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NUMBER 8571

PEL 55

EROMANGA BASIN

1992 CRATER SEISMIC SURVEY

REPORTS FOR THE PERIOD 5/5/92 TO NOVEMBER 1992

Submitted by

**Stirling Resources NL
1992**

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MINES AND ENERGY
SOUTH AUSTRALIA



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Mines and Energy South Australia, PO Box 151, Eastwood, SA 5063

Enquiries: Records Management

Mines and Energy South Australia
191 Greenhill Road, Parkside 5063
Telephone: (08) 274 7687
Facsimile: (08) 272 7597

ENVELOPE 8571**TENEMENT:** PEL 55; Eromanga Basin**TENEMENT HOLDER:** Stirling Resources NL**CONTENTS OF VOLUME ONE**

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Stirling Resources N.L.

(Incorporated in Western Australia)



A.C.N. 008 877 745

1st Floor, 57 Havelock Street, West Perth, Western Australia 6005
Telephone (09) 322 5945, Facsimile (09) 481 0663
Postal Address: P.O. Box 303, West Perth, W.A. 6005

OUR REF: BB:mo

5 May 1992

The Director General
South Australian Department of
Mines and Energy
P O Box 151
EASTWOOD SA 5063

Dear Sir,

RE: APPLICATION FOR CONSENT TO CARRY OUT SEISMIC SURVEY IN PEL 55

In accordance with the Petroleum Act (1940-1989), Stirling Resources N.L. as licensee of PEL 55, hereby applies for permission to conduct a survey of approximately 60 kilometres within the permit area.

SURVEY DETAILS

NAME:	Crater Seismic Survey
PROPOSED DATE OF COMMENCEMENT:	June
EXPECTED DURATION:	8 days
CONTRACTOR:	To be advised
ENERGY SOURCE:	Vibroseis
TECHNIQUE:	60 FLD Multifold Seismic
PERMITTING & LINE CLEARING:	P - TBA LC - TBA
CREW SIZE:	40
ESTIMATED COST:	\$200,000
PERSON IN CHARGE:	Mr R.J. Beattie

Operation will be supervised by Stirling Resources N.L. personnel. TBA has been engaged for permitting and line clearing.

The Aboriginal Heritage Branch will be contracted to ensure that the lines avoid all known aboriginal sites and a local representative will be visited for confirmation of local conditions.

Stirling Resources N.L. wishes to adopt the Code of Environmental Practice prepared by Santos to cover the seismic operations in the Cooper Basin. Three versions of the preliminary programme map are enclosed.

- a) 1:250,000 topographic map;
- b) 1:85,000 colour aerial photo mosaic;
- c) 1:50,000 programme map.

The line locations are preliminary as it is intended to further inspect the locations and revise if possible to avoid and minimise environmental impact. A Declaration of Environmental Factors is also attached. It is requested that flexibility be allowed in the program approval so that further fine tuning of line locations can be accommodated during line preparation to further avoid and minimise environmental impact. In the event that a line is required to be significantly moved and thus encounter different clearing requirements, SADME will be consulted.

Yours sincerely,
For and on behalf of
STIRLING RESOURCES N.L.



R.J. BEATTIE
Chief Geophysicist

Encl.



Stirling Resources N.L.

(Incorporated in Western Australia)

000005



A.C.N. 008 877 745

1st Floor, 57 Havelock Street, West Perth, Western Australia 6005
Telephone (09) 322 5945, Facsimile (09) 481 0663
Postal Address: P.O. Box 303, West Perth, W.A. 6005

DECLARATION OF ENVIRONMENTAL FACTORS

1. INTRODUCTION

This declaration of environmental factors is attached to and forms part of the application for consent to carry out the Crater Seismic Survey in PEL 55. The principal details of the survey are listed in the application letter. The following sections are intended to address the requirements of Regulation 16 under the Petroleum Act of South Australia. In addition, for each line a detailed description is attached which lists factors specific to that line and lists any special line clearing requirements. 1:250,000 topographic maps and 1:85,000 aerial photograph mosaics have been used to locate the lines. Further inspections in the field will be used to position the lines more effectively.

2. LAND USE

The Crater Seismic Survey in PEL 55 is located in the Sturt Stoney Desert and the area consists of open stoney undulating country (gibber plain). Co-operation and liaison with the landholder in the area at Mangerannie Station is considered a high priority and a representative will contact the owner to discuss the survey and his requirements regarding line clearing, fencing, camps, water bores etc.

3. ENVIRONMENTAL SUBDIVISIONS

The programmed lines are all located on open stoney undulating country (gibber plain) with small sand dunes (< 10 m) and little vegetation.

4. SENSITIVE ENVIRONMENTAL AREAS

No sensitive environmental areas are known to exist in the survey areas, however care will be taken when crossing drainage channels, sand dunes and treed areas.

5. ENVIRONMENTAL IMPACT

The majority of the programme is over Gibber plain and will require little or no line clearing other than through drainage channels. Towed rollers will be used on the gibber plain leaving the surface intact but passable for vehicles. Individual trees or clumps of trees will be avoided.

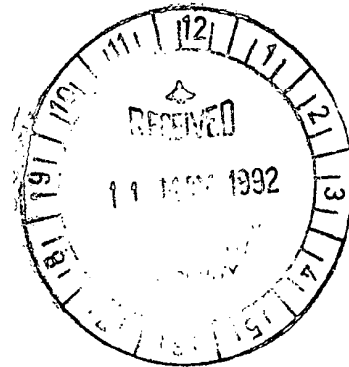
6. ENVIRONMENTAL PROTECTION

The survey will be carried out using the guidelines of the "Code of Environmental Practice" for seismic operations in PEL 5 and 6 in the Cooper Basin issued by Santos in April 1991. This code lists measures to protect the environment and to minimise environmental impact during line clearing and recording.

The proposed operation will utilise a camp and hence further protection is provided by restricting the crew to the seismic lines, access trails and the camp area. The field personnel will be fully briefed on the responsibilities to the environment and will be issued with copies of the "Code of Environmental Practice". An environmental audit following the survey will illustrate the before and after situation in sensitive areas.

7. ABORIGINAL SITES

The Aboriginal Heritage Branch and an "Elder" of the local community in Maree are to be consulted to ensure the survey avoids any known sites of significance. Care will be taken, particularly around water holes and breakaways, to note and avoid any site encountered during the course of the survey.



LINE S92-01

ORIENTATION: NW-SE
 LENGTH: 7 kilometres
 ENVIRONMENTAL ASSOCIATIONS: gibber plain
 DESCRIPTION: The line is relatively flat on gibber plain, crossing the Sullivan Wells Track about 1 kilometre southwest of the Hogarth Dam.
 SPECIAL REQUIREMENTS: 1. The line will only need to be rolled with a minor amount of cutting through drainage channels.

LINE S92-02

ORIENTATION: WSW-ENE
 LENGTH: 9.5 kilometres
 ENVIRONMENTAL ASSOCIATIONS: 1. gibber plain
 2. sand dunes, plain
 DESCRIPTION: The line crosses the Sullivan Wells Track and a small sand dune on the west end. The remainder of the Line is on relatively flat gibber plain with small drainage channels.
 SPECIAL REQUIREMENTS: 1. A small cut in the sand dune and drainage channels with remainder of line rolled.

LINE S92-03

ORIENTATION: WSW-ENE
 LENGTH: 11 kilometres
 ENVIRONMENTAL ASSOCIATIONS: 1. gibber plain
 2. sand dunes, plain
 DESCRIPTION: The line crosses the Sullivan Wells Track on the west end and a small sand dune on the east end. The remainder of the Line is on relatively flat gibber plain with small drainage channels.
 SPECIAL REQUIREMENTS: 1. A small cut in the sand dune and drainage channels with remainder of line rolled.

LINE S92-04

ORIENTATION: WSW-ENE
 LENGTH: 11 kilometres
 ENVIRONMENTAL ASSOCIATIONS: 1. gibber plain
 2. sand dunes, plain
 DESCRIPTION: The line starts at the Sullivan Wells Track on the west end and crosses sand dunes on both the west and east ends of the line. The remainder of the line is across relatively flat gibber plain with minor drainage channels.
 SPECIAL REQUIREMENTS: 1. Small cuts in the sand dunes and drainage channels with remainder of line rolled.

LINE S92-05

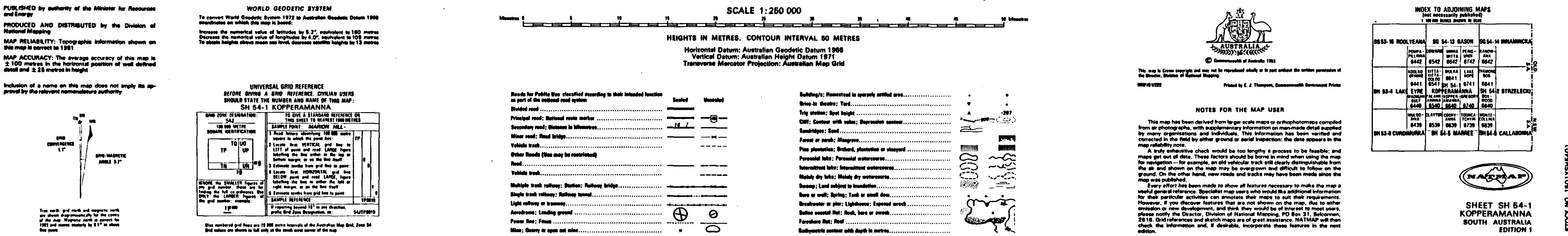
ORIENTATION: WSW-ENE
 LENGTH: 9.5 kilometres
 ENVIRONMENTAL ASSOCIATIONS: 1. gibber plain
 2. sand dunes, plain
 DESCRIPTION: The line has sand dunes on both the west and east ends with the remainder being gibber plain with minor drainage channels.
 SPECIAL REQUIREMENTS: 1. Small cuts in the sand dunes and drainage channels with remainder of line rolled.
 2. Line positioned to north of salt lake on east end.

LINE S92-06

ORIENTATION: WSW-ENE
 LENGTH: 6 kilometres
 ENVIRONMENTAL ASSOCIATIONS: 1. gibber plain
 2. sand dunes, plain
 DESCRIPTION: The line crosses sand dunes on the east end with the remainder of the line on gibber plain with minor drainage channels.
 SPECIAL REQUIREMENTS: 1. Small cuts in the sand dunes and drainage channels with remainder of line rolled.

LINE S92-07

ORIENTATION: WSW-ENE
 LENGTH: 6 kilometres
 ENVIRONMENTAL ASSOCIATIONS: 1. gibber plain
 2. sand dunes, plain
 DESCRIPTION: The line crosses sand dunes and the Birdsville Track on the east end and Yowakirreninna Creek on the west end with the remainder of the line on gibber plain with minor drainage channels.
 SPECIAL REQUIREMENTS: 1. Small cuts in the sand dunes and drainage channels with remainder of line rolled.
 2. Special care not to damage creek banks or creek bed of Yowakirreninna Creek on west end of line which feeds Coodnacarra Dam.



LENNARD OIL N.L.

PEL 55

CRATER

SEISMIC SURVEY

North Sheet

AUTHOR B BEATTE

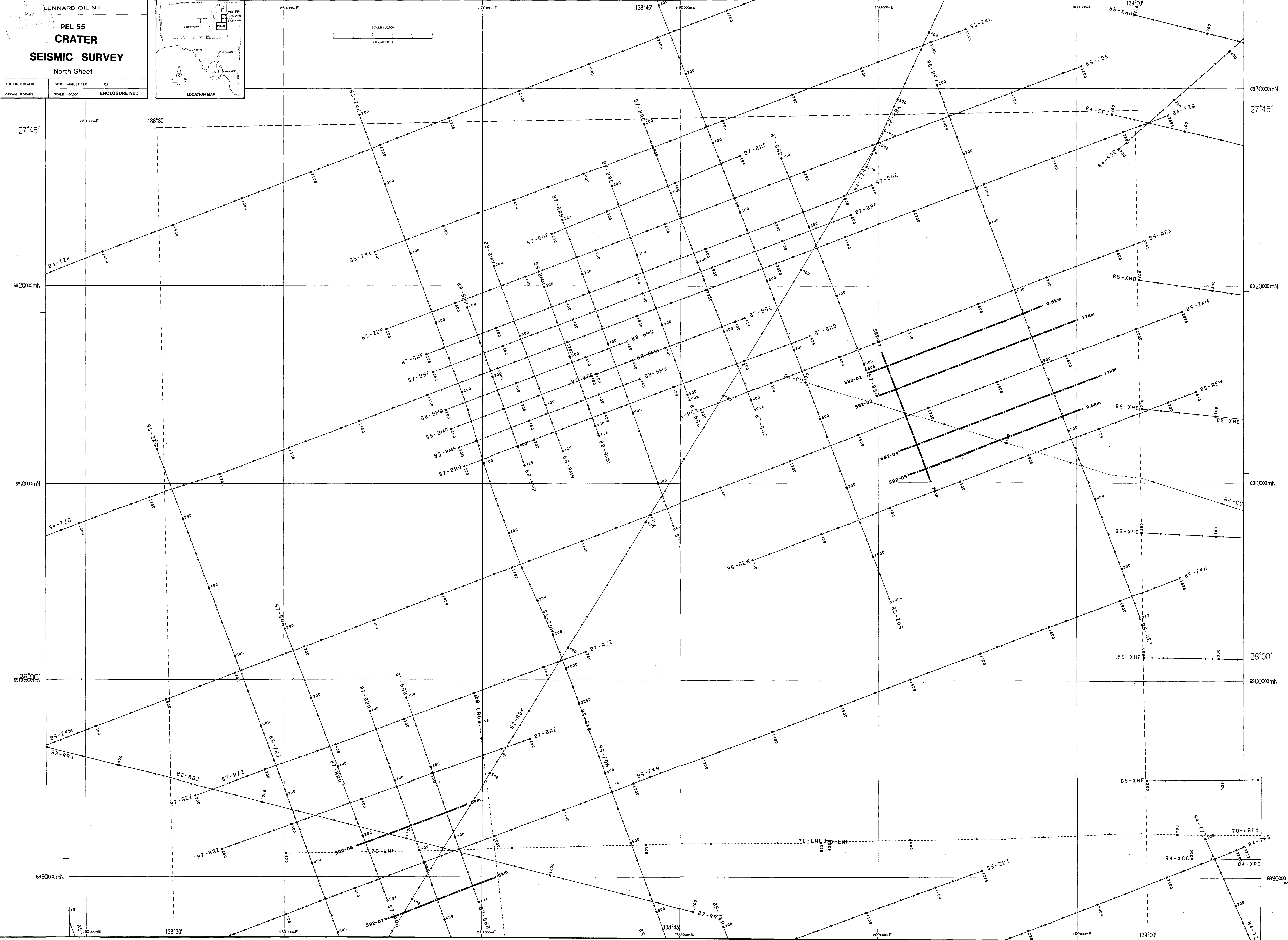
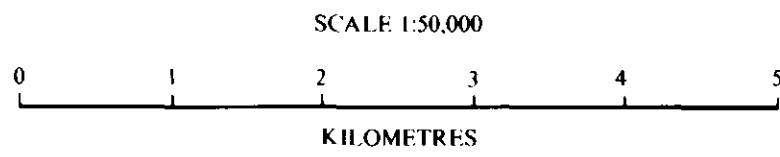
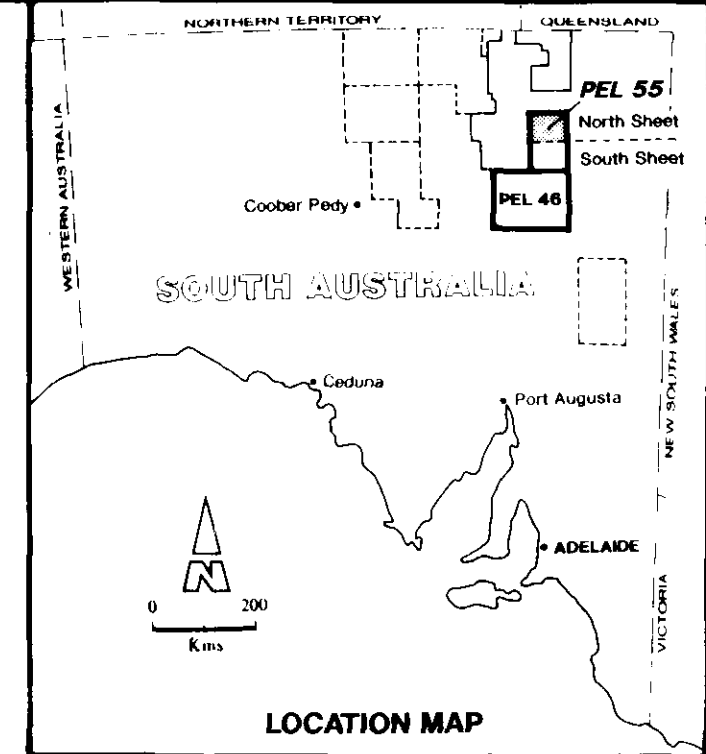
DATE AUGUST 1991

C.I.

DRAWN ROWIES

SCALE 1:50,000

ENCLOSURE No.:



000009

FIELD AREA REPORT

ON THE

1992 CRATER SEISMIC SURVEY

FOR

STIRLING RESOURCES NL

IN THE

MUNGERANNIE AREA OF PEL55

IN

SOUTH AUSTRALIA

BETWEEN THE

23RD AND 29TH JUNE 1992

BY

SEISMOGRAPH SERVICE LIMITED

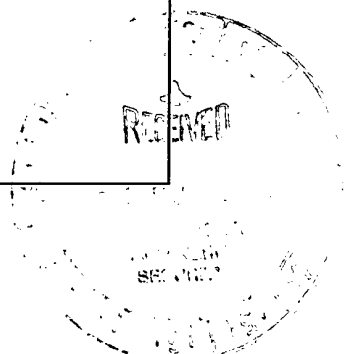
PARTY 180

Mines & Energy SA

R95/00846



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SYNOPSIS

LOGISTICS

SURVEY

RECORDING

APPENDICES

SYNOPSIS

Seismograph Service Limited (SSL) were contracted to perform a seismic data acquisition survey in the Mungerannie area of PEL55 in South Australia for Stirling Resources NL during June 1992 as part of their 1992 Crater Seismic Survey.

All data was recorded using the Vibroseis method onto magnetic tapes at 6250 bpi.

LOGISTICS

During the contract the crew was accommodated and fed at the Mungerannie Road House. All consumables for the contract were brought with the crew when it mobilised from Adelaide. All fuels for vehicles were purchased from the Shell agent in Marree.

Truck storage and mounted Mechanics' and Observers' workshops were provided for the maintenance of line equipment and vehicles.

All permitting for the operation was carried out by the Client representative.

All vibroseis data and Observer's logs were despatched by TNT Air Couriers to the Horizon Processing Centre in Perth. Paper records were despatched to the Stirling Resources office in Perth.

SURVEY

The lines were laid out and surveyed by a team consisting of 1 Surveyor and 2 Chainmen.

The lines were pegged at 25 metre intervals by 2 chainmen using a 100 metre chain divided into 4 station intervals. Every second peg was numbered, every 10th peg was wooden, painted white and all intermediate stations marked with plastic pins with odd and even numbers having different colours. Permanent markers were placed at start and end of lines, intersections with other seismic lines, roads, significant bends in the line and at intervals not exceeding 3 kilometres. Permanent markers consisted of steel droppers driven into the ground to resistance to which were bolted metal tags with line name, station number and proximity to cross line.

Levelling and traversing were carried out simultaneously using reciprocal vertical angles and internal angle traversing. Azimuth control was by sunshots at each end of lines. Distances to change points were taken both forwards and backwards and three rounds of angles were taken at every change points. A distance, vertical and horizontal angle was read to every intermediate peg and all intersections that were not change points. Change points were placed at intervals no greater than 2000 metres.

All elevations and co-ordinates were computed on an IBM compatible computer using SSL survey software. On completion the survey data was despatched to the Client on paper files. At a later date the data on magnetic discs was reformatted to UK00A format and sent on magnetic discs to the Client.

The survey specifications allowed for an error of $10\sqrt{K}$ centimetres for vertical loops and $5\sqrt{K}$ metres for horizontal loops, where K was the distance around the loop in kilometres.

RECORDING

All seismic lines throughout the contract were recorded using the Vibroseis method. SSL employed three Failing Y1100 BBV vibrator units on line with one spare mounted on International Paystar 5000 6x6 trucks. Linear sweeps were generated by a Sercel VE416 DPG sweep generator and controlled in each vibrator by a VE416 DSD control unit. The three vibrators operated in line at a fixed distance apart.

The recording instrument used was a Sercel SN348 with a Sercel CS2502 correlator and stacker. Correlated only records were recorded onto magnetic tape using one of two Sercel MS8 tape decks. The tapes were recorded in SEGB format at 6250 bpi. The recording instruments were mounted in an airconditioned cab mounted on an Iveco Magirus 4x4 truck. A list of recording parameters is included in Appendix C.

All acquisition work used a 120 channel configuration. The spread on line, including the SN348 station units, geophone strings and cables was moved by the line crew using four Mitsubishi 4x4 Canter vehicles capable of carrying large amounts of spread. 12 line men, including the leading hand, were contracted to move the spread, together with an Observer in charge and an Observer acting as spread checker.

The vibrators on line were maintained by a vibrator mechanic who was provided with a Toyota 4x4 PC which acted both as transport for the vibrator operators and as a vibrator and recording truck servicing unit.

Communication between line crew units was maintained using Philips VHF radios. Three frequencies were permitted for use in the contract area. One frequency was used solely by the vibrators for voice and Sercel VE416 data communication, another by the line crew and the third frequency by the chainers and surveyors. Several of the radios were multi channel allowing for communication between units.

LIST OF APPENDICES

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Recording Parameters	Appendix C
SEGB Field Tape List	Appendix D
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SSL PERSONNEL

APPENDIX A

Staff

Party Chief

Phil Catton

Deputy Party Chief

Peter Harvey

Senior Observer

Chris Hall

Assistant Observers

Warren McIntosh
Eric Mueller

Mechanics

Dave Jagers
Bob Provis

Surveyor

Tony Jackson

Auxiliary Staff

Vibrator Operators

Kenneth O'Regan
Don Nelson
Richard Shipman

Leading Hand

Barry Wood

Line Crew

Alli Thomson
Rob MacPherson
Shirley Bobrowski
Greg Connor
Jeff Mountford
Randal Sparrow
Andrew Drohan
Jamie Finch
Geoff Hammond
Carl Brandon
Maryanne Stacey

Chainers

Colin French
Alain Mugnier

Geophone Repair

James Howard

APPENDIX B

EQUIPMENT LIST

- 1 Sercel 348 120# Recording System
- 400 Sercel 348 Station Units
- 10 Power Relay Units
- 380 40m lengths of Telemetry Cable
- 2 MS8TT Twin Tape Decks
- 1 OYO DFM 480 Camera
- 1 Sercel 2502 Correlator/Stacker
- 4000 SM4 10Hz Geophones
- 6 100m Extension Cables
- 1 Sercel Sweep Generator
- 4 Sercel VE416 Sweep Control Units
- 1 GS900 Geophone Checker
- 1 Trouble Tracker
- 1 Line Monitoring System
- 2 GRIP Geophone Checkers
- 1 Set of Test Equipment
- 1 Veribo Station Unit Tester
- 1 Vigil Vibrator QC System
- 7 VHF Line Radios
- 12 VHF Line Radios
- 3 Mobile Telephones

- 1 Wild T1 Theodolite
- 1 Wild D15L Distomat
- 1 386 IBM/AT Survey Computer System

- 4 International Harvester Paystar 5000 6x6 Trucks with Y1100B Vibrator Units
- 1 Deutz 4x4 Recording Truck with 40 KVA Generator and Twin a/c units
- 4 Mitsubishi Canter 4x4 Line Vehicles
- 3 Toyota 4x4 Base Camp Vehicles
- 2 Toyota 4x4 Survey Vehicles
- 1 Toyota 4x4 Station Wagon for Vibrator Operators
- 2 Toyota 4x4 Line Vehicles

- 1 MAN 4x4 Cargo Truck
- 1 Hino 4x4 Cargo Truck
- 1 MAN 4x4 Mechanics' Workshop
- 1 MAN 4x4 Observers' Workshop
- 1 50 KVA Generator

APPENDIX C

RECORDING PARAMETERS

BLOCK:	PEL55
AREA:	Mungerannie
LINES:	SRC92-01 to SRC92-07
No. Channels	120
Tape Format	SEGB, SEG polarity, 6260 bpi
Low Cut Filter	8Hz at 12dB/octave
High Cut Filter	125Hz at 72dB/octave
Sample Rate	2ms
Sweep Frequency	10-80Hz
Sweep Function	6s linear upsweep, 250ms taper
Sweeps per VP	2
Vibrator Array	3 vibs in line, 12.5m pad to pad, 12.5m move up, centred between stations
Station Interval	25m
Receivers	Strings of 12 Sensor SM4 10Hz geophones
Receiver Wiring	Wired 6 in series by 2 in parallel
Receiver Array	In line with 2.1m spacing, centred on station
Centre Gap	4 dead stations
CDP Fold	60
Spread	1537.5m - 62.5m - 0 - 62.5m - 1537.5m

APPENDIX D

FIELD TAPE LISTING

Reel	Line	VP's
001	SRC92-06	441/0-283/2
002		282/1-201/0
003	SRC92-07	199/0-360/1
004		361/2-439/0
005	SRC92-05	199/0-369/0
006		370/1-526/7
007		527/8-579/0
008	SRC92-04	641/0-473/2
009		472/1-308/7
010		307/6-201/0
011	SRC92-03	199/0-368/9
012		369/0-533/4
013		534/5-639/0
014	SRC92-02	581/0-420/9
015		419/8-254/3
016		253/2-201/0
017	SRC92-01	199/0-359/0
018		360/1-479/0

PERMANENT MARKER REPORT

Line	Station	Adjusted Easting (m)	Adjusted Northing (m)	Adjusted Elevation (m)	Comment
SRC92-01	200	289 887.6	6 916 652.67	44.78	
SRC92-01	230	290 153.16	6 915 950.94	50.37	Int. SRC92-02
SRC92-01	340	291 125.99	6 913 376.97	49.78	Int. 85-ZKm
SRC92-01	401	291 664.01	6 911 948.84	52.87	Int. SRC92-04
SRC92-01	480	292 363.34	6 910 100.32	59.65	
SRC92-02	200	289 172.81	6 915 574.21	51.33	Start of line
SRC92-02	242	290 153.16	6 915 950.94	50.37	Int. SRC92-01
SRC92-02	340	292 438.60	6 916 836.10	43.56	
SRC92-02	440	294 771.76	6 917 738.32	46.12	
SRC92-02	539	297 082.37	6 918 630.92	47.74	
SRC92-02	580	298 039.20	6 919 001.10	50.52	
SRC92-03	200	289 680.46	6 914 393.48	49.23	
SRC92-03	240	290 613.96	6 914 753.53	45.40	
SRC92-03	329	292 689.78	6 915 557.42	48.48	
SRC92-03	440	295 278.46	6 916 561.32	54.16	
SRC92-03	537	297 540.18	6 917 437.98	57.12	Int. 86-AEY
SRC92-03	640	299 942.35	6 918 370.18	67.05	
SRC92-04	200	290 750.71	6 911 605.11	53.77	
SRC92-04	239	291 664.01	6 911 948.84	52.87	Int. SRC92-01
SRC92-04	335	293 908.65	6 912 799.54	54.38	
SRC92-04	435	296 247.79	6 913 687.57	70.31	
SRC92-04	537	298 633.43	6 914 591.71	68.56	
SRC92-04	640	301 041.46	6 915 506.63	65.33	End of line
SRC92-05	200	291 244.72	6 910 473.73	58.91	
SRC92-05	236	292 086.02	6 910 795.92	58.30	
SRC92-05	335	294 398.85	6 911 677.88	63.03	

Line	Station	Adjusted Easting (m)	Adjusted Northing (m)	Adjusted Elevation (m)	Comment
SRC92-05	435	296 736.16	6 912 570.55	65.37	
SRC92-05	534	299 049.48	6 913 454.82	63.40	Int. 86-AEY
SRC92-05	580	300 122.94	6 913 866.53	64.51	
SRC92-06	200	263 420.12	6 891 561.37	46.93	PM start of line
SRC92-06	220	263 888.98	6 891 736.18	47.19	Int. 87-BAA
SRC92-06	270	265 061.28	6 892 173.55	48.05	Int. 82-RBJ
SRC92-06	318	266 185.76	6 892 592.98	49.49	
SRC92-06	395	267 990.90	6 893 265.17	53.00	
SRC92-06	440	269 045.65	6 893 657.38	54.62	End of line
SRC92-07	200	264 877.17	6 887 826 87	49.68	
SRC92-07	242	265 857.11	6 888 207.35	51.40	
SRC92-07	313	267 512.99	6 888 851.72	55.85	
SRC92-07	390	269 308.03	6 889 549.63	62.18	Int. 87-BBB
SRC92-07	440	270 473.26	6 890 004.37	61.09	

000021

CRATER SEISMIC SURVEY

PEL 55

ENVIRONMENTAL AUDIT

OCTOBER 1992

Mines & Energy SA

R95/00845



00120995



PEL 55 ENVIRONMENTAL AUDIT

The Crater Seismic Survey in PEL 55 was located on the Sturt Stony Desert which consists mainly of gibber plain with some small moving sand dunes and claypan areas. The only vegetation in the area was in the claypan areas or in drainage channels and on sand dunes. No sensitive environmental areas were encountered during the survey.

Dozer Crew

The Dozer Crew were given copies of the Dozer Manual at the start of the survey and instructed to adhere as close as possible to the techniques and rules in the manual. The Dozer Crew (Denham & O'Keeffe Earthmoving) had previous experience with Santos and were monitored closely by the company representative. As the photographs show, very little line cutting was necessary for the survey, and the Dozer Crew did a good job conforming to the Code of Practice.

Seismic Crew

The Seismic Crew were given copies of the Code of Environmental Practice - Seismic before the survey commenced and told to follow the instructions for the Seismic Operation.

The crew did not use a camp but were housed at the Mungeranie Roadhouse. Personnel were instructed no refuse was to be left on the seismic lines, and vehicles were to keep to access tracks and seismic lines as much as possible. The smaller trucks were found to have little effect on the stony plain, however the big trucks broke through the surface and had to be carefully controlled.

The recording crew (Seismograph Service Limited) had extensive experience working for Santos in northern South Australia including a previous survey in this area. The crew were very conscientious in adhering to the Code of Environmental Practice.

Survey

All survey pegs and flagging were removed from the seismic lines. Permanent markers were placed at intersections and otherwise as required by the regulations.

Crater Prospect

48 kilometres of seismic were recorded on the Crater Prospect in the northeast portion of the licence. The area was primarily gibber plain with several small sand dunes. The majority of the seismic line was just walked with the dozer, blade up, to mark the track. Small cuts were made at drainage channels with high steep sides to smooth a track for the trucks. A small cut was made in the sand dunes to reduce the steep western flanks for the trucks. As these are moving sand dunes any trace of the lines will be covered within a few months by the strong summer winds. Detours were made around several patches of trees in the drainage channels. Several pictures taken after the crew finished are enclosed to show the minimal amount of line cutting which was necessary.

Taltra Prospect

12 kilometres of seismic was recorded on the Taltra Prospect, to the southwest of Mungeranie Station. The area was mainly claypan with low brush and some patches of trees. The low brush was cleared only enough to allow the trucks to pass and detours were made around the trees. A small cut was made in the sand dune on the east end of the lines to smooth the steep western flank for the trucks. Care was taken to ensure that Line 92-07 was not easily visible from the Birdsville Track at the crossing.

Old Seismic Lines

Some minor erosion was evident on the 1982 lines caused by water running down the line between the windrows. In general the seismic lines from previous surveys recorded in the area were found to be in good condition. The photographs show the lack of significant erosion on a 1985 Line at Crater which was used for access. The more recent seismic lines were difficult to locate.

Conclusions

As was stated in the Declaration of Environmental Factors no sensitive environmental areas are known to exist in the survey areas and none were found during the survey. The lines were found as described in the DEF Line Descriptions and the special requirements covered all the problems encountered during the line clearing and through the survey.

The recent rainfall in the area combined with the hot summer winds should eliminate most of the traces of the seismic lines in the survey areas.

Stirling Resources N.L.



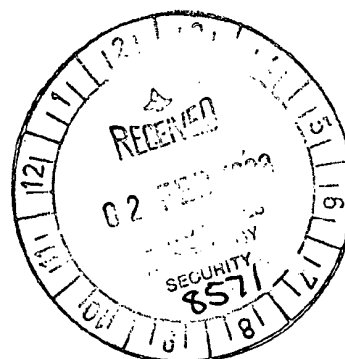
OPEN FILE

PEL 55

CRATER SEISMIC SURVEY

AND REPROCESSING

GEOPHYSICAL INTERPRETATION



By R.J. Beattie
November 1992

Mines & Energy SA

R95/00847



00120997

1. SUMMARY

The Crater Seismic Survey comprising 60 line kilometres was carried out in PEL 55 to detail two previously mapped prospects, referred to as the Crater Prospect and Taltra Prospect. In addition seismic reprocessing was undertaken on several lines at the Crater Prospect to improve data quality, for mapping of the prospect.

The seismic data acquired over the Crater Prospect (48 kilometres) was poorer in quality than anticipated, due to loss of reflection quality below the Coorikiana Sandstone. The Coorikiana Sandstone was a high amplitude event which was easily mapped over the prospect. A large structural closure of approximately 80 square kilometres in area has been mapped at this level at the Crater Prospect.

The seismic data acquired over the Taltra Prospect (12 kilometres) was very good quality. A significant structural closure of approximately 66 square kilometres in area has been mapped at the Top Cadna-Owie Formation level.

Drilling locations have been recommended on both the Crater and Taltra Prospects as follows:

Crater Prospect
Seismic Line SRC 92-03, shotpoint 270.

Taltra Prospect
Seismic Line 85-ZKN, shotpoint 890.

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ENCLOSURES

Crater Prospect

Time Structure Maps

- 1 Coorikiana Sandstone
- 2 Top Cadna-Owie Fm
- 3 Base Jurassic
- 4 Seismic Line SRC 92-03

Taltra Prospect

Time Structure Maps

- 5 Top Cadna-Owie Fm
- 6 Base Jurassic
- 7 Seismic Line SRC92-07

3. INTRODUCTION

The PEL 55 licence area is located in the southwest Eromanga Basin approximately 50 kilometres to the west of the Cooper Basin/Eromanga Basin production areas in northeastern South Australia.

Previous seismic mapping of the permit had identified several prospects and leads worthy of follow-up seismic. A 60 kilometre seismic programme was recorded over the Crater and Taltra Prospects to detail the structures and upgrade the prospects to drillable status.

The Crater Seismic Survey included 48 kilometres of detailing seismic over the Crater Prospect and 12 kilometres of detailing seismic over the Taltra Prospect to find optimum drilling locations for the two structures. The line clearing crew arrived on 6 June 1992 and the seismic crew left the area on 30 June 1992. There was a one week delay between the line clearing crew and recording crew due to delays transporting the seismic crew from New Zealand.

4. SURVEYING

The surveyors commenced on the 6 June 1992 on Lines 92-07 and 92-06 on the Taltra Prospect. The new seismic lines were set off using permanent markers from previous surveys checked by sunshots. While calculating the co-ordinates the surveyors discovered an error in the original shotpoint maps which was attributed to a wrong conversion from the Clarke 1885 Grid used by Santos to the Australian National Grid. SADME recalculated the coordinates for the previous surveys and a new map was plotted with the correct line coordinates by Tesla-10 in Perth.

A list of the permanent markers left on the lines of the Crater Survey is contained in the operations report by Seismograph Service Limited.

5. LINE CLEARING

Line clearing was carried out by Denham and O'Keeffe Earthmoving, Cunnamulla, and commenced on 7 June 1992 on lines 92-07 and 92-06 (Taltra Prospect). On 8 June Line 92-06 was completed and the dozer was moved to the Crater Prospect. The 5 Lines in the Crater Prospect area were completed on 11 June 1992. The dozer was moved back northeast to the area of the large sand dunes where a small dam was constructed for the station. The dozer was left in this area in case the sand dunes required more work when the recording crew arrived. The dozer crew left on 12 June and returned on 25 June. No further work was required on the sand dunes and the line clearing crew and equipment were demobilised on 27 June 1992.

Denham and O'Keeffe Earthmoving are recommended for the roadwork and site preparation for the forthcoming well because of their knowledge of the area and the environmental regulations. The work was conducted in a highly professional manner.

6. RECORDING

The recording crew was Seismograph Service Limited, Party 180, which arrived at the permit on 22 June 1992 after some delays in trans-shipment from New Zealand. Recording commenced on 23 June, however an instrument failure in the recorder stopped production for one day until a replacement component could be transported up from Adelaide. Recording commenced again on 24 June and was completed on 29 June 1992. An operations report by Seismograph Service Limited contains crew statistics and parameters used in the survey. No uphole survey was conducted.

The survey was recorded using the vibroseis technique with 3 vibrators on line at all times. The group interval and source interval were both 25 metres which with the 120 trace system resulted in a coverage of 6000%. The recording crew averaged 10 kilometres per day which was good considering the size of the programme and the number of line moves.

7. CREW SUPERVISION

The line clearing and recording were supervised on behalf of the PEL 55 Joint Venture by Stirling Resources N.L.. Close attention was paid to the Code of Environmental Practice during the line clearing, in particular, but also during the recording to ensure there was no excess environmental damage during the survey. The company was required to declare any sensitive areas before the survey then audit the environmental damage by the survey for SADME on completion of the survey.

Some parameter testing was carried out at the beginning of the survey to determine the number of vibrator sweeps, the length and frequency of sweeps, and the source array for the sweeps. Parameters used in the survey were similar to those used by Santos for the detailing seismic in the Mulapula and Mulkarra West areas in 1987-88.

Overall the seismic survey was completed efficiently and without any serious problems. Both the line clearing crew and the recording crew operated in a very professional manner and would be recommended for future work.

8. PROCESSING AND REPROCESSING

Processing of the Crater Seismic Survey and reprocessing of two old lines was carried out by Simon Horizon in Perth. The following sequence was used to process/reprocess the seismic data.

- Demultiplex
- Elevation Statics
- Amplitude Recovery
- Deconvolution - Predictive
- CDP Sort
- Velocity Analysis (1.2 km interval)
- Residual Statics - Surface Consistent
- Velocity Analysis (0.8 km interval)
- NMO Corrections
- Mute
- Scaling
- Statics - Datum
- Residual Statics - CDP Consistent
- Stack - 60 Fold/Reproc: 24-48 Fold
- Migration - Finite Difference
- Band Pass Filter - 10/14 - 75/85
- Scaling - AGC

No uphole or refraction work was carried out for statics corrections. Studies carried out by both Santos and Stirling Resources N.L. determined that the static corrections calculated for previous surveys were completely surface consistent in the survey area. The surface consistent residual statics programme was used to calculate the statics profile which was then corrected vertically at the tie points to the old data. The results of the processing/reprocessing programme in the Crater Prospect area were disappointing. The highly disturbed zone between the Coorikiana Sandstone and the Basement was still uninterpretable. Considerable experimentation with velocities particularly in migration did not seem to effectively collapse the diffracted energy in the bad data zone.

9. INTERPRETATION

General

The geophysical interpretation was concentrated in the immediate areas of the Crater and Taltra Prospects. Reflection identification was correlated across from the Mulkarra West-1 and Mulapula-1 well locations where synthetic seismograms were available to tie the seismic data to the well tops. Seismic data in the area around the two prospects was of several vintages from 1982 to 1986 and migrated sections were not available from the Mines Department.

Mapping

Maps were drawn over the two prospect areas as follows:-

Crater Prospect

1. Coorikiana Sandstone
2. Top Cadna-Owie Formation
3. Base Jurassic (Basement)

Taltra Prospect

1. Top Cadna-Owie Formation
2. Base Jurassic (Basement)

Crater Prospect

The most reliable map in this area is the Coorikiana Sandstone Map. The Coorikiana was a good seismic event above the highly disturbed Jurassic section and exhibits drape over the rim of the suspected meteorite crater. The highest point on the larger anomaly on this map was chosen as the proposed location for the well site.

The Base Jurassic Map was also considered reasonably reliable although the event is poor in the central portion of the crater. The highest point on this map coincided with the high point on the Coorikiana Map.

The Top Cadna-Owie Formation Map was not considered to be very reliable because the seismic event was very difficult to correlate through the meteorite crater rim area. The entire Jurassic section was highly disturbed in the meteorite crater rim area with no continuous seismic event between the Coorikiana Sandstone and the Base Jurassic. A normal but highly fractured Eromanga Sequence is expected in the Crater Prospect.

Estimated potential oil reserves for the Crater Prospect are as follows:-

COORIKIANA SANDSTONE (From Top Coorikiana Sst Map):

Areal Closure	=	80 sq kms; 19,768 acres
Vertical Closure	=	35 msecs
Gross Pay	=	18 m; 59 ft
Net Pay (25%)	=	4.5 m; 15 ft
Geometry Factor	=	0.3
Net Reservoir Volume	=	88,956 acre-ft
Porosity	=	20%
Oil Saturation	=	70% FVF: 1.1
Barrels per acre-foot	=	$7758 \times 0.20 \times 0.70 \times 1/FVF (0.95) = 1032 \text{ BPAF}$
Est. Oil In Place	=	92 mm BBLS
Est. Recoverable Oil (25%)	=	23 mm BBLS

NAMUR SANDSTONE (From Cadna-Owie Map):

Areal Closure	=	15 sq kms; 3,707 acres
Vertical Closure	=	45 msec
Gross Pay	=	22 m; 72 ft
Net Pay (65%)	=	14.3 m; 47 ft
Geometry Factor	=	0.4
Net Reservoir Volume	=	69,692 acre-ft
Porosity	=	20%
Oil Saturation	=	70% FVF: 1.1
Barrels per acre-foot	=	$7758 \times O (0.20) \times So (0.70) \times 1/FVF (0.95) = 1032 \text{ BPAF}$
Est. Oil In Place	=	72 mm BBLS
Est. Recoverable Oil (25%)	=	18 mm BBLS

HUTTON SANDSTONE (From Base Jurassic Map):

Areal Closure	=	30 sq kms; 7,413 acres
Vertical Closure	=	70 msec
Gross Pay	=	35 m; 115 ft
Net Pay (80%)	=	28 m; 92 ft
Geometry Factor	=	0.4
Net Reservoir Volume	=	272,798 acre-ft
Porosity	=	20%
Oil Saturation	=	70% FVF: 1.1
Barrels per acre-foot	=	$7758 \times O (0.20) \times So (0.70) \times 1/FVF (0.95) = 1032 \text{ BPAF}$
Est. Oil In Place	=	282 mm BBLS
Est. Recoverable Oil (25%)	=	70 mm BBLS

ESTIMATED TOTAL RECOVERABLE OIL = 111 mm BBLS

Taltra Prospect

Both maps on the Taltra Prospect were considered reliable because of the good quality seismic in the area. The Top Cadna-Owie Formation Map reflects the structure of the Namur Sandstone which is the principle reservoir in the area. Structural closure was created by compaction causing drape over basement structuring. The Taltra Prospect is located on the flank of the Birdsville Track Ridge which is a basement feature trending across the northwest corner of the licence. Geology is expected to be similar to that found in the Mulkarra West-1 well.

Estimated potential oil reserves for the Taltra Prospect are as follows:-

Areal Closure	=	66.5 sq kms; 16,432 acres (Top Cadna-Owie Map)
Vertical Closure	=	20 msec; 10 m; 33 ft
Gross Pay	=	10 m; 33 ft
Net Pay	=	5 m; 16.5 ft (Murta); 7.5 m; 25 ft (Namur)
Geometry Factor	=	0.6
Net Reservoir Volume	=	162,677 acre-ft (Murta); 246,480 acre-ft (Namur)
Porosity	=	15% (Murta); 20% (Namur)
Oil Saturation	=	70% FVF: 1.1
Barrels per acre-foot	=	$7758 \times O (0.15) \times So (0.70) \times 1/FVF (0.95) = 774 \text{ BPAF}$ (Murta)
Barrels per acre-foot	=	$7758 \times O (0.20) \times So (0.70) \times 1/FVF (0.95) = 1032 \text{ BPAF}$ (Namur)
Est. Oil In Place	=	126 mm BBLS (Murta); 254 mm BBLS (Namur)
Est. Recoverable Oil (25%)	=	31 mm BBLS (Murta); 64 mm BBLS (Namur)

10. CONCLUSIONS & RECOMMENDATIONS

The Crater Seismic Survey and reprocessing was used to detail the Crater and Taltra Prospects and to determine drilling locations to test the two structures for hydrocarbons. The seismic data over the Crater Prospect was poorer in quality than anticipated especially in the Jurassic Eromanga sequence. The seismic data over the Taltra Prospect was very good in quality.

Interpretation and mapping of data acquired from the Crater Survey confirmed the presence of the Crater and Taltra Prospects, proved useful in detailing the structures and provided confidence in selecting drilling locations. The following drilling locations have been recommended to test the structures.

Crater Prospect

Seismic Line SRC92-03 SP 270

Taltra Prospect

Seismic Line 85-ZKN SP 890

27° 43 '00"

PEL 55

TIME STRUCTURE MAP

NORTHERN SHEET

AUTHOR: B.BEATTIE	DATE: OCTOBER 1992	C.I. = 10 MSECS
DRAWN: R.DAVES	SCALE: 1:50,000	ENCLOSURE No:



Kilometers



138° 24' 00"	255000E	260000E	265000E	270000E	275000E	138° 45' 00"	280000E	285000E	290000E	295000E	300000E	305000E	139° 02' 00"
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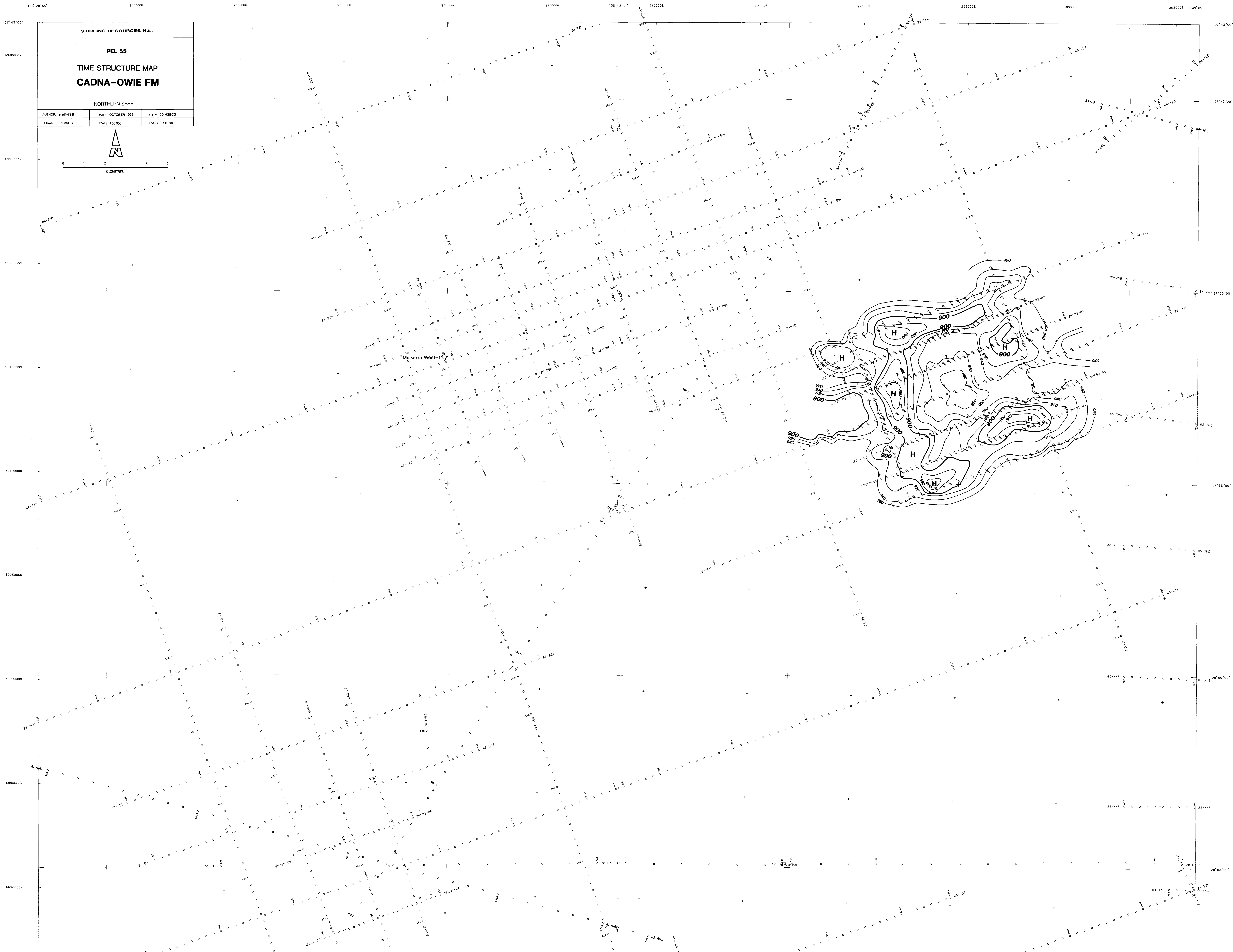
PEL 55

NORTHERN SHEET

AUTHOR: BBEATTIE	DATE: OCTOBER 1992	C.I. = 20 MSECS
DRAWN: R DAVIES	SCALE: 1:50,000	ENCLOSURE No.:



0 1 2 3 4 5
KILOMETRES



8571-6

STIRLING RESOURCES NL

1992-CRATER SURVEY

PEL-55-S.A.

LINE # SRC92-03

VPS # 200 - 640

MIGRATED STACK

RECORDING PARAMETERS

RECORDED JUNE 1992 BY S.S.
SOLAR TIME 12:00:00
SOLAR DATE 1992-06-01
NO. OF VIBS. 3
SOURCE ARRAY 1
SHEEP FREQUENCY 10-80 Hz
VIB SPACING 12.5 m with 12.5 m MOVEUP
SHEEP'S P. 2
ARRAY LENGTH 37.5 m
SHEEP LENGTH 1.5 m
SOURCE INTERVAL 2.5 m

GRAIN MODE 1
FILTER 1
HIGH 125 Hz
NOTCH OUT
FIELD TYPE 1
TAPE DENSITY 1
FIELD FORMAT 1
DATA CHANNELS 1
SAMPLER RATE 1
RECORD LENGTH 1

SENSOR 3M (100m)
GEOPHONE ARRAY 12 IN LINE # 2-1
GROUP INTERVAL 25 m
SPLIT SPEED 1537.5-62.5-62.5-1537.5 m
SPEED

COVERAGE 1
DIP OF SHOOTING 0 m
LENGTH OF LINE 11.0 km

SEQUENCE

DEMULTIPLY

STATICS

AMPLITUDE RECOVERY

DECONVOLUTION

COP SORT

VELOCITY ANALYSIS

RESTORATION/STATISTICS

VELOCITY ANALYSIS

NMO CORRECTIONS

MUTE

SCALING

STATISTICS

RESIDUAL STATISTICS

STACK

MIGRATION

BAND PASS FILTER

SCALING

PROCESSING PARAMETERS

SLOPE TO HORIZON INTERNAL CORREL

FLATTENING DATA CORRECTION

ELEVATION STATISTICS

AMPLITUDE COMPENSATION (db) 11 + 20 Log(1) to 3 seconds

RANDOM LIMITED PREDICTIVE DECONVOLUTION (10-80 Hz)

0.5% WHITE NOISE, 120 msec OPERATOR, 10 msec OP

DESIGN WINDOWS 200 - 2000 msec OPERATOR, 63 m

200 - 2500 msec OPERATOR, 1530 m

PRELIMINARY DVS VELOCITY ANALYSIS PERFORMED AT APPROXIMATELY 1.1 km INTERVALS

SURFACE CONSISTENT RESIDUAL STATISTICS (INTERNAL)

7 TRACE PILOT, 350-1500 m CORRELATION WINDOW

MULTI FUNCTION GRABBERS AND STACKS (INTERNAL)

AT APPROXIMATELY 0.5 km INTERVALS USING RESIDUAL STATISTICS

VELOCITY FUNCTIONS REFERENCED TO SURFACE

OFFSET 1 110 130 200 250 310 360 410 460 510 560 610 660 710 760 810 860 910 960 1010 1060 1110 1160 1210 1260 1310 1360 1410 1460 1510 1560 1610 1660 1710 1760 1810 1860 1910 1960 2010 2060 2110 2160 2210 2260 2310 2360 2410 2460 2510 2560 2610 2660 2710 2760 2810 2860 2910 2960 3010 3060 3110 3160 3210 3260 3310 3360 3410 3460 3510 3560 3610 3660 3710 3760 3810 3860 3910 3960 4010 4060 4110 4160 4210 4260 4310 4360 4410 4460 4510 4560 4610 4660 4710 4760 4810 4860 4910 4960 5010 5060 5110 5160 5210 5260 5310 5360 5410 5460 5510 5560 5610 5660 5710 5760 5810 5860 5910 5960 6010 6060 6110 6160 6210 6260 6310 6360 6410 6460 6510 6560 6610 6660 6710 6760 6810 6860 6910 6960 7010 7060 7110 7160 7210 7260 7310 7360 7410 7460 7510 7560 7610 7660 7710 7760 7810 7860 7910 7960 8010 8060 8110 8160 8210 8260 8310 8360 8410 8460 8510 8560 8610 8660 8710 8760 8810 8860 8910 8960 9010 9060 9110 9160 9210 9260 9310 9360 9410 9460 9510 9560 9610 9660 9710 9760 9810 9860 9910 9960 10010 10060 10110 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68260 68310 68360 68410 68460 68510 68560 68610 68660 68710 68760 68810 68860 68910 68960 69010 69060 69110 69160 69210 69260 69310 69360 69410 69460 69510 69560 69610 69660 69710 69760 69810 69860 69910 69960 70010 70060 70110 70160 70210 70260 70310 70360 70410 70460 70510 70560 70610 70660 70710 70760 70810 70860 70910 70960 71010 71060 71110 71160 71210 71260 71310 71360 71410 71460 71510 71560 71610 71660 71710 71760 71810 71860 71910 71960 72010 72060 72110 72160 72210 72260 72310 72360 72410 72460 72510 72560 72610 72660 72710 72760 72810 72860 72910 72960 73010 73060 73110 73160 73210 73260 73310 73360 73410 73460 73510 73560 73610 73660 73710 73760 73810 73860 73910 73960 74010 74060 74110 74160 74210 74260 74310 74360 74410 74460 74510 74560 74610 74660 74710 74760 74810 74860 74910 74960 75010 75060 75110 75160 75210 75260 75310 75360 75410 75460 75510 75560 75610 75660 75710 75760 75810 75860 75910 75960 76010 76060 76110 76160 76210 76260 76310 76360 76410 76460 76510 76560 76610 76660 76710 76760 76810 76860 76910 76960 77010 77060 77110 77160 77210 77260 77310 77360 77410 77460 77510 77560 77610 77660 77710 77760 77810 77860 77910 77960 78010 78060 78110 78160 78210 78260 78310 78360 78410 78460 78510 78560 78610 78660 78710 78760 78810 78860 78910 78960 79010 79060 79110 79160 79210 79260 79310 79360 79410 79460 79510 79560 79610 79660 79710 79760 79810 79860 79910 79960 80010 80060 80110 80160 80210 80260 80310 80360 80410 80460 80510 80560 80610 80660 80710 80760 80810 80860 80910 80960 81010 81060 81110 81160 81210 81260 81310 81360 81410 81460 81510 81560 81610 81660 81710 81760 81810 81860 81910 81960 82010 82060 82110 82160 82210 82260 82310 82360 82410 82460 82510 82560 82610 82660 82710 82760 82810 82860 82910 82960 83010 83060 83110 83160 83210 83260 83310 83360 83410 83460 83510 83560 83610 83660 83710 83760 83810 83860 83910 83960 84010 84060 84110 84160 84210 84260 84310 84360 84410 84460 84510 84560 84610 84660 84710 84760 84810 84860 84910 84960 85010 85060 85110 85160 85210 85260 85310 85360 85410 85460 85510 85560 85610 85660 85710 85760 85810 85860 85910 85960 86010 86060 86110 86160 86210 86260 86310 86360 86410 86460 86510 86560 86610 86660 86710 86760 86810 86860 86910 86960 87010 87060 87110 87160 87210 87260 87310 87360 87410 87460 87510 87560 87610 87660 87710 87760 87810 87860 87910 87960 88010 88060 88110 88160 88210 88260 88310 88360 88410 88460 88510 88560 88610 88660 88710 88760 88810 88860 88910 88960 89010 89060 89110 89160 89210 89260 89310 89360 89410 89460

138° 28' 00"	255000E	260000E	265000E	270000E	275000E	138° 45' 00"	280000E	285000E	290000E	295000E	300000E	305000E	139° 02' 00"
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PEL 55

NORTHERN SHEET

0 1 2 3 4 5
KILOMETRES



[illegible]

LINE SRC92-07
→ NE

STIRLING RESOURCES NL

1992 CRATER SURVEY

VPCL 55 S.A.

LINE SRC92-07

VPS 200 - 440

MIGRATED STACK

RECORDING PARAMETERS

RECORDED JUNE 1992 BY:SSL
SOURCE DATA
NO. OF VIBS. 3
SOURCE ARRAY 1
SHEEP FREQUENCY 10-40 Hz
VIB SPACING 12.5 m with 12.5 m NOVELP
SHEEP/V.P. 2
ARRAY LENGTH 37.5 m
SHEEP LENGTH 6 m
SOURCE INTERVAL 25 m
RECEIVER DATA
GEOPHONE TYPE 5060R SH (10Hz)
GEOPHONE ARRAY 12 IN-LINE @ 2.1 m
GROUP INTERVAL 25 m
SPREAD TYPE SPLIT SPREAD
SPREAD 1537.5-62.5-62.5-1537.5 m

RECORDING & STACKING
GAIN MODE 1 JFP
FILTER 1 LOW 8 Hz @ 12 DB/OCT
HIGH 125 Hz @ 72 DB/OCT
NOTCH OUT
FIELD TIME CORRECT
TAPE DENSITY 6250 BPI
FIELD FORMAT 3008 (zero phase correlated)
DATA CHANNELS 120 TRACKS
SAMPLE RATE 2 msec
RECORD LENGTH 4 sec
COVERED 8000
DIRM OF SHOOTING 54 → NE
LENGTH OF LINE 8.0 Km

SEQUENCE

DEMULPLEX

STATICS 10N

AMPLITUDE RECOVERY

DECONVOLUTION

CDP SORT

VELOCITY ANALYSIS

RESIDUAL STATICS

VELOCITY ANALYSIS

NMO CORRECTIONS

MUTE

SCALING

STATICS

RESIDUAL STATICS

STACK

MIGRATION

BAND PASS FILTER

SCALING

PROCESSING PARAMETERS

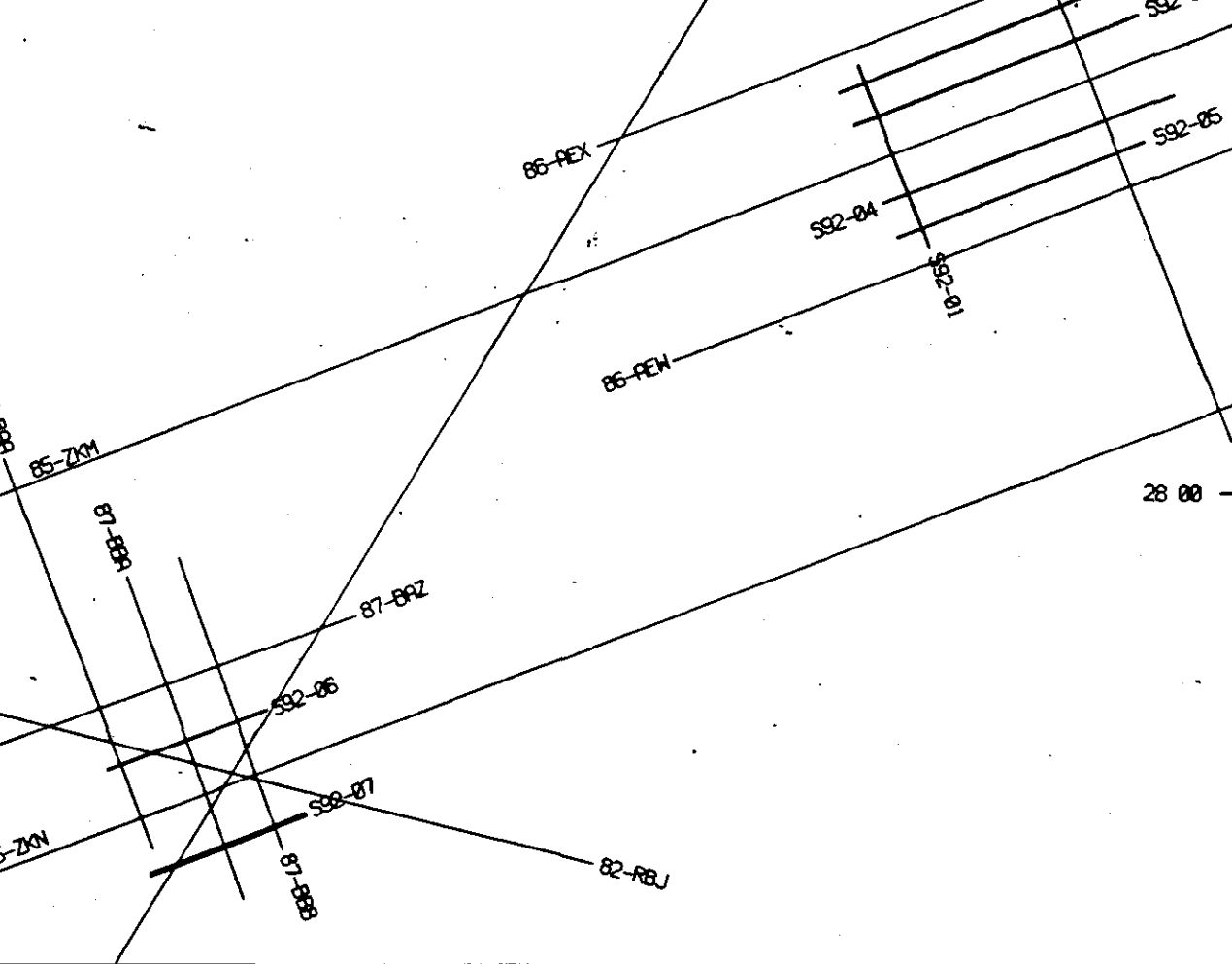
SEG TO HORIZON INTERVAL FORMAT
FLORING DATA CORRECTION
ELEVATION STATICS
AMPLITUDE CORRECTION 100%
BAND LIMITED PREDICTIVE DECONVOLUTION (410-80 Hz)
0.5% WHITE NOISE 120 msec OPERATOR 16 msec GPP
DESIGN WINDOWS 200 - 2000 msec @ 63 m
800 - 2500 msec @ 1530 m
PRELIMINARY CDS VELOCITY ANALYSIS PERFORMED AT
APPROXIMATELY 1.2 Km INTERVALS
SURFACE CONSISTENT RESIDUAL STATICS (NEBUAI)
7 TRACE PILOT 350-1400 ms CORRELATION WINDOW
MULTI-FUNCTION OTHERS AND STACKS (CONVUL)
AT APPROXIMATELY 0.7 Km INTERVALS USING RESIDUAL STATICS
VELOCITY FUNCTIONS REFERENCED TO SURFACE
OFFSET 113 130 263 513 663 1130 1530 m
TIME 0 150 200 400 500 750 1000 msec
500 ms AGG GATES
FLORING DATA TO DATA
DATA 0 = 1 REPLACEMENT VELOCITY = 1800 m/s
CDP CONSISTENT TRIM STATICS (PSTRA)
7 TRACE WEIGHTED PILOT 300-1600 ms CORRELATION WINDOW
60 FOLD CDP STACK
FINITE DIFFERENCE MIGRATION METHOD
110% SMOOTHED STACKING VELOCITIES
COSINE SQUARED TAPERS
APPLICATION TIME (msec) FREQUENCY LIMITS (Hz)
1000 10/14 - 75/65
DUAL WINDOW AGG 1000 + 400 MS GATES

DISPLAY PARAMETERS

NORMAL POLARITY + NEGATIVE VALUE ON TAPE REPRESENTED BY A TROUGH
VERTICAL SCALE 5.0 ms/sec
HORIZONTAL SCALE 24.2 Tr/Inch
INTENSITY 1.2
GAIN 1600
BIAS 0 %
1 : 11905
0.8 0.5 1.0 Km
NORTH EAST

PEL 55

CRATER SEISMIC SURVEY



000044

**1992 CRATER SEISMIC SURVEY
SEISMIC DATA PROCESSING REPORT
FOR
STIRLING RESOURCES N.L.**

LOCATION PEL 55 - SOUTH AUSTRALIA

**COMPILED BY : ROBERTSON RESEARCH
AUSTRALIA PTY. LTD.**

MAY 1996

Robertson

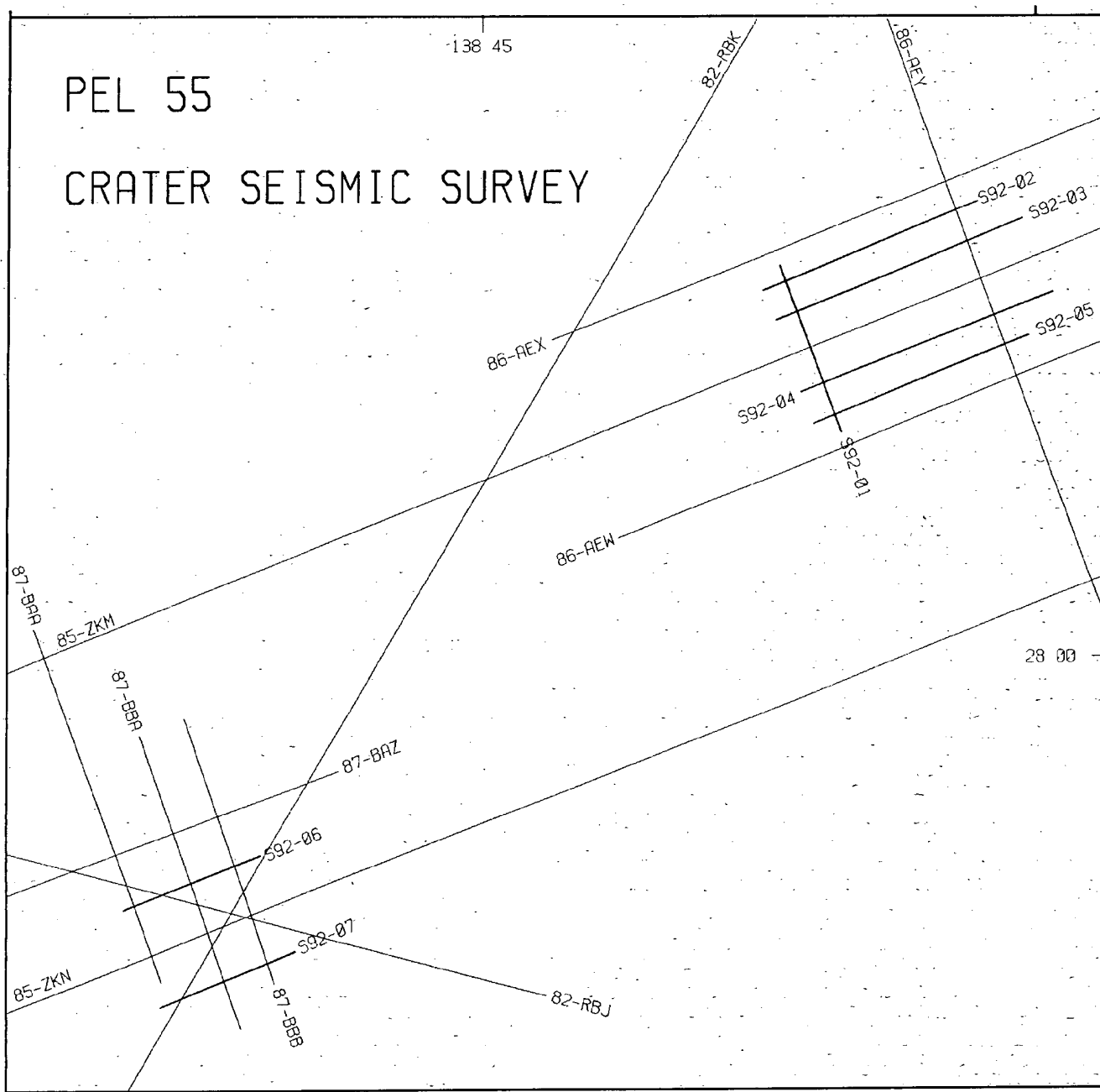
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1. **INTRODUCTION**

The 1992 Crater Seismic Survey was acquired for Stirling Resources N.L. by SSL in June 1992. The survey comprised seven lines recorded with a nominal fold of 60. Two older lines, 85-ZKM and 86-AEY, were also reprocessed at the same time as the new data.

Processing was conducted by Robertson Research Australia (formerly Simon Petroleum Technology Australia) at their Perth office. Processing parameter tests were mainly carried out on lines SRC92-01, SRC92-04 and SRC92-05. All Lines were processed to 3 seconds. Final filming was completed in September 1992.

1.1 PROJECT MAP

1.2 PROCESSING SEQUENCE DIAGRAM

1. TRANSCRIBE SEGB / SEG Y TO HORIZON INTERNAL FORMAT
|
2. ELEVATION STATICS
|
3. AMPLITUDE RECOVERY
|
4. BAND LIMITED PREDICTIVE DECONVOLUTION
|
5. CDP SORT
|
6. PRE-STACK EQUALISATION
|
7. VELOCITY ANALYSIS (APPROX. 1.5 KM INTERVALS)
|
8. SURFACE CONSISTENT RESIDUAL STATICS
|
9. VELOCITY ANALYSIS (APPROX. 0.7 KM INTERVALS)
|
10. NORMAL MOVEOUT CORRECTION
|
11. OUTER TRACE MUTE
|
12. FLOATING DATUM TO FINAL DATUM
|
13. CDP CONSISTENT RESIDUAL STATICS
|
14. COMMON DEPTH POINT STACK
|
15. FD MIGRATION
|
16. BAND PASS FILTER
|
17. SCALING

1.3 FINAL DISPLAYS

Final displays were produced as follows:

- | | | | |
|----|-----------------|--------------------|-------------|
| 1. | Final Stack | Horizontal Scale : | 1:12,097 |
| | | Vertical Scale : | 5.0 in/sec |
| 2. | Final Migration | Horizontal Scale : | 1:12,097 |
| | | Vertical Scale : | 5.0 in/sec |
| 3. | Final Migration | Horizontal Scale : | 1:12,097 |
| | | Vertical Scale : | 10.0 in/sec |

1.4 ARCHIVE DATA

The following data were archived on an Exabyte tape in SEG Y 2.3 GB format.

- A. Raw Stacks
- B. Final Migrations

There is a description block separating each data set which contains the line number and a description of the data which follow.
The time of first sample is - 100 ms.

000050

5

1.5 LINE SUMMARY

LINE	VP RANGE	KMS
SRC92-01	200 - 480	7.00
SRC92-02	200 - 580	9.50
SRC92-03	200 - 640	11.00
SRC92-04	200 - 640	11.00
SRC92-05	200 - 580	9.50
SRC92-06	200 - 440	6.00
SRC92-07	200 - 440	6.00
85-ZKM	1550 - 1950	15.00
86-AEY	450 - 750	11.25

TOTAL: 86.25

The logo for Robertson, featuring the word "Robertson" in a serif font, with a stylized wave or underline beneath the text.

2. ACQUISITION PARAMETERS

2.1 1992 DATA

Source	Vibroseis
Source Array	3 Vibes inline
Array Centre	Centred between station
Sweep Length	6 seconds
Sweep Frequencies	Linear Upsweeps : 10-80 Hz
Source Interval	25 m
Fold	60
Number of Data Channels	120
Spread Type	Split Spread
Offsets	1537.5-62.5-x-62.5-1537.5 m
Group interval	25 m
Geophone Array	12 inline at 2.1 m
Geophone Type	Sensor SM4 10 Hz
Recording Instrument	SERCEL SN348
Record Length	4 seconds (Correlated)
Correlation Type	Zero Phase
Sample Period	2 msec
Gain Mode	IFP
Recording Filter	High cut: 125 Hz @ 72 dB/Oct Low cut: 8 Hz @ 12 dB/Oct
Tape Format	SEGB

ACQUISITION PARAMETERS (ctd)**2.2 LINE 85-ZKM**

Source	Vibroseis
Source Array	3 Vibes inline
Array Centre	Centred between station
Sweep Length	12 seconds
Sweep Frequencies	Linear Upsweeps : 10-75 Hz
Source Interval	75 m
Fold	24
Number of Data Channels	96
Spread Type	Split Spread
Offsets	1856.3-93.7-x-93.7-1856.3 m
Group interval	37.5 m
Geophone Array	12 inline at 3.4 m
Geophone Type	GSC-20D 10 Hz
Recording Instrument	DFS V
Record Length	4 seconds (Correlated)
Correlation Type	Zero Phase
Sample Period	4 msec
Gain Mode	IFP
Recording Filter	High cut: 90 Hz @ 72 dB/Oct Low cut: 8 Hz @ 18 dB/Oct
Tape Format	SEGY

ACQUISITION PARAMETERS (ctd)2.3 LINE 86-AEY

Source	Vibroseis
Source Array	3 Vibes inline
Array Centre	Centred between station
Sweep Length	12 seconds
Sweep Frequencies	Linear Upsweeps : 10-75 Hz
Source Interval	37.5 m
Fold	48
Number of Data Channels	96
Spread Type	Split Spread
Offsets	1856.3-93.7-x-93.7-1856.3 m
Group interval	37.5 m
Geophone Array	12 inline at 3.4 m
Geophone Type	GSC-20D 10 Hz
Recording Instrument	DFS V
Record Length	4 seconds (Correlated)
Correlation Type	Zero Phase
Sample Period	4 msec
Gain Mode	IFP
Recording Filter	High cut: 90 Hz @ 72 dB/Oct Low cut: 8 Hz @ 18 dB/Oct
Tape Format	SEGY

3. FIELD DATA SUPPORT MATERIAL

The following support information was provided

- a) Observers' reports
- b) Coordinate and elevation information

4. PROCESSING TECHNIQUES AND PARAMETER VERIFICATION

An overall test sequence was established during the processing of Line SRC92-01 and SRC92-05. A comprehensive suite of tests was conducted on these two lines which included true amplitude recovery, deconvolution, D.M.O., mutes, post-stack filter, scaling, Tau-p filtering and migration. Similar parameters were then applied to the two reprocessing lines in order to attempt to achieve character consistency.

The adjustment and fine tuning of the parameters to achieve the final processing sequence was discussed between Bob Beattie on behalf of Stirling Resources and representatives of Robertson Research.

4.1 TRANSCRIPTION

Field data recorded in SEGB format (new data) and SEG Y format (repro data), were transcribed to Robertson internal format. The 1992 lines were kept at 2ms and the repro lines remained at 4ms.

4.2 ELEVATION STATICS

The seismic datum was 0m a.s.l and a replacement velocity of 1800m/s was used.

4.3 AMPLITUDE COMPENSATION

A synthetic gain recovery curve of $1.0t + 20 \log(t)$ was applied from 0.0 to 3.0 seconds to all the data.

4.4 DECONVOLUTION

Extensive deconvolution testing was conducted on this dataset. This included predictive deconvolution and surface consistent deconvolution. These comparisons were made on a stack panel with residual statics applied. In the final analysis, band limited predictive deconvolution (16ms gap) was chosen by Mr Bob Beattie as this was deemed to give the best continuity at the target horizon.

4.5 VELOCITY ANALYSIS

First pass velocity analysis was performed by using constant velocity stack panels of 21 traces over a velocity scan of 1500 to 4500 m/s at increments of 100 m/s at approximately 1.5 kilometre intervals.

Final velocity analysis was performed by "OMNIVEL" analyses, located at approximately 0.8 kilometre intervals. Each analysis comprised 21 CDPs stacked with 9 velocity functions with up to ± 4 percent variation on the central input function which is derived from the first pass velocity analysis. A contoured power display based on the power of stack of the inner 3 CDPs and a display of the central CDP gather both raw and with NMO corrections from each of the 9 velocity functions are used to interpret the optimum velocity function.

4.6 RESIDUAL STATICS

Robertson's NEBULA package was used to determine surface-consistent residual statics. A pilot trace is cross correlated with each data trace and the cross correlation functions are summed for each shot and station. The peak of each summed cross correlation is used to determine the static for each shot and receiver. The shifts from anomalous cross correlations are given a low weighting in the decomposition. The pilot trace is formed by summing adjacent traces; the number of traces summed, and the individual weights assigned to them is kept constant. Three iteration passes are used with statics generated in previous iterations being applied to the data for the current iteration. The pilot trace correlation is started from alternate ends of the line on successive iterations in order to ensure penetration of a reasonable pilot trace into poor signal-to-noise areas.

4.7 MUTING TRIALS

Mutes were selected by inspecting a series of stacked panels with increasing offsets included into each successive panel. An outer trace mute was applied to the data to remove any high amplitude noise at earlier times on the record and over-stretched moveout reflectors. The mute has a 60 ms taper.

The mute was tested on lines SRC92-01, SRC92-06 and 86-AEY.

4.8 FILTER TRIAL

A suite of filter sets was applied to a panel of stacked CDPs with only one set of filters on each panel. Filtering was performed in the frequency domain by applying a cosine-squared function. The cosine-squared cut-off filters are described by four frequencies F1, F2, F3 and F4. A time variant filter was selected from the series of filter trials. The filter was tested on line SRC92-04.

4.9 FINITE DIFFERENCE (F.D.) MIGRATION

The migration method uses the technique of downward continuation in order to map reflectors to their true time position. As some dips are greater than 15 degrees, the second order solution was used. The depth step was 20 ms.

Trials with varying percentages of the stacking velocity were tested. There was some discussion about the optimum percentage of stacking velocity to use but eventually 110% was chosen, though as high as 130% was tested on line SRC92-04.

5. SUMMARY OF THE PROCESSING PARAMETERS

5.1 1992 DATA

1. Transcribe SEGB data into Robertson internal format.
2. Statics application : floating datum correction. Elevation statics used.
3. Application of synthetic gain curve of $1.0t + 20 \log(t)$ to 3.0 seconds
4. Band limited predictive deconvolution (10-80 Hz)

Operator Length	: 120 ms
Gap	: 16 ms
White Noise	: 0.5%
Design windows	: 200 - 2000 ms near offset
	: 800 - 2500 ms far offset
5. CDP Sort
6. Pre-stack scaling
500 ms length AGC gates
7. Velocity analysis using CVS panel

Frequency of analyses	: 1.5 Km intervals
Velocity range	: 1500 to 4500 m/s
Number of CDP/analysis	: 21
8. Surface consistent residual statics
Number of pilot traces : 7
9. Velocity analysis using 'OMNIVEL'

Frequency of analyses	: 0.8 Km intervals
Velocity range	: 1500 to 4500 m/s
Number of CDP/analysis	: 21
Number of 4% increment panels per analysis	: 9
10. NMO correction using second pass velocity functions as annotated.
11. Outer trace mute

Offset (m)	: 113	138	263	513	663	1138	1538
Time (ms)	: 0	150	260	400	500	750	1000

12. Floating datum to m.s.l datum.
13. CDP consistent residual statics
Number of pilot traces : 7
14. Common depth point stack
15. F.D. Migration
Wave- equation method
110% stacking velocities. 20 ms depth step
Second order solution
16. Band Pass Filter

Application Time (ms)	Freq (Hz)
0-3000	10 - 14 - 75 - 85
17. Scaling
Dual window AGC with lengths of 1000 and 400 ms
50% application

SUMMARY OF THE PROCESSING PARAMETERS (ctd)**5.2 LINES 85-ZKM & 86-AEY**

1. Transcribe SEG Y data into Robertson internal format.
2. Statics application : floating datum correction. Elevation statics used.
3. Application of synthetic gain curve of $1.0t + 20 \log(t)$ to 3.0 seconds
4. Band limited predictive deconvolution (10-75 Hz)

Operator Length	: 120 ms	
Gap	: 16 ms	
White Noise	: 0.5%	
Design windows	: 200 - 2000 ms	near offset
	: 1000 - 2200 ms	far offset
5. CDP Sort
6. Pre-stack scaling
500 ms length AGC gates
7. Velocity analysis using CVS panel

Frequency of analyses	: 1.5 Km intervals
Velocity range	: 1500 to 4500 m/s
Number of CDP/analysis	: 21
8. Surface consistent residual statics
Number of pilot traces : 7
9. Velocity analysis using 'OMNIVEL'

Frequency of analyses	: 0.8 Km intervals
Velocity range	: 1500 to 4500 m/s
Number of CDP/analysis	: 21
Number of 4% increment panels per analysis	: 9
10. NMO correction using second pass velocity functions as annotated.
11. Outer trace mute

Offset (m)	: 131	206	506	881	1294	1856
Time (ms)	: 0	150	420	550	800	1200

12. Floating datum to m.s.l datum.
13. CDP consistent residual statics
Number of pilot traces : 7
14. Common depth point stack
15. F.D. Migration
Wave- equation method
110% stacking velocities. 20 ms depth step
Second order solution
16. Band Pass Filter

Application Time (ms)	Freq (Hz)
0-3000	10 - 14 - 75 - 85
17. Scaling
Dual window AGC with lengths of 1000 and 400 ms
50% application

6. **CONCLUSION**

The project proceeded in a smooth and timely manner though there was some extra time spent deciding upon the optimum velocity percentage for migration. Final stacks and migrations were completed by the end of August 1992 and filmed and archived in early September 1992.

Robertson Research Australia would like to thank Bob Beattie for his courtesy, co-operation and immediate replies to queries.



Phil Cook
ROBERTSON RESEARCH AUSTRALIA PTY LTD