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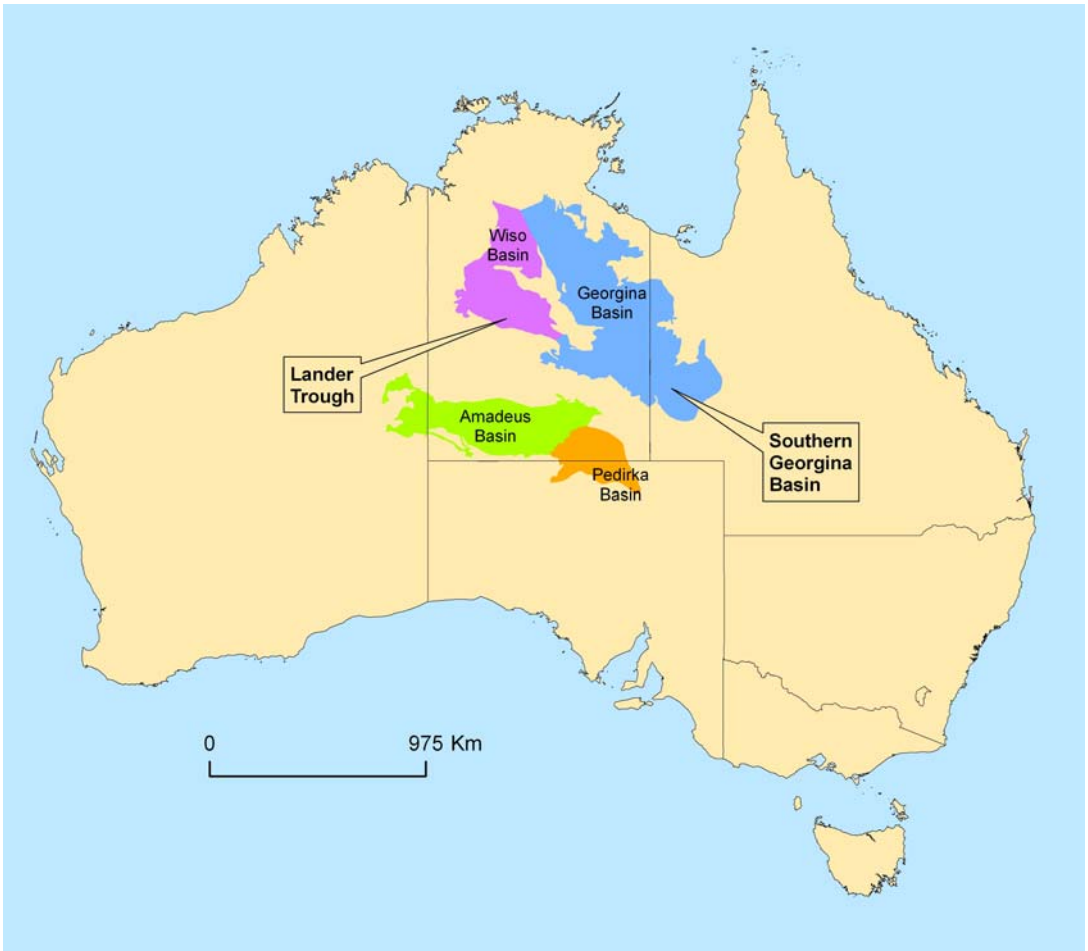
65 MILLION ACRES ADDITIONAL UNCONVENTIONAL PLAY EXPLORATION TARGETS

Central Petroleum Limited (ASX:CTP) ("Central" or the "Company") has pleasure in announcing a new Technical Note from the Company detailing up to 65 million acres (260,000 km^2) of unconventional play exploration targets in its acreage. These horizon areas are an incremental addition to those unconventional exploration plays and resources detailed by DSWPET Pty Ltd in the Southern Georgina and Amadeus Basins totalling some 11 million acres.

The additional unconventional play exploration targets described by Ambrose and Heugh in the attached Technical Note 11.12.01 (in the Palaeozoic and Pre-Cambrian throughout the Lander Trough of the Wiso Basin, the Amadeus Basin and Pedirka/Eromanga Basins) are represented by known mature source rocks with elevated TOCs (Total Organic Contents) in a series of superimposed (vertically stacked) horizons which have been drilled, at least in part. Many of these horizons have been logged, sampled and analysed but not specifically for the purposes of unconventional exploration.

Although the commercial exploitation of most unconventional exploration play targets such as those in North America is restricted to a modest percentage (20-40%) of the total play area, the exploration targets described in the accompanying technical note may represent important additional horizons for exploration going forward for the Company.



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These results are preliminary and based on sparse drilling and sampling from historical and recent exploration over a 50 year period. Significantly more exploration, sampling and analyses is required before any resource figures may result. The observations in the accompanying Technical Note are subject to review as more data comes to hand.

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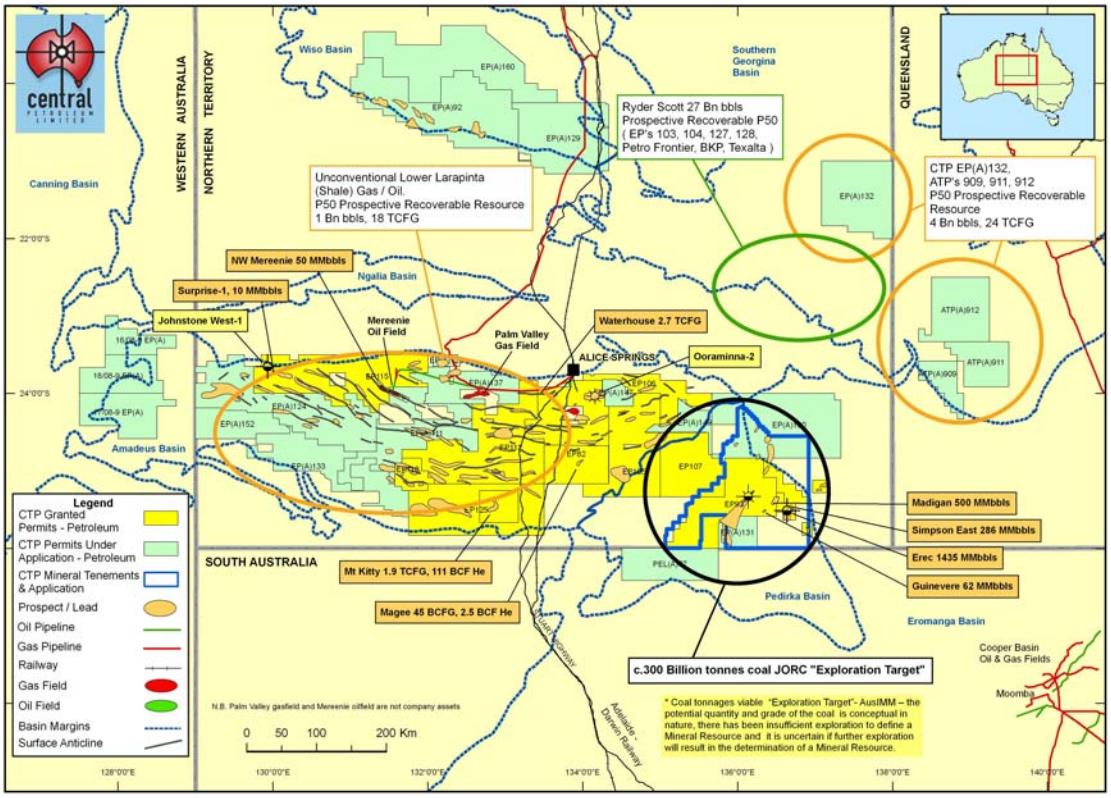
NOTICE: The participating interests of the relevant parties in the respective permits and permit applications which may be applicable to this announcement are:

- *EP-82 (excluding the Central subsidiary Helium Australia Pty Ltd ("HEA") and Oil & Gas Exploration Limited ("OGE") (previously He Nuclear Ltd) Magee Prospect Block) - HEA 100%*
- *Magee Prospect Block, portion of EP 82 – HEA 84.66% and OGE 15.34%.*
- *EP-93, EP-105, EP-106, EP-107, EPA-92, EPA-129, EPA 130, EPA-131, EPA-132, EPA-133, EPA-137, EPA-147, EPA-149, EPA-152, EPA-160, ATP-909, ATP-911, ATP-912 and PELA-77 - Central subsidiary Merlin Energy Pty Ltd 100% ("MEE").*
- *The Simpson, Bejah, Dune and Pellinor Prospect Block portions within EP-97 – MEE 80% and Rawson Resources Ltd 20%.*
- *EP-125 (excluding the Central subsidiary Ordiv Petroleum Pty Ltd ("ORP") and OGE Mt Kitty Prospect Block) and EPA-124 – ORP 100%.*
- *Mt Kitty Prospect Block, portion of EP 125 - ORP 75.41% and OGE 24.59%.*
- *EP-112, EP-115, EP-118, EPA-111 and EPA-120 - Central subsidiary Frontier Oil & Gas Pty Ltd 100%.*
- *PEPA 18/08-9, PEPA 17/08-9 and PEPA 16/08-9 - Central subsidiary Merlin West Pty Ltd 100%.*

Unconventional Hydrocarbons – New Exploration Targets in the Amadeus and Eromanga Basins, the Wiso Basin (The Lander Trough) and the Pedirka Basin (Eringa and Madigan Troughs)

(CTP Technical Note11.12.01)



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Executive Summary

Recent examination of Central Petroleum's vast acreage portfolio has resulted in the preliminary identification of up to 260,000 km^2 (65 million acres) of additional unconventional play target areas in individual, sometimes superimposed horizons at different depths.

Subject to further review as more information comes to hand, this could increase the Company's total area of unconventional play potential to some 76 million acres.

Centrals large exposure to frontier acreage in Central Australia is consistent with CTP's strategy of taking "whole of basin" positions over sparsely explored Palaeozoic and older basins containing thick source rock sequences which have passed through or into the peak oil/gas generation window. These sequences lend themselves to both conventional and unconventional plays, with source facies offering composite "source - reservoir- seal" capacity within the one unit.

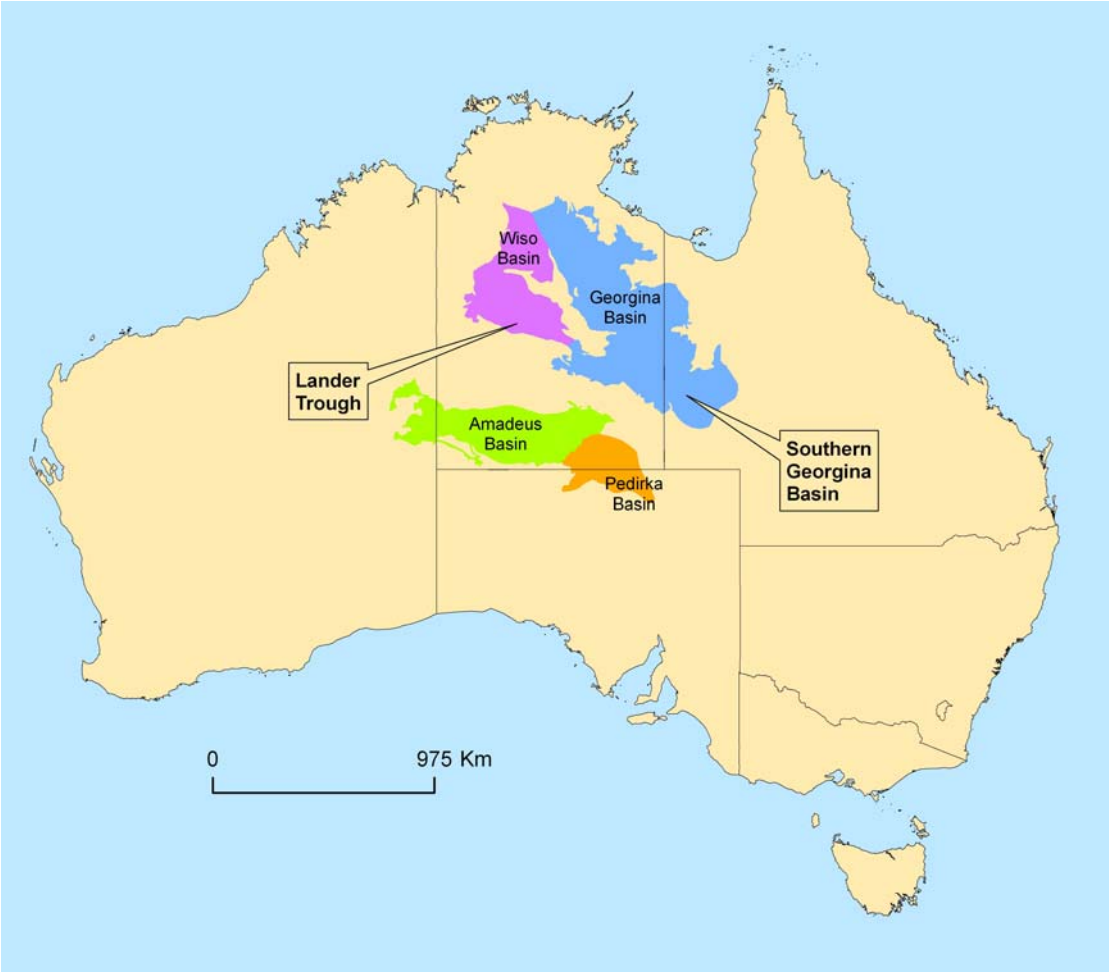
A relative lack of data has inhibited, but not precluded initial assessment of first tier unconventional hydrocarbon plays in CTP's Amadeus Basin (Larapinta Group) and Georgina Basin (Arthur Creek Formation); these have been documented as thoroughly as data allows (Ambrose and Heugh, 2007, DSWPET, 2010 and 2011). These independently documented unconventional plays cover an area of c. 11 million acres (45,000 km^2) in partially superimposed surface areas with P50 Prospective Resources totalling 5 billion barrels of oil and 42 trillion cubic feet of gas.

Supplementing existing conventional play types and reasonably well studied unconventional plays such as the Larapinta Group in the Amadeus Basin and the Arthur Creek Formation in the Southern Georgina Basin are incremental unconventional plays in :

1) the Amadeus Basin Gillen Member, Aralka Formation, Pertatataka Formation and the basal Giles Creek Shale-thought to be a chronostratigraphic equivalent to the Arthur Creek Shale of the Southern Georgina Basin (47 million acres).
2) the Wiso Basin (Montejinnie Limestone) (11 milion acres).
3) the Southern Georgina Basin (shaley facies of the Thorntonia Limestone),
4) the Eromanga Basin (early Cretaceous Toolebuc Fm/Oodnadatta Fm- up to 7 million acres)
5) the Warburton Basin; Unnamed Devonian source rocks in fore-reef and basinal facies.

These additional play types total up to 65 million acres, (260,000 km^2), in partially superimposed surface areas.

One significant conclusion relevant to the tectonic history of wide areas of the Wiso, Georgina and Amadeus basins is the fact that episodic epeirogenic uplift and erosion has occurred post hydrocarbon migration which occurred at various times from the Ordovician through to the Carboniferous. This commonality dictates that the Lander Trough / Greenswamp Shelf in the southern Wiso Basin would have almost certainly reached the oil and gas windows respectively. This scenario is proven in the Amadeus Basin and seismically defined hydrocarbon indicators indicate it is also true in the Pedirka/ Warburton basins.



Amadeus Basin Unconventional (Early Middle Cambrian)

The basal Giles Creek Shale and Upper Shannon Formation

- **The basal Giles Creek shale (GCS) stratigraphic interval has direct correlatives in several basins in Central Australia, verifying this package resulted from an unusual suite of palaeo-climatic/geological conditions which existed in the early-middle Cambrian. This sheet – like unit formed on an undulating surface resulting from uplift and peneplanation associated with the last phase of the Petermann Ranges Orogeny.**

- **In the Amadeus Basin, the GCS shales can be conservatively estimated to cover a large area (12,800 km^2) being bound to the south and north by the Central Ridge and Arunta Block respectively, while the westerly extent is determined by the**

- **A significant gas show occurred in Orange-1 where 200 units of gas was recorded and trip gas was flared; the shale was about 30 m thick at this location and included carbonaceous dark grey/ black shale as noted in drill cuttings.**

- **The sheet-like GCS shales were deposited on a peneplaned surface and facies variations controlling organic content were subtle. However, the Missionary Plains Trough was slightly more basinal through time and thus may have a higher probability of carbonaceous shale than more oxic facies variants to the west. Indeed the shales are more deeply buried here which is an advantage for unconventional shale gas in that this relatively deep zone would host sufficient temperatures and pressures to transfer adsorbed gas on kerogen into free gas in microporosity, with a consequent greater chance of over-pressuring thus favouring higher production rates.**

- **A second relatively high risk unconventional play exists in the Upper Shannon Formation but further sampling and coring is required to substantiate this secondary target.**

Amadeus Basin Unconventional (Neorproterozoic)

Gillen Member, Aralka Formation, Pertatataka Fm

- **The Gillen member, which has a gross target area of 58400 km^2 is the most attractive target at this stage. It occurs in the oil/gas window at shallow depths over wide areas of the southern Amadeus Basin as a result of episodic basin unroofing and has produced hydrocarbons and helium in Magee1. A ubiquitous massive top salt seal high grades this play on a regional scale.**

- **The Aralka and Pertatataka Formations, which have gross target areas of 49500 km^2 and 66,100 km^2 respectively are known gas source rocks, the latter having sourced hydrocarbon accumulations at Dingo and Orange. Up coming exploration will evaluate these regional conventional and unconventional plays.**

Eromanga Basin Unconventional (Early Cretaceous).

Toolebuc Formation, Oodnadatta Formation

- **The Early Cretaceous Toolebuc Fm is an enigmatic source rock in the Eromanga Basin (Simpson Desert area) where there are sparse, weak gas shows (sometimes with a minor component of heavy hydrocarbon molecules) but it is thermally immature on a regional basis. It is probable that the methane component is of biogenic origin while the heavy molecules result from early – mature oil extracts residing in the rock and released during the drilling process. The unit will be closely monitored during exploration drilling.**

- **Significant gas shows of up to 65 units denote ?gas charged "hot" sandstones in the lower Oodnadatta Formation in Simpson-1. These were probably sourced from underlying Toolebuc Formation shales, the gas being of biogenic origin comprising mainly methane, although 3% heavy molecules were noted. This type of gas show is uncommon but in this case may reflect a structurally trapped gas accumulation with thick claystones providing vertical seal. Four way dip closure at this level has been mapped seismically. The total gross column is 40 m thick including 22 m of tight "hot" vfg-fg sandstone.**

- **The Simpson East Prospect will be carefully monitored for Cretaceous gas during drilling and should be fully evaluated from an exploration standpoint. A similar approach will be applied during the drilling of the Madigan structure which has definite structural closure at deeper levels and is likely to have Oodnadatta Fm sandstones developed in the Cretaceous section. A review of seismically defined closure at Cretaceous levels in both prospects is ongoing.**

Wiso Basin – Lander Trough Unconventional (Middle Cambrian)

Montejinni Limestone

- **Results of maturation studies of the Lander Trough further encourage the search for both conventional and unconventional oil/gas in Central's Lander Trough acreage. Up to c.11 million acres in Central's application areas probably resides in the early to late oil window with some deeper sequences falling into the early gas window. The unconventional potential of these sequences could be directly analogous to that occurring to the east in the Georgina Basin.**

- **Regional palaeontological studies have confirmed that stratigraphic equivalents of Middle Cambrian source rocks from the Georgina Basin (the Arthur Creek Shale and the Middle Thorntonia Limestone) occur in the Lander Trough of the Wiso Basin. Limited geochemical data suggests the latter includes viable algael/bacterial source rocks but a definitive drill hole intersection(s) is required to confirm this comparison.**

- **Maturation modelling of the known source interval in the Lander Trough, the middle Cambrian Montejinni Limestone, indicates this unit today lies in the late oil to early gas window in the western Lander Trough. The overlying Hooker Formation lies in the main oil window while the Late Cambrian sequence is in the late oil window or is immature. In the eastern Lander Trough, the Montejinni Limestone could lie in the middle-late oil window or more likely in the early-middle oil window. The dominant phase of oil generation occurred in the Ordovician with a second pulse occurring during the early Alice Springs Orogeny (Devonian). Episodic basin unroofing has brought target source rocks and potential reservoirs to relatively shallow depths.**

- **These models greatly enhance the petroleum exploration potential of the Lander Trough and Green Swamp Shelf in general, including the potential for unconventional oil/gas. The modelling has reduced the perceived risk pertaining to oil generation and migration which is encouraging given CTP has "whole of basin" coverage of this area.**

Warburton Basin Unconventional (Devonian)

Unnamed Devonian Source Rocks

- **The Devonian facies mosaic mapped out in EP 97 and surrounds includes similar basinal facies to the Duvernay shales found in Alberta which produce (oil and wet gas) extensively from basinal facies equivalents of the Leduc reefal complexes.though. The Warburton reef-basin facies has yet to be penetrated in the Simpson Desert area. However, the gas chimneys and HRDZ's observed in this general area are indicative of hydrocarbon migration insinuating the existence of Devonian source facies closely associated with reefal developments. The unconventional play is high risk, but it would compliment conventional targets, and potential long term rewards could be very significant**.

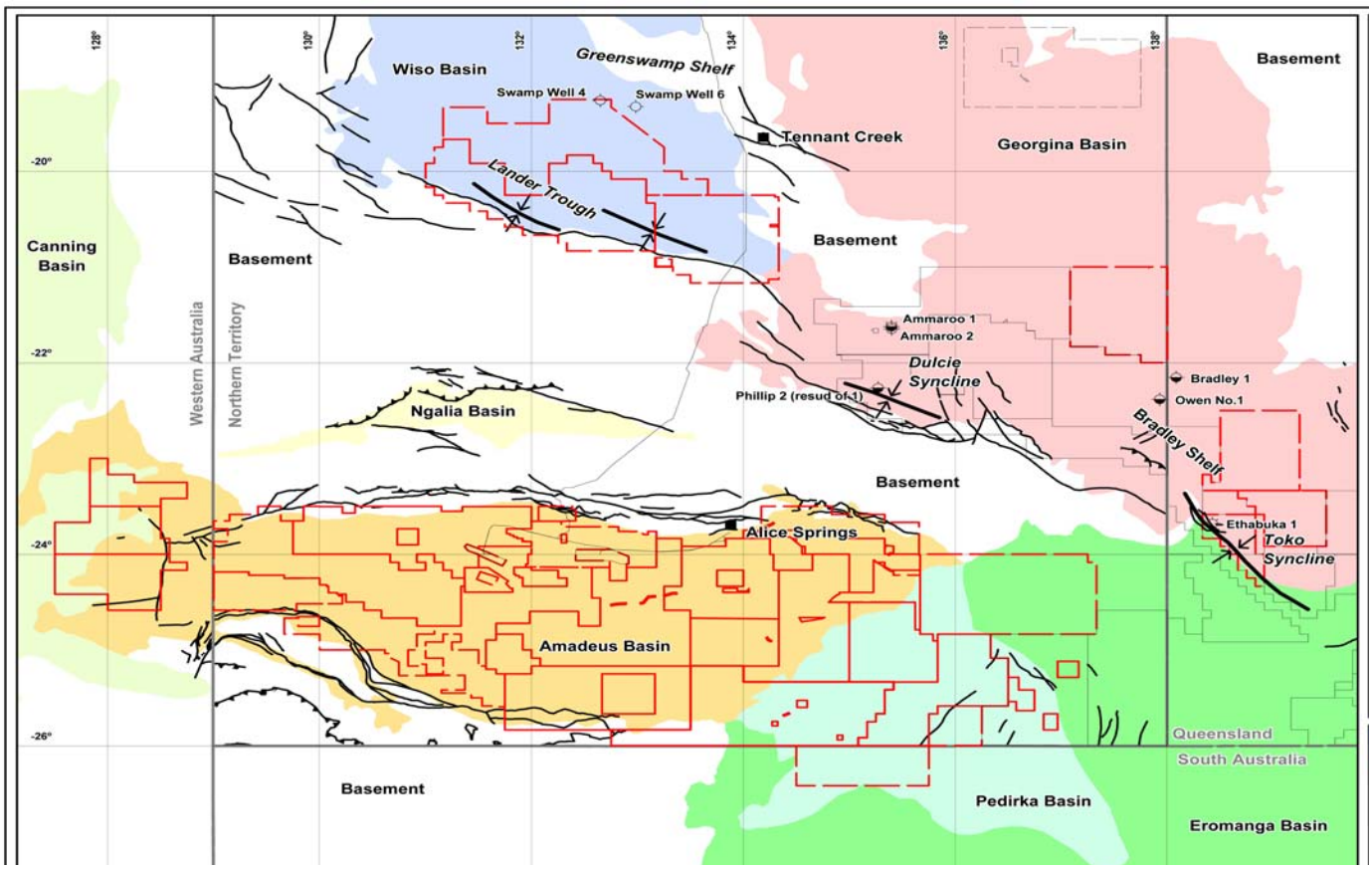


Figure 1 Central Australian Basins – Location Diagram and CTP Permits

Unconventional Hydrocarbons – New Exploration Targets in the Amadeus, Pedirka and Wiso Basins

Introduction

Central Petroleum's tenement holdings include well documented (considering the amount of data available) unconventional plays in the Georgina Basin (Arthur Creek Formation) and Amadeus Basin (Larapinta Group), and these form the first tier of CTP's unconventional exploration portfolio. However, the unconventional hydrocarbon potential of other Amadeus Basin source rock sequences (namely the Gillen Member, Aralka Formation, Pertatataka Formation, basal Giles Creek Shale, and upper Shannon Formation) remain largely unassessed due to paucity of data but these are documented to some extent in this report.

Similarly, the likelihood of organic rich Middle Cambrian source rock sequences in the Lander Trough, probably analogous to stratigraphic equivalents in the Georgina Basin, once again extends the potentialities of the unknown in this depocentre which lacks any drill hole penetration.

In addition, for the first time a conventional/unconventional gas play has emerged in the Cretaceous of the Eromanga Basin and further assessment should occur in the upcoming 2012 drilling program. All of these second tier unconventional targets are discussed in some detail below, but given the paucity of data no attempt is made here to estimate hydrocarbon volumetrics although prospective areas are listed.

I. Amadeus Basin- Potential Cambrian Unconventional Plays

The fact that most Cambrian sequences have been drilled with air in the Amadeus Basin suggests that it is likely the source potential of this sequence has been underestimated. The Giles Creek Dolomite and the Shannon Formation correlate with the Arthur Creek Formation and Arrinthrunga Fm respectively, both of which (particularly the former) are prolific source rocks in the southern Georgina Basin (Laurie in Press). The Georgina and the Amadeus basins were separated at this time by the emergence of the Arunta Block but both are defined by stylized carbonate/ shale parasequences which denote depositional signatures for various carbonate ramp facies. Thick basinal shales (algal/bacterial source material) which define the source sequences in the Georgina Basin are readily studied in fully cored stratigraphic drillholes. This type of drilling is generally absent through the Cambrian in the Amadeus Basin and assessment of source potential is thus tenuous, but a discussion of the most promising Cambrian unconventional targets occurs below.

I.I Giles Creek Dolomite "basal black shale" Unconventional Hydrocarbon Potential

In the northeastern Amadeus Basin, the middle Cambrian Giles Creek Dolomite varies from 300-400 m in thickness and comprises shallow marine mudrock and peritidal dolostone which form metre to decimetre shale carbonate parasequences. An important period of uplift and peneplanation separates this unit from the underlying Chandler Formation (Thorntonia Limestone equivalent) as evidenced by the following:

1) The Chandler Formation isopach is extremely variable below the unconformity while the sheet-like development of the basal Giles Creek Dolomite shales (GCS) indicates preceding uplift and peneplanation.
2) In the Dingo-Orange area the Chandler Formation is unconformably overlain by a thin transgressive sandstone 10-12 m thick forming a prominent transgressive parasequence denoted by well rounded and frosted, fine – medium quartz grains (Dingo Member – Gorter et al, 1982a, Marsden et al, 1985). These coarse clastics represent initial erosive deposits on the basal unconformity and where found in structural closure they represent a viable target reservoir-seal couplet.

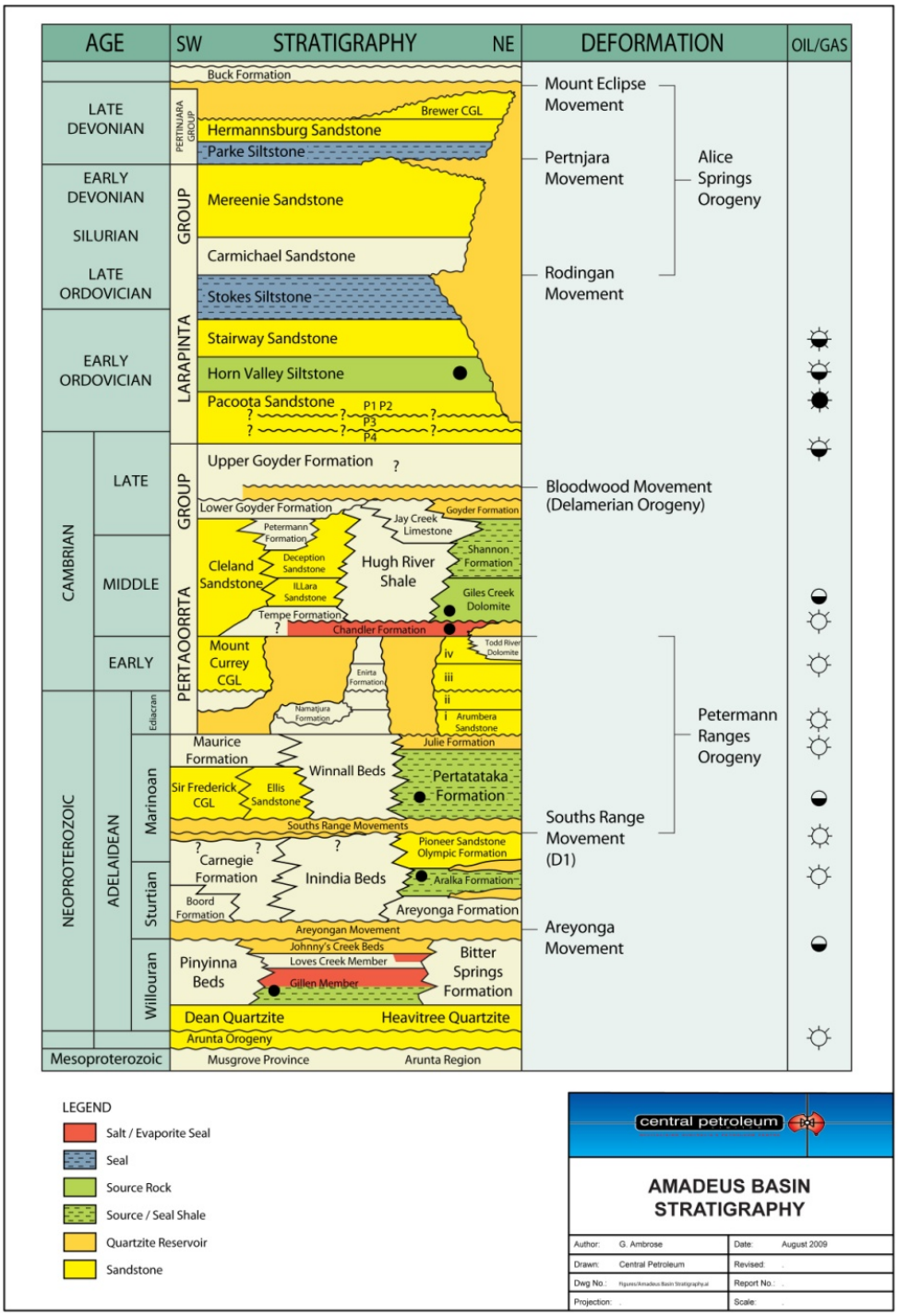


Figure 2 Stratigraphic Column Amadeus Basin

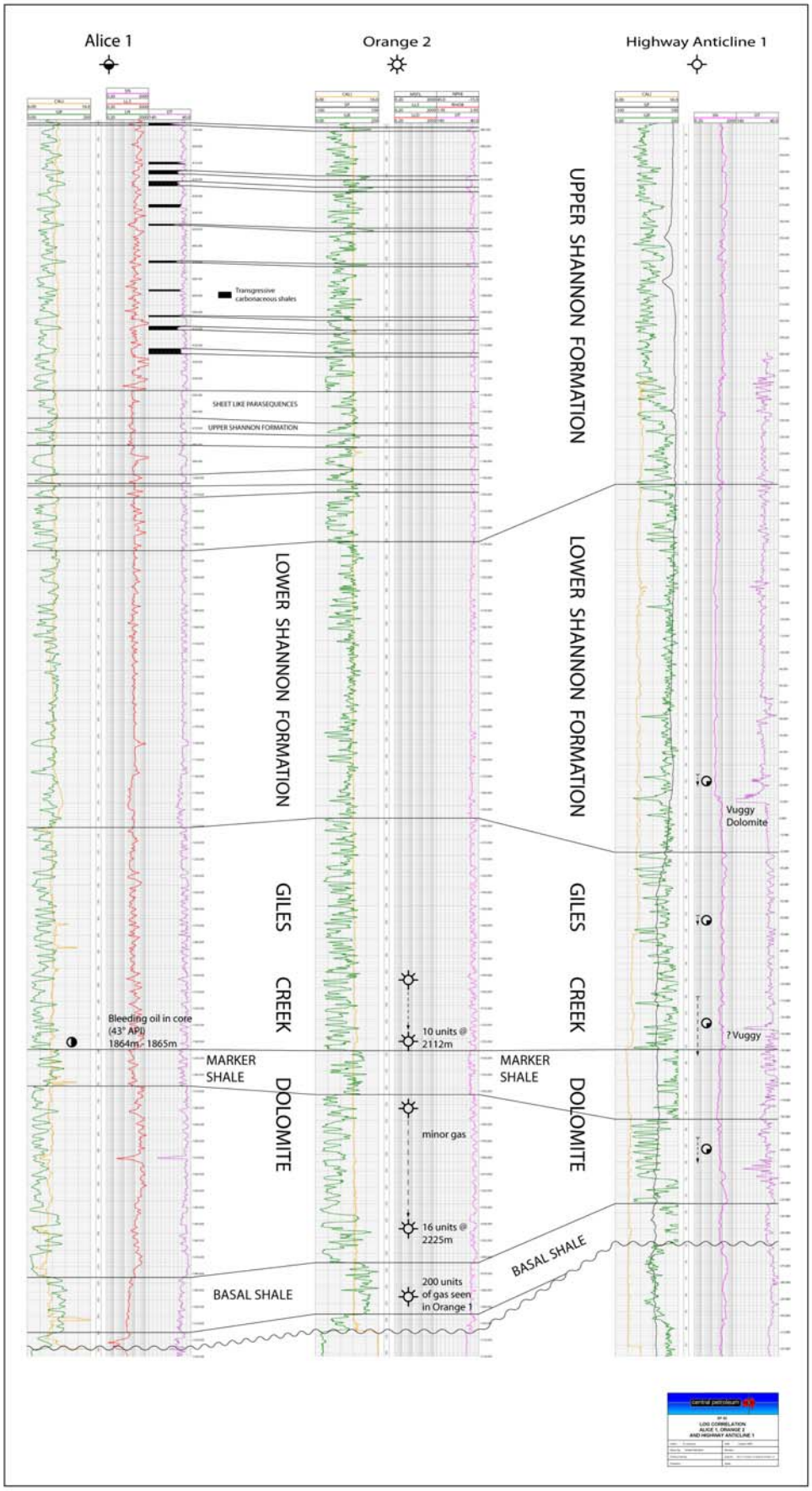


Figure 3 Stratigraphic Cross-section: Alice-1-----Orange-2-------Highway Anticline-1

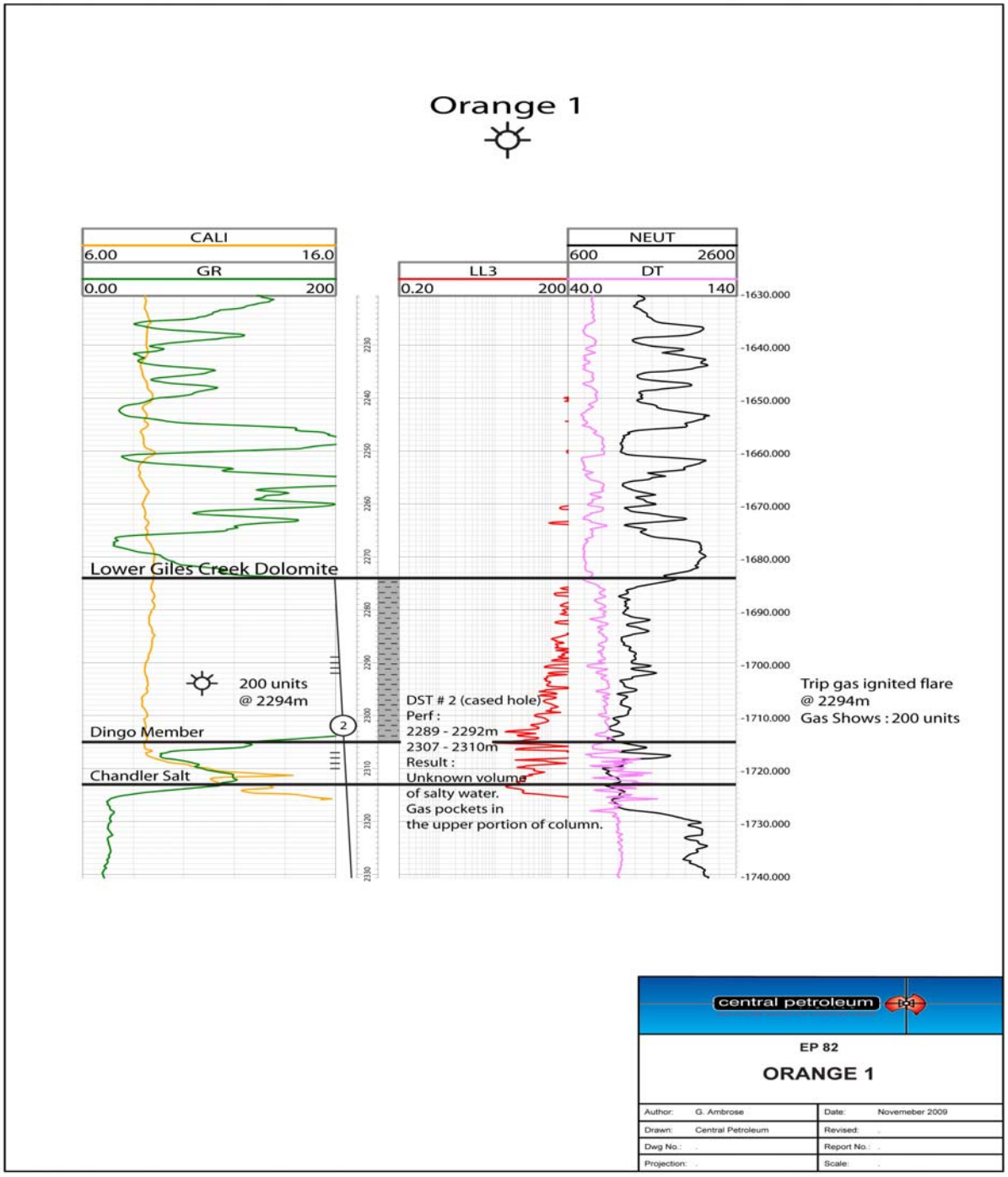


Figure 4. Orange-1, basal Giles Creek Shale.

This note defines the possible distribution of important organic black shales formed in the basal Giles Creek Dolomite section referred to herein as the GCS shale. The assessment of this unit's potential for unconventional shale gas is a result of a significant gas show in Orange-1 and recognition of black shale elsewhere in cuttings.

The unconformity between the GCS-Dingo Member and the underlying Chandler Formation denotes a regional event which correlates with the Thorntonia Limestone – Lower Arthur Creek Formation unconformity which is mapped regionally in the Georgina Basin (Dr. J. Lawrie, pers.com). The latter is an extremely rich source rock in this basin where CTP holds substantial interests. In addition, these organic shales transcend basin boundaries

considering an analogous transgressive shale is also mapped in the Officer Basin to the south (the Apamurra Fm – Gorter, 2006).

In the Amadeus Basin, the full Giles Creek Dolomite subdivision occurs in the following wells: Alice-1, Wallaby-1, Dingo1-4, Orange1-2, Highway-1, James Range-1 and Finke-1 . Lateral continuity of sheet like members, including the GCS, characterises the sequence . In the middle of the Missionary Plains Syncline the Giles Creek Dolomite grades westwards into silts, shales and carbonates of the Tempe Formation which unconformably overlie the Chandler Formation, the unconformity marking the last phase of the Petermann Ranges Oorogeny.

Defining the extent of the GCS shale is problematical as well control is very sparse and most drilling, aside from the aforementioned wells, did not reach the Cambrian section. However seismic data, particularly dip lines across the Missionary Plains Syncline, but also along strike from Dingo field, indicate continuity of the sequence which shows a constant isopach into the Missionary Plains Syncline. Continuity of the GCS shale is inferred , however it is difficult to guage the exact extent of the GCS “black shales” considering many of the wells were drilled with air resulting in poor cuttings returns.

However, black shales have been recorded in widely spaced wells; namely Orange-1, the Dingo field, Highway-1 and the Hermansberg 41 stratigraphic well. In Orange-1 the GCS shale comprises 30 m of dark brown to dark grey shale which recorded a significant gas show of 200 units (Fig.4). Bradshaw (1991) records relatively high TOC levels in the lower Giles Creek Dolomite of up to 3%. Also several feet of black resinous shale was cored in Highway-1 and CTP is in the process of retrieving this core, and also the Hermansberg-41 core for analysis. Black shales up to 6 m thick are cored in the latter but further work is required to confirm stratigraphic equivalence with GCS shales.

At this stage of exploration the westward extension of the GCS prospective area is defined by the Waterhouse High where carbonaceous shales are missing from the GCDS section. The area perceived as being prospective is largely in the Ooraminna Sub-basin and is defined in Figure 6. New data/interpretations could expand this area in the future.

I.II Shannon Formation Unconventional Hydrocarbon Potential (Late Middle Cambrian).

In the eastern portion of the basin the lower Shannon Formation is paraconformable on the Giles Creek Dolomite. The contact probably represents a change from a largely progradational sequence to aggradational sedimentation. A lower shale rich member, where parasequences are dominated by stromatolites, typically comprises a thin basal subtidal facies overlain by relatively thicker intertidal facies. The upper Shannon Formation comprises relatively thick , basal subtidal carbonates overlain by thinner intertidal facies. Kennard and Lindsay (1991) noted that the change from aggradational ,shelf margin deposits of the lower Shannon Formation to transgressive thrombolitic deposits of the upper Shannon Formation, can be traced to the Ellery Creek area where the analogous contact occurs between the Hugh River Shale and Jay Creek Limestone.

The shales of the middle Shannon Formation are multicoloured being red/green/ brown in colour with little evidence of source rock potential. However, they do provide an important regional seal and DST data fom a number of wells supports the notion that aquifer salinities increase dramatically from the Goyder Formation down section into the Giles Creek Dolomite.

There is some evidence of carbonaceous shale in the Upper Shannon Formation and a description from two wells occurs below:
Orange-1: This section, which is designated by upward fining carbonate/shale parasequences 5 m -10 m thick, is usually devoid of hydrocarbon shows with little indication of carbonaceous shales. However, in Orange-1 60 units of gas (methane) was recorded at 1798 m in this sequence, probably emanating from a shale capping one of these cycles. Thus

the entire Cambrian section needs to be carefully monitored during future drilling campaigns and consideration should be given to core at salient levels.

Alice-1: Cuttings desciptions from the Upper Shannon Formation include black, brown, red and orange shales. Little hard data is available but core 15 recovered a total of about 2 ft of dark grey/black /dark green shale. It is believed carbonaceous shales in this part of the section are reflected by high gamma ray/high sonic transgressive marine shale layers 1-3 m thick which cap upward shoaling parasequences usually less than 20 m thick. It is estimated from elogs that the total amount of organic shale in this part of the section (560 m – 950 m) totals about 20 m which is considered significant.

The upper Shannon Formation unconventional potential remains very difficult to quantify as does that of the Giles Creek Dolomite. At this point the prospective area could be reasonably expected to cover at least the same area as that deemed prospective for the GCS.

II. Amadeus Basin Unconventional Plays – Neoproterozoic

II.I Gillen Member Unconventional Hydrocarbon Potential

Additional second tier unconventional gas targets occur in the Neoproterozoic Gillen , Aralka and Pertatataka Formations but very little study has been directed at their unconventional potential. Wet gas sourced from the Gillen Formation was recovered in Magee-1 and these lacustrine shales are extremely widespread with regional top seal provided by extensive and thick evaporites . This uconventional play is thus believed to be the most attractive in the Neoproterozoic.

The source rock facies in Magee1 occurs at the base of this unit and comprises oil prone,transgressive, black / lacustrine shales; details are published in Marshall (2004).The lower Gillen Member is preserved in outcrop in Ormiston Gorge type section on the northern margin of the basin. The sequence in the southern part of the basin in Magee-1 the only well penetration, comprises a 20 m interval of dolomite and siltstone which directly overlies the Heavitree Quartzite and includes thin bitumen stained, carbonaceous laminae.The interval is relatively lean with depleted TOC's ranging from 0.5 to 0.8 %. An MPI-derived reflectance of 1.02 (VRe) indicates this zone is still within the late oil window, although this trap has undergone gas flushing attributed to migration from the deeper parts of the basin. The upper member contains relatively little organic shale and is not considered a significant source rock.

Kerogen types reported by McKirdy (1977) are consistently gas prone, except for a sample at 2057.1 m in Mt Charlotte-1. He reported high EOM:TOC values from Gillen core indicating hydrocarbon migration from this unit. In addition, some C2 to C4 molecules were recorded in the Magee-1 (DST-1) gas sample which flowed gas/Helium from the Heavitree Quartzite. Gorter (1982a) indicated from a Quality Index value at 2191 m in Mt Winter-1 (value less than 1) that the shale is gas prone; high Tmax of 499 Deg C and 457 Deg C (NTGS data base) suggest the sequence was through the gas window. The overall dearth of well intersections dictates that only tentative conclusions can be drawn from sparse geochemical data and generally TOC's have been denuded to a some extent as a result of hydrocarbon expulsion.

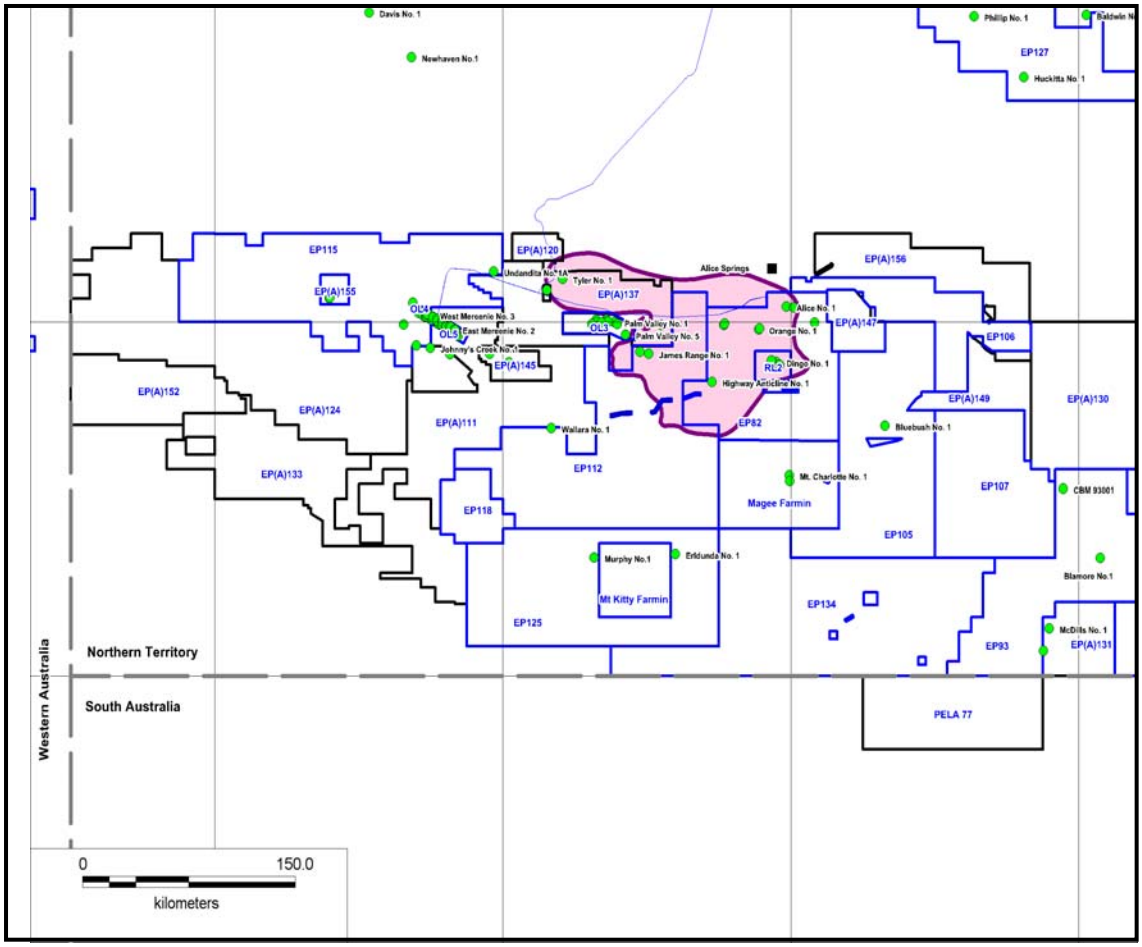


Figure 5 Areal Distribution of oil/gas mature Giles Creek Dolomite "basal shale"

The Gillen Member has sheet like extent over the basin and source quality is determined by algal/bacterial contents. Depth of burial increases from south to north but varies from major depocentres (through the gas window) to adjacent palaeohighs, especially in the southern portion of the basin, which could in part lie in the oil/wet gas window (eg Magee-1). The distribution of maturation is poorly known but is summarized below:

 In the main depocentres north and west of the Central Ridge; ie the Carmichael Sub-basin, Missionary Plains Trough and Orange Syncline, the Gillen is deeply/buried by ASO molasse deposits and is through the gas window with target depths exceeding 5000 m. Regional salt seal overlying the shale would have prevented hydrocarbons migrating to reservoir seal / couplets higher in the section. Maturities along palaeohighs such as the Mereenie High, Palm Valley High, Gairdner Trend and Finke-Highway Trend are likely to be at least in the gas window with the Heavitree occurring at depths below the likely commercial threshold. In addition dynamic salt intrusion into the cores of these anticlinal highs greatly disrupted the sequences at this level.

 There is considerable unconventional potential in the southern part of the basin where the section is less deeply buried and there is a possibility of wet gas targets as well as ubiquitous dry gas and Helium.

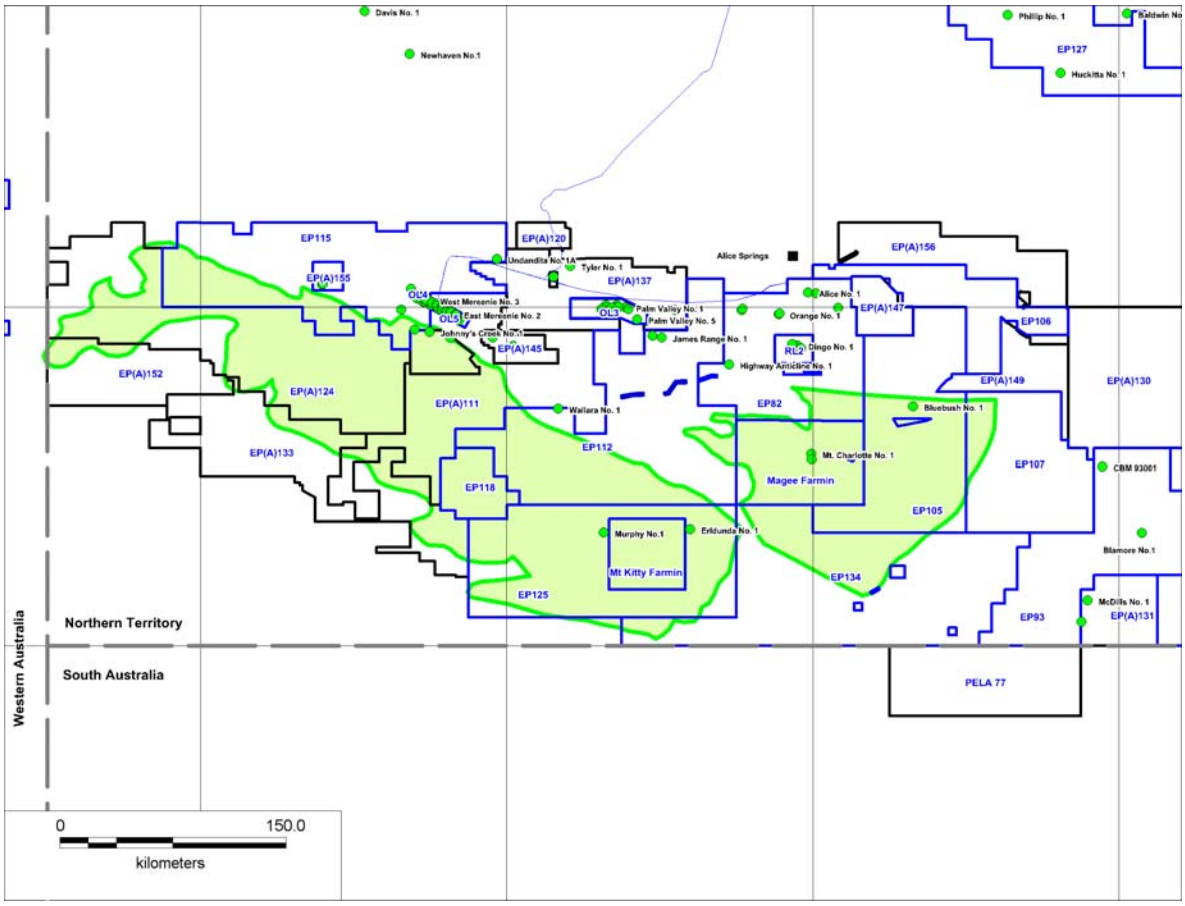
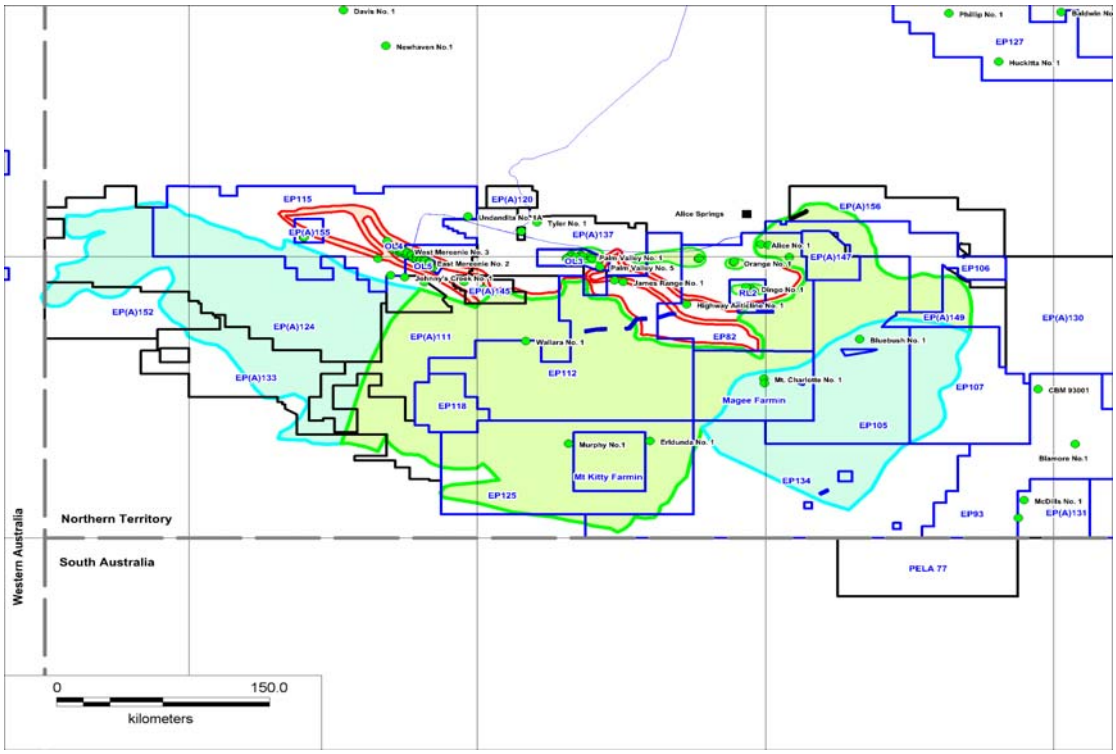


Figure 6 Areal distribution of the Gillen Member Unconventional Play

Figure 9. Gillen Member shales

II.II Aralka Formation Unconventional

Previously neglected Sturtian shales of the Aralka Formation (Cryogenian ~ 660 Ma) are now recognized on a basin wide scale and previously unpublished analyses indicate this petroleum system contains the highest retained organic carbon contents of any source rock in the Neoproterozoic sequence.The main depositional locus for organically rich shales of the Aralka Formation occurs in the northeastern portion of the basin and where the sequence is up to 1000 m thick, being unconformable to disconformable on the Areyonga Formation glacials (Kennard and Nicholl,1986). The shales are absent on the Finke-Highway Trend but continue in the southern portion of the basin where they occur in Wallara-1, Murphy-1 and Erldunda-1 and average 30-50 m in thickness. Shales in Erldunda-1 record TOC's of between 1.5 and 3.5%. with a current low hydrogen index indicating a bias towards gas potential with subordinate oil potential; the sequence is probably in the oil window. Similarly Murphy-1 recorded TOC's ranging from 2.3% to 3.2% with maturities in the early oil window. Samples from Wallara-1 1(~1280-1300 m) are in the early gas window as supported by a MPI derived Vr0 ~ 1.1%. TOC's have probably been denuded by hydrocarbon generation and average <1% TOC. Overall there is little source rock data available from this sequence but stratigraphically analogous shales (ie in vertical juxtaposition with the Sturtian glacials) have generated prolific oil accumulations at this level in Oman and Siberia, where a key factor controlling entrapment is the presence of thick evaporite seals.



Aralka/Pioneer Petroleum System

- Aralka Formation Thin -
- Aralka Formation
- Pioneer Sandstone Halo

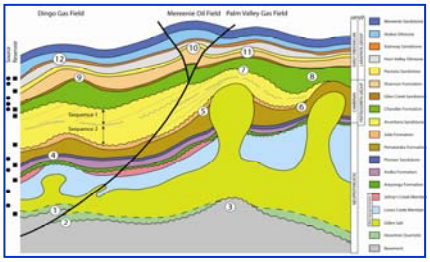


Figure 10 Areal Distribution of Aralka Unconventional Play

II.III Pertatataka Formation Unconventional

The Pertatataka Formation is a ubiquitous, thick shale package which is usually disconformable on the Areyonga Formation or Pioneer Sandstone. It represents a rift drift basinal sequence formed during dispersal of elements of the Rodinia Super-continent. Despite a relatively low organic content (probably due to maturation loss), the shales represent a viable gas prone source rock in the northern part of the basin (eg Dingo field) which is supported by isotope studies of source rock extracts and gas samples (C. Boreham, pers.com. – Geoscience Australia) . Some oil potential occurs in the lower shales in Ooraminna-1 and Wallara-1 and and overall it is likely these Late Neoproterozoic source rocks were generative over a far wider area than previously interpreted (Ambrose, 2006a and b, Young and Ambrose, 2007).

New data from stratigraphic drill hole NTGS BRD05-DD01 located in the southwestern portion of the basin has upgraded the hydrocarbon potential of this area (Ambrose, 2006 a and b, Ambrose, 2007). In this well Pertatataka shales are in the oil window at 480 m indicating major uplift and erosion in this area. An oil stain was recorded in a small fracture at this depth and this sample, together with a source rock extract from the same zone were submitted for geochemical analysis. New geochemical analytical techniques developed by Dr Jochen Brock, have resulted in the matching of very unusual hydrocarbon signatures from both the source rock extract and the oil stain. The petroleum sample and the sedimentary bitumen share several very unusual characteristics including acyclic isoprenoids >C20 which were unusually abundant and included C40 carotenoids (Dr. J. Brock, pers.com., Ambrose, 2006b). Also present in both samples were unusual diahopanes and farrihopanes. Furthermore, the hydrocarbon signature compounds, whilst being very unusual, closely match similar Neoproterozoic oils from Oman believed to have been derived from an analogous stratigraphic interval.

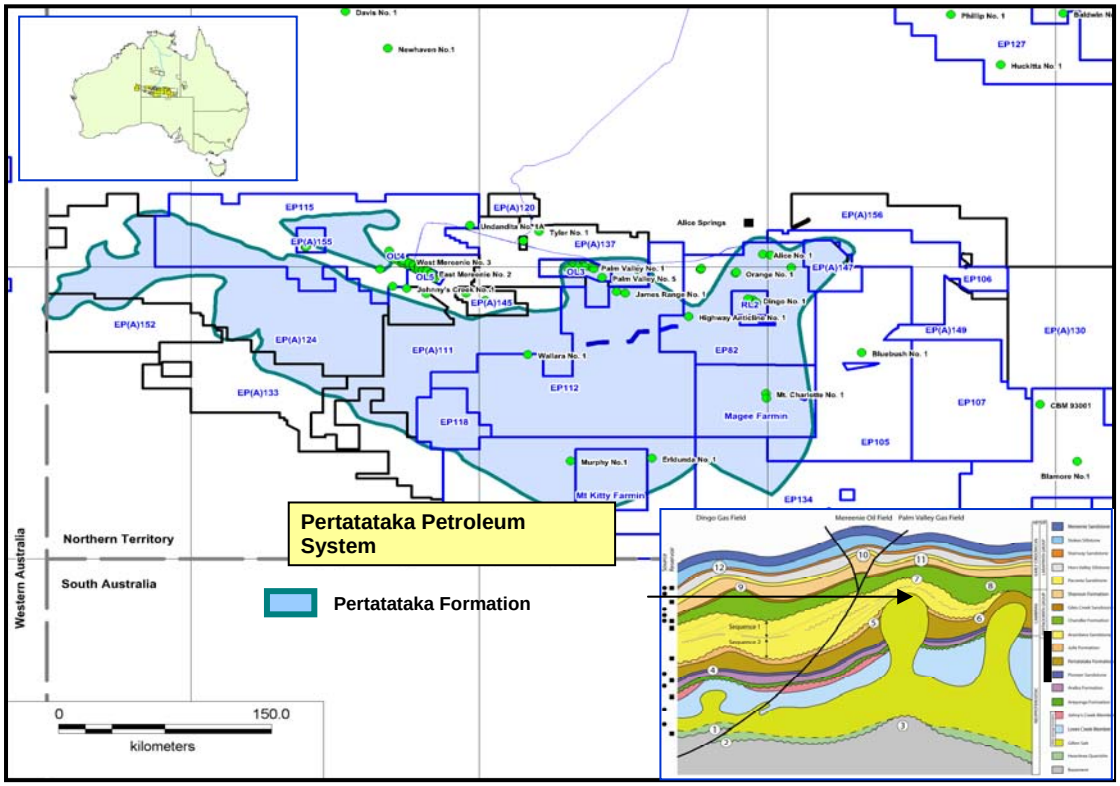


Figure 11 Areal Distribution of the Pertatataka Unconventional Play

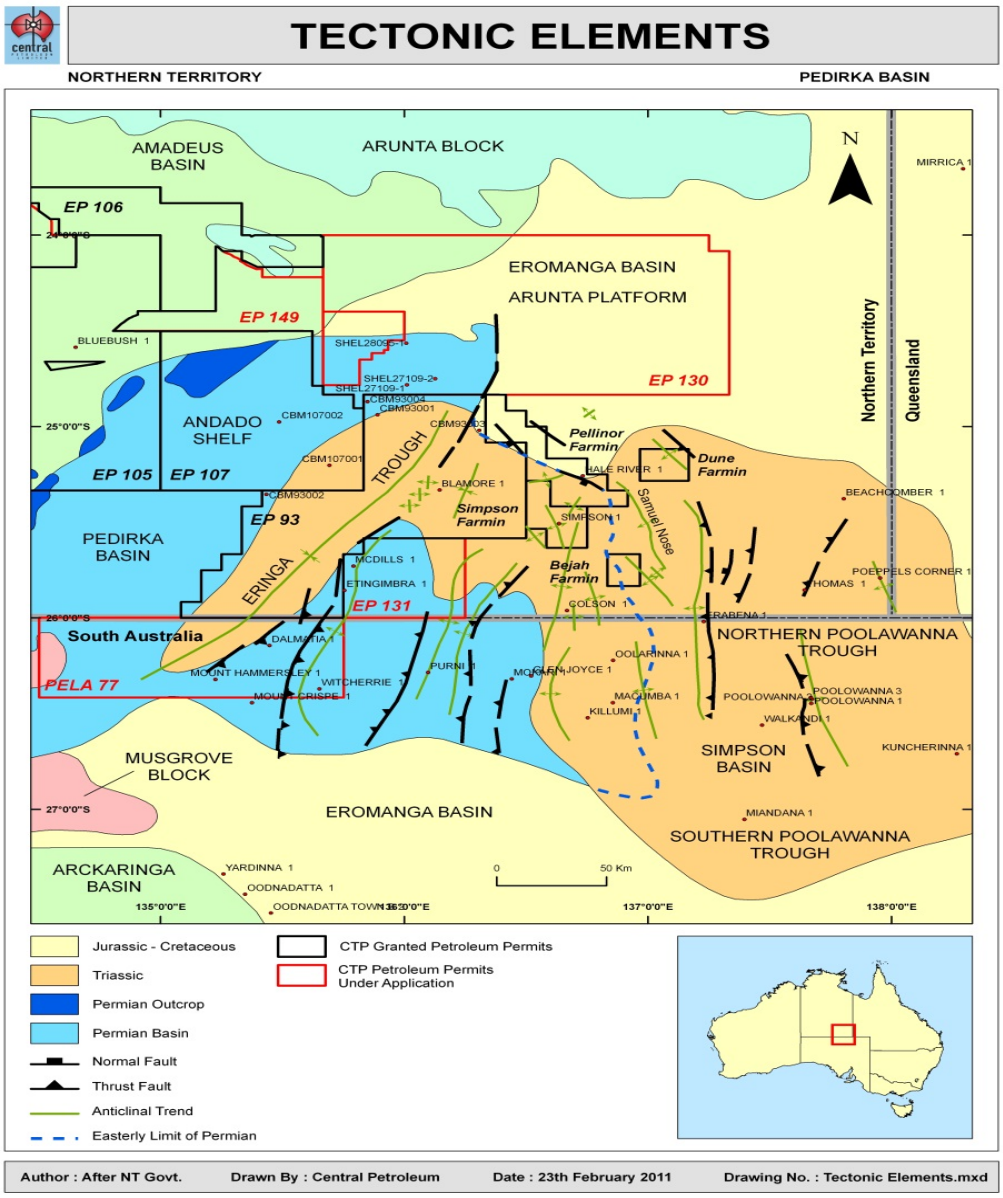


Figure 12 : Tectonic Elements Simpson Desert Area

IV – Unconventional Cretaceous/Devonian Targets Simpson Desert Area

Introduction

Two potential early Cretaceous source /reservoir rocks. are of interest in the Simpson Desert area, namely the Toolebuc Formation and the overlying basal Oodnadatta Formation. The former is widely discussed in the literature and to the east, in the area of the Galilee Basin, greenfields explorer Exoma Energy has mounted a regional exploration program. There is much anecdotal evidence of oil and gas shows in the Toolebuc in this area but the thermal maturity is generally low and hence the resource type remains uncertain. In the Julia Creek area the sequence is considered an oil shale while Boreham and Powell (1987) indicated that in a general sense the unit should be regarded as an immature petroleum source rock.

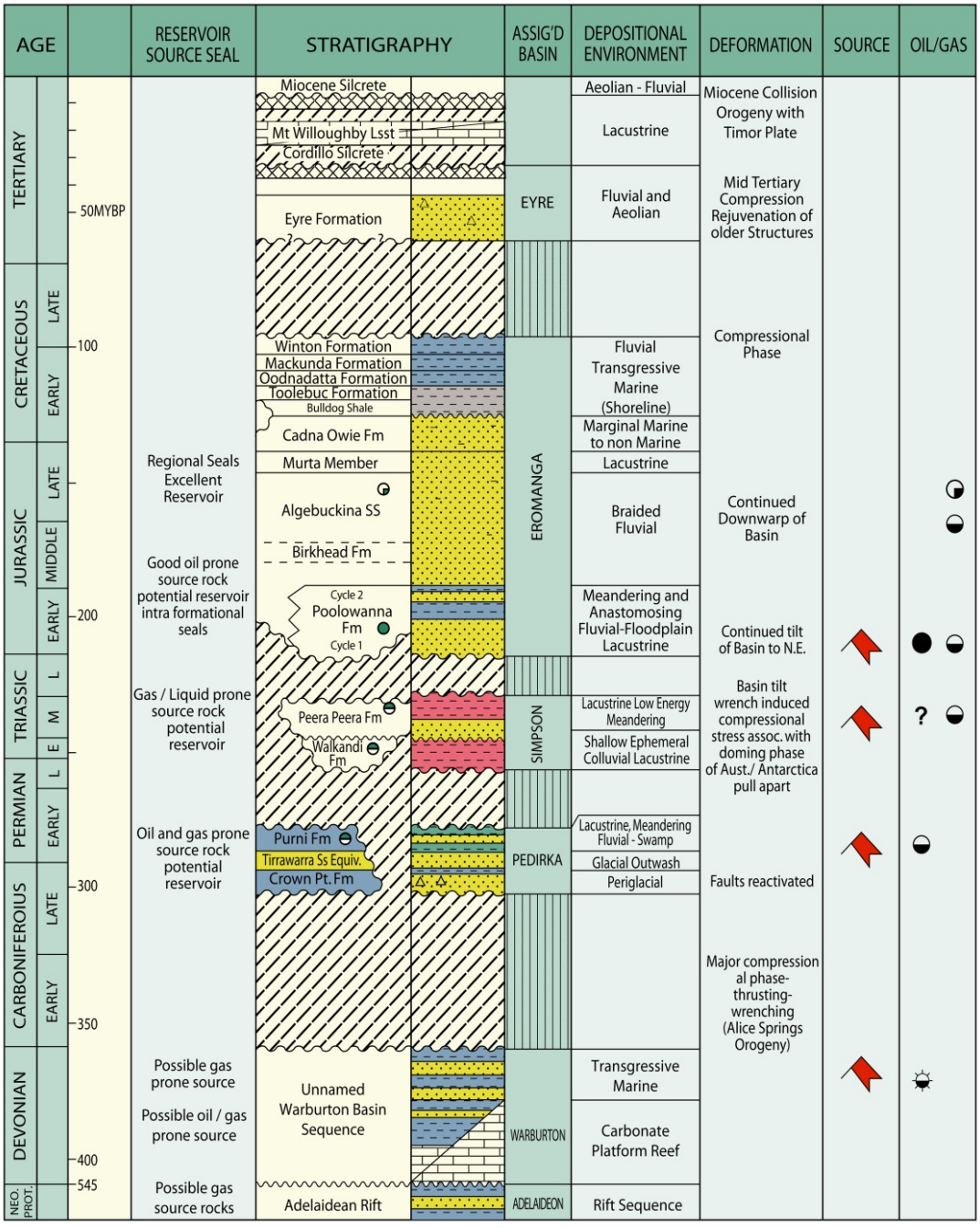


Figure 13 Stratigraphic Table, Simpson Desert Area

The early Cretaceous Toolebuc Formation was deposited in a late Albian transgressive epicontinental sea. The sequence is sheet-like and very extensive, varying in thickness from 10-50 m in the study area south of the Arunta Block in central Australia. The unit occurs in the middle part of a Cretaceous succession up to 2000 m thick consisting of deltaic, marine and lacustrine mudstone, siltstone, sandstone, coquinite, limestone and minor coal. Measured high organic contents and numerous intersected oil and gas shows in stratigraphic and exploration wells in the south – central Eromanga Basin led to a number of published papers in the 1980's (Ozmic, 1986; Sherwood and Cook, 1986; Boreham and Powell,1987; Saxby,1986). Intermittent studies have been undertaken since then but the sequence has really come under increased scrutiny with the advent of unconventional gas/oil plays emerging in central Australian basins.

More recently Exoma Energy, who are exploring the Galilee Basin to the east, have two dedicated wells cored through the Toolebuc: 1) Bessies -1 recovered live liquid hydrocarbons on the core barrel and tests on recovered samples are progressing, 2) Euston-1: displayed evidence of gas release and gas desorption studies are continuing. The shaly Toolebuc sequence in this area is up to 40 m thick (averages 20 m in thickness) with mean TOC's of 9% ranging up to 20%. The unit comprises mainly carbonaceous shale becoming more limey to the west with occasional coquinite. Exoma are currently carrying out laboratory studies, including gas desorption work, prior to further drilling which may include lateral drill holes and staged fracture stimulation.

In CTP' s areas in the Simpson Desert area, the Toolebuc Fm is an enigmatic source rock; it is a rich oil/gas source rock which sometimes gives up minor gas shows (sometimes with a minor component of heavy hydrocarbon molecules) on drill penetration. It is not known to be thermally mature for oil/gas generation anywhere in CTP's areas and hence the gas shows are believed to be biogenic in origin. There are no known analogous source rock formations in North American basins so comparative studies are lacking.

A more leading edge scenario invokes the ideas of Dr. F. Mango (a former Stanford University professor) who proposes two paths to the formation of natural gas:

1) A traditional, thermogenic path operating almost exclusively at high temperatures.
2) A low temperature catalytic path (metathesis). The proposed catalysts in this process are low valent transition metals. This process redefines the time-temperature dimensions of gas habitats opening the possibility of gas generation at very low subsurface temperatures. This remains a highly speculative model for Toolebuc gas but it may be significant that Boreham and Powell (1987) report high vanadyl group metals in several samples of Toolebuc Formation.

Further study is needed to rationalise the origin of the Toolebuc Fm wet gas and oil shows in the area of the Galilee Basin. It may be the methane component is of biogenic origin while the heavy molecules result from early – mature oil extracts residing in the rock and released during the drilling process. It is noteworthy that thermally immature Perimian coals in CBM 93-001 give gas shows with a similar heavy molecule content to the Toolebuc shows – no thermogenic hydrocarbons are present in either case. The methane component of the shows in the Permian coals is largely derived from the inertinite /vitrinite component of the coal while the liptinite/exinite component provides the heavier HC molecules.

An important conundrum relevant to exploration of the Toolebuc Fm throughout the Eromanga Basin as a whole is that despite the presence of minor gas shows in the Simpson Desert area numerous oil and gas shows to the east in the Galilee Basin area, there is a general absence of thermal maturity on a regional basis. It should be noted that in the Simpson Desert area high mud weights applied during early exploration drilling may have inhibited gas shows to some extent thus accounting for their general paucity. The Toolebuc Fm has not recorded any flows to surface although a slightly older-sheet like sandstone, the Coorikiana Sandstone, recorded a small gas flow from a well in SA .

Gas Shows in the Toolebuc Formation in the Simpson Desert Area

1) Well CBM 93-004 : A thin Toolebuc unit gave a 12 unit gas show which was all C1. Background gas was all C1 (2 units). The absence of heavy HC molecules would suggest only gas prone source material is present – the methane is probably of biogenic origin.
2) Well CBM 93-003 : a thin Toolebuc Formation unit gave a 8 unit gas show which was mainly C1 but included 10 ppm heavier molecules. The gas stayed in the system into the top Algebuckina Sandstone where the background gas was <1 unit.

Note that no other gas shows have been recorded but this may in fact result from 1) no gas detector being run through this section which is unlikely 2) Overbalanced mud systems suppressing gas shows, which is more likely. Oil and gas shows appear to be far more intense to the northeast in the area of the Galilee Basin. In this well gas shows were also recorded in the overlying shale/silt sequence which may be equivalent to the lower Oodnadatta Formation.

Hydrocarbon Potential of the Lower Oodnadatta Formation Sandstones

A review of the lower Oodnadatta Fm in the Simpson Desert area occurs below, the most important show occurring in Simpson-1.

Well	**Base Oodnadatta**	**Top Oodnadatta**	**Isopach**	**lithology**	**HC Shows**
Simpson-1	775	735	40	fg-vfg lithic ss, gy sh,gl	65 units C1 3% heavies
	Interbedded	Ood clayst	Are carbonaceous	Gas 97:1:1:1:	Several gas peaks in ss
Blamore-1	No basal Ood ss	NA	NA	NA	No gas shows
Hale River-1	No basal Ood sands	NA	NA	NA	No gas shows
Colson-1	Oods sands present	635	775	vfg-fg lithic ,gl ss	No gas shows
Thomas-1	804 Minor ss	1107	NA	Vfg tight ss	No gas shows
Mc Dills-1	Eroded				
Etingimbra-1	Eroded				
Poeppels Cr-1	815.9	1119.1	303.2	Tr vfg ss	Trace gas
CBM93-001	No ss noted.		Show in the	Toolebuc but	2 units C1 (Toolebuc)
			No significant	ss noted	10 ppm C5
Beachcomber	610	871	261	Silt , claystone,ss	No gas show

CBM93-002	? eroded				No Gas Shows
CBM93-003	Thin sands in Lower Oodnadatta				No gas shows. Bg=2 units, no heavies
CBM93-004	No ss noted	Probably eroded			No gas show
Macumba-1	695.8	1149.9	454.1	Vfg-fg.,tight	No gas show
				Int.clayst,silt	
Poolowanna-1	882.6	1280	397.4	Vfg-fg,tight	No gas show
				Int.clst,silt	
Purni-1	475	783.2	308.2	Minor ss a/a	No gas show
Witcherie-1	15.2	120.6	105.4	Silty ss,clayst	No gas show
Mt Hammersley-1	eroded				
Dalmatia-1	eroded				
Glen Joyce-1	871	998	127	Allaru,ss at top,tight	No gas show
Kilumni-1	820.5	1142.6	322.1	a/a	No gas show

Interpretation of Gas Shows in the Oodnadatta Formation

The gas shows in the Lower Oodnadatta Formation in Simpson-1 are signifant as they occur in v.f.g to f.g. glauconitic 'hot' sandstones containing gas peaks of up to 65 units (C1 97:1:1:1). The sandstones occur over a gross interval of about 40 m; drill rates and curttings indicate up to 22 m gross sand. Given the complete absence of gas shows at this level anywhere else in the study area, the following tentative conclusions are drawn:

- The sandstones are gas charged but this cannot be definitely confirmed as there was no testing or coring undertaken and the only Elog coverage was through casing; this precludes accurate definition of hydrocarbon saturation and porosity.
- The gas play may be structural formed in a 4 way dip closure at this level; such closures are mapped at deeper horizons.
- The most likely source of gas are Toolebuc organic rich shales – the gas in this case must be biogenic while the small percentage of heavy HC molecules are probably derived from very early mature oil extracts. There is a much smaller chance that these are Devonian sourced hydrocarbons migrating up a ?fault plane, but given the absence of shows lower in the section this seems unlikely.
- At least three sand:shale interfaces occur in a gross column of about 40 m.

Recent structural mapping over the Simpson structure indicates 4 way dip closure occurs at early Cretaceous levels with the planned Simpson East-1 well lying updip of Simpson-1 which

recorded significant gas shows. The Cretaceous section will be closely monitored (elogs, possible DST) to evaluate the possibility of a gas accumulation in the Oodnadatta Formation.

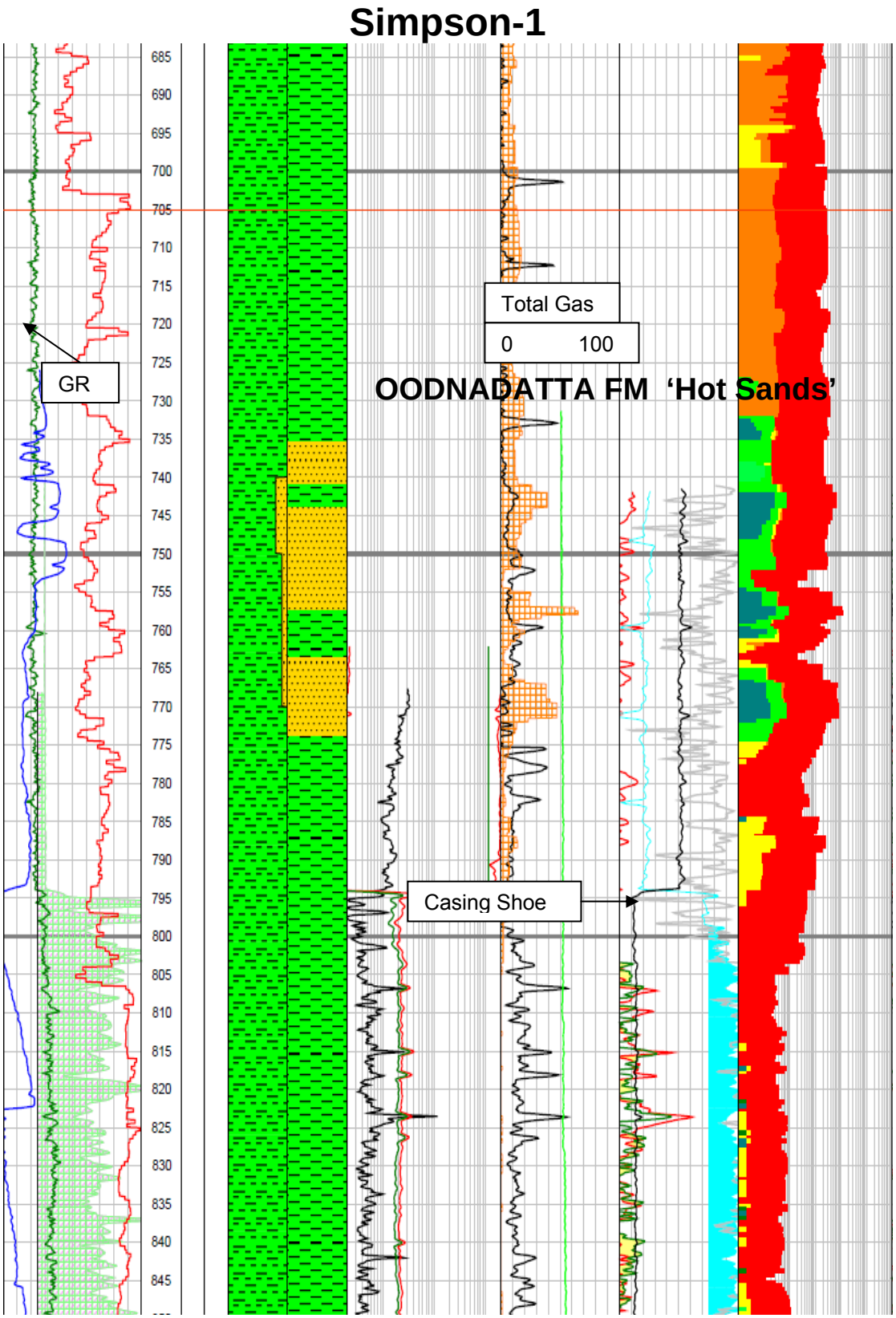


Figure 14 Simpson 1, Oodnadatta Formation gas show.

Unnamed Devonian Source Rocks

Hydrocarbon gas chimneys and associated HRDZ's are associated with major fault zones controlling basinal facies down dip from Devonian platform/reefal complexes in EP 93 and EP 97. The charge is most likely coming from Devonian source rocks which were probably generative during the Cretaceous. This is encouraging from a charge perspective and it is well known from other drilled Devonian carbonate basins that associated facies can provide excellent oil/gas source potential (eg back-reef/basinal and fore-reef facies). For example, the Duvernay Fm shales of western Canada are the source rocks (basinal facies) for a number of upper Devonian Alberta oil and gas fields. It has been predicted the Duvernay shales are at the precipice of being a timeless unconventional resource play and significant gas and liquids production has already been established.

The Devonian facies mosaic mapped out in EP 97 and surrounds includes similar basinal facies to the Duvernay shales found in Alberta although there have been no drill hole penetrations as yet. However, the gas chimneys and HRDZ's are indicative of hydrocarbon migration insinuating the existence of Devonian source facies closely associated with reefal developments. The unconventional play is high risk, but it would compliment conventional targets, and potential long term rewards could be very significant.

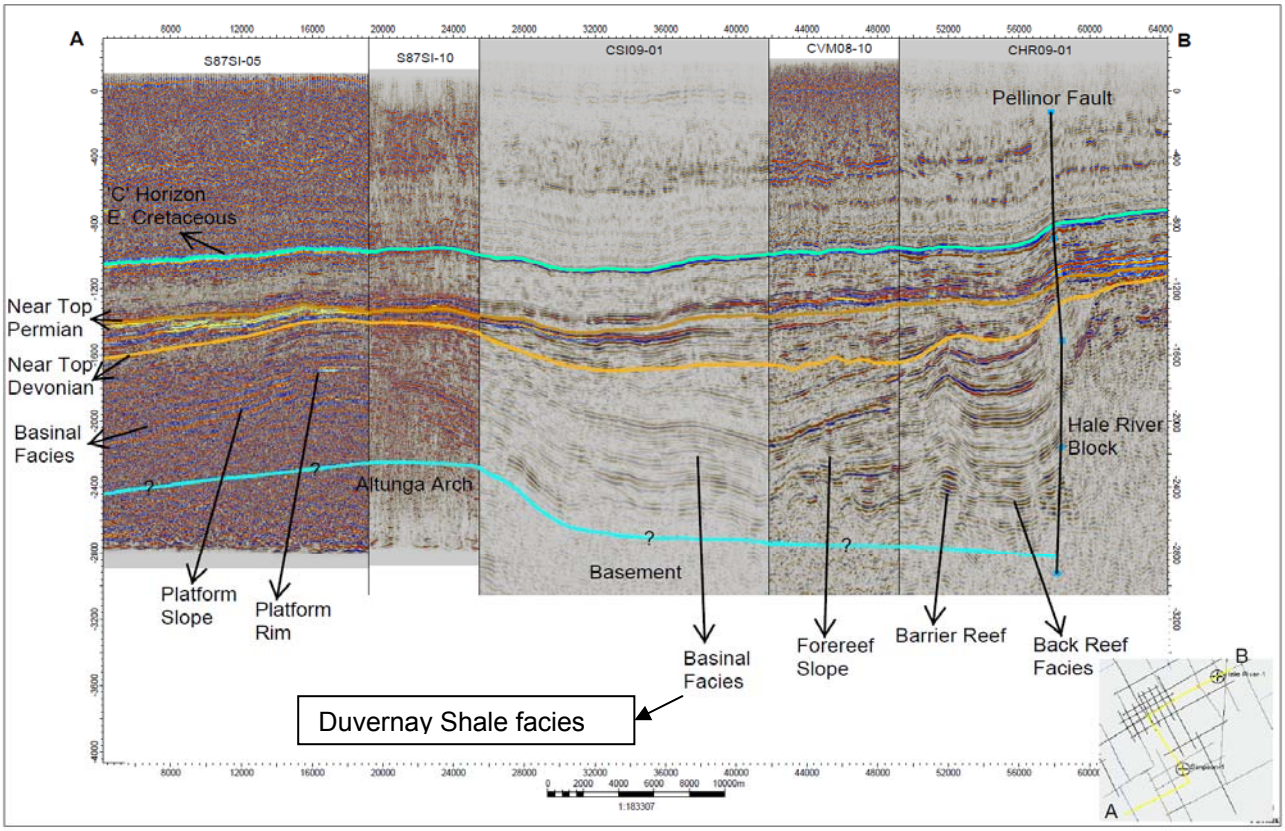


Figure 15 Devonian Palaeofacies in EP 97

V. Wiso Basin : Lander Trough – Greenswamp Shelf

Introduction

In central Australia, three contiguous, enechelon depocentres (ie the Lander Trough, the Dulcie Syncline and Toko Syncline) define the southern margin of the Wiso Basin, and the southern and the southeastern margins of the Georgina Basin respectively . The regional geology of these basins has been revamped over recent years and most recent regional correlations occur in the accompanying stratigraphic table. The Dulcie and Toko Synclines in the Georgina Basin have proven potential to generate oil and gas from carbonaceous Middle Cambrian source rocks at two separate stratigraphic levels (the Thorntonia Limestone and Arthur Creek Fm), both of which are well documented. In all of these areas there is strong evidence of uplift and erosion post hydrocarbon migration.

Unconventional Middle Cambrian Arthur Creek plays have been promoted in both areas and Petrofrontier are currently drilling the Baldwin/ MacIntyre area in the NT portion of the southern Georgina Basin. CTP has recently been granted title to its Queensland permits and this year will commence exploration for conventional - unconventional oil /gas in the Toko Syncline and the Bradley Shelf respectively.

The Lander Trough is much less well known than the Georgina Basin but this report revisits the Middle Cambrian geology of the Lander Trough and Greenswamp Shelf where CTP holds a whole of basin acreage position. By analogy with new perceptions of unconventional oil/shale gas prospectivity in the Georgina Basin it is hoped the prospectivity of the Lander Trough area will be similarly enhanced encouraging the acquisition of new data.

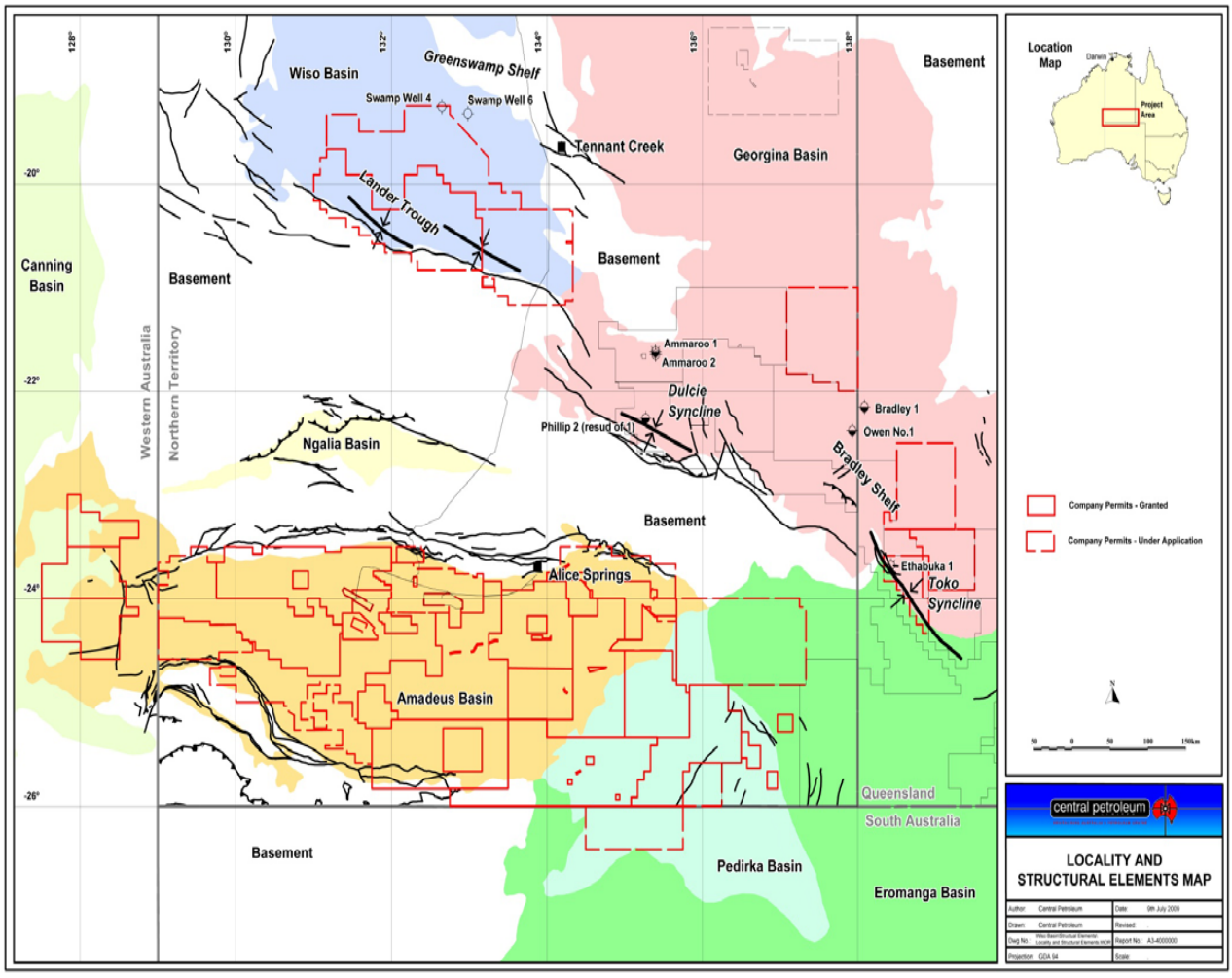


Figure 16 Basin Location Map showing CTP's Tenements in Central Australia

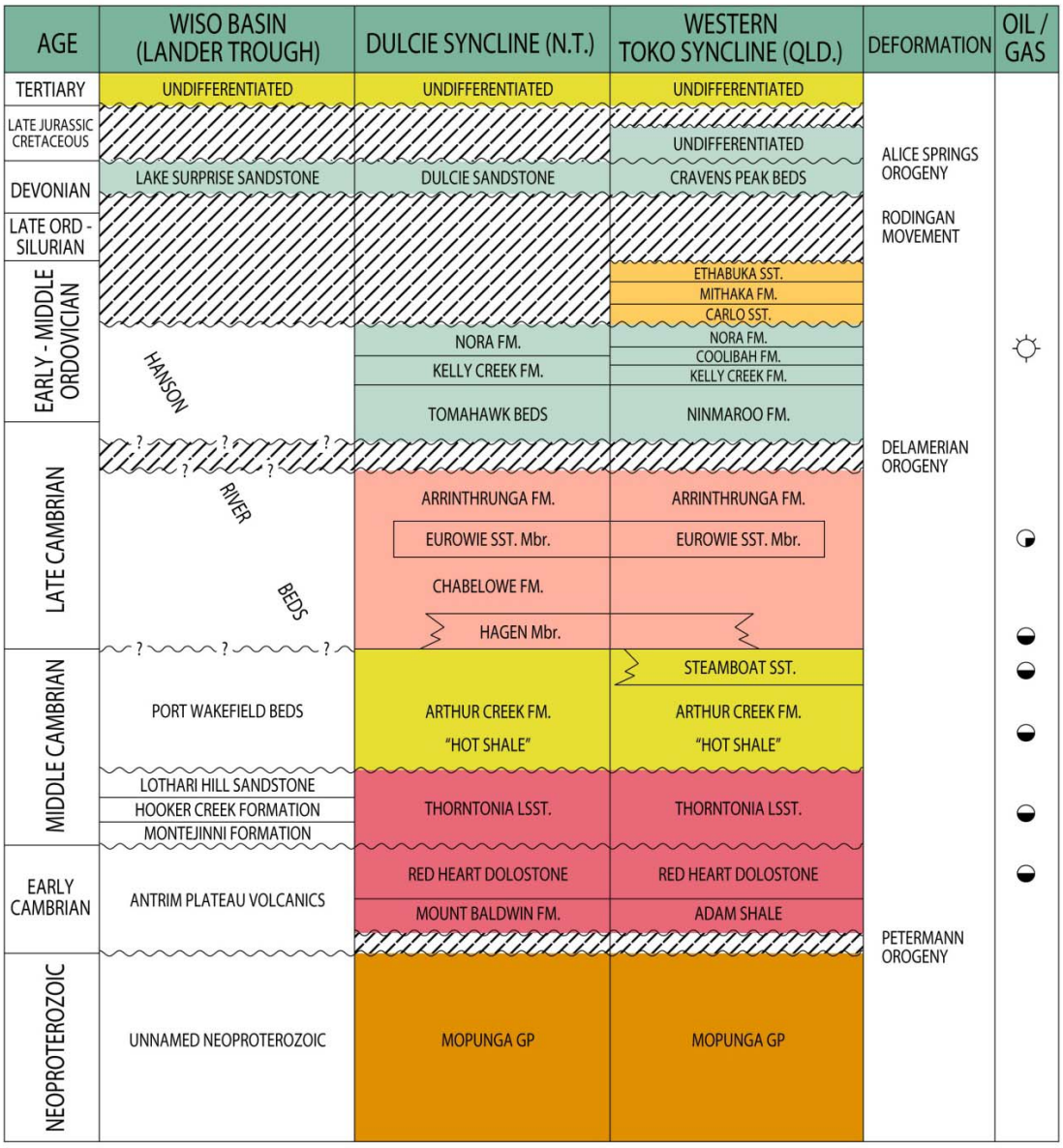


Figure 17 : Stratigraphic Table

The lack of deep drilling in the Wiso Basin, particularly in the Lander Trough, has hindered stratigraphic and source rock studies including burial history and thermal modelling which form the basis of source rock maturation modelling. However, new gravity and aeromagnetic interpretations indicate about 2000 m and 3000 m of Palaeozoic sediments (ie post Pre-Cambrian sediments) are present in the eastern and western Lander Trough depocentres respectively : this note details maturation modelling of the western depocentre and assesses the implications for maturation in the eastern depocentre.

Petroleum Geology of the Lander Trough / Greenswamp Shelf

The Lander Trough comprises two enechelon depocentres separated by a mid-basin high. The fault pattern in the area comprises conjugate strike slip faults and normal extensional faults probably reflecting right lateral wrenching orientated along primary north-northwest trending steep reverse fault(s) juxtaposing Palaeozoic sediments against Arunta Block basement (Russell, 1998).

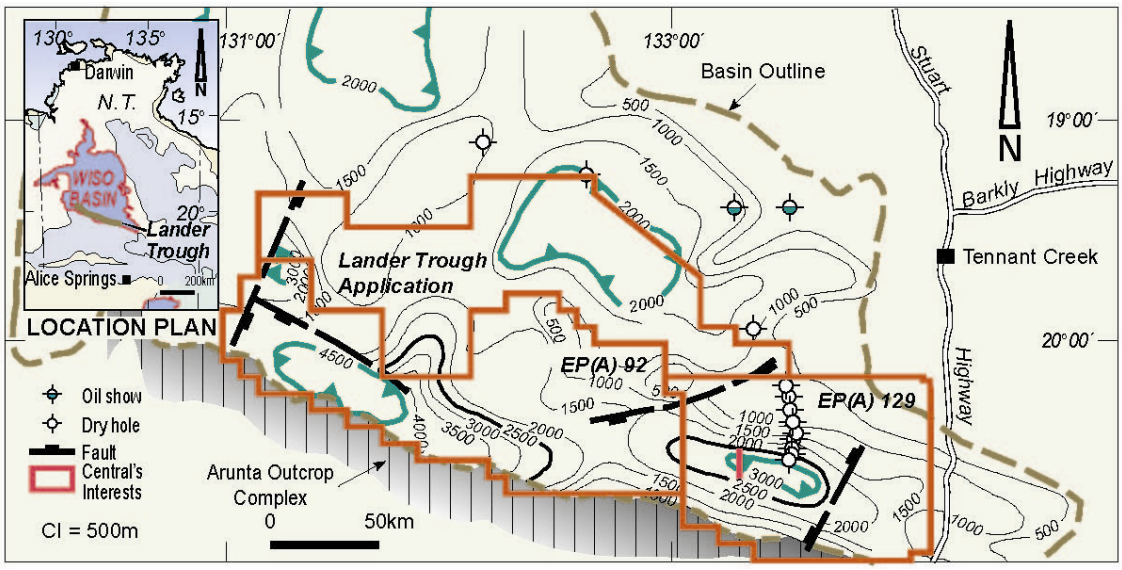


Figure 18: Lander Trough and Green Swamp Shelf-areomagnetic depth to basement (BMR, now Geoscience Australia)

The two dominant source rocks in a sister basin to the east (the Georgina Basin) are the Middle Cambrian Thorntonia Limestone and Arthur Creek Formation. Stratigraphically equivalent source rocks in the Lander Trough reside in the Montejinni Limestone and the Point Wakefield Beds-Hanson River Beds respectively. The stratigraphy is well constrained by palaeontology but the only well data comes from the Greenswamp Shelf.

The complete absence of well control data in the Lander Trough is a major constraint on the burial history and maturation models but by applying geothermal gradient data from the Dulcie Syncline in the western Georgina Basin and drawing on limited maturation data from the Greenswamp Shelf, reasonable conclusions can be drawn regarding the type of hydrocarbons generated and the timing of migration.

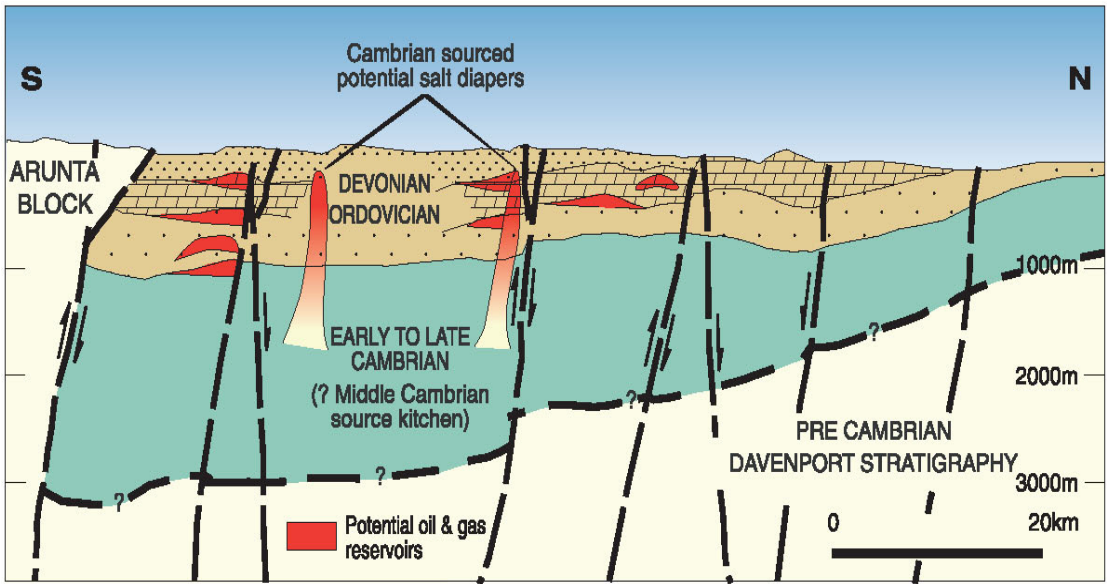


Figure 19: North – South Cross-section across the Lander Trough

Samples of oil prone Montejinni carbonaceous carbonates from the Greenswamp wells on the northern flank of the Lander Trough (Greenswamp Shelf) yielded some TOC's over 1% and a corrected hydrogen indice of 539 mg/g. Significantly, Tmax values in overlying carbonaceous rocks of the Hooker Fm suggest an insitu vitrinite relectance of Vr0 0.50 – 0.65 (Tmax 435-440 deg.c) which marks the early oil window. Tarry residues and interpreted residual hydrocarbons were reported in Green Swamp 1 and 6 respectively. (Gorter et al,1998).The current shallow depth of burial (~ 200-300m) coupled with the insitu maturation of Vr0 0.6 (average of GS-1 and GS-6) suggests major basin unroofing on the shelf and possibly the sediments in the deeper trough as well - certainly this sequence would have generated and expelled oil and possibly gas from the western Lander Trough where the sequence is estimated to be 3000 m deeper than that intersected on the Greenswamp Shelf. Additional evidence comes from the western Georgina Basin where an equivalent sequence, the Thorntonia Limestone, is 100+ m thick and comprises black bituminous limestone and shale which have excellent source rock characteristics (TOC's of up to 2.75%- Dunster et al, 2007).

Maturation Modelling – Lander Trough

The Lander Trough comprises two enechelon depocentres where depth to magnetic basement is modelled, from west to east, to be 4500 m and 3000 m respectively. The former is modelled here (undertaken by consultant Dr. Natt Arian) with input parameters related to the predicted stratigraphic section, and tectonic and geothermal histories, provided by CTP. The applied temperature gradient for the period of the Alice Springs Orogeny (ie 54 Deg. C/km) was derived from data in the Dulcie Syncline in the western Georgina Basin which is published in Gibson et al (2007).

Detailed maturation modelling of the deeper western axis of the Lander Trough is summarised in Figure 20. The main uncertainties pertain to the thickness and lithology of the Palaeozoic section. Depth to magnetic basement is estimated at 4500 m (Kennewell et al,1977 and Questa Australia Pty Ltd, 1989) . If this is accurate, and other modelled parameters are reasonable, then the onset of oil generation from Middle Cambrian source rocks would have commenced in the Ordovician. However, if indeed the interpreted depth to basement is in fact depth to Early Cambrian volcanics, which occur to the north, then there are two major implications:

1)The depth of the probable source horizons in the western depocentre would be over 1000 m deeper than in the proposed model (ie 4000 m versus 3000 m, to the Montejinni Limestone). This would dictate the Montejinni Limestone in the west would have almost certainly have entered the gas window during the Alice Springs Orogeny.

2)The depth of the probable source horizons in the shallower eastern Lander Trough would be about 2800 – 3000 which, based on the same thermal model applied for the western depocentre, would suggest proposed Middle Cambrian source rocks entered the oil window in the Ordovician and today reside in the mid-late oil window.

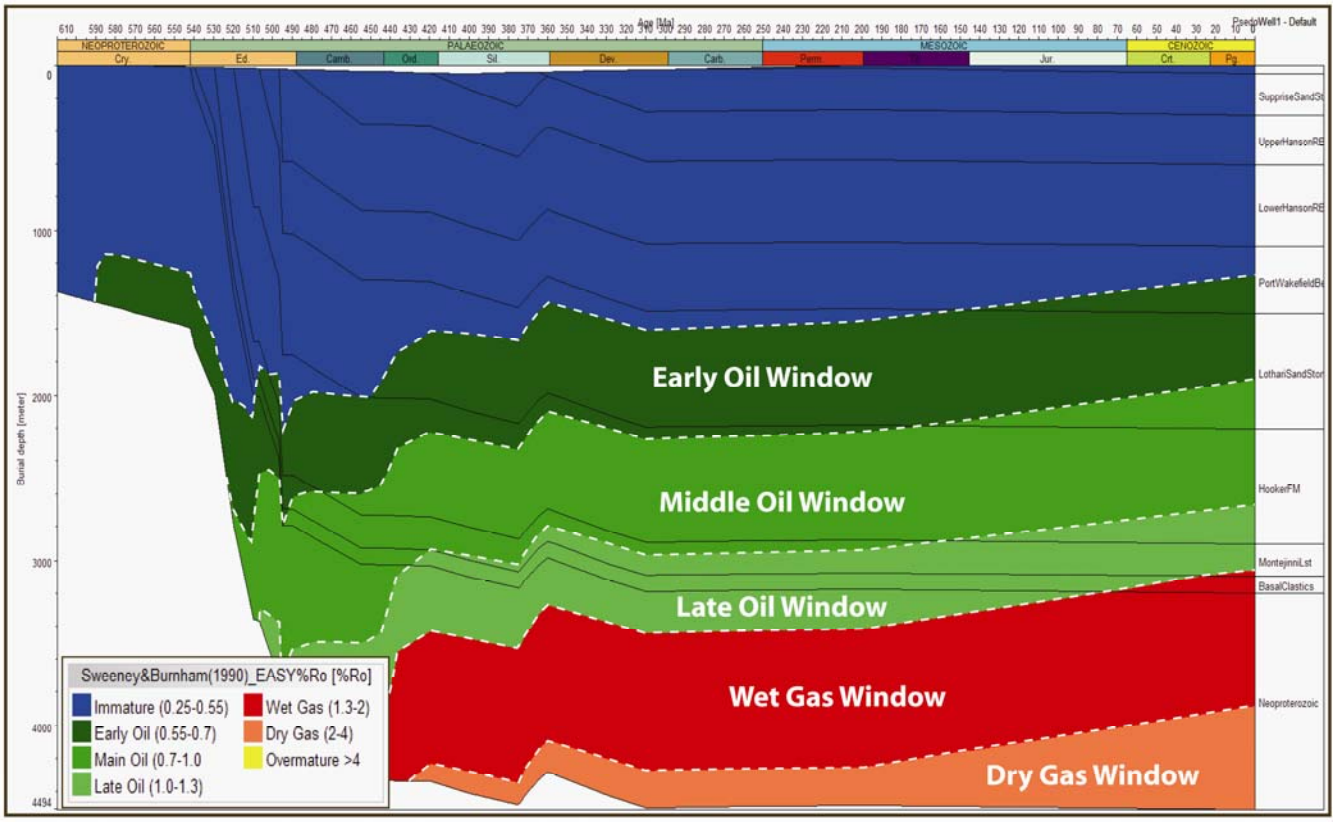


Figure 20 Burial History and Maturation Modelling, Western Lander Trough

Unconventional Hydrocarbons

Unconventional hydrocarbons are being investigated to the east in the Georgina Basin where carbonaceous Arthur Creek Fm siltstones are the main target. The equivalent stratigraphic sequence in this area is the Port Wakefield Beds.

In terms of thermal maturation, there is both a conservative (low case) and optimistic (high case) depth model for both depocentres in the Lander Trough. The conservative model puts the Middle Cambrian source sequences in the eastern and western depocentres in the early oil window and mid-late oil window respectively. The optimistic model puts these source rocks in the western and eastern depocentres in the early-middle gas window and the mid-late oil window respectively. Data derived from exploration drill holes Green Swamp 1 and Green Swamp 6 (Gorter et al., 1998) showed the Hooker Creek Fm in the mid-early oil window of maturation as indicated by Tmax = 435-440 deg C. There is thus a case to be put that all of Central's permit applications, which are all well to the south and all considerably deeper than GS-1 and GS-6 host source rocks, could be prospective for both unconventional and conventional hydrocarbons. This is an area of 43,000 km2. Given the results so far it is possible the middle Cambrian Montejinni Limestone may be the main source in the Lander Trough but this remains high risk given the lack of drilling .

Appendix -1

A Review of Hydrocarbon Habitat in the Lower Cretaceous Of the Simpson Desert Area

(Appendix to CTP Technical Note December 2011- Unconventional Hydrocarbons – New Exploration Targets in the Amadeus, Eromanga and Wiso (Lander Trough) Basins)

Executive Summary

- **Lower Cretaceous hydrocarbon targets are widespread in CTP's tenements in the Simpson Desert area. The sheet like Toolebuc Formation is a well documented source rock whose unconventional oil/gas potential is being investigated by several operators including Central. This formation may be the source for potential gas plays in the overlying Oodnadatta Formation.**

- **Significant gas shows (up to 65 units C1, 3% C2 +) occur in 'hot' sandstones in the lower Oodnadatta Formation in the Simpson-1 structure south of the Hale River Block. The gas is probably of biogenic origin being derived from bituminous shales in the underlying Toolebuc Formation. Minor heavy HC molecules probably originated from early mature oil extracts originating from the same source rock. The gross gas column could exceed 40 m.**

- **This potential gas play may be a conventional structural play relying on reservoir/seal couplets formed in structural closure. However there may also be an unconventional component to the trap.**

- **The 'hot' sands of the Oodnadatta Formation are vfg-fg and tight, and any commercial productivity would rely on reservoir stimulation. The Toolebuc Formation is itself a target but the unit is thermogenically immature on a regional basis and assessment of its potential requires further exploration and application of new ideas / technology. Given the high hydrogen indices of the shale's organic material there may potential for wet gas but the likelihood of thermogenic oil appears low.**

- **There are important implications for well site operations regarding full evaluation of these zones during the drilling of the upcoming Madigan-1 exploration well and succeeding wells in the Simpson Desert area.**

Introduction

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More recently Exoma Energy, who are exploring the Galilee Basin to the east, have two dedicated wells cored through the Toolebuc: 1) Bessies -1 recovered live liquid hydrocarbons on the core barrel and tests on recovered samples are progressing, 2) Euston-1: displayed evidence of gas release and gas desorption studies are continuing. The shaly Toolebuc sequence in this area is up to 40 m thick (averages 20 m in thickness) with mean TOC's of 9% ranging up to 20%. The unit comprises mainly carbonaceous shale becoming more limey to the west with occasional coquinite. Exoma are currently carrying out laboratory studies, including gas desorption work, prior to further drilling which may include lateral drill holes and staged fracture stimulation.

In CTP' s areas in the Simpson Desert area, the Toolebuc Fm is an enigmatic source rock; it is a rich oil/gas source rock which sometimes gives up minor gas shows (sometimes with a minor component of heavy hydrocarbon molecules) on drill penetration. It is not known to be thermally mature for oil/gas generation anywhere in CTP's areas and hence the gas shows are believed to be biogenic in origin. There are no known analogous source rock formations in North American basins so comparative studies are lacking.

A more leading edge scenario invokes the ideas of Dr. F. Mango (a former Stanford University professor) who proposes two paths to the formation of natural gas:

3) A traditional, thermogenic path operating almost exclusively at high temperatures.
4) A low temperature catalytic path (metathesis). The proposed catalysts in this process are low valent transition metals. This process redefines the time-temperature dimensions of gas habitats opening the possibility of gas generation at very low subsurface temperatures. This remains a highly speculative model for Toolebuc gas but it may be significant that Boreham and Powell (1987) report high vanadyl group metals in several samples of Toolebuc Formation.

Further study is needed to rationalise the origin of the Toolebuc Fm wet gas and oil shows in the area of the Galilee Basin. It may be the methane component is of biogenic origin while the

heavy molecules result from early – mature oil extracts residing in the rock and released during the drilling process. It is noteworthy that thermally immature Perimian coals in CBM 93-001 give gas shows with a similar heavy molecule content to the Toolebuc shows – no thermogenic hydrocarbons are present in either case. The methane component of the shows in the Permian coals is largely derived from the inertinite /vitrinite component of the coal while the liptinite/exinite component provides the heavier HC molecules.

There follows a review of the Toolebuc Fm in and around CTP's tenements in the Simpson Desert area with a drill hole summary occurring in Table-1.

Table-1

Well	**Base Toolebuc**	**Top Toolebuc**	**Isopach**	**Lithology**	**HC Shows**
Simpson-1	775 Sandstone in	735 L.Oodnadatta FM. Toolebuc on seismic	40	fg-vfg lithic ss, ? grey sh. HS ABSENT	65 units C1 0.5 units C5+ in ss. Gas 97:1:1:1
Simpson-1	901	906	Shale	HS ABSENT	No gas show
	Toolebuc on	seismic	High Res		
Blamore-1	Undiff.	Present on	seismic	HS ABSENT	No gas show
Hale River-1	641.9	677.8	35.9	Sh,md-dk gry **HS 2m** at base	None noted in WCR No gas log.
				Lsst, Inoceramus	
Colson-1	1082	1111	29	Dk gy-black sh,limey stks HS present	5m HS but No gas shows rec.
McDills-1	Undiff.				
Etingimbra-1	? 130	158	28	HS 3 m at base	3 m HS but ? No shows
CBM 93-001	Toolebuc log signature is missing~340	~360	20	HS ABSENT But seismic Sig. present	2 units of gas with trace heavies in Toolebuc.
CBM 93-002	Undiff.	? eroded		HS Undiff	No gas show
CBM 93-003	245	262	17	HS 4 m thick	Wk gas show 8/2 units
CBM 93-004	244	262	18	HS 1 m thick	Wk gas show 12/2 units No heavies.
CBM107-001	248	262	14	HS 3 m thick	No gas show
CBM107-002	Eroded or facies change			HS Undiff.	No gas show

Thomas-1	1107	1159	52	Dominantly Organic shale inc HS	No gas show
				Sh,lsst,coal	
Mokari-1	876.2	911.5	35.3	?	? No Gas Show
Mount Hammersley 1	Undiff.			?eroded	No gas show
Dalmatia-1	Undiff.			?eroded	No gas show
Glen Joyce-1	998	1021	23	Silt, one lsst,	No gas show
				Tr vfg ss	
Killumni-1	1142.6	1173	30.4	V.carb silt, vfg ss	No gas show
Witcherie-1	120.6	~140		Blk organic sh, tr siltst	No gas show
Beachcomber 1	871	942	71	Claystone	1 unit C1
Poolowanna-1	1280	1317.8	37.8	Dk gy carb.silt	No gas show
				Lsst, vfg ss	
Poolowanna-2	1278	1322.7	43.9	Dk gy carb.silt	? No gas show
Poeppels Cr-1	1119.1	1185	65	Dk Gy 2 x HS carb.sh	No Gas show

An important conundrum relevant to exploration of the Toolebuc Fm throughout the Eromanga Basin as a whole is that despite the presence of numerous oil and gas shows there is a general absence of thermal maturity on a regional basis. It should be noted that in the Simpson Desert area high mud weights applied during early exploration drilling may have inhibited gas shows to some extent thus accounting for their general sparcity. The Toolebuc Fm has not recorded any flows to surface although a slightly older-sheet like sandstone, the Coorikiana Sandstone, recorded a small gas flow from a well in SA .

Gas Shows in the Toolebuc Formation in the Simpson Desert Area

3) Well CBM 93-004 : A thin Toolebuc unit gave a 12 unit gas show which was all C1. Background gas was all C1 (2 units). The absence of heavy HC molecules would suggest only gas prone source material is present – the methane may be of biogenic origin.
4) Well CBM 93-003 : a thin Toolebuc Formation unit gave a 8 unit gas show which was mainly C1 but included 10 ppm heavier molecules. The gas stayed in the system into the top Algebuckina Sandstone where the background gas was <1 unit.

Note that no other gas shows have been recorded but this may in fact result from 1) no gas detector being run through this section which is unlikely 2) Overbalanced mud systems suppressing gas shows, which is more likely. Oil and gas shows appear to be far more intense to the northeast in the area of the Galilee Basin.

Hydrocarbon Potential of the Lower Oodnadatta Formation Sandstones

The Bessies-1 well drilled in the Galilee Basin by Exoma intersected 40 m of primary Toolebuc shale with gas shows as well as recovering a small quantity of free liquid hydrocarbons. In this well gas shows were also recorded in the overlying shale/silt sequence which may be equivalent to the lower Oodnadatta Formation. A review of the lower Oodnadatta Fm in the Simpson Desert area occurs below, the most important show occurring in Simpson-1.

Well	**Base Oodnadatta**	**Top Oodnadatta**	**Isopach**	**lithology**	**HC Shows**
Simpson-1	775	735	40	fg-vfg lithic ss, gy sh,gl	65 units C1 3% heavies
	Interbedded	Ood clayst	Are carbonaceous	Gas 97:1:1:1:	Several gas peaks in ss
Blamore-1	No basal Ood ss	NA	NA	NA	No gas shows
Hale River-1	No basal Ood sands	NA	NA	NA	No gas shows
Colson-1	Oods sands present	635	775	vfg-fg lithic ,gl ss	No gas shows
Thomas-1	804 Minor ss	1107	NA	Vfg tight ss	No gas shows
Mc Dills-1	Eroded				
Etingimbra-1	Eroded				
Poeppels Cr-1	815.9	1119.1	303.2	Tr vfg ss	Trace gas
CBM93-001	No ss noted.		Show in the	Toolebuc but	2 units C1 (Toolebuc)
			No significant	ss noted	10 ppm C5
Beachcomber	610	871	261	Silt , claystone,ss	No gas show
CBM93-002	? eroded				No Gas Shows
CBM93-003	Thin sands in Lower Oodnadatta				No gas shows. Bg=2 units, no heavies
CBM93-004	No ss noted	Probably			No gas show

		eroded			
Macumba-1	695.8	1149.9	454.1	Vfg-fg.,tight	No gas show
				Int.clayst,silt	
Poolowanna-1	882.6	1280	397.4	Vfg-fg,tight	No gas show
				Int.clst,silt	
Purni-1	475	783.2	308.2	Minor ss a/a	No gas show
Witcherie-1	15.2	120.6	105.4	Silty ss,clayst	No gas show
Mt Hammersley-1	eroded				
Dalmatia-1	eroded				
Glen Joyce-1	871	998	127	Allaru,ss at top,tight	No gas show
Kilumni-1	820.5	1142.6	322.1	a/a	No gas show

Interpretation of Gas Shows in the Oodnadatta Formation, Toolebuc Fm, Simpson Desert area.

It has been proposed herein that the wet gas shows in the Toolebuc Formation in the Galilee area are self sourcing – ie the methane component is locally sourced and of biogenic origin while the heavier hydrocarbon molecules come from early-mature oil extracts residing in the source rock and released during the drilling process. In the same way thermally immature coals give up wet gas shows (when liptinite and vitrinite macerals are present) eg CBM 93-001.

In the Simpson Desert area gas shows in the Toolebuc are fairly sparse compared with the Galilee area but this could in part result from the use of over-balanced mud systems during drilling. However, at this stage it appears this unit may not be as organically rich (or as thick) as that seen to the east in the Galilee area although no core or cuttings have been analysed.
The gas shows in the Lower Oodnadatta Formation in Simpson-1 are of major interest as they occur in high GR, v.f.g to f.g. glauconitic 'hot' sandstones containing gas peaks of up to 65 units (C1 97:1:1:1). The sandstones occur over a gross interval of about 40 m. Given the complete absence of gas shows at this level anywhere else in the study area, the following tentative conclusions are drawn:

- The sandstones are gas charged but this cannot be definitely confirmed as there was no testing or coring undertaken and the only Elog coverage was through casing; this precludes accurate definition of hydrocarbon saturation and porosity.
- The gas play may be structural formed in a 4 way dip closure at this level; such closures are mapped at deeper horizons.
- The most likely source of gas are the Toolebuc organic rich shales – the gas in this case must be biogenic while the small percentage of heavy HC molecules are probably derived from very early mature oil extracts associated with the Toolebuc shales. There is a much smaller chance that these are Devonian sourced hydrocarbons migrating up a ?fault plane but given the absence of shows lower in the section this seems unlikely.
- At least three sand:shale interfaces occur in a gross column of about 40 m.

Recommendations

- The lower Oodnadatta Fm (3 m samples recommended) and Toolebuc Fm (1 m samples recommended) should be carefully monitored in Madigan-1 for gas/oil shows and evidence of source, reservoir and seal.
- If significant gas shows are encountered an appropriate program of coring, testing and elogging may be warranted. The sands are “hot’ which needs to be considered in designing elog coverage.
- Gas samples should be acquired during drilling and / or testing for isotope studies which will establish the veracity of the biogenic gas model.
- SWC’s should be acquired through the Early Cretaceous section, especially in the Toolebuc Formation, to establish source rock parameters.

- Where appropriate mud weights should not exceed hydrostatic pressure when the Toolebuc Formation and lower Oodnadatta Formation are encountered during exploration drilling.

Conclusions

- The Toolebuc Fm is an enigmatic source rock in the Simpson Desert area.where there are sparse, weak gas shows (sometimes with a minor component of heavy hydrocarbon molecules) but it is thermally immature on a regional basis. However, a possible explanation may be that the methane component is of biogenic origin while the heavy molecules result from early – mature oil extracts residing in the rock and released during the drilling process.

- The gas noted in the lower Oodnadatta Formation in Simpson -1 is probably sourced from the Toolebuc Formation being of biogenic origin and comprising mainly methane. This type of gas show is rare thus far and may relate to the fact that viable sandstones reside in structural closure immediately above the Toolebuc Fm. Interbedded thick claystones appear to provide vertical seal

- The Simpson East Prospect should be carefully monitored for Cretaceous gas during drilling and should be fully evaluated from an exploration standpoint. A similar approach should be applied during the drilling of the Madigan structure which has definite major closure at deeper levels and is likely to have Oodnadatta Fm sandstones developed in the Cretaceous section. A review of seismically defined closure at Cretaceous levels in both prospects is adviseable.