Envelope No. 6165

PEL 23

OFFICER BASIN

1984 MARLA BORE SEISMIC SURVEY
FINAL REPORT
ACQUISITION & PROCESSING

Submitted by

Comalco Aluminium Ltd
1985

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PRIMARY INDUSTRIES
AND RESOURCES SA

CONTENTS ENVELOPE 6165

Survey Code 84 OF 01

TENEMENT: P.E.L. 23.

TENEMENT HOLDER: Comalco Aluminium Ltd.

PLANS: 1984 Seismic Survey Lines -

- Murloocoppie 1:250,000 Sheet.	6165-22
- Wintinna 1:250,000 Sheet.	6165-23
- Giles 1:250,000 Sheet.	6165-24 to 25
- Wells 1:250,000 Sheet.	6165-26
- Giles 1:250,000 Sheet.	6165-27
- Wells 1:250,000 Sheet.	6165-28
- Wintinna 1:250,000 Sheet.	6165-29 to 30.
- Murloocoppie 1:250,000 Sheet.	6165-31 to 32

GEOSOURCE

Petty-Ray Geophysical Division

1984 ACCOMPANYING REPORT 1

COMALCO ALUMINIUM LIMITED

FINAL OPERATIONS REPORT

MARLA BORE SEISMIC SURVEY 1984

P.E.L. 23, SOUTH AUSTRALIA

BY

PETTY-RAY GEOPHYSICAL DIVISION

GEOSOURCE INCORPORATED

CREW 6316

A B S T R A C T

COMALCO ALUMINIUM LIMITED engaged Petty-Ray Geophysical Division, Geosource Incorporated, to conduct a Seismic Exploration Survey in Petroleum Exploration Lease 23 in the Marla Bore / Emu regions of South Australia.

P.E.L. 23 covers some 23,000 square kilometres. This 1984 survey was mainly concentrated in the western and southern portions of P.E.L. 23.

Marla Bore is located on the Stuart Highway, approximately 1200 kilometres north of Adelaide and approximately 500 kilometres south of Alice Springs.

The climate of the region is arid, with extremely irregular annual rainfall. Summers are very hot, with temperatures rising well above 40°C between November and March. Freezing conditions are not unusual during the winter months of June to August.

Party 6316, a 120 Trace Thumper* crew, was mobilised to conduct the survey and commenced production on the 3rd April, 1984. The last day of production being the 8th August, 1984.

During this survey, a total of 1278 kilometres of 60 Fold Data was acquired.

Supervision was provided by Messrs. A. Kenny and J. Akerman on behalf of Comalco, with Messrs. J. Horsley and M. Swatton on behalf of Petty-Ray Geophysical.

* TRADE MARK - GEOSOURCE

CONTENTS

CONTENTS (Continued)

APPENDICES

CONTENTS (Continued)

FIGURES

ENCLOSURES - FOLDER TWO

1. INTRODUCTION

1.1 General

Comalco Aluminium Limited engaged Crew 6316 of Petty-Ray Geophysical Division, Geosource Incorporated, to conduct a Thumper* Seismic Survey of 1278 kilometres, in their concession P.E.L. 23 in South Australia.

The Crew equipment was mobilised from E.P. 186 in the Gibson Desert of Western Australia and Alice Springs.

Key personnel were supplied by Petty-Ray Geophysicals Australian operations, while field hands were recruited from Perth, Alice Springs, Port Augusta and Melbourne.

The operation was supported by Petty-Ray Geophysicals Perth and Alice Springs Offices, with daily contact by S.S.B. radio.

1.2 Purpose of the Survey

The purpose of the survey was to expand the overall knowledge of the area and also to provide some more detailed data to the 1983 Seismic Survey.

1.3 Terrain

The terrain varied greatly from rocky outcrops with heavily wooded mulga around Marla Bore, to spinifex plains and concentrated sand dunes in the south-western section of the concession around the Emu test-bomb site. The sand dune country also having some heavily wooded areas of mulga.

1. INTRODUCTION (Continued)

1.4 Airstrips

A previously constructed airstrip at Emu claypan, capable of handling twin engine aircraft of the Cessna Conquest size, was maintained and used in support of the operation in the latter stages.

Similarly, a previously constructed airstrip at Dingo claypan, capable only of handling single engine aircraft of the Cessna 206 size, was in use during the latter stages of the operation.

1.5 Main Camp Sites

Camp sites were cleared for the field crew at selected intervals along the access roads/lines in order to minimise drive times to and from the field.

2. LOGISTICS

2.1.1 Alice Springs Office

The Petty-Ray facilities, situated at 10 Hele Crescent, were used as a forwarding and administration Base for Party 6316, with daily contact with the crew for the passing of requisitions and general communications.

2.1.2 Perth Office

The Petty-Ray/Geosource Offices, located at 35 Sarich Court, Osborne Park, were used as a back-up for the Alice Springs Office, with daily contact with Crew through S.S.B. radio for the passing of daily reports and also for liaison with client representatives.

2.2 Supply

Food and parts supplies were forwarded to the Crew by weekly truck charter from Compass Transport from Alice Springs to Marla Bore initially and then to Mt. Willoughby.

This proved highly satisfactory, the truck departing Alice Springs on Monday afternoon and arriving at Marla Bore/Mt. Willoughby early Tuesday morning.

From these centres, all cargo was ferried to crew by Party 6316's own supply truck.

Urgent parts were forwarded on the daily bus service that operates between Alice Springs and Adelaide and also on crew-change charter flights during the latter stages of the operation.

2. LOGISTICS (Continued)

2.3 Crew Change

A constant crew-change rotation roster of six weeks work and two weeks leave was maintained during the entire operation. Originally all crew-changes were conducted by bus from either Marla Bore or Mt. Willoughby to Alice Springs on a Saturday, in order for staff people to be able to make connecting commercial flights to Perth, Brisbane or Melbourne. Similarly, people were sent by bus south to Port Augusta or Adelaide.

Towards the end of the contract, when the distances from Camp to Mt. Willoughby were greatly increased, airstrips at Dingo and Emu claypans were utilised for a fortnightly crew change. A charter flight was organised to Alice Springs. All south-bound people were driven to Coober Pedy and then transported by bus to their respective destinations.

2.4 Data Transportation

All field data was despatched approximately on a weekly basis via Opal Airlines. Field tapes and Observers Logs being sent directly to Hosking Geophysical's Perth Processing Centre. Uphole plots, Elevations and Co-ordinates were sent to Comalco's Adelaide Office, where they were photocopied before being sent back to Crew. Telexes stating line numbers, number of boxes and contents, were sent to Comalco, Hosking Geophysical and Petty-Ray, Perth, with each shipment. All shipments of data were also accompanied by relevant transmittals and Data Shipment Monitors.

3. FIELD OPERATIONS

3.1 Logistics

3.1.1 Water

In the beginning, good quality water was obtained from Marla Bore and a bore on Wintinnia Station. As the Crew moved southwards, all water was obtained from Middle Bore on Wintinnia Station for the rest of the contract.

Transportation of water from the bores to the water storage trailer, located at the Petty-Ray campsite, was carried out by the Crew's six wheel drive cargo truck, fitted with a 2000 gallon water tank.

Once the Crew was working around Emu, water was a constant problem, as it was necessary for a 19 to 20 hour round trip to Middle Bore from Crew every second day.

3.1.2 Fuel and Lubricants

All fuel and lubricants were purchased from the Ampol Roadhouse at Marla Bore. Transportation of these fuels and lubricants was carried out by Parnell's for Ampol and were delivered to the Petty-Ray campsites.

The fly-camp for the surveyors was supplied from the production camp as required.

On occasions the line clearance contractors were also supplied with fuel and lubricants from the Petty-Ray camps.

3. FIELD OPERATIONS (Continued)

3.2 Line Clearing

Line clearing was performed by dozers from Hans Herr and graders from Rob Van Eck under contract to Comalco and controlled by Petty-Ray surveyors.

Clearing was initially done using one dozer (Komatsu D85A) to cut the trace and a grader (Caterpillar 16G) to widen the line to approximately 7 metres and grade.

Problems were encountered when we entered the breakaway country east of Wintinnia near Arckaringa Creek. Deep gullies, hard rock outcrops and steep slopes slowed dozing and grading. An extra dozer (Komatsu D125A) was brought in early to widen and ease parts of lines 84-0150/0620 in this area for Weight and Jug Trucks.

The two dozers initially cut trace on separate lines but we again struck problems when the 16G blew its main hydraulic pump. The dozers then had to return to Lines 84-0240/0220/0165/0092/0090/0085 to widen them while two Caterpillar 12E graders (or equivalent from Claude Collins - Stuart Highway Patrol Graders) were used until the 16G repairs were completed.

This mishap cut dozer lead dramatically and hindsight shows that we should have used one dozer on trace and one on second cut widening and reducing dunes, immediately we started cutting lines west of Alice Springs - Tarcoola Railway. The timber cover was very heavy here and really beyond the true capabilities of the 16G.

From this stage onwards, one dozer was used to cut trace and one to second cut and reduce dunes before the grader finished off.

3. FIELD OPERATIONS (Continued)

3.2 Line Clearing (Continued)

A third dozer (Komatsu D85A - Milan Rakos - Mintabie) was brought in to grade the Access Road and help with second cut and reducing dunes, as we were cutting 84-0170 and 84-0050.

A second grader from Rob Van Eck (Caterpillar 140G) was also brought in to grade accesses and to help with line clearing.

The main problem encountered by the line clearance crew was logistics. The area west of line 84-0085 was devoid of any previous access roads and contained very soft/ sandy ground making it difficult to transport fuel and move camps. Lack of back-up vehicles and personnel, particularly in the dozer camp, increased this problem.

The line width was reduced to single weight truck width in the dune areas to reduce dozing time. In the breakaway country around Wintinnia, it was sometimes impossible to even cut single trace and the effort was reduced to line access only.

In the final analysis, the line clearance crew just managed to finish in front of the recording crew but overall put in a well below average performance, particularly the dozers, due mainly to inexperience in seismic work and total lack of back-up facilities.

In addition to line clearance, the crew graders regraded several station tracks for access, regraded railway access road from Wintinnia to Marla, Mable Creek to bottom of Line 84-0050, Mable Creek to Emu Road and created the access road from the end of the Middle Bore Road at 84-0085 to 84-0010 through the centre of the south-west of the prospect, including redoing

3. FIELD OPERATIONS (Continued)

3.2 Line Clearing (Continued)

the old seismic line to Emu. Campsites and rubbish pits were also cut at intervals along the access road for the main camp and filled in afterwards.

3. FIELD OPERATIONS (Continued)

3.3 Surveying

Prior to the commencement of line clearing, a reconnaissance of the proposed programme was carried out by Comalco - one in the Marla area at the start and another in the Emu area before we crossed to the west side of the railway line.

Line clearance commenced on 8th March, 1984 and was completed on 30th July, 1984.

Chaining and surveying commenced on 18th March, 1984 and was completed in the field on 31st July, 1984.

Lines were set off mainly from Toyota speedo distance along lines, some from Sat-Nav. positioning equipment and a few from pegging or surveying on previous lines. Setting off was our greatest problem on this job, once we crossed to the west side of the railway line. The dozing and grading lead was never great enough to delay the dozers while we surveyed in to accurately set off lines. Consequently, we had problems with lines not being in the correct place. It is difficult to be accurate with a speedo across approximately 40 km of first cut line, with approximately 60 or 70 sand dunes to cross. The 1:250,000 Topographic Map did not show all the dunes, so they could not be counted as a check.

Bearings of the lines were set by Sunshot (Altitude Method), for true bearing and the dozer kept on line by a surveyor poling behind on all lines.

Chaining was carried out using a 150m long, 6mm diameter aircraft control cable marked at 30m intervals and regularly checked against a 50m surveying tape, also checked daily against EDM distance measured along the

3. FIELD OPERATIONS (Continued)

3.3 Surveying (Continued)

lines. A wooden peg was used on every fifth station and pin flags were used between. Station numbers were written on all pegs and pin flags with line numbers marked on every fiftieth station.

Surveying was carried out using Wild T1 Theodolite for angles and a Wild D14L Distomat for measuring slope distances.

Methods used were Reciprocal Vertical angles at each turn point for reduced levels at those points, then Single Ray for all intermediate reduced levels. These were shot to every change of grade point on line. Horizontal Co-ordinates were developed at the same time by turning double angles at each turn point, E.D.M. distance between using sunshots to control bearings.

Computations were done using HP41CV calculators. Programmes used were Sunshot (Altitude Method) using Polynomial Co-efficients for Declination of the sun, Diff-Diff programme for Reciprocal Verticals with correction co-efficient for curvature and refraction Single Ray for reduced levels at intermediates using co-efficient for curvature and refraction and A.M.G. co-ordinates were computed using horizontal distance between turn points with only a scale factor correction.

Closures, both Horizontal and Vertical, were well within contract parameters throughout the prospect. The only time we approached the parameters was with the verticals from the Highways B.M.'s near railway line down 84-0165/0170/0190 to the 3rd Order level work at Emu. This was a total traverse length of approximately 240 kilometres without ties, apart from our own loops near the railway line. Some of it along 84-0165 we re-ran where it was traverse without a loop (0.17m difference between traverses over approximately 80

3. FIELD OPERATIONS (Continued)

3.3 Surveying (continued)

kilometres). Time did not permit re-runs in similar positions on 84-0170 and 84-0190.

We tried tying to the National Mapping Trig. Points, but proved them to be incorrect by 6 to 7 metres in elevation. Levels on Trig. Points only guaranteed by Lands and Survey to ± 5 metres as they were aneroid barometer levels. Our level traverse from Highways B.M. to N.M. Trig. Point K672 (Aston Minor) just off 84-0240/0165 Int. indicates this as being optimistic.

The only way to eliminate this problem is to put in a couple of translocated Satellite Navigation points along 84-0170 and 84-0190, or if lines are cut in this area next year, we should find the problem by loops.

Note: As the closure is within allowable limit, it is purely technical, but it is just good surveying practice to eliminate large misclosures such as this one, either by more control or more loops.

Control for the prospect was taken from the Highways B.M.'s (centre line work for new Stuart Highway) near the railway line, looped through our lines on the eastern part of the prospect. The south-western part came from the Highways B.M.'s and was tied horizontally to the N.M. Trig. Points and vertically to the 3rd Order National Levelling B.M.'s near Emu.

As well as the lines, we also cut an access road through the centre of the south-western part of the prospect. This was cut as closely to a pre-drawn line as possible to satisfy Aboriginal considerations. Heavy mulga scrub, numerous low sand dunes (unmarked on 1:250,000 Topographics) and the consequent need for many corners,

3. FIELD OPERATIONS (Continued)

3.3 Surveying (Continued)

made this a difficult exercise. Without the aerial/landsat photos, it would have been a very prolonged job indeed.

Permanent markers were set at all starts and ends of lines, all intersections of lines, old and new, all intersections with the Stuart Highway, Access Roads, station tracks and many fence lines that also provided access. They were also set at 5 kilometre intervals along the lines.

Results were forwarded to Comalco on a line by line basis on a reduced level and co-ordinate sheet format going with the data shipment from the recording crew for the relevant line.

Information Lists to be forwarded at the end of contract will be:-

Starts and Ends of Lines List
P.M. Lists
Well Ties
Vertical and Horizontal Loop Closure Map
List of Elevation/Co-Ordinates for all Upholes
Shotpoint Location Map.

3. FIELD OPERATIONS (Continued)

3.4 Uphole Surveys

A total of 143 upholes were shot and recorded during the 1984 Marla Seismic Survey.

Selection and drilling of uphole locations and depths came under the direct control of Comalco Aluminium Limited, as did the geological and geophysical logging operations that took place before uphole shooting was carried out.

Petty-Ray Geophysical conducted the uphole shooting. A shooting harness was fabricated with an explosive charge consisting of a detonator and a 'K' size booster set at every 10 metres up the hole, except for the 10 metres nearest the surface, which generally had just a detonator set at 7, 5 and 3 metres respectively below the surface.

Individual shots were then recorded via surface geophones into a Geometrics E.5 1210F Nimbus instrument.

The upholes were not programmed to any particular depth and ranged from 50 metres to 200 metres. The final depth being dictated by the Comalco geologist on site.

The static corrections computed from the uphole survey were used as a standard to tie the static corrections derived from the reflection survey. At a few locations the upholes were not deep enough to reach sub-weathering and could not be used as a standard.

For a full list of Uphole locations and maximum depths they were shot to, refer to Appendix VII.

3. FIELD OPERATIONS (Continued)

3.5 Recording

3.5.1 Noise Study

A Walkaway noise analysis was carried out at the intersection of lines 84-0500 and 84-0088 on the 2nd April, 1984, prior to the commencement of production recording, in order to adequately identify and evaluate any coherent source generated noise waves. A ' dog leg' or 'L' formed part of the receiver array to reveal the presence and severity of any off-line noise

The main interfering noise train observed on the records had a wavelength of approximately 90 metres and a velocity of approximately 1330 metres per second.

For details of source and array parameters used in the noise study refer to figure VI.

3. FIELD OPERATIONS (Continued)

3.5 Recording (Continued)

3.5.2 Production

The weight-drop technique was used to acquire 60 Fold Data on the assigned programme.

Usually two trucks, each with a 3 tonne weight and dropping from 2.7m at alternative 7.5m intervals along the line, were used. Over high dunes or in instances of breakdown, one unit could continue with a marginal increase in the time interval between drops.

Parameters for recording were as follows:

Spread:	1830-60-0-60-1830
Station Interval:	30m
No. of Recording Channels:	120
Sample Rate:	4 milliseconds
Record Length:	4 seconds
Filters - Lo-Cut:	Out
- Hi-Cut:	62.5 HZ (72 dB/Octave Slope)
- Notch:	Out
C.D.P. Coverage:	60 Fold
Source Array:	4 Drops/Station @ 7.5 metre intervals (effectively 8 weighted Drops/Station with Varisource).
Varisource:	Normal
Receiver Array:	24 Geophones in line at 1.25 m spacing centred on station marker.

Varisource uses an electronic array weighting of sources to optimise field effort. Individual drops are assigned two different precalculated weights and summed in two complementary memory locations.

3. FIELD OPERATIONS (Continued)

3.5 Recording (Continued)

3.5.2 Production (Continued)

By simultaneously maintaining the two distinct sums with complementary weighting, the field effort required to produce the same amount of input energy per summed record is halved when compared to conventional summing methods.

This method also aids in the suppression of ground-roll.

The 60 Fold coverage stated above is nominal only. Use of Varisource with split spread configuration as used on this survey, results in channels 60 and 120 being invalid partials in that they are weighted sums of only one segment of 4 drops and results in an actual C.D.P. multiplicity of 59 Fold.

A total of 1278 kilometres of data was recorded during the survey.

Due to extremely rough terrain on lines where the weight trucks were unable to drop, a maximum of 12 skips were allowed before recoveries were conducted. Hence, at some points on these lines, a C.D.P. multiplicity ranging from 48 - 60 Fold was obtained.

A paper monitor recording was taken of either the Hi or Lo 60 traces at every fifth drop station for quality control.

Statics were produced from hand-picking first breaks on the reflection monitors for every 20th station approximately. These in turn were integrated with the time corrections computed from the upholes to provide weathering control. A velocity profile was drawn for every line utilising all first-break information from the reflection recording.

3. FIELD OPERATIONS (Continued)

3.6 Work History

MARCH	8:	Line Clearance started.
	26:	Drill Crew started.
	27:	First Uphole shot.
APRIL	2:	Noise Study Conducted.
	3:	Production Recording started on Line.
	21:	Recorder down all day - no Production.
JULY	31:	Line Clearance Completed.
AUGUST	1:	Last Uphole shot.
	8:	Production Recording completed on Line 84-0010.

4. CONCLUSIONS AND RECOMMENDATIONS

The weight drop technique, coupled with the Varisource weighted summing facility, has proven to be a most economical acquisition tool in this type of terrain, in a semi-reconnaissance seismic survey such as was conducted.

It is recommended that a more detailed programme be recorded to further delineate suggested structural features, before embarking on a drilling programme.

The upgrading of C.D.P. multiplicity from 48 Fold in the 1983 Marla survey to 60 Fold in this years survey has proven to be highly satisfactory with a greater classification of features than was previosuly acquired.

Respectfully submitted,
PETTY-RAY GEOPHYSICAL DIVISION
GEOSOURCE INCORPORATED

M. Swatton,
AREA SUPERVISOR.

APPENDIX I

EQUIPMENT

1	ESD, MDS-10, 120 Trace Digital Field System complete with MTM-100, 9 Track, 1600 B.P.I. Tape Transport (SEG B format), three SMM-1 mass memories for stacking capability and Varisource option Cab mounted on International 4 x 4 Truck.
1	SDW 400 B, 60 Trace Electrostatic Camera.
1	LT-240 Line Checker.
1	RLS-240 Rotary Migrator Switch.
1	WDC-6 Weight Drop Control Box.
1	Geophone Shaker Table.
1	Tektronic 465B Oscilloscope.
1	Precision DC Source.
82	C.D.P. Cable Sections - each with 3 takeouts at 37.5 metre intervals.
504	Strings of MD-79 10 HZ Geophones - each string has 12 phones.
2	Extension Cables - each 100 metres long.
2	Extension Cables - each 20 metres long.
3	Weight Truck Units mounted on Ford, Kenworth and Mack 6 x 6 Trucks.
6	Isuzu TSD 45 4 x 4 Trucks (4 for cables and geophones, 1 for maintenance equipment, 1 for supply).
1	Leader 6 x 6 Water / Cargo Truck with Crane.
1	Mack 6 x 6 Water / Cargo Truck with 500 Gallon Fuel Tank.
11	Toyota Landcruiser 4 x 4 Trucks (1 x Party Manager, 3 x Recording Crew, 1 x Mechanic, 1 x Refraction, 1 x Preloader, 3 x Survey, 1 x Utility).
2	Kitchen Trailers

APPENDIX I

EQUIPMENT (Continued)

1	Dining Trailer.
4	10 Man Sleeping Trailers.
1	8 Man Sleeping Trailers.
2	Ablution Trailers
1	Office Trailer (including accommodation for Party Manager and Client Representative).
1	Survey / Seismology Office Trailer (including accommodation for Surveyors and Seismologists).
1	Store / Workshop Trailer.
1	Mechanics Workshop Trailer.
2	Generators 80 KVA.
2	Generators 20 KVA.
2	Fuel Storage Trailers - capacity 1500 gallons each.
2	Water Storage Trailers - capacity 1500 gallons each.
1	Explosives Trailer.
1	Explosives Magazine.
1	Detonator Magazine.
2	12 Trace Geometrics ES-1210F Nimbus Instruments with 12 x 10 HZ Uphole Phones.
4	100 Watt S.S.B. Radios.
2	25 Watt S.S.B. Radios.
14	V.H.F. Radios (General Duties & Source Control).
1	DI-4 Distomat.
1	DI-4L Distomat.
2	Wild T1 Theodolites.
1	Wild T16 Theodolite.
1	Apple II Desk Top Computer System.
1	Precision Chain.
	Fire Extinguishers for Camp and Vehicles.

APPENDIX II

KEY PERSONNEL

SUPERVISOR:	J. Horsley
PARTY MANAGER:	R. Hayden
ASSISTANT PARTY MANAGER:	S. Hallows
SENIOR OBSERVER:	S. Gall
OBSERVER:	K. Stewart
JUNIOR OBSERVER:	M. White
WEATHERING OBSERVER:	R. Heyer
SENIOR MECHANIC:	J. De Vries
SOURCE AND CAMP MECHANICS:	M. Sheedy D. Craig J. O'Brien
SEISMOLOGISTS:	G. Freemantle A. Le Nair
SENIOR SURVEYOR:	I. Beattie
CONTRACT SURVEYOR:	P. Fairbrother
SURVEYORS:	P. Weatherly D. Wilson A. Sullivan D. Caldicott
PRELOADER / SHOOTERS:	G. Stewart R. Heyer
CAMP TRUCK DRIVERS:	D. Hobbs J. Coleman B. Ballard
WEIGHT TRUCK DRIVERS:	N. Tahapehi D. Hood C. Elder J. O'Brien
COOKS:	R. See P. King

APPENDIX III

STATISTICAL SUMMARY

MONTH 1984	NUMBER OF STATIONS	COVERAGE KMS	RECORDING DAYS	AVERAGE KMS/DAY
APRIL	8,537	255.84	28	9.137
MAY	8,942	268.11	30	8.937
JUNE	11,405	341.95	30	11.398
JULY	11,092	332.61	31	10.729
AUGUST	2,649	79.44	8	9.930
TOTALS	42,625	1,277.95	127	10.063

APPENDIX IV

WELL TIES - COMALCO - MARLA

	ELEVATION	NORTHING	EASTING	COMMENTS
MT. WILLOUGHBY NO. 1	239.31	6,940,343.49	428,373.24	Adjacent to Int. 84-0150/ 0620.
MANYA NO. 1	240.90	6,916,076.15	369,610.15	Adjacent to 1172 + 16 m 84-0085
MANYA NO. 2	236.60	6,909,621.37	373,444.85	Adjacent to 921 + 23 m 84-0085
MANYA NO. 3	244.10	6,916,275.34	369,486.45	Adjacent to 1180 + 9 m 84-0085
MANYA NO. 4	234.54	6,897,967.71	380,572.91	Adjacent to 466 + 7 m 84-0085

APPENDIX V.

START OF LINE - END OF LINE DISTANCE LIST

LINE	S.O.L.	E.O.L.	DISTANCE KM
84-0010	100	2390	68.700
84-0020	100	2609	75.270
84-0030	133	2114	59.430
84-0040	100	1510	42.300
84-0500 250	100	2332	66.960
84-0060	100	1512	42.360
84-0700 270	100	1700	48.000
84-0080	90	1155	31.950
84-0085	100	1257	34.710
84-0088	100	957	25.710
84-0090	130	1195	31.950
84-0092	100	2205	63.150
84-0150	94	2380	68.580
84-0165	57	3900	115.290
84-0170	1030	3097	62.010
84-0190	120	3050	87.900
84-0220	123	950	24.810
84-0240	100	1550	43.500
84-0320	40	1211	35.130
84-0360	100	1564	43.920
84-0400	85	Surveyed to 1280 Recorded to 1267	35.850 35.460
84-0480	100	2940	85.200
84-0500E	100	400	9.000
84-0500W	100	357	7.710

APPENDIX V

START OF LINE - END OF LINE
DISTANCE LIST

LINE	S.O.L.	E.O.L.	DISTANCE KM	
84-0600	100	513	12.390	
84-0620	103	1280	35.310	
84-0710	105	757	19.560	
TOTAL			1276.650	1276.260

PLUS - NOT RECORDED

84-0110	100	816	21.480

APPENDIX VI

L I S T   O F   P E R M A N E N T   M A R K E R S

LINE 84-0010

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	277.68	6,827,325.06	227,501.28	S.O.L.
168	260.24	6,828,988.76	226,312.40	Int. with Emu Road
355 + 18	265.42	6,833,577.10	223,029.43	Int. 84-0010/84-0190 (440 + 11 on 84-0190)
527	273.76	6,837,769.88	220,031.17	
659	257.73	6,841,000.19	217,729.28	Bend
862 + 15	255.17	6,846,183.69	214,486.12	Int. with Access Road
981	260.19	6,849,207.06	212,601.00	
1120	304.91	6,852,752.05	210,392.22	
1286	348.41	6,856,979.73	207,748.68	
1436 + 7	322.81	6,860.805.19	205,355.28	
1631 + 5	344.16	6,865,772.64	202,246.58	Int. 84-0010/84-0196
1838	365.43	6,871,042.16	198,947.91	
1974	370.52	6,874,505.53	196,758.23	
2093	332.78	6,877,519.43	194,836.63	
2237 + 10	308.26	6,881,180.28	192,506.95	
2390	303.02	6,885,051.81	190,051.34	E.O.L.

APPENDIX VI

L I S T O F P E R M A N E N T M A R K E R S

LINE 84-0020

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	313.97	6,832,364.51	259,546.32	S.O.L.
194	324.65	6,834,351.82	257,532.86	
385	296.64	6,838,402.02	253,421.36	
562	310.75	6,842,107.18	249,662.28	
696	312.46	6,844,799.11	246,934.49	
842 + 12	308.97	6,847,891.51	243,799.82	
965 + 4	286.39	6,850,481.94	241,167.25	Int. 84-0020/84-0190 (1265 + 2 - 84-0190)
1178	293.71	6,854,964.02	236,603.78	
1355	259.56	6,858,692.59	232,802.65	Int. with Access Road
1503 + 15	300.74	6,861,821.88	229,616.49	
1681	341.10	6,865,560.84	225,805.83	
1834 + 24	327.36	6,868,795.89	222,496.34	
2041 + 15	317.17	6,873,136.83	218,048.33	
2158 + 25	313.94	6,875,598.45	215,524.61	Int. 84-0020/84-0196
2195	338.03	6,876,356.65	214,746.26	
2340	389.89	6,879,398.65	211,628.25	
2475	369.19	6,882,222.73	208,719.54	
2609	393.69	6,885,034.18	205,835.15	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0030

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
133	291.07	6,843,535.42	287,214.55	S.O.L.
275 + 17	300.74	6,846,541.47	284,163.43	
499 + 25	306.02	6,851,275.41	279,358.72	Int. 84-0030/84-0170 (1096 + 3 - 84-0170)
708 + 15	303.50	6,855,674.80	274,897.16	
882	306.93	6,859,335.28	271,183.34	
1040 + 15	295.09	6,862,673.58	267,789.08	Int. with Access Road
1188	293.18	6,865,781.84	264,631.80	
1347 + 4	294.16	6,869,135.39	261,220.97	Int. 84-0030/84-0190 (2176 + 4 - 84-0190)
1503 + 27	292.28	6,872,446.82	257,864.66	
1730 + 14	316.03	6,877,221.83	253,005.62	
1884	321.60	6,880,458.45	249,714.38	
2041 + 16	349.31	6,883,777.43	246,334.89	
2114	342.93	6,885,305.52	244,785.69	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0040

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	296.16	6,856,358.99	296,263.33	S.O.L.
205	305.46	6,858,587.29	294,030.43	
305 + 13	295.48	6,860,714.01	291,885.88	Int. 84-0040/84-0170 (1615 + 27 - 84-0170)
473	299.20	6,864,259.49	288,311.81	
585	289.31	6,866,630.35	285,924.59	Int. with Access Road
651	291.20	6,868,022.17	284,519.94	
818	297.56	6,871,557.29	280,960.61	
968	309.49	6,874,792.20	277,823.43	
1137	318.84	6,878,445.84	274,302.57	
1210 + 10	317.57	6,880,023.50	272,770.03	Int. 84-0040/84-0190 (2704 + 19 - 84-0190)
1288	331.40	6,881,690.32	271,148.39	
1444	312.78	6,885,045.74	267,889.78	
1510	302.77	6,886,455.75	266,501.06	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0050

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	218.49	6,834,481.46	338,275.55	S.O.L.
211	228.44	6,837,133.20	336,248.34	
342	237.27	6,840,266.68	333,856.16	
463	237.51	6,843,155.36	331,642.27	
630	237.39	6,847,204.33	328,536.87	
724 + 4	246.83	6,849,450.06	326,814.49	Int. 84-0050/84-0110 (166 + 10 - 84-0110)
905	234.67	6,853,770.03	323,505.18	
1099	261.54	6,858,411.21	319,965.39	
1214	259.92	6,861,149.73	317,879.85	
1412 + 15	283.64	6,865,863.74	314,282.65	
1580	299.71	6,869,842.47	311,242.06	
1735 + 14	276.55	6,873,530.70	308,424.70	Int. 84-0050/84-0170 (2312 + 6 - 84-0170)
1873	258.60	6,876,788.43	305,927.72	
2022	251.40	6,880,325.95	303,218.42	
2909	257.62	6,884,757.41	299,826.19	
2332	269.65	6,887,672.75	297,595.89	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0060

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	231.93	6,853,228.61	345,499.65	S.O.L.
269 + 2	228.10	6,857,304.94	342,472.31	Int. 84-0060/84-0110 (748 + 24 - 84-0110)
440	232.27	6,861,420.77	339,409.01	
612	235.88	6,865,565.31	336,327.56	
801	240.39	6,870,117.84	332,940.33	
959	258.76	6,873,924.11	330,108.68	
1022	246.05	6,875,443.50	328,979.65	Int. with Access Road
1131 + 10	243.79	6,878,077.94	327,021.18	Int. 84-0060/84-0165 (187 + 11 - 84-0165)
1237	269.11	6,880,619.18	325,123.61	
1391 + 6	274.35	6,884,336.80	322,359.15	Int. 84-0060/84-0170 (2899 + 2 - 84-0170)
1512	272.77	6,887,244.35	320,195.72	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0070

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	226.81	6,876,019.30	360,207.94	S.O.L.
249	214.55	6,880,009.78	358,190.24	
367	219.02	6,883,169.11	356,591.33	
450	218.06	6,885,390.15	355,465.45	
595	233.31	6,889,269.64	353,495.45	
672	243.13	6,891,331.16	352,451.43	Int. with Access Road
780	259.72	6,894,237.63	351,018.52	
923 + 11	272.80	6,898,093.74	349,116.45	Int. 84-0070/84-0165 (1181 + 5 - 84-0165)
1142	288.01	6,903,974.20	346,195.69	
1315	279.60	6,908,621.42	343,874.75	
1420	281.54	6,911,444.89	342,475.47	
1540	273.68	6,914,672.77	340,880.33	Int. with Access Road From 84-0080
1598	282.33	6,916,234.09	340,108.64	
1700	280.01	6,918,978.33	338,754.44	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0080

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
90	222.01	6,891.657.42	372,432.69	S.O.L.
185	229.14	6,894,031.78	370,857.06	
345	228.49	6,898,032.42	368,208.34	
505	243.59	6,902,034.75	365,559.33	
620	252.58	6,904,911.18	363,655.58	
774 + 23	241.72	6,908,781.40	361,088.60	Int. 84-0080/84-0165 (1715 + 8 - 84-0165)
970	257.00	6,913,672.55	357,863.27	
1155	250.76	6,918,310.24	354,813.51	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0085

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	229.89	6,888,652.94	386,393.75	S.O.L.
267 + 20	234.06	6,892,922.56	383,737.83	Fence
407	240.57	6,896,470.17	381,529.96	Int. with Access Road
477 + 6	233.01	6,898,255.40	380,413.99	Int. 84-0085/84-0150 (173 + 14 - 84-0150)
603	236.24	6,901,463.83	378,427.11	
740	237.10	6,904,965.02	376,277.20	
865 + 15	239.50	6,908,183.78	374,327.50	
1014	245.61	6,911,987.48	372,036.25	
1133 + 25	241.37	6,915,077.02	370,204.77	Int. with Middle Bore Access Road
1181	243.65	6,916,296.52	369,484.25	Int. 84-0085/84-0165 (2090 + 18 - 84-0165)
1257	243.03	6,918,256.48	368,322,92	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0088

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	334.33	6,975,145.42	347,615.33	S.O.L.
213 + 25	323.21	6,972,034.51	349,037.25	Int. 84-0088/84-0500W (178 + 10 - 84-0500W)
338	319.72	6,968,640.40	350,580.91	Int. with Mintabie Road
510	313.23	6,963,931.43	352,710.04	
783	301.55	6,956,457.66	356,093.68	Int. 84-0088/84-0360 (291 + 5 - 84-0360)
957	285.21	6,951,698.26	358,253.93	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0090

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
130	256.84	6,902,102.21	388,626.24	S.O.L.
214 + 20	250.82	6,904,231.29	387,241.75	Int. 84-0090/84-0150 (474 + 28 - 84-0150)
383	240.96	6,908,468.46	384,493.28	
547	248.28	6,912,593.04	381,813.99	
693 + 11	253.58	6,916,279.81	379,425.77	
730	241.67	6,917,203.07	378,828.35	Int. with Middle Bore Access Road
776	249.71	6,918,362.19	378,078.30	
915 + 3	247.90	6,921,876.96	375,824.24	Int. 84-0090/84-0165 (2372 + 10 - 84-0165)
1022	255.62	6,924,572.90	374,085.29	
1195	252.46	6,928,951.11	371,263.58	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0092

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	258.01	6,892,390.78	402,773.59	S.O.L.
194.12	257.25	6,894,774.44	401,253.38	Fence
260	259.59	6,896,430.77	400,195.02	
433	262.38	6,900,798.33	397,405.97	
586	271.39	6,904,660.62	394,941.13	
746 + 11	259.50	6,908,706.15	392,354.91	Int. 84-0092/84-0150 (701 + 6 - 84-0150)
850	257.91	6,911,323.37	390,682.32	
1022	257.66	6,915,663.07	387,905.76	
1165	258.85	6,919,273.16	385,598.52	
1182 + 20	256.78	6,919,719.14	385,312,39	Int. with Middle Bore Access Road
1307	263.09	6,922,854.02	383,301.07	
1450 + 12	260.03	6,926,477.57	380,975.86	Int. 84-0092/84-0165 (2602 + 15 - 84-0165)
1636	268.15	6,931,152.93	377,976.34	
1781	266.40	6,934,810.73	375,633.28	
1915	265.14	6,938,191.14	373,466.53	Int. 84-0092/83-0020 & 83-0300 (221 - 83-0200 / 232-0300
2050	271.42	6,941,596.39	371,287.78	
2162 + 12	269.34	6,944,435.07	369,476.56	Int. 84-0092/84-0320 (70 + 9 - 84-0320)
2205	271.45	6,945,509.19	368,788.43	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0110

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	242.26	6,848,551.94	325,029.64	S.O.L.
166 + 10	246.83	6,849,450.06	326,814.49	Int. 84-0110/84-0050 (724 + 4 - 84-0050)
230	246.56	6,850,310.09	328,523.46	
408	243.77	6,852,711.78	333,307.43	
600	225.96	6,855,299.14	338,470.67	
748 + 24	228.10	6,857,304.94	342,472.31	Int. 84-0110/84-0060 (269 + 2 - 84-0060)
816	217.89	6,858,207.77	344,282.40	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0150

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
94	229.96	6,896,682.95	378,617.75	S.O.L.
173 + 14	233.01	6,898,255.40	380,413.99	Int. 84-0150/84-0085 (477 + 6 - 84-0085)
351	244.88	6,901,777.25	384,436.88	
474 + 28	250.82	6,904,231.29	387,241.75	Int. 84-0150/84-0090 (214 + 20 - 84-0090)
644	259.54	6,907,577.38	391,056.90	
701 + 6	259.50	6,908,706.15	392,354.91	Int. 84-0150/84-0092 (746 + 11 - 84-0092)
850	267.87	6,911,657.99	395,698.22	
924	271.69	6,913,122.55	397,366.91	
1070 + 8	288.82	6,916,019.07	400,663.26	Int. 84-0150/84-0240 (167 + 6 - 84-0240)
1229 + 28	292.90	6,919,178.11	404,271.90	Int. 84-0150/A.S. - Tarc. Railway Line.
1337 + 7	290.58	6,921,298.51	406,692.89	Fence
1358 + 10	291.77	6,921,716.56	407,169.42	Fence
1378 + 8	283.53	6,922,108.88	407,620.27	Int. 84-0150/84-0400 (800 + 12 - 84-0400)
1468	311.22	6,923,882.80	409,643.56	
1627	286.73	6,927,028.77	413,228.83	Int. with Stuart Hwy.
1643 + 10	283.93	6,927,351.55	413,596.60	Int. 84-0150/84-0480 (2843 + 26 - 84-0480)
1651 + 20	281.25	6,927,516.55	413,784.31	Fence
1862	259.48	6,931,664.00	418,510.29	

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0150 (Continued)

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
1959	265.38	6,933,573.21	420,685.02	Fence
2031 + 5	280.07	6,934,992.88	422,300.38	Fence
2118 + 10	272.88	6,936,706.40	424,249.25	
2302 + 27	239.43	6,940,332.99	428,373.28	Int. 84-0150/84-0620 (1200 + 6 - 84-0620)
2380	244.90	6,941,856.59	430,114.40	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0165

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
57	249.35	6,875,489.87	324,090.99	S.O.L.
187 + 11	243.79	6,878,077.94	327,021.18	Int. 84-0165/84-0060 (1131 + 10 - 84-0060)
292	252.65	6,880,158.45	329,374.83	
416	268.92	6,882,623.67	332,160.61	
579 + 15	288.53	6,885,881.24	335,830.68	
722 + 10	269.80	6,888,732.17	339,030.39	Bend
855	250.79	6,891,563.93	341,825.85	Bend
1015	263.89	6,894,767.82	345,399.84	
1181 + 5	272.80	6,898,093.74	349,116.45	Int. 84-0165/84-0070 (923 + 11 - 84-0070)
1250	263.59	6,899,465.36	350,659.14	
1405	256.85	6,902,569.82	354,137.45	
1530	248.60	6,905,067.69	356,935.77	
1715 + 8	241.72	6,908,781.40	361,088.60	Int. 84-0165/84-0080 (774 + 23 - 84-0080)
1820	241.64	6,910,876.30	363,430.74	
1943	239.76	6,913,341.80	366,186.12	Int. with Access Road
2090 + 18	243.65	6,916,298.52	369,484.25	Int. 84-0165/84-0085 (1181 - 84-0085)
2205	250.12	6,918,530.31	372,086.56	
2372 + 10	247.90	6,921,876.96	375,824.24	Int. 84-0165/84-0090 (915 + 3 - 84-0090)
2602 + 15	260.03	6,926,477.57	380,975.85	Int. 84-0165/84-0092 (1450 + 12 - 84-0092)

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0165 (Continued)

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
2740 + 29	271.63	6,929,238.07	384,079.41	Int. 84-0165/84-0220 (203 + 4 - 84-0220)
2870	288.50	6,931,815.40	386,968.92	
2998 + 7	309.27	6,934,378.97	389,843.16	Int. 84-0165/84-0240 (877 + 20 - 84-0240)
3171 + 24	302.17	6,937,847.64	393,715.53	Int. 84-0165/83-0400 (607 + 10 - 83-0400)
3336	296.53	6,941,128.52	397,383.52	
3488 + 11	285.97	6,944,171.73	400,790.34	Int. 84-0165/84-0480 (2137 + 20 - 84-0480)
3607 + 7	281.18	6,946,542.43	403,448.87	Fence
3690 + 10	304.89	6,948,201.82	405,305.26	Fence
3818 + 15	309.08	6,950,766.23	408.163.18	Int. 84-0165/84-0620 (438 + 18 - 84-0620)
3900	315.15	6,952,398.21	409,985.05	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0170

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
1030	301.26	6,850,123.10	277,820.53	S.O.L.
1096 + 3	306.02	6,851,275.41	279,358.72	Int. 84-0170/84-0030 (499 + 25 - 84-0030)
1289	308.78	6,854,796.68	284,040.66	
1469	302.85	6,858,056.68	288,358.61	
1615 + 27	295.48	6,860,714.01	291,885.88	Int. 84-0170/84-0040 (305 + 13 - 84-0040)
1778	295.34	6,863,699.98	295,734.63	
1970	297.96	6,867,236.04	300,294.77	
2115	288.06	6,869,910.22	303,735.71	
2247	276.80	6,872,331.23	306,874.38	Int. with Access Road
2312 + 24	276.55	6,873,530.70	308,424.70	Int. 84-0170/84-0050 (1735 + 84-0050)
2433	270.66	6,875,745.70	311,283.69	
2553	278.11	6,877,957.83	314,135.81	
2746	285.97	6,881,512.46	318,723.22	
2899 + 2	274.35	6,884,336.80	322,359.15	Int. 84-0170/84-0060 (1391 + 6 - 84-0060)
2915	275.62	6,884,630.28	322,737.82	
3097	258.66	6,887,979.89	327,068.54	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0190

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
120	265.68	6,827,028.80	215,969.27	S.O.L.
263 + 17	300.74	6,829,963.78	219,132.98	
385 + 20	271.90	6,832,459.63	221,824.64	Int. with Emu-Neale Junction Road
440 + 11	265.42	6,833,577.10	223,029.43	Int. 84-0190/84-0010 (355 + 18 - 84-0010)
551 + 15	259.80	6,835,851.80	225,481.52	Int. with Old Seismic Line
728 + 3	281.30	6,839,461.18	229,372.77	
899	309.64	6,842,960.04	233,130.71	
1117 + 17	284.21	6,847,450.34	237,929.14	
1265 + 2	286.39	6,850,481.94	241,167.25	Int. 84-0190/84-0020 (965 + 4 - 84-0020)
1450 + 11	283.78	6,854,279.37	245,243.46	
1636	278.10	6,858,080.96	249,331.03	
1811 + 15	298.92	6,861,672.08	253,193.46	
1880	275.71	6,863,074.51	254,703.53	Int. with Access Road
1993	285.16	6,865,386.12	257,193.86	
2176 + 4	293.58	6,869,135.39	261,220.97	Int. 84-0190/84-0030 (1347 + 4 - 84-0030)
2265	298.21	6,870,963.66	263,166.99	
2381 + 19	301.76	6,873,367.17	265,719.44	
2558 + 16	319.67	6,877,008.03	269,581.63	
2704 + 19	317.57	6,880,023.50	272,770.03	Int. 84-0190/84-0040 (1210 + 10 - 84-0040)
2904	331.12	6,884,132.19	277,118.36	
3050	332.03	6,887,144.53	280,297.17	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0220

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
123	272.36	6,927,143.96	385,271.31	S.O.L.
203 + 4	271.63	6,929,238.07	384,079.41	Int. 84-0220/84-0165 (2740 + 29 -84-0165)
370 + 15	277.27	6,933,594.77	381,600.28	
534 + 15	280.98	6,937,867.62	379,157.34	
666 + 4	274.59	6,941,295.94	377,197.38	Int. 84-0220/83-0300 (435 + 11 - 83-0300)
869 + 25	272.39	6,946,603.42	374,161.66	Int. 84-0220/84-0320 (242 + 14 - 84-0320)
950	274.43	6,948,689.01	372,967.77	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0240

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	284.49	6,914,267.27	401,660.79	S.O.L.
167 + 5	289.82	6,916,019.07	400,663.26	Int. 84-0240/84-0150 (1070 + 8 - 84-0150)
319	285.40	6,919,941.06	398,348.79	
478	280.32	6,924,051.14	395,922.57	Int. with Middle Bore Access Road
534	285.80	6,925,498.51	395,068.20	
695	320.91	6,929,654.97	392,617.85	
877 + 20	309.27	6,934,378.97	389,843.16	Int. 84-0240/84-0165 (2998 + 7 - 84-0165)
1093	308.94	6,939,952.89	386,588.27	
1223	303.04	6,943,322.36	384,630.28	Bend
1333	308.44	6,946,297.06	383,216.63	Int. 84-0240/83-0300 (765 + 11 - 83-0300)
1485 + 11	309.78	6,950,319.89	381,062.78	Int. 84-0240/84-0320 (504 + 12 - 84-0320)
1550	292.48	6,951,995.49	380,088.64	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0320

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
40	274.49	6,944,054.85	368,652.77	S.O.L.
70 + 9	269.34	6,944,435.07	369,476.56	Int. 84-0320/84-0092 (2162 + 14 - 84-0092)
128 + 7	270.49	6,945,159.91	371,053.40	Int. 84-0320/83-0200 (527 + 23 - 83-0200)
242 + 15	272.39	6,946,603.42	374,161.66	Int. 84-0320/84-0220 (869 + 25 - 84-0220)
401	292.58	6,948,649.19	378,451.23	Bend
504 + 12	309.78	6,950,319.89	381,062.78	Int. 84-0320/84-0240 (1485 + 11 - 84-0240)
579	292.65	6,951,515.45	382,949.26	Int. 84-0320/83-0400 (1335 + 9 - 83-0400)
710	294.01	6,953,633.95	386,274.88	
899 + 10	314.07	6,956,690.24	391,076.23	Int. 84-0320/84-0480 (1608 + 23 - 84-0480)
939 + 29	322.96	6,957,349.14	392,110.70	Fence
960 + 6	325.84	6,957,678.37	392,627.61	Fence
1000	335.66	6,958,319.11	393,633.54	
1130 + 8	306.68	6,960,431.21	396,940.24	Int. 84-0320/83-0600 (518 + 22 - 83-0600)
1211	323.38	6,961,733.19	398,988.82	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0360

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	293.32	6,952,702.98	351,741.07	S.O.L.
291 + 5	301.55	6,956,457.66	356,093.68	Int. 84-0360/84-0088 (783 - 84-0088)
475	298.64	6,960,047.26	360,291.09	
691 + 6	304.74	6,964,274.02	365,225.64	Int. 84-0360/83-0200 (1361 + 14 - 83-0200)
899 +6	302.11	6,968,340.40	369,977.24	Int. 84-0360/83-0400 (2223 + 4 - 83-0400)
1059	317.92	6,971,462.71	373,624.45	
1219 + 11	299.11	6,974,598.48	377,288.46	Int. 84-0360/84-0480 (854 + 25 - 84-0480)
1410	299.43	6,978,324.88	381,637.55	Int. with Stuart Highway
1447 + 1	300.16	6,979,048.01	382,481.60	Int. 84-0360/83-0600 (1502 + 18 - 83-0600)
1564	305.84	6,981,333.61	385,151.58	E.O.L.

APPENDIX VI

L I S T   O F   P E R M A N E N T   M A R K E R S

LINE 84-0400

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
85	254.36	6,906,870.65	422,724.08	S.O.L.
116 + 5	252.36	6,907,533.73	422,065.31	Fence
265	270.05	6,910,700.30	418,924.99	
430	272.54	6,914,217.53	415,441.54	Int. with Stuart Hwy.
520	285.30	6,916,135.52	413,540.18	
655	281.12	6,919,012.42	410,690.56	
724 + 12	277.80	6,920,490.67	409,225.53	Fence
800 + 12	283.53	6,922,108.88	407,620.27	Int. 84-0400/84-0150 (1378 + 8 - 84-0150)
925	302.88	6,924,906.43	405,147.38	
941 + 15	299.00	6,925,276.96	404,819.37	Fence
1060	310.89	6,927,935.08	402,462.59	
1156 + 10	324.11	6,930,097.50	400,547.08	Fence
1200	330.47	6,931,078.84	399,678.97	S.O.L. 83-0400 (230 - 83-0400)
1280	311.40	6,932,873.24	398,085.43	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0480

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	355.99	6,992,545.57	363,473.71	S.O.L.
309 + 6	354.33	6,987,563.05	367,299.18	Int. 84-0480/84-0710 (452 + 28 - 84-0710)
440	338.36	6,984,454.43	369,697.21	
531 + 6	320.22	6,982,285.64	371,368.29	Int. 84-0480/83-0700 (887 + 23 - 83-0700)
595	314.79	6,980,770.68	372,535.20	Int. with Stuart Hwy.
631 + 28	311.82	6,979,893.23	373,210.31	Int. 84-0480/84-0500E (282 + 14 - 84-0500E)
725	303.96	6,977,682.42	374,913.32	
854 + 25	299.11	6,974,598.48	377,288.46	Int. 84-0480/84-0360 (1219 + 11 - 84-0360)
930	306.83	6,972,812.83	378,663.43	
1077	304.09	6,969,321.33	381,352.66	
1250	293.93	6,965,210.85	384,516.64	
1415	304.26	6,961,292.30	387,536.88	
1526 + 15	307.36	6,958,644.51	389,576.98	Fence
1608 + 23	314.07	6,956,690.24	391,076.23	Int. 84-0480/84-0320 (899 + 10 - 84-0320)
1640 + 20	315.98	6,955,934.26	391,666.39	Fence
1758	326.21	6,953,154.81	393,819.28	
1871 + 11	310.32	6,950,471.11	395,904.23	Int. with Track to Stuart Hwy.
1906 + 18	306.62	6,949,634.96	396,550.38	Fence

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0480 (Continued)

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
1934	315.89	6,948,985.28	397,052.44	
2137 + 20	285.97	6,944,171.73	400,790.34	Int. 84-0480/84-0165 (3488 + 11 - 84-0165)
2306	272.09	6,940,189.51	403,884.96	
2460	280.35	6,936,516.78	406,664.28	
2511 + 20	282.69	6,935,280.94	407,596.06	Int. with Track to Wintinnia.
2600 + 8	276.31	6,933,155.61	409,202.46	Fence
2778	290.94	6,928,923.73	412,405.13	Fence
2826	288.74	6,927,774.76	413,274.28	Int. with Stuart Hwy.
2843 + 26	283.93	6,927,351.55	413,696.60	Int. 84-0480/84-0150 (1643 + 12 - 84-0150)
2858	285.77	6,927,010.82	413,854.50	Fence
2940	282.78	6,925,055.94	415,341.87	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0500E

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	326.14	6,978,198.25	368,005.12	S.O.L. (791 + 6 - 83-0500)
167	319.00	6,978,820.52	369,916.67	E.O.L. 83-0500 - 875
282 + 14	311.82	6,979,893.23	373,210.31	Int. 84-0500E/84-0480 (613 + 28 - 84-0480)
387	307.13	6,980,864.64	376,190.98	Int. with Stuart Hwy.
400	307.50	6,980,985.13	376,561.81	E.O.L.

LINE 84-0050W

100	326.19	6,971,312.79	346,796.62	S.O.L.
178 + 10	323.21	6,972,034.51	349,037.25	Int. 84-0500W/84-0088 (213 + 25 - 84-0088)
290	317.10	6,973,065.56	352,228.52	S.O.L. 83-0500 - 100
357	315.51	6,973,685.52	354,143.08	E.O.L. (183 + 18 - 83-0500)

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0600

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	358.62	6,992,718.40	371,842.43	S.O.L.
184 + 24	341.90	6,990,707.81	373,406.02	Int. 84-0600/84-0710 (681 + 20 - 84-0710)
320	328.98	6,987,499.62	375,897.49	
435 + 23	311.11	6,984,753.96	378,030.47	Fence
442 + 26	310.58	6,984,585.56	378,160.83	E.O.L. 83-0600 - 1795
513	306.69	6,982,921.22	379,457.47	E.O.L. (Int. 84-0600/83-0600 & 83-0700)

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0620

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
103	298.46	6,955,944.41	399,532.80	S.O.L.
179 + 25	292.15	6,954,759.68	401,507.63	Int. 84-0620/83-0600 (215 - 83-0600)
235	305.05	6,953,907.83	402,924.67	
271 + 8	301.42	6,953,348.92	403,858.48	Int. with Bore Road
294 + 25	299.62	6,952,985.93	404,464.95	Fence
438 + 18	309.08	6,950,766.23	408,163.18	Int. 84-0620/84-0165 (3818 + 15 - 84-0165)
525	327.01	6,949,527.99	410,431.44	
675	305.93	6,947,481.16	414,433.93	Int. with Stuart Hwy.
865	299.65	6,944,895.42	419,491.95	
1034	276.75	6,942,593.67	423,973.81	
1147	262.13	6,941,059.49	426,961.10	Int. with Access Road.
1200 + 6	239.43	6,940,332.99	428,373.28	Int. 84-0620/84-0150 (2302 + 27 - 84-0150)
1280	243.99	6,939,251.59	430,481.80	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0710

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
105	326.67	6,982,769.38	358,014.58	S.O.L.
156 + 7	330.02	6,983,476.20	359,381.50	Int. 84-0710/83-0400
330	336.77	6,985,871.89	364,020.68	
452 + 28	354.33	6,987,563.05	367,299.18	Int. 84-0710/84-0480 (309 + 6 - 84-0480)
500	329.62	6,988,210.27	368,556.22	
681 + 20	341.90	6,990,707.81	373,406.01	Int. 84-0710/84-0600 (184 + 24 - 84-0600)
757	336.58	6,991,745.51	375,417.70	E.O.L.

APPENDIX VII

LIST OF UPHOLES

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
32	213 (088)	102	100	Int. 500/088	324.90	6,971,894	349,100
33	494	84	80	088	310.28	6,963,494	352,907
40	161	54	50	360	294.59	6,953,352	352,492
39	786 (088)	125	120	Int. 360/088	297.45	6,956,376	356,131
38	495	87	80	360	297.21	6,960,438	360,746
37	691 + 6 (0360)	90	85	360/200	304.74	6,964,274	365,226
29	155/156	74	70	710	330.20	6,983,466	359,362
36	956/957	102	100	360	304.06	6,969,987	371,900
35	852 (480)	104	100	Int. 360/480	299.11	6,974,598	377,288
30	428	132	130	600	311.68	6,986,267	376,858
31	282/281 (500)	104	100	Int. 480/500	311.82	6,979,893	373,210
27	681 (710)	93	90	Int. 600/710	341.90	6,990,708	373,406
28	315/316 (480)	86	80	Int. 710/480	348.64	6,987,414	367,415
26	160	93	90	480	360.69	6,990,589	364,968
42	1440	105	100	480	291.79	6,967,825	382.506

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
46	1601 (480)	134	120	Int. 480/320	314.78	6,956,876	390,940
44	1393	80.5	80	480	301.45	6,961,815	387,134
58	2140	127	120	480	286.09	6,944,113	400,837
52	1871	152	150	480	310.59	6,950,480	395,898
67	2400	201	195	480	279.40	6,937,937	405,595
84	2845	167	160	480	285.18	6,927,321	413,619
75	2612	157	150	480	280.46	6,932,882	409,409
82	1960	157	150	150	266.26	6,933,593	420,708
81	1200 (620)	200	195	Int. 150/620	239.43	6,940,333	428,373
57	440 (620)	149	140	Int. 620/165	310.33	6,950,747	408,195
51	180	135	130	620	292.15	6,954,760	401,508
66	673	174	170	620/Stuart Hwy.	305.99	6,947,508	414,381
45	1130/1129	134	130	Int. 320/600	306.68	6,960,431	396,940
47	690/689	164	160	320	292.50	6,953,304	385,756
59	3171/3172 (0165)	138	130	Int. 400/165	302.17	6,937,848	393,716

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
71	1202/1203	156	150	092	255.51	6,920,216	384,994
87	742 (092)	102	100	Int. 092/150	260.06	6,908,596	392,425
88	475 (150)	77	75	Int. 150/090	250.99	6,904,234	387,243
78	969/970	84	80	092	253.63	6,914,340	388,756
96	147	124	120	092	356.85	6,893,576	402,018
93	453	108	105	092	259.66	6,901,301	397,085
92	183/182	156	150	0400	259.77	6,908,945	420,664
85	800 (400)	156	150	Int. 150/400	283.53	6,922,109	407,620
91	388	174	170	0400	270.84	6,913,323	416,329
90	595	166	160	0400	283.44	6,917,733	411,956
62	1450	155	150	Int. 0165/0092	260.03	6,926,478	380,976
86	167	156	150	0150	230.92	6,898,126	380,265
77	390	131	125	0240	282.48	6,921,777	397,265
53	1115/1116	157	150	0240	298.72	6,940,536	386,249
48	505/506	187	180	0320	309.37	6,950,333	381.092

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
49	341/342	126	120	0320	283.63	6,947,881	376,843
50	71	143	140	Int. 0092/0320	268.34	6,944,435	369,477
59	3171/3172	134	130	Int. 0165/0400	302.17	6,937,848	393,716
74	164 [Reshoot]	68	65	0088	324.65	6,973,397	348,416
69	638	119	115	0240	293.59	6,928,185	393.484
61	2742 (0165)	126	120	Int. 0165/0220	272.55	6,929,258	384,102
54	423	138	130	0220	271.86	6,934,964	380,817
60	2998 (0165)	187	180	Int. 0165/0240	309.27	6,934,379	389,843
95	206	156	150	0085	233.90	6,891,353	384,716
89	477 (0085)	144	140	Int. 0085/0150	233.01	6,898,255	380,414
80	106	122	120	0085	230.80	6,888,806	386,299
73	921	126	120	0085	236.36	6,909,609	373,468
64	2090	137	135	Int. 0085/0165	247.90	6,916,297	369,484
55	1692	138	130	0092	261.63	6,932,566	377,073
65	872/873 [Reshoot]	111	105	0360	306.28	6,967,817	369,366

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
76	1005	164	160	0400	300.12	6,926,702	403,557
68	1223	174	170	0400	322.43	6,931,595	399,220
94	666 (0220)	71	70	Int. 0300/0220	274.59	6,941,296	377,197
107	1181 + 5	94	90	Int. 0165/0070	272.80	6,898,094	349,116
79	433	156	150	0090	240.41	6,909,727	383,677
56	1125	138	130	0090	248.29	6,927,187	372,402
72	680	138	130	0090	246.21	6,915,943	379,644
83	1334 (0240)	156	150	Int. 0300/240	308.44	6,946,324	383,201
178	220	156	150	0320	273.38	6,946,313	373,554
99	775 (0080)	138	135	Int. 0165/0080	241.72	6,908,781	361,089
103	1450	138	130	0165	251.70	6,903,470	355,144
98	928	138	130	0080	251.99	6,912,617	358,557
101	363	138	130	0080	226.86	6,898,483	367,910
100	573	138	130	0080	245.36	6,903,736	364,434
102	159	126	120	0080	221.90	6,893,382	371,288

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
97	1089	103	100	0080	258.99	6,916,655	355,899
70	230 [Reshoot]	123	120	0500 E	314.48	6,979,406	371,714
108	671	134	130	0070	242.92	6,891,304	352,465
106	1154	138	130	0070	285.51	6,904,296	346,035
105	1398	144	140	0070	277.33	6,910,852	342,769
109	415	138	130	0070	215.05	6,884,454	355,940
110	164	126	120	0070	215.88	6,877,733	359,341
104	1642	144	140	0070	278.22	6,917,418	339,525
112	684/685	84	80	0165	269.60	6,887,976	338,183
113	436/437	105	100	0165	264.72	6,883,032	332,621
116	187 (0165)	60.6	60	Int. 0165/0060	243.79	6,878,078	327,021
111	938	94	90	0165	258.52	6,893,226	343,681
118	558	138	130	0060	236.60	6,864,263	337,295
117	841	114	110	0060	232.68	6,871,081	332,222
122	2265	114	110	0050	263.44	6,886,084	298,809

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
123	1991	114	110	0050	239.65	6,879,593	303,780
125	1483	114	110	0050	268.92	6,867,544	312,998
126	1231	124	120	0050	254.52	6,861,555	317,570
127	981	114	110	0050	257.34	6,855,584	322,115
128	724	114	110	Int. 0050/0110	246.83	6,849,450	326,814
176	455	102	100	0050	235.66	6,842,965	331,788
119	269	114	110	Int. 0060/0110	228.10	6,857,305	342,472
177	167	114	110	0050	217.34	6,836,085	337,050
149	1890	102	100	0190	274.87	6,863,282	254,927
142	2177 (0190)	104	100	Int. 0190/0030	293.58	6,869,135	261,221
139	2046	84	80	0030	342.86	6,883,872	246,239
141	1583	84	80	0030	292.87	6,874,115	256,166
140	1825	62	60	0030	311.09	6,879,211	250,982
143	1066	124	120	0030	291.16	6,863,211	267,243
144	778	61.8	60	0030	285.57	6,857,142	273,409

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
146	204	125	120	0030	287.09	6,845,034	285,694
134	907	126	120	0040	290.71	6,873,474	279,100
135	609	126	120	0040	286.63	6,867,137	285,413
129	2089/2090	114	110	0170	281.11	6,869,441	303,132
124	1735 (0050)	124	120	Int. 0050/0170	276.55	6,873,531	308,425
130	1856	114	110	0170	292.80	6,865,140	297,589
121	2595	126	120	0170	268.46	6,878,733	315,137
115	1391 (0050)	126	120	Int. 0060/0170	274.35	6,884,337	322,359
133	1208 (0040)	66	60	Int. 0040/0190	311.99	6,879,974	272,818
131	2981	66	60	0190	326.95	6,885,722	278,796
138	2433	72	70	0190	296.58	6,872,310	264,597
132	1432	72	70	0040	305.46	6,884,787	268,140
136	305 (0040)	114	110	Int. 0040/0170	295.48	6,860,714	291,886
137	1355	92	90	0170	301.81	6,855,994	285,624
145	1095 (0170)	102	100	Int. 0170/0030	306.17	6,851,296	279,382

APPENDIX VII

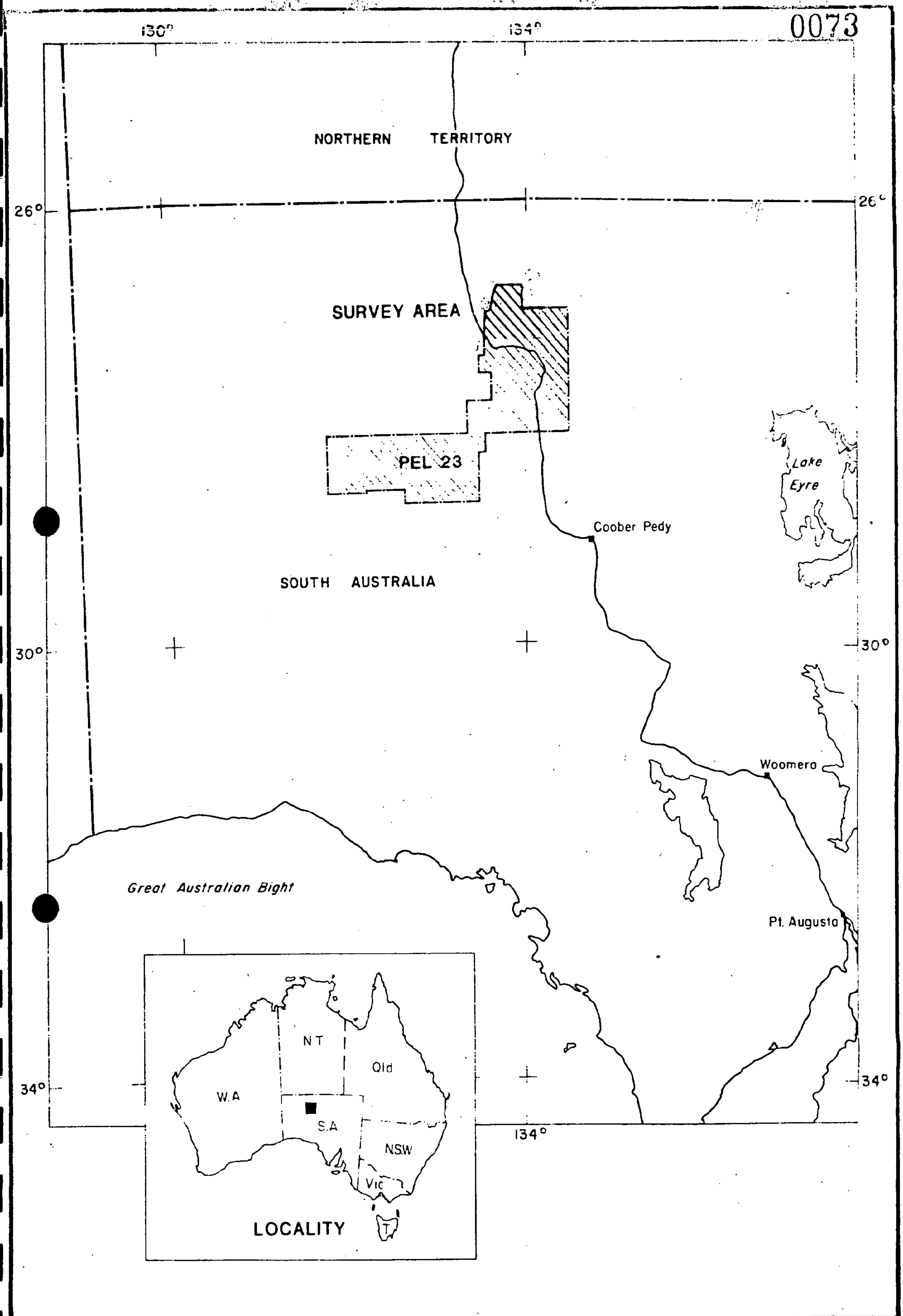
LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
160	2541	74	70	0020	369.31	6,883,602	207,293
151	2285	52	50	0020	353.73	6,878,242	212,811
152	2035	52	50	0020	314.13	6,873,000	218,188
153	1767	74	70	0020	312.79	6,867,365	223,960
154	1497	74	70	0020	294.06	6,861,959	229,477
155	1232	66	60	0020	263.41	6,856,099	235,447
156	965 (0020)	63	60	Int. 0020/0190	286.39	6,850,482	241,167
157	689	62	60	0020	306.68	6,844,652	247,084
158	433	54	50	0020	297.80	6,839,413	252,396
159	165	84	80	0020	317.77	6,833,735	258,158
150	1581	84	80	0190	272.15	6,856,955	248,120
168	183	72	70	0190	278.02	6,828,310	217,349
166	441 (0190)	72	70	Int. 0190/0010	265.42	6,833,577	223,029
162	724	83	80	0190	275.75	6,839,378	229,283
161	994	84	80	0190	279.70	6,844,912	235,219

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
167	178	72	70	0010	261.81	6,829,231	226,140
165	638	84	80	0010	253.12	6,840,484	218,096
164	913	96	90	0010	258.42	6,847,471	213,684
163	1191	52	50	0010	305.82	6,854,560	209,259
171	1483	84	80	0010	309.67	6,861,996	204,611
172	1758	83	80	0010	335.62	6,869,003	200,226
173	2035	84	80	0010	351.50	6,876,050	195,774
174	2323	84	80	0010	310.62	6,884,329	190,504



PETTY RAY GEOPHYSICAL

LOCATION MAP

Figure 1

0074

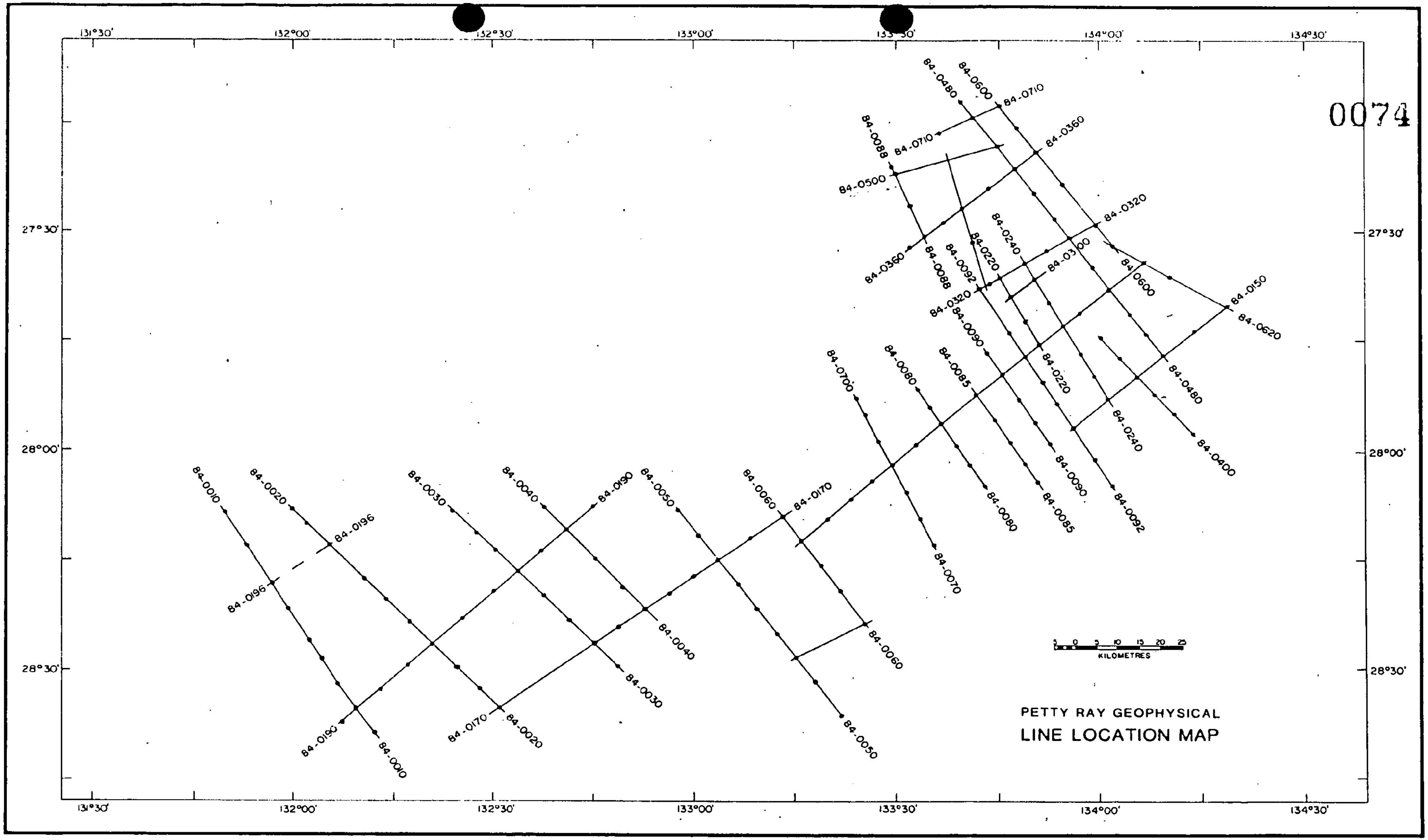
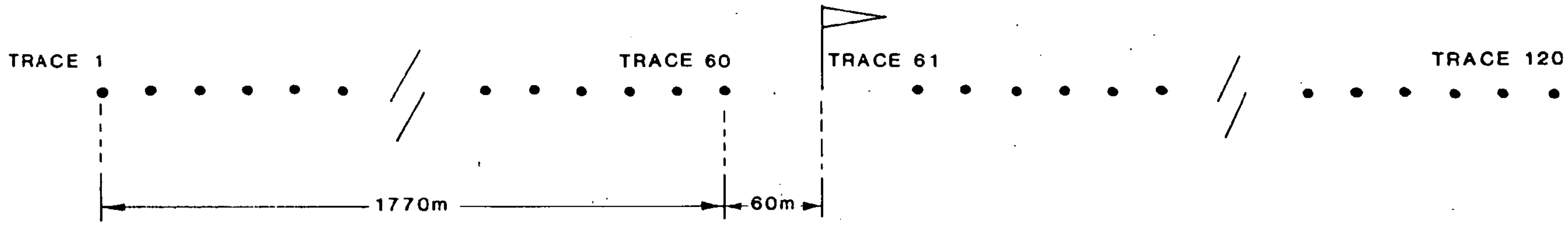


FIGURE 2.



1830-60-0-60-1830

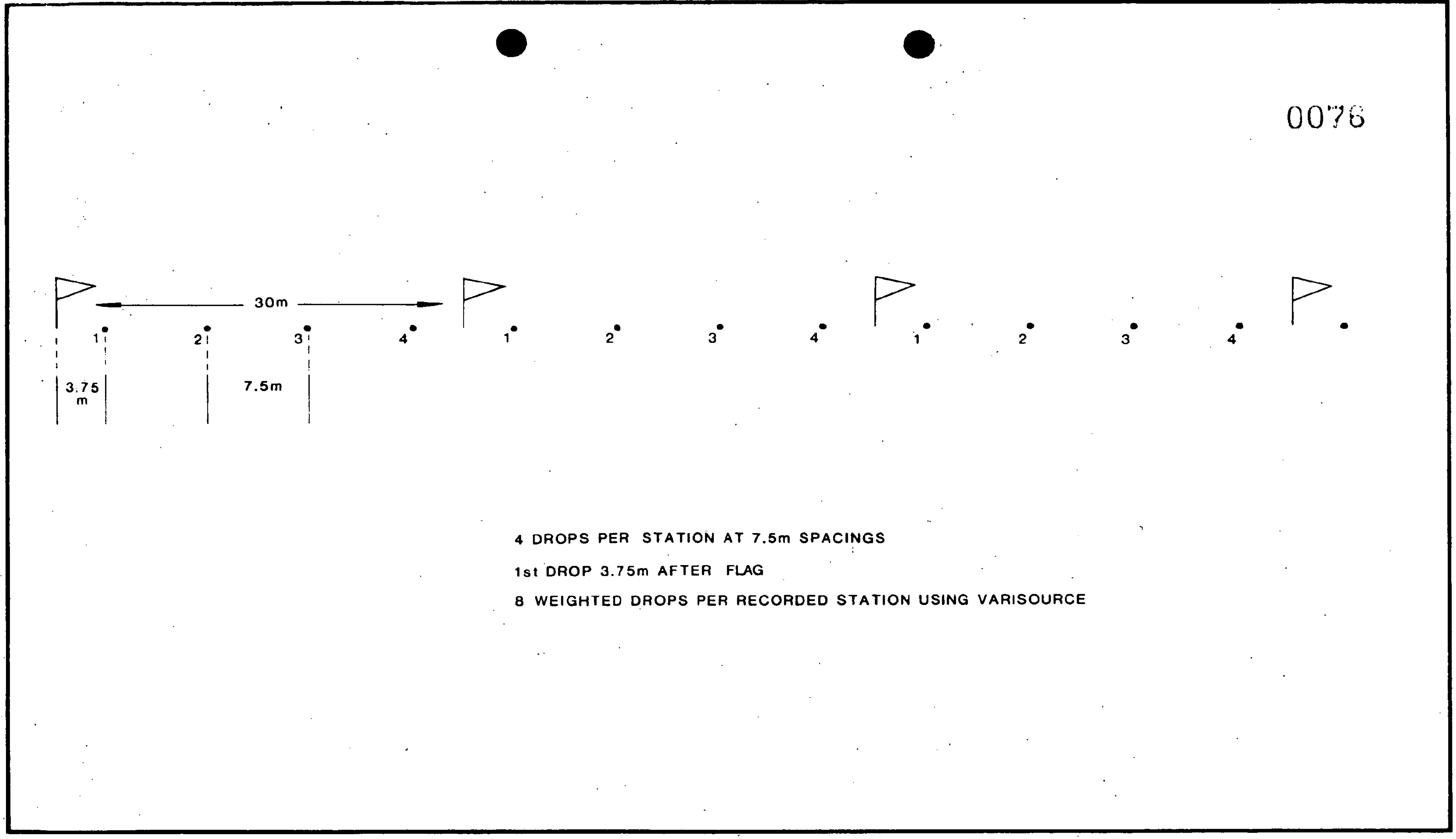
60-60

SYMMETRICAL SPLIT SPREAD

PETTY RAY GEOPHYSICAL

SPREAD DIAGRAM

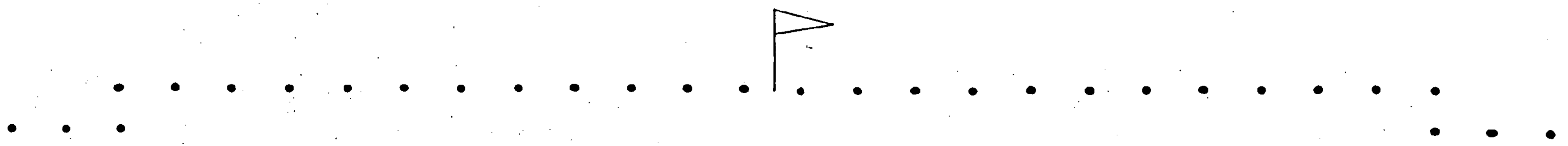
Figure 3



PETTY RAY GEOPHYSICAL

SOURCE ARRAY

Figure 4

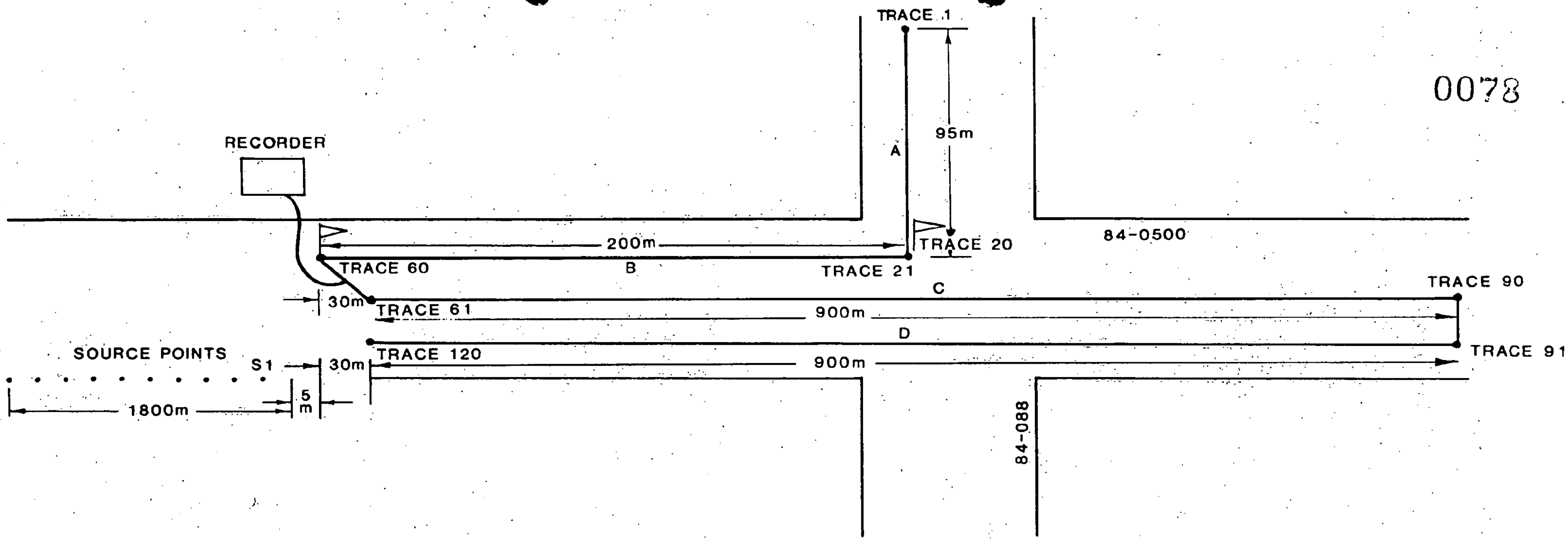


STATION INTERVAL 30m
24 GEOPHONES/TRACE IN LINE ALONG LINE 1.25m SPACING
2 STRINGS, 12 PHONES/STRING, SERIES SERIES CONNECTED
TYPE SM-4, 10Hz, COIL RESISTANCE 335ohm

PETTY RAY GEOPHYSICAL

RECEIVER ARRAY

Figure 5



0078

A. 20 GROUPS OF 12 GEOPHONES BUNCHED at 5m SEPARATION

B. 40 GROUPS OF 12 GEOPHONES BUNCHED at 5m SEPARATION

C. 30 GROUPS OF 24 GEOPHONES OVER 30m (at 1.3m SEPARATION) CENTERED ON FLAG 30m APART

D. 30 GROUPS OF 24 GEOPHONES OVER 60m (at 2.6m SEPARATION) CENTERED ON FLAG 30m APART

SOURCE POINTS at 5-15m 52-205m 5-3-405m 5-4-605m 5-5-805m 5-6-1005m 5-7-1205m 5-8-1405m 5-9-1605m 5-10-1805m FROM TRACE 60

N.B. SOURCE POINT10 PACED DISTANCE ONLY , NOT SURVEYED

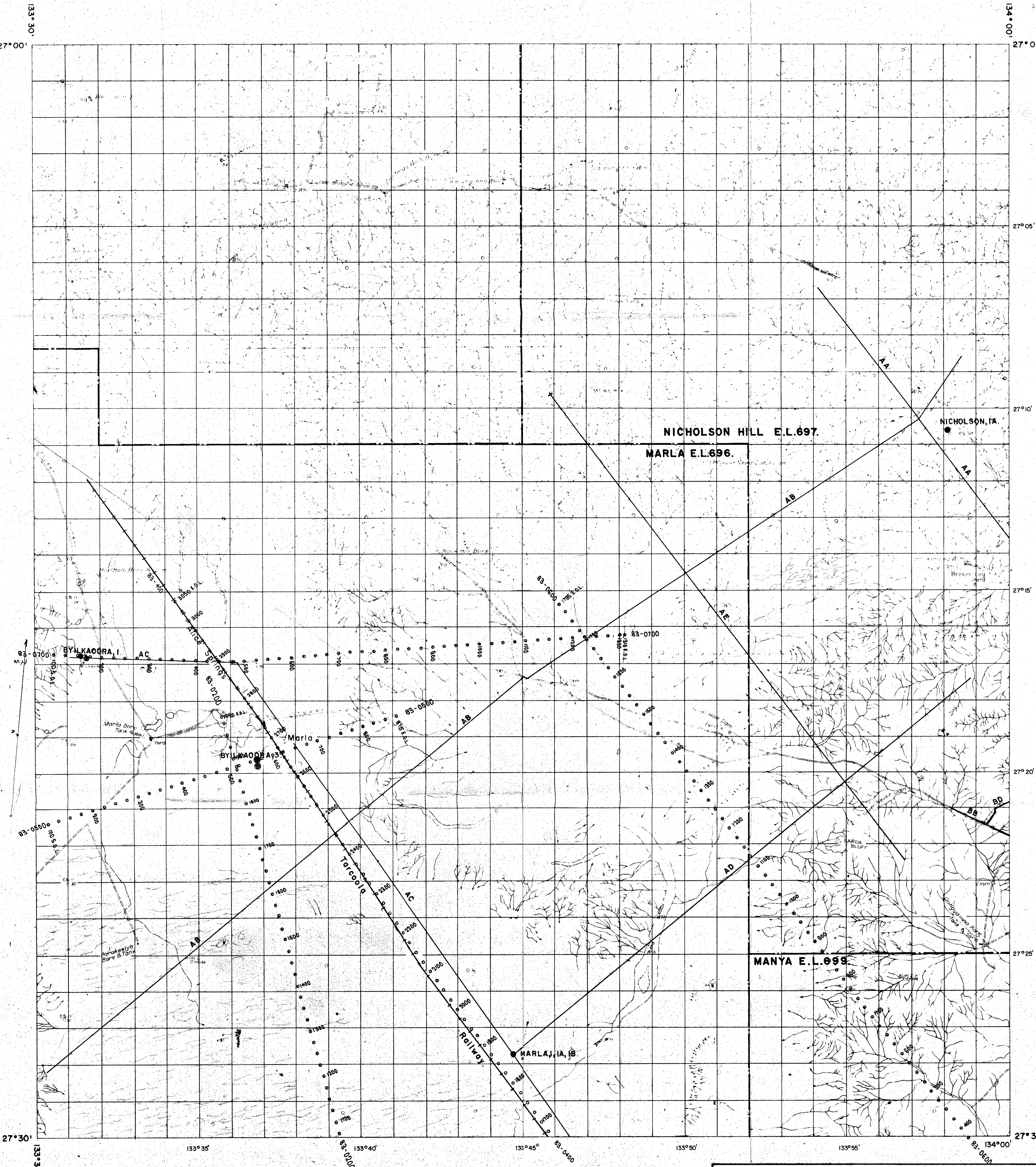
NOT TO SCALE

COMPLETED APRIL 2, 1984

PETTY RAY GEOPHYSICAL

NOISE STUDY AT INTERSECTION OF 84-0500 & 84-088

Figure 6.



MARLA
5643

SCALE — 1:100000

KILOMETRES 0 2 4 6 8 10 KILOMETRES

● Comalco drill hole.

Comalco E.L. boundary.

Comalco survey line.

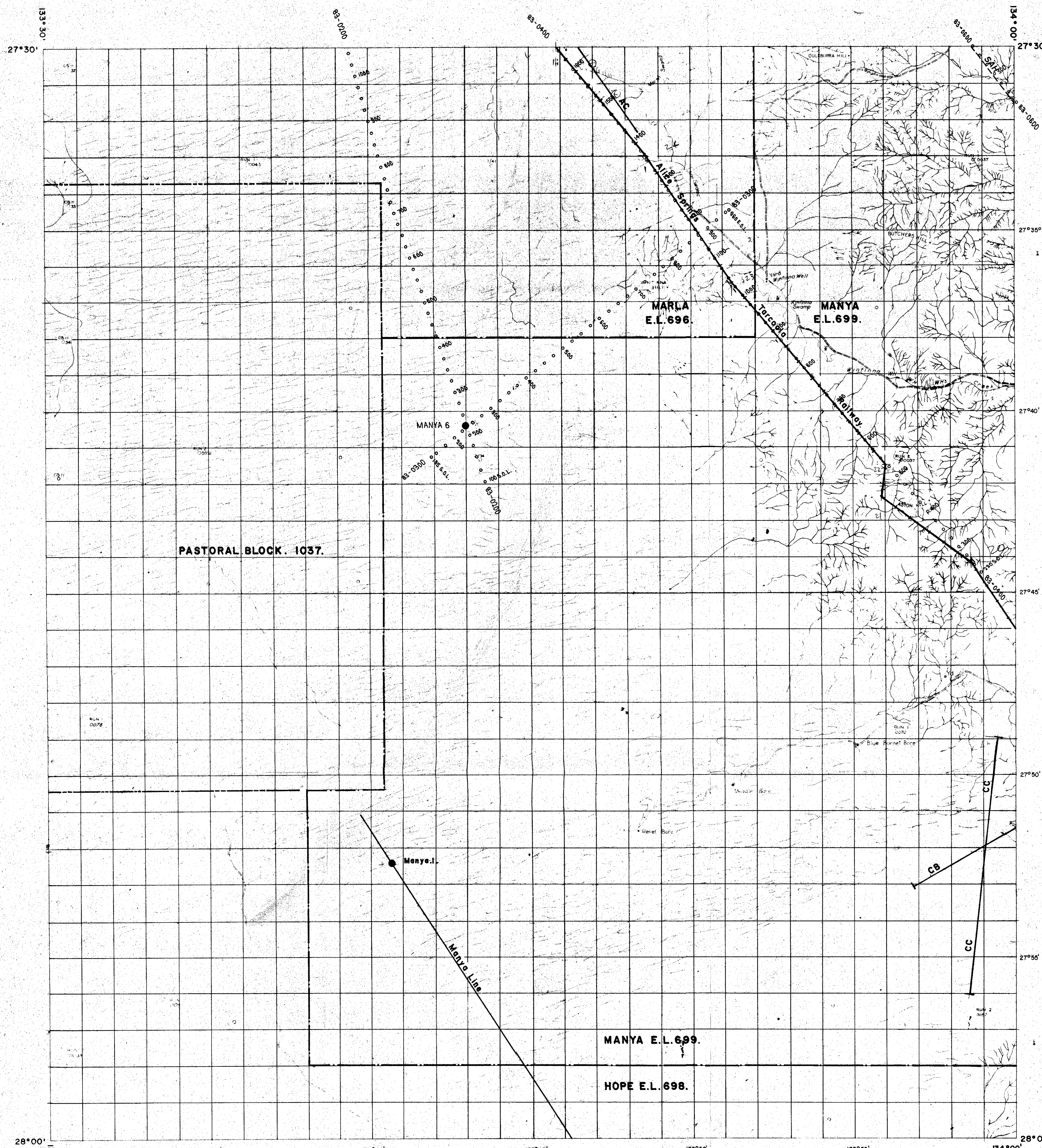
COMALCO ALUMINIUM LIMITED

MARLA.SA.
P.E.L. 23.

SEISMIC SHOTPOINT LOCATION MAP

6165-1

Compiled: S.A. Mines Dep't	Revised: B.F. Brady	Drawn: B.F. Brady
Date:	Scale: 1:100,000	Drg. No. SA-83-544

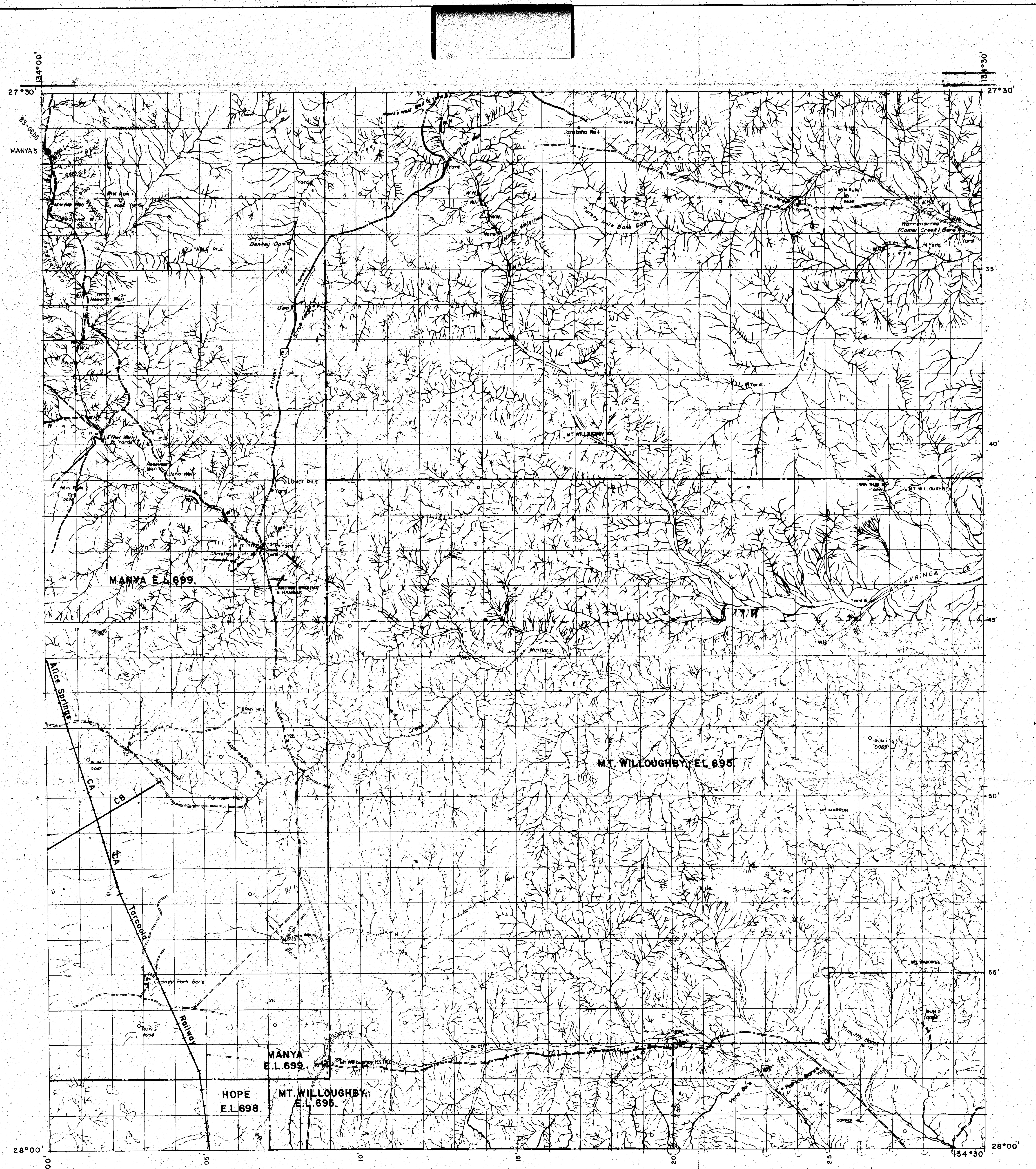


OULDBURRA
5642

SCALE — 1:100 000
KILOMETRES 0 2 4 6 8 10 KILOMETRES

● Comalco drill hole.
Comalco E.L. boundary.
CB Comalco survey line.

COMALCO ALUMINIUM LIMITED		
MARLA. S.A. P.E.L. 23. SEISMIC SHOTPOINT LOCATION MAP		6165-2
Compiled: SA Mines Dep't.	Revised: B.F. Brady.	Drawn: B.F. Brady.
Date:	Scale: 1:100,000	Drg. No: SA-83-543



WINTINNA
5742

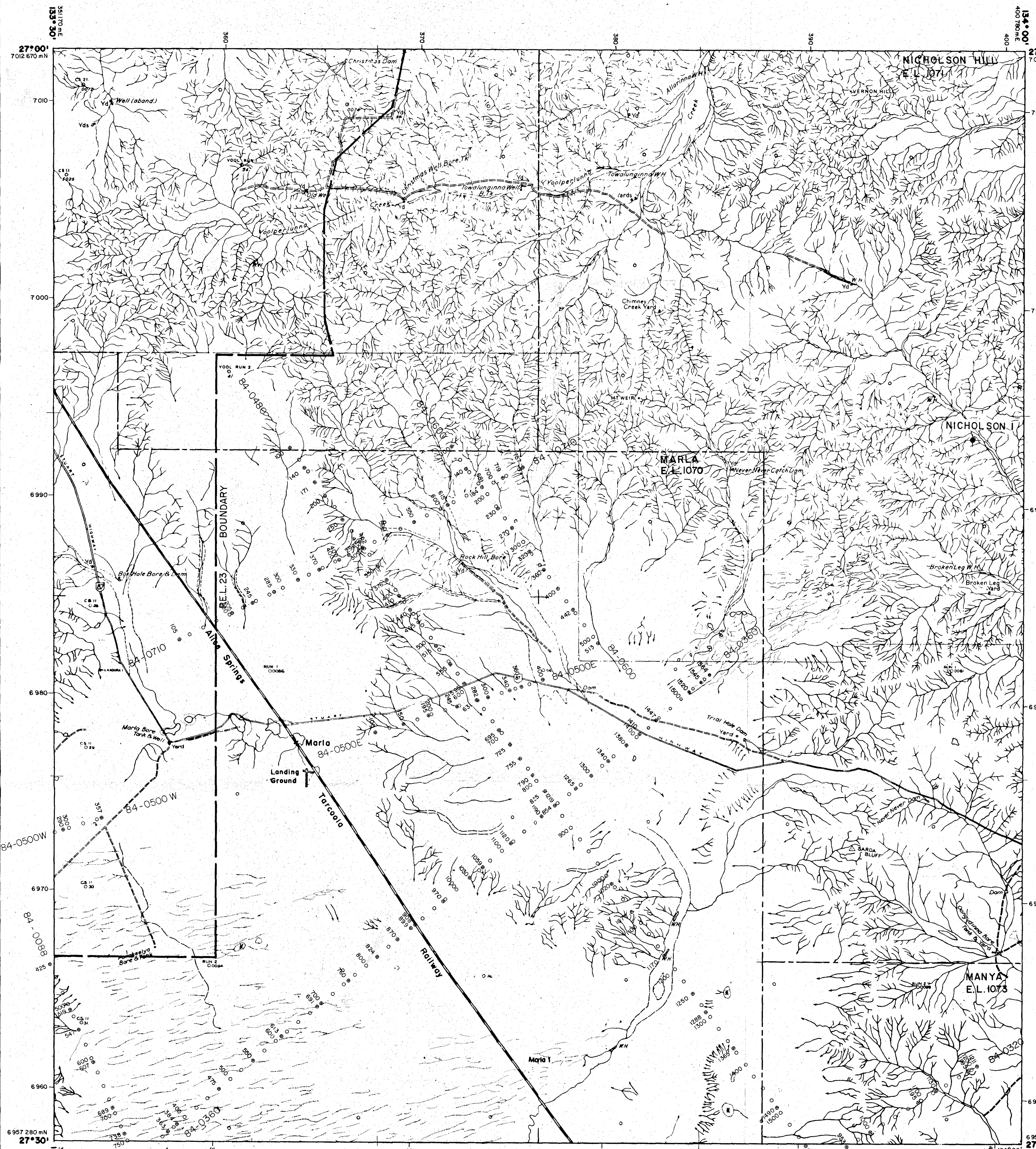
SCALE- 1:100,000
0 2 4 6 8 10 KILOMETRES

Comalco E.L. Boundary
CA Comalco survey lines.

COMALCO ALUMINIUM LIMITED
MARLA.SA.
P.E.L. 23.
SEISMIC SHOTPOINT LOCATION MAP

6165-3

Compiled. S.A Mines Dept.	Revised B. F. Brady.	Drawn. B. F. Brady
Date.	Scale. 1:100,000	Drg No SA-83-545



INDEX

MARLA	WELBOURN	TODMORDEN
WINTINNA		
OULDBURRA	WINTINNA	ARCKARINGA

SCALE — 1:100 000

KILOMETRES 0 2 4 6 8 10

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

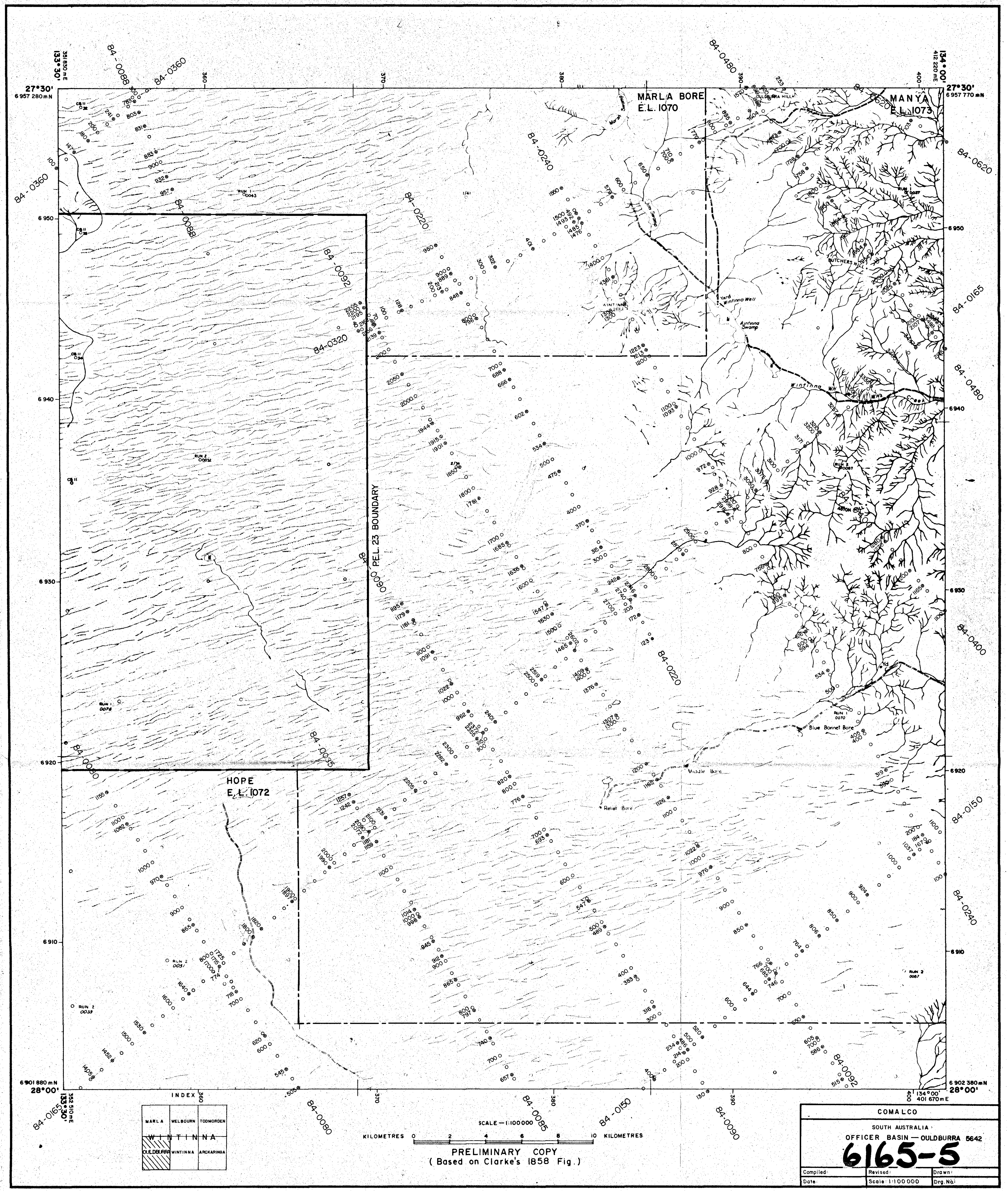
COMALCO

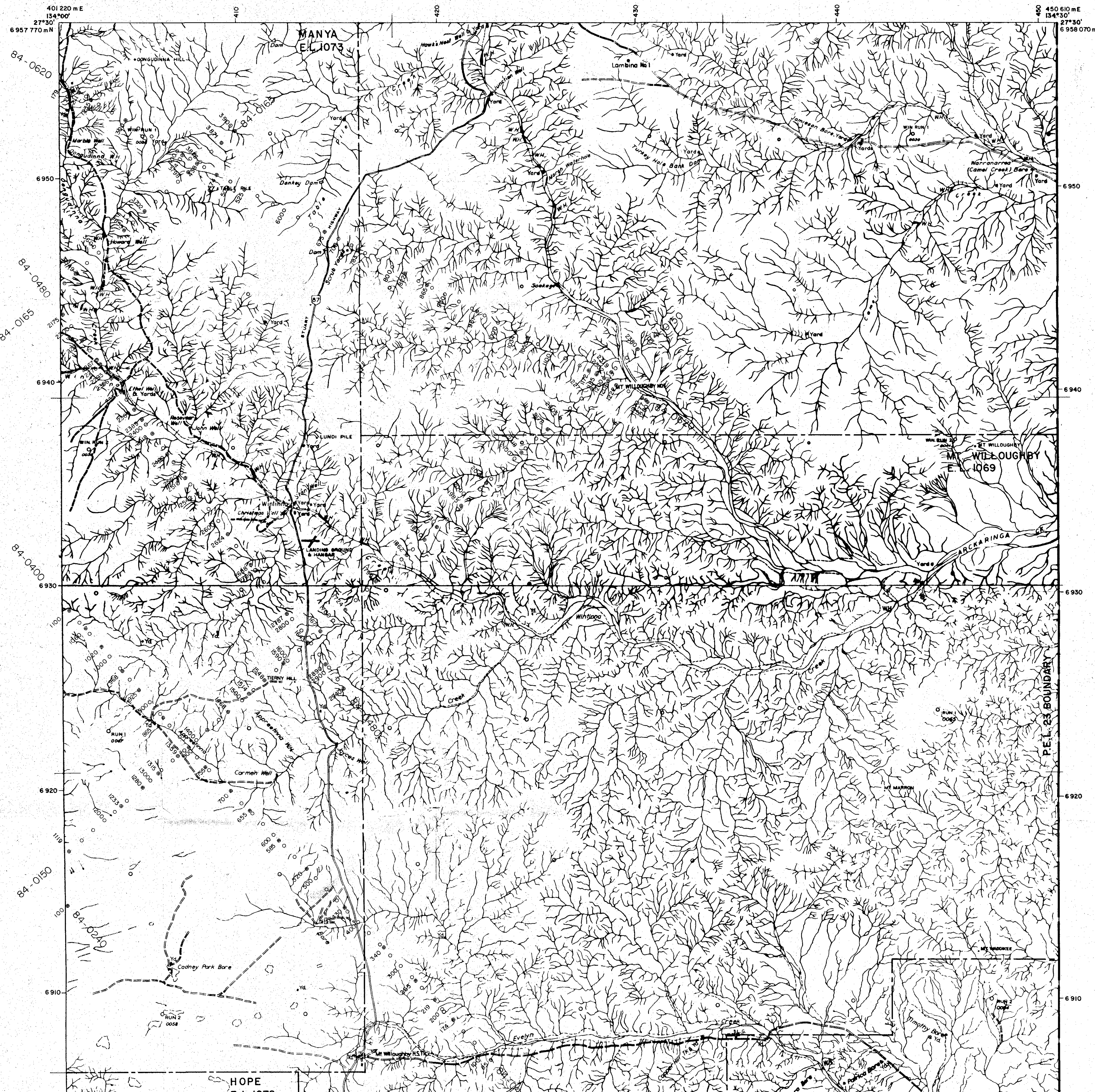
SOUTH AUSTRALIA

OFFICER BASIN — MARLA 5643

6165-4

Compiled:	Revised:	Drawn:
Date:	Scale: 1:100 000	Drg. No.:


MARLA BORE
E.L. 1070
MANYA
E.L. 1073
HOPE
E.L. 1072
PEL 23 BOUNDARY
Wintinna Well
Wintinna Swamp
BUTCHERS HILL
OULDBURRA HILL
Blue Bonnet Bore
Middle Bore
Relief Bore
84-0360
84-0088
84-0092
84-0320
84-0220
84-0240
84-0480
84-0620
84-0165
84-0400
84-0150
84-0080
84-0085
84-0090
27°30'
28°00'
133°30'
134°00'
INDEX
MARLA
WELBOURN
TODMORDEN
WINTINNA
OULDBURRA
ARCKARINGA
SCALE — 1:100 000
KILOMETRES 0 2 4 6 8 10 KILOMETRES
PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)
COMALCO
SOUTH AUSTRALIA
OFFICER BASIN — OULDBURRA 5642
6165-5
Compiled:
Revised:
Drawn:
Date:
Scale: 1:100 000
Drg. No:



INDEX

MARLA	WELBOURN	TOOMORDEN
WINTINNA		
OULDBURRA	WINTINNA	ARCKARINGA

SCALE 1:100 000

KILOMETRES 0 2 4 6 8 10 KILOMETRES

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

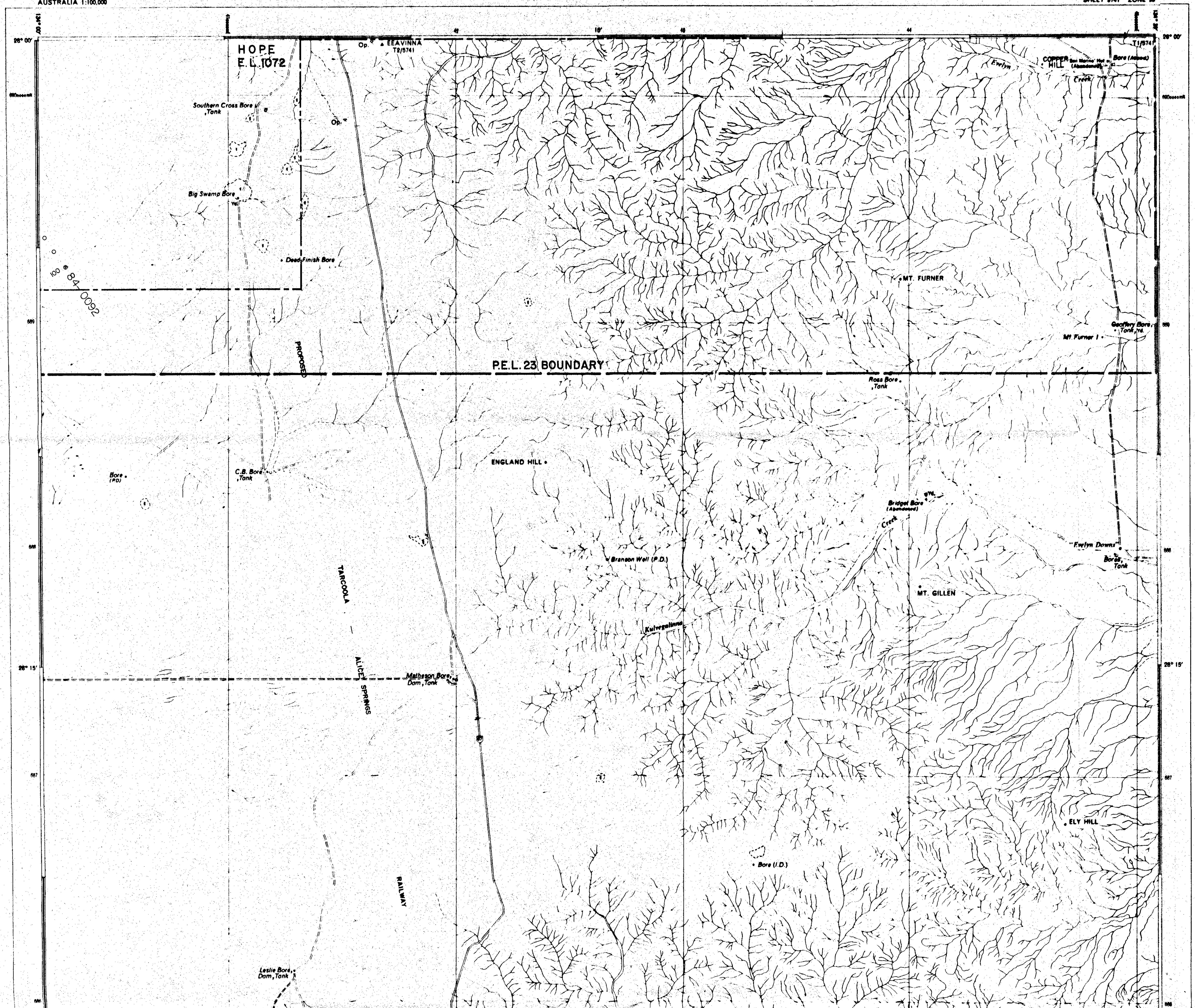
COMALCO		
SOUTH AUSTRALIA		
OFFICER BASIN — WINTINNA 5742		
6165-6		
Compiled:	Revised:	Drawn:
Date: October, 1981.	Scale: 1:100 000	Drg. No.:

MURLOOCOPPIE

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA
DEPARTMENT OF MINES, ADELAIDE

AUSTRALIA 1:100,000

SHEET 5741 ZONE 53



HEAD STATION, OUT STATION, HUT	
NATIONAL ROUTE NUMBER	
HIGHWAY OR MAIN ROAD	
SECONDARY ROAD	
TRACK	
TRACK ALONG BOUNDARY FENCE	
RAILWAY AND STATION	
RAILWAY AND SIDING	
VERMIN OR DOG PROOF FENCE	
POWER TRANSMISSION LINE	
MINE & PROSPECT OR MINERAL OCCURRENCE	
QUARRY	
YARD	
TRIG STATION	
IDENTIFIED HILL OR MOUNTAIN	
FERRY	
LIGHTHOUSE OR BEACON	
REEF	
TANK, BORE, WELL	
SPRING	
WATERHOLE	
DAM	
EPHEMERAL STREAM CHANNEL	
OUTWASH OR FLOOD PLAIN	
CLAY PAN, SALT PAN, SWAMP	
MANGROVE	
SAND DUNES	
ARTESIAN BORE	
OIL BORES	
GAS	
OIL AND GAS	
OIL	
DRY	
STRATIGRAPHIC	

INDEX TO ADJOINING SHEETS

NAARACK	MURLOOCOPPIE	MIRACKINA
YARLE	MABEL CREEK	ALGEBUCKINA

SCALE:— 1:100 000

MILES — KILOMETRES

TRANSVERSE MERCATOR PROJECTION

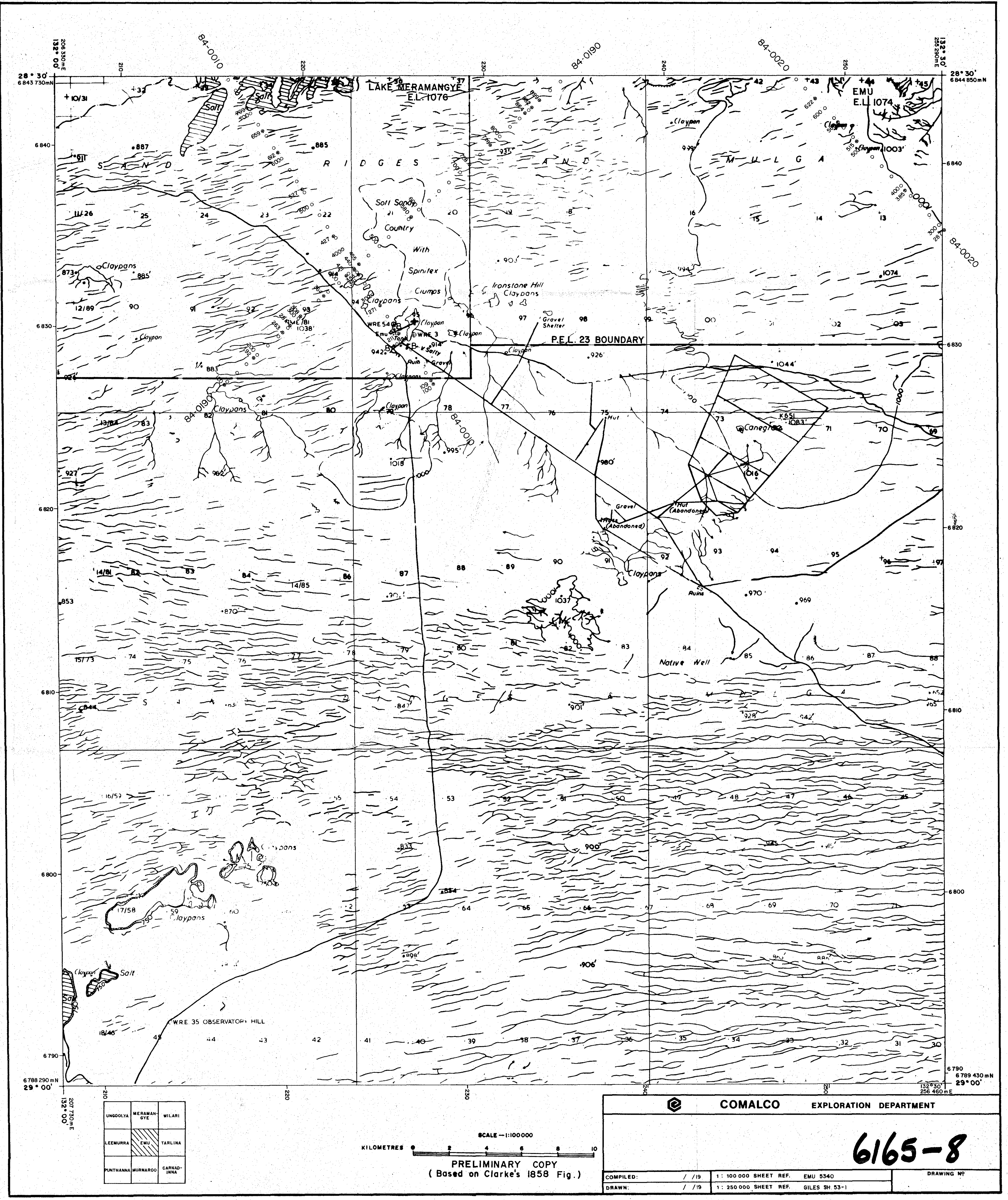
HORIZONTAL DATUM: AUSTRALIAN GEODETIC DATUM 1966

Planimetric information prepared by Department of Mines, South Australia, using slotted template assembly of [illegible] and [illegible] aerial photography flown by Department of Lands, South Australia.
Based on survey control established by Department of Lands, South Australia.

GRID LINES ARE 10,000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID, ZONE 53

COMALCO EXPLORATION DEPARTMENT

COMPILED:	/ /19	1:100 000 SHEET REF. MURLOOCOPPIE 5741	DRAWING Nº
DRAWN:	/ /19	1:250 000 SHEET REF. MURLOOCOPPIE SH.53-2	6165-7


LAKE MERAMANGYE
E.L. 1076
EMU
E.L. 1074
SAND RIDGES AND MULGA
Salt
Claypan
Claypans
Salt Sand Country With Spinifex Clumps
Ironstone Hill
Gravel Shelter
P.E.L. 23 BOUNDARY
WRE 54
WRE 3
Emu
Ruin
Hut
Hut (Abandoned)
Gravel
Canegrass
K651
Ruins
Native Well
WRE 35 OBSERVATORY HILL
84-0010
84-0190
84-0020
28° 30'
29° 00'
132° 00'
132° 30'
6 843 730 mN
6 844 850 mN
6 788 290 mN
6 789 430 mN
206 330 mE
255 290 mE
207 730 mE
256 460 mE
UNGOOLYA
MERAMANGYE
WILARI
LEEMURRA
EMU
TARLINA
PUNTHANNA
MURNAROO
CARNADINNA
SCALE - 1:100 000
KILOMETRES 0 2 4 6 8 10
PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)
COMALCO
EXPLORATION DEPARTMENT
6165-8
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1 : 250 000 SHEET REF. GILES SH 53-1
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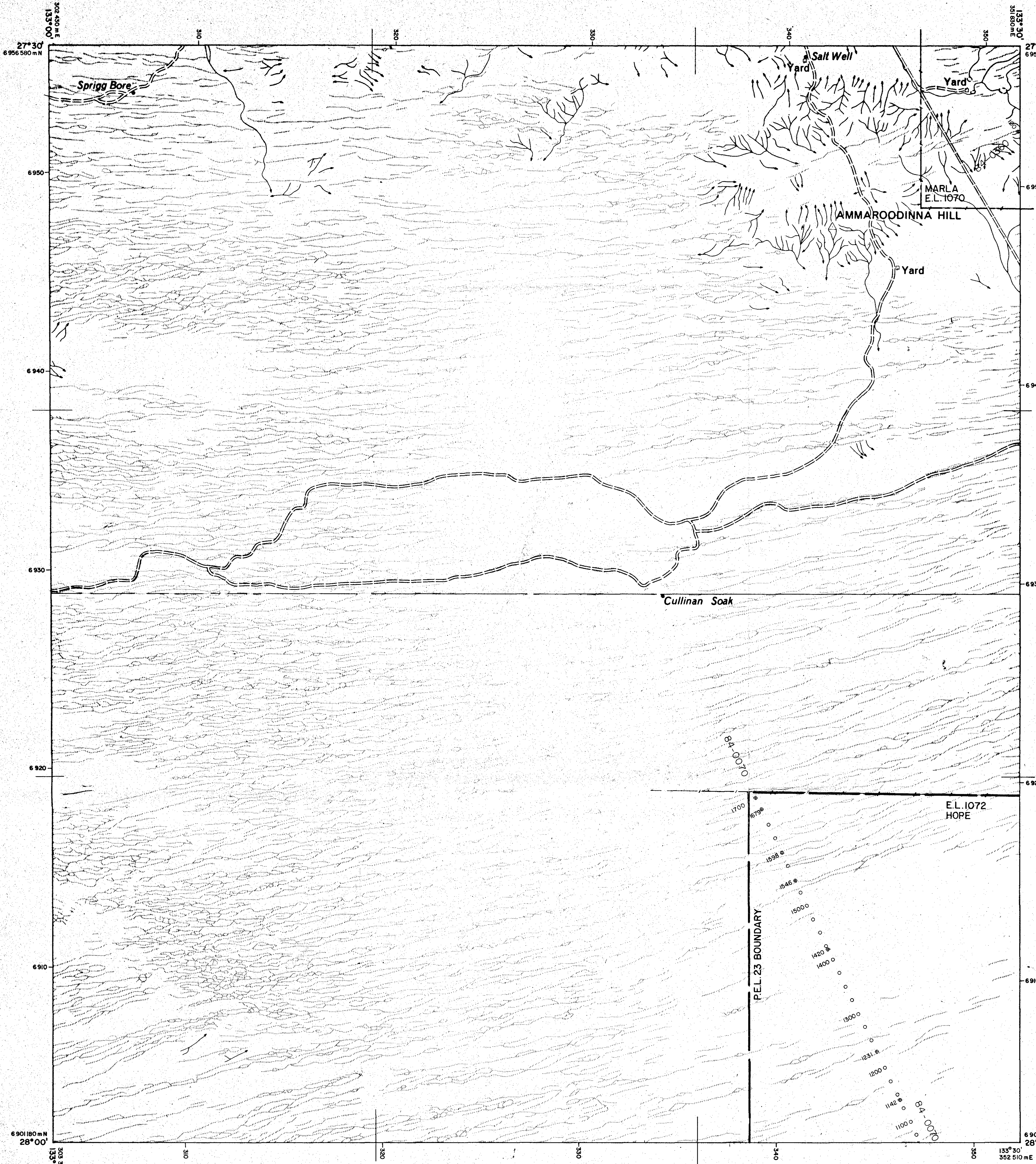

ETITINNA	WANTA-PELLA	MARLA
OOLARINNA	AMMA-ROODINNA	OULDBURRA
WILARI	MAMALLA	NAARACK

SCALE — 1:100 000

KILOMETRES 0 2 4 6 8 10

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

COMALCO EXPLORATION DEPARTMENT

6165-9

DRAWING Nº

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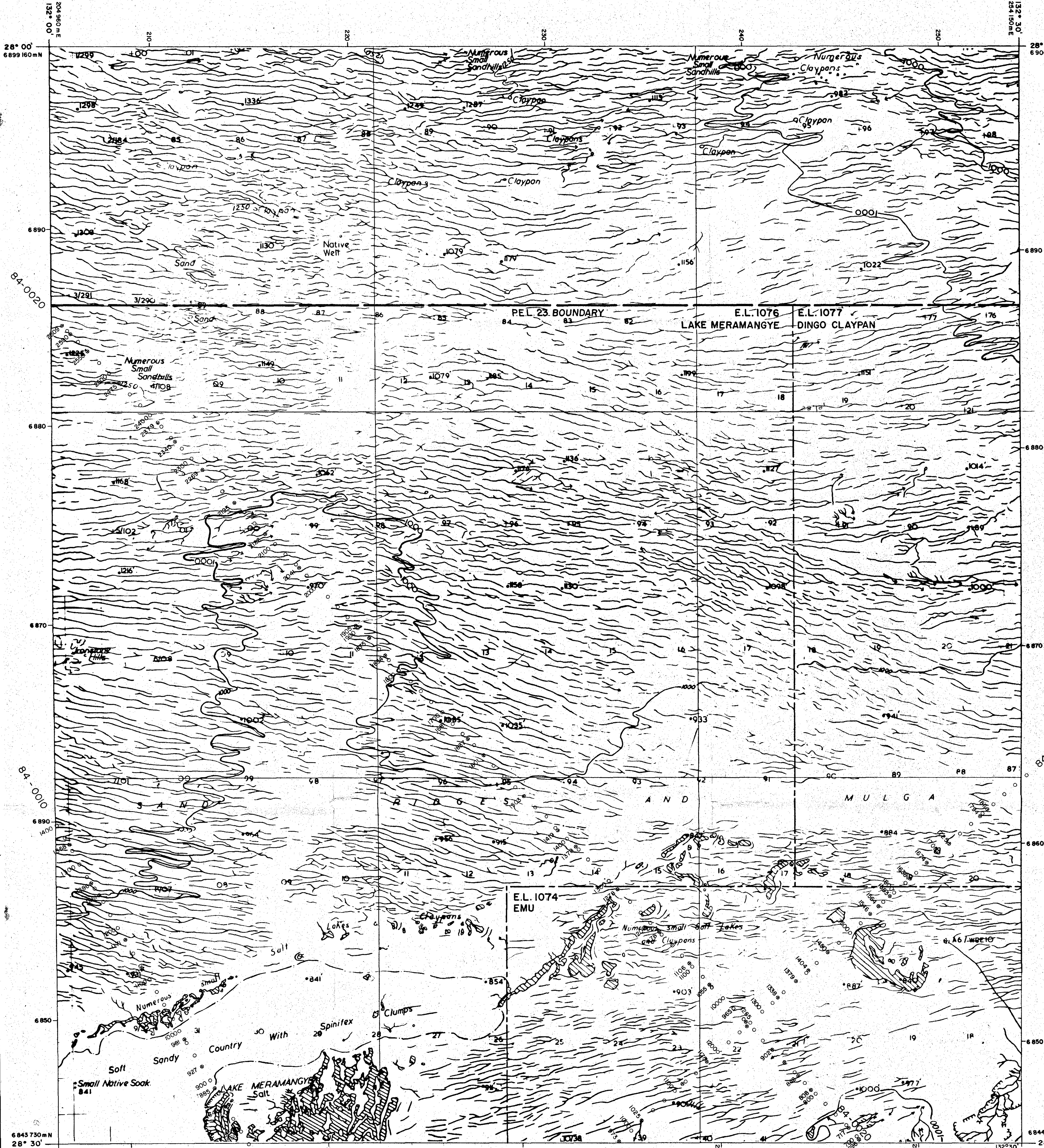

INDEX

Meramangye	WILARI	MAMALLA
G	I L	E S
EMU	TARLINA	ALINYA

SCALE — 1:100000

KILOMETRES 0 2 4 6 8 10

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

COMALCO EXPLORATION DEPARTMENT

6165-10

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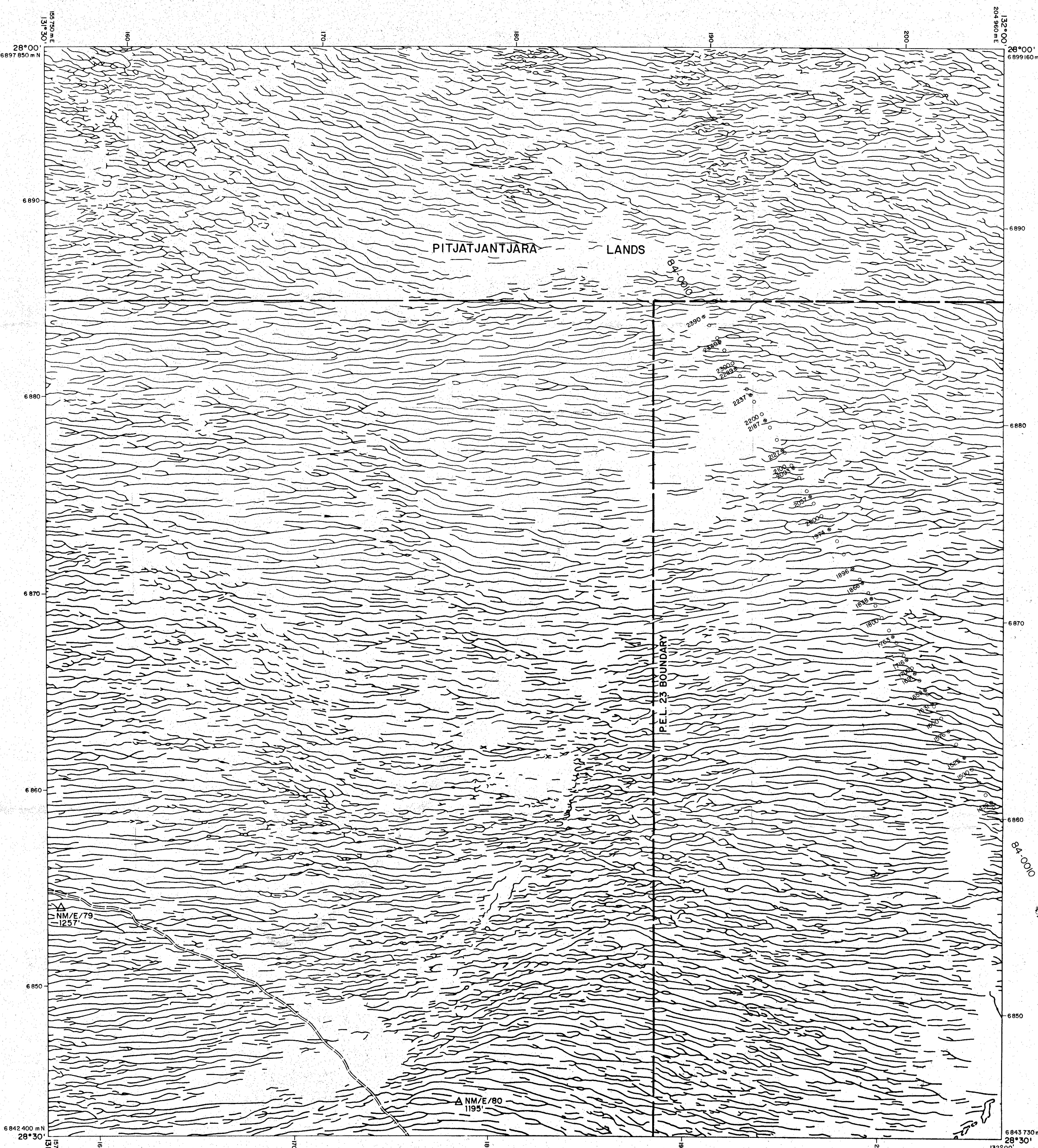

SCALE 1:100 000

KILOMETRES 0 2 4 6 8 10

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

WRIGHT	TANANA	NARANA
PUPILLA	UNGOOLYA	MERAMANGYE
MENA	LEEMURRA	EMU

COMALCO EXPLORATION DEPARTMENT

6165-11

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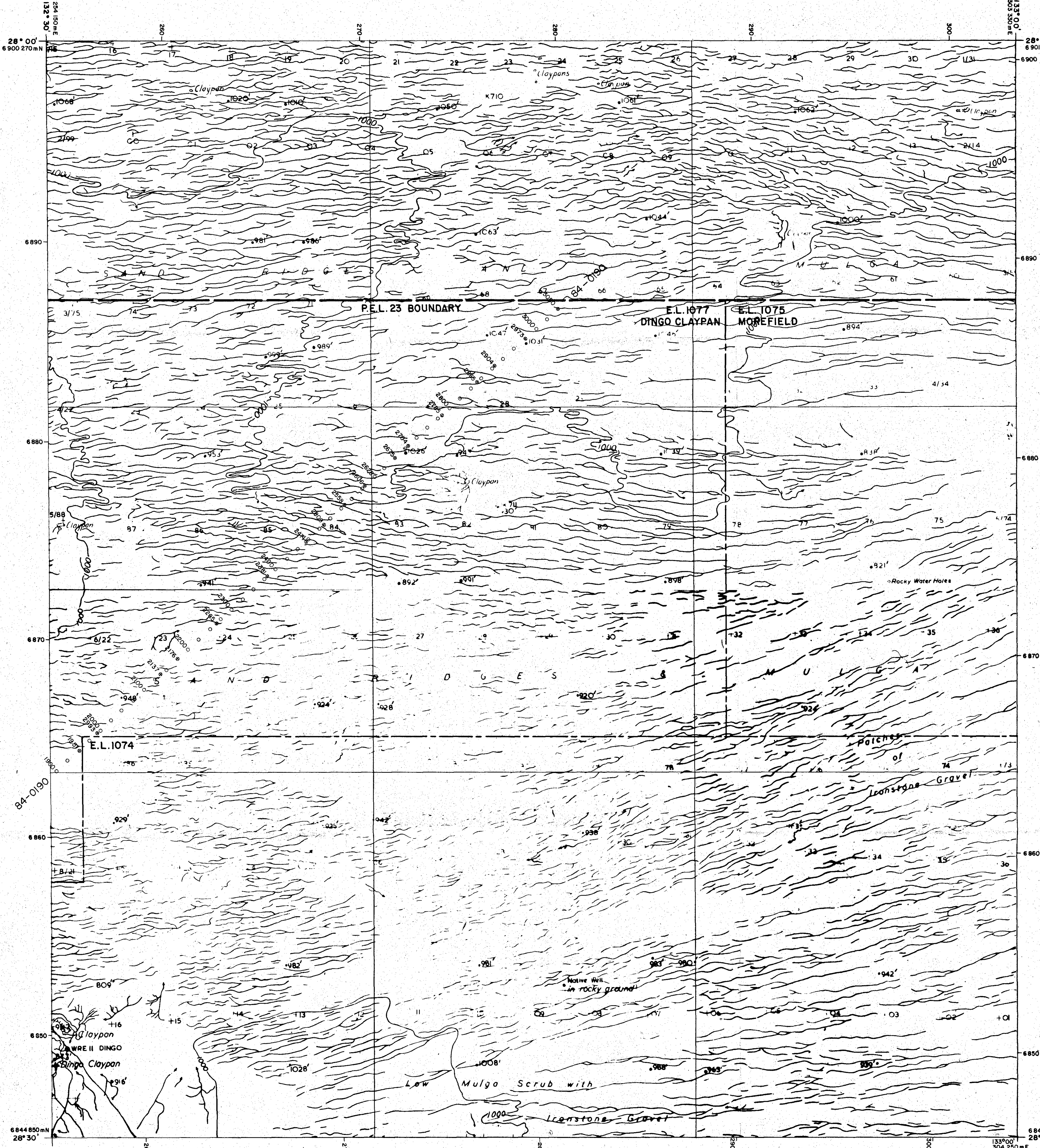
DRAWING No



INDEX

MERAMANGYE	WILARI	MAMALLA
G	I L	E S
EMU	TARLINA	ALINYA

SCALE – 1:100 000

KILOMETRES 0 2 4 6 8 10

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

COMALCO EXPLORATION DEPARTMENT

6165-12

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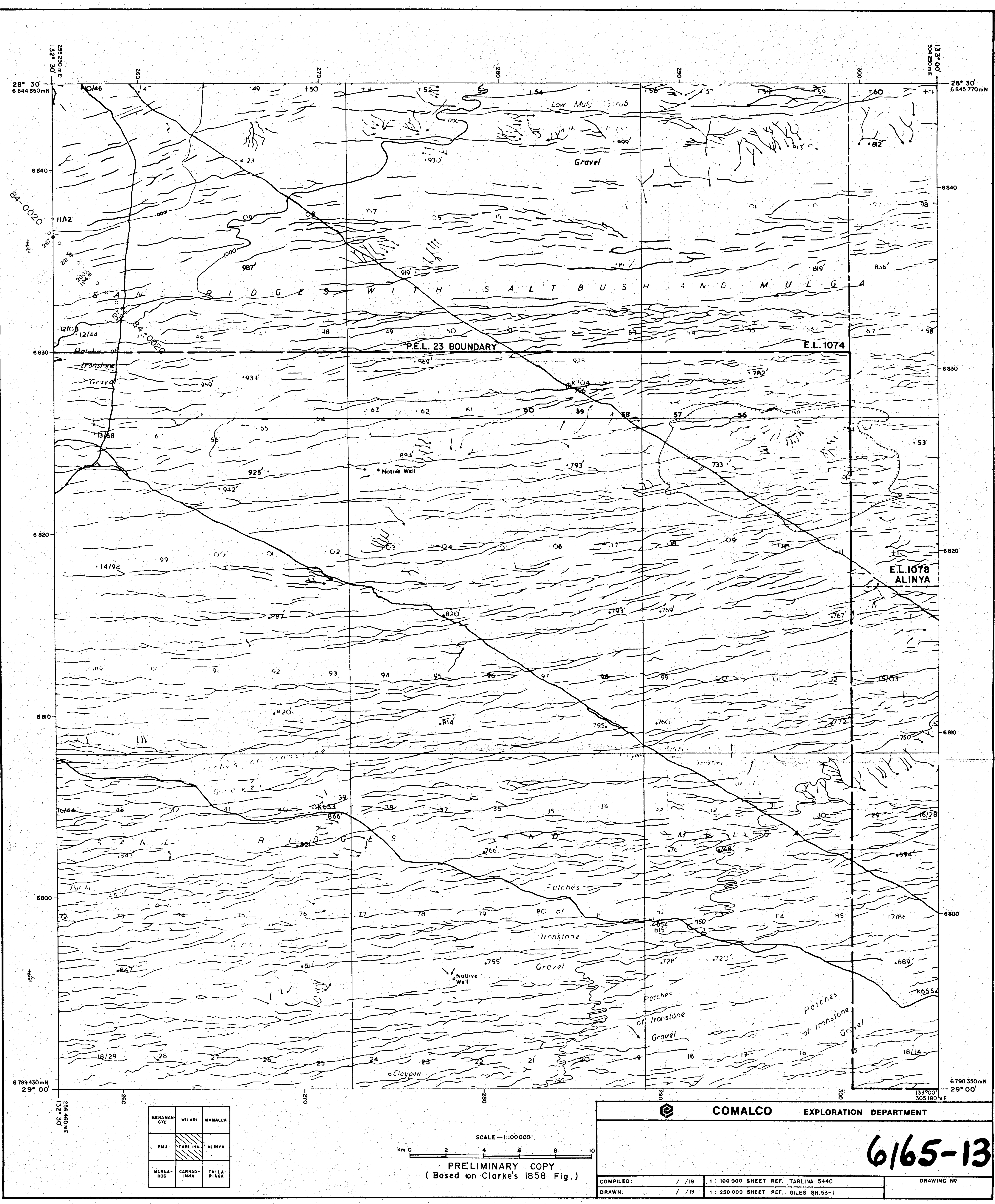

SAND RIDGES WITH SALTBUSH AND MULGA
P.E.L. 23 BOUNDARY
E.L. 1074
E.L. 1078
ALINYA
84-0020
Low Mulga Scrub
Gravel
Native Well
Patches of Ironstone Gravel
Claypan
28° 30'
29° 00'
132° 30'
133° 00'
6 844 850 mN
6 845 770 mN
6 789 430 mN
6 790 350 mN
255 290 mE
304 250 mE
256 460 mE
305 180 mE
MERAMANGYE
WILARI
MAMALLA
EMU
TARLINA
ALINYA
MURNAROO
CARNADINNA
TALLARINGA
SCALE — 1:100 000
Km 0 2 4 6 8 10
PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)
COMALCO
EXPLORATION DEPARTMENT
6165-13
COMPILED: / /19
DRAWN: / /19
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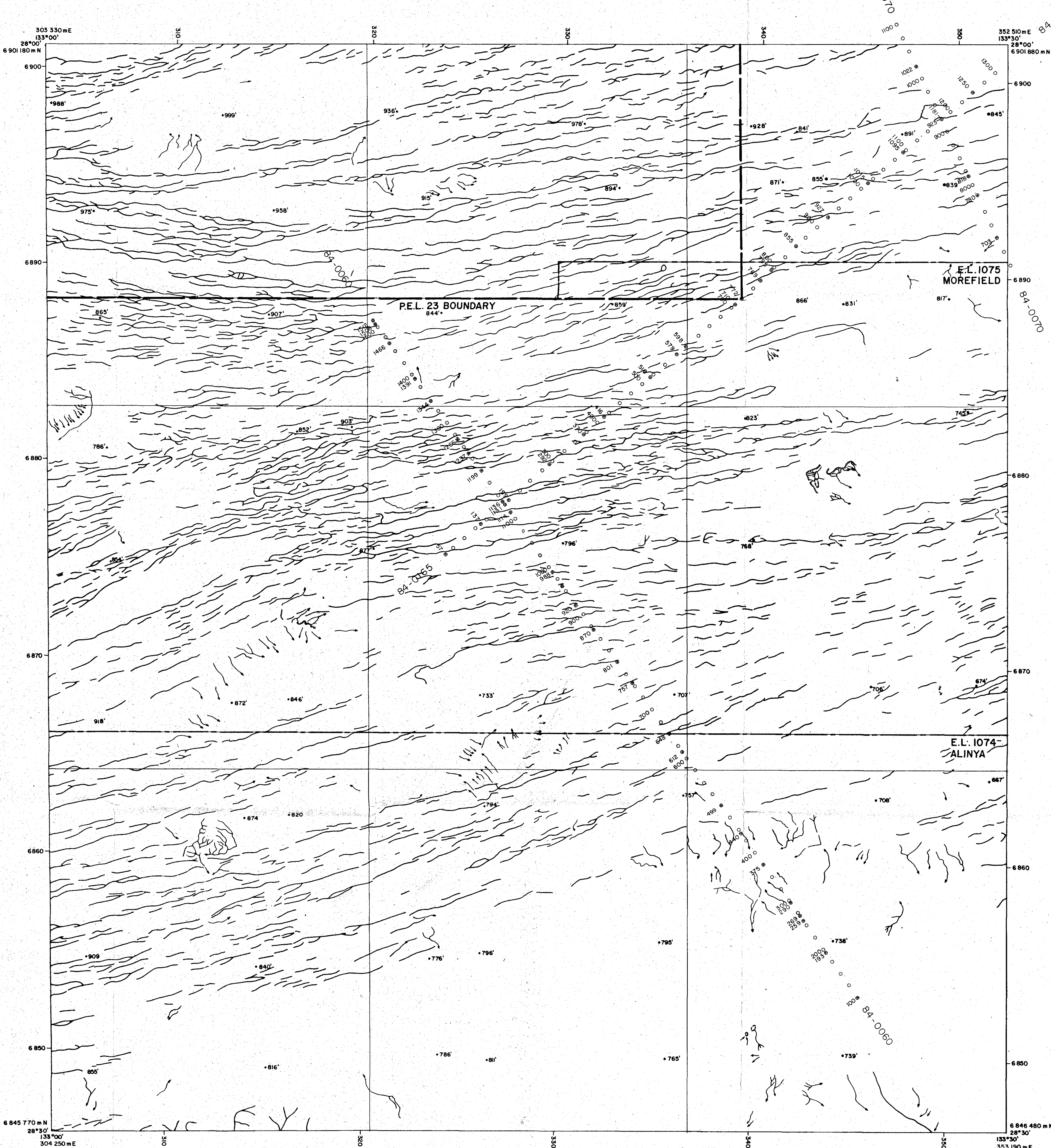
1 : 250 000 SHEET REF. GILES SH.53-1
DRAWING No



SCALE 1:100 000

KILOMETRES 0 2 4 6 8 10 KM

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

COLARINNA	AMMA-ROODINNA	OULDBURRA
WILARI	MAMALLA	NAARACK
YARLINA	ALINYA	YARLIE

COMALCO EXPLORATION DEPARTMENT

6165-14

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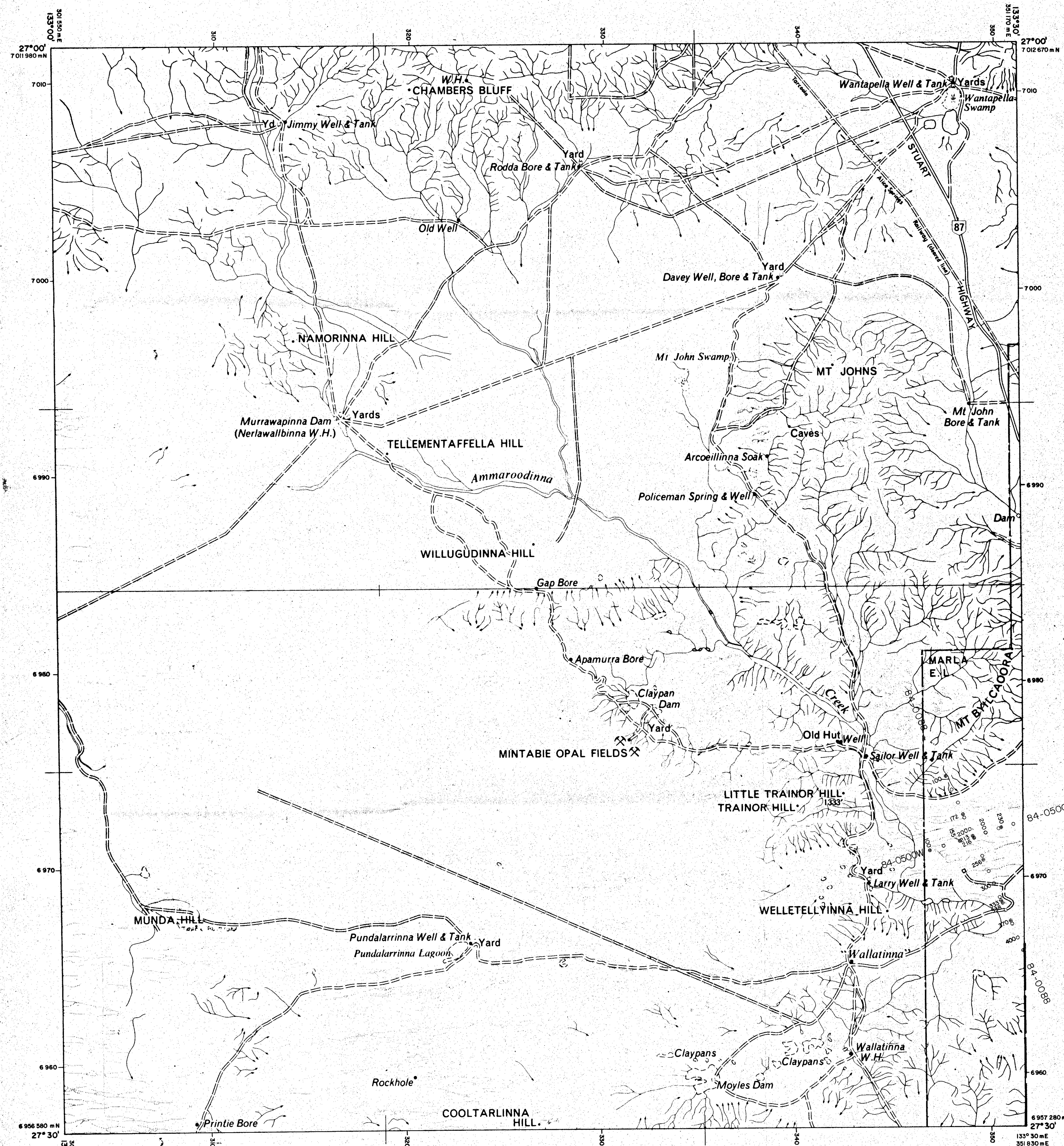

MOORIL-YANNA	AGNES CREEK	UNGALOOT-ANNA
ETITINNA	WANTA-PELLA	MARLA
DOLARINNA	AMMA-ROODINNA	OULDBURRA

SCALE — 1:100 000

KILOMETRES 0 2 4 6 8 10

PRELIMINARY COPY
(Based on Clarke's 1858 Fig.)

COMALCO EXPLORATION DEPARTMENT

6165-15

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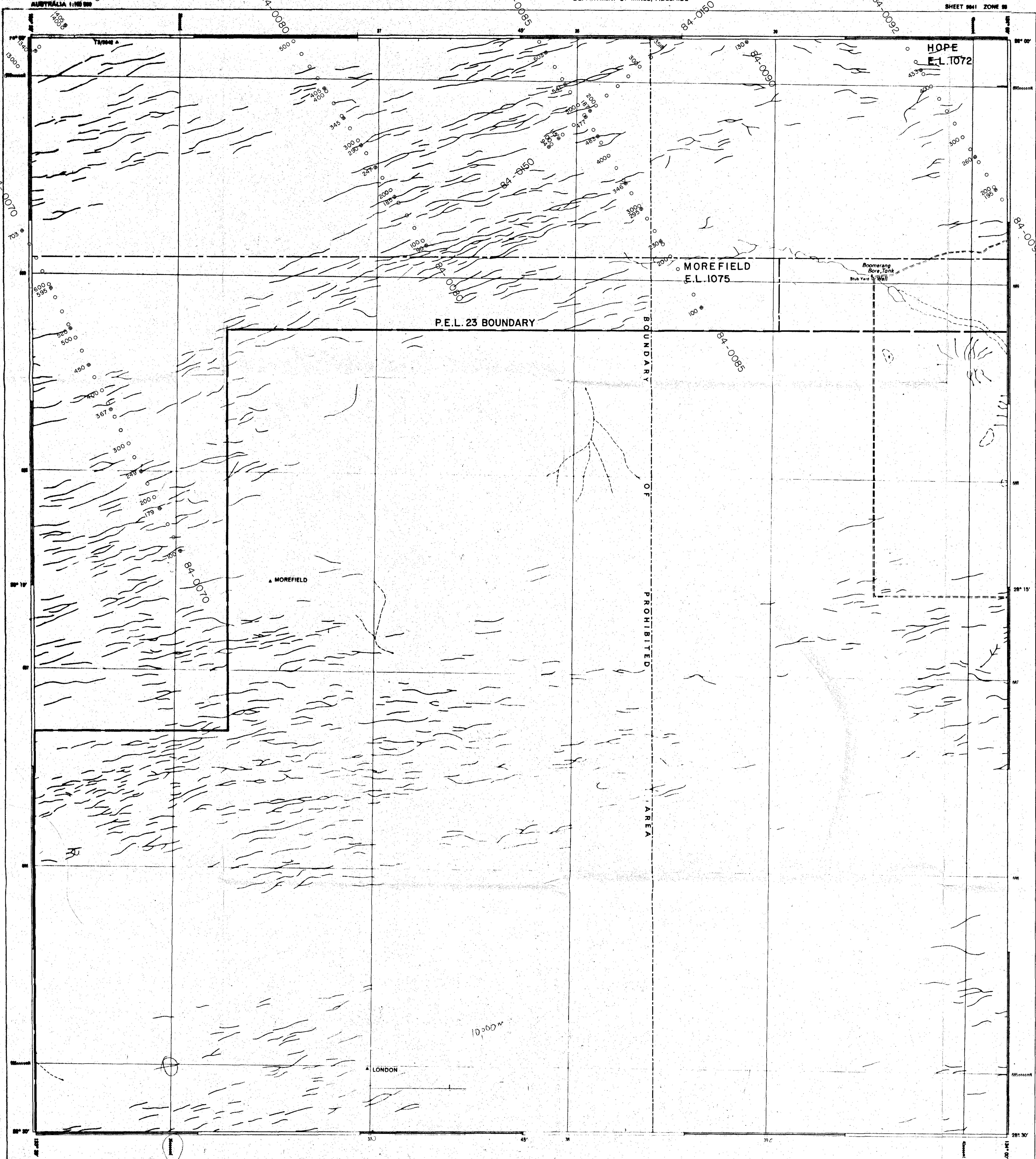
DRAWN:	/ /19	1 : 250 000 SHEET REF. EVERARD SG. 53-13	

NAARACK

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA
DEPARTMENT OF MINES, ADELAIDE



HEAD STATION, OUT STATION, HUT
NATIONAL ROUTE NUMBER
HIGHWAY OR MAIN ROAD
SECONDARY ROAD
TRACK
TRACK ALONG BOUNDARY FENCE
RAILWAY AND STATION
RAILWAY AND SIDING
VERMIN OR DOG PROOF FENCE
POWER TRANSMISSION LINE
MINE & PROSPECT OR MINERAL OCCURRENCE
QUARRY
YARD
TRIG STATION
IDENTIFIED HILL OR MOUNTAIN
FERRY
LIGHTHOUSE OR BEACON
REEF
TANK, BORE, WELL
SPRING
WATERHOLE
DAM
EPHEMERAL STREAM CHANNEL
OUTWASH OR FLOOD PLAIN
CLAY PAN, SALT PAN, SWAMP
MANGROVE
SAND DUNES
ARTESIAN BORE
OIL BORES
GAS
OIL AND GAS
OIL
DRY
STRATIGRAPHIC

INDEX TO ADJOINING SHEETS

NAARACK	MURLOOCOPPIE	MIRACKINA
YARLE	MABEL CREEK	ALLGEBULLCULLIA

1 250,000

SCALE:— 1:100 000

MILES 0 1 2 4 6 8 MILES

KILOMETRES 0 1 2 4 6 8 10 12 KILOMETRES

TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: AUSTRALIAN GEODETIC DATUM 1966

Planimetric information prepared by Department of Mines, South Australia, using slotted template assembly of [illegible] and [illegible] aerial photography flown by Department of Lands, South Australia.
Based on survey control established by Department of Lands, South Australia.

GRID LINES ARE 10,000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID, ZONE 53

S.A. DEPT. OF MINES
OFFICE COMPILATION
SUBJECT TO FIELD CHECK

COMALCO EXPLORATION DEPARTMENT

6165-16

COMPILED:	/ /19	1:100 000 SHEET REF. NAARACK 5641	DRAWING Nº
DRAWN:	/ /19	1:250 000 SHEET REF. MURLOOCOPPIE SH 53-2	


WANTAPELLA
MARLA
AMMAROODINNA
OULDBURRA
WINTINNA
MAMALLA
NAARACK
MURLOOCOPPIE
V+0·17
N-0·06
E+0·66
V-0·02
N-0·35
E-0·65
V+0·17
N-0·06
E+0·66
V-0·32
N+7·08
E-1·23
V-0·33
N-1·93
E-5·05
V-0·51
N-2·35
E+5·34
V+0·40
N+2·27
E-1·40
V+0·50
N+4·18
E-2·11
V+0·57
N+2·29
E+3·90
V-0·13
N-0·38
E-4·65
V+0·48
N-1·49
E-3·88
V+0·70
N+2·27
E+3·02
V-0·73
N+2·23
E+2·84
V N/A
N-2·00
E-1·07
V N/A
N-4·33
E-3·46
V N/A
N-2·49
E-0·52
V-0·16
N+0·36
E+0·20
6965-17
PETTY RAY GEOPHYSICAL
LOOP CLOSURES

27° 00'
7 000 000 mN
27° 30'
6 950 000 mN
6 900 000 mN
28° 00'
6 850 000 mN
28° 30'
6 800 000 mN
29° 00'
UNGOOLYA
MERAMANGYE
WILARI
EMU
TARLINA
84-0010
84-0020
84-0030
84-0040
84-0050
84-0190
84-0170
84-0196
ADOPT
317·87
V + 0·34
N + 5·95
E + 4·08
V - 0·56
N - 0·20
E + 0·26
NOTE: HORIZONTAL MISCLOSURE AT NM/E81 is ACTUALLY MISCLOSURE BETWEEN NM/E81 & 5541-1041 TRAVERSE RUNNING VIA 84-0165 84-0060 84-0170 84-0040 84-0190
V + 0·04
N + 0·21
E - 8·16
NM/E81
6829733·148
219938·454
310·10
V + 1·54
N N/A
E
B.M. 2980
6828302·25
227169·16
263·12
NOTE: VERTICAL MISCLOSURE AT B.M. 2980 IS ACTUALLY MISCLOSURE BETWEEN B.M. 2980 & 5642-5053 HIGHWAYS B.M. TRAVERSE RUNNING VIA 84-0165 84-0060 84-0170 84-0040 84-0190 84-0010
6165-18
150000 mE
131° 30'
200000 mE
132° 00'
250000 mE
132° 30'
300000 mE
133° 00'
PETTY RAY GEOPHYSICAL
LOOP CLOSURES

SADME copy

1984 ACCOMPANYING REPORT 2

0079

FINAL REPORT

COMALCO ALUMINIUM LTD.

PETTY-RAY PARTY 6316

3RD APRIL - 8TH AUGUST, 1984

RECEIVED
6 AUG 1985
MINES
SECURITY
6165

Compiled by:

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Akerman & Associates,

Delhan Pty. Ltd.

3 Freshwater Parade,
Claremont, Western Australia, 6010.

Telephone: (09) 383 3416

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

APPENDIX

FIGURE

TABLE OF CONTENTS (Cont'd)

APPENDIX

FIGURE

INTRODUCTION

From 3rd April, 1984 to 8th August, 1984, a seismic survey was carried out for Comalco Aluminium Ltd. by Petty-Ray Geophysical, a Division of Geosource Inc., Party 6316, in PEL-23 in the Eastern Officer Basin of South Australia. Although the survey was primarily intended as a reconnaissance to extend a structural overview of the area, a detailed programme was carried out in the northeast of the area, to further information obtained during the regional project of 1983.

As a comprehensive suite of experiments was carried out in 1983, experimental work for the 1984 programme was limited to a walkaway noise analysis, carried out on 3rd April at the intersection of Lines 84-0500 and 84-0088.

During the project, a total of 1,278 surface kilometres of seismic line was covered by 60-fold, common-depth-point reflection recording, using the weight-drop, or 'thumper' source.

Work was carried out from camps positioned, to minimise travel time, at suitable locations within the survey area. Because main camp was moved frequently, fly camps were used only by the survey section.

One hundred and forty-three (143) drilled uphole shots were recorded over the prospect, to provide near-surface control. No attempt was made to interpolate between upholes with refraction spreads, due to lack of success with these the previous year.

Data processing was carried out by Hosking Geophysical Corporation (Aust.) of West Perth, Western Australia.

Supervision for Comalco Aluminium Ltd., was carried out by G. Stainton and G. Cucuzza, of Comalco, and J.C. Akerman and A.R. Kenny, of Delhan Consultants. Petty-Ray was represented by Party Managers, R. Hayden and S. Hallows, and Supervisor J. Horsley.

Operations were concluded on 8th August, 1984.

LOCATION, TERRAIN, ACCESS AND LOGISTICS, WEATHER

The area examined in 1984 was between latitude 27°15'S and 28°45'S, longitude 131°45'W and 134°15'W (Figure 1).

Terrain varied from sharply cut ravines in laterite, in the extreme east of the area, through a low relief zone, sparsely vegetated with mulga and Eucalyptus scrub in the centre of the prospect, to four metre high sand dunes, tending to spinifex, west from Line 83-0200 (see Figure 2).

Both Marla Bore and Mt. Willoughby were used as logistical foci. Marla Bore lies 1,200 kilometres north of Adelaide (500 kilometres south of Alice Springs), consisting of a motel complex on the Stuart Highway, about two kilometres from the Marla Siding on the Alice Springs-Tarcoola Railway. Mt. Willoughby lies approximately 110 kilometres southeast of Marla Bore on the Stuart Highway.

Marla Motel was initially used as a delivery point for food and parts supplied from Alice Springs by Compass Transport. Subsequently, these were dropped at Mt. Willoughby. Supplies leaving Alice Springs on Monday afternoons arrived at Marla Bore or Mt. Willoughby early the following day and were then ferried to base camp by Petty-Ray supply truck. Telephones at Marla Bore and Mt. Willoughby assisted communications. An access road to the western area of the prospect was prepared (Figure 2).

Drinking water of good quality was obtained initially from Marla Bore and subsequently from the Middle Bore on Wininna Station. Although attempts were made to find potable water in the western area of the prospect, a bore developed at the intersection of the access road to the west with Line 35-019, provided extremely unpotable water suitable only for drilling. As operations advanced to the west, a twenty hour round trip to Middle Bore by the Petty-Ray six-wheel drive cargo truck, fitted with a 2,000 gallon water tank, became necessary every second day.

Fuel and lubricants were obtained from the Ampol Service Station attached to the Marla Hotel, and delivered to Petty-Ray campsites by Parnells Transport.

Location, Terrain, Access and Logistics, Weather (Cont'd)

An airstrip capable of handling twin-engined aircraft at Emu Claypan was improved and used in support of the operation as recording advanced to the west. A smaller strip, suitable for single-engined aircraft at Dingo Claypan was also used in the latter stages of the operation.

Again, weather favoured the 1984 project, with cold nights and generally dry, mild days. What little rain fell served only to improve traction and coupling over sand dunes.

EXPERIMENTAL PROGRAMME

As a comprehensive experimental programme to determine recording parameters and to compare four energy sources (shothole dynamite, cord dynamite, weight-drop and vibrator) was performed in 1983, experimental work in 1984 was confined to a walkaway noise analysis prior to recording, in order to identify coherent noise. Included in the noise spread was a dogleg component to reveal lateral noise (Figure 6).

The principal interfering noise train was noted to have a wavelength of about 90 metres and an apparent velocity of 1,200 m/sec. Ground noise was adequately coped with by a geophone array of 24 geophones in line at 1.25 intervals, centred on station markers 30 metres apart and F-K filtering in processing.

A comparison between the recording rate on one weight truck and two weight trucks was carried out on Line 84-0010. It was found that recording rate with one weight truck was about 20% slower than with two.

LINE-CUTTING

H. Herr provided a Komatsu D85-A horsepower (roughly equivalent to a Caterpillar D-7) bulldozer, with hydraulically operated 3.8 metre bull blade and ripper and power shift, to first cut lines which were subsequently widened and finished with Caterpillar 16G grader, provided by R. Van Eck.

This combination proved inadequate in the deep gullies and rock outcrops of the area east of Wintinna near Arckaringa Creek, and a second bulldozer (Komatsu D125A) was brought in to assist. The inadequacy was primarily due to poor performance and lack of experience of bulldozer operators, in that lead bulldozers barely grazed lines or chopped them up badly, leaving most of the work to the 16G grader, which was well operated.

Two Caterpillar 12E graders were introduced temporarily to replace the 16G when the main hydraulic pump of the latter failed. The D125A and the D85A had to return to widen lines for the two smaller graders until the 16G became operable.

A third bulldozer (D85A, owned by M. Rakos of Mincabie) was added to line cutting strength to assist with access road cutting and dune reduction, whiles Lines 84-0170 and 84-050 were cut. A second grader (Caterpillar 140G) was also introduced, in order to maintain line cutting lead.

Line cutting units were used to improve station roads for access and to cut the main access road from Middle Bore at 84-0085 to 84-0010. Campsites and rubbish pits were dug and cleaned up after use throughout the course of the programme.

Comments on line-cutting are contained in the section covering conclusions and recommendations.

SURVEYING

The survey section consisted of, at any one time, two surveyors and two chainmen, the latter assigned to other tasks when not required for actual surveying.

Field equipment consisted of one Wild D1-4L Distomat, two Wild T1 theodolites and a Wild T16 theodolite. Chaining was carried out with a 150 metre length of 6 cm diameter aircraft control cable, calibrated at 30 metre intervals, and checked regularly against a 50 metre surveying tape. Computations were carried out with HD41 CV calculators.

Lines were chained at 30 metre intervals, with a wooden peg at every fifth station, and pin flags between station numbers were written on pin flags, and pegs and line numbers on every fiftieth station. Permanent markers consisted of star pickets at line intersections, intersections of roads, at the start and ends of lines and at five kilometre intervals along lines.

Field work was carried out using the Wild T1 theodolite for angles and the Distomat for measuring slope distances. Reciprocal verticals were used to calculate turn points and a single ray formula was used for all intermediate reduced levels. Double angles were turned for horizontal co-ordinates and bearing controlled by sunshots. Hanging lines were double run, with a solar observation taken at the last point on the line to close bearings or co-ordinates. Horizontal distances were verified with Distomat.

Surveying was carried out in a professional manner. All closures, horizontal and vertical, were well within contract parameters and tied also, though barely within contract parameters, vertically from highway bench marks near the railway to third order work at Emu.

The Petty-Ray surveyor found National Mapping trig. points to be incorrect by six to seven metres in elevation (these were aneroid barometer levels).

The access road through the centre of the southwestern part of the prospect was cut as closely to a predrawn line as possible, to comply with Pitjantjatjara Council considerations. This task, made difficult by heavy mulga scrub and sand dunes dictating bends, was facilitated by Comalco's provision of aerial/landsat photographs.

WEATHERING CONTROL

Weathering control was provided by uphole recording of holes drilled to between 50 and 100 mm, as dictated by the on-site Comalco geologist. For locations, refer to Appendix 7. One hundred and forty-three (143) upholes were drilled.

Harnesses were prepared for each hole, with a 'K' booster and detonator set at ten metre intervals, up the harness to the top ten metre interval, where single detonators were located at seven, five and three metres below the surface.

A Geometrics E5 1210F Nimbus was used to record separate shots up the harness.

Drilling, loading and recording of all upholes was observed by a Comalco staff member, in order to ensure loading and recording at the required depths (except where drilling was difficult, when another location could be chosen).

Static corrections computed from the uphole survey were used to tie static corrections derived from the reflection survey.

It was found during the 1983 survey, that attempts to use refraction data to interpolate between upholes were not successful, due to anomalous results, probably caused by high velocity, near-surface stringers. Statics were produced in 1984 by hand picking first breaks on the reflection monitors of every twentieth drop point. These statics were calibrated against statics computed from upholes. A velocity profile was drawn for every line, utilising all first break information from the reflection recording.

RECORDING

The recording system provided for the survey was an electronic systems division MDS-10 120 channel digital field system, with sixty trace SDW 400 electrostatic camera, MTM-100, nine track, 1600 BPI tape transport (SEG B Format), three SMM-1 mass memories for stacking capability and Varisource option.

Recording parameters were set, following the evaluation of the noise analysis on 3rd April, 1984.

Parameters for recording were as follows:

Spread	:	1830 -60 -0 -60 - 1830
Station Interval	:	30 metres
Number of Recording Channels	:	120
Sample Rate	:	4 m/sec
Record Length	:	4 seconds
Filters - Lo cut	:	Out
Filters - Hi cut	:	62.5 Hz (72 of B/Octane Scope)
Filters - Notch	:	Out
CDP Coverage	:	600%
Source Array	:	4 drops/station @ 7.5 metre intervals (effectively 8 weighted drops/station with varisource)
Varisource	:	Normal
Receiver Array	:	24 geophones in line at 1.25 metre spacing, centred on station marker

Recording (Cont'd)

[Note on Varisource (courtesy Petty-Ray):

Varisource uses an electronic array weighting of sources to optimise field effort. Individual drops are assigned two different precalculated weights and summed in two complementary memory locations.

By simultaneously maintaining the two distinct sums with complementary weighting, the field effort required to produce the same amount of input energy per summed record is halved when compared to conventional summing methods.

This method also aids in the suppression of ground-roll.

The 60-fold coverage stated above is nominal only. Use of Varisource with split spread configuration, as used on this survey, results in channels 60 and 120 being invalid partials, in that they are weighted sums of only one segment of four drops and results in an actual CDP (Common Depth Point) multiplicity of 59-fold.]

Where terrain was rough, necessitating either undershooting or skips, the Client Representative authorised up to 12 skips, i.e., a reduction to 48-fold rather than undershooting recovery shots.

Paper monitors were examined for quality control at every fifth shot, alternatively high or low, sixty traces.

QUALITY CONTROL AND DATA TRANSMITTAL

Four second paper monitors were produced after every fifth drop point, showing, alternately, the high and low 60 groups, and examined by the Observer for any irregularities. Time to breaks or near traces was noted as a check that the CDP switch was correctly set.

Monthly tests were performed before commencement or recording and as soon as practical after the beginning of each month thereafter. These were examined both by the Observer and Client Representative.

Monitor records of daily production were examined on arrival in base camp and in the field by Client Representative. Features checked included documentation of non-standard shots, and dead or noisy traces on Observer's logs, crossfeed and observable signal-to-noise ratio. Field numbers on monitors were compared with those entered on Observer's logs. Overall appearance and clarity of data was assessed. Frequency content of reflected events was examined where possible, as was frequency and velocity of interfering systematic noise.

The Contractor's Seismologist was requested to produce an elevation and weathering profile, showing velocities as computed from uphole and refraction plots and appropriate static corrections. As has been mentioned previously, anomalous velocities and intercepts, derived from refraction profiles, were the rule rather than the exception, due to complex faulting and high velocity stringers; interpolation from refraction recording did not prove as effective as that produced by the processor from hand picked statics, derived from breaks on production records.

Data Transmittal

All field data was despatched, approximately on a weekly basis, via Opal Airlines, with field tapes and Observer's logs being sent directly to Hosking Geophysical's Perth Processing Centre. Uphole plots, elevations and co-ordinates were sent to Comalco's Adelaide Office, where they were photocopied before being sent back to crew. Telexes, stating line numbers, number of boxes and contents, were sent to Comalco, Hosking Geophysical and Petty-Ray, Perth, with each shipment. All shipments of data were also accompanied by relevant transmittals and Data Shipment Monitors.

Reports

A daily production report was passed by the Party Manager to the Petty-Ray office in Brisbane. A separate report was passed by the Client Representative to the Comalco office in Adelaide. Communications was usually possible by single sideband radio. However, the telephones at Marla Bore and Mt. Willoughby were sometimes employed.

CONCLUSIONS AND RECOMMENDATIONS

The 1984 PEL-23 seismic survey for Comalco Aluminium Pty. Ltd. was performed satisfactorily. A certain lack of co-operation was experienced from the Party Heads. However, this deficiency was adequately dealt with by Comalco Representatives. Similarly, support from Brisbane Office was again lacklustre.

Key personnel were excellent. Recording survey and workshop staff all demonstrated keenness and willingness to co-operate.

Similarly, as a result of Comalco policy that a core of recording labour was to be experienced, the recording crew reached an early high level of productivity and morale and continued at this level throughout the operation, despite indifferent management.

Deficiencies specified in the 1983 Final Report (poor camp discipline, poor food preparation, lack of recreational facilities, irregular leave schedules) were addressed by Comalco before commencement of the operation by making award of contract contingent on suitable action.

Line-cutting by bulldozers was poor, necessitating the presence of a surveyor to keep operators on line. Bulldozing contractors had insufficient support in vehicles and personnel, and were difficult to contact. Initial cutting by bulldozer operators was inadequate so that a disproportionately high amount of line-clearing work fell on the operator of the Caterpillar 16G grader.

The 1984 survey demonstrated weight drop to be a suitable tool for regional seismic recording in PEL-23. Data quality observed in 60-fold final sections was generally of high quality.

Recommendations

1. Should the same contractor be chosen to carry out future work for Comalco, every attempt should be made to ensure the presence of the same key personnel.

2. Award of contract for line-clearing should be made contingent on adequate provision of back-up vehicles and personnel. Line-clearing contractors must provide operators experienced in line-cutting, and good communication between line-cutters, surveyors and Comalco Representative must be provided.

L.C. ACKERMAN.

[illegible] May, 1985.

APPENDIX I

EQUIPMENT

1 ESD, MDS-10, 120 Trace Digital Field System complete with MTM-100, 9 Track, 1600 B.P.I. Tape Transport (SEG B format), three SMM-1 mass memories for stacking capability and Varisource option Cab mounted on International 4 x 4 Truck.

1 SDW 400 B, 60 Trace Electrostatic Camera.

1 LT-240 Line Checker.

1 RLS-240 Rotary Migrator Switch.

1 WDC-6 Weight Drop Control Box.

1 Geophone Shaker Table.

1 Tektronic 465B Oscilloscope.

1 Precision DC Source.

82 C.D.P. Cable Sections - each with 3 takeouts at 37.5 metre intervals.

504 Strings of MD-79 10 HZ Geophones - each string has 12 phones.

2 Extension Cables - each 100 metres long.

2 Extension Cables - each 20 metres long.

3 Weight Truck Units mounted on Ford, Kenworth and Mack 6 x 6 Trucks.

6 Isuzu TSD 45 4 x 4 Trucks (4 for cables and geophones, 1 for maintenance equipment, 1 for supply).

1 Leader 6 x 6 Water / Cargo Truck with Crane.

1 Mack 6 x 6 Water / Cargo Truck with 500 Gallon Fuel Tank.

11 Toyota Landcruiser 4 x 4 Trucks (1 x Party Manager, 3 x Recording Crew, 1 x Mechanic, 1 x Refraction, 1 x Preloader, 3 x Survey, 1 x Utility).

2 Kitchen Trailers

APPENDIX I

EQUIPMENT (Continued)

1	Dining Trailer.
4	10 Man Sleeping Trailers.
1	8 Man Sleeping Trailers.
2	Ablution Trailers
1	Office Trailer (including accommodation for Party Manager and Client Representative).
1	Survey / Seismology Office Trailer (including accommodation for Surveyors and Seismologists).
1	Store / Workshop Trailer.
1	Mechanics Workshop Trailer.
2	Generators 80 KVA.
2	Generators 20 KVA.
2	Fuel Storage Trailers - capacity 1500 gallons each.
2	Water Storage Trailers - capacity 1500 gallons each.
1	Explosives Trailer.
1	Explosives Magazine.
1	Detonator Magazine.
2	12 Trace Geometrics ES-1210F Nimbus Instruments with 12 x 10 HZ Uphole Phones.
4	100 Watt S.S.B. Radios.
2	25 Watt S.S.B. Radios.
14	V.H.F. Radios (General Duties & Source Control).
1	DI-4 Distomat.
1	DI-4L Distomat.
2	Wild T1 Theodolites.
1	Wild T16 Theodolite.
1	Apple II Desk Top Computer System.
1	Precision Chain.
	Fire Extinguishers for Camp and Vehicles.

APPENDIX II

KEY PERSONNEL

SUPERVISOR:	J. Horsley
PARTY MANAGER:	R. Hayden
ASSISTANT PARTY MANAGER:	S. Hallows
SENIOR OBSERVER:	S. Gall
OBSERVER:	K. Stewart
JUNIOR OBSERVER:	M. White
WEATHERING OBSERVER:	R. Heyer
SENIOR MECHANIC:	J. De Vries
SOURCE AND CAMP MECHANICS:	M. Sheedy D. Craig J. O'Brien
SEISMOLOGISTS:	G. Freemantle A. Le Nair
SENIOR SURVEYOR:	I. Beattie
CONTRACT SURVEYOR:	P. Fairbrother
SURVEYORS:	P. Weatherly D. Wilson A. Sullivan D. Caldicott
PRELOADER / SHOOTERS:	G. Stewart R. Heyer
CAMP TRUCK DRIVERS:	D. Hobbs J. Coleman B. Ballard
WEIGHT TRUCK DRIVERS:	N. Tahapehi D. Hood C. Elder J. O'Brien
COOKS:	R. See P. King

APPENDIX III

STATISTICAL SUMMARY

MONTH 1984	NUMBER OF STATIONS	COVERAGE KMS	RECORDING DAYS	AVERAGE KMS/DAY
APRIL	8,537	255.84	28	9.137
MAY	8,942	268.11	30	8.937
JUNE	11,405	341.95	30	11.398
JULY	11,092	332.61	31	10.729
AUGUST	2,649	79.44	8	9.930
TOTALS	42,625	1,277.95	127	10.063

APPENDIX IV

WELL TIES - COMALCO - MARLA

	ELEVATION	NORTHING	EASTING	COMMENTS
MT. WILLOUGHBY NO. 1	239.31	6,940,343.49	428,373.24	Adjacent to Int. 84-0150/ 0620.
MANYA NO. 1	240.90	6,916,076.15	369,610.15	Adjacent to 1172 + 16 m 84-0085
MANYA NO. 2	236.60	6,909,621.37	373,444.85	Adjacent to 921 + 23 m 84-0085
MANYA NO. 3	244.10	6,916,275.34	369,486.45	Adjacent to 1180 + 9 m 84-0085
MANYA NO. 4	234.54	6,897,967.71	380,572.91	Adjacent to 466 + 7 m 84-0085

APPENDIX V

START OF LINE - END OF LINE
DISTANCE LIST

LINE	S.O.L.	E.O.L.	DISTANCE KM
84-0010	100	2390	68.700
84-0020	100	2609	75.270
84-0030	133	2114	59.430
84-0040	100	1510	42.300
84-0500	100	2332	66.960
84-0060	100	1512	42.360
84-0700	100	1700	48.000
84-0080	90	1155	31.950
84-0085	100	1257	34.710
84-0088	100	957	25.710
84-0090	130	1195	31.950
84-0092	100	2205	63.150
84-0150	94	2380	68.580
84-0165	57	3900	115.290
84-0170	1030	3097	62.010
84-0190	120	3050	87.900
84-0220	123	950	24.810
84-0240	100	1550	43.500
84-0320	40	1211	35.130
84-0360	100	1564	43.920
84-0400	85	Surveyed to 1280 Recorded to 1267	35.850 35.460
84-0480	100	2940	85.200
84-0500E	100	400	9.000
84-0500W	100	357	7.710

APPENDIX V

START OF LINE - END OF LINE DISTANCE LIST

LINE	S.O.L.	E.O.L.	DISTANCE KM	
84-0600	100	513	12.390	
84-0620	103	1280	35.310	
84-0710	105	757	19.560	
TOTAL			1276.650	1276.260

PLUS - NOT RECORDED

LINE	S.O.L.	E.O.L.	DISTANCE KM
84-0110	100	816	21.480

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0010

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	277.68	6,827,325.06	227,501.28	S.O.L.
168	260.24	6,828,988.76	226,312.40	Int. with Emu Road
355 + 18	265.42	6,833,577.10	223,029.43	Int. 84-0010/84-0190 (440 + 11 on 84-0190)
527	273.76	6,837,769.88	220,031.17	
659	257.73	6,841,000.19	217,729.28	Bend
862 + 15	255.17	6,846,183.69	214,486.12	Int. with Access Road
981	260.19	6,849,207.06	212,601.00	
1120	304.91	6,852,752.05	210,392.22	
1286	348.41	6,856,979.73	207,748.68	
1436 + 7	322.81	6,860.805.19	205,355.28	
1631 + 5	344.16	6,865,772.64	202,246.58	Int. 84-0010/84-0196
1838	365.43	6,871,042.16	198,947.91	
1974	370.52	6,874,505.53	196,758.23	
2093	332.78	6,877,519.43	194,836.63	
2237 + 10	308.26	6,881,180.28	192,506.95	
2390	303.02	6,885,051.81	190,051.34	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0020

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	313.97	6,832,364.51	259,546.32	S.O.L.
194	324.65	6,834,351.82	257,532.86	
385	296.64	6,838,402.02	253,421.36	
562	310.75	6,842,107.18	249,662.28	
696	312.46	6,844,799.11	246,934.49	
842 + 12	308.97	6,847,891.51	243,799.82	
965 + 4	286.39	6,850,481.94	241,167.25	Int. 84-0020/84-0190 (1265 + 2 - 84-0190)
1178	293.71	6,854,964.02	236,603.78	
1355	259.56	6,858,692.59	232,802.65	Int. with Access Road
1503 + 15	300.74	6,861,821.88	229,616.49	
1681	341.10	6,865,560.84	225,805.83	
1834 + 24	327.36	6,868,795.89	222,496.34	
2041 + 15	317.17	6,873,136.83	218,048.33	
2158 + 25	313.94	6,875,598.45	215,524.61	Int. 84-0020/84-0196
2195	338.03	6,876,356.65	214,746.26	
2340	389.89	6,879,398.65	211,628.25	
2475	369.19	6,882,222.73	208,719.54	
2609	393.69	6,885,034.18	205,835.15	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0030

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
133	291.07	6,843,535.42	287,214.55	S.O.L.
275 + 17	300.74	6,846,541.47	284,163.43	
499 + 25	306.02	6,851,275.41	279,358.72	Int. 84-0030/84-0170 (1096 + 3 - 84-0170)
708 + 15	303.50	6,855,674.80	274,897.16	
882	306.93	6,859,335.28	271,183.34	
1040 + 15	295.09	6,862,673.58	267,789.08	Int. with Access Road
1188	293.18	6,865,781.84	264,631.80	
1347 + 4	294.16	6,869,135.39	261,220.97	Int. 84-0030/84-0190 (2176 + 4 - 84-0190)
1503 + 27	292.28	6,872,446.82	257,864.66	
1730 + 14	316.03	6,877,221.83	253,005.62	
1884	321.60	6,880,458.45	249,714.38	
2041 + 16	349.31	6,883,777.43	246,334.89	
2114	342.93	6,885,305.52	244,785.69	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0040

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	296.16	6,856,358.99	296,263.33	S.O.L.
205	305.46	6,858,587.29	294,030.43	
305 + 13	295.48	6,860,714.01	291,885.88	Int. 84-0040/84-0170 (1615 + 27 - 84-0170)
473	299.20	6,864,259.49	288,311.81	
585	289.31	6,866,630.35	285,924.59	Int. with Access Road
651	291.20	6,868,022.17	284,519.94	
818	297.56	6,871,557.29	280,960.61	
968	309.49	6,874,792.20	277,823.43	
1137	318.84	6,878,445.84	274,302.57	
1210 + 10	317.57	6,880,023.50	272,770.03	Int. 84-0040/84-0190 (2704 + 19 - 84-0190)
1288	331.40	6,881,690.32	271,148.39	
1444	312.78	6,885,045.74	267,889.78	
1510	302.77	6,886,455.75	266,501.06	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0050

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	218.49	6,834,481.46	338,275.55	S.O.L.
211	228.44	6,837,133.20	336,248.34	
342	237.27	6,840,266.68	333,856.16	
463	237.51	6,843,155.36	331,642.27	
630	237.39	6,847,204.33	328,536.87	
724 + 4	246.83	6,849,450.06	326,814.49	Int. 84-0050/84-0110 (166 + 10 - 84-0110)
905	234.67	6,853,770.03	323,505.18	
1099	261.54	6,858,411.21	319,965.39	
1214	259.92	6,861,149.73	317,879.85	
1412 + 15	283.64	6,865,863.74	314,282.65	
1580	299.71	6,869,842.47	311,242.06	
1735 + 14	276.55	6,873,530.70	308,424.70	Int. 84-0050/84-0170 (2312 + 6 - 84-0170)
1873	258.60	6,876,788.43	305,927.72	
2022	251.40	6,880,325.95	303,218.42	
2909	257.62	6,884,757.41	299,826.19	
2332	269.65	6,887,672.75	297,595.89	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0060

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	231.93	6,853,228.61	345,499.65	S.O.L.
269 + 2	228.10	6,857,304.94	342,472.31	Int. 84-0060/84-0110 (748 + 24 - 84-0110)
440	232.27	6,861,420.77	339,409.01	
612	235.88	6,865,565.31	336,327.56	
801	240.39	6,870,117.84	332,940.33	
959	258.76	6,873,924.11	330,108.68	
1022	246.05	6,875,443.50	328,979.65	Int. with Access Road
1131 + 10	243.79	6,878,077.94	327,021.18	Int. 84-0060/84-0165 (187 + 11 - 84-0165)
1237	269.11	6,880,619.18	325,123.61	
1391 + 6	274.35	6,884,336.80	322,359.15	Int. 84-0060/84-0170 (2899 + 2 - 84-0170)
1512	272.77	6,887,244.35	320,195.72	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0070

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	226.81	6,876,019.30	360,207.94	S.O.L.
249	214.55	6,880,009.78	358,190.24	
367	219.02	6,883,169.11	356,591.33	
450	218.06	6,885,390.15	355,465.45	
595	233.31	6,889,269.64	353,495.45	
672	243.13	6,891,331.16	352,451.43	Int. with Access Road
780	259.72	6,894,237.63	351,018.52	
923 + 11	272.80	6,898,093.74	349,116.45	Int. 84-0070/84-0165 (1181 + 5 - 84-0165)
1142	288.01	6,903,974.20	346,195.69	
1315	279.60	6,908,621.42	343,874.75	
1420	281.54	6,911,444.89	342,475.47	
1540	273.68	6,914,672.77	340,880.33	Int. with Access Road From 84-0080
1598	282.33	6,916,234.09	340,108.64	
1700	280.01	6,918,978.33	338,754.44	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0080

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
90	222.01	6,891.657.42	372,432.69	S.O.L.
185	229.14	6,894,031.78	370,857.06	
345	228.49	6,898,032.42	368,208.34	
505	243.59	6,902,034.75	365,559.33	
620	252.58	6,904,911.18	363,655.58	
774 + 23	241.72	6,908,781.40	361,088.60	Int. 84-0080/84-0165 (1715 + 8 - 84-0165)
970	257.00	6,913,672.55	357,863.27	
1155	250.76	6,918,310.24	354,813.51	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0085

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	229.89	6,888,652.94	386,393.75	S.O.L.
267 + 20	234.06	6,892,922.56	383,737.83	Fence
407	240.57	6,896,470.17	381,529.96	Int. with Access Road
477 + 6	233.01	6,898,255.40	380,413.99	Int. 84-0085/84-0150 (173 + 14 - 84-0150)
603	236.24	6,901,463.83	378,427.11	
740	237.10	6,904,965.02	376,277.20	
865 + 15	239.50	6,908,183.78	374,327.50	
1014	245.61	6,911,987.48	372,036.25	
1133 + 25	241.37	6,915,077.02	370,204.77	Int. with Middle Bore Access Road
1181	243.65	6,916,296.52	369,484.25	Int. 84-0085/84-0165 (2090 + 18 - 84-0165)
1257	243.03	6,918,256.48	368,322,92	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0088

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	334.33	6,975,145.42	347,615.33	S.O.L.
213 + 25	323.21	6,972,034.51	349,037.25	Int. 84-0088/84-0500W (178 + 10 - 84-0500W)
338	319.72	6,968,640.40	350,580.91	Int. with Mintabie Road
510	313.23	6,963,931.43	352,710.04	
783	301.55	6,956,457.66	356,093.68	Int. 84-0088/84-0360 (291 + 5 - 84-0360)
957	285.21	6,951,698.26	358,253.93	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0090

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
130	256.84	6,902,102.21	388,626.24	S.O.L.
214 + 20	250.82	6,904,231.29	387,241.75	Int. 84-0090/84-0150 (474 + 28 - 84-0150)
383	240.96	6,908,468.46	384,493.28	
547	248.28	6,912,593.04	381,813.99	
693 + 11	253.58	6,916,279.81	379,425.77	
730	241.67	6,917,203.07	378,828.35	Int. with Middle Bore Access Road
776	249.71	6,918,362.19	378,078.30	
915 + 3	247.90	6,921,876.96	375,824.24	Int. 84-0090/84-0165 (2372 + 10 - 84-0165)
1022	255.62	6,924,572.90	374,085.29	
1195	252.46	6,928,951.11	371,263.58	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0092

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	258.01	6,892,390.78	402,773.59	S.O.L.
194.12	257.25	6,894,774.44	401,253.38	Fence
260	259.59	6,896,430.77	400,195.02	
433	262.38	6,900,798.33	397,405.97	
586	271.39	6,904,660.62	394,941.13	
746 + 11	259.50	6,908,706.15	392,354.91	Int. 84-0092/84-0150 (701 + 6 - 84-0150)
850	257.91	6,911,323.37	390,682.32	
1022	257.66	6,915,663.07	387,905.76	
1165	258.85	6,919,273.16	385,598.52	
1182 + 20	256.78	6,919,719.14	385,312,39	Int. with Middle Bore Access Road
1307	263.09	6,922,854.02	383,301.07	
1450 + 12	260.03	6,926,477.57	380,975.86	Int. 84-0092/84-0165 (2602 + 15 - 84-0165)
1636	268.15	6,931,152.93	377,976.34	
1781	266.40	6,934,810.73	375,633.28	
1915	265.14	6,938,191.14	373,466.53	Int. 84-0092/83-0020 & 83-0300 (221 - 83-0200 / 232-03
2050	271.42	6,941,596.39	371,287.78	
2162 + 12	269.34	6,944,435.07	369,476.56	Int. 84-0092/84-0320 (70 + 9 - 84-0320)
2205	271.45	6,945,509.19	368,788.43	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0110

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	242.26	6,848,551.94	325,029.64	S.O.L.
166 + 10	246.83	6,849,450.06	326,814.49	Int. 84-0110/84-0050 (724 + 4 - 84-0050)
230	246.56	6,850,310.09	328,523.46	
408	243.77	6,852,711.78	333,307.43	
600	225.96	6,855,299.14	338,470.67	
748 + 24	228.10	6,857,304.94	342,472.31	Int. 84-0110/84-0060 (269 + 2 - 84-0060)
816	217.89	6,858,207.77	344,282.40	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0150

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
94	229.96	6,896,682.95	378,617.75	S.O.L.
173 + 14	233.01	6,898,255.40	380,413.99	Int. 84-0150/84-0085 (477 + 6 - 84-0085)
351	244.88	6,901,777.25	384,436.88	
474 + 28	250.82	6,904,231.29	387,241.75	Int. 84-0150/84-0090 (214 + 20 - 84-0090)
644	259.54	6,907,577.38	391,056.90	
701 + 6	259.50	6,908,706.15	392,354.91	Int. 84-0150/84-0092 (746 + 11 - 84-0092)
850	267.87	6,911,657.99	395,698.22	
924	271.69	6,913,122.55	397,366.91	
1070 + 8	288.82	6,916,019.07	400,663.26	Int. 84-0150/84-0240 (167 + 6 - 84-0240)
1229 + 28	292.90	6,919,178.11	404,271.90	Int. 84-0150/A.S. - Tar Railway Line.
1337 + 7	290.58	6,921,298.51	406,692.89	Fence
1358 + 10	291.77	6,921,716.56	407,169.42	Fence
1378 + 8	283.53	6,922,108.88	407,620.27	Int. 84-0150/84-0400 (800 + 12 - 84-0400)
1468	311.22	6,923,882.80	409,643.56	
1627	286.73	6,927,028.77	413,228.83	Int. with Stuart Hwy.
1643 + 10	283.93	6,927,351.55	413,596.60	Int. 84-0150/84-0480 (2843 + 26 - 84-0480)
1651 + 20	281.25	6,927,516.55	413,784.31	Fence
1862	259.48	6,931,664.00	418,510.29	

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0150 (Continued)

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
1959	265.38	6,933,573.21	420,685.02	Fence
2031 + 5	280.07	6,934,992.88	422,300.38	Fence
2118 + 10	272.88	6,936,706.40	424,249.25	
2302 + 27	239.43	6,940,332.99	428,373.28	Int. 84-0150/84-0620 (1200 + 6 - 84-0620)
2380	244.90	6,941,856.59	430,114.40	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0165

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
57	249.35	6,875,489.87	324,090.99	S.O.L.
187 + 11	243.79	6,878,077.94	327,021.18	Int. 84-0165/84-0060 (1131 + 10 - 84-0060)
292	252.65	6,880,158.45	329,374.83	
416	268.92	6,882,623.67	332,160.61	
579 + 15	288.53	6,885,881.24	335,830.68	
722 + 10	269.80	6,888,732.17	339,030.39	Bend
855	250.79	6,891,563.93	341,825.85	Bend
1015	263.89	6,894,767.82	345,399.84	
1181 + 5	272.80	6,898,093.74	349,116.45	Int. 84-0165/84-0070 (923 + 11 - 84-0070)
1250	263.59	6,899,465.36	350,659.14	
1405	256.85	6,902,569.82	354,137.45	
1530	248.60	6,905,067.69	356,935.77	
1715 + 8	241.72	6,908,781.40	361,088.60	Int. 84-0165/84-0080 (774 + 23 - 84-0080)
1820	241.64	6,910,876.30	363,430.74	
1943	239.76	6,913,341.80	366,186.12	Int. with Access Road
2090 + 18	243.65	6,916,298.52	369,484.25	Int. 84-0165/84-0085 (1181 - 84-0085)
2205	250.12	6,918,530.31	372,086.56	
2372 + 10	247.90	6,921,876.96	375,824.24	Int. 84-0165/84-0090 (915 + 3 - 84-0090)
2602 + 15	260.03	6,926,477.57	380,975.85	Int. 84-0165/84-0092 (1450 + 12 - 84-0092)

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0165 (Continued)

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
2740 + 29	271.63	6,929,238.07	384,079.41	Int. 84-0165/84-0220 (203 + 4 - 84-0220)
2870	288.50	6,931,815.40	386,968.92	
2998 + 7	309.27	6,934,378.97	389,843.16	Int. 84-0165/84-0240 (877 + 20 - 84-0240)
3171 + 24	302.17	6,937,847.64	393,715.53	Int. 84-0165/83-0400 (607 + 10 - 83-0400)
3336	296.53	6,941,128.52	397,383.52	
3488 + 11	285.97	6,944,171.73	400,790.34	Int. 84-0165/84-0480 (2137 + 20 - 84-0480)
3607 + 7	281.18	6,946,542.43	403,448.87	Fence
3690 + 10	304.89	6,948,201.82	405,305.26	Fence
3818 + 15	309.08	6,950,766.23	408.163.18	Int. 84-0165/84-0620 (438 + 18 - 84-0620)
3900	315.15	6,952,398.21	409,985.05	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0170

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
1030	301.26	6,850,123.10	277,820.53	S.O.L.
1096 + 3	306.02	6,851,275.41	279,358.72	Int. 84-0170/84-0030 (499 + 25 - 84-0030)
1289	308.78	6,854,796.68	284,040.66	
1469	302.85	6,858,056.68	288,358.61	
1615 + 27	295.48	6,860,714.01	291,885.88	Int. 84-0170/84-0040 (305 + 13 - 84-0040)
1778	295.34	6,863,699.98	295,734.63	
1970	297.96	6,867,236.04	300,294.77	
2115	288.06	6,869,910.22	303,735.71	
2247	276.80	6,872,331.23	306,874.38	Int. with Access Road
2312 + 24	276.55	6,873,530.70	308,424.70	Int. 84-0170/84-0050 (1735 + 84-0050)
2433	270.66	6,875,745.70	311,283.69	
2553	278.11	6,877,957.83	314,135.81	
2746	285.97	6,881,512.46	318,723.22	
2899 + 2	274.35	6,884,336.80	322,359.15	Int. 84-0170/84-0060 (1391 + 6 - 84-0060)
2915	275.62	6,884,630.28	322,737.82	
3097	258.66	6,887,979.89	327,068.54	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0190

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
120	265.68	6,827,028.80	215,969.27	S.O.L.
263 + 17	300.74	6,829,963.78	219,132.98	
385 + 20	271.90	6,832,459.63	221,824.64	Int. with Emu-Neale Junction Road
440 + 11	265.42	6,833,577.10	223,029.43	Int. 84-0190/84-0010 (355 + 18 - 84-0010)
551 + 15	259.80	6,835,851.80	225,481.52	Int. with Old Seismic Line
728 + 3	281.30	6,839,461.18	229,372.77	
899	309.64	6,842,960.04	233,130.71	
1117 + 17	284.21	6,847,450.34	237,929.14	
1265 + 2	286.39	6,850,481.94	241,167.25	Int. 84-0190/84-0020 (965 + 4 - 84-0020)
1450 + 11	283.78	6,854,279.37	245,243.46	
1636	278.10	6,858,080.96	249,331.03	
1811 + 15	298.92	6,861,672.08	253,193.46	
1880	275.71	6,863,074.51	254,703.53	Int. with Access Road
1993	285.16	6,865,386.12	257,193.86	
2176 + 4	293.58	6,869,135.39	261,220.97	Int. 84-0190/84-0030 (1347 + 4 - 84-0030)
2265	298.21	6,870,963.66	263,166.99	
2381 + 19	301.76	6,873,367.17	265,719.44	
2558 + 16	319.67	6,877,008.03	269,581.63	
2704 + 19	317.57	6,880,023.50	272,770.03	Int. 84-0190/84-0040 (1210 + 10 - 84-0040)
2904	331.12	6,884,132.19	277,118.36	
3050	332.03	6,887,144.53	280,297.17	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0220

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
123	272.36	6,927,143.96	385,271.31	S.O.L.
203 + 4	271.63	6,929,238.07	384,079.41	Int. 84-0220/84-0165 (2740 + 29 -84-0165)
370 + 15	277.27	6,933,594.77	381,600.28	
534 + 15	280.98	6,937,867.62	379,157.34	
666 + 4	274.59	6,941,295.94	377,197.38	Int. 84-0220/83-0300 (435 + 11 - 83-0300)
869 + 25	272.39	6,946,603.42	374,161.66	Int. 84-0220/84-0320 (242 + 14 - 84-0320)
950	274.43	6,948,689.01	372,967.77	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0240

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	284.49	6,914,267.27	401,660.79	S.O.L.
167 + 5	289.82	6,916,019.07	400,663.26	Int. 84-0240/84-0150 (1070 + 8 - 84-0150)
319	285.40	6,919,941.06	398,348.79	
478	280.32	6,924,051.14	395,922.57	Int. with Middle Bore Access Road
534	285.80	6,925,498.51	395,068.20	
695	320.91	6,929,654.97	392,617.85	
877 + 20	309.27	6,934,378.97	389,843.16	Int. 84-0240/84-0165 (2998 + 7 - 84-0165)
1093	308.94	6,939,952.89	386,588.27	
1223	303.04	6,943,322.36	384,630.28	Bend
1333	308.44	6,946,297.06	383,216.63	Int. 84-0240/83-0300 (765 + 11 - 83-0300)
1485 + 11	309.78	6,950,319.89	381,062.78	Int. 84-0240/84-0320 (504 + 12 - 84-0320)
1550	292.48	6,951,995.49	380,088.64	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0320

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
40	274.49	6,944,054.85	368,652.77	S.O.L.
70 + 9	269.34	6,944,435.07	369,476.56	Int. 84-0320/84-0092 (2162 + 14 - 84-0092)
128 + 7	270.49	6,945,159.91	371,053.40	Int. 84-0320/83-0200 (527 + 23 - 83-0200)
242 + 15	272.39	6,946,603.42	374,161.66	Int. 84-0320/84-0220 (869 + 25 - 84-0220)
401	292.58	6,948,649.19	378,451.23	Bend
504 + 12	309.78	6,950,319.89	381,062.78	Int. 84-0320/84-0240 (1485 + 11 - 84-0240)
579	292.65	6,951,515.45	382,949.26	Int. 84-0320/83-0400 (1335 + 9 - 83-0400)
710	294.01	6,953,633.95	386,274.88	
899 + 10	314.07	6,956,690.24	391,076.23	Int. 84-0320/84-0480 (1608 + 23 - 84-0480)
939 + 29	322.96	6,957,349.14	392,110.70	Fence
960 + 6	325.84	6,957,678.37	392,627.61	Fence
1000	335.66	6,958,319.11	393,633.54	
1130 + 8	306.68	6,960,431.21	396,940.24	Int. 84-0320/83-0600 (518 + 22 - 83-0600)
1211	323.38	6,961,733.19	398,988.82	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0360

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	293.32	6,952,702.98	351,741.07	S.O.L.
291 + 5	301.55	6,956,457.66	356,093.68	Int. 84-0360/84-0088 (783 - 84-0088)
475	298.64	6,960,047.26	360,291.09	
691 + 6	304.74	6,964,274.02	365,225.64	Int. 84-0360/83-0200 (1361 + 14 - 83-0200)
899 +6	302.11	6,968,340.40	369,977.24	Int. 84-0360/83-0400 (2223 + 4 - 83-0400)
1059	317.92	6,971,462.71	373,624.45	
1219 + 11	299.11	6,974,598.48	377,288.46	Int. 84-0360/84-0480 (854 + 25 - 84-0480)
1410	299.43	6,978,324.88	381,637.55	Int. with Stuart Highw[illegible]
1447 + 1	300.16	6,979,048.01	382,481.60	Int. 84-0360/83-0600 (1502 + 18 - 83-0600)
1564	305.84	6,981,333.61	385,151.58	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0400

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
85	254.36	6,906,870.65	422,724.08	S.O.L.
116 + 5	252.36	6,907,533.73	422,065.31	Fence
265	270.05	6,910,700.30	418,924.99	
430	272.54	6,914,217.53	415,441.54	Int. with Stuart Hwy.
520	285.30	6,916,135.52	413,540.18	
655	281.12	6,919,012.42	410,690.56	
724 + 12	277.80	6,920,490.67	409,225.53	Fence
800 + 12	283.53	6,922,108.88	407,620.27	Int. 84-0400/84-0150 (1378 + 8 - 84-0150)
925	302.88	6,924,906.43	405,147.38	
941 + 15	299.00	6,925,276.96	404,819.37	Fence
1060	310.89	6,927,935.08	402,462.59	
1156 + 10	324.11	6,930,097.50	400,547.08	Fence
1200	330.47	6,931,078.84	399,678.97	S.O.L. 83-0400 (230 - 83-0400)
1280	311.40	6,932,873.24	398,085.43	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0480

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	355.99	6,992,545.57	363,473.71	S.O.L.
309 + 6	354.33	6,987,563.05	367,299.18	Int. 84-0480/84-0710 (452 + 28 - 84-0710)
440	338.36	6,984,454.43	369,697.21	
531 + 6	320.22	6,982,285.64	371,368.29	Int. 84-0480/83-0700 (887 + 23 - 83-0700)
595	314.79	6,980,770.68	372,535.20	Int. with Stuart Hwy.
631 + 28	311.82	6,979,893.23	373,210.31	Int. 84-0480/84-0500E (282 + 14 - 84-0500E)
725	303.96	6,977,682.42	374,913.32	
854 + 25	299.11	6,974,598.48	377,288.46	Int. 84-0480/84-0360 (1219 + 11 - 84-0360)
930	306.83	6,972,812.83	378,663.43	
1077	304.09	6,969,321.33	381,352.66	
1250	293.93	6,965,210.85	384,516.64	
1415	304.26	6,961,292.30	387,536.88	
1526 + 15	307.36	6,958,644.51	389,576.98	Fence
1608 + 23	314.07	6,956,690.24	391,076.23	Int. 84-0480/84-0320 (899 + 10 - 84-0320)
1640 + 20	315.98	6,955,934.26	391,666.39	Fence
1758	326.21	6,953,154.81	393,819.28	
1871 + 11	310.32	6,950,471.11	395,904.23	Int. with Track to Stuart Hwy.
1906 + 18	306.62	6,949,634.96	396,550.38	Fence

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0480 (Continued)

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
1934	315.89	6,948,985.28	397,052.44	
2137 + 20	285.97	6,944,171.73	400,790.34	Int. 84-0480/84-0165 (3488 + 11 - 84-0165)
2306	272.09	6,940,189.51	403,884.96	
2460	280.35	6,936,516.78	406,664.28	
2511 + 20	282.69	6,935,280.94	407,596.06	Int. with Track to Wintinnia.
2600 + 8	276.31	6,933,155.61	409,202.46	Fence
2778	290.94	6,928,923.73	412,405.13	Fence
2826	288.74	6,927,774.76	413,274.28	Int. with Stuart Hwy.
2843 + 26	283.93	6,927,351.55	413,696.60	Int. 84-0480/84-0150 (1643 + 12 - 84-0150)
2858	285.77	6,927,010.82	413,854.50	Fence
2940	282.78	6,925,055.94	415,341.87	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0500E

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	326.14	6,978,198.25	368,005.12	S.O.L. (791 + 6 - 83-0500)
167	319.00	6,978,820.52	369,916.67	E.O.L. 83-0500 - 875
282 + 14	311.82	6,979,893.23	373,210.31	Int. 84-0500E/84-0480 (613 + 28 - 84-0480)
387	307.13	6,980,864.64	376,190.98	Int. with Stuart Hwy.
400	307.50	6,980,985.13	376,561.81	E.O.L.

LINE 84-0050W

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	326.19	6,971,312.79	346,796.62	S.O.L.
178 + 10	323.21	6,972,034.51	349,037.25	Int. 84-0500W/84-0088 (213 + 25 - 84-0088)
290	317.10	6,973,065.56	352,228.52	S.O.L. 83-0500 - 100
357	315.51	6,973,685.52	354,143.08	E.O.L. (183 + 18 - 83-0500)

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0600

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
100	358.62	6,992,718.40	371,842.43	S.O.L.
184 + 24	341.90	6,990,707.81	373,406.02	Int. 84-0600/84-0710 (681 + 20 - 84-0710)
320	328.98	6,987,499.62	375,897.49	
435 + 23	311.11	6,984,753.96	378,030.47	Fence
442 + 26	310.58	6,984,585.56	378,160.83	E.O.L. 83-0600 - 1795
513	306.69	6,982,921.22	379,457.47	E.O.L. (Int. 84-0600/83-0600 & 83-0700)

APPENDIX VI

L I S T   O F   P E R M A N E N T   M A R K E R S

LINE 84-0620

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
103	298.46	6,955,944.41	399,532.80	S.O.L.
179 + 25	292.15	6,954,759.68	401,507.63	Int. 84-0620/83-0600 (215 - 83-0600)
235	305.05	6,953,907.83	402,924.67	
271 + 8	301.42	6,953,348.92	403,858.48	Int. with Bore Road
294 + 25	299.62	6,952,985.93	404,464.95	Fence
438 + 18	309.08	6,950,766.23	408,163.18	Int. 84-0620/84-0165 (3818 + 15 - 84-0165)
525	327.01	6,949,527.99	410,431.44	
675	305.93	6,947,481.16	414,433.93	Int. with Stuart Hwy.
865	299.65	6,944,895.42	419,491.95	
1034	276.75	6,942,593.67	423,973.81	
1147	262.13	6,941,059.49	426,961.10	Int. with Access Road.
1200 + 6	239.43	6,940,332.99	428,373.28	Int. 84-0620/84-0150 (2302 + 27 - 84-0150)
1280	243.99	6,939,251.59	430,481.80	E.O.L.

APPENDIX VI

LIST OF PERMANENT MARKERS

LINE 84-0710

STN.	ELEVATION	NORTHING	EASTING	COMMENTS
105	326.67	6,982,769.38	358,014.58	S.O.L.
156 + 7	330.02	6,983,476.20	359,381.50	Int. 84-0710/83-0400
330	336.77	6,985,871.89	364,020.68	
452 + 28	354.33	6,987,563.05	367,299.18	Int. 84-0710/84-0480 (309 + 6 - 84-0480)
500	329.62	6,988,210.27	368,556.22	
681 + 20	341.90	6,990,707.81	373,406.01	Int. 84-0710/84-0600 (134 + 24 - 84-0600)
757	336.58	6,991,745.51	375,417.70	E.O.L.

APPENDIX VII

LIST OF UPHOLES

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
32	213 (088)	102	100	Int. 500/088	324.90	6,971,894	349,100
33	494	84	80	088	310.28	6,963,494	352,907
40	161	54	50	360	294.59	6,953,352	352,492
39	786 (088)	125	120	Int. 360/088	297.45	6,956,376	356,131
38	495	87	80	360	297.21	6,960,438	360,746
37	691 + 6 (0360)	90	85	360/200	304.74	6,964,274	365,226
29	155/156	74	70	710	330.20	6,983,466	359,362
36	956/957	102	100	360	304.06	6,969,987	371,900
35	852 (480)	104	100	Int. 360/480	299.11	6,974,598	377,288
30	428	132	130	600	311.68	6,986,267	376,858
31	282/281 (500)	104	100	Int. 480/500	311.82	6,979,893	373,210
27	681 (710)	93	90	Int. 600/710	341.90	6,990,708	373,406
28	315/316 (480)	86	80	Int. 710/480	348.64	6,987,414	367,415
26	160	93	90	480	360.69	6,990,589	364,968
42	1440	105	100	480	291.79	6,967,825	382.506

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
46	1601 (480)	134	120	Int. 480/320	314.78	6,956,876	390,940
44	1393	80.5	80	480	301.45	6,961,815	387,134
58	2140	127	120	480	286.09	6,944,113	400,837
52	1871	152	150	480	310.59	6,950,480	395,898
67	2400	201	195	480	279.40	6,937,937	405,595
84	2845	167	160	480	285.18	6,927,321	413,619
75	2612	157	150	480	280.46	6,932,882	409,409
82	1960	157	150	150	266.26	6,933,593	420,708
81	1200 (620)	200	195	Int. 150/620	239.43	6,940,333	428,373
57	440 (620)	149	140	Int. 620/165	310.33	6,950,747	408,195
51	180	135	130	620	292.15	6,954,760	401,508
66	673	174	170	620/Stuart Hwy.	305.99	6,947,508	414,381
45	1130/1129	134	130	Int. 320/600	306.68	6,960,431	396,940
47	690/689	164	160	320	292.50	6,953,304	385,756
59	3171/3172 (0165)	138	130	Int. 400/165	302.17	6,937,848	393,716

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
71	1202/1203	156	150	092	255.51	6,920,216	384,994
87	742 (092)	102	100	Int. 092/150	260.06	6,908,596	392,425
88	475 (150)	77	75	Int. 150/090	250.99	6,904,234	387,243
78	969/970	84	80	092	253.63	6,914,340	388,756
96	147	124	120	092	356.85	6,893,576	402,018
93	453	108	105	092	259.66	6,901,301	397,085
92	183/182	156	150	0400	259.77	6,908,945	420,664
85	800 (400)	156	150	Int. 150/400	283.53	6,922,109	407,620
91	388	174	170	0400	270.84	6,913,323	416,329
90	595	166	160	0400	283.44	6,917,733	411,956
62	1450	155	150	Int. 0165/0092	260.03	6,926,478	380,976
86	167	156	150	0150	230.92	6,898,126	380,265
77	390	131	125	0240	282.48	6,921,777	397,265
53	1115/1116	157	150	0240	298.72	6,940,536	386,249
48	505/506	187	180	0320	309.37	6,950,333	381.092

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
49	341/342	126	120	0320	283.63	6,947,881	376,843
50	71	143	140	Int. 0092/0320	268.34	6,944,435	369,477
59	3171/3172	134	130	Int. 0165/0400	302.17	6,937,848	393,716
74	164 [Reshoot]	68	65	0088	324.65	6,973,397	348,416
69	638	119	115	0240	293.59	6,928,185	393.484
61	2742 (0165)	126	120	Int. 0165/0220	272.55	6,929,258	384,102
54	423	138	130	0220	271.86	6,934,964	380.817
60	2998 (0165)	187	180	Int. 0165/0240	309.27	6,934,379	389,843
95	206	156	150	0085	233.90	6,891,353	384,716
89	477 (0085)	144	140	Int. 0085/0150	233.01	6,898,255	380,414
80	106	122	120	0085	230.80	6,888,806	386,299
73	921	126	120	0085	236.36	6,909,609	373,468
64	2090	137	135	Int. 0085/0165	247.90	6,916,297	369,484
55	1692	138	130	0092	261.63	6,932,566	377,073
65	872/873 [Reshoot]	111	105	0360	306.28	6,967,817	369,366

APPENDIX VII

L I S T O F U P H O L E S (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
97	1089	103	100	0080	258.99	6,916,655	355,899
70	230 [Reshoot]	123	120	0500 E	314.48	6,979,406	371,714
108	671	134	130	0070	242.92	6,891,304	352,465
106	1154	138	130	0070	285.51	6,904,296	346,035
105	1398	144	140	0070	277.33	6,910,852	342,769
109	415	138	130	0070	215.05	6,884,454	355,940
110	164	126	120	0070	215.88	6,877,733	359,341
104	1642	144	140	0070	278.22	6,917,418	339,525
112	684/685	84	80	0165	269.60	6,887,976	338,183
113	436/437	105	100	0165	264.72	6,883,032	332,621
116	187 (0165)	60.6	60	Int. 0165/0060	243.79	6,878,078	327,021
111	938	94	90	0165	258.52	6,893,226	343,681
118	558	138	130	0060	236.60	6,864,263	337,295
117	841	114	110	0060	232.68	6,871,081	332,222
122	2265	114	110	0050	263.44	6,886,084	298,809

APPENDIX VII

L I S T   O F   U P H O L E S (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
76	1005	164	160	0400	300.12	6,926,702	403,557
68	1223	174	170	0400	322.43	6,931,595	399,220
94	666 (0220)	71	70	Int. 0300/0220	274.59	6,941,296	377,197
107	1181 + 5	94	90	Int. 0165/0070	272.80	6,898,094	349,116
79	433	156	150	0090	240.41	6,909,727	383,677
56	1125	138	130	0090	248.29	6,927,187	372,402
72	680	138	130	0090	246.21	6,915,943	379,644
83	1334 (0240)	156	150	Int. 0300/240	308.44	6,946,324	383,201
178	220	156	150	0320	273.38	6,946,313	373,554
99	775 (0080)	138	135	Int. 0165/0080	241.72	6,908,781	361,089
103	1450	138	130	0165	251.70	6,903,470	355,144
98	928	138	130	0080	251.99	6,912,617	358,557
101	363	138	130	0080	226.86	6,898,483	367,910
100	573	138	130	0080	245.36	6,903,736	364,434
102	159	126	120	0080	221.90	6,893,382	371,288

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
123	1991	114	110	0050	239.65	6,879,593	303,780
125	1483	114	110	0050	268.92	6,867,544	312,998
126	1231	124	120	0050	254.52	6,861,555	317,570
127	981	114	110	0050	257.34	6,855,584	322,115
128	724	114	110	Int. 0050/0110	246.83	6,849,450	326,814
176	455	102	100	0050	235.66	6,842,965	331,788
119	269	114	110	Int. 0060/0110	228.10	6,857,305	342,472
177	167	114	110	0050	217.34	6,836,085	337,050
149	1890	102	100	0190	274.87	6,863,282	254,927
142	2177 (0190)	104	100	Int. 0190/0030	293.58	6,869,135	261,221
139	2046	84	80	0030	342.86	6,883,872	246,239
141	1583	84	80	0030	292.87	6,874,115	256,166
140	1825	62	60	0030	311.09	6,879,211	250,982
143	1066	124	120	0030	291.16	6,863,211	267,243
144	778	61.8	60	0030	285.57	6,857,142	273,409

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
146	204	125	120	0030	287.09	6,845,034	285,694
134	907	126	120	0040	290.71	6,873,474	279,100
135	609	126	120	0040	286.63	6,867,137	285,413
129	2089/2090	114	110	0170	281.11	6,869,441	303,132
124	1735 (0050)	124	120	Int. 0050/0170	276.55	6,873,531	308,425
130	1856	114	110	0170	292.80	6,865,140	297,589
121	2595	126	120	0170	268.46	6,878,733	315,137
115	1391 (0050)	126	120	Int. 0060/0170	274.35	6,884,337	322,359
133	1208 (0040)	66	60	Int. 0040/0190	311.99	6,879,974	272,818
131	2981	66	60	0190	326.95	6,885,722	278,796
138	2433	72	70	0190	296.58	6,872,310	264,597
132	1432	72	70	0040	305.46	6,884,787	268,140
136	305 (0040)	114	110	Int. 0040/0170	295.48	6,860,714	291,886
137	1355	92	90	0170	301.81	6,855,994	285,624
145	1095 (0170)	102	100	Int. 0170/0030	306.17	6,851,296	279,382

APPENDIX VII

LIST OF UPHOLES (Continued)

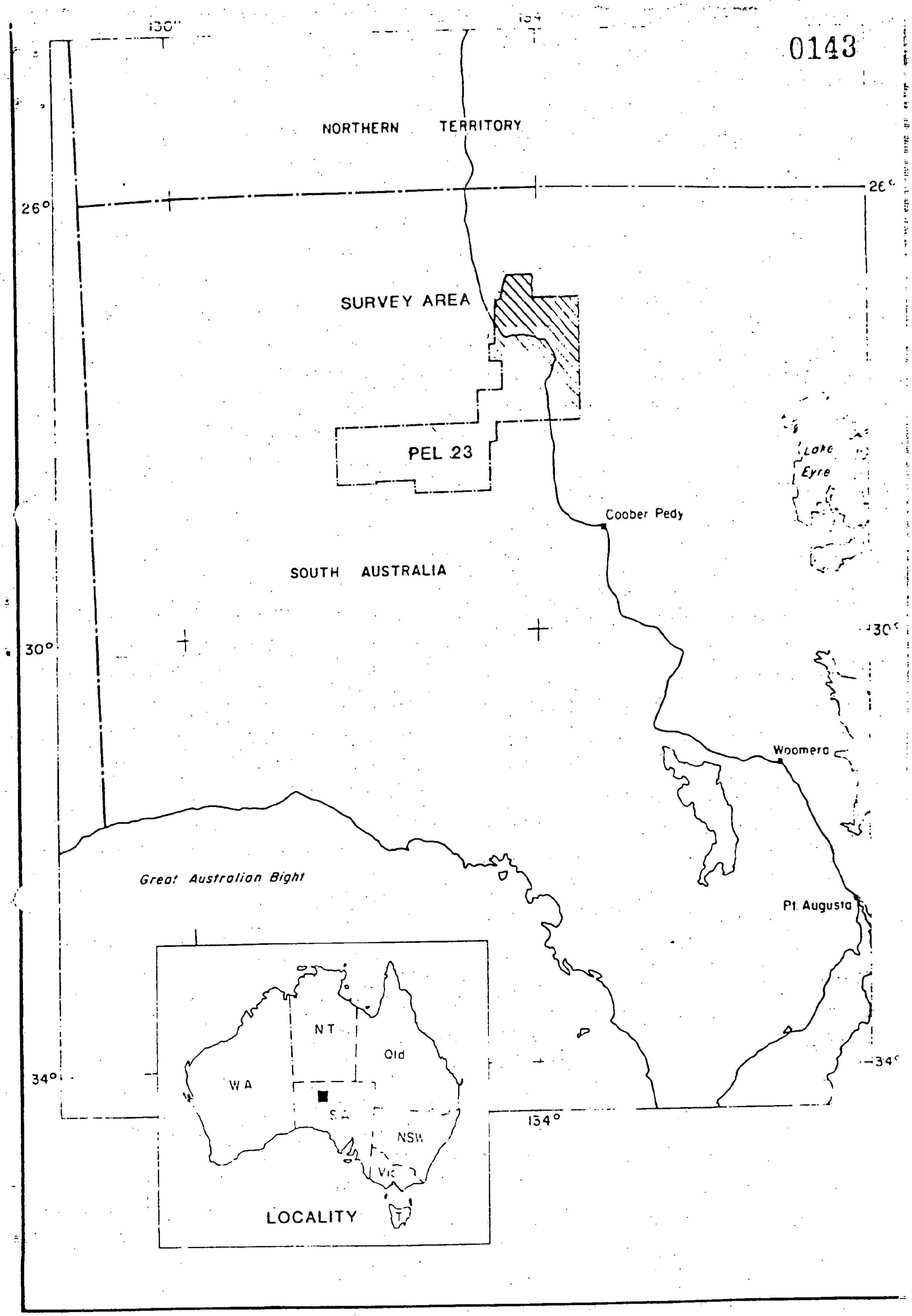
NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
160	2541	74	70	0020	369.31	6,883,602	207,293
151	2285	52	50	0020	353.73	6,878,242	212,811
152	2035	52	50	0020	314.13	6,873,000	218,188
153	1767	74	70	0020	312.79	6,867,365	223,960
154	1497	74	70	0020	294.06	6,861,959	229,477
155	1232	66	60	0020	263.41	6,856,099	235,447
156	965 (0020)	63	60	Int. 0020/0190	286.39	6,850,482	241,167
157	689	62	60	0020	306.68	6,844,652	247,084
158	433	54	50	0020	297.80	6,839,413	252,396
159	165	84	80	0020	317.77	6,833,735	258,158
150	1581	84	80	0190	272.15	6,856,955	248,120
168	183	72	70	0190	278.02	6,828,310	217,349
166	441 (0190)	72	70	Int. 0190/0010	265.42	6,833,577	223,029
162	724	83	80	0190	275.75	6,839,378	229,283
161	994	84	80	0190	279.70	6,844,912	235,219

APPENDIX VII

LIST OF UPHOLES (Continued)

NO.	SHOT POINT	DRILL DEPTH METRES	MAX. SHOT DEPTH METRES	LINE NO.	ELEVATION	NORTHING	EASTING
167	178	72	70	0010	261.81	6,829,231	226,140
165	638	84	80	0010	253.12	6,840,484	218,096
164	913	96	90	0010	258.42	6,847,471	213,684
163	1191	52	50	0010	305.82	6,854,560	209,259
171	1483	84	80	0010	309.67	6,861,996	204,611
172	1758	83	80	0010	335.62	6,869,003	200,226
173	2035	84	80	0010	351.50	6,876,050	195,774
174	2323	84	80	0010	310.62	6,884,329	190,504

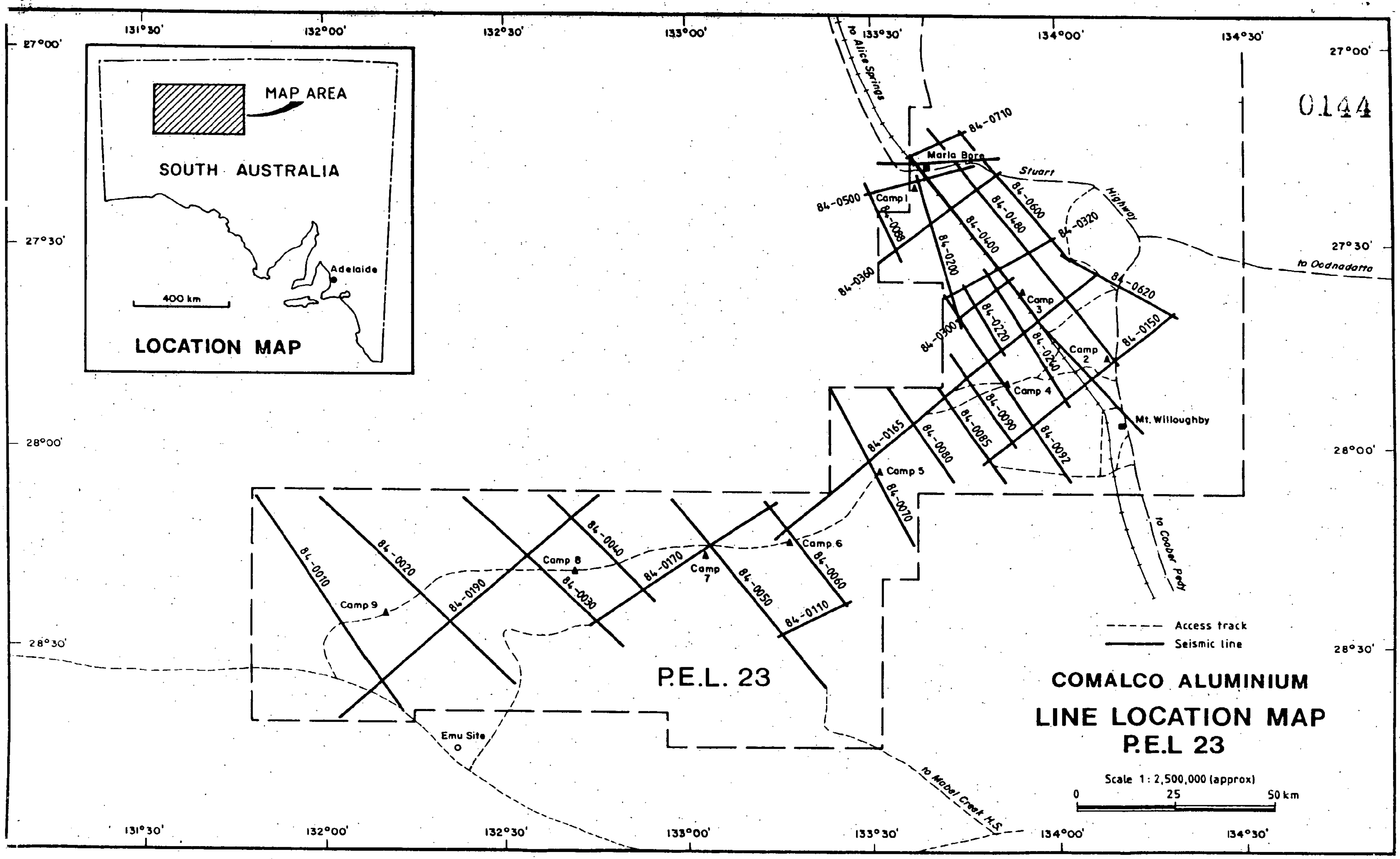
0143

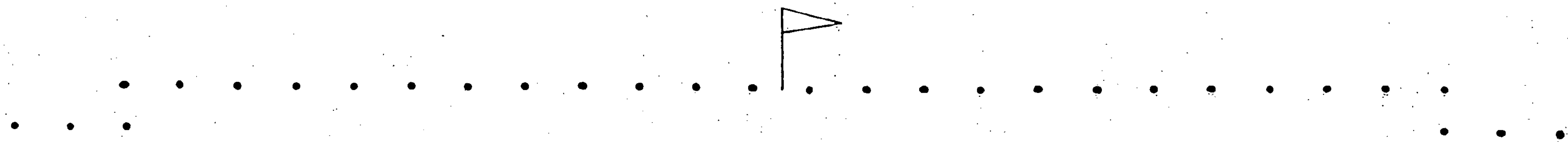


PETTY RAY GEOPHYSICAL

LOCATION MAP

Figure

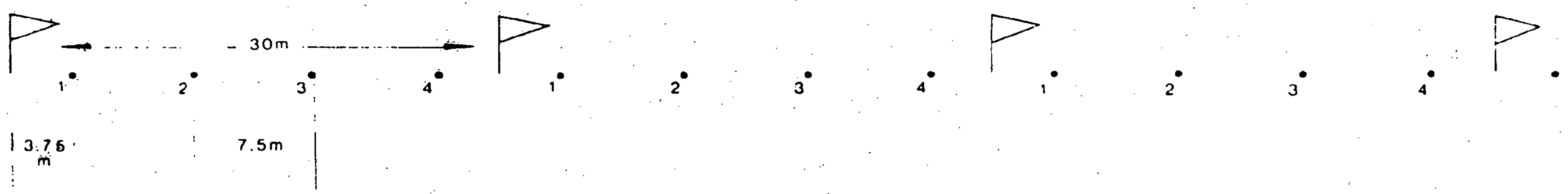

0144
MAP AREA
SOUTH AUSTRALIA
Adelaide
400 km
LOCATION MAP
to Alice Springs
Marla Bore
Stuart Highway
to Oodnadatta
Camp 1
Camp 2
Camp 3
Camp 4
Camp 5
Camp 6
Camp 7
Camp 8
Camp 9
Mt. Willoughby
to Coober Pedy
Emu Site
to Mabel Creek H.S.
84-0710
84-0500
84-0088
84-0360
84-0200
84-0400
84-0480
84-0600
84-0320
84-0620
84-0150
84-0300
84-0220
84-0260
84-0090
84-0085
84-0092
84-0165
84-0080
84-0070
84-0060
84-0110
84-0050
84-0170
84-0040
84-0030
84-0190
84-0020
84-0010
P.E.L. 23
Access track
Seismic line
COMALCO ALUMINIUM
LINE LOCATION MAP
P.E.L 23
Scale 1: 2,500,000 (approx)
0
25
50 km
131°30'
132°00'
132°30'
133°00'
133°30'
134°00'
134°30'
27°00'
27°30'
28°00'
28°30'



STATION INTERVAL 30m
24 GEOPHONES/TRACE IN LINE ALONG LINE 1.25m SPACING
2 STRINGS, 12 PHONES/STRING, SERIES SERIES CONNECTED
TYPE SM-4, 10Hz, COIL RESISTANCE 335ohm

PETTY RAY GEOPHYSICAL

RECEIVER ARRAY



4 DROPS PER STATION AT 7.5m SPACINGS

1st DROP 3.75m AFTER FLAG

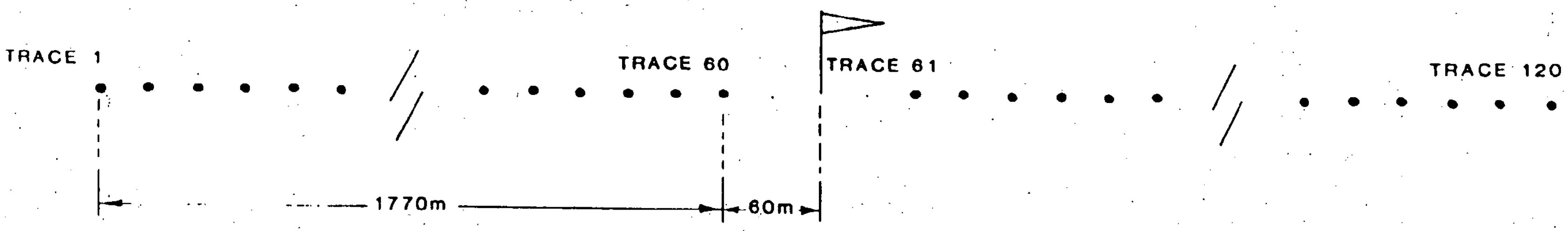
8 WEIGHTED DROPS PER RECORDED STATION USING VARISOURCE

PETTY RAY GEOPHYSICAL

SOURCE ARRAY

Figure

0147



1830-60-0-60-1830

60-60

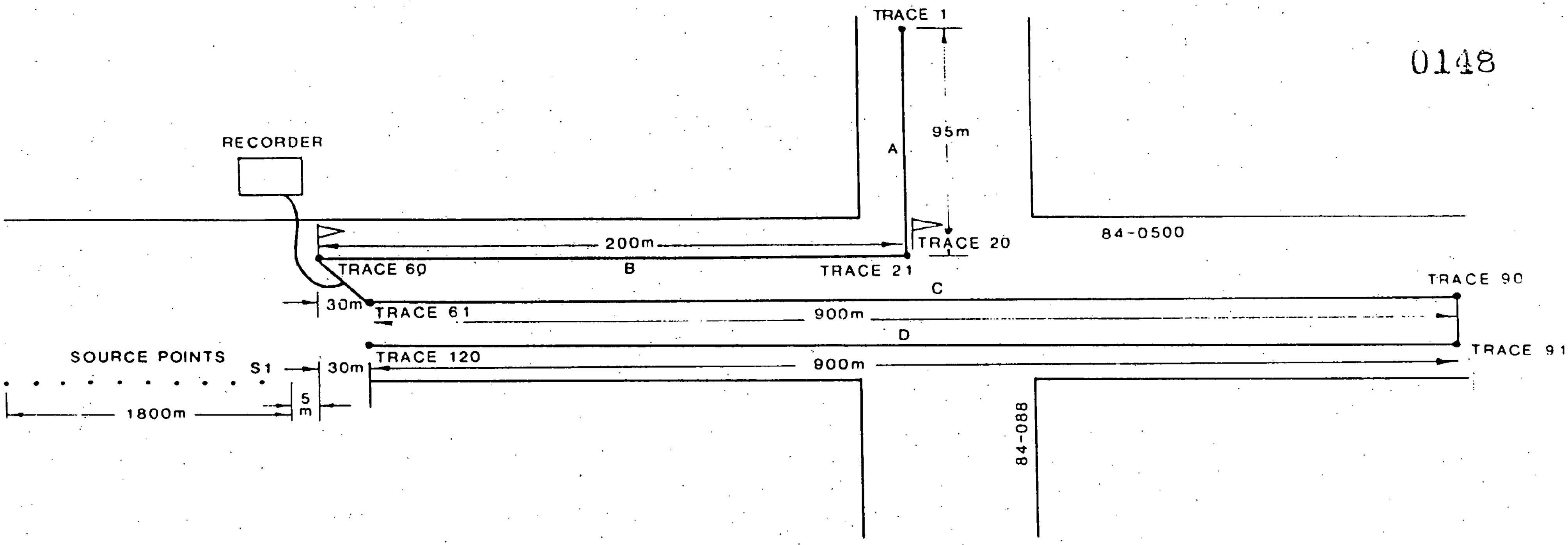
SYMMETRICAL SPLIT SPREAD

PETTY RAY GEOPHYSICAL

SPREAD DIAGRAM

Figure

0148



A. 20 GROUPS OF 12 GEOPHONES BUNCHED at 5m SEPARATION
B. 40 GROUPS OF 12 GEOPHONES BUNCHED at 5m SEPARATION
C. 30 GROUPS OF 24 GEOPHONES OVER 30m (at 1.3m SEPARATION) CENTERED ON FLAG 30m APART
D. 30 GROUPS OF 24 GEOPHONES OVER 60m (at 2.6m SEPARATION) CENTERED ON FLAG 30m APART

SOURCE POINTS at 5-15m 52-205m 5-3-405m 5-4-605m 5-5-805m 5-6-1005m 5-7-1205m 5-8-1405m 5-9-1605m 5-10-1805m FROM TRACE 60

N.B. SOURCE POINT10 PACED DISTANCE ONLY , NOT SURVEYED

NOT TO SCALE

COMPLETED APRIL 2, 1984

PETTY RAY GEOPHYSICAL

NOISE STUDY AT INTERSECTION OF 84-0500 & 84-088

Figure 6

SAOME

1984 ACCOMPANYING REPORT 3

PROCESSING REPORT

FOR COMALCO ALUMINIUM LIMITED

LOCATION: MARLA BORE : OFFICER BASIN : SOUTH AUSTRALIA

1984 SURVEY

PEL 23

COMPILED BY:

HOSKING GEOPHYSICAL CORPORATION (AUSTRALIA)

INDEX

INTRODUCTION

The field survey was undertaken over the period April to August 1984 by Petty-Ray Geophysical crew 6316. The processing was conducted concurrently by Hosking Geophysical Corporation (Australia) at their Perth office.

Cont/...2

FIELD SURVEY INFORMATION

A) ACQUISITION PARAMETERS -

1) 1984 SURVEY:

SOURCE	THUMPER
FOLD	6000%
SPREAD CONFIGURATION	120 TRACE: OFFSETS: 1830-60-0-60-1830 M
GROUP INTERVAL	30M
S.P. INTERVAL	30M
SOURCE ARRAY	8 x 7.5 M WITH 1 WT. TRUCK "VARISOURCE"
GEOPHONE TYPE	MD79 10 Hz
GEOPHONE CONFIGURATION	24 x 1.25 M IN LINE
RECORDING INSTRUMENT	MDS10
RECORD LENGTH	4 SEC
SAMPLE RATE	4 MSEC
RECORDING FILTER	OUT-62.5 Hz LINE 84-010 : 12-62.5 Hz
GAIN	IFP
TAPE FORMAT	1600 B.P.I. SEGB

2) 1983 GEOSYSTEMS REPROCESSING:

SOURCE	VIBROSEIS
FOLD	8500/8600%
SPREAD CONFIGURATION	512 TRACE : OFFSETS; 2560-0-2550 M
GROUP INTERVAL	10M
S.P. INTERVAL	30M
SOURCE ARRAY	3 IN LINE ; 8 SWEEPS OVER ARRAY LENGTH & 30% DRIVE ON VIBRATORS
SWEEP	6000 MSEC ; LINEAR SWEEP #1 : 12/56 Hz SWEEP #2 : 12/60 Hz SWEEP #3 - 4 : 12/100 Hz SWEEP #5 - 8 : 24/100 Hz
GEOPHONE TYPE	10 HZ
GEOPHONE CONFIGURATION	6 x 1.67 M
RECORDING INSTRUMENT	GEOCOR IV
RECORD LENGTH	10 SEC : 4 SEC LISTENING TIME
SAMPLE RATE	2 MSEC
GAIN	IFP
TAPE FORMAT	1600 B.P.I. GSC2

Cont/...3

B) FIELD DATA SUPPORT MATERIAL -

The following support information was provided:
a) observers logs, b) surveying reports, c) uphole survey plots.

In general, support data was accurate with noteable exceptions being the numbering and location of upholes and intersections with the 1983 survey lines.

Cont/...4

DATA QUALITY OVERVIEW

A) 1984 SURVEY :

In general, the 1984 survey was of higher quality than the 1983 survey. This was due mainly to a higher fold redundancy, a change in the spread configuration to a wider group interval split spread, and to the movement of some portions of the survey into better data areas. As with the 1983 survey, the 1984 data continued to suffer from high amplitude organised noise which required F-K filtering.

It was observed by the client that some improvement in the data quality on the last line shot (line 84-010) over a similar parallel line (line 84-020). It was hypothesised that this was due to the inclusion of a low cut filter in the field on line 84-010, eliminating high amplitude low frequency noise which was possibly overloading the dynamic range of the recording instruments. It is difficult to ascertain whether this explanation is correct or whether the data was simply better on line 84-010 with respect to line 84-020 without further field testing using identical data.

B) 1983 GEOSYSTEMS REPROCESSING :

The data was of generally poorer quality to the thumper data. This was offset to some degree in good data zones by a higher fold and frequency range. In poorer data zones and in particular, the southern end of the line, data quality was worse than that of the thumper. Reflection energy tended to arrive predominantly on the outside traces, more so than on the thumper data, making initial muting critical.

The main improvement over the thumper data was in the good data zones where higher frequency data was revealed, particularly in the shallow data where the improvement can also be attributed to a reduced near trace offset. It should however be noted that even in the better data zones, continuity of reflections diminished with respect to the thumper data (eg; the major reflector over VP's 1800-1880).

Cont/...5

PROCESSING PARAMETER EXPERIMENTATION

A) 1984 SURVEY :

Testing followed the same direction as the 1983 test sequence. Initial pre-stack testing was performed on line 84-500W with initial mute tests carried out on all lines as per the 1983 survey.

1. F-K FILTERING:

Because of severe organised noise trains F-K filtering parameters were critical in improving the signal to noise ratio. Several displays were made of records in the T-X and F-K domain, varying the velocity rejection zone. The final parameters chosen were the same as the 1983 survey in their velocity rejection zone.

The application of 500 msec AGC scaling before F-K filtering was used to equalise the relative amplitudes of noise and data. This was removed after F-K filtering.

2. TRUE AMPLITUDE RECOVERY:

T.A.R. was not tested but kept the same as for the 1983 survey. The reason for this is that the source and area were common to both surveys.

3. PRE-DECONVOLUTION BAND PASS FILTER:

Filter panels of shot records were displayed to determine this filter. A filter was chosen to remove noise remaining after the F-K filter whilst still retaining a wide band-pass before applying deconvolution.

4. PRE-STACK DECONVOLUTION:

Stack panels were created for different minimum and zero phase deconvolution types ; predictive with gaps of 8,16,24,32, and 40 msec, spiking with 1%,2% and 5% W.N., and zero phase multichannel spiking with 2% W.N. Operator length of 100 msec and design window of 300-1300 msec for near offset, and 700-1900 msec for far offset traces remained constant. The same deconvolution as the 1983 survey was chosen.

Cont/...6

5. INITIAL MUTING:

Tests took the form of variable offset stacks and display of NMO corrected CDP gathers. Initial muting was critical and parameter changes were required frequently through the prospect as was the case when processing the 1983 survey. As a result initial mute tests were run several times on each line (see Appendix B).

6. POST-STACK BAND PASS FILTERING:

Band pass stack panels were produced to determine the band pass filter. A slight reduction in the high cut was chosen after 1800 msec.

7. POST-STACK SCALING:

It was preferred in processing the 1983 survey that scaling only be performed to equalise the data laterally and thus a constant window was employed. As an additional 500 msec were processed in the 1984 survey, two windows were employed to give some time variant equalisation.

8. POST-STACK DECONVOLUTION:

Stack panels of various deconvolution types were displayed. No significant improvement could be achieved in the application of this process.

B) 1983 GEOSYSTEMS PROCESSING :

A similar test sequence to the above was performed on Geosystems line 83-200.

The initial mute test proved to be of greater importance than with the thumper due to a greater dependence on outside traces for reflection data. Four mute tests were run in total and their results showed a need to track the major reflector dipping up to the south.

Cont/...7

In addition to the normal processing a final stack was also produced using the 256 trace "DFS" (differential sum) data produced by Geosystems and employing parameters tested on the 512 trace data. The comparison between the two versions revealed that generally the 512 trace input produced a superior result though the overall noise level was somewhat greater.

In March 1985, a further test was performed over an extended V.P. range (1351-2740). The line was stacked using static, velocity, and muting parameters derived from the original thumper data. A further panel (V.P.'s 2120-2280) was produced with the thumper deconvolution parameters. The purpose of this test was to create a more direct comparison between the two sources by removing some of the processing parameter differences. Continuity was severely reduced on the main reflector and to a lesser extent on other evetns. The main reason for this was the severity of the thumper mute compared to that designed on the vibroseis data. As would be expected, however, events were higher in frequency and in a few instances weak events became more pronounced. Some improvement in the first 200 msec was observed.

It should be noted that the thumper proved to be overall the better source in terms of continuity in spite of the fact that the vibroseis data was of almost double the fold and with a considerably shorter group interval and near trace offset.

Cont/...8

WEATHERING STATICS

Weathering statics were derived from the production weight drop refraction breaks and upholes.

Refraction breaks were picked by hand from the production records (every shot) and statics derived using the Gardner/ Layat method. Breaks were picked in both the forward and reverse directions and intercept times converted to one way statics as described in Appendix E.

Statics were also calculated at each uphole location using uphole times and depths. The uphole statics were compared with the refraction statics and differences computed at each uphole location. A difference profile was then produced by linear interpolation. Final "uphole calibrated" statics were derived by combining the difference and refraction profiles.

Statics were calculated using a datum of 100M above mean sea level and a replacement velocity of 2000 M/sec. To avoid data being lost by being moved to above 0 time, sections were processed and displayed from a negative time of 200 msec.

A change in weathering model was required as the survey moved to the southeast. A change from a two weathering layers case to a one layer case was made due to a considerable thickening in the first layer making picking of the second refractor impossible. The change in weathering model is annotated at the top of each relevant section.

An attempt was made to pick the first breaks of the vibroseis data on 83-200, however, the breaks were too poor to enable confident and continuous picking. The thumper derived statics were used in all final displays of this line.

Cont/...9

PROCESSING SEQUENCE

A) 1984 SURVEY:

1) DEMULTIPLEX - Conversion of field data to Phoenix I format. Data was output to 2.5 seconds.

2) LINE GEOMETRY CREATION

3) F-K FILTERING - Dip cuts of 6.3/7.5/156/208 msec/trace with wrap around to 1.25 times the alias wave number, and reverse cut of 208/145/4.46/2.5 msec/trace with wrap around to 0.75 times the alias wave number.

4) TRUE AMPLITUDE RECOVERY - Using the formula

$$GAIN = K\ (t^n)\ (e^{at})$$

K and n = 1, a = 0.1

5) BAND PASS FILTERING - 5/10/60/65 Hz

6) DECONVOLUTION - Predictive deconvolution with a 100 msec operator length, 28 msec gap, 5% W.N., and a design window of 300 to 1300 msec for the near offset, 700 to 1900 msec on the far offset.

7) TRACE EQUALISATION - 500 msec A.G.C. scaling

8) DATUM STATICS (1) - Application of the floating datum correction as calculated from the average total static corrections within each C.D.P. Weathering statics were computed using the Gardner/ Layat method (see Appendix E).

9) NORMAL MOVEOUT CORRECTIONS - Locations for constant velocity stack analyses were initially determined from the brute stack. Extra CVS's were run as required. Each CVS was run over 21 CDP's.

10) INITIAL MUTING - Full parameter definition can be found in Appendix B.

Cont/...10

11) DATUM STATICS (2) - Correction of data to a datum of 100 M above mean sea level.

12) RESIDUAL STATICS - Residual statics were run in two passes: a) a surface consistent solution where the maximum allowable shift was +/- 30 msec with a maximum allowable shift in the design of the model trace of +/- 12 msec; b) a CDP trim solution calculated on a y trace pilot with 90% weighting towards the centre CDP and a maximum allowable shift of +/- 20 msec (traces whose calculated correction was larger than this value were reduced in amplitude to 30%). Design windows were varied from line to line in both of the above solutions.

13) STACK - 60 fold

14) POST-STACK BAND-PASS FILTER - 5/10/60/65 Hz from 0-1200 msec, 5/10/40/45 Hz from 1600-2500 msec.

15) SCALING - Two windows whose join followed the end of the CDP trim design window were used.

POST-STACK EXTRA PROCESSING:

a) Migration - Finite difference wave equation. Applied only on selected lines.

b) 2 on 1 Decimating Mix - Applied to all lines. The display of this process was annotated as "Compressed".

B) <u>1983 GEOSYSTEMS REPROCESSING</u>:

1) DEMULTIPLEX - Crosscorrelated by Geosystems. Output to 2 seconds. Two output types - a) "DFS": 6 x 2 running mix to give 256Tr b) complete 512 Trace records

2) LINE GEOMETRY CREATION

3) TRUE AMPLITUDE RECOVERY - Using the formula

$$GAIN = K\ (t^n)\ (e^{at})$$

K and n = 1, a = 0.1

Cont/...11

4) F-K FILTERING - Lozenge filter design.

5) BAND PASS FILTERING : 10/15/90/100 Hz

6) DECONVOLUTION - Predictive deconvolution with a 100 msec operator length, 16 msec gap, 1% W.N., and a design window of 100 to 1100 msec for the near offset, 1100 to 2000 msec on the far offset.

7) TRACE EQUALISATION - 500 msec A.G.C. scaling

8) DATUM STATICS (1) - Application of the floating datum correction as calculated from the average total static corrections within each CDP. Weathering statics were computed using the Gardner/ Layat method from the thumper first breaks (see Appendix E).

9) NORMAL MOVEOUT CORRECTIONS - Locations for constant velocity stack analyses were initially determined from the brute stack. Each CVS was run over 21 CDP's.

10) INITIAL MUTING - Full parameter definition can be found in Appendix B.

11) DATUM STATICS (2) - Correction of data to a datum of 100 M above mean sea level.

12) RESIDUAL STATICS - Residual statics were run in two passes : a) a surface consistent solution where the maximum allowable shift was +/- 30 msec with a maximum allowable shift in the design of the model trace of +/- 12 msec; b) a CDP trim solution calculated on a 9 trace pilot with 90% weighting towards the centre CDP and a maximum allowable shift of +/- 20 msec (traces whose calculated correction was larger than this value were reduced in amplitude to 30%).

13) STACK - 85/86 fold

14) POST-STACK BAND-PASS FILTER - 10/15/90/100 Hz

15) SCALING - 2000 msec constant window

Cont/...12

FINAL DISPLAY

A) 1984 SURVEY -

Three different film displays were produced:

a) Final stacked section
b) 2 on 1 decimated mix section
c) Migrated stack section (on chosen lines)

Films were produced with a bias of 0% and normal polarity (a negative value on tape displayed as a trough).

Time display starts at -200 msec to enable display of data above datum.

The display scale for the Final and Migrated stacks was 10 traces/cm (1:15000) and 10 cm/sec with wiggle and variable area. The 2 on 1 mix section was displayed at 16.8 traces/cm (1:50398) and 10 cm/sec with variable area only.

A line graph plot of the one way static at each location was displayed above the section. This is the combined elevation and weathering static for each surface location (not C.D.P.).

B) 1983 GEOSYSTEMS REPROCESSING -

Film displays were produced for the 512 trace data, "DFS" data, and 512 trace "thumper parameter" tests.

Films were produced with a bias of 0% and normal polarity (a negative value on tape displayed as a trough).

Time display starts at -200 msec to enable display of data above datum.

Two display scales were produced for each of the 512 trace stacks : 12 traces/cm (1:24000) and 10 cm/sec with wiggle and variable area, and 24 traces/cm (1:12000) and 10 cm/sec with variable area only. The "DFS" stack was displayed at 12 traces/cm (1:12000) and 10 cm/sec with wiggle and variable area.

Cont/...13

A line graph plot of the one way static at each location was displayed above the section. This is the combined elevation and weathering static for each surface location (not C.D.P.).

Cont/...14

CONCLUSION AND RECOMMENDATIONS

As with the 1983 survey, the signal to noise ratio of the field records was poor. However, high multiplicity, effective velocity filtering, and close control over velocity, initial muting, and weathering statics, enabled final stacks of good quality to be produced.

In general, the final stack quality of the 1984 program was higher than that of the 1983 survey due to higher multiplicity and conversion to a symmetrical split spread with a wider group interval.

The comparison tests between the Geosystems vibroseis data and the 1983 thumper data on line 83-200 showed that thumper was the better source in terms of the continuity and amplitude on the majority of events. Some additional high frequency information was obtained, mainly in the shallow section, with the vibroseis, but serious limitations in the resolution of other events (such as where the major reflector shallows on the southern end of the line) indicated that thumper was overall the superior source. Vibroseis may prove to be a useful tool in detailing over good data areas where thumper data has already been acquired. Possible improvement may also be gained with the vibroseis if sweeps begin at lower frequencies, provided that adequate coupling can be maintained.

Cont/...15

APPENDIX A

FINAL FILMS

Film sections were produced as follows:

Line No.	Shot Point Range: Final Stack (1:15,000) Compressed Stack (1:50,398)	Shot Point Range: Migrated Stack
84-10	2390- 100	2390- 100
84-20	100-2609	100-2609
84-30	2114- 133	2115- 133
84-40	100-1510	700-1510
84-50	100-2332	720-1720
84-60	1512- 100	1512- 100
84-70	1700- 100	1700- 100
84-80	90-1155	90-1155
84-85	100-1257	100-1257
84-88	100- 957	100- 957
84-90	1195- 130	1195- 130
84-92	2205- 100	100-1140
84-150	94-2380	800-1450
84-165	3900- 59	3900- 59
84-170	3097-1030	-
84-190	3050- 120	1050-3050
84-220	950- 123	950- 123
84-240	100-1550	100-1550
84-320	1211- 43	1211- 43
84-360	100-1564	100-1564
84-400	1267- 85	1267- 85
84-480	100-2912	100-2912
84-500W	357- 100	357- 100
84-500E	100- 400	-
84-600	513- 100	-
84-620	1279- 103	103- 700
84-710	757- 105	757- 105

In addition, 30 fold stacks were displayed on film at 1:15,000 as follows:

Line No.	Shot Point Range
84-20	1100-1900
84-85	100-1257
84-88	100- 957

APPENDIX B

INITIAL MUTING

It was of critical importance to the stack data quality to observe the need to change the initial muting. Following is a list of the initial muting employed on each line. Gaps in S.P. ranges signify an area of linear interpolation.

Line No.	S.P.	Offset(M)	Time(Msec)
84-010	100-1630	210	0
		330	220
		1110	720
		1830	900
	1780-2390	210	0
		270	170
		330	260
		750	550
		1830	800
84-020	Whole Line	150	0
		210	100
		450	300
		630	400
		990	460
		1830	800
84-030	133-600	270	0
		330	200
		450	350
		690	520
		1830	1100
	700-1440	270	0
		300	200
		750	420
		1110	650
		1530	970
		1830	1100
	1740-2114	270	0
		300	150
		570	330
		1110	690
		1830	1100

84-040	100-280	210	0
		390	240
		750	420
		1110	650
		1830	900
	640-980	210	0
		390	270
		930	610
		1110	700
		1830	950
	1200-1510	210	0
		390	210
		990	570
		1230	710
		1830	900
84-050	100-320	210	0
		330	300
		390	350
		630	480
		1230	600
		1830	800
	600-1540	150	0
		210	150
		330	300
		450	370
		870	550
		1830	900
	1780-2332	150	0
		330	280
		510	390
		810	630
		990	800
		1830	1100
84-060	100-660	150	0
		210	190
		450	400
		870	600
		1830	900
	720-1040	150	0
		330	330
		1110	660
		1830	780
	1100-1512	150	0
		270	200
		870	580
		1830	750

84-070	100-800	210	0
		330	220
		510	450
		750	620
		1830	900
	1000-1320	210	0
		330	300
		510	400
		990	620
		1410	750
		1830	900
	1500-1700	150	0
		270	300
		630	510
		870	600
		1110	820
		1830	1050
84-080	90-690	150	0
		270	200
		450	450
		850	700
		1830	1000
	780-1155	150	0
		270	200
		450	450
		630	620
		1830	920
84-085	Whole Line	150	0
		210	200
		270	300
		450	430
		870	800
		1830	1100
84-088	Whole Line	168	0
		480	250
		960	440
		1860	630
84-090	130-780	210	0
		270	200
		390	400
		750	650
		1290	880
		1830	1000
	800-1195	210	0
		270	200
		390	400
		750	650
		1110	730
		1830	850

84-092	100-820	150	0
		270	270
		570	560
		750	650
		990	750
		1830	1000
	890-1300	150	0
		330	280
		510	460
		630	550
		990	680
		1830	900
	1340-1860	150	0
		330	320
		630	500
		990	570
		1830	1000
	2060-2205	150	0
		150	110
		270	320
		570	500
		1110	700
		1830	900
84-150	94-440	150	0
		210	200
		390	320
		510	450
		1110	630
		1830	850
	500-1020	150	0
		210	350
		630	530
		1830	1000
	1060-1400	210	0
		270	200
		510	470
		1230	1000
		1830	1150
	1440-1950	150	0
		210	280
		510	470
		870	800
		1830	1180
	2000-2380	150	0
		270	280
		330	400
		810	640
		1830	1020

84-165	59-1000	210	0
		330	210
		570	390
		990	600
		1830	900
	1260-1960	150	0
		330	220
		510	300
		990	530
		1830	900
	2020-2900	210	0
		330	240
		570	400
		930	620
		1350	870
		1830	1100
	3000-3450	150	0
		270	280
		390	450
		1290	750
		1830	900
	3500-3900	150	0
		270	350
		630	520
		930	570
		1830	900
84-170	1030-1200	210	0
		330	250
		690	430
		870	520
		1830	800
	1680-2230	210	0
		330	260
		450	360
		930	630
		1830	850
	2590-3097	210	0
		330	210
		510	350
		1230	600
		1830	900
84-190	120-2000	150	0
		210	100
		450	300
		630	400
		900	460
		1830	800
	2100-3050	150	0
		270	200
		480	400
		990	500
		1830	800

84-220	WHOLELINE	210	0
		450	300
		690	370
		1170	590
		1830	800
84-240	100-660	150	0
		210	250
		330	360
		930	880
		1170	1000
		1830	1250
	700-1550	150	0
		270	280
		390	450
		1290	750
		1830	900
84-320	43-260	168	0
		312	230
		1128	510
		1830	650
	400-600	168	0
		216	220
		480	340
		960	470
		1830	670
	800-1211	216	0
		288	175
		768	350
		1320	545
		1830	650
84-360	100-291	168	0
		480	250
		960	440
		1860	630
	591	168	0
		312	230
		1128	510
		1860	650
	899	264	0
		360	150
		696	300
		1224	540
		1860	650
	1447-1564	168	0
		216	200
		840	410
		1416	550
		1860	650

84-400	85-410	210	0
		270	200
		510	470
		1230	930
		1830	1100
	440-920	210	0
		270	200
		510	470
		1230	1000
		1830	1150
	960-1267	210	0
		390	270
		690	550
		1830	1100
84-480	100-380	210	0
		270	110
		510	300
		1050	550
		1830	800
	420-780	168	0
		480	250
		960	440
		1860	630
	820-2140	216	0
		288	175
		768	350
		1320	545
		1830	650
	2160-2912	150	0
		210	270
		750	610
		1830	880
84-500W	Whole Line	168	0
		480	250
		960	440
		1860	630
84-500E	Whole Line	168	0
		480	250
		960	440
		1860	630

84-600	Whole Line	168	0
		216	200
		648	410
		1416	590
		1830	650
84-620	103-300	168	0
		216	200
		840	410
		1416	550
		1830	650
	450-530	150	0
		270	300
		570	550
		1110	720
		1470	850
		1830	980
	550-700	150	0
		270	300
		630	630
		1230	830
		1830	950
	720-1279	150	0
		270	300
		630	650
		990	750
		1830	950
84-710	Whole Line	210	0
		270	110
		510	300
		1050	550
		1830	800

83-200 (Geosystems)	1494-2020	100	0
		220	150
		520	270
		760	460
		1700	640
		2560	900
	2070-2350	100	0
		220	220
		750	350
		1230	500
		2010	650
		2560	800
	2385-2738	100	0
		180	240
		380	300
		700	420
		1100	550
		2100	650
		2560	820

APPENDIX C

LINE INFORMATION

LINE NO.	FIELD TAPES	S.P. RANGE
NOISE STUDY	1	
84-0500E	2,3	100-400
84-0500W	4,5	357-100
84-0088	6 - 10	100-957
84-0360	11 - 19	100-1564
84-0600	20 - 22	513-100
84-0710	23 - 26	757-105
84-0480	27 - 42	100-2912
84-0400	43 - 46, 46A, 47 48	1267-85
84-0150	49 - 56, 88 - 93	94-2380
84-0620	57 - 63	1279-103
84-0165	64 - 68, 108 - 115, 144 - 152	3900-59
84-0320	69 - 75	1211-43
84-0092	76 - 87	2205-100
84-0240	94 - 102	100-1550
84-0220	103 - 107	950-123
84-0090	116 - 121	1195-130
84-0085	122 - 128	100-1257
84-0080	129 - 134	90-1155
84-0070	135 - 143	100-1700
84-0060	153 - 160	1512-100
84-0050	161 - 173	100-2332
84-0170	174 - 185	3097-1030
84-0040	186 - 193	100-1510
84-0190	194 - 200, 213 - 223	3050-120
84-0030	201 - 212	2114-133
84-0020	224 - 238	100-2609
84-0010	239 - 252	2390-100

APPENDIX D

ARCHIVED PURCHASE TAPES

Raw and Migrated stack data for the 1984 survey was archived on tape in SEGY 32 Bit IBM floating point "Archive" format. There is a descriptor block on tape containing the line number of the data which follows.

Raw Stacks

PURCHASE TAPE	LINE NO.
C.P.T. 530	84-480, 500W, 500E, 600
C.P.T. 532	84-620, 710
C.P.T. 533	84-20, 85, 88 (30 FOLD STACK)
C.P.T. 534	84-150, 170
C.P.T. 535	84-165, 220
C.P.T. 536	84-190, 240
C.P.T. 537	84-50, 60
C.P.T. 538	84-70, 80, 85
C.P.T. 539	84-88, 90, 92
C.P.T. 540	84-10, 20
C.P.T. 541	84-30, 40
C.P.T. 547	84-320, 360, 400
C.P.T. 395	GEOSYSTEMS 83-200(DFS), 83-200 (512 TR 85 FOLD DATA)

Migrated Stacks

PURCHASE TAPE	LINE NO.
C.P.T. 483	84-10, 20
C.P.T. 551	84-480, 500W, 620, 710
C.P.T. 552	84-30, 40
C.P.T. 553	84-50, 60
C.P.T. 554	84-70, 80, 85
C.P.T. 555	84-88, 90, 92
C.P.T. 556	84-150, 165
C.P.T. 557	84-190, 220, 240
C.P.T. 558	84-320, 360, 400

APPENDIX E

GARDNER/LAYAT WEATHERING STATICS METHOD

The weathering statics method used by Hosking Geophysical has its development in the procedures established by Gardner and Layat. Trace by trace shot and receiver corrections are derived by establishing a continuous intercept curve from refraction breaks picked from the acquired data.

Intercept time is essentially the difference between the actual travel time of the refracted wave and the time if the wave had travelled a straight line between shot and receiver at the subweathering velocity, or $I = T - X/Vm$. With the redundancy in multi-fold coverage, intercept curves are developed which are the accumulated differences of the variations in time between traces encountering the velocity marker at the base of the weathering and constant value of the trace interval divided by the marker velocity, as described in the above equation. These curves are derived for both the forward and reverse profiles and averaged to eliminate possible errors in the estimation of the marker velocity.

Intercept times are reduced to one way statics by the equation $S=KI$, where $K = 1/2 \cos \theta \ (Vw/Vc-1)$, resulting in a profile which gives a static at every surface position.

Details on the theoretical background for the method may be found in the paper "Modified Gardner Delay Time and Constant Distance Correlation Interpretation" by C. Layat, printed in the S.E.G. publication "Seismic Refraction Prospecting".

APPENDIX F

MISTIE BETWEEN 84-150 AND 84-400

A mistie of 10 msec two-way-time was noted between lines 84-150 and 84-400. Subsequent revision of the refraction statics revealed a small anomaly could be picked at the intersection point on 84-400. It should be noted that this anomaly is highly interpretive but explains the observed mistie. Although the static values at the intersection were identical on both lines, the absence of this anomaly on 84-400 caused static errors on interpolation between the tie point and adjacent uphole locations upon calibration of the refraction statics to the upholes.

No correction has been made for this mistie on the film displays.