Open File Envelope No. 7362/2

PEL 38

OTWAY BASIN

GREENWAYS 1 TEST REPORTS

Submitted by

SADME and Sealot Pty Ltd
1995

Enquiries: Customer Services
Ground Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

PRIMARY INDUSTRIES
AND RESOURCES SA

ENVELOPE 7362/2

TENEMENT: PEL 38; Otway Basin

TENEMENT HOLDER: Mosaic Oil NL (operator), Barcoo Petroleum NL, Beach Petroleum NL and Bruce Anderson Oil Corp. of Australia

CONTENTS

END OF CONTENTS

AMDEL
CORE
SERVICES

13 October 1992

Department of Mines and Energy
PO Box 151
EASTWOOD SA 5063

Attention: Rod Austin

REPORT: HH/1949

CLIENT REFERENCE:	EX 1240 11/06/0700
MATERIAL:	Rock Samples
LOCALITY:	Greenways-1
WORK REQUIRED:	Source Rock Analysis

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

BRIAN L WATSON
Laboratory Supervisor
on behalf of Amdel Core Services Pty Ltd

1. INTRODUCTION

Eleven (11) samples were received for TOC analysis, Rock-Eval pyrolysis and vitrinite reflectance analysis. This report is a formal presentation of results which were forwarded by facsimile as they became available.

2. ANALYTICAL PROCEDURES

2.1 Sample Preparation

Samples (as received) were ground in a Siebtechnik mill for 20-30 seconds.

2.2 Total Organic Carbon (TOC)

Total organic carbon was determined by digestion of a known weight (approximately 0.2 g) of powdered rock in HCl to remove carbonates, followed by combustion in oxygen in the induction furnace of a Leco WR-12 Carbon Determinator and measurement of the resultant CO_2 by infra-red detection.

2.3 Rock-Eval Pyrolysis

A 100 mg portion of powdered rock was analysed by the Rock-Eval pyrolysis technique (Girdel IFP-Fina Mark 2 instrument; operating mode, Cycle 1).

2.4 Organic Petrology

Representative portions of each sample (crushed to -14+35 BSS mesh) were obtained with a sample splitter and then mounted in cold setting Glasscraft resin using a 2.5 cm diameter mould. Each block was ground flat using diamond impregnated laps and carborundum paper. The surface was then polished with aluminium oxide and finally magnesium oxide.

Reflectance measurements were made with a Leitz MPV1.1 microphotometer fitted to a Leitz Ortholux microscope and calibrated against synthetic standards. All measurements were taken using oil immersion (n = 1.518) and incident monochromatic light (wavelength 546 nm) at a temperature of 23±1°C.

3. RESULTS

TOC and Rock-Eval data are listed in Table 1. Figure 1 is a plot of T_{max} versus Hydrogen Index illustrating kerogen Type and maturity. Table 2 is a summary of the vitrinite reflectance measurements which are presented along with histograms in Appendix 1, while Figure 2 is a plot of measured vitrinite reflectance versus depth.

4. INTERPRETATION

4.1 Maturity

Vitrinite reflectance measurements were hampered by the paucity of vitrinite and the presence of cavings which result in a lowering of the measured vitrinite reflectance values. The samples, therefore, are likely to be marginally mature for the generation of liquid hydrocarbons (VR ≈

0.37-0.50%; Table 2, Figure 2). Oil generation from thermally labile exinites (resinite, bituminite and suberinite) commences at VR = 0.45%. Rock-Eval T_{max} values show that these samples are marginally mature-mature for the generation of liquid hydrocarbons (VR_{EQUIV} ≈ 0.4-0.6%; Table 1, Figure 1).

The S_2 peak of the sample from 1360-1369 metres depth is small and ill-defined. Therefore, the T_{max} value of this sample is unreliable.

High production indices (PI >0.2) suggest the presence of migrated hydrocarbons at 1390-1399 and 1414-1423 metres depth.

A more reliable estimate of maturity could be obtained by vitrinite reflectance analysis of the relatively organically rich sample from 1441-1450 metres depth.

4.2 Source Richness

Both organic richness and source richness are consistently poor in the samples studied (TOC <1%, $S_1 + S_2$ <2 kg of hydrocarbons/tonne; Table 1), with the exception of the samples from 1267-1276 and 1441-1450 metres depth. Both of these samples both have fair organic richness (TOC = 1-4%; Table 1), with the former having excellent source richness ($S_1 + S_2$ = 7.54 kg of hydrocarbons/tonne; Table 1) and the latter having fair source richness ($S_1 + S_2$ = 3.81 kg of hydrocarbons/tonne; Table 1).

4.3 Kerogen Type and Source Quality

Hydrogen Index and T_{max} values (Table 1, Figure 1) indicate that these samples contain organic matter which have bulk compositions which range from that of Type IV to Type II-III kerogen. Pyrolysis-GC analyses of the better quality samples (1267-1276 and 1441-50 metres depth) may more accurately assess the oil-source potential of these intervals.

TABLE 1

AMDEL CORE SERVICES

Rock-Eval Pyrolysis 08/30/92

Client: South Australian Department of Mines and Energy

Well: Greenways-1

Depth (m)	T Max	S1	S2	S3	S1+S2	PI	S2/S3	PC	TOC	HI	OI
991-1000	434	0.03	0.28	0.63	0.31	0.10	0.44	0.02	0.69	40	91
1093-1102	433	0.11	1.10	1.07	1.21	0.09	1.02	0.10	1.05	104	101
1267-1276	433	0.31	7.23	0.79	7.54	0.04	9.15	0.62	3.67	197	21
1360-1369	444	0.01	0.05	0.65	0.06	0.17	0.07	0.00	0.34	14	191
1390-1399	392	0.09	0.23	0.94	0.32	0.28	0.24	0.02	0.44	52	213
1414-1423	429	0.13	0.43	0.89	0.56	0.23	0.48	0.04	0.67	64	132
1441-1450	440	0.12	3.69	0.72	3.81	0.03	5.12	0.31	1.54	239	46
1450-1459	433	0.05	0.47	0.59	0.52	0.10	0.79	0.04	0.66	71	89
1459-1468	438	0.06	0.80	0.53	0.86	0.07	1.50	0.07	0.97	82	54
1480-1489	436	0.11	0.50	0.85	0.61	0.18	0.58	0.05	0.57	87	149
1561-1570									0.12		

TABLE 2

SUMMARY OF VITRINITE REFLECTANCE MEASUREMENTS

GREENWAYS-1

Depth (m)	Mean Maximum Reflectance (%)	Standard Deviation	Range	Number of Determinations
1267 - 1270	0.37	0.05	0.30 - 0.52	31
*1390 - 1399	0.42	0.04	0.35 - 0.48	12
*1450 - 1459	0.41	0.04	0.33 - 0.50	27
*1561 - 1570	0.44	0.03	0.40 - 0.48	5

* Influenced by cavings.

HYDROGEN INDEX vs T max

Client :SADME
Location :GREENWAYS-1

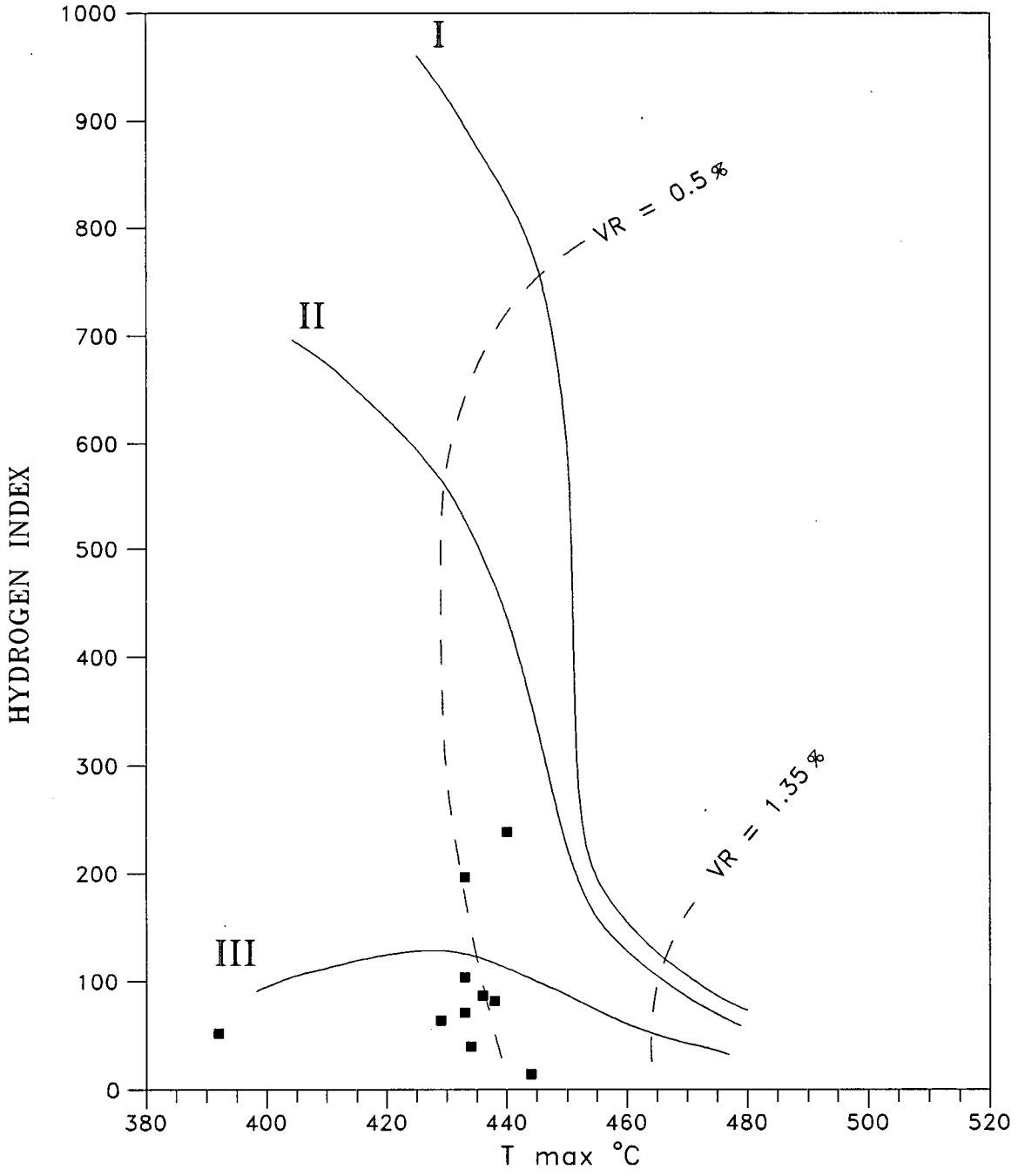
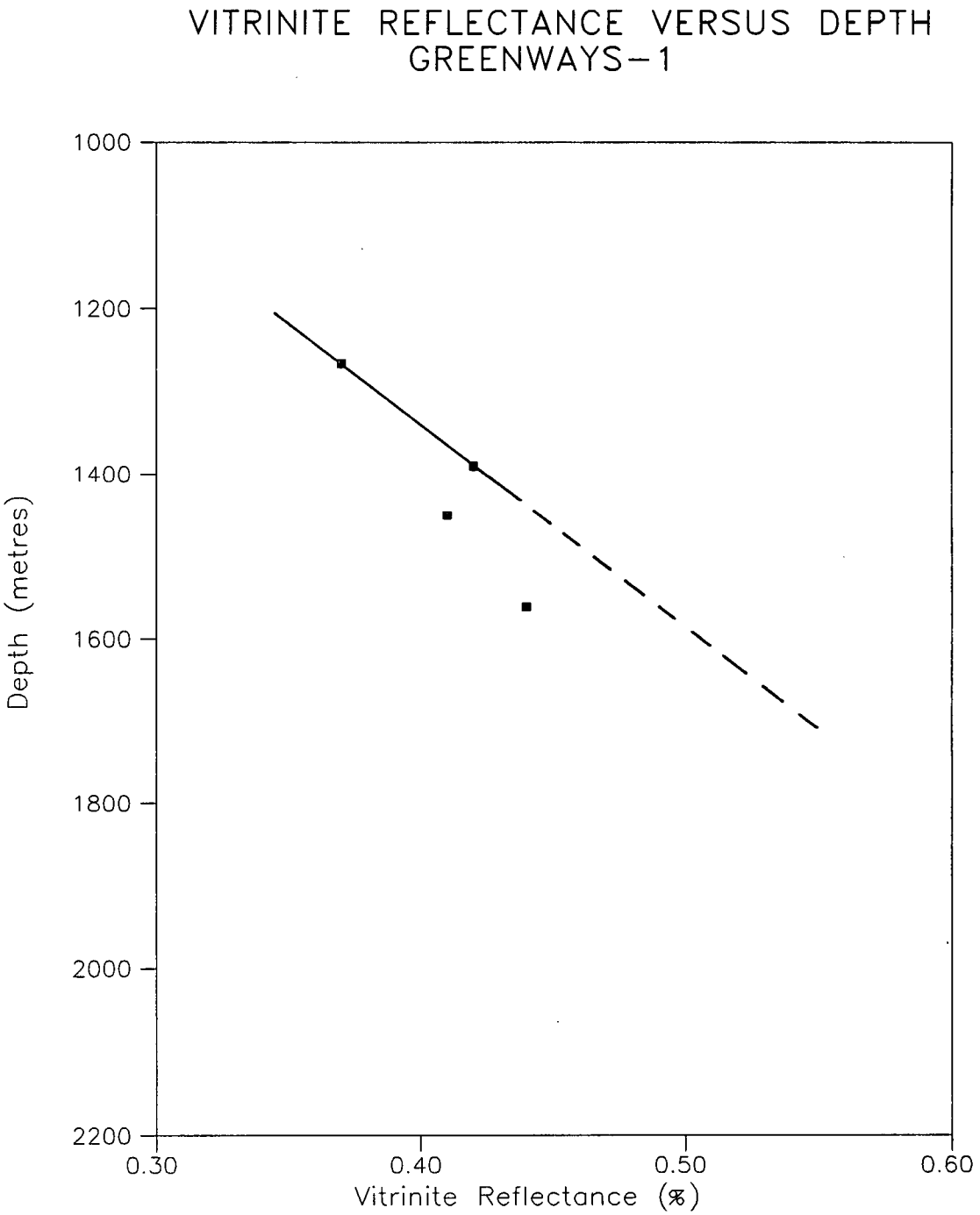


FIGURE 2


VITRINITE REFLECTANCE VERSUS DEPTH
GREENWAYS-1
1000
1200
1400
1600
1800
2000
2200
Depth (metres)
0.30
0.40
0.50
0.60
Vitrinite Reflectance (%)

APPENDIX 1

HISTOGRAM PLOTS OF VITRINITE REFLECTANCE DATA

GREENWAYS-1

VITRINITE REFLECTANCE VALUES

Well Name: GREENWAYS-1
Depth: 1267-1270 m

Sorted List

0.30	0.34	0.38	0.52
0.32	0.34	0.39	
0.32	0.35	0.39	
0.33	0.35	0.40	
0.34	0.35	0.41	
0.34	0.35	0.41	
0.34	0.35	0.42	
0.34	0.36	0.43	
0.34	0.37	0.45	
0.34	0.37	0.46	

Number of values= 31

Mean of values 0.37
Standard Deviation 0.05

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

30-32	***
33-35	**********
36-38	****
39-41	*****
42-44	**
45-47	**
48-50	
51-53	*

VITRINITE REFLECTANCE VALUES

Well Name: GREENWAYS-1
Depth: 1309-1399 m

Sorted List

0.35	0.46
0.36	0.48
0.38	
0.39	
0.42	
0.42	
0.44	
0.44	
0.45	
0.46	

Number of values= 12

Mean of values 0.42
Standard Deviation 0.04

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

35-37	**
38-40	**
41-43	**
44-46	*****
47-49	*

VITRINITE REFLECTANCE VALUES

Well Name: GREENWAYS-1
Depth: 1450-59 m

Sorted List

0.33	0.40	0.44
0.35	0.41	0.44
0.37	0.41	0.45
0.37	0.41	0.45
0.38	0.42	0.45
0.39	0.42	0.47
0.39	0.42	0.50
0.40	0.42	
0.40	0.43	
0.40	0.43	

Number of values= 27

Mean of values 0.41
Standard Deviation 0.04

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

33-35	**
36-38	***
39-41	*********
42-44	********
45-47	****
48-50	*

VITRINITE REFLECTANCE VALUES

Well Name: GREENWAYS-1
Depth: 1561-70 m

Sorted List

0.40
0.41
0.46
0.47
0.48

Number of values= 5

Mean of values 0.44
Standard Deviation 0.03

HISTOGRAM OF VALUES
Reflectance values multiplied by 100

40-42 **
43-45
46-48 ***

Dynamic

Satellite

Surveys

95-98

Final Operations Report

on

PETROLEUM WELL LOCATION

for

SEALOT PTY LTD

GREENWAYS, SOUTH AUSTRALIA

October 1995

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

The following report covers the Petroleum Well Location Survey performed by Dynamic Satellite Surveys (DSS) for SEALOT Pty Ltd. Greenways #1 well is located in PEL25, approximately 3km south of Greenways in Southern South Australia.

The survey was performed in order to accurately locate Greenways #1 and tie to existing seismic, with the well coordinated relative to the Australian Map Grid (AMG) and Australian Height Datum (AHD).

2. RESOURCES

2.1 PERSONNEL

The GPS observations and computations were performed by Andrew White and Bill Hedditch. The report was finalised by Andrew White.

2.2 EQUIPMENT

The following equipment was provided by DSS for the duration of the job:

4WD Vehicles	x1
NovAtel Single Frequency Narrow Correlator GPS Receivers and Antennae	x2
Dataloggers in the form of small Palmtop PCs	x2
486 Renard Notebook Computer for processing	x1
Printer	x1

Ancillary equipment like tribrachs, tripods and adaptors were used.

3. SURVEY PROCEDURES

3.1 SURVEY DATUM

3.1.1 Geodetic Datum

Raw GPS data is acquired on the WGS 84 datum, described by the following parameters:

Datum:	WGS 84 (World Geodetic System 1984)
Spheroid:	WGS 84
Semi-Major Axis Length:	6 378 137.0
Inverse Flattening:	298.257223563
Unit of Measure:	International Metre

Coordinate sets were transformed directly to the Australian Map Grid (AMG) based on the Australian Geodetic Datum 1984 (AGD 84):

Datum:	AGD 84 (Australian Geodetic Datum 1984)
Spheroid:	ANS (Australian National Spheroid)
Semi-Major Axis Length:	6 378 160.0
Inverse Flattening:	298.25
Unit of Measure:	International Metre

Coordinate conversions WGS 84 to AGD 84 were performed using the following transformation parameters :

Translations:	ΔX:	116.00 m	ΔY:	50.47 m	ΔZ:	-141.69 m
Rotations:	$\Delta\Omega$:	0.230"	$\Delta\phi$:	0.390"	ΔK:	0.344"
Scale:	Δs :	-0.0983 ppm				

3.1.2 Map Projection

Cartesian coordinates obtained were based on the Australian Map Grid (Zone 54) projection. Parameters defining this projection are :

Projection:	AMG 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
Unit of Measure:	International Metre

3.1.3 Vertical Datum

All elevations obtained relative to WGS84 have been reduced to the Australian Height Datum (AHD) using the OSU-89A Geoid - Spheroid Separation model. The "Geoid Heights" software developed by Hirsch and Rizos, from the University of New South Wales, was used to derive these N values.

3.2 SURVEY METHODS

3.2.1 Techniques

The Global Positioning System (GPS) utilises US Department of Defense NAVSTAR satellites to provide real-time three-dimensional positioning. When phase data from the satellites is post-processed, a significant increase in the accuracy of results can be obtained. Accuracies of 1 part per million (ppm) are possible with dual frequency units, 3-4 ppm being possible with single frequency units.

DSS utilise the GPS system in various modes of operation (ie: static, kinematic and real-time differential techniques). On this project static and kinematic GPS survey methods were employed.

The method of static GPS involves setting one receiver over a point of known position and another receiver over a point of unknown position. The observation period required for this method is dependant upon the level of accuracy desired and the length of the line being observed. Typically, observation times range between 20 and 60 minutes, using the narrow-correlator GPS receivers from NovAtel.

The method of kinematic GPS involved once again, a receiver over a point of known position and another roving receiver to coordinate the required points.

The roving receiver required a static initialisation sand then the receiver was free to move, but, continuous satellite "lock" must be maintained. The receiver then visits all the required points where details of the point were entered. Upon completion of the survey of the unknown point the roving receiver then closed onto a known point or another static observation was performed.

3.2.2 Reconnaissance

Access to the well site was able to be determined with the aid of 1:100,000 topographic maps, and directions provided by The Department of Mines and Energy.

The relevant land owner was contacted prior to the survey commencing.

3.2.3 Observing

All GPS observations took place on Wednesday, 18th October 1995.

The Classic Static observation technique and kinematic technique were used throughout the survey.

Observation times ranged from 30 minutes for the short baselines observed between PM's near the well, to over 1 hour, when tying in to the distant control marks. Only satellite data logged over an elevation mask of 15° was used in the baseline computations.

4. DATA PROCESSING AND QUALITY CONTROL

4.1 GPS PROCESSING

The field Dataloggers were downloaded to the main processing PC using LAPLINK software. The GPS processing was then done using GRAFNAV software developed by Premier GPS of Canada. This is a very sophisticated program capable of giving results to the required accuracy. All factors indicating quality of the obtained solutions are monitored during processing.

4.1.1 Control

Datum for the survey was Camel Back Trig. station.

Located approximately 13 km north of the Greenways #1 Well. This is a 1st order mark. the coordinates used are as follows.

Camel Back Trig:	427724.083	E
	5891981.607	N
	70.658	Ht

To verify this control data, ties were made to a number of other permanent markers.

Firstly, a tie was made to an old seismic PM placed and surveyed by DSS in 1990. PM 798+2, SC90-15 was tied to Elgin Trig Station in 1990. Misties to this PM are shown below.

STATION	ΔE	ΔN	ΔHT
SC90-15 VP 798+2	0.0	-0.2	+0.12

Ties were also made to two other seismic permanent markers placed by Geosystems in 1992. Misties are shown below.

STATION	ΔE	ΔN	ΔHT
G92-07 VP 413	0.66	-1.27	0.56
G92-09 VP 244	1.16	-0.90	0.72

Ties were also made to two 1986 seismic PM's. DSS does not have access to this 1986 survey data and as such no misties can be shown.

The final observed coordinates for these 1986 PM's are included in Appendix A.

4.1.2 Accuracies and Precisions

As can be seen, the tie between Camel Back Trig and the PM tied to Elgin Trig is very good.

The ties to the 1992 permanent markers also show reasonable Misties which were typical of GPS vs. conventional surveys. These ties were good gross error checks.

5. CONCLUSION AND RECOMMENDATIONS

The survey proceeded smoothly with the Greenways #1 well being surveyed within one day. Sufficient redundant measurements were made to Government control to ensure a reliable datum was established for the project.

The survey was completed at a rate and accuracy which could not be matched by conventional survey methods.

Final coordinates for all surveyed pints, including ties to two 1992 seismic permanent marks appear in Appendix A.

Respectfully Submitted,

Andrew White.

APPENDIX A

Final Coordinates

SEALOT
AGD 84 AHD

WELL LOCATION
UTM projection

DSS

OCTOBER 1995
AMG ZONE 54 CM=141
DYNAMIC SATELLITE SURVEY

Point name	Easting	Northing	Elevation	Cde	Comments
GREENWAYS # 1 WELL	425164.975	5879330.566	16.225	OO	GROUND ELEVN
G92-07 VP 413	424740.744	5880374.726	15.532	OO	PM
G92-09 VP 244	425150.955	5877534.587	15.381	OO	PM
CAMELBACK TRIG 6923/1182	427724.083	5891981.607	70.658	OO	DATUM
OHE86-128 VP 386	424973.988	5878885.876	15.720	OO	PM
OHE86-134 VP 284+9	424908.212	5879453.433	15.779	OO	PM
SC90-15 VP 798+2	425057.541	5870655.142	13.041	OO	PM

Final Coordinates Latitude and Longitude AGD84

(Coordinates shown are those observed by DSS)

STATION	LATITUDE	LONGITUDE
Greenways #1	-37° 13' 45".8673	140° 09' 23".0435
G92-07 VP 413	-37° 13' 11".8644	140° 09' 06".2086
G92-09 VP 244	-37° 14' 44".1374	140° 09' 21".8250
OHE86-128 VP 386	-37° 14' 00".2409	140° 09' 15".1324
OHE86-134 284+9	-37° 13' 41".8063	140° 09' 12".6691
SC90-15 VP 798+2	-37° 18' 27".3261	140° 09' 15".5374

APPENDIX B

Station Location Diagram

Dynamic Satellite Surveys

STATION LOCATION DIAGRAM

DSS-FF-1
REV 3.
April 199

PROJECT / JOB # 95-98 CLIENT SEALOT DAY/DATE OCT '95

AREA: GREENWAYS STATION NAME: GREENWAYS # 2

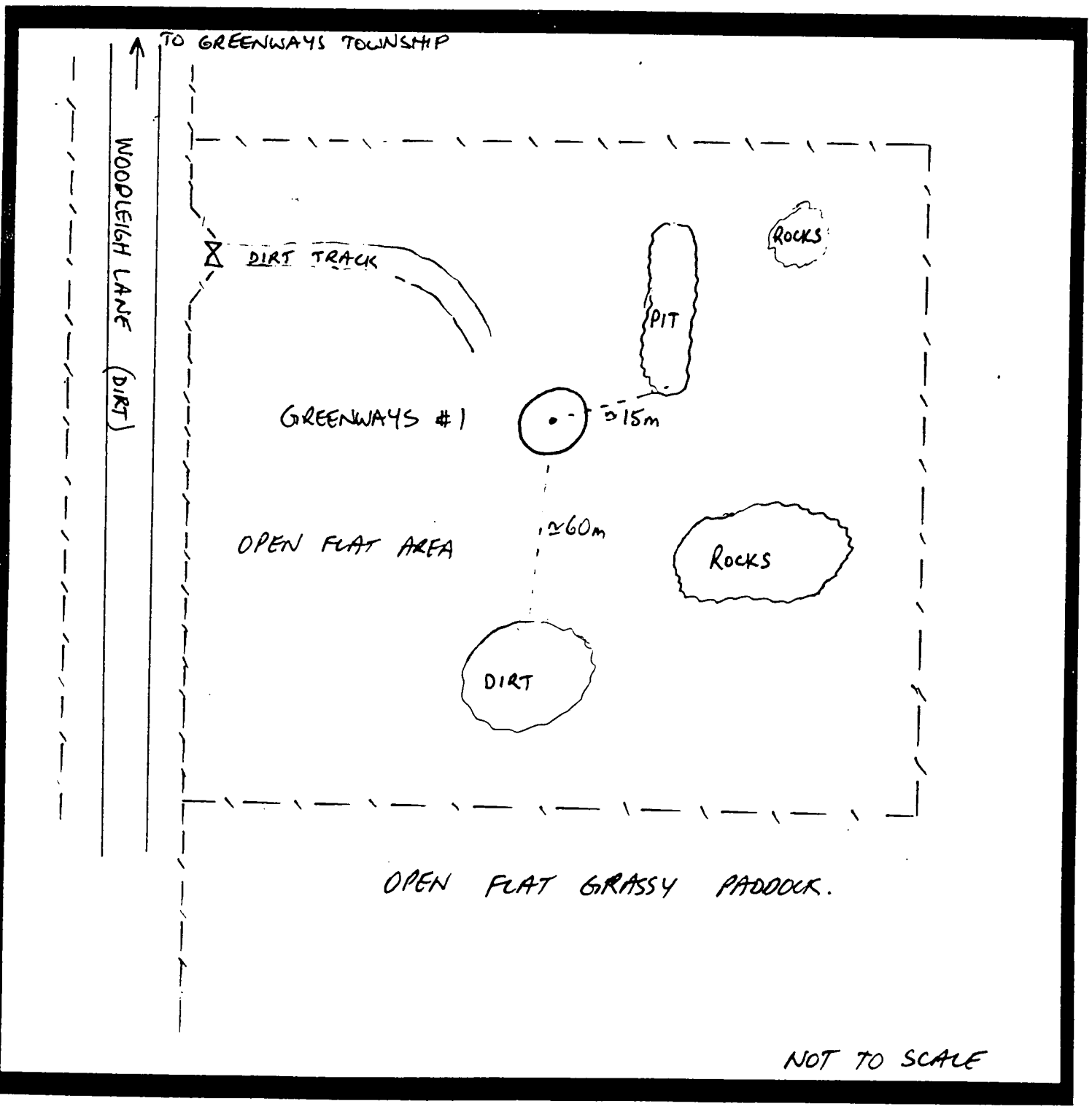
MAP REFERENCE: _____ TIED IN NETWORK TO: _____

AMG84/66 E 425164.98
N 5879330.57

ZONE: 54
CM = 141°

AHD R.L. 16.20
Accuracy?

Description of Mark: Well located by sign on pole & surrounded by 0.5m high tank.



APPENDIX C

Control Station Summary

STATION SUMMARY

Authority DIVISION OF NATIONAL MAPPING

Original Station Established by: Royal Australian Survey Corps Date:

Existing Station Marked by: Department of Lands, S.A. Date: 1962

Reference Books: R.A.S.C. summary, Lands Dept. S.A. Clarke summary.
GP 691 VAP 1321, 373, 522, 374 TPS 2110, 111, 115, 116, 119
NM 8846, NM 8847, NM 13973, NM 13759 National Adjustment 14/5/66 Section 21-23 Serial 27

Cadastral Location: State South Australia County/District

Parish/Hundred Allotment/Section/Portion

Map Name:

DATUM: Aust

RECTANGULA

GRID BEARI

37

Access and Locality Sketch:

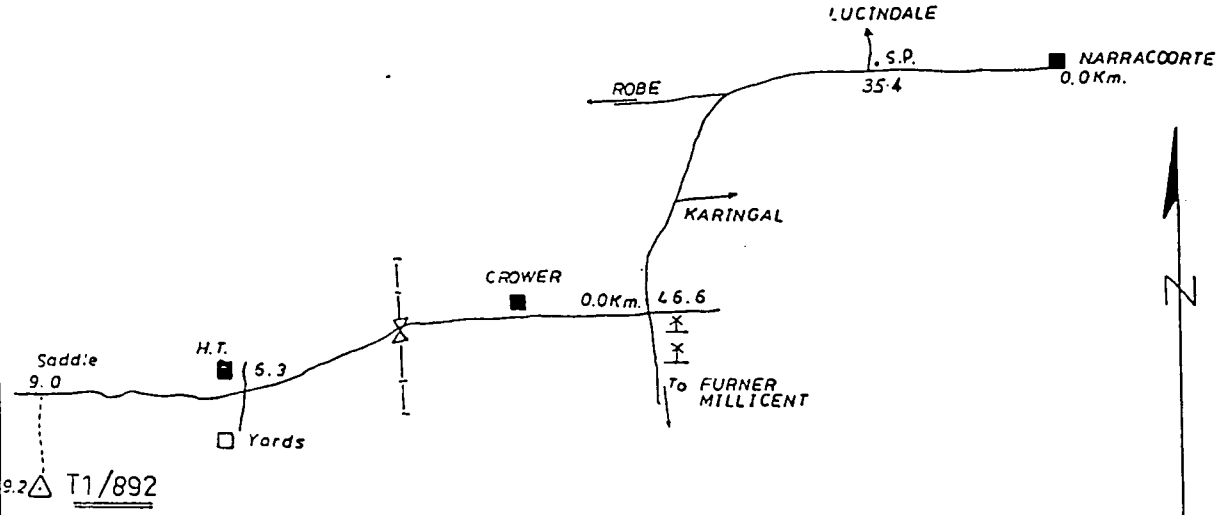
Particulars of station marking and beacon:

Station Mark; A section of galvanised iron piping cemented into limestone 0.3m below surface.

Beacon : A steel quadripod with 0.1m x 0.1m centre pole and disc 0.9m in diameter. Height to top of discs above G.M. is 4.81m.

Reference Marks: Three iron rods set in concrete.

Access : From Naracoorte 0.0Km proceed along the Naracoorte-Bray Junction-Robe road to 'Karingal'. Continue on to crossroads at 46.6 Km. Follow road west to homestead and thence west along track to 56.6 Km. The trig station is approximately 0.2km north of this point. Ring Millicent Phone 33 2546 (Crowage) who will inform the owner (McGuiness) Owner requests no camping on property. (1973 information).



Not to Scale
Distances in kilometres.

Station revisited by: National Mapping., 1973.

Cadastral Connections & Reference Marks.

Beari
Dista

Photo

Certified

SERIAL 2

...ATION SUMMARY

Station Number and Name: T1/892 CAMELBACK **6923/1182** Order: FIRST

Map Name: Penola Map Number: SJ 54-6 Scale 1: 250,000

DATUM: Australian Geodetic Datum 1966

RECTANGULAR COORDINATES: Australian Map Grid: In Metres

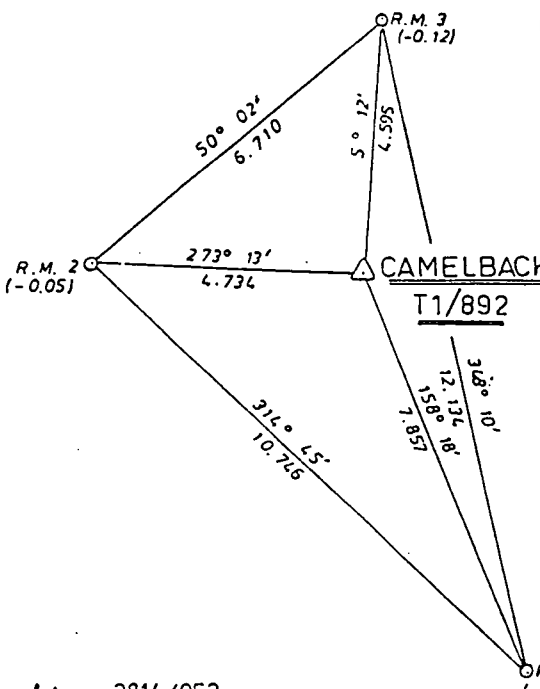
Serial 27 GRID BEARING = ADJ AZIMUTH + CONVERGENCE HEIGHTS: In Metres on the Australian Height Datum

12 6923/ 1182 CAMELBACK ORDER = 1 AGD84

LATITUDE	LONGITUDE	EL	MC	PVC	GHT
37 6 56.09845 S	140 11 11.29201 E	70.658	.528	-1.565	12.552

E	N	CONVERGENCE	ZONE
427724.083	5891981.607	-0 29 27.33	54.

STATION	NAME	DISTANCE	AZIMUTH
5 6823/ 1154 1	MT BENSON	34667.864	284 58 6.87
6 6823/ 1162 1	RICHMOND PK	28538.031	253 18 19.97
13 6923/ 1183 1	ELGIN	28088.584	191 9 23.97
14 6923/ 1255 1	FURNER	26465.233	158 17 43.96
17 6924/ 2061 1	MINECROW	31888.130	5 9 3.38
18 6924/ 2062 1	BOWAKA	20692.186	329 12 7.25
26 6823/ 1167 1	WEST DAIRY	19177.036	260 53 48.80
27 6823/ 1168 1	GLEN PARA	21878.479	280 55 50.83
37 6923/ 1323 1	EAST AVENUE	12197.655	86 48 7.29
40 6923/ 1326 1	WEST AVENUE	12539.431	162 20 45.09
48 6924/ 2069 1	NYARA	15700.185	27 48 .36



WGS 84 coords:

$\phi = -37°06'50''.8555$

$\lambda = 140°11'16''.2696$

ht: 85.523

N: 14.865

Bearings are true.
Distances in metres.

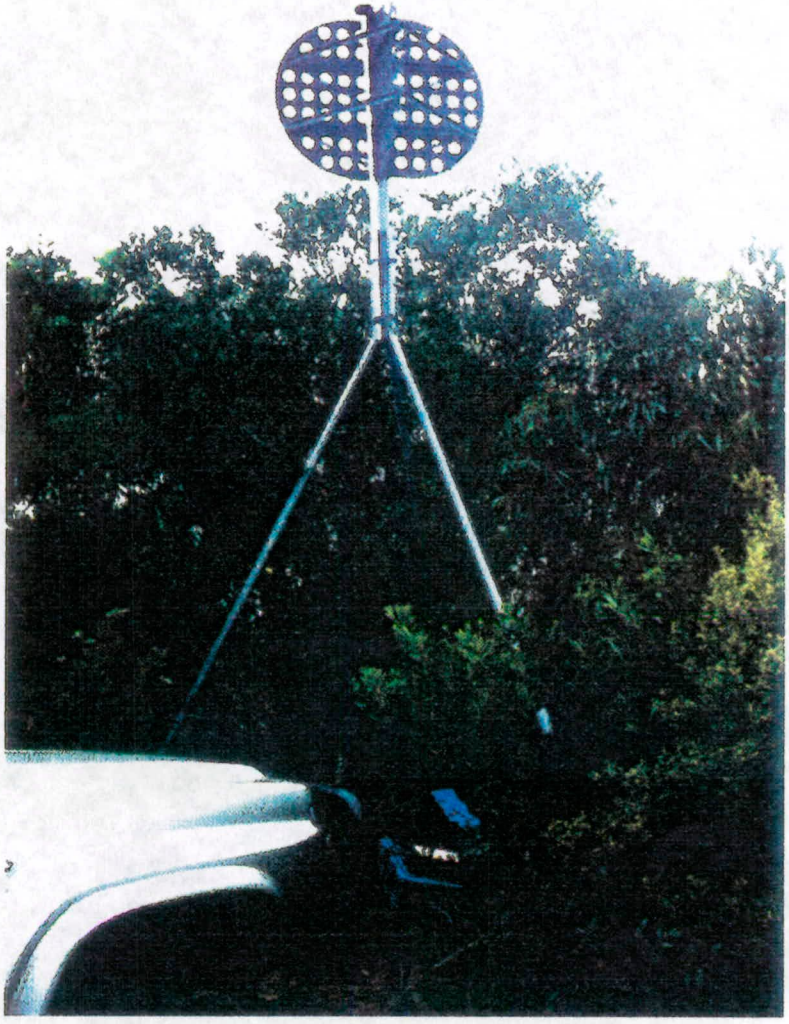
Cadastral Connections & Reference Marks.

Photo Identification: 1139/63 2814/052

Certified free of transcription errors: Wood K. Grant Date: 18-10-63

APPENDIX D

Photographs



Camel Back Trig

Greenways #1 Well Head

GPS on Well Head

North East of Well

Looking South from Well

South East of Well