Eden Energy Ltd

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First and Final Report

Bollards Lagoon Project
GEL 169

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1 Introduction

1.1 Background

GEL169 is located south of Moomba in the Eromanga Basin on features related to the Cooper Basin model developed by Geodynamics Pty Ltd. Although it is outside the Cooper Basin depo-centre there are significant sediment sections in the Tennapera Trough providing good thermal insulation for basement granites. In addition there is some evidence for regional lineaments providing a focus for fracturing and aquifer development in basement sections.

Two main 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 a large portion 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 and 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 little as 2-3 km.

1.2 Licence Data

Geothermal Exploration Licence 169 (GEL169) was granted on 9th May 2005 with an initial term of five years over an area of 498km^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 first permit year of GEL 169.

2 Work Requirements

The Year 1 work programme negotiated by Eden with PIRSA for GEL 169 comprised:

- Geological and geophysical review;
- Seismic reprocessing; and
- Logging and petrographic investigations.

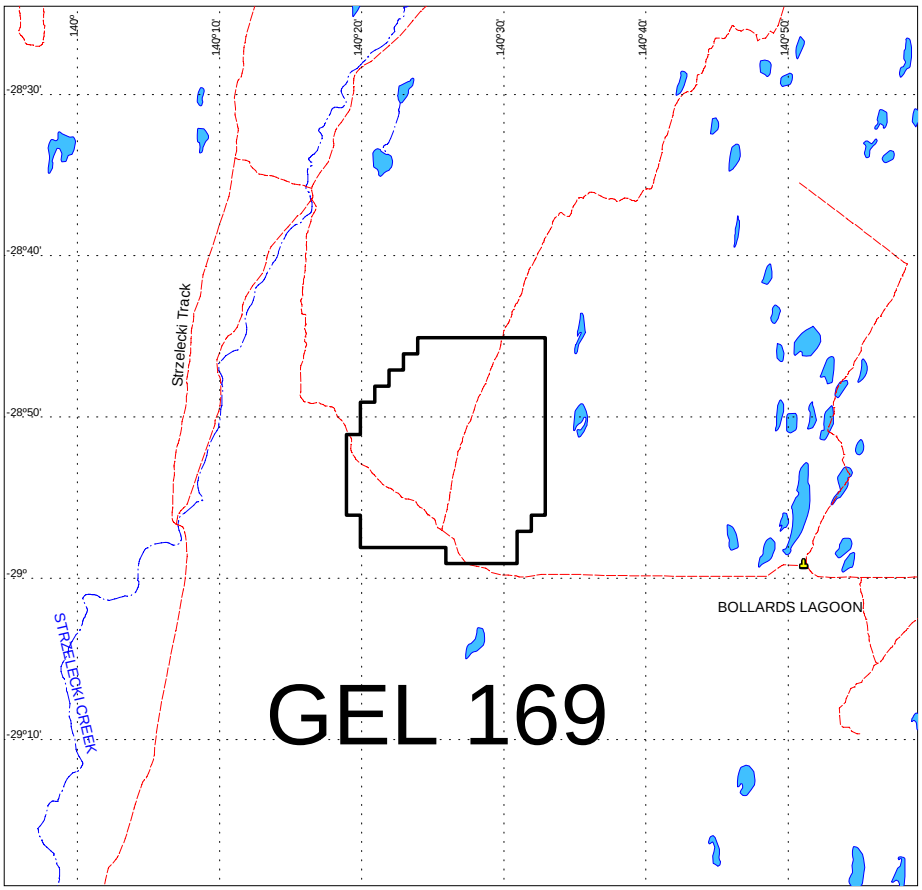

Figure 1: Location of GEL169

3 Work Conducted

During the first year of the licences Eden concentrated on reviewing all the available data for the area and assessing the validity of its initial rationale for the tenement application.

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.

Relevant features of the geological evolution in the Bollards Lagoon area are summarised by Thornton (1979). GEL169 is located on the southern margins of the Cooper/Eromanga Basin in close proximity to the Tennapera Trough which may provide geothermal prospects with deep sediment cover comparable to the Moomba region (Figure 2 and Figure 3).

The Eromanga Basin is part of the trans-Australian platform cover. It is a large depression with a north-east to south-west trend and, in Queensland, a general dip towards the south and south-west. To the north, the upper part of the sequence is continuous with the Carpentaria Basin over the Euroka Arch, and to the south-east with the Surat Basin over the Nebine Ridge. In the far northeast and northwest it abuts Pre-Cambrian rocks of the Georgetown and Mount Isa Inliers respectively. At least 50% of the Eromanga Basin is underlain by older basins. These include the Georgina Basin, the Galilee Basin which in turn is underlain in part by the Drummond and Adavale Basins, and the Cooper Basin and underlying Warrabin Trough. The Simpson Basin underlies a small part of the Eromanga Basin in Queensland in the west near Poeppel Corner. The Maneroo Platform in the central part of the basin and the Thargomindah and Cheepie Shelves in the south are main areas of Eromanga Basin sedimentation directly overlying basement.

The Eromanga Basin succession reaches a maximum thickness of at least 2600m in the central to south-western part of the basin overlying the Cooper Basin.

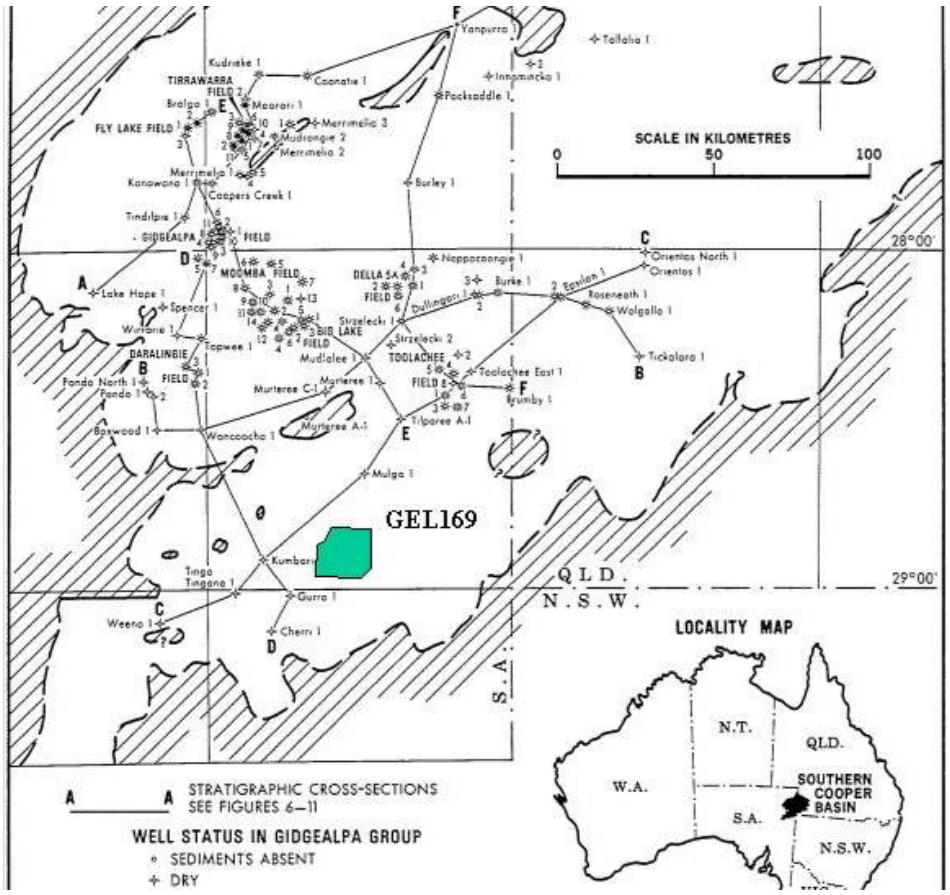

Figure 2: GEL169 - Bollards Lagoon and relevant oil well locations.

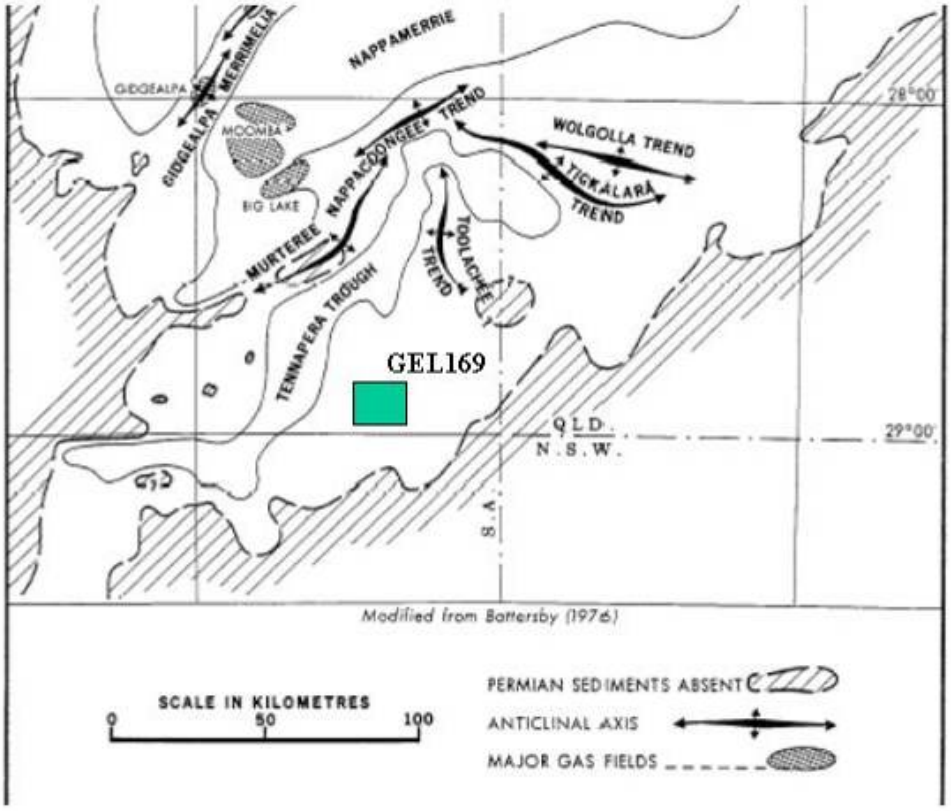

Figure 3: GEL169 - Structural elements in the Cooper/Eromanga Basin and location of Tennapera Trough

The lower part, of Jurassic age, is composed mainly of continental fluvial and lacustrine quartzose sandstone interbedded with lesser siltstone and mudstone (carbonaceous in part) and very minor coal. The overlying Early Cretaceous succession is firstly fluviatile, followed by transgressive shallow marine consisting of siltstone, mudstone, claystone and labile sandstone. A regressive phase follows and the Late Cretaceous succession was deposited under paralic, lacustrine and fluvial conditions. After the Cenomanian, the basin was virtually filled. The north-eastern part was exposed because of a fall in sea-level and since then, has been subjected to deep weathering and erosion. The south-western part of the basin underwent continuing, intermittent sedimentation until recent times.

Permian coal measures and shales are the principal hydrocarbon source rocks in the region and are dominated by Type III kerogens derived from higher plant assemblages. Oils and condensates are typically medium to light (30– 60º API) and paraffinic, with low to high wax contents. Most Permian oils in Permian reservoirs contain significant dissolved gas and show no evidence of water washing. Gas composition is closely related to maturity/depth with drier gas occurring towards basin depocentres although there is strong geological control on hydrocarbon composition. The Patchawarra Trough contains the bulk of the oil and wet gas reserves consistent with local source rocks being in the ‘oil window’, while the hot Nappamerri Trough (40–50ºC/km), underlain in part by granite, is over mature and contains mainly dry gas. Thin, laterally discontinuous coals represent the best source rocks of the upper Nappamerri Group, whilst shales tend to be organically lean. The lower Nappamerri Group is coal-poor, contains kerogen that tends to be oxidised, and any source rocks are humic-rich and gas-prone.

The Cooper-Eromanga Basin sediments have been subjected to several tectonic movements that began with periods of extension during the Permian. Later wrench-induced NE-SW 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.

There are two distinct structural trends, north-easterly to south-westerly and north-westerly to south-easterly. The former orientation defines the present trend of the northern Cooper Basin and is in accord with the majority of trends in the southern Cooper Basin, especially in South Australia. The north-easterly to south-westerly orientation is shown by the Tanbar, Gilpeppee, Morney, Curalle and Betoota Anticlines/Trends. The north-westerly to south-easterly orientation is shown by the Galway-Ingella, Hammond and Steward Anticlines/Trends. These two distinct structural trends were influenced by much earlier faults which were reactivated a number of times between the Permian and the Tertiary. Similar trends are observed in the regional magnetics and regional gravity data which reflect the underlying basement topography and reveal major lateral contacts (see Figure 4 and Figure 5).

3.2 Modelling & Interpretation of Geophysical Data

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

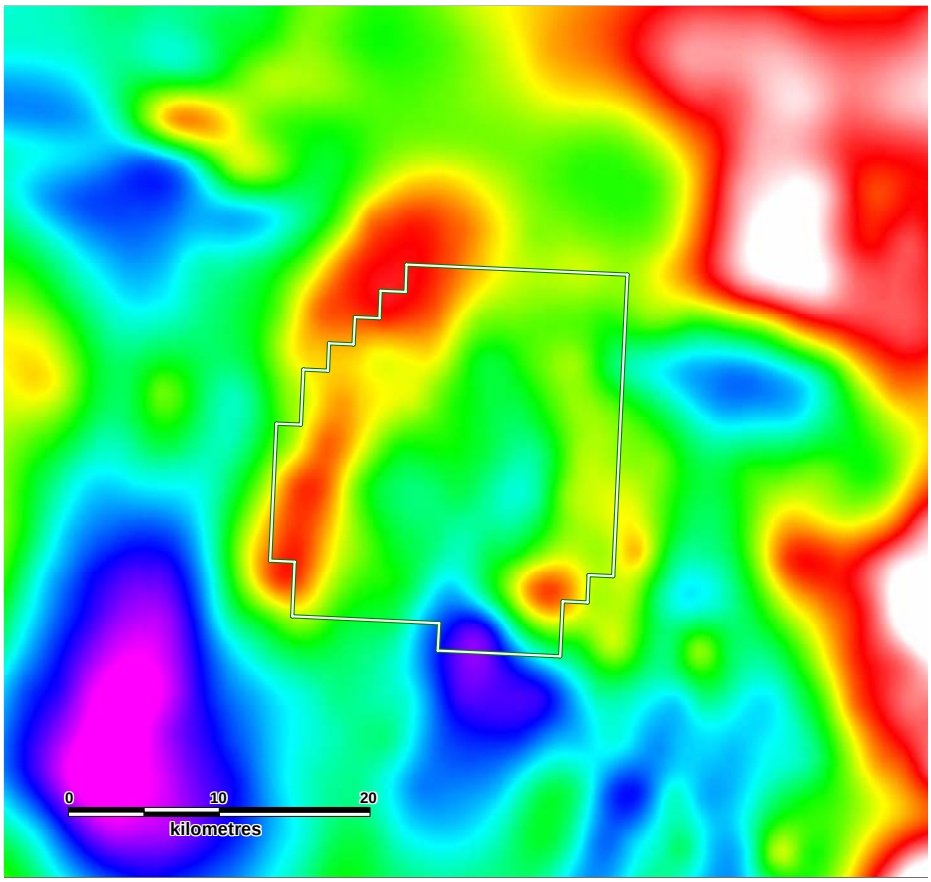

Figure 4: GEL 169 - Reprocessed TMI

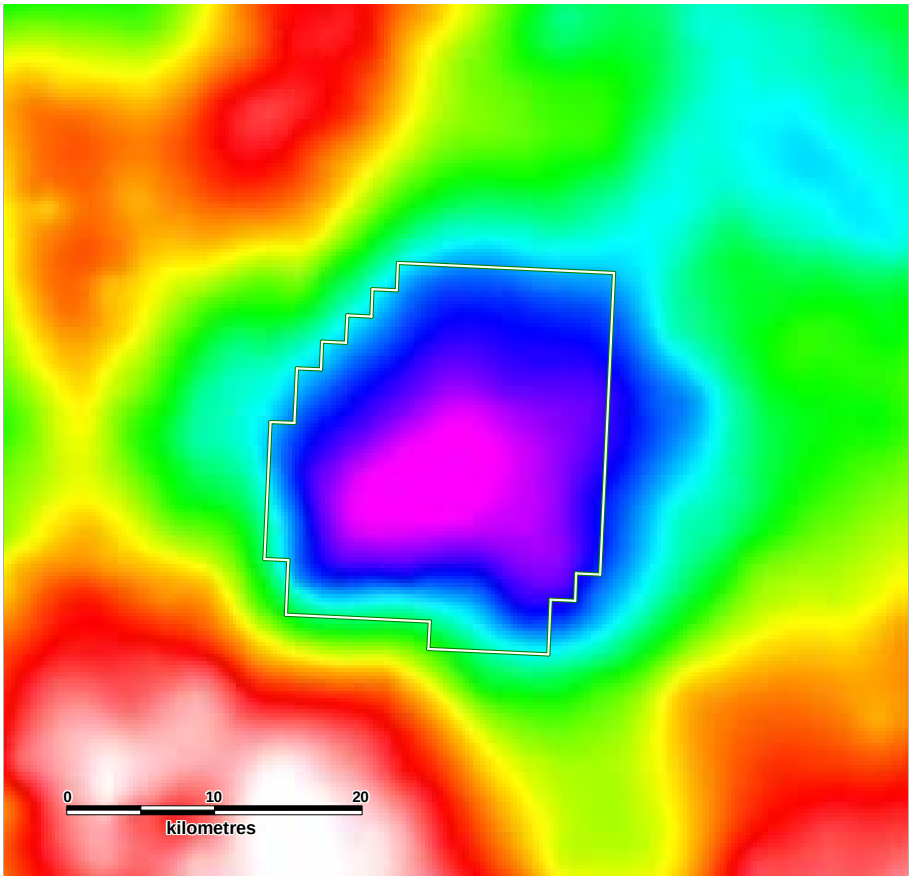

Figure 5: GEL 169 - Reprocessed Bouguer Gravity image

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 Model Data

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 GEL169, and Beach Petroleum have recently completed Noarlunga 1 near the centre of GEL169. However most of these previous studies have been directed towards an understanding of oil maturation in the Tenappera Trough and do not directly image the site of Bollards Lagoon. Consequently estimates of temperature and stratigraphy require significant extrapolation and interpretations of the basement configuration. Only a single temperature was collected in Noarlunga 1 limiting its usefulness, though the stratigraphic information was useful.

Some relevant information can be obtained from images of gravity and magnetic data also published by PIRSA (see Figure 6and Figure 7). These confirm the major structural elements of the Tenappera Trough margins and support previous indications of orthogonal trend lines running NE and NW. Possible faulting or stress associated with these lineaments may provide zones of deep fracturing along the margins of the tenement suitable for the location and propagation of deep high-yield aquifers.

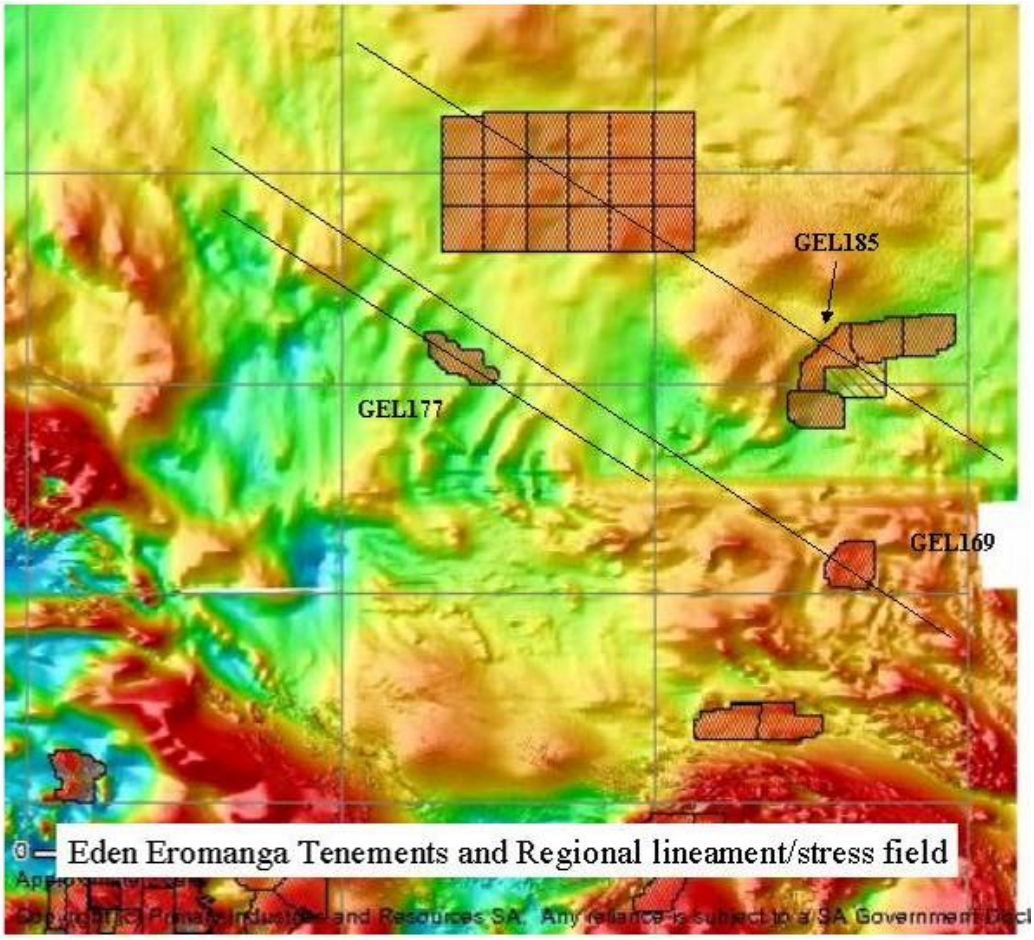

Figure 6: GEL 169 - regional TMI magnetics and structural trends / lineaments (Cull 2005).

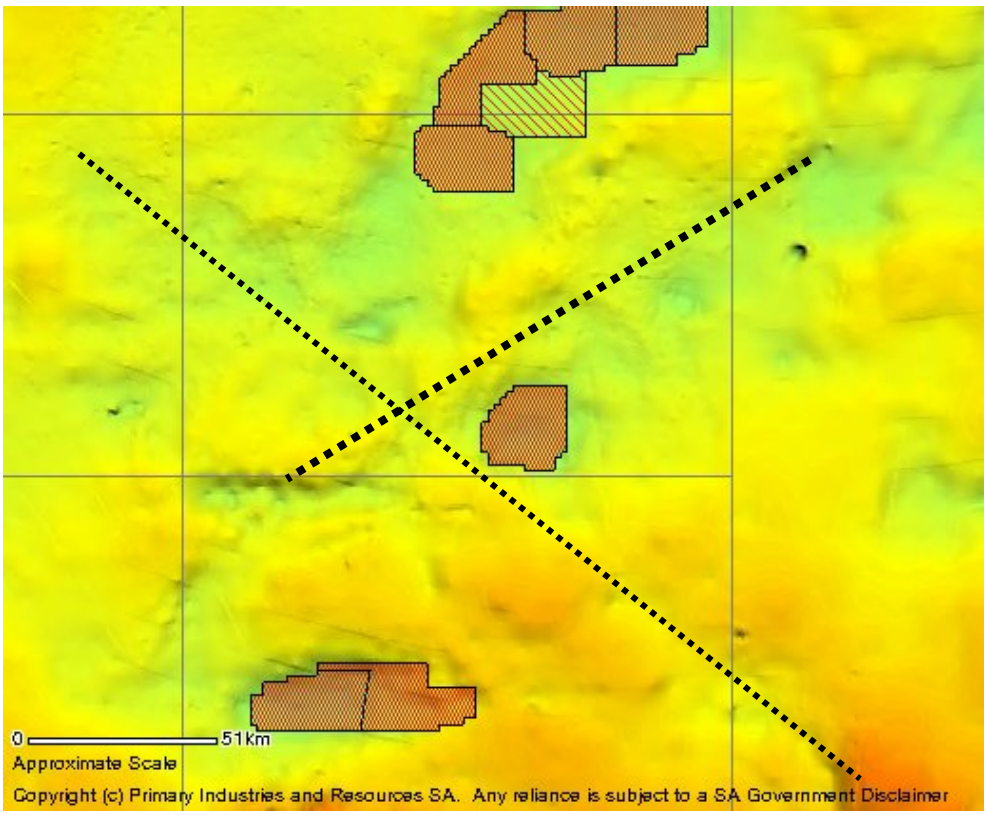

Figure 7: GEL 169 - Regional gravity data and orthogonal basement trends.

Estimates of temperature can be reasonably based on stratigraphic logs obtained for Mulga 2 immediately to the north of the tenement (see). Estimates of thermal conductivity are based on related measurements on similar units elsewhere in the Eromanga Basin and values of regional heatflow extrapolated from a 3' grid. However there are significant uncertainties in these key parameters resulting in a broad range of possible models (see Figure 8). In view of the uncertain basement structure no attempt is made to extrapolate the resulting geothermal gradient beyond 2000m depth indicated for the Tenappera Trough. The comparatively low values of temperature are consistent with previous models indicating mature or under-mature hydrocarbon content in this area (e.g. Kantsler et al. 1983).

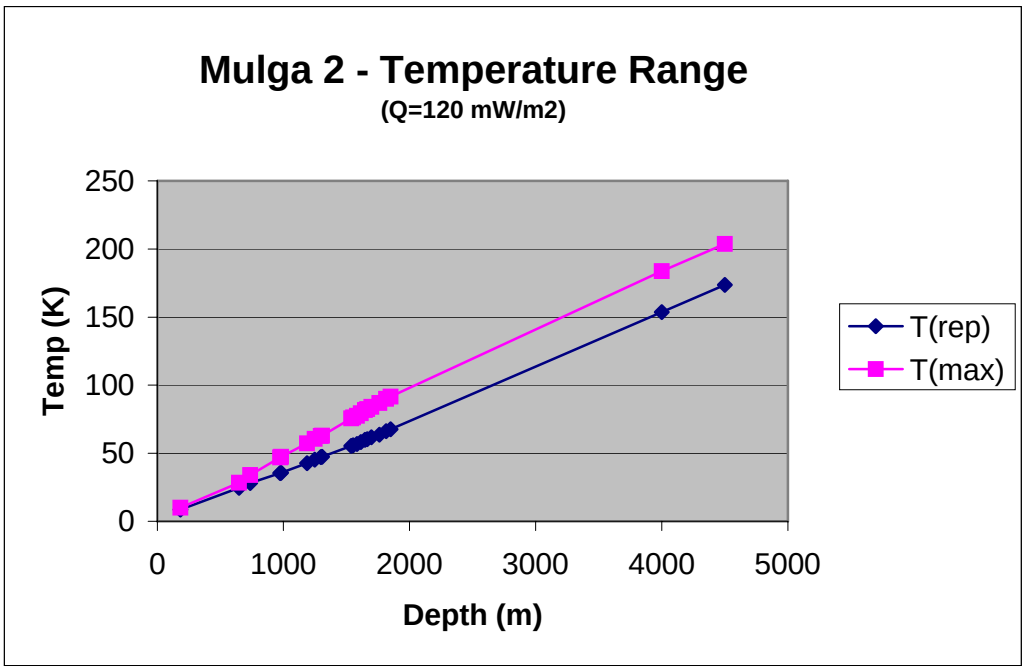

Figure 8: GEL 169 - Temperature estimates for Mulga 2 assuming no anomalous local heat production.

3.4 Recommendations from Data Review

Cull (2005) concluded that GEL169 is considered a moderate geothermal prospect. It has several features comparable to the hot Cooper Basin sections but is more limited in several key aspects. In particular while basement radiogenics may provide similar rates of heat generation the extent of thermal insulation is much more limited. Maximum cover occurs in the Tenappera Trough but that structure is located well to the north of the tenement. There are some bounding lineaments with a similar orientation to the Tenappera Trough which may indicate reasonable prospects for deep stress and local fracture systems associated with loading of the margins but there are no obvious features within the boundaries to provide a focus for further exploration.

High temperatures may be obtained on the margins of deep troughs as a result of thermal refraction. This would favour geothermal energy prospects on GEL169 since basement rocks are relatively shallow in this area. However temperatures of 200ºC are unlikely at depths less than 3500m and excess drilling costs can be expected for basement areas at depths less than 2000m. Better 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.

Additional estimates of heatflow are required to confirm current geothermal models based on regional data and representative values for thermal conductivity. Suitable data can be obtained from shallow holes (to 300m) or core samples can be extracted from existing PIRSA stores for thermal conductivity.

4 Year 1 Expenditure

Table 1

Commercial in Confidence

5 Year 2 Work Programme

Eden was to undertake reviews of the geology and geophysics of the Bollards Lagoon area in the first year of the licence, and if necessary, to complete some seismic reprocessing and logging and petrographic investigations.

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.

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 169 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.

7 Key References

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