Eden Energy Ltd

ACN 109 200 900

First Annual Report

Moomba Project
GEL 185

14th May 2005 to 13th May 2006

HELD BY:	Eden Energy Ltd
MANAGER & OPERATOR:	Eden Energy Ltd
AUTHOR(s):	Graham M. Jeffress
SUBMITTED TO:	Greg Solomon
DUE DATE FOR SUBMISSION:	23rd July 2006
PROSPECTS:	
COMMODITY(s):	Geothermal Energy
KEY WORDS:	Moomba, Innamincka, geothermal

Distribution:

- PIRSA Petroleum
- Eden Energy Ltd

Submitted by : ______________________________

Accepted by : ______________________________

CONTENTS

List of Figures

1 Introduction

1.1 Background

Two principal components are required for a heat reservoir within the earth's crust to achieve the required temperature for commercial power generation:

(a) Primary heat production within the reservoir

The primary heat production from within a buried body results largely from radioactive decay of minerals within the body. Hence, large bodies which are relatively rich in such minerals will have the ability to generate anomalously large amounts of heat. In particular large, late stage granite plutons or large mineralised systems rich in radioactive minerals are potential targets.

In addition, the temperature of such reservoirs would be enhanced if they are located in an area of anomalous heat flow within the crust, such as the fairly well defined area occupying much of northeastern South Australia.

(b) Insulation of the heat reservoir

It is essential that the heat generated within the reservoir be trapped effectively, and the most efficient natural insulators are fine grained sediments, in particular carbonaceous shales or coal seams. Modelling by others indicates that around four to five kilometres of sedimentary cover would be required to blanket a granitic heat reservoir to ensure sufficient heat was retained. Large mineralised systems rich in radioactive minerals may require less sedimentary cover, possibly as low as two to three kilometres.

Following review of public domain information, the Moomba North area in the northeast of South Australia was selected as it appears to exhibit certain of the key model parameters in terms of geothermal energy as summarised above.

Importantly, Geodynamics Limited has already made significant progress in demonstrating the technical robustness of the general area for geothermal power generation. To date, Geodynamics has successfully drilled into and hydraulically stimulated the target heat reservoir (granite) in its initial well, Habanero 1. High temperatures in the target granite have been confirmed (>250ºC at 4421m depth), a stimulated zone in excess of that expected has been obtained in testing and overpressures (35Mpa) have been discovered in the target granite due to existing joints and fractures containing water under pressure. This later feature is believed by Geodynamics to enhance the potential efficiency of the project.

Clearly a significant part of the initial technical risk of Eden's Moomba North proposal has been addressed by Geodynamics work. Accordingly, Eden's work program will benefit from Geodynamics program but will be tailored to addressing more particularly specific issues pertaining to its area.

1.2 Licence Data

Geothermal Exploration Licence 185 was granted on 14th May 2005 with an initial term of five years over an area of 494km^2.

Figure 1 shows the licence locations.

1.3 Period

In accordance with Section 33 of the Petroleum Regulations 2000, this report details work conducted during the first permit year of GEL185.

2 Work Requirements

The revised Year 1 work programme negotiated by Eden with PIRSA for the combined Witchellina GELs (166,167, 168) comprised:

- Geological and geophysical review (to be carried out in the area covered by GELs 166, 167 & 168).

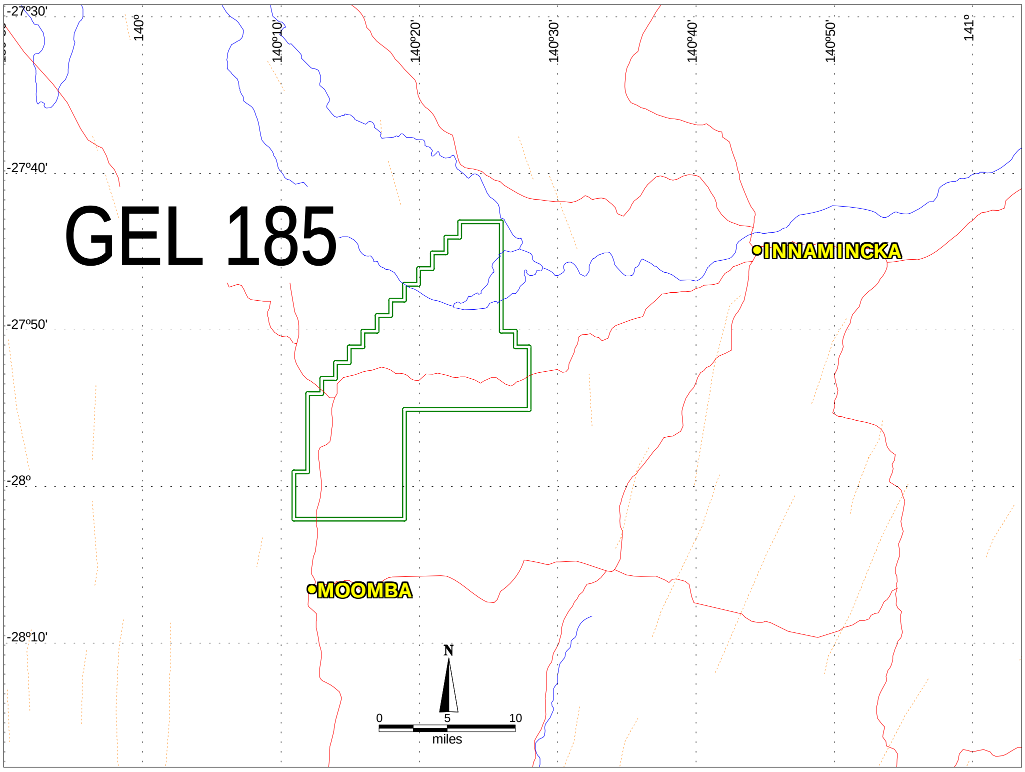


Figure 1: Location of GEL 185

3 Work Conducted

In year one, work has focussed on a thorough review of all available geological and geophysical data to ensure the technical robustness of the Moomba North site. Review of all relevant drilling data from both within the area and surrounds was begun. Year One work was designed to reduce the relative technical risk, and confirm that the initial assumptions about Moomba North as a suitable site and to lay the groundwork for the next stages of the work programmes.

3.1 Geological Review

During the first year of the licences, Eden has focussed on acquiring and reviewing all the available open file data relevant to the project area.

A review of the published literature on the geology of the region was undertaken.

GEL185 is located near Moomba in the Eromanga Basin in close proximity to the advanced operations of Geodynamics Pty Ltd. There are strong regional trends with continuity of structural elements between the two tenements resulting in similar geothermal conditions. Consequently the Geodynamics program provides a close analogue for future operations on GEL185.

3.1.1 Structural Geology

The Cooper Basin is extensively described in Gravestock et al (1998). It is a north-easterly oriented intracratonic basin located in northeastern South Australia and southwestern Queensland. It is filled with mainly terrestrial sediments showing fluvial, coal measure and lacustrine affinities ranging from Lower Permian to Triassic age. The oldest sediments have some glacial attributes. Unconformably overlying the Cooper Basin is the much more extensive Eromanga Basin, a broad intra-cratonic sag feature containing Jurassic-Cretaceous fluvial, lacustrine and marginal marine sediments with significant coal-bearing intervals. High geothermal gradients in the area are associated with the low thermal conductivity insulating properties of the basin sediments (and in particular the coal measures).

The Cooper-Eromanga Basin sediments have been subjected to several tectonic movements that began with periods of extension during the Permian. Later wrench-induced northeast-southwest compressional stress caused basin-wide folding and faulting during the Triassic with reactivation of palaeofaults and structural contacts. Following reactivation in the Early Cretaceous, the Eromanga Basin suffered maximum sudsidence under marine conditions. Late Miocene crustal shortening imparted a period of east-west compression on the basin resulting in widespread folding, transcurrent faulting and reverse faulting. These periods of reactivation have produced a significant number of major structural traps providing a focus for hydrocarbon exploration in the Moomba region particularly in the Nappamerri and Patchawarra Troughs along with their adjacent structural ridges.

3.1.2 Basement Condition

Numerous geophysical surveys have been conducted in the Moomba area for oil and gas exploration. The basin structure has been extensively outlined by seismic profiling and the stratigraphy has been confirmed by deep drilling. Completion logs are available in many locations. However the geothermal potential of the region has been more directly established by Geodynamics Pty Ltd in their exploratory Habanero geothermal wells. Geodynamics have previously targeted basement granites with anomalous concentrations of U, K, and Th. There are no significant lateral anomalies identified in that region and consequently the Habanero observations are immediately relevant.

In particular Geodynamics report that the initial drilling indicates that the underlying granite is a medium to coarse grained, reduced granite with relatively high abundances of radiogenic elements. The heat generation capacity, based on these abundances, is in the range 7-10 watts/m^3, around three times higher than a typical granite. The granite was originally a two-mica granite with accessory tourmaline, but it has suffered from extensive burial metamorphism since being covered by the sedimentary blanket. Effectively all the biotite has been altered to chlorite, and plagioclase has been altered to albite+calcite+hydrated Ca-silicates. Widespread alaskite dykes and irregular bodies invade the coarser grained normal granite. The granite was previously dated using zircons as Carboniferous, but new monazite dating to be carried out in this project is expected to provide a better age estimate.

Evidence from borehole imaging logs indicate that sub-horizontal joints and fractures dominate the fracture systems in the granite. These fractures are expected to make ideal pathways for fluid flow and heat extraction. In an operation known as hydraulic stimulation the fluid permeability of these fractures is increased by pumping water into the fractures at high pressure. This enhanced fluid pressure causes optimally oriented fractures to exceed the critical state for slip. The resulting micro-earthquakes are mapped with an acoustic monitoring network. For the current project, a network of 4 shallow, 3 moderate depth, and one deep well has been constructed. Mapping of micro-earthquake hypocenters with this network will then provide the basis for positioning the production wells. Similar projects overseas have shown that following slip, the permeability of a granite joint is enhanced by many orders of magnitude.

3.2 Modelling & Interpretation of Geophysical Data

Public domain magnetic and gravity data were compiled and re-processed.

3.3 Thermal Data Review

Professor James Cull from Monash University reviewed geothermal constraints for the area and undertook preliminary modelling of thermal parameters.

3.3.1 Geothermal Constraints

The geothermal exploration program conducted by Geodynamics has been accompanied by extensive documentation on geological and geophysical conditions in the area. Many details have been released at public meetings, in conference proceedings and in company progress reports. Similar geothermal conditions are expected for any future developments in GEL 185.

Geodynamics report that temperatures of approximately 240°C are observed at depths of 3700m near the top of the granite basement. The temperature gradient in the granite results in an increase in the rock temperature by ~3°C for every 100m into the granite. The high temperatures at these depths relate to a number of independent geological conditions coinciding in the area:

- the presence of low conductivity sediments overlying the granite;
- the optimal thickness of these sediments which allows access to hot rock without needing to resort to the expensive drilling equipment required for drilling beyond 5km depth;
- a granite chemistry containing relatively high abundances of radiogenic elements giving high heat productivity (high heat production or HHP granite);
- the previous unroofing of the Palaeozoic granite which resulted in brittle unloading features; and,
- the existence of high tectonic stresses in the sediments and granite leading to low fluid permeability, conductive heat flow and minimised heat loss by convection.

There are multiple seismic sections available in the area and the subsurface structure is relatively well known from extensive programs of oil exploration. Similarly several deep wells have been drilled on the margins of GEL185. However interpretations are largely irrelevant in view of the extensive direct geothermal data available from the Geodynamics drilling program at Habenero.

3.4 Recommendations from Data Review

Cull (2005) concluded that in view of the proximity of the Eden Energy GEL in relation to the Habanero drilling conducted by Geodynamics no additional survey work is required in the immediate future. It is anticipated that technology developed for the Habanero site can be readily adopted or modified for the extraction of geothermal power on the adjacent blocks.

In the longer term, several specific drill sites will be selected in relation to regional lineaments and favourable stress fields identified from airborne magnetic data. Direct targeting of hot rocks or saline fluids within shear zones may be possible using magnetotelluric (MT or AMT) profiles to detect zones of anomalous electrical resistivity and surveys options will be assessed.

4 Year 1 Expenditure

Table 1

Commercial in Confidence

5 Year 2 Work Programme

Activities scheduled for Year Two are designed to secure funds for subsequent, higher cost aspects of the work program, better define the target reservoirs by conducting specific, targeted geophysical surveys (if required) and selection of a suitable initial test drill site.

Work planned for the second year of GEL 185 will be designed to increase our knowledge of the depth to basement and heat flow in the project area.

Part of this aim will be accomplished by assessing the use of a magnetotelluric (MT) survey.

6 Compliance with the Petroleum Act (Reg. 33)

6.1 Summary of the regulated activities conducted under the licence during the year

Eden has not undertaken any regulated activities as defined under the Petroleum Act in GEL 185 during the licence year.

6.2 Report for the year on compliance with the Act, these Regulations, the licence and any relevant Statement of Environmental Objectives

Given that no regulated activities were undertaken during the reporting period, many of the regulations are inapplicable at this stage and no non-compliances have been noted, with the exception of late submission of this report.

6.3 Statement concerning any action to rectify non-compliance with obligations imposed by the Act, these regulations or the licence, and to minimise the likelihood of the recurrence of any such non-compliance

Eden recognises the importance of achieving regulatory compliance and is committed to achieving appropriate practices in its management strategies, work practices and procedures. Eden is committed to operating in an environmentally and socially responsible manner.

6.4 Summary of any management system audits undertaken during the relevant licence year, including information on any failure or deficiency identified by the audit and any corrective action that has, or will be, taken

Eden is a new company and is developing appropriate systems and documentation to cover Field Operations, Environmental Management, Health and Safety issues and compliance checklists to ensure the requirements of relevant Acts and Regulations are met.

Eden's activities have been essentially desktop studies at this stage and no management system audits have been undertaken as yet.

6.5 List of all reports and data relevant to the operation of the Act generated by the licensee during the relevant licence year

Most of the work conducted during the first licence year comprised compilation of various public domain data and preparation of a number of memoranda by consultants. The contents of the memoranda have been incorporated into this report.

No new surveys or data relating to the tenement have been acquired.

6.6 Report on any Incidents reportable to the Minister under the Act and Regulations during the relevant Licence Year

No reportable incidents occurred.

6.7 Report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably present, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be, taken

No threats have been identified.

6.8 Statement outlining operations proposed for the ensuing year

See Section 5 above.

7 Key References

Cull, J.P. (2005) Notes from Reviews of Eden Energy Ltd's Geothermal Prospects – *Unpublished Memoranda to Eden Energy Ltd*.

Gravestock, D.I., .Hibburt, J., and Drexel, J.F., (eds) 1998. Petroleum Geology of South Australia Volume 4 - Cooper Basin, PIRSA

ACN 109 200 900

Second Annual Report

Moomba Project
GEL 185

14th May 2006 to 13th May 2007

HELD BY:	Eden Energy Ltd
MANAGER & OPERATOR:	Eden Energy Ltd
AUTHOR(s):	Graham M. Jeffress
SUBMITTED TO:	Greg Solomon
DUE DATE FOR SUBMISSION:	23rd July 2007
PROSPECTS:	
COMMODITY(s):	Geothermal Energy
KEY WORDS:	Moomba, Innamincka, geothermal

Distribution:

- PIRSA Petroleum
- Eden Energy Ltd

Submitted by : ____________________

Accepted by : ____________________

CONTENTS

List of Figures

1 Introduction

1.1 Background

Following review of public domain information, the Moomba North area in the northeast of South Australia was selected as it appears to exhibit certain of the key model parameters required for geothermal energy, namely high heat flow, adequate insulating sediment, and suitable basement conditions.

Importantly, Geodynamics Limited has already made significant progress in demonstrating the technical robustness of the general area for geothermal power generation.

Clearly a significant part of the initial technical risk of Eden's Moomba North proposal has been addressed by Geodynamics work. Accordingly, Eden's work program will benefit from Geodynamics program but will be tailored to addressing more particularly specific issues pertaining to its area.

1.2 Licence Data

Geothermal Exploration Licence 185 was granted on 14th May 2005 with an initial term of five years over an area of 494km^2.

Figure 1 shows the licence locations.

1.3 Period

In accordance with Section 33 of the Petroleum Regulations 2000, this report details work conducted during the first permit year of GEL185.

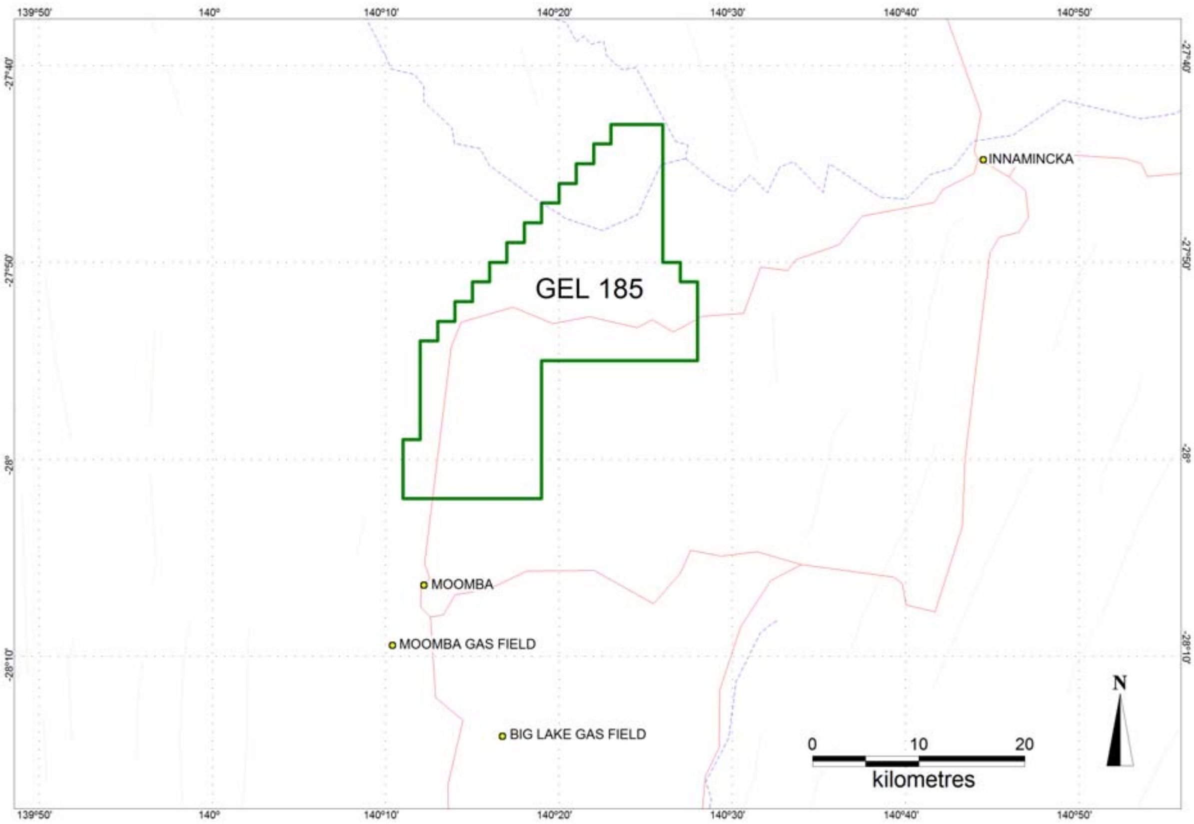


Figure 1: Location of GEL 185

2 Work Requirements

The work programme agreed by Eden with PIRSA for the first two years of GEL 185 comprised completing geological and geophysical reviews, allow targeting of DRILL HOLE IN Year 3.

MT surveys were recognised as an essential tool to refine the collar location.

Subsequent to these initial activities Eden planned secure funds for subsequent, higher cost aspects of the work programme, better define the target reservoirs by conducting specific, targeted geophysical surveys (if required) and selection of a suitable initial test drill site.

3 Work Conducted

Work undertaken in Year 2 consisted of acquisition of further public domain data, consolidation of existing data sets and retention of appropriate consultants to assist with the evaluation of the tenement.

Review of the available well completion data was positive, with the potential for geothermal resources in sedimentary aquifers in the base of the sediment pile recognised, as well as the potential for basement EGS resources. Collation and interpretation of all available seismic data has not yet bee completed.

Assessment of the available potential field data showed that whilst the aeromagnetic data was acceptable, the gravity data would provide better information on major faults (loci for geothermal fluids), location of basement granites and basin geometry if more data points were available.

During the licence year, Eden has sought to arrange a magnetotelluric (MT) survey of the region, given the Eden believes this tool offers the most cost effective means to select test sites for drilling within the tenement. However, suitable contractors with the appropriate equipment, experience and availability were not able to be located. Subsequent to the licence year, a number of new possibilities were identified and Eden are hopeful of conducting an MT survey in 2007.

The inability to conduct MT work at Mungeranie has meant that Eden were unable to select a site to drill a confirmatory slimline hole to test the geothermal gradient and collect material for thermal conductivity measurement, and this work will therefore need to be postponed to later years of the licence.

A variation to the licence minimum work requirements has been submitted.

4 Year 2 Expenditure

Table 1

Commercial in Confidence	

5 Year 3 Work Programme

Activities scheduled for Year 3 are designed to secure funds for subsequent, higher cost aspects of the work program, better define the target reservoirs by conducting specific, targeted geophysical surveys (if required) and selection of a suitable initial test drill site.

Work planned for the third year of GEL 185 is now designed to increase our knowledge of the depth to basement and heat flow in the project area as well as define specific locations to drill a test hole.

Eden consider that MT, combined with detailed modelling of the potential field data, will provide the best way forward. A thorough assessment of the available seismic data has also yet to be completed.

Consequently Eden are proposing a potential infill gravity survey, at least an orientation MT survey and synthesis of the public domain seismic interpretations and SeeBASE information.

Results from all of these areas will be used to select a test site for a drilling a prospecting geothermal hole – in 2008 – dependent on drill rig availability.

In parallel with technical work, Eden will be commencing more detailed economic/commercial assessments of all of the geothermal licences held by the company to identify the best strategies to progress the projects.

6 Compliance with the Petroleum Act (Reg. 33)

6.1 Summary of the regulated activities conducted under the licence during the year

Eden has not undertaken any regulated activities as defined under the Petroleum Act in GEL 185 during the licence year.

6.2 Report for the year on compliance with the Act, these Regulations, the licence and any relevant Statement of Environmental Objectives

Given that no regulated activities were undertaken during the reporting period, many of the regulations are inapplicable at this stage and no non-compliances have been noted, with the exception of late submission of this report.

6.3 Statement concerning any action to rectify non-compliance with obligations imposed by the Act, these regulations or the licence, and to minimise the likelihood of the recurrence of any such non-compliance

Eden recognises the importance of achieving regulatory compliance and is committed to achieving appropriate practices in its management strategies, work practices and procedures. Eden is committed to operating in an environmentally and socially responsible manner.

6.4 Summary of any management system audits undertaken during the relevant licence year, including information on any failure or deficiency identified by the audit and any corrective action that has, or will be, taken

Eden is a new company and is developing appropriate systems and documentation to cover Field Operations, Environmental Management, Health and Safety issues and compliance checklists to ensure the requirements of relevant Acts and Regulations are met.

Eden's activities have been essentially desktop studies at this stage and no management system audits have been undertaken as yet.

6.5 List of all reports and data relevant to the operation of the Act generated by the licensee during the relevant licence year

Most of the work conducted during the first licence year comprised compilation of various public domain data and preparation of a number of memoranda by consultants. The contents of the memoranda have been incorporated into this report.

No new surveys or data relating to the tenement have been acquired.

6.6 Report on any Incidents reportable to the Minister under the Act and Regulations during the relevant Licence Year

No reportable incidents occurred.

6.7 Report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably present, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be, taken

No threats have been identified.

6.8 Statement outlining operations proposed for the ensuing year

See Section 5 above.

ACN 109 200 900

Third Annual Report

Moomba Play

GEL 185

HELD BY: Eden Energy Ltd
MANAGER & OPERATOR: Eden Energy Ltd
AUTHOR(s):
SUBMITTED TO:
DUE DATE FOR SUBMISSION: 13th June 2008
PROSPECTS:
COMMODITY(s): Geothermal Energy
KEY WORDS: Moomba North, geothermal

Distribution:
• PIRSA Petroleum
• Eden Energy Ltd

Submitted by : ____
Accepted by : ____

CONTENTS

List of Figures

1. Introduction

1.1 Background

GEL185 is located north of the Moomba oil and gas field in the Cooper Basin on features related to the Cooper Basin model developed by Geodynamics Pty Ltd. It is located on the southern margin of the Nappamerri Trough in the Cooper Basin depocentre where there are significant sediment sections providing good thermal insulation for interpreted basement granites. In addition there is some evidence for regional lineaments providing a focus for fracturing and aquifer development in basement sections.

Modelling of data from Open file sources predicts suitable temperature rocks at depths of 3-4km.

1.2 Licence Data

Geothermal Exploration Licence 185 (GEL185) was granted on 14th April 2005 with an initial term of five years over an area of 494km^2.

Figure 1 shows the licence location.

1.3 Period

In accordance with Section 33 of the Petroleum Regulations 2000, this report details work conducted during the third permit year of GEL 185 (14/04/2007 to 13/04/2008).

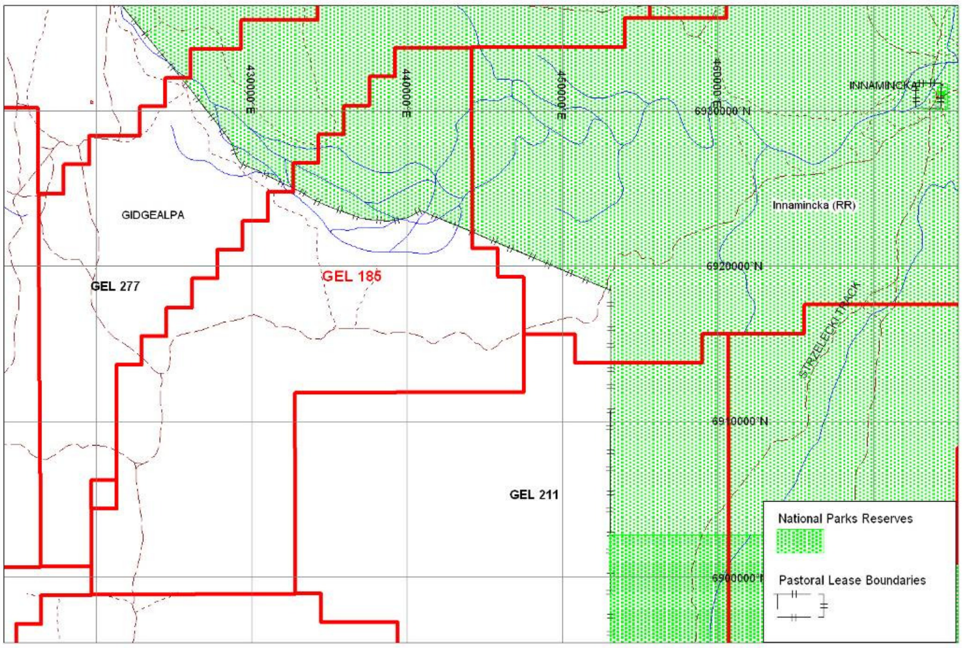


Figure 1 Location map of GEL 185

2. Work Requirements

The Year 3 work programme negotiated by Eden with PIRSA for GEL 185 comprised:

- Geological and geophysical reviews in an attempt to define basement lithology;
- Magnetotelluric survey and interpretations;
- Initial planning for preliminary exploration hole.

3. Work Conducted

Work conducted in year three consisted of acquisition of further public domain data, consolidation of existing data and retention of appropriate consultants to assist with the evaluation of the tenement. A geothermal assessment and review of open file seismic data was completed.

A Magnetotelluric (MT) survey was designed and conducted during the year, as it is believed that this geophysical method can provide a cost effective tool in working towards assessing the tenement with a view to suitable placement of drill hole(s) for heat flow assessment. The final interpretation of the MT data is still being awaited at the time of writing this report. This survey was planned to be conducted in the 2007 calendar year, however contractor delays meant that the acquisition did not occur until early 2008.

.

3.1 Geophysical Data Acquisition

The engagement of suitably qualified contractors to undertake the desired MT acquisition survey of GEL185 was finally achieved in early 2008. The survey was undertaken by Quantec Geoscience. A total of two lines, nominally in north-south and east-west orientations, were sampled with a total of 45 sample locations being measured, 24 along line 2 (east west), and 21 along line 1 (north south) (Figure 2).

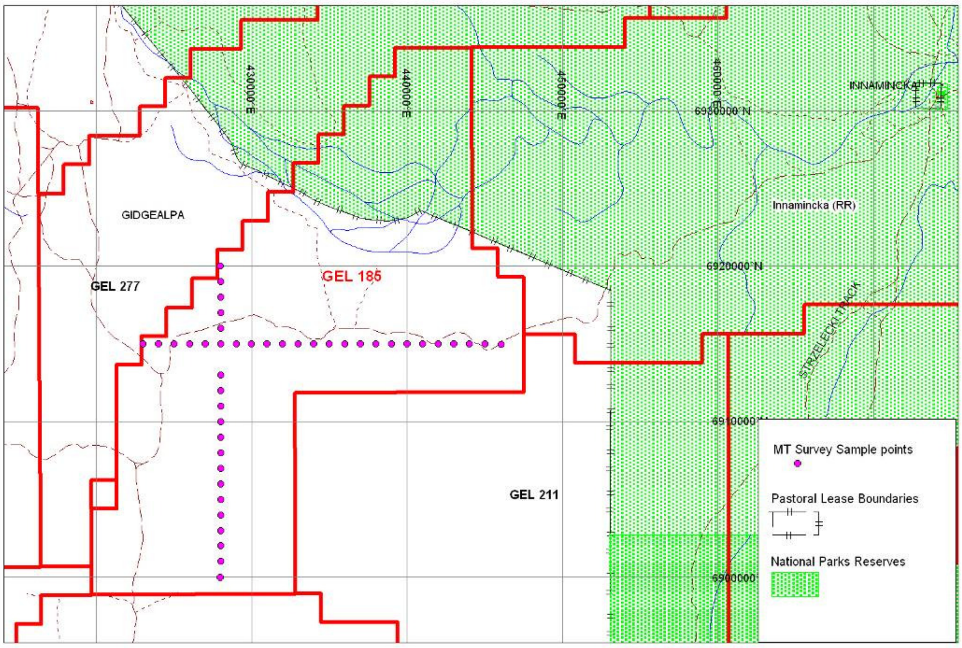


Figure 2 Location of MT sample points

3.2 Recommendations from MT Survey Results

At the time of writing this report the final interpretations have not yet been received from the geophysical contractor.

4. Year 3 Expenditure

See Appendix 1.

5. Year Four Work Programme

Eden was to undertake reviews of the geology and geophysics of the Moomba Play area in the first two years of the licence, with an aim to gaining a comprehensive understanding of the geology of the area and to plan a location for the drilling of a test hole to assess heat flow.

A revised work programme has been agreed with PIRSA. The year four work programme will involve:

- Geological and geophysical studies;
- A preliminary feasibility study
- A slimline prospecting well (500m)

6. Compliance with the Petroleum Act (Reg. 33)

6.1 Summary of the regulated activities conducted under the licence during the year

Eden completed a Magnetotelluric survey. No indications of non-compliance with the Statement of environmental objectives for ground based geophysical operations (non-seismic) in South Australia are evident from operational records.

6.2 Report for the year on compliance with the Act, these Regulations, the licence and any relevant Statement of Environmental Objectives

Eden has complied with all relevant sections of the Act and Regulations as they pertain to the regulated activities conducted during the year.

The relevant SEO for this activity is - *Statement of environmental objectives for ground geophysical operations (non-seismic) in South Australia*.” PIRSA August 2007.

6.3 Statement concerning any action to rectify non-compliance with obligations imposed by the Act, these regulations or the license, and to minimise the likelihood of the recurrence of any such non-compliance

Eden recognises the importance of achieving regulatory compliance and is committed to achieving appropriate practices in its management strategies, work practices and procedures. Eden is committed to operating in an environmentally and socially responsible manner.

There were no instances of non compliance for this reporting period.

6.4 Summary of any management system audits undertaken during the relevant licence year, including information on any failure or deficiency identified by the audit and any corrective action that has, or will be, taken

Eden is a new company and has developed appropriate systems and documentation to cover Field Operations, Environmental Management, Health and Safety issues and compliance checklists to ensure the requirements of relevant Acts and Regulations are met.

As these systems are newly developed and the work conducted to date has not shown any deficiencies in the systems, no management system audits have been undertaken as yet.

6.5 List of all reports and data relevant to the operation of the Act generated by the licensee during the relevant licence year

One report was generated during the year relevant to the operation of the Act:

> “Seismic Interpretation of Geothermal Licence (GEL) Areas 169, 177, 185 South Australia”. *HDR Pty Ltd 2007*.

No other reports or data relating to the tenement have been received at this time.

Hot Dry Rocks Pty Ltd
ABN 12 114 617 622

PO Box 251 (31/141 Osborne St)
South Yarra VIC 3141 Australia
Phone: +61 3 9867 4072
Email: info@hotdryrocks.com
Web: www.hotdryrocks.com

SEISMIC INTERPRETATION OF GEOTHERMAL EXPLORATION LICENCE (GEL) AREAS 169, 177 & 185, SOUTH AUSTRALIA

A report prepared for Eden Energy Ltd

October 2007

Ben Waining & Gareth Cooper – Hot Dry Rocks Pty Ltd, PO Box 251, South Yarra, Vic 3141, Australia
Ph: 61 (0) 448 503 932 **Email:** Gareth.Cooper@hotdryrocks.com **Web:** http://www.hotdryrocks.com

Contents

List of Figures:

Executive Summary

An interpretation of existing open file seismic data was undertaken at the request of Eden Energy (ENE) for a selected number of lines within GELs 185, 177 and 169 in the NE of South Australia. Key horizons and interpreted depths were mapped, and an outline of potential prospectivity based on these interpretations has been given.

Seismic and drilling data constraints exist for this assessment, due to a lack of comprehensive 2D seismic coverage and wells within the study areas, particularly within depocentres. This has resulted in reasonable assumptions of stratigraphy and stacking velocities having to be made in some instances.

This assessment has concluded that all of the tenements studied hold some level of reasonable prospectivity for geothermal resource exploration.

GEL169; Bollards Lagoon:

- Located on the southern margin of the Tenappera Trough.
- Interpreted ?granite basement at approximately 2000m depth, although speculative due to a lack of direct evidence.
- The lack of greater than 2000m of sedimentary cover (subject to thermal modeling), therefore the potential for a DBSA type geothermal play is low.
- High calculated geothermal gradient and favourable modelled heat flows for the tenement provide the potential for the development of an EGS play within basement.
- Drill testing of the depth to interpreted ?granite, and associated thermal condition measurements, are recommended as a first phase exploration program.

GEL177; Mungerannie:

- Located on the eastern side of the Birdsville Ridge, within the Eromanga Basin.
- Depth to crystalline basement within this region has been interpreted to be on average approximately 2000m. There is no drill testing to this depth to fully test this assumption.
- A calculated average geothermal gradient of about 56°C/km exists at Mulkarra West-1, indicating probable low temperature risks (subject to thermal modeling).
- Risks associated with thermal resistance (insulation) may be reduced in the north of the tenement where basin sequences are thicker.
- It is unlikely that Deeply Buried Sedimentary Aquifer (DBSA)-type geothermal plays will be viable. Consequently EGS-type plays are more likely.
- Consideration should be given to further refining temperatures in the area through a program of shallow drilling and heat flow modelling.

GEL185; Moomba North:

- Located at the southern end of the Nappamerri Trough, a section of the deepest Permian sediments in the Cooper Basin.
- Sedimentary formations included in the Permian succession include those associated with the majority of oil and gas reservoirs in the Cooper Basin.
- Given both elevated geothermal gradients and thick sedimentary sequences with potentially suitable physical properties of porosity and permeability this area may be suited to the exploration for both DBSA and EGS type plays.
- Definition of the lateral extent and characteristics of sands in potential DBSA plays will require further sequence stratigraphic analysis.
- Depths to sedimentary formations with potential for development of geothermal systems may commence from approximately 2.6km (Toolachee Formation), although this requires validation with thermal modeling within the trough centre.

1. Introduction and Background

Hot Dry Rocks Pty Ltd (HDRPL) was commissioned by Eden Energy Ltd (EDE) to interpret existing seismic data for their three South Australian tenements:-

- GEL169 – Bollards Lagoon
- GEL177 – Mungerannie
- GEL 185 – Moomba North

All three tenements lie within or on the margins of the Cooper Basin, South Australia.

The aims of the study were:-

- To map key horizons, with regards to geothermal systems, from selected 2D reflection seismic lines in each tenement.
- To produce mapped horizons in two way time (TWT) and depth for the purpose of defining potential drill targets
- To advise on prospectivity risks, based on seismic data, for each tenement

To facilitate these aims, the following tasks were undertaken:-

- Identification of suitable open-file 2D seismic data and well completion reports
- Ordering of digital seismic and navigation data
- Loading and quality assurance of SEGY seismic and navigation data in Kingdom Suite software
- Interpretation of 2D seismic lines in TWT, tying of data and integration with limited well data
- Depth conversion of seismic data from average stacking velocity profiles
- Export of XYZ horizon grids and production of maps for key horizons.

2. Limitations

Given time and data constraints for this project, interpretations have been based on formation tops from existing well reports (lithostratigraphy). No detailed sequence stratigraphic analysis was undertaken. In the absence of well synthetics and velocity data only simple depth conversion was undertaken based on average stacking velocities. As existing wells are located on marginal basement highs and away from the trough axis (depocentre), the use of stacking velocities should provide reasonable estimates of depth.

Temperature data, including bottom hole temperatures and geothermal gradients, used for this report are based on data provided within well completion reports. Where these data have been used to extrapolate indicative values for temperature across the areas of study it should be noted that such extrapolations are simplistic and to not account for lateral and vertical variation in bulk rock conductivity or heat flow. Delineation of the detailed temperature regimes would require further specific study, beyond the scope of this report.

3. Geology of the Cooper Basin

The intracratonic Cooper Basin represents a Late Carboniferous to Triassic depositional episode terminated at the end of the Middle Triassic with widespread compressional folding, regional uplift and erosion. It lies unconformably over early Palaeozoic sediments of the Warburton Basin and is overlain disconformably by the central Eromanga Basin. The three major troughs (Patchawarra, Nappamerri and Tenappera) are separated by ridges that may be structurally associated with the reactivation of NW trending thrust faults in the underlying Warburton Basin, (PIRSA 2006) or may be topographic highs with significant shaping from glacial geomorphic processes (Boucher, 2001).

The evolution of the Cooper Basin commenced with deformation along the eastern Australian Plate, leading to uplift in central Australia and subsequent development of a major continental ice sheet. The Cooper Basin floor became an erosional surface with relief being topographic rather than structural (Gravestock, Jensen-Schmidt ch5 in Gravestock et al 1998). Decay of the ice sheets from the Late Carboniferous led to the release of enormous volumes of sediment and the deposition of lacustrine units with intervening regressive fluvodeltaic sediments (including the Patchawarra and Tirrawarra Formations) from the Early Permian through until the Early Triassic. An episode of uplift (Daralingie movement) in the Early Permian led to some erosion. Late Permian deposition of peat swamp and floodplain sediments (Toolachee Formation) led conformably into the early Triassic organically lean and oxidised lacustrine and fluvial deposits. There are no recorded coal formations from the Early Triassic period, with a return to peat formation occurring in the Cooper Basin in the Late Triassic (Alexander, E.M. Ch6 in Gravestock et al 1998). Unconformably lying over the Cooper Basin sediments are the Early Jurassic to Late Cretaceous sediments of the Eromanga Basin.

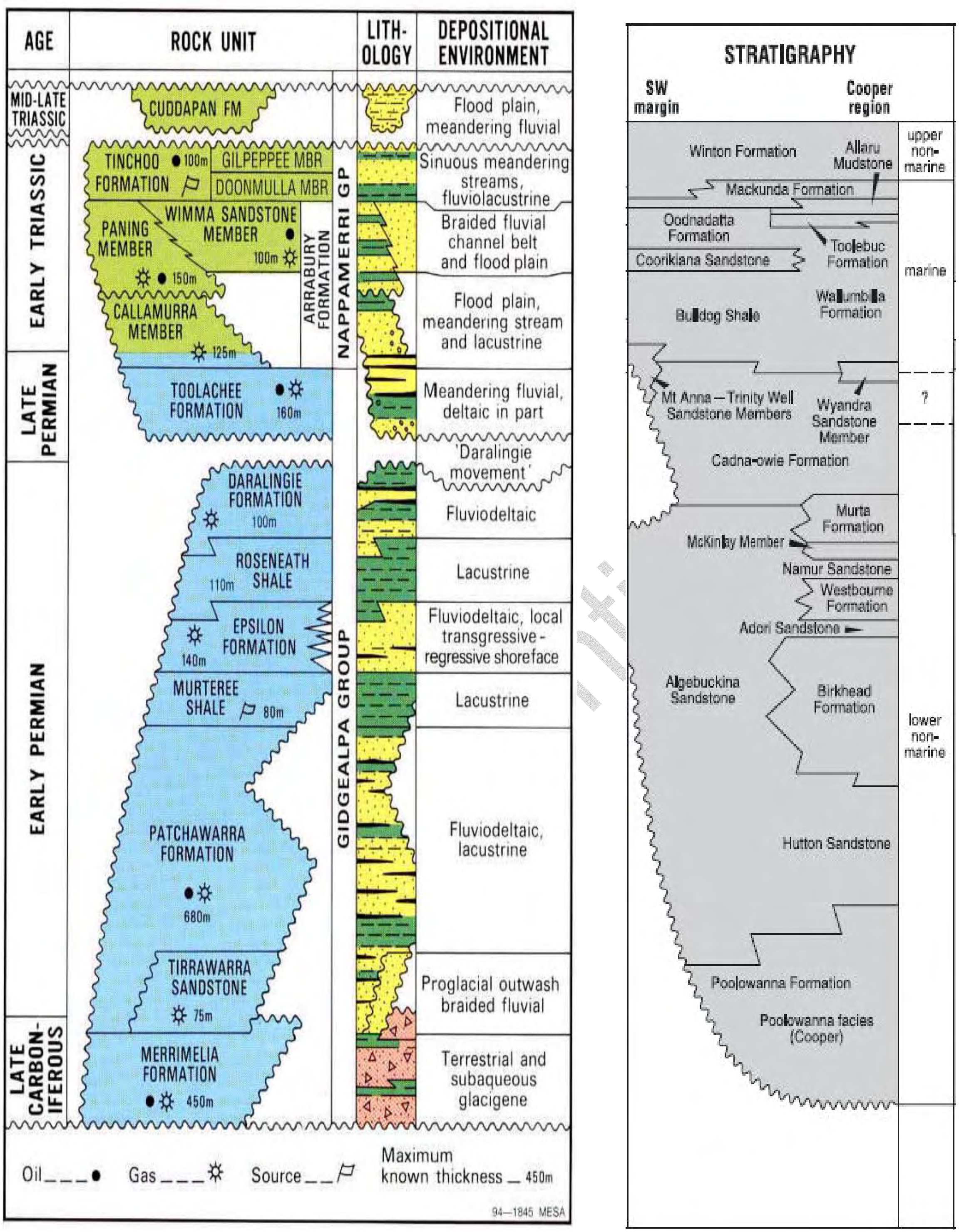


Fig. 1. Geological Summary of the Cooper Basin (Drexel and Preiss 1995) (left) and Eromanga Basin (Alexander and Sansome ch5 in Alexander & Hibburt 96)

4. Depth Conversion

Average stacking velocities were compiled to derive a polynomial best-fit for available seismic data (Fig. 2). This time-depth relationship was used to approximate depth maps in each area. Given the absence of well velocity data for the central trough area it is reasonable to assume that this methodology will produce adequate depth maps within an error margin of about ±200m.

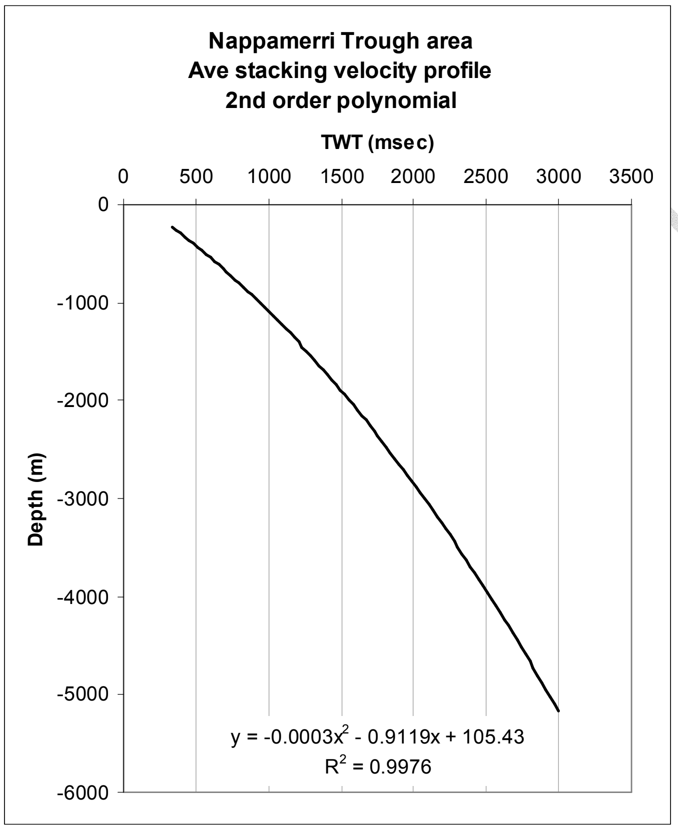


Fig. 2 Sample of time – depth relationship from average seismic stacking velocities

5. Interpretation of GELs

5.1 GEL 169 – Bollards Lagoon

5.1.1 Location & geology

Located on the southern margin of the Cooper Basin on the southern flank of the Tenappera Trough (in an area referred to as the Battunga Trough in the Beach Petroleum Noarlunga-1 well completion report), this area comprises a basement high which was drilled for hydrocarbons (Noarlunga-1). The well intersected a condensed Jurassic and Permian sequence before entering pre-Permian basement at 1504m depth (about 1260msec TWT). The well was terminated at 1539m in basement metasediments.

The recoded BHT was corrected to give a value of 91.3°C (Beardsmore, 2007) giving a geothermal gradient of 44.1°C /km. Further north Aldinga-1 has a calculated geothermal gradient of 55.1°C /km.

5.1.2 Seismic interpretation

The Bollards Lagoon area is notable for having relatively shallow basement (1200-1300msec TWT, or about 1500m depth). Consequently it is unlikely that, at these shallow depths, significant geothermal aquifers will be intersected. Consequently seismic interpretation has concentrated on the deeper horizons at or beneath basement level.

Sample strike and dip seismic lines are shown in figures 3 and 4 respectively. Key horizons are described as:-

- **Palaeozoic basement:** a poorly defined trough at around 1200-1300msec TWT characterised by distinctive onlap of overlying Permian and Jurassic sediments. The basement seismic package is characterised by a weak sub-parallel reflectors which appear to show growth towards major faults, indicating an older rift sequence (Warburton Basin). The basement horizon is offset by a number of larger normal faults, some of which exhibit inversion.

- **?Granite horizon:** the interpretation of granite at depth in this area is speculative. Whilst there are some indicators of possible igneous intrusion in the area, such as high heat flow, there remains an absence of direct evidence such as well intersections. However seismic data show a general diffuse zone of reflectors at depth which may be characteristic of a ?Carboniferous granite. Reflectors may also represent high density metasediments of the Warburton Trough. Confidence in the interpretation of this horizon is poor and the horizon is typically marked by the cessation of sub-parallel reflectors, interpreted to be the approximate base of Palaeozoic metasediments. Depth to the interpreted ?Granite is highly variable, but at Noarlunga-1 it is interpreted to be at about 1500msec TWT or ~2000m depth.

- **Numur Sandstone:** this horizon has been interpreted for reference purposes only and is characterised by a dominant trough at about 1000mesc TWT. There is some truncation of reflectors beneath the horizon and mild downlap onto the horizon, suggesting a period of structuring and erosion at the end of the Late Jurassic-Early Cretaceous.

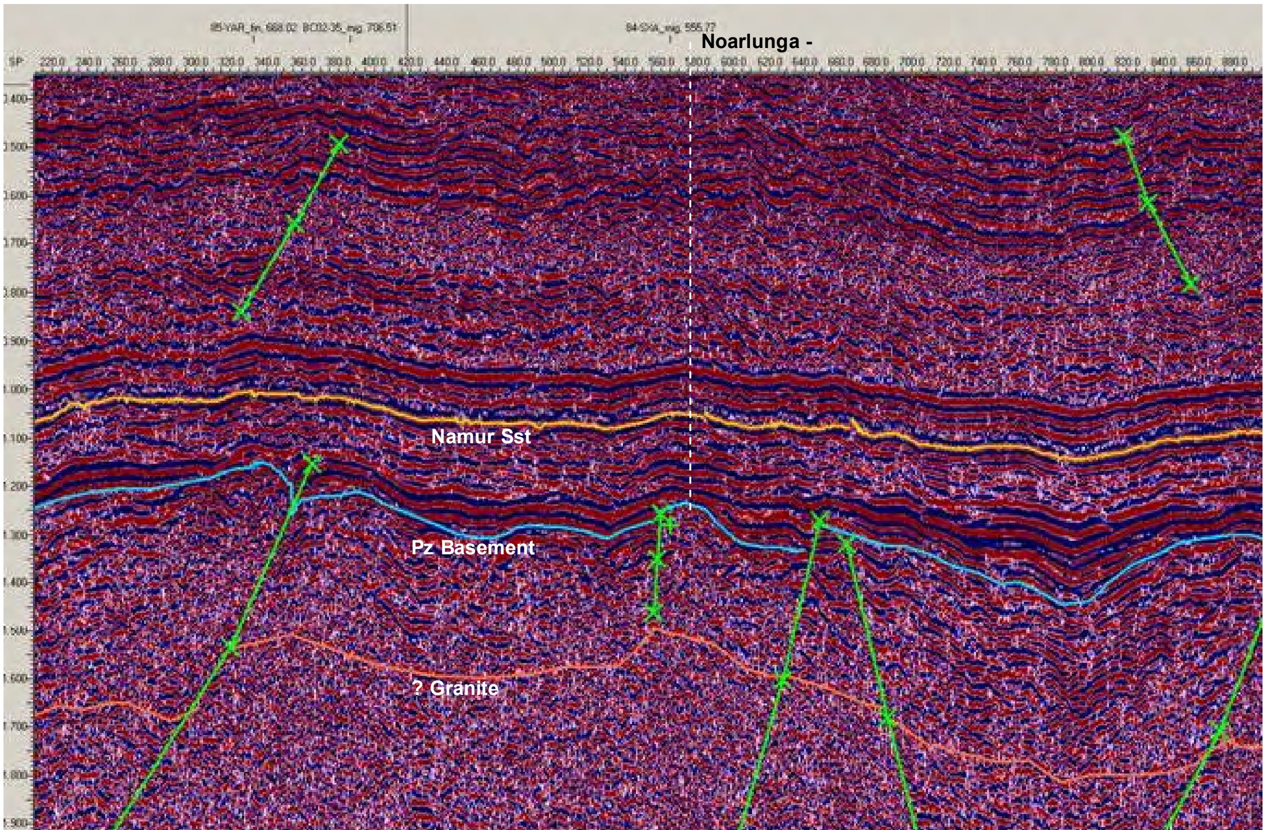


Fig 3 Seismic strike line 84SWX through Noarlunga-1 (see Fig. 5 for location)

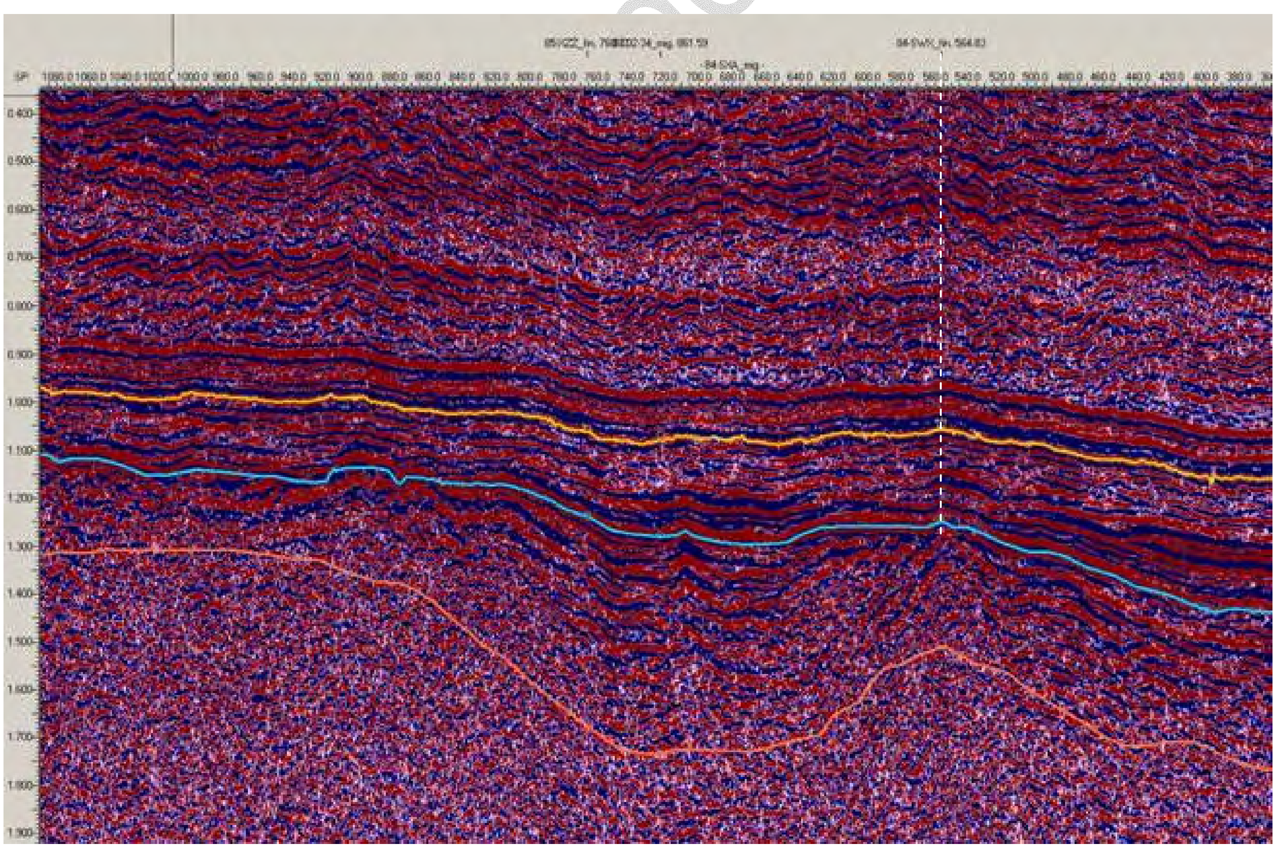


Fig 4 Seismic dip line 84SXA through Noarlunga-1 (see Fig. 5 for location)

The thinning of the Permian and Jurassic sequences onto basement highs and the characteristic onlap of these reflectors indicates that the pre-Permian basement at Noarlunga-1 and further to the south was an existing high at the time of Tenappera Trough development such that only a condensed section is present through much of the tenement.

Mapping of the top Palaeozoic basement horizon in TWT and depth shows basement is highest in the south (Fig. 5) at about 1200m depth and reaches about 2000m depth in the north. Although speculative, interpreted the top ?granite horizon shows a similar trend, although its relief is more rugose (Fig. 6).

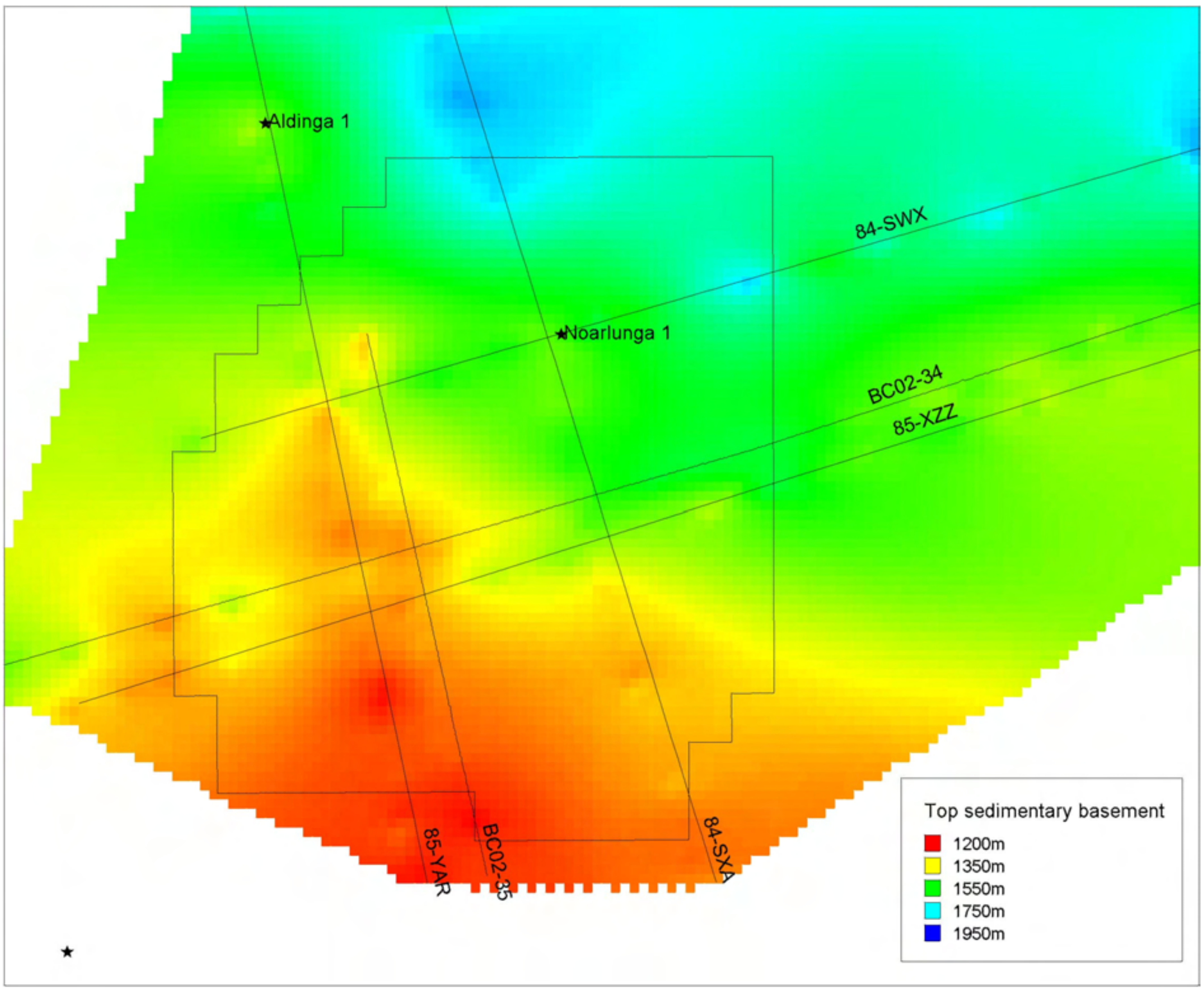


Fig 5 Depth (m) interpreted top Palaeozoic basement metasediments, GEL 169.

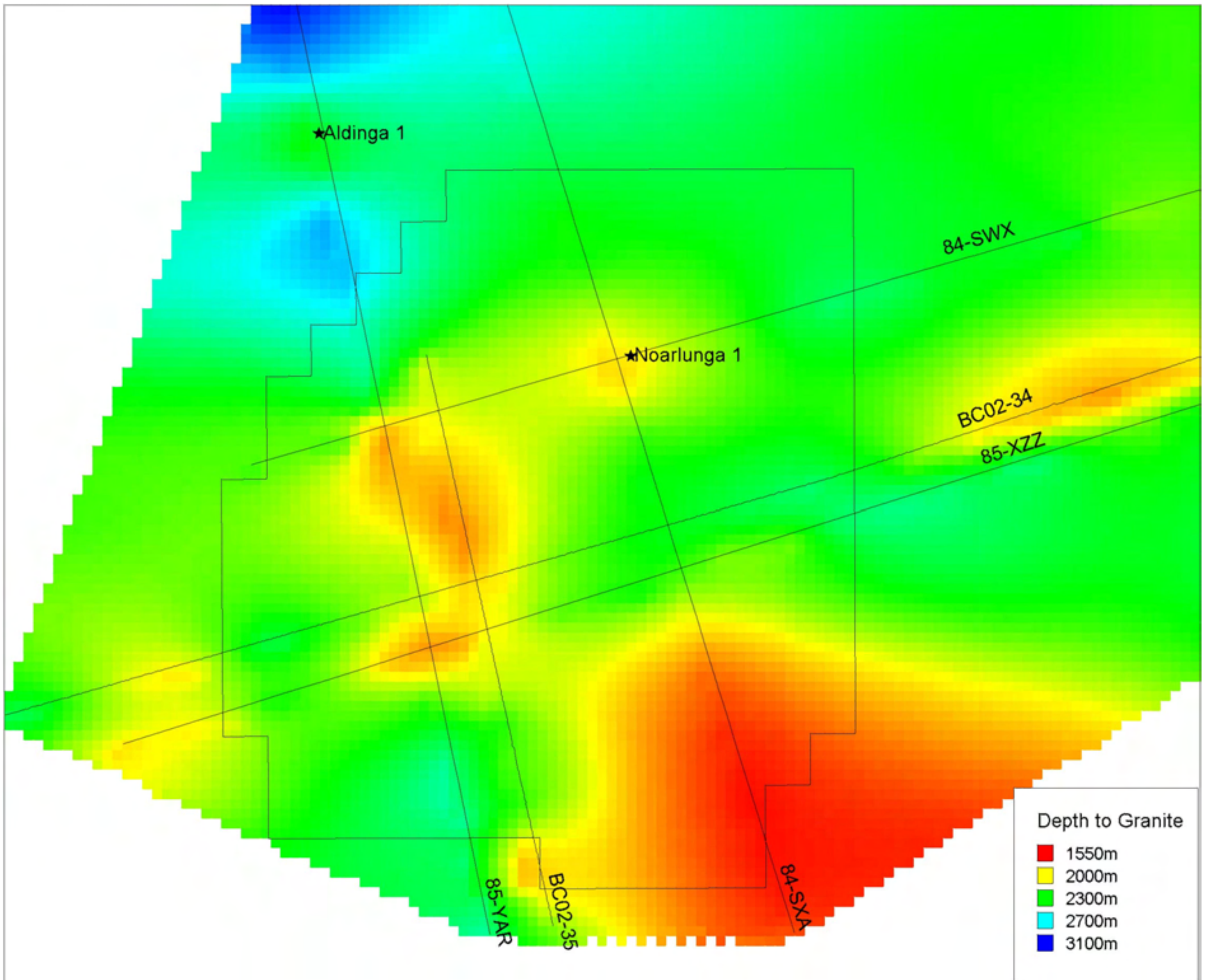


Fig 6 Depth (m) speculative interpretation of top ?granite, GEL 169.

5.1.3 Geothermal Systems Assessment

A comprehensive geothermal systems assessment of GEL169 was conducted by Beardsmore (2007) on behalf of Eden Energy Ltd. This report highlights favourable modelled heat flows for the tenement (100-119 mWm^{-2}) and suggests that the major risks are associated with the nature of the reservoir, in particular whether or not granite may subcrop in the area.

The characteristics of seismic reflectors assessed in this study suggest that a granite body at depth may be interpreted in this area, however the absence of direct evidence means that this interpretation remains speculative.

Seismic data also suggest that the tenement has a relatively thin post-Permian basin cover, particularly in the south and as such it is probable that risks associated with thermal resistance (insulation) may be reduced in the north of the tenement where basin sequences are almost 2km thick (Fig. 5).

Given the relatively shallow depth of the post-Permian basin sequence in this tenement, it is unlikely that Deeply Buried Sedimentary Aquifer (DBSA)-type geothermal plays will be viable. Consequently EGS-type plays are more likely.

5.1.4 Recommendations & possible drilling targets

It is recommended that prior to deep drilling, value may be obtained by testing the interpretation of seismic data presented in this report by re-entering drill hole Noarlunga-1, if technically possible. If the interpreted granite is present, as discussed in this report, the granite may be intersected at a depth of 400-500m below the present TD level of Noarlunga-1. This may prove a cost effective way in mitigating reservoir risks prior to deep drilling.

In terms of overall drilling risk for geothermal exploration, thermal resistance risks may be better addressed by drilling targets in the NW of the tenement where basin sequences reach about 2km in depth and the interpreted ?granite (if present) is in excess of 2.5km in depth. Based on temperature modelling of wells for this tenement (Beardsmore, 2007) it is expected that workable geothermal gradients (>150°C) may be intersected at depths of about 3km (approximately at the same level as the top of the interpreted granite to the north of the tenement, Figure 6). However the lateral and vertical distributions of temperature throughout the tenement require detailed thermal modeling to validate this.

5.2 GEL 177 – Mungerannie

5.2.1 Location & geology

Located predominantly within the Eromanga Basin and on the eastern side of the Birdsville Ridge (and possibly within the southwest margin of the Cooper Basin), Mulkarra West-1 was drilled on the eastern margin of the tenement and terminated in what is described as "Cambrian-Ordovician" metasediments, although palynological dating of samples ceases above this point in the mid – late Jurassic Birkhead Fm. Consequently the age correlations at depth in this well are questionable. The lithology of the TD core was described in the Mulkarra West-1 well completion report as a colorless to white meta sandstone with almost 100% quartz grains with minor associated trace minerals. Alternatively this may describe an occurrence of the Cooper Basin Hutton Sandstone, or a sandstone member of the Eromanga Basin Poolwanna Fm.

The well was terminated at 1286.9m within "metasediments" with a BHT of 92.5°C and an average geothermal gradient of about 56°C/km.

5.2.2 Seismic interpretation

The Mulkarra West-1 well suggests that the Mungerannie area has a relatively shallow basement (1000msec TWT, or about 1200m depth). Consequently it is unlikely that, at these shallow depths, significant geothermal sedimentary aquifers will be intersected. Consequently seismic interpretation has concentrated on the deeper horizons at or beneath basement level, as interpreted from well data.

Sample strike and dip seismic lines are shown in figures 7 and 8 respectively. Key horizons are described as:-

- **Palaeozoic basement (from well pick):** Mulkarra West-1 indicates that Palaeozoic metasediments are intersected at about 1200m depth. This position coincides with a strong negative trough in the seismic data (about 1000msec TWT). However both the depth and seismic characteristics of this horizon are inconsistent with known basement intersections in other parts of the region. In particular seismic line 84TZQ shows minor offset of this horizon (yellow horizon) by multiple planar faults. These faults do not offset deeper seismic horizons beneath 1300msec TWT, suggesting ductile displacement at this level. This is not characteristic of brittle basement metasediments. In addition to this the seismic package between 1000 and 1300msec TWT exhibits a number of sequence boundaries, defined by multiple downlaps and apparent prograding sequences from the south (Fig. 8). This progradational sequence is probably more consistent with the glacial-fluvial depositional environment of the Permian and perhaps Jurassic. Given the absence of palynological control for the age determination at this level of the well, the "Palaeozoic basement" horizon as defined from the well is regarded in this study to more characteristic of the Hutton Sandstone or related unit.

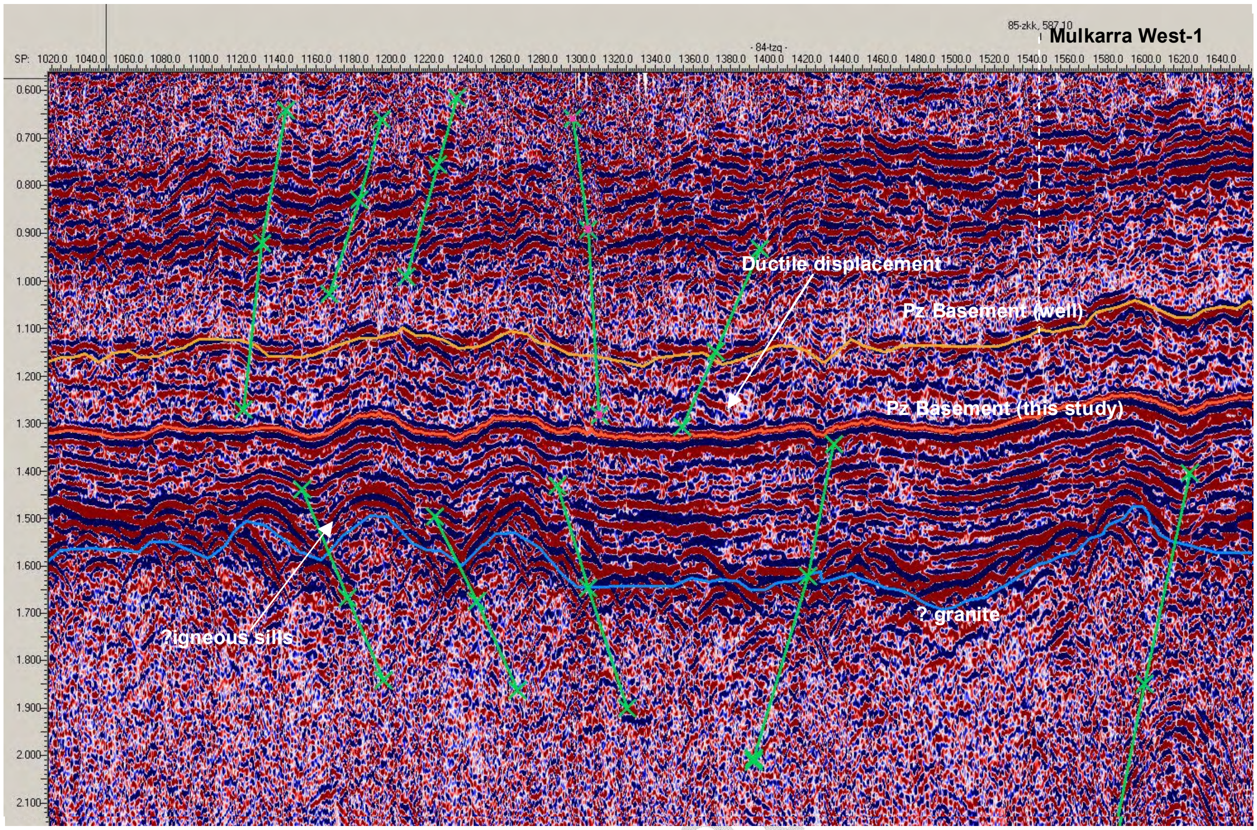


Fig 7. Seismic line 84TZQ through Mulkarra West-1 (see Fig. 9 for location)

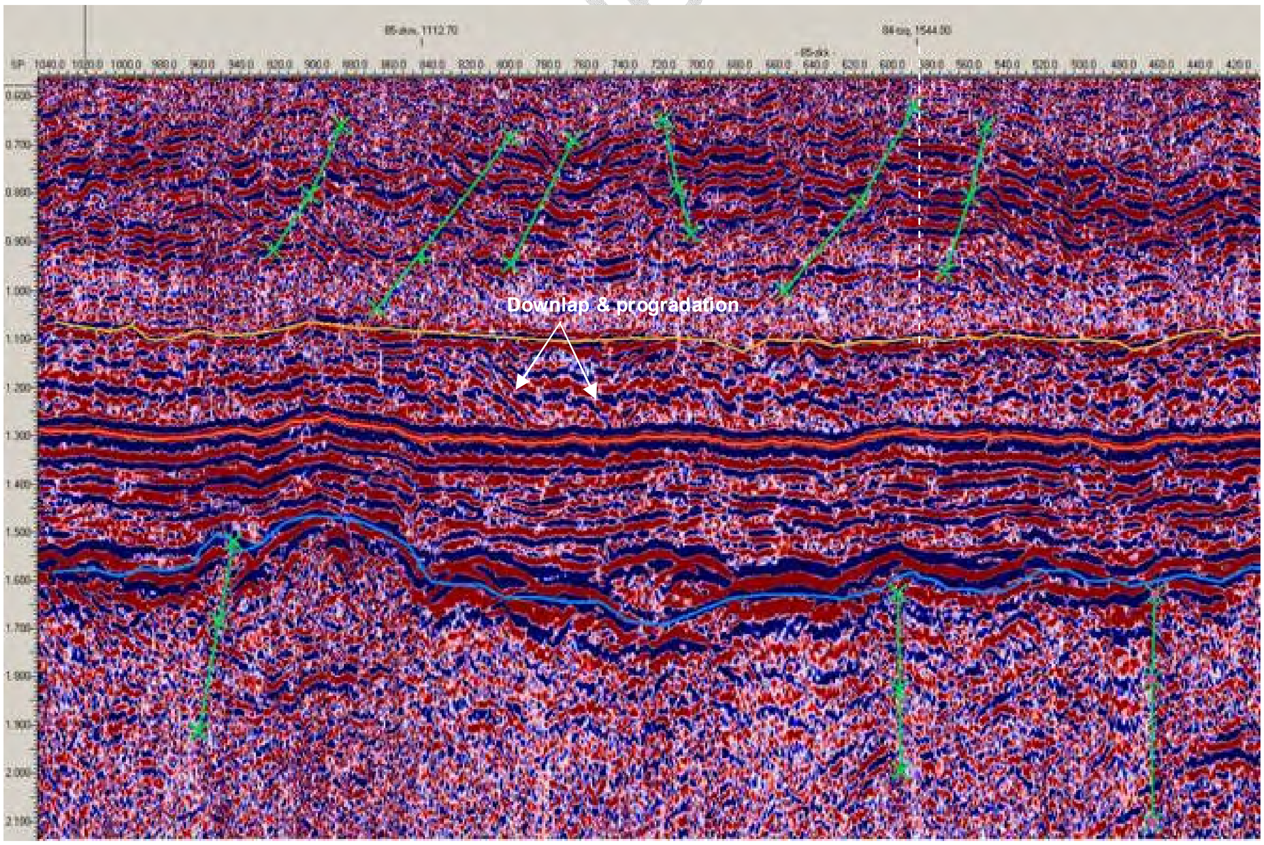


Fig 8. Seismic line 85zkk, Mungerannie Region.

- **Palaeozoic basement (this study):** The interpreted top Palaeozoic basement horizon in this study is defined by a dominant acoustic impedance boundary at about 1300msec TWT. The basement sequence comprises a package of sub-parallel reflectors interpreted to represent the Cambrian-Ordovician Warburton Basin sequence. The basement reflector is downlapped by possible Permian reflectors of a prograding sequence. Whilst similar seismic characteristics have been observed for the basement in other areas, the absence of deep well control means that this interpretation is unconstrained for GEL177.

- **Granite? Horizon:** The deepest and most prominent acoustic impedance boundary in GEL177 occurs at 1500-1600msec TWT and represents a marked density/lithology change. It is possible that this reflector may represent Warburton Basin sequence or alternatively it may represent ?Carboniferous granite. Apparent onlap of overlying seismic reflectors may suggest an unconformable contact with the Warburton Basin sequence, however the draping of reflectors across highs may be more indicative of differential compaction above a granite. Some seismic lines in this area show uplift of reflectors adjacent to highs, indicative of igneous intrusion. Likewise the blue horizon in figures 7 and 8 shows a characteristic bell or ringing geometry which may also be indicative of igneous sills near the top of a disconformable contact. Again, whilst speculative, there are seismic characteristics in this area which may be indicative of granite at depth.

Mapping of the speculative top ?granite horizon in this area (Fig. 9) shows that the horizon is shallowest in the southeast of the tenement (about 1800m depth) and deepest in the northwest of the tenement (about 2200m depth).

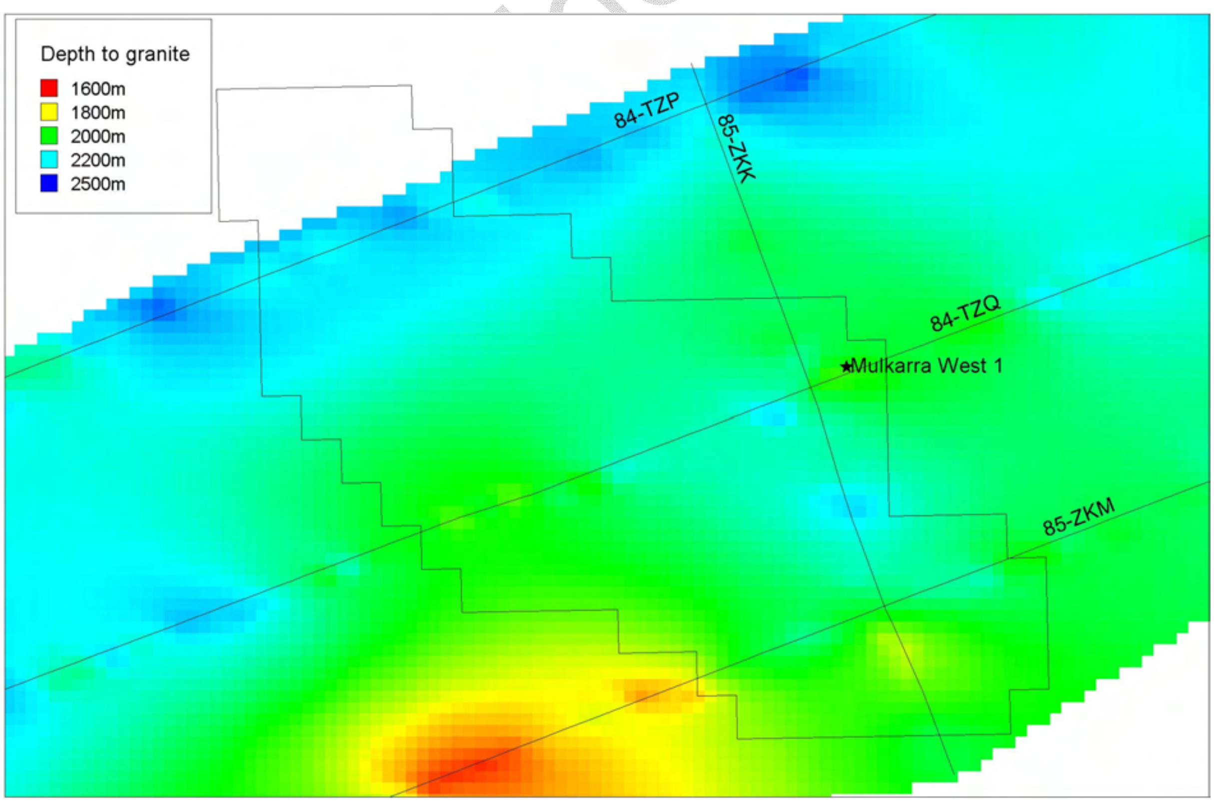


Fig 9. Depth (m) speculative interpretation of top ?granite GEL177.

5.2.3 Geothermal Systems Assessment

Temperature data from Mulkarra West-1, suggest that the geothermal gradient in this area is about 56°C/km, indicating that temperature risks may be low.

Seismic characteristics assessed in this study suggest that a granite body at depth may be interpreted in this area, however the absence of direct evidence means that this interpretation remains speculative.

Seismic data also suggest that the tenement has a relatively thin post-Permian basin cover, particularly in the south and as such it is probable that risks associated with thermal resistance (insulation) may be reduced in the north of the tenement where basin sequences are thicker (Fig. 9). In this area the interpreted Palaeozoic plus post-Permian basin sequence reaches a thickness of about 2.2km, however the lithology and thermal properties of any possible Warburton Basin rocks are unknown.

Given the relatively shallow depth of the post-Permian basin sequence in this tenement, it is unlikely that Deeply Buried Sedimentary Aquifer (DBSA)-type geothermal plays will be viable. Consequently EGS-type plays are more likely.

5.2.4 Recommendations & possible drilling targets

The sedimentary sequences and subsequent depth to interpreted granite of this area are shown to deepen to the north of the tenement (Fig. 9). In terms of overall drilling risk for geothermal exploration, thermal resistance risks may be better addressed by drilling targets in the north and possibly the central eastern area of the tenement where basin sequences reach about 2km in depth and the interpreted ?granite (if present) is in excess of 2.2km in depth. Based on temperature data from Mulkarra West-1 it is expected that workable temperatures (>150°C) may be intersected at depths of about 2.4km which approximates the top of the interpreted ?granite in the north of the tenement (Fig. 9), however extrapolation of temperatures across the tenement requires detailed thermal modelling. Consideration may also be given to further refining temperatures in the area through a program of shallow drilling and heat flow modelling.

5.3 GEL 185 – Moomba North

5.3.1 Location & geology

This area is located at the southern end of the Nappamerri Trough, on the northern flank of the Moomba Field. The Nappamerri Trough contains the deepest and thickest sections of Permian sediments in the Cooper Basin. Wells used to assist in interpretation for this report comprise those drilled within GEL185 including those of the Moomba gas field (specifically Moomba 73 and 86) and Mootanna-1 on the eastern margin of the tenement area. Moomba-73 terminated in pre-Permian basement at 3025m, with Moomba-86 TD of 3085m being within the early Permian Patchawarra Fm, highlighting the deepening of the sediments away from the topographic high of the Moomba gas field. Mootanna-1 had a TD of 3050m and was terminated within early-mid Permian sediments of a Roseneath Shale member, with potentially an additional 1000+m of Permian sediments below this, overlying the basement.

BHTs for these wells ranged from 212^{o}C (Moomba-86) to 183^{o}C (Moomba-73), with calculated geothermal gradients ranging from 54^{o}C/km in Moomba-73, 58^{o}C/km in Mootanna-1 to 62^{o}C/km in Moomba-86.

Given both elevated geothermal gradients and a thick sedimentary sequence, this tenement, unlike GELs 169 and 177, may be ideally suited to Deeply Buried Sedimentary Aquifer (DBSA) geothermal plays, although the lateral and vertical distribution of temperatures across the tenement requires modeling and validation.

5.3.2 Seismic interpretation

Seismic data show that the Moomba North area has a thick sedimentary cover with a deep basement (>2500mesc TWT or >4.2 km deep). Key horizons interpreted in this study include:

- **Toolachee Formation** (yellow)**:** The interpreted top of this formation lies at about 1700mSec to 1900mSec, deepening towards the north. Good lithological control has been achieved on this seismic interpretation from the well picks from Mootanna-1, Moomba-73 and Moomba-86 wells. The top Toolachee is characterised is by a seismic trough which in part is downlapped by progradational sequences from the north of the area (Fig. 12). The rest of the sequence is dominated by strong amplitude reflectors, which appear sub-parallel, but in detail define multiple sequence boundaries. Particularly towards the base of the Toolachee, there are a number of apparent onlapping reflectors and mounded features suggesting possible fan (sand) deposits and associated Trangressive Systems Tracts (TSTs). These deeper reflectors suggest possible sediment supply into a lacustrine-deltaic environment, prograding from the south and are more likely to be associated with the Daralingie and Epsilon Formations (Figures 12 and 13). The position of sandier units within this system may be important with regards to targeting Deeply Buried Sedimentary Aquifer geothermal systems.

- **Patchawarra Formation** (tomato)**:** The basis for the interpretation of this formation was a coal member, the Patchawarra Coal. This member lies at about 2100mSec to 2300mSec, and is picked from a prominent peak from the lower parts of the Patchawarra Formation. The interpreted depth correlates well with the drill data from this area. The top of the Patchawarra is interpreted to be at approximately 150mSec above this coal member. Sandstones are known to occur above the coal marker. The basal Patchawarra represents a major transgressive episode across the basin.

- **Tirrawarra Formation** (green)**:** This formation top has been interpreted at about 2400mSec through the centre of the tenement area. It has been picked as a trough between two distinct seismic peaks. This approximates to 3600 – 3800 metres depth, which correlates with the minor intercept of a Tirrawarra member in Moomba-86 on the northern edge of the Moomba rise, where the Tirrawarra Formation onlaps basement. The Tirrawarra was deposited in a fluvial-lacustrine system and actually comprises a number of sequence boundaries (Seggie, 1997). Sandstones are typically restricted to the marginal highs as braided delta and shore face deposits. Sandstones within the deeper basin trough are more likely to be restricted to fan deposits along major sequence boundaries and overlain by thick mudstones and shales of the Low Stand Systems Tract (LST).

- **Palaeozoic basement** (blue)**:** The interpreted top Palaeozoic basement horizon in this study is defined by a dominant acoustic impedance boundary at about 2500mSec. It exhibits more complex structure and extensive faulting can be identified.

5.3.3 Geothermal Systems Assessment

Unlike the other two permits assessed in this report, this area has significant scope for deeply buried sedimentary aquifer type geothermal plays. It is also possible that potential EGS plays may exist within the basement, however mapping suggest that the sedimentary rock interval from the Toolachee Formation to the Tirrawarra Formation may be deep enough to be within the range of workable geothermal temperatures (>150°C), subject to further thermal modelling. Consequently, if a suitable sedimentary reservoir is defined at these levels, there may be little economic justification for continued drilling to basement depths for an EGS play.

There are three main target formations for the development of a DSBA; the Toolachee, Patchawarra and Tirrawarra formations, all of which are known to have reservoir sands for oil and gas in the Cooper Basin and display the necessary porosity and permeability qualities to allow their development as a DBSA, based on available well data. However defining the location of sand units within these formations will require greater definition of seismic sequence stratigraphy and subsequent mapping.

High geothermal gradients, overlying lithologies that are expected to demonstrate low levels of thermal conductivity (good heat insulation), and the favourable physical sediment properties shown within the sandstone members of these formations all suggest that DBSA plays may be viable.

With increasing depth, and subsequent increase in temperature the Patchawarra and Tirrawarra Sandstone units will be the major targets for the development of DBSA type plays. However it is expected that some of the porosity and permeability characteristics of these formations may be affected by the depth of burial within the Nappamerri Trough, with the effects of compaction being a negative impact in this regard.

Based on well data temperatures in excess of 250^{o}C may expected within the upper basement in this area, although the validity of extrapolating gradients from margin highs to the trough centre requires a greater understanding of bulk rock conductivities. This area may also be a target for the development of an EGS type play.

5.3.4 Recommendations & possible drilling targets

Based on available well BHTs it may be expected that temperatures adequate for the development of a geothermal system (>150^{o} C) should attainable at depths starting at approximately 2.6 km (near the top of the Toolachee Formation), although detailed temperature modeling in the centre of the trough is required to validate this. The lower Toolachee Formation can have favourable sandstones with reservoir qualities, although the lateral extent of these sands in sequence stratigraphic terms is unknown.

The central part of the tenement holds the most attractive depth profile for further investigations. Due to the lack of drill data within this tenement it is recommended that this area be targeted for drill testing and confirmation of interpretations and assumptions made to date.

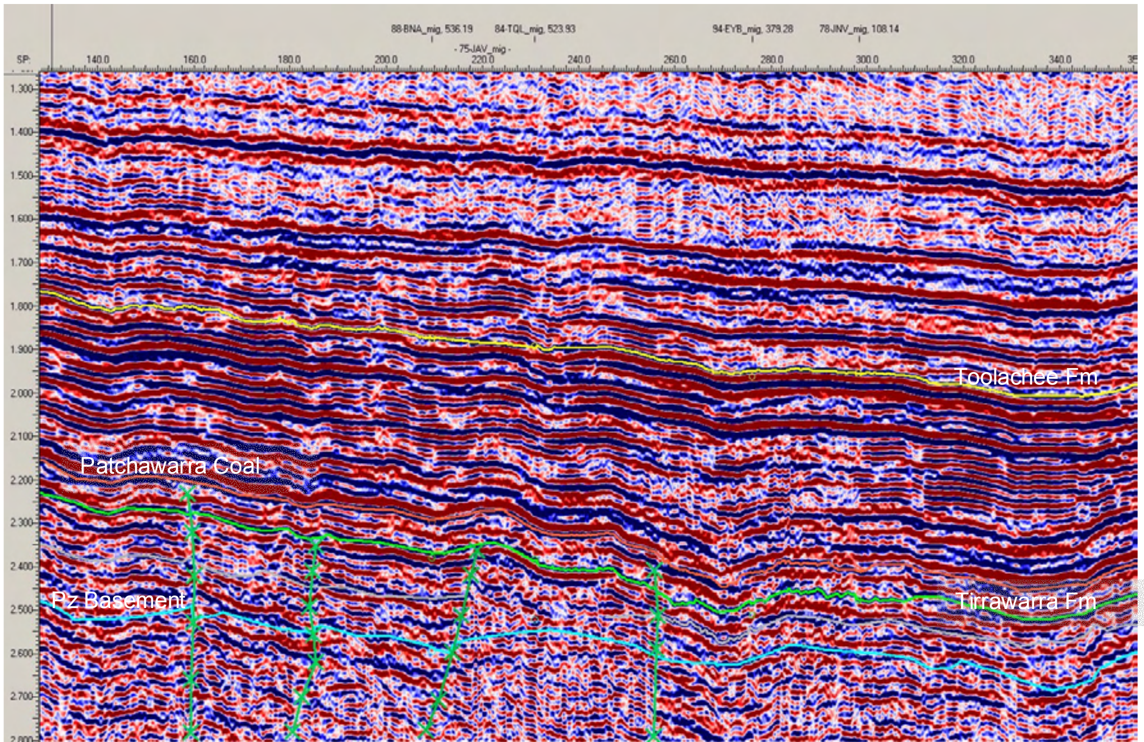


Fig 10 Seismic line 75JAV, Moomba North area (see Fig. 14-17 for location)

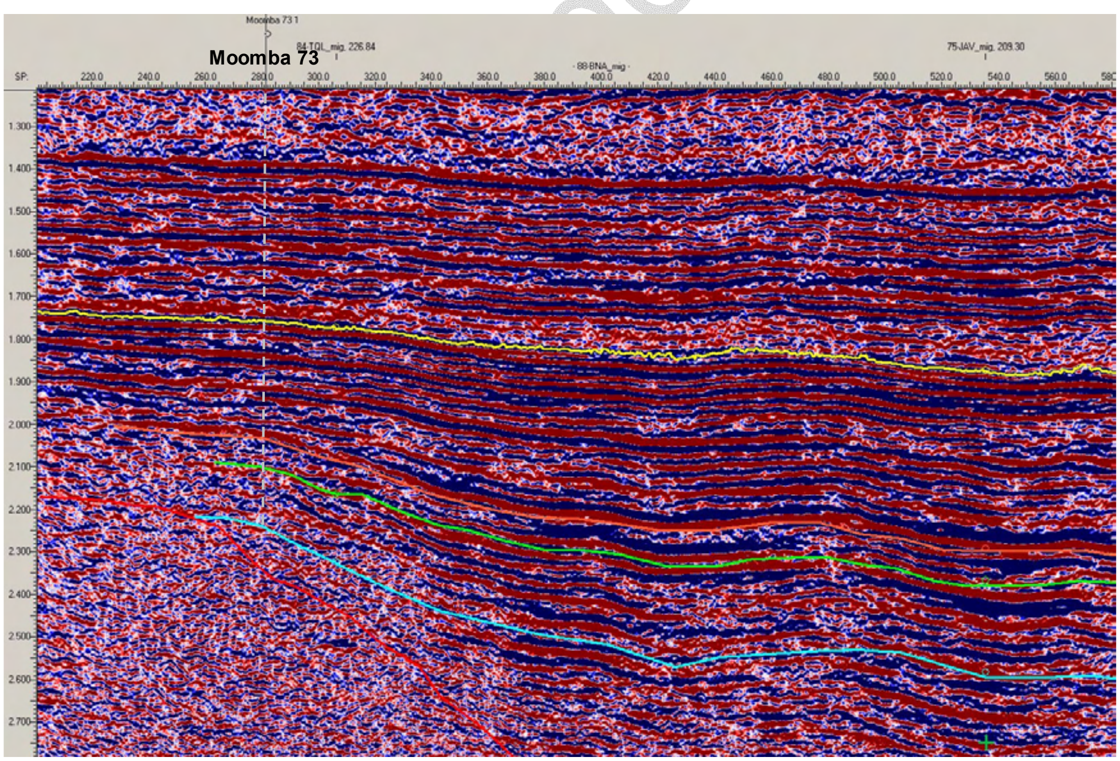


Fig 11 Seismic line 88BNA, Moomba North area (see Fig. 14-17 for location)

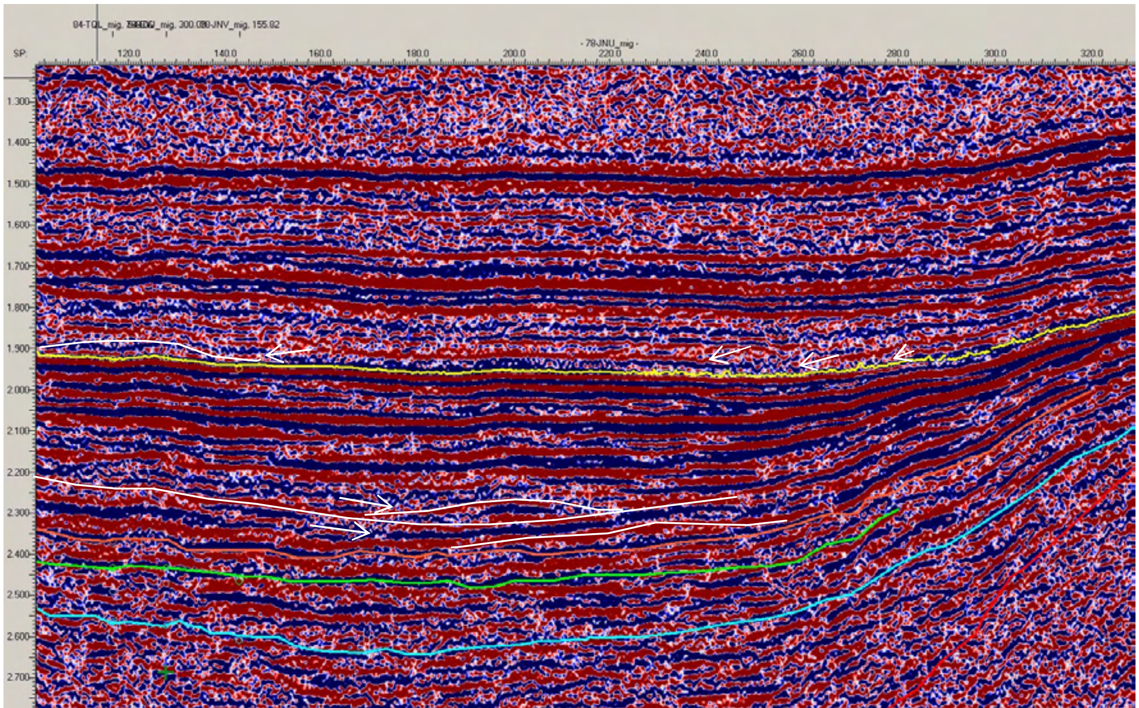


Fig 12 Seismic line 78JNU, Moomba North area (see Fig. 14-17 for location)

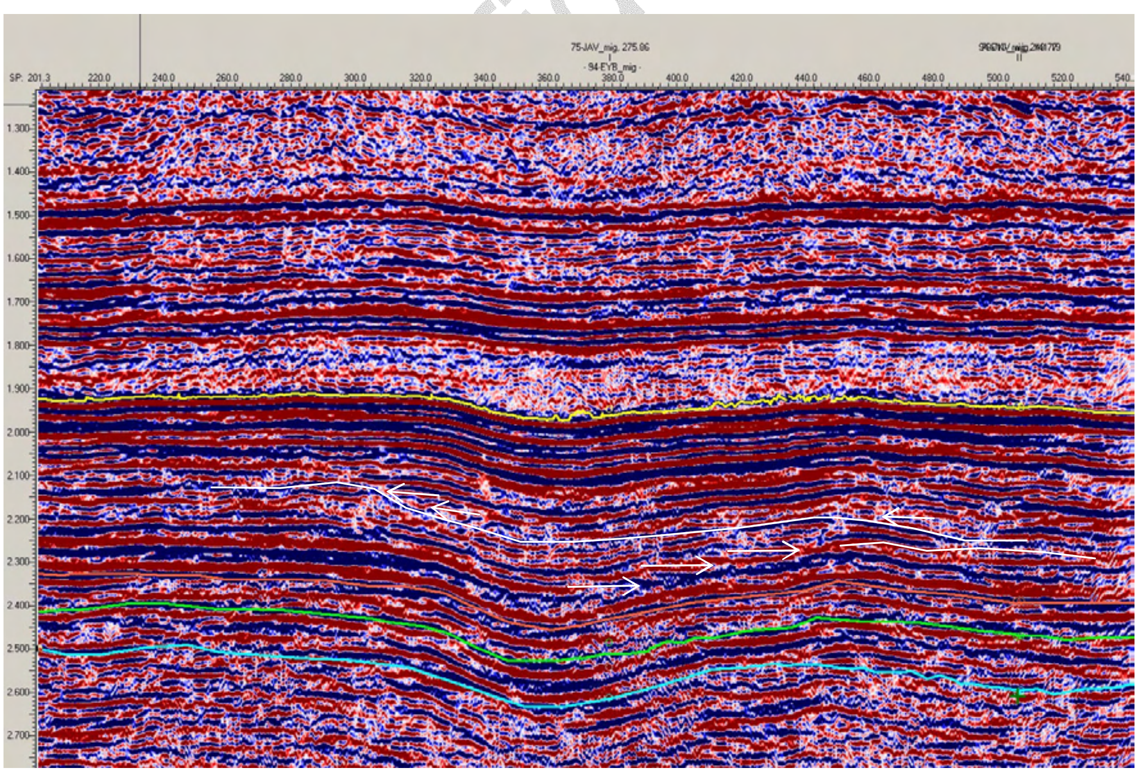


Fig 13 Seismic line 94EYB, Moomba North area (see Fig. 14-17 for location)

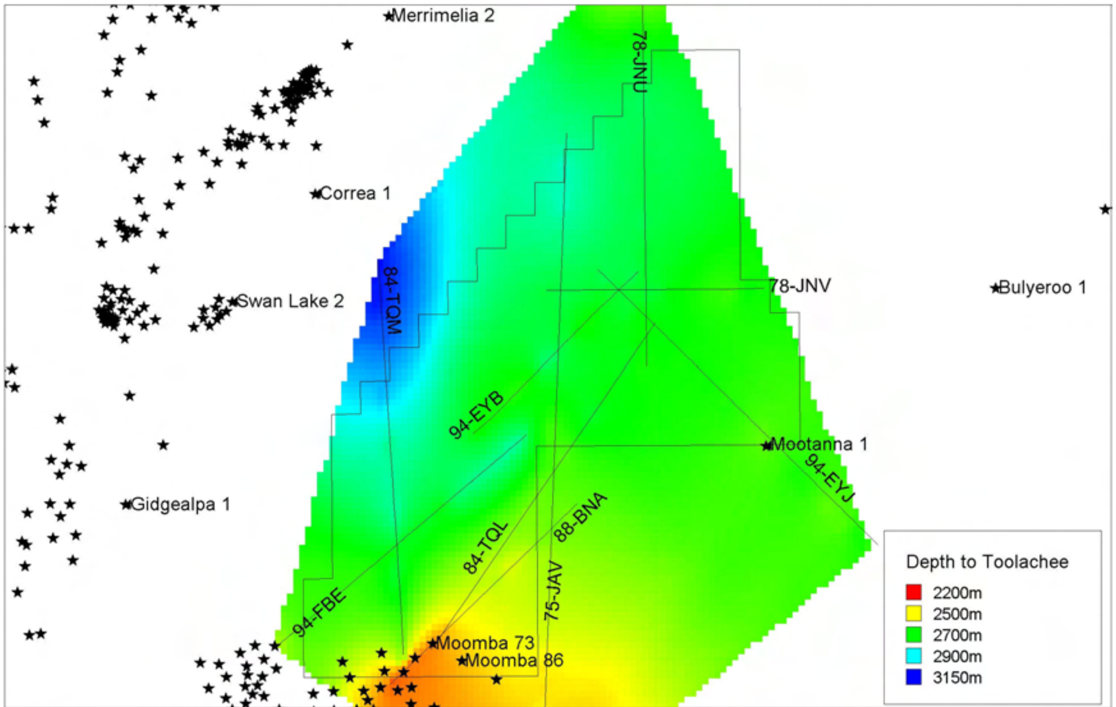


Fig14. Depth (m) interpreted top Toolachee Fm GEL185

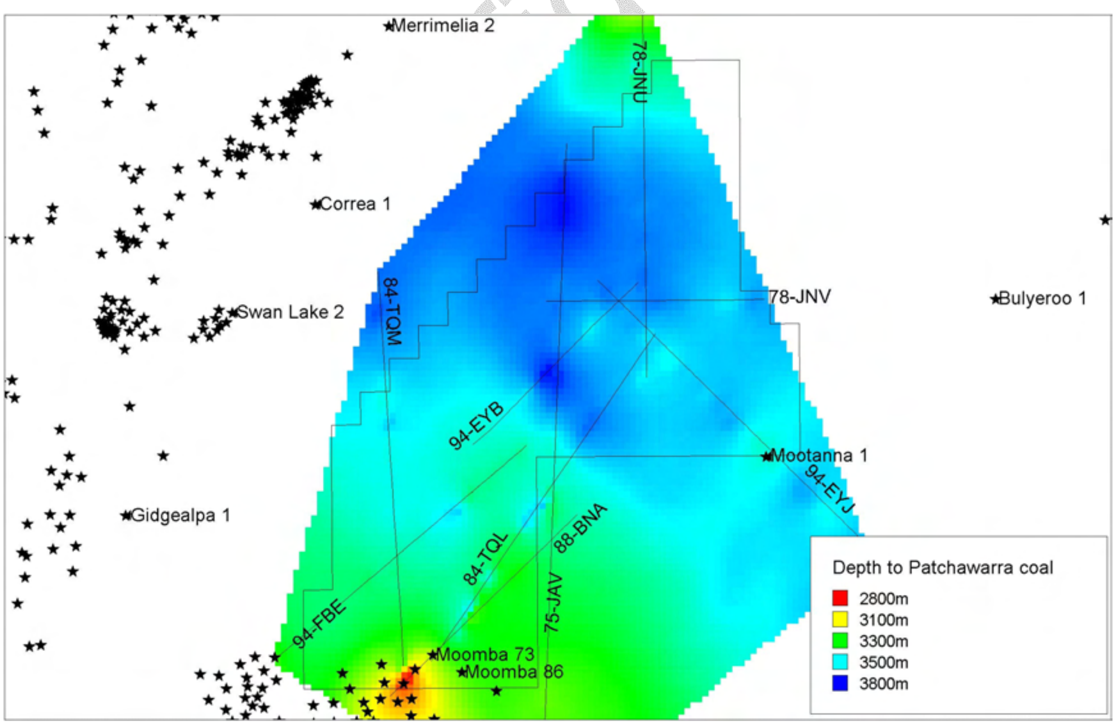


Fig 15. Depth (m) interpreted top Patchawarra Coal member GEL185

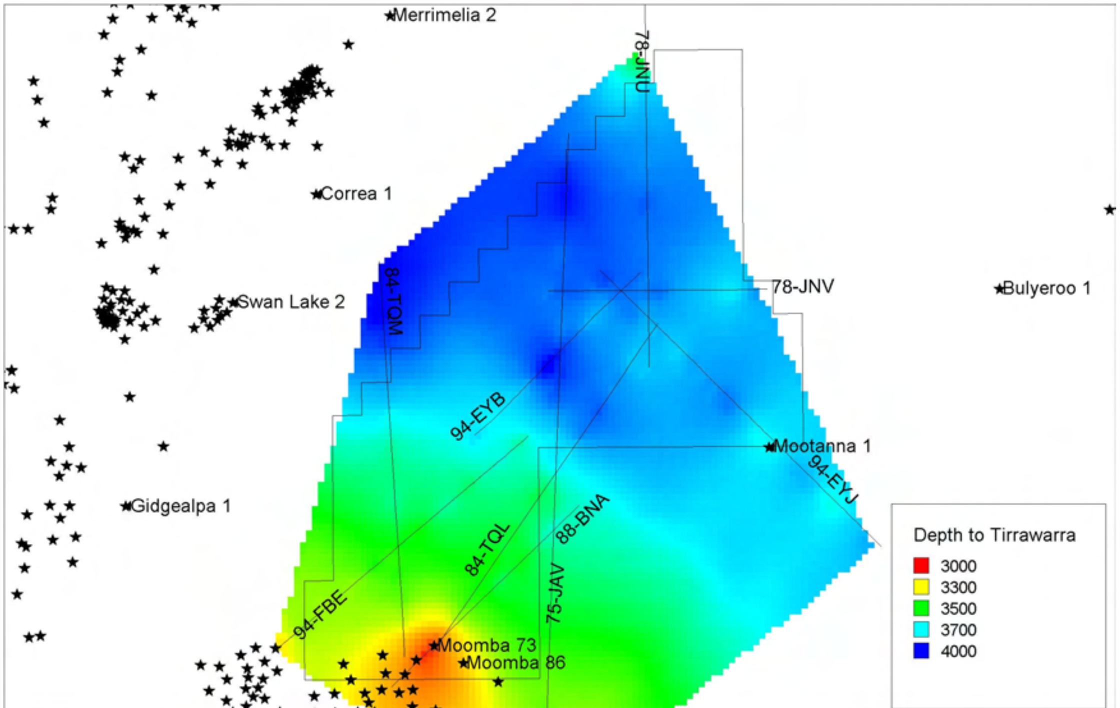


Fig 16. Depth (m) interpreted top Tirrawarra Fm GEL185

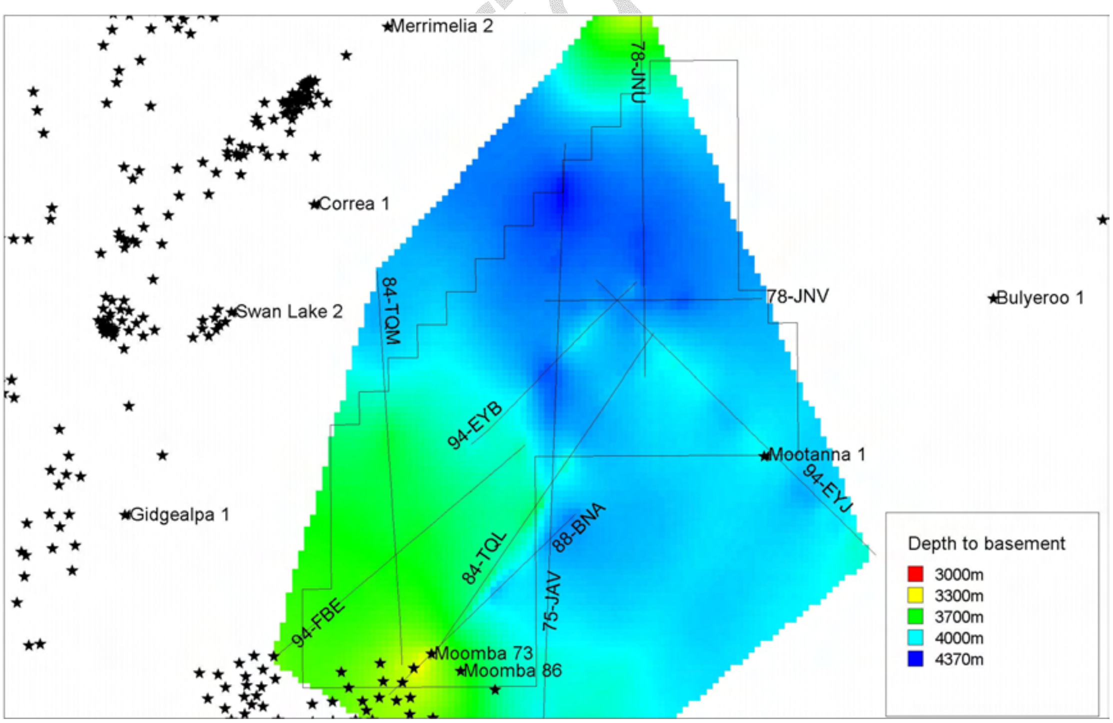


Fig 17. Depth (m) interpreted top Pre Permian Basement GEL185

References

Alexander E.M. & Hibburt J.,(eds) 1996 Petroleum Geology of South Australia Volume 2 - Eromanga Basin *PIRSA*

Beach Petroleum, 2004. Noarlunga-1, Well Completion Report, PEL95 South Australia.

Beardsmore GR, 2004. The influence of basement on surface heat flow in the Cooper Basin. *Exploration Geophysics*, 35, 223-235.

Beardsmore GR and Cull JP, 2001. Crustal Heat Flow: A Guide to Measurement and Modelling, *Cambridge University Press, pp324*.

Beardsmore GR, 2007. Review of Geothermal Systems in GEL169. Confidential *HDRPL consulting report to Eden Energy Ltd, July 2007*.

Boucher, R. 2001. Cooper Basin Ridges, are they structural? In *MESA Journal 21, April 2001*.

Emery D and Myers K, 1996. Sequence Stratigraphy. *Blackwell Science Ltd, Oxford.* Pp 297.

Drexel, J.F. and Preiss W.V. (Eds) 1995. The geology of South Australia. Vol 2, The Phanerozoic. *South Australia Geological Survey Bulletin, 54*.

Gravestock, D.I. Hibburt, J. & Drexel, J.F. (eds) 1998. Petroleum Geology of South Australia Volume 4 - Cooper Basin *PIRSA*

Howard LE & Sass JH. 1964. Terrestrial Heat flow in Australia. *Journal of Geophysical Research*, 69, pp 1617-1626.

PIRSA 2006 Petroleum and geothermal exploration and development in South Australia

Seggie R J 1997. Reservoir characterization of the Moorari/Woolkina Field Complex, Cooper Basin. *The APPEA Journal*, 70-86.

ACN 109 200 900

Fourth Annual Report

Moomba Play

GEL 185

14/4/2008 to 07/01/2010

HELD BY: Eden Energy Ltd
MANAGER & OPERATOR: Eden Energy Ltd
AUTHOR(s):
SUBMITTED TO:
DUE DATE FOR SUBMISSION: 13th June 2009
PROSPECTS:
COMMODITY(s): Geothermal Energy
KEY WORDS: Moomba North, geothermal

Distribution:
• PIRSA Petroleum
• Eden Energy Ltd

CONTENTS

List of Figures

1. Introduction

1.1 Background

GEL185 is located north of the Moomba oil and gas field in the Cooper Basin targeting either an engineered geothermal play granite basement (analogous to the Geodynamics play) or targeting a hot sedimentary aquifer play.

It is located on the southern margin of the Nappamerri Trough in the Cooper Basin depocentre where there are significant sediment sections providing good thermal insulation for interpreted basement granites.

In addition there is some evidence for regional lineaments providing a focus for fracturing and aquifer development in basement sections.

Modelling of data from public domain sources predicts suitable temperature rocks at depths of 3-4km.

1.2 Licence Data

Geothermal Exploration Licence 185 (GEL185) was granted on 14th April 2005 with an initial term of five years over an area of $494km^2$.

Figure 1 shows the licence location.

Various suspensions and variations have been granted for the licence.

A suspension from 7 April to 31 December 2009 was granted. The current expiry date of the licence is 7 January 2011.

1.3 Period

In accordance with Section 33 of the Petroleum and Geothermal Energy Regulations 2000, this report details work conducted during the Fourth permit year of GEL 185 (14/04/2008 to 7/1/2010, including the suspension period).

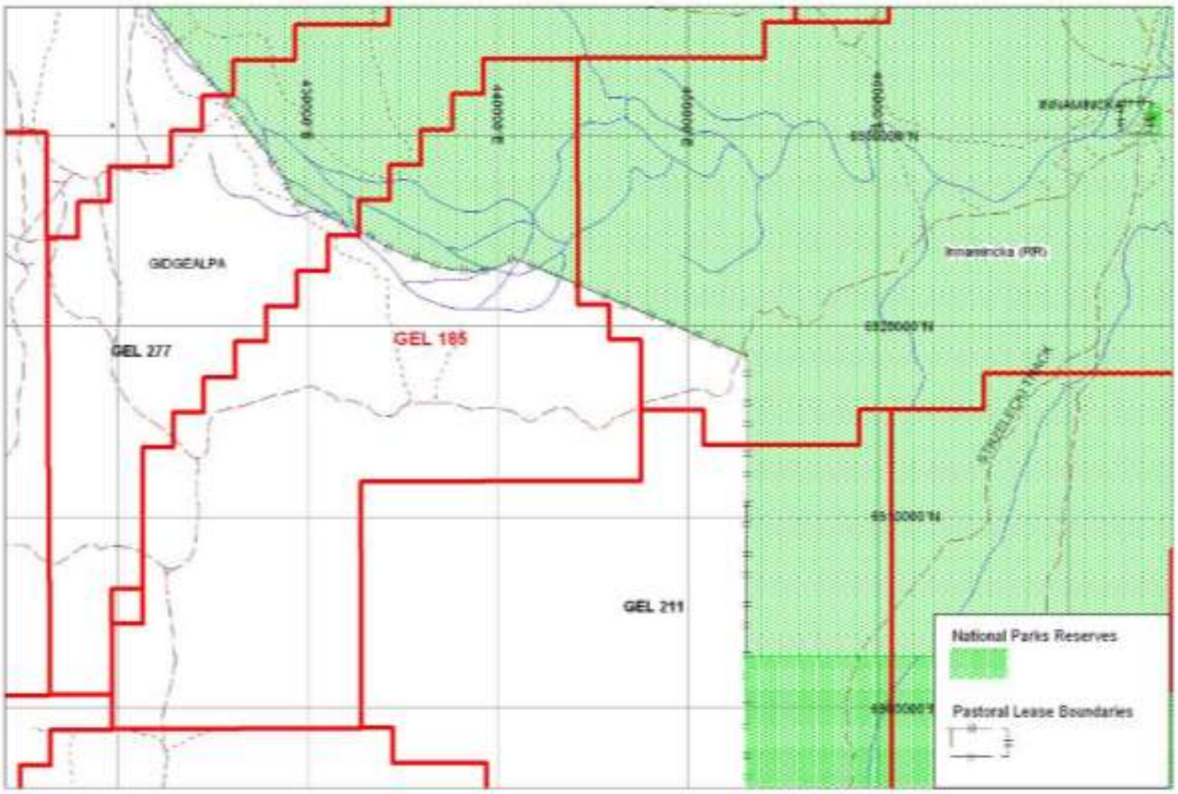


Figure 1 Location map of GEL 185

2. Work Requirements

The original work programme for GEL comprised the stages shown in Table 1:

Table 1: GEL 185 Original Work Programme

Year of Term of Licence	Minimum Work Requirements
One	• Geological and geophysical review • Seismic reprocessing • Logging and petrographic investigations
Two	• Limited, infill geophysical surveys (if required)
Three	• Drill one test well • Thermal and stress analysis
Four and Five	• Drill one test well • Conduct circulation test

A variation to this work programme was approved on 23rd April 2008 as shown in Table 2:

Table 2: GEL 185 Work Programme Variation Approved 23/4/2008

Year of Term of Licence	Minimum Work Requirements
One	• Geological and geophysical studies
Two	• Geological and geophysical studies
Three	• Review of seismic data; • Acquisition and modelling of magneto-telluric data
Four	• Geological and geophysical studies; • Conduct a preliminary feasibility study; • Drill one slimline prospecting well (500m);
Five	• Drill one test well (3,500 to 4,000m) and conduct flow test

This work programme was applicable to all of licence Year 4.

Subsequently, another variation for GEL 185 was approved on 28th April 2010.

3. Work Conducted

Work conducted in Year 4 comprised :

- Interpretation of MT data
- An assessment of the current level of knowledge and available data for the project area, leading to an indication of the risks associated with the reservoir and temperature for the project.

  This work was designed to develop a roadmap for exploration activities that will lead to an Inferred Resource (as per the Australian Geothermal Reporting Code, 2008) hosted by the geothermal play/s.

.

3.1 Magnetotelluric Survey processing and Interpretation

An MT survey was undertaken by Quantec Geoscience in Year 3 of the GEL. A total of two lines, nominally in north-south and east-west orientations, were sampled with a total of 45 sample locations being measured, 24 along line 2 (east west), and 21 along line 1 (north south) (Figure 2).

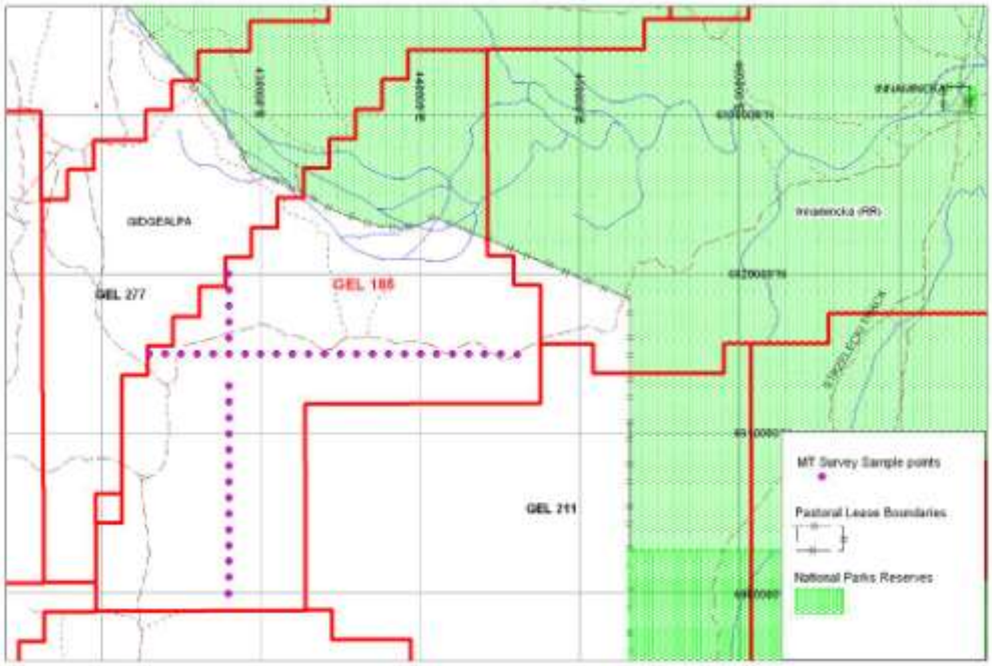


Figure 2 Location of MT sample points

4. Year 4 Expenditure

See Appendix 1.

5. Year Five Work Programme

Eden was to undertake reviews of the geology and geophysics of the Moomba Play area in the first two years of the licence, with an aim to gaining a comprehensive understanding of the geology of the area and to plan a location for the drilling of a test hole to assess heat flow.

Subsequent issues with programme timing and funding lead to licence variations being granted for GEL185.

A revised work programme has been agreed with PIRSA (Table 3). The year five work programme will involve drilling one well.

Table 3: GEL 185 Work Programme Variation approved 28/4/2010

Year of Term of Licence	Minimum Work Requirements
One	• Geological and geophysical studies.
Two	• Geological and geophysical studies.
Three	• Review of seismic data; • Acquisition and modelling of magneto-telluric data.
Four	• Geological and geophysical studies.
Five	• Drill one well.

An agreement with Origin Energy has been reached whereby Origin will undertake this work.

6. Compliance with the Petroleum Act (Reg. 33)

6.1 Summary of the regulated activities conducted under the licence during the year

Eden completed a range of desktop studies, interpreting MT data and assessing the steps needed to estimate an Inferred Resource for the GEL.

6.2 Report for the year on compliance with the Act, these Regulations, the licence and any relevant Statement of Environmental Objectives

Eden complied with all relevant sections of the Act and Regulations as they pertain to the regulated activities conducted during the year, apart from:

- Compliance with the approved work programme – Eden did not the agreed work requirements.
- Eden not complying with Section 33 (1) of the Regulations pertaining to the provision of an annual report within two months after the end of the licence year.

6.3 Statement concerning any action to rectify non-compliance with obligations imposed by the Act, these regulations or the license, and to minimise the likelihood of the recurrence of any such non-compliance

Eden recognises the importance of achieving regulatory compliance and is committed to achieving appropriate practices in its management strategies, work practices and procedures. Eden is committed to operating in an environmentally and socially responsible manner.

Eden's failure to meet the work programme requirements was subject of negotiations with the Department and rectification of the breach was sought by application for a variation to the work programme.

Eden's failure to report in a timely fashion was addressed by seeking appropriate staff or consultants to assist Eden's Directors in managing the requirements of the licence.

6.4 Summary of any management system audits undertaken during the relevant licence year, including information on any failure or deficiency identified by the audit and any corrective action that has, or will be, taken

Eden has developed appropriate systems and documentation to cover Field Operations, Environmental Management, Health and Safety issues and compliance checklists to ensure the requirements of relevant Acts and Regulations are met.

As these systems are newly developed and the work conducted to date has not shown any deficiencies in the systems, no management system audits have been undertaken as yet.

Furthermore Eden have been focussed on capital raising and corporate activities, and have only undertaken desktop studies, therefore audits were not completed.

6.5 List of all reports and data relevant to the operation of the Act generated by the licensee during the relevant licence year

Three reports were generated during the year relevant to the operation of the Act:

1. HDRPL Schedule of Activities for Eden-Terratherma Tenements Jun08
2. HDRPL Terratherma - Risk Assessment of Identified Geothermal Plays Nov08
3. Geophysical Survey Interpretation Report Regarding the Quantec SPARTAN Magnetotelluric Survey over the Cooper Project South Australia, Australia, on behalf of Eden Energy, Australia

No other reports or data relating to the tenement have been received at this time.

6.6 Report on any Incidents reportable to the Minister under the Act and Regulations during the relevant Licence Year

No reportable incidents occurred.

6.7 Report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably present, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be, taken

No threats have been identified.

Appendix 1

Table 1: GEL185 Moomba Play Expenditure 14/05/08 – 13/05/09

Salaries	
Field Exploration	
Consultants and Contractors	9600
Exploration	
Site Access and Native Title Issues	
Drilling	
Analysis and Testwork	
Transport	1125
Travel and Accommodation	
OHS	
Data Acquisition	
Tenement	2815
Overheads	1350
TOTAL	**14,890**

Hot Dry Rocks Pty Ltd
Geothermal Energy Consultants

HEAD OFFICE
PO Box 251
South Yarra, Vic 3141
Australia
T +61 3 9867 4078
F +61 3 9279 3955
E info@hotdryrocks.com
W www.hotdryrocks.com

ABN: 12 114 617 622

SERVICES
Exploration
Rock Property Measurements
Project Development
Portfolio Management
Grant Applications

Geothermal Tenements

Schedule of Activities.

Prepared for Eden Energy/ Terratherma

June 2008

Ben Waining

Executive summary

Eden Energy/Terratherma has a large geothermal tenement holding in South Australia, with one tenement also in NSW. A number of the licences within SA are now within their fourth year, and as such require significant capital investment for the meeting of agreed licence commitments for the fourth and fifth years, including the drilling of at least two prospecting wells and five deep test wells.

Based on discussions between Hot Dry Rocks Pty Ltd and Eden Energy/Terratherma in June 2008, the provision of a document to outline a proposed schedule of activities was requested.

There will be significant work load requirements for the progressing of plans to drill prospecting wells within GEL185 and 169 by the end of this calendar year. In addition to this there is also a requirement for the assessment of data for large areas of tenements held by Eden/Terratherma to allow an informed decision making process to occur in determining the suitability of some areas to the exploration and business models of Eden/Terratherma.

This document is provided to allow for further discussion and evolution of the scheduled works.

Table of Contents

1.0 Introduction

Eden Energy/Terratherma (Eden) is the licensee for a total of 22 Geothermal Exploration Licences (GEL) in South Australia and one in NSW. Eden has requested Hot Dry Rocks Pty Ltd (HDRPL) to undertake a review of work currently required under the licence commitments and to provide a prioritised schedule of activities, based the activity plan provided to Eden/Terratherma in early June 2008.

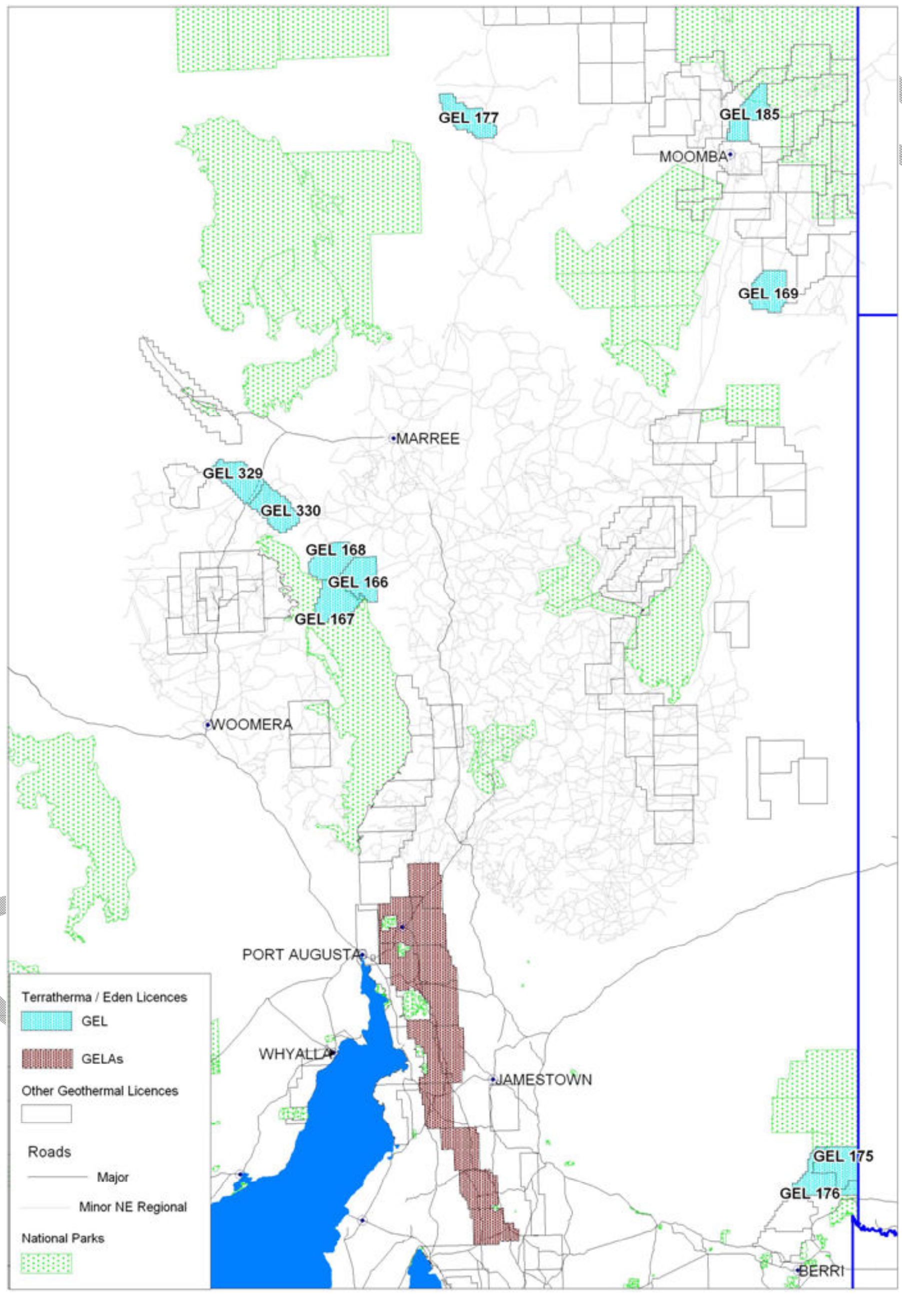


Figure 1. Tenement location map.

2.0 Schedule of activities

This section details each of the licences and their proposed work activities, with recommendations and prioritisation of actions that HDR believe EDE should undertake to progress the exploration projects. Dates provided in brackets are indicative.

2.1 GEL 185 – Moomba

GEL185 has a licence anniversary of 14 May, and is currently into its fourth licence year. Year four (2008/2009) licence commitments as agreed with PIRSA include:

- Geological and geophysical studies
- Conduct a pre feasibility study
- Drill one slimline prospecting well (500m).

Year five commitment is to drill one test well (3500 – 4000m) and conduct flow test.

2.1.1 Proposed activities

Based on discussion between Eden and HDRPL in June 2008, Eden's preferred approach for exploration within this tenement is to undertake a program of drilling up to three prospecting (heat flow) wells to mitigate temperature risks for the Moomba play, and to better place the required deep test well in the final licence year. It is understood that the preferred timing of this drilling project would be towards the end of the 2008 calendar year.

2.1.2 Recommended steps

1. Review MT interpretation (mid July expected delivery) in combination with seismic interpretation of GEL185, to aid in well site selection. [July-August]
2. Utilise geophysics gravity to aid in well site selection. [September]
3. Commence regulatory documentation requirements, finalised with selection of well sites. [August – October]
4. Drill wells, and collect core for conductivity analysis. [November-December]
5. Conductivity analysis and heat flow calculation. [December – January]
6. Commence sequence stratigraphic work to better constrain deep well targeting for fifth year activities. [January - ??]
7. Decision point in April 2009 for May 2009 tenement anniversary.

2.2 GEL 177 – Mungerannie

GEL177 has a licence anniversary of 1 January, and is currently into its fourth licence year. Year four (2008/2009) licence commitments as agreed with PIRSA include:

- Geological and geophysical studies
- Conduct a pre feasibility study
- Drill one slimline prospecting well (500m).

Year five commitment is to drill one test well (3500 – 4000m) and conduct flow test.

2.2.1 Proposed activities

Based on discussion between Eden and HDRPL in June 2008, Eden's preferred approach for exploration within this tenement is to undertake a review of the interpreted MT data and seismic interpretation. Should there be some encouragement to further this play, some limited heat flow drilling may be warranted.

2.2.2 Recommended steps

1. Review MT interpretation (mid July expected delivery) in combination with seismic interpretation of GEL177, to aid in play assessment. [July-August]
2. If the Mungeranni play shows improved levels of prospectivity than current interest, then prospecting well planning should progress as per GEL185.

Decision point in December 2008 for January 2009 tenement anniversary

2.3 GEL 169 – Bollards Lagoon

GEL169 has a licence anniversary of 9 May, and is currently in its fourth year. Year four (2008/2009) licence commitments as agreed with PIRSA include:

- Geological and geophysical studies
- Conduct a pre feasibility study

Year five commitment is to drill one test well (3500 – 4000m) and conduct flow test.

2.3.1 Proposed activities

Based on discussion between Eden and HDRPL, Eden's preferred approach for exploration within this tenement is to undertake a program of drilling up to two prospecting (heat flow) wells to prove up the expected heat flow regime of the area, and to better place the required deep test well in the final licence year. It is understood that the preferred timing of this drilling project would be towards the end of the 2008 calendar year.

2.3.2 Recommended steps

1. Review MT interpretation (mid July expected delivery) in combination with seismic interpretation of GEL169, to aid in well site selection. [July-August]
2. Utilise geophysics gravity to aid in well site selection. [September]
3. Commence regulatory documentation requirements, finalised with selection of well sites. [August – October]
4. Drill wells as part of the GEL185 drilling contract, and collect core for conductivity analysis. [November-December]
5. Conductivity analysis and heat flow calculation. [December – January]

Decision point in April 2009 for May 2009 tenement anniversary.

2.4 GEL 166/167/168 – Witchellina/Mulgaria

Licences for this group of tenements have a combined licence anniversary of 13 July, and are currently about to commence their fourth year. Year four (2008/2009) licence commitments as agreed with PIRSA include:

- Geological and geophysical studies
- Conduct a pre feasibility study
- Investigate development issues, and conduct preliminary EIS.

Year five commitment is to drill one test well (3500 – 4000m) and conduct flow test.

2.4.1 Proposed activities

Based on discussion between Eden and HDRPL in June 2008, Eden's preferred approach for exploration within this tenement group is to undertake an immediate review of the existing geophysics to ascertain their usefulness in determining the nature of the reservoir (RIO/granitic basement).

2.4.2 Recommended steps

1. Review existing geophysics – determine suitability and usefulness in assessing play. [June]
2. Determine the usefulness of the existing petroleum well (Stuart Shelf WWD1) for temperature data collection. [June]
3. If the Witchellina play shows improved levels of prospectivity than current interest, then renegotiation of licence commitments should proceed in a direction to enable possible enhancement of the geophysics and prospecting well drilling late in the fourth year of the licence.

Decision point in June 2008 and if progresses to year four, June 2009

2.5 GEL 175/176 – Renmark

Licences for these tenements have their anniversary in May. The tenements are currently in their fourth year. Year four (2008/2009) licence commitments as agreed with PIRSA include:

- Geological and geophysical studies
- Conduct a pre feasibility study

Year five commitment is to drill one test well (3500 – 4000m) and conduct flow test.

2.5.1 Proposed activities

Based on discussion between Eden and HDRPL in June 2008, Eden's preferred approach for exploration within this tenement group is to review the current temperature data for the NSW component (EL7090) of the Renmark Trough tenements to determine the nature of the heat flow anomaly within this region.

2.5.2 Recommended steps

1. Review existing temperature data from the Nulla Nulla well (NSW) – see EL7090. [July]
2. If a heat flow anomaly exists, review any available data for the NE sector of GEL175, to obtain potential second prospecting well target for this tenement. [September]
3. Consider the regional nature of the heat flow data to date and land access issues to determine the prospectivity of GEL176. [April]

Decision point in April 2009 for May 2009 tenement anniversary.

2.6 EL 7090 – Nulla Nulla

This tenement was awarded to Eden in February 2008. The NSW licence commitments are for an annual expenditure of $217 000.

2.6.1 Proposed activities

The first step for this area is to determine the nature of the reported thermal anomaly in this area (based on temperature data from the Nulla Nulla 1 well). Should this reported anomaly prove to be robust with the latest temperature data, a review of existing geophysics (interpretation of 2D seismic) and possible acquisition would be warranted. To date Eden has received temperature logs from the Nulla Nulla well and this information will provide some capability to calculate the estimated heat flow for this region.

2.6.2 Recommended steps

1. Review existing temperature data from the Nulla Nulla well (NSW). [July]
2. If a heat flow anomaly exists, review any available geophysical data (seismic) in the region, undertake 2D seismic interpretation. [Aug-Sept]
3. Potentially acquire new geophysics if required [October]
4. Plan prospecting well (dependant on results and expenditure commitment level). [Nov-Dec]

Decision point in January 2009 for February 2009 tenement anniversary.

2.7 GEL 329/330 – Coorichina

Licence anniversary for these tenements is 8 January. The licences are currently in their first licence year (2008/2009). Year one licence commitments as agreed with PIRSA include:

- Geological and geophysical studies

There are no drilling commitments until year three (2010) when two heat flow holes (prospecting wells) are required.

2.7.1 Proposed activities

Based on discussion between Eden and HDRPL in June 2008, Eden's preferred approach for exploration within this tenement group is to review the current data available.

2.7.2 Recommended steps

1. Conduct a desktop review of existing data for the region (regional seismic line, geophysics). [August - Sept]
2. Determine the suitability of any existing drill holes for temperature surveys. [September]
3. Undertake additional geophysics acquisition if required. [2009]

Decision point in April 2009 for May 2009 tenement anniversary.

GEL 411-422 – Port Pirie

These tenements have not yet been accepted by Terratherma.

2.8.1 Proposed activities

These tenements require a review of all available geological and geophysical data, and of any current mineral licence activities occurring.

2.8.2 Recommended steps

1. Conduct a desktop review of existing data for the region (regional seismic line, geophysics). [August - Sept]
2. Determine the suitability of any existing drill holes for temperature surveys. [October]
3. Undertake additional geophysics acquisition if required. [2009]

3.0 Conclusions

Eden hold a significant area of exploration tenure within South Australia, with one additional tenement grant in NSW. Approximately half of the tenement area in SA is moving into its fourth year of licence (GEL 185, 177, 169, 166-168, 175, 176), the licence commitments for these tenements include a commitment to drill at least two prospecting wells (GEL 185 and 177) for the 2008/2009 year.

Discussions held between HDRPL and Eden in June 2008 highlighted the need for a schedule of activities to be produced to allow Eden to move forward with many of their tenement holdings, or to make decisions required to streamline and further develop their geothermal exploration business model.

Of the tenements held there are some significant levels of work proposed for at least two of the tenements (GEL 185, 169) which involves the drilling of prospecting holes to ascertain heat flow values for these tenements. There is also potential for additional wells to be planned dependant on the outcome of data reviews and business strategy decisions.

Much of the work scheduled for the 2008/2009 year involves the review and assessment of the prospectivity of the tenements based on the data available.

Dates given for each of the proposed steps are indicative of the suggested timing of work to be undertaken, and may change dependant on external factors, including the securing of drilling rigs, the delivery of data as required and the escalation of prospectivity determined during data review.

Appendix 1: Table of scheduled work.

Tenement	June 08	July	Aug	Sept	Oct	Nov	Dec	Jan 2009	Feb	Mar	April	May	June
185		MT/seismic review	MT/seismic review	Locating wells	finalise regulatory requ	3 wells	HF Calcs	commence seismic sequ strat on existing 2D			Decision Point		
177		Overall assessment - business plan / exploration model.	MT/seismic review	Further work??			Decision Point						
169		MT/seismic review	MT/seismic review	Locating wells	finalise regulatory requ		2 wells	HF Calcs	commence seismic sequ strat on existing 2D		Decision Point		
166-168	Overall assessment - business plan / exploration model.	Review of existing geophysics	Further work??										Decision Point
175/176		Review of data in combination with EL7090	Review of data in combination with EL7090	Review of data in combination with EL7090						1 well ??	Decision Point		

EL 7090		HF analysis and reporting (Nulla)	Geological / geophysical studies - availability of seismic survey data… reinterpret where available.	Geological / geophysical studies - availability of seismic survey data… reinterpret where available.	Geophysics acquisition if required		prospecting well ?	Decision Point				
329/330			Desktop review of available data	Desktop review of available data			Decision Point					
411-422			Desktop review of available data	Desktop review of available data	Desktop review of available data							

Hot Dry Rocks Pty Ltd
Geothermal Energy Consultants

HEAD OFFICE
PO Box 251
South Yarra, Vic 3141
Australia
T +61 3 9867 4078
F +61 3 9279 3955
E info@hotdryrocks.com
W www.hotdryrocks.com

ABN: 12 114 617 622

SERVICES
Exploration
Rock Property Measurements
Project Development
Portfolio Management
Grant Applications

Terratherma – Risk Assessment of Identified Geothermal Plays.

Prepared for Terratherma Ltd

October 2008 Final Report

Ben Waining

Executive summary

Terratherma hold significant acreage of geothermal tenements in South Australia and NSW. In order to allow for the strategic planning of required exploration activities across these tenements and for the development of a roadmap to inferred resource estimation, an analysis of the current level of knowledge and work required has been conducted. This report sets out each of the Terratherma geothermal plays on a tenement by tenement basis.

Details of the known elements of each of the plays have been provided in the context of what is known and what is still required to be ascertained to allow for the development of inferred resources, as per the *Australian Geothermal Reporting Code*. An Inferred Resource is defined as an estimation of thermal energy in place to a low level of confidence.

The status of each of the plays varies considerably in terms of the information held, and what is required for the calculation of inferred resources. All the tenement areas require some drilling of heat flow holes to constrain this aspect of the geothermal system assessments. Reservoir size and types also requires further investigations to allow for calculation of inferred resources to any level of confidence. This aspect of the required works should be possible with detailed analysis of known geological settings and existing geophysics. There is scope for the acquisition of further geophysics in many of the areas to further constrain reservoir geological settings. Deep drilling has been presented as an option to provide greater insights into the geology and temperatures at depth, it is however not seen as a requirement for the development of inferred resources due to the low level of confidence required in the estimation of thermal energy.

Table of Contents

1.0 Introduction

This document outlines the current level of knowledge and available data for each of Terratherma's geothermal projects, and so provides an indication of the risks associated with the reservoir and temperature (heat flow, thermal resistance) aspects of each of the identified plays. The aim of this report is to allow Terratherma to develop a roadmap for their exploration activities that will allow for the determination of Inferred Resources (as per the *Australian Geothermal Reporting Code, 2008*) contained within each of the identified plays.

The Inferred Resource category, as defined in the *Australian Geothermal Reporting Code, 2008*), requires each play to have sufficient data to enable the calculation of thermal energy in place, to a low level of confidence. The resource is inferred from geological, geochemical and geophysical evidence and is assumed but not verified as to its ability to deliver the geothermal energy. A reasonable understanding of the three dimensional subsurface geology, measurements (can be indirect) of temperature (heat flow and conductivity to allow for extrapolations of temperature below measured depths), and sufficient information to allow for an estimate of the areal and volumetric extent of the resource are required to progress exploration results to the Inferred Resource category. It should not be necessary to undertake deep drilling to gain an inferred resource estimation, however this approach is an option that may constrain geological and geophysical assumptions.

In the context of the plays within the Terratherma tenements the required information will include (but should not necessarily be limited to): building of a geological model, measurements of heat flow and conductivity with associated analysis and extrapolation of temperatures to depth (specifically to depths where temperature would exceed an economic cut off of 150°C), analysis of available geophysical data (seismic, gravity and MT) to determine extent, depth and thickness of target reservoir units, and possible sequence stratigraphy analysis of seismic data to determine the probability of encountering permeable sedimentary units of suitable thickness.

A summary sheet of requirements per tenement is provided at the end of each chapter. These summaries outline of the interpreted geological risks and uncertainties associated with two of the key geothermal system requirements (temperature and reservoir) and also provide a guide for further work. The fourth key element of a geothermal system – water, has not been considered in this report.

2.0 GEL 185 (Moomba North)

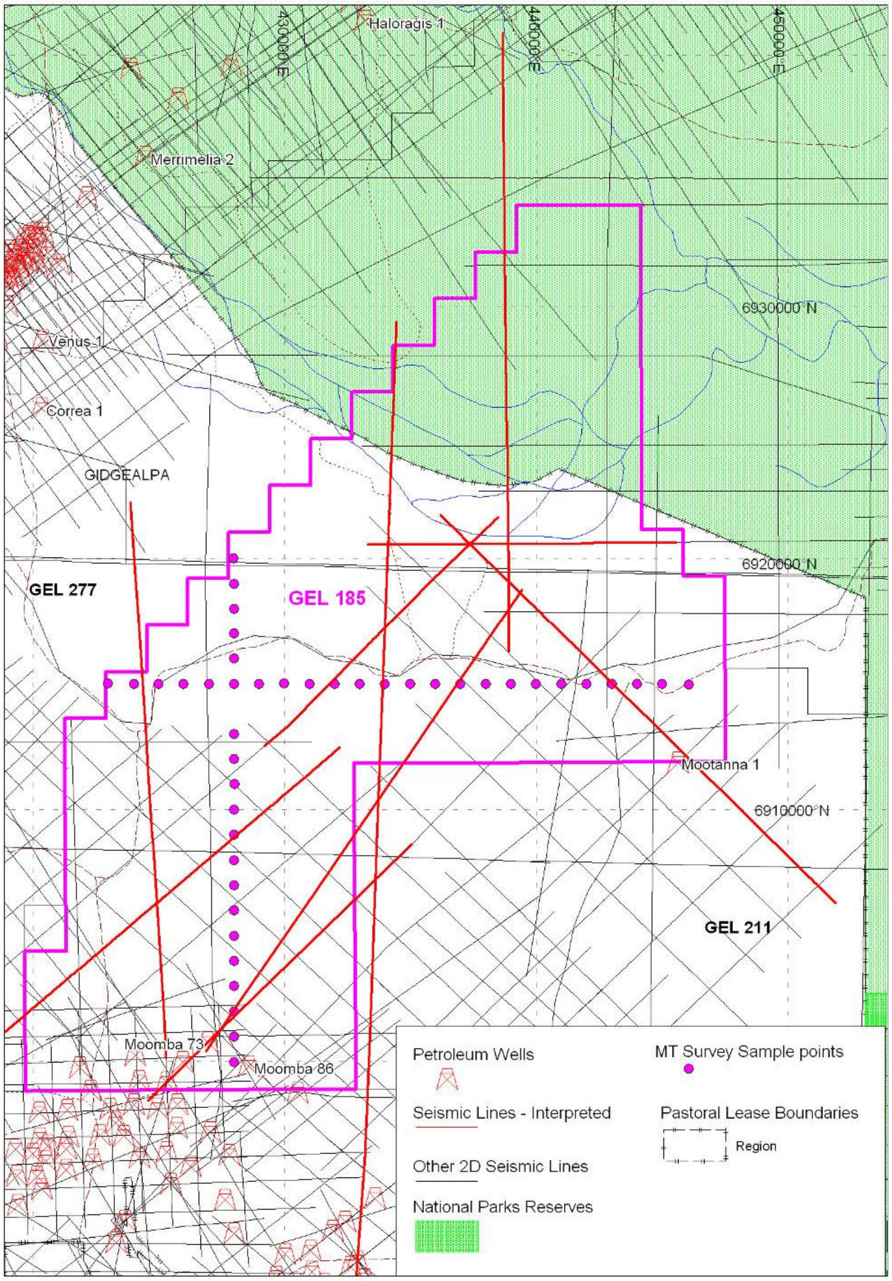


Figure 2.1 GEL 185, location and work undertaken.

2.1 GEL 185 (Moomba) key risks.

2.1.1 Thermal Resistance (insulation)

The Nappamerri Trough contains the thickest and deepest sediments in the Cooper Basin area, and consists of Jurassic to Cretaceous sediments of the Eromanga Basin sequence overlying Late Carboniferous to Middle Triassic sediments of the Cooper Basin. The depth and lithology of these sediments provide excellent insulating properties that have allowed the development of significant thermal gradients. Many of the formations in the Cooper Basin sedimentary sequence have relatively low conductivity of 1.5–2.0 W/mK, partly due to an abundance of coal measures (Beardsmore 2004[1]).

2.1.2 Heat Flow

Whilst there are no wells specifically drilled for the purposes of heat flow determination within the tenement area there are a number of heat flow values calculated from well temperatures directly south of GEL185 that allow for the moderation of risk associated with heat flow. Figure 1.2 shows the distribution of published heat flow values for the Cooper Basin.

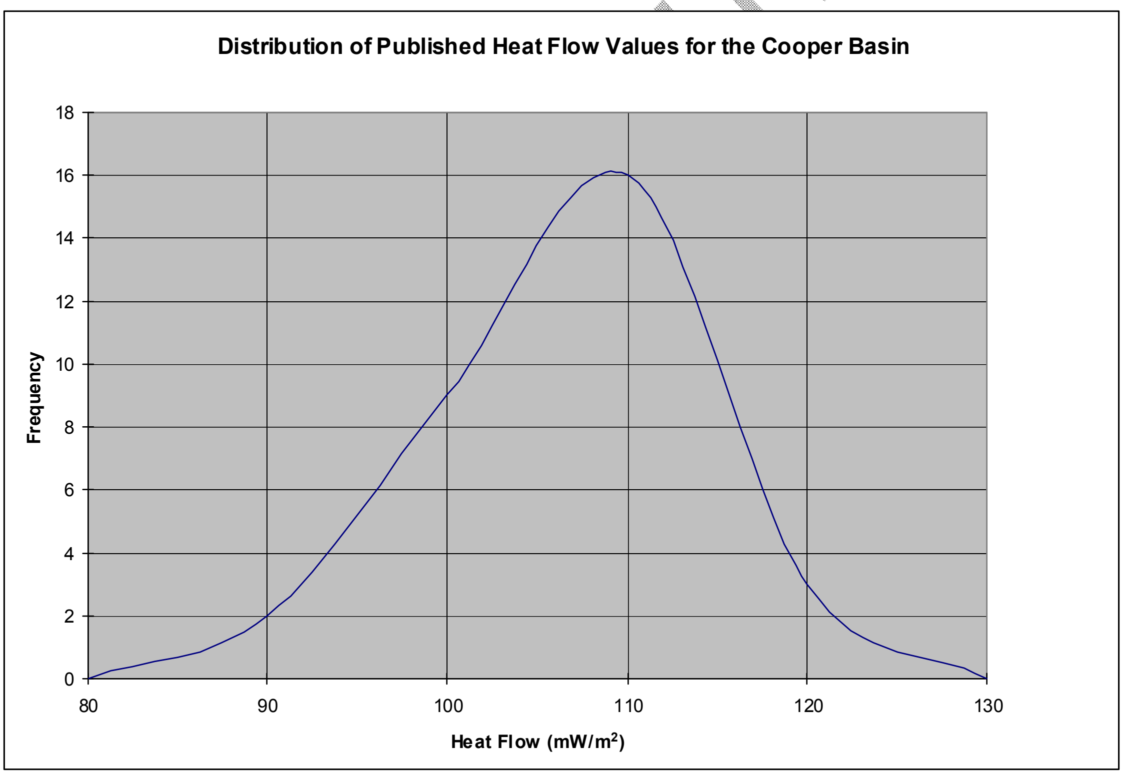


Figure 2.2. Distribution of published heat flow values in the Cooper Basin (Beardsmore 2004[2])

[1] **Beardsmore, G** (2004) The influence of basement on surface heat flow in the Cooper Basin; *Exploration Geophysics* v35, 223-235

2.1.3 Temperature

The high observed thermal gradients from existing wells on the margins and flanks of the trough, and the known sequences of sediments with a low conductive nature, provides for an expectation of achieving suitable temperature in the area from approximately 2500 m depth, approximating coinciding with the Toolachee Formation. The unknown extent of a granitic basement (heat generation capacity) is the key risk associated with heat flow and temperature in this area.

2.1.4 Reservoir

The risk associated with there being basement (pre Permian sediments or crystalline) suitable for fracture stimulation poses a relatively low risk. However, whether or not it exists within economic drilling depths poses a somewhat higher risk.
The sedimentary reservoir potential of this area is high risk, mainly due to a lack of knowledge of the physical parameters of the sediments within the depths of the Nappamerri Trough. There have been some wells (notably Mootanna 1, Moomba 73 & 86) drilled on the margins of the trough surrounding the area contained within GEL185, which allow for estimated sedimentary formation depths and give some indication of porosity and permeability. Recent formation depth interpretations for the area have been made for Terratherma (via Eden Energy) from seismic interpretation (Cooper & Waining 2007). It should be noted that the porosity/permeability values can vary markedly with depositional environment, location and depth, mainly due to the effects of overburden pressures and varying degrees of diagenesis.

2.1.5 Land Access

The northern area of this tenement is within the Innamincka Regional Reserve, managed under the National Parks and Wildlife Act SA 1972. The reserve is a multiple use area, with availability for use as a pastoral lease (currently used for cattle grazing), and is open for developments under the Mining and Petroleum Acts of SA. Geodynamics' Habanero project is within the Reserve. Access conditions are more stringent than outside the reserve system, however these are not significant in the context of the Petroleum Act's environmental requirements. The tenement is coincident with the Reserve only in the northern portion, where there are other logistical issues that would need to be addressed, such as the main channel and floodplain area of the Cooper Creek. The creek line may create some access issues, and floodplain area would have to be considered when designing permanent installations. Overall: issue of low to moderate significance.

2.2 Plays:

2.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

GEL 185 has the potential to host a DBSA type play. There are three main late Carboniferous to Permian sedimentary formations that should be considered as feasible targets, based on the current level of knowledge of probable reservoir characteristics and temperature at depth. The primary lithology and depth of burial of a formation combine to affect its porosity and permeability. The most common hydrocarbon reservoirs in the Cooper Basin region are sandstone facies with early phase silicification; the silicification helps the unit resist compaction effects. These reservoirs include the Patchawarra, Tirrawarra and Toolachee Formations (Appendix 2 details the formations characteristics and porosity and permeability frequency analysis). The distribution of genetic facies and the varying effects of diagenesis, in conjunction with overall compaction effects, are considered the main factors causing reduction of porosity and permeability from marginal and midflank areas of the basin to the deep Nappamerri Trough (Gravestock et al 1998[3]).

2.2.2 Engineered Geothermal Systems (EGS)

This is perhaps the preferred option for the development of a geothermal play within this tenement area. The depth of the Nappamerri Trough, whilst providing excellent thermal resistance, may also place the crystalline basement beyond the depth of economic development – ie >5000 m. However, seismic interpretation undertaken on this area suggests that the top of the pre Permian basement (Warburton Basin) lies within economic depths, ie at approximately 4000 m – 4500 m, for the development of an EGS type geothermal play. The mid-late Ordovician sediments of the Warburton Basin may be suitable for the development of an EGS play as they display complex structural development with extensive faulting, which are not observed in the overlying Cooper Basin sediments (Sun 1999)[4]. The Carboniferous granite (Big Lake Suite) intrusions in this region may also have altered the sediments via silicification and contact metamorphism, improving the sediments ability to host fracture stimulation.

2.3 Inferred Resource Requirements

Whilst there are some measured heat flow and conductivity values for this region, there are very few measurements (or wells) actually within the area of the tenement (figure 1). To enable an Inferred Resource calculation there will need to be a greater density of measured values within the tenement area. This will require the drilling of at **least 3 heat flow holes**.

Areal extent and volumetric calculations can be reasonably constrained for this tenement. However, to refine this component of the Inferred Resource estimation, further interpretation of 2D seismic and MT data would be required. There are approximately 24 existing 2D seismic lines that have not been interpreted for the purposes of geothermal exploration that could be re-interpreted (figure 1), and a reinterpretation of the MT data may better constrain the volume of crystalline basement/sedimentary aquifer within the licence area. At this stage there are no specific data suggesting the existence of the Big Lake Suite Granodiorite beneath the tenement. Confirmation of heat flow values for the area may provide evidence of this.

If the option to interpret existing 2D seismic data was exercised, it would be valuable to also build on the previous interpretation undertaken by HDRPL (Cooper and Waining 2007[5]) in order to better constrain depth conversions (with the purchase of stacking velocities from PIRSA) in the context of the additional lines. Better seismic depth constraints will aid interpretation of MT data and seismic horizon/well data mapping.

---

[3] **Gravestock, D.I., Hibburt, J.E. and Drexel, J.F. (Eds), 1998.** The petroleum geology of South Australia. Volume 4: Cooper Basin. South Australia. Department of Primary Industries and Resources. Petroleum Geology of South Australia Series.
[4] **Sun, X. 1999**. Fracture analysis of the Eastern Warburton Basin (Early Palaeozoic) South Australia.
[5] **Cooper G.T., Waining B., 2007**. Seismic interpretation of geothermal exploration licence (gel) areas 169, 177 & 185, South Australia.

For the purposes of investigating the potential of a DBSA type play, a review of the seismic data to assess its suitability for sequence stratigraphic interpretation is recommended. This is desirable to test the physical characteristics of the units and to locate targets of probable sand units/channels with suitable porosity and permeability features required for a DBSA type play. Successful completion could be followed by deep drilling (3000–5000 m), to confirm interpretations. The drilling of a deep test well could reduce the need for one or more of the heat flow wells to constrain temperature assumptions.

To maximise the Inferred Resource for GEL185, consideration should be given to further geophysical data acquisition, specifically in the NW quarter of the tenement where there currently exist no geophysical data other than regional gravity. For the purposes of an Inferred Resource, additional data would allow for a more accurate estimation of the areal extent of potential reservoirs.

Steps to an Inferred Resource: GEL185

- Constrain heat flow over an area of approx 20 x 20 km (confirmation of heat ± granite basement)
- Identify and prioritise target play – ie EGS or DBSA.
- Ascertain areal extent and thickness of potential reservoir – seismic/MT/gravity
- Test/estimate sedimentary aquifer (if identified) physical properties (porosity/permeability)
- Input data to 3D modeller (eg “GeoTherm”) for inversion and 3D heat flow modelling and interpretation.

Task	Timeline – setup	Timeline – execution	Cost
Drilling – Heat Flow holes x 3	6 months lead in: regulatory approvals, securing of rig.	±2 weeks / 500m hole. 6 – 8 weeks total	$300 000 per well
2D seismic interpretation	data ordering/ delivery – 1 month	1 month interpretation (24 lines)	$8,000 (plus purchase of data)
Sequence Stratigraphy	Data review/ ordering – 1 month	1 month interpretation	$15 000 (approx)
MT interpretation	Book in for interpretation ±1 week wait	2 weeks	$7,000
Deep Drilling	6 months, post above efforts. Rig securing, regulatory approvals	±6 – 8 weeks for 3 – 5 km deep slim hole.	approx. $5M to 3500 m

GEL 185	Moomba North. Nappamerri Trough, Cooper Basin	493.72 km^2

Temperature at Depth

Positive Indications
In region of known high heat flow - calculated (107 to 115mW/m2) on margins of tenement from temperature and lithology values recorded in WCRs (Mootanna 1, Moomba 73 & 86).
Thick sedimentary section with excellent insulating properties
Significant Unknowns
No data to allow temperature calculations within the deeper areas of the trough.
Extent of heat producing granite (Big Lake Suite Granodiorite) under licence area
Negative Indications
none
Best Estimate based on current Information
Based on modelling of heat flow on the Mootanna 1 well (conductivity values from Beardsmore 2004) temperatures of >150 Deg C should be realised at approximately 2500 m.

Risk Analysis		Uncertainty analysis
Despite unknowns, expectation is that the high heat flow and subsurface temperature will be continuous.	0.85	

Actions to de-risk Temperature at Depth

Drill three heat flow holes across tenement to confirm assumptions of heat flow.

DBSA Reservoir

DBSA:
Positive Indications
extensive known oil and gas reservoir units at greater than 2500 m depth
Significant Unknowns
permeability & porosity conditions of target units within the Nappamerri Trough
Negative Indications
permeability & porosity conditions at >2500m, unlikely sufficent to produce large flowrates

Risk Analysis		Uncertainty analysis
Unknown porosity and permeability of sediments at depth. Low expectation of significant flow rates being achieved.		

EGS Reservoir

EGS:
Positive Indications
Published studies on the regional stress regime show a predominantly compressive regime (Sv minimum), allowing for the preferential development of horizontal (sub) fractures.
Very high flow rates obtained by Geodynamics from fractured systems 40 km to East
Significant Unknowns
extent and capability of natural fracture networks to yield large flow rates after hydraulic fracture, either in deep crystalline basement or pre Permian sedimentary section
Negative indications
Depth to crystalline basement lithology may be beyond economic drilling depth.

Risk Analysis		Uncertainty analysis
Excessive depth to an EGS target	0.7	

Actions to de-risk Reservoir

Review and interpretation of existing geophysical data to determine/constrain depth and physical properties of target reservoir units.

* Geological Risk	0.595

2.4 Summary Table GEL 185 (* geological risk is described as percentage likelihood of technical success based on the available geological data)

3.0 GEL 169 (Bollards Lagoon)

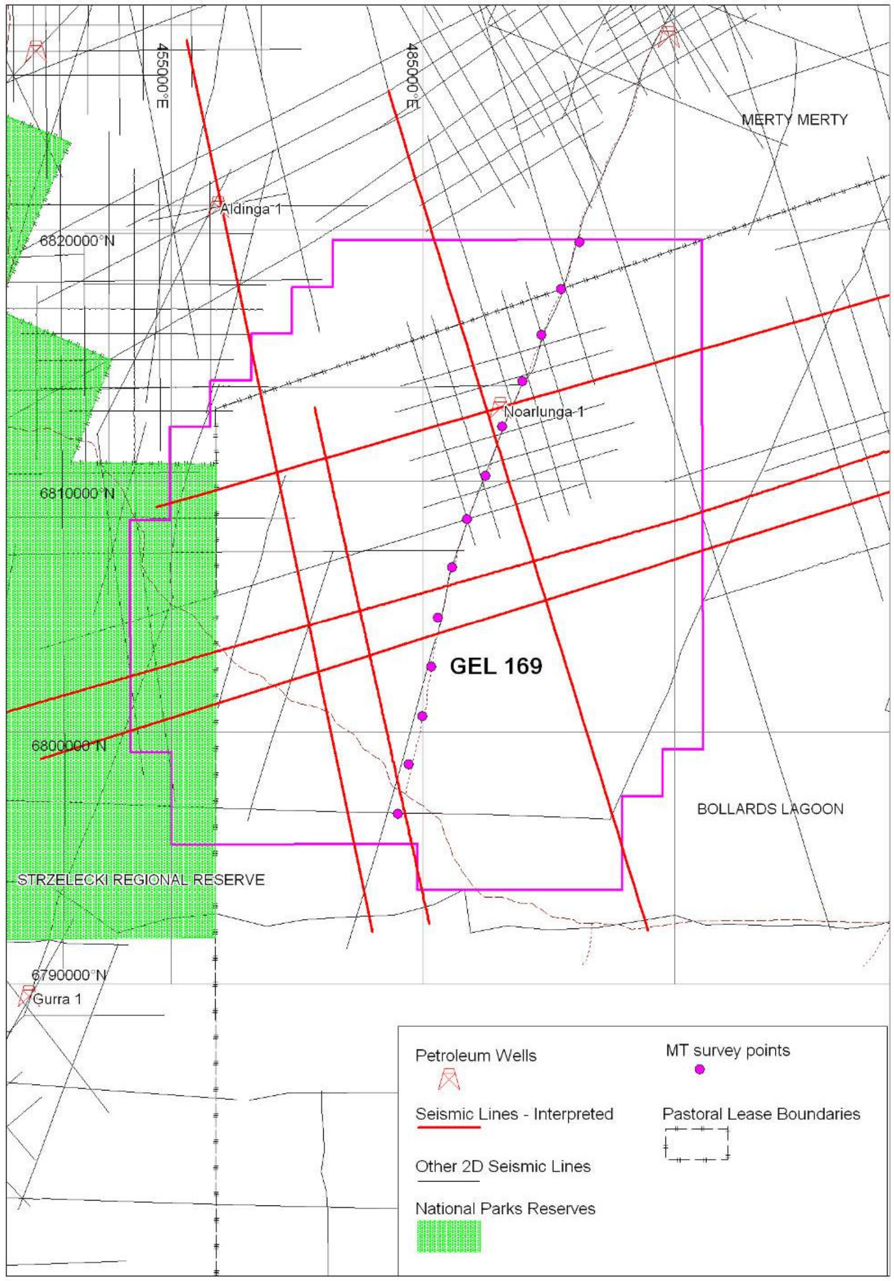


Figure 3.1 Location and works summary – GEL169

3.1 GEL 169 key risks.

3.1.1 Thermal Resistance (insulation)

Seismic interpretation of existing 2D lines and the lithologies encountered in the Noarlunga 1 well give good evidence for a maximum thickness in the order of two kilometres of sediment package overlying basement. Cooper Basin sediments of this thickness are towards the lower end of requirements for sufficient thermal insulation to develop high temperatures at depth. The sediment cover is interpreted to thin towards the southeast quarter of the tenement.

3.1.2 Heat Flow

The combination of published conductivities for the overlying sediments and reported temperatures from the wells drilled in this area have allowed for the estimation of heat flow for GEL169. A conservative estimate of heat flow in Noarlunga 1 was provided by HDRPL (Beardsmore 2007[6]) at a value of 100 mW/m². This level of heat flow is considered to be low risk in terms of there being adequate heat flow for the development of a geothermal system, and is equivalent to other highly prospective regions throughout Australia. Confirmation of this level of heat flow occurring across the whole tenement area is required.

3.1.3 Temperature

With the assumptions of purely conductive vertical heat flow, and a basement geology homogenous to a depth of 5000 m and equivalent to the Big Lake Suite Granodiorite, temperature projections to depth indicate that at depths of 3000 – 3500 m, temperature in the order of >150°C can be achieved.

3.1.4 Reservoir

The development of a reservoir within GEL169 poses the highest risk in this play. Insufficient sedimentary cover precludes the option of developing a DBSA type play, leaving an EGS type play the most probable option. The ability to enhance or develop sufficient fracture permeability within the granitic basement for economic rates of flow is currently undemonstrated for this type of play, although expectations are that this goal can be achieved.

3.1.5 Land Access

There are no identified significant issues related to land access for this tenement. The extreme western margin of the tenement coincides with the Strzelecki Regional Reserve, however this should not be an impediment to project development. The tenement area is currently utilised as grazing leases.

3.2 Plays:

3.2.1 Engineered Geothermal Systems (EGS)

An EGS play is the most viable option for this tenement area. The interpretation of a granitic basement is speculative at this stage, based primarily on seismic interpretation (Cooper and Waining 2007[5]) and an assumption of a granitic heat

[6] **Beardsmore, G.R. 2007.** Review of Geothermal Systems in GEL 169. Unpublished report to Eden Energy.

source to explain the modelled high heat flow. There was no drill intercept of granite in Noarlunga 1, with this well terminating in Palaeozoic sediments of the Warburton Basin.

3.3 Inferred Resource Requirements

To allow for the development of an Inferred Resource (low level confidence estimation of Thermal Energy in Place) for GEL 169, some key uncertainties require clarification.

Modelled high heat flow in this area should be confirmed through the drilling of a specific heat flow hole. The temperatures reported within Noarlunga 1 were not equilibrated, so conservative estimates of true formation temperatures were used in the calculation of the 100 mW/m² value for this well. A heat flow hole should be located to the south of Noarlunga 1.

The interpretation of a granitic basement remains speculative due to the lack of direct evidence such as well intersections. However, seismic data and the apparent elevated heat flow are consistent with the existence of a granite at depth. Detailed geophysical studies (eg. gravity survey) may help delineate basement lithology, alternatively physical evidence of basement lithology may be obtained with drilling to about 2000 m.

An Inferred Resource can be estimated without the physical evidence of granitic basement, providing that the heat flow value is confirmed and assumptions are made regarding the existence of a viable reservoir lithology in the basement.

Steps to an Inferred Resource: GEL169

- Constrain heat flow estimate, with at least one well.
- Confirm existence of granitic basement (geophysical study/physical sampling – drill, or use probabilistic approach of high heat)
- Ascertain areal extent and thickness of potential reservoir – seismic/MT/gravity
- Input data to 3D modeller (eg “GeoTherm”) for inversion and 3D heat flow modelling and interpretation.

Task	Timeline – setup	Timeline – execution	Cost
Drilling – Heat Flow holes x 1	6 months lead in: regulatory approvals, securing of rig.	±2 weeks / 500m hole. 2 weeks total	$300 000 per well
MT interpretation Deep Drilling	Book in for interpretation ±1 week wait 6 months, post above efforts. Rig securing, regulatory approvals	±2 weeks ±6 – 8 weeks for 3 – 5 km deep slim hole.	$5,000 approx. $5M to 3500 m

GEL 169	Bollards Lagoon. Cooper Basin	498.25 km^2

Temperature at Depth

Positive Indications
High regional heat flow. Calculated values from the Noarlunga well provides a high level surface heat flow of 97mW/m^2. Cooper Basin sediments of 2 km thickness in this area provide adequate insulation for a resource below 3000 m, within interpreted granitic basement.
Significant Unknowns:
Extent of high heat flow. Nature of basement lithology (interpreted to be granite, possibly heat producing).
Negative Indications:
None known
Best Estimate based on current Information
Modelling of heat flow and lithology data estimates temperatures of >150 Deg C at approximately 3200 m, where sediments at least 2000 m thick.

Risk Analysis		Uncertainty analysis
no evidence of heat flow extending over all tenement. Confirmation required in southern parts	0.75	

Actions to de-risk Temperature at Depth

drill additional heat flow in the southern part of tenement - confirm continuation of high heat flow

EGS Reservoir

Positive Indications
Published studies on the regional stress regime show a predominantly compressive regime (Sv minimum), allowing for the preferential development of horizontal (sub) fractures. Primary target within economic drilling depths
Significant Unknowns:
Basement lithology. Pre existing fracture state, localised stress regime
Negative Indications:
none known

Risk Analysis		Uncertainty analysis
speculative interpretation of granitic basement from seismic, no physical evidence.	0.75	

Actions to de-risk Reservoir

Drill well to >2000 m to confirm basement lithology interpretation, ascertain stimulation capacity, and confirm heat generation assumptions. Reinterpret geophysics for further clarification of target reservoir state.

Geological Risk	0.563

3.4 Summary Table GEL 169

4.0 EL 7090 (NSW – Nulla Nulla/Ennisvale)

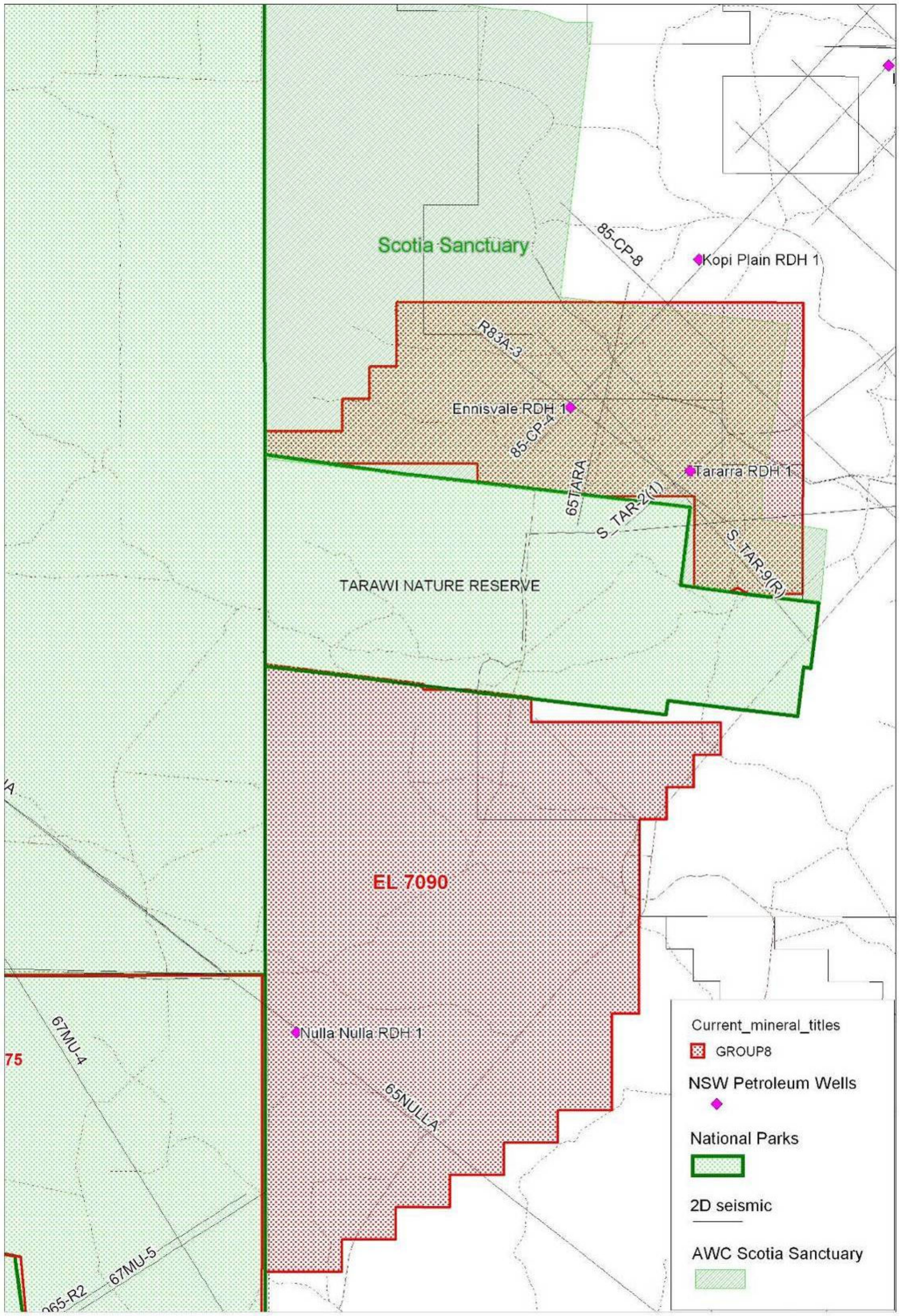


Figure 4.1 Location and work to date on EL7090

4.1 EL 7090 key risks.

4.1.1 Thermal Resistance (insulation)

It is expected that the total thermal resistance of the sedimentary sequences in this area is moderately high. Measurements of thermal conductivity of analogous Tertiary units (Murray Group and Renmark Group) by Beardsmore and Matthews 2007[7], returned an average value of approximately 1.8 W/mK. These units are in the order of 400 m thick across the Tararra Trough. The assumed conductivity values for the Devonian to Cretaceous sediments are also in the mid to low range, allowing for a reduction of the risks associated with thermal resistance. Scheduled measurements of conductivity on core samples from Nulla Nulla 1 and Ennisvale 1 will refine these assumptions and allow calculation of the thermal resistance within the drilled sections of the trough – ie to 1200 m.

4.1.2 Heat Flow

Precision temperature logs and corrected BHT's recorded from the Nulla Nulla 1 well, combined with thermal conductivity values from measured and assumed values, suggest a heat flow value of 75 mW/m², which is above the median value of 64.5 mW/m² in the Australian heat flow database. A preliminary calculation of heat flow at the Ennisvale well site returned a similar value of 72 mW/m². The risk associated with heat flow for this project is seen as moderate. Scheduled conductivity sampling of formations from both these wells will further constrain these heat flow calculations. The moderate heat flow values suggest a degree of anomalous heat generation from the basement, but granite with high heat generating capacity is not necessarily expected.

4.1.3 Temperature

With a heat flow of approximately 75 mW/m², and assumed conductivities and lithologies beneath TD it would be expected that temperatures of >150°C should be achievable at depths of approximately 4000 m. This level of heat flow does not give adequate confidence in the interpretation of a heat producing granite at depth.

4.1.4 Reservoir

The reservoir potential in this region is of a moderate to high risk, due to there being no specific data on the composition of the basement. Previous investigations, including seismic studies, exploratory drilling, and gravity surveys have all failed to confidently identify the nature of the basement lithology. The interpretation of lithologies within the Tararra Trough below approximately 1200 m depth should also be treated as speculative. The thickness of the sedimentary sequence in this trough has been interpreted (OZ SEEBASE[8]) to be approximately 4000 m, which allows for the potential development of a reservoir above the economic basement. The Murray

[7] **Beardsmore G.B. & Matthews C. 2007**. New Heat Flow Data from south-eastern Australia. *Exploration Geophysics* **38**, 260-269

[8] OZ SEEBASE™ Study 2005, Public Domain Report to Shell Development Australia by FrOG Tech Pty Ltd.

Basin Petroleum Data Package Report (Sniffen 1985[9]) suggested the geology at depth in the Tararra Trough is probably Adelaidean Late Proterozoic sediments.

4.1.5 Land Access

The northern half of the tenement package (Ennisvale area) is owned and operated by Australian Wildlife Conservancy (AWC) as a privately owned wildlife sanctuary – Scotia Sanctuary. They currently have a number of fenced areas of land to prevent feral predator entry and to allow for threatened species introductions. The discussions held to date between HDRPL and AWC indicate that this work is currently predominantly north of the Ennisvale site, but that further work is planned for the whole area. On-ground access to this area may be troublesome, especially for surveys such as seismic that will need to traverse large areas. Focussed and well planned drilling expeditions should be possible, but HDRPL recommends that the negotiation phase of any on-ground works commence early.

4.2 Plays:

4.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

The modelled heat flow and interpreted depth of the Tararra Trough does not preclude the possibility for the development of a DBSA type play in this region. However risks associated with locating sediments with suitable permeability and/or fracture networks are high. There has been no drill penetration below 1200 m in the Trough, and seismic interpretations are speculative due to poor resolution at depths greater than this.

4.2.2 Engineered Geothermal Systems (EGS)

An EGS type play is currently the more likely option in this region. However, the suitability of lithologies at required depths to host fracture networks amenable to hydraulic enhancement is unknown. The actual basement lithology interpreted for this region remains speculative.

4.3 Inferred Resource Requirements

There is insufficient definitive information from this site to date to allow for the estimation of an inferred resource with any level of confidence.

No drill has penetrated below 1200 m in the Tararra Trough, and as such the interpretations of nature, depth and thickness of the underlying rock strata are speculative at best. There is no definitive picture of the nature of the basement, which has a bearing on both the heat generating capacity and reservoir potential of the deeper units. In addition, the reliance on two BHT's from 1980's drilling (Nulla Nulla and Ennisvale wells) and assumed thermal conductivities for the calculation of heat flow is insufficient for an inferred resource estimate. New heat flow holes are required to constrain the temperature risk, confirm the heat flow value, and to define an area/volume of interest.

---

[9] **Sniffen MJ. 1985**. Petroleum Data Package, Murray Basin New South Wales. NSW Geological survey Report GS 1985/008

Further modelling of depths to basement may also be required via the use of geophysics such as MT surveys, and possibly seismic (although seismic to date does not appear to provide adequate resolution for basement studies). A slim drill hole to approximate depths of extrapolated economic temperatures (3 – 4 km) is an option to confirm the existence of suitable reservoir strata and temperatures for the development of a geothermal play.

Steps to an Inferred Resource: EL7090

- Constrain heat flow assumptions, with input of measured conductivities when available.
- Drilling of at least two heat flow wells in the southern portion of the tenement package, and one to the north. Land access negotiations with AWC will be required for the north.
- Investigate existence of permeable sediments at approximately 4000 m, or basement amenable to fracture stimulation (geophysical study/physical sampling – drill)
- Ascertain areal extent and thickness of potential reservoir (seis-mic/MT/gravity)
- Input data to 3D modeller (eg "GeoTherm") for inversion and 3D heat flow modelling and interpretation.

Task	Timeline – setup	Timeline – execution	Cost
Drilling – Heat Flow holes x 3	6 months lead in: regulatory approvals, land access and securing of rig.	±2 weeks / 500m hole. 6 – 8 weeks total	$300 000 per well
MT Survey and interpretation	Survey design and access negotiations ± 3 months - interpretation ±1 month wait	Data acquisition approx 2 weeks. Interpretation: ±1 month	Dependant on survey design
Deep Drilling	6 months, post above efforts. Rig securing, regulatory approvals	±6 – 8 weeks for 3 – 5 km deep slim hole.	approx. $5M to 3500 m.

EL 7090	Nulla Nulla: Tararra Trough	919.6 km^2

Temperature at Depth

Positive Indications

heat flow calculations on Nulla Nulla 1 and Ennisvale provide a moderate surface heat flow of up to 75mW/m^2.

Significant Unknowns

The region has very little data coverage to allow for high levels of confidence in a high regional heat flow. Lack of knowledge of lithologies below approx 1200 m. Heat flow value does not confirm the interpretation of a heat producing granite at depth

Negative Indications:

moderate heat flows may push depth of achieving adequate temperatures to below economic depths

Best Estimate based on current Information

Temperature logging and extrapolation of temperature to depth provides an estimation of achieving 150 Deg C at approximately 4000 m.

Risk Analysis		Uncertainty analysis
depth to adequate temperatures may be below economic depths	0.55	

Actions to de-risk Temperature at Depth

drill heat flow holes to confirm heat flow values for greater tenement area.

Reservoir

DBSA:

Positive Indications

indications of silicified lithology below 1100 m (Nulla Nulla 1) possibly suitable for fracture stimulation

Significant Unknowns

basement lithology, localised stress regime. DBSA potential unlikely, but not completely discounted. extent of silicified lithologies unknown.

Negative Indications

depth to suitable lithology and temperature may be below economic depths.

Risk Analysis		Uncertainty analysis
Depth to required reservoir may be sub economic. Lithologies unknown.	0.4	

Actions to de-risk Reservoir

Determine depth to suitable lithology for stimulation (geophysics). Assess localised stress regime, and constrain geological knowledge (drill test).

Geological Risk	**0.220**

4.4 Summary Table EL 7090

5.0 GEL 175 - 176 (Renmark)

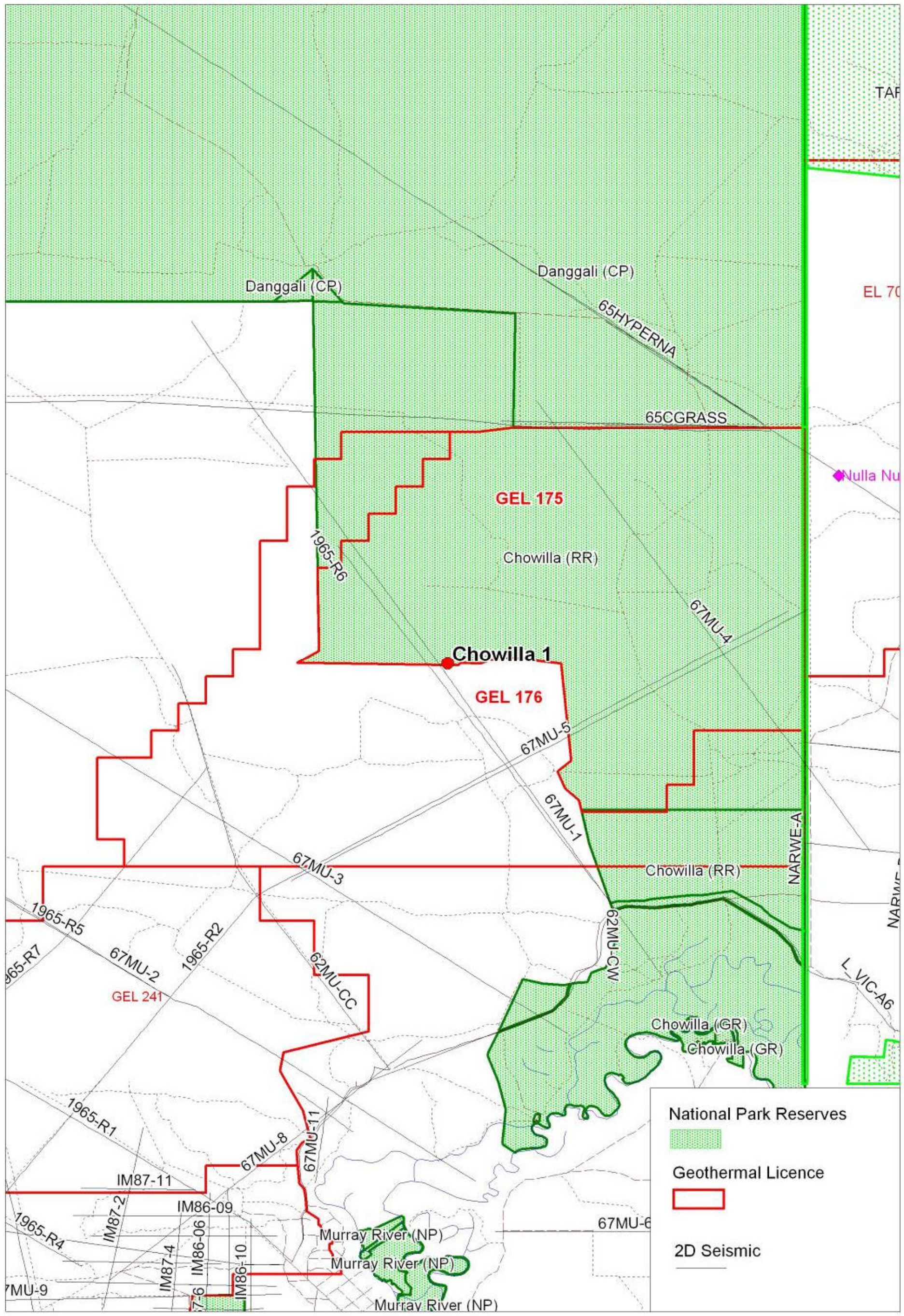


Figure 5.1 Location and work to date on GEL 175, 176

5.1 GEL 175 - 176 key risks.

5.1.1 Thermal Resistance (insulation)

Published thermal conductivity values from the Murray and Renmark Group sediments (Matthews & Beardsmore 2007[7]), and subsequent measured values from the Chowilla 1 well, indicate very good thermal insulation in the top 500 m of this area. It is expected that the underlying sediments would also provide a reasonable level of thermal insulation.

5.1.2 Heat Flow

Heat flow calculated from measured conductivities and temperatures from the Chowilla 1 well returned a relatively low value of 51 ± 2.0 mW/m^2. Whilst this one value does not necessarily indicate low heat flow across both GEL 175 and 176, it does indicate that for the location of Chowilla 1, there is a low heat flow and a low chance of encountering temperatures required for the development of a geothermal play within economic depths. There remains scope to look to the north east of GEL 175, where regional geophysics indicates a subtle change in the underlying geological conditions, whilst there still being a reasonable chance of suitable thickness of cover sequence. Overall, however, the risk for locating adequate heat flow in this area is high.

5.1.3 Temperature

With good thermal insulation but poor heat flow the risk associated with finding appropriate temperatures within economically viable depths is high. A preliminary extrapolation of temperature at depth using estimated conductivities of the sediment pile of the Renmark Trough suggests a temperature of 150°C at approximately 4500 m.

5.1.4 Reservoir

With the expected depths to adequate temperatures for the development of a geothermal play being in excess of 4500 m, it is expected that the target reservoir would be within the basement. The nature of the basement underlying the Renmark tenements is unknown and interpretations of granitic basement are highly speculative. HDRPL speculates that the basement is more likely comprised of early to mid Palaeozoic sediments and metasediments of Adelaidean age.

5.1.5 Land Access

GEL 176 overlies Calperum Station, which is also a nature reserve managed by the Australian Landscape Trust, and a UNESCO recognised area of significant landscape. This area also coincides with the majority of a very deep gravity low and the Renmark Trough. There may be difficulties gaining access to the land for the purpose of exploration, both logistically and possibly from a PR perspective if ALT chose to disagree with the exploration rights associated with the GEL.
GEL175 is coincident with the Chowilla Regional Reserve (National Parks and Wildlife SA) and is also a grazing lease (Robertsons – Chowilla Station). There are no significant impediments to project development with Regional Reserves, especially in the context of standard environmental requirements under the Petroleum Act.

5.2 Plays:

5.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

It is highly unlikely that this area would support the development of a DBSA type play. It is expected that required depths to reach economically viable temperatures (based on the Chowilla Heat Flow result) for the generation of power resources would most likely be beneath the interpreted depth of sediment in the Renmark Trough.

5.2.2 Engineered Geothermal Systems (EGS)

The development of a geothermal project in this tenement package would most likely be focussed on an EGS type play. Current heat flow modelling, however, suggests that viable temperatures may not be encountered in this area until at least 4500 – 5000 m depth.

5.3 Inferred Resource Requirements

A lack of specific data on the geology and geothermal potential of this area means significant work would be required to provide data for the estimation of an inferred resource.

The discovery and confirmation of an area high heat flow is the minimum requirement to set this project on a course to an inferred resource estimation. To date, there are no indications of anomalous elevated heat flow and no evidence of a heat producing lithology underlying the thick sediments of the trough.

Steps to an Inferred Resource: **GEL 175, 176**

- Ascertain that elevated heat flow exists away from Chowilla 1.
- Drilling of at least two heat flow wells in each of the tenements. Land access negotiations with ALT will be required for GEL176.
- Collect evidence of suitable reservoir (geophysical study/physical sampling – drill)
- Ascertain areal extent and thickness of potential reservoir (seismic/MT/gravity)
- Input data to 3D modeller (eg “GeoTherm”) for inversion and 3D heat flow modelling and interpretation.

Task	Timeline – setup	Timeline – execution	Cost
Drilling – Heat Flow holes x 4	6 months lead in: regulatory approvals, securing of rig.	±2 weeks / 500m hole. 8 weeks total	$300 000 per well
MT Survey and interpretation	Survey design and access negotiations ± 3 months - interpretation ±1 month wait	Data acquisition approx 2 weeks. Interpretation: ±1 month	Dependant on survey design
Deep Drilling	6 months, post above efforts. Rig securing, regulatory approvals	±6 – 8 weeks for 3 – 5 km deep slim hole.	approx. $5M to 3500 m.

GEL 175/176	Chowilla: Renmark Trough	993.95 km^2

Temperature at Depth

Positive Indications

good thermal resistance should a heat source be discovered within tenement package

Significant Unknowns:

areal extent of heat flow. Location of any heat producing basement within tenements.

Negative Indications:

low surface heat flow and high thermal resistance suggesting lack of heat source at depth

Best Estimate based on current Information

suggested temperatures of approximately 150 Deg C would be found at approximately 4500 m.

Risk Analysis		Uncertainty analysis
very low surface heat flow, indicating a probable lack of heat generation.	0.2	

Actions to de-risk Temperature at Depth

Drill further heat flow holes in the northern areas of the tenement to confirm calculated heat flow from Chowilla 1 is not anomalously low for the region.

Reservoir

Positive Indications

suitable lithologies for geothermal reservoir are interpreted to lie within economic drilling depths

Significant Unknowns

local stress regime knowledge. Existing fracture state of reservoir target unknown.

Negative Indications

none known

Risk Analysis		Uncertainty analysis
highly speculative basement interpretation, lack of target lithology determination.	0.4	

Actions to de-risk Reservoir

Review and interpretation of existing geophysical data to determine/constrain depth and physical properties of target reservoir. Drill deep well and confirm lithology and suitability to host fracture stimulation.

Geological Risk	0.080

5.4 Summary Table GEL 175/176

6.0 GEL 166, 167 & 168 (Witchellina/Mulgaria)

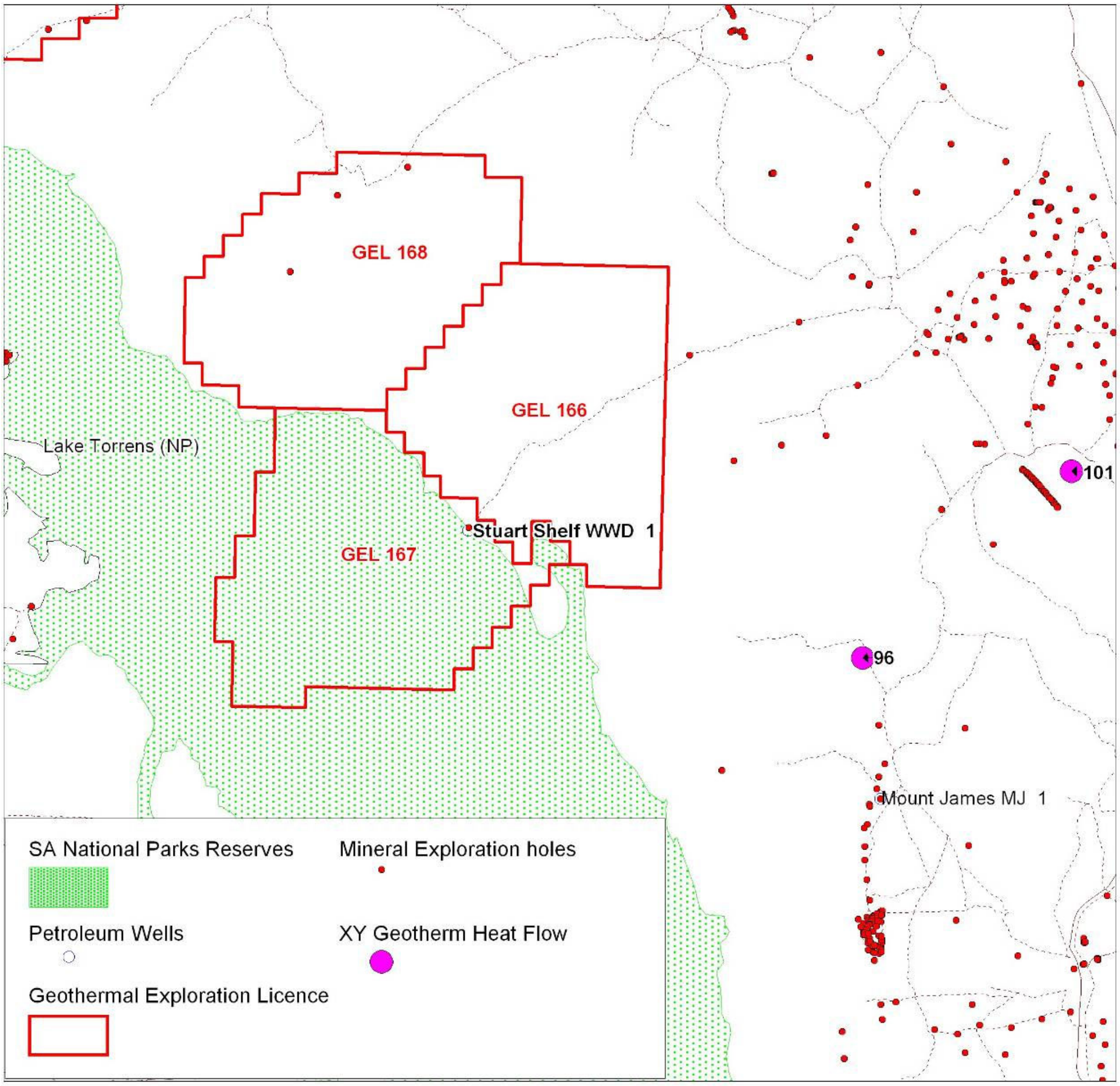


Figure 6.1 Location and work to date on GELs 166-168

6.1 GEL 166, 167 & 168 key risks.

6.1.1 Thermal Resistance (insulation)

Based on the SEEBASE sediment thickness data there is up to 9000 m of Proterozoic sediment (Adelaidean) over the interpreted basement in the area. This suggests a moderate risk (due to lack of published conductivity data for these sediments) of there being sufficient thermal insulation in this area, especially for any DBSA type play. The tenements lie to the east of the Torrens Hinge Zone, a zone of known thick Proterozoic sediment accumulation overlying the eastern margin of the Gawler Craton. Torrens Energy has released heat flow results and temperature extrapolations for its Parachilna Project that suggest that the thermal resistivity of the

Adelaidean sediments in this region is sufficient to allow for the development of elevated temperatures shallower than 5 km.
A WMC report (1986 partial relinquishment report EL 783, 784 and 1316 – Stuart Shelf) describes the area as being part of the Torrens Complex with a difficult to determine basement composition with possible deep iron formation affinities, lying beneath thick Adelaidean sediments.

6.1.2 Heat Flow

There are no recorded temperatures known from within this project area. The lack of temperature data and the inconclusive interpretations of basement lithologies suggest a high risk associated with heat flow. There are two published elevated heat flow values located approximately 40 km east (101 mW/m²) and 25 km SE (96 mW/m²). Neither of these locations appears to be sited on contiguous gravity or magnetic image signatures. Therefore, the risk that these elevated heat flow values are not applicable in the tenement area remains high. Should these published heat flow data to the east, and the values reported by Torrens Energy (to the south) indicate regionally elevated heat flow, then heat flow in the tenement area may be similarly elevated.

6.1.3 Temperature

There are no known available published temperature data for this area. If elevated heat flow exists within this area and the insulating properties of the overlying Adelaidean sediments provide sufficient thermal resistance, then suitable conditions for elevated temperatures within economic depths should exist.

6.1.4 Reservoir

There is insufficient knowledge of the properties of the Adelaidean sediments for determining the probability for the development of a DBSA reservoir. An EGS type play may be investigated either in the Proterozoic sediments/metasediments or crystalline basement where it lies within economic depths. There are no drill intercepts of the basement within this area, so the prediction of crystalline basement is speculative and contains a high degree of risk. The speculative WMC interpretation of a deep iron formation is the most relevant to this area. Sediment thicknesses of up to 9000 m are indicated by the SEEBASE data.

6.1.5 Land Access

GEL 167 is coincident with the Lake Torrens National Park. Whilst this Park is proclaimed to allow for access under the Mining and Petroleum Acts of SA, it would require significant investments in time and human resources to undertake suitable studies to ensure environmental issues were dealt with in the planning stages of an exploration/development program. In addition to these requirements the logistics of exploration on a salt lake surface (especially for drilling type operations, or use of any heavy machinery) could be a major difficulty, and would incur significant extra cost to any program.
Eden Energy undertook much of the environmental assessment, indigenous heritage notifications and approvals work required by the Petroleum Act for drilling operations between late 2005 and mid 2007. Work approvals were in place for the drilling out of a cement plug (at 20 m) in Stuart Shelf WWD1 and obtaining further core from the bottom of this hole, and also for the drilling of a new well (Witchellina 1) to the east of

the existing well. These approvals remain largely in place allowing for less investment required in the regulatory approvals of any further drilling work in a specific area.
Tenements 166 and 168 do not have any known issues associated with land access.

6.2 Plays:

6.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

It is highly unlikely that the conditions in this area would support the development of a DBSA type play.

6.2.2 Engineered Geothermal Systems (EGS)

It would be expected that the likely target for this area would be an EGS type play, either within suitable Proterozoic sediments at depth or within the crystalline basement. The unknown stratigraphy and basement type, due to lack of drill penetration in this region, does not allow for any reduction in the risks associated with the development of a suitable reservoir.

6.3 Inferred Resource Requirements

For the estimation of an inferred resource, this area requires the confirmation and quantification of elevated heat flow. After confirmation of high heat flow, further investigations on the thermal resistance, basement type and reservoir potential can be undertaken.

Steps to an Inferred Resource: GEL166 - 168

- Ascertain heat flow for the area (off Lake Torrens).
- Drilling of at least two heat flow wells in 166 and 168 tenements.
- Build geological model to provide input to reservoir investigations.
- Confirm existence of suitable reservoir (geophysical study/physical sampling – drill)
- Ascertain areal extent and thickness of identified reservoir (seismic/MT/gravity)
- Input data to 3D modeller (eg “GeoTherm”) for inversion and 3D heat flow modelling and mapping.

Task	Timeline – setup	Timeline – execution	Cost
Drilling – Heat Flow holes x 2 - 3	6 months lead in: regulatory approvals, securing of rig.	±2 weeks / 500m hole. 4 – 6 weeks total	$300 000 per well
Geological investigations/ modelling (MT/seismic/ other	Survey design and access negotiations ± 3 months - interpretation ±1 month wait	Data acquisition approx 2 weeks. Interpretation: ±1 month	Dependant on survey type and design

geophysics)			
Deep Drilling	6 months, post above efforts. Rig securing, regulatory approvals	±6 – 8 weeks for 3 – 5 km deep slim hole.	approx. $5M to 3500 m.

GEL 166-168	Witchellina: Torrens Hinge Zone		1456.84 km^2
Temperature at Depth			
Positive Indications Regional heat flow is elevated for area (Torrens Hinge Zone), expected good thermal resistance in Adelaidean sediments. **Significant Unknowns**: No measured temperatures from tenements. No significant knowledge of sediment lithologies. **Negative Indications:** none known **Best Estimate based on current Information** based on surrounding values (Torrens Energy to South, Austherm heat flow values to east) temperatures suitable for geothermal resources should be obtainable within 5 km of surface.			
Risk Analysis			**Uncertainty analysis**
No known temperature or heat flow data from tenement area.	0.3		
Actions to de-risk Temperature at Depth			
Drill heat flow holes across tenement to confirm assumptions of heat flow. Constrain underlying geological assumptions to allow for extrapolation of temperature to depth.			
Reservoir			
Positive Indications deep sedimentary cover interpreted (FrogTec), allowing for possibility of DBSA type play. **Significant Unknowns** basement lithology and depth. Sedimentary properties at target depth. Local stress regime. **Negative Indications** none known			
Risk Analysis			**Uncertainty analysis**
Lack of knowledge of potential reservoir units.	0.3		
Actions to de-risk Reservoir			
Review and interpretation of existing geophysical data to determine/constrain depth and physical properties of target reservoir. Drill deep well and test reservoir conditions.			
Geological Risk	**0.090**		

6.4 Summary Table GEL 166 - 168

7.0 GEL 329 & 330 (Coorichina)

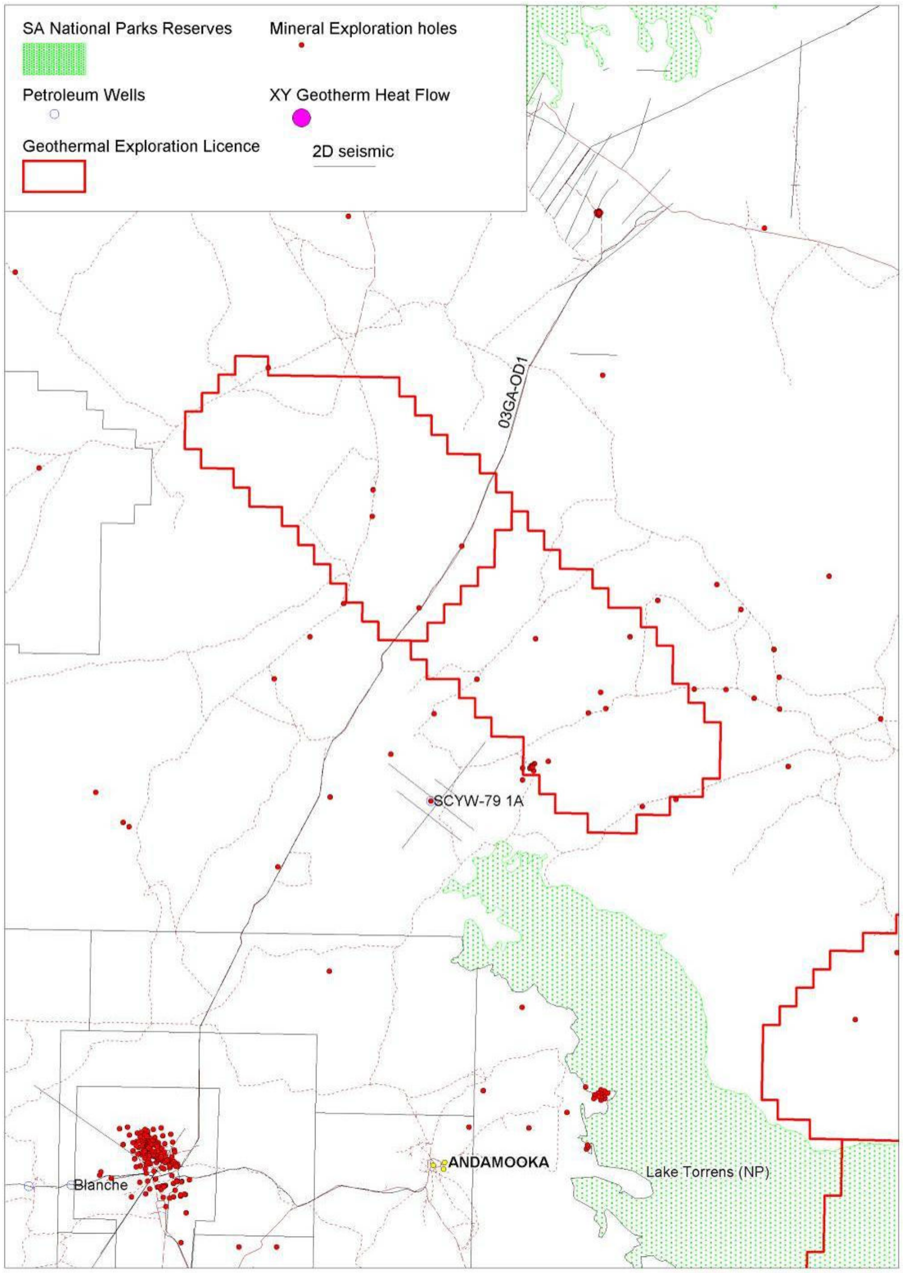


Figure 7.1 Location and work to date on GEL 329, 330

7.1 GEL 329 & 330 key risks.

7.1.1 Thermal Resistance (insulation)

The depth of sediment within these tenements is an unknown at this stage. The regional deep seismic traverse (north–south) interpretation suggests sediments up to

5 km thick through the centre of the tenements. A number of old coal exploration holes exist throughout the tenement area, however none exceed 40 m in depth. Results released by Torrens Energy (Parachilna Project) suggest that the thermal resistance of the Adelaidean sediments in its project area is sufficient to produce high temperatures within economic depths.

7.1.2 Heat Flow

There is insufficient information to enable a prediction of heat flow, so risk remains high. There are no published temperature data or heat flow data from this region. Evidence from surrounding regions and the proximity of the anomalously high heat flow zone of the Torrens Hinge Zone suggests that there may be some potential for this area to also host moderate to high heat flow, although this is highly speculative at this stage.
A WMC drill hole approximately 30 km south of the tenements intercepted granitic gneiss at 900 m. The regional gravity and magnetics shows a similar magnetic signature trending towards the Coorichina tenements, however the continuation of this lithology beneath the basin is highly speculative. Notes on the interpretation of the Gawler Craton Seismic Survey suggest a possible Archean granulite extending beneath the basin

7.1.3 Temperature

There is insufficient information to reliably predict temperatures within economically viable depths in this area, so temperature risk remains very high. If the sediments of the basin are at least 4 km thick, if they have favourable thermal resistance, and there is a viable heat source, then this risk is substantially reduced.

7.1.4 Reservoir

It would be assumed from the regional data available to date that the crystalline basement may be beyond the economic depth for the development of a geothermal EGS play in some areas of the tenement. Similarly the potential for an EGS development within the basal units of the profile (interpreted to be mafic volcanics from the regional seismic line) is restrained by the depth of this unit, at approximately 5000 m. However there is good potential for fracture stimulation of pre existing fractures within the overlying sequences with extensive faulting visible on the seismic section. Sediment petrophysical properties (porosity and permeability) for this area are unknown. The risk of suitable reservoir conditions is high due to lack of information.

7.1.5 Land Access

There are no known issues associated with land access in this area.

7.2 Plays:

7.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

Unknown if this will be a primary target type play, however the age of sediments and lack of knowledge about the nature of the lithologies of this area suggest a high risk rating for this type of target.

7.2.2 Engineered Geothermal Systems (EGS)

It would be assumed at this early stage that an EGS system would be the primary target play. Risks associated with this type of play remain high due to the lack of local information, although the presence of pre existing fractures (faults) is encouraging for the development of permeability suitable for an EGS type play.

7.3 Inferred Resource Requirements

There are currently no data on which to base a resource estimation. Geological information of the area to aid in constraining the volumetric extent of any potential reservoir, and heat flow calculations for determining probable temperatures at depth, would be required as preliminary steps to provide input to the process.

GEL 329/330	Coorichina: Mulgaria Sub Basin	993.28 km2

Temperature at Depth

Positive Indications
good depth of cover sediments to provide insulation.
Significant Unknowns:
Heat flow. Existence of heat source. Nature and properties of overlying sediments.
Negative Indications:
none known
Best Estimate based on current Information
too early to make estimate. Lack of information

Risk Analysis		Uncertainty analysis
no locally derived data to make accurate assessment	0.2	

Actions to de-risk Temperature at Depth

Drill heat flow holes across tenements to calculate heat flow and ascertain some sediment properties

Reservoir

Positive Indications
pre existing fractures - faults at target depths
Significant Unknowns
depth to suitable reservoir. Target unit physical properties. Local stress conditions.
Negative Indications
none known

Risk Analysis		Uncertainty analysis
unknown suitability of area to host geothermal reservoir	0.3	

Actions to de-risk Reservoir

Review and interpretation of existing geophysical data to determine/constrain depth and physical properties of target reservoir units.

Geological Risk	0.060

7.4 Summary Table GEL 329/330

8.0 GEL 411-422 (Port Pirie)

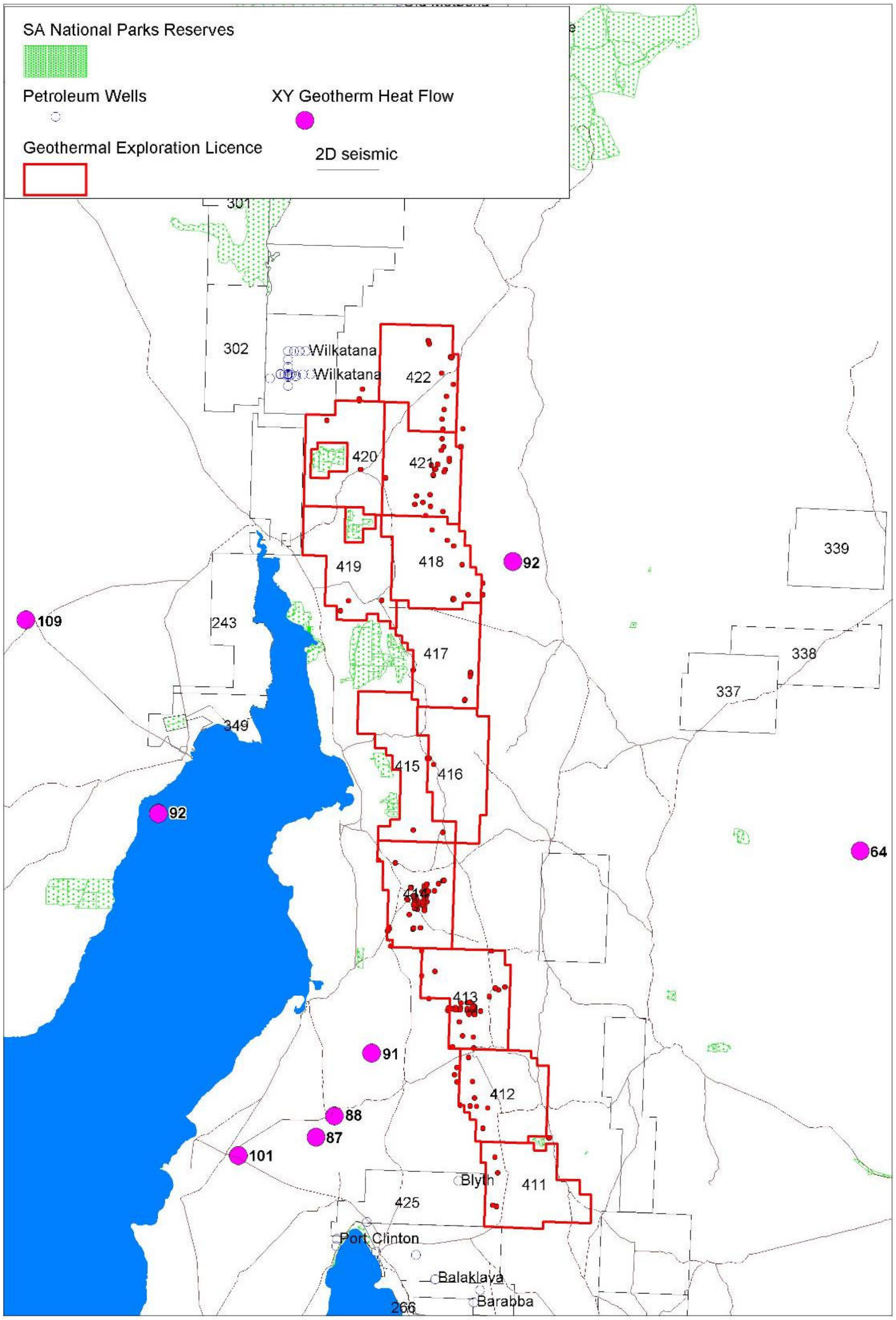


Figure 8.1 Location and work to date on GELs 411 - 422

8.1 GEL 411 – 422 key risks.

8.1.1 Thermal Resistance (insulation)

There is up to 9000 m of sediment cover in this area (Proterozoic sediments of the Adelaide Geosyncline), based on 2006 published interpretations by FrogTech. This should provide adequate thickness of cover, but the physical properties of these sediments are unknown, and there are no known published thermal conductivity data for these rocks. The presence of one drill hole to in excess of 800 m (with core) provides a lead on gaining relatively easy access to some data of this type. The location of this area in relation to the strongly tilted Flinders Ranges also requires investigation, as there is potential for a vertical foliation or rock fabric that could impact detrimentally on the vertical thermal conductivity.

8.1.2 Heat Flow

There are no known published heat flow values from within the tenement area, but the area lies within the South Australian Heat Flow Anomaly region. There is one published heat flow value of (92 mW/m²) from approximately 12 km east of GEL418. It could be assumed that there is some degree of elevated heat flow within this region, however this is highly speculative until physical measurements can be made and a geological model can be developed.

8.1.3 Temperature

There is no known published temperature data from the tenement area. There are, however, 32 mineral exploration wells that have been drilled in excess of 75 m deep (and a further 270 less than 70 m) within the tenement. Some of these may be still be open and available for temperature logging. There is one stratigraphic well (Depot Creek 1) that has been drilled in the north western most corner of the tenements to a depth of 874 m. The status of any of these drill holes is unknown in relation to their suitability for temperature logging. Elevated temperatures could be expected if the sediments show suitable thermal insulative properties, and if elevated heat flow values continue through this area.

8.1.4 Reservoir

There is insufficient information currently available to determine the reservoir potential of this area. Reservoir risks, therefore, remain very high. It is expected that any potential reservoir would be of the EGS type, with fracture stimulation required to enhance natural fractures most probably present in the Proterozoic Adelaidean sediments.

8.1.5 Land Access

There are no known areas of land access issues within the tenement areas. The Port Pirie tenement boundaries appear to have been selected to avoid areas of National Park managed reserves. There may still be other areas within the tenements where extra environmental safeguards will be required (such as areas of remnant native vegetation) that will be identified during initial investigations into this area.

8.2 Plays:

8.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

Further geological modelling and investigations are required to determine the nature of the sediments in this area, to ascertain their suitability to the development of a DBSA type play. The age and depth of burial of these sediments may not favour this type of play development.

8.2.2 Engineered Geothermal Systems (EGS)

At this early stage it is expected that the development of an EGS type play will be the primary target, provided suitable temperature and rock mechanical properties can be demonstrated, and that stimulation of any pre existing natural fracture networks can be successfully achieved.

8.3 Inferred Resource Requirements

This tenement package is in very early stages of investigations, and will require all facets of a geothermal play to be investigated and quantified prior to the estimation of an inferred resource.

GELs 411-422	Port Pirie: Torrens Hinge Zone	5937 km2

Temperature at Depth

Positive Indications
Torrens Hinge Zone an area of known elevated heat flows. Good depth of sedimentary cover.

Significant Unknowns:
No known temperature data. No heat flow values within tenements. Thermal resistance of cover sediments unknown. Speculative interpretation of actual depth of sedimentary cover.

Negative Indications:
none known

Best Estimate based on current Information
too early to make estimate

Risk Analysis		Uncertainty analysis
Expected elevated heat flow. Lack of measured data.	0.2	

Actions to de-risk Temperature at Depth

Drill heat flow holes across tenement targets to measure heat flow. Constrain unknown geology for temperature calculations.

Reservoir

Positive Indications
none known, probable pre existing fractures

Significant Unknowns
Target depth. nature of basement at depth.

Negative Indications
none known

Risk Analysis		Uncertainty analysis
Possible proterozoic basement EGS type play.	0.3	

Actions to de-risk Reservoir

Review and interpretation of existing geophysical data to determine/constrain depth and physical properties of target reservoir. Build geological model of areas of interest.

Geological Risk	0.060

8.4 Summary Table GEL 411 - 422

9.0 GEL 177 (Mungeranie)

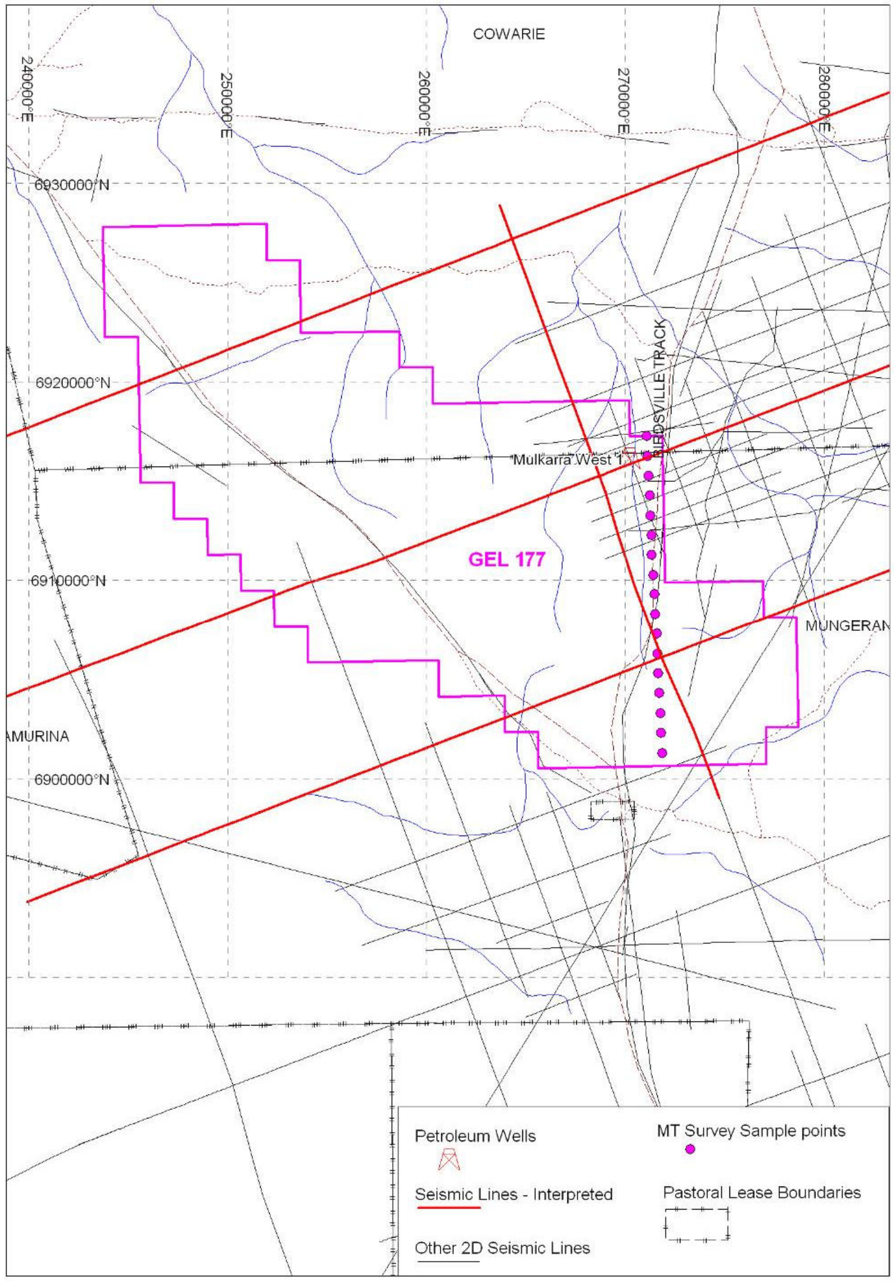


Figure 9.1 Location and work to date on GEL 177

9.1 GEL 177 key risks.

9.1.1 Thermal Resistance (insulation)

The depth of sediment overlying basement (interpreted) in this area is less than 2000 m (Cooper and Waining 2007[5]). This is unlikely to provide sufficient insulation to generate the temperature required for a viable geothermal resource within the sedimentary pile, although there are no published data available on the thermal conductivity of the Cambrian-Ordovician Warburton Basin sediments. The level of thermal insulation remains a moderate to high risk aspect of this play.

9.1.2 Heat Flow

A heat flow value has not been calculated for this area, but the BHT recorded in Mulkarra West # 1 well (92.5°C at 1286.9 m) suggests a relatively high geothermal gradient of 56°C/km. Heat flow is a low to moderate risk based on the BHT temperature recorded in Mulkarra 1, however the lack of conductivity information on the Palaeozoic sediments of the Warburton Basin make this a speculative interpretation.

9.1.3 Temperature

Temperature is not identified as a high risk in this area. Based on previous work (seismic interpretation and geothermal gradients) temperatures in excess of 150°C should be obtainable within 3000 m of surface. This is, however, a speculative interpretation at this stage due to paucity of data. Further thermal modelling would be required across the tenement to confirm this as a moderate or low risk.

9.1.4 Reservoir

The most probable reservoir target in this area is an EGS type play in the interpreted basement granites. Modelling of the local stress regime and confirmation of crystalline basement would be required stages to reduce the reservoir risk.

9.1.5 Land Access

There are no known issues associated with land access that are associated with this area.

9.2 Plays:

9.2.1 Deeply Buried Sedimentary Aquifer (DBSA)

It is not expected that this type of play will be applicable in this region.

9.2.2 Engineered Geothermal Systems (EGS)

Based on the interpretation of seismic in this area, and the initial MT survey results, it is expected that the basement is of crystalline nature and amenable to fracture stimulation and the development of a geothermal reservoir. The lack of physical evidence of the nature of the basement means that this assumption remains speculative, and assumed risk cannot be moderated without fresh data collection.

9.3 Inferred Resource Requirements

This area requires significant work to allow an estimation of an inferred resource. Whilst some of the required data are available (seismic and MT) for further interpretation and delineation of the volumetric extent of an identified reservoir, there are no heat flow data, and no physical sample of the basement material for determining thermal properties or suitability for fracture stimulation.

At least one heat flow hole would be required to confirm the temperature data recorded in Mulkarra West #1.

Steps to an Inferred Resource: GEL177

- Model heat flow based on Mulkarra #1 lithologies and temperatures, and ascertain heat flow for the wider area.
- Drilling of at least one specific heat flow well.
- Investigate existence of suitable reservoir (geophysical study/physical sampling – drill)
- Ascertain areal extent and thickness of potential reservoir (seismic/MT/gravity)
- Input data to 3D modeller (eg "GeoTherm") for inversion and 3D heat flow modelling and mapping.

Task	Timeline – setup	Timeline – execution	Cost
Drilling – Heat Flow holes x 1 - 2	6 months lead in: regulatory approvals, securing of rig.	±2 weeks / 500m hole. 2 - 4 weeks total	$300 000 per well
MT interpretation	Book in for interpretation ±1 week wait	2 weeks	$7,000
Deep Drilling	6 months, post above efforts. Rig securing, regulatory approvals	±6 – 8 weeks for 3 – 5 km deep slim hole.	approx. $5M to 3500 m.

GEL 177	Mungerannie. Eromanga (Cooper) Basin	497.4 km^2

Temperature at Depth

Positive Indications
temperatures recorded in Mulkarra West 1 well are of high order (92.5 Deg C at 1286 m).
Significant Unknowns:
Conductivities of Warburton Basin sediments. Proven heat producing lithology at depth.
Negative Indications:
Shallow sedimentary cover.
Best Estimate based on current Information
Based on assumed conductivities it would be expected that temperatures of approximately 150 Deg C could be reached within 3500 m of surface.

Risk Analysis		Uncertainty analysis
High temperatures recorded, shallow cover, no conductivity data	0.5	

Actions to de-risk Temperature at Depth

Drill further heat flow holes across tenement to confirm assumptions of heat flow, measure unknown sedimentary sections for conductivity.

Reservoir

Positive Indications
Lithology at TD of Mulkarra has been logged as metasediments, possible suitable for frac stimulation.
Significant Unknowns
Lithology at 3500 m target depth. Local stress regime.
Negative Indications
none known

Risk Analysis		Uncertainty analysis
unknown basement lithology and stress regime	0.5	

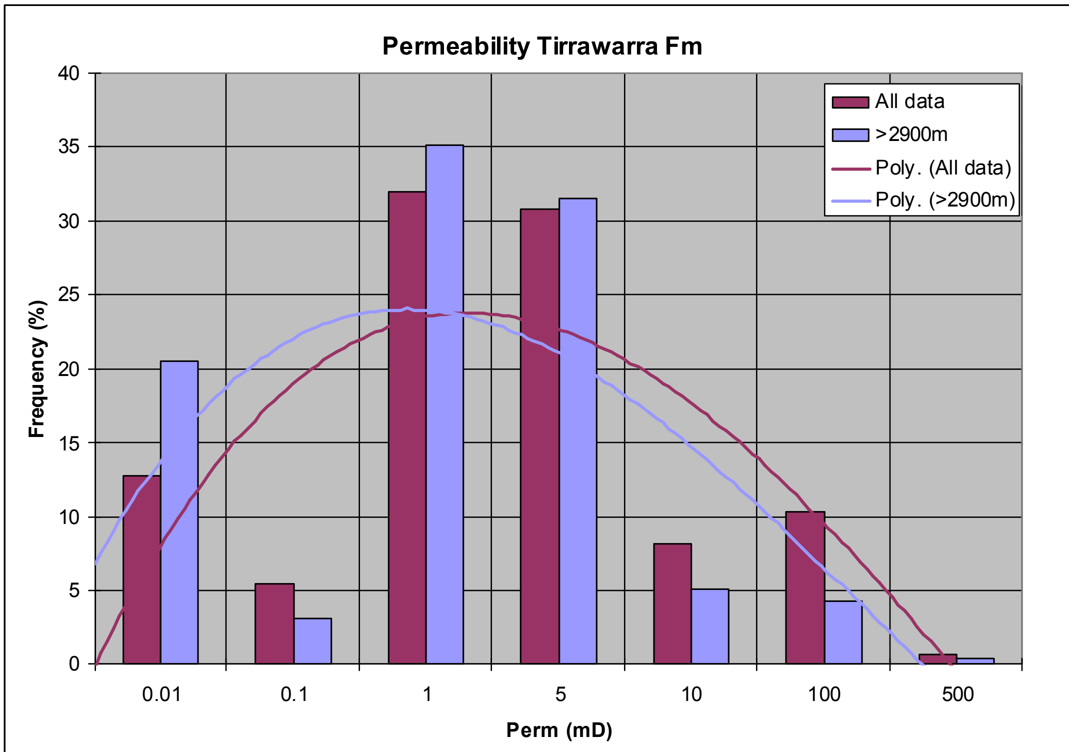
Actions to de-risk Reservoir

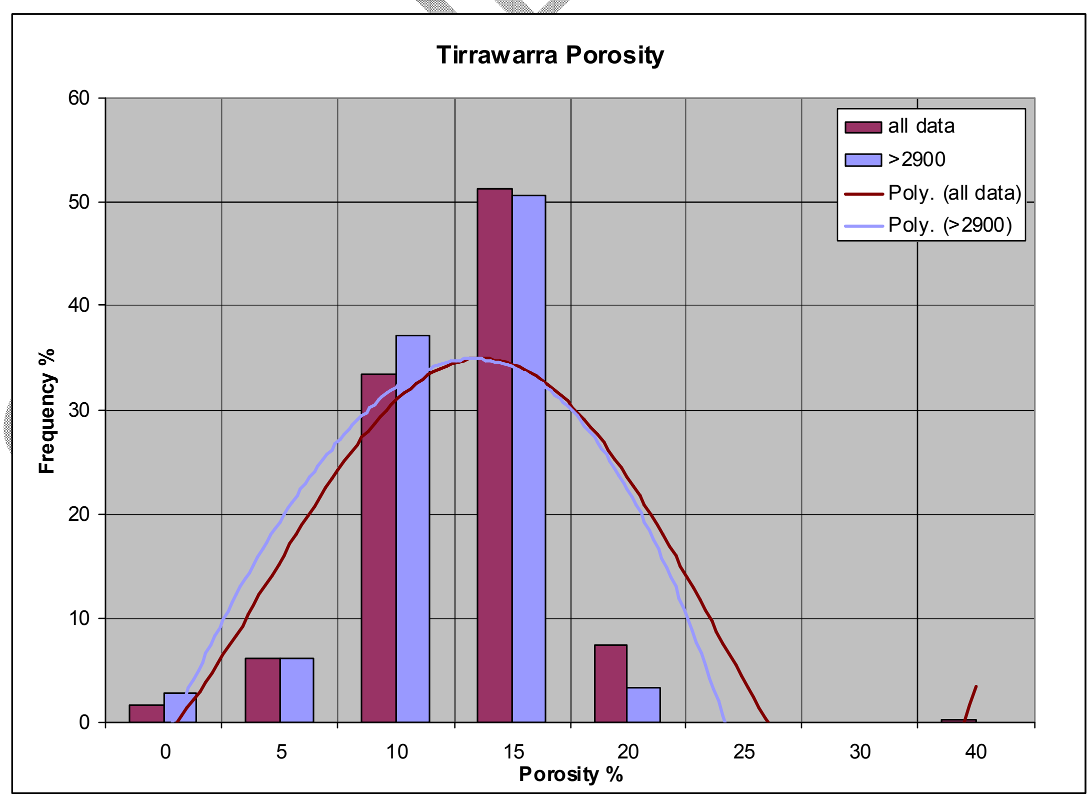
Review and interpretation of existing geophysical data to determine/constrain depth and physical properties of target reservoir units. Drill deep well and test reservoir suitability

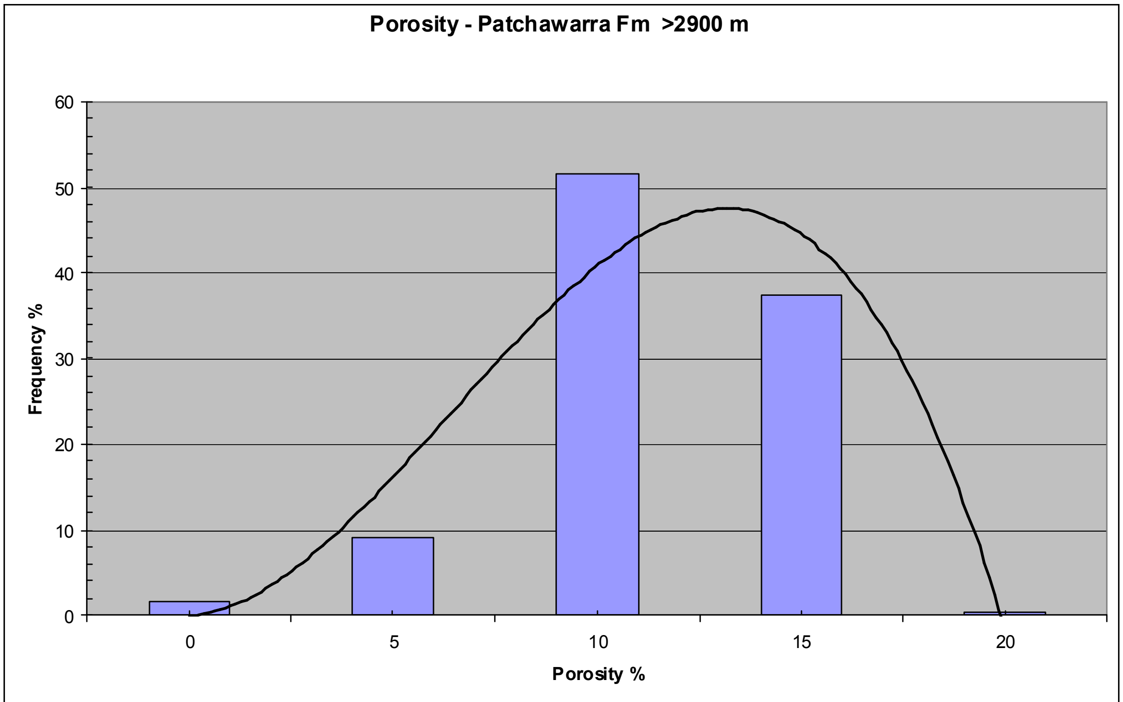
Geological Risk	0.250

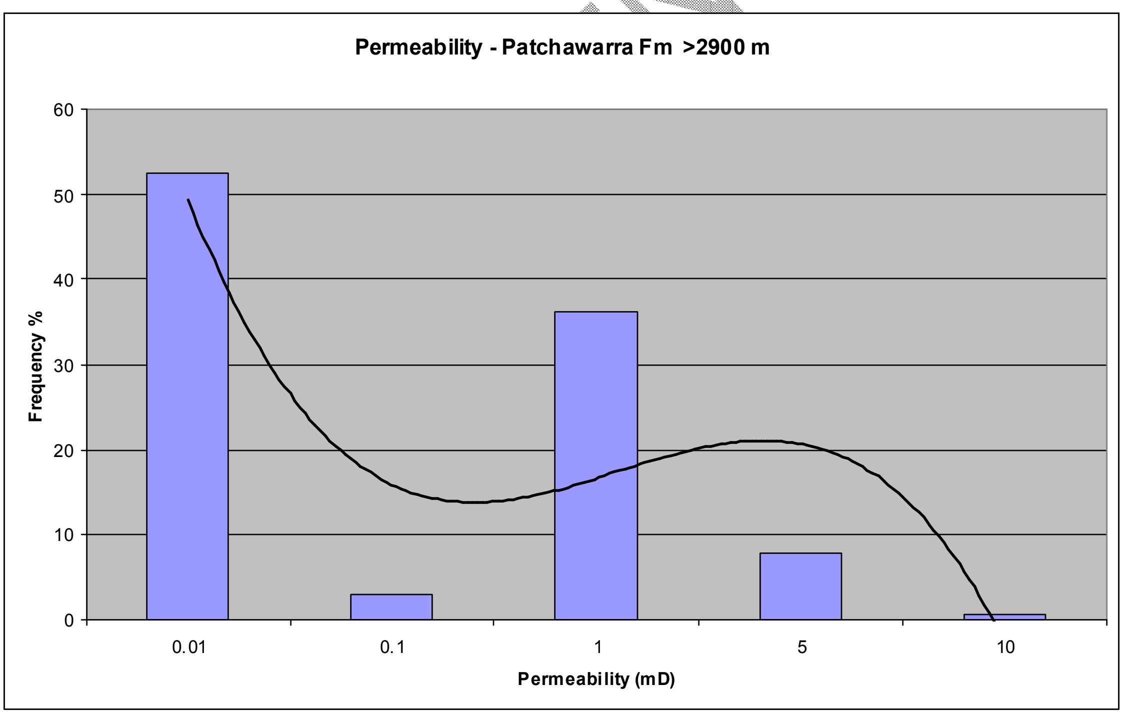
9.4 Summary Table. GEL 177

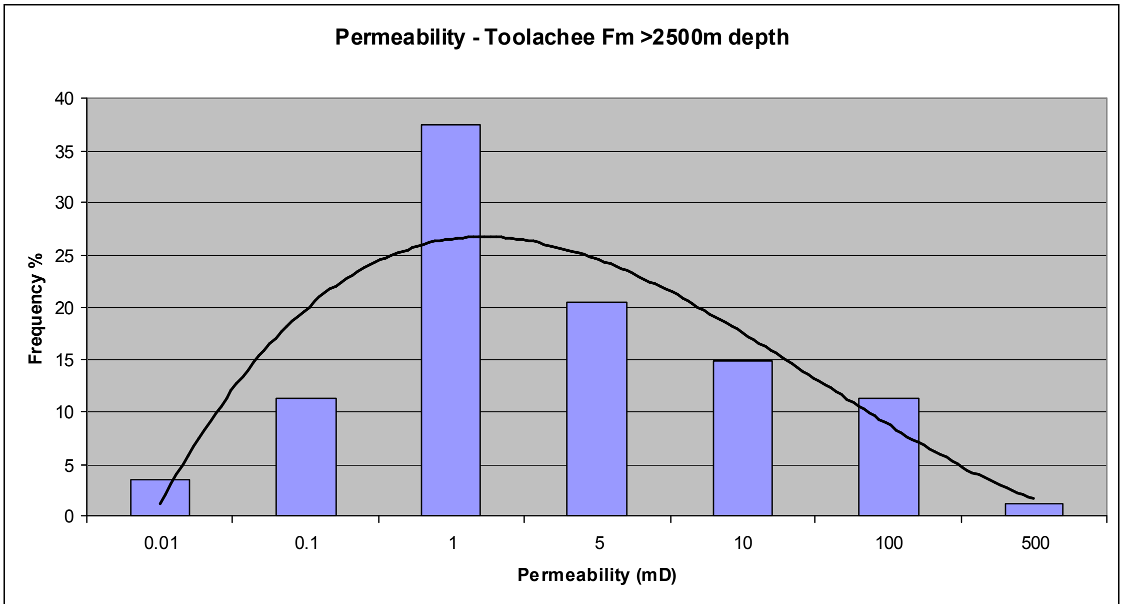
Appendix 1 – Physical properties of target formations - Cooper Basin, GEL 185

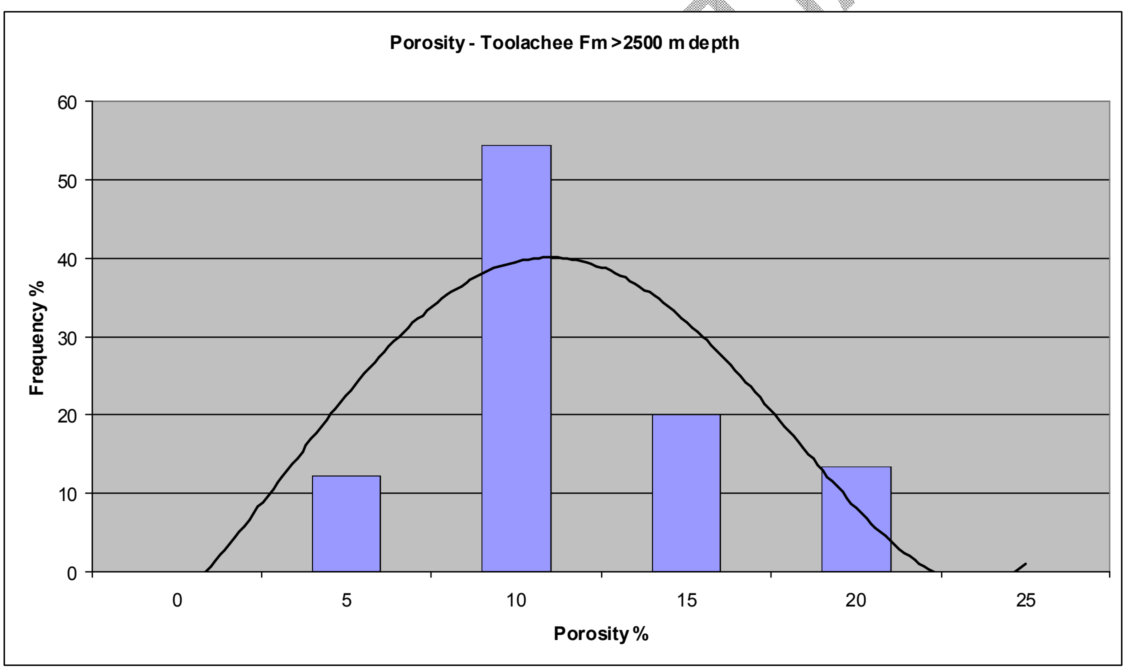





Porosity - Patchawarra Fm >2900 m
60
50
40
30
20
10
0
Frequency %
0
5
10
15
20
Porosity %


Permeability - Patchawarra Fm >2900 m
60
50
40
30
20
10
0
Frequency %
0.01
0.1
1
5
10
Permeability (mD)


Permeability - Toolachee Fm >2500m depth
Frequency %
40
35
30
25
20
15
10
5
0
0.01
0.1
1
5
10
100
500
Permeability (mD)


Porosity - Toolachee Fm >2500 m depth
Frequency %
60
50
40
30
20
10
0
0
5
10
15
20
25
Porosity %

Origin Energy Geothermal Pty Ltd

Annual Report

Licence Year 5

8 January 2010 - 7 January 2011

GEL 185

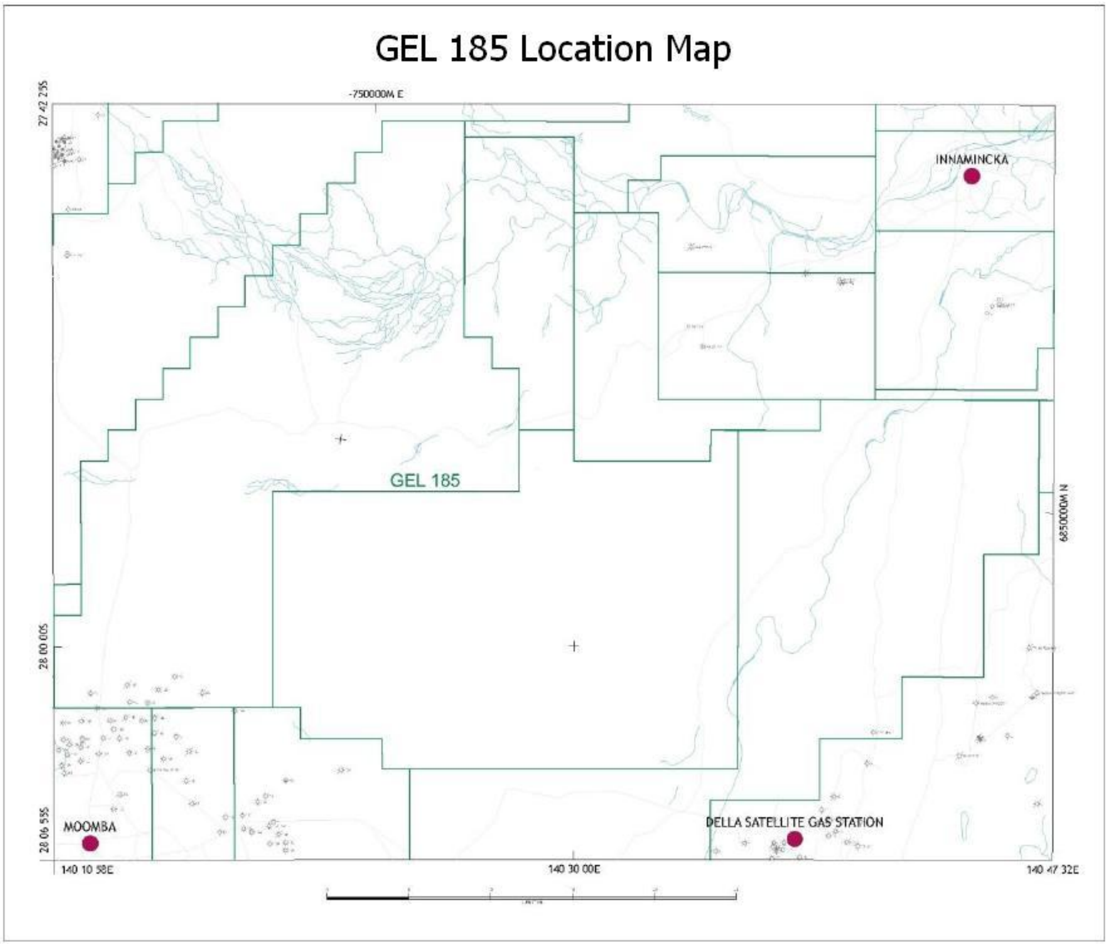
CONTENTS Page No.

1 *Introduction*

Geothermal Exploration Licence (GEL) 185 was granted on 14 April 2005 with an initial term of five years. The licence is located in the Cooper Basin, South Australia. The location of GEL 185 is seen in Figure 1 below.

This report details the work conducted during Year 5 of the licence (8 January 2010 – 7 January 2011 inclusive) in accordance with Regulation 33 of the *Petroleum and Geothermal Energy Act 2000*.

Figure 1 GEL 185 Location Map



2 *Permit Summary*

For the duration of Licence Year 5 licensees for Geothermal Exploration Licence (GEL) 185 were:

For the period 8 January 2010 – 21 October 2010

- Origin Energy Geothermal Pty Ltd 70%
- Eden Energy Ltd 30%

For the period 22 October 2010 – 7 January 2011

- Origin Energy Geothermal Pty Ltd 100%

The original work commitments (including variations) associated with GEL 185 are seen in Table 1.

Table 1 Original work commitments by licence year

Year of term of Licence	Minimum Work Requirements
One	• Geological and geophysical studies
Two	• Geological and geophysical studies
Three	• Review of seismic data; • Acquisition and modelling of magneto-telluric data
Four	• Geological and geophysical studies
Five	• Drill one well

Licence Year *5* concluded on 7 January 2011. Table 2 displays the minimum work program (after all variations) and the actual work completed up until the end of the current reporting period. Note that work commitments for Year 5 were suspended.

Table 2 Final work program and work completed (as of end of current reporting period) by licence year

Licence Year	Minimum Work Program	Actual Work
Year 1 (14/04/2005-13/04/2006)	Geological and geophysical studies	See GEL 185 Year 1 Annual Report (Eden Energy Ltd)
Year 2 (14/04/2006-13/04/2007)	Geological and geophysical studies	See GEL 185 Year 2 Annual Report (Eden Energy Ltd)
Year 3 (14/04/2007-13/04/2008)	Review of seismic data; Acquisition of modelling of magneto-telluric data	See GEL 185 Year 3 Annual Report (Eden Energy Ltd)
Year 4 (14/04/2008-07/01/2010	Geological and geophysical studies	See GEL 185 Year 4 Annual Report (Eden Energy Ltd)
Year 5 (08/01/2010-07/01/2011)	Drill one well **Note:** Commitment to Drill one well was suspended until Licence Year 6	Cultural Heritage and Environmental Survey

On 9 November 2010, a suspension of work commitments for Licence Year 5 was granted for the period from and including 8 January 2011 to 7 January 2012.

An extension of GEL 185 licence was granted, such that GEL 185 will now expire 7 January 2012.

3 <u>Regulated Activities</u>

Pursuant to Regulation 33(2)(a) under the Act, an annual report must include:

"a summary of the regulated activities conducted under the licence during the [current reporting] year."

This information is detailed below in designated sections.

Drilling and Related Activities
No regulated activities undertaken in the licence reporting period

Seismic Data Acquisition
No regulated activities undertaken in the licence reporting period

Seismic Data Processing and Reprocessing
Origin reprocessed seismic data during the licence reporting period.

Geochemical, Gravity, Magnetic and other surveys
No regulated activities undertaken in the licence reporting period

Production and Processing
No regulated activities undertaken in the licence reporting period

Pipeline/Flowline Construction and Operation
No regulated activities undertaken in the licence reporting period

Preliminary Survey Activities
Preliminary Cultural Heritage and Environmental surveys were conducted in GEL185 on 12 November 2010.

4 <u>Compliance Issues</u>

Licence and Regulatory Compliance
Pursuant to Regulations 33(2) (b) & (c), an annual report must include:

"a report for the year on compliance with the Act, these regulations, the licence and any relevant statement of environmental objectives;" and

"a statement concerning any action to rectify non compliance with obligations imposed by the Act, these regulations or the licence, and to minimise the likelihood of recurrence of any such non-compliances."

Origin was fully compliant with licence, regulatory and SEO requirements during the reporting year ending 7 January 2011, including timely payment of forward licence fees and security bond.

Origin acknowledges that it was non-compliant with the submittal of this report, as it was not submitted by the due date of 7 March 2011. Origin is committed to ensuring that it is fully compliant with all Licence and Regulatory requirements in future.

Compliance with Statement of Environmental Objectives

Origin will conduct its activities in GEL 185 under the Statement of Environmental Objectives, Drilling and Well Operations, South Australian Cooper Basin, November 2009 (Santos). These objectives are listed below.

1. Minimise risks to the safety of the public and other third parties.
2. Minimise disturbance and avoid contamination to the soil.
3. Avoid the introduction or spread of pest plants and animals and implement control measures as necessary.
4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.
5. Avoid disturbance to sites of cultural and heritage significance.
6. Minimise loss of aquifer pressure and avoid aquifer contamination.
7. Minimise disturbance to native vegetation and native fauna.
8. Minimise air pollution and greenhouse gas emissions.
9. Maintain and enhance partnerships with the Cooper Basin community.
10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure.
11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal.
12. Remediate and rehabilitate operational areas to agreed standards.

Origin was fully compliant with the SEO for Licence Year 5. As Origin did not conduct any on-ground work in Licence Year 5, there is no requirement to assess the compliance of individual activities against the SEO for this year.

Management System Audits

Pursuant to Regulation 33(2) (d) under the Act, an annual report must include:

"a summary of any management system audits undertaken during the relevant licence year including information on any failure or deficiency identified by the audit and any corrective actions that has, or will be taken".

No audits were conducted during Licence Year 5 (8 January 2010 - 7 January 2011).

Report and Data Submissions

Pursuant to Regulation 33(2) (e) under the Act, an annual report must include:

"a list of all reports and data relevant to the operation of the Act generated by the licensee during the licence year".

Cultural Heritage and Environmental Survey reports were generated during Licence Year 5, as a result of survey operations in November 2010. These were submitted to PIRSA after the reporting period for Licence Year 5.

Incidents
Pursuant to Regulation 33(2) (f), an annual report must include:

"in relation to any incidents reported to the Minister under the Act and these Regulations during the relevant licence year –

(i) an overall assessment and analysis of the incidents, including the identification and analysis of any trends that have emerged; and

(ii) an overall assessment of the effectiveness of any action taken to rectify non-compliance with obligations imposed by the Act, these regulations or the licence, or to minimise the risk of recurrence of any such non-compliance".

No incidents occurred in GEL 185 during the reporting year.

Threat Prevention
Pursuant to Regulation 33(2) (g) under the Act, an annual report must include:

"a report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably presents, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be taken".

There are no threats to activities under the licence as work commitments for GEL 185 have been suspended.

Future Work Program
Pursuant to Regulation 33(2) (h) under the Act, an annual report must include:

Work commitments for Licence Year 5 have been suspended until Licence Year 6. The work commitment is to drill one well, as outlined in Table 1.

5 Expenditure Statement

Please refer to Appendix 1 for the expenditure statement for the current reporting period.

APPENDIX 1 Expenditure Statement (commercial in confidence)

Drilling activities	$ 0
Seismic activities	$ 20,000
Technical evaluation and analysis	$ 160,000
Other surveys	$ 10,000
Facility construction and modification	$ 0
Operating and administration expenses	$ 125,000
TOTAL	$ 315,000

These costs were incurred for GEL 185 during licence Year 5.

Origin Energy Geothermal Pty Ltd

Annual Report

Licence Year 6

8 January 2011 - 7 January 2012

GEL 185

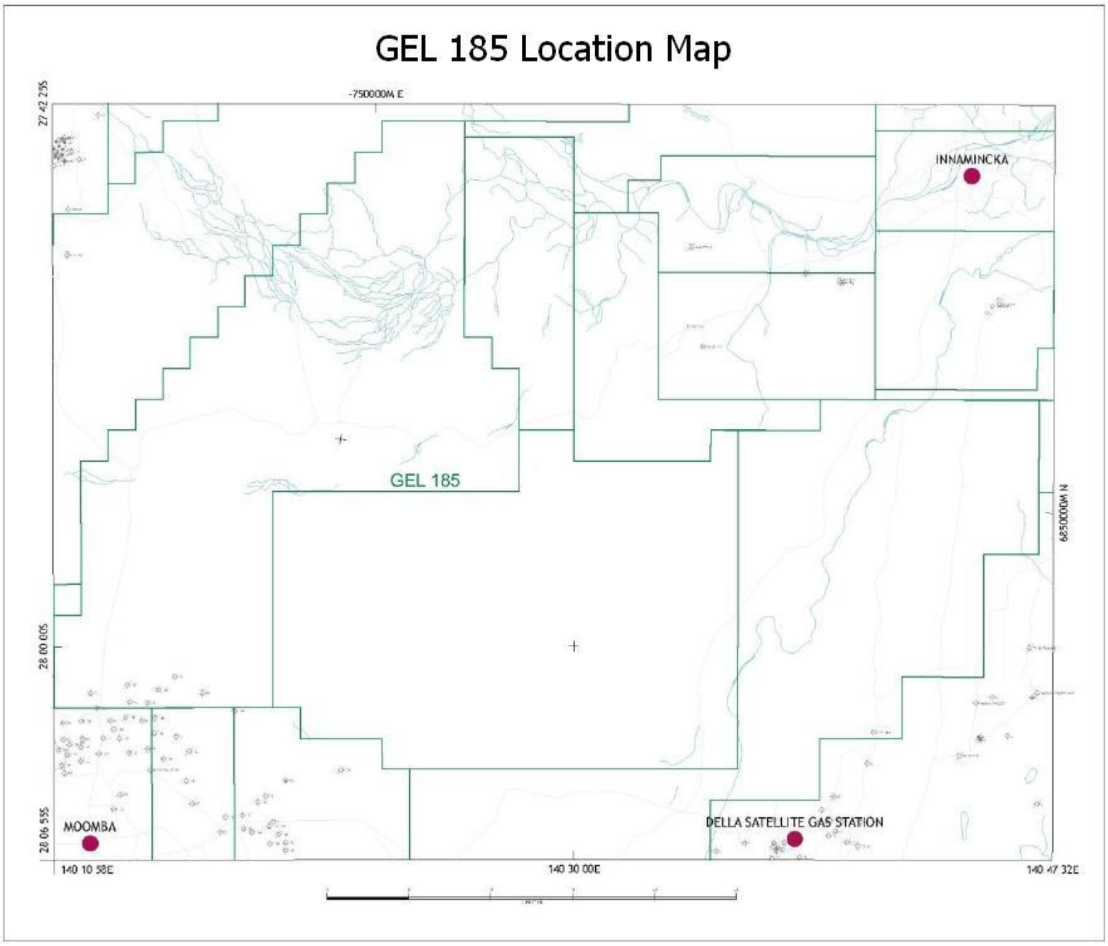
CONTENTS Page No.

1 *Introduction*

Geothermal Exploration Licence (GEL) 185 was granted on 14 April 2005 with an initial term of five years. The licence is located in the Cooper Basin, South Australia. The location of GEL 185 is seen in Figure 1 below.

This report details the work conducted during Year 6 of the licence (8 January 2011 – 7 January 2012 inclusive) in accordance with Regulation 33 of the *Petroleum and Geothermal Energy Act 2000*.

Figure 1 GEL 185 Location Map



2 *Permit Summary*

For the duration of Licence Year 5 licensee for Geothermal Exploration Licence (GEL) 185 was Origin Energy Geothermal Pty Ltd.

The original work commitments (including variations) associated with GEL 185 are shown in Table 1.

Table 1 Original work commitments by licence year

Year of term of Licence	Minimum Work Requirements
One	• Geological and geophysical studies
Two	• Geological and geophysical studies
Three	• Review of seismic data; • Acquisition and modelling of magneto-telluric data
Four	• Geological and geophysical studies
Five	• Drill one well

Licence Year 6 concluded on 7 January 2012. Table 2 displays the minimum work program (after all variations) and the actual work completed up until the end of the current reporting period. Note that work commitments for Year 5 were suspended.

Table 2 Final work program and work completed (as of end of current reporting period) by licence year

Licence Year	Minimum Work Program	Actual Work
Year 1 (14/04/2005-13/04/2006)	Geological and geophysical studies	See GEL 185 Year 1 Annual Report (Eden Energy Ltd)
Year 2 (14/04/2006-13/04/2007)	Geological and geophysical studies	See GEL 185 Year 2 Annual Report (Eden Energy Ltd)
Year 3 (14/04/2007-13/04/2008)	Review of seismic data; Acquisition of modelling of magneto-telluric data	See GEL 185 Year 3 Annual Report (Eden Energy Ltd)
Year 4 (14/04/2008-07/01/2010	Geological and geophysical studies	See GEL 185 Year 4 Annual Report (Eden Energy Ltd)
Year 5 (08/01/2010-07/01/2011)	**Note:** Commitment to Drill one well was suspended until Licence Year 6	Cultural Heritage and Environmental Survey
Year 6 (08/01/2011-07/01/2012)	Drill one well **Note:** Commitment to Drill one well was suspended until Licence Year 7.	Cultural Heritage Work Area Clearance

On 21 December 2011, a suspension of work commitments for Licence Year 6 was granted for the period from and including 8 January 2012 to 7 January 2013. Following meetings between Origin and DMITRE executives, at which Origin outlined the results obtained from the Origin-Operated Celsius 1 well drilled in GRL 8, an extension of GEL 185 licence was granted, such that GEL 185 will now expire

7 January 2013. While the well encountered encouraging temperatures, it did not meet the Shallows Joint Venture's expectations in terms of permeability thickness.

3 Regulated Activities

Pursuant to Regulation 33(2)(a) under the Act, an annual report must include:

"a summary of the regulated activities conducted under the licence during the [current reporting] year."

This information is detailed below.

Drilling and Related Activities
No regulated activities undertaken in the licence reporting period

Seismic Data Acquisition
No regulated activities undertaken in the licence reporting period

Seismic Data Processing and Reprocessing
No regulated activities undertaken in the licence reporting period

Geochemical, Gravity, Magnetic and other surveys
No regulated activities undertaken in the licence reporting period

Production and Processing
No regulated activities undertaken in the licence reporting period

Pipeline/Flowline Construction and Operation
No regulated activities undertaken in the licence reporting period

Preliminary Survey Activities
A preliminary Cultural Heritage survey was conducted in GEL185 on May 2011 in conjunction with the Yandruwandha Yawarrawarrka Traditional Land Owners (Aboriginal Corporation).

4 Compliance Issues

Licence and Regulatory Compliance
Pursuant to Regulations 33(2) (b) & (c), an annual report must include:

"a report for the year on compliance with the Act, these regulations, the licence and any relevant statement of environmental objectives;" and

"a statement concerning any action to rectify non compliance with obligations imposed by the Act, these regulations or the licence, and to minimise the likelihood of recurrence of any such non-compliances."

Origin was fully compliant with licence, regulatory and SEO requirements during the reporting year ending 7 January 2011, including timely payment of forward licence fees.

Origin acknowledges that it was non-compliant with the submittal of the Licence Year 5 Annual Report, as it was not submitted by the due date of 7 March 2011. Origin remains committed to ensuring that it is fully compliant with all Licence and Regulatory requirements in future.

Compliance with Statement of Environmental Objectives

Origin will conduct its activities in GEL 185 under the Statement of Environmental Objectives, Drilling and Well Operations, South Australian Cooper Basin, November 2009 (Santos). These objectives are listed below.

1. Minimise risks to the safety of the public and other third parties.
2. Minimise disturbance and avoid contamination to the soil.
3. Avoid the introduction or spread of pest plants and animals and implement control measures as necessary.
4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.
5. Avoid disturbance to sites of cultural and heritage significance.
6. Minimise loss of aquifer pressure and avoid aquifer contamination.
7. Minimise disturbance to native vegetation and native fauna.
8. Minimise air pollution and greenhouse gas emissions.
9. Maintain and enhance partnerships with the Cooper Basin community.
10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure.
11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal.
12. Remediate and rehabilitate operational areas to agreed standards.

Origin was fully compliant with the SEO for Licence Year 6. As Origin did not conduct any on-ground work in Licence Year 6, the assessment the compliance of individual activities against the SEO for this year is not required.

Management System Audits

Pursuant to Regulation 33(2) (d) under the Act, an annual report must include:

"a summary of any management system audits undertaken during the relevant licence year including information on any failure or deficiency identified by the audit and any corrective actions that has, or will be taken".

No audits were conducted during Licence Year 6.

Report and Data Submissions

Pursuant to Regulation 33(2) (e) under the Act, an annual report must include:

"a list of all reports and data relevant to the operation of the Act generated by the licensee during the licence year".

A Cultural Heritage Survey report was generated during Licence Year 6, as a result of survey operations in May 2011.

Incidents
Pursuant to Regulation 33(2) (f), an annual report must include:

"in relation to any incidents reported to the Minister under the Act and these Regulations during the relevant licence year –

(i) an overall assessment and analysis of the incidents, including the identification and analysis of any trends that have emerged; and

(ii) an overall assessment of the effectiveness of any action taken to rectify non-compliance with obligations imposed by the Act, these regulations or the licence, or to minimise the risk of recurrence of any such non-compliance".

No incidents occurred in GEL 185 during the reporting year.

Threat Prevention
Pursuant to Regulation 33(2) (g) under the Act, an annual report must include:

"a report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably presents, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be taken".

There are no threats to activities under the licence as work commitments for GEL 185 have been suspended.

Future Work Program
Pursuant to Regulation 33(2) (h) under the Act, an annual report must include:

> *"unless the relevant licence year is the last year in which the licence is to remain in force – a statement outlining operations proposed for the ensuing year".*

Work commitments for Licence Year 6 have been suspended until Licence Year 7. The work commitment is to drill one well, as outlined in Table 1.

This involves preparation of well site and access tracks, drilling and testing of well to confirm reservoir properties and remediation of disturbed well site. The approximate duration of these activities is several months.

5 Expenditure Statement

Please refer to Appendix 1 for the expenditure statement for the current reporting period.

APPENDIX 1 Expenditure Statement (commercial in confidence)

Drilling activities	$ 0
Seismic activities	$ 0
Technical evaluation and analysis	$ 0
Other surveys	$ 22,283
Facility construction and modification	$ 0
Operating and administration expenses	$ 988,505*
TOTAL	$ 1,010,788

These costs were incurred for GEL 185 during licence Year 6.

* Includes $700, 000 consideration for Eden Energy's remaining 30% stake in GEL 185.
* Does not include $50,000 security bond payment.

Annual Report

Origin Energy Geothermal Pty Ltd

Licence Year
8 January 2012 **-** *7 January 2013*
GEL 185

Contents

1 Introduction

Geothermal Exploration Licence (GEL) 185 was granted on 14 April 2005 with an initial term of five years. The licence is located in the Cooper Basin, South Australia. The location of GEL 185 is seen in Figure 1 below.

This report details the work conducted during Year 7 of the licence (8 January 2012 – 7 January 2013 inclusive) in accordance with Regulation 33 of the *Petroleum and Geothermal Energy Act 2000*.

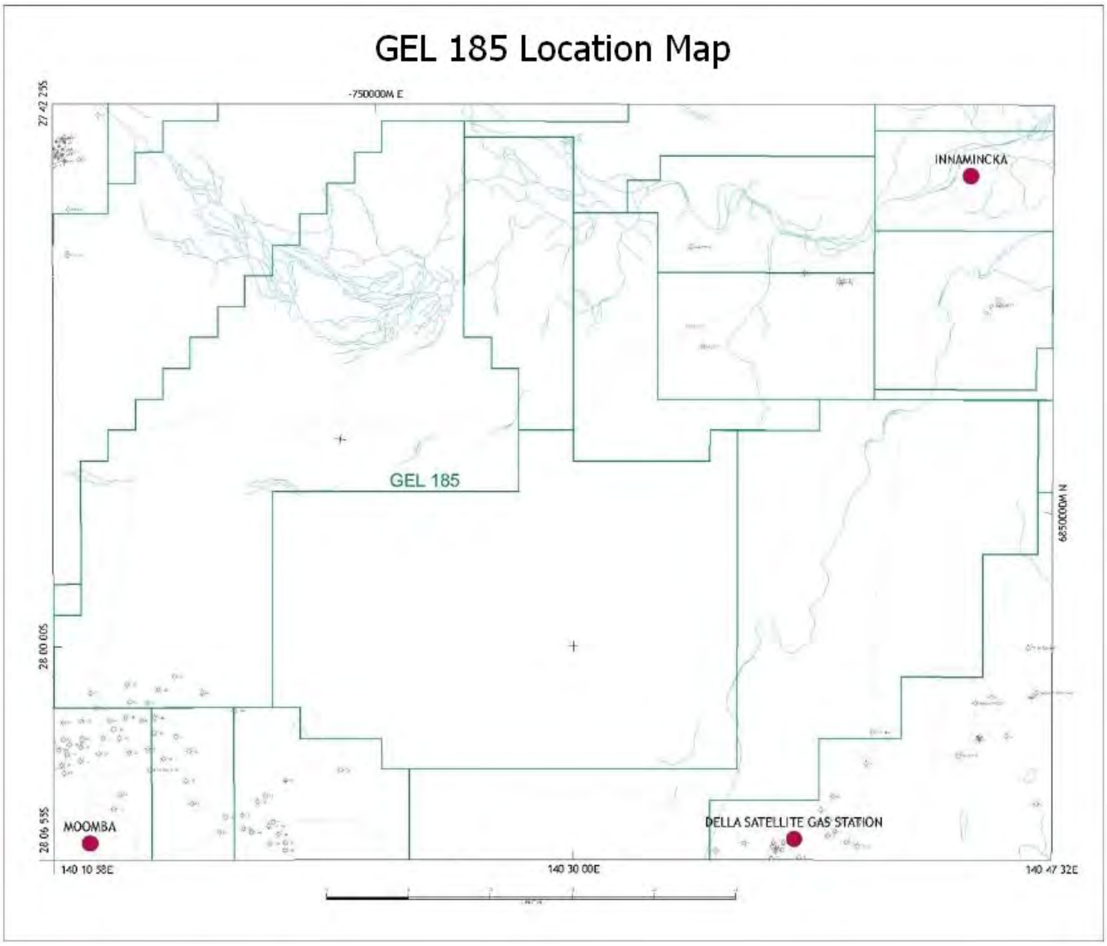


Figure 1 GEL 185 Location Map

2 Permit Summary

For the duration of Licence Year 7 licensee for Geothermal Exploration Licence (GEL) 185 was Origin Energy Geothermal Pty Ltd. The original work commitments (including variations) associated with GEL 185 are shown in Table 1.

Year of term of Licence	Minimum Work Requirements
One	• Geological and geophysical studies
Two	• Geological and geophysical studies
Three	• Review of seismic data; • Acquisition and modelling of magneto-telluric data
Four	• Geological and geophysical studies
Five	• Drill one well

Table 1: **Original work commitments by licence year**

Licence Year 7 concluded on 7 January 2013. Table 2 displays the minimum work program (after all variations) and the actual work completed up until the end of the current reporting period. Note that work commitments for Year 5 and 6 were suspended.

Licence Year	Minimum Work Program	Actual Work
Year 1 (14/04/2005-13/04/2006)	Geological and geophysical studies	See GEL 185 Year 1 Annual Report (Eden Energy Ltd)
Year 2 (14/04/2006-13/04/2007)	Geological and geophysical studies	See GEL 185 Year 2 Annual Report (Eden Energy Ltd)
Year 3 (14/04/2007-13/04/2008)	Review of seismic data; Acquisition of modelling of magneto-telluric data	See GEL 185 Year 3 Annual Report (Eden Energy Ltd)
Year 4 (14/04/2008-07/01/2010	Geological and geophysical studies	See GEL 185 Year 4 Annual Report (Eden Energy Ltd)
Year 5 (08/01/2010-07/01/2011)	Commitment to Drill one well was suspended until Licence Year 6	Cultural Heritage and Environmental Survey
Year 6 (08/01/2011-07/01/2012)	Commitment to Drill one well was suspended until Licence Year 7.	Cultural Heritage Work Area Clearance negotiations
Year 7 (08/01/2012-07/01/2013)	Commitment to Drill one well was varied in Licence Year 7, and replaced by technical report (See Appendix 2)	• Cultural Heritage Work Area Clearance Agreement negotiations completed • Completion of technical studies relating to Hot Shallow Aquifer (HSA) Geothermal resources in the Cooper Basin.

Table 2: **Final work program and work completed (as of end of current reporting period) by licence year**

On 21 November 2012, Origin and DMITRE executives met. Origin presented the results obtained from the HSA technical studies within the Cooper Basin over license Year 7 (08/01/2012-07/01/2013). A variation of GEL 185 licence work program for Year 7 was granted (to be replaced by a detailed technical report) as was acceptance of Origins intent to Surrender GEL 185 on the 7th of January 2013.

Origin also highlighted that it had successfully completed negotiations with the Yandruwandha / Yawarrawarrka Indigenous Group (YY) over a cultural heritage management plan for Origin's operated geothermal activities in the Cooper Basin. This consisted of a Work Area Clearance Agreement (WACA) and a Community Skills Scholarships Agreement (CSSA).

3 Regulated Activities 1

Pursuant to Regulation 33(2)(a) under the Act, an annual report must include:
"a summary of the regulated activities conducted under the licence during the [current reporting] year."

This information is detailed below.

3.1 Drilling and Related Activities

No regulated activities undertaken in the licence reporting period

3.2 Seismic Data Acquisition

No regulated activities undertaken in the licence reporting period

3.3 Seismic Data Processing and Reprocessing

No regulated activities undertaken in the licence reporting period

3.4 Geochemical, Gravity, Magnetic and other surveys

No regulated activities undertaken in the licence reporting period

3.5 Production and Processing

No regulated activities undertaken in the licence reporting period

3.6 Pipeline/Flowline Construction and Operation

No regulated activities undertaken in the licence reporting period

3.7 Preliminary Survey Activities

No regulated activities undertaken in the licence reporting period

4 Compliance Issues

4.1 Licence and Regulatory Compliance

Pursuant to Regulations 33(2) (b) & (c), an annual report must include:

"a report for the year on compliance with the Act, these regulations, the licence and any relevant statement of environmental objectives;" and

"a statement concerning any action to rectify non compliance with obligations imposed by the Act, these regulations or the licence, and to minimise the likelihood of recurrence of any such non-compliances."

Origin was fully compliant with licence, regulatory and SEO requirements during the reporting year ending 7 January 2013, including timely payment of forward licence fees.

Compliance with Statement of Environmental Objectives

Origin has conducted its activities in GEL 185 under the Statement of Environmental Objectives, Drilling and Well Operations, South Australian Cooper Basin, November 2009 (Santos). These objectives are listed below.

1. Minimise risks to the safety of the public and other third parties.
2. Minimise disturbance and avoid contamination to the soil.
3. Avoid the introduction or spread of pest plants and animals and implement control measures as necessary.
4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.
5. Avoid disturbance to sites of cultural and heritage significance.
6. Minimise loss of aquifer pressure and avoid aquifer contamination.
7. Minimise disturbance to native vegetation and native fauna.
8. Minimise air pollution and greenhouse gas emissions.
9. Maintain and enhance partnerships with the Cooper Basin community.
10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure.
11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal.
12. Remediate and rehabilitate operational areas to agreed standards.

Origin was fully compliant with the SEO for Licence Year 7. As Origin did not conduct any on-ground work in Licence Year 7, the assessment of compliance of individual activities against the SEO for this year is not required.

4.2 Management System Audit

Pursuant to Regulation 33(2) (d) under the Act, an annual report must include:

"a summary of any management system audits undertaken during the relevant licence year including information on any failure or deficiency identified by the audit and any corrective actions that has, or will be taken".

No audits were conducted during Licence Year 7.

4.3 Report and Data Submissions

Pursuant to Regulation 33(2) (e) under the Act, an annual report must include:

"a list of all reports and data relevant to the operation of the Act generated by the licensee during the licence year".

As agreed at the meeting on the 21st of November with DMITRE, Origin has included as an Appendix to this Year 7 Annual report, a technical report – Appendix 2 Final Technical report on the results of exploration work conducted to investigate the Shallows Geothermal Play, with attached seismic assessment report – Moomba-Big Lake-Daralingie 3D Seismic Attribute Mapping for Hutton Sandstone Geothermal Evaluation, detailing the technical studies results which were presented at the meeting. Both these technical report are to remain permanently confidential material, as agreed at the meeting with DMITRE on 21st of November.

4.4 Incidents

Pursuant to Regulation 33(2) (f), an annual report must include:

"in relation to any incidents reported to the Minister under the Act and these Regulations during the relevant licence year –

(i) an overall assessment and analysis of the incidents, including the identification and analysis of any trends that have emerged; and

(ii) an overall assessment of the effectiveness of any action taken to rectify non-compliance with obligations imposed by the Act, these regulations or the licence, or to minimise the risk of recurrence of any such non-compliance".

No incidents occurred in GEL 185 during the reporting year.

4.5 Threat Prevention

Pursuant to Regulation 33(2) (g) under the Act, an annual report must include:
"a report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably presents, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be taken".

There are no threats to activities under the licence as GEL 185 tenement has been surrendered.

4.6 Future Work Program

Pursuant to Regulation 33(2) (h) under the Act, an annual report must include:
"unless the relevant licence year is the last year in which the licence is to remain in force – a statement outlining operations proposed for the ensuing year".

There are no future work commitments for GEL 185 as Origin has surrendered the GEL 185 tenement.

5 Expenditure Statement

Please refer to Appendix 1 for the expenditure statement for the current reporting period.

6 Appendices

Appendix 1 - Expenditure Statement (Commercial in confidence)
Appendix 2 - Shallows Geothermal Play Interpretive Technical Report Post Drilling of Celsius 1

Appendix 1 – Expenditure Statement (Commercial in confidence)

Technical and administration expenses	$ 370 526*
TOTAL	$ 370 526

These costs were incurred for GEL 185 during licence Year 7.

* Does not include $50,000 security bond payment.