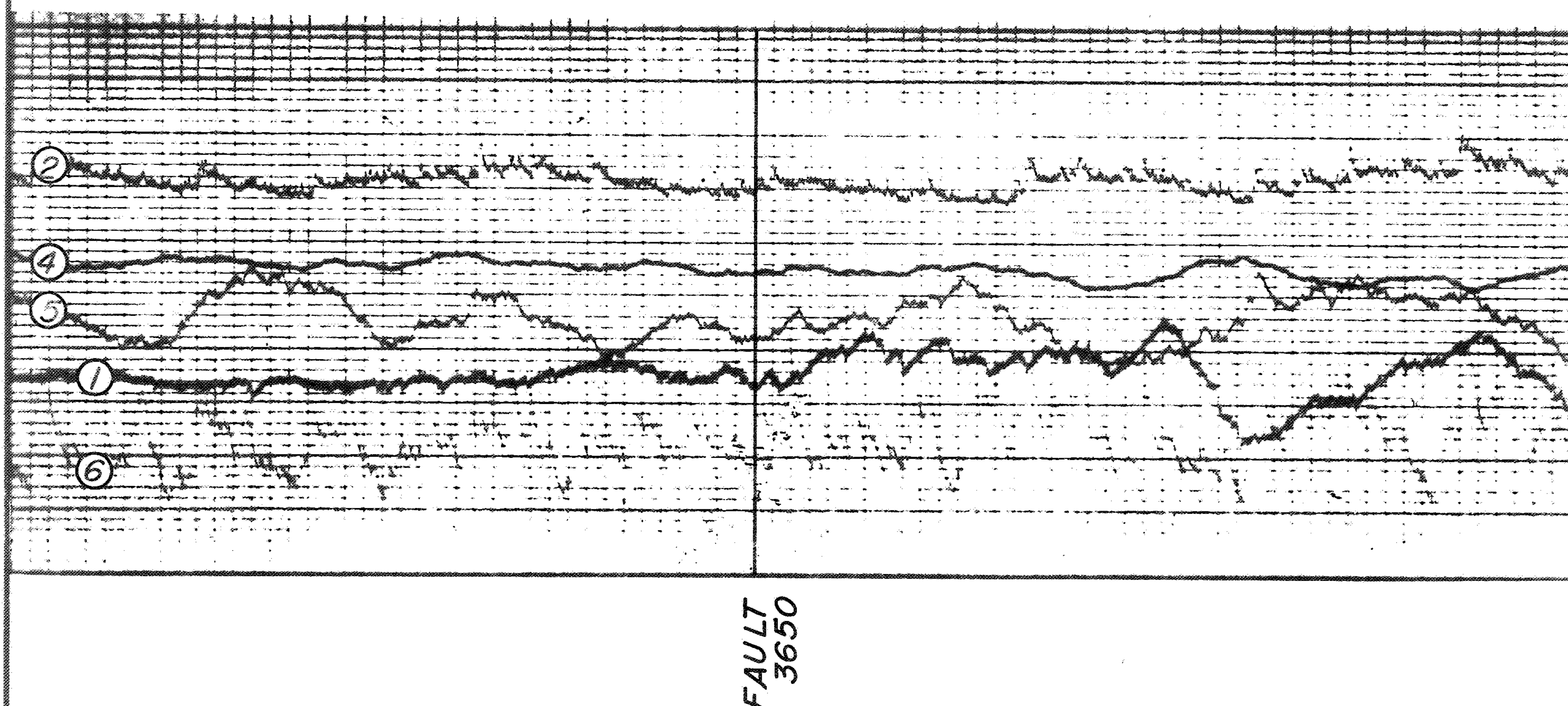
FLIGHT 2   DATE 7·2·71

LINE 5   TRAVERSE 8   DIRECTION EAST

AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 500 feet
2. Low Frequency Field Strength. (6 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 2

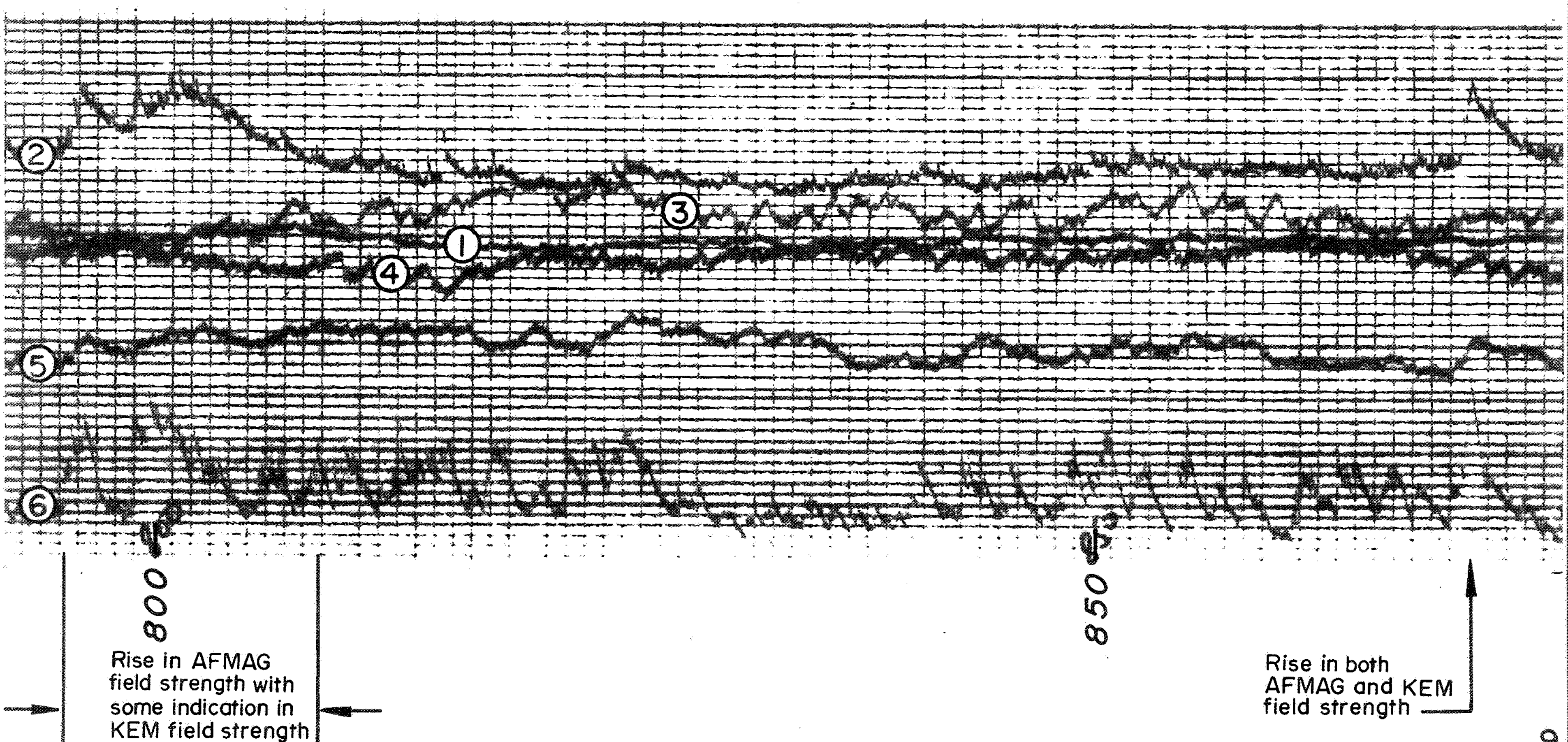
FLIGHT 2 DATE 7·2·71

LINE 5 TRAVERSE 7 DIRECTION WEST

AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 700 feet
2. Low Frequency Field Strength. (6 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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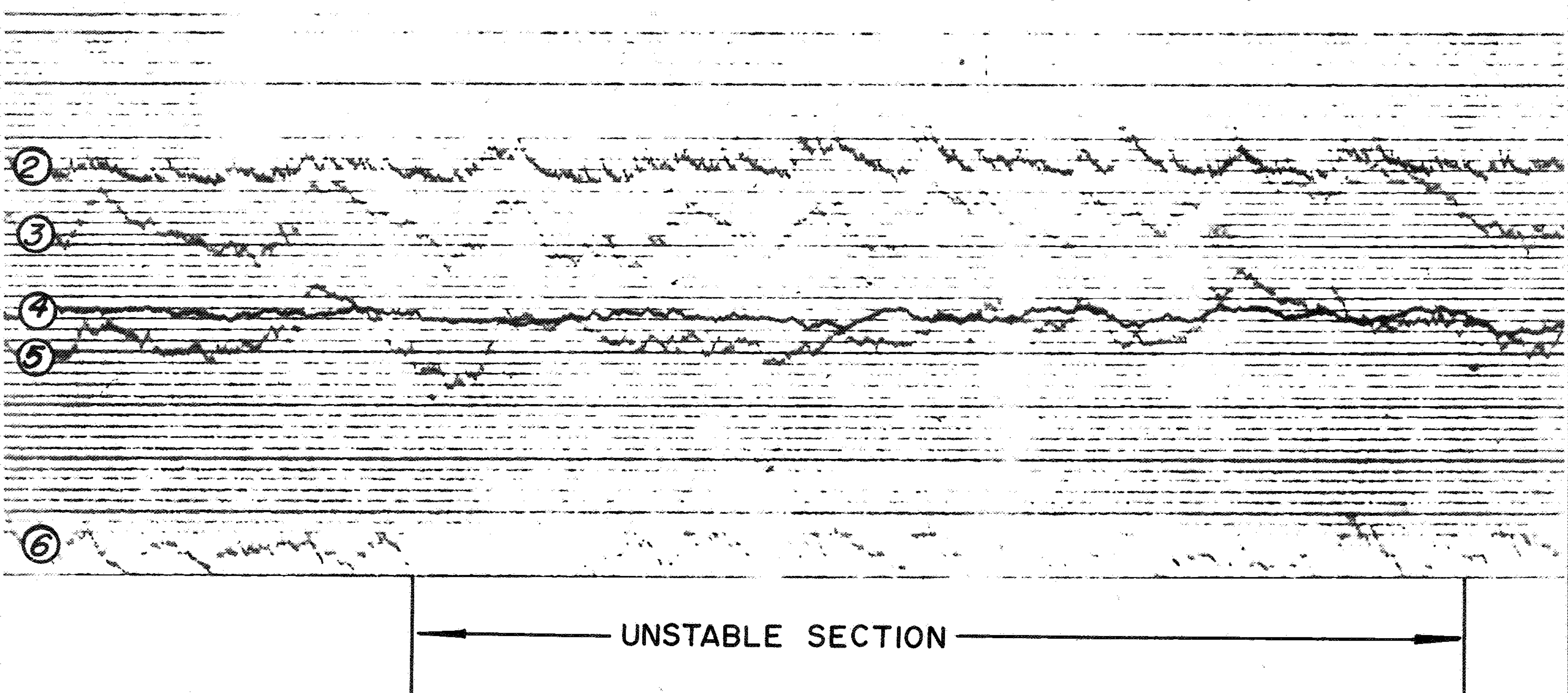
APPENDIX 3

FLIGHT — DATE 5·2·71

GROUND TEST
AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 0 feet
2. Low Frequency Field Strength. (6 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX *3*

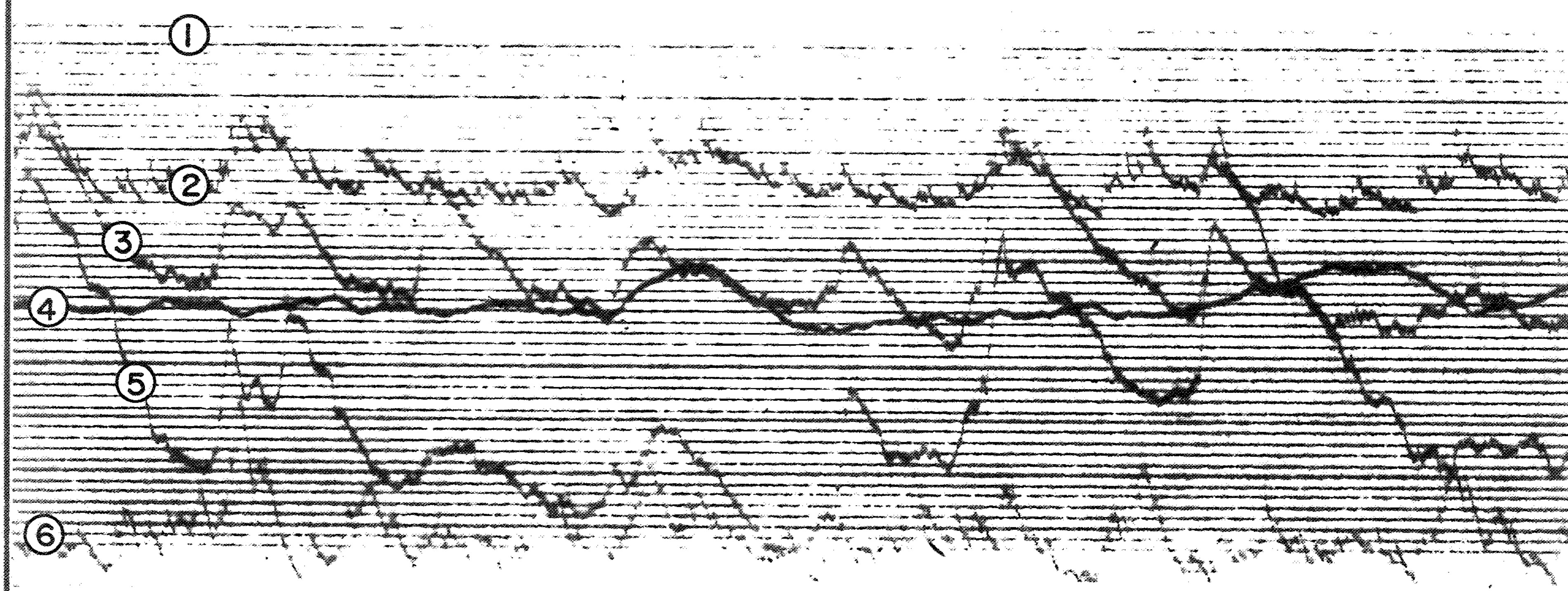
FLIGHT *3* DATE *7·2·71*

LINE *5* TRAVERSE *9* DIRECTION *WEST*

AFMAG and KEM

TRACE IDENTIFICATION.

1. Altimeter *6,000* feet
2. Low Frequency Field Strength. (*0* dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 3

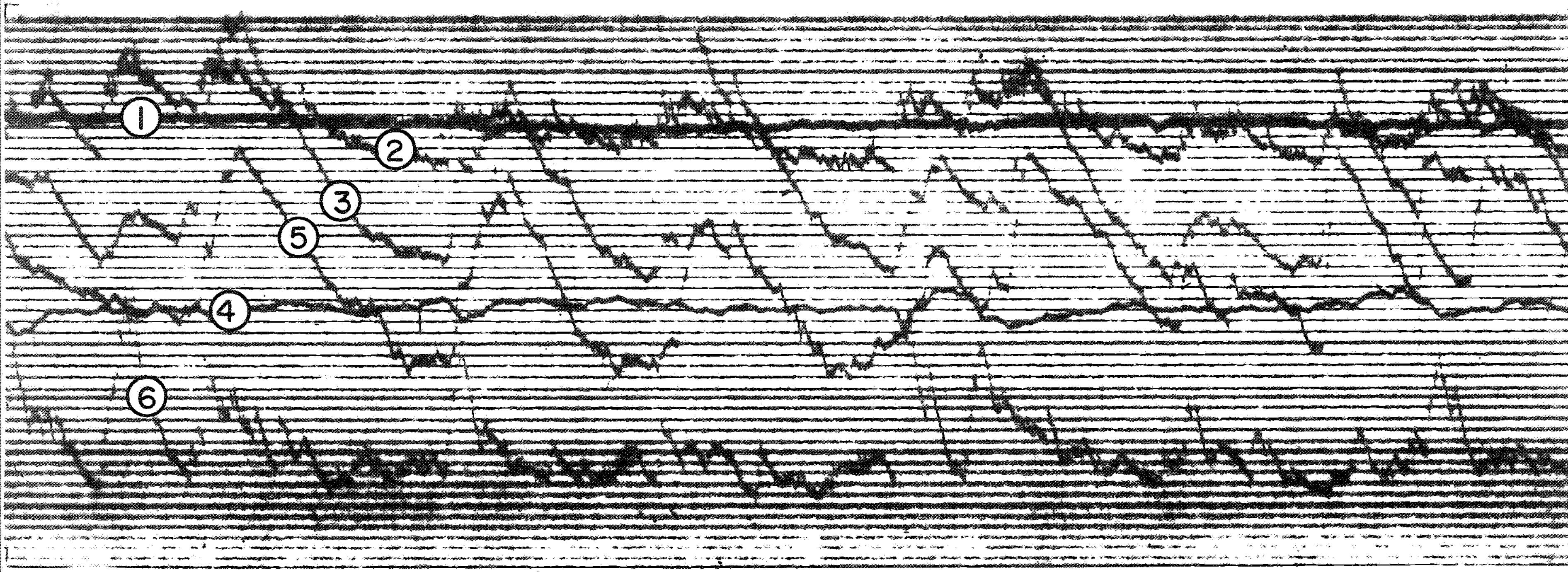
FLIGHT 3 DATE 7·2·71

LINE 5 TRAVERSE 10 DIRECTION EAST

AFMAG and KEM

TRACE IDENTIFICATION

1. Altimeter 1,000 feet
2. Low Frequency Field Strength. (0 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 4

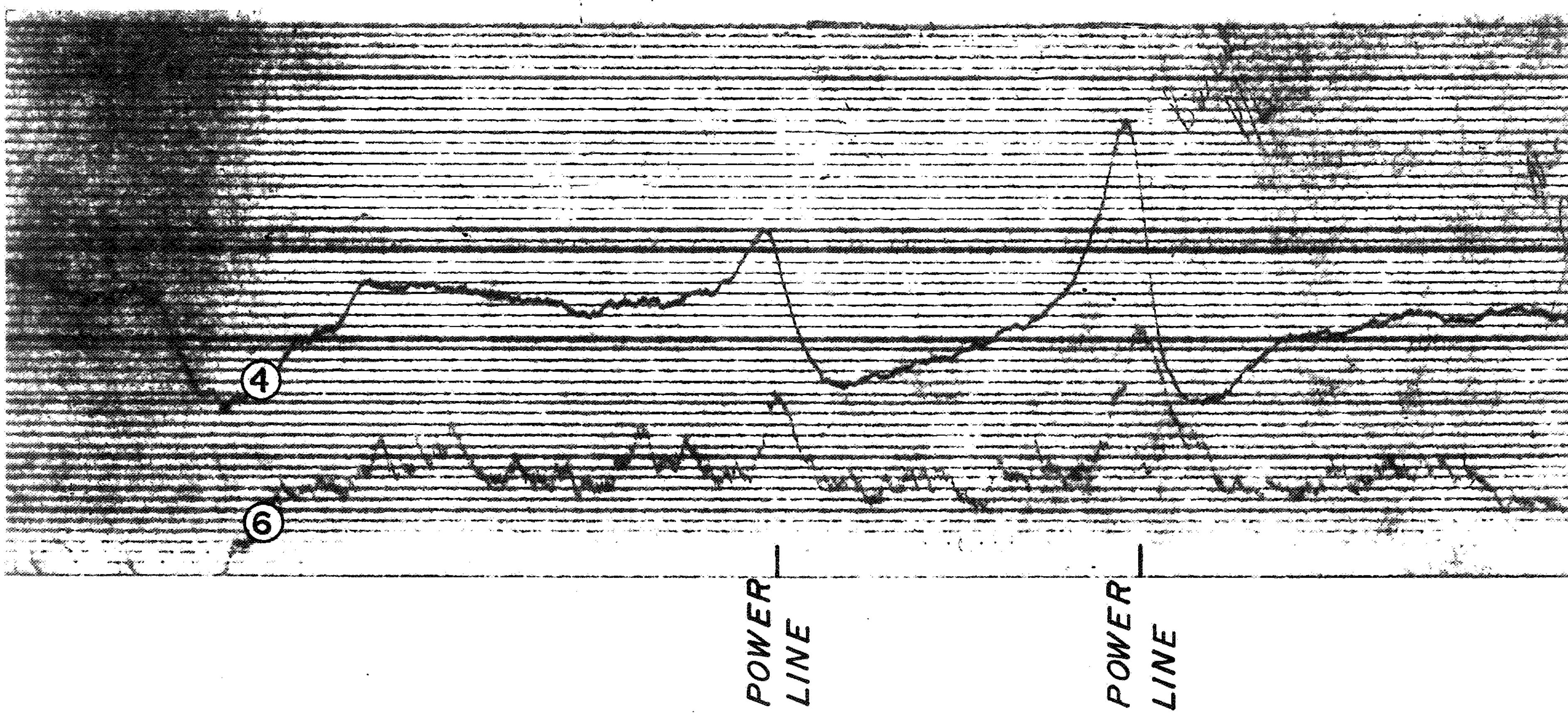
FLIGHT 5 DATE 13·2·71

POWER LINE UNDER RUNWAY

KEM ONLY

TRACE IDENTIFICATION

1. Altimeter 0 feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 5

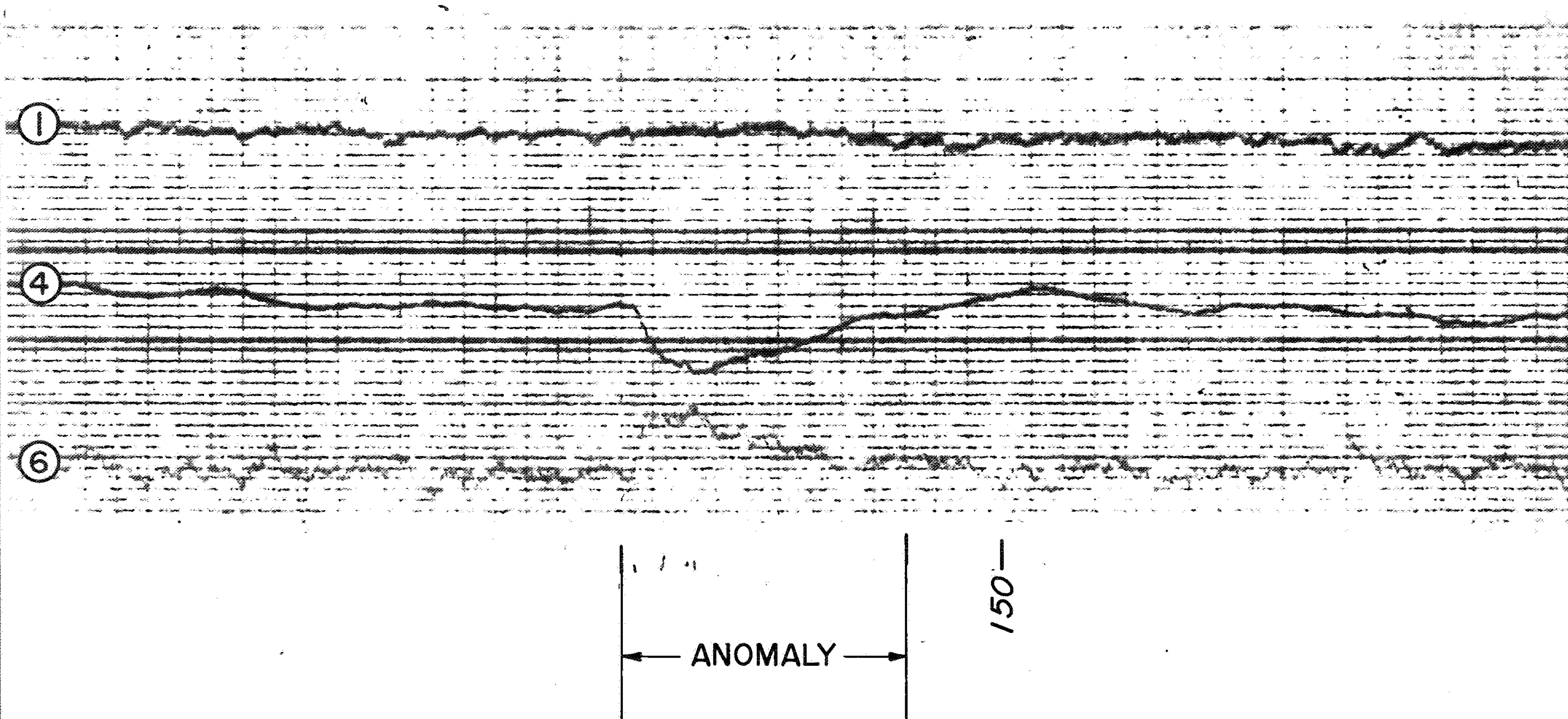
FLIGHT 6 DATE 15·2·71

LINE 5 TRAVERSE 11 DIRECTION WEST

KEM ONLY

TRACE IDENTIFICATION

1. Altimeter 1,000 feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX *5*

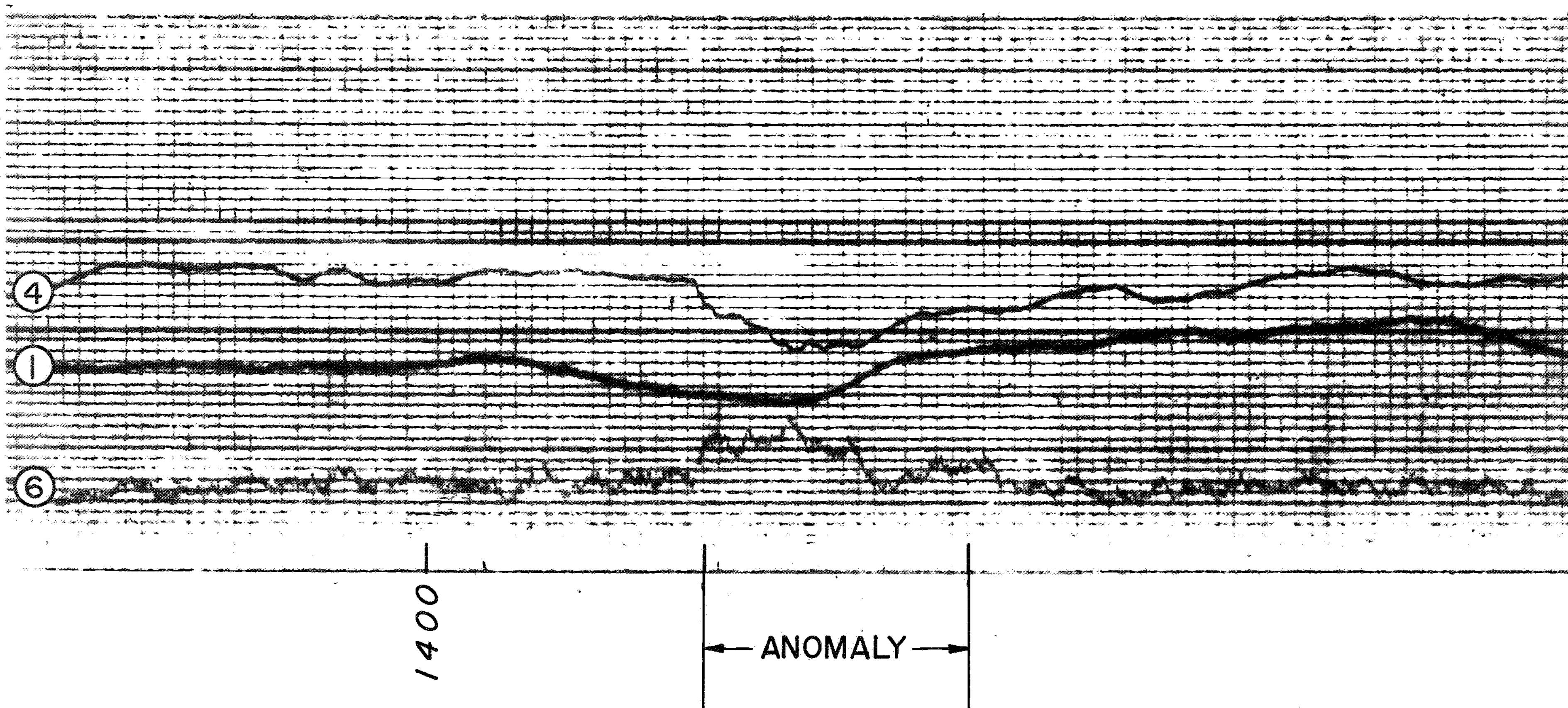
FLIGHT *6* DATE *15 · 2 · 71*

LINE *5* TRAVERSE *12a* DIRECTION *EAST*

KEM ONLY

TRACE IDENTIFICATION

1. Altimeter *500* feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX *5*

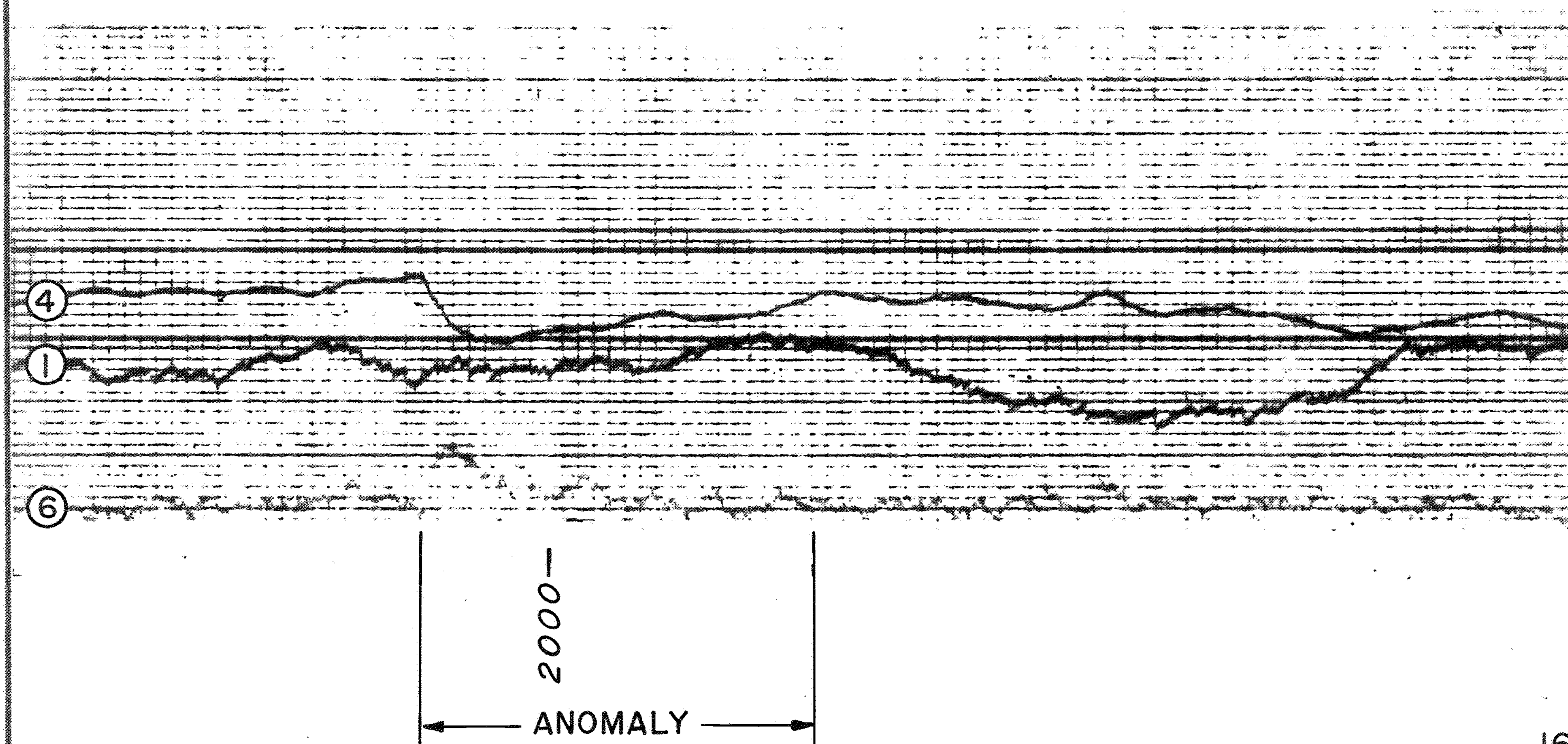
FLIGHT *6* DATE *15·2·71*

LINE *5* TRAVERSE *12b* DIRECTION *EAST*

KEM ONLY

TRACE IDENTIFICATION

1. Altimeter *500* feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 5

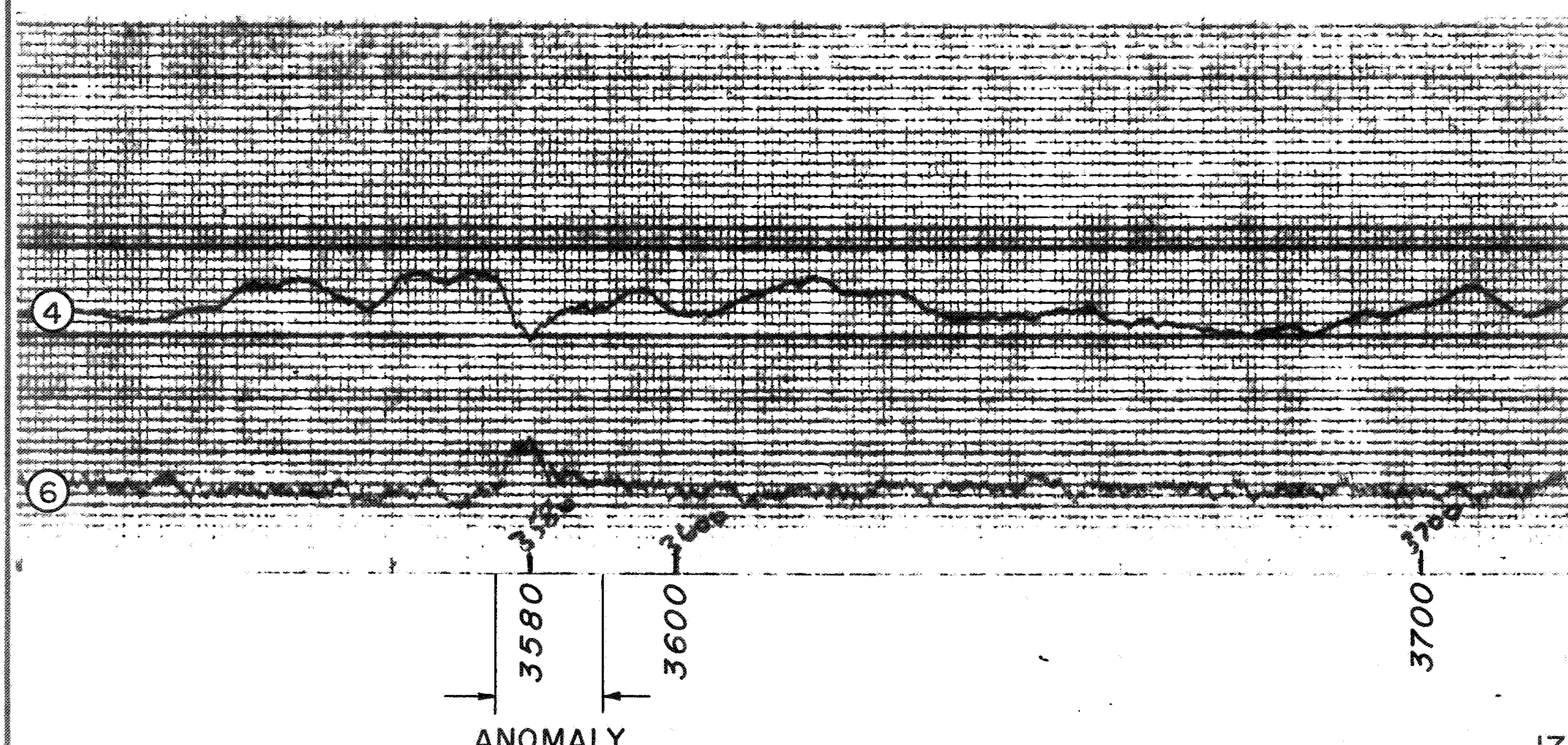
FLIGHT 6 DATE 15·2·71

LINE 5 TRAVERSE 13a DIRECTION WEST

KEM ONLY

TRACE IDENTIFICATION

1. Altimeter 250 feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 5

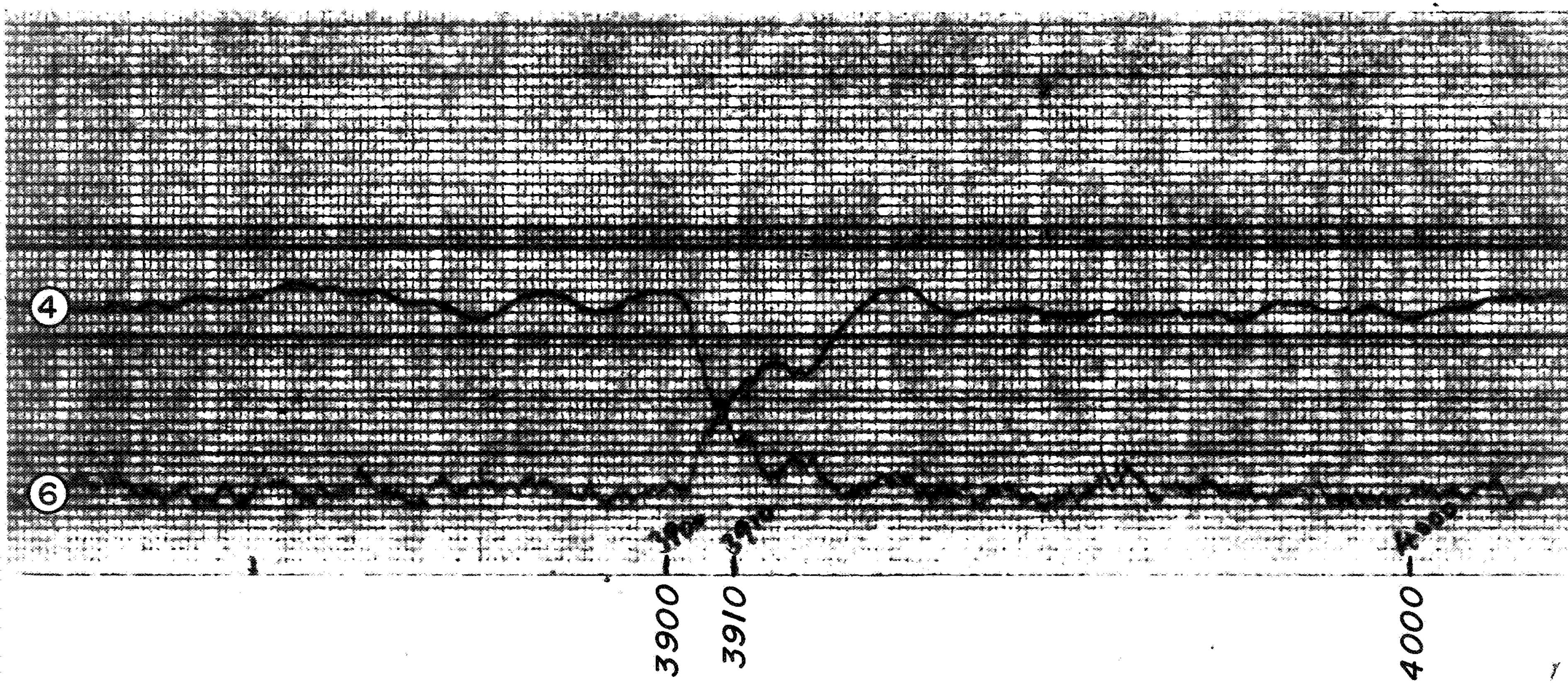
FLIGHT 6 DATE 15·2·71

LINE 5 TRAVERSE 13b DIRECTION WEST

KEM ONLY

TRACE IDENTIFICATION

1. Altimeter 250 feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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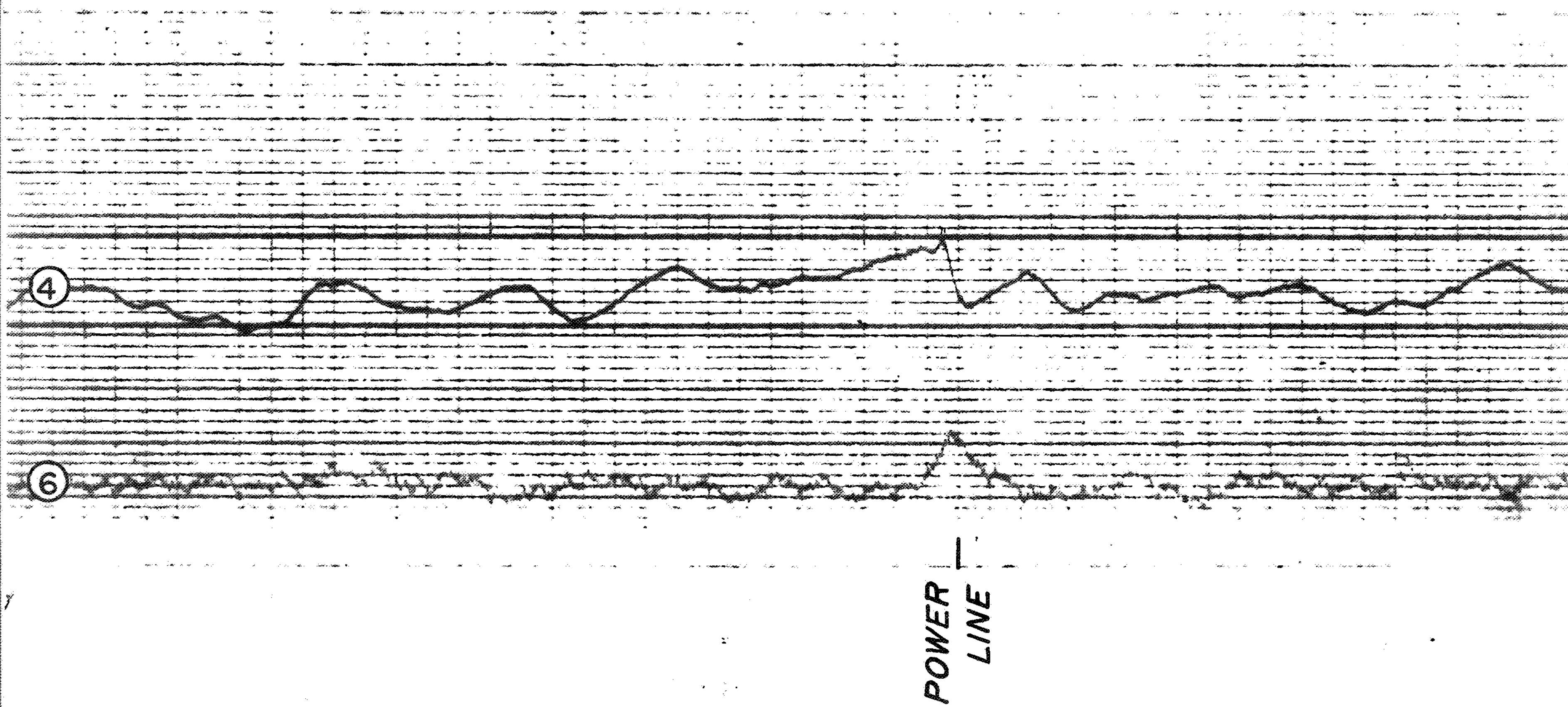
APPENDIX 5

FLIGHT 6 DATE 15·2·71

ANDAMOOKA
POWER LINE

TRACE IDENTIFICATION

1. Altimeter 250 feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6 KEM Field Strength.



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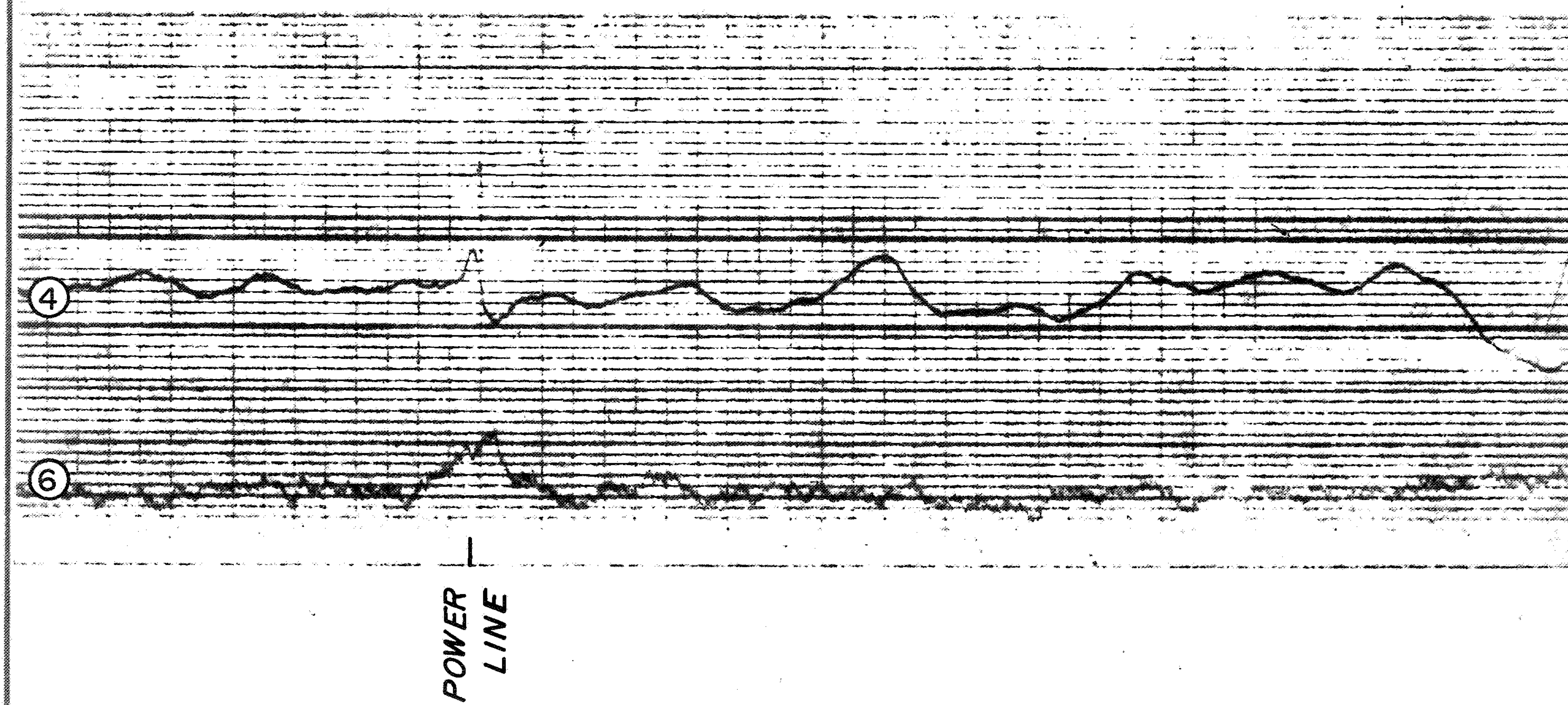
APPENDIX 5

FLIGHT 6 DATE 15·2·71

ANDAMOOKA POWER LINE

TRACE IDENTIFICATION

1. Altimeter 250 feet
2. Low Frequency Field Strength. (dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



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APPENDIX 6

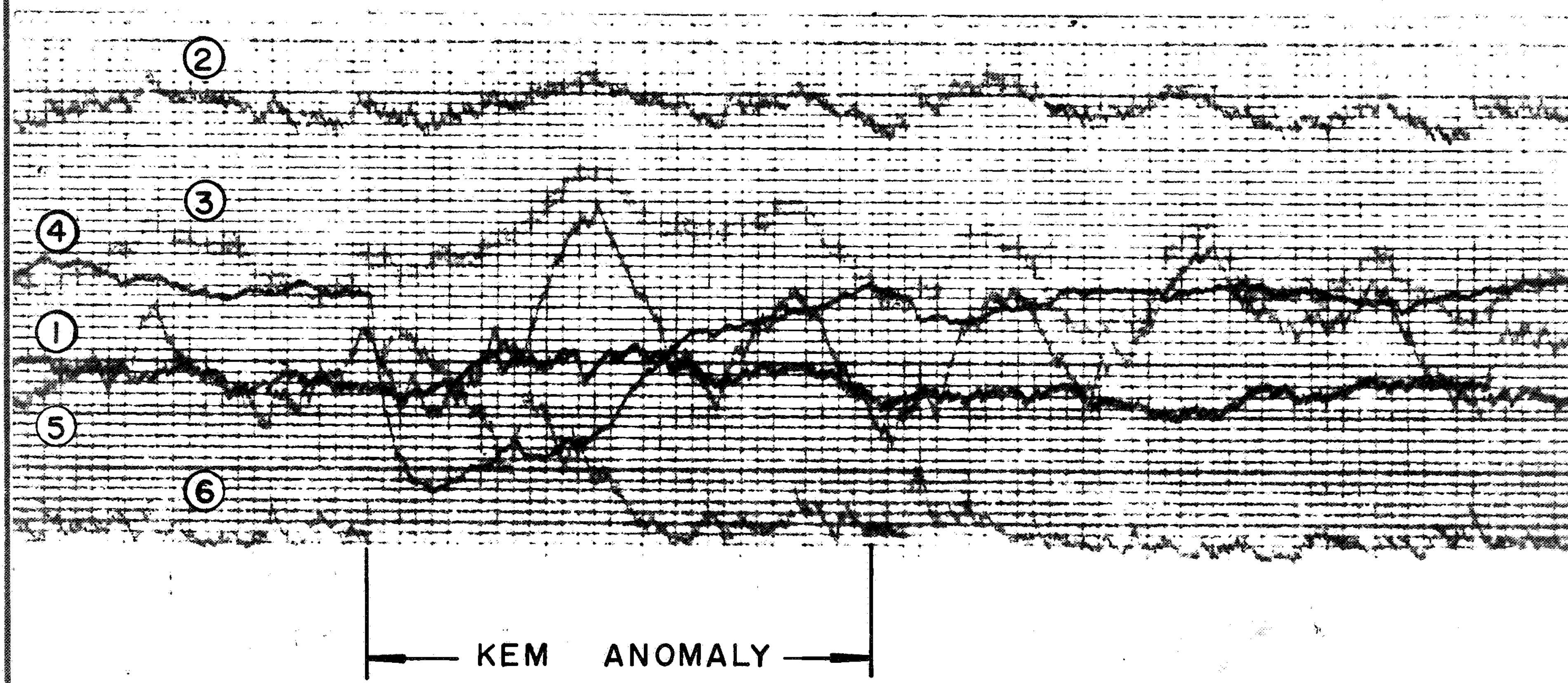
FLIGHT 8 DATE 16·2·71

LINE 5 TRAVERSE 14 DIRECTION WEST

KEM and AFMAG

TRACE IDENTIFICATION

1. Altimeter 500 feet
2. Low Frequency Field Strength. (0 dB)
3. High Frequency Field Angle.
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



McPHAR GEOPHYSICS PTY. LTD.

APPENDIX 6

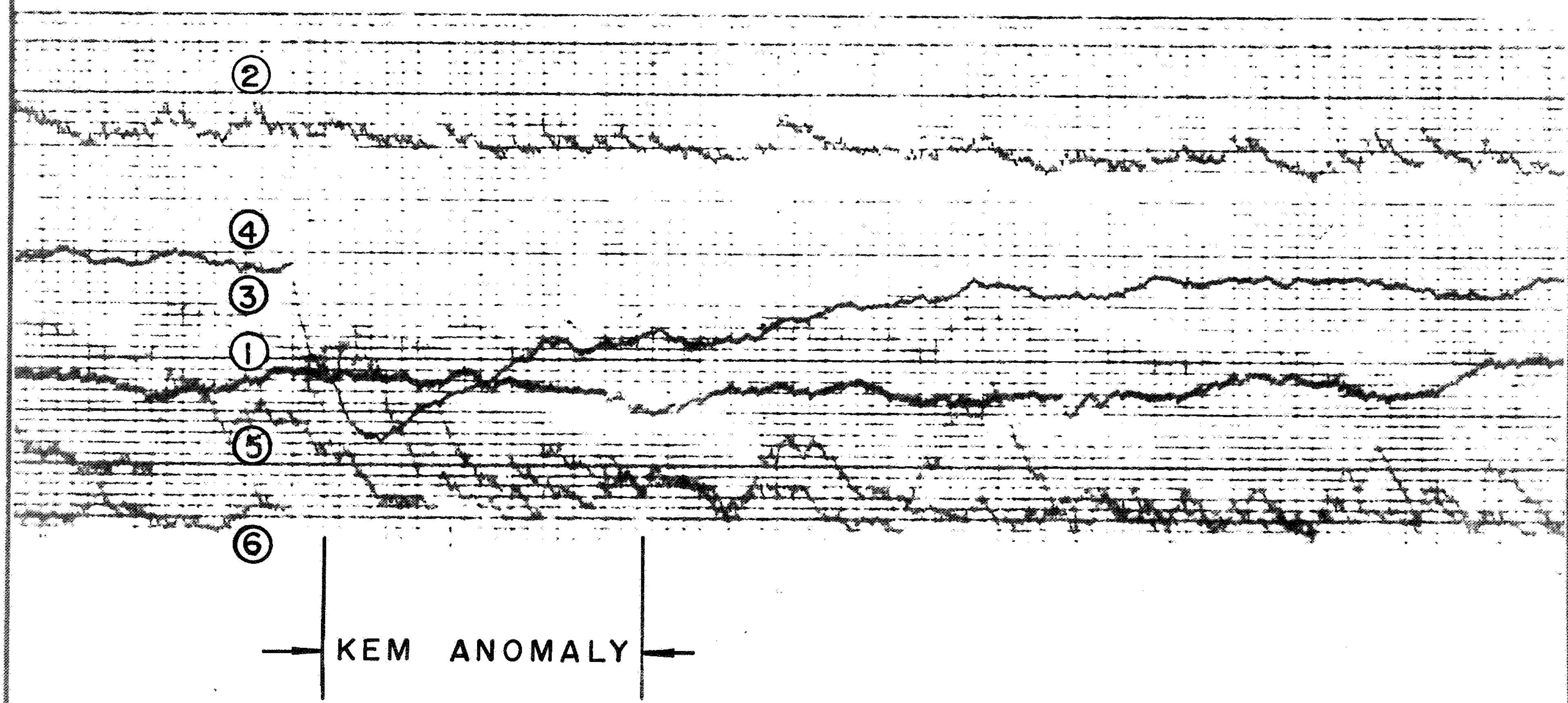
FLIGHT 8 DATE 16·2·71

LINE 5 TRAVERSE 15 DIRECTION EAST

KEM and AFMAG

TRACE IDENTIFICATION

1. Altimeter 500 feet
2. Low Frequency Field Strength. (0 dB)
3. High Frequency Field Angle
4. KEM Field Angle.
5. Low Frequency Field Angle.
6. KEM Field Strength.



Special Mining Lease 524

LAKE TORRENS AREA

FINAL REPORT

Special Mining Lease 524 - LAKE TORRENS AREA

FINAL REPORT

Since the last quarterly report the following work has been carried out:-

Drilling

A rotary percussion hole has been drilled to 670 ft. on the eastern end of the gravity traverse over the Nankabunyana Negative anomaly (see Fig. 1) to test for mineralisation in Cambrian rocks. No Cambrian strata was penetrated and the hole was entirely in Cainozoic rocks.

In the last quarterly report it was suggested that "basement" rocks should be within 200-400 ft. of the surface in the area drilled. This estimate was based on evidence from the gravity traverse in conjunction with the regional gravity data and the assumption that rocks with similar densities to Adelaidean or Cambrian rocks would underlie this Cainozoic sediment. This depth estimate was adjusted to give a maximum thickness of 550 ft. after drilling at Ediacara revealed a higher density contrast. The drill hole was abandoned at 670 ft. as it was apparent that the assumption that Cambrian or Adelaidean rocks occur beneath the young sediments in this area was probably wrong.

The drill hole (T3) which is located approximately 12 mls. north-west of the Ediacara Mineral Field intersected a thick sequence of grey-green clay and calcareous shale overlain by sands and sandy clay and underlain by dark-grey lignitic clay. This sequence is,in general, similar to that intersected in T1 at Ediacara.

The carbonaceous beds are probably upper Eocene in age thus the hole is entirely in Cainozoic rocks. Uranium content of the lignites is very low, the average content of the last 120 ft. of this hole being 5 ppm. U_3O_8. A detailed log of the hole is given in Appendix I.

Ground Geophysics

The report on the gravity and magnetic traverses carried out on this lease and on our adjacent lease (S.M.L. 353) is presented in Appendix II.

Airborne AFMAG-KEM Survey

The report on this abortive survey by McPhar Geophysics is presented in Appendix III.

Ground Water Sampling

A map showing wells and bores sampled and metal contents of groundwaters is given in Fig. 2.

Aeromagnetic and Gravity Maps

A map showing estimates of depth to magnetic basement within SMLs 524 and 353 is presented in Fig. 3. Information for this map was obtained from published reports of the B.M.R. Regional gravity data obtained from the Department of Mines and the B.M.R. is shown in Fig. 1.

This final report presents the remainder of the information and results which we have gathered on this lease.

P.J. Binks.

Sept. 1971.

APPENDIX 1

ROTARY DRILL HOLE T3, NANKABUNYANA CREEK

PROJECT	S.M.L. 524	LOGGING	R. Okill
CO-ORDINATES	-	CONTRACTOR	Geosurveys of Australia Pty. Ltd.
ORIENTATION	Vertical	ASSAYS	McPhar
COMMENCED	18.6.71	BIT SIZE	6.75"
COMPLETED	14.7.71	DRILL	Mayhew 1000
OBJECT	To test for near surface mineralised Cambrian rocks.		
RESULTS	The hole was abandoned in Cainozoic rocks		

REF. NO.	DEPTH	RECOVERY	Cu	Pb	Zn	U_3O_8	GEOLOGICAL LOG
-	0-20 ft.	No sample					Red sand and white clay.
QS 1877	20-30						Gravel comprising well-rounded purple and green micaceous shale and white quartzite.
8	30-40						Red-brown sand and white sandy clay, red-brown cemented gritty sandstone and gravel as above with dolomite pebbles.
9	40-50						Red to white pliable clay (rounded quartz and shale sand grains), occasional small pebbles.
1880	50-60						Pliable grey-brown sandy clay, cemented gritty sandstone, small dolomite and shale pebbles.
1	60-70						As above.
2	70-80						Red-brown sandy clay, minor dolomite, kunkar and shale gravel
3	80-90						Kunkar and red-brown sand.
4	90-100						Brown to grey sandy clay, minor kunkar and weathered brown dolomite.
5	100-110						As above, occasional shale pebbles.
6	110-120						Sandy brown clay, kunkar, minor red-brown sand.
7	120-130						Plastic purple and sandy brown clay, minor kunkar
8	130-140						Plastic purple and light green pliable clay, some sand.
9	140-150						Purple to brown plastic clay, very little sand.
1890	150-160						Yellow-brown and purple clay, occasional gravel and fine red sand.
1	160-170						Purple, yellow-brown and minor grey-green plastic clay, minor fine sand.
2	170-180						As above.
3	180-190						Pale green and minor yellow and purple plastic clay, minor fine sand.
4	190-200						As above.
5	200-210						Purple and minor pale green plastic clay, minor fine sand.
6	210-220						Purple, pale green and yellow-brown plastic clay with fine sand.
7	220-230						Pale green and purple plastic clay, minor fine sand.

ROTARY DRILL HOLE T3, NANKABUNYANA CREEK (continued)

REF. NO.	DEPTH	RECOVERY	Cu ppm	Pb ppm	Zn ppm	U_3O_8 ppm	GEOLOGICAL LOG
QS 1898	230-240						As above.
9	240-250						As above, minor yellow clay
1900	250-260						As above
1	260-270	47 lbs.					Pale green to grey calcareous shale, red-brown and yellow clay
2	270-280	45					As above
3	280-290	45					As above
4	290-300	37					Pale green to grey, red-brown and yellow soft pliable clay
5	300-310	28 lbs					As above
6	310-320	51					As above
7	320-330	51					Pale green to grey and minor yellow and white soft pliable clay, rare gypsum.
8	330-340	44					Pale green-grey and dark brown pliable clay
9	340-350	27					Pale green, dark grey, minor white and yellow clay
1910	350-360	53					Pale green, white and minor yellow clay
1	360-370	40					Grey to green calcareous shale and clay, dark grey, white and minor yellow clay
2	370-380	58					As above
3	380-390	45					Pale green-grey and dark greenish grey and minor white clay
4	390-400	54					As above
5	400-410	57					Pale green-grey pliable clay
6	410-420	42					As above
7	420-430	41					As above
8	430-440	44					Pale green and grey-green clay, minor grey calcareous shale and rare rounded quartzite gravel
9	440-450	43					Green-grey calcareous shale, green, grey, white and yellow clay. Rare gravel.
1920	450-460	32					As above
1	460-470	44					As above
2	470-480	31					Grey-green, minor grey, yellow and brown clay, white soft limestone.
3	480-490	37					As above
4	490-500	39					Soft green clay, grey-green calcareous shale, minor white limestone.
5	500-510	37					Grey-green calcareous shale.

ROTARY DRILL HOLE T3 - NANKABUNYANA CREEK (continued)

REF. NO.	DEPTH	RECOVERY	Cu ppm	Pb ppm	Zn ppm	U_3O_8 ppm	GEOLOGICAL LOG
QS 1926	510-520	47 lbs.					As above
7	520-530	37					As above
8	530-540	46					As above, rare shale gravel fragments
9	540-550	42					Grey-green calcareous shale, minor soft carbonaceous charcoal-grey clay
1930	550-560	41					Soft charcoal-grey carbonaceous clay and grey-green calcareous shale.
1	560-570	41	30	55	95	5*	Dark grey carbonaceous soft clay, minor green calcareous shale, yellow and brown clay
2	570-580	33	35	50	95	5*	Dark brown (lignitic) to dark grey carbonaceous clay
3	580-590	34	45	50	75	6	As above
4	590-600	36	65	50	85	8	Dark brown (lignitic) soft clay, very minor yellow and brown sandy clay
5	600-610	34	35	40	70	5*	As above, rare pyrite.
6	610-620	44	30	45	75	5*	Soft dark brown clay with fairly abundant lignite.
7	620-630	46	35	45	75	5*	As above
8	630-640		80	50	65	5*	Dark brown lignitic clay with occasional white-yellow clay pellets(?)
9	640-650		60	45	65	5 *	As above
1940	650-660		45	35	65	5*	Dark brown lignitic clay with occasional clay pellets
1	660-670		190	40	65	6	As above, black sapropelic (?) patches.

* indicates "less than"

APPENDIX 2

May 12th, 1971

LAKE TORRENS GRAVITY SURVEY - PRELIMINARY REPORT

1. Introduction

Detailed gravity traverses were completed across three known gravity anomalies east of Lake Torrens, S.A. (S.M.L. 353). The aim of the survey was to check for possible correlations between known or inferred faults, which may control mineralization, and large gravity anomalies previously outlined by a regional gravity survey. This information, supplemented by magnetometer traverses, would also facilitate the choice of drilling sites in two of the areas.

1.1 Time of Survey

The survey was conducted during the period April 22 to May 3, 1971.

1.2 Line Mileage

A total of 21 line-miles of gravity and magnetometer traverses were completed.

1.3 Presentation of Results

The reduced data for each traverse were presented in the form of profiles. (see drawings 10106, 10107, 10108). These include

(i) magnetic field intensity,

(ii) barometric elevation,

(iii) free-air gravity, and

(iv) Bouguer gravity (P_B = 1.9 and P_B = 2.7).

Inferred density cross-sections were based on the gravity results and the known geology.

2. Survey Areas

The locations of the three survey lines are superimposed on the regional gravity in Figure 1.

2.1 Ediacara

Traverse 1 crossed the Ediacara Fault where considerable geological control was already available from previous seismic and drilling programmes (see Figure 2). It was anticipated that the Ediacara Fault itself would coincide with a marked gravity contrast between the dense Adelaidean rocks to the east and the lighter clays and sands to the west.

Sub-economic lead-zinc-silver mineralization is known to be associated with Cambrian limestones and dolomites on the east side of the fault, at shallow depths. Deep drilling is currently in progress on the west side to test for mineralization associated with a possible Cambrian reducing basin. If preliminary drilling shows positive results, then further drilling along strike, or in similar faulted zones would be warranted.

2.2 Nankabunyana

It was suggested by Mike Shalley that the negative regional gravity anomaly west of Nankabunyana Creek could possibly indicate a restricted sedimentary basin. The N-S trending gravity high over the Nankabunyana Creek may indicate fault-controlled closure of the basin. This suggests a possible similarity with Ediacara. Gravity traverses across both features would provide a direct comparison of the major structural features in each area.

2.3 Norwest Fault

Traverse No. 3 crosses the Norwest Fault. Regional gravity indicates a pronounced gravity low in the locality of the fault. Jock Smith has proposed that the gravity low may be related to a narrow fractured zone on the west side of the fault. This could act as a "drainage" trap for secondary mineralization.

3. Field Techniques

Because of the large distance between survey lines, the three traverses were conducted independently. A base station was established near each traverse to arbitrarily define a datum plane (zero elevation), a gravity reference (variable), and a magnetic field reference (100 grammas).

All lines were pegged at 500 ft. intervals, to mark gravity stations. Distances were paced, and were accurate to ± 50 ft. except for traverse No. 3 where errors of up to ± 150 ft. occurred in rugged terrain. Errors in station spacing, and a 16° error in bearing over a distance of 1 mile on traverse No. 2, should not adversely effect interpretations.

3.1 Instrumentation

A Scintrex (Prospector) CG-2 gravity meter (No. 222) was employed for the gravity survey. After making drift corrections (0.4 mgals.), all readings were reliable to ± 0.1 mgals.

An aneroid (Paulin) barometer was used for elevation determinations. The average of 3 consecutive readings was taken at each station and, after drift corrections (120 ft.), the elevations relative to the datum plane were reliable to within ± 10 ft., except in the rugged terrain of traverse No. 3 where errors of ± 20 ft. may have occurred. (A 15 ft. error in elevation will result in approximately 1 mgal. error in the resulting Bouguer gravity.)

A McPhar M700 magnetometer (No. 7048) was employed. Readings were taken at 250 ft. intervals and a three-point averaging filter was used to give "smootheal" readings at each 500 ft. station. After drift corrections (120 gammas) the magnetic field readings were reliable to ± 30 gammas. (K - indices recorded at Mundaring never exceeded 4 during the magnetometer surveys.)

4. Discussion

4.1 Bougner Density, P_B.

Consultation with the S.A. Dept. of Mines yielded the following choice of Bouguer densities based on their previous experience with gravity surveys in the area.

		P_B
1.	Adelaidean and basement rocks	2.67
2.	Tertiary consolidated rocks	2.2
3.	Tertiary clays and sand	1.9

Since the gravity anomalies sought were known to be large, the dependence upon the Bouguer gravity should be small, except in areas of high topographic relief. The Bouguer gravity was therefore calculated using the extreme values of $P_B = 1.9$ and $P_B = 2.7$. The Free-air gravity, corresponding to $P_b = 0$, was also plotted to show the correlation between gravity and topography.

4.2 Corrections to Gravity Readings

Latitude corrections were made for traverses 1 and 3, whose magnetic bearings were 270° and 47° respectively. No correction was applied for traverse No. 2 which had a bearing of 262°. (Magnetic north is approximately 8° east of geographic north in the Lake Torrens area.)

Terrain corrections were not added to any of the gravity traverses. Failure to apply terrain corrections will introduce maximum errors of 1.5 mgals., 0.5 mgals., and 8.0 mgals in the Bouguer gravity profiles 1, 2 and 3 respectively. The application of terrain corrections would tend to increase the Bouguer gravity preferentially in areas of high topographic relief.

5. Discussion of Results

5.1 Magnetics

The magnetometer traverses failed to reveal any magnetic sources at shallow to moderate depths on any of the traverses. Only small gradients associated with very deep sources, in the crystalline basement, were observed. Consequently the magnetics were of negligible value in locating faults, even where large vertical displacements were known to occur close to the surface.

In all cases the magnetic profiles were in good agreement with the regional aeromagnetics compiled by the S.A. Dept. of Mines (see Figure 2).

5.2 Gravity

5.2.1 Ediacara

A marked transition in the Bouguer gravity values is evident over the Ediacara Fault. The Bouguer gravity changes by 5 to 8 mgals., depending upon the choice of plateau and P_B, with the higher values occurring over the denser Adelaidean rocks to the east of the fault. A smaller but distinct decrease in Bouguer gravity occurs east of the 4000'W station.

The approximate correlation between the Bouguer gravity and topography is unquestionably real. It is therefore unrealistic to choose a Bouguer density in the usual way by minimizing this correlation. However, the value P_B = 2.7 is to be preferred on subjective grounds, since the dominant topographic relief is associated with Adelaidean rocks.

5.2.2 Nankabunyana

The Bouguer gravity is characterized by a constant positive gradient from the west end of the survey line to 10,000'W where a plateau is reached. None of the smaller characteristics of the gravity profile is significant in view of the limited accuracy of the field methods used (approximately ± 1.0 mgals.).

The Bouguer density P_B = 1.9 appears to minimize the correlation between Bouguer gravity and topography, consistent with the fact that topographic relief is controlled by sand dunes. However, the choice of P_B would not significantly effect interpretation anyway.

5.2.3 Norwest Fault

The Bouguer gravity shows an apparent correlation with the topography when P_B = 2.7. The Bouguer gravity with P_B = 1.9 shows less correlation with the topography, although this value of P_B appears too low for predominantly Adelaidean rocks. This apparent inconsistency is discussed in section 6.3.

There appears to be a gravity low of 3 to 5 mgals (in the vicinity of the fault itself) which is not correlated with the Topography.

6. Interpretation

6.1 Ediacara

The gravity anomaly over the Ediacara Fault is entirely consistent with a density contrast of 0.77 between the Adelaidean rocks to the east and approximately 700 ft. of tertiary clays and sand to the west.

Direct interpretation of the gravity anomaly by the method of characteristic curves (Grant and West, 1965, p.282) indicates a probable density contrast of 0.56, with a proportionate increase in depth (to approximately 1000 ft.)

The latter estimate is not significantly "better" than the former one, considering the precision of the data (± 1 mgal., neglecting terrain corrections). Preliminary drilling should provide better control of depths and densities.

A possible fault, bounded by low-density (Tertiary ?) deposits is inferred at 3700'W.

6.2 Nankabunyana

The small gravity gradient rules out faulting on a similar scale to Ediacara. Interpretation of the total anomaly in terms of a step model would require an unrealistic, large depth of burial.

A more likely explanation of the anomaly is a gradual deepening of the hard-rock upper contact with Tertiary deposits. A wedge-shaped layer of Tertiary clays and sand overlain by a uniform layer of up to 200 ft. of similar deposits could easily account for the anomaly.

It is conceivable that several small faults may occur in the denser rocks below the Tertiary deposits, but the existence of one or two faults of large vertical displacement, as might occur on the boundary of an old sedimentary basin, would not be consistent with the Bouguer gravity profile.

6.3 Norwest Fault

Because of the rugged terrain encountered on this traverse it is difficult to form an interpretation without first applying terrain corrections to the gravity data. The addition of terrain corrections will probably increase the correlation between topography and Bouguer gravity when P_B - 1.9, and decrease the correlation between topography and Bouguer gravity when $P_B = 2.7$.

Since no topographic maps are available for this area, it is probable that no terrain corrections were included in the previous regional gravity survey. This may account for the apparent large negative gravity anomaly on the regional map.

Rough terrain corrections could be computed with the aid of field notes, stereo photos and elevations for the regional gravity survey. From the present gravity profiles it appears probable that there is a small negative anomaly over the fault, which may indicate a fractured zone of the type proposed by Jock Smith.

7. Conclusions

7.1 There is a pronounced gravity anomaly over the Ediacara Fault. The anomaly is easily explained in terms of the known geology.

7.2 It is highly unlikely that the Nankabunyana gravity anomaly is caused by a Cambrian basin bounded by a N-S fault on the eastern side. The probability of a structural similarity to Ediacara is remote.

7.3 The apparent gravity low over the Norwest Fault probably results from failure to apply terrain corrections during the regional gravity survey. However, it is probable that a small negative anomaly coincides with the fault zone, indicating a possible fractured zone where a solution-trap orebody might exist.

8. Recommendations

8.1 Preliminary deep drilling should be confined to the west scale of the Ediacara Fault, with possibly one hole at the western end of the Nankabunyana traverse.

8.2 Terrain corrections should be attempted for the Norwest Fault traverse to improve the reliability of interpretation. This will require approximately one week's office work once stereo photos and spot elevations from the regional gravity survey are available. One drill hole should be reserved for drilling upon completion of the interpretation.

8.3 If Cambrian rocks are intersected at Ediacara, without signs of mineralization, consideration should be given to using downhole I.P. or E.M. to assess the possibility of nearly sulphide mineralization.

8.4 If preliminary drilling gives some encouragement, then further gravity traverses, and possibly aerial VLF, should be considered to define other faults in the area.

Art Loveless.

June 21st, 1971

LAKE TORRENS GRAVITY SURVEY - ADDENDUM TO PRELIMINARY REPORT.

1. Introduction

Terrain corrections have been computed to enable the calculation of a more reliable Bouguer gravity profile across the Norwest Fault. An interpretation is included in the present report.

Estimates of the depth of Tertiary overburden in the Nankabunyana area are also given at the request of Peter Binks.

2. Terrain Corrections

First order terrain corrections were computed for the Norwest Fault gravity traverse (No. 3) by assuming a two-dimensional model for the topographic relief. A further (second order) correction was made with the aid of stereo photos and tables published by Hammer (Geophysics, 4, 184, 1939).

The maximum terrain correction was 4.6 mgals. Although no topographic map was available, the corrections computed on the basis of the estimated topographic relief are probably reliable to within 1.5 mgals. Including all sources of error, the Bouguer gravity data is estimated to be reliable to within 3 mgals. (at the 95% confidence limit). For most stations the error should be 1 mgal. or less.

3. Norwest Fault

3.1 Bouguer Gravity Results

The Bouguer gravity profile still shows a large (9 mgal.) negative anomaly. Previously, it was anticipated that terrain corrections would largely eliminate this apparent anomaly. The effect of the terrain corrections was to displace the centre of the anomaly further east and to resolve it more clearly from a smaller (3 mgal.) anomaly centred at 15000'E.

The Bouguer density $P_B = 2.7$ gm/cm^3 is considered to be within 0.2 gm/cm^3 of the "ideal" Bouguer density for this area, on the basis of the reported density of Adelaidean rocks. The Bouguer density which gives minimum correlation with the topography is $P_B = 1.6$. This is an unrealistic density, and we must conclude that there is a real mass deficiency which coincides with a zone of high topographic relief.

3.2 Interpretation

3.2.1 The Major Anomaly

This anomaly is of interest only because of its possible association with the smaller anomaly over the fault zone.

This large negative anomaly probably reflects a local decrease in density within the Adelaidean rocks (0.3 gm/cm^3 density contrast). The change in density may be abrupt or gradual. A somewhat larger density contrast would be indicated if the density variations do not persist to considerable depth. The illustrated cross section of inferred density is diagrammatic only; it is not intended to accurately define sharp discontinuities in density although such discontinuities may exist. Further geological control is necessary before a detailed density cross-section could be proposed.

An alternative interpretation of this anomaly is that major faulting has occurred to the east of the Norwest Fault. Horizontal rather than vertical displacement would be more likely to produce the anomaly. It is essential to this interpretation that density contrasts exist (e.g. between the quartzites and dolomites). This interpretation seems improbable to the writer, although there may be some geological evidence to support it.

The possibility that this is simply an isostatic anomaly may be eliminated because of its narrow half-width of only 1 mile.

3.2.2 The Minor Anomaly

The anomaly at 15000'E is of primary interest because it appears to coincide roughly with the position of the Norwest Fault. Previous interpretation suggests that this may be associated with a zone of fracturing.

Now that the anomaly has been more accurately determined, a more confident interpretation is possible. A study of the characteristic shape and magnitude of the anomaly indicates that its source must have a minimum width of 1000 ft. and a probable density contrast of less than 0.2 gm/cm^3. In view of the similar density variations inferred in the locality of the major gravity anomaly, it is probable that this small anomaly arises from a modest mass deficiency within the steeply dipping Copley quartzites immediately east of the fault.

Peter Binks has suggested that 500 ft. would be a maximum realistic width of a possible fractured zone coincident with the Norwest Fault. Furthermore, the quartzites outcrop as far west as 15000'E which is the centre of the gravity anomaly. The combined evidence largely rules out the possibility that a zone of fracturing is the primary cause of the anomaly.

The small depression in the Bouguer gravity to the west of the fault has been attributed to shallow Tertiary cover. This may be quite unrealiable since any regional trends, or density contrasts across the fault, could not be adequately delineated.

4. Nankabunyana - Depth of Teritiary Cover

4.1 Variation in Depth Along Traverse

The difference in the thickness of Tertiary deposits at the two ends of the traverse line was interpreted as 680 ± 100 ft., assuming a density contract of 0.77 gm/cm^3 between Tertiary and Adelaidean rocks.

Preliminary drilling west of Ediacara indicates that a density contrast of 0.56 gm/cm^3 may be more accurate (see section 6.1 of Preliminary Report). If similar densities prevail at Nankabunyana, then a difference in thickness of Tertiary deposits between the two ends of the traverse line may be closer to 1000 ft.

4.2 Depth at East end of Traverse

The depth of Tertiary cover at the east end of the Nankabunyana traverse cannot be determined from the gravity profiles. However, a rough estimate of the depth may be made from the regional gravity map by assuming that gravity variations between Ediacara and Nankabunyana largely reflect differences in the depth to the underlying Adelaidean rocks. A probable depth of 200 ft. was obtained in this way, although a depth of up to 400 ft. would be quite consistent with the above assumption (where a density contrast of 0.77 gm/cm^3 is adopted). If a density contrast of 0.56 gm/cm^3 is adopted, then the depth may approach 550 ft.

4.3 Depth at Centre of Nankabunyana Gravity Low

Once again, the regional gravity data provides the only indication of the depth of Tertiary cover near the Nankabunyana negative anomaly (due west of the traverse line). Assuming that the gravity low results entirely from an increase in the depth of Tertiary cover, then this depth must be approximately 1300 ft. greater than that at the east end of the Nankabunyana traverse (assuming a density contrast of 0.77 gm/cm^3 between the Tertiary and underlying Adelaidean rocks). This difference in depth becomes 1800 ft. when a density contrast of 0.56 gm/cm^3 is adopted.

Based on the above estimates, the total thickness of the Tertiary deposits is probably within the range 1500 ft. to 2300 ft. at the centre of the negative anomaly. There may, of course, be density variations in the underlying rocks which contribute significantly to the Bouguer gravity, thereby reducing the thickness of Tertiary cover required to explain the anomaly.

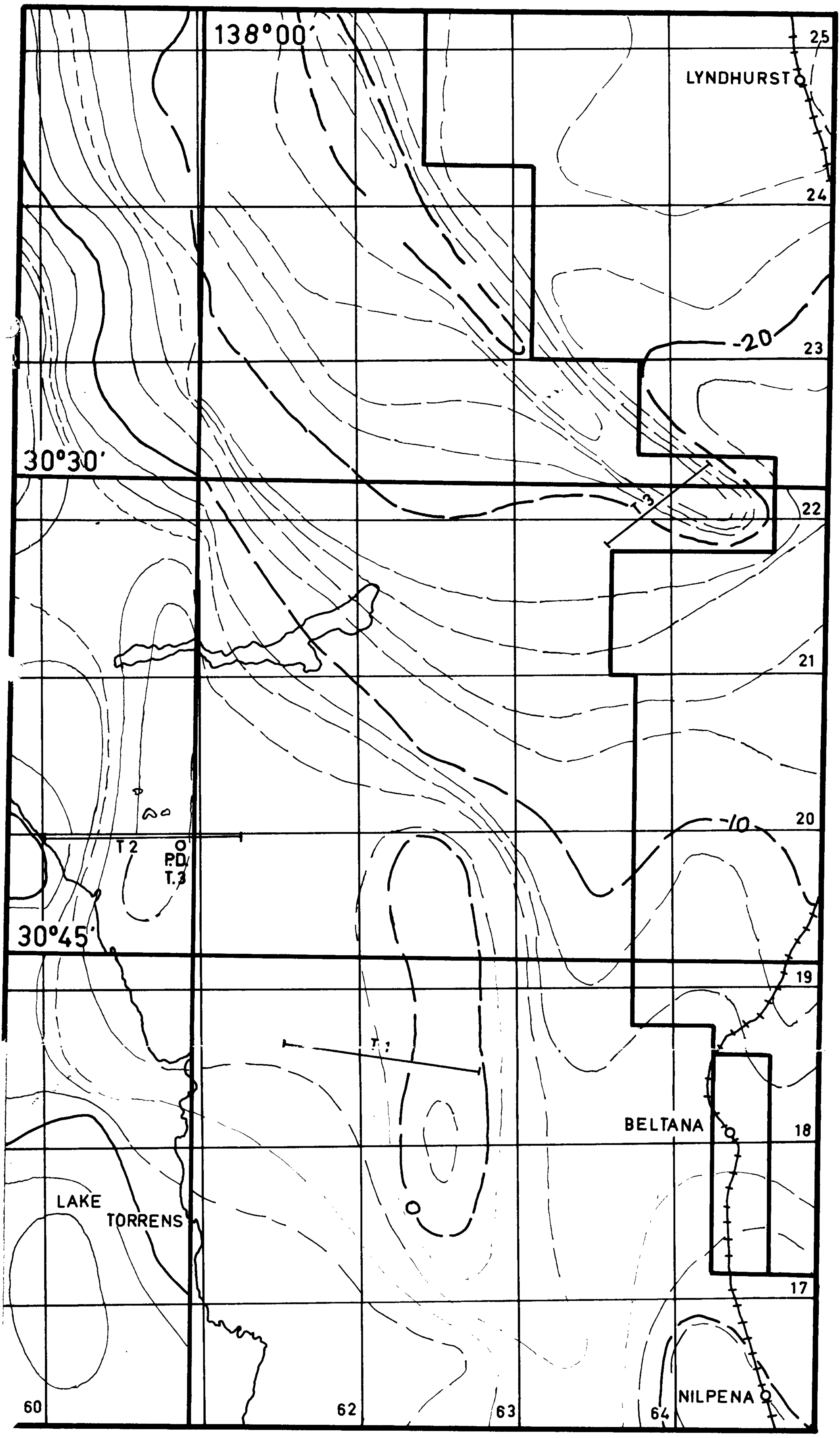
5. Conclusions

1. Gravity anomalies east of the Norwest Fault are probably caused by lateral density variations (0.3 gm/cm^3) within the Copley quartzites and/or the Skillogalee Dolomites.
2. It is highly unlikely that the negative anomaly over the Norwest Fault is caused by a fractured zone where a "drainage trap" for secondary mineralization might occur.
3. The depth of Tertiary cover at the East end of the Nankabunyana traverse is estimated to be 200 to 550 ft.
4. The depth of Tertiary cover at the centre of the Nankabunyana negative gravity anomaly is estimated to be 1500 to 2300 ft.

6. Recommendations

Drilling is not warranted at Nankabunyana or over the Norwest Fault on the basis of the geophysical results.

Art Loveless.



LEGEND

-10-
Contour interval
= 2 milligals

Grid is the 10,000 yard Transverse Mercator Grid Zone 5 (Australia Series).

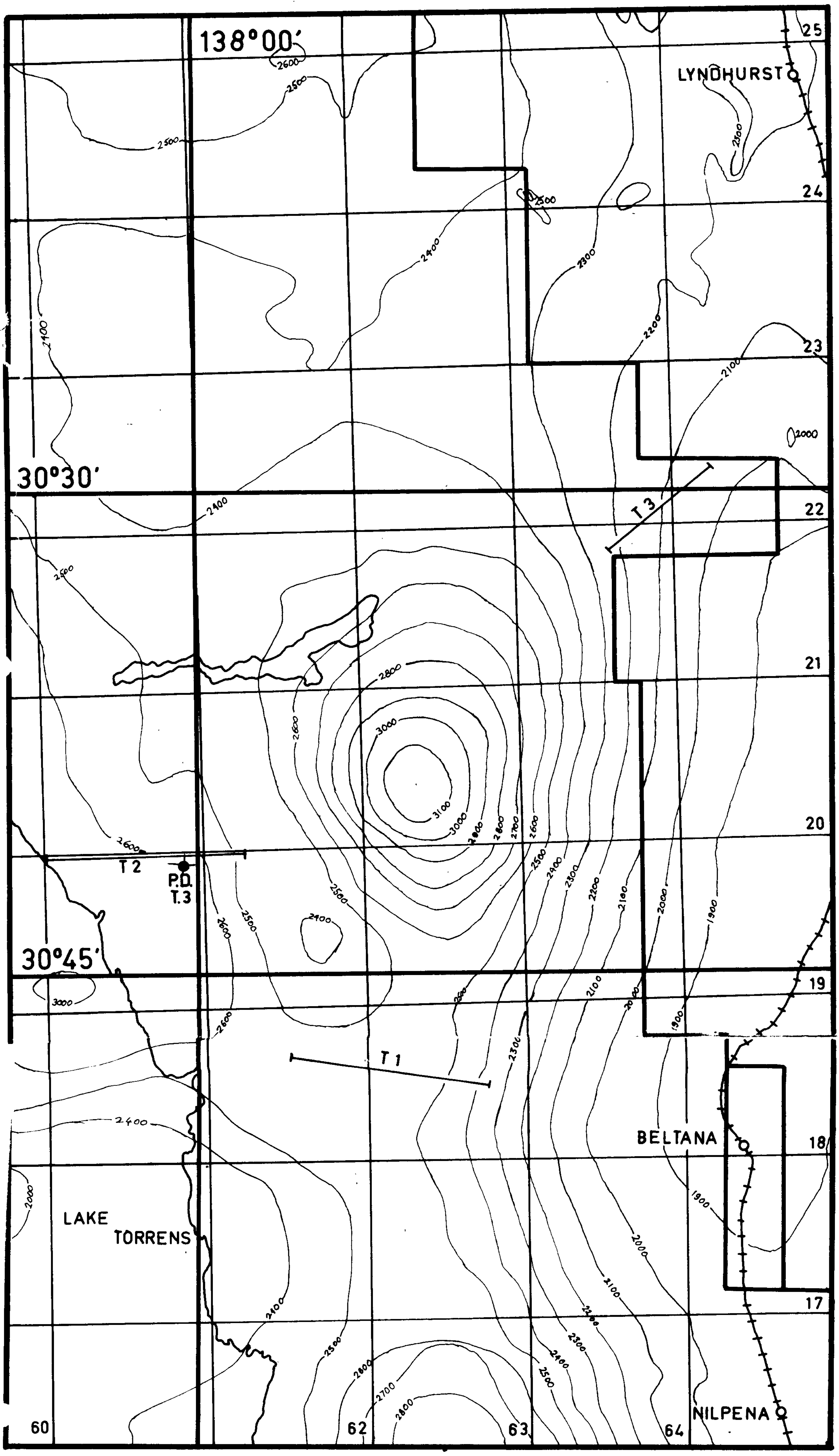
True North

O P.D. - Percussion Drill Hole

T1
Traverse lines 1, 2 and 3

REVISION	CARPENTARIA EXPLORATION COMPANY PTY LTD.		
	REGIONAL BOUGUER GRAVITY MAP (After B.M.R. 1970) Showing Locations of Gravity Traverses and Drill Hole T.3.		FIG. 1
	SCALE 1:250,000	GEOL BRP	DATE July '71
	CHECKED	DRAWN.	DRG. No 15117

1559-1



LEGEND

Magnetic Contours (values in gammas)

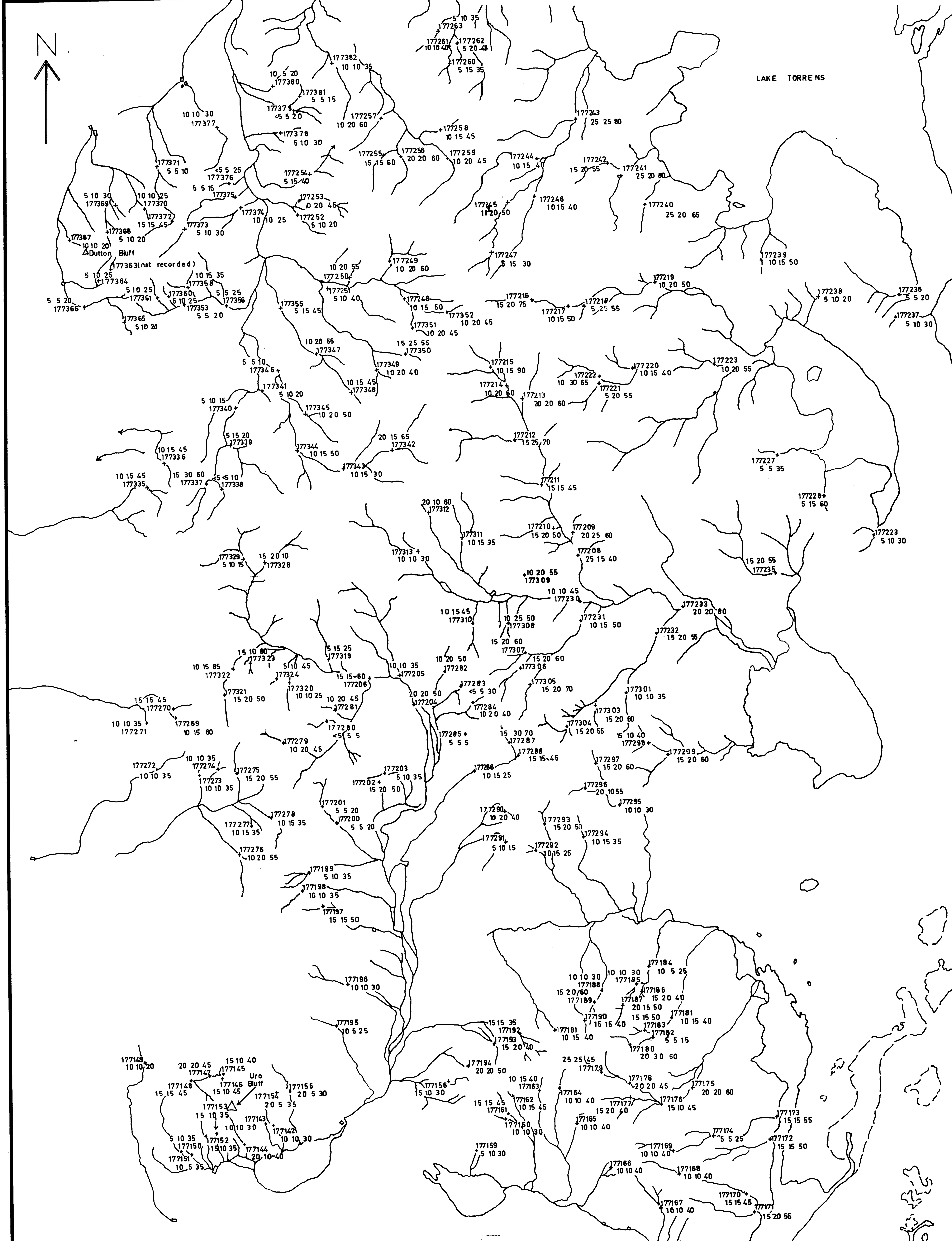
Grid is the 10,000 yard Transverse Mercator Grid Zone 5 (Australia Series).

Traverse lines 1, 2 and 3

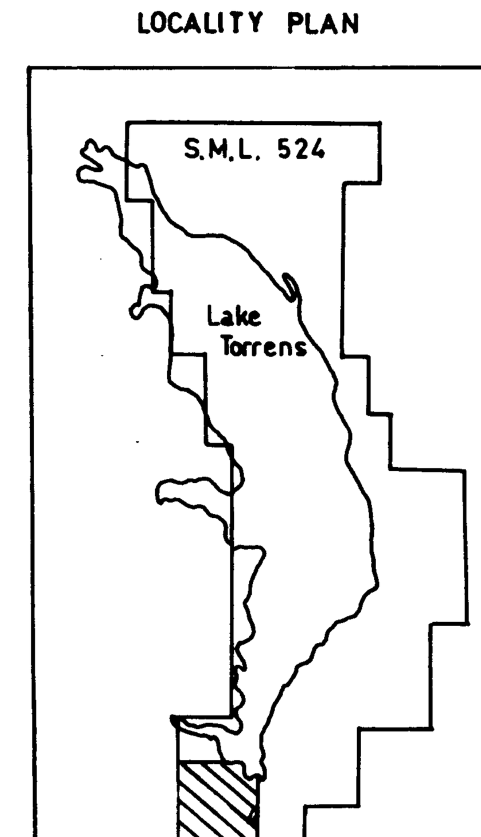
P.D.- Percussion Drill Hole

1559-2

REVISION	CARPENTARIA EXPLORATION COMPANY PTY LTD.		
	REGIONAL AEROMAGNETIC MAP Showing Locations of Magnetic Traverses and Drill Hole T. 3.		FIG. 2
	SCALE 1:250,000	GEOL B.R.P	DATE July '71
	CHECKED	DRAWN	DRG No 15118



LOCALITY PLAN



CARPENTARIA EXPLORATION COMPANY PTY. LTD.		
S.M.L. 524 - LAKE TORRENS AREA		
Drainage Geochemistry - S.W. Area		
Scale: as shown	Geol:	Date: May 1971
		15113

FIG. 1

REFERENCE:-

177155-Geochemical Reference No.

20, 5, 30-Contents of Cu, Pb and Zn respectively in stream sediment samples in parts per million.

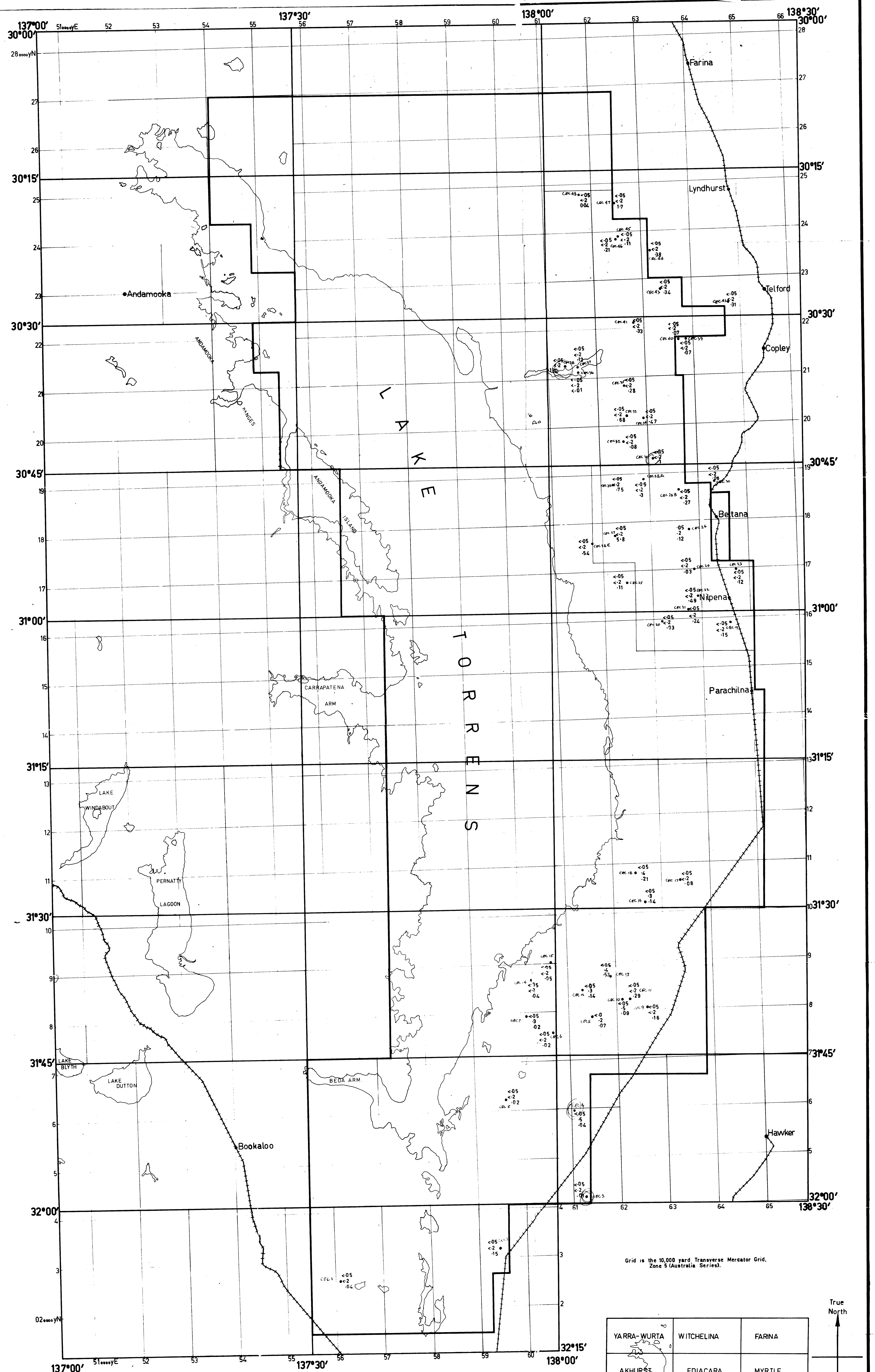
SCALE

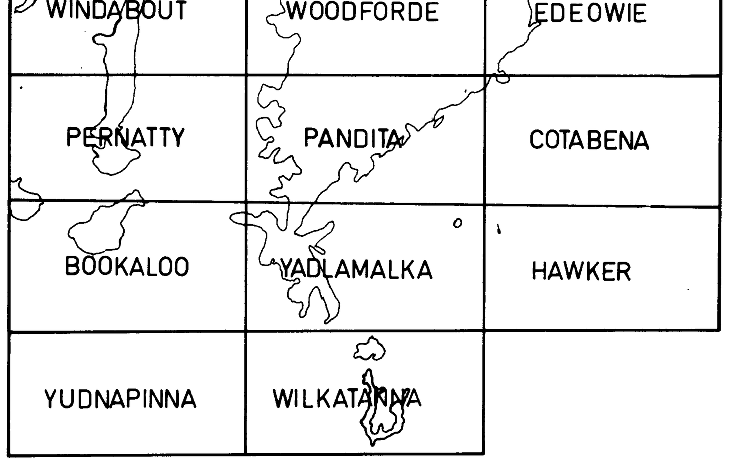
1: 46,770

0 1ml.

1559-3

137°00'
137°30'
138°00'
138°30'
30°00'
30°15'
30°30'
30°45'
31°00'
31°15'
31°30'
31°45'
32°00'
32°15'
Farina
Lyndhurst
Telford
Copley
Andamooka
Beltana
Nilpena
Parachilna
Hawker
Bookaloo
CARRAPATENA
LAKE WINDABOUT
PERNATTY LAGOON
LAKE BLYTH
LAKE DUTTON
L A K E
T O R R E N S
Nankabunyana Traverse
Grid is the 10,000 yard Transverse Mercator Grid, Zone 5 (Australia Series).
True North
YARRA-WURTA
WITCHELINA
FARINA
AKHURST
EDIACARA
MYRTLE
ANDAMOOKA
SCOTT
COPLEY
YELTACOWIE
MURDIE
BELTANA
ARCOONA
CARRAPATENA
PARACHILNA
WINDABOUT
WOODFORDE
EDEOWIE
PERNATTY
PANDITA
COTABENA
BOOKALOO
YADLAMALKA
HAWKER
YUDNAPINNA
WILKATANA
Reference for 1 mile base sheets
BOUGUER GRAVITY ANOMALY
Legend
Contour interval : 2 milligals
Data from survey by S.A. Dept. of Mines, 1962
Data from survey by B.M.R., 1970
Data from survey by Geosurveys, 1957
4 0 4 8 12 16 20 miles
Scale equals 1/250,000.
Drn. R.J.S. Date 23/11/70 Scale 1/250,000
LAKE TORRENS AREA
SML 524,353
REGIONAL GRAVITY
15117
CARPENTARIA EXPLORATION COMPANY PTY. LTD.
FIG.1.





Reference for 1 mile base sheets.

LEGEND

● <·05 Copper contents of groundwaters in parts per million
·3 Lead
·11 Zinc

4 0 4 8 12 16 20 miles.

Scale equals 1/250,000.

Drn. R.J.S. Date 23/11/70 Scale 1/250,000

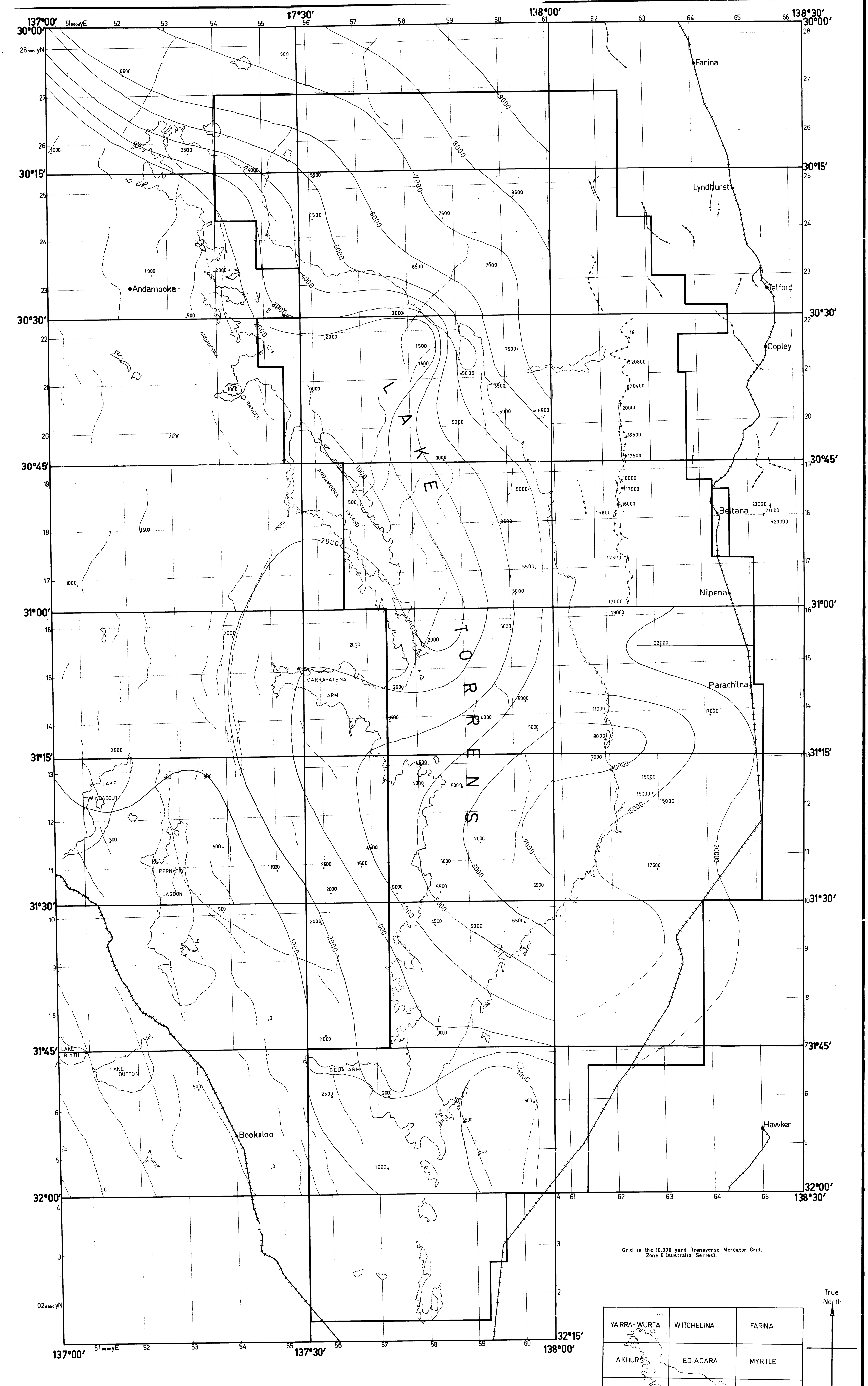
LAKE TORRENS AREA
SML's 524 & 353

CU, PB, ZN CONTENTS OF GROUNDWATERS
15125

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

1559-S

FIG. 2



Grid is the 10,000 yard Transverse Mercator Grid, Zone 5 (Australia Series).

True North

YARRA-WURTA	WITCHELINA	FARINA
AKHURST	EDIACARA	MYRTLE
ANDAMOOKA	SCOTT	COPLEY
YELTACOWIE	MURDIE	BELTANA
ARCOONA	CARRAPATENA	PARACHILNA
WINDABOUT	WOODFORDE	EDEOWIE
PERNATTY	PANDITA	COTABENA
BOOKALOO	YADLAMALKA	HAWKER
YUDNAPINNA	WILKATANA	

Reference for 1 mile base sheets

REFERENCE

	Magnetic Anomaly Trend
.2000	Estimated Depth To Magnetic Basement Rock In Feet
	Depth Contour
	Magnetic Trend Shallow Source
	Magnetic Trend Deep Source
2000	Basement Depth Estimate Corrected For Magnetic Strike Depth In Feet Below Sea Level

4 0 4 8 12 16 20 miles.

Scale equals 1/250,000.

Drn. R.J.S. Date 23/11/70 Scale 1/250,000

LAKE TORRENS AREA

SML 524, 353

CONTOURS ON MAGNETIC BASEMENT

1518

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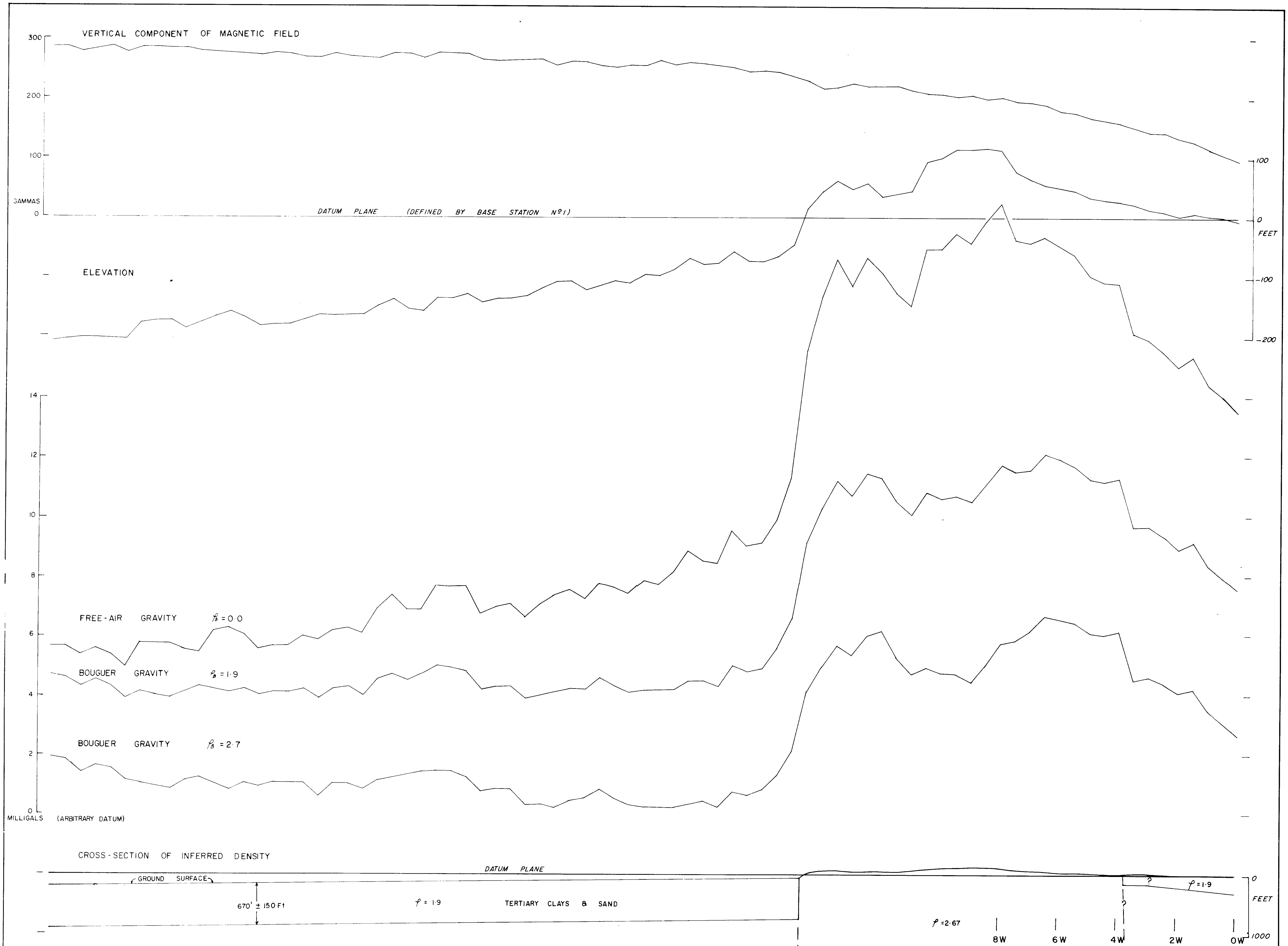
1559-6

FIG. 3

All data from published Records of Bureau Of Mineral Resources



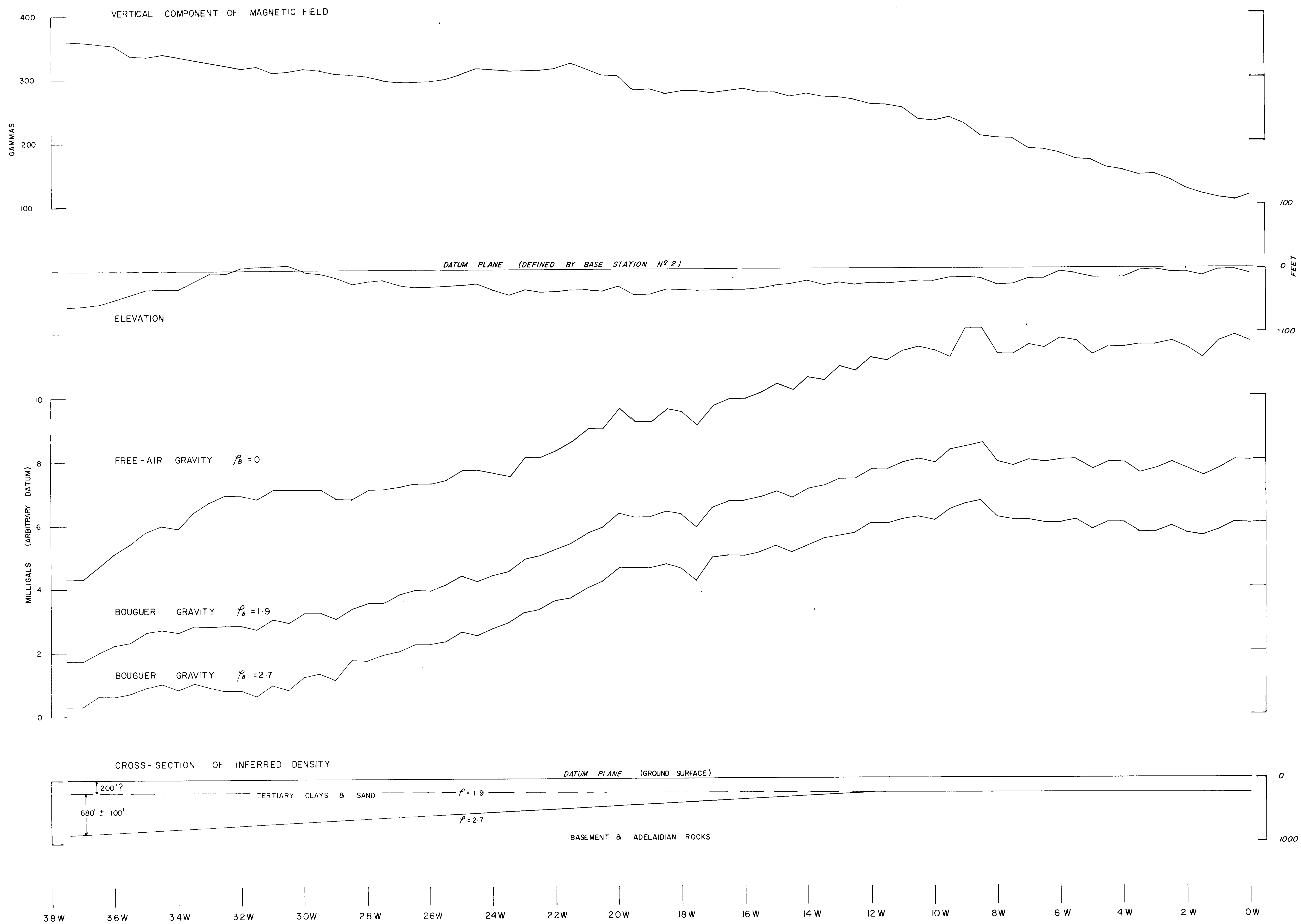
REVISION	

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

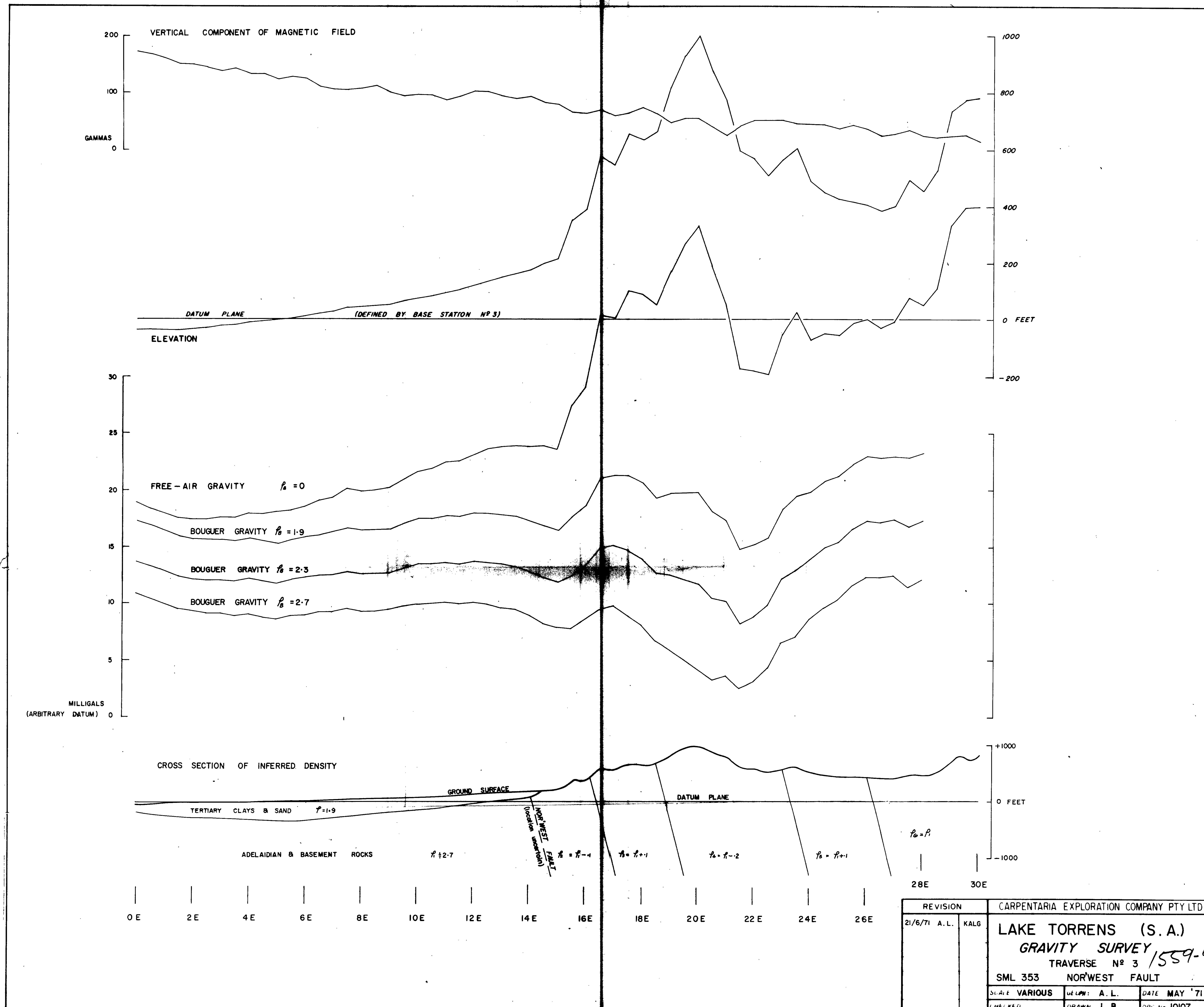
LAKE TORRENS (S.A.)
GRAVITY SURVEY
TRAVERSE Nº 1
SML 353 EDIACARA

1559-7

SCALE VARIOUS	GEOPH: A. L.	DATE: MAY '71
CHECKED:	DRAWN: L. B.	DRG. No 10108



REVISION	CARPENTARIA EXPLORATION COMPANY PTY LTD.		
	LAKE TORRENS (S. A.) GRAVITY SURVEY TRAVERSE Nº 2 1559-8		
	SML 353 NANKABUNYANA		
	SCALE VARIOUS	GEOPH: A. L.	DATE MAY '71
	CHECKED:	DRAWN. L. B.	DRG No 10106


VERTICAL COMPONENT OF MAGNETIC FIELD
200
100
GAMMAS
0
1000
800
600
400
200
0 FEET
-200
DATUM PLANE
(DEFINED BY BASE STATION Nº 3)
ELEVATION
30
25
20
15
10
5
0
MILLIGALS
(ARBITRARY DATUM)
FREE-AIR GRAVITY ρB = 0
BOUGUER GRAVITY ρB = 1·9
BOUGUER GRAVITY ρB = 2·3
BOUGUER GRAVITY ρB = 2·7
CROSS SECTION OF INFERRED DENSITY
GROUND SURFACE
DATUM PLANE
TERTIARY CLAYS & SAND ρ = 1·9
NOR'WEST FAULT
(location uncertain)
ADELAIDIAN & BASEMENT ROCKS
ρ1 ≑ 2·7
+1000
0 FEET
-1000
0E
2E
4E
6E
8E
10E
12E
14E
16E
18E
20E
22E
24E
26E
28E
30E
REVISION
21/6/71 A.L. KALG
CARPENTARIA EXPLORATION COMPANY PTY LTD
LAKE TORRENS (S.A.)
GRAVITY SURVEY
TRAVERSE Nº 3
1559-9
SML 353 NOR'WEST FAULT
SCALE VARIOUS
DESIGN: A.L.
DATE MAY '71
CHECKED
DRAWN L.B.
DRG No 10107

CARPENTARIA EXPLORATION PTY. LTD.

LAKE TORRENS – SML 524

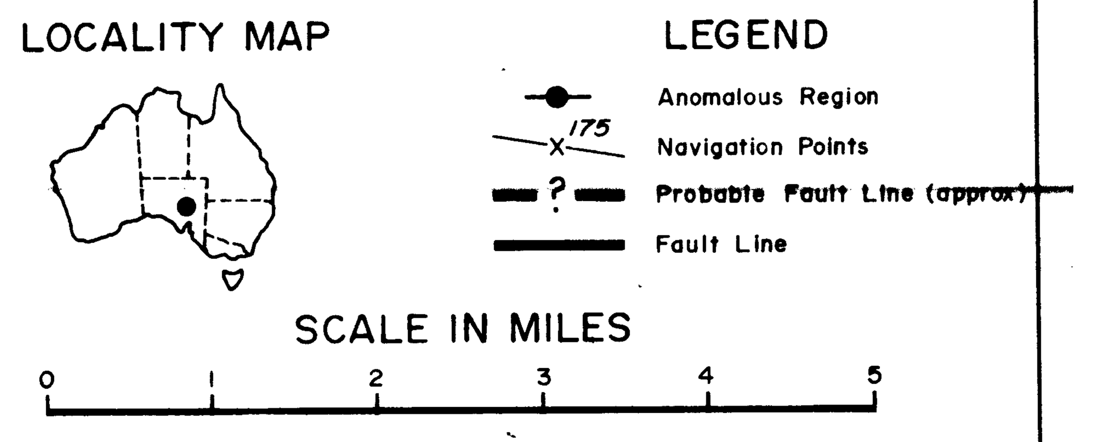
SOUTH AUSTRALIA

FLIGHT PATH PLOT

SHOWING

ANOMALOUS VLF EM RESULTS

LINE 5 AT 1000'



McPHAR GEOPHYSICS PTY. LTD.

NOTE: This survey was flown with a McPhar AF-4 AFMAG Electromagnetic System, and a McPhar KEM V.L.F. Electromagnetic System, installed in a Cessna 182, surveyed at mean terrain clearance intervals of 250, 500 and 1,000 feet.
Survey Flown: February 1971

1559-10

Drawn: May 1971 Approved: J.C.S. Dwg: AFP 71/053

CARPENTARIA EXPLORATION PTY. LTD.

LAKE TORRENS – SML 524

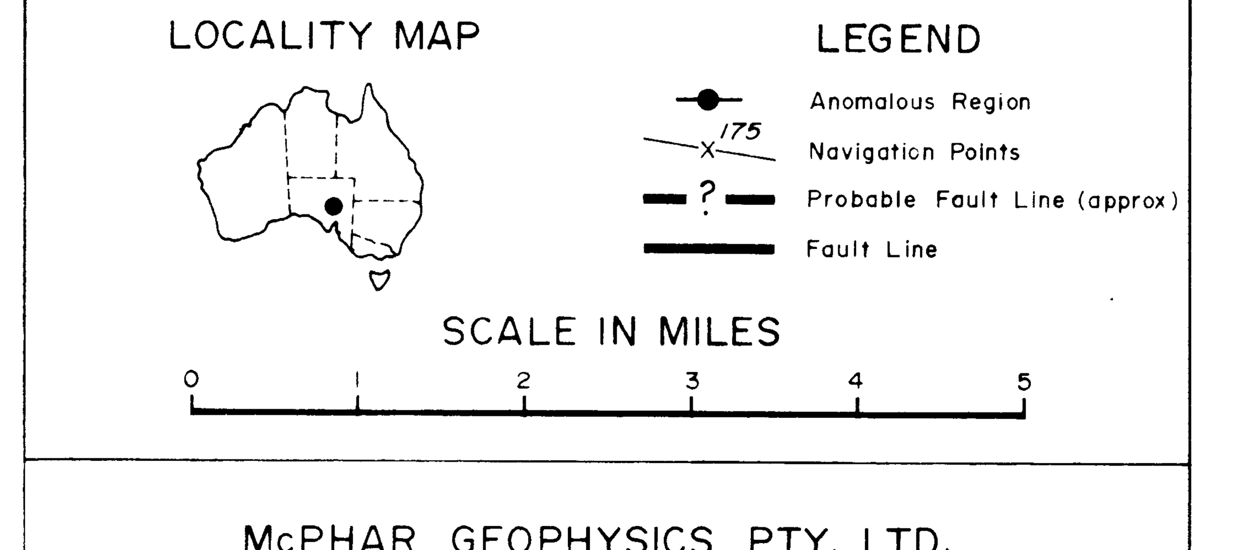
SOUTH AUSTRALIA

FLIGHT PATH PLOT

SHOWING

ANOMALOUS VLF EM RESULTS

LINE 5 AT 500'



McPHAR GEOPHYSICS PTY. LTD.

NOTE: This survey was flown with a McPhar AF-4 AFMAG Electro-magnetic System, and a McPhar KEM V.L.F. Electromagnetic System, installed in a Cessna 182, surveyed at mean terrain clearance intervals of 250, 500 and 1,000 feet.
Survey Flown: February 1971

1559-11

Drawn: May 1971 Approved: J.C.S. Dwg: AFP 71/052

CARPENTARIA EXPLORATION PTY. LTD.

LAKE TORRENS – SML 524

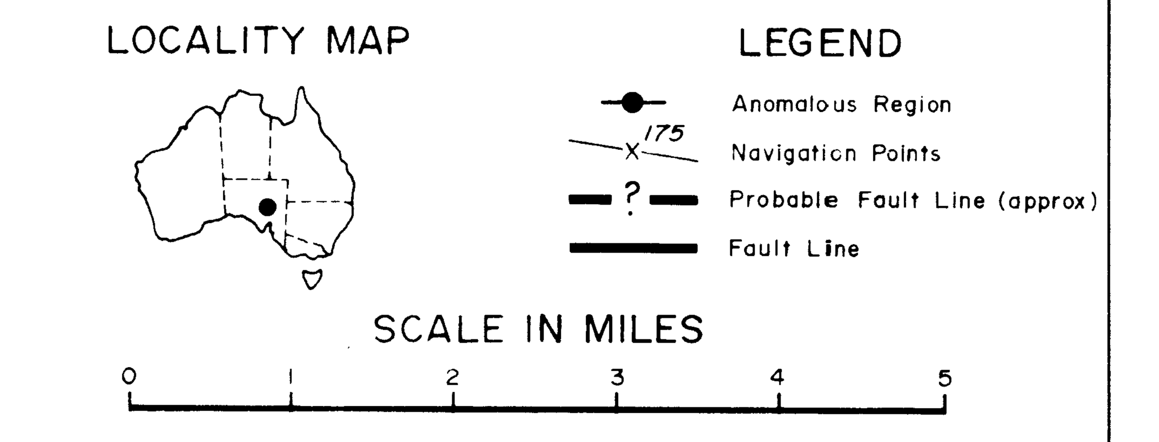
SOUTH AUSTRALIA

FLIGHT PATH PLOT

SHOWING

ANOMALOUS VLF EM RESULTS

LINE 5 AT 250'



McPHAR GEOPHYSICS PTY. LTD.

NOTE: This survey was flown with a McPhar AF-4 AFMAG Electromagnetic System, and a McPhar KEM V.L.F. Electromagnetic System, installed in a Cessna 182, surveyed at mean terrain clearance intervals of 250, 500 and 1,000 feet.
Survey Flown: February 1971

1559-12

Drawn: May 1971 Approved: J.C.S. Dwg: AFP 71/051