Australian Government
Geoscience Australia

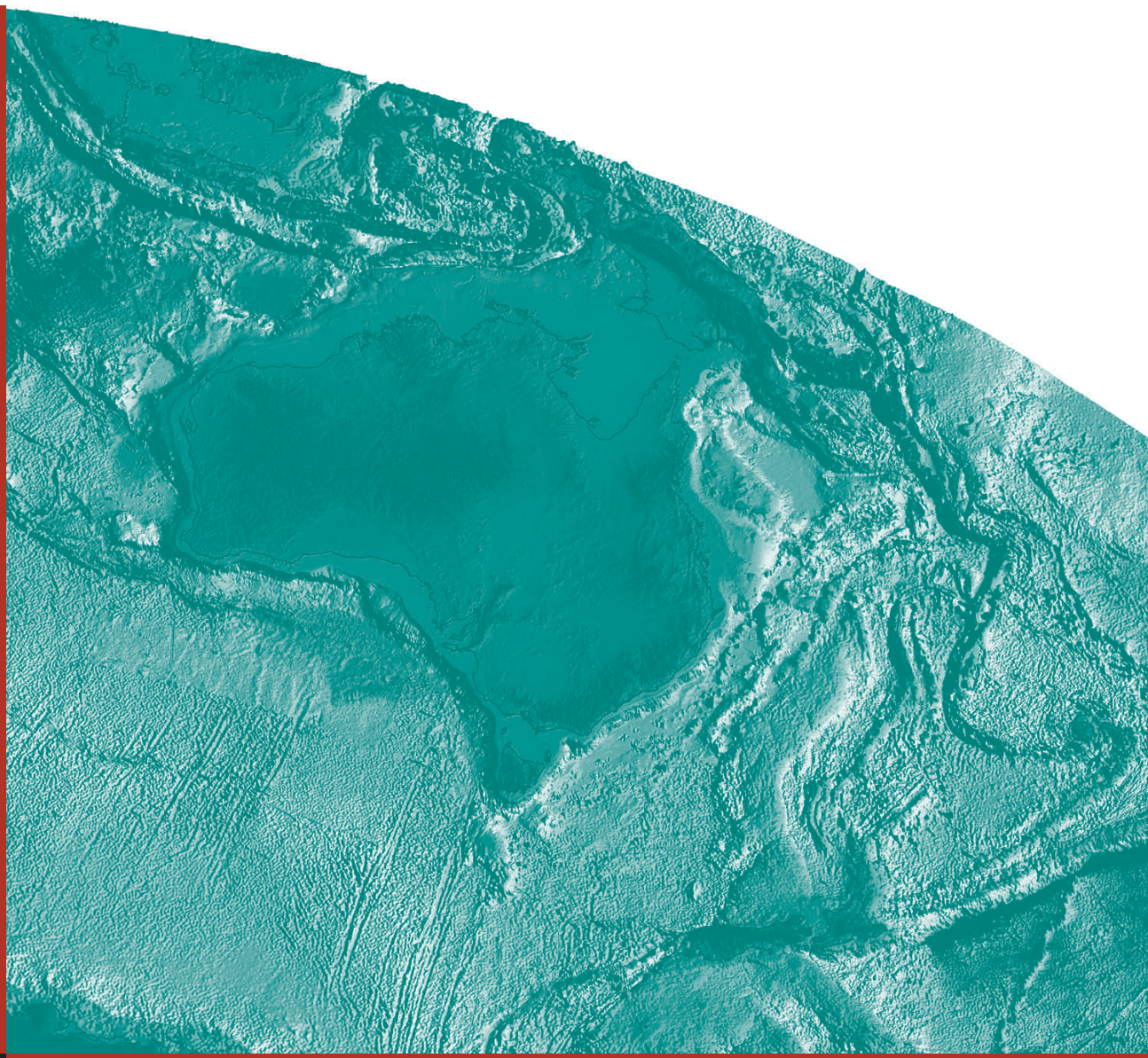
ANSIR NATIONAL RESEARCH FACILITY FOR EARTH SOUNDING

Government of South Australia
Primary Industries and Resources SA

Curnamona, SA, 2003 and 2004 seismic survey (L164) operations report

D. W. Johnstone, T. Fomin & A. Shearer

Record
2006/03



Department of Industry, Tourism & Resources

Minister for Industry, Tourism & Resources: The Hon. Ian Macfarlane, MP
Parliamentary Secretary: The Hon. Robert Baldwin, MP
Secretary: Mark Paterson

Geoscience Australia

Chief Executive Officer: Dr Neil Williams

ISSN: 1448-2177
ISBN: 1 920871 67 5

GeoCat No. 61398

Bibliographic reference: Johnstone, D. W., Fomin, T. & Shearer, A., 2006. Curnamona, SA, 2003 & 2004 seismic survey (L164) operations report. *Geoscience Australia Record* 2006/03.

Contents

EXECUTIVE SUMMARY

A seismic survey using the Australian National Seismic Imaging Resource (ANSIR) Hemi 60 Vibroseis vehicles, ARAM24 acquisition equipment and Pelton controllers was carried out in the Curnamona Province of South Australia. A total of 197.6 km of 2-D seismic reflection data were collected to 18 seconds two way time over a single line at a nominal 60 fold CDP coverage. These data were acquired under contract by Trace Energy Services (2003) and by Terrex Seismic (2004). The survey commenced in August 2003 but was abandoned due to wet weather. Survey operations were recommenced and completed in July 2004.

The project was undertaken to meet the objectives of ANSIR proposal 03-02R as lodged by researchers from PIRSA, Office of Minerals, Energy and Petroleum, SA. The principal scientific objective of this survey was to provide a regional crustal seismic image of the Curnamona Province. This dataset will assist in the understanding of the geological architecture and resource potential of the region particularly in areas under cover.

This line links with a seismic transect in the Broken Hill Block undertaken by Australian Geological Survey Organisation (AGSO) in 1996 and provides a future opportunity for an eventual east-west continuation across the Adelaide Geosyncline and the Gawler Craton.

The survey was funded by PIRSA, Office of Minerals, Energy and Petroleum, SA and the *pmd**CRC with project supervision undertaken by ANSIR and in-kind support from Geoscience Australia (GA).

Geographical Area

The seismic survey was situated in South Australia west of Broken Hill, NSW, Figure 1. Line 03GA-CU1 commenced at the NSW/SA border at a point coincident with a seismic line recorded by the Australian Geological Survey Organisation (AGSO) in 1996 (line 96AGS-B1A, station 100). The traverse passed through the Honeymoon Mine site and close to Kalkaroo, Strathearn and Curnamona stations. Supplies and logistics were sourced from Broken Hill, NSW.

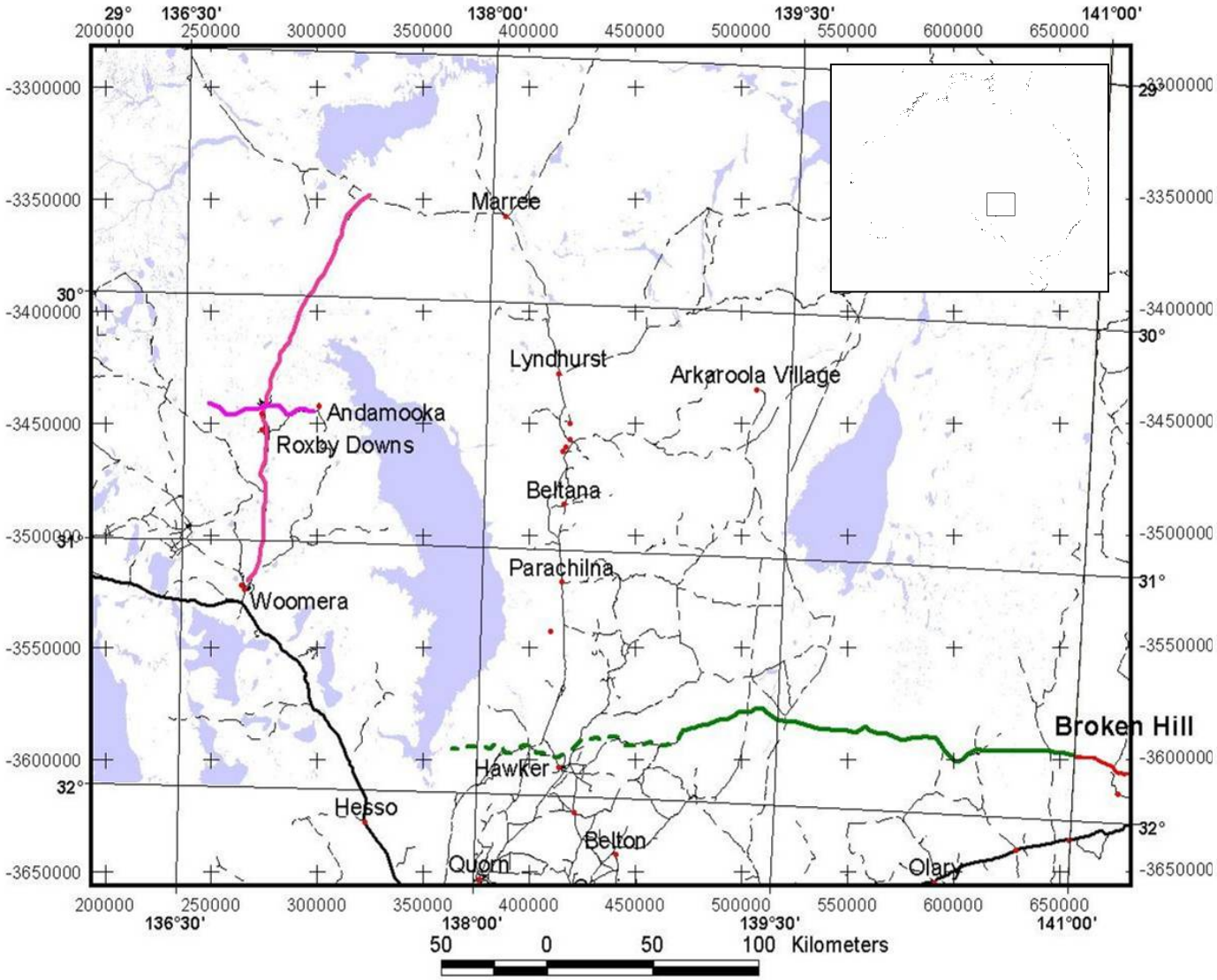


Figure 1. Location Map, Curnamona line 03GA-CU1 in solid green, Broken Hill 1996 in red, 2003 Gawler survey in purple and dashed green line is a possible extension.

Weather

Wet weather in August of 2003 caused the survey to be shut down after recording only 38 km of the proposed line (Figure 2). The survey recommenced in July 2004 and was completed without any further stops for bad weather.

Figure 2. Wet weather at Honeymoon mine site 15/8/2003

Logistics

Recording equipment, vibrators and the seismic crew were mobilised from Roxby Downs in August of 2003 after the completion of the 2003 ANSIR Gawler Craton survey, arriving at Honeymoon mine site on the 7th August. For the 2004 survey the Terrex seismic crew and equipment were mobilised from the 2004 ANSIR NSW Darling Basin survey in Wilcannia arriving at Honeymoon mine site on the 2nd July.

Access to the seismic line was via local roads and farm tracks while supplies for the crew were obtained from Broken Hill. Some supplies were transported by plane to the Honeymoon airstrip.

Accommodation and meals for the crew were provided at the Honeymoon mine site and at Curnamona station (Figure 3).

Fuel for all vehicles was bought in bulk from Broken Hill and delivered to the Honeymoon mine site and Curnamona station.

All other logistics were supported out of Trace Energy Services/Terrex Seismic Perth Office and from ANSIR headquarters in Canberra.
The crew list and daily operations reports are contained in the appendices of this report.

Figure 3. Accommodation at Curnamona station was in the shearers quarters.

SURVEYING, LINE CLEARING & PERMITTING

Surveying & gravity

Line pegging, surveying and gravity readings for the survey were contracted to Dynamic Satellite Surveys (DSS) of Yeppoon, Qld. The surveying party consisting of Lynne Baker (DSS), Andrew Gibb (DSS) and Andrew Shearer (PIRSA) arrived at Honeymoon mine site on the 4th August 2003. Mark Lefebvre (DSS) joined the crew later. Pegging and surveying at 40 m station intervals and gravity readings at every 10th station commenced at station 1000 located at the NSW/SA border. This point was tied into the permanent marker for the 1996 AGSO line (96AGS-BH1A).

A total of 2220 stations were surveyed & pegged before the rains caused a stop. The surveyors demobilized from Honeymoon on the 15th August, 2003. The last gravity reading was at station 3220.

Surveying recommenced on the 27th June, 2004. Frank Tangney and Craig Davey mobilized from Yeppoon on the 20th June 2004 and arrived at Curnamona station on the 23rd June. As a significant number of pegs from the 2003 survey were no longer present, repegging from station 1840 was required. Pegging, surveying and gravity readings were continued on from station 3220.

DSS report numbers, 03034 (b) & 04049 describe the operational and technical details of the surveying. These reports are reproduced in the appendix.

Final data was delivered in UTM grid coordinate format based on the GDA94 datum using the GRS80 reference spheroid. Elevations were referenced to the AHD.

Lines were pegged at 40 metre group interval with every 5th peg labeled. White wooden pegs were placed every 10th station with plastic pin markers in between. Pink pin markers were used for even station numbers and blue pin markers for odd station numbers.

Line clearing

No line clearing was required for the survey as it was all along existing tracks and minor roads. A grader was hired after the completion of the 2003 work to rehabilitate the tracks that were damaged by survey activities during heavy rains near Honeymoon mine.

Permitting

An initial scouting was carried out in April of 2003 by Andrew Shearer (PIRSA) and David Johnstone (ANSIR) to ascertain the feasibility of several options that were presented at the time (see Appendix J). This recon provided useful information on the logistics of conducting a survey of this size in this area. The recon undertaken defined the final route of the seismic line through Honeymoon minesite, Curnamona station and terminated at the railway line to the west of the town of Hawker. PIRSA was responsible for the permitting of the survey.

The permitting also included an Aboriginal heritage survey as required by SA state legislation. This survey was undertaken by Philip Fitzpatrick in July 2003 accompanied by Andrew Shearer and David Johnstone ("Aboriginal Heritage Survey, Gawler Craton and Curnamona Seismic Profiling 2003, A Report to Geoscience Australia and Primary Industries & Resources South Australia, Philip Fitzpatrick".)`

RECORDING / PROCESSING

Test program

An experimental program was carried out before the start of production on the 8th August 2003 to determine the optimum acquisition parameters for the survey. Table 1 details the tests undertaken.

This program was designed to allow a comparison of a number of source parameters. Both monosweep and varisweep configurations were tested over different sweep frequencies. Sweep length and source configuration were also varied.

The production parameters were chosen based upon an analysis of the monitor records examined in the recording truck. These consisted of 3 by 12 second varisweeps (7-56 Hz, 12-80 Hz & 8-72 Hz) with a 15 m pad to pad spacing of the vibrators and a 15 m moveup between sweeps. The receiver array was fixed with 12 geophones laid in line over the 40 m station interval.

Table 1. Curnamona seismic survey acquisition parameter test program.

	Curnamona Experimentals				**8/08/2003**			**Project code 23012**						
	40 m group interval, 40 m vibe interval							**Survey No L164**						
	210 channel, 2 ms sample rate, asymmetrical spread - 180-VP-30													
	Record length 20 s,			**minimum production record length 18 s**										
FFID		**VP**		**Spread**		**Sweep**	**Sweep**	**No**	**Sweep**		**Source**	**No**	**Source array**	**Comments**
No						**Type**	**Freq**	**Sweeps**	**Length (s)**		**Config**	**Vibes**	**length**	
1	I	**1200**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	O.D. 2003 line 1 sweep
							12 - 80hz	3	12			3	60	
							8 - 72hz	3	12			3	60	
2		**1201**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	
							12 - 80hz	3	12			3	60	
							8 - 72hz	3	12			3	60	
3		**1202**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	
							12 - 80hz	3	12			3	60	
							8 - 72hz	3	12			3	60	
4		**1203**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	
							12 - 80hz	3	12			3	60	
							8 - 72hz	3	12			3	60	
5		**1204**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	
							12 - 80hz	3	12			3	60	
							8 - 72hz	3	12			3	60	
6	II	**1200**		1030-1239		Vari	8 - 64hz	3	12		15mUp, 15P-P	3	60	New design 1 (Leonie)
							12 - 90hz	3	12			3	60	
							10 - 76hz	3	12			3	60	
7		**1201**		1030-1239		Vari	8 - 64hz	3	12		15mUp, 15P-P	3	60	New design 1
							12 - 90hz	3	12			3	60	
							10 - 76hz	3	12			3	60	
8		**1202**		1030-1239		Vari	8 - 64hz	3	12		15mUp, 15P-P	3	60	New design 1
							12 - 90hz	3	12			3	60	
							10 - 76hz	3	12			3	60	
9		**1203**		1030-1239		Vari	8 - 64hz	3	12		15mUp, 15P-P	3	60	New design 1
							12 - 90hz	3	12			3	60	
							10 - 76hz	3	12			3	60	
10		**1204**		1030-1239		Vari	8 - 64hz	3	12		15mUp, 15P-P	3	60	New design 1
							12 - 90hz	3	12			3	60	
							10 - 76hz	3	12			3	60	
11	III	**1200**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	New design 2 (Kiwi)
							12 - 80hz	3	12			3	60	
							4 - 48hz	3	12			3	60	
12		**1201**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	New design 2
							12 - 80hz	3	12			3	60	
							4 - 48hz	3	12			3	60	
13		**1202**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	New design 2
							12 - 80hz	3	12			3	60	
							4 - 48hz	3	12			3	60	
14		**1203**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	New design 2
							12 - 80hz	3	12			3	60	
							4 - 48hz	3	12			3	60	
15		**1204**		1030-1239		Vari	7 - 56hz	3	12		15mUp, 15P-P	3	60	New design 2
							12 - 80hz	3	12			3	60	
							4 - 48hz	3	12			3	60	
16	IV	**1200**		1030-1239		Mono	6-90hz	3	12		15mUp, 15P-P	3	60	Lachlan freqs
17		**1201**		1030-1239		Mono	6-90hz	3	12		15mUp, 15P-P	3	60	Lachlan freqs
18		**1202**		1030-1239		Mono	6-90hz	3	12		15mUp, 15P-P	3	60	Lachlan freqs
19		**1203**		1030-1239		Mono	6-90hz	3	12		15mUp, 15P-P	3	60	Lachlan freqs
20		**1204**		1030-1239		Mono	6-90hz	3	12		15mUp, 15P-P	3	60	Lachlan freqs
21	V	**1200**		1030-1239				3	15		15mUp, 15P-P	3	60	Best frequencies range
								3	15			3	60	chosen by Kiwi
								3	15			3	60	
22		**1201**		1030-1239				3	15		15mUp, 15P-P	3	60	
								3	15			3	60	
								3	15			3	60	
23		**1202**		1030-1239				3	15		15mUp, 15P-P	3	60	
								3	15			3	60	
								3	15			3	60	
24		**1203**		1030-1239				3	15		15mUp, 15P-P	3	60	
								3	15			3	60	
								3	15			3	60	
25		**1204**		1030-1239				3	15		15mUp, 15P-P	3	60	
								3	15			3	60	
								3	15			3	60	
26	VI	**1200**		1030-1239				3			No mUp, 15P-P	3	60	Best frequency range &
								3				3	60	best length of sweep
								3				3	60	chosen by Kiwi
27		**1201**		1030-1239				3			No mUp, 15P-P	3	60	
								3				3	60	
								3				3	60	
28		**1202**		1030-1239				3			No mUp, 15P-P	3	60	
								3				3	60	
								3				3	60	
29		**1203**		1030-1239				3			No mUp, 15P-P	3	60	
								3				3	60	
								3				3	60	
30		**1204**		1030-1239				3			No mUp, 15P-P	3	60	
								3				3	60	
								3				3	60	

Recording

The first production profile was recorded on the line on the 8th August 2003 following the three hour testing program.
A total of 197.6 km of data was recorded which consisted of 2,601 production records using the ARAM24 seismic recorder (Figure 4).
Full details of recording parameters used are given in appendix 'I'.
Seismic data were recorded on SEGY format in 3490E magnetic tape and also compact disc. A second 3490E tape was produced in the recording cab for later lodgement with the petroleum branch of PIRSA.
The ARAM24 shooting logs and the observers comments file were downloaded onto floppy disc.
Magnetic tapes were labeled with tape number, file range, VP range and date. Field tape listings are given in appendix D.
Data from the field operations were passed to the ANSIR on-site processing geophysicist on a daily basis for QA/QC.

Figure 4. Recorder on line near station 5600.

Field QC & processing.

ANSIR supplied an on site processing system and geophysicist for the duration of the field program.
A PC based LINUX platform running DISCO/FOCUS seismic processing software was used to QC field tapes and data. This ensured that any problems with data or media were able to be addressed at an early stage.
In addition to being a good tool for QC of the data acquisition and experimental program this also allowed 'field' stacks to be produced as shown in Figure 5.
A set of SEGY shot records on DVD was also produced as a back up dataset using the field processing system.

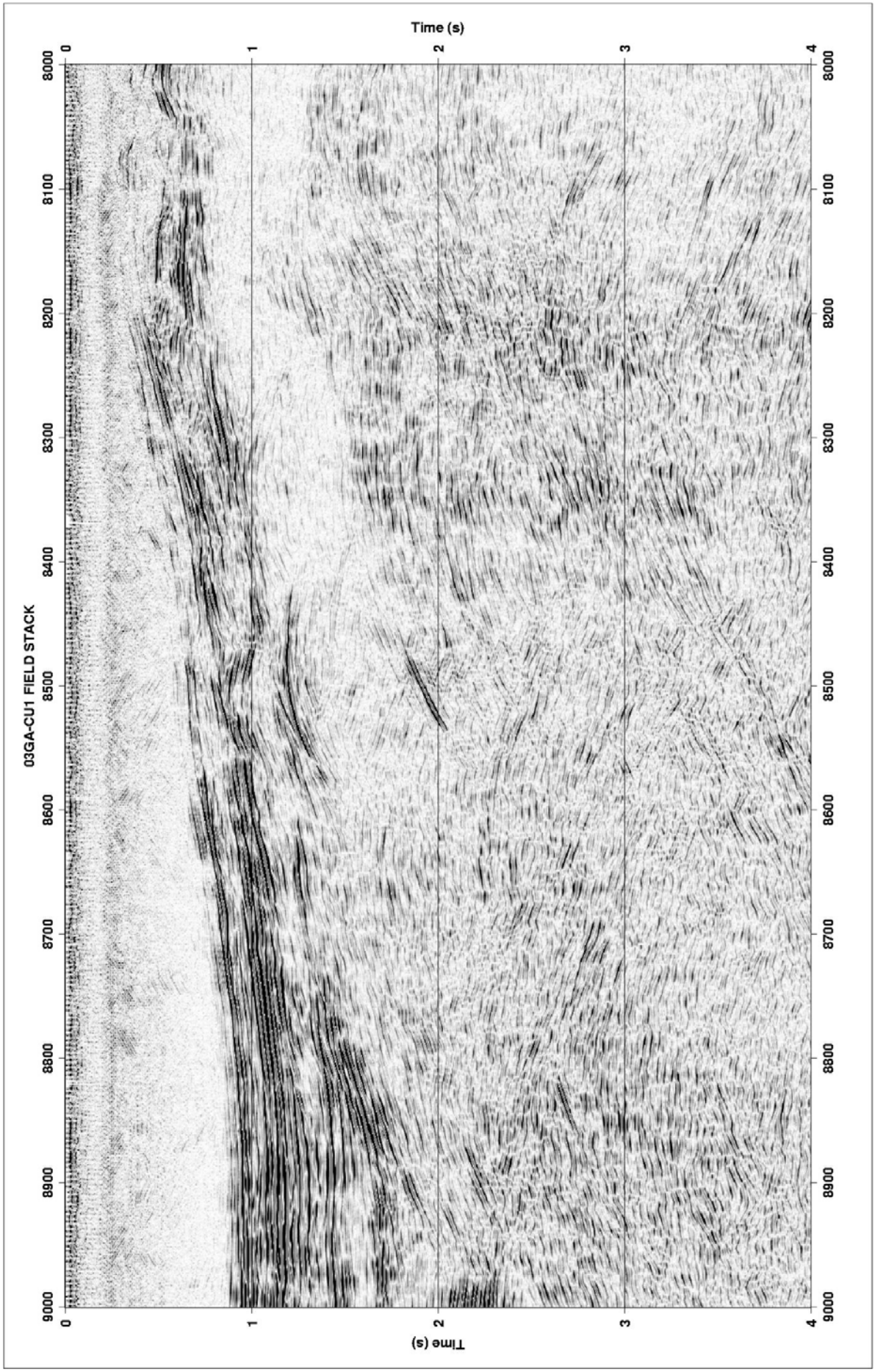


Figure 5. Example of field stack.

APPENDIX "A"

ANSIR project proposal

03-02R

ANSIR AUSTRALIAN NATIONAL SEISMIC IMAGING RESOURCE

APPLICATION FOR USE OF FACILITY EQUIPMENT

1. PROJECT TITLE

Seismic imaging of the Meso-palaeoproterozoic basement architecture, Curnamona region, South Australia: Constraining the basement structure of the Curnamona Province and cratonic nucleus and implications for hydrothermal fluid flow and Pb-Zn and IOCG mineralisation

2. PRINCIPAL INVESTIGATOR

Name: Paul Heithersay
Address: PIRSA Office of Minerals, Energy and Petroleum

3. CO-INVESTIGATORS

Name: Stuart Robertson
Address: PIRSA Office of Minerals, Energy and Petroleum

Name: Bruce Goleby (or other GA seismologist)
Address: GA, Minerals and Geohazards Division

4. SUMMARY OF SCIENTIFIC OBJECTIVES

- Determine the depth, geometry and distribution of the Meso-Proterozoic basement, and unconformably overlying Neoproterozoic, Cambrian, Mesozoic and Tertiary sediments.
- Determine the geometry, extent at depth and crustal significance of major structures.
- Determine which structures controlled the original volcano-sedimentary basin geometry and changes in sedimentary and volcanic facies across the region. This will also involve developing a model that will distinguish on a seismic profile between steep late faults that offset stratigraphy and steep or deformed early faults that controlled stratigraphy.
- Investigate the geometry of known and potential major fluid conduits and determine their role in the development of a) hydrothermal IOCG deposits (eg. Benagerie Ridge, Portia), and b) growth faults controlling potential syngenetic Pb-Zn metal deposition. The principal objective being vectoring to economic mineralisation under areas of barren cover.
- Continue the seismic section westward from the present Broken Hill section, with the view of eventual east-west continuation across the Adelaide Geosyncline and the Gawler Craton.

5. SUMMARY OF EQUIPMENT REQUEST

ARAM24 seismic reflection recording system with 10Hz geophones
4xIVI Vibrators

6. PROPOSED TIMING

April-June, 2004

7. CLASS OF APPLICATION

Preliminary - Funding under Application

8. SCIENTIFIC JUSTIFICATION - 1 page maximum

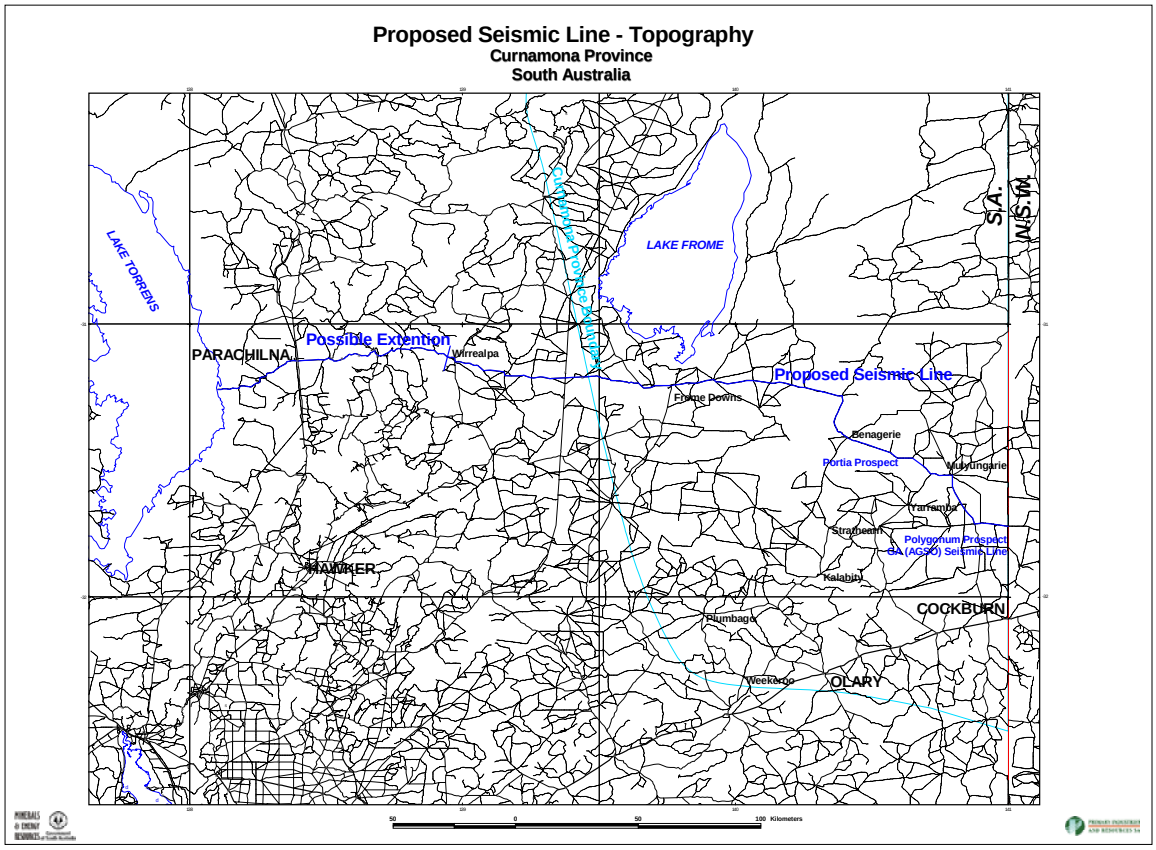
The proposed seismic work is to be carried out within a framework of an ongoing program of seismic data acquisition initially across the Curnamona Province, and eventually southern Australia. The resultant extensive transects across the Curnamona Province and surrounding Neoproterozoic 'Delamerian mobile belts' will enhance the geological and metallogenic framework, and help our understanding of the crustal evolution of southern Australia.

Initially, the program will focus on the prospective Palaeoproterozoic Curnamona Province which contains the Broken Hill lodes and a number of significant IOCG deposits. Both styles of deposit are expected to be controlled to a greater or lesser degree by extensive fracturing. Outcrop is poor, but a combination of surface mapping and geophysical interpretation has allowed solid geology maps to be constructed and a structural history for the area to be interpreted with a moderate degree of success, however repeated reactivation of structures makes interpretation at the surface difficult.

This first deeply penetrating profile will contribute important information about basement architecture, and hopefully basin architecture. Recent geochronology ties the Curnamona Province to Mount Isa Block, which shares the attributes of world class Pb-Zn mineralisation, and lesser but important IOCG mineralisation. It is expected that a full seismic transect across the Curnamona Province will prove of similar value to the traverse across the Eastern and Western Successions. It is intended that the data be used to enhance exploration investment and targeting.

The proposed location of the deep seismic transect(s) are indicated in the attached map. The final locations will be determined after consultation with the local land owners and an analysis of topographical constraints. The final length of line acquired will depend on the final budget.

Map Showing proposed location and possible extension



9. EQUIPMENT REQUEST AND PROPOSED EXPERIMENTAL DESIGN

Equipment required for deep seismic reflection profiling:

ARAM24 seismic reflection recording system
24 bit Delta-Sigma technology
240 active channels
10 Hz geophones

4x IVI 30,000 lb Vibrators

and all necessary equipment to run a deep seismic survey.

A separate proposal may be submitted to undertake passive listening experiments during the collection of the seismic reflection work.

Design:

At this stage it is suggested that the survey will have the following parameters:
40m geophone group interval
40m or 80m Vib interval,
giving a sub-surface coverage of 120 or 60 fold Vibroseis data
18 - 20 s record length
3 or 4 sweeps of approx 8-12 sec sweep length covering the frequency range 8Hz to 110 Hz.
(the latter parameters will be determined during initial field experiment's and constantly monitored for suitability).

10. MINIMUM EQUIPMENT CONFIGURATION
As above.

11. ALTERNATIVE PROJECT DATES & TIMING CONSTRAINTS
Actual timing of survey will be dependent on Access requirements and final funding limitations.

12. NATURE AND SOURCE OF FUNDING
Still being determined - It is anticipated that funding will involve contributions from GA (as part of the BHEI Project), PIRSA and the *pmd**CRC. The local exploration industry will also be approached for possible involvement.

The Institution proposing a project is responsible for the costs of the project, including mobilisation of the equipment and the costs of any ANSIR personnel used in support of the project. The Institution is required to provide a guarantee of Insurance for all equipment used in the project.

13. SIGNATURE OF PRINCIPAL INVESTIGATOR

..... DATE: .....

14. CONFIRMATION OF INSTITUTIONAL SUPPORT AND ACCEPTANCE OF THE STANDARD TERMS FOR ACCESS TO ANSIR EQUIPMENT

.....…... DATE: .....

POSITION HELD:

APPENDIX “B”

Equipment / vehicles

RECORDING EQUIPMENT

Acquisition System:

. Aram 24 Bit Seismic Data Acquisition System
. Pelton Advance 2 Model 6 Encoder Sweep Generator ESG
. One (1) Pelton Advance 2 Model 6 PC Based VIBSIG Real QC System
. Forty Eight (48) Remote Acquisition Modules (384 Channels)
. Forty Eight (48) Telemetry Data Cables (384 Channels), with 8 take-outs per cable
. Four Hundred (400) Geophone Strings. OYO GS-32CT (12 per group)
. Sensor SMT-200 Geophone Tester and QC System

Source equipment

. Four (4) IVI Hemi 60 Vibrators, 60,000lb peak force
. Four (4) Pelton Advance 2 Model 6 VCE’s
. Vibrators are equipped with Force Control and Ground Force Phase Lock

VEHICLES

Jul-04

CLIENT **PIRSA**

VEHICLE	REGISTRATION	RENTAL	TERREX	GOVERNMENT		01-Jul-04	02-Jul-04	03-Jul-04	04-Jul-04	05-Jul-04	06-Jul-04	07-Jul-04	08-Jul-04	09-Jul-04	10-Jul-04	11-Jul-04	12-Jul-04	13-Jul-04	14-Jul-04	Days on Crew
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	
100 Series Landcruiser Wagon	TBJM-13	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
Dual Cab Turbo Hilux	TBJM-15	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Troop Carrier	587-GCT	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Trayback (Cable)	1BGN-212		Yes			1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Trayback (Cable)	1BGO-007		Yes			1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Trayback (Geophone)	TBJM-16	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Trayback	TBJM-28	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Trayback	TBJM-12	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
Landcruiser Trayback	TBJM-44	Yes				1	1	1	1	1	1	1	1	1	1	1	1	1		13
																				0
LIGHT VEHICLE LIST					**Actual Numbers**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**0**	**117**
					Contract Numbers	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
					Additional Numbers	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Brolga Birdwagon Vibe				Yes		1	1	1	1	1	1	1	1	1	1	1	1			
Ibis Birdwagon Vibe				Yes		1	1	1	1	1	1	1	1	1	1	1	1			
Curlew Birdwagon Vibe				Yes		1	1	1	1	1	1	1	1	1	1	1	1			
Jabiru Birdwagon Vibe				Yes		1	1	1	1	1	1	1	1	1	1	1	1			
Sandpiper Minivibe				Yes																
Isuzu Recorder				Yes		1	1	1	1	1	1	1	1	1	1	1	1	1		
Isuzu Service Truck						1	1	1	1	1	1	1	1	1	1	1	1	1		
Paystar Flatdeck																				
HEAVY VEHICLE LIST					**Actual Numbers**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**2**	**0**	**74**
					Contract Numbers	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
					Total Vehicle Numbers	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**11**	**0**	**191**

TOTAL FUEL USAGE - APPROXIMATELY 7000 li.

APPENDIX "C"

Occupational health and safety standards

Company requirements for Trace/Terrex crew.

- Crew startup induction / safety meeting
- Sunday crew safety meeting
- Long sleeve shirts and covered footwear must be worn by field crew at all times
- Sunscreen
- Reflective vests for all recording personnel working along roads
- Satellite phone in recorder
- Functional UHF radio fitted in all line vehicles
- Random drug and alcohol tests
- Vehicles fitted with first aid kits
- Line vehicles fitted with flashing beacons
- Road signs
- Gloves to protect hands

Figure 6. Line crew packing gear at Curnamona station.

APPENDIX "D"

Tape listing

3490 Field tapes, SEGY, 2 ms sampling rate, 18 seconds record length

TAPE #	LINE	START DATE	FFID 1	CHAN 1	FFID n	ACTIVE CHAN n	AUX TRACES	DATA TRACES	TOTAL TRACES	VP 1	VP n
L16403001	03GA-CU1	8/08/03	1	1	30	210	60	7200	7260	1200	1204
L16403002	03GA-CU1	9/08/03	31	1	136	240	210	25385	25595	1000	1184
L16403003	03GA-CU1	9/08/03	136	1	241	240	210	25336	25546	1186	1396
L16403004	03GA-CU1	9/08/03	241	1	321	240	160	19424	19584	1398	1556
L16403005	03GA-CU1	10/08/03	321	1	376	240	112	13440	13552	1558	1668
L16403006	03GA-CU1	10/08/03	427	1	526	240	200	24000	24200	1770	1970
L16403007	03GA-CU1	1/09/03	377	1	426	240	100	12000	12100	1670	1768
L16404008	03GA-CU1	3/07/04	527	1	609	240	166	19920	20086	1972	2136
L16404009	03GA-CU1	3/07/04	610	1	691	240	164	19680	19844	2138	2300
L16404010	03GA-CU1	3/07/04	692	1	774	240	166	19920	20086	2302	2464
L16404011	03GA-CU1	4/07/04	775	1	856	240	164	19680	19844	2466	2628
L16404012	03GA-CU1	4/07/04	857	1	938	240	164	19680	19844	2630	2779
L16404013	03GA-CU1	4/07/04	939	1	1020	240	164	19680	19844	2780	2861
L16404014	03GA-CU1	5/07/04	1021	1	1102	240	164	19680	19844	2862	2943
L16404015	03GA-CU1	5/07/04	1103	1	1182	240	160	19200	19360	2944	3102
L16404016	03GA-CU1	6/07/04	1183	1	1264	240	164	19680	19844	3104	3266
L16404017	03GA-CU1	6/07/04	1265	1	1346	240	164	19680	19844	3268	3426
L16404018	03GA-CU1	6/07/04	1347	1	1428	240	164	19680	19844	3428	3590
L16404019	03GA-CU1	7/07/04	1429	1	1510	240	164	19680	19844	3592	3754
L16404020	03GA-CU1	7/07/04	1511	1	1592	240	164	19680	19844	3756	3918
L16404021	03GA-CU1	8/07/04	1593	1	1674	240	164	19680	19844	3920	4082
L16404022	03GA-CU1	8/07/04	1675	1	1756	240	164	19680	19844	4084	4246
L16404023	03GA-CU1	8/07/04	1757	1	1838	240	164	19680	19844	4248	4410
L16404024	03GA-CU1	8/07/04	1839	1	1882	240	88	10560	10648	4412	4498
L16404025	03GA-CU1	9/07/04	1883	1	1964	240	164	19680	19844	4500	4662
L16404026	03GA-CU1	9/07/04	1965	1	2046	240	164	19680	19844	4664	4826
L16404027	03GA-CU1	9/07/04	2047	1	2128	240	164	19680	19844	4828	4990
L16404028	03GA-CU1	10/07/04	2129	1	2210	240	164	19680	19844	4992	5154
L16404029	03GA-CU1	10/07/04	2211	1	2292	240	164	19680	19844	5156	5265
L16404030	03GA-CU1	10/07/04	2293	1	2374	240	164	19680	19844	5266	5396
L16404031	03GA-CU1	10/07/04	2375	1	2456	240	164	19680	19844	5398	5560
L16404032	03GA-CU1	11/07/04	2457	1	2538	240	164	19680	19844	5562	5724
L16404033	03GA-CU1	11/07/04	2539	1	2620	240	164	19680	19844	5726	5888
L16404034	03GA-CU1	11/07/04	2621	1	2646	240	52	6240	6292	5890	5940

3490E ARAM24 SEG-Y field tapes - master copy

3490 Field tape copies, SEGY, 2 ms sampling rate, 18 seconds record length

TAPE #	LINE	START DATE	FFID 1	CHAN 1	FFID n	ACTIVE CHAN n	AUX TRACES	DATA TRACES	TOTAL TRACES	VP 1	VP n
L16404008copy	03GA-CU1	3/07/04	527	1	609	240	166	19920	20086	1972	2136
L16404009copy	03GA-CU1	3/07/04	610	1	691	240	164	19680	19844	2138	2300
L16404010copy	03GA-CU1	3/07/04	692	1	774	242	166	19920	20086	2302	2464
L16404011copy	03GA-CU1	4/07/04	775	1	856	242	164	19680	19844	2466	2628
L16404012copy	03GA-CU1	4/07/04	857	1	938	242	164	19680	19844	2630	2779
L16404013copy	03GA-CU1	5/07/04	939	1	1020	242	164	19680	19844	2780	2861
L16404014copy	03GA-CU1	5/07/04	1021	1	1102	242	164	19680	19844	2862	2943
L16404015copy	03GA-CU1	5/07/04	1103	1	1182	240	160	19200	19360	2944	3102
L16404016copy	03GA-CU1	6/07/04	1183	1	1264	240	164	19680	19844	3104	3266
L16404017copy	03GA-CU1	6/07/04	1265	1	1346	240	164	19680	19844	3268	3426
L16404018copy	03GA-CU1	6/07/04	1347	1	1428	240	164	19680	19844	3428	3590
L16404019copy	03GA-CU1	7/07/04	1429	1	1510	240	164	19680	19844	3592	3754
L16404020copy	03GA-CU1	7/07/04	1511	1	1592	240	164	19680	19844	3756	3918
L16404021copy	03GA-CU1	8/07/04	1593	1	1674	240	164	19680	19844	3920	4082
L16404022copy	03GA-CU1	8/07/04	1675	1	1756	240	164	19680	19844	4084	4246
L16404023copy	03GA-CU1	8/07/04	1757	1	1838	240	164	19680	19844	4248	4410
L16404024copy	03GA-CU1	8/07/04	1839	1	1882	240	88	10560	10648	4412	4498
L16404025copy	03GA-CU1	9/07/04	1883	1	1964	240	164	19680	19844	4500	4662
L16404026copy	03GA-CU1	9/07/04	1965	1	2046	240	164	19680	19844	4664	4826
L16404027copy	03GA-CU1	9/07/04	2047	1	2128	240	164	19680	19844	4828	4990
L16404028copy	03GA-CU1	10/07/04	2129	1	2210	242	164	19680	19844	4992	5154
L16404029copy	03GA-CU1	10/07/04	2211	1	2292	242	164	19680	19844	5156	5265
L16404030copy	03GA-CU1	10/07/04	2293	1	2374	242	164	19680	19844	5266	5396
L16404031copy	03GA-CU1	10/07/04	2375	1	2456	242	164	19680	19844	5398	5560
L16404032copy	03GA-CU1	12/07/04	2457	1	2538	242	164	19680	19844	5562	5724
L16404033copy	03GA-CU1	13/07/04	2539	1	2620	242	164	19680	19844	5726	5888
L16404034copy	03GA-CU1	14/07/04	2621	1	2646	242	52	6240	6292	5889	5940

3490E ARAM24 SEG-Y field tapes - copy

CD Field tapes, SEGY, 2 ms sampling rate, 18 seconds record length

TAPE #	LINE	START DATE	FFID 1	CHAN 1	FFID n	ACTIVE CHAN n	AUX TRACES	DATA TRACES	TOTAL TRACES	VP 1	VP n
CD16403001	03GA-CU1	8/08/03	1	1	30	210	60	7200	7260	1200	1204
CD16403002	03GA-CU1	9/08/03	31	1	110	240	160	19200	19360	1000	1014
CD16403003	03GA-CU1	9/08/03	111	1	190	240	160	19200	19360	1016	1176
CD16403004	03GA-CU1	9/08/03	191	1	270	240	160	19200	19360	1178	1456
CD16403005	03GA-CU1	9/08/03	271	1	302	240	64	7680	7744	1458	1520
CD16403006	03GA-CU1	10/08/03	303	1	354	240	104	12480	12584	1522	1624
CD16403007	03GA-CU1	10/08/03	345	1	425	240	162	19440	19602	1606	1766
CD16403008	03GA-CU1	10/08/03	426	1	435	240	20	2400	2420	1768	1786
CD16403009	03GA-CU1	12/08/03	436	1	517	240	164	19680	19844	1788	1952
CD16403010	03GA-CU1	15/08/03	518	1	526	240	18	2160	2178	1954	1970
CD16404008	03GA-CU1	3/07/04	527	1	609	240	166	19920	20086	1972	2136
CD16404009	03GA-CU1	3/07/04	610	1	691	240	164	19680	19844	2138	2300
CD16404010	03GA-CU1	4/07/04	692	1	774	240	166	19920	20086	2302	2464
CD16404011	03GA-CU1	4/07/04	775	1	856	240	164	19680	19844	2466	2628
CD16404012	03GA-CU1	4/07/04	857	1	938	240	164	19680	19844	2630	2779
CD16404013	03GA-CU1	5/07/04	939	1	1020	240	164	19680	19844	2780	2861
CD16404014	03GA-CU1	5/07/04	1021	1	1102	240	164	19680	19844	2862	2943
CD16404015	03GA-CU1	5/07/04	1103	1	1182	240	160	19200	19360	2944	3102
CD16404016	03GA-CU1	6/07/04	1183	1	1264	240	164	19680	19844	3104	3266
CD16404017	03GA-CU1	6/07/04	1265	1	1346	240	164	19680	19844	3268	3426
CD16404018	03GA-CU1	6/07/04	1347	1	1428	240	164	19680	19844	3428	3590
CD16404019	03GA-CU1	7/07/04	1429	1	1510	240	164	19680	19844	3592	3754
CD16404020	03GA-CU1	7/07/04	1511	1	1592	240	164	19680	19844	3756	3918
CD16404021	03GA-CU1	7/07/04	1593	1	1674	240	164	19680	19844	3920	4082
CD16404022	03GA-CU1	8/07/04	1675	1	1756	240	164	19680	19844	4084	4246
CD16404023	03GA-CU1	8/07/04	1757	1	1838	240	164	19680	19844	4248	4410
CD16404024	03GA-CU1	8/07/04	1839	1	1882	240	88	10560	10648	4412	4498
CD16404025	03GA-CU1	9/07/04	1883	1	1964	240	164	19680	19844	4500	4662
CD16404026	03GA-CU1	9/07/04	1965	1	2046	240	164	19680	19844	4664	4826
CD16404027	03GA-CU1	9/07/04	2047	1	2128	240	164	19680	19844	4828	4990
CD16404028	03GA-CU1	10/07/04	2129	1	2210	240	164	19680	19844	4992	5154
CD16404029	03GA-CU1	10/07/04	2211	1	2292	240	164	19680	19844	5156	5265
CD16404030	03GA-CU1	10/07/04	2293	1	2374	240	164	19680	19844	5266	5396
CD16404031	03GA-CU1	10/07/04	2375	1	2456	240	164	19680	19844	5398	5560
CD16404032	03GA-CU1	11/07/04	2457	1	2538	240	164	19680	19844	5562	5724
CD16404033	03GA-CU1	11/07/04	2539	1	2620	240	164	19680	19844	5726	5888
CD16404034	03GA-CU1	11/07/04	2621	1	2646	240	52	6240	6292	5890	5940

CD-RW ARAM24 SEG-Y field records

Note: data is recorded in ‘little endian’ format and requires byte swapping prior to use for data processing. EBCDIC header not useable.

DVD Field processing tapes, SEGY, 2 ms sampling rate, 18 seconds record length

DVD #	LINE	START DATE	FILE NAME	FFID 1	CHAN 1	FFID n	ACTIVE CHAN n	AUX TRACES	DATA TRACES	TOTAL TRACES	VP 1 (from .mlf)
DVD16404001	03GA-CU1	3/07/04	L16404008.sgy	527	1	609	242	166	19920	20086	1972
	03GA-CU1	3/07/04	L16404009.sgy	610	1	691	242	164	19680	19844	2138
	03GA-CU1	3/07/04	L16404010.sgy	692	1	774	242	166	19920	20086	2302
	03GA-CU1	4/07/04	L16404011.sgy	775	1	856	242	164	19680	19844	2466
	03GA-CU1	4/07/04	L16404012.sgy	857	1	938	242	164	19680	19844	2630
	03GA-CU1	5/07/04	L16404013.sgy	939	1	1020	240	164	19680	19844	2780
DVD16404002	03GA-CU1	5/07/04	L16404014.sgy	1021	1	1102	240	164	19680	19844	2862
	03GA-CU1	5/07/04	L16404015.sgy	1103	1	1182	240	160	19200	19360	2944
	03GA-CU1	6/07/04	L16404016.sgy	1183	1	1264	240	164	19680	19844	3104
	03GA-CU1	6/07/04	L16404017.sgy	1265	1	1346	240	164	19680	19844	3268
	03GA-CU1	7/07/04	L16404018.sgy	1347	1	1428	240	164	19680	19844	3428
	03GA-CU1	7/07/04	L16404019.sgy	1429	1	1510	240	164	19680	19844	3592
DVD16404003	03GA-CU1	7/07/04	L16404020.sgy	1511	1	1592	240	164	19680	19844	3756
	03GA-CU1	8/07/04	L16404021.sgy	1593	1	1674	240	164	19680	19844	3920
	03GA-CU1	8/07/04	L16404022.sgy	1675	1	1756	240	164	19680	19844	4084
	03GA-CU1	8/07/04	L16404023.sgy	1757	1	1838	240	164	19680	19844	4248
	03GA-CU1	8/07/04	L16404024.sgy	1839	1	1882	240	88	10560	10648	4412
	03GA-CU1	9/07/04	L16404025.sgy	1883	1	1964	240	164	19680	19844	4500
	03GA-CU1	9/07/04	L16404026.sgy	1965	1	2046	240	164	19680	19844	4664
DVD16404004	03GA-CU1	9/07/04	L16404027.sgy	2047	1	2128	240	164	19680	19844	4828
	03GA-CU1	9/07/04	L16404028.sgy	2129	1	2210	240	164	19680	19844	4992
	03GA-CU1	10/07/04	L16404029.sgy	2211	1	2292	240	164	19680	19844	5156
	03GA-CU1	10/07/04	L16404030.sgy	2293	1	2374	240	164	19680	19844	5267
	03GA-CU1	10/07/04	L16404031.sgy	2375	1	2456	240	164	19680	19844	5398
	03GA-CU1	11/07/04	L16404032.sgy	2457	1	2538	240	164	19680	19844	5562
DVD16404005	03GA-CU1	11/07/04	L16404033.sgy	2539	1	2620	240	164	19680	19844	5726
	03GA-CU1	11/07/04	L16404034.sgy	2621	1	2646	240	52	6240	6292	5890

DVD 32 bit IBM floating point standard SEG-Y shot records

Exabyte Field tapes, SEGY, 2 ms sampling rate, 18 seconds record length

TAPE #	LINE	START DATE	FFID 1	CHAN 1	FFID n	ACTIVE CHAN n	AUX TRACES	DATA TRACES	TOTAL TRACES	VP 1	VP n
E16403001	03GA-CU1	8/08/03	1	1	30	210	60	6300	6360	1200	1204
E16403002	03GA-CU1	10/08/03	1	1	435	240	870	103500	104370	1000	1786
E16403003	03GA-CU1	15/08/03	427	1	526	240	200	24000	24200	1770	1970

Exabyte ARAM24 SEG-Y field tapes.

APPENDIX "E"

Emergency telephone numbers

Trace Energy Services			***Ph.***	***08 9434 4388***
U2 / 37 Howson Way			***Fx.***	***08 9434 5211***
Bibra Lake W.A				
.				
Andy Brett	***Operations Manager***		***Mb.***	***0422 375 497***
Bob Stephenson	***Crew Manager***		***Mb.***	***0427 741 425***
John Philippson	***Mechanic***		***Mb.***	***0409 150 914***
Shane Goossens	***Lead Opp***		***Mb.***	***0438 100 329***
Noel Grainger	***Cable Tech.***		***Mb.***	***0417 440 340***
Leeton McHugh	***Line Boss***		***Mb.***	***0422 232 319***
Recorder		***Sat Ph.***		***0145 111 350***
UHF Radio	***Channel 14 in all Vehicles Fitted with radios***			
D.S.S.	***Lynne Baker***	***Sat Ph***		***0145 111527***
David Johnstone	***ANSIR***		***Mb.***	***0427 600 263***
Andrew Shearer	***PIRSA***		***Ph***	***08 8463 3045***
Honeymoon Mine	***Dean Roberts***		***Mob***	***0427 073 957***
Curnamona Station	***Jeff & Lynette Pumpa***		***Ph***	***08 8648 4850***

HOSPITAL

Broken Hill Base Hospital	***Ph.***	***08 8080 1333***

AMBULANCE

Broken Hill Ambulance	***Ph.***	***131211***
Emergency	***Ph***	***000***

POLICE

Cockburn Police	***Ph.***	***000***
Broken Hill	***Ph***	***08 8087 0299***
Epic Energy (Gas pipeline)	***Ph***	***1800 625655***

APPENDIX "F"

Safety and toolbox meetings

SAFETY MEETING
Date: 4 July
Location: Curnamona
Crew: 402
Conducted by: Leeton McHugh
Attended by: John Turner, Darren Rae, Frank Whitehead, Shane Goosens, John Richardson, Brad Richardson, Adam Toth, Ray Auckram, Shaun Stafford, Mick Hallam, Warren Campbell, Nick Helme, Tom Hedditch, Des Postans, Abby Bann, , Lionel Dabe, Quenton Mower, Tammy Pohatu, Emma Burton, Garry Stewart,
Meeting opened @ 6.30am
Meeting closed @ 7.00am

ACTION POINTS PREVIOUS MEETING
1. The purchase of 4 new Water Containers (20litres) ***PURCHASED***
2. Step for cable truck ***NOT DONE***
3. New supplies for First Aid Kits(enough for 9 vehicles) ***PURCHASED***
4. Changing troop carriers from side saddle seats to forward facing seats (RV) ***NOT DONE***

TOPICS DISCUSSED

- Emergency Response Procedure. This procedure was discussed in depth going through the seven steps when dealing with an emergency situation. Types of emergencies were an unconscious person, flesh wound, broken limb, snake bite, fire.

The seven steps were as follows

1. Call on radio "EMERGENCY EMERGENCY EMERGENCY"
2. State who you are
3. What is the type of emergency
4. State your exact location
5. Field transportation arranged
6. Local emergency services notified
7. Stay calm while you wait for assistance

- Support telephone numbers list requested for personnel
- Compound muster point was located
- The location of fire extinguishers and alarms in the compound was verified.
-

ACTION POINTS
1 Smoke alarms for Curnamona shearing quarters ***PURCHASED 7-6-2004***
2 Step for cable truck
3 Collapsible stretcher
4 Changing troop carriers from side saddle seats to forward facing seats (RV)
5 Emergency response stickers for vehicles
6 First aid procedure cards

SAFETY MEETING

Date: 12 July
Location: Curnamona
Crew: 402
Conducted by: Jon Turner
Attended by: Jon Turner, Darren Rae, Frank Whitehead, Shane Goosens, John Richardson, Brad Richardson, Adam Toth, Ray Auckram, Shaun Stafford, Mick Hallam, Warren Campbell ,Tom Hedditch, Des Postans, Quentin Mower, June Brummell, Liz Goold, Peter O'Donnell, Doug Crispe, Brendon Bell, Liam Shuttleworth, Garry Stewart, Shane McKiernan, Sean Purcell, Dave Johnstone, Tanya Fomin
Meeting opened @ 6.30am
Meeting closed @ 7.00am

ACTION POINTS PREVIOUS MEETING
5. Step for cable truck ***NOT DONE***
6. Changing troop carriers from side saddle seats to forward facing seats (RV) ***NOT DONE***
7. Collapsible stretcher ***NOT DONE***
8. Emergency response stickers for vehicles ***NOT DONE***
9. First aid procedure cards ***NOT DONE***

TOPICS DISCUSSED

- **Map Reading was discussed with the crew and the importance of understanding where you are on the line.**
- **Vehicle checks to be done before travelling long distances.**
- **Correct spacing between vehicles when travelling on the highway.**
- **Make sure that your vehicle is fuelled and has correct tyre pressures at all times, this is a problem that has contributed to vehicle rollovers in the past.**

ACTION POINTS
1. Step for cable truck
2. Changing troop carriers to forward facing seats
3. Collapsible stretcher
4. Emergency response stickers for vehicles
5. First aid procedure cards

TOOLBOX MEETING MINUTES

Date: 2 July 2004
Client: AGSO
Prospect: Broken Hill
Time: 7.30 - 7.45am
Minutes:

Meeting opened by **Jon Turner**. John thanked the crew for an efficient pick up and moves yesterday. He discussed the plan for today starting with an equipment count from the shipping container situated at the yard in Pinnacles Rd South of town.
The crew would then have 1 hour to purchase their personals before picking up the vehicles which had been serviced at Trood's Auto Centre.
Leeton will take 2 cable trucks and the jug ute to the supermarket for the food order pick up and then carry on to Honeymoon Mine to lay 120 stations of spread.

TOOLBOX MEETING MINUTES

Date: 3 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Jon Turner.** Jon thanked those people for laying the 120 stations of spread on the new line and explained how long the crew would be working form the Honeymoon camp before moving to Curnamona Station on Wednesday the 7th of July.

Leeton McHugh announced the job changes for the following week and reminded the line crew of large amounts of dust that will be kicked up by vehicles, gate that must be shut, 40 meter stations will have different geophone spacing.
I reminded everyone to do their daily vehicle checks.

Nick asked for people to have respect for others privacy and to keep noise levels down as others may be trying to sleep.

TOOLBOX MEETING MINUTES

Date: 5 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Leeton McHugh**. I asked the front crew if they needed first aid supplies and a fire extinguisher and their answer was yes. I told them this would be supplied.
It was agreed that all line crew should be aware of any medical condition their co-workers may have which could be to the detriment of that persons health if you were called upon to administer first aid.
I explained to those people running cable trucks that when making a cable crossing they must shift a set of phone in order to make a station live, they cannot leave it without doing this. Cable is also

not to be thrown on top of tall trees as this makes it difficult for the pick up crew to efficiently load their vehicle.
Local owners of motorbikes and vehicles are using our designated access roads so we must maintain our set speed limits and be conscious of their presence.

TOOLBOX MEETING MINUTES

Date: 7 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Leeton McHugh**. I reminded the crew to complete vehicle checks before starting engines and to walk around their vehicles looking for faults that will need to be reported. I explained that urinating in the field must be done in a discrete manner and at least 20 meters away from the line.
Also to remember to clean windows and windscreens as dirt will impair your vision and mirrors should also be adjusted for each different driver.
No one will ever ride on the outside of the door of a vehicle. This is illegal and extremely dangerous. A warning will be given to any person seen doing this.

Nick mentioned that the back left tail light was faulty in the jug ute

Tom mentioned that the right front park light was faulty.

Sean mentioned that the passenger seat in the Hilux is locked up and cannot be freed.

John Turner explained to the crew that we would be moving camp Wednesday so everyone would have to pack their bags and take bedding with them. He also mentioned that Darren would be bringing in the food order Tuesday night.

TOOLBOX MEETING MINUTES

Date: 8 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Tony Hutchison**. Tony informed the crew that he would be taking over the position of Line Boss while Leeton Mchugh was away for two weeks. Tony allocated jobs to the crew for the next week and reminded them that if their work was not of a good standard that they would be replaced and shifted to the back crew. Tony emphasized the importance of safety and care when driving because of the dusty conditions that the crew is working in.

Jon Turner emphasized the importance of map reading skills when operating a vehicle and that if the driver couldn't read the maps provided correctly to let another crew member drive. Jon explained to the crew the implications and possible dangers involved when a vehicle is lost and a search is started.

TOOLBOX MEETING MINUTES

Date: 9 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Tony Hutchison**. Tony asked the crew to avoid driving through the sections of bull dust where possible and to slow down when traveling past other members of the line crew. Tony also instructed the crew to make sure that all gates on line were to be left in the same way they were found to avoid problems with stock.

TOOLBOX MEETING MINUTES

Date: 10 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Tony Hutchison**. Tony asked the cable drivers to move their box drops as far forward of the station as possible to avoid having to drag cable and phones when a shorter cable is laid. Tony also asked that when the crew are collecting geophones from the line that they take extra care and to slow down so as not to tangle the leads, this will aid in the more efficient laying of the spread.

TOOLBOX MEETING MINUTES

Date: 11 July 2004
Client: AGSO
Prospect: Curnamona
Time: 6.30 - 6.45am
Minutes:

Meeting opened by **Jon Turner**. Jon informed the crew of their schedule for the coming week and asked that they be prepared for camp move the following day. He also thanked the line crew for an efficient and trouble free job thus far.

Tony Hutchison reminded the crew that too many errors in key positions would result in that person being removed from their job and put on back crew. He also emphasized that he had faith in the crew and expected each person to be performing their duties to a high standard.

Nick Helme reminded the crew of the dusty conditions and asked that each vehicle drive with their headlights on at all times.

APPENDIX "G"

Crew list

CREW LIST – 2003 Curnamona Survey

	Name	Position	Company
1	R. Stephenson	Crew Manager	Trace Energy Services
2	R Gregg	Safety Officer	"
3	M Bokor	Observer / Technician	"
4	P O'Donnell	Observer	"
5	J. Philippson	VibeMechanic	"
6	N Grainger	Cable / Phone Repair	"
7	S Goossens	Vibrator Operator	"
8	A Bann	Vibrator Operator	"
9	S Beneke	Vibrator Operator	"
10	A Pippos	Vibrator Operator	"
11	D Postans	Vibrator Operator	"
12	L McHugh	Line Boss	"
13	R Auckram	Line Crew	"
14	T Ernst	Line Crew	"
15	L Goold	Line Crew	"
16	J Goossens	Line Crew	"
17	J Keane	Line Crew	"
18	S Toll	Line Crew	"
19	D Hildred	Line Crew	"
20	T Hutchison	Line Crew	"
21	M Bann	Line Crew	"
22	J Pope	Line Crew	"
23	D W Johnstone	Geophysicist	ANSIR
24	A Shearer	Geophysicist	PIRSA
25	L Baker	Surveyor	DSS
26	A Gibb	Surveyor	"
27	M Lefebvre	Surveyor	"

CREW LIST – 2004 Curnamona Survey

1	A Shearer	Geophysicist	PIRSA
2	T Fomin	"	ANSIR
3	D Johnstone	"	"
4	J Turner	Crew manager	Terrex Seismic
5	S McKiernan	Cook	Contract
6	F Whitehead	Observer	Terrex Seismic
7	P O'Donnell	"	"
8	D Rea	Cable repair	"
9	A Bann	Lead Vib op	"
10	D Postans	Vib op	"
11	R Aukram	"	"
12	A Toth	"	"
13	D Crisp	"	"
14	S Purcell	"	"
15	S Goosens	Vib tech	"
16	L McHugh	Line boss	"
17	T Hutchison	"	"
18.	L Dabe	Line crew	"
19	E Burton	"	"
20	T Hutchison	"	"
21	T Pohatu	"	"
22	S Stafford	"	"
23	T Hedditch	"	"
24	J Richardson	"	"
25	B Richardson	"	"
26	W Campbell	"	"
27	M Hallam	"	"
28	L Shuttleworth	"	"
29	E Gould	"	"
30	J Brummell	"	"
31	N Helme	"	"
32	G Stewart	"	"
33	S Purcell	"	"
34	Q Mower	"	"
35	B Bell	"	"
36	C Davey	Surveyor	DSS
37	F Tangney	"	DSS

APPENDIX “H”

Recording parameter sheets

ANSIR AUSTRALIAN NATIONAL SEISMIC IMAGING RESOURCE

2003
03GA-CU1

RECORDING PARAMETER SHEET

Client:	pmd*CRC / PIRSA	Line:	03GA-CU1 (2003)
Crew:	Trace Energy Services 401	Prospect Area:	Curnamona SA
Survey:	Curnamona Seismic Survey	Date Recorded:	8/08/2003 to 12/8/2003
Instrument:	ARAM24 NT (Ver 1.309)	Direction of Rec:	East to West

Recording parameters

Traces per File	242
Record Length	18 sec
Sample Rate:	2 msec
Tape Format	SEG-Y
Shot Points	1000 to 1970
Rec To Rec	1000 to 2089
Files	1 to 526

Sweep Frequency

Swp 1	7 to 56 Hz
Swp 2	12 to 80 Hz
Swp 3	8 to 72 Hz
Swp 4	
Swp 5	
Swp 6	
Swp 7	
Swp 8	

Receiver Parameters

Station Interval	40 m
Geophone Array Length	40 m
Geophone Array Centre	Mid Station .5
Geophone Type	OYO GS32CT
Geophones Per String	12
Strings Per Station	1
Connection	Series/Parallel
Spread Geometry	Symmetrical
# of Station Gap at SP	0

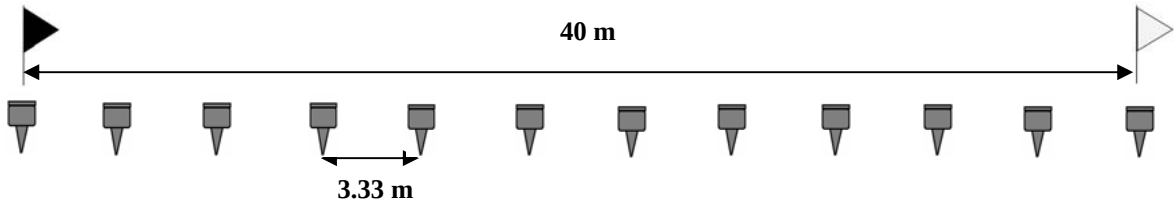
Source Parameters

No. of Sources On-Line	3
No. of Sweeps per VP	3
Sweep Length:	12 sec
Sweep Type	Linear
Sweep Type Mono / Vari	Vari
VP Interval	80 m
Source Array Length	60 m
Vibe Spacing Pad to Pad	15 m
Vibe Move Up	15 m
VP Source Centre	On Station
Vibe Electronics	Pelton Adv II Model 6
Vibrator QC	Vibra Sig
Force Control	Peak and Trough
Phase Lock	Ground Force
High Force Output	90%
Pelton Rev. Level	6E

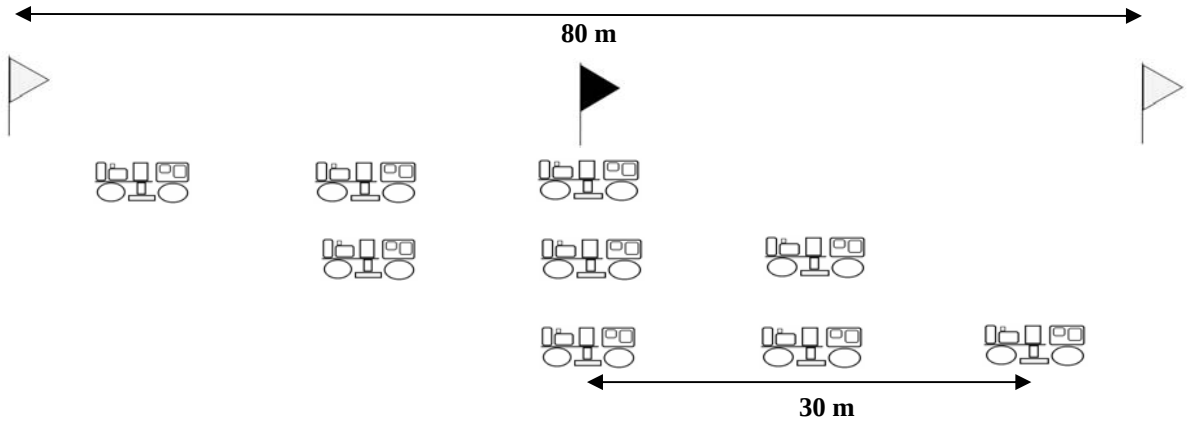
Auxiliary Traces

Time Break	241
True Reference	242

Receiver Array: 12 Phones over 40m 3.33m between Phones Centred between pegs



Source Array: 3 vibes Over 60m 15m pad to pad centred on VP 15m moveups



ANSIR AUSTRALIAN NATIONAL SEISMIC IMAGING RESOURCE

2004
03GA-CU1

RECORDING PARAMETER SHEET

Client:	pmd*CRC / PIRSA	Line:	03GA-CU1 (2004)
Crew:	Terrex Seismic 402	Prospect Area:	Curnamona SA
Survey:	Curnamona Seismic Survey	Date Recorded:	3/07/2004 to 11/07/2004
Instrument:	ARAM24 NT (Ver 2.405)	Direction of Rec:	East to West

Recording parameters

Traces per File	242
Record Length	18 sec
Sample Rate:	2 msec
Tape Format	SEG-Y
Shot Points	1972 to 5940
Rec To Rec	1852 to 5940
Files	527 to 2646

Sweep Frequency

Swp 1	7 to 56 Hz
Swp 2	12 to 80 Hz
Swp 3	8 to 72 Hz
Swp 4	
Swp 5	
Swp 6	
Swp 7	
Swp 8	

Receiver Parameters

Station Interval	40 m
Geophone Array Length	40 m
Geophone Array Centre	Mid Station .5
Geophone Type	OYO GS32CT
Geophones Per String	12
Strings Per Station	1
Connection	Series/Parallel
Spread Geometry	Symmetrical
# of Station Gap at SP	0

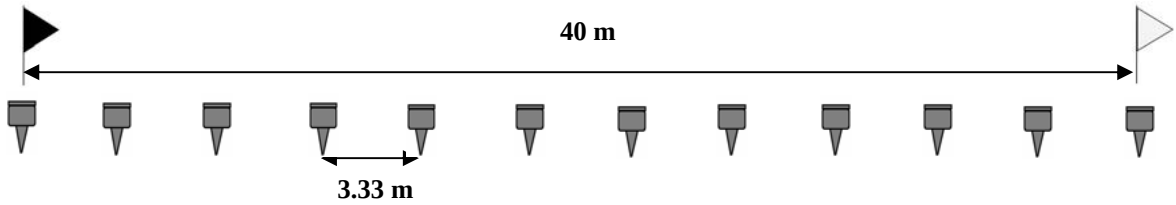
Auxiliary Traces

Time Break	241
True Reference	242

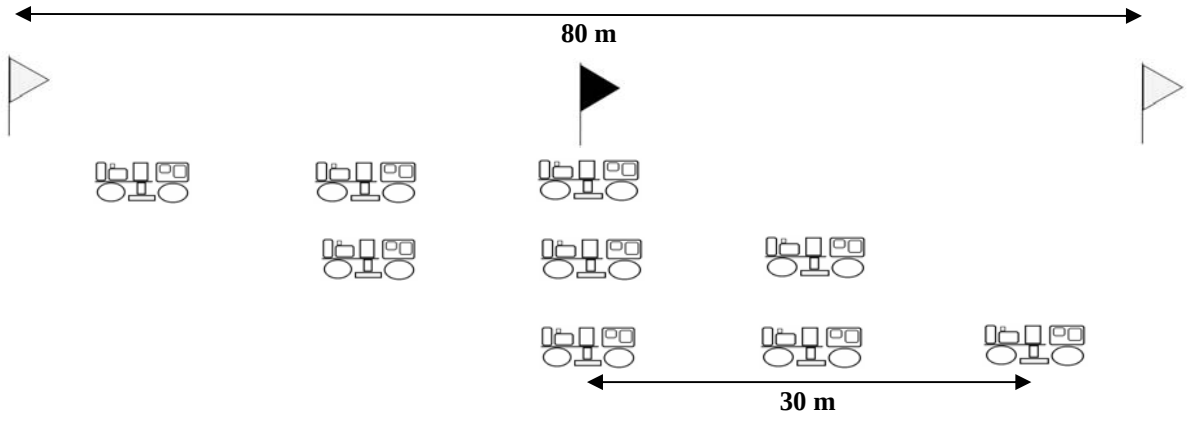
Source Parameters

No. of Sources On-Line	3
No. of Sweeps per VP	3
Sweep Length:	12 sec
Sweep Type	Linear
Sweep Type Mono / Vari	Vari
VP Interval	80 m
Source Array Length	60 m
Vibe Spacing Pad to Pad	15 m
Vibe Move Up	15 m
VP Source Centre	On Station
Vibe Electronics	Pelton Adv II Model 6
Vibrator QC	Vibra Sig
Force Control	Peak and Trough
Phase Lock	Ground Force
High Force Output	90%
Pelton Rev. Level	6E

Receiver Array: 12 Phones over 40m 3.33m between Phones Centred between pegs



Source Array: 3 vibes Over 60m 15m pad to pad centred on VP 15m moveups



APPENDIX “I”

Daily production reports

TRACE ENERGY SERVICES
DAILY PRODUCTION REPORT

CREW 401 DATE…… 7-Aug-03

Client.....……	ANSIR	Party Manager.	Bob Stephenson
Survey Name.	Curnamona	Client Rep…..	David Johnstone
Area.....……	Curnamona	Weather..……	Fine
State.....……	South Australia		

RECORDING			Kms.	SKIPS	PROFILES		TOTALS
Line No……	Rec	Rec				Profiles…..	0
Line No……	Rec	Rec				Skips……..	0
Line No……	Rec	Rec				Kms..……	0.000
Line No……	Rec	Rec				Cum Kms..	0.000
Line No……	Rec	Rec					

HOURS			Down Time -		Extra Charges	
	Test Time.....……		Recorder……..		Extra Hrs…..	0.00
	Recording Time…		Cables.....….....		Detours Charge Hrs	0.00
Other Time	Line Change…..		ATU's.....……		Washdowns…..Hrs	0.00
	Recorder Move..		Detours/Terr…		Extra Other Charge..	0.00
	Detours/Terrain.		W / on Spread.		Total Extra……..Hrs	0.00
	Experimental…		Stock Damage		Total Extra(Job).Hrs	0.00
	QC spread		Other.....……		Processing Hrs……	
	Mobilisation ……	11.00				
	Weather Time…					
	Stock Damage..		Total Down Time..……	0.00	Total Day…….Hrs	11.00
	Safety Meeting..		Cum. Down Time (Job)	0.00	Total Hrs (Job)…….	11.00

COMMENTS: **Trace Energy Services crew mobilised from Roxby Downs to Honeymoon Mine Site. Three Vibs on site plus container. Fourth Vib arriving tomorrow. David Johnstone towed ANSIR office trailer from Roxby Downs to Honeymoon Mine Site.**

SURVEY									
Line No……	03GA-CU1	STN..	1920	STN..	2470	Kms.	22.000		
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.		Total Kms..……	
Line No……		STN..		STN..		Kms.		Cum. Kms. (Job)……	

GRAVITY									
Line No……	03GA-CU1	STN..	1740	STN..	2370	Kms.	25.200		
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.		Total Kms..……	
Line No……		STN..		STN..		Kms.		Cum. Kms. (Job)……	

RANGING		COMMENTS :		
Line No……	Kms			
Line No……	Kms			
Line No……	Kms		Total Kms..……	0.000
Line No……	Kms		Cum. Kms. (Job)……	0.00

LINE CLEAR						
Dozer	1	Line No……	Kms. Cut……	Hrs.	Total Kms..……	0.000
Dozer	2	Line No……	Kms. Cut……	Hrs.	Cum. Kms. (Job)……	0.000
Dozer	3	Line No……	Kms. Cut……	Hrs.	Total Hours……..	0.00
Grader	1	Line No……	Kms.Graded….	Hrs.	Total Hrs (Job)……	0.00

DRILLING					PRE LOADING			Elect Dets
Rig No.	1	# Mtr	#Holes	Hrs	1	# Holes	# Dets	# Charges
Rig No.	2	# Mtr	#Holes	Hrs	2	# Holes	# Dets	# Charges
Rig No.	3	# Mtr	#Holes	Hrs	3	# Holes	# Dets	# Charges
Rig No.	4	# Mtr	#Holes	Hrs	4	# Holes	# Dets	# Charges
Rig No.	5	# Mtr	#Holes	Hrs	5	# Holes	# Dets	# Charges
Rig No.	6	# Mtr	#Holes	Hrs	6	# Holes	# Dets	# Charges

Total # Mtr……	0.0	Cum # Mtr(Job)…….	0.0	Total # Holes……	0	Cum #Holes(Job)	0
Total Drilled……	0.0	Cum Drilled(Job)..	0.0	Total Dets…….	0	Cum Dets(Job)	0
Total Hrs……..	0.0	Total # Hrs(Job)……	0.0	Total Charges	0	Total # Charges(Job)	0

COMMENT

TRACE ENERGY SERVICES
DAILY PRODUCTION REPORT

CREW 401 DATE…… 8-Aug-03

Client.....……	ANSIR	Party Manager.	Bob Stephenson
Survey Name.	Curnamona	Client Rep…..	David Johnstone
Area.....……	Curnamona	Weather..……	Fine
State.....……	South Australia		

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No……	03GA-CU1	Rec	1000.0	Rec	1010.0	0.400	0	5	Profiles…..	5
Line No……		Rec		Rec					Skips……..	0
Line No……		Rec		Rec					Kms..……	0.400
Line No……		Rec		Rec					Cum Kms..	0.400
Line No……		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....……	1.60			Extra Hrs…..	0.00
	Test Time.....……		Recorder……..		Detours Charge Hrs	0.00
	Recording Time…	0.80	Cables.....…...		Washdowns…..Hrs	0.00
Other Time	Line Change…..		ATU's.....……		Extra Other Charge..	0.00
	Recorder Move..		Detours/Terr…		Total Extra……..Hrs	0.00
	Detours/Terrain.		W / on Spread.		Total Extra(Job).Hrs	0.00
	Experimental…	1.30	Stock Damage		Processing Hrs.……	
	Vibs to end Line	0.70	Other.....……			
	Lay Spread …….	2.00				
	Unload Container	3.20				
	QC Spread …….	1.10	Total Down Time..……	0.00	Total Day…….Hrs	11.00
	Safety Meeting..	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job)…….	22.00

COMMENTS: **Wait on crane to unload container off truck, unload container onto vehicles. Lay spread on line 03GA-CU1 from stn. 1000 to stn 1387. Trouble shoot line, run experimental, commence recording.**

SURVEY								
Line No……	03GA-CU1	STN..	2470	STN..	3120	Kms.	26.000	
Line No……		STN..		STN..		Kms.		
Line No……		STN..		STN..		Kms.		
Line No……		STN..		STN..		Kms.		Total Kms..……
Line No……		STN..		STN..		Kms.		Cum. Kms. (Job)……

GRAVITY								
Line No……	03GA-CU1	STN..	2370	STN..	2970	Kms.	24.000	
Line No……		STN..		STN..		Kms.		
Line No……		STN..		STN..		Kms.		
Line No……		STN..		STN..		Kms.		Total Kms..……
Line No……		STN..		STN..		Kms.		Cum. Kms. (Job)……

RANGING		COMMENTS :		
Line No……	Kms			
Line No……	Kms			
Line No……	Kms		Total Kms..……	0.000
Line No……	Kms		Cum. Kms. (Job)……	0.00

LINE CLEAR						
Dozer	1	Line No……	Kms. Cut..……	Hrs.	Total Kms..……	0.000
Dozer	2	Line No……	Kms. Cut..……	Hrs.	Cum. Kms. (Job)……	0.000
Dozer	3	Line No……	Kms. Cut..……	Hrs.	Total Hours……..	0.00
Grader	1	Line No……	Kms.Graded….	Hrs.	Total Hrs (Job)……	0.00

DRILLING					PRE LOADING			Elect Dets
Rig No.	1	# Mtr	#Holes	Hrs	1	# Holes	# Dets	# Charges
Rig No.	2	# Mtr	#Holes	Hrs	2	# Holes	# Dets	# Charges
Rig No.	3	# Mtr	#Holes	Hrs	3	# Holes	# Dets	# Charges
Rig No.	4	# Mtr	#Holes	Hrs	4	# Holes	# Dets	# Charges
Rig No.	5	# Mtr	#Holes	Hrs	5	# Holes	# Dets	# Charges
Rig No.	6	# Mtr	#Holes	Hrs	6	# Holes	# Dets	# Charges

Total # Mtr……	0.0	Cum # Mtr(Job)…….	0.0	Total # Holes……	0	Cum #Holes(Job)	0
Total Drilled……	0.0	Cum Drilled(Job)..	0.0	Total Dets…….	0	Cum Dets(Job)	0
Total Hrs……..	0.0	Total # Hrs(Job)……	0.0	Total Charges	0	Total # Charges(Job)	0

COMMENT

TRACE ENERGY SERVICES
DAILY PRODUCTION REPORT

CREW 401 DATE…… 9-Aug-03

Client.....……	ANSIR	Party Manager.	Bob Stephenson
Survey Name.	Curnamona	Client Rep…...	David Johnstone
Area.....……	Curnamona	Weather..…...	Fine
State.....……	South Australia		

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No…….	03GA-CU1	Rec	1010.0	Rec	1520.0	20.400	1	254	Profiles…..	254
Line No…….		Rec		Rec					Skips……..	1
Line No…….		Rec		Rec					Kms..……	20.400
Line No…….		Rec		Rec					Cum Kms..	20.800
Line No…….		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....……	1.20			Extra Hrs…..	0.00
	Test Time.....……		Recorder……..		Detours Charge Hrs	0.00
	Recording Time…	8.50	Cables.....…...		Washdowns…..Hrs	0.00
Other Time	Line Change…..		ATU's.....……		Extra Other Charge..	0.00
	Recorder Move..	0.50	Detours/Terr…		Total Extra……..Hrs	0.00
	Detours/Terrain.		W / on Spread.		Total Extra(Job).Hrs	0.00
	Experimental…		Stock Damage		Processing Hrs.……	
	QC Spread …….	0.50	Other.....……			
	Wait on Spread.					
	Weather Time…					
	Stock Damage..		Total Down Time..……	0.00	Total Day…….Hrs	11.00
	Safety Meeting..	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job)…….	33.00

COMMENTS: **Excelent days production.**
Front Crew stn 1388 to stn 1707, Total 319 stns.
Back Crew stn 1000 to stn 1380, Total 380 stns.

SURVEY							
Line No…….	03GA-CU1	STN..		STN..		Kms.	
Line No…….		STN..		STN..		Kms.	
Line No…….		STN..		STN..		Kms.	
Line No…….		STN..		STN..		Kms.	Total Kms..……
Line No…….		STN..		STN..		Kms.	Cum. Kms. (Job)……

GRAVITY								
Line No…….	03GA-CU1	STN..	2970	STN..	3120	Kms.	6.000	
Line No…….		STN..		STN..		Kms.		
Line No…….		STN..		STN..		Kms.		
Line No…….		STN..		STN..		Kms.		Total Kms..……
Line No…….		STN..		STN..		Kms.		Cum. Kms. (Job)……

RANGING		COMMENTS :		
Line No…….	Kms			
Line No…….	Kms			
Line No…….	Kms		Total Kms..……	0.000
Line No…….	Kms		Cum. Kms. (Job)……	0.00

LINE CLEAR						
Dozer	1	Line No…….	Kms. Cut..……	Hrs.	Total Kms..……	0.000
Dozer	2	Line No…….	Kms. Cut..……	Hrs.	Cum. Kms. (Job)……	0.000
Dozer	3	Line No…….	Kms. Cut..……	Hrs.	Total Hours……..	0.00
Grader	1	Line No…….	Kms.Graded….	Hrs.	Total Hrs (Job)……	0.00

DRILLING					PRE LOADING			Elect Dets
Rig No.	1	# Mtr	#Holes	Hrs	1	# Holes	# Dets	# Charges
Rig No.	2	# Mtr	#Holes	Hrs	2	# Holes	# Dets	# Charges
Rig No.	3	# Mtr	#Holes	Hrs	3	# Holes	# Dets	# Charges
Rig No.	4	# Mtr	#Holes	Hrs	4	# Holes	# Dets	# Charges
Rig No.	5	# Mtr	#Holes	Hrs	5	# Holes	# Dets	# Charges
Rig No.	6	# Mtr	#Holes	Hrs	6	# Holes	# Dets	# Charges

Total # Mtr……	0.0	Cum # Mtr(Job)…….	0.0	Total # Holes……	0	Cum #Holes(Job)	0
Total Drilled……	0.0	Cum Drilled(Job)..	0.0	Total Dets…….	0	Cum Dets(Job)	0
Total Hrs……..	0.0	Total # Hrs(Job)……	0.0	Total Charges	0	Total # Charges(Job)	0

COMMENT **Survey crew installing new base stations. Base 14 & 15, Gravity observations were made during control observations.**

TRACE ENERGY SERVICES
DAILY PRODUCTION REPORT

CREW 401 DATE…… 10-Aug-03

Client.....	ANSIR	Party Manager.	Bob Stephenson
Survey Name.	Curnamona	Client Rep…..	David Johnstone
Area.....	Curnamona	Weather..……..	Raining
State.....	South Australia		

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No…….	03GA-CU1	Rec	1520.0	Rec	1786.0	10.640	0	133	Profiles…..	133
Line No…….		Rec		Rec					Skips……..	0
Line No…….		Rec		Rec					Kms..……..	10.640
Line No…….		Rec		Rec					Cum Kms..	31.440
Line No…….		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	0.70			Extra Hrs…..	0.00
	Test Time.....		Recorder……..		Detours Charge Hrs	0.00
	Recording Time…	4.40	Cables.....……..		Washdowns…..Hrs	0.00
Other Time	Line Change…..		ATU's.....……		Extra Other Charge..	0.00
	Recorder Move..	0.30	Detours/Terr…		Total Extra……..Hrs	0.00
	Detours/Terrain.		W / on Spread.		Total Extra(Job).Hrs	0.00
	Experimental…		Stock Damage		Processing Hrs.……	
	QC Spread ……..	0.20	Vibes ……..			
	Wait on Spread.					
	Weather Time…	5.10				
	Stock Damage..		Total Down Time..……	0.00	Total Day…….Hrs	11.00
	Safety Meeting..	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job)…….	44.00

COMMENTS: **Commenced raining at 11am,line crew shut down at 11.30am, kept recording until 12.25, recorded to end of spread.**
Front crew stn 1708 to 1906, Total 198 stns.
Back crew stn 1381 to 1579, Total 198 stns.

SURVEY									
Line No……	03GA-CU1	STN..	3120	STN..	3220	Kms.	4.000		
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.		Total Kms..……	
Line No……		STN..		STN..		Kms.		Cum. Kms. (Job)……	

GRAVITY									
Line No……	03GA-CU1	STN..	3120	STN..	3220	Kms.	4.000		
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.			
Line No……		STN..		STN..		Kms.		Total Kms..……	
Line No……		STN..		STN..		Kms.		Cum. Kms. (Job)……	

RANGING		COMMENTS :		
Line No……	Kms			
Line No……	Kms			
Line No……	Kms		Total Kms..……	0.000
Line No……	Kms		Cum. Kms. (Job)……	0.00

LINE CLEAR						
Dozer	1	Line No…….	Kms. Cut..……	Hrs.	Total Kms..……	0.000
Dozer	2	Line No…….	Kms. Cut..……	Hrs.	Cum. Kms. (Job)……	0.000
Dozer	3	Line No…….	Kms. Cut..……	Hrs.	Total Hours……..	0.00
Grader	1	Line No…….	Kms.Graded….	Hrs.	Total Hrs (Job)..……	0.00

DRILLING					PRE LOADING			Elect Dets
Rig No.	1	# Mtr	#Holes	Hrs	1	# Holes	# Dets	# Charges
Rig No.	2	# Mtr	#Holes	Hrs	2	# Holes	# Dets	# Charges
Rig No.	3	# Mtr	#Holes	Hrs	3	# Holes	# Dets	# Charges
Rig No.	4	# Mtr	#Holes	Hrs	4	# Holes	# Dets	# Charges
Rig No.	5	# Mtr	#Holes	Hrs	5	# Holes	# Dets	# Charges
Rig No.	6	# Mtr	#Holes	Hrs	6	# Holes	# Dets	# Charges

Total # Mtr……	0.0	Cum # Mtr(Job)…….	0.0	Total # Holes……	0	Cum #Holes(Job)	0
Total Drilled……	0.0	Cum Drilled(Job)..	0.0	Total Dets…….	0	Cum Dets(Job)	0
Total Hrs……..	0.0	Total # Hrs(Job)……	0.0	Total Charges	0	Total # Charges(Job)	0

COMMENT **Survey standby 3 hrs due to rain. Track back to camp very wet and slippery, worstn area between kalkaroo and Strathearn stations.**

TRACE ENERGY SERVICES
DAILY PRODUCTION REPORT

CREW 401 DATE…… 12-Aug-03

Client.....	ANSIR	Party Manager.	Bob Stephenson
Survey Name.	Curnamona	Client Rep…..	David Johnstone
Area.....	Curnamona	Weather.....	Thunder Storms
State.....	South Australia		

RECORDING					Kms.	SKIPS	PROFILES		TOTALS
Line No…….	Rec	1786.0	Rec	1970.0	7.360	1	91	Profiles…..	91
Line No…….	Rec		Rec					Skips……..	1
Line No…….	Rec		Rec					Kms..……	7.360
Line No…….	Rec		Rec					Cum Kms..	38.800
Line No…….	Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	0.50				
	Test Time.....		Recorder……..		Extra Hrs…..	0.00
	Recording Time…	3.20	Cables.....…...		Detours Charge Hrs	0.00
Other Time	Line Change…..		ATU's.....……		Washdowns…..Hrs	0.00
	Recorder Move..	0.70	Detours/Terr…		Extra Other Charge..	0.00
	Detours/Terrain.		W / on Spread.		Total Extra……..Hrs	0.00
	Experimental…		Stock Damage		Total Extra(Job).Hrs	0.00
	QC spread		Other.....……		Processing Hrs……	
	Mobilisation ……					
	Weather Time…	4.20				
	Stock Damage..		Total Down Time..……	0.00	Total Day…….Hrs	8.90
	Safety Meeting..	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job)…….	8.90

COMMENTS:

SURVEY						
Line No……	03GA-CU1	STN..	STN..	Kms.		
Line No……		STN..	STN..	Kms.		
Line No……		STN..	STN..	Kms.		
Line No……		STN..	STN..	Kms.	Total Kms..……	0.000
Line No……		STN..	STN..	Kms.	Cum. Kms. (Job)……	

GRAVITY						
Line No……	03GA-CU1	STN..	STN..	Kms.		
Line No……		STN..	STN..	Kms.		
Line No……		STN..	STN..	Kms.		
Line No……		STN..	STN..	Kms.	Total Kms..……	
Line No……		STN..	STN..	Kms.	Cum. Kms. (Job)……	

RANGING		COMMENTS :		
Line No……	Kms			
Line No……	Kms			
Line No……	Kms		Total Kms..……	0.000
Line No……	Kms		Cum. Kms. (Job)……	0.00

LINE CLEAR						
Dozer	1	Line No…….	Kms. Cut……	Hrs.	Total Kms..……	0.000
Dozer	2	Line No…….	Kms. Cut……	Hrs.	Cum. Kms. (Job)……	0.000
Dozer	3	Line No…….	Kms. Cut……	Hrs.	Total Hours……..	0.00
Grader	1	Line No…….	Kms.Graded….	Hrs.	Total Hrs (Job)……	0.00

DRILLING					PRE LOADING			Elect Dets
Rig No.	1	# Mtr	#Holes	Hrs	1	# Holes	# Dets	# Charges
Rig No.	2	# Mtr	#Holes	Hrs	2	# Holes	# Dets	# Charges
Rig No.	3	# Mtr	#Holes	Hrs	3	# Holes	# Dets	# Charges
Rig No.	4	# Mtr	#Holes	Hrs	4	# Holes	# Dets	# Charges
Rig No.	5	# Mtr	#Holes	Hrs	5	# Holes	# Dets	# Charges
Rig No.	6	# Mtr	#Holes	Hrs	6	# Holes	# Dets	# Charges

Total # Mtr……	0.0	Cum # Mtr(Job)…….	0.0	Total # Holes……	0	Cum #Holes(Job)	0
Total Drilled……	0.0	Cum Drilled(Job)..	0.0	Total Dets…….	0	Cum Dets(Job)	0
Total Hrs……..	0.0	Total # Hrs(Job)……	0.0	Total Charges	0	Total # Charges(Job)	0

COMMENT

Terrex Seismic Company
Daily Report

Date..... 2-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager..... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING				Kms.	SKIPS	PROFILES	TOTALS
Line No.....	03GA-CU1	Rec	Rec				Profiles..... 0
Line No.....		Rec	Rec				Skips..... 0
Line No.....		Rec	Rec				Kms..... 0.000
Line No.....		Rec	Rec				Cum Kms. 0.000
Line No.....		Rec	Rec				

HOURS			Down Time -		Extra Charges	
	Travel Time.....	1.50	Recorder.....		Extra Hrs.....	
	Test Time.....		Cables.....		Detours Charge Hrs	
	Recording Time...					
Other Time	Layout Spread	3.00	ATU's.....		Washdowns.....Hrs	
	Recorder Move..		Detours/Terr...		Extra Other Charge..	
	Detours/Terrain.		W / on Spread.		Total Extra.....Hrs	
	Troubleshoot		Stock Damage		Total Extra(Job).Hrs	
	Wait on Spread.		Other.....		Processing Hrs.....	
	QC Spread.					
	Vibes.....					
	Recorder Shutdown.		Total Down Time.....	0.00	Total Day.....Hrs	4.50
	Toolbox....		Cum. Down Time (Job)	0.00	Total Hrs (Job).....	4.50

All vehicles serviced in Broken Hill today.Vibe Tech, Line Boss and eight line crew departed Broken Hil
at 12:30pm for Honeymoon Mine. Crew arrived Honeymoon at 2:00pm and layed 160 stations on line GA03-CU1.
The remaining line crew departed Broken Hill at 3:30pm and arrived at Honeymoon at 5:00pm.
Damage to the vibrators occurred overnight while they were parked 45km west of Wilcannia.
Front Crew 1840 - 2000

SYRVEY:

Line No.....	STN..	STN..	Kms.	
Line No.....	STN..	STN..	Kms.	
Line No.....	STN..	STN..	Kms.	Total Kms..... 0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job)..... 0.000

COMMENTS:

LINE CLEAR

Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	1	# Mtr	#Holes	Hrs				
Rig No.	1	# Mtr	#Holes	Hrs				
Rig No.	2	# Mtr	#Holes	Hrs				
Rig No.	2	# Mtr	#Holes	Hrs				
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0				
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0				
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0				

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT:

Terrex Seismic Company
Daily Report

Date..... 3-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager. Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No.....	03GA-CU1	Rec	1972.0	Rec	2302.0	13.20		166	Profiles.....	166
Line No.....		Rec		Rec					Skips.....	
Line No.....		Rec		Rec					Kms.....	13.200
Line No.....		Rec		Rec					Cum Kms..	13.200
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	0.40				
	Test Time.....		Recorder.....		Extra Hrs.....	0.00
	Recording Time...	5.80	Cables.....		Detours Charge Hrs	0.00
Other Time	Line Change		ATU's.....		Washdowns.....Hrs	0.00
	Recorder Move..		Detours/Terr...		Extra Other Charge..	0.00
	Detours/Terrain.		W / on Spread.		Total Extra.....Hrs	0.00
	Troubleshoot	0.50	Stock Damage		Total Extra(Job).Hrs	0.00
	Wait on Spread.	2.80	Vibes.....		Processing Hrs.....	
	QC Spread.					
	Vibes.....	0.50				
	Recorder Shutdown.	0.50	Total Down Time.....	0.00	Total Day.....Hrs	10.80
	Toolbox....	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	15.30

COMMENTS: The line crew continued to layout spread and production began at 10:30am. Vibe tech continued to work on the damaged vibes and had all four operational by start of production. The line is in good condition and production rates should be approximately 16 - 18 kms per day. Based on these production rates the surveyors were contacted and told to peg an extra 30kms of line to give a total of approximately 170kms
Front Crew 1960 - 2430
Back Crew 1840 - 2170

SURVEY					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR						
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs				
Rig No.	4	# Mtr	#Holes	Hrs				
Rig No.	5	# Mtr	#Holes	Hrs				
Rig No.	6	# Mtr	#Holes	Hrs				
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0				
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0				
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0				

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT

Terrex Seismic Company
Daily Report

Date..... 4-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager..... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES	TOTALS	
Line No.....	03GA-CU1	Rec	2304.0	Rec	2788.0	19.44		254	Profiles.....	254
Line No.....		Rec		Rec					Skips.....	0
Line No.....		Rec		Rec					Kms.....	19.440
Line No.....		Rec		Rec					Cum Kms.	32.640
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	1.25				
	Test Time.....		Recorder.....		Extra Hrs.....	0.00
	Recording Time...	8.00	Cables.....		Detours Charge Hrs	0.00
Other Time	Line Change		ATU's.....		Washdowns.....Hrs	0.00
	Recorder Move..	0.80	Detours/Terr...		Extra Other Charge..	0.00
	Detours/Terrain.		W / on Spread.		Total Extra.....Hrs	0.00
	Troubleshoot		Stock Damage		Total Extra(Job).Hrs	0.00
	Wait on Spread.	0.25	Vibes		Processing Hrs.....	
	QC Spread.					
	Vibes.....	0.20				
	Recorder Shutdown.	0.20	Total Down Time.....	0.00	Total Day.....Hrs	11.00
	Toolbox....	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	26.30

COMMENTS: Crew Manager and client reps travelled to Curnamona Station to inspect accommodation facilities and to speak with station owners and surveyors. The surveyors were told to continue pegging for another day to increase the total line length to approximately 160km. At station 2766 the client changed the recording parameters to increase fold by shaking every station, this will continue until station 2944 where we will change back to the original parameters. The increased fold is for a 90 degree bend that occurs in the line at approx station 2825
Front Crew 2431 - 2943
Back Crew 2171 - 2647

SURVEY		STN..	STN..	Kms.		
Line No.....		STN..	STN..	Kms.		
Line No.....		STN..	STN..	Kms.		
Line No.....		STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....		STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR						
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000	
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000	
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00	
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00	

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs				
Rig No.	4	# Mtr	#Holes	Hrs				
Rig No.	5	# Mtr	#Holes	Hrs				
Rig No.	6	# Mtr	#Holes	Hrs				
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0				
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0				
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0				

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT

Terrex Seismic Company
Daily Report

Date..... 5-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager..... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No.....	03GA-CU1	Rec	2789.0	Rec	3102.0	12.56		235	Profiles...	235
Line No.....		Rec		Rec					Skips.....	0
Line No.....		Rec		Rec					Kms.....	12.560
Line No.....		Rec		Rec					Cum Kms	45.200
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	1.90			Extra Hrs.....	0.00
	Test Time.....		Recorder.....		Detours Charge Hrs	0.00
	Recording Time...	6.90	Cables.....		Washdowns.....Hrs	0.00
Other Time	Line Change		ATU's.....		Extra Other Charge.	0.00
	Recorder Move..	0.40	Detours/Terr...		Total Extra.....Hrs	0.00
	Detours/Terrain.		W / on Spread.		Total Extra(Job).Hrs	0.00
	Troubleshoot	0.70	Stock Damage		Processing Hrs.....	
	Wait on Spread.		Other.....			
	Data to CD	0.60				
	Vibes.....					
	Recorder Shutdown	0.10	Total Down Time.....	0.00	Total Day.....Hrs	10.90
	Toolbox....	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	37.20

Travel time increasing as crew progresses further away from camp. The recording parameters reverted back to the original specifications at station 2944 where the vibes returned to an 80 meter source array
Front Crew 2944 - 3259
Back Crew 2647 - 2959

SURVEY					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR					
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs				
Rig No.	4	# Mtr	#Holes	Hrs				
Rig No.	5	# Mtr	#Holes	Hrs				
Rig No.	6	# Mtr	#Holes	Hrs				
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0				
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0				
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0				

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT

Terrex Seismic Company
Daily Report

Date..... 6-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager.... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES	TOTALS	
Line No.....	03GA-CU1	Rec	3104.0	Rec	3512.0	16.40		408	Profiles..	408
Line No.....		Rec		Rec					Skips.....	0
Line No.....		Rec		Rec					Kms.....	16.400
Line No.....		Rec		Rec					Cum Km	61.600
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	2.20		Recorder.....	Extra Hrs.....	0.00
	Test Time.....			Cables.....	Detours Charge Hrs	0.00
	Recording Time...	6.60		ATU's.....	Washdowns.....Hrs	0.00
Other Time	Line Change			Detours/Terr...	Extra Other Charge	0.00
	Recorder Move..	1.20		W / on Spread.	Total Extra.....Hrs	0.00
	Detours/Terrain.			Stock Damage	Total Extra(Job).Hr	0.00
	Troubleshoot	0.45		Other.....	Processing Hrs.....	
	Wait on Spread.					
	Data to CD	0.25				
	Vibes.....	0.15				
	Recorder Shutdown.			Total Down Time.....	Total Day.....Hrs	11.15
	Toolbox....	0.30		Cum. Down Time (Job)	Total Hrs (Job).....	48.35

Cable repair technician travelled to Broken Hill to meet incoming personnel and to pick up this weeks food supplies. There were no production delays today and with camp move tomorrow the travel time wil start to decrease.
Front Crew 3259 - 3631
Back Crew 2959 - 3387

SURVEY:					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job)....	0.000

COMMENTS:

LINE CLEAR						
Dozer	1	Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2	Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job)....	0.000
Dozer	3	Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1	Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:							LVL:				
Rig No.	3	# Mtr	#Holes	Hrs			1	# Holes	#Line		
Rig No.	4	# Mtr	#Holes	Hrs			1	# Holes	#Line		
Rig No.	5	# Mtr	#Holes	Hrs			2	# Holes	#Line		
Rig No.	6	# Mtr	#Holes	Hrs			2	# Holes	#Line		
Total # Mtr.....		0.0	Cum # Mtr(Job).....		0.0		Total # Holes.....	0	Cum #Holes(Job)	0	
Total Drilled.....		0.0	Cum Drilled(Job)..		0.0						
Total Hrs.....		0.0	Total # Hrs(Job).....		0.0						

COMMENT

Crew Manager: _____ Client Rep: _____

Terrex Seismic Company
Daily Report

Date..... 7-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager..... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING					Kms.	SKIPS	PROFILES	TOTALS	
Line No.....	03GA-CU1	Rec	3514.0	Rec 3944.0	17.28		216	Profiles..	216
Line No.....		Rec		Rec				Skips.....	0
Line No.....		Rec		Rec				Kms.....	17.280
Line No.....		Rec		Rec				Cum Km:	78.880
Line No.....		Rec		Rec					

HOURS			Down Time -		Extra Charges	
	Travel Time.....	2.00			Extra Hrs.....	0.00
	Test Time.....		Recorder.....		Detours Charge Hrs	0.00
	Recording Time...	6.50	Cables.....		Washdowns.....Hrs	0.00
Other Time	Line Change		ATU's.....		Extra Other Charge	0.00
	Recorder Move..	0.90	Detours/Terr...		Total Extra.....Hrs	0.00
	Detours/Terrain.		W / on Spread.		Total Extra(Job).Hr:	0.00
	Troubleshoot	0.50	Stock Damage			
	Wait on Spread.	0.20	Other.....		Processing Hrs.....	
	Data to CD	0.25				
	Vibes.....	0.15				
	Recorder Shutdown	0.20	Total Down Time.....	0.00	Total Day.....Hrs	11.00
	Toolbox....	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	59.35

COMMENTS: Vibrators broke a water pipe in two places today. The landowner was informed and he repaired the damage. It was difficult to determine where the pipe was located and was not the fault of the operators As a result of the broken pipe the vibrators went to low force at station 3688 and resumed high force at station 3786. We had a camp move today from Honeymoon Mine to Curnamona Station. The Move took approximately four hours and camp was operational by 4:00pm.
Front Crew 3631 - 4063
Back Crew 3387 - 3819

SURVEY					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job)....	0.000

COMMENTS:

LINE CLEAR					
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job)....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

					LVL:				
Rig No.	3	# Mtr	#Holes	Hrs	1	# Holes	#Line		
Rig No.	4	# Mtr	#Holes	Hrs	1	# Holes	#Line		
Rig No.	5	# Mtr	#Holes	Hrs	2	# Holes	#Line		
Rig No.	6	# Mtr	#Holes	Hrs	2	# Holes	#Line		
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0	Total # Holes.....	0		Cum #Holes(Job)	0
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0					
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0					

COMMENT

Crew Manager: _____ Client Rep: _____

Terrex Seismic Company
Daily Report

Date..... 8-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No.....	03GA-CU1	Rec	3946.0	Rec	4498.0	22.16		277	Profiles.....	277
Line No.....		Rec		Rec					Skips.....	0
Line No.....		Rec		Rec					Kms.....	22.160
Line No.....		Rec		Rec					Cum Kms.	101.040
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	0.75				
	Test Time.....		Recorder.....		Extra Hrs.....	0.00
	Recording Time...	8.30	Cables.....		Detours Charge Hrs	0.00
Other Time	Line Change		ATU's.....		Washdowns.....Hrs	0.00
	Recorder Move..	0.60	Detours/Terr...		Extra Other Charge..	0.00
	Detours/Terrain.	0.10	W / on Spread.		Total Extra.....Hrs	0.00
	Troubleshoot	0.40	Stock Damage		Total Extra(Job).Hrs	0.00
	Wait on Spread.		Vibes		Processing Hrs.....	
	Data to CD	0.30				
	Vibes.....	0.10				
	Recorder Shutdown	0.15	Total Down Time.....	0.00	Total Day.....Hrs	11.00
	Toolbox....	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	70.35

COMMENTS: Crew change today, five personnel out and five in. Line crew was down three people all day. Shorter travel time and no delays made for an excellent days production, the line crew worked extremely wel today considering that they were short staffed.
Front Crew 4063 - 4631
Back Crew 3819 - 4371

SURVEY						
Line No.....	STN..	STN..	Kms.			
Line No.....	STN..	STN..	Kms.			
Line No.....	STN..	STN..	Kms.			
Line No.....	STN..	STN..	Kms.		Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.		Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR						
Dozer	1 Line No.....	Kms. Cut.....	Hrs.		Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.		Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.		Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.		Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:						LVL:				
Rig No.	3	# Mtr	#Holes	Hrs		1	# Holes	#Line		
Rig No.	4	# Mtr	#Holes	Hrs		1	# Holes	#Line		
Rig No.	5	# Mtr	#Holes	Hrs		2	# Holes	#Line		
Rig No.	6	# Mtr	#Holes	Hrs		2	# Holes	#Line		
Total # Mtr.....		0.0	Cum # Mtr(Job).....		0.0	Total # Holes.....	0	Cum #Holes(Job)		0
Total Drilled.....		0.0	Cum Drilled(Job)..		0.0					
Total Hrs.....		0.0	Total # Hrs(Job).....		0.0					

COMMENT

Crew Manager: _____ Client Rep: _____

Terrex Seismic Company
Daily Report

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Date..... 9-Jul-04
Crew..... 402
Crew Manager.... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No.....	03GA-CU1	Rec	4500.0	Rec	5052.0	22.16		277	Profiles.....	277
Line No.....		Rec		Rec					Skips.....	0
Line No.....		Rec		Rec					Kms.....	22.160
Line No.....		Rec		Rec					Cum Kms..	123.200
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	0.70				
	Test Time.....		Recorder.....		Extra Hrs.....	0.00
	Recording Time...	8.60	Cables.....		Detours Charge Hrs	0.00
Other Time	Line Change		ATU's.....		Washdowns.....Hrs	0.00
	Recorder Move..	0.55	Detours/Terr...		Extra Other Charge..	0.00
	Recorder Problem	0.40	W / on Spread.		Total Extra.....Hrs	0.00
	Troubleshoot		Stock Damage		Total Extra(Job).Hrs	0.00
	Wait on Spread.		Vibes		Processing Hrs.....	0.00
	Data to CD					
	Vibes.....	0.40				
	Recorder Shutdown	0.10	Total Down Time.....	0.00	Total Day.....Hrs	11.00
	Toolbox....	0.25	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	81.35

COMMENTS: Some problems with the generator on the recorder today, it has been booked in for a service on Monday in Broken Hill. No other production delays today. Cable repair technician stayed in Broken Hill overnight to pickup incoming observer and parts for generator.
Front Crew 4631 - 5203
Back Crew 4371 - 4923

SURVEY					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR						
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs					
Rig No.	4	# Mtr	#Holes	Hrs					
Rig No.	5	# Mtr	#Holes	Hrs					
Rig No.	6	# Mtr	#Holes	Hrs					
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0					
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0					
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0					

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....		0	Cum #Holes(Job)		0
		0			
		0			

COMMENT

Crew Manager: _____ Client Rep: _____

Terrex Seismic Company
Daily Report

Date..... 10-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager.. Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES		TOTALS
Line No.....	03GA-CU1	Rec	5054.0	Rec	5470.0	16.72		255	Profiles.....	255
Line No.....		Rec		Rec					Skips.....	0
Line No.....		Rec		Rec					Kms.....	16.720
Line No.....		Rec		Rec					Cum Kms.	139.920
Line No.....		Rec		Rec						

HOURS			Down Time -		Extra Charges	
	Travel Time.....	1.10			Extra Hrs.....	0.00
	Test Time.....		Recorder.....			
	Recording Time...	7.40	Cables.....		Detours Charge Hrs	0.00
Other Time	Line Change		ATU's.....		Washdowns.....Hrs	0.00
	Recorder Move..	0.30	Detours/Terr...		Extra Other Charge..	0.00
	Detours/Terrain.	1.50	W / on Spread.		Total Extra.....Hrs	0.00
	Troubleshoot	0.40	Stock Damage		Total Extra(Job).Hrs	0.00
	Wait on Spread.		Other.....		Processing Hrs.....	0.00
	Data to CD					
	Vibes.....					
	Recorder Shutdown	0.15	Total Down Time.....	0.00	Total Day.....Hrs	11.10
	Toolbox....	0.25	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	92.45

COMMENTS: Production delay today waiting for Epic Energy to locate a suitable crossing for the vibes over the Moomba - Adelaide gas pipeline. Peter O'Donnell arrived on crew to continue training with the ARAM
Front Crew 5203 - 5659
Back Crew 4923 - 5343

SURVEY

Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR

Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs				
Rig No.	4	# Mtr	#Holes	Hrs				
Rig No.	5	# Mtr	#Holes	Hrs				
Rig No.	6	# Mtr	#Holes	Hrs				
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0				
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0				
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0				

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT

Terrex Seismic Company
Daily Report

Date..... 11-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager. Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING						Kms.	SKIPS	PROFILES	TOTALS
Line No.....	03GA-CU1	Rec	5472.0	Rec	5940.0	18.80		235	235
Line No.....		Rec		Rec					0
Line No.....		Rec		Rec					18.800
Line No.....		Rec		Rec				Cum Kms..	158.720
Line No.....		Rec		Rec					

HOURS			Down Time -		Extra Charges	
	Travel Time.....	1.90				
	Test Time.....		Recorder.....		Extra Hrs.....	0.00
	Recording Time...	7.70	Cables.....		Detours Charge Hrs	0.00
Other Time	Line Change		ATU's.....		Washdowns.....Hrs	0.00
	Recorder Move..	0.60	Detours/Terr...		Extra Other Charge..	0.00
	Detours/Terrain.		W / on Spread.		Total Extra.....Hrs	0.00
	Troubleshoot	0.40	Stock Damage		Total Extra(Job).Hrs	0.00
	Wait on Spread.	0.40	Other.....		Processing Hrs.....	0.00
	Data to CD					
	Vibes.....					
	Recorder Shutdown.		Total Down Time.....	0.00	Total Day.....Hrs	11.25
	Toolbox....	0.25	Cum. Down Time (Job	0.00	Total Hrs (Job).....	103.70

COMMENTS: Line 03GA-CU1 completed at 4:30pm today. Line crew picked up 140 stations and returned to camp.
Remainder of spread to be picked up and packed tomorrow, then demobe to Broken Hill.
Front Crew 5659 - 5940
Back Crew 5343 - 5700

SURVEY					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR					
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs			
Rig No.	4	# Mtr	#Holes	Hrs			
Rig No.	5	# Mtr	#Holes	Hrs			
Rig No.	6	# Mtr	#Holes	Hrs			
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0			
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0			
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0			

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT

Terrex Seismic Company
Daily Report

Date..... 12-Jul-04
Crew..... 402

Client.... PIRSA-pmd*CRC
Area.... Curnamona
PEL.....
State.... SA

Crew Manager.... Jon Turner
Client Rep..... Dave Johnstone
Weather..... Fine

RECORDING			Kms.	SKIPS	PROFILES	TOTALS
Line No.....	Rec	Rec			Profiles.....	0
Line No.....	Rec	Rec			Skips.....	0
Line No.....	Rec	Rec			Kms.....	0.000
Line No.....	Rec	Rec			Cum Kms..	158.720
Line No.....	Rec	Rec				

HOURS			Down Time -		Extra Charges	
	Travel Time.....	2.00	Recorder.....		Extra Hrs.....	0.00
	Test Time.....		Cables.....		Detours Charge Hrs	0.00
	Recording Time...		ATU's.....		Washdowns.....Hrs	0.00
Other Time	Line Change		Detours/Terr...		Extra Other Charge..	0.00
	Recorder Move..		W / on Spread.		Total Extra.....Hrs	0.00
	Detours/Terrain.		Stock Damage		Total Extra(Job).Hrs	0.00
	Troubleshoot		Other.....		Processing Hrs.....	0.00
	Spread Pickup	2.50				
	QC Spread.					
	Vibes.....					
	Recorder Shutdown.		Total Down Time.....	0.00	Total Day.....Hrs	4.80
	Toolbox....	0.30	Cum. Down Time (Job)	0.00	Total Hrs (Job).....	108.50

COMMENTS: Line crew picked up remaining spread and packed it into the crates on the truck. The crew departec Curnamona station at approx. 11:30am and arrived in Broken Hill at 3:30pm. Contract completed.
Back Crew 5700 - 5940

SURVEY					
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.		
Line No.....	STN..	STN..	Kms.	Total Kms.....	0.000
Line No.....	STN..	STN..	Kms.	Cum. Kms. (Job).....	0.000

COMMENTS:

LINE CLEAR					
Dozer	1 Line No.....	Kms. Cut.....	Hrs.	Total Kms.....	0.000
Dozer	2 Line No.....	Kms. Cut.....	Hrs.	Cum. Kms. (Job).....	0.000
Dozer	3 Line No.....	Kms. Cut.....	Hrs.	Total Hours.....	0.00
Grader	1 Line No.....	Kms.Graded....	Hrs.	Total Hrs (Job).....	0.00

COMMENTS:

DRILLING:

Rig No.	3	# Mtr	#Holes	Hrs				
Rig No.	4	# Mtr	#Holes	Hrs				
Rig No.	5	# Mtr	#Holes	Hrs				
Rig No.	6	# Mtr	#Holes	Hrs				
Total # Mtr.....		0.0	Cum # Mtr(Job).....	0.0				
Total Drilled.....		0.0	Cum Drilled(Job)..	0.0				
Total Hrs.....		0.0	Total # Hrs(Job).....	0.0				

LVL:

1	# Holes	#Line			
1	# Holes	#Line			
2	# Holes	#Line			
2	# Holes	#Line			
Total # Holes.....	0	Cum #Holes(Job)	0		

COMMENT

APPENDIX "J"

South Australian Deep Seismic Reconnaissance Report

The eastern margin of the Gawler Craton and the central Curnamona Province regions within South Australia have been identified as potential sites for deep seismic profiling surveys. A series of seismic lines were proposed to cover the areas of interest (Figure 1).

Figure 1. Location of proposed deep seismic lines in South Australia

The southern Curnamona Province line, coloured pink in Figure 1, starts to the west of Hawker then travels through: Wilippa, Curnamona, Strathearn and Kalkaroo Stations to the NSW /SA boarder. A total distance of 304 kilometres.

The northern Curnamona Province line, coloured red in Figure 1, starts at Old Motpena Station then travels through the townships of Parachilna and Blinman to Frome Downs and Mulyungarie Stations then to the NSW/SA boarder. A total distance of 306 kilometres.

The main north-south Gawler Craton line, coloured purple in Figure 1, stretches from the intersection of the Borefield Road and the Oodnadtta Track in the north almost to Woomera township in the south.

The Gawler northeast – southwest line, coloured green in Figure 1, is common with the north-south line in the vicinity of Olympic Dam mine. North of the mine area this line travels northeast across the top of Lake Torrens and to the west of the mine the line trends approximately due west.

These lines were traversed to assess access issues and possible environmental concerns. Based on these results the southern line on the Curnamona Province proved to be more preferable as road access through the Flinders

Ranges is less restrictive than for the northern line. Also there are more possibilities for accommodation along the southern line, if the northern line were chosen then a field camp would need to be utilised. On discussion with PIRSA geologists the position of the southern line satisfactorily intersects the target geological features and is also in close proximity to known geological control and mineralization.

Access to the main north-south Gawler Craton line was very good. To the north of Olympic Dam Mine the proposed route follows the Borefield Road, which is public access road. To the south the route is along the bitumen main highway. The only impediment to access along the bitumen road is the lack of road shoulder in the vicinity of the Roxby Downs Township. In order to position the line as close as possible to the Olympic Dam Mine and avoid a majority of the mine infrastructure. Access along the northeast – southwest line is predominantly along poorly maintained tracks and hence is not as preferable as the north-south line from an access standpoint. Both lines bisect the main target geological features. Accommodation for both lines could be based at Roxby Downs, although consideration would need to be given to availability.

Pastoral Contacts

I am still compiling all contact details for the relevant pastoral contacts**.**

Willipa Station
Dennis and Michelle Hilder
Private Mail Bag 24
Carrienton SA
(08) 8648 4878

Mundi Mundi Station
Terry Blore
80911628

Curnamona Station
Jeff and Lynettte Pumpa
Private Mail Bag 13
Yunta SA
(08) 8648 4850
UHF Channel 6

Strathearn Station
Richard and Cristabel Treloar
80911528 ph
80911604 fax

Kalkaroo Station (run from Boolcoomata Station)
Langdon & Heather Badger
80911613

Mulyungarie Station (part of Mutooroo Pastoral Company)
Tony Conners – Manager
80911614
Darren – Overseer

Frome Downs Station
Alec and Deb Wilson
86484823
0418659181

Skeleton Outstation 86484843
Alistair – overseer 86484835

Angoricina Station
Ian and Di Farger

Weraloona Sation (Wooltana)
Heathgate Resources
Peter & Deb Moroney
86484821

Wirrealpa Station
Warren & Barbara Farger
86484828

Motpena Station
Daryl and Barbara Fels

Mulgeria Station
Robby Savage
86758313

Witchalena Station
Mark – Manager
Joe Grose – Overseer 86757793

Stuart Creek Station
Purple Downs Station
Andamooka Station
Roxby Downs Station
Property Manager
John Reid
WMC Olympic Dam
86718664 w
86711250 h
0409534852

PIRSA & GA CONTACTS

David Johnstone
Geophysicist
Geoscience Australia
(02) 62499446

Andrew Shearer
Geophysicist
PIRSA
84633045

Laura Johnston
Principal Advisor Legislation
PIRSA
0401 122 013
84633099

Rob Larkins
Senior Liaison Officer
86725800
0419863855
Satelite0414848736

WMC CONTACTS

Stewart Eldridge
Geology & Analytical Services Manager
WMC Olympic Dam
PO Box 150
Roxby Downs SA 5725
(08) 86718240
0418837645

Richard Yeels
Corporate Affairs manager
WMC
Level 2/ 170 Greenhill Road
Parkside SA 5063
81729301
0418842557

Darren Herpich
GIS Officer
Environment Branch
WMC Olympic Dam

Lachlan Reynolds
Exploration Geologist
WMC Olympic Dam

Epic Energy - for information on the gas pipeline
1800625655

Accommodation

Willipa Station – up to 20 people, modern looking quarters
Curnamona Station - Unavailable during March / April and late Oct to early Nov
Mulyungarie Station –Unavailable from the end of March to early April due to Shearing
Motpena Station - shearing in April

Land Owners (Traditional)

A location diagram of Native Tittle Claimant boundaries is shown in Figure 3. I am still collating all relevant contact details at the present.

Group: **Kujani**
Claim Number: (SC00/003)
Contact: Mark McKenzie Snr
Area: large claim covering both Gawler and Curnamona lines.

Group: **Arabuna**
Claim Number: (SC98/002)
Contact: Reggie Dodd (Marree)
86758351
Area: Borefield Road

Group: **Kutatja (Kokatha People Committee)**
Claim Number: (SC99/002)
Contact: Andrew Starkey
(Woomera – Range Liaison Officer)
86743291
Area: Roxby Area

Group: **Adnyamathanha (Flinders Ranges Heritage Group)**
Claim Number: (SC99/001 & SC95/001)
Contact: Reece Coultard and Vicki Wilton
86484194
Area: Curnamona Line

Also need to find out about:
Barngala
Andamooka Land Council

Consultant
Suzie Hutchings
Adelaide University
0418856858

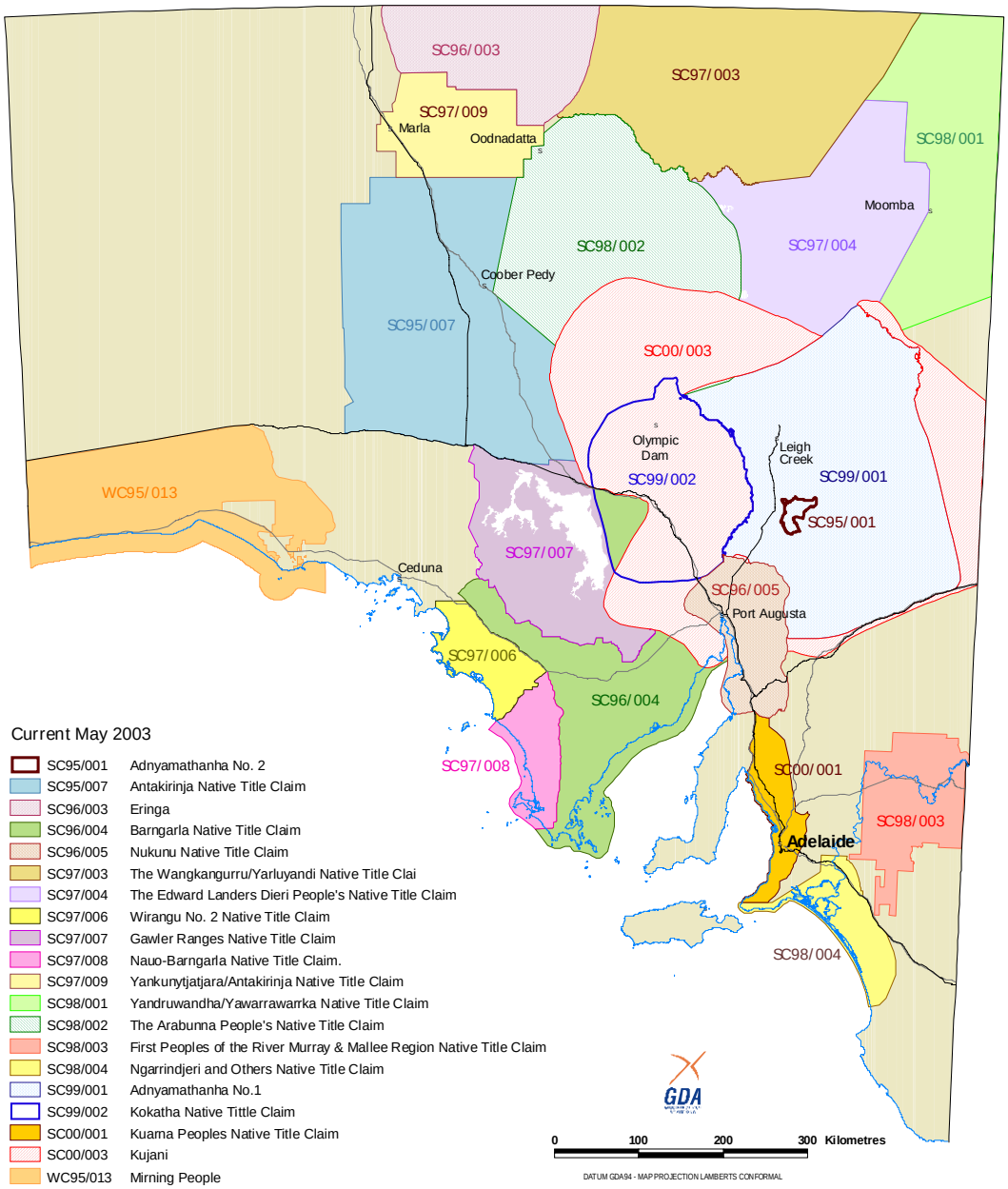


Figure 2. Native Tittle Claimant Boundaries

Notes from discussions with Rob Larkins and Laura Johnstone

- Need to do a heritage clearance to cover ourselves from any future possible repercussions.
- Personally speak to traditional owners, explaining our proposed work program to see if they want to do a clearance.
- Send notice of entry to land owners in conjunction with above.
- Contact DOSA to check the register of sites

TO DO

- Send letter to DOSA to check register
  Attn: Helen Cook
- Vehicle Permits: http://www.transport.sa.gov.au/permits/heavy_vehicle/index.asp
- Notice of entry to land owners

APPENDIX “K”

ARAM24 SEG-Y tape format

ARAM24

SEISMIC ACQUISITION SYSTEM

SEG-Y Tape Format

Introduction

The ***ARAM24*** **Seismic Acquisition System** supports the **SEG-Y** digital tape format.

The information in the tape headers is valuable for validation and quality control when tapes are sent to a processing center.

SEG-Y Tape Format

The **SEG-Y** format used for the seismic data is **32 Bit IBM Floating Point**.

There are three **SEG-Y** headers in the ***ARAM24*** software and they are:

(1) 3200 Byte Header

A character header displays the details of the seismic acquisition system hardware and the common parameters for acquisition of the seismic data as **EBCDIC** data. This character header is located at the beginning of each tape.

(2) 400 Byte Header

A binary header displays the recording parameters for the energy source point location and receiver flags as 16 bit and 32 bit unsigned binary data. This binary header is located after the character header at the beginning of each tape.

(3) 240 Trace Header

A trace header displays the geophone location and acquisition parameters that may change for each trace. This trace header is prefixed to each trace in a seismic data file.

All header information is entered during the creation of a seismic acquisition project. The ARAM24 Software requires the operator to fill in header information during project creation, which is subsequently used for all header types. Details of the **SEG-Y** tape format and headers are described on the following pages.

Abbreviations:

BOT	**Beginning of Tape Mark**
EOF	**End Of File Mark**
EOT	**End of Tape Mark**
IBG	**Inter Block Gap**

For additional details on **SEG-Y** tape header formats refer to **Geophysics, Volume 40, Number 2, April 1975, Pages 344 to 352.**

Figure 1: SEG-Y Tape Format

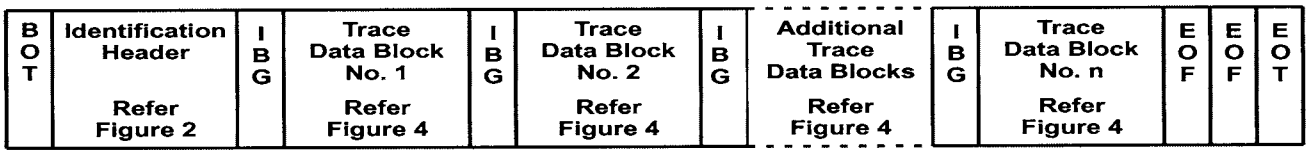


Figure 2 : SEG-Y Identification Header Format

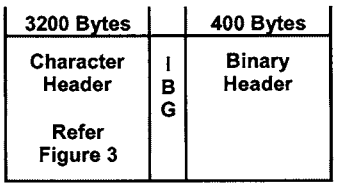


Figure 3 : SEG-Y Character Header Format

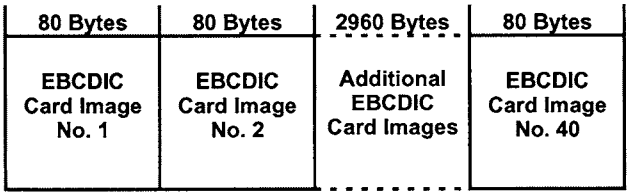
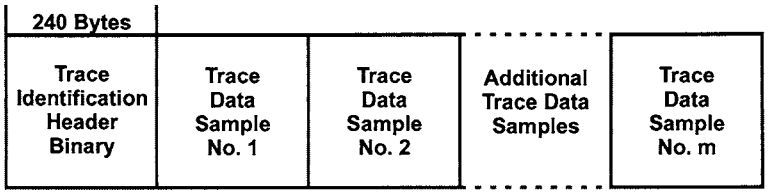
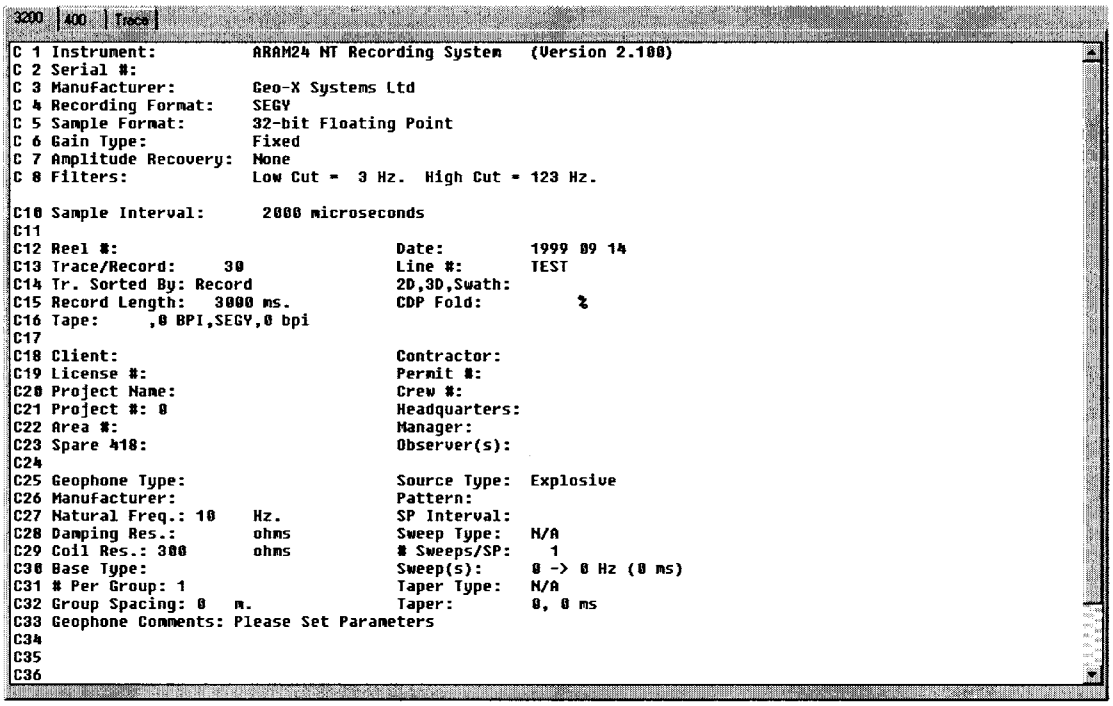


Figure 4 : SEG-Y Trace Data Block Format



SEG-Y 3200 Byte Character Header

The **SEG-Y 3200** byte character header is recorded in **EBCDIC** format as **40** lines of **80** characters. The following information describes what the 3200 Byte Header consists of.



Instrument

ARAM24 **Seismic Acquisition System**, is the name of the instruments.

Serial Number

The serial number of the *ARAM24* **Seismic Acquisition System** as provided by the manufacturer, **Geo-X Systems Ltd.**

Manufacturer

Geo-X Systems Ltd., is the name of the manufacturer of the *ARAM24* **Seismic Acquisition System**.

Recording Format

The recording format for configuring the seismic data this format is designated as a **SEG-Y** format.

Sample Format

The sample format is **32 Bit IBM Floating Point**.

Gain Type

The type of gain used to acquire seismic data, which is **Fixed**.

Amplitude Recovery

The amplitude recovery process used to acquire the seismic data, there is no amplitude recovery process used with the ARAM24 and this is displayed as **None**.

Filter - Low Cut

The low cut filter frequency in Hertz used to acquire the seismic data.

Filter - High Cut

The high cut filter frequency in Hertz used to acquire the seismic data, the high cut filter frequency is variable and is dependent on the frequency selection made.

Start Time Delay

The start time delay is the amount of time in milliseconds between the start signal, which begins the acquisition cycle, and the time break signal, which starts the acquisition of seismic data.

Sample Interval

The sample interval time in microseconds used to acquire the seismic data.

Reel Number

This item refers to the digital tape reel number where the seismic data is stored which is a numeric number.

Trace / Record

The number of traces that are recorded for a seismic data file, this includes: data traces, dummy traces, and zero traces.

Trace Sorted By

The traces are sorted within each seismic data file, there is no other trace sorting options used and this is displayed as **Record**.

Record Length

The length of time in microseconds that the seismic data is acquired.

Density

The digital tape recording density in bits per inch used for storage of the seismic data, the density is dependent on the tape drive format. This item is not used in the ***ARAM24*** software program.

Client

The company name of the Client who is usually the financial sponsor for the project.

License Number

The license number authorizes the Client to carry out the seismic project, the license number is usually assigned by a statutory authority and provided to the Contractor by the Client.

Project Name

The name assigned to the seismic project. The name is assigned by the Client, and usually relates to the Client's name and / or the location of the seismic project.

Project Number

The project number assigned to the seismic project by the Client.

Area Number

A location number of the area where the seismic project is carried out usually assigned by the Client.

Legal Description

The legal survey coordinates defining the location of the project, generally provided by the Client.

Geophone Type

The geophone Manufacturer's model number of the geophone elements used for the seismic project.

Manufacturer

The company name of the geophone Manufacturer.

Natural Frequency

The natural resonant frequency in Hertz of the geophone elements, this information is obtained from the geophone manufacturers specifications sheet.

Damping Resistance

The damping resistance in ohms, that is terminated on the geophone elements. The resistance dampens the movement of the geophone coil and reduces random background signal noise.

Coil Resistance

The geophone element coil resistance in ohms, this information is obtained from the geophone manufacturers specifications sheet.

Base Type

The type of base used on the geophone cases for planting in or on the ground, variations in ground conditions such as rock, dry dirt, sand, snow, marsh, and water will determine the type of base used. Typical bases include spikes or plates of various lengths, diameters and construction shape.

Number Per Group

The number of geophone elements connected together for each geophone group. In some cases more than one geophone string is connected together to make a group. This information is usually included in the seismic project specifications.

Group Spacing

The total distance in meters or feet between each geophone group.

Pattern

The geophone group pattern used for planting the geophone elements on the ground. The pattern will usually be in a line at right angles to the receiver line. Other configurations may be used such as a line parallel to the receiver line, a star, a block, or a single location pattern.

Date

The date the seismic data is acquired, the date is displayed as year / month / day of month.

Line Name

The receiver line name or names corresponding to the acquired seismic data.

2-D, 3-D, Swath

The type of pattern used for the acquisition of the seismic data (2-D, 3-D or Swath).

CDP Fold

The percentage CDP fold used for the acquisition of the seismic data, this information is usually included in the seismic project specifications.

Contractor

The company name of the seismic contractor doing the seismic project.

Permit Number

The permit number assigned by a statutory authority and / or Client to authorize the Contractor to operate in the project area.

Crew Number

The seismic Contractor's crew number assigned to the seismic project.

Headquarters

The location of the headquarters of the seismic Contractor assigned to carry out the seismic project.

Manager

The name of the seismic Contractor's Manager assigned to the seismic project.

Observer(s)

The name or names of the seismic Contractor's Observer(s) assigned to the seismic project.

Source Type

The type of energy source used for the acquisition of seismic data. There are several source type options for example: Vibroseis, Explosive, Air Gun, Water Gun etc...

Pattern

The shooting pattern of the energy source.

Source Point Interval

The total distance in meters or feet between the energy source points used for the seismic acquisition.

Sweep Type

The type of sweep curve used to acquire the seismic data, there are several sweep type options: Not Applicable, Linear, Parabolic, Exponential or Other.

Number Of Sweeps / Source Point

The number of sweeps used for each source point, the number of sweeps is dependent on the parameter selections made in the 'Record' menu see Chapter 8 of the Software Manual.

Sweep(s)

Enter the sweep file name and parameters used for the acquisition of seismic data.

Comments

Enter general information relevant to the seismic project, this may include such things as special settings, variables, and other factors that may affect the acquisition of the seismic data.

SEG-Y 400 Byte Binary Header

The **SEG-Y 400** byte header is recorded in binary format. The binary tape header displays the recording parameters for the energy source point and receiver flag locations as 16 bit and 32 bit unsigned binary data. This binary header is located at the beginning of each tape following the character header.

Four byte locations are in the form of 32 bit integer data, two byte locations are in the form of 16 bit integer data while all other byte locations are zero.

The figure below displays the byte locations and the descriptions of the **SEG-Y 400 Byte Binary Header**.

Figure : SEG-Y 400 Byte Binary Header

Byte Locations	Description
1 to 4	Job Identification Number.
5 to 8	Undefined.
9 to 12	Reel Number.
13 to 14	Number of Data Traces per Record including Dummy and Zero Traces.
15 to 16	Number of Auxiliary Traces per Record.
17 to 18	Sample Interval in Microseconds for this File.
19 to 20	Undefined.
21 to 22	Number of Samples per Data Trace for this File.
23 to 24	Undefined.
25 to 26	Data Sample Format Code 1 = 32 Bit IBM Floating Point (4 bytes) 2 = 32 Bit Fixed Point (4 bytes) 3 = 16 Bit Fixed Point (2 bytes) 4 = 32 Bit Fixed Point with Gain Code (4 bytes)
27 to 30	Undefined
31 to 32	Number of Composites Code 1 = No Sum 2 = 2 Sums etc.
33 to 34	Sweep Frequency at Start
35 to 36	Sweep Frequency at End
37 to 38	Sweep Length in Milliseconds
39 to 40	Sweep Type Code 0 = Not Applicable 1 = Linear 2 = Parabolic 3 = Exponential 4 = Other
41 to 42	Undefined
43 to 44	Sweep Trace Taper Length at Start
45 to 46	Sweep Trace Taper Length at End
47 to 48	Sweep Taper Type Code 0 = Not Applicable 1 = Linear 2 = COS Squared 3 = Other
49 to 50	Correlated Data Traces Code 1 = No 2 = Yes
51 to 54	Undefined
55 to 56	Measurement System Code 0 = Not Applicable 1 = Meters 2 = Feet

57 to 58	Impulse Signal Code 0 = Not Applicable 1 = Increase in pressure or upward geophone case movement gives negative number on tape 2 = Increase in pressure or upward geophone case movement gives positive number on tape
59 to 60	Vibratory Polarity Code 0 = Not Applicable 1 = Seismic Signal lags Pilot Sweep by 337.5 ° to 22.5 ° 2 = Seismic Signal lags Pilot Sweep by 22.5 ° to 67.5 ° 3 = Seismic Signal lags Pilot Sweep by 67.5 ° to 112.5 ° 4 = Seismic Signal lags Pilot Sweep by 112.5 ° to 157.5 ° 5 = Seismic Signal lags Pilot Sweep by 157.5 ° to 202.5 ° 6 = Seismic Signal lags Pilot Sweep by 202.5 ° to 247.5 ° 7 = Seismic Signal lags Pilot Sweep by 247.5 ° to 292.5 ° 8 = Seismic Signal lags Pilot Sweep by 292.5 ° to 337.5 °

Job ID (Byte Location 1 to 4)

Refer to the project specifications for the identification number assigned to the project, then enter it in this field.

Line # (Byte Location 5 to 8)

Enter the number of the first receiver line being recorded on the project.

Reel # (Byte Location 9 to 12)

This read-only field, which is entered automatically by the system, lists the tape identification number that is assigned before data is written to a blank tape.

Traces/Record (Byte Location 13 to 14)

The number of traces that are recorded for a seismic data file, this number will include data traces, dummies and zero traces.

Auxiliary Traces/Record (Byte Locations 15 to 16)

Use this field to indicate how many auxiliary traces are being recorded to tape with the seismic data.

Sample Interval (Byte Locations 17 to 18)

The sample interval time in microseconds used to acquire the seismic data. The sample interval is dependent on the parameter selections made in the 'Record' menu see Chapter 8 of the ARAM24 Software Manual.

Original Sample Interval (Byte Location 19 to 20)

The sample rate that data was originally recorded at.

Sample/ Trace (Byte Location 21 to 22)

The number of samples per trace used to acquire the seismic data.

Original Samples/Trace (Byte Location 23 to 24)

Definition

Data Format (Byte Location 25 to 26)

The data sample format code:
(1) = 32 Bit IBM Floating Point (4 Bytes)
(2) = 32 Bit Fixed Point (4 Bytes)
(3) = 16 Bit Fixed Point (2 Bytes)
(4) = 32 Bit Fixed Point with Gain Code (4 Bytes)

Correlated

Refer to the project specifications to verify whether or not data copied to the tape will be correlated. Upon moving the cursor onto this field an option menu appears. Use it to choose the desired correlation option.

CDP Fold

Refer to the project specifications to verify the fold percentage required for the project, then enter it in this field.

Sorting

Refer to the project specifications to verify how project data will be sorted. Upon moving the cursor onto this field, the 'Sorting' menu appears.

No. of Composites (Byte Location 31 to 32)

This field displays the number of sweeps (composites) per shot record.
(1) = No sum
(2) = 2 Sums
(3) = 3 Sums Etc.

Sweep Frequency Start (Byte Location 33 to 34)

The lowest frequency used for the acquisition of a reference sweep.

Sweep Frequency End (Byte Location 35 to 36)

The highest frequency used for the acquisition of a reference sweep.

Sweep Length (Byte Location 37 to 38)

The length in milliseconds of the sweep used to acquire the seismic data.

Sweep Type (Byte Locations 39 to 40)

The type of sweep curve used to acquire the seismic data, there are several sweep type options.

0 = Not Applicable

1 = Linear

2 = Parabolic

3 = Exponential

4 = Other

Undefined (Byte Location 41 to 42)

These byte locations are vacant and are not used.

Sweep Start Taper (Byte Location 43 to 44)

The sweep start taper time in milliseconds used for the sweep.

Sweep End Taper (Byte Location 45 to 46)

The sweep end taper time in milliseconds used for the sweep.

Sweep Taper Type (Byte Location 47 to 48)

The code for the type of taper used for the sweep, there are several sweep taper type options:

0 = Not Applicable

1 = Linear

2 = Cos Squared

3 = Other

Correlation (Byte Location 49 to 50)

The code for correlation either **ON** or **OFF**.

1 = No Correlation

2 = Yes Correlation

Undefined (Byte Location 51 to 54)

These byte locations are vacant and are not used.

Distance Measurement Units (Byte Location 55 to 56)

Use this menu to define whether metric or imperial units of measure were used to lay out the project recorded on the tape.

0 = Not Applicable

1 = Meters

2 = Feet

Impulse Signal (Byte Location 57 to 58)

The code for the source impulse signal options.

0 = Not Applicable

1 = Increase in pressure or upward geophone case movement gives a negative polarity data signal.

2 = Increase in pressure or upward geophone case movement gives a positive polarity data signal.

Signal Lag (Byte Location 59 to 60)

The phase by which the seismic data signal is lagging the source impulse.

0 = Not Applicable

1 = Seismic signal lags pilot sweep by 337.5 to 22.5 degrees.

2 = Seismic signal lags pilot sweep by 22.5 to 67.5 degrees.

3 = Seismic signal lags pilot sweep by 67.5 to 112.5 degrees.

4 = Seismic signal lags pilot sweep by 112.5 to 157.5 degrees.

5 = Seismic signal lags pilot sweep by 157.5 to 202.5 degrees.

6 = Seismic signal lags pilot sweep by 202.5 to 247.5 degrees.

7 = Seismic signal lags pilot sweep by 247.5 to 292.5 degrees.

8 = Seismic signal lags pilot sweep by 292.5 to 337.5 degrees.

SEG-Y Trace Header

The **SEG-Y** trace header used in the ***ARAM24*** **Seismic Acquisition System** is a **240**-byte header. A trace header is prefixed to the beginning of each trace. Four byte locations are in the form of 32 bit integer data, two byte locations are in the form of 16 bit integer data while all other byte locations are zero.

The figure below displays the byte locations and the descriptions of the **SEG-Y Trace Header**.

Byte Locations	Description
1 to 4	Trace Sequence Number within Project
5 to 8	Trace Sequence Number within Reel
9 to 12	File Number
13 to 16	Trace Number within File
17 to 20	Current Source Point
21 to 28	Undefined
29 to 30	Trace Identification Code 1 = Seismic Data 2 = Dead 3 = Dummy
31 to 32	Number of Composites
33 to 34	Number of Horizontally Summed Traces Yielding this Trace
35 to 36	Data Use Code 1 = Production 2 = Test
37 to 114	Undefined
115 to 116	Number of Samples in this Trace
117 to 118	Sample Interval in Microseconds for this Trace
119 to 124	Undefined
125 to 126	Correlated Data Traces Code 1 = No 2 = Yes
127 to 156	Undefined
157 to 158	Year Data Recorded
159 to 160	Day of Year
161 to 162	Hour of Day
163 to 164	Minute of Hour
165 to 166	Second of Minute
167 to 168	Time Base Code 1 = Local
169 to 180	Undefined
181 to 184	Receiver Flag Number
185 to 186	Port
187 to 188	Channel
189 to 202	Source Line Name
203 to 204	RAM Serial Number
209 to 222	Receiver Line Name
223 to 240	Undefined

Trace Sequence In Project (Byte Location 1 to 4)

Each trace in the seismic project is assigned a sequential number.

Trace Sequence In Reel (Byte Location 5 to 8)

Each trace on a digital tape reel is assigned a sequential number.

File Number (Byte Location 9 to 12)

The seismic data file number where the trace is located.

Trace Number In File (Byte locations 13 to 16)

Each trace in a seismic data file is assigned a sequential number.

Current Source Point (Byte Location 17 to 20)

The current source point number used to acquire the seismic data trace.

Undefined (Byte Locations 21 to 28)

These byte locations are vacant and are not used.

Trace Identification Code (Byte Location 29 to 30)

The code for the type of data information contained within the trace.

1 = Seismic Data Trace

2 = Dead Trace

3 = Dummy Trace

9 = Auxiliary Trace

Number Of Composites (Byte Location 31 to 32)

The number of sweeps or source impulses that are summed together for the given source point and used to generate the trace.

Summed Traces (Byte Location 33 to 34)

The number of horizontally summed traces used to generate the trace.

Data Use Code (Byte Location 35 to 36)

The code defining the type of seismic data file where the trace is located.

1 = Production

2 = Test

Undefined (Byte Location 37 to 114)

These byte locations are vacant and are not used.

Samples In Trace (Byte Location 115 to 116)

The number of data samples in the trace.

Sample Interval Of Trace (Byte location 117 to 118)

The sample interval in microseconds for the seismic data in the trace.

Undefined (Byte Location 119 to 124)

These byte locations are vacant and are not used.

Correlated Data Traces (Byte Location 125 to 126)

The code for correlated data trace **ON** or **OFF** option.

1 = No Correlation

2 = Yes Correlation

Undefined (127 to 156)

These byte locations are vacant and are not used.

Year (Byte Locations157 to 158)

The year that the seismic data trace is acquired.

Day (Byte Locations 159 to 160)

The day of the year that the seismic data trace is acquired.

Hour (Byte Location 161 to 162)

The hour of the day that the seismic data trace is acquired.

Minute (Byte Location 163 to 164)

The minute of the hour that the seismic data trace is acquired.

Second (Byte Location 165 to 166)

The second of the minute that the seismic data trace is acquired.

Time Zone (Byte Location 167 to 168)

The code for the time zone where the seismic data trace is acquired.

1 = Local Time

Undefined (Byte Location 169 to 180)

These byte locations are vacant and are not used.

Receiver Flag (Byte Location 181 to 184)

The receiver flag number used to acquire the seismic data trace.

Port (Byte Location 185 to 186)

The input **Port** number used to carry the seismic data trace to the **Central Equipment**.

In the ***ARAM24* Seismic Acquisition System** this will correspond to an **"LIU" Line Interface Unit** number.

System Channel (Byte Location 187 to 188)

The system channel number that corresponds to the receiver flag used to acquire the seismic data trace.

Source Line (Byte Location 189 to 202)

The source line name where the current source point is located that is used to acquire the seismic data trace.

Ram Serial Number (Byte Location 203 to 204)

The serial number of the RAM used to acquire that particular trace.

Receiver Line (Byte Location 209 to 222)

The receiver line name where the receiver flag is located that is used to acquire the seismic data trace.

Undefined (Byte Location 229 to 240)

These byte locations are vacant and are not used.

APPENDIX “L”

DSS survey report 03034(b)

Dynamic Satellite Surveys

03034 (b)

Final Operations Report

on the

2003 Curnamona Seismic Survey

for

TRACE ENERGY SERVICES Pty Ltd and GEOSCIENCE AUSTRALIA

July/August 2003

The Director
Dynamic Satellite Surveys Pty Ltd
PO Box 713
Yeppoon QLD 4703
Telephone: 07 4939 2866
International: +61 7 4939 2866.
Facsimile: 07 4939 2867
E-mail: yeppoon@dss.com.au

Table of Contents

1

INTRODUCTION

The following report covers the **2003 Curnamona 2D Seismic Survey**, performed by **Dynamic Satellite Surveys Pty Ltd** (DSS) whilst contracted to **Trace Energy Services Pty Ltd** for **Geoscience Australia**.

The survey operation was conducted near Honeymoon Mine, SA, approximately 80kms north west of Broken Hill.

A 2D seismic line totalling **88.8 kilometres** in length was surveyed at a 40m station intervals. The line is summarised below.

LINE	START	END	DISTANCE
03GA-CU1	1000	3220	88.8kms

The survey operations commenced on 5th August and were completed on 15th August, 2003 when the project was shut down due to wet weather.

2

INSTRUMENTATION AND PERSONNEL

2.1 Personnel and Logistics

DSS personnel involved in the survey were as follows.

Lynne Baker (Senior Surveyor)	-	Bachelor of Engineering - (Geomatic) UNSW
Andrew Gibb (Surveyor)	-	Bachelor of Geomatics (Surveying) - Melbourne University
Mark Lefebvre (Surveyor)	-	Bachelor of Applied Science (Surveying) - M.I.S.

Personnel and equipment logistics were supported by the DSS Yeppoon office.

Survey operations were based at the Honeymoon Mine Camp situated towards the eastern end of the seismic line.

2.2 Equipment

Equipment provided by DSS and used on this project.

	Description	Qty
Vehicles	Toyota Landcruiser Trayback - Hired	2
GPS receivers	NovAtel RT20 c/w VHF Telemetry	3
	NovAtel Millenium Dual Frequency	1
Computers	Dell Inspiron 5000	1
	GRiD 386 Field PCs	3
	Compaq iPAC Pocket PC	1
Software	GravNav / GravNet GPS post-processing - Waypoint Consultancy	1
	Nav98 field software - DSS	Ver4.0
	MIB2001 for Windows - DSS	Ver4.0.3
	TransIt 2000 - DSS	Ver2.04
Gravity Meter	Scintrex CG-3 Automated Gravity Meter	1
Satellite Telephone	Motorola Iridium - With Data Connections.	1
Printer	Canon S100SP	1
Miscellaneous	Necessary standard surveying equipment	
	Sundry office and transport equipment	
	Field and Office Consumables	

3

SURVEY REFERENCE SYSTEMS

3.1 Geodetic Datum

The Geocentric Datum of Australia 1994 (GDA94) is based on the Geodetic Reference System 1980 (GRS80) model described by the following parameters.

Datum:	GDA94 (Geocentric Datum of Australia 1994)
Spheroid:	GRS 1980
Reference Frame:	ITRF92(International Terrestrial Reference Frame)
Semi-Major Axis Length:	6 378 137.0
Inverse Flattening:	298.257222101
The Unit of Measure:	International Metre

3.2 Map Projection

Final rectangular coordinates were based on the Map Grid of Australia (MGA). Parameters for this projection are as follows.

Projection:	Universal Transverse Mercator (UTM) Zone 54
Latitude of Origin:	0°
Central Meridian (CM):	141° E
Scale Factor at CM:	0.9996
False Easting:	500 000
False Northing:	10 000 000
The Unit of Measure:	International Metre

3.3 Height Datum

All elevations obtained relative to WGS 84 have been reduced to the Australian Height Datum (AHD) using the AUSGEOID98 Geoid - Spheroid separation model to determine the geoid-ellipsoid separation (N) for the particular area.

GPS observations are made on the WGS84 datum. The height associated with this datum is an ellipsoidal height (h). The Australian Height Datum (AHD), the height datum associated with MGA94, is an orthometric height which is measured as the height above mean sea level, or the geoid (h).

The function that defines the relationship between the ellipsoid and orthometric heights is:

H = h - N

Or

AHD = WGS84 - Geoid-Ellipsoid Separation.

AUSGEOID98 is the third in a series of national geoid models produced for Australia by the Australian Surveying and Land Information Group (AUSLIG). The geoid-ellipsoid data is prepared for the Australian region from:

- EGM96 Global Geopotential Model;
- 1996 Australian Gravity DataBase, from the Australian Geological Survey Organisation (AGSO);
- AUSLIG / AGSO GEODATA nine-second digital elevation model;
- Satellite altimeter - derived free air gravity anomalies offshore;
- Theories, techniques and software developed by Associate Professor Will Featherstone, Curtin University of Technology[1].

AUSGEOID98 N values were obtained using the GrafNet Version 6.03 software, distributed by Waypoint. Consulting Inc.

[1] Johnston, G.M., Featherstone, W.E. (1998) AUSGEOID98: A New Gravimetric Model for Australia

4

SURVEY CONTROL

In 1996 DSS conducted an extensive gravity survey in the area and as part of that project a zero order control network was observed. Gravity was also observed at these points. These marks have since been re-adjusted to MGA94 coordinates to 1st Order. Three of the survey marks were used on this project as control stations. Initially the horizontal coordinates were converted from AMG84 to MGA94 using "GDAy" version 2.0 (Roger Fraser) software but later in the Yeppoon office the government coordinates were obtained.

All new stations were connected with static GPS observations and two stations were also observed for at least four hours in order to compute an AUSPOS[2] position to use as control checks. A listing of all new stations is located in **Appendix A - Survey Control**.

Initially a mark from the 1996 survey, 7034/1049, was held fixed in the network adjustment. This station has the following MGA (zone 54) and AHD coordinates:

Station	Easting	Northing	Height	Comments
7034/1049	488345.103	6489223.097	114.071	Hz 1st, Vt 4th Order

[2] AUSPOS - Geoscience Australia at website: http://www.ga.gov.au/bin/gps.pl

Checks were made to an AUSPOS mark, two other 1996 marks and an old permanent marker from a 1996 seismic survey. These checks yielded the following miscloses:

Station	Easting	Northing	Elevation	Comments
7034/1048	455289.383	6488463.282	119.623	Hz Zero, Vert 4th Order
	455289.427	6488463.284	119.645	Static tie
	0.044	0.002	0.022	
6934/1066	412415.732	6495791.489	122.040	Hz Zero, Vert 4th Order
	412415.881	6495791.493	121.938	Static tie
	0.149	0.004	-0.102	
BAS13	436298.111	6489011.063	136.741	AUSPOS
	436298.173	6489011.077	136.773	Static tie
	0.062	0.014	0.032	
96AGS-BH1	500232.4	6488335.1	135.5	DSS 96-22 Converted
Stn 100	500231.9	6488335.5	135.0	RT20 tie
	-0.5	0.4	-0.5	

The miscloses are relatively small given the large distances over which the observations were made. The local height control fits together well and the heights agree with the AUSPOS result. In the final network adjustment the local control points were held fixed in both horizontal and vertical components. Coordinates for the new base stations can be found in **Appendix A: Survey Control** and diagrams for the points can be found in **Appendix C: Control Station Diagrams**.

5

MONUMENTATION

The line was pegged at a 40 metre station interval.

Every fifth station was marked with a numbered, white, wooden peg. The stations in between were marked with pinflags with even numbered stations being pink and odd stations being blue.

Although permanent markers were not required, in order to propagate control throughout the area, four new permanent marks were placed. These new stations and existing stations are listed with their coordinates in **Appendix A - Survey Control.**

Permanent markers consist of a 1650mm steel star picket driven to approximately 1.2 metres, and tagged with an aluminium plate stating the base number, line and station number.

6

METHOD OF SURVEY

6.1 Surveying and Chaining

The lines were surveyed using DSS' RT20 real-time kinematic surveying technique. Every tenth station (gravity point) was observed using the kinematic surveying technique.

RT20 enables both position and elevation coordinates to be acquired in real-time and on the appropriate datum while the kinematic method requires post-processing of the GPS data.

The survey methods utilised phase data received from US Navy NAVSTAR Satellites to provide three-dimensional positioning. One receiver was set up as a base station at a known location while another receiver was used as a remote rover.

To obtain real-time capabilities VHF telemetry is required between the base and the remote GPS receiver. Numerous remote receivers can be used at any given time with any base station.

NovAtel real-time kinematic can achieve accuracies of better than ±0.3m in position and elevation, depending on base line length. The expected precision for locating pegged positions is better than 0.3 metres and is generally better than 0.2 metres.

The kinematic method, whilst being more time consuming in the field and office, can achieve a higher accuracy of ±0.1 in position and elevation. Most observations show standard deviations of 0.05m or better.

Initialisation of the RT20 rover GPS usually takes as little as 2-3 minutes, although this is greatly dependant on satellite geometry, availability and base line length.

For the kinematic method initialisation took 10 minutes at the start of each day.

6.2 GPS Processing and Quality Control

When using RT20 and kinematic, all data is recorded internally in GRiD palmtop data loggers and downloaded to the office computer each evening.

Any recording of positions when the values are in excess of 0.3m is highlighted to the surveyor at time of recording, and the GPS may be re-initialised until a more accurate solution is calculated.

Quality of the satellite data is monitored by careful examination of the various on-screen quality control statistics produced by DSS' software.

These checks on data integrity are in the form of standard deviation (or sigma) values for Easting, Northing and Height and are generally better than 0.2 metres.

Any position which falls outside the required tolerances is flagged for further investigation and re-recorded if necessary.

Numerous checks on pre-recorded marks were observed during each days survey. These observations confirm the integrity of the GPS base receiver and the placed markers.

The coordinates are then checked by determining point to point direction and distance.

Profile plots are examined to identify any height anomalies.

All final survey data was presented in MGA, GDA and AHD coordinates.

The post-processing of the kinematic and static observations was done using "Grafnet" and "Grafnav" software from Waypoint Consulting, Canada. Standard deviations for each point were determined by the software and checked by the surveyor. Final positional data for the gravity points was presented in MGA, GDA and AHD coordinates.

6.3 Gravity observations

Gravity was observed at every 10th station (400m apart) using a Scintrex CG-3 automated gravity meter. Two readings of 40 seconds were observed on each point.

At the beginning and end of each day gravity was observed at the nearest gravity base station. Three of the survey control marks were gravity bases. These marks had concrete plates next to them where accurate gravity values had been assigned in a 1996 gravity survey.

Station	MGA Zone 54 (GDA94)*		AHD	Isogal65
	Easting	Northing	Elevation	Gravity
7034/1048	455289.38	6488463.28	119.62	979438.613
7034/1049	488345.10	6489223.10	114.07	979438.580
6934/1066	412415.73	6495791.49	122.04	979426.238

*MGA values were converted from AMG values using "GDAy" version 2.0 (Roger Fraser) software.

Six hour loops were observed usually beginning from the GPS base station being used each day. Ten percent of points were repeated and there was at least one node point common between loops. These conditions were specified by the client and adhered to.

As the gravity meter took readings the standard deviations were monitored. Whenever the standard deviation rose above 0.1 dial units, the reading was stopped and started again. When two consecutive readings disagreed by 0.05 dial units or more, a third reading was taken.

The gravity values were recorded internally in the gravity meter as well as hand recorded. The data was downloaded to the office computer each night and any bad recordings were edited.

The gravity data along with positional data was then given to Andrew Shearer (PIRSA) for processing.

7

DATA PRESENTATION

All line files were checked for data integrity before the survey crew demobilised from Honeymoon Mine.

All final data was in UTM grid coordinate format in the MGA projection on the GDA94 reference spheroid and GDA94 latitudes and longitudes. All elevations were on the Australian Height Datum (AHD).

Files produced were:

03GA-CU1.int	Line data for all stations in MGA94 coordinates
03GA-CU1.seg	Line data in SegP1 format
03GA-CU1.uka	Line data in UK00A format
Curnamona.pms	Listing of all permanent markers placed and relevant survey marks.

All files are backed up on digital disks in the Yeppoon office for future reference.

No hard copy data was provided.

8

SAFETY

DSS personnel are aware of safety conditions concerning all exploration seismic surveys. The DSS “Quality Policy Statement” and “Health, Safety and Environment Policy” were adhered to at all times.

Each vehicle was fitted with a UHF, shovel, fire extinguisher, first-aid kit, vehicle recovery equipment, satellite or CDMA phone and weekly vehicle maintenance check lists.

The main safety hazards on the job were:

- ★ Kangaroos and emus on the tracks
- ★ Dust on the tracks causing low visibility
- ★ Wet, slippery tracks
- ★ Isolation

The survey was accident and incident free.

9

CHRONOLOGICAL SUMMARY

DATE	DESCRIPTION
4th August	Lynne Baker and Andrew Gibb mobilised from Roxby Downs to Honeymoon Mine Camp with Andrew Shearer (PIRSA). Mark Lefebvre mobilised from Melbourne to Broken Hill.
5th August	Created N-value files, assembled control information. Mark Lefebvre mobilised from Broken Hill to Honeymoon Mine Camp arriving 9:00am. Survey: 03GA-CU1 13.20 km **Survey Total: 13.20 km** Gravity: 03GA-CU1 12.00 km **Gravity total: 12.00 km** New base, "HONEY", established.
6th August	Survey: 03GA-CU1 23.60 km **Survey Total: 36.80 km** Gravity: 03GA-CU1 17.60 km **Gravity total: 29.60 km**
7th August	Survey: 03GA-CU1 22.00 km **Survey Total: 58.80 km** Gravity: 03GA-CU1 25.20 km **Gravity total: 54.80 km** New base, "BAS13", established.
8th August	Survey: 03GA-CU1 26.00 km **Survey Total: 84.80 km** Gravity: 03GA-CU1 24.00 km **Gravity total: 78.80 km**
9th August	Survey: Only control observed **Survey Total: 84.80 km** Gravity: 03GA-CU1 6.00 km **Gravity total: 84.80 km** Bases HONEY, BAS13, BAS14, BAS15 tied in to local control. Mark demobilised to another job at Innaminka.

DATE	DESCRIPTION	
10th August	Survey: 03GA-CU1 4.00 km	**Survey Total: 88.80 km**
	Gravity: 03GA-CU1 4.00 km	**Gravity total: 88.80 km**
		Total Number of Gravity Points = 223
	Stopped survey at 12:00 noon due to rain. It took 2 hours (as opposed to 1 hour) to get back to camp due to the wet, very slippery tracks.	
	3 hours standby due to rain.	**Total Standby = 3 hours**
11th August	Survey: Standby	**Survey Total: 88.80 km**
	Gravity: Standby	**Gravity total: 88.80 km**
		Total Number of Gravity Points = 223
	10 hours standby due to rain.	**Total Standby = 13 hours**
12th August	Survey: Re-observed one kinematic run.	**Survey Total: 88.80 km**
	Gravity: Standby	**Gravity total: 88.80 km**
		Total Number of Gravity Points = 223
	6 hours standby due to rain.	**Total Standby = 19 hours**
	We were able to re-observe a kinematic run that was situated close to the camp but by the time we'd finished that it started to rain again which meant we couldn't continue survey and gravity.	
13th August	Survey: Standby	**Survey Total: 88.80 km**
	Gravity: Standby	**Gravity total: 88.80 km**
		Total Number of Gravity Points = 223
	10 hours standby due to rain.	**Total Standby = 29 hours**
14th August	Survey: Standby	**Survey Total: 88.80 km**
	Gravity: Standby	**Gravity total: 88.80 km**
		Total Number of Gravity Points = 223
	10 hours standby due to rain.	**Total Standby = 39 hours**
15th August	Crew shut down due to wet weather.	
	Lynne and Andrew demobilised to Adelaide. Washed vehicles.	
19th August	Lynne demobilised to Yeppoon.	
20th August	Report. Andrew demobilised to Melbourne.	
21st August	Report.	

10

OPERATIONAL ASPECTS

As the area was relatively flat and open we were able to receive radio signal from our base up to 12kms away. This meant that control could be spaced at 20km intervals.

Already having good control stations in the area meant that little time was spent setting up control.

One kinematic run had to be re-observed. The data from the original run seemed to look alright on the surface but it was difficult to process and gave large miscloses on the check stations. It was possibly due to a bad antenna cable on the base receiver. Unfortunately this problem could not be detected in the field - only at the processing stage. The re-observation and all other kinematic observations processed really well.

The gravity meter worked well in this area. Wind and soft ground did affect the readings on some occasions. This meant we had to shelter the gravity meter from the wind using the vehicle and ensure that the levelling legs were pressed firmly into the ground to minimise these effects.

The total length of the line was 88.8 kilometres (originally planned to be 160 kms) and it took 6 days (not including standby time) to complete the pegging and gravity, giving an average production rate of 14.8 kilometres per day. This average includes all time spent on control and travel.

The travel time was in excess of one hour for 2 of the 6 days.

The seismic line was along existing tracks which meant the line was easy to access and drive along (except when wet).

Rain eventually turned the tracks into channels and made them impossible to work on. Before demobilising all crew had to get clearance from the local police to use the roads. Clearance for light vehicles was granted at 9:00am on 15th August so our crew demobilised shortly thereafter.

11

CONCLUSIONS AND RECOMMENDATIONS

DSS' RT20 GPS real time techniques were well suited to the job. The flat and relatively open terrain meant that GPS signal was exceptional and pegging could proceed at a good rate.

Line trace diagrams were provided to main crew to aid in line traversing.

There were no safety incidents on the project.

The survey was completed in minimal time and to a high degree of accuracy.

Submitted by

Lynne Baker

12

APPENDICES

Survey Control

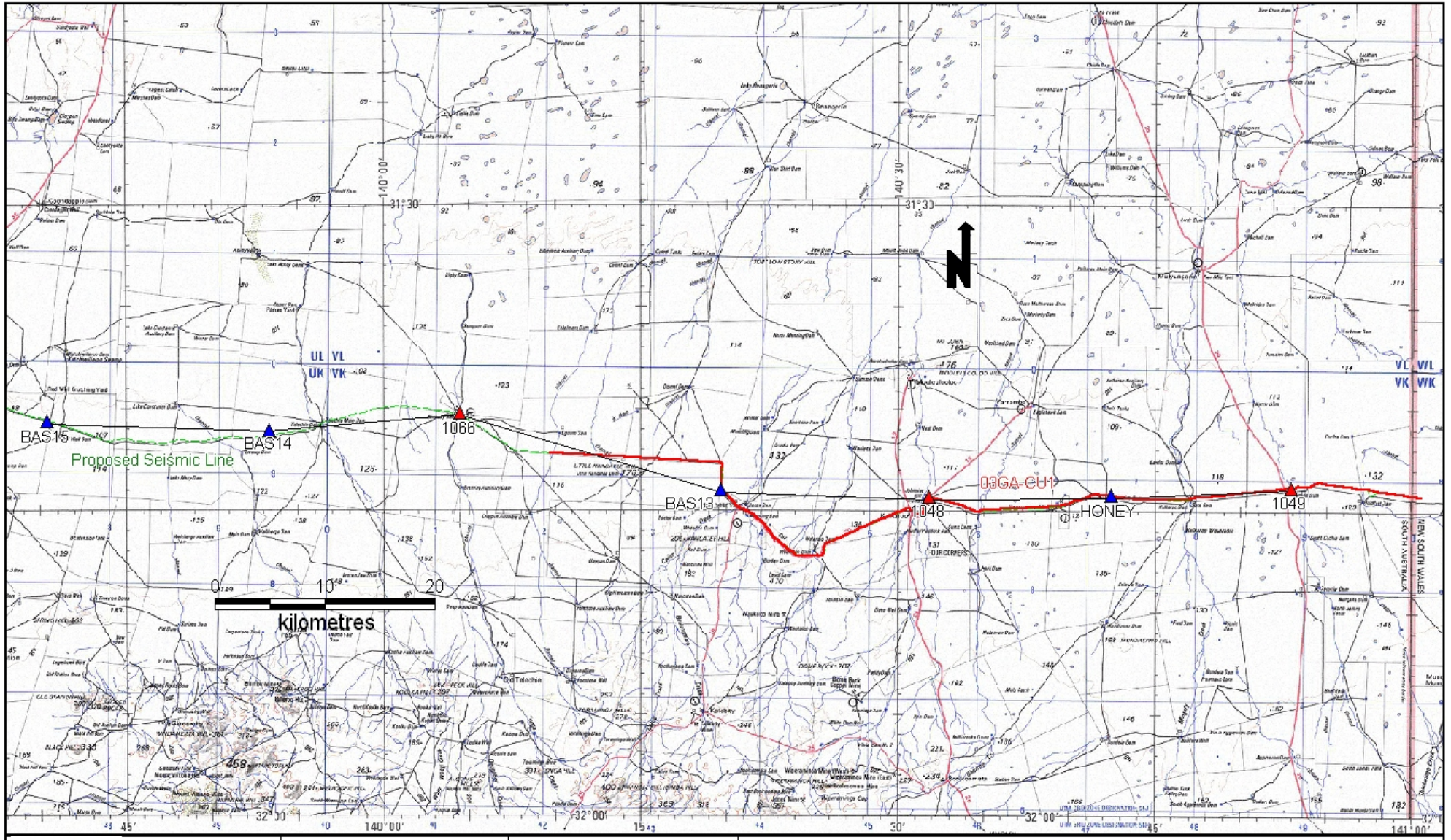
Survey Control

Revision 0, 20th August 2003
Coordinates are MGA 94 (Zone 54), Elevations are AHD

Survey Control Points / Permanent Markers

Line name	Stn	Easting	Northing	Elevation	Comments
03GA-CU1	1000	500231.9	6488335.5	135.0	SOL
03GA-CU1	1038+20	488345.103	6489223.097	114.071	7034/1049
03GA-CU1	1723+13	471869.204	6488568.042	118.994	HONEY
03GA-CU1	2150	455289.383	6488463.282	119.623	7034/1048
03GA-CU1	2761+20	436298.101	6489011.075	136.812	BAS13
03GA-CU1		412415.732	6495791.489	122.040	6934/1066
03GA-CU1		394966.560	6494063.300	111.105	BAS14
03GA-CU1		374656.447	6494647.366	101.999	BAS15

Network Diagram



Dynamic Satellite Surveys

▲ Gravity Station

▲ Control Station

——— Seismic Line

——— Control Tie

Drawn By: L. Baker

Revision: 0.0

Date: 20/08/03

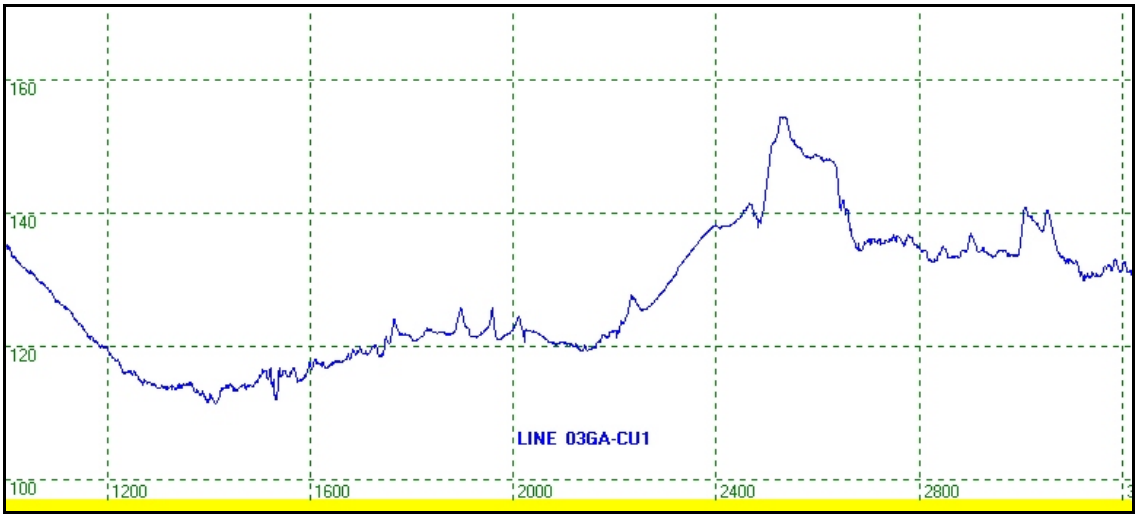
File: Curnamona.WOR

Trace Energy Services

CURNAMONA

Control Station Diagrams

Profile Plot



03GA-CU1

Photographs

Chain and Survey on line 03GA-CU1 near Kalkaroo.

GPS guidance system inside the vehicle.

RT20 tie to old PM 96AGS-BH1 STN 100 (SOL).

Honeymoon

Mine Camp - Survey H.Q.

APPENDIX “M”

DSS survey report 04049

Dynamic Satellite Surveys *04049*

Final Operations Report

on the

2004 Curnamona Seismic Survey

for

Terrex Seismic Pty Ltd and GEOSCIENCE AUSTRALIA

June/July 2004

The Director
Dynamic Satellite Surveys Pty Ltd
PO Box 713
Yeppoon QLD 4703
Telephone: 07 4939 2866
International: +61 7 4939 2866.
Facsimile: 07 4939 2867
E-mail: yeppoon@dss.com.au

Table of Contents

1

INTRODUCTION

The following report covers the **2004 Curnamona 2D Seismic Survey**, performed by **Dynamic Satellite Surveys Pty Ltd** (DSS) whilst contracted to **Terrex Seismic Pty Ltd** for **Geoscience Australia**.

The survey operation was conducted near Curnamona Station, approximately 100km north of Yunta, South Australia.

The survey was a continuation of the Curnamona 2D, 2003 (Job No. 03034) which was rained out in August 2003.

A 2D seismic line totalling **108.8 kilometres** in length was surveyed at a 40m station intervals. The line is summarised below.

LINE	START	END	DISTANCE
04GA-CU1	3220	5940	108.8 km

The survey operation commenced on the 23rd June and was completed on the 5th July.

2

INSTRUMENTATION AND PERSONNEL

2.1 Personnel and Logistics

DSS personnel involved in the survey were as follows.

Craig Davey (Senior Surveyor) - B. App Science(Surveying) - QUT

Frank Tangney (Surveyor) - Certificate Engineering Surveying - Tafe WA

Personnel and equipment logistics were supported by the DSS Yeppoon office.

Survey operations were based at Curnamona Station situated towards the western end of the seismic line.

2.2 Equipment

Equipment provided by DSS and used on this project.

	Description	Qty
Vehicles	Toyota Landcruiser Trayback - Hired	2
GPS receivers	NovAtel RT20 c/w VHF Telemetry	3
Computers	Dell Inspiron 5000	1
	GRiD 386 Field PCs	3
	Compaq iPAC Pocket PC	1
Software	GravNav / GravNet GPS post-processing - Waypoint Consultancy	1
	Nav98 field software - DSS	Ver 4.2
	MIB2001 for Windows - DSS	Ver 4.0.3
	TransIt 2000 - DSS	Ver 2.04
Gravity Meter	Scintrex CG-3 Automated Gravity Meter	1
Satellite Telephone	Motorola Iridium - With Data Connections.	1
Printer	Canon S100SP	1
Miscellaneous	Necessary standard surveying equipment	
	Sundry office and transport equipment	
	Field and Office Consumables	

3

SURVEY REFERENCE SYSTEMS

3.1 Geodetic Datum

The Geocentric Datum of Australia 1994 (GDA94) is based on the Geodetic Reference System 1980 (GRS80) model described by the following parameters.

Datum:	GDA94 (Geocentric Datum of Australia 1994)
Spheroid:	GRS 1980
Reference Frame:	ITRF92(International Terrestrial Reference Frame)
Semi-Major Axis Length:	6 378 137.0
Inverse Flattening:	298.257222101
The Unit of Measure:	International Metre

3.2 Map Projection

Final rectangular coordinates were based on the Map Grid of Australia (MGA). Parameters for this projection are as follows.

Projection:	Universal Transverse Mercator (UTM) Zone 54
Latitude of Origin:	0°
Central Meridian (CM):	141° E
Scale Factor at CM:	0.9996
False Easting:	500 000
False Northing:	10 000 000
The Unit of Measure:	International Metre

3.3 Height Datum

All elevations obtained relative to WGS 84 have been reduced to the Australian Height Datum (AHD) using the AUSGEOID98 Geoid - Spheroid separation model to determine the geoid-ellipsoid separation (N) for the particular area.

GPS observations are made on the WGS84 datum. The height associated with this datum is an ellipsoidal height (h). The Australian Height Datum (AHD), the height datum associated with MGA94, is an orthometric height which is measured as the height above mean sea level, or the geoid (H).

The function that defines the relationship between the ellipsoid and orthometric heights is:

H = h - N

Or

AHD = WGS84 - Geoid-Ellipsoid Separation.

AUSGEOID98 is the third in a series of national geoid models produced for Australia by the Australian Surveying and Land Information Group (AUSLIG). The geoid-ellipsoid data is prepared for the Australian region from:

- EGM96 Global Geopotential Model;
- 1996 Australian Gravity DataBase, from the Australian Geological Survey Organisation (AGSO);
- AUSLIG / AGSO GEODATA nine-second digital elevation model;
- Satellite altimeter - derived free air gravity anomalies offshore;
- Theories, techniques and software developed by Associate Professor Will Featherstone, Curtin University of Technology[1].

AUSGEOID98 N values were obtained using the GrafNet Version 6.03 software, distributed by Waypoint. Consulting Inc.

[1] Johnston, G.M., Featherstone, W.E. (1998) AUSGEOID98: A New Gravimetric Model for Australia

4

SURVEY CONTROL

Before the previous crew, working on the Curnamona 2D (2003), were rained out they had extended the control west past Station #3220, the eventual EOL. The existing control was utilised for both the re-surveying and surveying of 04GA-CU1.

In addition three (3) more control points, BAS 16, BAS 17 and BAS 18 were coordinated so that the line could be extended westward toward Station #5490.

Coordinates for the new and existing base stations can be found in **Appendix A - Survey Control.**

5

MONUMENTATION

The line was pegged at a 40 metre station interval.

Every fifth station was marked with a numbered, white, wooden peg. The stations in between were marked with pinflags with even numbered stations being pink and odd numbered stations being blue.

Although permanent markers were not required, in order to propagate control throughout the area, three new permanent marks were placed. These new stations and existing stations are listed with their coordinates in **Appendix A - Survey Control.**

Permanent markers consist of a 1650mm steel star picket driven to approximately 1.2 metres, and tagged with an aluminium plate stating the base, line and station number.

6

METHOD OF SURVEY

6.1 Surveying and Chaining

The lines were surveyed using DSS' RT20 real-time kinematic surveying technique. Every tenth station (gravity point) was observed using the kinematic surveying technique.

RT20 enables both position and elevation coordinates to be acquired in real-time and on the appropriate datum while the kinematic method requires post-processing of the GPS data.

The survey methods utilised phase data received from US Navy NAVSTAR Satellites to provide three-dimensional positioning. One receiver was set up as a base station at a known location while another receiver was used as a remote rover.

To obtain real-time capabilities VHF telemetry is required between the base and the remote GPS receiver. Numerous remote receivers can be used at any given time with any base station.

NovAtel real-time kinematic can achieve accuracies of better than ±0.3m in position and elevation, depending on base line length. The expected precision for locating pegged positions is better than 0.3metres and is generally better than 0.2 metres.

The kinematic method, whilst being more time consuming in the field and office, can achieve a higher accuracy of ±0.1m in position and elevation. Most observations show standard deviations of 0.05m or better.

Initialisation of the RT20 rover GPS usually takes as little as 2-3 minutes, although this is greatly dependant on satellite geometry, availability and base line length.

For the kinematic method initialisation took 10 minutes at the start of each day.

6.2 GPS Processing and Quality Control

When using RT20 and kinematic, all data is recorded internally in GRiD Palmtop data loggers and downloaded to the office computer each evening.

Any recording of positions when the values are in excess of 0.3m is highlighted to the surveyor at time of recording, and the GPS may be re-initialised until a more accurate solution is calculated.

Quality of the satellite data is monitored by careful examination of the various on-screen quality control statistics produced by DSS' software.

These checks on data integrity are in the form of standard deviation (or sigma) values for Easting, Northing and Height and are generally better than 0.2m.

Any position which falls outside the required tolerances is flagged for further investigation and re-recorded if necessary.

Numerous checks on pre-recorded marks were observed during each days survey. These observations confirm the integrity of the GPS base receiver and the placed markers.

The coordinates are then checked by determining point to point direction and distance.

Profile plots are examined to identify any height anomalies.

All final survey data was presented in MGA, GDA and AHD coordinates.

The post-processing of the kinematic and static observations was done using "Grafnet" and "Grafnav" software from Waypoint Consulting, Canada. Standard deviations for each point were determined by the software and checked by the surveyor. Final positional data for the gravity points was presented in MGA, GDA and AHD coordinates.

6.3 Gravity observations

Gravity was observed at every 10th station (400m apart) using a Scintrex CG-3 automated gravity meter. Two readings of 60 seconds were observed on each point.

At the beginning and end of each day gravity was observed at the nearest gravity base station. Three of the survey control marks were gravity bases. These marks had concrete plates next to them where accurate gravity values had been assigned in a 1996 gravity survey.

Station	MGA Zone 54 (GDA94)*		AHD	Isogal65
	Easting	Northing	Elevation	Gravity
7034/1048	455289.38	6488463.28	119.62	979438.613
7034/1049	488345.10	6489223.10	114.07	979438.58
6934/1066	412415.73	6495791.49	122.04	979426.238

*MGA values were converted from AMG values using "GDAY" Ver2.0 (Roger Fraser) software.

Six (6) hour loops were observed usually beginning from the GPS base station being used each day. Ten percent of points were repeated and there was at least one node point common between loops. These conditions were specified by the client and adhered to.

As the gravity meter took readings the standard deviations were monitored. Whenever the standard deviation rose above 0.1 dial units, the reading was stopped and started again. When two consecutive readings disagreed by 0.05 dial units or more, a third reading was taken.

The gravity values were recorded internally in the gravity meter as well as hand recorded. The data was downloaded to the office computer each night and any bad recordings were edited.

The gravity data along with positional data was then forwarded to Andrew Shearer (PIRSA) for processing.

7

DATA PRESENTATION

All line files were checked for data integrity before the survey crew demobilised from Curnamona Station.

All final data was in UTM grid coordinate format in the MGA94 projection on the GDA94 reference spheroid and GDA94 latitudes and longitudes. All elevations were on the Australian Height Datum (AHD71).

Files produced were:

04GA-CU1.int	Line data for all stations in MGA94 coordinates**.**
04GA-CU1.seg	Line data in SegP1 format.
04GA-CU1.uka	Line data in UK00A format.
Curnamona.pms	Listing of all permanent markers placed and relevant survey marks.

All files are backed up on digital disks in the Yeppoon office for future reference.

No hard copy data was provided.

8

SAFETY

DSS personnel are aware of safety conditions concerning all exploration seismic surveys. The DSS “Quality Policy Statement” and “Health, Safety and Environment Policy” were adhered to at all times.

Each vehicle was fitted with a UHF radio, shovel, fire extinguisher, first-aid kit, vehicle recovery equipment, satellite or CDMA phone and weekly vehicle maintenance check lists.

The main safety hazards on the job were:

- ★ Kangaroos and emus on the tracks.
- ★ Dust on the tracks causing low visibility.
- ★ Isolation.

The survey was accident and incident free.

9

CHRONOLOGICAL SUMMARY

DATE	**DESCRIPTION**
23rd June	Craig Davey and Frank Tangney mobilised from Munnahill to Curnamona Station. Vehicles were unloaded, GPS set up in vehicles and office set up. Scouted line east of Curnamona Station finding Stn. 3220, the last peg from the previous Curnamona 2D in 2003.
24th June	Started at Stn. 3220 to begin re-chaining old pegs from Curnamona 2D, 2003. Checked from 3220 to 2835 before finding that there were insufficient pegs remaining after 12 months to be able to replace with a 40m chain. Scouted line to 1840, the beginning of the required rechaining. Return Curnamona, three hour drive (105km).
25th June	Drove to 1048, set up the GPS Base and then began re-surveying using the GPS to navigate to the previously surveyed positions. Re-surveyed 1840 to 2400.
26th June	Resurvey 2400 to 2835.
27th June	Resurvey from 3070 to 3220. Survey: 04GA-CU1 11.20 km ***Survey Total: 20 km*** Gravity: Familiarisation with Gravity meter and base run between 1066 and 1048.
28th June	Survey: 04GA-CU1 20.00 km ***Survey Total: 31.20 km***

DATE	**DESCRIPTION**		
29th June	Survey: 04GA-CU1	26.60 km	***Survey Total: 57.80 km***
30th June	Survey: 04GA-CU1	2.40 km	***Survey Total: 60.20 km***
	Gravity: 04GA-CU1	20.80 km	***Gravity total: 20.80 km***
	Control survey to establish BAS 16 and BAS 17.		
1st July	Survey: 04GA-CU1	27.60 km	***Survey Total: 87.80 km***
	Gravity: No observations.		***Gravity total: 20.80 km***
2nd July	Survey: Kinematic obs. 3700 - 4200.		***Survey Total: 87.80 km***
	Gravity: 04GA-CU1	18.40 km	***Gravity total: 39.20 km***
3rd July	Survey: Kinematic obs. 3220-3730 and 4210-4700.		***Survey Total: 87.80 km***
	Gravity: 04GA-CU1	21.60 km	***Gravity total: 60.80 km***
4th July	Survey: Kinematic obs. 4700-5410		***Survey Total: 87.80 km***
	Gravity: 22.40		***Gravity total: 83.20 km***
	Control to establish BAS 18		
5th July	Survey: GA04-CU1	21.00 km	***Survey Total: 108.8 km***
	Gravity: GA04-CU1	6.00 km	***Gravity total: 89.20 km***
			Total Number of Gravity Points = 223

After being told to finish the line at 5415 we were then directed by the client to continue the line to try and achieve 160km for the seismic crew to record. The line was surveyed to STN 5940 (End of Line).

The gravity was not completed, again at the client's request and this was left to be completed at a later date.

6th July Office work in the morning before de-mobilising via Honeymoon mine (Terrex camp), drop off data and continue onto Broken Hill.

10

OPERATIONAL ASPECTS

As the area was relatively flat and open we were able to receive radio signal from our base up to 12kms away. This meant that control could be spaced at 20km intervals.

Already having good control stations in the area meant that little time was spent setting up control.

The gravity meter worked well in this area. Wind and soft ground did affect the readings on some occasions. This meant we had to shelter the gravity meter from the wind using the vehicle and ensure that the levelling legs were pressed firmly into the ground to minimise these effects.

The total length of the line was 108.8 kilometres and it took nine days (not including re-survey) to complete the pegging and gravity, giving an average production rate of 12.1 kilometres per day. This average includes all time spent on control and travel.

The travel time was long when moving from Curnamona to the eastern end of the line.

The seismic line was along existing tracks which meant the line was easy to access and drive along.

11

CONCLUSIONS AND RECOMMENDATIONS

DSS' RT20 GPS real time techniques were well suited to the job. The flat and relatively open terrain meant that GPS signal was exceptional and pegging could proceed at a good rate.

Line trace diagrams were provided to main crew to aid in line traversing.

There were no safety incidents on the project.

The survey was completed in minimal time and to a high degree of accuracy.

Submitted by

Craig Davey

12

APPENDICES

Survey Control

Survey Control

Coordinates are MGA 94 (Zone 54), Elevations are AHD71

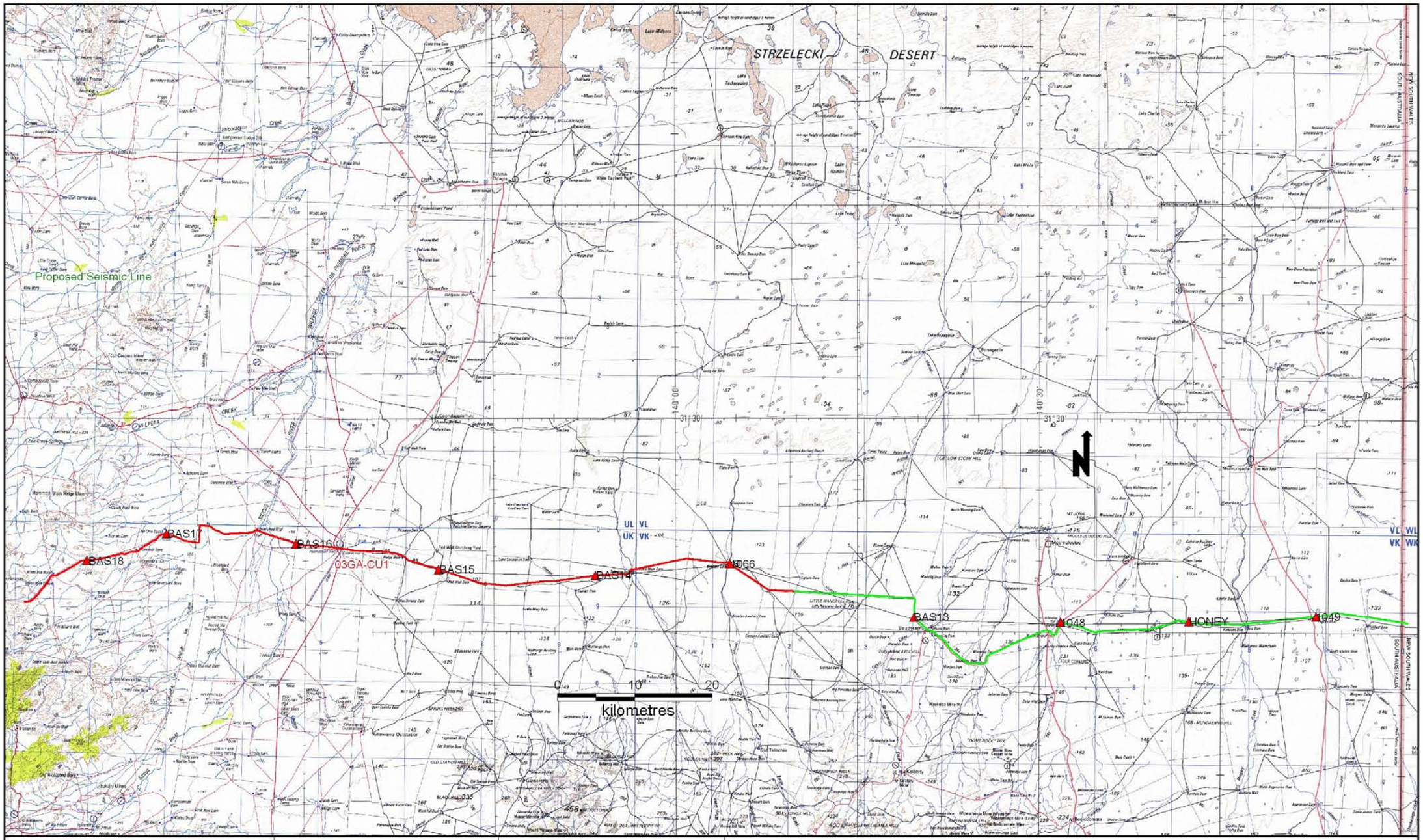
Revision 0, 13th July 2004

Survey Control Points / Permanent Markers

Line name	Stn	Easting	Northing	Elevation	Comments
03GA-CU1	1000	500231.9	6488335.5	135.0	SOL*
03GA-CU1	1038+20	488345.103	6489223.097	114.071	7034/1049*
03GA-CU1	1723+13	471869.204	6488568.042	118.994	HONEY*
03GA-CU1	2150	455289.383	6488463.282	119.623	7034/1048*
03GA-CU1	2761+20	436298.101	6489011.075	136.812	BAS13*
03GA-CU1		412415.732	6495791.489	122.040	6934/1066*
03GA-CU1		394966.560	6494063.300	111.105	BAS14*
03GA-CU1		374656.447	6494647.366	101.999	BAS15*
04GA-CU1		356134.389	6497757.343	86.487	BAS16
04GA-CU1		339364.281	6498813.502	119.849	BAS17
04GA-CU1		329072.679	6495200.588	196.595	BAS18

* Published from Curnamona 2D, 2003 (03034)

Network Diagram



Dynamic Satellite Surveys

- Gravity Station
- Control Station
- Seismic Line
- Control Tie

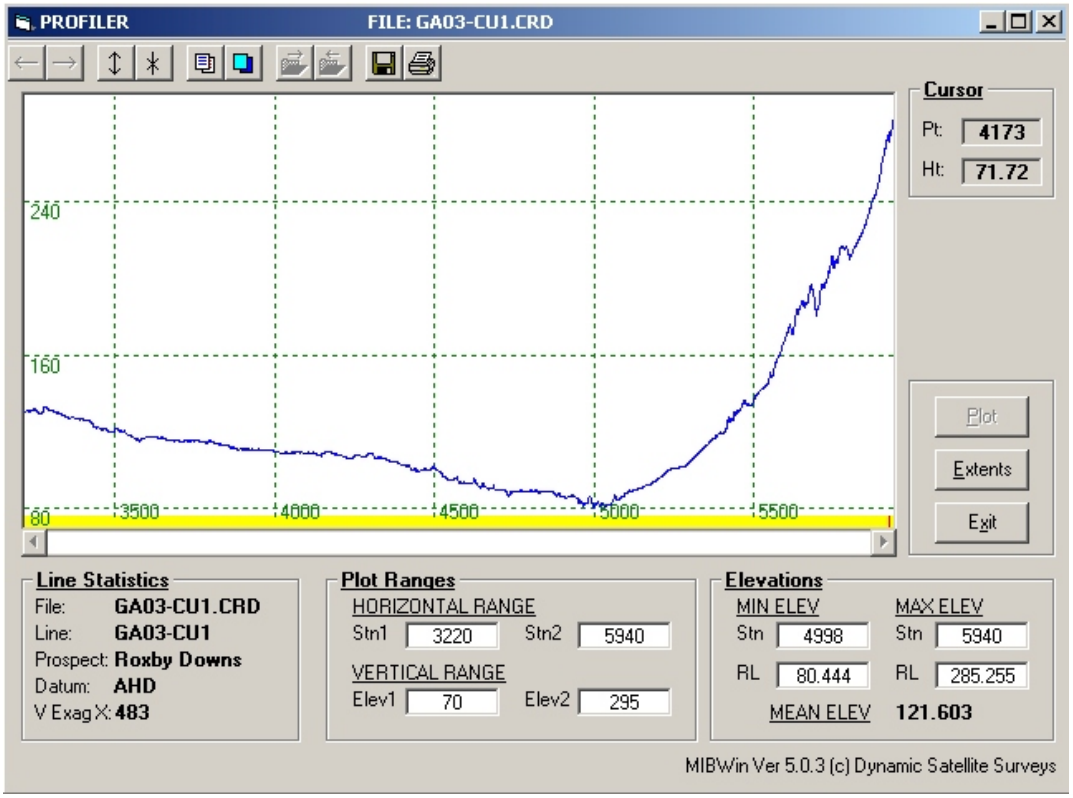
Drawn By: D. Williams
Revision: 2.0
Date: 29/07/04
File: 04049.WOR

Terrex Seismic Pty Ltd

CURNAMONA

Control Station Diagrams

Profile Plot



APPENDIX “N”

Aboriginal Heritage Survey

Aboriginal Heritage Survey

Gawler Craton & Curnamona Seismic Profiling 2003

A Report to Geoscience Australia and Primary Industries & Resources SA

Philip Fitzpatrick

July 2003

Introduction

Geoscience Australia and the office of Minerals and Energy Resources of the Department of Primary Industries and Resources SA are planning to acquire regional deep seismic reflection data within the Gawler and Curnamona Regions.

The data will provide a major advance in the understanding the crustal setting of the Olympic Dam mineral system and will provide a foundation for new exploration models for copper and gold deposits. The data from the Curnamona Region will be used in a similar way to obtain important information about basement and, possibly, basin architecture that can be used to enhance exploration investment in the area.

The Australian National Seismic Imaging Resource using its Facilities Manager, Trace Energy Services Pty Ltd will acquire the seismic data. The seismic survey is scheduled to begin in late July or early August 2003 and will take about 1 month to complete.

The Gawler Craton seismic project consists of two seismic traverses, a ~200 km regional north-south line and a ~60 km east-west cross line. Both lines follow existing roads or station tracks. The first line commences at the northern end of the Borefield Road and follows the main road south to Olympic Dam and thence south again to a point just north of Woomera Township. The second line commences just west of Andamooka and follows the bitumen road into Olympic Dam before crossing to a point about 30 km west of the mine site.

The Curnamona Region seismic project consists of a single east west orientated traverse of ~200 km and follows minor roads and station tracks. The line commences north west of Broken Hill inside the South Australian border on Mundi Mundi station. From there it travels due west through Kalkaroo, Strathearn, Telechie, Curnamona, Willipa and the Flinders Ranges to a point about 30 km west of Hawker on the eastern side of the rail line to Leigh Creek.

The recording crew will use about 10 vehicles. These include 4 Vibroseis trucks, a recording truck and about 5 4WD line vehicles for moving the recording equipment. The field crew lay out sections of cables totalling up to 14 km in length, which are connected at intervals of about 40 metres to sets of geophones. The geophones are planted a few centimetres into the ground to detect seismic waves produced by the synchronised vibrating of the ground beneath the Vibrosesis trucks. The whole process is controlled from the recording truck and logged onto magnetic tape for later analysis. The cables, trucks and vehicles will operate either on the road verge, the adjacent drainage channel or on the road itself.

Geoscience Australia and Primary Industries and Resources SA were advised that because the seismic survey will follow major roads and station tracks there is

no requirement to conduct a Work Area Clearance with the various Native Title claimants. Whilst care must be taken to avoid damage to Aboriginal sites during the survey there is also no legal requirement to conduct an Aboriginal Heritage Survey over the two routes. However, to avoid the possibility of damaging sites during the survey, Geoscience Australia and Primary Industries and Resources SA elected to carry out a low-level site reconnaissance survey of the route. This report details the results of that survey.

Background Information

The seismic route between Woomera and the northern end of the Borefield Road passes through the traditional territories of the Barngarla, Kokatha and Kujani. The route between Hawker and Broken Hill passes through the traditional territories of the Barngarla, Yadliaura, Ngurunta and Wiljakali (Tindale 1974). The Barngarla, Kujani and Yadliaura are generally believed to belong to the "Central Lakes culture-group", the group of tribes inhabiting the Lake Eyre Basin, Yorke and Eyre Peninsulas, the Flinders Ranges and the Mid-North.

The Yadliaura and Kujani are sometimes included in a Flinders Ranges hills confederation known as the Adnyamathanha. All of these groups base their social organization on the division of society into two exogamous, matrilineal moieties, termed *Araru* and *Matheri*, share the same form of patrilineal ceremonial totemism and have similar systems of religious beliefs and practices. They all once practised circumcision and the chest-scarification rite known as the *wilyeru*. The last *wilyeru* ceremonies among the Kokatha and Barngkala men took place in 1938-39. The last *wilyeru* ceremonies in the Flinders Ranges took place near Nepabunna in 1947-48. Barney Coffin was the last known full Yadliaura person. He died at Port Augusta about 1981.

A number of Barngarla families lived at the Poonindie mission that was set up near Port Lincoln in 1850. Their numbers gradually declined however and, when the mission was disbanded in 1896, the remaining Barngarla were transferred to an Aboriginal settlement established at Point Pearce, on Yorke Peninsula.

A small number of Barngarla continued to live in the Gawler Ranges where they worked on stations. After the construction of the east west railway line in 1915 they were joined by groups of Kokatha from the west and Yunkantjatjara from the Musgrave Ranges. The three groups have since become closely linked through marriage. Other Barngarla lived at the ration depot established at Iron Knob as well as at the tiny settlement of Hummock Hill (later to become Whyalla) and on the outskirts of Port Augusta.

During the establishment of Olympic Dam a study was made of the Kokatha and, to a lesser extent, the Barngarla, as part of the Olympic Dam Environmental Impact Statement. Peter Sutton, in particular, carried out a very detailed literature search and attempted to clarify the so-called Kukata/Kokatha

distinction. This distinction centred around the tribal group which covered a large area to the north and west of the Gawler Ranges described by Tindale as Kukata and a similar group appearing in the literature called Kokatha (or sometimes "the Gawler Ranges tribe") who seemed to be confined to the Gawler Ranges. Sutton concluded that the Kokatha were probably the Gawler Range tribe and Kukata (*kuka*=meat hence = meat eaters) was a generic term used by nearby groups to describe the unknown, but feared, people living in the mallee country north of the Nullarbor Plain.

Ronald Berndt was contracted by the Olympic Dam Joint Venturers to review all of the data collected on the Aborigines in the Olympic Dam area and probably had most of the data then available on the area to consult. Berndt thought the Kokatha represented Western Desert influences with a strong patrilineal social organization while the Barngarla represented the Central Lakes or *wilyeru* culture. Berndt may not be entirely correct in this assumption because one of the elderly informants consulted for another study carried out by the author clearly remembers Kokatha speakers going through what were obviously *wilyeru* initiation ceremonies in the 1920s. She also remembers other Kokatha men taking part in a ceremonial journey involving initiation from Cowell and the West Coast towards Edwards Creek deep into the heart of *wilyeru* practising peoples' country in January 1930. Whilst she maintained that the word "Kokatha" was generally unknown in the 1930s and described the men as "Matuwangka" (*wangka* = language) the individuals named clearly belonged to the group now referred to as Kokatha.

It is most likely that groups belonging to the Central Lakes culture initially occupied the area around Olympic Dam. Within these groups both men and women joined together in many ritual events. Other groups belonging to the Western Desert culture were actively expanding into the area from the north and west at the time of European intrusion. These groups were organised along strict patrilineal lines with strict separation of the sexes during ritual.

With the advent of Europeans the populations of both of these cultural groups quickly diminished, with the survivors reduced to existence in fringe camps and on missions along the coast and outside major towns and in sparse communities amongst the cattle and sheep stations. This process of reduction in population was so rapid that most of the cultural knowledge for the area was lost at the same time. The decline in numbers probably occurred between the mid-1850s and 1870. These culturally similar groups eventually intermarried amongst themselves and with Europeans and are mainly represented by Barngarla and Kokatha descendants today.

The ration depots on the stations and particularly those along the East-West Railway, built in the early part of the 1900s, attracted more people from the north, particularly the Musgrave Ranges, and, despite early resistance by the Barngarla and Kokatha, eventually became a force in the demography of the area. These

people imported their own cultural traditions into the area, including mythologies. This new traditional knowledge replaced that lost during the initial European invasion.

This process eventually established a link between the Western Desert people and the people to the south and east so that today these northern groups, particularly the Yunkantjatjara and Antakarinya, are seen as a logical source of ritual knowledge. Consequently, Barngarla and Kokatha people seeking information about myth and ritual today refer to these northern groups, particularly the elderly people living at Coober Pedy who worked on the southern pastoral properties in their younger years. This development is perfectly consistent with the dynamics of Aboriginal ritual traditions and has probably been occurring in a similar manner for thousands of years.

The Kuyani were traditionally the neighbours of the Flinders Ranges group (Adnyamathanha) and were affiliated with country to the north west of the main ranges between Parachilna and Stuart Creek. In later years they joined with the groups to observe a common identity with the Adnyamathanha and their neighbours with whom they shared social and cultural beliefs and practices. This decision to embrace a common identity, which was said to be formally arrived at, reportedly also included the Wailpi and Yadliaura. In each case the former group members have intermarried extensively with the Adnyamathanha and other hills groups.

Hercus (1973:5) quoting testimony from "Old Alice" Oldfield, the last known Kuyani speaker described Kuyani country as extending from the western edge of the Flinders Ranges to Coondambo near Lake Gairdner, from Coward Springs to Billa Kalina. She noted, however, that there was a majority of Arabana and some Kokatha living at Finnis Springs in the heart of Kuyani country. Elsewhere (1996:148) Hercus refers to a group of Kuyani from near the northern tip of Lake Torrens as "the Mirrabuckinna mob".

The earliest description of Kuyani country is probably that provided by K.W. Kingsmill of Beltana Station and published in Curr (1886:118). According to that description "The extent of country inhabited by the Kooyianie Blacks is about 100 miles long by 50 wide, Beltana being situated in the south-eastern portion of it. The names of the neighbouring tribes are Koonarie on the north, a much more numerous tribe than this; the Keidnamutha (Adnyamathanha) on the east, a fierce and warlike tribe; and the Koocatho on the west, of which very little is known. The Kooyianie, or Beltana Blacks, number now about 50."

To date no known descendants of the Ngurunta and Wiljakali have been located. In 1871 there were one hundred and forty five Aboriginal people living in the Olary area. Twelve were at Boolcoomata, thirty-one at Outalpa and one hundred and two at Bimbowrie, where a ration depot was operating. In 1892 the numbers had been reduced to fifty. Following the death of Outalpa George, about that

time, these people migrated to Poolamacca Station, about 70 kilometres north of Broken Hill.

Groups of people from the Barrier Ranges were still at Poolamacca in 1926 when Mr J Brougham was the manager. In 1944 R. M. Berndt interviewed a Wiljakali descendant who had been born at Bimbowrie in 1864. A "mission" was operating east of Olary at Mingary in the early 1960s but it is not known if any of these people were local.

The Wiljakali man interviewed by Berndt in 1944 related a version of the Eaglehawk and Crow myth. This myth is well known to the Adnyamathanha of the Flinders Ranges. It is also known that the Bronze Wing Pigeon myth travels out of the Flinders Ranges towards Broken Hill. The existence of these myths in the area tends to support a cultural link between the Wiljakali and the Adnyamathanha. This relationship may have also extended to the Ngurunta. At the same time early reports by the Port Augusta-based Sub-Protector of Aborigines in the 1870s refers to frequent visits to the area by young men from the Darling River area. At one stage a group of fifteen young men were in the area, possibly for ceremonial reasons.

Diligent research would probably lead to the identification of traditional owners for the plains area east of the Flinders Ranges. It would also be reasonable to suggest that these descendants are now living in the area east of Broken Hill, probably in the Cobar area. In the absence of Wiljakali and Ngurunta descendants Adnyamathanha people from the Flinders Ranges have assumed a caretaker role over the area. As noted above the Adnyamathanha are culturally similar to the Wiljakali and Ngurunta and many of the myths running through the area originate in the Flinders Ranges. The practice of care-taking territory in the absence of the traditional owners is a legitimate process in many parts of Australia.

The Survey

The survey was conducted between 10 and 13 July. The author accompanied a representative from Primary Industries and Resources SA, Andrew Shearer, over both routes. David Johnstone, from Geoscience Australia, accompanied the survey during the Woomera to Borefield Road phase.

The routes along the main bitumen road between Woomera and Olympic Dam and between Olympic Dam and Andamooka were covered at normal speeds from a travelling vehicle. Where known sites occurred or where dune deflations and playas were seen the vehicle was slowed down for closer inspection with foot inspections being carried out on some occasions.

The route between Hawker and Broken Hill along station tracks was necessarily covered at much slower speeds allowing a good coverage. All of the creek crossings on this route were inspected on foot.

The areas through which both routes travel was relatively dry and vegetation cover was not a problem during the survey.

Two archaeological sites in close proximity to the Woomera to Borefield Road route were noted. The first of these occurs on the western side of the Olympic Dam Mine Lease on the east west survey line at WGS84 663527 6626575. The site occurs at the southern end of a dune encircling a small playa where wind has eroded the dune. A wide range of waste flakes and tools lie on the hard surface including cores, blades, chisels and grinding stones. This material generally consists of silcrete, quartzite and chert. It is reasonably easy to skirt the site without causing any damage to it.

The second site occurs on the northern side of the Andamooka Road adjacent to a long dune that passes close to the road at WGS84 695797 6626059. The site consists of material almost exactly similar to that on the site described above. The site is a reasonable distance from the road (~20 metres) but is close enough to be damaged by foot traffic if the adjacent area is used as a testing site. The best way to ensure that this does not happen is to omit the edge of the road at that point from the survey process.

No sites were noted along the entire length of the Hawker to Broken Hill route. Surveys conducted for mining exploration activities south of this area report similar paucities of sites. In the southern area the larger occupation campsites occur close to major water sources in creeks. There is not, however, a diminishing spread of artefacts scattered over the landscape away from the sites as occurs in the Olympic Dam area. The country along which the survey route lies is probably too far from the ranges in the south and too far from the large Wilpena Creek and Lake Frome complexes to the north to have been much traversed in traditional times, although there is no paucity of game in the area. It is probable, however, that the large numbers of emus and kangaroos in the area today are a result of dams built by pastoralists.

There is a section of creek along which the survey route travels just west of Willipa homestead with water washed but stable flats. A closer inspection of these flats may reveal old campsites and hearths and it would be advisable to take care not to run vehicles off the main track in this area. The area occurs in the vicinity of WGS 321219 6489652.

Recommendations

The survey crews should avoid the two campsites in the Olympic Dam area described above. It may be worthwhile to flag the site west of the Olympic Dam

Mine Lease area so that vehicles avoid it. At the same time it would not be wise to tell people why the area is flagged off, just in case there are artefact collectors amongst the survey crew.

It would also be worthwhile to incorporate a component about Aboriginal Heritage in any inductions that take place for the survey in the Olympic Dam area. Artefacts are scattered throughout most of the area and the survey crews should be aware of their obligations under Section 23 of the Aboriginal Heritage Act not to damage, disturb or interfere with sites. Ben Garwood, from WMC Resources, could conduct such an induction. Alternatively, either Andrew Starkey, the Aboriginal Liaison Officer from Woomera, or Reg Dodd from the Marree Arabunna Centre could be approached to conduct the induction. Andrew may wish to be present when the survey work is carried out in the Olympic Dam area anyway.

There are unlikely to be any problems along the Hawker to Broken Hill survey route but it may be useful for the survey crew to contact Pauline Coulthard from the Flinders Ranges Aboriginal Heritage Consultative Committee at Hawker when they are in the Curnamona to Hawker area.

References

Anonymous. (1965), A History of the Beltana Pastoral Company Limited, Beltana Pastoral Company, Adelaide.

Berndt, R.M. (1959), The concept of the tribe in the Western Desert of Australia. Oceania 30(2):82-107.

Berndt, R.M. (1985), Traditional Aborigines in Twidale C.R., Tyler M.J. and Davies , M. (eds) Natural History of Eyre Peninsula. Royal Society of South Australia (Inc).

Berndt, R.M. (1987), "Panaramittee Magic", Records of the South Australian Museum, Volume 20, May 1987, pp 15-28.

Buttfield, J.P. (1868), Reports for 1868-1874: Correspondence of the Aborigines Department, State Records GRG 52.

Curr, E. (1886), The Australian Race, Volumes 1-3 Melbourne.

Davis, C. & McKenzie, P. (1985), Adnyamathanha Genealogy, Aboriginal Heritage Branch, Adelaide.

Ellis, R.W. (2001), Report of an Inspection for Equinox Resources Limited of RAB Drilling Traverses in the Ethiudna Joint Venture Area, Mt Victor, South Australia.

Fitzpatrick, P. (2001), Delta Gold Limited, Curnamona Project: Survey of Aboriginal Heritage.

Hercus, L. (1973), "Only Old Alice can talk Gujani" in Aboriginal News, Volume 1 Number 4 December.

Hercus, L. & Koch, G. (1996), "A native died sudden at Lake Allalina" in Aboriginal History, Volume 20.

Lennon, J. (2000), I'm The One That Know This Country, Aboriginal Studies Press, Canberra, A.C.T.

Mawson D. & Hossfeld P, (1926), "Relics of Aboriginal Occupation in the Olary District of South Australia", Transactions of the Royal Society of South Australia, Volume 50, pp 17-21.

Nobbs, M, (2000), Aboriginal Painters of the Olary District of South Australia, MS, Adelaide.

Richardson, N.A. (1925), Pioneers of the northwest of South Australia 1856 to 1914. W.K.Thomas and Co. Adelaide.

Tindale, N.B. (1974) Aboriginal Tribes of Australia: Their terrain, environmental controls, distribution, limits, and proper names. University of California Press.

Appendix 1: Plates

Plate 1: The archaeological scatter at WGS84 663527 6626575 on the east west survey line west of the Olympic Dam Mine Lease area. The site should be skirted by vehicles following a route close to the two figures standing on the right side of the photograph.

Appendix 2: Figures

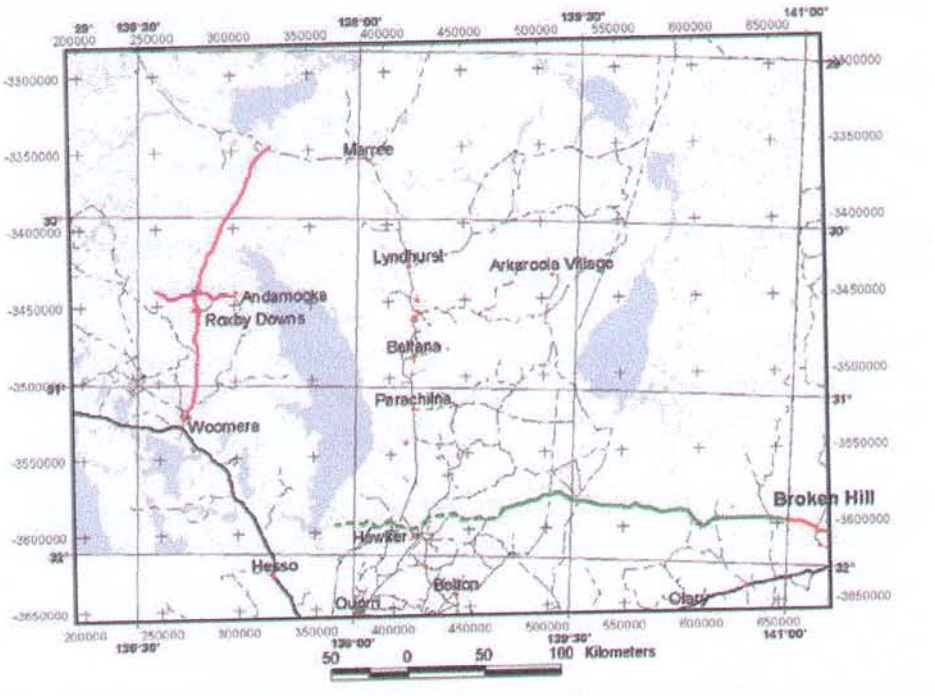
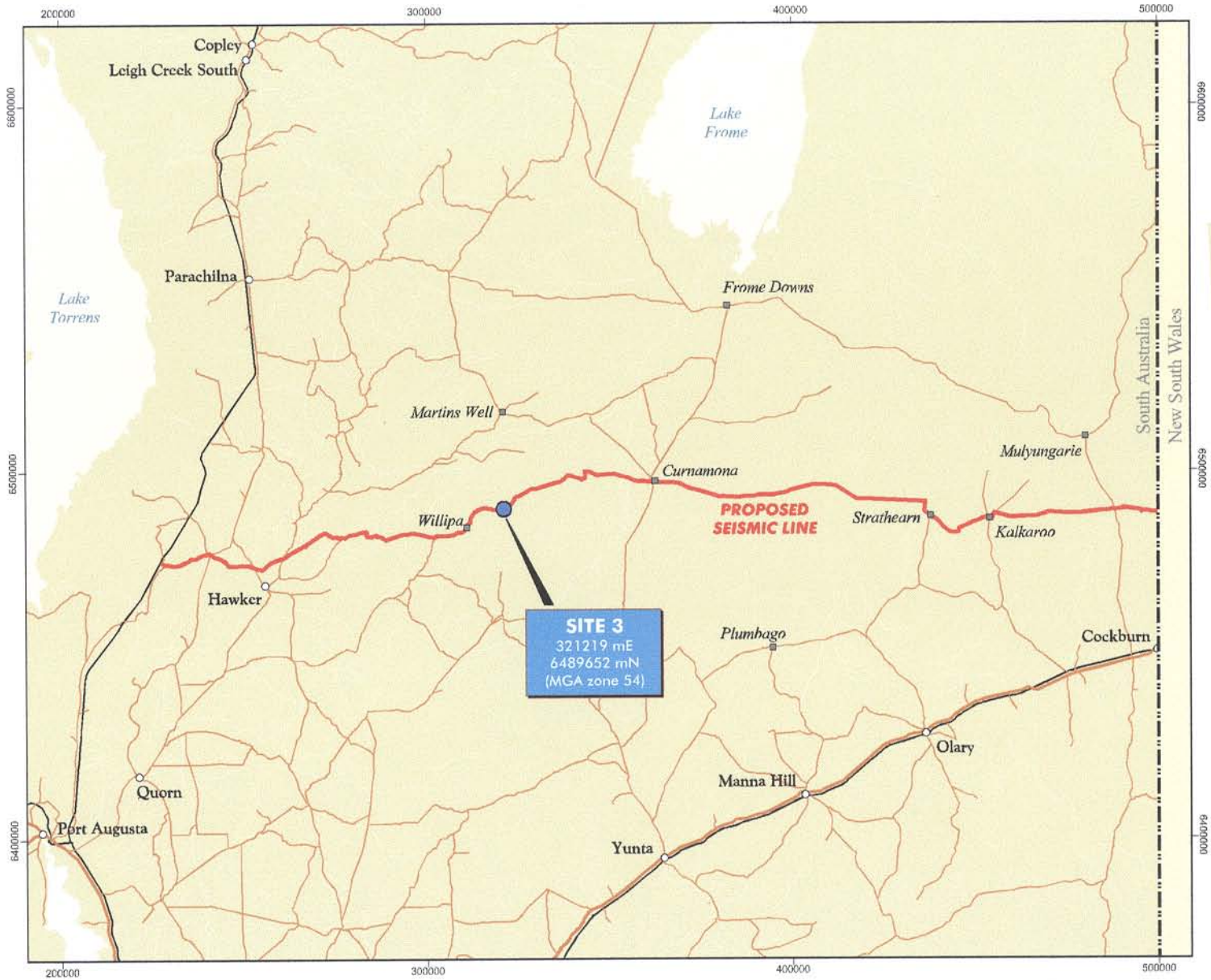


Figure 1: Location of seismic surveys in Gawler and Curnamona regions.



MINERALS & ENERGY

PRIMARY INDUSTRIES AND RESOURCES SA

Disclaimer

There is no warranty that this map is free from errors or omissions. Issued under the authority of the Hon Paul Holloway MLC. Selected data on this map are available digitally and can be downloaded from www.pir.sa.gov.au

GDA

0 10 20 30 40 50 Kilometres

DATUM GDA94 - MAP PROJECTION MGA ZONE 54

Curnamona Province South Australia

SEISMIC LINE and RESTRICTED SITE LOCATIONS

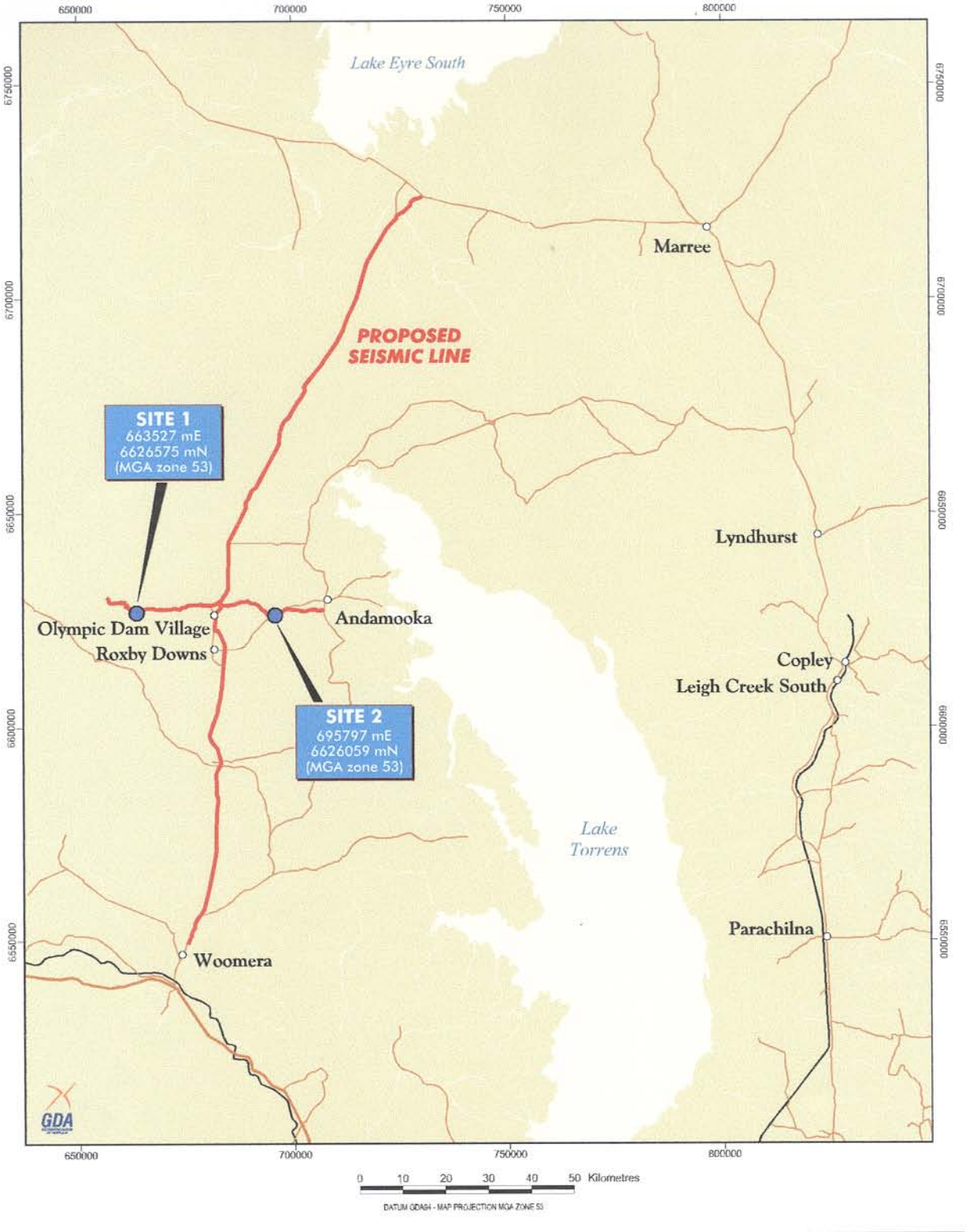
Produced by: PIRSA Publishing Services
Plan number: 201978_002
Date produced: 17 July 2003

MINERALS & ENERGY

Government of South Australia

Gawler Craton – South Australia
SEISMIC LINE and RESTRICTED SITE LOCATIONS

PRIMARY INDUSTRIES AND RESOURCES SA



Production details

Produced by: PIRSA Publishing Services

Plan number: 201978_001

Date produced: 17 July 2003

Data source: databases maintained by PIRSA Spatial Information Services

Author / contact details

Shearer, A.
PIRSA Minerals and Energy, 101 Grenfell Street,
Adelaide, South Australia 5000

internet:www.minerals.pir.sa.gov.au
email: pirsa.minerals@saugov.sa.gov.au
Phone: (08) 8463 3000

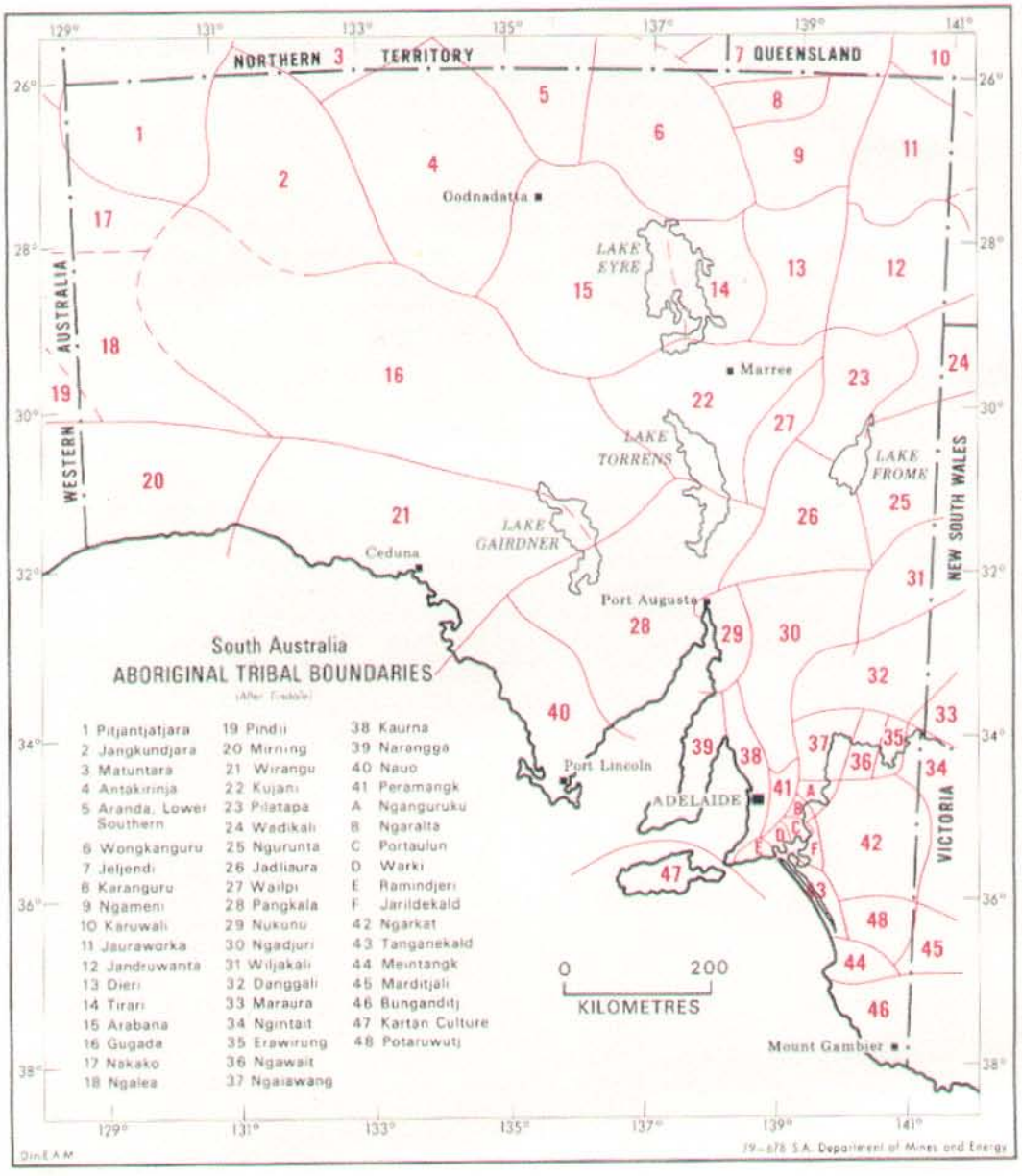


Figure 2: Tribal Areas