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PEL 5 AND PEL 6, BIRDSVILLE TRACK RIDGE BLOCK

EROMANGA BASIN

1979 PULCARA SEISMIC SURVEY

FINAL REPORT

Submitted by

Delhi Petroleum Pty Ltd
1982

MINES AND ENERGY
SOUTH AUSTRALIA

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ENVELOPE 4504

TENEMENT: PEL 5 and PEL 6, Birdsville Track Ridge Block; Eromanga Basin

TENEMENT HOLDER: Delhi Petroleum Pty Ltd (operator), Santos Ltd, Vamgas Ltd and South Australian Oil and Gas Corp. Pty Ltd

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END OF CONTENTS

P.E.L. 5 AND 6

SOUTH AUSTRALIA

PULCARA SEISMIC SURVEY

1979

DELHI PETROLEUM PTY. LTD.

E.F. Tadiar

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PULCARA SEISMIC SURVEY

1.0 INTRODUCTION

The Pulcara Seismic Survey was a 293 km reconnaissance programme in northeastern corner of P.E.L. 5 and 6 in an area referred to as the Birdsville Track Ridge (Fig. 1). Participants in the area are Delhi Petroleum Pty. Ltd., Santos Ltd., Vamgas Ltd. and South Australian O and Gas Corporation Pty. Ltd.

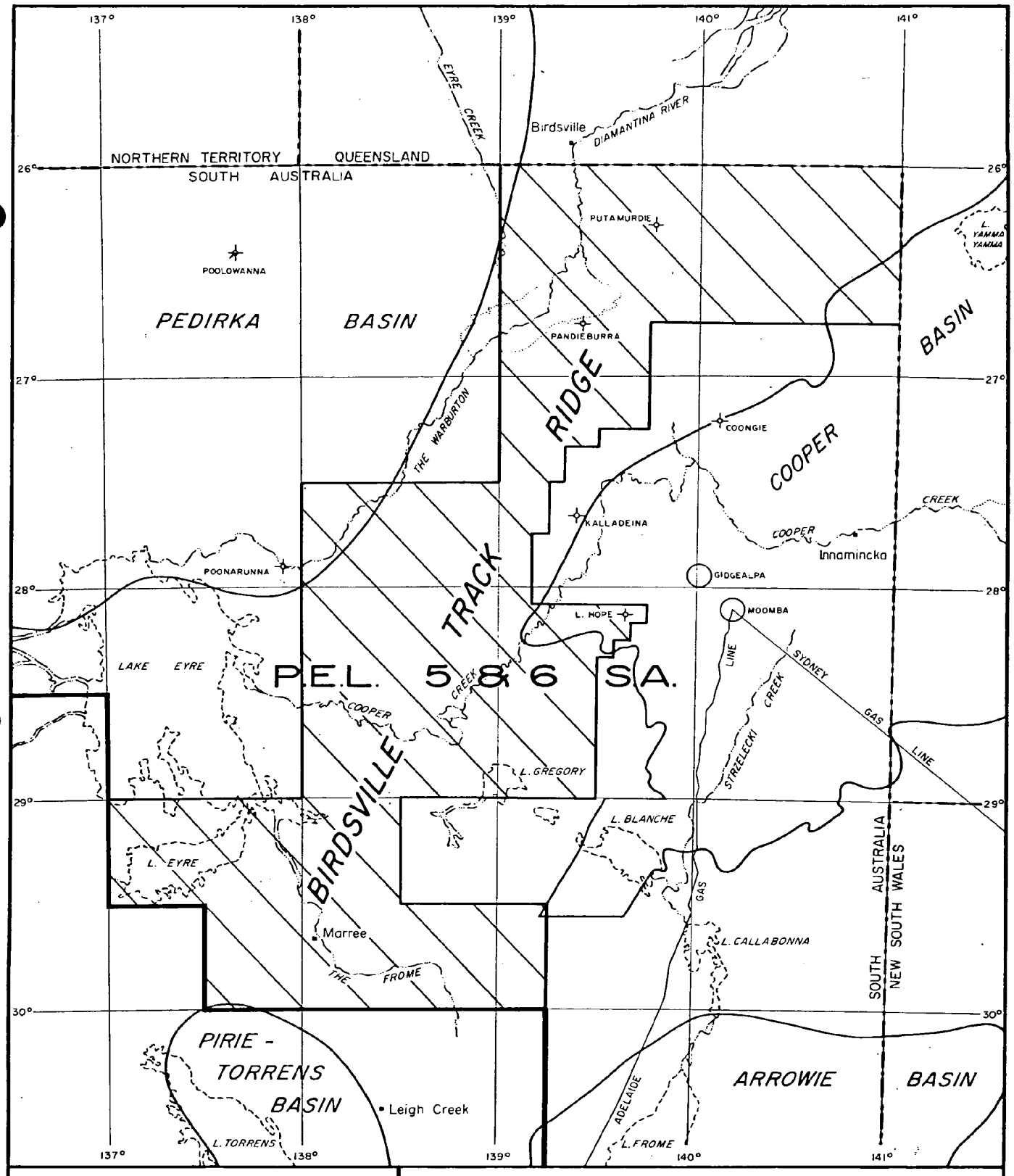
Delhi, as operator for the survey, contracted Geophysical Exploratio Services Pty. Ltd. (GES) for field acquisition and Fogarty and Sons Pty. Ltd. for line clearing. Data processing was contracted to Seismograph Service Ltd. (SSL) in Adelaide.

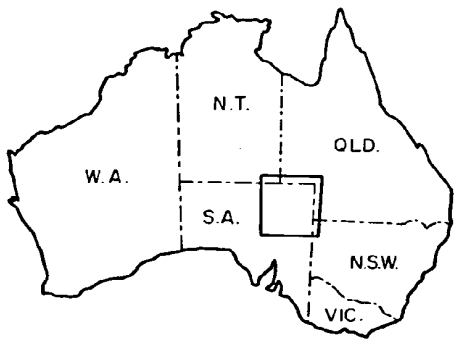
The Pulcara programme consisted of 293 kilometres of seismic coverage recorded in the north-central and northeastern part of the BTR block (Fig. 2). The data were recorded six-fold using a 48-channel DFS III system and geoflex as the energy source. Production began on 26 September, 1979 and the programme was completed on 3 November, 1979.

The survey extended regional coverage into an area sparsely controlle by seismic and located a prospective structural lead in the northeastern part of the area.

2.0 PURPOSE OF SURVEY

Prior to 1979 the only available seismic information within the surve





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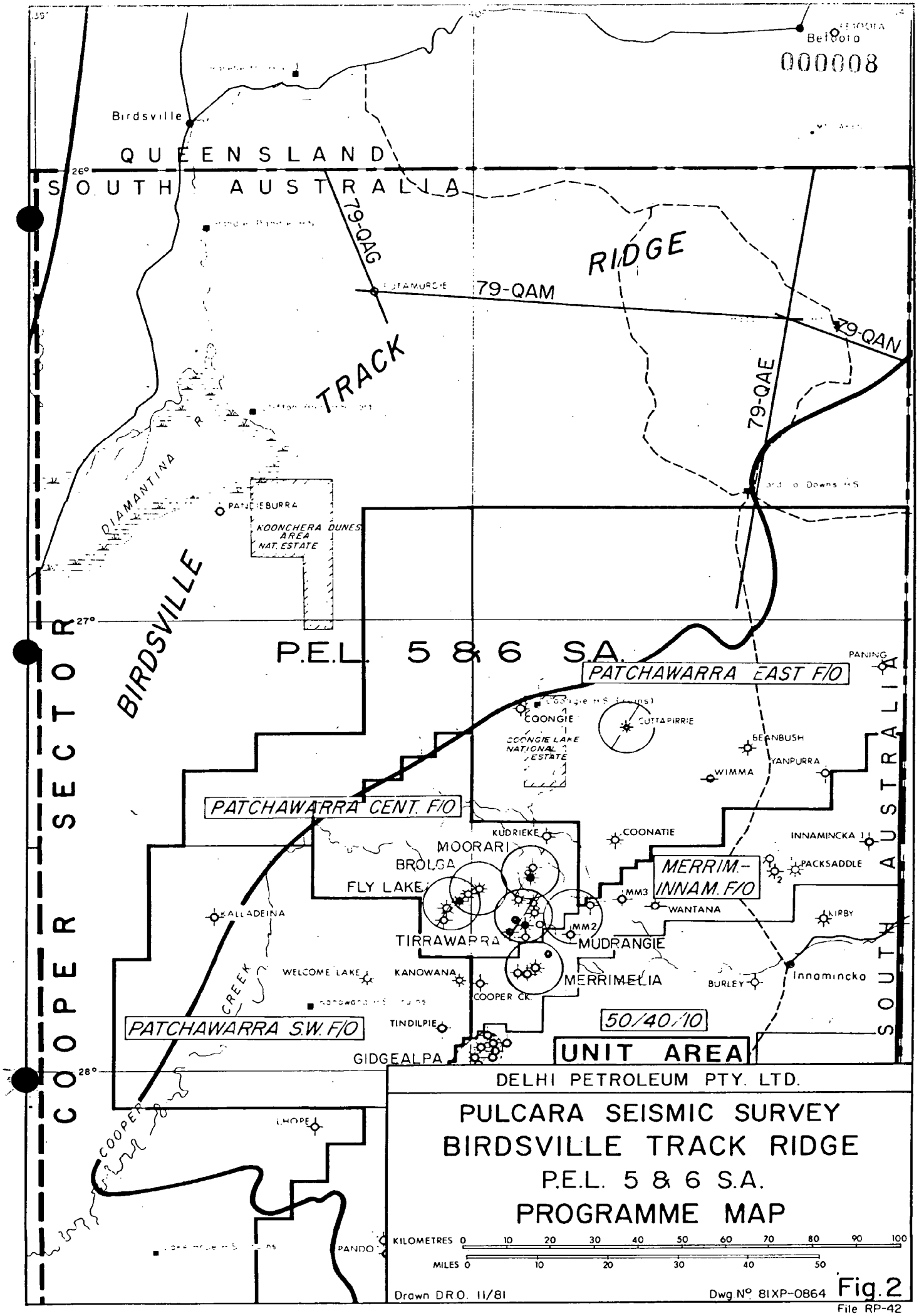
PULCARA SEISMIC SURVEY
BIRDSVILLE TRACK RIDGE
P.E.L. 5 & 6 S.A.
LOCATION MAP

0 50 100 150 200 KILOMETRES

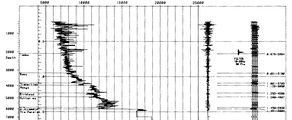
MILES 0 50 100 150

Drawn: J.A.T./D.R.O 11/81 Dwg.N° 81XP-0863 **Fig. 1**

File RP-42


000008
Birdsville
QUEENSLAND
SOUTH AUSTRALIA
26°
27°
28°
79-QAG
79-QAM
79-QAN
79-QAE
RIDGE
TRACK
BIRDSVILLE
DIAMANTINA R.
PANDIEBURRA
KOONCHERA DUNES AREA NAT. ESTATE
P.E.L. 5 & 6 S.A.
COOPER SECTOR SOUTH AUSTRALIA
PATCHAWARRA EAST F/O
PATCHAWARRA CENT. F/O
PATCHAWARRA S.W. F/O
MERRIM.-INNAM. F/O
COONGIE
COONGIE LAKE NATIONAL ESTATE
CUTTAPIRRIE
BEANBUSH
YANPURRA
WIMMA
PANING
KUDRIEKE
COONATIE
INNAMINCKA
PACKSADDLE
MOORARI
BROLGA
FLY LAKE
MM3
MM2
WANTANA
KIRBY
KALLADEINA
TIRRAWARRA
MUDRANGIE
WELCOME LAKE
KANOWANA
MERRIMELIA
BURLEY
Innamincka
COOPER CK
CREEK
TINDILPIE
GIDGEALPA
50/40/10
UNIT AREA
L. HOPE
PANDO
DELHI PETROLEUM PTY. LTD.
PULCARA SEISMIC SURVEY
BIRDSVILLE TRACK RIDGE
P.E.L. 5 & 6 S.A.
PROGRAMME MAP
KILOMETRES 0 10 20 30 40 50 60 70 80 90 100
MILES 0 10 20 30 40 50
Drawn DRO. 11/81
Dwg Nº 81XP-0864
Fig.2
File RP-42

PUTAMURDIE No. 1



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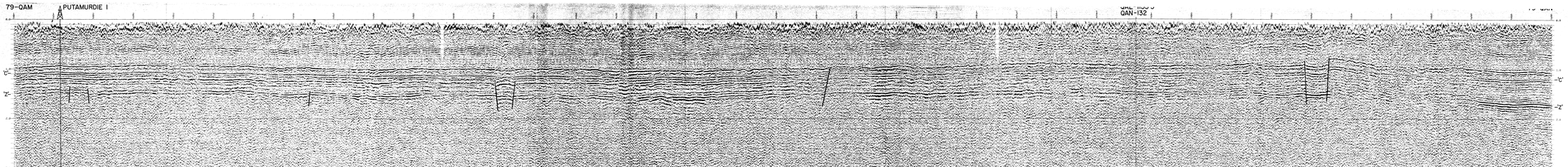
PULCARA SEISMIC SURVEY
BIRDSVILLE TRACK RIDGE
P.EL. 5 & 6 S.A.

SEISMIC SECTION QAM / QAN

Fig. 3

4504-1



Dwg.No. 81XP-0865 D.R.O. 11/81

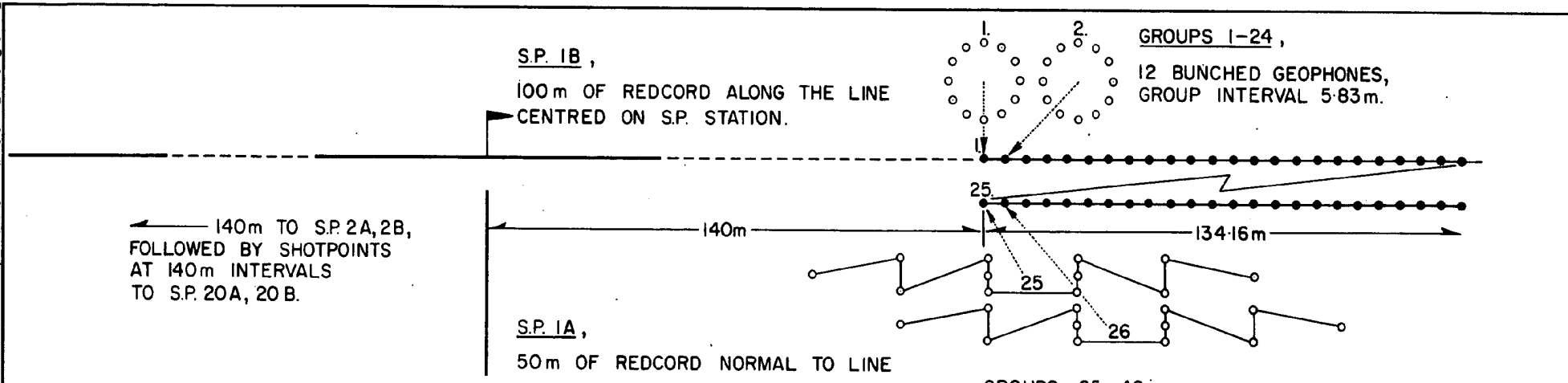
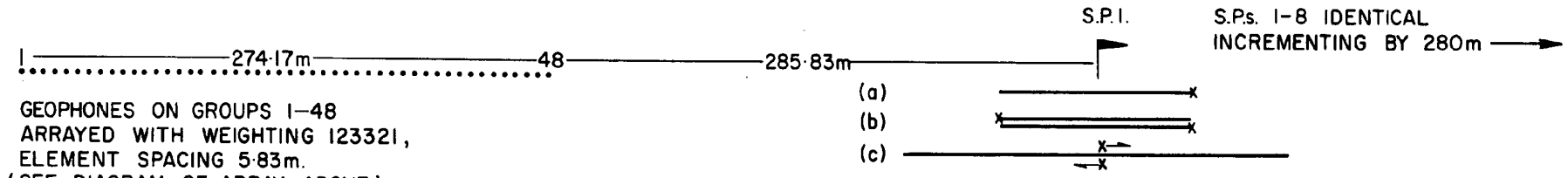


DIAGRAM OF NOISE SPREAD

RECORDED APRIL 22nd 1979.



GEOPHONES ON GROUPS 1-48
ARRAYED WITH WEIGHTING 123321,
ELEMENT SPACING 5·83m.
(SEE DIAGRAM OF ARRAY ABOVE)

(a) 100m REDCORD CAPPED AT x.
(b) 2 x 100m REDCORD CAPPED AT x.
(c) 200m REDCORD CAPPED AT x.

SOURCE CONFIGURATION EXPERIMENT

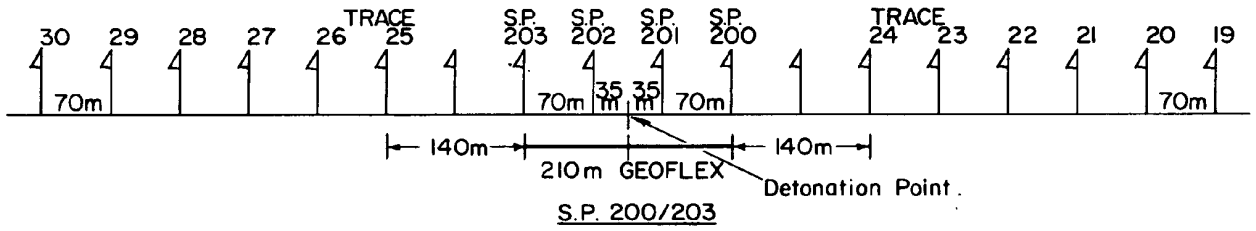
MAY 5th 1979

PULCARA SEISMIC SURVEY EXPERIMENTAL LAYOUTS

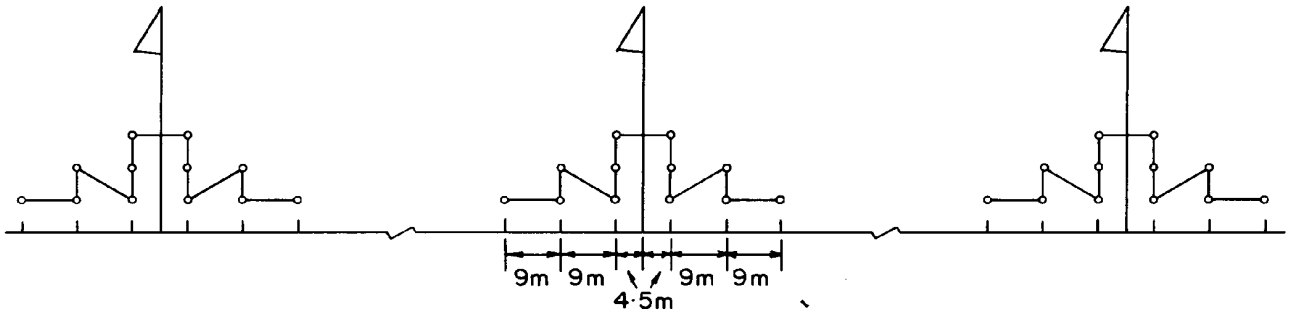
Fig.4.

File RP-42

SPREAD GEOMETRY

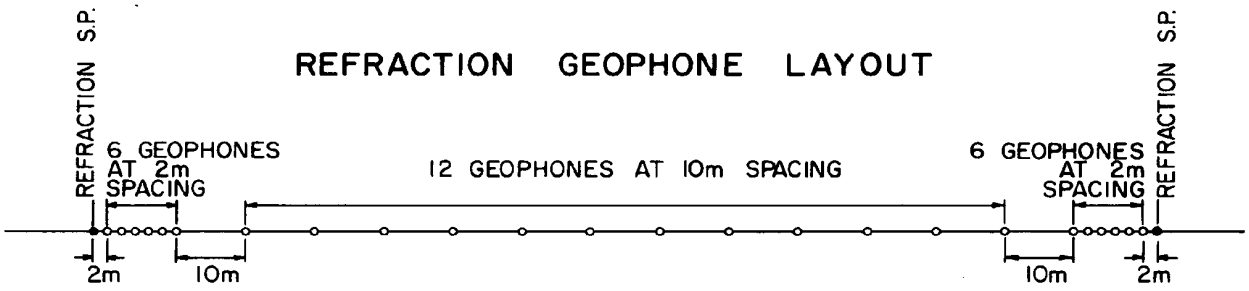


REFLECTION GEOPHONE PATTERN



12 GEOPHONES/TRACE, 6 EACH SIDE OF CENTRE
STAKE CONNECTED SERIES; BOTH STRING CONNECTED IN PARALLEL

REFRACTION GEOPHONE LAYOUT



2m TO 4m OF REDCORD BURIED 1m BELOW THE SURFACE
SHOT OFF EACH END.

1979
PULCARA SEISMIC SURVEY

SPREAD GEOMETRY
GEOPHONE PATTERN — GEOPHONE LAYOUT

Dwg.N° 81XP-0866 D.R.O. 12/81

Fig.5

File RP-42

area were old analogue sections acquired from various surveys conducted between 1957 and 1966 (see Section 4.0).

The Pulcara Seismic Survey was intended to extend regional seismic coverage using multifold recording techniques, to tie the Wilparoo Area in Queensland and the Patchawarra Trough at the northeastern margin of the Cooper Basin, and to provide control for future seismic work in the area.

3.0 REGIONAL GEOLOGY

The Birdsville Track Ridge is a NE-SW trending structural high that separates the Pedirka Basin to the west and the Cooper Basin to the east (Encl. 1).

Although the Cooper and Pedirka Basins are Permo-Triassic in age, no Permian section exists across the Birdsville Track Ridge. However, a thin Cooper Basin section has been interpreted on the flank of the Ridge to the southeast of the Haddon Downs area.

The first sediments to be deposited on the pre-Permian basement are presumed to be the Upper Triassic sediments seen at Putamurdie No. 1 and Pandieburra No. 1. The ridge is inferred to to have been in existence as a "high" for most or all of Permian time and until late Triassic time.

The Upper Triassic sediments (Peera Peera Beds) on the ridge continue westward into the Pedirka Basin but do not occur to the east. A hiatus is observed in the east that extends from the end of the Lower Triassic (Nappamerri) until the middle of the Lower Jurassic. Thus,

during this period the southern Cooper Basin was a land form and the the Birdsville Track Ridge was a depositional area.

Sedimentation was continuous across the northern part of the ridge during the latter part of the Lower Jurassic with the deposition of sediments believed to be equivalent to the Evergreen and Precipice formations of the Surat Basin.

A complete sequence of sediments ranging in age from Middle Jurassic to Recent covers the whole northern part of the area. The Jurassic units appear to maintain a rather uniform thickness across the ridge suggesting that the area extending from the southern Cooper Basin to the Pedirka Basin was a relatively even depositional surface throughout the Jurassic period.

The Birdsville Track Ridge area is dominated by NE-SW structural trends with secondary features running approximately E-W. The present structures could have resulted from either uplift during the early Cretaceous times or subsidence of the earlier depositional centres in the Cooper and Pedirka Basins to the east and west, respectively. The latter of these possibilities seems more likely and probably formed part of the overall subsidence of the Great Artesian Basin which resulted in the marine incursion at the beginning of the Cretaceous. Further uplift during the Tertiary led to the development of the anticlinal features such as the one at Haddon Downs and other similar structures.

4.0 PREVIOUS GEOPHYSICAL EXPLORATION

The early geophysical exploration in the vicinity includes the Haddon Downs Seismic Survey in 1957, the Nappamilkie Seismic Survey in 1958, and the Innamincka-Goyders Lagoon Seismic Survey in 1961.

In 1962, Geophysical Service International (GSI) carried out a gravity survey on behalf of Delhi Australia Petroleum Ltd. in the areas south of Birdsville and extended as far east as Pandie-Pandie at the north-west corner of the BTR block. In the same year, United Geophysical carried out a single-fold analogue seismic survey for Delhi Australia Pty. Ltd., which covered the areas north of Clifton Hills. In 1963, the Diamantina River-McGregor Ranges Seismic Survey included detailed programmes just north of Clifton Hills and immediately east of Lake Etamunbanie.

Three wells have been drilled within the Birdsville Track Ridge area. Putamurdie No. 1 and Pandieburra No. 1 were both drilled in 1963 with no commercial hydrocarbon shows. Lake Hope No. 1 was drilled in 1971 and was also plugged and abandoned.

In 1963, Wongella Geophysical Pty. Ltd. conducted a helicopter gravity survey for the French Petroleum Company (Aust.) Pty. Ltd. in northern South Australia and again the work was extended only as far east as Pandie-Pandie. The early regional gravity surveys yielded results that were of limited use. Interpretation was made difficult by the unknown nature of the underlying rocks and the variable nature of the basement.

The 1964 Cooper Creek Seismic Survey and the Strzelecki-Cooper Seismic Survey in 1965 included regional lines extending into the area.

In 1966, Delhi Australia Petroleum Ltd., through United Geophysical Corp., ran a few regional lines west of Cordillo Downs as part of the Eromanga-Frome Seismic Survey. Until 1979, no further geophysical work was done in the area.

5.0 DATA ACQUISITION AND PROCESSING

The 1979 Pulcara Seismic Survey data acquisition was contracted to Geophysical Exploration Services Pty. Ltd. (GES) of Brisbane, and line-clearing to Fogarty and Sons Pty. Ltd. of Acacia Ridge, Brisbane.

Field operations commenced on 26 September, 1979 and completed on 3 November of the same year. Full operational details are given in Appendix I. Personnel and equipment are calculated in Apendix II.

Data processing was by Seismograph Service Ltd. (SSL) in Adelaide. A summary of equipment and processing parameters is given in Appendix IV.

6.0 INTERPRETATION

Horizon tops were carried from Putamurdie No. 1 to the west, Curalle No. 1 to the north, and Beanbush No. 1 to the south. Correlation with Curalle No. 1 was made thru lines 79-QAA, 79-QAB, and 79-QAE, and with Beanbush No. 1 via 79-QAE, 78-JPN, and 73-EAG.

Two principal mapping horizons were picked and time structure maps drawn. The 'C' horizon corresponds to the top of the Cretaceous Transition Beds and the 'Z' horizon to the top of the pre-Permian basement.

A number of structural leads were delineated by the seismic work. The most significant of these is a broad and low-relief anticlinal feature noted between SP 1320 and SP 1500 on line 79-QAM. Closure to

the north and south is also suggested by line by 79-QAE, which crosses 79-QAM at a point not far from the apparent crest of the anomaly. Two-way-times to the top of the 'C' and 'Z' horizons are 1.0 sec. and 1.5 seconds respectively, indicating 3000 feet of Mesozoic section.

Other seismic roll-overs are apparent on the western end of line 79-QAM. These are generally gentle-dipping features and are fault-bounded on one or both flanks.

A lead with larger flank-faulting is seen between SP 345 and SP 375 on line 79-QAN east of the 79-QAM anticlinal anomaly. This horst-graben structure could represent the southern extension of the Curalle trend.

Thickening of sediments between Putamurdie No. 1 and Haddon Downs is confirmed by 79-QAM, although the change in thickness is slight. As expected, 79-QAE shows thickening towards the south into the Cooper Basin. The Interpreted Limit of Permian sedimentation is near SP 500 on line 79-QAE.

Time-structure contour maps for the 'C' and 'Z' horizons are included as Enclosures 2 and 3 of this report. A summary of the lines used in the interpretation is given in Appendix V.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The Pulcara Seismic Survey provided regional seismic coverage for the north and northeastern parts of the Birdsville Track Ridge and located a number of structural leads requiring follow-up work.

Present geological and geophysical evidence point to the northeastern corner of the area as the most prospective, but further evaluation

requires considerably more seismic control. Recommendations are:

1. Extend the regional seismic grid to the northwest tying Putamurdie No. 1 to the Pandie-Pandie, and Clifton Hills areas.
2. Run regional seismic lines to investigate the north-central part of the block, between Putamurdie No. 1 and Cordillo Downs.
3. Run a 12-fold detailed seismic programme over the leads noted on line 79-QAM, particularly the anticlinal anomaly in the Haddon Downs area. This programme could cover the horst-graben feature observed on line 79-QAN.

It is envisaged that some 1000 kilometres of geoflex seismic would be necessary to carry out the above recommendations.

REFERENCES

1. Akerman J.C., Wilparoo and Pulcara Seismic Surveys Final Field Operations Report, 1979.

2. Burnett,P.J., Birdsville Track Ridge Block Prospectivity Report, Delhi Petroleum Pty. Ltd., (unpubl.), Mar 1980.

3. GES Pty. Ltd., Party 1, Wilparoo-Pulcara Seismic Survey Operations Report, 1979.

PULCARA SEISMIC SURVEY

APPENDIX I

FIELD OPERATIONS

The Pulcara Seismic Survey was contracted to G.E.S. Pty. Ltd. Party 1. The survey began 26 September, 1979 and was completed 3 November of the same year. A total of 293 kilometres of regional coverage was shot during this period.

A. RECORDING

Digital seismic recording used a T.I. 48-channel DFS III system and data was recorded on one-inch magnetic tapes. The programme was shot six-fold with a station interval of 70 metres.

Recording parameters used were essentially similar to the parameters used in the Wilparoo Seismic Survey in Queensland that immediately preceded this Survey. These parameters were determined from the experiments performed on the eastern end of line 79-QAA from April 19th to April 22nd (Fig. 4).

The recording perameters used were:

Station interval	70 metres
Spread	1925-315-0-315-1925
Multiplicity	600% CDP
Geophone pattern	123321 centred on station peg

No. of Geophones/Group	12
Geophone spacing	9 metres
Sample rate	2 ms
Record length	4 seconds
Recording filters	Hi cut 124 Hz 72 db/octave Lo cut 8 Hz 18 db/octave
Energy source	Geoflex
Source configuration	In-line 210 metres centred between stations
S.P. Interval	280 metres

Diagrams showing spread and geophone configurations are shown on Figure 4.

Monthly instrument tests conforming with DFS III operating standards were carried out on the crew.

B. LINE CUTTING

Two bulldozers, a D7E and a D7G plus a CAT 12E grader were used for line clearing. Both dozers and the grader were contracted from Fogarty and Sons Pty.Ltd. of Acacia Ridge, Brisbane.

The D7E was utilized for line cutting and clearing while the D7G performed the ploughing of geoflex into the ground.

The dozers and the grader generally encountered great difficulty due to the very hard nature of the rock capping the surface and the presence of hard cobbles and boulders distributed widely over the survey area.

C. SURVEYING

Lines were set off on a grid by surveyors using Wild T1 Theodolites. Due to frequent changes in local magnetic declination, horizontal control was based on plate angles and solar observations. The average magnetic declination over the area examined in 1979 was approximately 7 deg. 00 min. E.

Lines were chained using a 140-metre dinghy rigging wire about 3mm in diameter. Wooden pegs with line and station identification were place every 10 stations while stations between these were marked by pin flagging.

Permanent markers were placed at all line intersections, ends of lines road crossings and every 100 stations. These markers were made of steel fence pickets bearing an aluminium tag containing line and station identification. A list of Permanent Markers with position and elevation are summarized in Appendix VI of this report.

Distances were checked for gross error by tacheometry and elevations were measured by tacheometric levelling. Levelling was checked against gross error by reading the rod at a set vertical angle, and then setting the centre crosshair on an even metre on the rod and reading the vertical angle. All turn points were read on both faces.

Survey control was established from bench marks, trig stations, well heads and old seismic permanent markers when available.

No horizontal computations were performed in the field. This work, as well as the drafting of shotpoint base maps, was done by Delhi's survey

section in Adelaide. Field surveying was undertaken by two surveyors working alternately and calculating survey notes independently.

D. SUPPLY AND COMMUNICATION

Due to the length of the lines in the original program a mobile camp with sleeping quarters in trailers was arranged. However some fly camping was required as it was impossible to take the main body of the camp into some areas due to the nature of the terrain.

Food was purchased from Quilpie with some meat, fresh fruit, vegetables and bread being sent from Brisbane on the weekly crew-change plane. Some food was obtained from Boulia when the crew operated close to Birdsville. Drinking water proved difficult to obtain in sufficient quantities and a constant supply run was needed.

Fuel and lubricants were purchased from both The Shell Company in Quilpie freighted by the local dealer to Betoota and also from The Shell Oil Company in Adelaide and shipped to Birdsville. All fuel was delivered in 200 litre drums.

Communication to and from the crew was by means of a Crammond Ranger 11 S.S.B. radio with three operating frequencies. Contact was maintained twice daily from Brisbane to base camp 7 days per week and twice daily from the base camp to the dozer campsite. The base camp also had the Flying Doctor Frequency.

A weekly air service from Brisbane by twin engine Piper Navajo aircraft was used for transporting personnel, food, spare parts and data. Heavy parts were sent by rail to Quilpie and forwarded by the mail truck to Betoota.

E. WEATHERING COMPUTATIONS

Static computations were done in the field using an HP 19C programmable calculator.

The procedure for determining weathering thickness consisted of shooting short refraction spreads at approximately 2 km intervals. Refraction shots were recorded on the DFS III during breaks in the normal production shooting. The spread comprised a 24-trace cable connected to single geophone stations with the following geometry:

S.P.

* . . . . . *

6 at 2m 12 at 6m 6 at 2m

One to two metres of geoflex rolled into a ball and augered to a depth of approximately 1 metre was used as energy source.

First arrival times from the refraction records were plotted against geophone distance from the shot. Weathering and sub-weathering velocities and intercept times derived from the plots were used to compute one-way static times using the following formula:

1. $$Zw = \frac{T\ Vw}{2 \cos (\sin^{-1} Vw/V1)}$$

2. $$Z1 = \frac{T2 - (Zw/Vw)\ 2 \cos (\sin^{-1} Vw/V2) V1}{2 \cos (\sin^{-1} V1/V2)}$$

Where: Zw = top of weathering layer

Z1 = second weathering layer

Vw = Weathering velocity

V1 = Subweathering velocity in a single layer case, or second weathering velocity in a double layer case

V2 = Subweathering velocity in a double layer case

T1 = Intercept time for V1

T2 = Intercept time for V2

Equation 1. refers to a single layer weathering case and Equation 2. to a double weathering case.

From the computed weathering depths, the static correction was calculated from:

$$\text{Static} = \frac{Zw}{Vw} + \frac{Z1}{V1} + \frac{(Eg - Zw - Z1)}{V2}$$

Where: Eg = Elevation at the geophone station.

Velocities and calculated statics were interpolated between refraction control points along the line.

The method of determining weathering depth worked satisfactorily in regions of low relief. In areas of high relief the spread was, at times, too short to provide weathering depth and sub-weathering velocity information. In this case, the charge offset from the near geophone was increased to allow deeper penetration. In some instances, plots of first arrivals revealed velocity inversions, possibly due to some high velocity stringers close to the surface (e.g., duricrust).

F. DATA DESPATCH

Tapes and ancillary paper data, including field monitors and static computation charts, were sent to G.E.S. Brisbane for forwarding to Delhi Adelaide on the weekly crew change flight departing from the field every Tuesday.

APPENDIX II

PERSONNEL AND CONTRACT EQUIPMENT

G.E.S.	Supervisor	C. Nielsen
	Party Manager	N. Griffin
	Asst. Party Manager	B. Clarke
	Instrument Engineer	D. Towery
	Observer	R. Fox
	Junior Observer	N. Petrie
	Asst. Junior Observer	P. McDonald
	Surveyor	J. McLachlan
	Asst. Surveyor	M. Hall
	Rodman	P. Harms
	Chainman	R. Pedersen
	Mechanic	D. Cook
	Cook	G. Chappel
	Asst. Cook	R. Goldsworthy
	Helpers	11
Fogarty	Bulldozer (Line-cutting) Operator	1
	Bulldozer (Plough) Operator	1
	Grader Operator	1

CAMP - G.E.S.

4 Olympic fibreglass four berth single axle 5 m sleeping trailers with annexes.

1 Olympic fibreglass single axle 5 m office trailer with annex.

1 Olympic fibreglass 4 m survey trailer with annex.

1	7 m steel framed kitchen trailer with gas stove and electric deep freeze.
1	4 m shower trailer.
1	5 m Savoy wood and metal client trailer.
1	Lister 12 kVA, 240 Volt, 50 Hz, single phase Dunlite generator.
1	3.5 kVA, 240 Volt, 50 Hz, single phase generator for fly-camping.
1	5 m mess tent.

CAMP - Fogarty & Sons

1	17 ft. Savoy wood and metal trailer
1	15 ft. wood and metal maintenance trailer.

EQUIPMENT

Vehicles - G.E.S. Pty. Ltd.

Party Manager	Diesel Toyota Landcruiser 4x4
Recording (Instrument Truck)	410A series International Acco 4x4 cab-over V8, flat bed, petrol.
Shooting Vehicle	Diesel Toyota Landcruiser 4x4
Geophone & Cable Vehicles	3 Diesel Toyota Landcruisers 1 Petrol Nissan 4x4
Surveyor's Vehicle	1 Diesel Toyota Landcruiser 4x4
Chaining Vehicle	1 Diesel Toyota Landcruiser 4x4
Client Representative Vehicle	1 Diesel Toyota Landcruiser 4x4
Camp Water Truck	International Model 60 4x4 petrol, with 3600 litre water tank.

Equipment - Fogarty and Sons

Line-Cutting bulldozer	Caterpillar D7-E, with hydraulic bull blade.
Geoflex ploughing bulldozer	Caterpillar D7-G with appropriate hydraulics.
Grader	Caterpillar 12E grader.
Vehicle	2 Diesel Toyota Landcruisers 4x4

APPENDIX III

STATISTICS

Total surface coverage (km)	283
Total days recording production	35
Average daily production-overall (km)	8.4
Average daily production on recording days only (km)	9.4
Days Experimental shooting	0
Days camp move	4
Days maintenance	0
Days lost due to rain	0
Days lost due to instrument failure	0
Days due to standby (no lines ready)	0
Days lost due to cable repairs	0
Total refraction profiles	1045
Survey duration (days)	40

APPENDIX IV

DATA PROCESSING

Field tapes were despatched to Adelaide for processing on Seismograph Service Limited's "Phoenix-Eye" processing system.

The hardware consisted of:

a) One RDS-500 CPU with 32K word memory

b) Two 80 megabyte discs with storage drive and controller

c) One array transform processor

d) Two 9-track magnetic tape transports

e) One KSR (Silent 700) teletypewriter

f) One electrostatic printer/plotter

g) One card reader and controller (300 cpm)

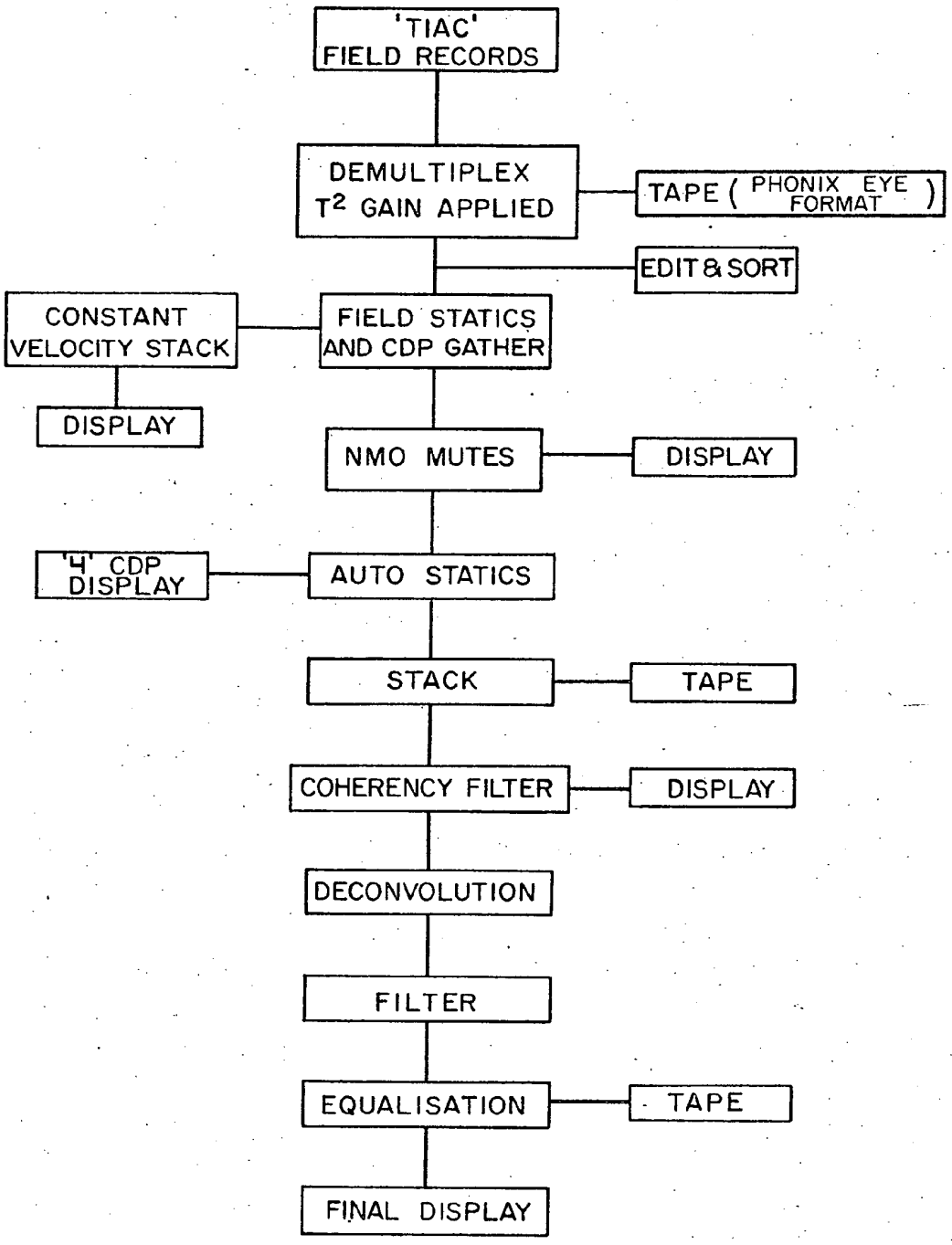
The following processing sequence was used (Figure 6):

1. Demultiplex with T-squared gain curve applied.
2. Resample to 4 ms.
3. CDP sort and bad traces edited.
4. Application of field statics.
5. Bandpass filter, 12-16-40-60 Hz, 0-3 sec.
6. Application of NMO corrections and trace mutes.
7. Automatic residual statics.
8. Stack.
9. Coherency filter.
10. Deconvolution (100 ms operator, 30 ms predictive gap).
11. Bandpass filter, 12-16-50-60 Hz, 0-3 sec.

12. Equalisation.

13. Film display, SEG polarity - 14 tpi, 5 ips.

PROCESSING FLOW DIAGRAM



Dwg.No. 80XP-0364

File No. RJ-36

FIGURE 6

APPENDIX V

SUMMARY OF INTERPRETED LINES

DELHI PETROLEUM PTY. LTD. SUMMARY OF SEISMIC COVERAGE

SEISMIC SURVEY / OPERATOR	LINE	STNS.	KM.	ACQUISITION				PROCESSING		
				CONTRACTOR	SOURCE / RECORDER	FOLD	INTERVAL GS./S.P.	CONTRACTOR	DISPLAY	QUALITY
PULCARA 1979	79-QAE	94-1708	113	G.E.S.	GEOFLEX DIGITAL	6	70m 280m	S.S.L.	V.A., W	F
DELHI PETROLEUM	79-QAG	102-1532	100	"	"	"	"	"	"	"
	79-QAM	102-652	38	"	"	"	"	"	"	"
	79-QAN	100-372	27	"	"	"	"	"	"	"
OONABRINTA 1978 DELHI INTERNATIONAL OIL CORPORATION	78-JPN	100-372	27	PETTY-RAY	VIBROSEIS DIGITAL	12	100m 200m	PETTY-RAY	V.A., W	F-G
MUDLANKIE 1973 DELHI INTERNATIONAL OIL CORPORATION	73-EAG	201-477	37	S.S.L.	VIBROSEIS DIGITAL	12	440 ft 440 ft	S.S.L.	V.A., W	F-G
EROMANGA FROME DELHI AUSTRALIAN PETROLEUM LTD.	66-NH	115-225	88	UNITED	DYNAMITE ANALOGUE	1	220 ft 2640 ft	PETTY-RAY	V.D.	P

LEGEND

- GS Geophone Station
- SP Source Point
- VA Variable Area
- VD Variable Density
- W Wiggle
- P Poor
- F Fair
- G Good
- D Digital
- A Analogue

000033

DELHI PETROLEUM PTY. LTD. SUMMARY OF SEISMIC COVERAGE

SEISMIC SURVEY / OPERATOR	LINE	STNS.	KM.	ACQUISITION				PROCESSING		
				CONTRACTOR	SOURCE / RECORDER	FOLD	INTERVAL G.S./S.P.	CONTRACTOR	DISPLAY	QUALITY
DIAMANTINA RIVER 1963 DELHI AUSTRALIAN PETROLEUM LTD.	BR44A	86-125	21	UNITED	DYNAMITE ANALOGUE	1	150 ft 1800 ft	UNITED	V.D.	P-F
	BR44B	1-87	47	"	"	"	"	"	"	"
	BR45	1-136	74	"	"	"	"	"	"	"
	BR46	1-62	33	"	"	"	"	"	"	"
	BR47	11-82	39	"	"	"	"	"	"	"
	BR48	19-42	13	"	"	"	"	"	"	"
	BR49	31-80	27	"	"	"	"	"	"	"
	BR50	15-50	19	"	"	"	"	"	"	"
	BR51	1-25	13	"	"	"	"	"	"	"
	BR52	37-50	7	"	"	"	"	"	"	"
	BR53	14-72	32	"	"	"	"	"	"	"
	BR54	49-79	17	"	"	"	"	"	"	"
	BR55	26-50	13	"	"	"	"	"	"	"
	BR56	49-73	13	"	"	"	"	"	"	"

LEGEND

GS Geophone Station
SP Source Point
VA Variable Area
VD Variable Density
W Wiggle
P Poor
F Fair
G Good
D Digital
A Analogue

APPENDIX VI

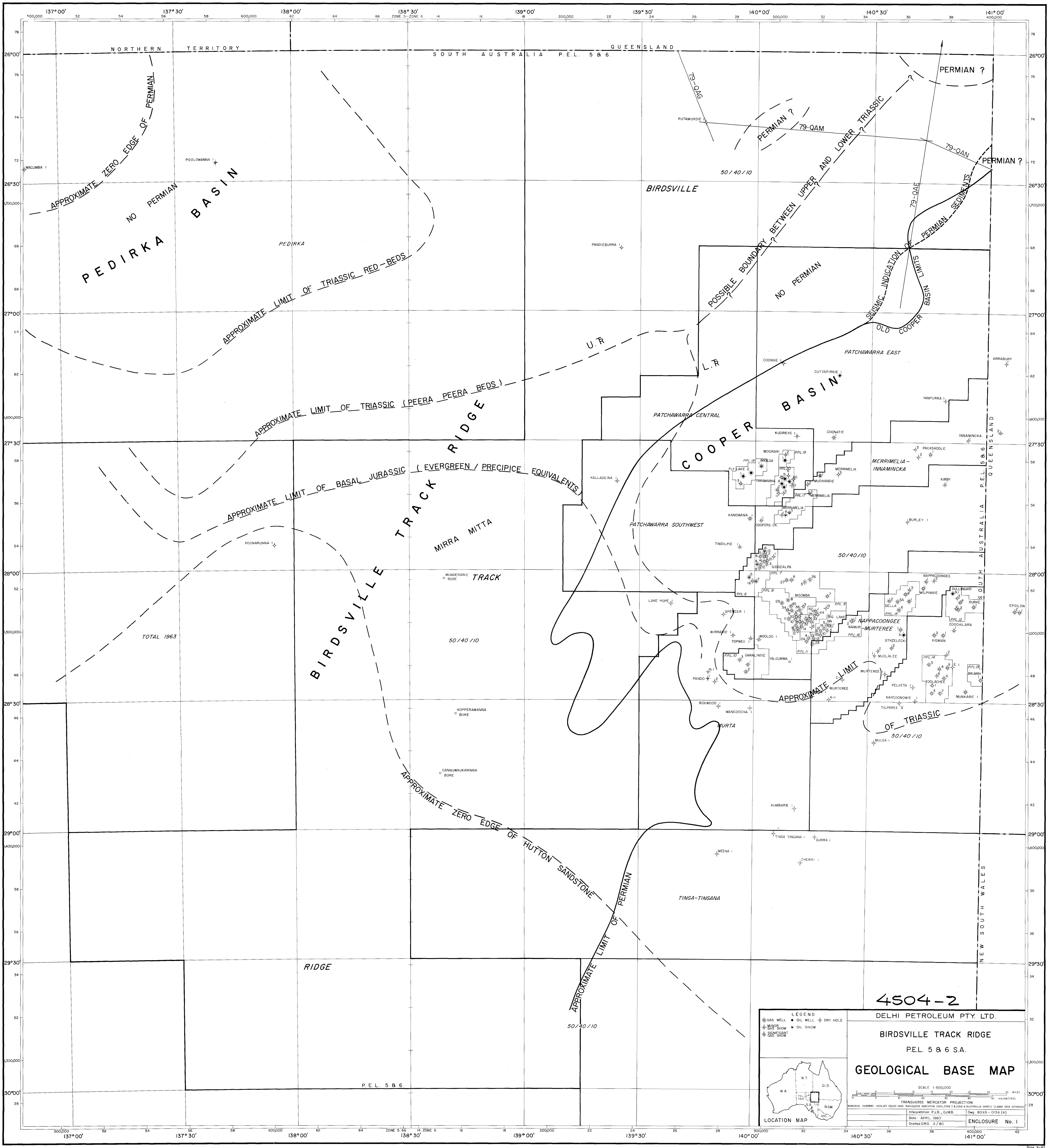
PERMANENT MARKERS

	Station	Easting	Northing	Elevation
Line 79-QAE	1669	344 096	1618 574	100.5
	1600	343 396	1613 804	98.7
	1500	342 366	1606 895	134.3
	1400	341 280	1599 995	156.6
	1300	340 195	1593 094	149.9
	1243	339 578	1589 160	199.4
	1200	338 882	1586 238	177.3
	1133+45	337 809	1581 728	181.8
	1100	337 454	1579 405	183.7
	1000	336 385	1572 502	143.0
	900	335 297	1565 602	107.6
	800	334 209	1558 701	108.9
	700	333 114	1551 803	118.7
	600	332 009	1544 905	104.5
	508	330 985	1538 560	78.0
	500	330 896	1538 009	80.9
	400	329 778	1531 113	61.5
	300	328 657	1524 218	52.1
	200	327 532	1517 323	45.9
	124	326 672	1512 079	43.3
	108	326 491	1510 974	46.8
	100	326 400	1510 421	41.3

Line 79-QAG	658	231 199	1617 870	88.7
	600	232 710	1614 106	65.5
	500	235 315	1607 616	61.2
	400	237 919	1601 127	54.8
	300	240 520	1594 636	35.9
	291	240 754	1594 051	34.9
	200	243 114	1588 142	46.3
	189	243 400	1587 427	43.5
	104	245 605	1581 901	47.5

	Station	Easting	Northing	Elevation
Line 79-QAM	100	239 639	1587 637	32.3
	153	243 672	1587 411	35.1
	200	246 949	1587 213	35.1
	284	252 805	1586 858	56.1
	300	253 921	1586 790	56.4
	400	260 894	1586 369	65.6
	500	267 866	1585 950	54.2
	600	274 838	1585 533	66.7
	700	281 811	1585 113	48.9
	800	288 784	1584 693	60.9
	900	295 756	1584 272	55.9
	939	298 475	1584 108	56.3
	1000	302 729	1583 851	68.7
	1065	307 261	1583 577	74.1
	1100	309 701	1583 429	98.5
	1200	316 674	1583 009	111.2
	1300	323 645	1582 587	187.8
	1400	330 618	1582 164	197.5
	1500	337 590	1581 742	181.7
	1503+10	337 809	1581 728	181.8
	1535	340 035	1581 594	176.9
Line 79-QAN	100	335 746	1582 600	188.1
	132	337 809	1581 728	181.8
	200	342 180	1579 876	185.4
	300	348 605	1577 147	166.7
	345	351 492	1575 908	132.6

400	355 021	1574 395	158.8
500	361 436	1571 641	170.8
600	367 848	1568 886	129.3
621	369 195	1568 306	130.5
655	371 379	1567 370	126.6



Base X-42
File C-43

140° 25' 140° 30' 140° 40' 140° 50' 141° 00'

26° 05'

26° 10'

26° 20'

26° 30'

26° 40'

79 QAE

79 QAM

79 QAN

79 QAE

1100 1090 1080 1070 1060 1050 1040 1030 1020 1110 1000 950 900 850 800 750 700 650 600

SOUTH AUSTRALIA
QUEENSLAND

4504-3

DELHI PETROLEUM PTY. LTD.

PULCARA SEISMIC SURVEY
(HADDON DOWNS AREA)
BIRDSVILLE TRACK RIDGE
'C' HORIZON
(TIME STRUCTURE)
TOP OF CADNA-OWIE FM.

SCALE 1 : 100,000

KILOMETRES 1 0 1 2 3 4 5 6

MILES 0 1 2 3 4

Projection: TRANSVERSE MERCATOR, CLARKE 1858	Drafted D.R.OWEN 11/81	Drawing Number 81XP-0859
Contour Interval : 10 milliseconds	Chief Draftsman	ENCLOSURE Nº 2
Datum : M.S.L. O' PORT ADELAIDE		
Chief Geophysicist:		
Interpretation: E.F. TADIAR	Date NOV. 1981	

File RP-42

140° 25' 140° 30' 140° 40' 140° 50' 141° 00'

26° 05'

26° 10'

26° 20'

26° 30'

26° 40'

SOUTH AUSTRALIA
QUEENSLAND

79 QAE

79 QAM

79 QAN

79 QAE

1520 1530 1540 1550 1560 1570 1580 1590

1500 1510 1520 1530 1540 1550

1500 1510 1520 1530 1540 1550

1470 1500 1510 1520 1530 1540

1510 1520 1530 1550 1570

4504 - 4

DELHI PETROLEUM PTY. LTD.

PULCARA SEISMIC SURVEY
(HADDON DOWNS AREA)
BIRDSVILLE TRACK RIDGE
'Z' HORIZON
(TIME STRUCTURE)

SCALE 1 : 100,000

KILOMETRES 0 1 2 3 4 5 6

MILES 0 1 2 3 4

Projection: TRANSVERSE MERCATOR, CLARKE 1858	Drafted Date	Drawing Number
Contour Interval : 10 milliseconds	D.R. OWEN 11/81	81XP-0860
Datum : M.S.L. O PORT ADELAIDE	Chief Draftsman	ENCLOSURE Nº 3
Chief Geophysicist:		
Interpretation: E.F. TADIAR	Date NOV. 1981	

File RP-42

QUEENSLAND
SOUTH AUSTRALIA

26 00 00S
26 15 00S
26 30 00S
26 45 00S
27 00 00S

139 45 00E
140 00 00E
140 15 00E
140 30 00E
140 45 00E
141 00 00E

SOUTH AUSTRALIA
QUEENSLAND

4504-5

DELHI PETROLEUM PTY. LTD.

PULCARA SEISMIC SURVEY
P.E.L. 5 & 6 S.A.

STATION LOCATION AND ELEVATION MAP

SCALE 1:250,000

KM. 5 0 5 10 15
4 0 4 8 MILES

DATUM: Mean Sea Level Pt. Adel. = Ometres

Date: February 1982

ENCL. 4