# Bancannia Trough Potential Strategic Release Area

Prepared by the Geological Survey of NSW

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# Contents

# Executive Summary

In June 2016, the NSW Government introduced the NSW Strategic Release Framework for Coal and Petroleum Exploration. The Framework implements a new process for issuing prospecting titles and is overseen by the Advisory Body for Strategic Release. The Advisory Body will make recommendations to the Minister about release of areas for petroleum exploration based on consideration of geological, social, environmental, economic and operator capability factors.

The Geological Survey of NSW (GSNSW) identifies potential areas for release for petroleum exploration, based on geological resource assessments, for consideration by the Advisory Body.

The GSNSW recommended the Bancannia Trough for consideration by the Advisory Body under the Strategic Release Framework in 2017. The Bancannia Trough is a sedimentary sub-basin in the Darling Basin in Western NSW and the assessed petroleum prospectivity, relative to other underexplored basins and sub-basins in the State's west, is in the highest tier. The Bancannia Trough is predominantly prospective for tight gas and has some potential for conventional gas. There is no potential for coal seam gas.

# Introduction

NSW contains ten main sedimentary basins that have known petroleum resources or prospectivity potential (Figure 1). There have been oil and gas shows from previous exploration in the main sedimentary basins and potential for discovery of conventional gas/oil, tight gas/oil, shale gas/oil and coal seam gas.

The relatively well explored coal-bearing basins in the eastern one third of NSW have identified coal seam gas resources. In contrast, the basins in the western two thirds of NSW are relatively underexplored, but have potential for the discovery of petroleum resources.

The GSNSW has an ongoing program to acquire, analyse and deliver new precompetitive data to improve understanding of the prospectivity of the underexplored basins in the western two thirds of NSW. This program is a part of the New Frontiers Minerals and Energy Exploration Initiative and is expected to progressively identify additional areas for consideration for strategic release.

The GSNSW has identified the Bancannia Trough for consideration by the Advisory Body for release as a new petroleum prospecting area (Figure 1).

This area was selected based on the current understanding of the level of prospectivity and history of petroleum exploration. The Bancannia Trough is considered a "Frontier Basin" with respect to petroleum exploration – it is relatively underexplored.

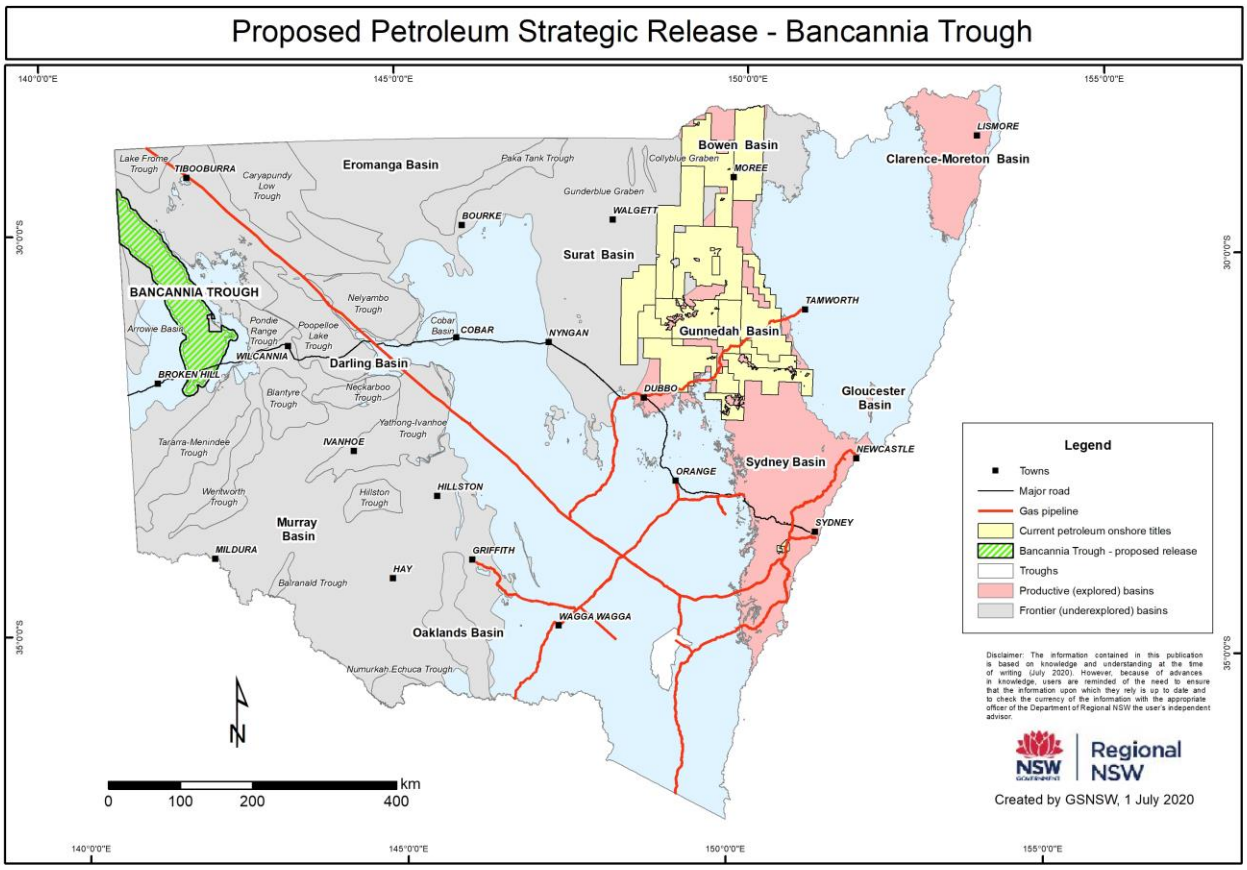


**Figure 1 - Bancannia Trough - potential strategic release area and current petroleum titles in NSW.**

# Bancannia Trough Strategic Release Area

The Bancannia Trough is a northwest-southeast trending sedimentary sub-basin within the Late Silurian to Early Carboniferous Darling Basin, located in western NSW. The southern margin of the Bancannia Trough is approximately 75 km east of Broken Hill and it extends northwest into South Australia. There are no towns within the trough (Figure 2).

The Bancannia Trough is approximately 40 km wide and 230 km long and covers an area of 10 000 km$^2$. The estimated maximum sediment thickness within the trough is greater than 6 km, comprising predominantly Devonian (419 Ma to 359 Ma) aged sandstone and siltstone. The Bancannia Trough is partially overlain by the Mesozoic Eromanga Basin (a part of the Great Australian Basin).

Based on current understanding, the Bancannia Trough is one of the more prospective areas for petroleum exploration in western NSW. All the elements of a petroleum system required to form a petroleum deposit appear to be present within it. The trough is also relatively close to the Moomba to Sydney gas pipeline and the all-weather Barrier Highway provides road access to the southern part of the trough.

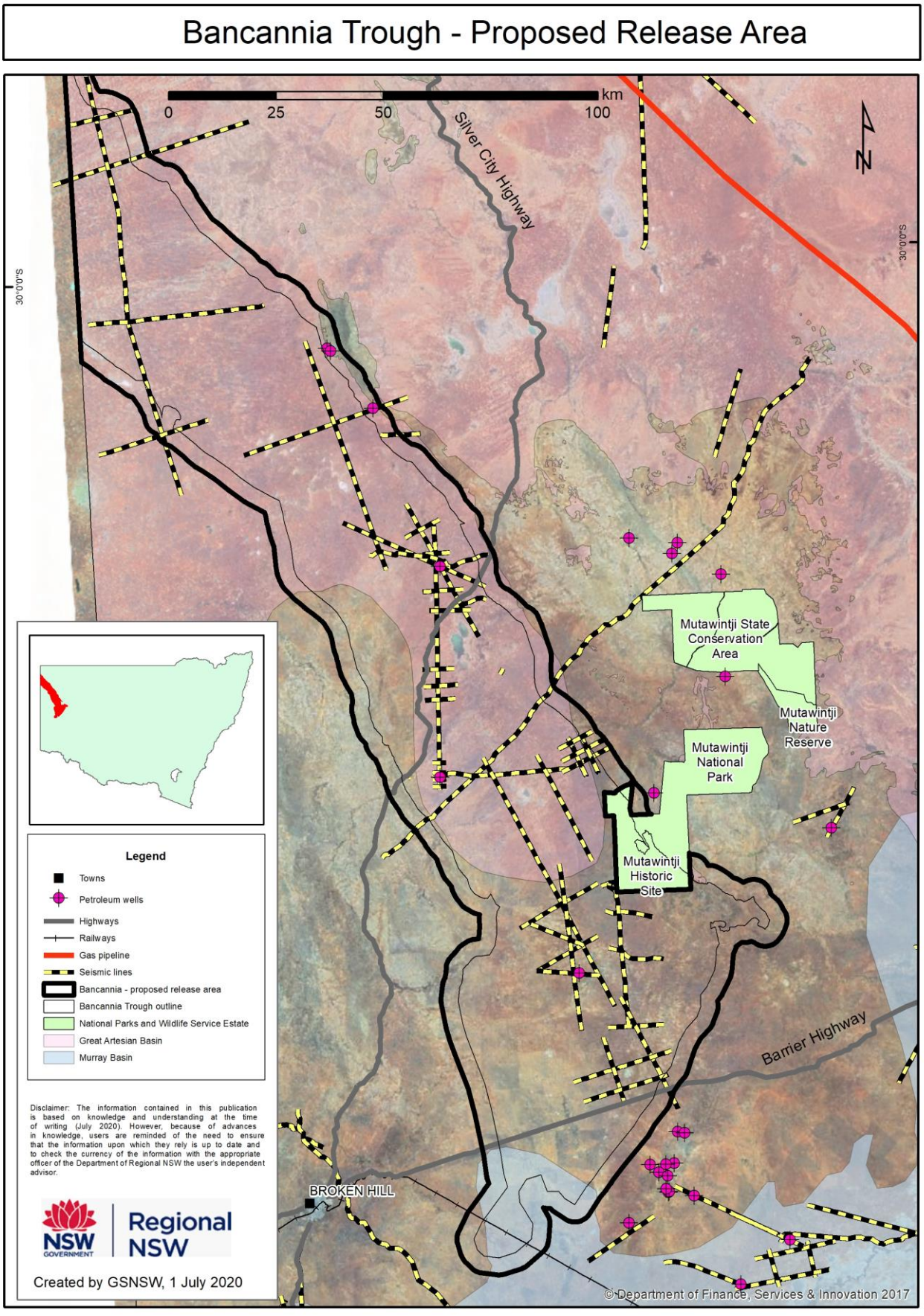


**Figure 2 - Bancannia Trough showing proposed release area, seismic lines and wells. The proposed release area excludes national parks and reserves and has a buffer of 4 km outwards from the interpreted geological boundary of the trough.**

# History of exploration

The Bancannia Trough is relatively underexplored and there have been no valid tests of possible 'traps' for petroleum. Exploration began in the early 1960s and has been sporadic since then. The southern portion of the trough has historically been of more interest to explorers than the north.

The history of previous petroleum exploration titles is shown in Table 1. In total, 17 PELs and one PSPAUTH have been granted over parts of the trough (Figure 3). In 2013, a Petroleum Exploration Licence Application was lodged for most of the Bancannia Trough, but was not granted.

Exploration for minerals concentrated on groups 1, 2 and 6 and began in the 1960s. Although over 50 historic mineral titles intersected the edge of the basin the exploration focussed mostly on mineralised orogenic areas outside of the Bancannia Trough.

# Exploration data

Exploration data includes well completion reports, geochemical analyses and seismic, aeromagnetic and gravity surveys (Figure 2). There are also geological interpretative reports available for the Bancannia Trough.

Three exploration wells have been drilled within the Bancannia Trough, namely Bancannia North-1, Bancannia South-1 and Jupiter-1. All wells had gas shows and some geological intervals had good porosity and permeability. None of these three wells were drilled on potential petroleum 'traps'.

Seismic surveys were conducted across the Bancannia Trough between 1965 and 1999. 48 of seismic lines totalling 890 km were acquired. The quality of the seismic data varies from poor to good and only a small percentage of the original seismic field data has been reprocessed using modern processing software.

**Table 1 - Historic petroleum exploration titles over or partially over the Bancannia Trough.**

| TITLE CODE | TITLE NO | TITLE HOLDER | ACT | APPROX. YEAR OF OPERATION | EXPLORATION HIGHLIGHTS | AREA |
|---|---|---|---|---|---|---|
| PEL | 31 | Clarence River Basin Oil Exploration Co NL | 1955 | 1960 -1964 | Seismic surveys: Lake Stewart (SS023) and Fort Grey (SS034) both outside of the trough. | northern margin of Bancannia Trough |
| PEL | 35 | Planet Exploration Company Pty Ltd | 1955 | 1960 - 1963 | Aeromagnetic survey interpretation: (AM015); Seismic survey: Tibooburra (SS028) (outside of the trough). | southern margin of Bancannia Trough |
| PEL | 44 | United Australian Oil Inc. | 1955 | 1961-1962 | Desktop studies | central Bancannia Trough |

| TITLE CODE | TITLE NO | TITLE HOLDER | ACT | APPROX. YEAR OF OPERATION | EXPLORATION HIGHLIGHTS | AREA |
|---|---|---|---|---|---|---|
| PEL | 52 | Alliance Oil Development Australia NL | 1955 | 1961 - 1968 | Gravity surveys: Scopes (GR027); Four Corners gravity and magnetics (GR029); Drilling: Little Topar (WCR168) (outside of the trough area); Aeromagnetic survey interpretation (AM015); Lake Wintlow (SS074) (outside of the trough), Lake Pamamaroo (SS029) (outside of the trough), Stephens Creek (SS026) (outside of the trough). | southern margin of Bancannia Trough |
| PEL | 71 | Lincoln Oil Ltd | 1955 | 1962 | Desktop studies | same as PEL114, central and southern Bancannia Trough |
| PEL | 76 | Australian Oil Corporation | 1955 | 1962 - 1966 | Gravity survey: Mt Arrowsmith (GR023). | northern Bancannia Trough |
| PEL | 78 | Planet Exploration Company Pty Ltd | 1955 | 1962 - 1966 | Aeromagnetic survey: Mootwingee (AM020); Gravity surveys: Stephens Creek (GR011), Westall's Tank, Mootwingee (GR014) and Topar (GR020); Seismic survey Mootwingee (SS042). | same as PEL155, south eastern Bancannia Trough |

| TITLE CODE | TITLE NO | TITLE HOLDER | ACT | APPROX. YEAR OF OPERATION | EXPLORATION HIGHLIGHTS | AREA |
|---|---|---|---|---|---|---|
| PEL | 114 | Planet Exploration Company Pty Ltd | 1955 | 1966 - 1970 | Aeromagnetic survey: Mootwingee (AM020); Gravity survey: Nucha (GR021); Drilling: Bancannia South-1 (WCR129), Bancannia North-1 (WCR130), Jupiter-1 (WCR139); Seismic surveys: Bancannia (SS061), Lake Windauka (SS066), Packsaddle (SS067); Nucha (SS070) and Pincally (SS080). | same as PEL71 central and southern Bancannia Trough |
| PEL | 125 | Clarence River Basin Oil Exploration Co NL | 1955 | 1966 - 1970 | Gravity surveys: Mt Arrowsmith (GR023) and Winnathee (SS087). | northern Bancannia Trough |
| PEL | 155 | Planet Exploration Company Pty Ltd | 1955 | 1969 | Desktop studies; Drilling: Gnalta-1 well drilled on tenement is outside of the trough. | same as PEL78, south eastern Bancannia Trough |
| PEL | 164 | Planet Exploration Company Pty Ltd | 1955 | 1969 - 1971 | Seismic survey: Pincally (SS080). | north, central and south Bancannia Trough |
| PEL | 193 | Beaver Exploration Australia NL | 1955 | 1973 - 1977 | Seismic survey: Menindee – regional (SS105) | Southern Bancannia Trough |
| PEL | 240 | Magnet Metals Ltd | 1955 | 1980 -1981 | Desktop studies | northern Bancannia Trough |
| PEL | 241 | Magnet Metals Ltd | 1955 | 1981 - 1990 | Desktop studies | central and southern Bancannia Trough |

| TITLE CODE | TITLE NO | TITLE HOLDER | ACT | APPROX. YEAR OF OPERATION | EXPLORATION HIGHLIGHTS | AREA |
|---|---|---|---|---|---|---|
| PEL | 265 | Kells Investments Pty Ltd | 1955 | 1984 | Desktop studies | northern Bancannia Trough |
| PEL | 268 | Base Resources Ltd | 1955 | 1984 - 1987 | Seismic survey: Alec's Tank (SS152). | central and southern Bancannia Trough |
| PEL | 425 | Otto Oil Pty Ltd | 1991 | 1998 - 2002 | Desktop studies | central and southern Bancannia Trough |
| PSPAUTH | 12 | Hardie Infrastructure Pty Ltd | 1991 | 2006 - 2009 | Desktop studies | northern and southern Bancannia Trough |

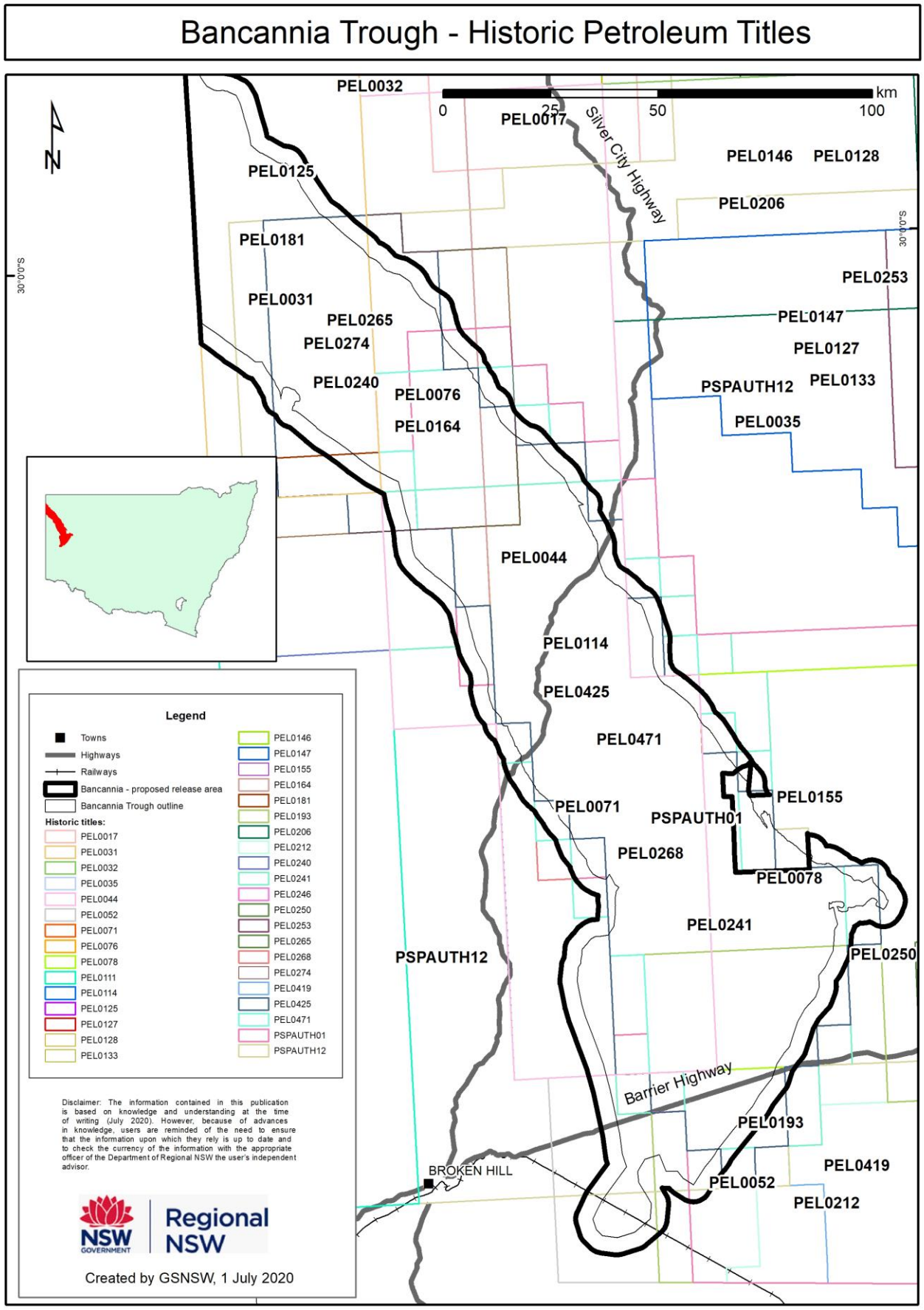


**Figure 3 - Historic petroleum exploration titles granted over parts of the Bancannia Trough.**

# Petroleum Assessment Analysis – Bancannia Trough

Name of area: **Bancannia Trough**

Location: 1:250,000: SH/54-15 (Broken Hill), SH/5411 (Cobham Lake), nearest town: Broken Hill

| Factor | Issue | Considerations | Petroleum Rating [MEG to tick one in each column] | Analysis |
|---|---|---|---|---|
| Availability of Geological data | Data density and veracity | Is the data sufficient to define a resource or potential resource and inform decision making? | ☐ Data are sufficient to define a petroleum resource.<br>☒ Data indicate the potential for the discovery of a petroleum resource.<br>☐ Data are insufficient to assess the exploration potential for the discovery of a petroleum resource.<br>☐ No petroleum resource potential exists. | <u>Historic data:</u><br>3 wells were drilled in the Bancannia Trough in 1968-69.<br>From 1965-1999, a total 48 of seismic lines covering 890 km<br>195 water bores and 8 shallow mineral exploration holes<br>Gravity and magnetic surveys, DEM<br>Surface sampling<br><u>Petroleum prospectivity indications:</u><br>Hydrocarbon shows encountered in wells.<br>Thick Devonian sequences were intersected in drill holes. Source rocks are expected in the Early Devonian (dry gas window based on modelling), reservoirs in Late Devonian. Seal intraformational or overlying Late Devonian.<br><u>Petroleum title history:</u><br>17 PELs and 1 PSPAUTH have been granted over parts of the trough. |

Continue Resource Assessment if ‘data are sufficient’ or indicate the potential for resource discovery.

| Factor | Issue | Considerations | Petroleum Rating [MEG to tick one in each column] | Analysis |
|---|---|---|---|---|
| Resource body characteristics | Resource type | | ☒ Conventional (oil, gas)<br>☒ Unconventional (oil, gas)<br>• Tight Sand / Carbonate (oil, gas) | Unconventional and the possibility of conventional systems. |
| | Resource quality | Does product quality meet the likely market/utilisation? | ☐ Yes<br>☐ No<br>☒ Cannot be determined | If gas is high percentage methane it will meet market requirements.<br><br>Unconventional and conventional petroleum - quality not tested. |
| | Resource size | What is the resource size/potential resource size? | ☐ Likely sufficient to support a stand-alone operation.<br>☐ Requires further appraisal or testing to assess resource size.<br>☒ Requires further exploration to identify resource potential. | Further seismic data is required to define additional potential target structures. Drilling is necessary to further understand the stratigraphy and better evaluate the petroleum potential. |
| | Geological resource constraints | Do other geological considerations impact the potential development of the Resource? | ☒ No significant resource constraints identified.<br>☐ Resource constraints are identified but unlikely to be detrimental to the development of the resource.<br>☐ Resource constraints indicate significant hurdles must be overcome if production were to proceed in the future. | Insufficient data to identify potential geological constraints. |

| Factor | Issue | Considerations | Petroleum Rating [MEG to tick one in each column] | Analysis |
|---|---|---|---|---|
| Ease of access | Existing infrastructure | Suitability of roads, power, water and outbound logistics (pipeline, rail or road) | ☐ Would require little or no change to existing infrastructure.<br>☒ Would require some upgrade to existing infrastructure.<br>☐ Would require provision of new infrastructure. | Pipeline: Moomba to Sydney gas pipeline runs approximately 125 km from the trough edge.<br><br>Roads: The Barrier Highway (which crosses through the southern part of the trough) is sealed, the Silver City Highway (to the west and running through the centre of the trough) is partially sealed. All remaining roads are unsealed. There are minor roads running through the southern portion of the trough.<br><br>Rail: The Orange – Broken Hill railway is available from Broken Hill to the west of the trough.<br><br>Towns: Broken Hill population approximately 20,000 people. |
| | Proximity to existing operations | Ability to share or leverage infrastructure of existing operations | ☐ Yes. Established petroleum district with local labour and service industry.<br>☒ Possibly. Potential synergies with existing operations and infrastructure.<br>☐ No. No synergies presently exist. | Although there are no existing petroleum operations in the region a gas pipeline runs approx. 125 km from the trough. |

| Factor | Issue | Considerations | Petroleum Rating [MEG to tick one in each column] | Analysis |
|---|---|---|---|---|
| | Capital costs | Style of operation the resource would support and likely capital costs and lead times | ☐ Potential conventional operations with relatively low capital and earliest product to market.<br>☐ Potential unconventional operations with likely favourable geological characteristics to facilitate resource flow with probable medium capital outlays.<br>☐ Potential unconventional operations with likely less favourable geological characteristics to facilitate resource flow, with probable significant capital outlays.<br>☒ Unable to reasonably determine at this time. | Will be able to be determined upon results of more rigorous exploration. |
| | Distance from market and outbound logistics (e.g. pipeline, port, rail, road) | Distance of resource from pipeline, port or a domestic market. | ☐ Close.<br>☒ Medium.<br>☐ Far. | Railway at Broken Hill approximately 130 km from the centre of the Bancannia Trough. Moomba – Sydney pipeline runs approximately parallel to the sub-basin 125 km to the east. |
| | | Level of establishment of pipeline, port or domestic market. | ☒ Established.<br>☐ Mostly established.<br>☐ Not yet established. | Market in NSW is established with only 3.5% of gas supplied from NSW gas fields, with sole operating field at Camden expected to cease production in 2023. |
| Market characteristics | Customer demand | | ☒ Current customer demand exists.<br>☐ Current customer demand is moderate.<br>☐ Current customer demand is low or may not exist. | NSW requires approx. 140 PJ of gas annually. Only 3.5% of gas is produced within NSW. |

| Factor | Issue | Considerations | Petroleum Rating [MEG to tick one in each column] | Analysis |
|---|---|---|---|---|
| Preliminary commercial viability assessment | Likely commercial viability as a stand-alone operation | Commercial viability of stand-alone operation at current market prices. | ☐ Project is likely to be financially robust.<br>☐ Project is currently marginal.<br>☐ Project is marginal to not commercially viable at this time.<br>☒ Unable to reasonably determine. | Project requires extensive exploration to determine its value. |
| Other strategic matters<br><br>*Note that some of these issues will be further or more fully considered in DRNSW's strategic issues assessment* | Existing land uses | Likelihood of competing land uses impacting on the resource. | ☐ Existing land uses would not impact extraction of the resource.<br>☒ Existing land uses would have some impact on extraction of the resource but could be managed.<br>☐ Existing land uses would likely prohibit extraction of the resource. | Currently the land use is primarily grazing land for sheep, rangeland goats and cattle.<br>Mutawintji National Park is on the eastern boundary of the trough and there is a proposal to increase the size of this further west into the trough. There are potentially heritage sites that may impact exploration. |
| | Environment/ hydrology | Environmental/ hydrological constraints to the resource and likelihood to prohibit resource extraction | ☒ Yes. Environmental constraints are likely.<br>☐ Some constraints that could be managed.<br>☐ No environmental constraints identified under current policy settings. | The Great Australian Basin (Eromanga Basin) overlies the northern and central parts of the trough.<br>The northern edge of the Murray Basin overlies the southern portion of the trough. |
| | Accessibility to market | | ☐ Product can be delivered with no hindrance.<br>☒ Product can be delivered but with some issues.<br>☐ Product can only be delivered with major changes. | Gas pipeline is near the basin (125 km). Pipeline extension would be required<br>Road and rail access are some distance from the trough. |

| Factor | Issue | Considerations | Petroleum Rating [MEG to tick one in each column] | Analysis |
|---|---|---|---|---|
| | Other constraints and critical risks | Other constraints that would prohibit or restrict further exploration or future extraction of the resource. | ☐ Yes<br>☒ Possibly<br>☐ No | Land access may be difficult in some locations due to landholder opposition to petroleum exploration. |
| **Additional Comments** | | | | |

END OF PETROLEUM RESOURCE ASSESSMENT TEMPLATE