Comet Ridge

UNDERGROUND WATER IMPACT REPORT

AUTHORITY TO PROSPECT 744 – GALILEE BASIN

COMET RIDGE

March 2023

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Document Revision History

Date	Version	Compiler/s	Reviewer/s
10/03/2020	Public Consultation Version	Dr Przemek Nalecki Dr Grazia Gargiulo	Melanie Fitzell Simon Garnett
01/03/2023	Public Consultation Version	Melanie Fitzell	Dr Przemek Nalecki Dr Grazia Gargiulo Dale Aaskow Simon Garnett

Executive Summary

The following is a revised Underground Water Impact Report (UWIR) completed for the purposes of meeting the requirements of Chapter 3 of the *Water Act 2000* (Qld). The report covers previous and proposed production testing activities on Authority to Prospect 744 (ATP 744) conducted by Comet Ridge. These activities include:

- a short- term production testing that occurred during 2013 at the Gunn 2 well (CSG well).
- a proposed five-spot pilot production test which is planned to commence on commission of the five-spot pilot scheme (referred to as Gunn Pilot); and
- a proposed short term production test of tight gas wells at the Albany Project site.

Since submission of the initial UWIR for ATP 744 (2014), Comet Ridge has not undertaken any further production testing at the Gunn 2 well. The proposed five-spot pilot has not been drilled at the time of writing this report, however the proposed pilot may be commissioned within the next three-year reporting period. The proposed Gunn Pilot design and forecasted production have not changed since the initial UWIR and therefore the modelling undertaken for the initial UWIR (2014) remains relevant for the next three-year reporting period and is covered in this report.

The Albany Project consists of two deep wells (Albany 1 ST1 and Albany 2) drilled respectively in 2018 and 2019 to test tight gas potential of the Lake Galilee Sandstone at the Albany Structure. The proposed short term production testing of Albany 1 ST1 and Albany 2 has not been undertaken at the time of writing this report, however the proposed production testing may commence within the next three-year reporting period. The forecasted the production has not changed for the Albany Project since the revised UWIR for ATP 744 (2020) and therefore the modelling remains relevant for the next three-year reporting period.

A review of hydrogeological data (from the GWDB and Baseline Assessments carried out in late 2020) has been undertaken to assess whether any new data warranted updates to the existing conceptual and numerical model presented in the 2020 UWIR for the Gunn Pilot or the Albany Project. The review determined that none of the hydrogeological data acquired since the 2020 UWIR would justify an update to the existing groundwater model. Also, none of the new hydrogeological data contradicts the previous findings.

The report provides:

- a description of the hydrogeological context of the area including description of the aquifers present and how they interact.
- an estimate of how much underground water will be required to be taken as result of the proposed production testing activities.
- an estimate of the groundwater level impacts as a result of the proposed production testing activities as determined through numerical groundwater flow models.
- a description of the predicted Immediately Affected Area (IAA) generated by the proposed production testing activities.
- a description of environmental values, the impacts that have occurred and the impacts that are likely to occur as a result of the exercising of underground water rights.

- a description of springs within the tenure and surrounding area.
- a monitoring strategy to verify modelling predictions and quantify impacts; and
- a reporting strategy back to the Department of Environment and Science (DES) should there have been a material change from predictions.

The key findings of the report for the Gunn Pilot are that:

- the shallow aquifers in the area are separated from the target coal seams by at least 300m of low permeability formation (Rewan Group);
- a small immediately affected area (IAA) is predicted **only** within the coal seam (C1 seam) being targeted.
- There are no water bores sourcing water from the coal seams of the Betts Creek beds within the IAA;
- There are no active landowner bores sourcing water from the Betts Creek beds located within ATP 744;
- The coal seams are the only formation predicted to have an IAA; as a result, no make good obligations are triggered;
- The C1 coal seam is the only interval predicted to experience drawdown during testing activities and no drawdown was predicted in the overlying or underlying aquifers or aquitards within the project area;
- No impacts on environmental values have been identified as a result of the previous or future exercise of underground water rights associated with the Gunn Pilot based on the current modelling results;
- There are five (5) active landholder bores within a 10km radius of the pilot, where water is being extracted from aquifers at least 440m above the coal seams;
- Only one active landowner bore is located within the IAA where water is sourced from the Moolayember Formation (at least 570m above the coal seams) for the purpose of stock watering; and
- There are no springs within ATP 744 or within 20km of the pilot, and none the nearest springs are sourcing water from the Betts Creek beds.

The key findings of the report for the Albany Project are that:

- The shallow aquifers in the area are vertically separated from the target formation the Lake Galilee Sandstone by over 2000m, within which at least 1000m is considered to be formations of low permeability (Rewan Group, Jericho Formation, silt layers within Betts Creek beds and Jochmus Formation);
- A small (~100m radius) immediately affected area (IAA) is predicted **only** within the Lake Galilee Sandstone which is the formation being targeted;
- There are no water bores sourcing water from the Lake Galilee Sandstone within the IAA;
- There are no known active landowner bores intersecting or sourcing water from the Lake Galilee Sandstone located within ATP 744 or anywhere else in the Galilee Basin;
- The Lake Galilee Sandstone is the only formation predicted to have an immediately affected area, meaning no make good obligations are triggered;

- The Lake Galilee Sandstone is predicted to experience drawdown only during testing activities and shortly thereafter. No drawdown was predicted in the overlying aquifers or aquitards within the project area;
- No impacts on environmental values have been identified as a result of the previous or future exercise of underground water rights associated with the Albany Project based on the current modelling;
- There are five (5) landholder bores within a 4km radius of the Albany Project (2 are unregistered bores), where water is being extracted from Moolayember Formation aquifer at least 2000m above the Lake Galilee Sandstone;
- There are no landowner bores located within the IAA where water is sourced from any of the overlying aquifers; and
- There are no springs within ATP 744 or within 15km of the Albany Project wells, and none of the nearest springs are sourcing water from the Lake Galilee Sandstone.

Overall, no material impacts to underground water resources are predicted as a result of the production testing activities planned in ATP 744. The monitoring strategy will ensure that realised groundwater changes align with predictions. As knowledge of the hydrogeology in the area expands, the models will be re-run with updated information and re-submitted to the DES.

Introduction

The *Water Act 2000* (Qld) (Water Act) requires petroleum tenure holders to manage impacts of extraction of underground water from their production testing or production activities. To assist in achieving this, petroleum tenure holders must prepare an Underground Water Impact Report (UWIR), which is used to proactively predict any possible impacts of the petroleum operations on underground water resources and implement monitoring and mitigation measures if necessary. An UWIR established responsibilities for resource tenure holders and ensures measures and programs are in place to respond to impacts on underground water.

The key aspects of an UWIR are:

- identify aquifers that are predicted to be impacted by resource tenure holders' exercising their underground water rights (immediately affected areas (IAA) and long term affected areas (LTAA)).
- establish obligations to monitor impacts on aquifers and springs.
- impose a strategy to mitigate impacts of any spring of interest, where required.
- assist with management of impacts of the exercise of water rights by resource tenure holders; and
- establish underground water obligations (make good obligations of the resource tenure holder for private water bores), where required.

An initial UWIR was prepared and submitted to the Department of Environment and Heritage Protection (DEHP) by Comet Ridge as operator of ATP 744. The initial UWIR was approved and took effect on 3 April 2014. Two subsequent reports were prepared, submitted, and approved and covered reporting periods 2017 to 2020 and 2020 to 2023. This UWIR is relevant for the next reporting period from 2023 to 2026.

As required under the *Water Act 2000 (Qld)*, during this period Comet Ridge will undertake annual reviews of the model drawdown predictions presented in this report. A summary of those reviews will be presented to Department of Environment and Science (DES) and where applicable will provide detail on how actual drawdown (if any) deviates from model predictions presented in this report.

This UWIR provides information about the relevant underground water extractions and the potential impacts on aquifers within ATP 744 in relation to any future production testing of a proposed five-well pilot program called the Gunn Pilot and future short term production testing of two tight gas wells known as the Albany Project.

The initial UWIR proposed the five-spot pilot would be operational in late 2014. The proposed five-spot pilot has not been drilled or constructed at the time of writing this report, however Comet Ridge may commit to the development of the pilot, which may occur within the next three-year reporting period. The arbitrary start date for commencement of production of the Gunn Pilot is assumed to be 1 October 2023 for the purposes of this report for the next three-year reporting period.

Production testing has not commenced at the Albany Project at the time of writing of this report and no production testing has occurred in the last three-year reporting period. Comet Ridge may commit to recommencement of operations at the Albany Project in the next three-year reporting period. The start of the production testing is assumed to be 1 July 2023 for the purposes of this report for the next three-year reporting period.

Project Area

ATP 744 is located along the eastern margin of the Galilee Basin in central Queensland and is approximately 90km northeast of Aramac (**Figure 1**). ATP 744 is held 100% by Comet Ridge Galilee Pty Ltd.

Three Potential Commercial Areas (PCA320, 321 and 322) a have been declared over the permit area. The initial 12-year permit term concluded on 31 October 2021, at which time 661 sub-blocks were relinquished from ATP 744. The permit was renewed by the Department of Resources (DoR) for a second 12-year term commencing 9 September 2022.

The permit is prospective for coal seam gas and conventional gas resources. The deeps section of the ATP is subject to a farm-in agreement with Vintage Energy Ltd to facilitate exploration of the deeper conventional and tight gas resources and defined as all strata commencing underneath the Permian coals (Betts Creek beds or Aramac Coal Measures coals). Comet Ridge maintains 100% equity of the coal seam gas targets.

Purpose

This UWIR has been prepared to describe the hydrogeological context of the project areas and predict the impacts on underground water associated with the proposed Gunn Pilot and Albany Project. A hydrogeological conceptualisation has been prepared to assist in understanding the aquifers in the project area. Numerical models have been prepared to predict groundwater impacts expected as a result of the proposed production testing at the proposed project locations. This UWIR also proposes a monitoring strategy to compliment and verify the groundwater modelling. The monitoring strategy will also be used to quantify any possible impacts and be used to refine future groundwater models.

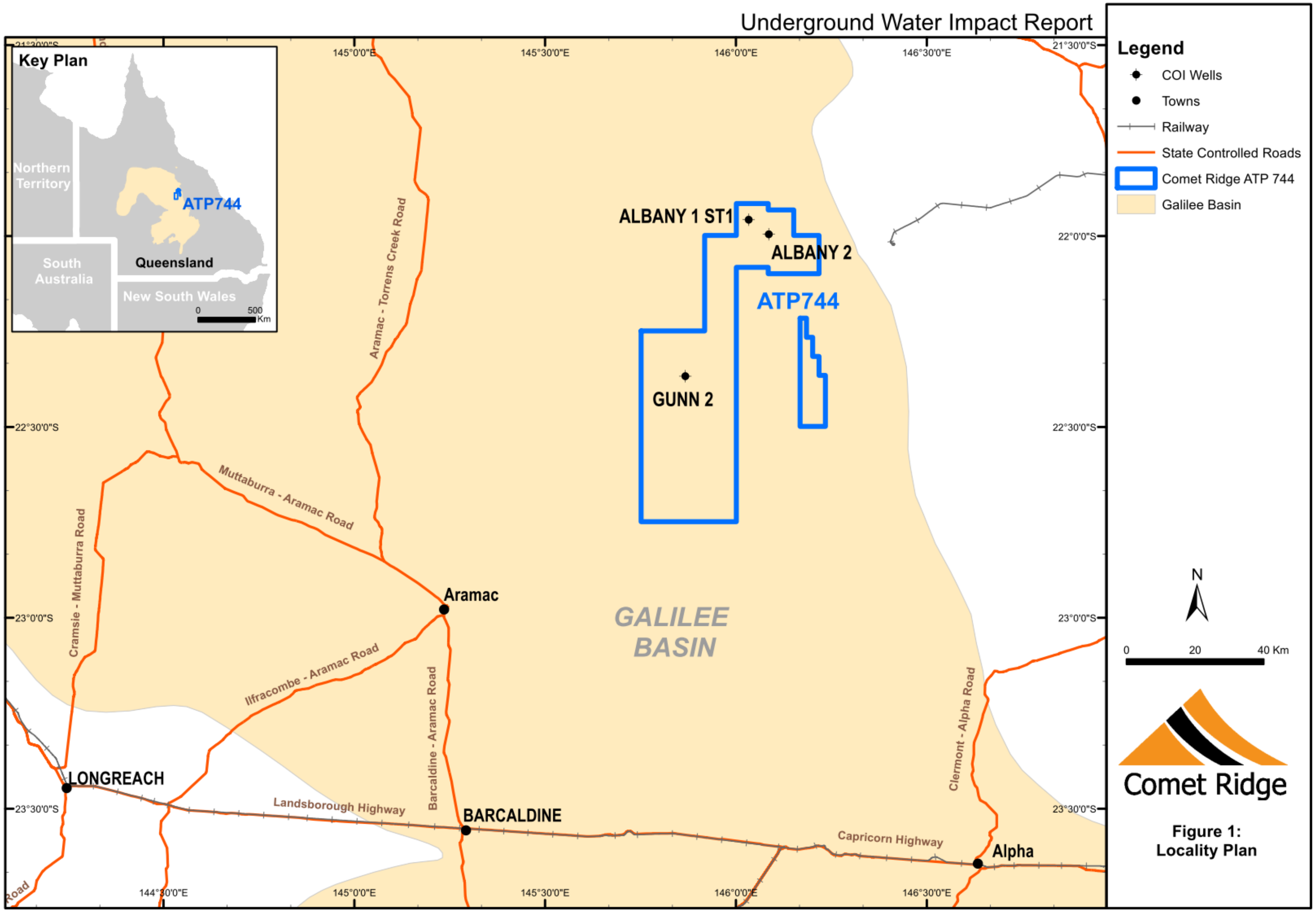

Figure 1: Locality Plan

Legislation

A UWIR is developed to document compliance with sections 370 to 383 of the *Water Act (2000)*. This UWIR has also been developed following the requirements outlined in the Guideline: Underground water impact reports and final reports (ESR/2016/2000), Version 3.03, prepared by DES.

Primary Queensland legislation that governs the management of resources including groundwater, with exploration and appraisal activities on ATP 744 are summarised below.

Petroleum and Gas (Production and Safety) Act 2004

Under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) the petroleum tenure holder may take or interfere with groundwater to the extent that it is necessary and unavoidable during the course of an activity authorised for the petroleum tenure. P&G Act requires tenure holders to comply with underground water obligations specified in the Water Act.

Water Act 2000

In terms of the management of impacts on underground water caused by the exercising of underground water rights by petroleum tenure holders, the requirements of the Water Act are achieved by:

- Requiring petroleum tenure holders to monitor and assess the impact of the exercise of underground water rights on water bores and to enter into 'make good' agreements with the owners of the bores
- The preparation of UWIRs that establish underground water obligations, including obligations to monitor and manage impacts on aquifers and springs;
- Establishing a management framework overseen by the Office of Groundwater Impact Assessment (OGIA) which addresses cumulative underground water impacts from multiple tenure holders in an area (e.g. the Surat Cumulative Management Area).

The Water Act gives OGIA other functions and powers for managing underground water. If a water bore has an impaired capacity as a result of gas extraction activities, an agreement will be negotiated with the owner of the bore about the following:

- The reason for the bore's impaired capacity.
- The measures the holder will take to ensure the bore owner has access to a reasonable quantity and quality of water for the authorised use and purpose of the bore; and
- Any monetary or non-monetary compensation payable to the bore owner for impact on the bore. If an agreement relating to a water bore is made the agreement is taken to be a 'make good' agreement for the bore.

The UWIR is required to define the IAA expected to result from gas extraction activities. An IAA is defined as an area where the predicted drawdown within 3 years is at least:

- 5 m for a consolidated aquifer.
- 2 m for an unconsolidated aquifer; or

- 0.2 m for a spring.

UWIRs are published to enable the community, including bore owners and other stakeholders, within the relevant area, to make submissions on the UWIR. Submissions made by bore owners will be summarised by Comet Ridge, addressed as appropriate and provided to the Department of Environment of Science (DES). UWIRs are submitted for approval by DES. The OGIA may also advise DES about the adequacy of these reports. The UWIR must then remain available on the petroleum tenure holder's website.

The OGIA will maintain a database of information collected under monitoring plans carried out by petroleum tenure holders in accordance with approved UWIRs. The database will also incorporate baseline assessment data collected by petroleum tenure holders.

Public Consultation

A full 20 business day consultation process is required to be run. Submissions may be made by bore owners and other stakeholders. Comet Ridge will consider all submissions and prepare a submissions summary to the DES together with the UWIR.

A public consultations notice will be prepared and circulated containing the following information:

- a description of the area to which the report relates.
- where copies of the report may be obtained
- how the copies may be obtained.
- how written submissions on the report may be given.
- that submissions must be given to the responsible entity.
- that a copy of submissions must be given to the chief executive.
- the day by which submissions may be made, that is at least 20 business days after the notice is published; and
- where the submissions may be given.

Consultation will be undertaken for a minimum of 20 business days and the final UWIR will be submitted within 10 days of the three years anniversary date of the initial UWIR. Comet Ridge will provide a copy of the report to any person who requests a copy.

Geological Summary

Galilee Basin

The Galilee Basin covers approximately 247,000 km², extending 700 km from Charleville in the south to near Charters Towers in the north and 550 km from Emerald in the east to Julia Creek in the northwest. The major population centre of Longreach is located to the south of the basin centre. Land use within the Galilee Basin is predominantly sheep and cattle grazing. Refer to **Figure 2** for the extents of the Galilee Basin.

Geological Setting

The Late Carboniferous to Middle Triassic Galilee Basin (**Figure 2**) is an intracratonic, dominantly fluvial, basin that extends over an area of approximately 247,000km² in central Queensland. The following structural and depositional overview has primarily been summarised from Hawkins and Green (1993).

The Galilee Basin is generally divided into northern and southern areas by the east-west Barcaldine Ridge. Up to 3,000m of dominantly fluvial sediments have been deposited within three main depocentres; the Koburra Trough in the east, the Lovelle Depression in the west and the Powell Depression in the south. ATP 744 lies within the eastern part of the Koburra Trough.

The basin unconformably overlies the Late Devonian – Early Carboniferous Drummond Basin in the east, Devonian Adavale Basin in the south and terminates against shallow basement rocks including the Proterozoic Mount Isa Inlier in the northwest, the Early Palaeozoic Lolworth-Ravensworth Block in the northeast and early Paleozoic Maneroo Platform in the south (Hawkins and Green, 1993). Strata from the Galilee Basin is exposed along the eastern and north-eastern margin. Elsewhere the basin is unconformably overlain by Jurassic-Cretaceous sediments of the Eromanga Basin. The Eromanga Basin is largely absent over the area of ATP 744. The Late Permian-Middle Triassic strata of the Galilee Basin is continuous with the Bowen Basin across the Springsure Shelf and Nebine Ridge in the south.

Basin initiation occurred when crustal extension during the Late Carboniferous reactivated older faults in underlying basins. Quartz-rich braided-stream sediments (Lake Galilee Sandstone) were initially restricted to the Koburra Trough in east. By the Early Permian widespread fluvial and lacustrine sedimentation (Jochmus and Jericho Formations) had extended to the other depocentres in the south and west. Widespread development of peat swamps resulted in the deposition of the Aramac Coal Measures in the western part of the Koburra Trough and Lovelle Depression.

E-W compression at the end of the Early Permian resulted in reverse fault movement, uplift and erosion resulting with a basin-wide mid-Permian unconformity. Thermal subsidence and subsequent foreland loading during the Late Permian led to widespread deposition of coal-bearing sediments of the Betts Creek beds across the northern part of the basin, while distal fluvial-deltaic, coastal plain and shallow marine sediments (Bandanna Formation, Colinlea Sandstone and Black Alley Shale) were deposited in the south. Widespread fluvial sedimentation (Rewan Group) continued to be deposited into the Early Triassic. Uplift during the Middle Triassic led to deposition of quartz-rich braided stream sediments (Clematis Group, Warang Sandstone) and widespread fluvial and lacustrine sediments

(Moolayember Formation). Sedimentation ended with an E-W compressional event during the Late-Triassic. Folding, uplift and widespread erosion resulted in a basin wide mid-Triassic unconformity at the top of the Galilee Basin sequence.

Coal development within the Galilee Basin is limited to the Permian. There are two major coal-bearing units within the basin; the Early Permian Aramac Coal Measures and the Betts Creek beds. The Aramac Coal Measures are restricted to the western Koburra Trough and Lovelle Depression. The Aramac Coal Measures have not been intersected in any exploration wells drilled within ATP 744, indicating the extent is restricted to west of the tenure area. The Late Permian Betts Creek beds are widespread throughout the northern part of the basin. The Betts Creek beds are equivalent to the Bandanna Formation in the Bowen Basin. The Aramac Coal Measures and Betts Creek beds are separated by the mid-Permian unconformity. The stratigraphy of the Galilee Basin is shown in **Figure 3**.

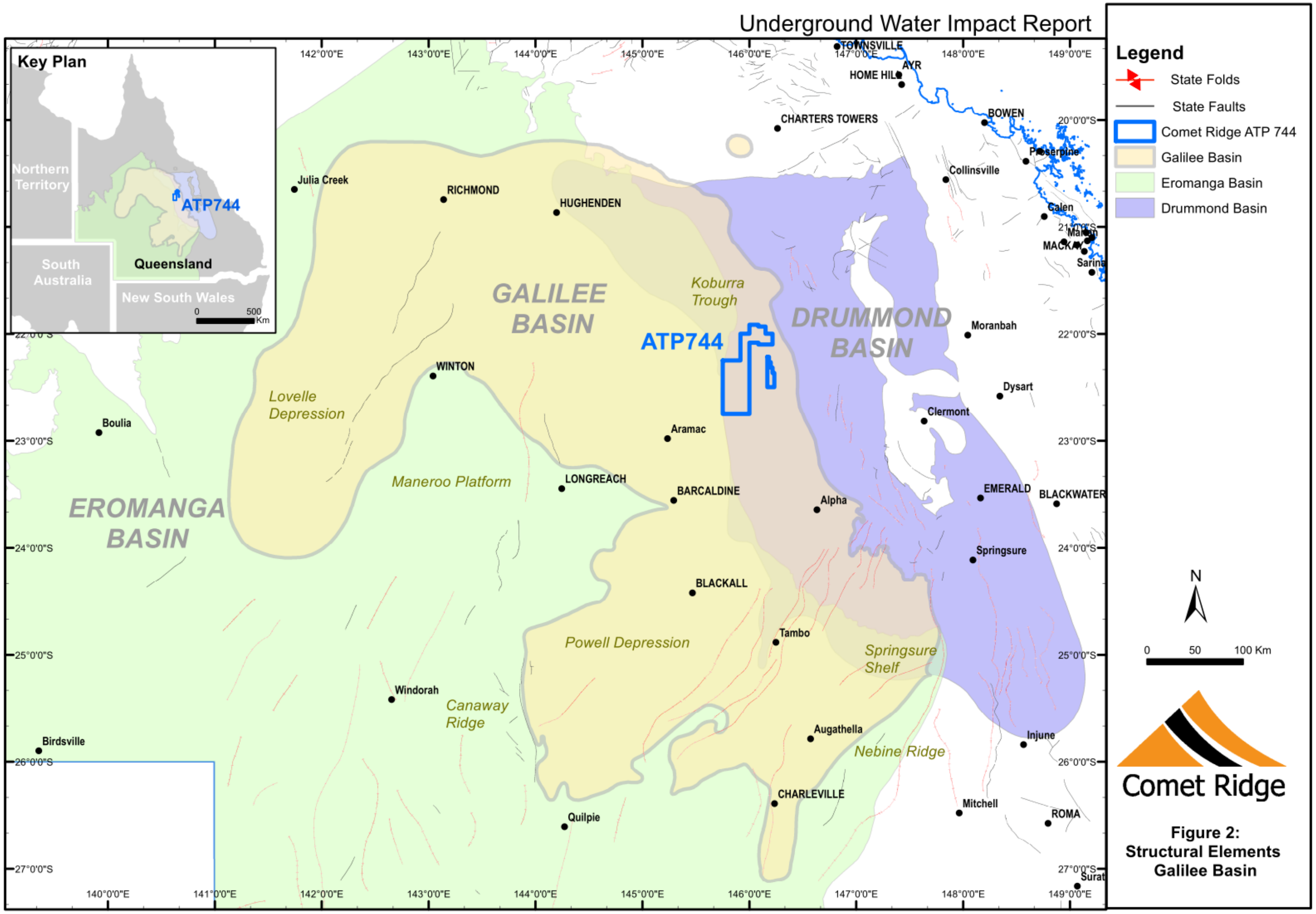

Figure 2: Structural Elements of the Galilee Basin.

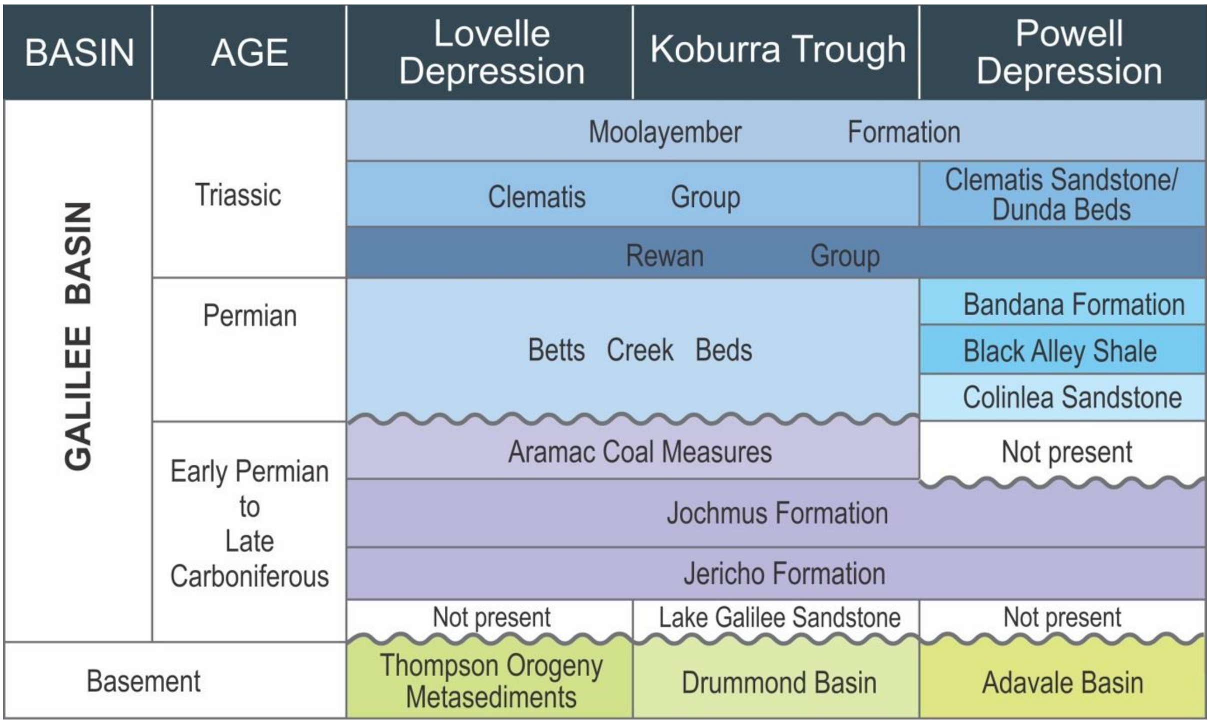

Figure 3: Stratigraphy of the Galilee Basin.

ATP 744 Geology

ATP 744 is located in a geologically and hydrogeologically diverse area. The tenure area is located across the Koburra Trough, which is the most significant structure in the north-eastern part of the basin (**Figure 2 & 3**).

The surface geology of the permit contains widespread Quaternary alluvium and Tertiary sediments that surround outcropping Triassic aged sediments of the Galilee Basin. The Dundas Beds (correlative equivalent to Clematis Group) crop out along the basin margin to the east of ATP 744. The Moolayember Formation and Clematis Group crop out over the Albany Structure in the central part of the tenure area. Betts Creek beds sub crop along the margin of the Galilee Basin and outcrop in small patches along the basin margin.

The Aramac Coal Measures are not present within the permit area. The Jochmus Formation, Jericho Formation and Lake Galilee Sandstone are subsurface only. Drummond Basin sediments crop out to the north-east of the tenure area to the east of the margin of the Galilee Basin. Eromanga Basin sediments are absent from the tenure area and crop out to the west of the tenure area boundary (**Figure 4 & 5**)

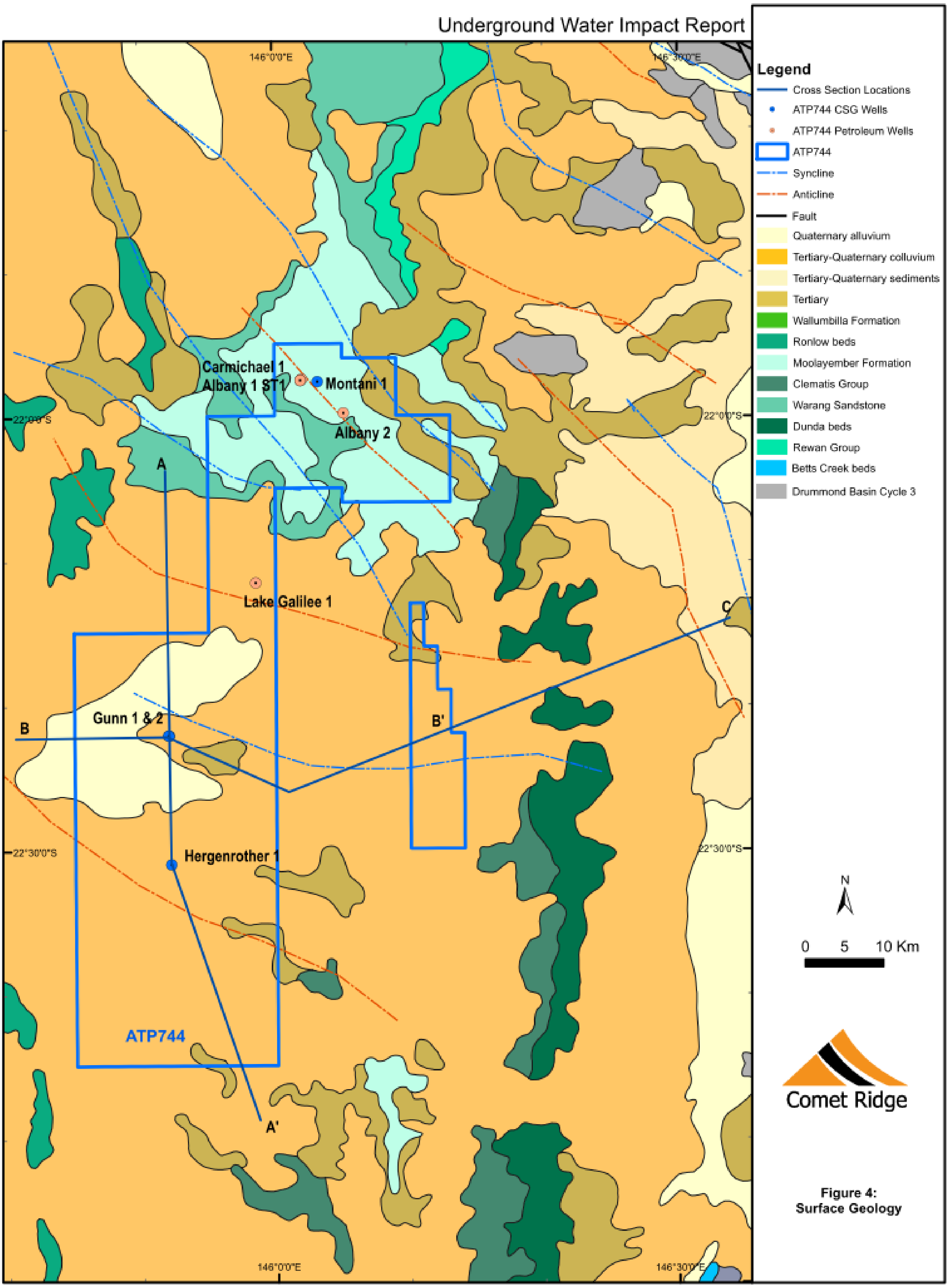

Figure 4: Surface geology map of ATP 744, showing locations of schematic cross-sections.

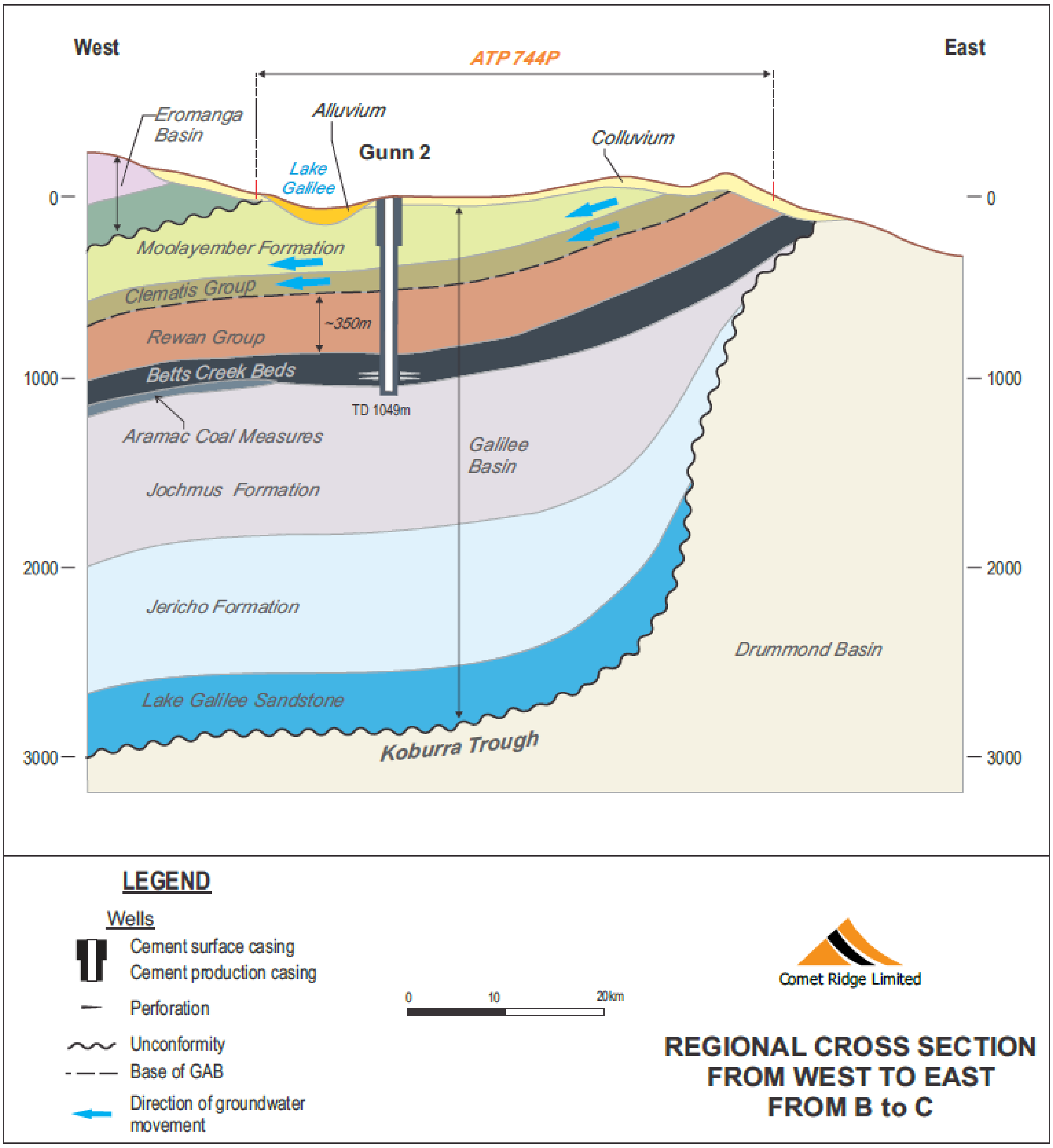

Figure 5: Regional schematic geological cross-section B-C from west to east across ATP 744

Report Structure

This report is divided into two major sections. Each section addresses separately the proposed pilot projects – Gunn Pilot and Albany Project. The two projects are different in nature and are planned to be developed in distinctively different geological and hydrogeological settings with no known or expected hydraulic connectivity between them. For the ease of addressing UWIR requirements, each section is constructed to form a complete report on its own. Some figures presented in this report relate to both projects.

For each part, the report contains:

- Project Information
    - Target Formation
    - Geological Structure
    - Project Description
- Part A: Underground Water Extraction
- Part B: Aquifer Information and Underground Water Flow and levels
- Part C: Groundwater Modelling
- Part D: Environmental Values
- Part E: Groundwater Monitoring
- Part F: Spring Impact and Management

GUNN PILOT PROJECT

Target Formation

The target formation for coal seam gas exploration within ATP 744 is the Betts Creek beds. The Betts Creek beds predominantly comprise high volatile bituminous coal seams that are interbedded with mudstone, siltstone, sandstone, and carbonaceous shale. Seven coal seams have been interpreted within the Betts Creek beds within the tenure area including the A, B, C, C1, D, D1 and E seams (**Figure 6)**. The Betts Creek beds sub-crop to the east of ATP 744. Depth to top of the Betts Creek beds ranges between 600m to 1000m within the permit area. Net thickness of coal seams range between 15 and 24m. The Betts Creek beds gradually deepen to the west across the permit area.

The target seam for the Gunn Pilot is the C1 seam only. The C1 target seam has a net thickness of 3 to 8m with an average gas content >4.0m^3/t on a dry ash free basis. In the vicinity of the proposed pilot coal seams are greater than 800m in depth (**Figure 7**).

The Early Triassic aged Rewan Group conformably overlies the Late Permian Betts Creek beds. The Betts Creek beds unconformably overly the Early Permian Jochmus Formation. The Rewan Group mainly comprises low permeability red to green mudstone sandstone and minor volcanilithic conglomerate and is a regional significant confining unit (RPS, 2012). The Rewan Group is over 300m in thickness in the vicinity of the proposed pilot program which confines and separates the Betts Creek beds from the locally significant Triassic aquifers of the Clematis Group and Moolayember Formation. (**Figure 8**)

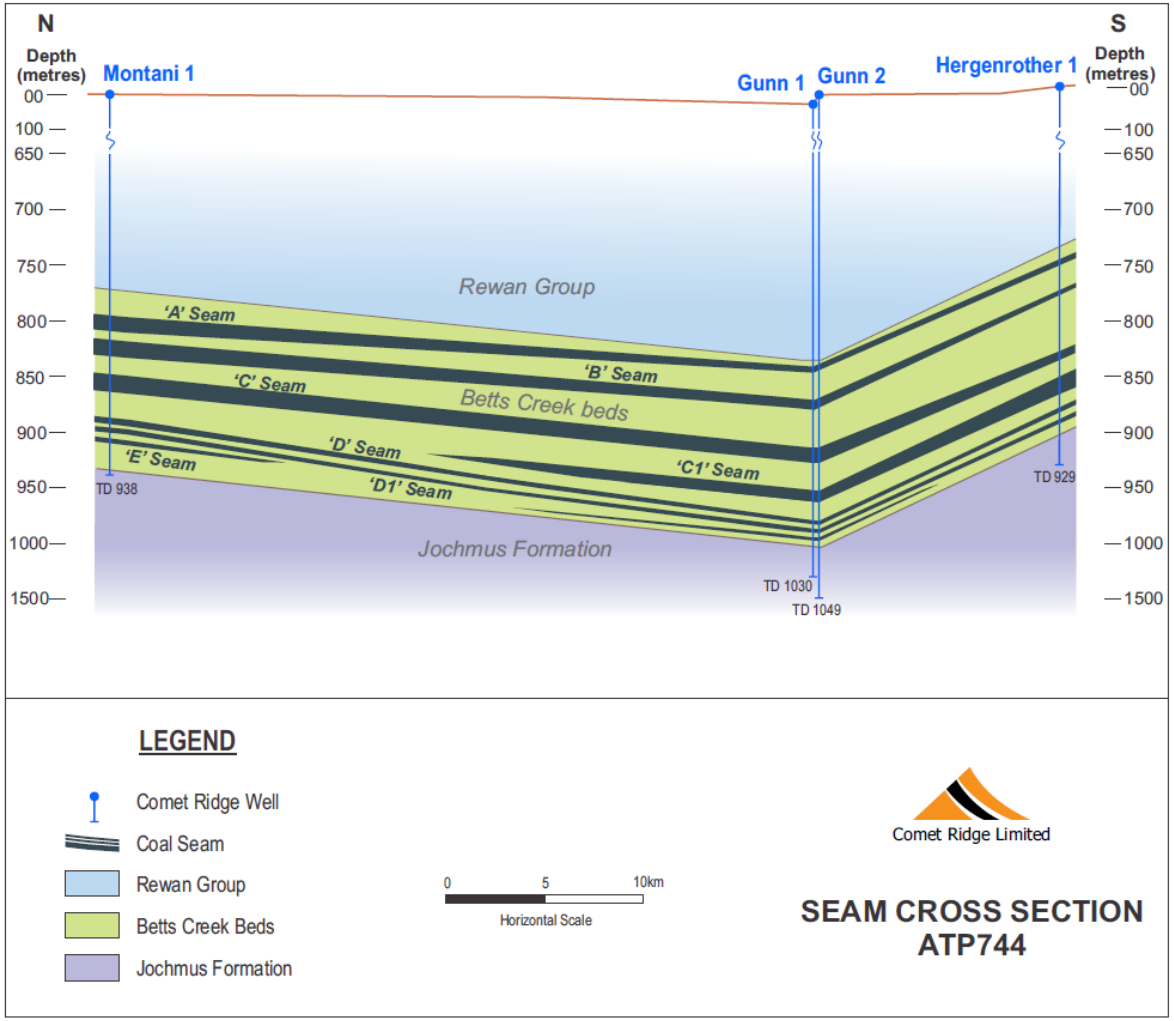

Figure 6: Schematic cross-section of coal seams within the Betts Creek beds in ATP 744

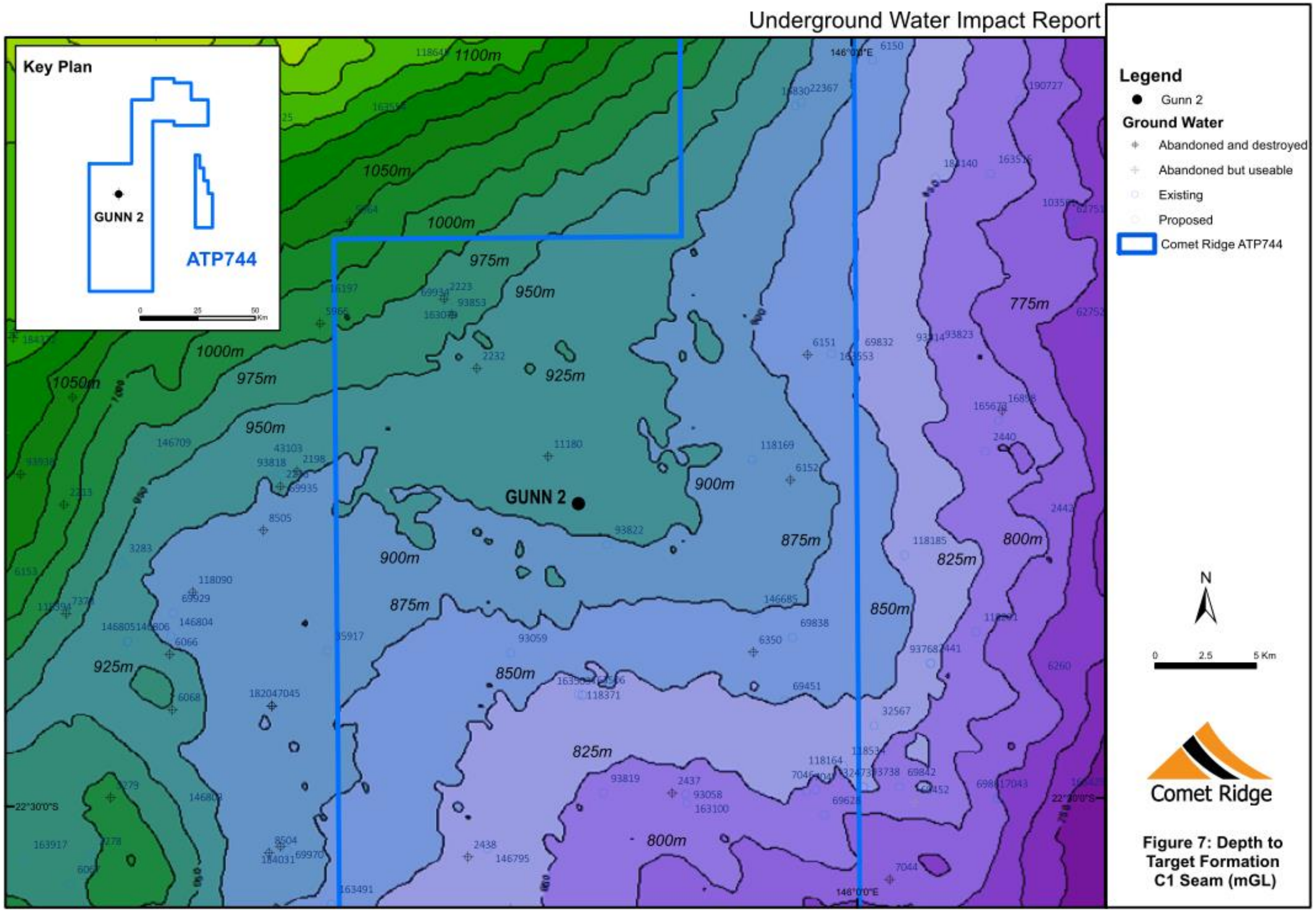

Figure 7: Depth (mGL) to top of CSG target formation, C1 seam.

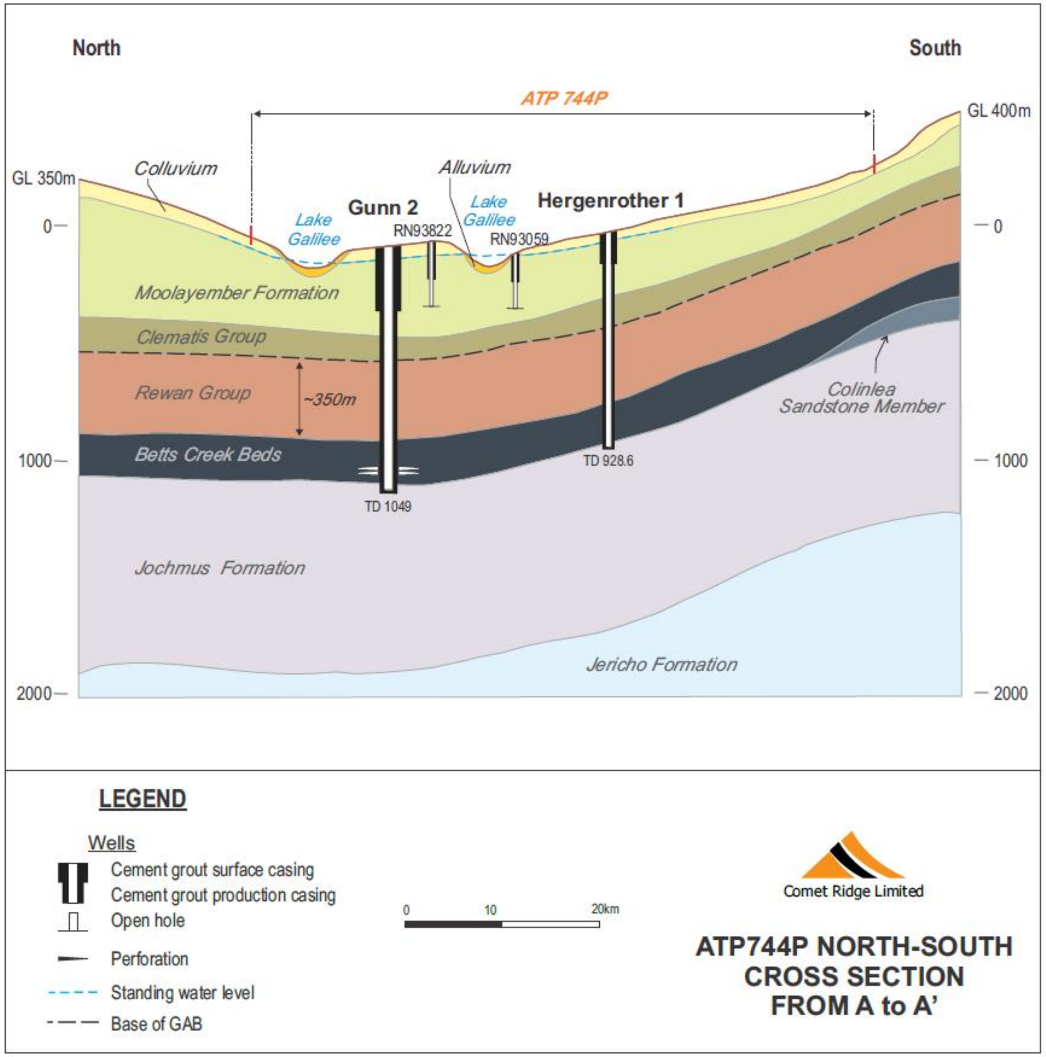

Figure 8: Schematic cross section from north to south across ATP 744 showing Rewan Group separating underlying Betts Creek beds from overlying Clematis Group and Moolayember Formation by >300m.

Geological Structure

A series of NW-SE trending anticlines and synclines have been mapped on seismic surveys across the permit area and minimal faulting is observed on surface mapping (**Figure 4**). Faulting interpreted on seismic surveys is primarily associated with basement rocks of the Drummond Basin (**Figure 10**). Significant structural features have been mapped outside the permit area to the north-east (**Figure 4 & Figure 10**).

Structuring associated with the Late Permian coal measures is generally broad and low relief and is associated with compressional events occurring during the mid–late Triassic. The Gunn 2 well is located on the north-eastern flank of a broad anticlinal structure named the Hergenrother Nose (**Figure 7**).

In the vicinity of the proposed pilot there is very little structure seen on seismic surveys. Small scale faults are associated with the Betts Creek beds, however these are interpreted to be confined to the coal seam interval and are not interpreted to extend into the overlying Triassic aquifers or underlying sediments (**Figure 9**).

There are no mapped large scale faults to suggest connection between the Betts Creek beds interval with overlying Triassic aquifers of the Clematis Group or Moolayember Formations in the vicinity of the proposed Gunn Pilot (**Figure 9**).

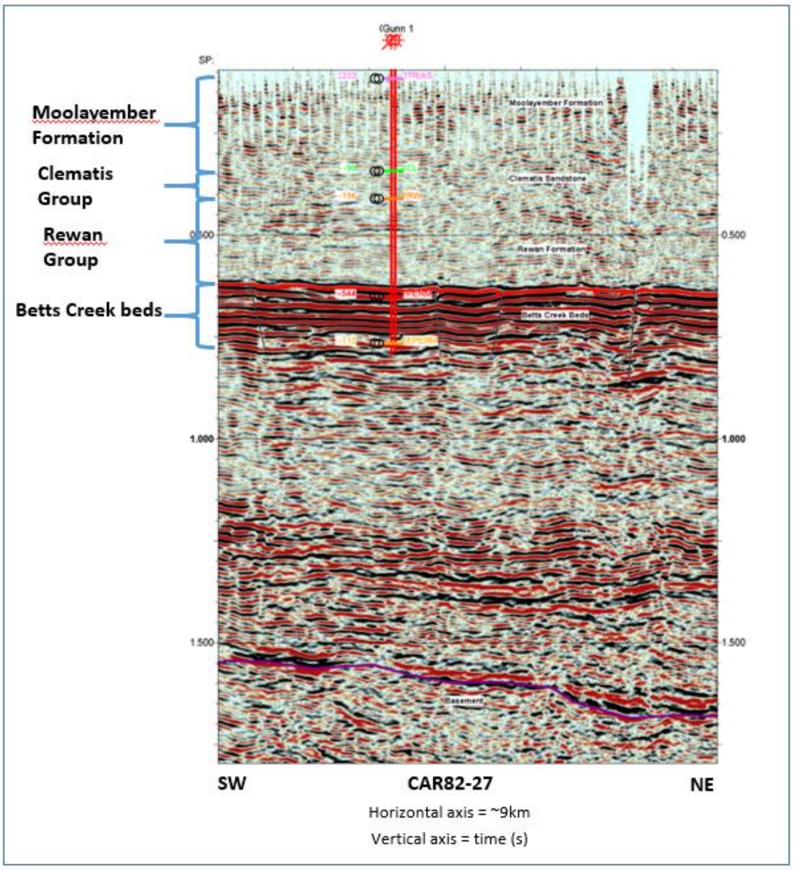

Figure 9: Northeast striking seismic line in vicinity of Gunn # 2 (Carmichael SS CAR82-27)

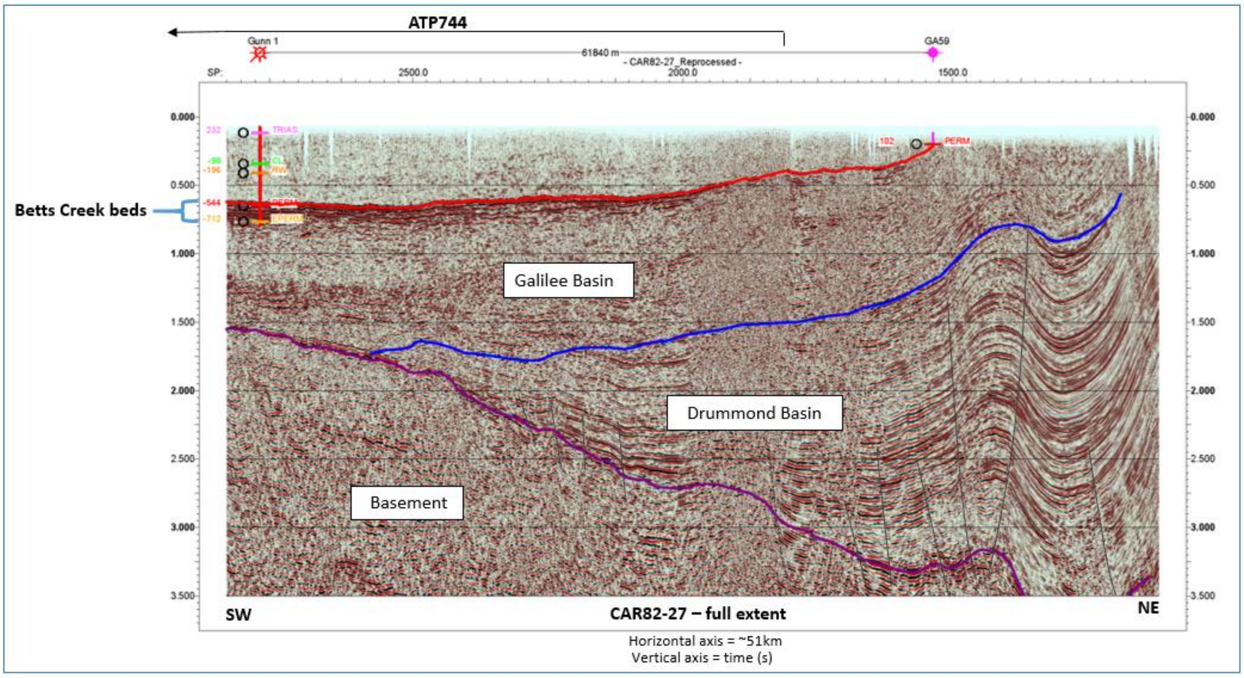

Figure 10: Northeast striking seismic line showing minimal structure and faulting within permit area (Carmichael SS CAR82-72)

Project Description

Activities during the initial period of tenure focussed on exploration, appraisal and delineation of coal seam gas resources within the Betts Creek beds. Exploration activities included four (4) coal seam gas exploration wells, one (1) coal seam gas appraisal well and acquisition of 252km of 2D seismic (2011 Gunn 2D Seismic Survey). As a result of this exploration the Gunn Project Area has been defined in the south-western leg of ATP 744 (**Figure 11**)

In late 2012, Comet Ridge drilled and completed the Gunn 2 appraisal well located approximately 70m west of Gunn 1 exploration well (**Figure 11**). Gunn 2 was drilled as a twin to the Gunn 1 to undertake additional flow testing of coal seams within the Gunn Project Area. Four (4) intervals were tested including two (2) intervals that had not been previously tested. All four (4) intervals demonstrated good to very good permeability.

Gunn 2 was drilled to total depth of 1049m and intersected 16.2m of net coal within the Betts Creek beds. The depth to the top of the Betts Creek beds was 835.5mRT. Six (6) individual coal intervals were intersected including A, B, C, C1, D and D1 seams.

The completion style for the well was designed to isolate the coal seams from overlying and underlying permeable sandstones within the Betts Creek beds and isolate overlying sandstone aquifers within the Clematis Group and Moolayember Formation from the Betts Creek beds. This completion also allowed perforation of the C1 seam to ensure water was only produced from the C1 seam interval.

The completion diagram for Gunn 2 is shown in **Figure 12**.

Coal seams within the Betts Creek beds are inter-bedded by sandstones and impermeable mudstones. Some sandstone intervals within the Betts Creek beds have shown to be permeable and comprise formation water.

Aquifers within the Clematis Group comprise one of the groundwater sources for livestock watering in the region. The Clematis Group is separated (>300m) from the underlying Betts Creek beds by a regionally significant confining unit, the Rewan Group (**Figure 8**).

The C1 seam was intersected between 950.2 and 956.8m and is bounded above and below by impermeable mudstone. The well was perforated over a four-meter interval from 952.5 to 956.5m to ensure that water was only being produced from the C1 seam reservoir (**Figure 12**).

The well was completed using industry standards and in compliance with Department of Natural Resources, Mines and Energy (DNRME), *Code of practice for the construction and abandonment of petroleum wells and associated bores in Queensland*, with steel casing from surface to 1042.57mDT which has been pressure sealed with cement to surface. Gunn 2 completion technique has allowed:

- Triassic aquifers to be isolated behind steel casing which has been pressure sealed with cement.
- isolation of the C1 coal seam from overlying and underlying intra-bedded permeable sandstone and other coal seams within the Betts Creek beds and
- Perforation of the C1 coal seam only to ensure water was only produced from this coal interval.

A cement bond log was run after cementing was completed to evaluate the integrity of the cement with the casing of the well. The cement bond log confirms the cement job in Gunn 2 has resulted in complete isolation of the Betts Creek beds from the Clematis Group and Moolayember Formation.

An extended production test was carried out on Gunn 2 between January and February 2013 and September and October 2013. The objective of the production test was to provide information on the completion methodology for a full pilot scheme and to obtain good quality water samples from the Betts Creek beds target coal.

The proposed Gunn Pilot will consist of five (5) vertical wells (**Figure 13**). All the wells are planned to be completed in the same style as Gunn 2. The C1 seam will be perforated and isolated from all other intervals allowing water and gas production from this interval only. Commissioning and water production from the proposed five-spot production pilot is expected to commence on completion of the drilling and construction of the pilot. Numerical modelling for the proposed future five spot pilot has been assigned an assumed production start date of 1 October 2023 for this reporting period. The underground water impacts of both the completed production testing on Gunn 2 and the proposed five-spot pilot have been simulated and are considered in this report.

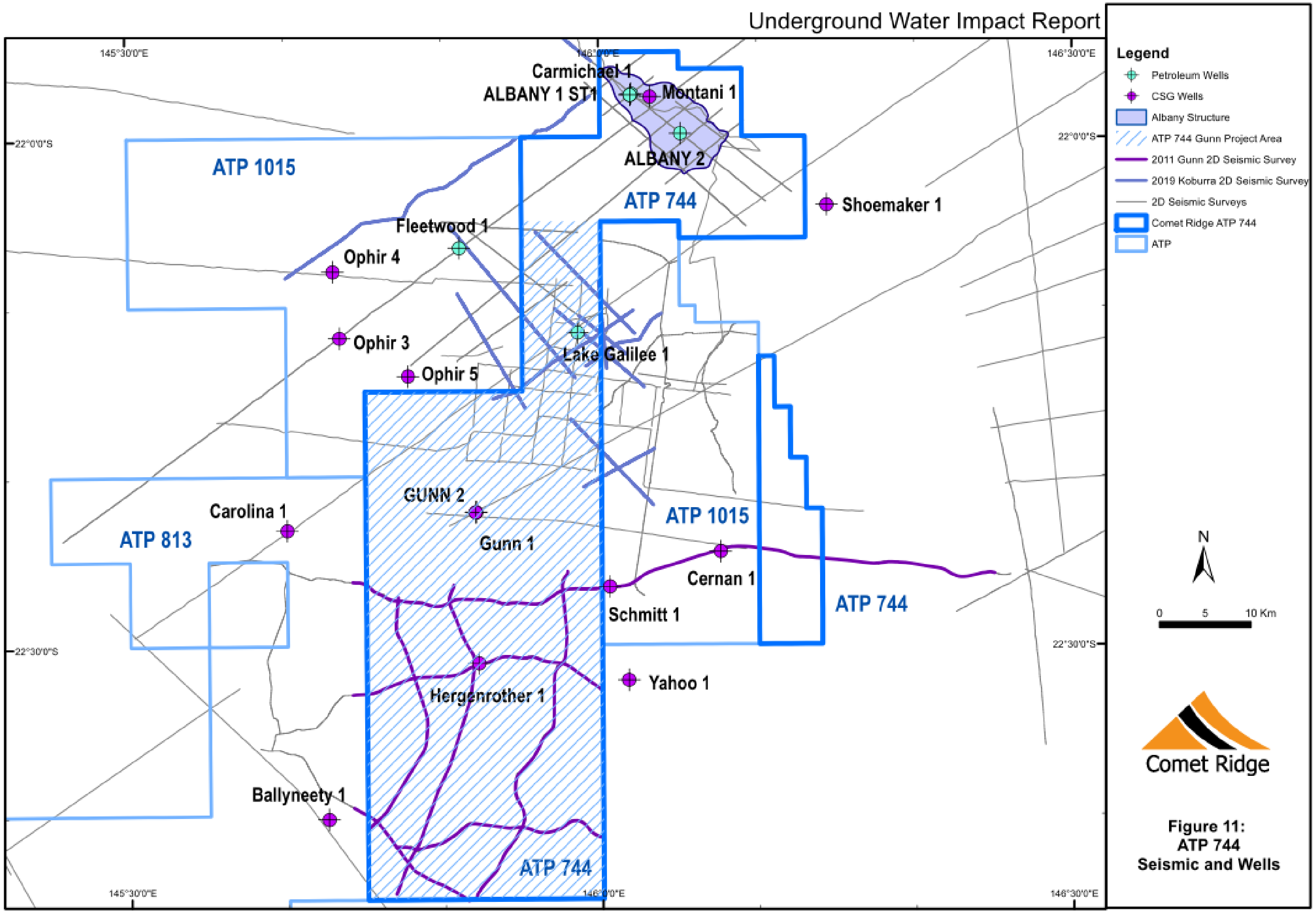

Figure 11: ATP 744 showing Gunn Project Area, Albany Structure, seismic and wells.

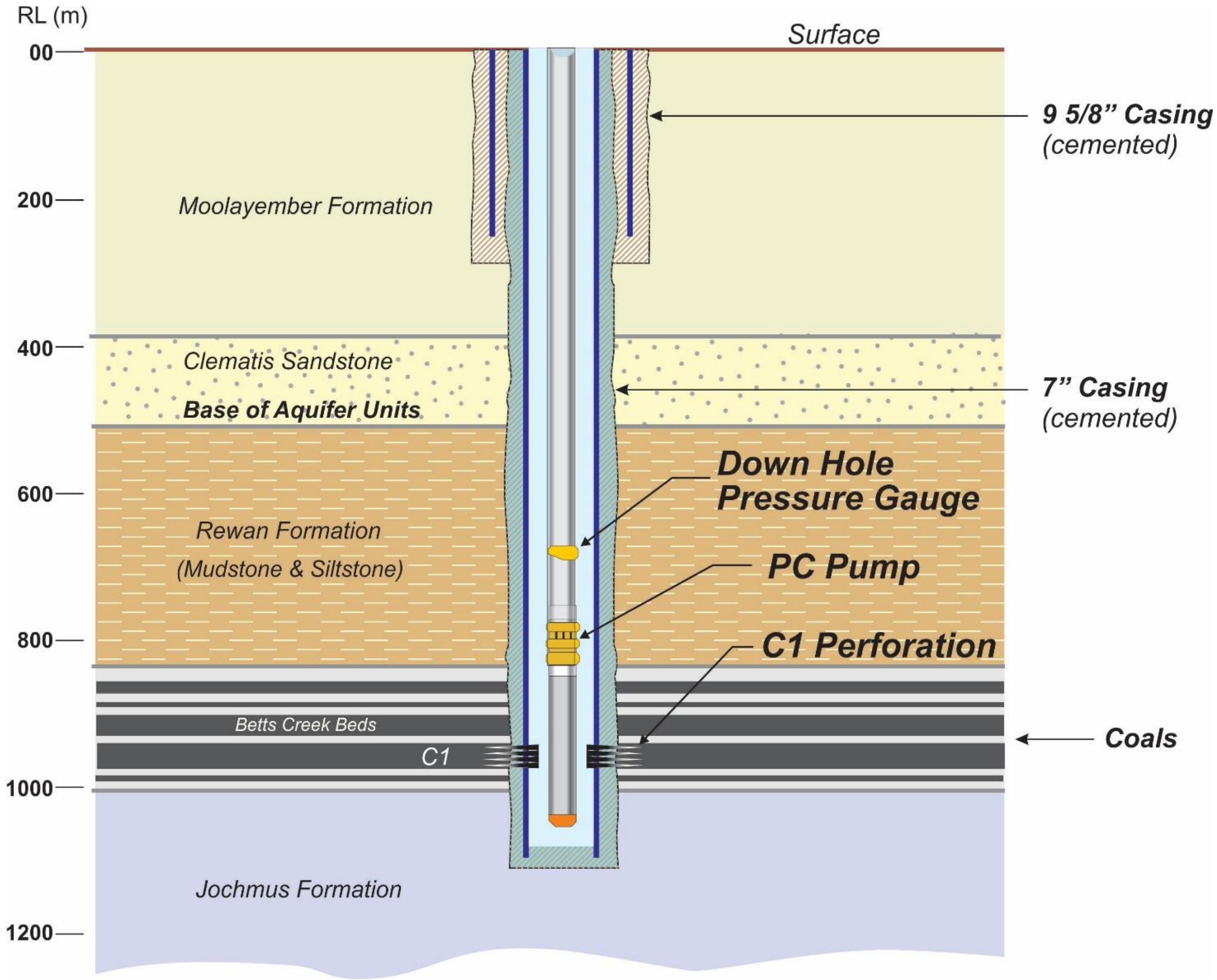

Figure 12: Gunn 2 production well completion design.

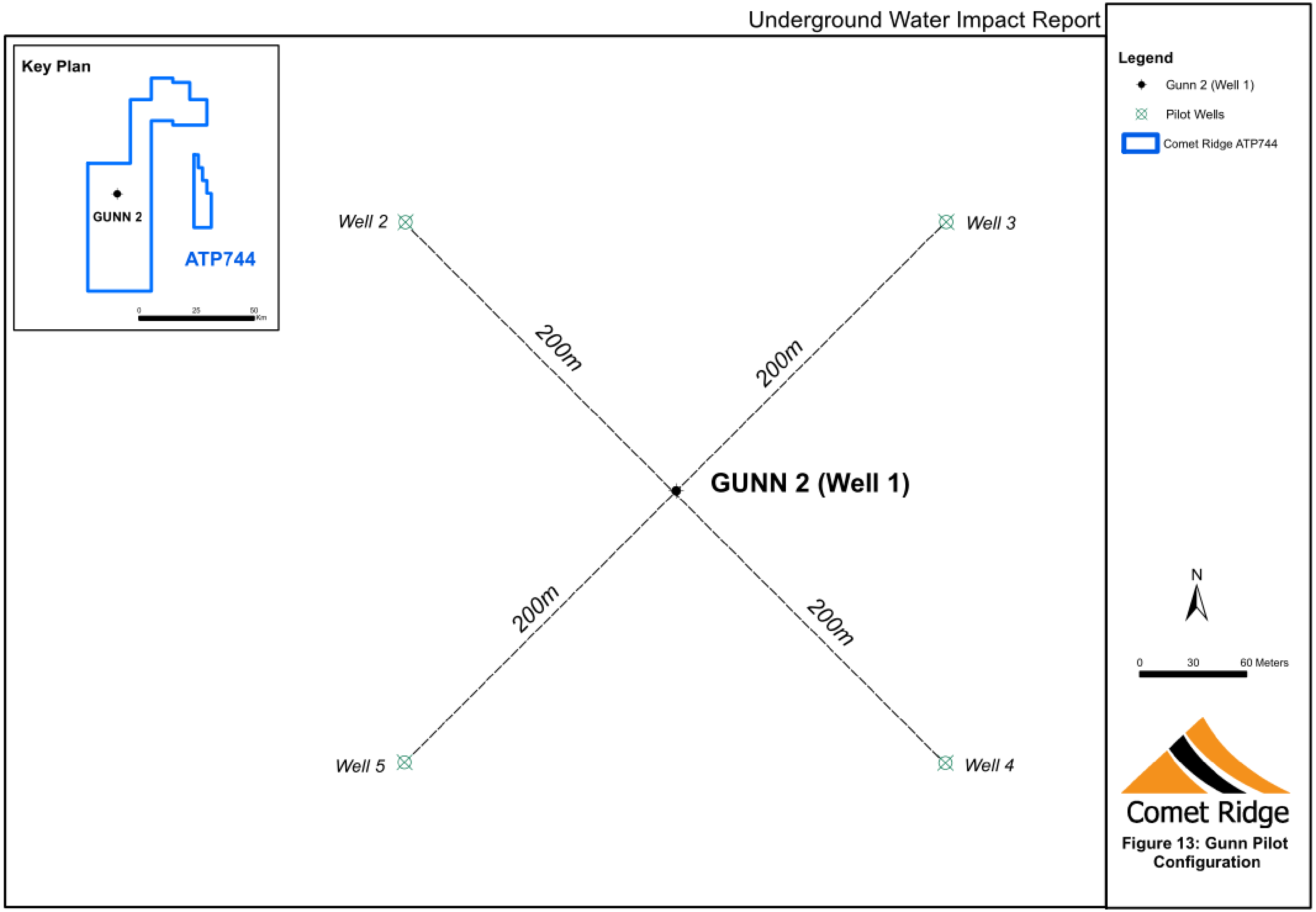

Figure 13: Proposed configuration of Gunn Pilot

Part A: Underground Water Extraction

Gunn 2 EPT – Quantity of Water Already Produced

To date, production testing from the C1 coal seam of the Betts Creek beds at Gunn 2 has occurred over two periods. Water was extracted using a progressive cavity pump (PCP) set at 969.95m which was powered by a diesel generator at the surface. The volume of water produced from the well was measured using a magnetic flow meter that measured and recorded volume in barrels per day and provided a cumulative volume. This data was relayed in real time via telemetry. In addition, down hole pressure monitoring was carried out which allowed an accurate understanding of water level and therefore drawdown of the targeted seam.

Total water extracted was as follows:

- 11 January 2013 to 16 February 2013 - 8,609bbls or 1.37ML
- 9 September 2013 to 16 October 2013 - 7,553bbls or 1.2ML

Average water production was 0.034ML per day during the first production period. Total water production over both testing periods (total 81 days) was 2.57ML. During the initial testing period the water rate progressively increased over a period of several weeks, with the well reaching a stabilised production rate of approximately 400bbls/day (0.064ML/day) (**Figure 14**). Down hole pressure mimicked the water level trends during the production test. As the pump speed was increased water produced increased and standing water levels deceased as did bottom hole pressures.

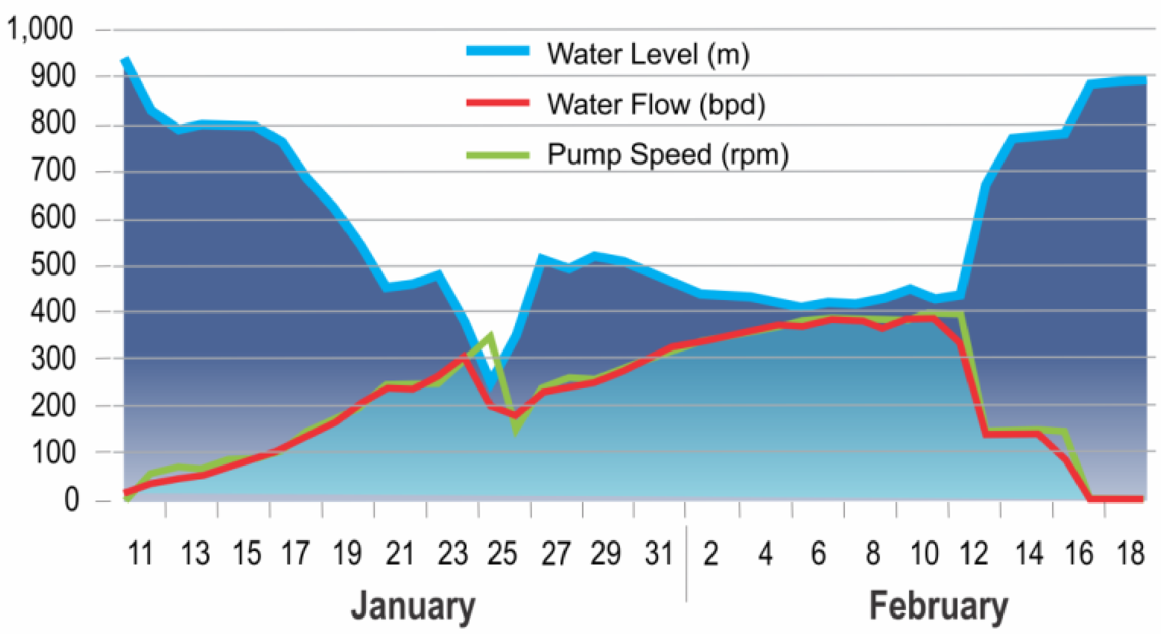

Figure 14: Gunn 2 extended production test 11 January 2013 to 16 February 2013-water level (m), water flow (bpd) and pump speed (rpm).

Gunn Pilot Reservoir Modelling – Quantity of water estimated to be produced over the next three years.

A reservoir simulation model for the proposed Gunn Pilot has been completed by Comet Ridge to forecast gas and water production of the proposed pilot.

The key objectives of the simulation model were twofold:

- History matching of the Gunn 2 extended production test.
- To predict future gas and water production rates for the proposed five-spot Gunn Pilot.

The reservoir modelling was conducted using Computer Modelling Group's (CMG) GEM simulation software. GEM is the industry's leading coal bed methane (CBM) simulator, as it can provide accurate early-time water and methane production predictions, as well as multi-component production predictions for enhanced CBM (ECBM) recovery.

The simulation was based on a 1 km by 1 km numerical model for the proposed vertical wells. Grid cell size for the model was set at 20m. The top of coal was based on the top of coal for the C1 seam in the Gunn Project Area.

The pilot configuration for the modelling comprised 5 wells. The central well (Gunn 2) remains in the middle of the grid with the other 4 wells positioned at 200m spacing's at NW, NE, SW and SE locations (**Figure 13**). Various sensitivities were run on permeability and skin parameters. The well drawdown was restricted, and a minimum flowing bottom hole pressure was also set.

Start date of the proposed five spot pilot program has been assumed to be 1 October 2023 for the purposes of this three year reporting period. The simulation predicted water production from the proposed Gunn Pilot over three years from the start date.

Modelled predicted water production and cumulative water production are shown graphically in **Figure 15**. The total volume of water expected to be produced from the five wells after three years of production (1/10/2023-1/11/2026) is approximately 22 ML, refer **Table 1**.

Table 1: Estimated quantity of water to be produced in the next three years.

Year	Estimated produced water in ML per year/well					
	Well 1 (Gunn 2)	Well 2	Well 3	Well 4	Well 5	Total all wells
Oct 2023 to Oct 2024	3.08	3.86	3.96	3.96	3.86	18.70
Oct 2024 to Oct 2025	0.37	0.43	0.44	0.44	0.43	2.10
Oct 2025 to Oct 2026	0.17	0.19	0.20	0.20	0.19	0.94
Total per well	**3.61**	**4.48**	**4.59**	**4.59**	**4.48**	**21.74**

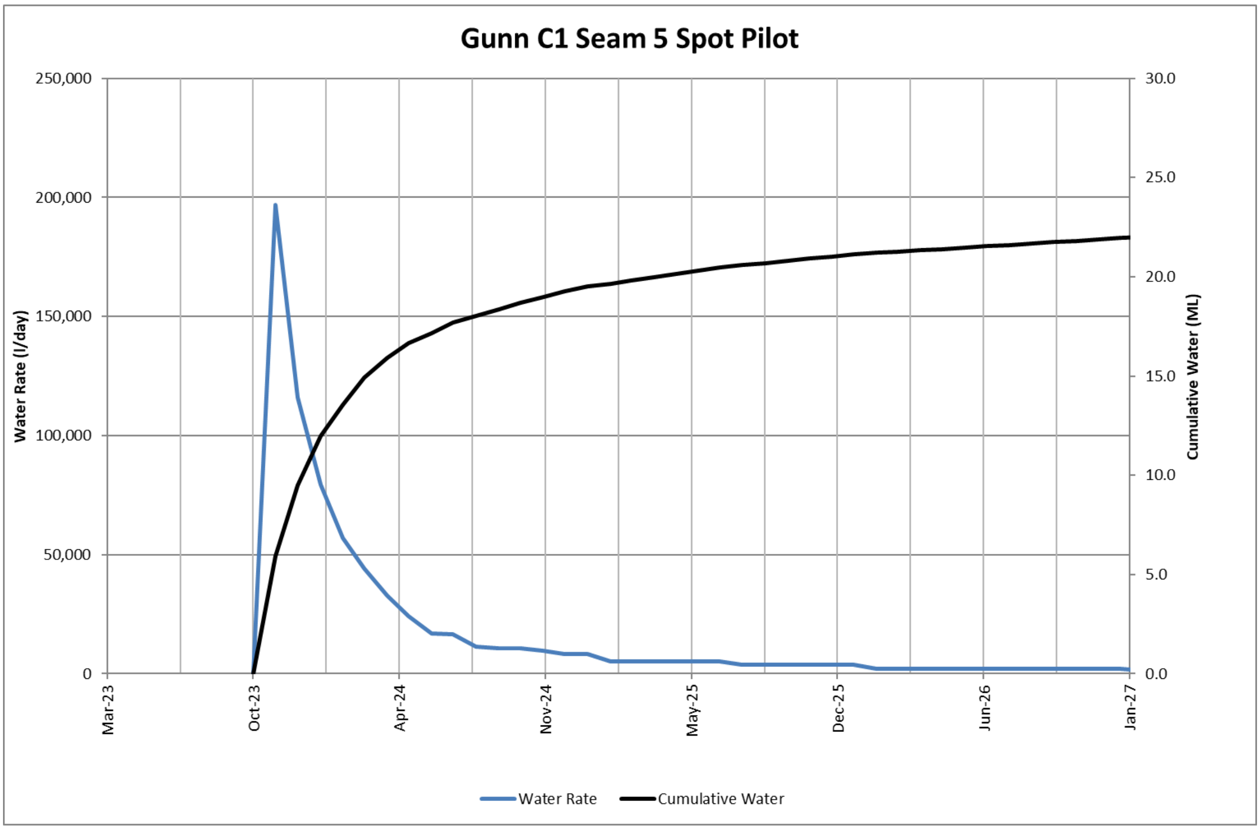

Figure 15: Modelled water rate and cumulative water production of the proposed pilot wells over three years from 01/10/2023.

Part B: Aquifer Information and Underground Water Flow and Levels

Hydrogeology of ATP 744

The hydrogeological significant formations of ATP 744 included the following:

- the Quaternary Alluvium and Tertiary Sediments.
- Moolayember Formation
- Clematis Group.
- Rewan Group.
- Betts Creek beds.
- Jochmus Formation and Jericho Formation.
- Lake Galilee Sandstone

Refer to **Figure 3** for additional information on the stratigraphy of these formations. Quaternary alluvium and Tertiary sediments are widespread over the tenure area (**Figure 4**). Triassic aged units of the upper Galilee Basin including intervals of the Moolayember Formation, and Clematis Group (formally part of the basal section of the Great Artesian basin (GAB)) are the most widely recognised aquifers within the tenure area. The Early Triassic Rewan Group underlies these units and can be over 300m in thickness over the tenure area. The Rewan Group is considered a regionally significant confining unit (Habermehl, 1980 & Queensland Herbarium, 2017).

In ATP 744, the Betts Creek beds are the target formation for coal seam gas production. The Permian Betts Creek beds are confined and separated from the overlying Triassic age aquifers by the Rewan Group, which is a regional aquitard. (**Figure 8** & **Figure 16**).

The lower Galilee Basin section comprises Late Carboniferous to Early Permian units of the Lake Galilee Sandstone, Jericho Formation and Jochmus Formation, respectively. The Jochmus Formation unconformably underlies the Betts Creek beds in the tenure area.

The Jericho Formation is over 750m below the Jochmus Formation and no wells within the ATP other than oil and gas exploration wells penetrate this formation. Lake Galilee Sandstone is the target formation for the Albany Project conventional wells, and it is discussed in the second part of this report (Albany Project). No wells within the ATP other than oil and gas exploration wells penetrate the Lake Galilee Sandstone. Therefore, the Jericho Formation and the underling Lake Galilee Sandstone are not considered further in this section of the report.

In the permit area, the Rewan Group separates the GAB aquifers in the upper Galilee Basin from the underlying Permian and Late Carboniferous aquifers and water-bearing units of the lower Galilee Basin (**Figure 8** & **Figure 16**).

It is considered very unlikely that the proposed five-spot pilot will directly interfere with locally significant aquifers, specifically, the Moolayember Formation and Clematis Group. They are typically separated vertically from the targeted Betts Creek beds by at least 300m by the Rewan Group, which is considered a regionally significant confining unit. Refer (**Figure 8** & **Figure 16**)

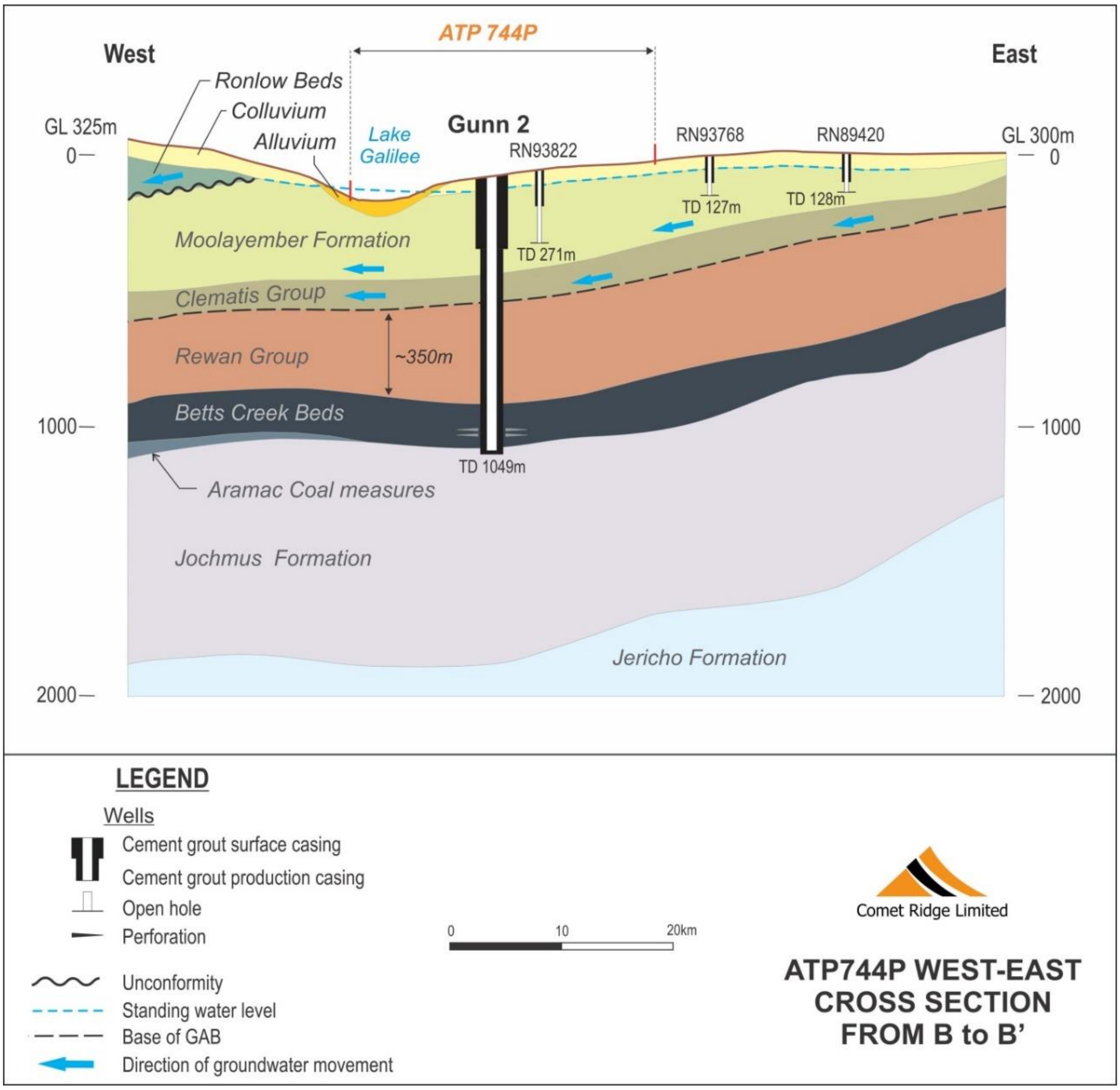

Figure 16: Schematic geological cross-section across ATP 744, showing Gunn 2 appraisal well, nearby groundwater bores and groundwater flow direction.

Aquifers

Quaternary Alluvium and Tertiary Sediments

Quaternary alluvium and Tertiary sediments are generally widespread across the permit surface (RPS 2012). however, they are thin relative to the underlying sequences.

Shallow unconfined groundwater is found in the alluvial deposits along the major river systems and creeks that drain the Galilee Basin study area (RPS 2012). Tertiary sediment aquifers host some appreciable individual supplies with both sub-artesian and artesian characteristics on the eastern margin of the Galilee study area (RPS 2012).

Moolayember Formation

The Moolayember Formation is a Middle to Late Triassic aged formation that is commonly present directly beneath the Quaternary alluvium and Tertiary sediments. The Moolayember Formation is dominantly mudstone and siltstone with interbeds of lithic sandstone and quartz sandstone (Olgers 1970). An assessment of the bore cards from the DoR Groundwater Database (GWBD) and baseline assessed registered water bores, suggests that many groundwater bores are likely tapping into this formation within ATP 744. Refer to **Appendix 1**.

Clematis Group

The Clematis Group is an Early to Middle Triassic aged formation that directly underlies the Moolayember Formation. The Clematis Group comprises fine to coarse quartzose sandstone, with conglomerate Beds and interbedded siltstone and mudstone (Vine 1972). An assessment of the bore cards from the GWDB and baseline assessed registered water bores, suggests a handful of groundwater bores are likely tapping into this formation within ATP 744. Refer to **Appendix 1**.

Water can be extracted from the Triassic formations of the Galilee Basin (Moolayember Formation and Clematis Group) at relatively shallow depths (Queensland Department of Natural Resources and Mines 2005). These aquifers are mostly accessed in the eastern portion of Galilee Basin study area where they sub crop beneath thin Quaternary alluvium and Tertiary sediments at shallow depths (RPS 2012). However, as the water quality is very variable, and supplies are dominantly sub-artesian and low yielding (<1L/s), this unit has provided only stock and domestic supplies (Groundwater Database – Queensland DNRME).

Rewan Group

The Rewan Group is an Early Triassic aged formation that comprises lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanolithic pebble conglomerate (at base) (RPS 2012). Available literature (including descriptions of the unit from coal seam gas wells drilled within ATP 744) suggest the formation is dominated by fine grained sediments which is generally characterised as an aquitard, separating underlying Permian sediments (including the coal bearing Betts Creek beds) and the overlying sandstones of the Clematis Group (Queensland Herbarium, 2017). This formation is locally more than 300 metres thick. Silicification and clay alteration has significantly reduced the porosity and permeability in this formation and no significant aquifers exist within (Queensland Department of Natural Resources and Mines 2005). The Rewan was deposited in a fluvial-lacustrine environment and is considered a regionally significant confining unit.

As a result, this formation is expected to form a barrier between the targeted Betts Creek beds and overlying significant aquifers of the region.

Betts Creek beds

The Late Permian Betts Creek beds comprise carbonaceous interbedded feldspathic lithic sandstone (Olgers 1970). Regionally, the Permian Betts Creek beds (and its equivalents) yield sufficient groundwater to be classified as water-bearing sediments (RPS 2012). However, fine grained low permeability strata are interspersed within the Betts Creek beds. No water bores have been identified to be sourcing from sandstones within the Betts Creek beds within the current extend of ATP 744. There are no mine monitoring bores drilled for the purpose of monitoring the water level and water quality within the Betts Creek beds in ATP 744. However, three mine monitoring bores have been drilled within coal mining permits adjacent to the north-eastern part of ATP 744. These bores have been drilled to monitor water levels and water quality within the formation and are located over 70km from the proposed Gunn Pilot area.

Groundwater Bores

A review of the DoR Groundwater Database (GWBD) was undertaken to identify registered bores that have not been abandoned and destroyed within the permit area. Refer to **Appendix 1** for a list of all registered and known unregistered groundwater bores in ATP 744. Refer to **Appendix 2** for all available water quality data and **Appendix 3** for all available water level data within ATP 744. Data has been compiled from the GWDB, baseline assessed landholder bores and, coal seam gas and petroleum wells within ATP 744.

There are fifty-eight (58) registered water bores in ATP 744. Forty-five (45) registered/licensed bores in ATP 744 are listed as existing and thirteen (13) are listed as abandoned or destroyed. Three (3) registered existing bores have been identified that are primarily being used as water monitoring bores (**Appendix 1**).

Data from the GWDB indicates that groundwater bores in the permit area have been drilled to relatively shallow depths are therefore sourcing shallow aquifers. Data from the GWDB indicates groundwater is principally drawn from shallow undifferentiated aquifers and aquifers of the Moolayember Formation or Clematis Group (**Appendix 2**). The records indicate groundwater is primarily being used as water supply for livestock watering (**Appendix 1**).

Within 20km of Gunn 2 there are thirty-three (33) registered bores which have not been abandoned and destroyed. One unregistered water bore has been identified within 10km of Gunn 2. Excluding Gunn 2, twenty-five (25) groundwater bores have groundwater level data (**Table 2**) and eight (8) have groundwater quality information (**Table 4**). Of the eight bores with groundwater quality data, five (5) are within ATP 744. These are active landholder bores for which a baseline assessment has been completed by Comet Ridge as per requirements of the Baseline Assessment Plan for ATP 744. The location of groundwater bores with Water Quality and Water Level data within 20km of Gunn 2 is shown on **Figure 17**.

Water Levels

Within 20km of Gunn 2, twenty-five (25) of these have ground water level data (**Table 2**).

Table 2: Available groundwater level data within 20km of Gunn 2. Recorded standing water level has been referenced to mean sea level where reference datum was known.

Registration Number	Formation Name	Date	SWL m from Reference Datum)	SWL (amSL)
6350	Moolayember Formation	1/10/1910	-7.6	NA
7046	Undifferentiated	10/01/1983	-48.76	NA
7047	Undifferentiated	10/01/1983	-33.52	NA
69451	Undifferentiated	18/09/1987	-16.5	NA
69628	Moolayember Formation	11/01/1990	-36.58	NA
93819	Clematis Group	5/07/2001	-8	NA
93822	Moolayember Formation	8/08/2001	-16	277.65
93827	Undifferentiated	18/08/2001	-33	NA
118164	Undifferentiated	25/08/2003	-54	NA
118169	Moolayember Formation	6/04/2004	-50	NA
118371	Clematis Group	8/06/2004	-7	NA
146685	Undifferentiated	13/08/2013	-54	234
146685	Clematis Group	13/08/2013	-12.6	275.4
146795	Clematis Group	2/10/2013	-30.4	279.6
163079	Undifferentiated	12/12/2013	-13	274
163079	Undifferentiated	12/12/2013	-18	269
163100	Undifferentiated	15/02/2013	-30	NA
163100	Clematis Group	15/02/2013	-17.5	NA
163503	Clematis Group	5/10/2015	-7.9	NA
163506	Moolayember Formation	9/07/2015	-6.8	NA
163553	Clematis Group	15/08/2015	-18	NA
93822#[1]	Moolayember Formation	10/10/2012	-60.71	232.94
118169#	Moolayember Formation	25/05/2013	-46.95	253.85
93059#	Moolayember Formation	26/05/2013	-9.8	273.2
93059	Moolayember Formation	24/10/1992	-12.19	270.81
163503#	Clematis Group	29/11/2017	-7.93	NA
163506#	Moolayember Formation	29/11/2017	-7.49	NA
118371#	Clematis Group	29/11/2017	-6.9	NA
Groundwate Bores within 20km Gunn -outside 744				
5964	Undifferentiated	1/01/1914	-39.6	NA
5966	Undifferentiated	1/01/1915	-24.4	NA
16197	Undifferentiated	28/11/1965	-36.6	279.6
16197#	Undifferentiated	22/10/2012	-59.03	257.17
32473	Undifferentiated	1/09/1969	-18.3	NA
93768	Undifferentiated	2/04/2001	-33	269.6
93768#	Undifferentiated	26/11/2012	-42.25	260.35
32567	Undifferentiated	4/10/1969	-21.3	NA
~Water Monitoring Bore - actual measurement type only				
#Baseline Assessed				
1 Purging of the bore was not able to be undertaken before SWL was measured.				

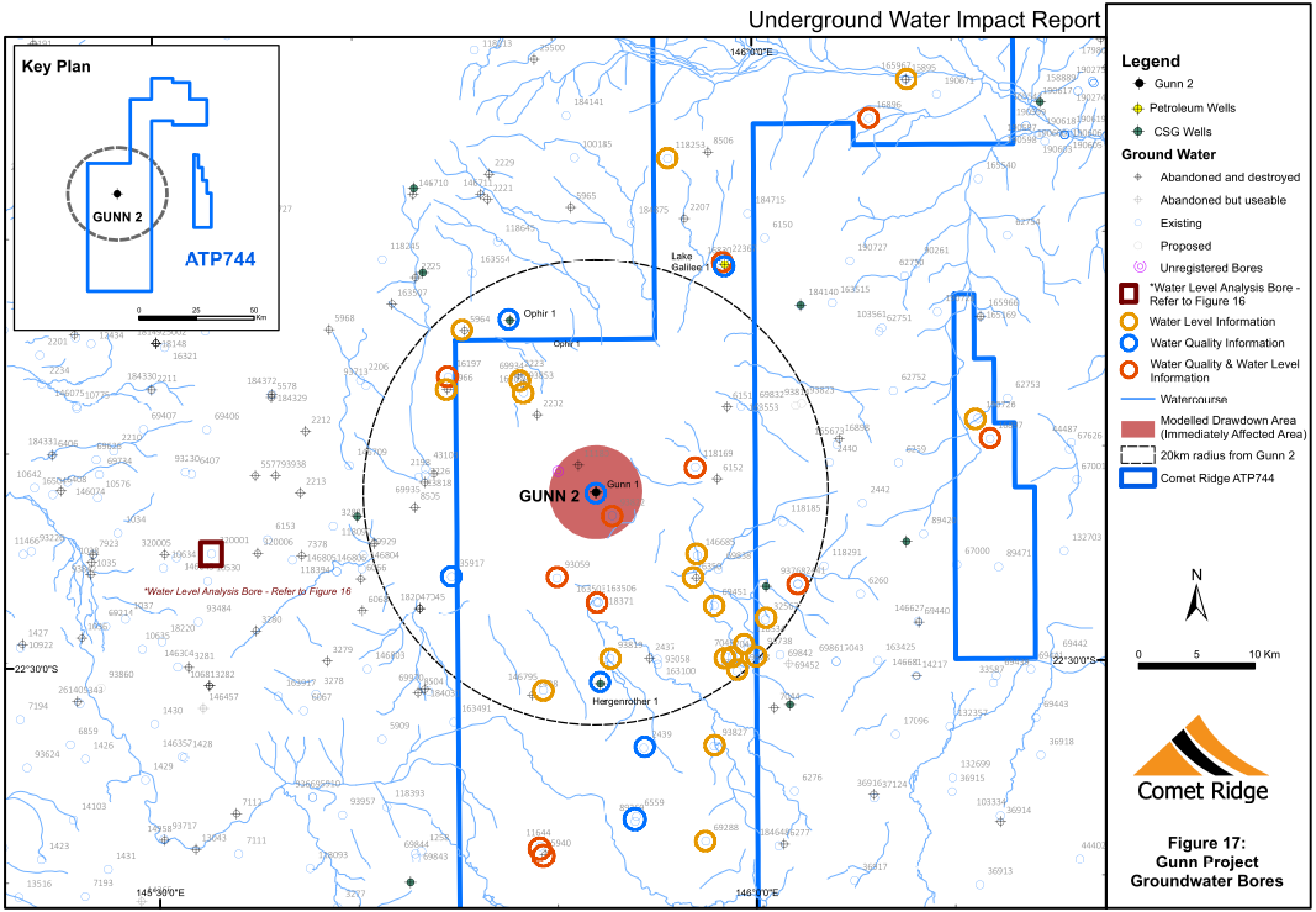

Figure 17: Groundwater Bores

ATP 744 Water Level Trends

Figure 19 to 23 present a timeseries water level trends compiled from GWDB data and data collected by Comet Ridge during baseline assessments of landholder groundwater bores within ATP 744 (as required under the ATP 744 Baseline Assessment Plan). Standing water level measurements (SWL) are presented relative to mean sea level. Only bores with recorded SWL Reference Datum were used in the analysis.

The locations of the bores are shown on **Figure 18**. The water level data presented is from groundwater bores within ATP 744 or within 20km of the Gunn and Albany Project areas with sufficient data to plot in a timeseries. There is no known water level data from groundwater bores or petroleum exploration wells for any formations or aquifers below the Betts Creek beds.

In general, the timeseries data indicates formations to be relatively stable over time. The majority of the timeseries water level data comes from mine monitoring bores located to the east and north-east of the Albany Project and ATP 744 along the Galilee Basin margin where the formations are relatively close to surface and close to sub-crop and where coal mining activity is prevalent.

Within 20km of the Gunn Pilot, no additional baseline assessments have been undertaken since 2017. All water with water level data within 20km of the Gunn Pilot are single data points and insufficient to determine a trend. The data from wells monitoring the Betts Creek beds are located over 70km to the north-east of the Gunn Project area and are sufficiently spatially separated that no interaction or impacts has occurred from activity at the Gunn Project site.

The temporal water trends for ATP 744 are summarised in **Table 3.**

The analysis of change in water level and cumulative departure from average rainfall has not been undertaken. While insufficient data was available to present potentiometric surfaces for any formation, an analysis conducted by RPS of the available groundwater level data in the general region indicates that the prevailing groundwater flow direction for ATP 744 is to the west (RPS 2012). Ongoing monitoring of underground water levels will be conducted in the future (refer **Groundwater Monitoring** section below for the proposed monitoring details) pending additional appraisal work is completed. As additional information becomes available, further data analysis will be undertaken and information revised.

Table 3: Summary of water level trends over time (ground water bores with sufficient data within ATP 744 or within 20km of the Gunn Pilot or Albany Project.

Formation	Figure	Description of Trends
Moolayember Formation	Figure 19	RN93059, 93822 & 118169 are located within ATP 744 and within 20km of Gunn Project, however, are single data points and insufficient to determine a trend. RN16895 is located within ATP 744 and within 20km of Albany Project, however, are single data points and insufficient to determine a trend. RN16897 is located outside 20km radius of either project area within ATP 744, however, is a single data point and insufficient to determine a trend.

		RN96545 is located within 200m of Albany 1 ST1. Although water level data is limited, the time-series data indicated relative stability in water level from 1995 to 2018. The data does indicate an apparent small reduction (3.3m) in water level post drilling, however, is followed by a rebound in water level to baseline levels post stimulation activities. The monitoring data is sparse however and at this stage it is unclear if the variation in water level was related to any site activities, possibly represented seasonal variations in water level or was induced by incidental bore use by the Landholder. RN16896 is located approximately 9km south of Albany 2. During the last round of Baseline Assessment, Caseys Bore (RN16896) recorded water level at 9.96m Below Ground Level (BGL). This measurement is approximately 15m higher than in the previous sampling event in 2019. Although possible, this result should be treated with caution. Based on the anecdotal information, at the time of sampling, the bore had not been used by the landholder in the previous few months due to the "wet year" conditions. However, the water level appears to be significantly higher than in all the surrounding bores (including two new drilled bores nearby) and the initial measurement of water level in Caseys Bore at the time of drilling (27.43m BGL in 1966). Field observation and photographic evidence of the bore total depth suggests a build-up of sediments at the bottom of the bore, or the presence of blockage. This increase of the water level might be a result of an artefact in the measurement due to a blockage, or a damage occurred in the casing installed in 1966. If the next water level measurement is consistent with the historical data, it would eliminate the potential risk to suggest that it most likely was an erroneous measurement. COI will verify the water level measurement and the bore casing internal conditions if further activities are planned in the area. The remaining are mine monitoring bores which are all located close to the Galilee Basin margin outside of ATP 744 but within 20km of Albany Project wells. Timeseries data indicates relative stability in water level from 2014 to 2022.
Clematis Group	Figure 20	RN146685 & RN146795 located within 20km of Gunn Project, however, are single data points and insufficient to determine a trend. The remaining data points are mine monitoring bores located close to the Galilee Basin margin outside of ATP 744 and within 20km of Albany Project wells. Timeseries data indicates relative stability in water level from 2013 to 2022 in these bores.
Rewan Formation	Figure 21	A single mine monitoring bore (RN132941) is located close to the Galilee Basin margin outside of ATP 744 and within 20km of Albany Project wells. Timeseries data indicates relative stability in water level from 2014 to 2022.
Betts Creek beds	Figure 22	Four mine monitoring bores located close to the Galilee Basin margin outside of ATP 744 and within 20km of Albany Project wells. Timeseries data indicates relative stability in water level from 2011 to 2022.

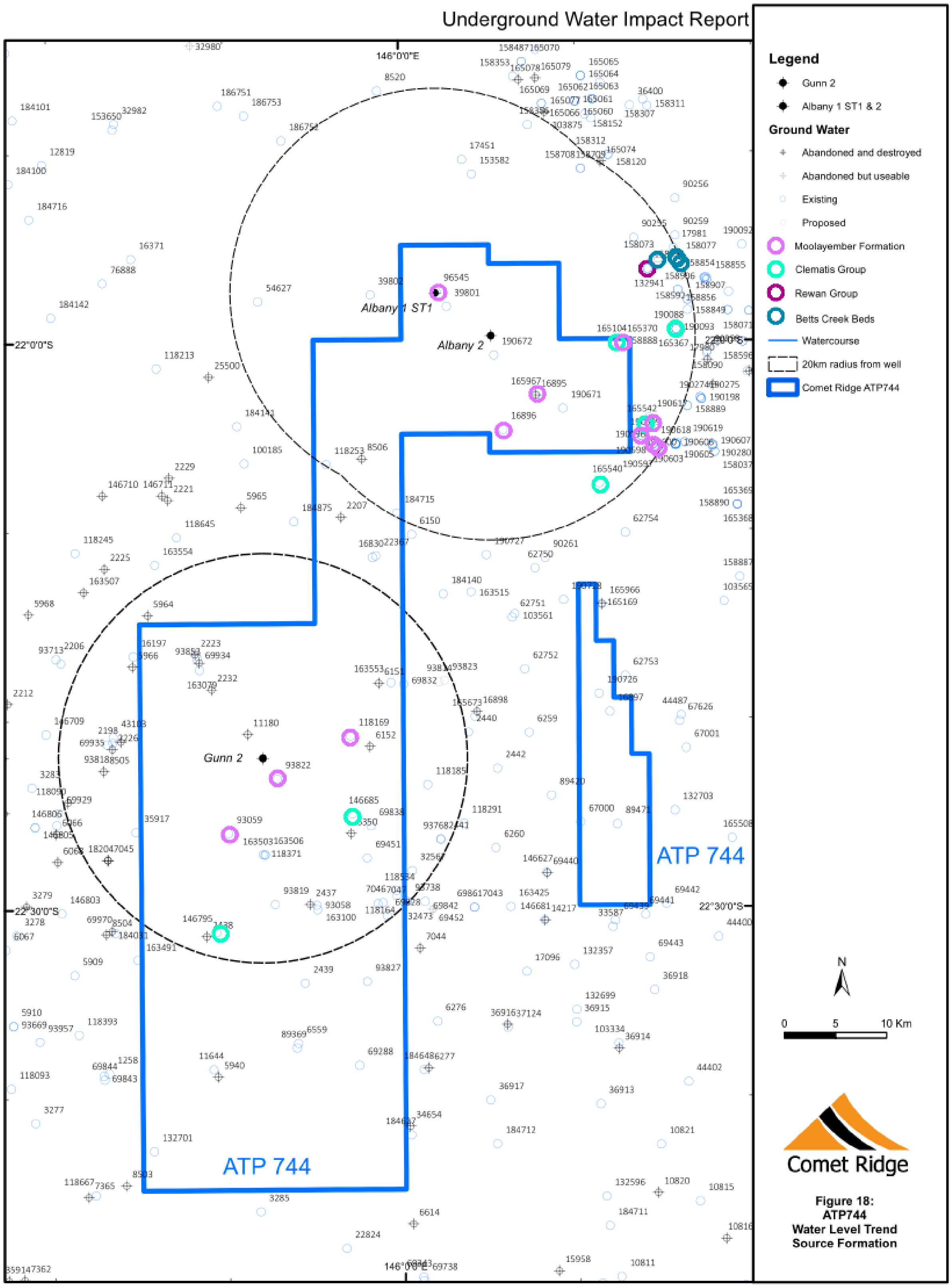

Figure 18: Location of Groundwater Bores used for water level trend showing source aquifer.

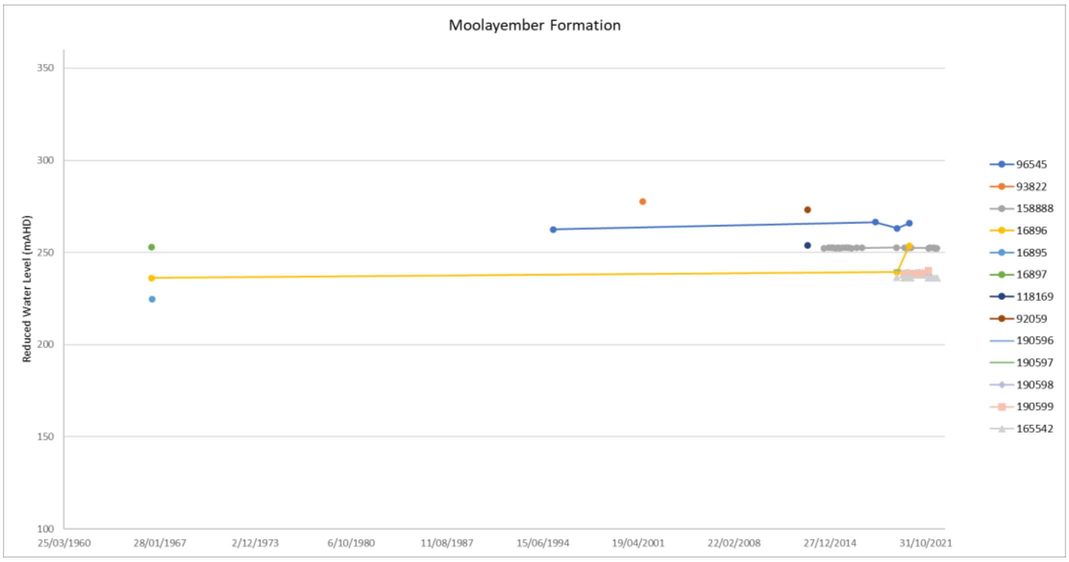

Figure 19: Moolayember Formation – timeseries water level measurements

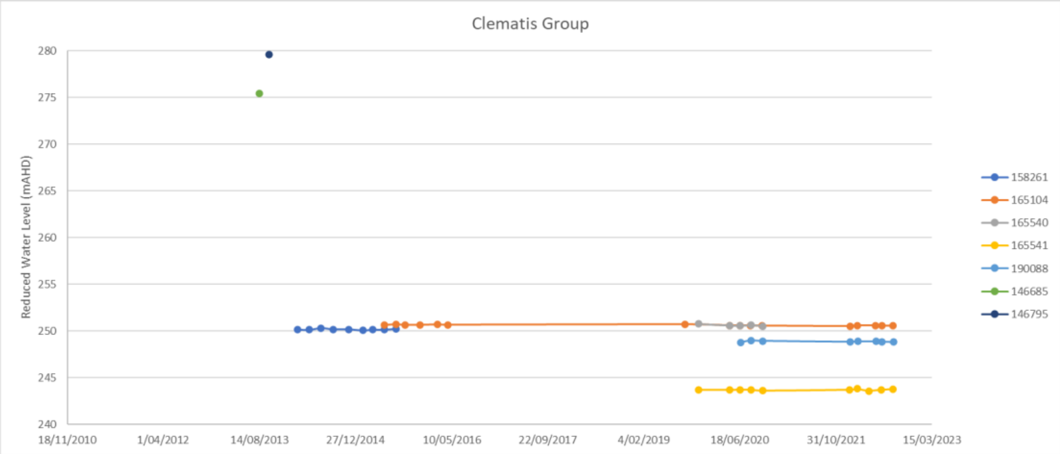

Figure 20: Clematis Group – timeseries water level information

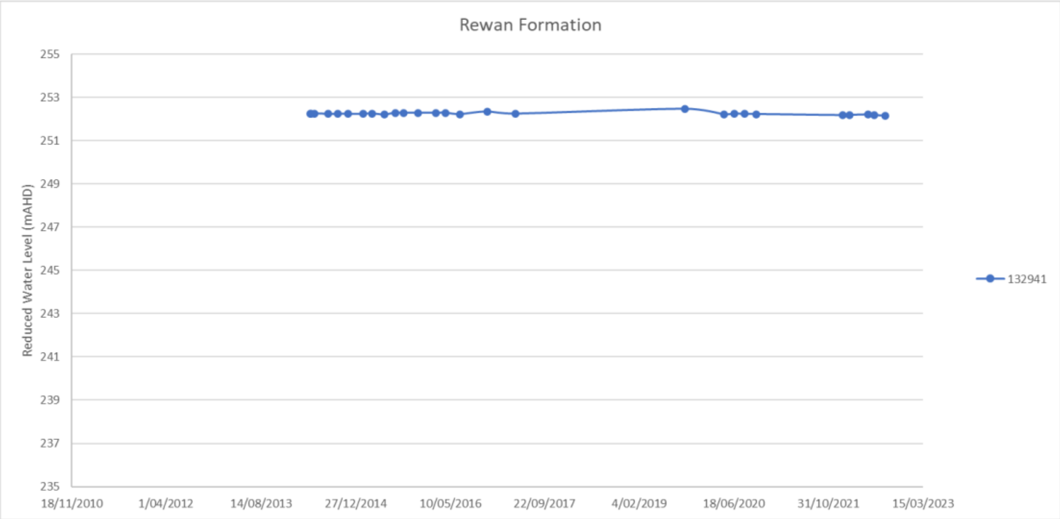

Figure 21: Rewan Formation – timeseries water level information

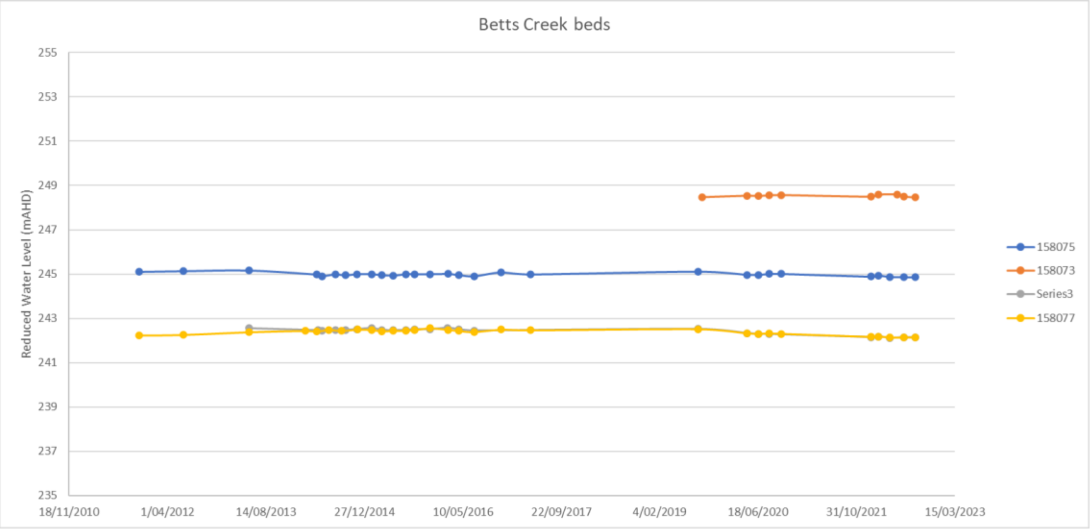

Figure 22: Betts Creek beds – timeseries water level information

Table 4: Water Quality data within 20km of Gunn 2

Bore registration number	Bore Name	Permit	Identified aquifer	Date Sampled	Depth of Sample (m)	Conductivity (uS/cm)	pH	Hardness (mg/L Ca)	Alkalinity (mg/L)	SAR	Total Dissolved Solids (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Iron (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulphate (mg/L)
Groundwater Bores - Baseline Assessment Analysis																					
93822 #	Stapleton Bore	744	Moolayember Formation	10/10/2012	271	12600	7.53	1470	61		8632	2080	30	424	100	0.82	61	<1	4540	0.7	2
118169 #	New Bore	744	Moolayember Formation	25/05/2013	204	7456	7.29		111		3840	1500	50.5	206	30.7	0. 359	111	<1	1912	0.53	78.5
93059#		744	Moolayember Formation	26/05/2013	246	40250	6.8		122		27100	8300	116	1540	1040	3. 27	122	<1	14810	0.7	1230
163503#		744	Clematis Sandstone	29/11/2017	420	997.5	7.16		77		400	129	19	8	6	1.3	77	<1	191		18
163506 #	New Six Mile Bore	744	Moolayember Formation	29/11/2017	20	9617	6.37		146		6080	1560	14	164	256	<0.05	146	<1	3290		558
Groundwater Bores within 20km Gunn#2 outside tenure																					
35917	Sunrise Bore	Outside 744	Moolayember Formation	26/02/1971	198	5150	7.6	800	150	22.2	4607.68	1442		256	39		183		2780	0.7	0
35917	Sunrise Bore	Outside 744	Moolayember Formation	27/07/1971	198	10000	7.2	1361	72	19.9	5767.97	1687		500	27		88		3510	0.7	0
35917	Sunrise Bore	Outside 744	Moolayember Formation	27/07/1971	198	10000	7.1	1298	8	20.3	5697.62	1682		470	30		10		3510	0.7	0
16197	New Bore	Outside 744	Undifferentiated	27/05/1966	514	500	7.1	12	176		252.97	73.3		4.8	0		214.5		64	0.4	5
16197#	New Bore	Outside 744	Undifferentiated	22/10/2012	514	462	7.76	<1	164		300	96	6	<1	<1	0.5	164	<1	42	0.2	<1
93768#	10 Mile aka House Bore	Outside 744	Undifferentiated	26/11/2012	127	5300	7.81	573	155		3440	902	16	114	70	0.1	155	<1	1480	0.5	119
69531*	Ophir 5[1]	Outside 744	Betts Creek Beds	12/01/2014	1075	30600	6.79	450	921		19900	1740	6560	144	22	11.6	921	<1	7970	6.7	1260
Petroleum Wells and CSG Wells																					
63856* (DST-3P)	Gunn 1	744	Betts Creek Beds	22/06/2010	948	38000	8.2	720	700	18	24060	1100	17000	240	29	22	700	<20	15000	2	160
63856* (DST-3O)	Gunn 1	744	Betts Creek Beds	22/06/2010	948	38000	8.2	700	710	18	24060	1100	18000	230	28	22	710	<20	15000	2	160
63856* (DST-2J)	Gunn 1	744	Betts Creek Beds	21/06/2010	912	69000	8.5	1200	1300	22	43687	1800	32000	400	61	52	1300	<20	15000	<5	1
63856* (DST-2I)	Gunn 1	744	Betts Creek Beds	21/06/2010	912	69000	8.4	1200	1400	21	43687	1700	31000	390	61	59	1400	<20	27000	<5	300
63856* (DST-2E)	Gunn 1	744	Betts Creek Beds	17/06/2010	912	9400	8.3	93	750	21	5952	460	2400	29	5.1	5.2	750	<20	2300	2	110
63856* (DST-1D)	Gunn 1	744	Betts Creek Beds	17/06/2010	840	9100	8.2	95	760	20	5762	450	2400	30	4.9	4.7	760	<20	2300	2	110
63856* (DST-3K)	Gunn 1	744	Betts Creek Beds	22/06/2010	948	86000	8.3	1300	1700	89	54451	1400	50000	420	68	170	1700	<20	35000	<0.5	410
63856* (DST-2F)	Gunn 1	744	Betts Creek Beds	20/06/2010	912	330	7.6	77	140	7	209	26	44	21	6	<1	140	20	38	<0.5	<0.5
63857* (DST-4I)	Hergenrother 1	744	Betts Creek Beds	2/06/2010	744	31000	7.4	110	880	11	19628	270	2100	36	5.5	24	880	20	12000	<5	8.1
63857* (DST-3H)	Hergenrother 1	744	Betts Creek Beds	1/06/2010	769	51000	7.4	1500	980	150	32291	2400	34000	470	77	39	980	20	15000	2	14
63857* (DST-3G)	Hergenrother 1	744	Betts Creek Beds	1/06/2010	769	51000	7.4	620	1100	18	32291	1000	12000	200	32	40	1100	20	18000	<5	15
63857* DST-2D)	Hergenrother 1	744	Betts Creek Beds	31/05/2010	826	14000	7.3	480	860	22	8864	1100	4100	160	22	20	860	20	3700	2	18
63857* (DST-2C)	Hergenrother 1	744	Betts Creek Beds	31/05/2010	826	14000	7.5	500	950	21	8864	1100	4100	170	22	17	950	20	4900	<5	15
63857* (DST-1B)	Hergenrother 1	744	Betts Creek Beds	30/05/2010	848	17000	7.5	680	760	21	10764	1200	4300	230	25	18	760	20	4800	<0.5	78
63857* (DST-1A)	Hergenrother 1	744	Betts Creek Beds	30/05/2010	848	17000	7.5	640	1500	21	10764	1200	4600	2 10	26	1.8	1500	20	6200	1	56
Gunn # 2 Water Samples from Production Test																					
Gunn #2 Sample 1	Gunn 2	744	Betts Creek Beds	13/01/2013	953	1780	8.79	15	846	54.4	1080	484	28	6	<1	0.16	733	113	126	11	<1
Gunn #2 Sample 2	Gunn 2	744	Betts Creek Beds	22/01/2013	953	1770	8.37	15	821	52	1050	463	20	6	<1	1.74	802	19	110	11.9	<1
Gunn #2 Sample 3	Gunn 2	744	Betts Creek Beds	29/01/2013	953	1730	8.33	15	818	52.4	1030	466	14	6	<1	1.76	810	8	97	11.7	<1
Gunn #2 Sample 4	Gunn 2	744	Betts Creek Beds	21/02/2013	953	1700	8.38	12	697	50.7	915	412	9	5	<1	2.5	672	24	99	11.1	<1

***DST Samples**

 # Baseline Assessment

[1] Coal seam gas exloration well

Groundwater Quality

Figures 23 and 24 have been produced using the available water quality analysis from the GWDB database and data collected by Comet Ridge during baseline assessments of landholder groundwater bores within ATP 744 (as required under the ATP 744 Baseline Assessment Plan). Analysis from DST's have been excluded.

No additional baseline assessments have been undertaken on groundwater bores within 20km of Gunn 2 since 2017.

The Piper tri-linear diagram indicates that the dominant water type for the Moolayember Formation and Clematis Sandstone is sodium chloride. Three water bores source undifferentiated aquifers (QWDB Bore Card). The Piper tri-linear diagram indicates that the dominant water type for two of these same is also sodium chloride.

No water bores within ATP 744 source or access the Betts Creek beds. Within 20km of the Gunn Project wells, the only water quality data from the Betts Creek beds is from laboratory analysis of the produced water collected during the extended production test of Gunn 2. The Piper tri-linear diagram indicates that the dominant water type for the Betts Creek beds is sodium bicarbonate which is typical for coal seam water chemistry (Van Voast 2003).

Water chemistry of the Betts Creek beds is quite distinct from the overlying Moolayember Formation, Clematis Group and most undifferentiated aquifers in the vicinity of Gunn 2 and across the entire permit area. One sample from an undifferentiated aquifer plot with a similar water composition to that of the Betts Creek beds at Gunn 2. The sample from the undifferentiated aquifer is however significantly fresher (EC <500 µS/cm) than the Betts Creek beds samples. Carbonate and bicarbonate contents are similar to those from the Moolayember Formation and Clematis Group rather than the Betts Creek beds. Additional geochemical data will be required to confirm the degree of relationship (if any) between these samples.

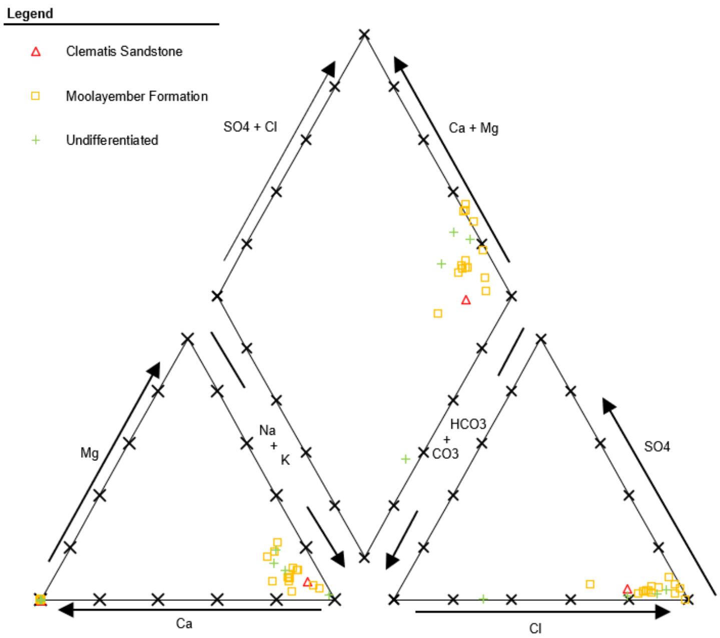

Figure 23: Piper Diagram for all available quality data within ATP 744 (excluding analysis from Gunn 2 and DST's)

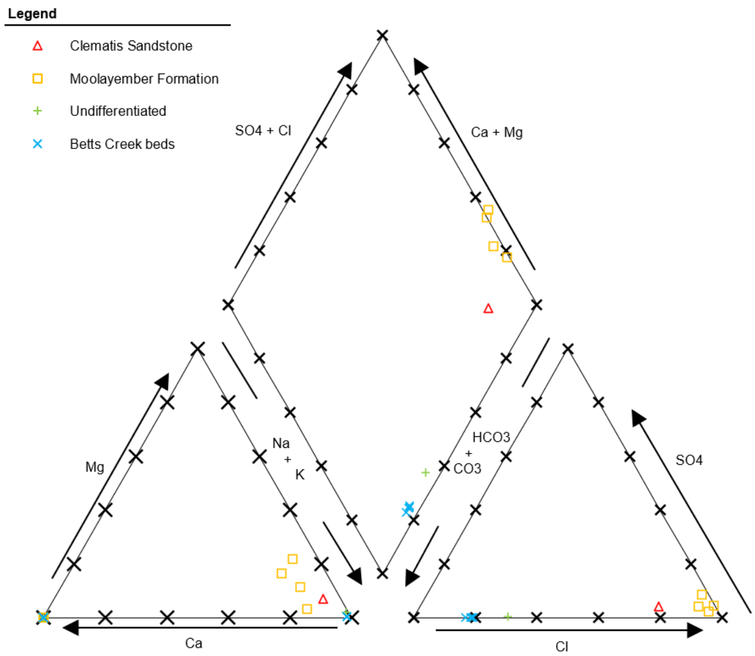

Figure 24: Piper Diagram for all available quality data within 20km of Gunn 2 including produced water from Gunn # production test (excluding analysis from DST's)

It is difficult to speculate whether water quality data confirms or disproves any possible connections between aquifers. If anything, it may suggest a possible hydraulic connection between the groundwater in the Moolayember Formation and the Clematis Group, although that conclusion is highly speculative, as the quality variation within Moolayember Formation potentially exceeds the differences in water quality between those two units.

Part C: Groundwater Modelling

In order to understand the possible impacts of the underground water extraction associated with the already conducted production testing on the Gunn 2 well and the proposed five-spot pilot, a groundwater numerical model has been developed. This model relies on the groundwater extraction forecasts described in **Underground Water Extraction** section above, data obtained through previous production testing and available literature of the groundwater properties of the area.

Water level data for the Galilee Basin aquifers could not be contoured over the project area because there are too few data points for the water bores associated with a formation to contour (RPS 2012). Therefore, the hydraulic heads within the Galilee Basin aquifers were estimated using available data on formation depths, formation pressures and groundwater levels and developing relationships between these formation characteristics. These derived relationships were found to be consistent with equivalent relationships derived previously by (RPS, 2012) and (Dixon et al, 2010). Where measured data were available, these measurements were used to constrain the estimates. The estimated hydraulic heads were then used in the model as the 'initial hydraulic heads'.

Pressure data available for the Joe Joe Group (Aramac Coal Measures, Jochmus Formation, Jericho Formation and Lake Galilee Sandstone) suggests higher pressures than in the Betts Creek beds. This indicates that the Betts Creek beds are capable of confining groundwater, but may not be an effective aquifer seals on a regional basis (former Department of Employment, Economic Development and Innovation (DEEDI), 2009). There is, however, evidence that the Rewan Group confines the groundwater that occurs within the Betts Creek beds and the Moolayember Formation confines the underlying Clematis Group aquifer (RPS 2012). In general, the Clematis Group exhibits higher permeabilities than the Moolayember Formation (Dixon et al., 2010).

Very limited porosity and permeability data presented difficulties for estimating the ranges of model parameters making it difficult to simulate groundwater flow in the basin (Dixon et al., 2010). In addition, data points show few clear trends in the distribution of porosity and permeability, with broad scatter across measurements in most of the stratigraphic units (Dixon et., al 2010). Therefore, measurements of hydraulic properties from the vicinity of the production test site were used where possible. **Table 5** shows the hydraulic conductivity values that were assigned to the formations when the groundwater model was built (these parameters were adjusted during the calibration process).

Table 5: Hydraulic Conductivity Data

Formation	Hydraulic Conductivity (Horizontal)	Hydraulic Conductivity (Vertical)	Reference
Moolayember Formation	2.9×10^{-6} m/s	9.7×10^{-7} m/s	Dixon et al 2010
Clematis Group	3.6×10^{-5} m/s	3.4×10^{-6} m/s	Dixon et al 2010
Rewan Group	4.5×10^{-5} m/s	1.2×10^{-5} m/s	Dixon et al 2010
Betts Creek beds	9.7×10^{-7} m/s	9.7×10^{-7} m/s	Dixon et al 2010
Betts Creek – Target Coal Seam	5.8×10^{-5} m/s	5.8×10^{-5} m/s	Comet Formation Tests (Gunn 2)
Jochmus Formation	9.7×10^{-7} m/s	9.7×10^{-7} m/s	Dixon et al 2010

In the last three-year reporting period, no additional appraisal work has been undertaken on the Gunn Pilot Project. A review of hydrogeological data (from the GWDB and Baseline Assessments carried out in late 2020) has been undertaken to assess whether any new data warranted updates to the existing conceptual and numerical model presented in the 2020 UWIR for the Gunn Pilot Project. The review determined that none of the hydrogeological data acquired since the 2020 UWIR would justify an update to the existing groundwater model. Also, none of the new hydrogeological data contradicts the previous findings.

The groundwater model presented below for the Gunn Pilot Project remains unchanged from the approved 2020 UWIR for ATP 744.

Groundwater Flow Model

MODFLOW was used to predict the extent of impacts within the target coal seam and within adjacent aquifers and aquitards. MODFLOW is a finite difference groundwater flow model, where the groundwater flow domain is discretised into rectangular or cubic block elements.

The groundwater flow model was constructed in a transient format to simulate the time period associated with proposed production testing and the proposed five-spot pilot. The time period for the groundwater flow simulations was 11/01/2022 to 01/11/2043 for the purposes of this three-year reporting period.

The pumping rates applied in the model were those predicted from the reservoir modelling. These pumping rates were converted to m^3/sec and applied at either a daily or monthly time steps, as per time step resolution in the reservoir model. All pumping was applied to layer 9 (the C1 coal seam).

A 20km by 20km model extent, centred on the Gunn 2 well was used for the groundwater flow model (**Figure 25**). The model grid was constructed with variable grid sizes to incorporate a finer grid in the area surrounding production testing. The grid cells ranged from 50 m by 50 m in the region of production testing to a maximum size of 500 m by 500 m.

12 layers were used in the model, including 7 layers to represent distinct coal seams within the Betts Creek beds. Where stratigraphic surfaces were available, these were used to create the model layers. As there was not enough information available to map the depths of individual coal seams across the whole model domain, constant thicknesses were selected for layers 5-11 (**Table 6**). The thicknesses for these layers were based on measured stratigraphic data for the Gunn 2 well.

Table 6: Thickness of Model Layers

Layer	Formation	Minimum Thickness (m)	Maximum Thickness (m)	Average Thickness (m)
1	Quaternary/Tertiary	9	70	37
2	Moolayember Formation	274	381	326
3	Clematis Group	98	121	102
4	Rewan Group	312	356	341
5-11	Betts Creek beds (including the target coal seam)	197	197	197
12	Jochmus Formation	80	183	122

The major groundwater recharge areas for the GAB are located in the north, west and east where the Eromanga and Galilee basin aquifers outcrop or subcrop beneath alluvial sediments. This recharge zone is outside of the model domain. In the absence of more detailed information about recharge rates, constant recharge rates were used in the groundwater flow model. The rates selected were consistent with the GAB resource study (Great Artesian Basin Coordinating Committee (GABCC) 1998) recommendation to use a recharge rate of 1-2% of mean annual rainfall as a basin wide average. This study pointed out that evaporation rates in the GAB typically exceed rainfall rates. Due to the uncertainty associated with this parameter, the recharge rate was varied during the calibration process.

A combination of constant head and constant flux boundary conditions was applied to specific layers in such a way that the general groundwater flow directions were maintained. Assignment of more accurate boundary conditions would require more detailed information about current hydraulic gradients in each aquifer and aquitard.

A transient calibration was carried out for the groundwater flow model using the water production test data. The parameter estimation software, PEST (Doherty 2009), was used to automatically adjust the parameters in order to improve the match between "simulated" and "observed" water levels for the production test. A large range of parameters were included in this calibration process to start with but once the model was found to be insensitive to many of the parameters, the range of parameters was refined to those shown in **Table 7**. Once the drawdown and recovery curves from the production test in 2013 were able to be simulated adequately, the model was used to predict groundwater level responses to the planned production of the five-spot pilot.

Table 7: Calibration Parameters

Parameter	Minimum	Maximum
Horizontal Hydraulic Conductivity – Moolayember Formation (m/s)	$2.90x10^{-8}$	$2.90x10^{-4}$
Horizontal Hydraulic Conductivity – Clematis Group (m/s)	$3.55x10^{-7}$	$3.55x10^{-3}$
Horizontal Hydraulic Conductivity - Rewan Group (m/s)	$4.54x10^{-7}$	$4.54x10^{-3}$
Horizontal Hydraulic Conductivity - Betts Ck (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Horizontal Hydraulic Conductivity - Betts Ck A (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Horizontal Hydraulic Conductivity - Betts Ck B (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Horizontal Hydraulic Conductivity - Betts Ck C (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Horizontal Hydraulic Conductivity - Betts Ck C1 (m/s)	$5.81x10^{-9}$	$5.81x10^{-5}$
Horizontal Hydraulic Conductivity - Betts Ck D (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Horizontal Hydraulic Conductivity - Betts Ck D1 (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Horizontal Hydraulic Conductivity – Jochmus Formation (m/s)	$9.68x10^{-9}$	$9.68x10^{-5}$
Recharge Rate (m/s)	$1.00x10^{-12}$	$1.00x10^{-8}$
Specific Yield - Rewan Group (-)	$1.00x10^{-3}$	$3.00x10^{-1}$
Specific Yield - Betts Creek (-)	$1.00x10^{-3}$	$3.00x10^{-1}$
Specific Yield - Betts Creek C1 (-)	$1.00x10^{-3}$	$3.00x10^{-1}$

Results and Discussion

Simulation results suggest that, only the target C1 coal seam is expected to experience drawdown and therefore the IAA (areas where the drawdown of greater than 5 metres is expected) is only predicted within the C1 seam of the Betts Creek beds.

The mapped IAA is required to be predicted in January 2026, which is within three years after the consultation day for this report (as required under the requirements of section 376(b)(iv) of the Water Act 2000). The predicted drawdown in January 2026 for the C1 seam of the Betts Creek beds is 96.5m at the centre of the pilot and decreases to 5m at maximum 4.13km from the centre point. The extent of the predicted 5m drawdown (IAA) in the C1 seam of the Betts Creek beds in January 2026 is shown in **Figure 25**. This therefore represents the immediately affected area (IAA) for the C1 seam in the Betts Creek beds.

No drawdown was predicted for any other layers above and below the Betts Creek beds.

There are no private water bores present within the IAA, which intersect the coal seams. Therefore, no bores are subject to make good obligations as a result of the IAA.

One existing registered water bore (RN: 93822) located within the IAA utilises water from the Moolayember Formation (at least 570m above the coal seams). The bore is used for the purpose of stock watering. A baseline assessment was completed on this water bore on 10 October 2012. This water bore is included in the schedule of monitoring bores, refer to **Section E: Groundwater Monitoring** section of this report.

Model simulated drawdown impacts (including IAA) are predicted to gradually decline by 2035. There is no IAA predicted for any other formation and there is no “long term affected area” predicted for any formation including the C1 coal seam.

The results of the groundwater modelling for this UWIR support other available hydrogeological information in suggesting that there is limited interaction between the Betts Creek beds and any other formation in the model area.

There are, however, limitations associated with the groundwater simulations performed. These relate primarily to the data availability, assumptions underlying the conceptual model and, the assumption that the water level responses during the production testing are indicative of the longer-term impacts that could be expected from a five-spot pilot. For this reason, ongoing monitoring of groundwater levels within the Betts Creek beds and in the overlying formations is proposed throughout the production test period.

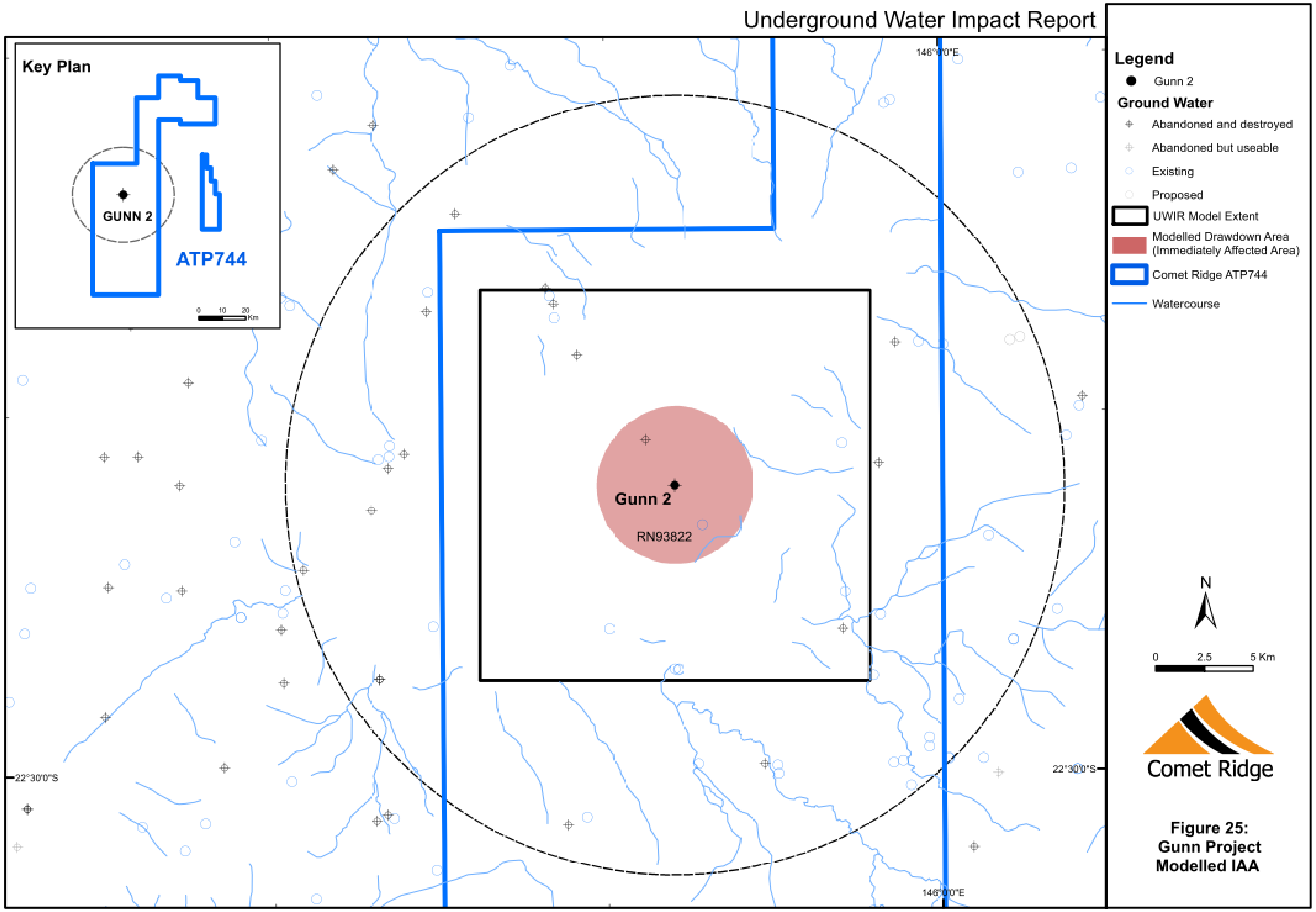

Figure 25: Modelled IAA: Gunn Project

Part D: Environmental Values

Environmental Values

The environmental values (EV's) of water are the qualities that make it capable of supporting aquatic ecosystems and human uses. The *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* is the primary legislation through which the EV's of water are protected. The following EV's have been listed under Section 6 (2) of the EPP Water and Wetland Biodiversity:

- Aquatic ecosystems associated with high ecological value, slightly disturbed, moderately disturbed and highly disturbed waters.
- Aquaculture
- Agriculture
- Recreation (primary, secondary and visual)
- Drinking water
- Industrial use
- Cultural and spiritual values

Identified Environmental Values

The following environmental values have been identified in ATP 744:

- Farm water supply (i.e., use of groundwater from water bores).
- Stock watering (i.e., use of groundwater from water bores).
- Domestic Use (i.e., use of groundwater from water bores).
- Aquatic ecosystem (i.e., Lake Galilee and waterways).
- Visual Appreciation (i.e., aesthetic qualities of Lake Galilee); and
- Cultural Values (i.e., aesthetic qualities of Lake Galilee)

All of the above listed environmental values are primarily associated with either surface water features (lakes and waterways), springs or Quaternary, Tertiary and Triassic aquifers accessed by registered groundwater bores.

The environmental values within the vicinity of ATP 744 and Gunn Pilot are described below:

Groundwater Dependant Ecosystems

Groundwater Dependant Ecosystems (GDE's) are ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services. Ecosystem dependency may vary temporally (over time) and spatially (depending on its location in the landscape). GDE's include aquifers, caves, lakes, palustrine, lacustrine and riverine wetlands including springs, rivers and vegetation that access groundwater through their roots.

Maps of the following GDE's are provided to show spatial relationship between the IAA, model extent and 20km radius from the proposed Gunn Pilot with mapped GDE's including wetlands and springs.

- Queensland Wetland Areas – water bodies, regional ecosystems and mapped nationally important wetlands, including springs across ATP 744 (**Figure 26**)
- Terrestrial Groundwater Dependant Ecosystems across ATP 744 (**Figure 27**)
- Surface Groundwater Dependant Ecosystems across ATP 744 (**Figure 28**)
- Potential Groundwater Dependant Aquifers across ATP 744 (**Figure 29**)

No underground GDE's are mapped across the permit area or surrounding area.

Aquatic Ecosystems

Wetlands are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6 metres. To be a wetland the area must have one or more of the following attributes:

- at least periodically the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or
- the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or
- the substratum is not soil and is saturated with water or covered by water at some time.

The most significant surface feature in the vicinity of the Gunn Pilot project is Lake Galilee which is recognised as a nationally important wetland and comprises both lacustrine wetland system (e.g., lakes 15.8%) and palustrine wetland system (e.g., vegetated swamps – 84.2%) (**Figure 26**). Lake Galilee habitat mainly comprises arid to semi-arid grass, sedge and herb swamp, saline lake and saline swamp and tree swamp. The wetland area is primarily sourced from shallow, unconfined, unconsolidated sedimentary aquifers which are closed alluvial systems with fluctuating and intermittent flow.

A second nationally important wetland area is located outside and adjacent to the north-eastern portion permit area known as Doongmabulla Springs (**Figure 26**). Doongmabulla Springs complex is located approximately 50km to the north-east of the Gunn Pilot area and therefore sufficiently separated from the project area and, as such, no impacts are expected.

No springs active are located within ATP 744 or within 20km of the Gunn Pilot. Mapped active springs are discussed further under the **Section F: Spring Impact and Management.**

Riverine wetlands have also been identified and are associated with waterways traversing the north - eastern portion of the permit area. Areas of remnant regional ecosystem comprising 1-50% wetland by area have also been mapped across the permit area (**Figure 26**).

Terrestrial groundwater dependant ecosystems in the area are primarily associated with either Tertiary Ironstone jump-ups or alluvium and sandy plains and wetlands (**Figure 27**). Tertiary Ironstone jump-ups comprise unconfined intermittent aquifers sourced from local bedrock which primarily support specific melaleuca vegetation. Unconsolidated alluvial and sandy plain systems are primarily sourced from localised shallow alluvial aquifers which generally support specific vegetation ecosystems (such as Bloodwood or Melaleuca) on old loamy and sandy soils with fluctuating or intermittent flow.

Watercourses traversing the permit area are described as either channels on sandstone ranges with fluctuating and intermittent flow sourced from unconfined consolidated sedimentary aquifers or channels on alluvia and sandy plains below 300m in elevation with fresh, intermittent flow sourced from unconfined shallow alluvial aquifers (**Figure 28**). Within the vicinity of the Gunn Pilot Project the primary Surface GDE is associated with Lake Galilee.

Potential GDE Aquifers within 20km of the Gunn Pilot Project primarily comprise either unconfined fractured sedimentary aquifers (Tertiary Ironstone jump-ups) or unconfined unconsolidated sedimentary aquifers (i.e., sandy plains, Quaternary Alluvium) with intermittent groundwater flow (**Figure 29**). Water quality ranges between fresh and brackish.

Impacts Arising from Previous Exercise of Underground Water Rights

The water that is subject to the underground water rights for ATP 744 petroleum activities for the Gunn Project is within the Betts Creek beds. The formation predominantly comprises coal seams that are inter bedded with mudstone, siltstone, sandstone and carbonaceous shale.

Forty-five (45) registered/licensed bores in ATP 744 are listed as existing and thirteen (13) are listed as abandoned or destroyed. Three (3) registered existing bores have been identified that are primarily being used as water monitoring bores. Bore records also indicate groundwater is principally drawn from either undifferentiated aquifers, Moolayember Formation or Clematis Group (**Appendix 1**).

No water bores within ATP 744 source the Betts Creek beds, therefore, activities proposed at the proposed Gunn Pilot are considered to have negligible impact on identified environmental values.

No underground water is being extracted from the C1 coal seam within the Betts Creek beds, to which this report relates. The actual impacts in the initial UWIR (dated 3 April 2014) were less than predicted as no water has been produced in the nine years since the initial UWIR in 2014 and the IAA prediction did not eventuate.

Within ATP 744, bore records indicate groundwater is primarily being used as water supply for livestock watering. There is no known use of groundwater for aquaculture purposes, domestic use, or industrial purposes within ATP 744. There are no documented cultural and spiritual values. The water is not used for any recreational purposes.

The following section provides information supporting the view that a hydraulic discontinuity exists between the Betts Creek beds and overlying aquifers within the area of the IAA and within 20km from the Gunn 2 well.

The Gunn 2 well was completed using industry standards and in compliance with the *Code of practice for the construction and abandonment of petroleum wells and associated bores in Queensland (2019).* (DNRME).

Gunn 2 completion technique has allowed:

- Triassic GAB aquifers to be isolated behind steel casing which has been pressure sealed with cement.

- isolation of the C1 coal seam from overlying and underlying intra-bedded permeable sandstone and other coal seams within the Betts Creek beds.
- Perforation of the C1 coal seam only, to ensure water was only produced from this coal interval.

A cement bond log was run after cementing was completed to evaluate the integrity of the cement with the casing of the well. The cement bond log confirms the cement job in Gunn 2 has resulted in complete isolation of the Betts Creek beds from the Clematis Group and Moolayember Formation aquifers.

The coals within the Betts Creek beds within the IAA and within 20km from Gunn 2 well and are separated from overlying Triassic aquifers by at least 300m of low permeability formation (Rewan Group), refer **Figure 16**. Available literature (including descriptions of the unit from coal seam gas wells drilled within ATP 744) suggest the formation is dominated by fine grained sediments which is generally characterised as an aquitard (Queensland Herbarium, 2017). For further information, refer section **Hydrogeology of ATP 744**.

In support of the above, the results of the groundwater modelling for this UWIR confirm that no drawdown was predicted for any other layers above and below the Betts Creek beds. The target C1 coal seam is the only layer where drawdown was predicted. Where the drawdown was greater than the 5m threshold for a confined aquifer, an immediately affected area (IAA) was mapped and only applies to the C1 seam. The results of the groundwater modelling for this UWIR support other available hydrogeological information in suggesting that there is limited interaction between the Betts Creek beds and any other formation in the model area. For more information, refer **Part C: Groundwater Modelling.**

In addition, no faults have been mapped within the IAA or within 20km from the Gunn 2 well that have been interpreted to connect the Betts Creek beds to overlying Triassic or Cenozoic aquifers or the ground surface (**Figure 2, Figure 4, Figure 9 & Figure 10**). For more information, refer section **Geological Structure.**

The Betts Creek beds sub-crop and crop out along the eastern margin of the Galilee Basin, outside and adjacent to north-eastern boundary of the permit area (**Figure 4**). These areas are located over 50km from the proposed Gunn Pilot project location and are considered sufficiently laterally separated from the proposed production testing and, as such, no impacts are expected.

There is also no identifiable connection between the coal seams of the Betts Creek beds and the surface within the IAA or within 20km of the Gunn 2 well, therefore no known association or connection with any terrestrial or surface GDE’s. No subterranean GDE’s have been mapped within the IAA in ATP 744.

No springs are located within the IAA or within 20km of the Gunn Pilot project. The closest springs are located to the west of the Gunn Pilot project area and are not sourced from the coal seams and therefore no impact on environmental values has been associated with any springs.

Environmental values identified within 20km of the Gunn Project or Permit area are not associated with the exercise of underground water rights from the Betts Creek beds and there are no impacts for any identified environmental values within or adjacent to the permit.

Table 8: Environmental values associated with the previous exercise of underground water rights.

Previous exercise of underground water rights	Environmental Values									
	Aquatic ecosystems	Farm supply	Stock Watering	Aquaculture	Primary Recreation	Secondary Recreation	Visual Appreciation	Drinking Water	Industrial Use	Cultural and Spiritual
Betts Creek beds within the IAA	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗

Impacts Arising from Future Effects of Underground Water Rights

For the water production envisaged in the next three years, the predicted drawdown has not changed. There are therefore no impacts likely on the environmental values in the period covered by this UWIR (April 2023 to April 2026).

Since the Betts Creek beds are currently not used as a water source within ATP 744, the impact on water users is considered negligible as previously indicated. However, the necessary monitoring strategies are documented under **Part E: Groundwater Monitoring** section of this document and any necessary baseline assessments on bores have or will be completed per requirements of the approved ATP 744 Baseline Assessment Plan. All active landowner bores within 10km of Gunn 2 well have been nominated as monitoring bores in this report, refer **Figure 30**.

As, and if, further development on the resource tenure continues, there could be an expansion of the immediately affected area, and there may be a long-term affected area in the future, but this is not possible to predict at this time. Future development of the area is contingent upon results from the production testing that will be carried out. Nevertheless, the impact on environmental values of the water is still considered to be negligible unless the water production increases in the future.

A review of the impact of environmental values from the exercise of underground water rights will be undertaken as part of the annual review process for the UWIR.

Table 9: Environmental values associated with the future exercise of underground water rights.

Future exercise of underground water rights	Environmental Values									
	Aquatic ecosystems	Farm supply	Stock Watering	Aquaculture	Primary Recreation	Secondary Recreation	Visual Appreciation	Drinking Water	Industrial Use	Cultural and Spiritual
Betts Creek beds within the IAA	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘

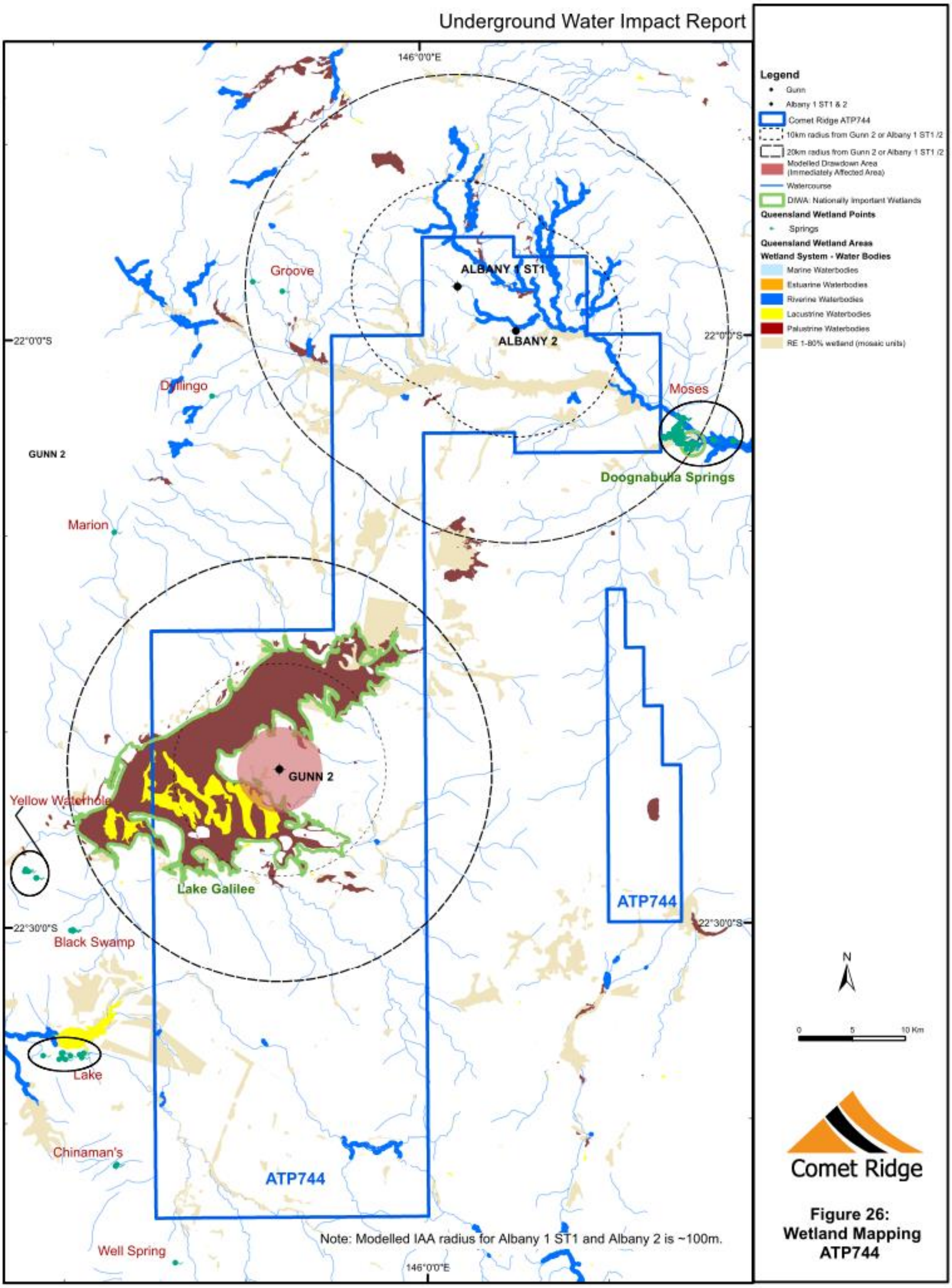

Figure 26: ATP 744 Wetland Mapping

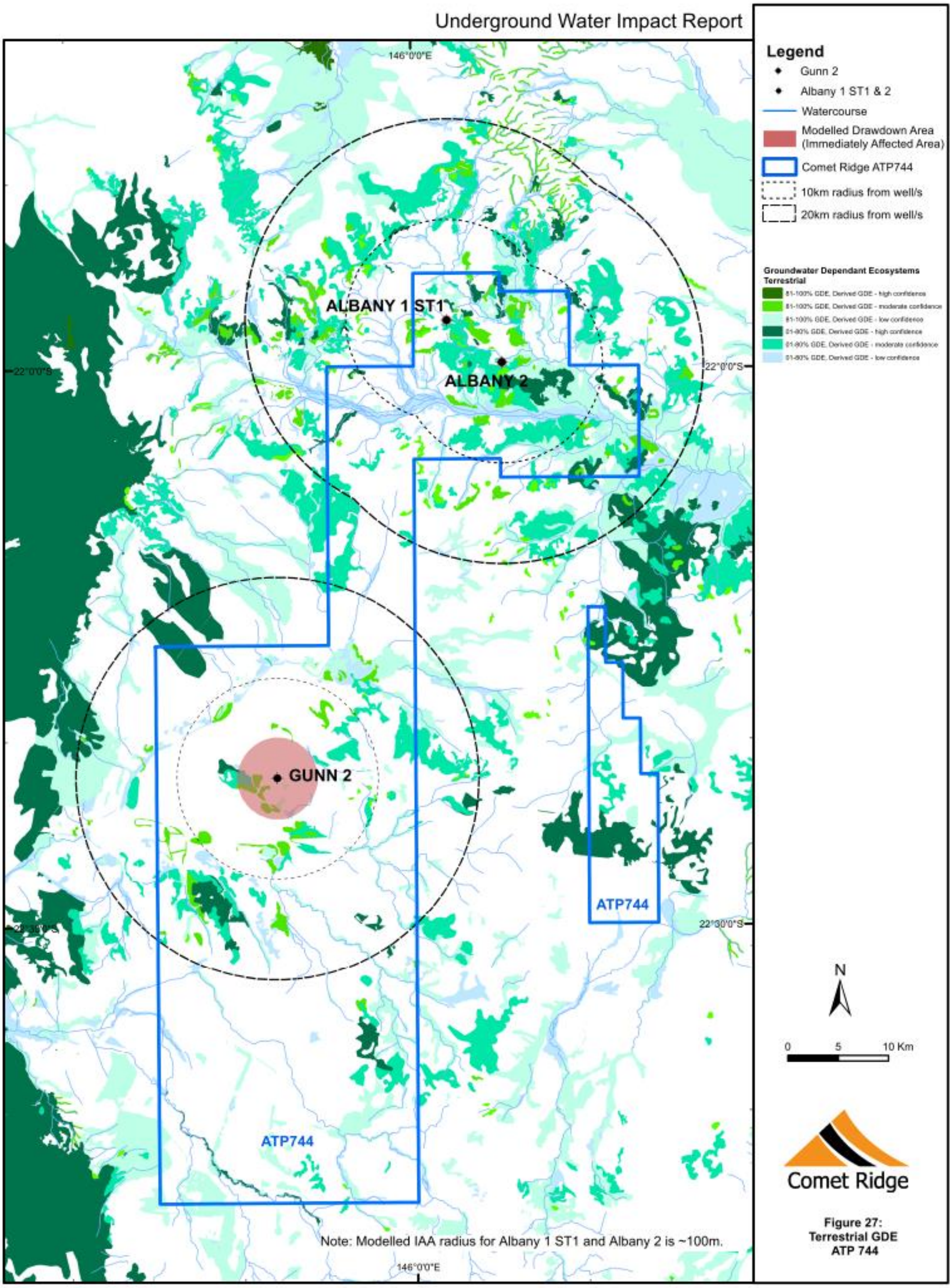

Figure 27: ATP 744 Terrestrial GDE Mapping

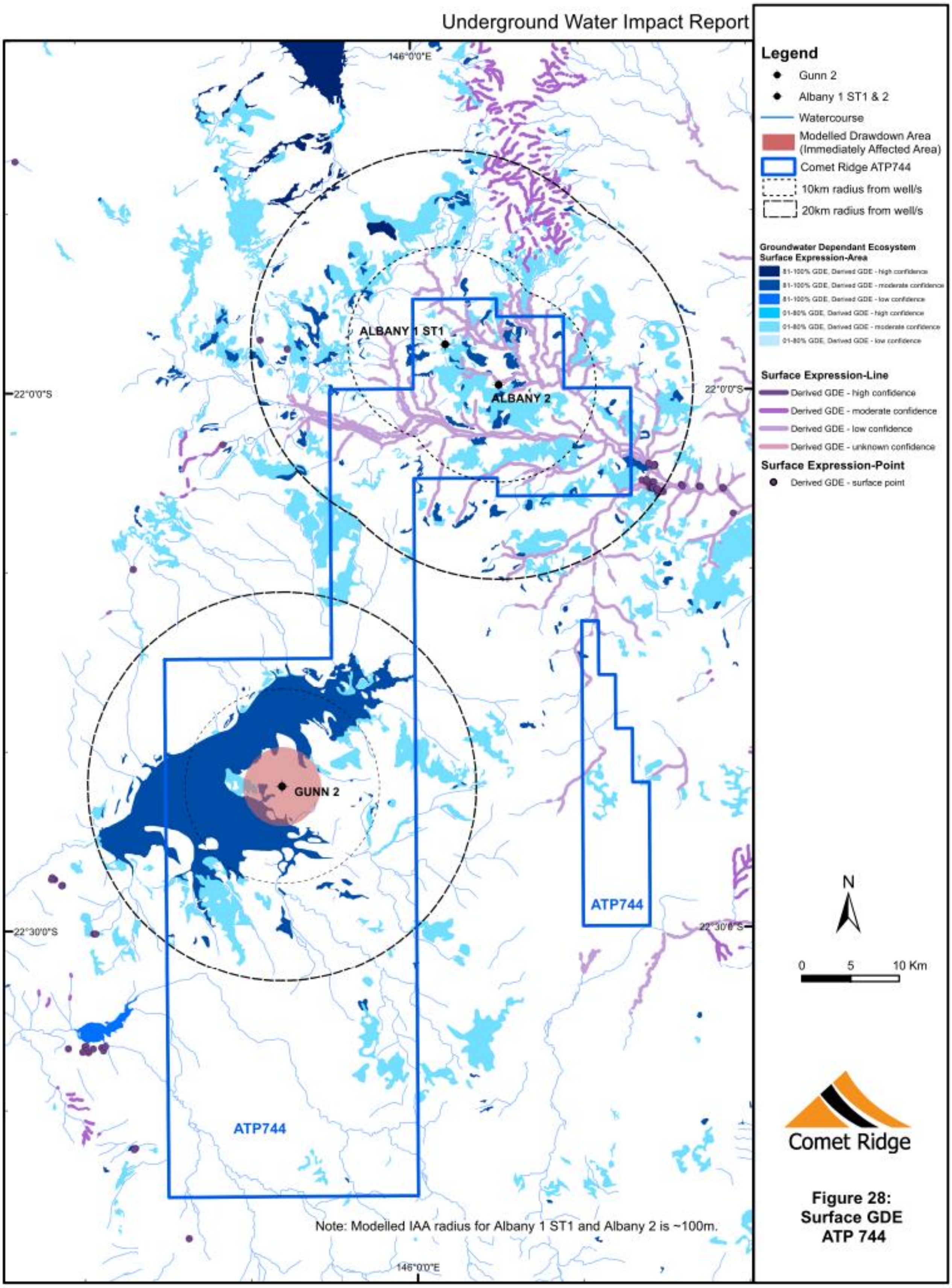

Figure 28: ATP 744 Surface GDE Mapping

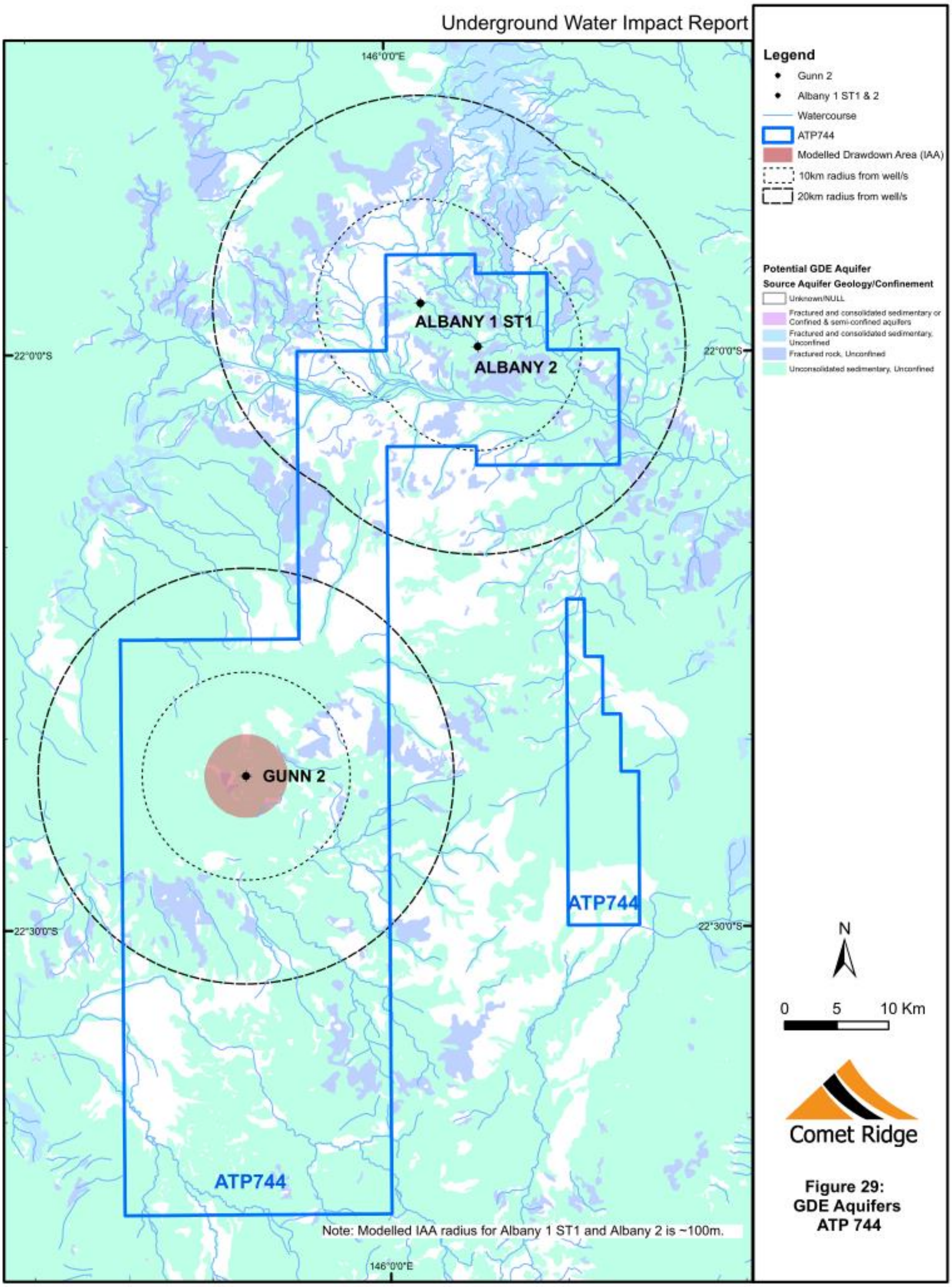

Figure 29: ATP 744 Potential GDE Aquifer

Part E: Groundwater Monitoring

The underground water monitoring strategy has been developed to address the findings of this UWIR, and to timely identify any changes in underground water levels and quality associated by the exercise of underground water rights within ATP 744. The information obtained through the monitoring strategy will also be used to confirm and refine future iterations of the groundwater modelling.

The proposed groundwater monitoring will verify the model predicted magnitude of impact and its reduction with time. Should there be a large discrepancy between monitoring data and the predictions generated through the model, the model will be updated with new information and re-run to generate updated predictions.

Rationale

The modelling predicts that there will be an IAA within the C1 seam of the Betts Creek beds, and there is no LTAA predicted as the impact reduces rapidly after production testing ceases. No anticipated impacts are predicted by the current modelling in the nearby aquifers. However, the groundwater monitoring of these aquifers will continue, and the information will be routinely fed back into the model to verify and improve the predictions of the modelling in the future.

Registered bores nearby the project area are primarily accessing the Moolayember and the Clematis aquifers. These aquifers are significantly separated (>300m) from the targeted coal seams by the Rewan Group. In addition, the production wellbores are cemented and cased to best practice to avoid aquifer cross-contamination.

Monitoring Strategy

Groundwater impact assessment criteria have been designed to identify any potential depressurisation within the coal measures and any adverse impacts that such depressurisation might induce on the adjacent aquifers including the alluvial aquifer systems. Impact assessment criteria for existing and proposed bores include piezometric pressure (measured as depth to water level) and water quality parameters (inclusive of field parameters and laboratory analytes) contained in the Section 3.6.4, Guideline Baseline Assessments, ESR/2016/1999, Version 3.04, DES.

If routine monitoring reveals either of the following scenarios an investigation into whether the changes can be attributed to the proposed production testing will be undertaken. If the change can be attributed to the production testing activities mitigation actions will be initiated.

Scenarios

- Water Level: Compare measured water level to previous monitoring rounds. If:
    - (a) water level is lower than previous lowest measurement by >5m or
    - (b) three subsequent monitoring events record a fall in water level >1m.

- Water Quality: Compare concentrations of analytes within **Table 10** to previous monitoring. If:
    - (a) value departs highest or lowest previous measurement by more than 25% or
    - (b) three subsequent monitoring events record an increase in one or more analytes concentrations.

It should be noted that water level triggers are applicable only to the dedicated monitoring bores (i.e., not used by landholders). In case the monitoring bore is also a landholder bore which may be actively used, the potential changes in water level and water quality must be assessed in accordance with the requirements outlined in the Guideline Bore Assessments (ESR/2016/2005), DES authorised under section 413 of the Water Act 2000.

Monitoring Locations

Existing bores extending into the Betts Creek beds available for monitoring in close proximity to the maximum impact zone of the IAA include the Gunn 1 bore and the proposed additional Gunn Pilot wells. Additional monitoring locations proposed are all accessible landholder bores within 10km of Gunn 2 including: RN: 118169, RN: 93822, RN: 93059, RN: 163506 and RN: 163503. The locations of monitoring bores are shown on **Figure 30.**

As there is no LTAA predicted, baseline sampling at considerable distance outside of IAA within ATP 744 or outside ATP 744 is not recommended.

The water monitoring program is proposed to commence when the pilot has been commissioned and production testing has commenced.

A list of bores and wells proposed to be monitored with parameters to be analysed and frequency of monitoring is shown in **Tables 10, 11 and 13.**

Table 10: Groundwater monitoring strategy

Registered Bore	Aquifer	Parameters	Frequency
Gunn 1	Clematis Group	Standing Water Level (SWL), Total Depth (TD), field parameters (pH, EC, T, DO, TDS and ReDox), Chemistry (1)	6 monthly
Gunn Pilot Wells	Betts Creek beds	SWL, TD, field parameters, Chemistry (1)	6 monthly
RN:118169	Moolayember Formation (2)	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12 months, then annually
RN: 93822	Moolayember Formation (2)	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12 months, then annually
RN: 93059	Moolayember Formation (2)	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12 months, then annually
RN:163506	Moolayember Formation	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12 months, then annually
RN: 163503	Clematis Group	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12 months, then annually

Table 11: Analytical plan-basic analytes

Category	Parameters	
Physical Parameters	pH Temperature Electrical conductivity Total dissolved solids	
Ions	Calcium Chloride Fluoride Potassium	Sodium Sulphate Magnesium
Metals (total and dissolved)	Aluminium Arsenic Barium Beryllium Boron Cadmium Chromium Cobalt Copper Iron	Lead Manganese Mercury Molybdenum Nickel Selenium Uranium Vanadium Zinc
Alkalinity and hardness	Alkalinity Total hardness as $CaC0_3$	
Dissolved Gases	Carbon dioxide (field) Methane (field and laboratory analysis) Hydrogen sulphide (field)	

Additional parameters may also be analysed if Comet Ridge deems prudent based on the activities occurring in the area and preliminary results. A likely list of potential analytes that will be additionally considered is presented in **Table 12**.

Table 12: Analytical plan-extended analytes

Category	Parameters	
Physical (Laboratory)	Benzene Toluene Ethylbenzene Xylene (total) Formaldehyde Naphthalene	Phenanthrene Benzo (a) pyrene Sodium hydroxide Formaldehyde Ethanol Gross alpha radiation
Nutrients	Ammonia Nitrate as N Nitrite as N	Nitrite + nitrate as N Notal nitrogen as N Total phosphorus
Microbiological	Total heterotrophic plate count Sulphate-reducing bacteria	
Miscellaneous	Ionic balance Sodium adsorption ratio (calculated)	

Sampling Methodology

Groundwater sampling will be undertaking according to the relevant methodology outlined in the Baseline Assessments Guideline 2017, (ESR/2016/1999), Version 3.04, DES, including:

- Samples will be collected, preserved and stored in accordance with the Environmental Protection (Water) Policy 2009 - Monitoring and Sampling Manual, Version 2 June 2018, DES.
- EPA Guidelines: Regulatory Monitoring and Testing–Groundwater Sampling (Environment Protection Authority, 2007); and
- Groundwater Sampling and Analysis–A Field Guide (Sundaram, et al., 2009).

QA/QC

QA/QC control measures will be implemented during the sampling program. These measures will be consistent with:

- AS/NZS 9000:2006 Quality management system series;
- quality assurance/quality control of AS/NZS 5667.11:1998; and

This includes:

- Groundwater sampling will be conducted by a suitably qualified and experienced professional in accordance with the relevant guidelines.
- All the laboratory analysis will be conducted by National Association of Testing Authorities (NATA) approved for the analyses required.
- All the equipment used to collect field parameters will be dedicated to each bore to avoid cross-contamination; and
- All the equipment used to collect field parameters will be calibrated according to the manufacturer standard operating procedures.

An annual review of the monitoring data will be conducted once the pilot has been commissioned and has commenced production testing. The review will be conducted by a suitably qualified and experienced hydrogeologist and will include assessment of groundwater level and quality data, and the suitability of the monitoring network.

All groundwater-based complaints will be investigated, and a register kept of the nature of any complaints, the results of the assessment, and any actions taken. The register will be made available to the regulating authority upon request.

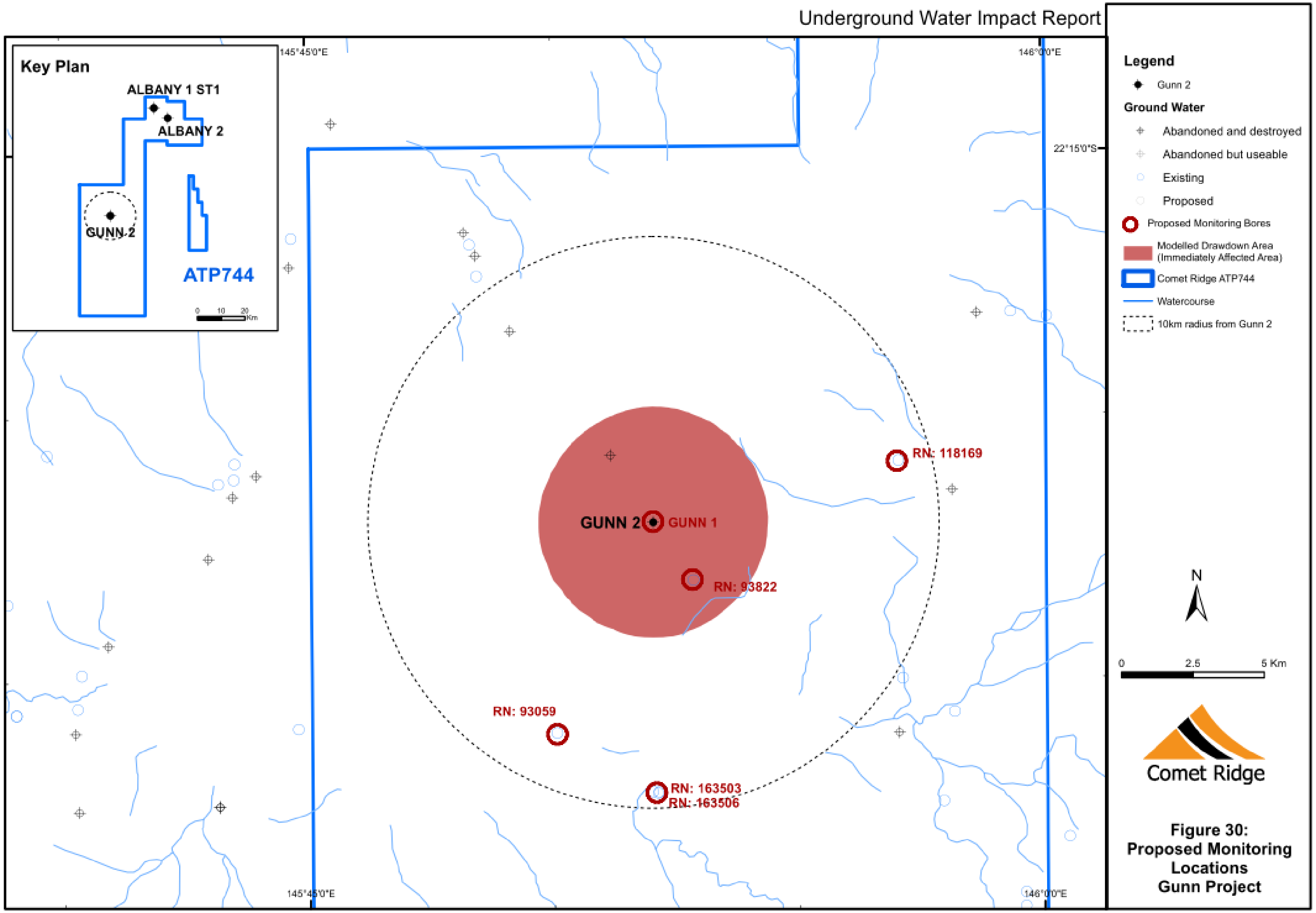

Figure 30: Proposed Monitoring Locations for Gunn Project

Part F: Spring Impact and Management

UWIRs are required to identify springs which could be potentially affected by underground water extraction activities. For these springs where predicted water levels within the source aquifer would decline more than 0.2 metres, a spring impact management strategy is required.

A review of the Queensland Springs Database, Queensland Government was undertaken in 2013 prior to the lodgement of the initial UWIR (Comet Ridge Limited, 2014). This report includes a review of the updated Version 5 of the Queensland Wetland Database, Queensland Government. The current mapped locations of springs with respect to ATP 744 is shown on **Figure 31**.

There are no identified active springs located within ATP 744.

No identified springs are located within 20km of the Gunn Pilot.

The nearest springs are understood to be recharge springs from either the Yellow Waterhole or Black Swamp (Queensland Wetland Database, research conducted in 2015) located south-west of the Gunn Pilot. It is interpreted that these springs are associated with the Hutton Sandstone aquifer or the Cadna-owie Formation / Hooray Sandstone aquifer system (RPS, 2012) and are west of the inferred Hutton - Rand unconformity and part of the Eromanga basin. These springs are not associated with the Betts Creek beds formation or any of the overlying aquifers.

The Eromanga Basin sequence is absent from the tenure and is not expected to be encountered during the proposed activities. There is currently no evidence of hydrogeological connection between the band of springs to the west of the permit area and the Betts Creek coal seams.

It is considered that the springs are sufficiently separated from the Gunn Pilot site that it is highly unlikely that production testing at the Gunn Pilot will result in a greater than 0.2m decline in water levels of springs and as such no impacts are expected.

A spring monitoring or management strategy is not considered to be required for this UWIR due to:

- No springs are located within 20km of the Gunn Pilot.
- No springs are located within the IAA.
- There is no known hydrological interconnection between the springs and the affected coal seams of the Betts Creek beds.

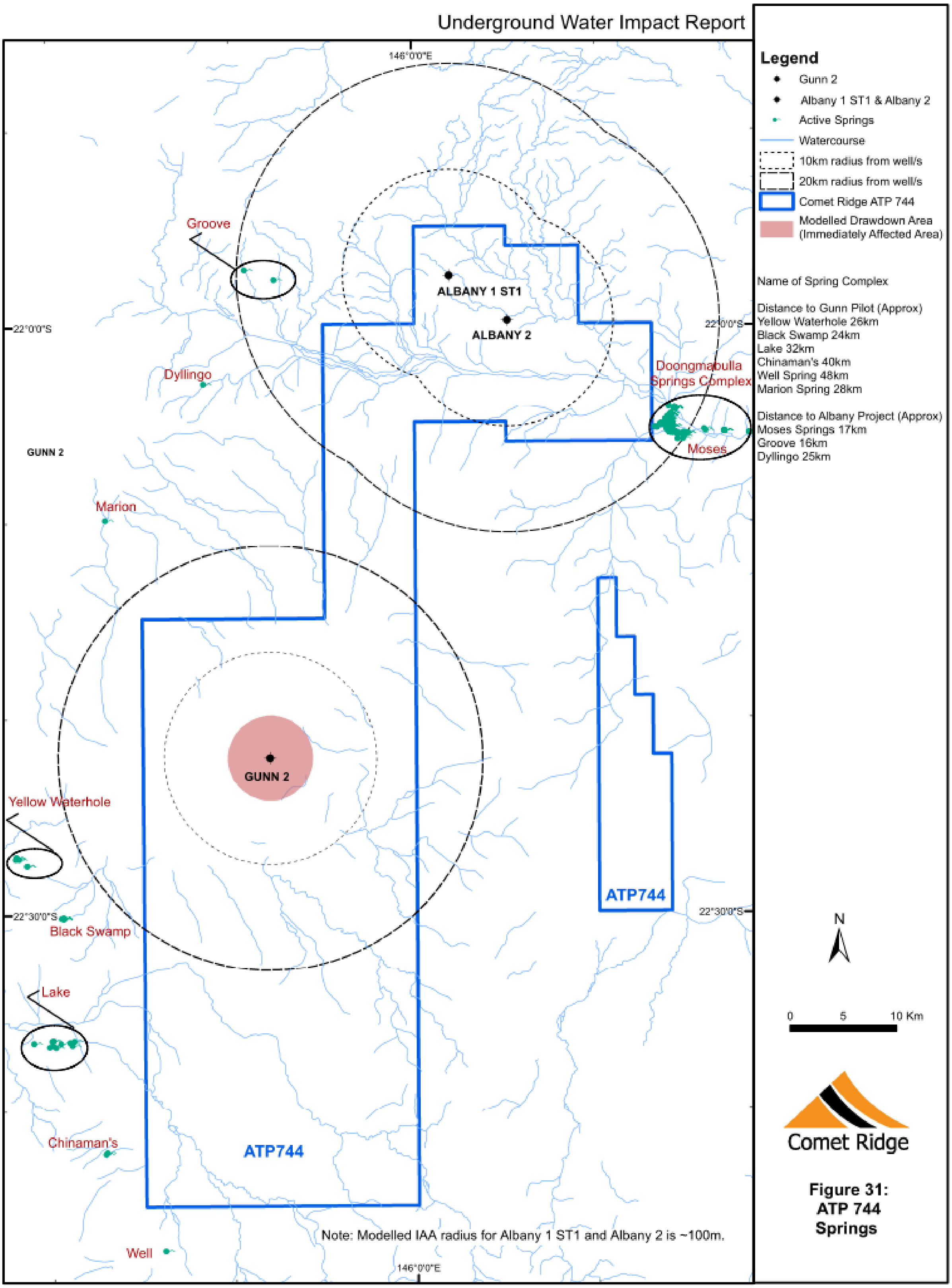

Figure 31. ATP 744 Springs

ALBANY STRUCTURE PROJECT

Target Formation

The Lake Galilee Sandstone is the primary target for conventional exploration and appraisal activities in ATP 744.

The Late Carboniferous to Early Permian Lake Galilee Sandstone is the basal unit of the Galilee Basin and unconformably overlies volcanic and clastic sediments of the Early Devonian to Early Carboniferous Drummond Basin (Refer to **Figure 3**). The Drummond Basin sediments are considered hydrological basement for the Albany Project. The Lake Galilee Sandstone is limited in distribution and appears to be only present in the Koburra Trough area, close to the eastern margin of the present Galilee Basin (**Figure 2**). The Lake Galilee Sandstone is only recognised subsurface and has been intersected in a limited number of petroleum exploration wells located along the axial trend of the Koburra Trough. Within ATP 744, four petroleum exploration wells have intersected the Lake Galilee Sandstone including Lake Galilee 1, Carmichael 1, Albany $1^{ST}1$ and Albany 2 (**Figure 32**).

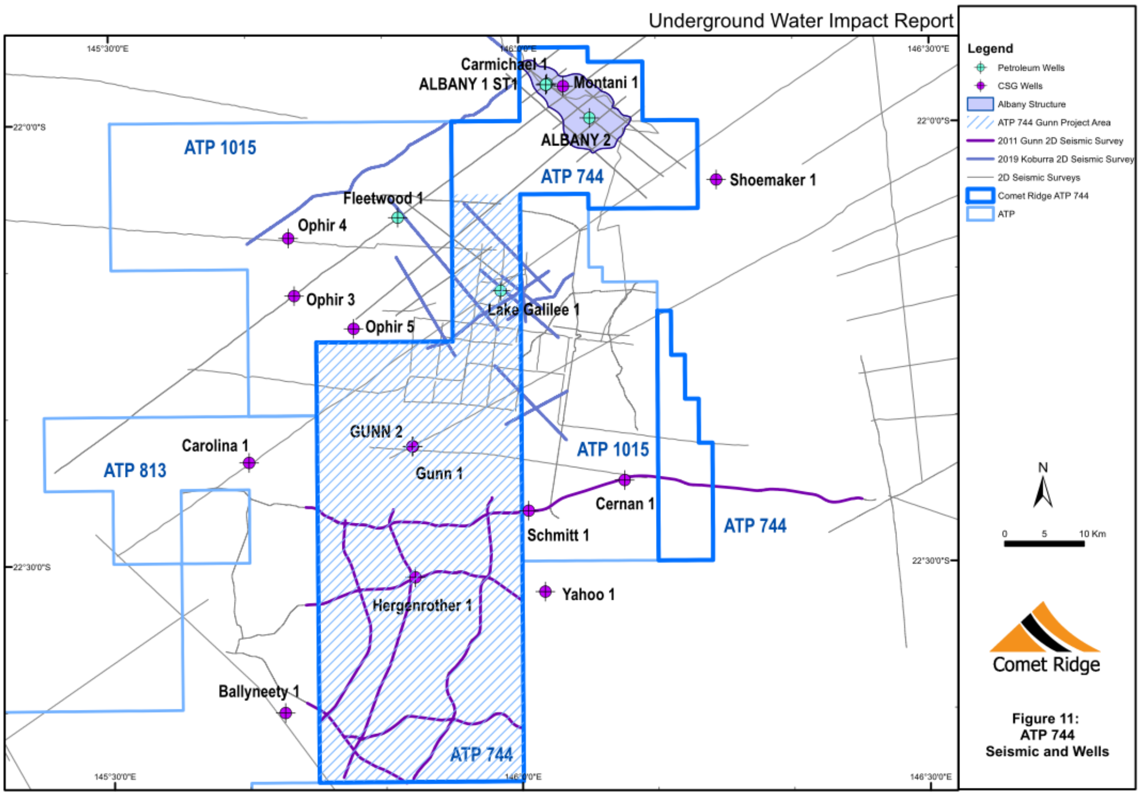

Figure 32: ATP 744 showing Gunn Project Area, Albany Structure, seismic and wells.

The Lake Galilee Sandstone comprises chiefly of sandstone with minor interbeds of siltstone, claystone and shale, and rare coal seam. The formation generally comprises a lower fine-coarse grained quartz lithic sandstone succession overlain by a siltstone to claystone interval and an uppermost unit of interbedded, fine-grained-medium grained quartz litharenite and siltstone. In the Albany Project area, five reservoir intervals (LGS1-LGS5) have been inferred and correlated within the Lake Galilee Sandstone formation interval (**Figure 33**).

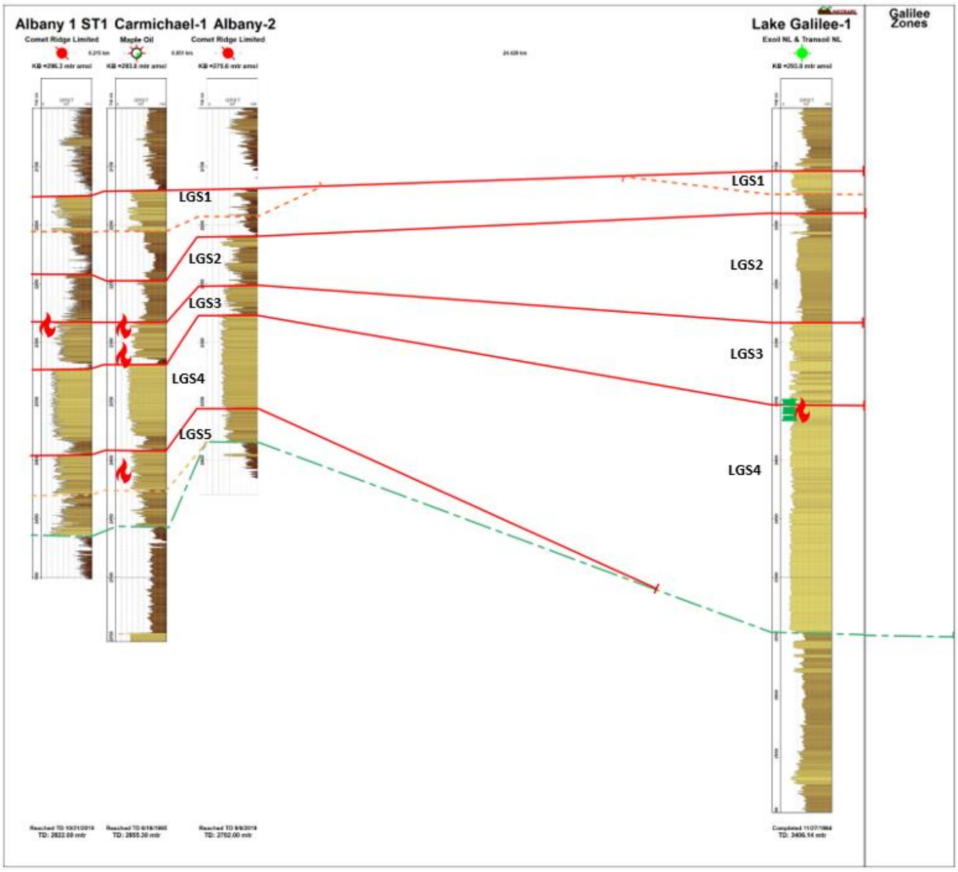

Figure 33: Cross Section: Lake Galilee Sandstone reservoir intervals - Carmichael 1 to Lake Galilee 1

The sandstone is generally described as light white grey to light grey, off white, clear to translucent, fine to medium grained, occasionally coarse grained to conglomeritic (in the lower section), sub-angular to rounded, firm to very hard, moderate to well sorted, commonly with siliceous and calcareous cement, micas and lithics, occasionally with traces of quartz overgrowths.

Sandstones range from immature to mature. More mature intervals are generally well rounded, and framework supported and have higher visual porosity compared to immature intervals. Immature sections have more angular to sub-spherical quartz grains which exhibit pressure solution and suturing along grain contacts. Limited re-crystallisation is associated with secondary porosity, however, is rare. Secondary quartz overgrowths have been noted. The formation has undergone compaction and concomitant suturing of inter-grain contacts. Porosity generally appears un-connected due to occlusion of pore throats by compaction and grain suturing. Silicification is apparent and appears to have preserved pores but reduced pore throat connectivity.

The quartz-rich sandstones of the Lake Galilee Sandstone are thought to have been derived from quartz detritus eroded from exposed granites of the Maneroo Platform to the south-west of the Galilee Basin and from the exposed Retreat Granite on the Anakie Inlier to the east of the Basin (**Figure 2**).

The Late Carboniferous section of the Galilee Basin was deposited in a fluvial-glacial to lacustrine environment. The Lake Galilee Sandstone, a largely quartzose sandstone with minor mudstone is interpreted as a braided stream deposit. The initial phase of deposition within the Galilee Basin (Lake Galilee Sandstone) is interpreted to be by braided stream river system which is inferred to have drained relatively high relief areas and flowed in a northerly direction depositing quartz-rich sands in the relatively narrow confining Koburra Trough area.

The Lake Galilee Sandstone is considered to be a tight sandstone reservoir as confirmed by DST and pressure results from Carmichael 1, Albany 2 and Albany ST1, and core analysis. Gross reservoir thickness inferred from log analysis ranges between 135.7 to 146.20m for Albany 1 ST1 and Albany 2 respectively.

The Lake Galilee Sandstone is vertically separated from overlying shallow aquifers of the Moolayember Formation and Clematis Sandstone, the primary source of groundwater in ATP 744 by over 2200m of which the majority of formations are considered low permeability formations or regional aquitards. (**Figure 34**).

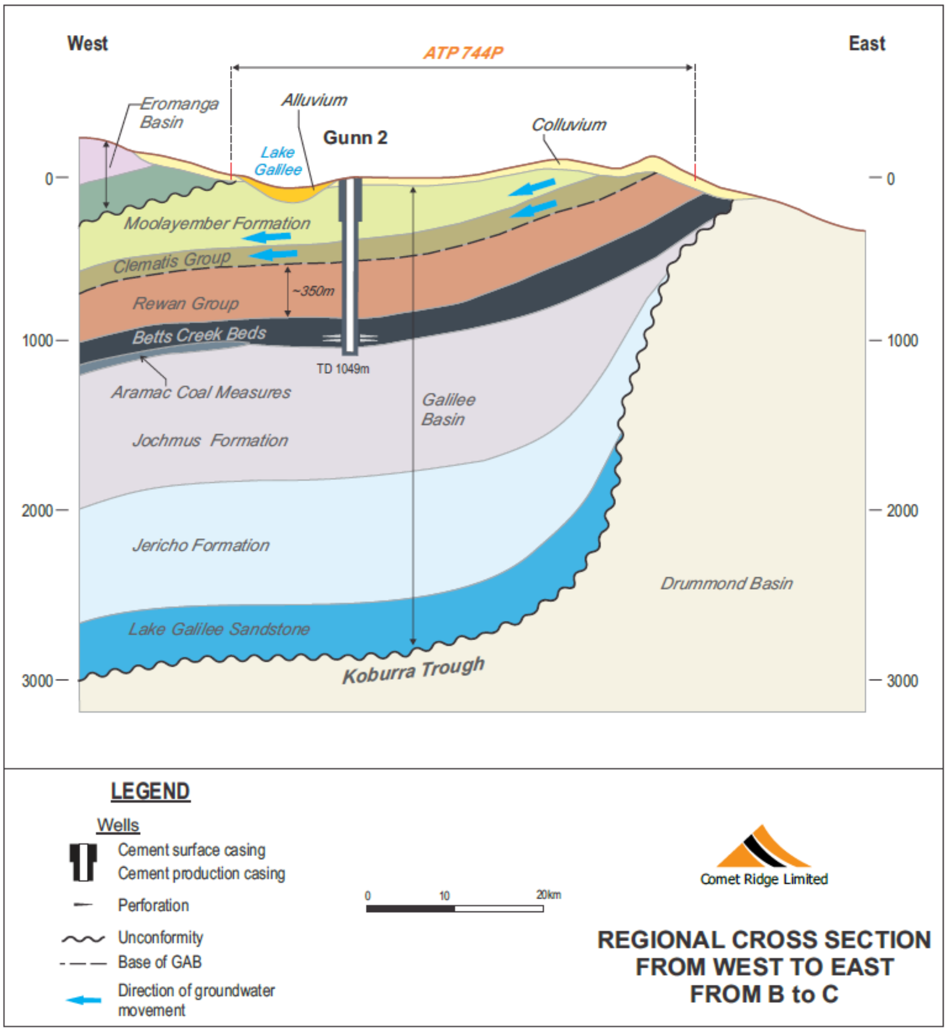

Figure 34: Regional schematic geological cross-section B-C from west to east across ATP 744

Geological Structure

The Albany Structure (**Figure 35**) is a clearly defined four-way closure with an aerial extent of 65km^2 to the lowest closing contour (LCC). Maximum closure relief is approximately 80m (to LCC). The northwest plunging structure is approximately 11km x 7km and is oriented NW-SE. The structure comprises two prominent culminations at the Lake Galilee Sandstone horizon. At the Lake Galilee Sandstone level, the lowest closing contour is interpreted at -2333mMSL and the structural spill point is located at the south-eastern end of the structure.

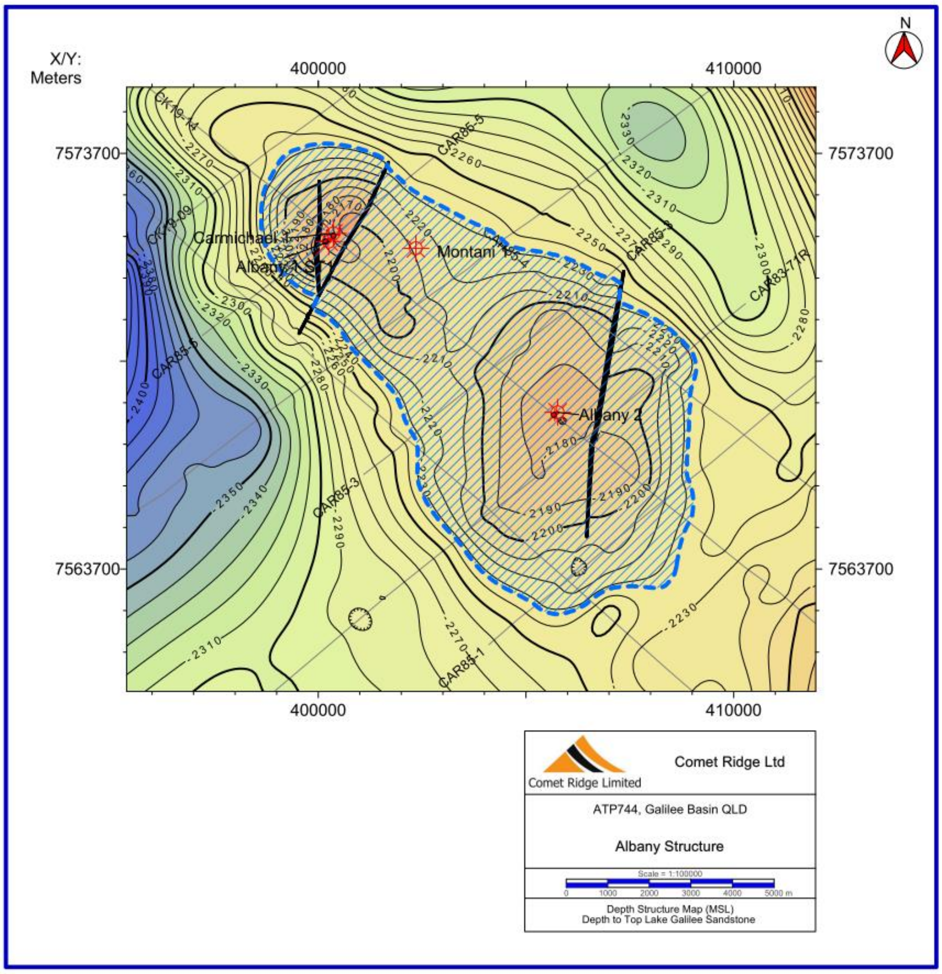

Figure 35: Albany Structure – depth to top Lake Galilee Sandstone (MSL)

The Albany Structure is oriented NW which aligned with a regional structural trend across the Koburra Trough. There is a general alignment of structures along the south-western flank of the Drummond Basin anticlines trending NW from the Albany Structure and has been defined as the Carmichael Structural Trend.

Some of the faults that have been identified across the tenure area and the Albany structure which extend from basement (Drummond) through the Lake Galilee Sandstone and into the Jericho Formation (possibly Lower Jochmus Formation) (**Figure 36**). However, no faults have been identified that connect the Lake Galilee Sandstone with the Betts Creek beds or the overlying Triassic or Quaternary/Tertiary aquifers or the ground surface. The intervening geological units seem to show good lateral continuity across the area of interest and lack large-scale structural features that may form vertical conduits between the target zone and shallower aquifers.

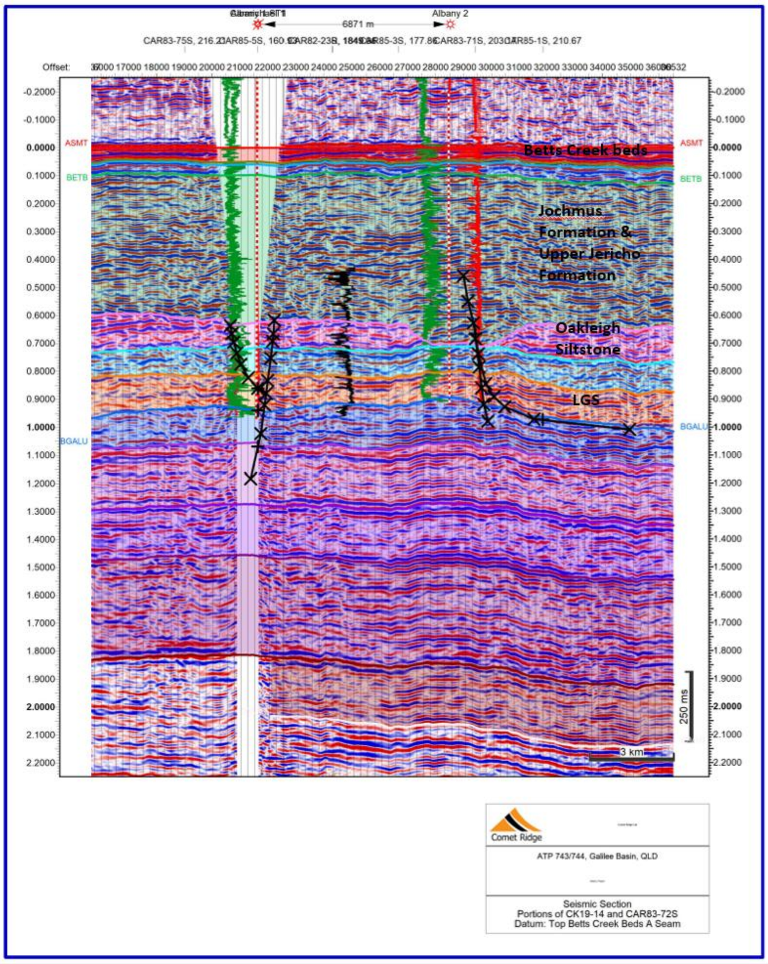

Figure 36: Cross-section though the Albany Structure from NW-SE, showing well locations and interpreted faults.

Project Description

In the early period of ATP 744 permit term, the work program for the exploration activities across ATP 744 were primarily focussed on CSG and further appraisal of the Gunn Project Area. In the latter half of the permit term, following the reinterpretation of the reservoir data over the Albany Structure, Comet Ridge changed the primary exploration and appraisal focus for ATP 744 from CSG to conventional oil and gas.

Conventional resources are generally appraised and developed in a shorter timeframe than CSG, as no prior de-watering of coals is required.

MON Carmichael 1 exploration well (**Figure 35**) was drilled by Maple Oil NL in 1995 on an earlier tenure to test the Albany Structure at the top of the Lake Galilee Sandstone at the intersection of seismic lines CAR85-72 and CAR85-5. The well was drilled to primarily test the Lake Galilee Sandstone, with secondary objectives including sandstones within the Jericho Formation.

It is considered to have validly tested the structure. Gas indications and oil shows were recorded throughout the Galilee sequence. DST's conducted across three intervals in the Lake Galilee Sandstone flowed gas to surface at rates too small to measure (RSTM).

The Carmichael 1 well confirmed the presence of a large accumulation of gas, and flowed gas to surface from three separate intervals of the Lake Galilee Sandstone but was deemed uneconomic at the time of drilling. An additional section of pay was not tested. However, there is evidence that the productivity of the tight gas reservoir was not optimally tested in Carmichael 1 due to the significant mud overbalance, resulting in formation damage and low gas flows during testing.

Comet Ridge sought a farm-in partner to further appraise conventional resources across the Galilee permits. On 1 November 2017, Comet Ridge announced an agreement had been executed with Vintage Energy Limited to farm-out the sandstone reservoir sequence of ATP 744, 743 and 1015.

Albany 1 was drilled by Comet Ridge in mid-2018 within the north-western closure on the Albany Structure (**Figure 35**). This was the first conventional well drilled in the eastern Galilee Basin in almost 25 years. The well was drilled as a twin to Carmichael 1 to re-evaluate the Lake Galilee Sandstone, the basal formation of the Galilee Basin.

Albany 1 was drilled with nitrogen rather than drilling mud through the sandstone reservoir section and recorded a stabilised gas flowrate of 230,000 scf/d across a 13m interval in the LGS3 reservoir interval within the Lake Galilee Sandstone. This gas flow is the first measurable flow of natural gas from the Lake Galilee Sandstone in the Galilee Basin. Unfortunately, the drill string became stuck while drilling of the flowing reservoir interval and the well was suspended before reaching the planned total depth (TD).

The Lake Galilee Sandstone reservoir falls within the category of unconventional reservoirs or tight gas, characterised by gas saturated low permeability sandstones. To potentially commercialise the gas resource, appraisal wells may require hydraulic stimulation treatment. The treatment is designed to improve deliverability within the gas saturated sandstones by increasing the pore volume connected to the wellbore.

In mid-2019, Comet Ridge drilled Albany 2 and later Albany 1 ST1 (side-track to the existing Albany 1 well). The objective was to determine the presence of hydrocarbons in the Lake Galilee Sandstone reservoir section in the southeast culmination of the Albany Structure, and to test the ability to obtain commercial gas flow rates through hydraulic stimulation.

Albany 2 appraisal well was spudded on 30 July 2019 on the south-east culmination of the Albany Structure (**Figure 35**), approximately 7.5km SE of Albany 1 well. The well was subsequently drilled to the final depth of 2702mMD into the Natal Formation - top of the Drummond Basin (**Figure 37**).

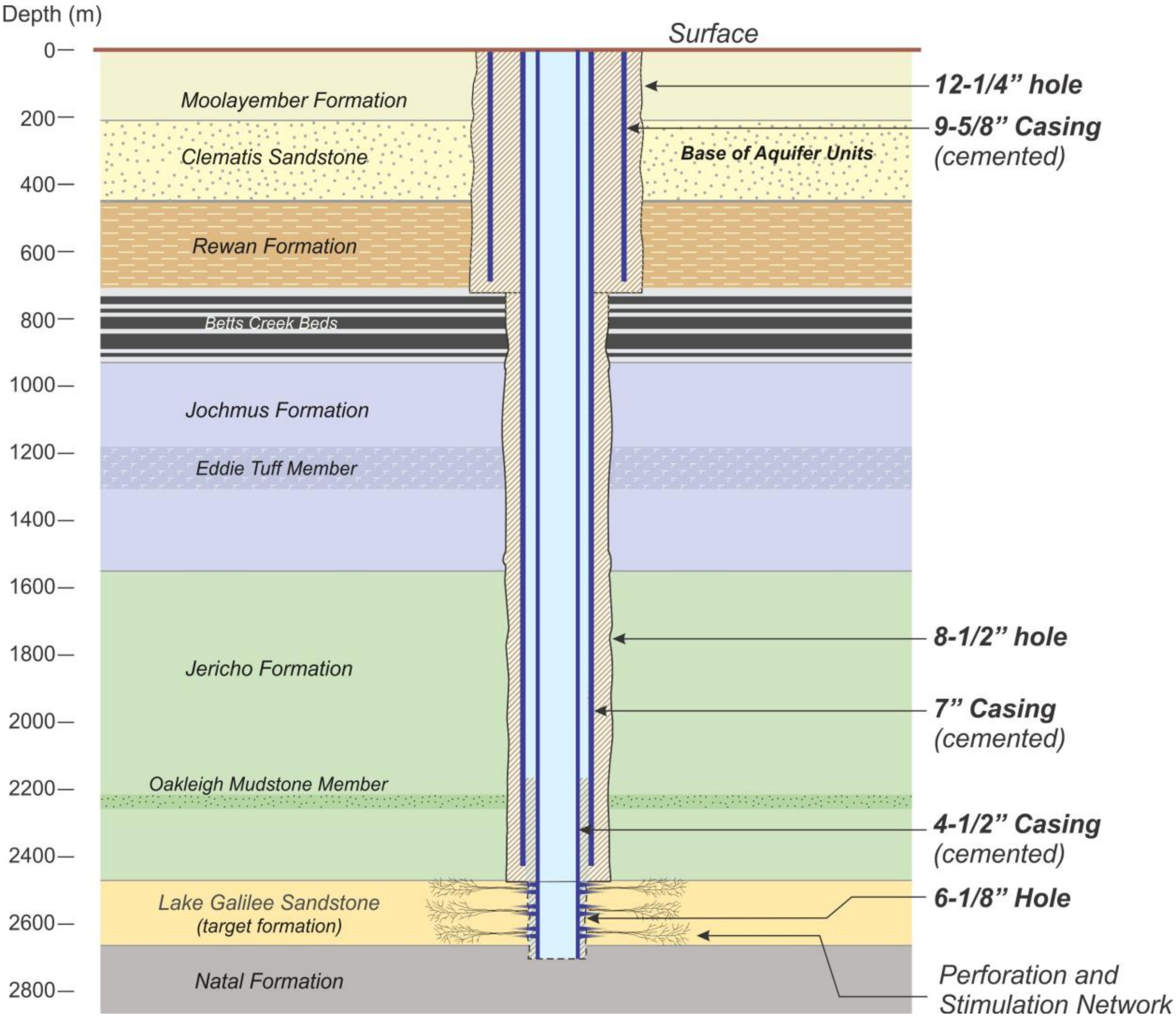

Figure 37. Albany 2 Well Design and Stimulation Schematic

Following Albany 2, Albany 1 appraisal well was re-entered and side-tracked from inside the 7" casing to the TD of 2822mMD in the Natal Formation (upper Drummond Basin). The well schematic is shown in **Figure 38**.

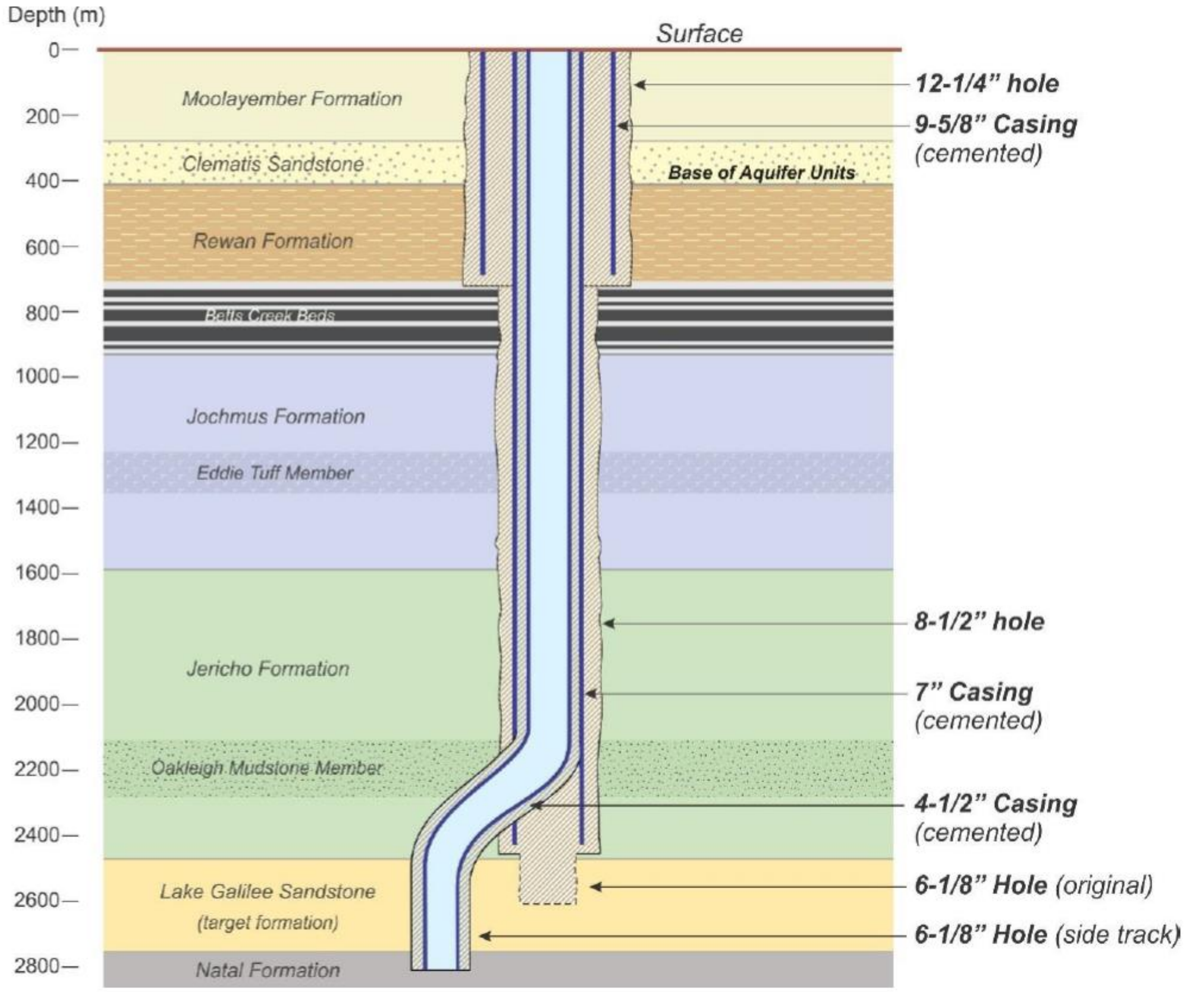

Figure 38. Albany 1 ST1 Well Design Schematic

Aquifers within shallow undifferentiated aquifers and aquifers of the Moolayember Formation and Clematis Group form the main groundwater source for livestock watering and water supply within the permit area. The Moolayember Formation and Clematis Group are vertically separated from the Lake Galilee Sandstone by over 2200m of which the majority of formations are considered low permeability formations or regional aquitards.

Both wells were completed using industry standards and in compliance with Department of Natural Resources, Mines and Energy (DNRME), *Code of practice for the construction and abandonment of petroleum wells and associated bores in Queenslan*d with multiple steel casing strings which have been pressure sealed with cement to surface.

The potential for leakage to aquifers due to loss of well integrity is also very low. Comet Ridge has reduced that risk to As Low As Reasonably Practical (ALARP) in the well design and during operations at each step in the process through monitoring. In particular:

- The well design and construction provide the mechanical integrity that reduces this risk to ALARP;
- Cement bond logs confirm the integrity of cement that fills the casing-well bore space and prevents migration;
- The potential aquifers of the lower Galilee Basin in both wells are protected behind both the 4-1/2” production casing and the 7” intermediate casing strings and their respective annular cement sheaths;
- The potential aquifers of the Moolayember Formation and Clematis Group are additionally protected by the 9-5/8” surface casing and cement.

Comet Ridge is confident that the confirmed integrity of the well construction; stimulation design, and the small scale of the planned stimulation treatments coupled with the described geological separation, is enough to minimise the risk of the treatment impacting aquifer units.

The first successful stimulation of the Lake Galilee Sandstone in the Galilee Basin was completed at Albany 2 in December 2019. Stimulation fluid flowback was completed for Albany 2 in January 2020.

Successful treatments were placed in two of the three target reservoir intervals in the Lake Galilee Sandstone. The third treatment was aborted, and the interval abandoned due to extremely high stresses and Near Well Bore Pressure Losses (NWBPL) encountered during the stimulation attempt. After stimulation treatments are placed, the stimulation fluid is generally flowed back. This process is known as stimulation flowback and is the recovery of fluid used in the stimulation treatment process. There may be a small amount of formation water, oil and/or gas recovered along with the stimulation fluid during this process.

Albany 2 was flowed back with the assistance of a Coiled Tubing unit and liquified Nitrogen. A total of 3570 bbls (568 KL) of fluid was produced which equates to ~93% of the stimulation load fluid. There was no free gas produced. Laboratory analysis of the produced fluid showed an increasing tendency to fresh water. It is unknown whether fluid production was sourced from a single or multiple stimulation treatment intervals.

Operations at Albany 2 were suspended on 28 January 2020, after flowback had been largely completed, due to heavy rainfall in the area. Stimulation and flowback were not completed at Albany 1 ST1 and all operations in the Galilee Basin were formally halted on 18 February 2020 due to continued wet conditions, with equipment demobilised to avoid significant wet weather standby charges over the remaining wet season.

No further appraisal work has been undertaken on either well at the Albany Project since January 2020. Both wells remain suspended for monitoring and full evaluation of results.

Part A: Underground Water Extraction

Water Extraction to Date

Conventional gas production is different from CSG gas production. Conventional gas production is generally from porous sandstone formations which does not require the depressurisation of the target beds (with respect to groundwater, and the need to remove groundwater to release the gas) to produce at economic quantities. Some water may be produced as a by-product; however, the volumes are relatively small.

The Lake Galilee Sandstone reservoir is interpreted to be predominantly dry gas with minor condensate. It is important to note that no water was intersected while drilling the reservoir section of Carmichael 1 in the past and no formation water was intersected or produced during the air/nitrogen (underbalanced) drilling phase of the reservoir section of Albany 1.

Analysis results of flowback fluid samples collected during stimulation flowback operations followed a trend of "freshening" flowback fluid. These results suggest some formation water may have been produced during operations. Volumetrics of possible formation water production are difficult to estimate.

Quantity of Water Estimated to be Produced Over the Next Three Years.

As previously mentioned, reservoir intervals of the Lake Galilee Sandstone are interpreted to be predominantly dry gas with minor condensate. If individual reservoir intervals are determined to be predominantly water-bearing during either drilling, well testing or stimulation phases, it is unlikely that production testing would be undertaken on that interval.

The Lake Galilee Sandstone formation within the study area is of very low permeability of less than 1 mD, which translates to less than 1 x 10-8 m/s hydraulic conductivity. Such low hydraulic conductivity values are typical for aquitards and confining units rather than aquifers.

To flow significant volumes of gas, the formation needs to be hydraulically stimulated to increase the pore volume connected to the wellbore. As previously discussed, following the hydraulic stimulation, the well is flowed back to recover the stimulation fluid before it can be gas flow tested. There may be a small amount of formation water, oil and/or gas recovered along with the stimulation fluid during this process.

Results from stimulation activities will be fully evaluated prior to proceeding to gas flow testing.

Albany 2 was stimulated at the end of 2019 and Albany 1 ST1 has not been stimulated. At the time of writing this report, both wells remain suspended for monitoring and full evaluation of results. There is no current timeframe to return to the project area to stimulate Albany 1 ST1.

It is anticipated, when production testing occurs, the gas flow test will be carried out for the maximum period of 30 days. Any additional production from these wells, post short term production testing will be dependent on the gas flow testing results.

Comet Ridge is not expecting to produce formation water during the gas flow production phase. However, to assess the potential impact of the gas testing activities on the surrounding hydrogeological regime, a nominal water production rate of 100 bbl/d (16 m^3/d) is assumed to be extracted daily from each of the wells during the entire period of 30-day testing. Such rate would total 480 m^3 of water from each of the Albany wells during the proposed gas flow testing period.

Part B: Aquifer Information and Underground Water Flow and Levels

Geological and Hydrogeological Settings

The Galilee Basin sediments were mainly deposited in a fluvio-lacustrine environment (i.e., by rivers and lakes), resulting in channel sands, floodplain siltstones and coals, lacustrine shales, alluvial fan deposits and some glacial deposits. The two major unconformities in the Galilee Basin divide the infilling of the Basin into two depositional episodes (CSIRO, 2014):

- Late Carboniferous-Early Permian - during this period the climate varied from glacial in the Late Carboniferous and early 'Early Permian' to warm and humid in the late 'Early Permian'. This episode is characterised by the sediments of the Joe Joe Group, which consists of the Lake Galilee Sandstone at its base, the Jericho Formation, the Jochmus Formation and the Aramac Coal Measures in the Koburra Trough (Hawkins 1978).
- Late Permian-Middle Triassic – the climate varied during this period from warm and humid in the Late Permian to more temperate in the Triassic. This episode started during the Upper Permian when the Betts Creek beds were deposited across the entire Basin (Allen & Fielding 2007b) and during the Triassic when there was deposition of the Rewan Group, the Clematis Group and the Moolayember Formation in the Koburra Trough.

The sequence is schematically presented in **Figure 34.** It should be noted that Moolayember and Clematis Sandstone are no longer formally part of GAB.

Refer to **Hydrogeology of ATP 744** under Gunn Project section for a description of aquifers from ground surface to the Betts Creek beds.

The lower Galilee Basin section comprises Late Carboniferous to Early Permian units of the Jochmus Formation, Jericho Formation and Lake Galilee Sandstone, respectively (**Figure 34**). The Jochmus Formation unconformably underlies the Betts Creek beds in the tenure area. The Jericho Formation is over 750m below the Jochmus Formation and no wells within the ATP other than oil and gas exploration wells penetrate this formation. The lower part of the Jericho Formation is interpreted to form a local aquitard above the reservoir interval of the targeted Lake Galilee Sandstone.

A high level hydrostratigraphy of the Galilee Basin is presented in **Figure 39** below (after Moya 2011). Based on the lithology of the units, it classifies them as aquifers, possible aquifers, or aquitards. The description of the units in the lower Galilee Basin is described below.

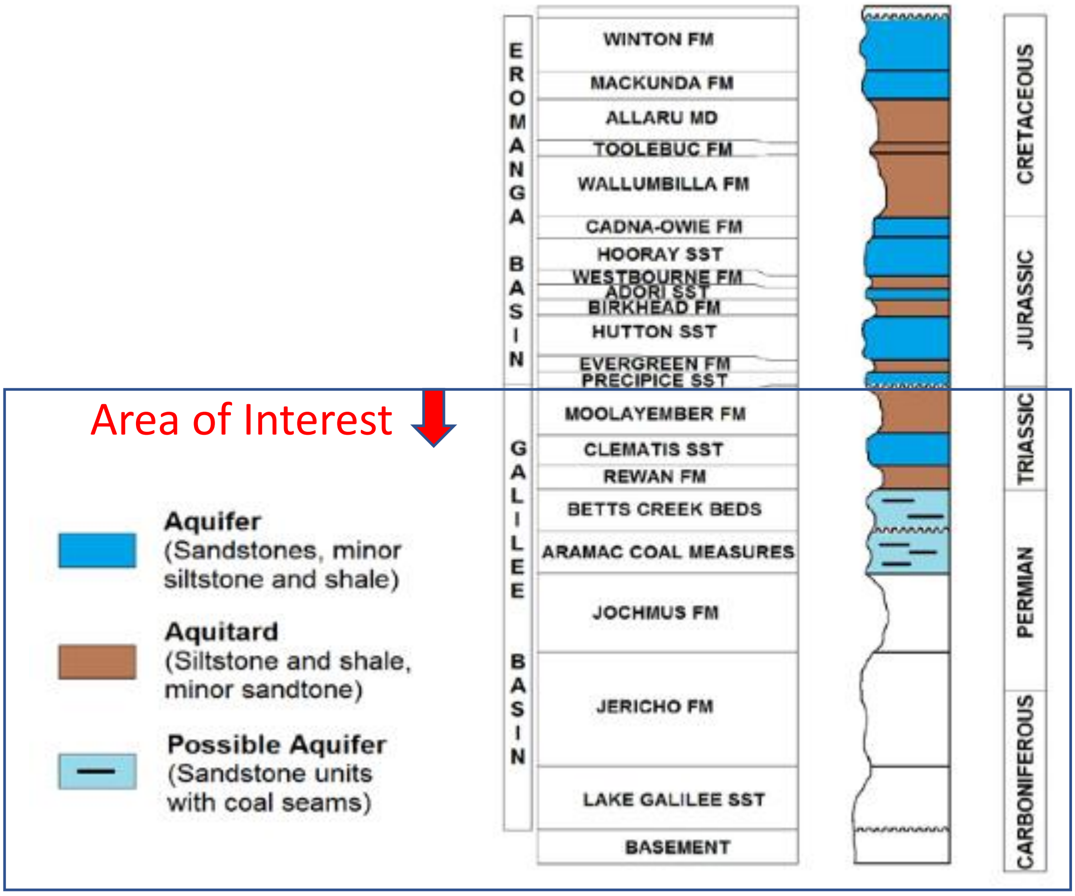

Figure 39. Simplified hydrostratigraphy in the Galilee and Eromanga Basins (after Mooya, 2011)

Jochmus Formation

Jochmus Formation – this formation is comprised of sandstone in the upper and lower parts, with a middle part composed of tuff with minor mudstones and siltstone. Marsh *et al.* (2008) considered that the sandstones within the Jochmus Formation appear to be more porous and permeable than the formations below but suggests there may be a high proportion of clay present (related to volcanic activity during deposition) but likely less in the Lovelle Depression. Permeabilities for this unit cited in Marsh *et al.* (2008) of 0 to 1634 mD (approximately zero to 1.6 m/day) are not indicative of an aquifer from a typical water resource perspective but indicate higher permeability than in underlying aquitards (CSIRO, 2014). The formation is approximately 650m thick in the Albany Project area. No groundwater bores intersect or source water from the Jochmus Formation in ATP 744.

Jericho Formation

Jericho Formation – this formation is predominantly comprised of siltstone and mudstone and is considered to act as an aquitard. This formation is over 800m thick in the project area, based on logs from the Albany Project wells. No groundwater bores intersect or source water from the Jericho Formation in ATP 744.

Lake Galilee Sandstone

The Late Carboniferous age Lake Galilee Sandstone is the basal formation of the Galilee Basin sequence. The Lake Galilee Sandstone comprises chiefly of sandstone with minor interbeds of siltstone, claystone and shale, and rare coal seam. The formation generally comprises a lower fine-coarse grained quartz lithic sandstone succession overlain by a siltstone to claystone interval and an uppermost unit of interbedded, fine-grained-medium grained quartz litharenite and siltstone.

Even though this formation has a predominantly sandstone lithology, quartz cementation has reduced the porosity and permeability to virtually zero, hence this unit can be considered an aquitard. Marsh *et al.* (2008) cites porosities of 2 to 10 per cent and permeability from 0 to 7 mD (average of 0.9 mD, which is approximately 0.001 m/day). The Lake Galilee Sandstone can be up to 260 m thick. The Lake Galilee Sandstone is completely subsurface and there are no known outcrops of the Lake Galilee Sandstone (RPS, 2012). No groundwater bores intersect or source water from the Lake Galilee Sandstone in ATP 744.

Hydraulic Properties.

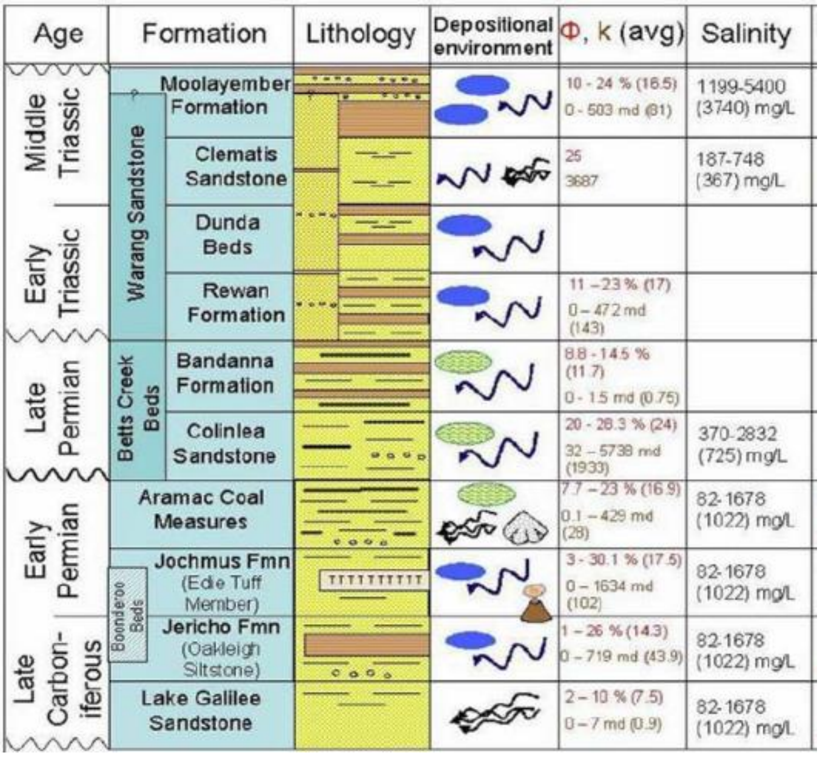

Figure 40. Summary of key properties of formations in the Galilee Basin (Marsh et al. 2008)

The high-level summary of the hydraulic parameters for the Galilee sequence is presented in **Figure 40** (after Marsh *et al.* 2008). The wide range of permeabilities measured within formations is likely to be related to various lithologies within that particular formation. It should also be noted that Marsh *et al. 2008* made no distinctions between horizontal and vertical permeabilities, which in the majority of depositional basins are expected to be significantly lower than horizontal permeabilities.

Worth noting are also the salinity measurements, suggesting the poorest quality groundwater is expected in the shallowest units of the area, while deepest parts of the basin show moderate quality with average measured salinity of just over 1000 mg/L. It is important to note here, that there is a very limited dataset of water samples from the lower Galilee sequence. Additional data points would be required to confirm these assumptions.

Groundwater Bores

A review of the DoR Groundwater Database (GWBD) was undertaken to identify registered bores that have not been abandoned and destroyed within the permit area. Refer to **Appendix 1** for a list of all registered and known unregistered groundwater bores in ATP 744. Refer to **Appendix 2** for all available water quality data and **Appendix 3** for all available water level data within ATP 744. Data has been compiled from the GWDB, baseline assessed landholder bores and, coal seam gas and petroleum wells within ATP 744.

There are fifty-eight (58) registered water bores in ATP 744. Forty-five (45) registered/licensed bores in ATP 744 are listed as existing and thirteen (13) are listed as abandoned or destroyed. Three (3) registered existing bores have been identified that are primarily being used as water monitoring bores (**Appendix 1**).

Data from the GWDB indicates that groundwater bores in the permit area have been drilled to relatively shallow depths are therefore sourcing shallow aquifers. Data from the GWDB indicates groundwater is principally drawn from shallow undifferentiated aquifers and aquifers of the Moolayember Formation or Clematis Group (**Appendix 2**). The records indicate groundwater is primarily being used as water supply for livestock watering (**Appendix 1**).

Within 20km of the Albany 1 ST1 and Albany 2 there are forty-four (44) registered bores which have not been abandoned and destroyed. Two unregistered water bores have been identified within 10km of Albany 1 ST1 and Albany 2. Twenty-eight (28) groundwater bore have groundwater level data (**Table 13**) and seven (7) have groundwater quality information (**Table 14**).

Of the seven (7) bores with groundwater quality data, five (5) are located within 10km of Albany 1 ST1 and Albany 2. These are active landholder bores for which a baseline assessment has been completed by Comet Ridge as per requirements of the Baseline Assessment Plan for ATP 744. The location of groundwater bores with Water Quality and Water Level data within 20km of Gunn 2 is shown on **Figure 41.**

Table 13: Available groundwater level data within 20km of Albany wells. Recorded standing water level has been referenced to mean sea level where datum was known.

Registration Number	Formation Name	Date	SWL (from Reference Datum)	SWL (amSL)
16895	Moolayember Formation	14/07/1966	-32.9	224.69
16896	Moolayember Formation	5/07/1966	-27.43	236.17
39801	Moolayember Formation	26/05/1975	-35.4	NA

158888~	Moolayember Formation	24/11/2014	-44.92	252.45
158888~	Moolayember Formation	4/02/2015	-44.85	252.52
158888~	Moolayember Formation	28/03/2015	-44.92	252.45
158888~	Moolayember Formation	25/05/2015	-44.96	252.41
158888~	Moolayember Formation	26/07/2015	-44.92	252.45
158888~	Moolayember Formation	9/09/2015	-44.94	252.43
158888~	Moolayember Formation	26/11/2015	-44.9	252.47
158888~	Moolayember Formation	27/02/2016	-44.88	252.49
158888~	Moolayember Formation	20/04/2016	-44.91	252.46
158888~	Moolayember Formation	5/07/2016	-44.97	252.4
158888~	Moolayember Formation	23/11/2016	-44.9	252.47
158888~	Moolayember Formation	20/04/2017	-44.92	252.45
158888~	Moolayember Formation	3/10/2019	-44.64	252.73
158888~	Moolayember Formation	26/04/2020	-44.91	252.46
158888~	Moolayember Formation	19/06/2020	-44.93	252.44
158888~	Moolayember Formation	13/08/2020	-44.88	252.49
158888~	Moolayember Formation	13/10/2020	-44.91	252.46
158888~	Moolayember Formation	12/01/2022	-44.97	252.4
158888~	Moolayember Formation	20/02/2022	-44.9	252.47
158888~	Moolayember Formation	26/05/2022	-44.92	252.45
158888~	Moolayember Formation	28/06/2022	-45	252.37
158888~	Moolayember Formation	25/08/2022	-45.02	252.35
165104~	Clematis Group	25/05/2015	-46.73	250.62
165104~	Clematis Group	26/07/2015	-46.66	250.69
165104~	Clematis Group	10/09/2015	-46.72	250.63
165104~	Clematis Group	29/11/2015	-46.71	250.64
165104~	Clematis Group	27/02/2016	-46.67	250.68
165104~	Clematis Group	20/04/2016	-46.7	250.65
165104~	Clematis Group	7/09/2019	-46.65	250.7
165104~	Clematis Group	26/04/2020	-46.77	250.58
165104~	Clematis Group	19/06/2020	-46.78	250.57
165104~	Clematis Group	13/08/2020	-46.77	250.58
165104~	Clematis Group	13/10/2020	-46.8	250.55
165104~	Clematis Group	12/01/2022	-46.85	250.5
165104~	Clematis Group	20/02/2022	-46.77	250.58
165104~	Clematis Group	26/05/2022	-46.77	250.58
165104~	Clematis Group	28/06/2022	-46.8	250.55
165104~	Clematis Group	25/08/2022	-46.81	250.54
96545	Moolayember Formation	21/03/1995	-30	262.52
118253	Moolayember Formation	17/02/2003	-48	NA
118253	Undifferentiated	17/02/2003	-42	NA
158888	Moolayember Formation	30/07/2014	-45.12	252.25
165967	Moolayember Formation	18/10/2019	-36	NA
184715	Clematis Group	6/05/2021	-36	NA
190671	Undifferentiated	29/10/2021	-28	NA
190672	Undifferentiated	31/10/2021	-40	NA
39801#	Moolayember Formation	27/04/2018	-28.78	NA
96545#	Moolayember Formation	27/03/2018	-26.02	266.5
Kade’s Bore#	Moolayember Formation	27/03/2018	-26.73	NA
96545#	Moolayember Formation	18/10/2019	-29.32	263.2
Carmichael House Bore#	Moolayember Formation	18/10/2019	-27.11	NA
Kade’s Bore#	Moolayember Formation	18/10/2019	-28.79	NA
16896#	Moolayember Formation	18/10/2019	-29.14	239.41

16896#	Moolayember Formation	29/08/2020	-9.96	253.64
96545#	Moolayember Formation	29/08/2020	-26.6	265.92
Carmichael House Bore#	Moolayember Formation	29/08/2020	-26.76	NA
Kade's Bore#	Moolayember Formation	29/08/2020	-26.67	NA
Groundwater Bores within 20km Albany -outside 744				
17981	Undifferentiated	19/04/1968	-24.4	NA
39802	Undifferentiated	9/04/1951	-36	NA
132941~	Rewan Formation	2/05/2014	-42.4	252.23
132941~	Rewan Formation	6/05/2014	-42.4	252.23
132941~	Rewan Formation	26/05/2014	-42.38	252.25
132941~	Rewan Formation	4/08/2014	-42.4	252.23
132941~	Rewan Formation	23/09/2014	-42.4	252.23
132941~	Rewan Formation	17/11/2014	-42.4	252.23
132941~	Rewan Formation	4/02/2015	-42.4	252.23
132941~	Rewan Formation	24/03/2015	-42.38	252.25
132941~	Rewan Formation	28/05/2015	-42.43	252.2
132941~	Rewan Formation	26/07/2015	-42.35	252.28
132941~	Rewan Formation	7/09/2015	-42.35	252.28
132941~	Rewan Formation	23/11/2015	-42.35	252.28
132941~	Rewan Formation	26/02/2016	-42.35	252.28
132941~	Rewan Formation	17/04/2016	-42.35	252.28
132941~	Rewan Formation	2/07/2016	-42.41	252.22
132941~	Rewan Formation	22/11/2016	-42.29	252.34
132941~	Rewan Formation	19/04/2017	-42.39	252.24
132941~	Rewan Formation	3/10/2019	-42.17	252.46
132941~	Rewan Formation	26/04/2020	-42.42	252.21
132941~	Rewan Formation	19/06/2020	-42.39	252.24
132941~	Rewan Formation	13/08/2020	-42.4	252.23
132941~	Rewan Formation	13/10/2020	-42.41	252.22
132941~	Rewan Formation	12/01/2022	-42.46	252.17
132941~	Rewan Formation	20/02/2022	-42.45	252.18
132941~	Rewan Formation	26/05/2022	-42.43	252.2
132941~	Rewan Formation	28/06/2022	-42.46	252.17
132941~	Rewan Formation	25/08/2022	-42.48	252.15
158073~	Betts Creek Beds[2]	8/09/2019	-46.6	248.48
158073~	Betts Creek Beds[2]	24/04/2020	-46.54	248.54
158073~	Betts Creek Beds[2]	19/06/2020	-46.55	248.53
158073~	Betts Creek Beds[2]	13/08/2020	-46.52	248.56
158073~	Betts Creek Beds[2]	13/10/2020	-46.51	248.57
158073~	Betts Creek Beds[2]	12/01/2022	-46.58	248.5
158073~	Betts Creek Beds[2]	20/02/2022	-46.49	248.59
158073~	Betts Creek Beds[2]	26/05/2022	-46.49	248.59
158073~	Betts Creek Beds[2]	28/06/2022	-46.57	248.51
158073~	Betts Creek Beds[2]	25/08/2022	-46.62	248.46
158075~	Betts Creek Beds[2]	8/11/2011	-36.79	245.1
158075~	Betts Creek Beds[2]	21/06/2012	-36.76	245.13
158075~	Betts Creek Beds[2]	20/05/2013	-36.73	245.16
158075~	Betts Creek Beds[2]	1/05/2014	-36.91	244.98
158075~	Betts Creek Beds[2]	26/05/2014	-36.98	244.91
158075~	Betts Creek Beds[2]	1/08/2014	-36.9	244.99
158075~	Betts Creek Beds[2]	23/09/2014	-36.94	244.95
158075~	Betts Creek Beds[2]	18/11/2014	-36.89	245
158075~	Betts Creek Beds[2]	4/02/2015	-36.89	245

158075~	Betts Creek Beds[2]	24/03/2015	-36.93	244.96
158075~	Betts Creek Beds[2]	24/05/2015	-36.95	244.94
158075~	Betts Creek Beds[2]	26/07/2015	-36.89	245
158075~	Betts Creek Beds[2]	9/09/2015	-36.89	245
158075~	Betts Creek Beds[2]	26/11/2015	-36.89	245
158075~	Betts Creek Beds[2]	27/02/2016	-36.88	245.01
158075~	Betts Creek Beds[2]	20/04/2016	-36.93	244.96
158075~	Betts Creek Beds[2]	6/07/2016	-36.98	244.91
158075~	Betts Creek Beds[2]	22/11/2016	-36.81	245.08
158075~	Betts Creek Beds[2]	19/04/2017	-36.9	244.99
158075~	Betts Creek Beds[2]	18/08/2019	-36.78	245.11
158075~	Betts Creek Beds[2]	24/04/2020	-36.92	244.97
158075~	Betts Creek Beds[2]	19/06/2020	-36.92	244.97
158075~	Betts Creek Beds[2]	13/08/2020	-36.88	245.01
158075~	Betts Creek Beds[2]	13/10/2020	-36.88	245.01
158075~	Betts Creek Beds[2]	12/01/2022	-37	244.89
158075~	Betts Creek Beds[2]	20/02/2022	-36.96	244.93
158075~	Betts Creek Beds[2]	19/04/2022	-37.01	244.88
158075~	Betts Creek Beds[2]	28/06/2022	-37.02	244.87
158075~	Betts Creek Beds[2]	25/08/2022	-37.03	244.86
158076~	Betts Creek Beds[2]	20/05/2013	-39.51	242.55
158076~	Betts Creek Beds[2]	6/05/2014	-39.6	242.46
158076~	Betts Creek Beds[2]	26/05/2014	-39.62	242.44
158076~	Betts Creek Beds[2]	1/08/2014	-39.6	242.46
158076~	Betts Creek Beds[2]	23/09/2014	-39.58	242.48
158076~	Betts Creek Beds[2]	18/11/2014	-39.55	242.51
158076~	Betts Creek Beds[2]	4/02/2015	-39.5	242.56
158076~	Betts Creek Beds[2]	24/03/2015	-39.58	242.48
158076~	Betts Creek Beds[2]	24/05/2015	-39.6	242.46
158076~	Betts Creek Beds[2]	25/07/2015	-39.58	242.48
158076~	Betts Creek Beds[2]	8/09/2015	-39.55	242.51
158076~	Betts Creek Beds[2]	25/11/2015	-39.55	242.51
158076~	Betts Creek Beds[2]	23/02/2016	-39.49	242.57
158076~	Betts Creek Beds[2]	19/04/2016	-39.55	242.51
158076~	Betts Creek Beds[2]	6/07/2016	-39.61	242.45
158076~	Betts Creek Beds[2]	18/08/2019	-39.54	242.52
158076~	Betts Creek Beds[2]	24/04/2020	-39.73	242.33
158076~	Betts Creek Beds[2]	19/06/2020	-39.76	242.3
158076~	Betts Creek Beds[2]	13/08/2020	-39.77	242.29
158076~	Betts Creek Beds[2]	12/01/2022	-39.91	242.15
158076~	Betts Creek Beds[2]	20/02/2022	-39.88	242.18
158076~	Betts Creek Beds[2]	19/04/2022	-39.94	242.12
158076~	Betts Creek Beds[2]	28/06/2022	-39.92	242.14
158076~	Betts Creek Beds[2]	25/08/2022	-39.92	242.14
158077~	Betts Creek Beds[2]	9/11/2011	-39.76	242.22
158077~	Betts Creek Beds[2]	21/06/2012	-39.73	242.25
158077~	Betts Creek Beds[2]	20/05/2013	-39.61	242.37
158077~	Betts Creek Beds[2]	1/03/2014	-39.55	242.43
158077~	Betts Creek Beds[2]	1/05/2014	-39.58	242.4
158077~	Betts Creek Beds[2]	1/07/2014	-39.5	242.48
158077~	Betts Creek Beds[2]	1/09/2014	-39.55	242.43
158077~	Betts Creek Beds[2]	24/11/2014	-39.49	242.49
158077~	Betts Creek Beds[2]	4/02/2015	-39.51	242.47
158077~	Betts Creek Beds[2]	24/03/2015	-39.56	242.42

158077~	Betts Creek Beds[2]	24/05/2015	-39.55	242.43
158077~	Betts Creek Beds[2]	26/07/2015	-39.54	242.44
158077~	Betts Creek Beds[2]	9/09/2015	-39.51	242.47
158077~	Betts Creek Beds[2]	26/11/2015	-39.43	242.55
158077~	Betts Creek Beds[2]	27/02/2016	-39.5	242.48
158077~	Betts Creek Beds[2]	19/04/2016	-39.55	242.43
158077~	Betts Creek Beds[2]	6/07/2016	-39.6	242.38
158077~	Betts Creek Beds[2]	22/11/2016	-39.49	242.49
158077~	Betts Creek Beds[2]	19/04/2017	-39.52	242.46
158077~	Betts Creek Beds[2]	18/08/2019	-39.47	242.51
158077~	Betts Creek Beds[2]	24/04/2020	-39.66	242.32
158077~	Betts Creek Beds[2]	19/06/2020	-39.68	242.3
158077~	Betts Creek Beds[2]	13/08/2020	-39.66	242.32
158077~	Betts Creek Beds[2]	13/10/2020	-39.68	242.3
158077~	Betts Creek Beds[2]	12/01/2022	-39.82	242.16
158077~	Betts Creek Beds[2]	20/02/2022	-39.8	242.18
158077~	Betts Creek Beds[2]	19/04/2022	-39.85	242.13
158077~	Betts Creek Beds[2]	28/06/2022	-39.85	242.13
158077~	Betts Creek Beds[2]	25/08/2022	-39.84	242.14
158261~	Clematis Sandstone	1/03/2014	-57.64	250.14
158261~	Clematis Sandstone	1/05/2014	-57.66	250.12
158261~	Clematis Sandstone	1/07/2014	-57.5	250.28
158261~	Clematis Sandstone	1/09/2014	-57.61	250.17
158261~	Clematis Sandstone	22/11/2014	-57.61	250.17
158261~	Clematis Sandstone	5/02/2015	-57.71	250.07
158261~	Clematis Sandstone	25/03/2015	-57.64	250.14
158261~	Clematis Sandstone	25/05/2015	-57.65	250.13
158261~	Clematis Sandstone	25/07/2015	-57.57	250.21
165540~	Clematis Sandstone	18/11/2019	3.42	250.77
165540~	Clematis Sandstone	25/04/2020	3.23	250.58
165540~	Clematis Sandstone	19/06/2020	3.18	250.53
165540~	Clematis Sandstone	16/08/2020	3.26	250.61
165540~	Clematis Sandstone	14/10/2020	3.16	250.51
165541~	Clematis Sandstone	18/11/2019	-5.59	243.69
165541~	Clematis Sandstone	25/04/2020	-5.58	243.7
165541~	Clematis Sandstone	19/06/2020	-5.56	243.72
165541~	Clematis Sandstone	16/08/2020	-5.57	243.71
165541~	Clematis Sandstone	14/10/2020	-5.68	243.6
165541~	Clematis Sandstone	9/01/2022	-5.57	243.71
165541~	Clematis Sandstone	20/02/2022	-5.48	243.8
165541~	Clematis Sandstone	21/04/2022	-5.7	243.58
165541~	Clematis Sandstone	26/06/2022	-5.56	243.72
165541~	Clematis Sandstone	24/08/2022	-5.51	243.77
165542~	Moolayember Formation	9/10/2019	-12.64	236.44
165542~	Moolayember Formation	25/04/2020	-12.75	236.33
165542~	Moolayember Formation	19/06/2020	-12.7	236.38
165542~	Moolayember Formation	16/08/2020	-12.67	236.41
165542~	Moolayember Formation	14/10/2020	-12.8	236.28
165542~	Moolayember Formation	9/01/2022	-12.83	236.25
165542~	Moolayember Formation	20/02/2022	-12.76	236.32
165542~	Moolayember Formation	21/04/2022	-12.8	236.28
165542~	Moolayember Formation	26/06/2022	-12.79	236.29
165542~	Moolayember Formation	24/08/2022	-12.83	236.25
190088~	Clematis Sandstone	22/06/2020	-57.49	248.78

190088~	Clematis Sandstone	16/08/2020	-57.31	248.96
190088~	Clematis Sandstone	16/10/2020	-57.35	248.92
190088~	Clematis Sandstone	12/01/2022	-57.44	248.83
190088~	Clematis Sandstone	22/02/2022	-57.4	248.87
190088~	Clematis Sandstone	29/05/2022	-57.4	248.87
190088~	Clematis Sandstone	28/06/2022	-57.43	248.84
190088~	Clematis Sandstone	26/08/2022	-57.47	248.8
190596~	Moolayember Formation	25/04/2020	-0.33	237.88
190596~	Moolayember Formation	19/06/2020	-0.36	237.85
190596~	Moolayember Formation	16/08/2020	-0.44	237.77
190596~	Moolayember Formation	24/02/2021	-0.32	237.89
190596~	Moolayember Formation	21/04/2021	-0.5	237.71
190596~	Moolayember Formation	7/06/2021	-0.34	237.87
190596~	Moolayember Formation	16/08/2021	-0.33	237.88
190596~	Moolayember Formation	26/10/2021	-0.33	237.88
190596~	Moolayember Formation	9/01/2022	-0.34	237.87
190597~	Moolayember Formation	28/10/2019	-0.32	240.3
190597~	Moolayember Formation	25/04/2020	-0.58	240.04
190597~	Moolayember Formation	19/06/2020	-0.5	240.12
190597~	Moolayember Formation	16/08/2020	-0.55	240.07
190597~	Moolayember Formation	24/02/2021	-0.51	240.11
190597~	Moolayember Formation	21/04/2021	-0.5	240.12
190597~	Moolayember Formation	7/06/2021	-0.49	240.13
190597~	Moolayember Formation	16/08/2021	-0.48	240.14
190597~	Moolayember Formation	26/10/2021	-0.48	240.14
190597~	Moolayember Formation	9/01/2022	-0.68	239.94
190598~	Moolayember Formation	25/04/2020	-0.58	238.96
190598~	Moolayember Formation	19/06/2020	-0.51	239.03
190598~	Moolayember Formation	16/08/2020	-0.44	239.1
190598~	Moolayember Formation	25/02/2021	-0.53	239.01
190598~	Moolayember Formation	21/04/2021	-0.52	239.02
190598~	Moolayember Formation	7/06/2021	-0.5	239.04
190598~	Moolayember Formation	16/08/2021	-0.43	239.11
190598~	Moolayember Formation	9/01/2022	-0.46	239.08
190599~	Moolayember Formation	25/04/2020	-0.78	238.39
190599~	Moolayember Formation	19/06/2020	-0.61	238.56
190599~	Moolayember Formation	16/08/2020	-0.67	238.5
190599~	Moolayember Formation	25/02/2021	-0.76	238.41
190599~	Moolayember Formation	21/04/2021	-0.65	238.52
190599~	Moolayember Formation	7/06/2021	-0.61	238.56
190599~	Moolayember Formation	16/08/2021	-0.58	238.59
190599~	Moolayember Formation	9/01/2022	-0.83	240

~Water Monitoring Bore - actual measurement type only

#Baseline Assessed

[1] Purging of the bore was not able to be undertaken before SWL was measured.

[2] Equivalent Formation relevant to ATP744

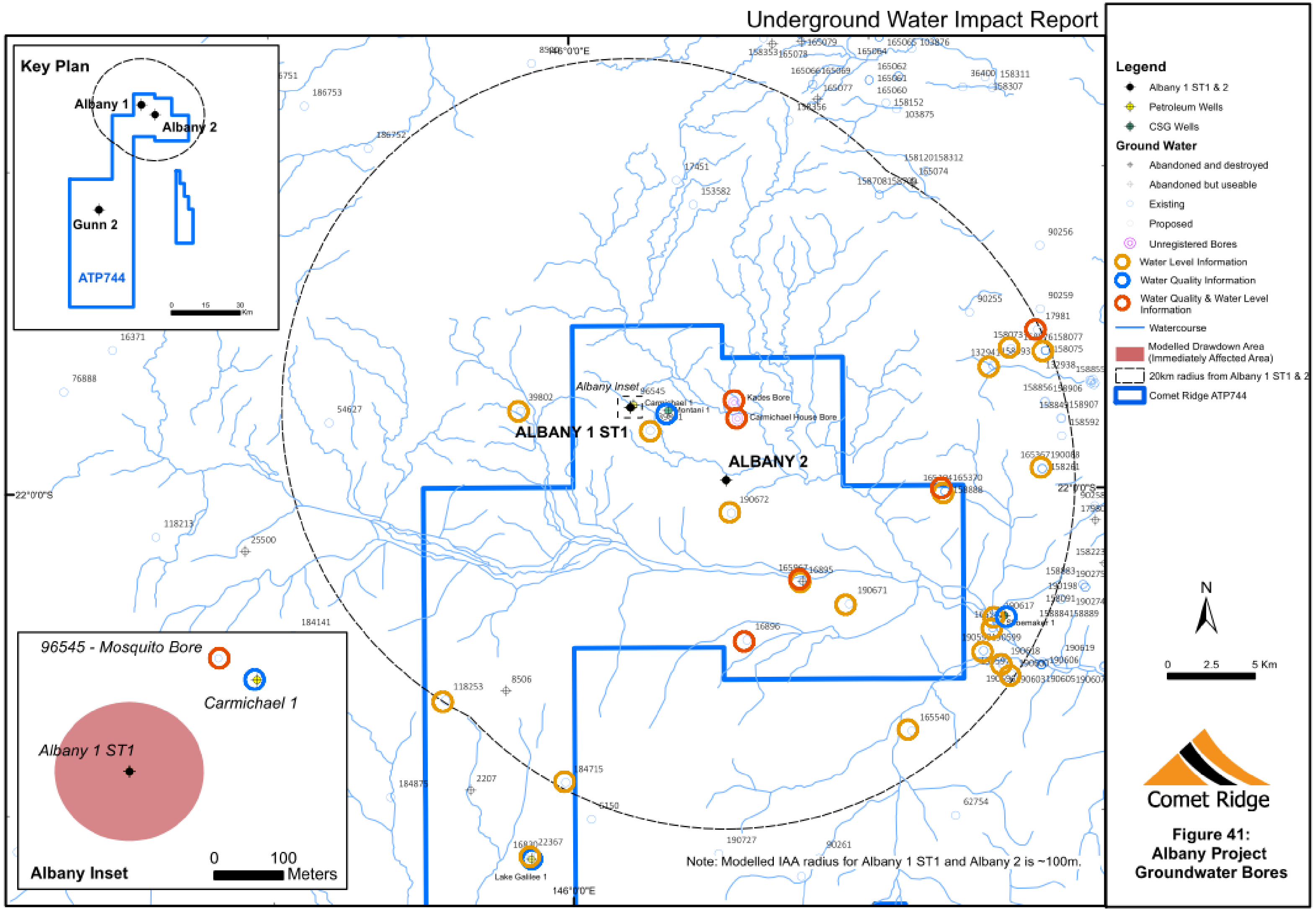

Figure 41. Groundwater Bores within 20km of Albany 2 and Albany 1 ST

No groundwater bores are located within a 2km radius of Albany 2. Two water bores respectively RN96545 (Mosquito Bore) and RN39801 (Cockatoo Bore) are located within a 2km radius of Albany 1 ST1.

RN96545 (Mosquito Bore) is located approximately 204m from the surface location of Albany 1 and sources water from the Moolayember Formation. Records from the baseline assessment indicate the bore was not in use prior to drilling Albany 1. Water from Mosquito Bore was utilised by Comet Ridge during drilling operations of Albany 1, ST1 and Albany 2.

RN39801 (Cockatoo Bore) is located approximately 1.75km from Albany 1. This bore was not operational at the time of the baseline assessment due to a collapsed surface casing. The broken windmill stroke prevented access to the aquifer and baseline water level and water quality has not been able to be undertaken on this water bore.

Two unregistered bores respectively Kades Bore and Carmichael House Bore are located within the 5km buffer zone of Albany 2. Records from baseline assessment indicate Kades bore has never been used by the landholder since installation. Carmichael House Bore is currently operational and used by the landholder.

Two other groundwater bores within 10km of Albany 2, respectively, RN16895 (Nankeroo Bore) and RN16896 (Caseys Bore) have also been baseline assessed by Comet Ridge.

The groundwater bores discussed above have undergone baseline assessment (where possible) by Comet Ridge as per requirements of the ATP 744 Baseline Assessment Plan. Most of the bores within a 10km radius of the Albany Project wells have been baseline sampled in 2018 (pre-drill), 2019 (post-drill) and 2020 (post stimulation and suspension) to monitor water level and quality changes. Records for all baseline assessed bores indicate water is being drawn from the Moolayember Formation, which is vertically separated from the target reservoir, the Lake Galilee Sandstone, by approximately 2200m.

Two new water bores were drilled in the vicinity of Albany 2 well since the 2020 UWIR, namely, RN190672 located approximately 2km south from Albany 2 and RN190671 located approximately 10 km south-east from Albany 2 which have not been baseline assessed to date. Based on drillers logs, both bores are recorded as sourcing the Moolayember Formation. Both bores will be baseline assessed as per requirements under the approved Baseline Assessment Plan for ATP 744.

Water Level

The summary of the water level measurements collected from the water bores within 20km radius from the Albany wells is presented in **Table 13**.

Water Level Trends

Refer to **ATP 744 Water Level Trends** under **Gunn Pilot Project** section for timeseries water level trends for all available data within ATP 744.

Four (4) of the baseline assessed water bores within 10km of Albany 1 ST1 and Albany 2 (RN96545 (Mosquito Bore), Unregistered (Kades Bore), Unregistered (Carmichael House Bore) and RN16896

(Caseys Bore)) have water level data. For assessments undertaken in 2020, all bores recorded a water level higher than in 2019.

For Nankaroo Bore (old bore), a baseline assessment was unable to be conducted in 2019, as a new bore (New Nankaroo Bore - RN165967) was going to be re-drilled. The New Nankaroo Bore was baseline assessed in 2020.

Water level description on two bores which have undergone baseline assessments in recent years relating to the Albany Project are described below.

RN96545 (Mosquito Bore) (refer to **Figure 18**) is located approximately 200m from Albany 1 ST1 well. This water bore sources water from the Moolayember Formation primarily for stock watering purposes. Water was extracted from this bore for use during drilling operations of Albany 1 ST1 and Albany 2 during 2019. Baseline Assessments were undertaken on this water bore in 2018 (pre-drill), 2019 (post-drill) and 2020 (post-stimulation). Although water level data is limited, the time-series data indicated relative stability in water level from 1995 to 2018. The data does indicate an apparent small reduction (3.3m) in water level post drilling, however, is followed by a rebound in water level to baseline levels post stimulation activities. The monitoring data is sparse however and at this stage it is unclear if the variation in water level was related to any site activities, possibly represented seasonal variations in water level or was induced by incidental bore use by the Landholder.

RN16896 (Casey's Bore) (refer to **Figure 18**) is located approximately 9km south of Albany 2 well. This water bore sources water from the Moolayember Formation primarily for stock watering purposes. Baseline Assessments were undertaken on this water bore in 2019 (post-drill) and 2020 (post-stimulation). During the last round of Baseline Assessment, Caseys Bore (RN16896) recorded water level at 9.96m Below Ground Level (BGL). This measurement is approximately 15m higher than in the previous sampling event in 2019. Although possible, this result should be treated with caution. Based on the anecdotal information, at the time of sampling, the bore had not been used by the landholder in the previous few months due to the "wet year" conditions. However, the water level appears to be significantly higher than in all the surrounding bores (including two new drilled bores nearby – details below) and the initial measurement of water level in Caseys Bore at the time of drilling (27.43m BGL in 1966). Field observation and photographic evidence of the bore total depth suggests a build-up of sediments at the bottom of the bore, or the presence of blockage. This increase of the water level might be a result of an artefact in the measurement due to a blockage, or a damage occurred in the casing installed in 1966. If the next water level measurement is consistent with the historical data, it would eliminate the potential risk to suggest that suggest that it was most likely an erroneous measurement. COI will verify the water level measurement and the bore casing internal conditions if further activities are planned in the area.

The last round of Baseline Assessment resulted in water level measurements higher than in the previous round. These results are most likely reflective of seasonal changes in groundwater levels, with fresher water from rainfall recharge contributing to water level rise and some improvements of water quality. Mosquito bore (RN96545), Kades bore, and Carmichael House bore water levels are similar, between 26 and 27m Below Ground Level (BLG) (between 0.35 and almost 3m higher than in the previous assessment). The assessment of the amount of recharge to the aquifer, based on the above data, is not possible unfortunately, due to the limited water level data available and the fact the bores are operated on "as required" basis by the Landholder and the volumes of produced water are not recorded. Water level measurements recorded on the bore cards of the two new bores drilled within 10km of Albany 1 ST1 and Albany 2 are -28mBGL (RN190671) and -40mBGL (RN190672). Based on the information presented above in this document, the water level reported in RN190671 "fits into" the general understanding of expected water level in Moolayember Formation in this area, the water level measured in RN190672 appears to be a bit low, although well within the range of water levels reported for this formation. There is always a considerable uncertainty related to the water level and water quality measurements taken immediately after the bore is drilled / constructed, as there is usually no or limited information available as to how the bore was developed prior to sampling.

There are no groundwater bores accessing aquifers deeper than the Betts Creek beds within 208km of either Albany 1 ST1 or Albany 2. There is one single groundwater bore accessing a deep aquifer from the Jochmus Formation (**Figure 42**). This groundwater bore is located 208km to the south-east of Albany 1 ST1 and Albany 2 where the Jochmus Formation shallows along the basin margin. No water level or water quality analysis data is available for this bore.

No groundwater bores access the Jericho Formation (immediately above the Lake Galilee Sandstone target formation) or the Lake Galilee Sandstone therefore a timeseries water level analysis cannot be undertaken.

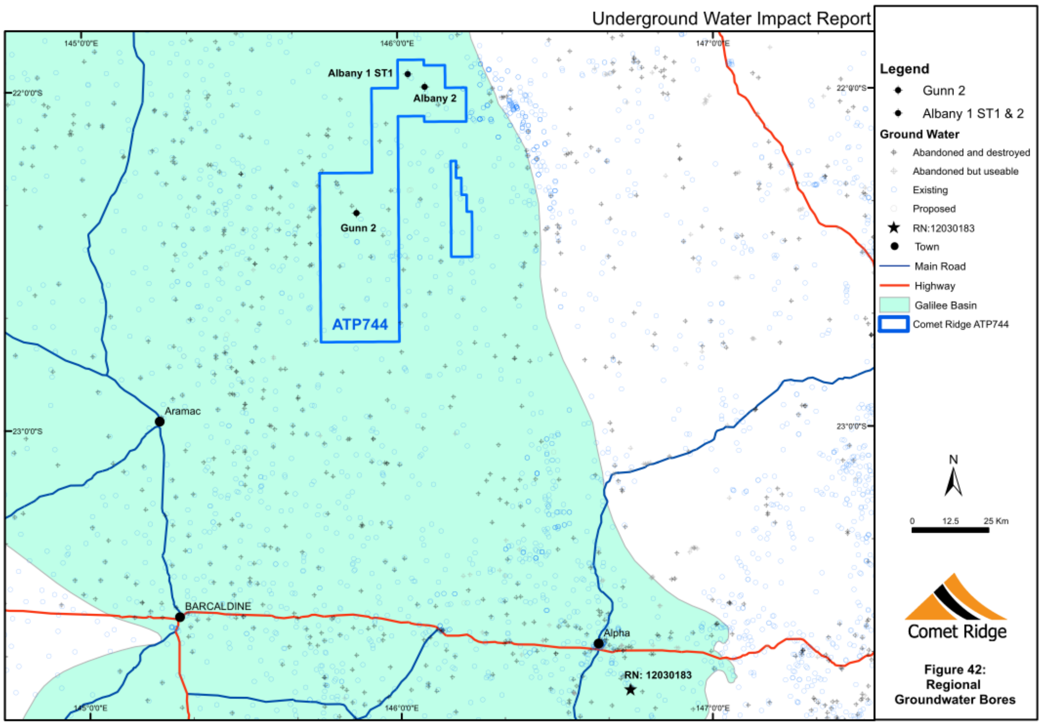

Figure 42. Albany wells and the closest groundwater bore accessing the Jochmus Formation.

Water Quality

Refer to **Water Quality** under **Gunn Pilot Project** section for additional detail.

Available water quality data within 20km of Albany 1 ST1 and Albany 2 is presented in **Table 14.** Water quality data has been collated using the available water quality analysis from the GWDB database and data collected by Comet Ridge during baseline assessments of landholder groundwater bores within ATP 744.

Bores within 10km of Albany 1 ST1 and 2 which have been baseline assessed and have water quality data include: RN 96545 (Mosquito Bore), Unregistered (Kades Bore), Unregistered (Carmichael House Bore), RN16896 (Caseys Bore) and New Nankaroo Bore (RN165967). The data is presented in **Table 14**.

Over the time there have been significant changes in how the data are collected from drilled bores. This has an implication on the quality of the historical data. Therefore, this set of data is of unknown quality as related to measurements dated back to the time of the bore installation.

Based on the available data:

- The groundwater quality of the Moolayember Formation is typically slightly brackish to saline (Bioregional Assessment Programme, Australian Government 2017). Recent measurements conducted as part of the baseline assessment in 2020, resulted in field measured EC varying between 629 to 3374µS and laboratory tested TDS varying between 497mg/L and 2720mg/L.
- The exception is New Nankaroo bore (RN165967). New Nankeroo bore has significantly higher Electrical Conductivity (EC) than all the other sampled bores in the area. The result fits into the range of EC measurements reported for the Moolayember Formation; however, it would classify as one of the outliers. This bore was in late 2019, next to the historical bore location and it is not clear if it has been used since the installation. The EC reported by the drillers in October 2019 was 1402 uS/cm, compared to 13031 uS/cm reported in August 2020 baseline assessment. The high EC value was consistent with the laboratory analytical results. It is possible the water was impacted by the construction materials, rather than being representative of the formation quality. Prior to re-sampling of the bore, it would be recommended to clean the casing by purging to replace several bore volumes of water, preferably measuring the EC of pumped water while purging until EC stabilises. It is intended that COI will verify these measurements if any further work is to be undertaken in the project area.
- Significant variability in water quality within the Moolayember Formation was observed in the data sourced from the groundwater database. The range of sampled TDS varied between 400 and 8630mg/L including few outliers in the range of 27,000mg/L. The reason of this variability is unknown, as the data in the government database are of unknown quality.
- Within the Clematis Group the water quality is generally reported as "potable" however data points within ATP 744 are limited. Within the QLD Government dataset available. The range of sampled TDS varied between 185 and 3542mg/L.
- Groundwater quality is highly variable with depth and location within the Betts Creek beds. While the whole range of samples sourced from the groundwater database vary in TDS between 200 and 54,000 mg/L, it is likely that only the samples collected from Gunn 2 during its initial flow testing represent the actual formation water quality. RPS (RPS, 2012) suggest

that bores screened within the coal seams yield slightly brackish to brackish groundwater, whilst bores screening the interburden yield fresh to slightly brackish groundwater.

- Most of the samples from "undifferentiated aquifers" may be attempted to be associated with either Moolayember Formation or Clematis Group. Their composition fits the general expectations of groundwater quality from those units, and well depths suggest they are collected from one or the other.

Figure 43 has been produced using the available water quality analysis from the GWDB database and data collected by Comet Ridge during baseline assessments of landholder groundwater bores within 20km of Albany 1 ST1 and Albany 2. The final three fluid samples from the stimulation flowback at Albany 2 have been included. Analysis from DST's have been excluded.

Successful treatments were placed in two of the three target reservoir intervals in the Lake Galilee Sandstone. Albany 2 was perforated across three intervals (one interval within LGS3 reservoir and two intervals within LGS2 reservoir) of the Lake Galilee Sandstone for hydraulic stimulation. Subsequent to the stimulation treatments the well was flowed back with the assistance of a Coiled Tubing unit and liquified Nitrogen. A total of 3570 bbls (568 KL) of fluid was produced which equates to ~93% of the stimulation load fluid. There was no free gas produced.

Fluid samples were collected on a regular basis during flow back operations. A total of twelve samples were sent to ALS Environmental in Brisbane for compositional analysis.

A single sample collected prior to shut-in at the end of the initial flowback period (19 December 2019 to 24 December 2019) was analysed on 28 December 2019. During the second flowback period (17 January 2020 to 23 January 2020), eleven flowback fluid samples were collected at approximately 12-hour intervals.

The chemistry of the stimulation fluid was estimated (no laboratory analysis was conducted) to have a chloride concentration of approximately 10,100mg/l and TDS of approximately 18,350mg/l based on a 2% KCL concentration stimulation fluid composition. Analysis results of flowback fluid samples collected over both flowback periods follow a trend of "freshening" flowback fluid (**Table 14**).

There has been a high degree of uncertainty around the chemistry of formation fluid from the Lake Galilee Sandstone. This is largely due to the limited number of samples (two) acquired during drill stem testing operations of historical petroleum wells. Potential contamination with drilling fluid cannot be ruled out. Nonetheless, water samples collected from the Lake Galilee Sandstone during testing operations of historical wells were analysed as relatively "fresh" based on chloride concentration (1305-3000mg/l).

Based on historical results and compositional results from flowback fluid samples, it is inferred some formation water may have been produced during flowback operations. Volumetrics of possible formation fluid are difficult to estimate. It is unknown whether fluid production was sourced from a single or multiple stimulation treatment intervals.

The Piper tri-linear diagram indicates that the dominant water type for the Moolayember Formation, Clematis Sandstone is sodium chloride. As discussed above, there is a high degree of uncertainty of formation water chemistry of Lake Galilee Sandstone. The Piper tri-linear diagram indicates the dominant water type of the final three flowback fluid samples analysed is sodium chloride.

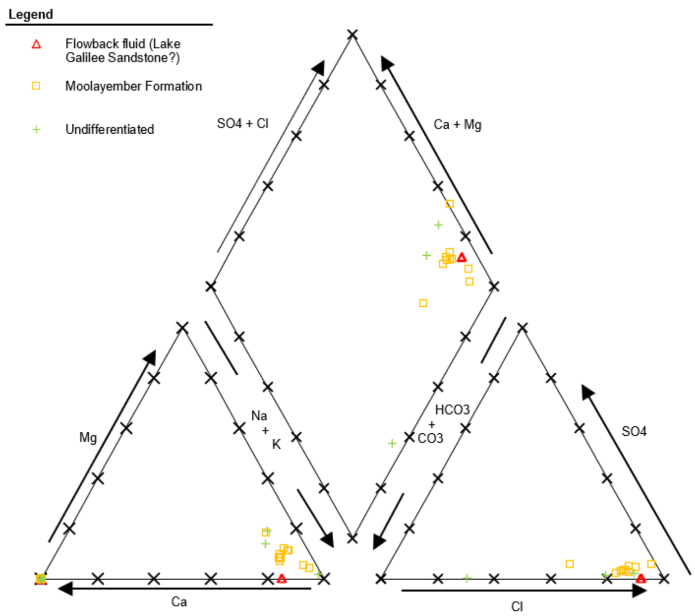

Figure 43: Piper Diagram for all available quality data within 20km of the Albany project wells including final 3 samples of flowback fluid from Albany 2 stimulation flowback operations.

It is difficult to speculate whether water quality data confirms or disproves any possible connections between aquifers. If anything, it may suggest a possible hydraulic connection between the groundwater in the Moolayember Formation and the Clematis Group, although that conclusion is highly speculative, as the quality variation within Moolayember Formation potentially exceeds the differences in water quality between those two units.

It is extremely unlikely that there is connection between the Lake Galilee Sandstone and the shallow Moolayember Formation and Clematis Group due to the significant vertical separation (>2000m) comprising predominantly low permeability formations and regional aquitards. In addition, no known faults have been identified that may intersect and connect Lake Galilee Sandstone with the Betts Creek beds or shallower aquifers.

Further geochemical data (including isotopes) from definitive aquifer/formation intervals would be required to potentially confirm formation water chemistry and the degree of hydraulic connection between formations.

Table 14: Available Water Quality data in the vicinity of Albany Project

Bore registration number	Bore Name	Permit	Identified aquifer	Date Sampled	Depth of Sample (m)	Conductivity (uS/cm)	pH	Hardness (mg/L Ca)	Alkalinity (mg/L)	SAR	Total Dissolved Solids (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Iron (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulphate (mg/L)
Groundwater Bores - DNRM GWDB Analysis																					
16896	Caseys Bore	744	Moolayember Formation	5/07/1966	118	8600	6.4	1265	100	18.6	5216.49	1518		256	152		122		2970	0.5	260
165104^	C14033SP (AGWB18)	744	Clematis Group	13/10/2020	188	367	6.1	47	10	2.9	184.04	46	10	2	10		12		106		4
Groundwater Bores - Baseline Assessment Analysis																					
96545 #	Mosquito Bore	744	Moolayember Formation	27/03/2018	230	1972.7	7.37		130		1100	287	17	37	17	0.44	125	<1	571		31
Unregistered #	Carmichael House Bore	744	Moolayember Formation	27/03/2018	69	1879.2	7.01		157		890	258	19	24	21	0.51	157	<1	486		24
Unregistered #	Kades Bore	744	Moolayember Formation	27/03/2018		1805.9	7.45		143		817	289	16	35	19	0.06	143	<1	516		35
96545 #	Mosquito Bore	744	Moolayember Formation	18/10/2019	230	1470	7.14	135	119		809	251	16	31	14	0.12	119	<1	429	0.3	28
Unregistered #	Carmichael House Bore	744	Moolayember Formation	18/10/2019	69	1850	7.7	159	130		971	322	19	24	24	<0.05	130	<1	548	0.3	38
16896 #	Caseys Bore	744	Moolayember Formation	18/10/2019	97	3280	7.94	144	146		1800	669	7	29	22	4.91	146	<1	983	0.3	91
16896 #	Caseys Bore	744	Moolayember Formation	29/08/2020	97	4190	7.96	137	208		2720	819	6	22	20	1.25	187	20	1120	0.3	118
165967 #	Nankaroo Bore	744	Moolayember Formation	29/08/2020	54	16700	6.75	2440	171		10800	2640	28	372	366	0.5	171	<1	5480	0.4	599
96545 #	Mosquito Bore	744	Moolayember Formation	29/08/2020	230	764	7.36	67	123		497	122	16	17	6	0.19	123	<1	152	0.4	25
Unregistered #	Carmichael House Bore	744	Moolayember Formation	29/08/2020	69	1980	7.6	170	139		1290	334	17	27	25	<0.05	138	<1	550	0.4	39
Groundwater Bores within 20km Albany#1 & #2 outside tenure																					
17981	10 Mile Bore	Outside 744	Undifferentiated	11/10/1973	102	1400	7.5	203	65	6.6	816.76	215	14	28.5	32	5.1	79		423	0.16	20
17981	10 Mile Bore	Outside 744	Undifferentiated	21/06/1993	102	1350	7.4	173	123	6.6	772.35	199	14.5	34.3	21.2	0	149.4	0.3	342	0.79	10.9
62965* (DST2-01)	Shoemaker 1[1]	Outside 744	Betts Creek Beds	2/02/2010	621	35700	7.3	840	1950	20	22603	1320	13700	275	36.4	33	1950	<10	19000	24	28
62965* (DST2-02)	Shoemaker 1[1]	Outside 744	Betts Creek Beds	27/01/2010	621	17500	7.3	610	726	14	11080	796	4610	204	25.6	24	726	<10	7300	16	7.2
62965* (DST2-03)	Shoemaker 1[1]	Outside 744	Betts Creek Beds	27/01/2010	621	11000	7.5	380	528	14	6965	622	2130	125	15.3	17	528	<10	3500	3.5	9.8
62965* (DST2-04)	Shoemaker 1[1]	Outside 744	Betts Creek Beds	27/01/2010	621	8570	7.6	67	478	29	5426	549	1710	9	10.9	9.3	478	<10	2400	<0.5	8.9
76264~EB1934693	Albany 2	744	Lake Galilee Sandstone	27/12/2019		11700		1050	205		8020	1140	1400	414	5	NA	250	<1	3480		39
76264~	Albany 2	744	Lake Galilee Sandstone	17/01/2020		10000	6.26	760	250		6500	855	1320	296	5	NA	305	<1	2960	6.6	<1
76264~	Albany 2	744	Lake Galilee Sandstone	18/01/2020		9210	7.93	715	206		5990	935	898	283	2	NA	248	<1	2790	5.9	<20
76264~	Albany 2	744	Lake Galilee Sandstone	19/01/2020		8220	7.83	620	203		5340	799	866	245	2	NA	248	<1	2430	6.8	34
76264~	Albany 2	744	Lake Galilee Sandstone	20/01/2020		6670	8.35	467	205		4340	694	670	187	1	NA	242	<1	1790	8	22
76264~	Albany 2	744	Lake Galilee Sandstone	20/01/2020		7560	8.28	543	199		4910	815	719	216	1	NA	243	<1	2210	6.8	4
76264~	Albany 2	744	Lake Galilee Sandstone	21/01/2020		7590	7.99	546	198		4930	820	717	217	1	NA	242	<1	2210	6	6
76264~	Albany 2	744	Lake Galilee Sandstone	21/01/2020		6520	8.4	451	174		4240	742	602	179	1	NA	193	16	1780	9.8	<10
76264~	Albany 2	744	Lake Galilee Sandstone	22/01/2020		6320	8.49	433	178		4110	717	606	170	2	NA	193	20	1670	10.5	<10
76264~	Albany 2	744	Lake Galilee Sandstone	22/01/2020		6020	8.44	386	175		3910	698	519	153	1	NA	193	17	1570	10.6	13
76264~	Albany 2	744	Lake Galilee Sandstone	23/01/2020		6030	8.65	394	187		3920	692	533	156	1	1	183	37	1590	10.6	15
76264~	Albany 2	744	Lake Galilee Sandstone	23/01/2020		6050	8.57	391	184		3930	716	533	155	1	2.26	183	33	1590	10.6	15
Petroleum Wells and CSG Wells																					
50066* (DST-3)	Carmichael 1	744	Betts Creek Beds	16/05/1995	918	NA	8	NA			NA	NA	NA	22.4	NA		NA	NA	1100		NA
50066* (DST-10)	Carmichael 1	744	Lake Galilee Sandstone	19/06/1995	2597	NA	8	64			NA	NA	NA	NA	NA		NA	NA	3000		NA
63063* (Sample B)	Montani 1	744	Betts Creek Beds	9/05/2010	791	12000	9.3	80	1090	23	7598	470	38000	16	9.5	34	920	170	3600	<5	210
63063* (Sample C)	Montani 1	744	Betts Creek Beds	9/05/2010	791	38000	10	60	3110	71	24060	2167	20000	60	47	38	2300	810	13000	<5	540

*DST Samples

Baseline Assessment

^ Water Monitoring Bore

[1] Coal seam gas exloration well

~Flow-back fluid analysis

Part C: Groundwater Modelling

Introduction

To understand and estimate the possible impacts of the groundwater extraction associated with planned production testing of the Albany wells, a numerical groundwater model has been constructed. In particular, the objective of the groundwater modelling was to estimate the water level decline in the Lake Galilee Sandstone and the potential for an impact on groundwater levels in the overlying formations including shallow aquifers.

In the last three-year reporting period, no additional appraisal work has been undertaken at the Albany Project. A review of hydrogeological data (from the GWDB and Baseline Assessments carried out in late 2020) has been undertaken to assess whether any new data warranted updates to the existing conceptual and numerical model presented in the 2020 UWIR for the Albany Project. The review determined that none of the hydrogeological data acquired since the 2020 UWIR would justify an update to the existing groundwater model. Also, none of the new hydrogeological data contradicts the previous findings.

The groundwater model presented below for the Albany project remains unchanged from the approved 2020 UWIR for ATP 744.

Methodology

Model grid

A three-dimensional, nine-layer groundwater model was constructed in MODFLOW under Groundwater Vistas user interface.

The model covers the area of approximately 390km^2 (17 x 21km), and it is centred on the Albany Structure. Model grid was constructed with variable grid size. The individual cell dimensions vary between 900m and 30m, with smaller grid cells around the Albany wells. The finite differences grid was rotated 45degrees to better align with the general, regional groundwater flow directions in the basin. Model grid and its location is presented in **Figure 44**.

Model vertical discreditation comprise nine (9) layers representing respective hydrogeological units, with the Lake Galilee Sandstone represented by three (3) numerical layers for greater accuracy of reproducing sand and shale sublayers.

Where stratigraphic surfaces were available, these were used to define top and bottom layer elevations. The summary of represented model layers and their average thicknesses is presented in **Table 15** below.

Table 15. Average thicknesses of model layers

Layer No	Formation	Average thickness (m)
1	Moolayember Formation	240
2	Clematis Group	128
3	Rewan Formation	309
4	Betts Creek beds incl Colinlea Sandstone	259
5	Jochmus Formation	690
6	Jericho Formation	820
7-9	Lake Galilee Sandstone	265

Boundary conditions

The literature on recharge processes in the Galilee Basin appears to be very limited. Marsh *et al.* (2008) states that groundwater recharge for the Triassic part of the Galilee sequence (the major aquifer sequence) occurs in the north-east with generally south westerly flow (CSIRO, 2014).

The recharge applied in the model was consistent with recommendations by the GAB resource study (GABCC 1998) to use a recharge rate of 1 – 2% of mean annual rainfall as a basin wide average. The mentioned study also suggested that the evaporation rates in GAB typically exceed rainfall rates.

Taking the above into account, recharge and evapotranspiration rates were fine-tuned during the model steady state calibration, resulting in:

- Recharge - 0.0003 mm/d (equivalent to approximately 1.5% of mean annual rainfall for the area).
- Evapotranspiration - 0.001 mm/d

To maintain the regional flow directions, the south-western edge of the model in layer 2 (Clematis Sandstone – main aquifer in the area) was designed as an outflow boundary, using MODFLOW's drain cells.

Model parameters

Hydraulic conductivity data applied in the model was based on literature review, regional data analysis and DST results from oil and gas wells drilled in the Galilee basin. In general, the availability of data decreases with depth, mostly because less wells are drilled to greater depths. There are no wells drilled deeper than Betts Creek beds, apart from conventional oil and gas wells in the area.

The Moolayember, Clematis and Rewan formations data is mostly based on regional data derived from water bores, while deeper formations hydraulic conductivity is derived from available DSTs (Albany 2, Lake Galilee 1, Koburra 1, Jericho 1, Jericho 2, Gunn-1, Hergenrother-1 and DNRME database).

Permeability data collected from DSTs was re-calculated into hydraulic conductivity using a conversion of 1mD = 1.1 x 10-8 m/d. Specific storage was calculated based on the formula provided in literature (Kruseman, de Ridder, 1992) and assuming sandstone compressibility of 1E-9 1/Pa.

The hydraulic parameters adopted in the model are presented in **Table 16** below.

Table 16. Hydraulic parameters adopted in the model.

Formation	Layer no	Kh (m/d)	Kv (m/d)	Ss	sy
Moolayember Fm	1	0.251	0.084	1.00E-05	8.8
Clematis Group	2	3.110	0.294	1.00E-05	12.5
Rewan	3	0.136	0.003	1.00E-05	3.0
Betts Creek beds	4	0.251	0.006	1.00E-05	3.0
Jochmus Fm	5	0.097	0.008	1.00E-05	5.0
Jericho Fm	6	0.067	0.003	1.00E-05	3.0
Lake Galilee Sandstone	7 - 9	0.006	0.003	1.00E-05	6.0

In the absence of available water level hydrographs from the wells within the model domain, only steady state calibration has been carried out. In general, the steady state calibration was carried out with the assistance of PEST and focused on achieving results consistent with general flow directions in GAB.

There is a very limited amount of SWL data in the area, and available data varies significantly in quality and timing (some water level measurements are available from close-by wells in DNRME database date back to 1950). Therefore, the steady state calibration focused on the data collected during Baseline Assessment carried out in October 2019, complemented by the most recent measurements from the DNRME database.

The calibration was focused on adjusting recharge, evapotranspiration and the elevation of the drain boundary condition to match measured groundwater levels. No changes to the regional values of hydraulic conductivity or storage parameters have been carried out. It is believed that hydraulic conductivity values represent well documented regional values, and lack of transient data prevented meaningful storage parameter calibrations.

The resulting water table calibrated reasonably well (within a few meters) with the Moolayember water level measurements, and also aligned well with deeper formations pressure measurements recorded in some of the deeper wells. Steady state calibrated model heads were then used as the initial heads for the model predictions.

As mentioned earlier in Part A, Comet Ridge believes that no water is likely to be produced during testing activities. However, for the modelling purposes, water production of $16m^3/d$ (100 bbl/d) from both Albany wells was assumed, for the period of 30 days. This assumption is considered conservative, in that it is likely to overestimate water production and predicted impact. For the modelling purposes, the testing was assumed to start on 1 July 2023 and continue until 1 August 2023.

Result and discussion

According to the simulation results, only Lake Galilee Sandstone is expected to experience drawdown (**Figure 44**). Therefore, the IAA is only expected within the sands of the Lake Galilee Sandstone and no impact was predicted in any of the overlying formations.

Due to the low horizontal permeabilities and relatively high porosities for the Lake Galilee Sandstone, the predicted cone of depression is confined to the proximity of the tested wells. The maximum extent of 5m drawdown contour (IAA) is predicted to a distance of approximately 100m from the well. The maximum drawdown extent is predicted at the end of the proposed testing period. The recovery is quick, with predicted drawdown decreasing to nil within a year. No drawdown is predicted at the end of the 3-year period to which this UWIR relates to.

No drawdown has been predicted in the overlying formations, and therefore no impact on any of the water bores or other environmental receptors is expected.

As discussed in Part A above, the most likely scenario is that no water will be produced from any of the wells during testing activities and potential production thereafter. In which case, there is no impact predicted in any of the formations including the Lake Galilee Sandstone itself.

In summary, the results of the modelling indicate the following:

- The IAA is only predicted within the Lake Galilee Sandstone.
- No impacts to any of the identified aquifers or springs is predicted.
- There are no registered groundwater water bores within the predicted IAA.
- The drawdown in the Lake Galilee Sandstone is likely to be only temporary, and recovery is expected to occur before the end of the 3-year assessment period; and
- No Long Term Affected Area (LTAA) is predicted.

Limitations

It should be noted that the numerical model has some inherent limitations impacting the accuracy of the predictions. The most obvious of which are the quality of available data the model is based on, the single-phase simulation, and the assumption of the magnitude of the water production rates during testing.

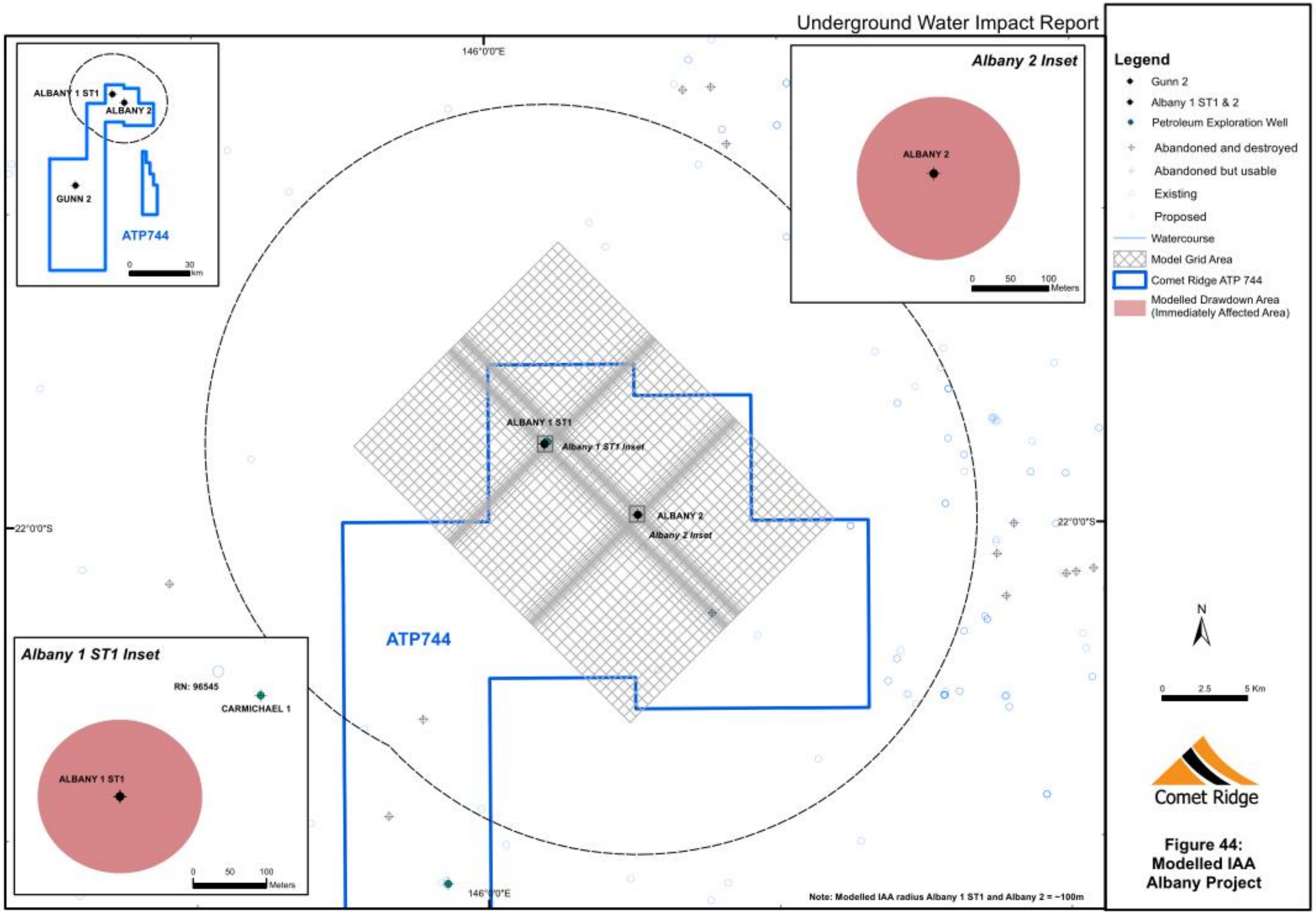

Figure 44: Modelled IAA for Albany Project

Part D: Environmental Values

Environmental Values

The environmental values (EV's) of water are the qualities that make it capable of supporting aquatic ecosystems and human uses. The *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* is the primary legislation through which the EV's of water are protected. The following EV's have been listed under Section 6 (2) of the EPP Water and Wetland Biodiversity:

- Aquatic ecosystems associated with high ecological value, slightly disturbed, moderately disturbed and highly disturbed waters.
- Aquaculture
- Agriculture
- Recreation (primary, secondary and visual)
- Drinking water
- Industrial use
- Cultural and spiritual values

Identified Environmental Values

The following environmental values have been identified in ATP 744:

- Farm water supply (i.e., use of groundwater from water bores).
- Stock watering (i.e., use of groundwater from water bores).
- Domestic Use (i.e., use of groundwater from water bores).
- Aquatic ecosystem (i.e., Lake Galilee and waterways).
- Visual Appreciation (i.e., aesthetic qualities of Lake Galilee); and
- Cultural Values (i.e., aesthetic qualities of Lake Galilee)

All of the above listed environmental values are primarily associated with either surface water features (lakes and waterways), springs or Quaternary, Tertiary and Triassic aquifers accessed by registered groundwater bores.

The environmental values within the vicinity of ATP 744 and Albany Project Area are described below:

Groundwater Dependant Ecosystems

Groundwater Dependant Ecosystems (GDE's) are ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes, and ecosystem services. Ecosystem dependency may vary temporally (over time) and spatially (depending on its location in the landscape). GDE's include aquifers, caves, lakes, palustrine, lacustrine and riverine wetlands including springs, rivers and vegetation that access groundwater through their roots.

Maps of the following GDE's are provided to show spatial relationship between the IAA, model extent and 20km radius from the proposed Albany Project Area with mapped GDE's including wetlands and springs.

- Queensland Wetland Areas – water bodies, regional ecosystems and mapped nationally important wetlands, including springs across ATP 744 (**Figure 26**)
- Terrestrial Groundwater Dependant Ecosystems across ATP 744 (**Figure 27**)
- Surface Groundwater Dependant Ecosystems across ATP 744 (**Figure 28**)
- Potential Groundwater Dependant Aquifers across ATP 744 (**Figure 29**)

No underground GDE's are mapped across the permit area or surrounding area.

Aquatic Ecosystems

Wetlands are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6 metres. To be a wetland the area must have one or more of the following attributes:

- At least periodically the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle;
- The substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers;
- The substratum is not soil and is saturated with water or covered by water at some time.

The most significant surface feature in ATP 744 is Lake Galilee which is recognised as a nationally important wetland and comprises both lacustrine wetland system (e.g., lakes 15.8%) and palustrine wetland system (e.g., vegetated swamps – 84.2%) (**Figure 26**). Lake Galilee habitat mainly comprises arid to semi-arid grass, sedge and herb swamp, saline lake and saline swamp and tree swamp. The wetland area is primarily sourced from shallow, unconfined, unconsolidated sedimentary aquifers which are closed alluvial systems with fluctuating and intermittent flow. Lake Galilee is located over 30km away the Albany Project area and is considered sufficiently laterally separated from the project area and, as such, no impacts are expected.

A second nationally important wetland area is located outside and adjacent to the north-eastern boundary of the permit area known as Doongmabulla Springs (**Figure 26**). The central point of the cluster is located approximately 20km to the east of the Albany 2 well. Its seasonal water balance is constant with some evaporation and associated reduction in extent in summer. It flows permanently, usually to a depth of 5-20cm. The water quality is fresh.

No active springs are located within ATP 744. Mapped active springs are discussed further under the **Section F: Spring Impact and Management.**

Riverine wetlands have also been identified and are associated with waterways traversing Albany Project Area. Areas of remnant regional ecosystem comprising 1-50% wetland by area have also been mapped across the Albany Project Area (**Figure 26**).

Terrestrial groundwater dependant ecosystems in the area are primarily associated with either Tertiary Ironstone jump-ups or alluvium and sandy plains and wetlands (**Figure 27**). Tertiary Ironstone jump-ups comprise unconfined intermittent aquifers sourced from local bedrock which primarily support specific melaleuca vegetation. Unconsolidated alluvial and sandy plain systems are primarily sourced from localised shallow alluvial aquifers which generally support specific vegetation ecosystems (such as Bloodwood or Melaleuca) on old loamy and sandy soils with fluctuating or intermittent flow.

Watercourses traversing the permit area are described as either channels on sandstone ranges with fluctuating and intermittent flow sourced from unconfined consolidated sedimentary aquifers or channels on alluvia and sandy plains below 300m in elevation with fresh, intermittent flow sourced from unconfined shallow alluvial aquifers (**Figure 28**). The main watercourse traversing the Albany Project area is Carmichael Creek system comprising Dyllingo and Cockatoo Creeks.

Potential GDE Aquifers within the vicinity of the Albany Project area comprise primarily either consolidated or fractured sedimentary aquifers (Tertiary Ironstone jump-ups) or unconsolidated sedimentary aquifers (i.e., sandy plains, Quaternary Alluvium) with intermittent groundwater flow. (**Figure 29**). Water quality is recorded as relatively fresh (<1500mg/L). Recharge is inferred to be dominantly via infiltration.

Impacts Arising from Previous Exercise of Underground Water Rights

The water subject to the underground water rights in ATP 744 petroleum activities for the Albany Project is within the Lake Galilee Sandstone. No activities resulting in extracting water from this formation have occurred within ATP 744 and therefore no previous impact have occurred.

Impacts Arising from Future Exercise of Underground Water Rights

No impact from future exercise of underground water rights is expected. Based on the results of the groundwater modelling, general geology, and hydrogeological settings, no impact to identified environmental values is expected from the water production (if any) from testing of the Albany Project wells (**Table 17**).

Forty-five (45) registered/licensed bores in ATP 744 are listed as existing and thirteen (13) are listed as abandoned or destroyed. Three (3) registered existing bores have been identified that are primarily being used as water monitoring bores. Bore records also indicate groundwater is principally drawn from either undifferentiated aquifers, Moolayember Formation or Clematis Group (**Appendix 1**).

No water bores within ATP 744 source the Lake Galilee Sandstone, therefore, activities proposed at the Albany Project are considered to have negligible impact to identified environmental values.

Within ATP 744, bore records indicate groundwater is primarily being used as water supply for livestock watering. There is no known use of groundwater for aquaculture purposes, domestic use, or industrial purposes within ATP 744. There are no documented cultural and spiritual values. The water is not used for any recreational purposes.

The following section provides information supporting the view that a hydraulic discontinuity exists between the Lake Galilee Sandstone and overlying aquifers within the area of the IAA and within 20km from the Gunn Project wells.

The potential for leakage to aquifers due to loss of well integrity is also very low. Albany 1 ST1 and Albany 2 were drilled and completed using industry standards and in compliance with the *Code of practice for the construction and abandonment of petroleum wells and associated bores in Queensland (2019).* (DNRME).

The well design and construction of both wells provide the mechanical integrity that reduces this risk to As Low As Reasonably Practical (ALARP). Cement bond logs confirm the integrity of cement that fills the casing-well bore space and prevents migration.

The potential aquifers of the lower Galilee Basin in both wells are protected behind both the 4-1/2" production casing and the 7" intermediate casing strings and their respective annular cement sheaths. In addition, the aquifers of the Moolayember Formation and Clematis Group and undifferentiated shallow aquifers in both wells are additionally protected by the 9-5/8" surface casing and cement.

Comet Ridge is confident that the confirmed integrity of the well construction; stimulation design, and the small scale of the planned stimulation treatments coupled with the described geological separation, is enough to minimise the risk of the treatment impacting aquifer units.

The Lake Galilee Sandstone reservoir within the IAA and 20km from the Albany Project wells is separated from overlying Triassic aquifers by at least 2000m, of which the majority are low permeability formations and regional aquitards. There is a very high degree of confidence that the chance of vertical connection between the gas-saturated Lake Galilee Sandstone targets and all potential aquifers is very low. This includes potential aquifers of the lower Galilee Basin within the Jericho and Jochmus Formations, the Betts Creek beds, and aquifers of the Moolayember Formation, Clematis Group.

In support of the above, the results of the groundwater modelling for the Albany Project wells suggest that no drawdown is expected in any other formations above the Lake Galilee Sandstone. The Lake Galilee Sandstone is the only layer where drawdown was predicted. Where the drawdown was greater than the 5m threshold for a confined aquifer, an immediately affected area (IAA) was mapped and only applies to the Lake Galilee Sandstone. The results of the groundwater modelling for this UWIR support other available hydrogeological information in suggesting that there is very limited interaction between the Lake Galilee Sandstone and any other formation in the model area. For more information, refer to **Part C: Groundwater Modelling**

In addition, no faults have been mapped within the IAA or within 20km of Albany Structure that have been interpreted to connect the Lake Galilee Sandstone to overlying Triassic or Cenozoic aquifers or the ground surface (**Figure 36**). The intervening geological units show good lateral continuity across the area of interest and lack large scale structural features that may form vertical conduits between the target zone and shallower aquifers.

The Lake Galilee Sandstone is entirely subsurface and there are no known outcrops of Lake Galilee Sandstone anywhere in the Galilee Basin. There is also no identifiable connection between the Lake Galilee Sandstone and the surface within the IAA or within 20km of the Albany Project wells, therefore no known association or connection with any terrestrial or surface GDE's. No subterranean GDE's have been mapped within the IAA in ATP 744.

No springs are located within the IAA or within 15km of the Albany Project wells. The closest springs to the project area are not sourced from the Lake Galilee Sandstone and therefore no impact on environmental values has been associated with any springs.

Environmental values identified within 20km of the Albany Project or permit boundary are not associated with the exercise of underground water rights from the Lake Galilee Sandstone and there are no impacts for any identified environmental values within or adjacent to the permit. However, the necessary monitoring strategies are documented under **Part E: Groundwater Monitoring** section of this document and any necessary baseline assessments on bores have or will be completed per requirements of the approved ATP 744 Baseline Assessment Plan. All active landowner bores within 4km of Albany Project wells have been nominated as monitoring bores in this report, refer **Figure 44**.

As, and if, further development on the resource tenure continues, and the Albany wells are on longer term production, there could be an expansion of the immediately affected area, and there may be a long-term affected area in the future, but this is not possible to predict at this time. The future development of the area is contingent upon results from the proposed future production testing.

A review of the impact of environmental values from the exercise of underground water rights will be undertaken as part of the annual review process for the UWIR.

Table 17: Environmental values associated with the future exercise of underground water rights.

Future exercise of underground water rights	Environmental Values									
	Aquatic ecosystems	Farm supply	Stock Watering	Aquaculture	Primary Recreation	Secondary Recreation	Visual Appreciation	Drinking Water	Industrial Use	Cultural and Spiritual
Lake Galilee Sandstone within the IAA	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘

Part E: Groundwater Monitoring

The underground water monitoring strategy has been developed to address the findings of this UWIR, and to accurately quantify potential water level and water quality changes caused by the exercise of underground water rights within ATP 744. The information obtained through the monitoring strategy will also be used to confirm and refine future iterations of the groundwater modelling.

The proposed groundwater monitoring will verify the model predicted magnitude of impact and its reduction with time. Should there be a large discrepancy between monitoring data and the predictions generated through the model, the model will be updated with new information and re-run to generate updated predictions.

Rationale

The modelling predicts that there will be a small and temporary IAA within the Lake Galilee Sandstone, and there is no LTAA predicted as the impact reduces rapidly within weeks after production testing ceases. No anticipated impacts are predicted by the current modelling in the nearby aquifers. However, the groundwater monitoring of these aquifers will continue, and the information will be routinely fed back into the model to verify and improve the predictions of the modelling in the future.

Registered bores nearby the project area are primarily accessing the Moolayember and the Clematis aquifers. These aquifers are separated from the targeted Lake Galilee Sandstone formation by the Rewan Group and Jericho Formation, both considered regional aquitards. In addition, there is a number of low permeability clay and silt layers within the lower portion of the Betts Creek beds and the Jochmus Formation, which act as additional flow barriers for the vertical movement of water. In general, the vertical separation distance between the targeted gas reservoir and the aquifers from which local registered bores are sourcing water exceeds 2000m in most of the cases. The Albany wells are cemented and cased to the best practice to avoid aquifer cross-contamination.

Monitoring Strategy

Groundwater impact assessment criteria have been designed to identify any potential depressurisation within the Lake Galilee Sandstone (if technically possible) and any adverse impacts that such depressurisation might induce on the overlying aquifers including alluvial aquifer systems. Impact assessment criteria for existing and proposed bores include piezometric pressure (measured as depth to water level) and water quality parameters (inclusive of field parameters and laboratory analytes) contained in the Section 3.6.4, Guideline Baseline Assessments, ESR/2016/1999, Version 3.04, DES.

If routine monitoring reveals either of the scenarios below, an investigation into whether the changes can be attributed to the proposed production testing will be undertaken. If the change can be attributed to the production testing activities, mitigation actions will be initiated.

Scenarios

- Water Level: Compare measured water level to previous monitoring rounds. If:
    (a) water level is lower than previous lowest measurement by >5m or

    (b) three subsequent monitoring events record a fall in water level >1m.

- Water Quality: Compare concentrations of analytes within **Table 18** to previous monitoring. If:
    (a) value departs highest or lowest previous measurement by more than 25% or
    (b) three subsequent monitoring events record an increase in one or more analytes concentrations.

It should be noted that water level triggers are applicable only to the dedicated monitoring bores (i.e., not used by landholders). In case the monitoring bore is also a landholder bore which may be actively used, the potential changes in water level and water quality must be assessed in accordance with the requirements outlined in the Guideline Bore Assessments (ESR/2016/2005), DES authorised under section 413 of the Water Act 2000.

The water monitoring program is proposed to commence when the Albany Project has been commissioned and has commenced production testing. At the time of this report, it is unclear when or even if production testing will occur.

Monitoring Locations

There are no registered or existing groundwater bores within close proximity to the Albany wells which access water deeper than the Moolayember Formation. Therefore, the possibility to monitor pressure/water level changes during production testing may be possible only if the testing program utilises downhole pressure gauges installed in the production wells.

In case, and only in case, when water is produced during testing, the additional monitoring is proposed in all accessible landholder bores within 4km of the testing site including RN: 96545 (Mosquito Bore), RN39801 (Cockatoo Bore), RN190672, and two unregistered bores – Kades bore and Carmichael House Bore. The locations of monitoring bores are shown on **Figure 45.**

As there is no LTAA predicted, baseline sampling at considerable distance outside of IAA within ATP 744 or outside ATP 744 is not recommended.

A list of bores and wells proposed to be monitored with parameters to be analysed and frequency of monitoring is shown in **Tables 18, 19 and 20.**

Table 18: Groundwater monitoring strategy

Bore	Formation	Parameters	Frequency
Albany ST1	Lake Galilee Sandstone	Water volumes, formation pressure, pH, EC, Chemistry (1)	Formation pressure measurements are recommended ONLY if well equipped with downhole gauges. Water volumes and quality measurements to be collected during testing activities.

Bore	Formation	Parameters	Frequency
Albany 2	Lake Galilee Sandstone	Water volumes, formation pressure, pH, EC, Chemistry (1)	Formation pressure measurements are recommended ONLY if well equipped with downhole gauges. Water volumes and quality measurements to be collected during testing activities.
RN96545 (Mosquito bore)	Moolayember Formation	Standing Water Level (SWL), Total Depth (TD), field parameters (pH, EC, T, DO, and TDS and ReDox), Chemistry (1)	6 monthly for 12months, then annually
unregistered (Kades Bore)	Moolayember Formation	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12months, then annually
unregistered (Carmichael House Bore)	Moolayember Formation	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12months, then annually
RN39801 (Cockatoo Bore)	Moolayember Formation	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12months, then annually
RN190672#	Undifferentiated	SWL, TD, field parameters, Chemistry (1)	6 monthly for 12months, then annually

(1) Chemistry – proposed analytes are presented in **Table 19** below.
Aquifer to be determined once baseline assessment is completed.

Table 19: Analytical plan-basic analytes

Category	Parameters	
Physical Parameters	pH Temperature Electrical conductivity Total dissolved solids	
Ions	Calcium Chloride Fluoride Potassium	Sodium Sulphate Magnesium
Metals (total and dissolved)	Aluminium Arsenic Barium Beryllium Boron Cadmium Chromium Cobalt Copper Iron	Lead Manganese Mercury Molybdenum Nickel Selenium Uranium Vanadium Zinc
Alkalinity and hardness	Alkalinity Total hardness as $CaC0_3$	
Dissolved Gases	Carbon dioxide (field only) Methane (field and laboratory) Hydrogen sulphide (field only)	

Additional parameters may also be analysed if required by Comet Ridge and based on the activities occurring in the area and preliminary results. A likely list of potential analytes that will be considered is presented in **Table 20.**

Table 20: Analytical plan-extended analytes

Category	Parameters	
Physical (Laboratory)	Benzene Toluene Ethylbenzene Xylene (total) Formaldehyde Naphthalene	Phenanthrene Benzo (a) pyrene Sodium hydroxide Formaldehyde Ethanol Gross alpha radiation
Nutrients	Ammonia Nitrate as N Nitrite as N	Nitrite + nitrate as N Notal nitrogen as N Total phosphorus
Microbiological	Total heterotrophic plate count Sulphate-reducing bacteria	
Miscellaneous	Ionic balance Sodium adsorption ratio (calculated)	

Sampling Methodology

Groundwater sampling will be undertaking according to the relevant methodology outlined in the Baseline Assessments Guideline 2017, (ESR/2016/1999), Version 3.04, DES, including:

- Samples will be collected, preserved and stored in accordance with the Environmental Protection (Water) Policy 2009 - Monitoring and Sampling Manual, Guidance on the sampling of groundwaters, Version 2 June 2018, DES.
- EPA Guidelines: Regulatory Monitoring and Testing—Groundwater Sampling (Environment Protection Authority, 2007); and
- Groundwater Sampling and Analysis—A Field Guide (Sundaram, et al., 2009).

QA/QC

QA/QC control measures will be implemented during the sampling program. These measures will be consistent with:

- AS/NZ 9000:2006 Quality management system series;
- quality assurance/quality control of AS/NZS 5667.11:1998; and

This includes:

- Groundwater sampling will be conducted by a suitably qualified and experienced professional in accordance with the relevant guidelines.
- All the laboratory analysis will be conducted by National Association of Testing Authorities (NATA) approved for the analyses required; and
- All the equipment used to collect field parameters will be dedicated to each bore to avoid cross-contamination; and

- All the equipment used to collect field parameters will be calibrated according to the manufacturer standard operating procedures.

An annual review of the monitoring data will be conducted when production testing has commenced on either of the Albany Project wells. The review will be conducted by a suitably qualified and experienced hydrogeologist and will include assessment of groundwater level and quality data, and the suitability of the monitoring network.

All groundwater-based complaints will be investigated, and a register kept of the nature of any complaints, the results of the assessment, and any actions taken. The register will be made available to the regulating authority upon request.

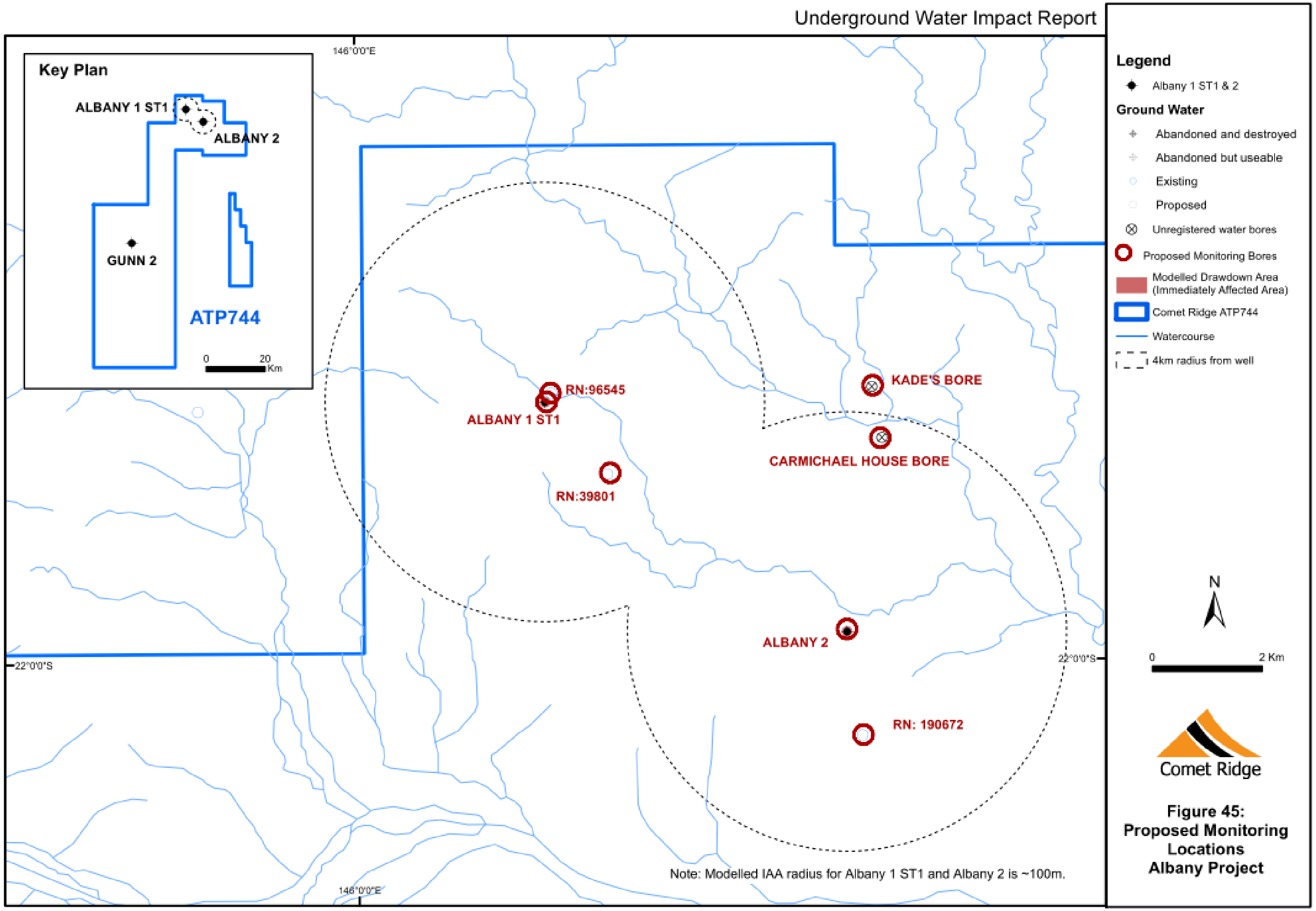

Figure 45: Albany Project Monitoring Bore

Part F: Spring Impact and Management

UWIR is required to identify springs which could be potentially affected by underground water extraction activities. For these springs where predicted water levels within the source aquifer would decline more than 0.2 metres, a spring impact management strategy is required.

A review of the Queensland Springs Database, Queensland Government was undertaken in 2013 prior to the lodgement of the initial UWIR (Comet Ridge Limited, 2014). This report includes a review of the updated Version 5 of the Queensland Wetland Database, Queensland Government. The current mapped locations of springs with respect to ATP 744 is shown on **Figure 31**.

There are no identified active springs located within ATP 744.

The Moses springs complex (a cluster of individual springs) is located approximately 20km to the south-east of the Albany Project area outside and adjacent to the tenure area. These springs form part of a larger isolated cluster of wetlands, known as the Doongmabulla Spring Complex, and are associated with the Carmichael River and its tributaries within and adjacent to the permit area.

The closest spring in the larger cluster is located approximately 17km to the south-east of the Albany 2 well. This group of springs is associated with the Galilee Basin, however, due to limitations in available data their aquifer source is ambiguous (Queensland Herbarium, 2017). Geological mapping and intersections from Shoemaker #1 coal seam gas well located approximately 600m to the north of the spring complex suggests an association with either the Moolayember Formation or Clematis Group. Shoemaker #1 intersected the Moolayember Formation beneath a thin veneer (3.20m) of Quaternary surficial sediments. The Clematis Group underlies the Moolayember Formation and was intersected at 80.8m depth. The Moses springs comprise approximately 30 individual mound springs and contribute to riverine wetland which are associated with the springs. The Doongmabulla Springs complex is also recognised as a Nationally Important Wetland area.

The Moses spring complex is sufficiently separated horizontally and vertically from the proposed production testing, and as such no impacts are expected.

Another spring group known as the Groove complex is located approximately 16km to the west of Albany 1 ST1 outside the permit area. These springs are associated with the Hooray Sandstone aquifer system (RPS, 2012) and are west of the inferred Hutton - Rand unconformity and part of the Eromanga basin. These springs are not associated with the Lake Galilee Sandstone or any of the overlying aquifers.

The Eromanga Basin sequence is absent from the tenure and is not expected to be encountered during the proposed activities. There is currently no evidence of hydrogeological connection between the band of springs to the west of the permit area and the Galilee Sandstone formation.

It is considered that these springs are sufficiently separated from the Albany Project site, and that it is highly unlikely that production testing at the Albany Project will result in a greater than 0.2m decline in water levels of springs and as such no impacts are expected.

A spring monitoring or management strategy is not considered to be required for this UWIR due to:

- No springs are located within the IAA of the Albany Project site.
- There is no known hydrological interconnection between the springs or aquifer feeding the springs and the Lake Galilee Sandstone from which the Albany Project may extract small volumes of water during well testing program;
- Vertical distance between the gas reservoir and the springs exceeds 2500m. Significant portion of those 2500m is comprised of formations with very low hydraulic conductivities, which are considered regional aquitards and confining beds and restrict the vertical movement of groundwater between aquifers;
- No faults with a potential to hydraulically connect target reservoir and surface have been identified in the area.

Review and Reporting

The accuracy of the predicted IAA will be reviewed on an annual basis once production testing has commenced on either the Gunn Project or Albany Project.

This will be based on a comparison of the two six-monthly sampling round results and water production data with the groundwater model predictions and the assumptions that were used to prepare it.

An annual report will be prepared to provide an update on changes to circumstances that would impact on predictions reported in the UWIR, and to provide updates on the implementation of the Water Monitoring Strategy. An annual review will not be prepared when a revised UWIR is required to be issued. The annual review will include a summary of the outcome of each review and will highlight if there has been a material change in any of the parameters since the modelling and IAA maps were generated. For the purposes of this statement, a discrepancy of more than 25% from predicted values will be treated as a material change. The annual review will be provided to the DES within 20 business days of the anniversary date of the approved UWIR.

In addition, records of all underground water extracted while exercising water rights will be collected daily. Water Production reports will be submitted to the Department Resources as per the requirements under the P&G Act. The results of any further Baseline Assessments required under Chapter 3 of the Water Act will be given to the OGIA in the approved form.

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Appendix 1 – ATP 744 Groundwater Bores

Bore Registration (RN)	Bore Name	Lot and Plan	RN Coordinate E_GDA94	RN Coordinate N_GDA94	Bore Status	Baseline Assessment Date	Aquifer	Role
2207	GALILEE	2GH54	-22.154838	145.943077	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
2223	CORINDA 55	2GH54	-22.275395	145.803636	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
2232	STATION CREEK NO. 40	1GH54	-22.306505	145.819192	Registered Water Bore (Abandoned and Destroyed)	NA (Abandoned and Destroyed or Collapsed)	NA	NA
2437	GIDYEA BORE	3GH56	-22.496505	145.911414	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
2438	CORK LEASE (3)	3GH56	-22.524283	145.813082	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
2439	CORK LEASE 4	3GH56	-22.565949	145.906136	Registered Water Bore (Existing)	NA	Undifferentiated	Unknown
5940		4GH57	-22.648136	145.822870	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
6151	OAKVALE NO 2	2SP181911	-22.301504	145.977800	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
6152	OAKVALE NO. 3	2SP181911	-22.357338	145.969190	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
6350	NO NAME	3GH56	-22.434005	145.950857	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
6559	WIDGEMAN BORE	3814PH116	-22.618962	145.899451	Registered Water Bore (Existing)	NA	Undifferentiated	Unknown
7046	HOUSE BORE	1GH19	-22.495393	145.980579	Licenced Water Bore (Existing)	NA	Undifferentiated	Unknown
7047	SPRING BORE	1GH19	-22.496227	145.975857	Registered Water Bore (Existing)	NA	Undifferentiated	Unknown
8506	NO NAME	2GH54	-22.103449	145.963077	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
11180	OAKVALE BORE	2SP181911	-22.345950	145.853080	Registered Water Bore (Abandoned and Destroyed)	NA (Abandoned and Destroyed or Collapsed)	NA	NA
11644	TOP BORE	4GH57	-22.641885	145.818703	Licenced Water Bore (Existing)	NA	Undifferentiated, Moolayember & Clematis	Water Supply
16830	NO 1 WATER WELL/XOIL	1SP166049	-22.190393	145.972800	Licenced Water Bore (Existing)	NA	Moolayember Formation	Stock Watering*
16895	NANKEROO BORE	633PH1478	-22.047782	146.128401	Licenced Water Bore (Existing)	NA (Abandoned and Destroyed or Collapsed Replaced with RN165967)	NA	NA
16896	CASEYS BORE	633PH1478	-22.078059	146.097270	Licenced Water Bore (Existing)	18/10/2019	Moolayember Formation	Stock Watering*
16897	GRICKS BORE	633PH1478	-22.327381	146.197289	Licenced Water Bore (Existing)	NA	Moolayember Formation	Water Supply
22367	ENL LAKE GALILEE 1	1SP166049	-22.189005	145.975855	Registered Water Bore (Existing)	NA	Undifferentiated	Stock Watering*
39801	COCKATOO BORE	686SP227322	-21.969166	146.044201	Registered Water Bore (Abandoned and Destroyed)	NA (Abandoned and Destroyed or Collapsed)	NA	NA
67000		4DR33	-22.424957	146.169029	Registered Water Bore (Existing)	NA	Undifferentiated	Water Supply
69288		3814PH116	-22.638763	145.957465	Licenced Water Bore (Existing)	NA	Moolayember Formation	Water Supply
69451		1GH19	-22.455712	145.965895	Licenced Water Bore (Existing)	NA	Undifferentiated	Unknown
69628	PARROTTS BORE	1GH19	-22.506782	145.984468	Licenced Water Bore (Existing)	NA	Moolayember Formation	Unknown
69838	6 MILE BORE	3GH56	-22.427481	145.969622	Licenced Water Bore (Existing)	NA	Clematis Group	Unknown
69934	House Bore	2GH54	-22.279006	145.805620	Licenced Water Bore (Existing)	NA	Moolayember Formation	Unknown
89369	WIDGEMAN BORE	3814PH116	-22.622968	145.898231	Licenced Water Bore (Existing)	NA	Clematis Group	Unknown

89471	RECONDITIONED BORE	4DR33	-22.426839	146.203923	Registered Water Bore (Existing)	NA	Undifferentiated	Unknown
93058	EASTMERE HOMESTEAD BORE	3GH56	-22.497094	145.917924	Licenced Water Bore (Existing)	NA	Clematis Group	Unknown
93059		3GH56	-22.433458	145.834379	Licenced Water Bore (Existing)	26/05/2013	Moolayember Formation	Unequiped and not in use
93819	3 MILE BORE	3GH56	-22.496282	145.878329	Licenced Water Bore (Existing)	NA	Clematis Group	Unknown
93822	STAPLETON BORE	3GH56	-22.385448	145.881084	Licenced Water Bore (Existing)	10/10/2012	Moolayember Formation	Stock Watering*
93827	CASHMERE BORE	3GH56	-22.564792	145.965180	Licenced Water Bore (Existing)	NA	Undifferentiated	Water Supply
93853	FLEETWOOD HOUSE BORE	2GH54	-22.282617	145.807525	Registered Water Bore (Abandoned and Destroyed)	NA	NA	NA
96545	MOSQUITO BORE	1AY35	-21.955822	146.034396	Licenced Water Bore (Existing)	27/03/2018	Moolayember Formation	Water Supply
118164	TOP BORE	1GH19	-22.488961	145.993692	Licenced Water Bore (Existing)	NA	Undifferentiated	Water Supply
118169	NEW BORE	2SP181911	-22.348013	145.950930	Licenced Water Bore (Existing)	25/05/2013	Moolayember Formation	Stock Watering*
118253	MANDYS BORE	2GH54	-22.108201	145.929389	Licenced Water Bore (Existing)	NA	Undifferentiated and Moolayember Formation	Water Supply
118371	GIDYEA	3GH56	-22.452279	145.866902	Registered Water Bore (Existing)	29/11/2017	Clematis Group	Water Supply
118534	LANE	1GH19	-22.484636	145.993692	Licenced Water Bore (Existing)	NA	Undifferentiated	Water Supply
132701		4GH57	-22.713697	145.761294	Registered Water Bore (Existing)	NA	Tertiary, Moolayember Formation, Clematis Group	Unknown
146685	7 MILE BORE	3GH56	-22.416793	145.952094	Registered Water Bore (Existing) -Monitoring Bore	NA (Monitoring Bore)	Clematis Group	Sub-artesian monitoring
146795		3GH56	-22.520671	145.822517	Registered Water Bore (Existing)	NA	Clematis Group	Unknown
158888	C14020SP	662PH1491	-22.001636	146.207849	Registered Water Bore (Existing) -Monitoring Bore	NA (Monitoring Bore)	Moolayember Formation	Mine Monitoring
163079	FLEETWOOD HOUSE BORE	2GH54	-22.289118	145.807913	Registered Water Bore (Existing)	NA	Clematis Group	Water Supply*
163100		3GH56	-22.501071	145.918379	Registered Water Bore (Existing)	NA	Clematis Group	Water Supply
163503		3GH56	-22.452719	145.868650	Registered Water Bore (Existing)	29/11/2017	Clematis Group	Stock Watering*
163506	NEW 6 MILE	3GH56	-22.452348	145.868976	Registered Water Bore (Existing)	29/11/2017	Moolayember Formation	Stock Watering*
163553	WEST LAVAINE BORE	2SP181911	-22.301104	145.989402	Registered Water Bore (Existing)	29/11/2017	Clematis Group	Water Supply
165104	C14033SP (AGWB18)	662PH1491	-22.001682	146.207640	Registered Water Bore (Existing) -Monitoring Bore	NA (Monitoring Bore)	Clematis Group	Mine Monitoring
165370	C14201VWP	662SP106939	-22.001574	146.207708	Registered Water Bore (Existing)	NA	NA	Mine Monitoring
165967	NEW NANKAROO BORE	633SP228220	-22.047786	146.128396	Registered Water Bore (Existing)	29/08/2020	Moolayember Formation	Stock Watering*
184715		1SP166049	-22.151318	145.995934	Registered Water Bore (Existing)	NA	Clematis Group	Water Supply
190671		633SP228220	-22.059584	146.154248	Registered Water Bore (Existing)	31/12/2027	Undifferentiated	Stock Watering*
190672		633SP228220	-22.012303	146.088932	Registered Water Bore (Existing)	31/12/2027	Undifferentiated	Water Supply
190726		633SP228220	-22.311389	146.187222	Registered Water Bore (Existing)	NA	Undifferentiated	Stock Watering*
Unregistered	DEAD BORE	2SP181911	-22.350533	145.836132	Water Bore (Abandoned and Destroyed)	25/05/2013	NA	NA
Unregistered	CARMICHAEL HOUSE BORE	1AY35	-21.963424	146.092614	Water Bore (Existing)	27/03/2018	Moolayember Formation	Water Supply*
Unregistered	KADES BORE	1AY35	-21.955031	146.090881	Water Bore (Existing)	27/03/2018	Moolayember Formation	Stock Watering*

* Inferred from Baseline Assessment Filed Visit or Bore Record

Appendix 2 – ATP 744 Water Quality Observations

Bore registration number	Bore Name	Permit	Identified aquifer	Date Sampled	Depth of Sample (m)	Conductivity (uS/cm)	pH	Hardness (mg/L Ca)	Alkalinity (mg/L)	SAR	Total Dissolved Solids (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Iron (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulphate (mg/L)
Groundwater Bores - DNRM GWDB Analysis																					
2439	Cork Lease 4	744	Undifferentiated	20/04/1970	178	6410	7.5	732	60	19.2	3834.44	1195		190	62.5		73		2234	1.05	116
5940		744	Undifferentiated	31/07/1962	203	0	7.5	3783	160	19.5	11091.5	2755.6		572	572		0	95.8	6046	0.5	1049.6
6559	Wideman Bore	744	Undifferentiated	18/04/1970		6500	7.8	719	171	19.5	3837.37	1201		110	108		208		2075	1.1	240
11644	Top Bore	744	Undifferentiated	25/10/1950	25	0		3268	356	45.7	19195.3	6010.3		570.6	447.6		0	213.1	9613.9	0.3	2339.5
11644	Top Bore	744	Moolayember Formation	25/10/1950	127	0		2657	110	30.2	12013.7	3572.1		533.4	321.8		0	65.8	6751	0.3	769.3
11644	Top Bore	744	Moolayember Formation	25/10/1950	188	0		2515	108	31.1	ND	3587.9		624.9	231.7		0	64.4	6512.2	0.3	986.7
11644	Top Bore	744	Clematis Group	10/11/1950	289	0		844	81	14.8	ND	985.3		198.8	84.4		0	48.6	1833.3	0.1	307.5
11644	Top Bore	744	Clematis Group	4/12/1951	289	0		639	76	18.9	3542.3	1096.8		201.6	32.9		0	45.8	1877.6	0.2	287.4
11644	Top Bore	744	Clematis Group	18/04/1970	289	0	7.5	206	72	9	ND	296		48	21	12	88		512	0.25	55
11644	Top Bore	744	Undifferentiated	1/01/1966		4800	7.8	720	70	13.5	2918.02	830		180	65.6		85.3		1590	0.48	210
16896	Caseys Bore	744	Moolayember Formation	5/07/1966	118	8600	6.4	1265	100	18.6	5216.49	1518		256	152		122		2970	0.5	260
16897	Gricks Bore	744	Moolayember Formation	26/06/1966	230	1400	8	116	65	15.7	776.34	388		10	22		79		275	0.5	42
165104^	C14033SP (AGWB18)	744	Clematis Group	13/10/2020	188	367	6.1	47	10	2.9	184.04	46	10	2	10		12		106		4
Groundwater Bores - Baseline Assessment Analysis																					
93822 #	Stapleton Bore	744	Moolayember Formation	10/10/2012	271	12600	7.53	1470	61		8632	2080	30	424	100	0.82	61	<1	4540	0.7	2
118169 #	New Bore	744	Moolayember Formation	25/05/2013	204	7456	7.29		111		3840	1500	50.5	206	30.7	0. 359	111	<1	1912	0.53	78.5
93059#		744	Moolayember Formation	26/05/2013	246	40250	6.8		122		27100	8300	116	1540	1040	3. 27	122	<1	14810	0.7	1230
163503#		744	Clematis Group	29/11/2017	420	997.5	7.16		77		400	129	19	8	6	1.3	77	<1	191		18
163506 #	New Six Mile Bore	744	Moolayember Formation	29/11/2017	20	9617	6.37		146		6080	1560	14	164	256	<0.05	146	<1	3290		558
96545 #	Mosquito Bore	744	Moolayember Formation	27/03/2018	230	1972.7	7.37		130		1100	287	17	37	17	0.44	125	<1	571		31
Unregistered #	Carmichael House Bore	744	Moolayember Formation	27/03/2018	69	1879.2	7.01		157		890	258	19	24	21	0.51	157	<1	486		24
Unregistered #	Kades Bore	744	Moolayember Formation	27/03/2018		1805.9	7.45		143		817	289	16	35	19	0.06	143	<1	516		35
96545 #	Mosquito Bore	744	Moolayember Formation	18/10/2019	230	1470	7.14	135	119		809	251	16	31	14	0.12	119	<1	429	0.3	28
Unregistered #	Carmichael House Bore	744	Moolayember Formation	18/10/2019	69	1850	7.7	159	130		971	322	19	24	24	<0.05	130	<1	548	0.3	38
16896 #	Caseys Bore	744	Moolayember Formation	18/10/2019	97	3280	7.94	144	146		1800	669	7	29	22	4.91	146	<1	983	0.3	91
16896 #	Caseys Bore	744	Moolayember Formation	29/08/2020	97	4190	7.96	137	208		2720	819	6	22	20	1.25	187	20	1120	0.3	118
165967 #	Nankaroo Bore	744	Moolayember Formation	29/08/2020	54	16700	6.75	2440	171		10800	2640	28	372	366	0.5	171	<1	5480	0.4	599
96545 #	Mosquito Bore	744	Moolayember Formation	29/08/2020	230	764	7.36	67	123		497	122	16	17	6	0.19	123	<1	152	0.4	25
Unregistered #	Carmichael House Bore	744	Moolayember Formation	29/08/2020	69	1980	7.6	170	139		1290	334	17	27	25	<0.05	138	<1	550	0.4	39
Groundwater Bores within 20km Gunn#2 outside tenure																					
35917	Sunrise Bore	Outside 744	Moolayember Formation	26/02/1971	198	5150	7.6	800	150	22.2	4607.68	1442		256	39		183		2780	0.7	0
35917	Sunrise Bore	Outside 744	Moolayember Formation	27/07/1971	198	10000	7.2	1361	72	19.9	5767.97	1687		500	27		88		3510	0.7	0

35917	Sunrise Bore	Outside 744	Moolayember Formation	27/07/1971	198	10000	7.1	1298	8	20.3	5697.62	1682		470	30		10		3510	0.7	0
16197	New Bore	Outside 744	Undifferentiated	27/05/1966	514	500	7.1	12	176		252.97	73.3		4.8	0		214.5		64	0.4	5
16197#	New Bore	Outside 744	Undifferentiated	22/10/2012	514	462	7.76	<1	164		300	96	6	<1	<1	0.5	164	<1	42	0.2	<1
93768#	10 Mile aka House Bore	Outside 744	Undifferentiated	26/11/2012	127	5300	7.81	573	155		3440	902	16	114	70	0.1	155	<1	1480	0.5	119
69531*	Ophir 5	Outside 744	Betts Creek Beds	12/01/2014	1075	30600	6.79	450	921		19900	1740	6560	144	22	11.6	921	<1	7970	6.7	1260
Groundwater Bores within 20km Albany#1 & #2 outside tenure																					
17981	10 Mile Bore	Outside 744	Undifferentiated	11/10/1973	102	1400	7.5	203	65	6.6	816.76	215	14	28.5	32	5.1	79	0	423	0.16	20
17981	10 Mile Bore	Outside 744	Undifferentiated	21/06/1993	102	1350	7.4	173	123	6.6	772.35	199	14.5	34.3	21.2	0	149.4	0.3	342	0.79	10.9
62965* (DST2-01)	Shoemaker 1	Outside 744	Betts Creek Beds	2/02/2010	621	35700	7.3	840	1950	20	22603	1320	13700	275	36.4	33	1950	<10	19000	24	28
62965* (DST2-02)	Shoemaker 1	Outside 744	Betts Creek Beds	27/01/2010	621	17500	7.3	610	726	14	11080	796	4610	204	25.6	24	726	<10	7300	16	7.2
62965* (DST2-03)	Shoemaker 1	Outside 744	Betts Creek Beds	27/01/2010	621	11000	7.5	380	528	14	6965	622	2130	125	15.3	17	528	<10	3500	3.5	9.8
62965* (DST2-04)	Shoemaker 1	Outside 744	Betts Creek Beds	27/01/2010	621	8570	7.6	67	478	29	5426	549	1710	9	10.9	9.3	478	<10	2400	<0.5	8.9
Petroleum Wells and CSG Wells																					
772	Lake Galilee 1	744	Moolayember Formation	24/06/1964	114		7.4	5200	180		19000	5000		765	800		220		10450	1.8	1110
772	Lake Galilee 1	744	Moolayember Formation	24/06/1964	158		7.6	440	115		27000	817		148	17		140		1480	0.5	14
772*	Lake Galilee 1	744	Lake Galilee Sandstone	7/12/1964	2738	NA	7.3	130	285		3500	955	NA	50	NA		348	NA	1305		76
50066* (DST-3)	Carmichael 1	744	Betts Creek Beds	16/05/1995	918	NA	8	NA			NA	NA	NA	22.4	NA		NA	NA	1100		NA
50066* (DST-10)	Carmichael 1	744	Lake Galilee Sandstone	19/06/1995	2597	NA	8	64			NA	NA	NA	NA	NA		NA	NA	3000		NA
76264~EB1934693	Albany 2	744	Lake Galilee Sandstone	27/12/2019		11700		1050	205		8020	1140	1400	414	5	NA	250	<1	3480		39
76264~	Albany 2	744	Lake Galilee Sandstone	17/01/2020		10000	6.26	760	250		6500	855	1320	296	5	NA	305	<1	2960	6.6	<1
76264~	Albany 2	744	Lake Galilee Sandstone	18/01/2020		9210	7.93	715	206		5990	935	898	283	2	NA	248	<1	2790	5.9	<20
76264~	Albany 2	744	Lake Galilee Sandstone	19/01/2020		8220	7.83	620	203		5340	799	866	245	2	NA	248	<1	2430	6.8	34
76264~	Albany 2	744	Lake Galilee Sandstone	20/01/2020		6670	8.35	467	205		4340	694	670	187	1	NA	242	<1	1790	8	22
76264~	Albany 2	744	Lake Galilee Sandstone	20/01/2020		7560	8.28	543	199		4910	815	719	216	1	NA	243	<1	2210	6.8	4
76264~	Albany 2	744	Lake Galilee Sandstone	21/01/2020		7590	7.99	546	198		4930	820	717	217	1	NA	242	<1	2210	6	6
76264~	Albany 2	744	Lake Galilee Sandstone	21/01/2020		6520	8.4	451	174		4240	742	602	179	1	NA	193	16	1780	9.8	<10
76264~	Albany 2	744	Lake Galilee Sandstone	22/01/2020		6320	8.49	433	178		4110	717	606	170	2	NA	193	20	1670	10.5	<10
76264~	Albany 2	744	Lake Galilee Sandstone	22/01/2020		6020	8.44	386	175		3910	698	519	153	1	NA	193	17	1570	10.6	13
76264~	Albany 2	744	Lake Galilee Sandstone	23/01/2020		6030	8.65	394	187		3920	692	533	156	1	1	183	37	1590	10.6	15
76264~	Albany 2	744	Lake Galilee Sandstone	23/01/2020		6050	8.57	391	184		3930	716	533	155	1	2.26	183	33	1590	10.6	15
63063* (Sample B)	Montani 1	744	Betts Creek Beds	9/05/2010	791	12000	9.3	80	1090	23	7598	470	38000	16	9.5	34	920	170	3600	<5	210
63063* (Sample C)	Montani 1	744	Betts Creek Beds	9/05/2010	791	38000	10	60	3110	71	24060	2167	20000	60	47	38	2300	810	13000	<5	540
63856* (DST-3P)	Gunn 1	744	Betts Creek Beds	22/06/2010	948	38000	8.2	720	700	18	24060	1100	17000	240	29	22	700	<20	15000	2	160
63856* (DST-3O)	Gunn 1	744	Betts Creek Beds	22/06/2010	948	38000	8.2	700	710	18	24060	1100	18000	230	28	22	710	<20	15000	2	160
63856* (DST-2J)	Gunn 1	744	Betts Creek Beds	21/06/2010	912	69000	8.5	1200	1300	22	43687	1800	32000	400	61	52	1300	<20	15000	<5	1
63856* (DST-2I)	Gunn 1	744	Betts Creek Beds	21/06/2010	912	69000	8.4	1200	1400	21	43687	1700	31000	390	61	59	1400	<20	27000	<5	300
63856* (DST-2E)	Gunn 1	744	Betts Creek Beds	17/06/2010	912	9400	8.3	93	750	21	5952	460	2400	29	5.1	5.2	750	<20	2300	2	110
63856* (DST-1D)	Gunn 1	744	Betts Creek Beds	17/06/2010	840	9100	8.2	95	760	20	5762	450	2400	30	4.9	4.7	760	<20	2300	2	110

63856* (DST-3K)	Gunn 1	744	Betts Creek Beds	22/06/2010	948	86000	8.3	1300	1700	89	54451	1400	50000	420	68	170	1700	<20	35000	<0.5	410
63856* (DST-2F)	Gunn 1	744	Betts Creek Beds	20/06/2010	912	330	7.6	77	140	7	209	26	44	21	6	<1	140	20	38	<0.5	<0.5
63857* (DST-4I)	Hergenrother 1	744	Betts Creek Beds	2/06/2010	744	31000	7.4	110	880	11	19628	270	2100	36	5.5	24	880	20	12000	<5	8.1
63857* (DST-3H)	Hergenrother 1	744	Betts Creek Beds	1/06/2010	769	51000	7.4	1500	980	150	32291	2400	34000	470	77	39	980	20	15000	2	14
63857* (DST-3G)	Hergenrother 1	744	Betts Creek Beds	1/06/2010	769	51000	7.4	620	1100	18	32291	1000	12000	200	32	40	1100	20	18000	<5	15
63857* DST-2D)	Hergenrother 1	744	Betts Creek Beds	31/05/2010	826	14000	7.3	480	860	22	8864	1100	4100	160	22	20	860	20	3700	2	18
63857* (DST-2C)	Hergenrother 1	744	Betts Creek Beds	31/05/2010	826	14000	7.5	500	950	21	8864	1100	4100	170	22	17	950	20	4900	<5	15
63857* (DST-1B)	Hergenrother 1	744	Betts Creek Beds	30/05/2010	848	17000	7.5	680	760	21	10764	1200	4300	230	25	18	760	20	4800	<0.5	78
63857* (DST-1A)	Hergenrother 1	744	Betts Creek Beds	30/05/2010	848	17000	7.5	640	1500	21	10764	1200	4600	2 10	26	1.8	1500	20	6200	1	56
Gunn # 2 Water Samples from Production Test																					
Gunn #2 Sample 1	Gunn 2	744	Betts Creek Beds	13/01/2013	953	1780	8.79	15	846	54.4	1080	484	28	6	<1	0.16	733	113	126	11	<1
Gunn #2 Sample 2	Gunn 2	744	Betts Creek Beds	22/01/2013	953	1770	8.37	15	821	52	1050	463	20	6	<1	1.74	802	19	110	11.9	<1
Gunn #2 Sample 3	Gunn 2	744	Betts Creek Beds	29/01/2013	953	1730	8.33	15	818	52.4	1030	466	14	6	<1	1.76	810	8	97	11.7	<1
Gunn #2 Sample 4	Gunn 2	744	Betts Creek Beds	21/02/2013	953	1700	8.38	12	697	50.7	915	412	9	5	<1	2.5	672	24	99	11.1	<1

***DST Samples**

 # Baseline Assessment

^ Water Monitoring Bore

Interpreted Aquifer+

~Flowback fluid analysis

Appendix 3 – ATP 744 Water Level Observations

Registration Number	Formation Name	Date	SWL (m from Reference Datum)	SWL (amSL)
5940	Undifferentiated	1/01/1924	-66.7	NA
6350	Moolayember Formation	1/10/1910	-7.6	NA
6559	Undifferentiated	18/03/1937	54.9	NA
7046	Undifferentiated	10/01/1983	-48.76	NA
7047	Undifferentiated	10/01/1983	-33.52	NA
11644	Clematis Group	20/11/1950	-29.26	NA
16895	Moolayember Formation	14/07/1966	-32.9	224.69
16896	Moolayember Formation	5/07/1966	-27.43	236.17
16897	Moolayember Formation	26/06/1966	-32	252.95
39801	Moolayember Formation	26/05/1975	-35.4	NA
69288	Moolayember Formation	28/01/1986	-16.2	NA
69451	Undifferentiated	18/09/1987	-16.5	NA
69628	Moolayember Formation	11/01/1990	-36.58	NA
69934	Moolayember Formation	29/02/1992	-12.1	NA
158888~	Moolayember Formation	24/11/2014	-44.92	252.45
158888~	Moolayember Formation	4/02/2015	-44.85	252.52
158888~	Moolayember Formation	28/03/2015	-44.92	252.45
158888~	Moolayember Formation	25/05/2015	-44.96	252.41
158888~	Moolayember Formation	26/07/2015	-44.92	252.45
158888~	Moolayember Formation	9/09/2015	-44.94	252.43
158888~	Moolayember Formation	26/11/2015	-44.9	252.47
158888~	Moolayember Formation	27/02/2016	-44.88	252.49
158888~	Moolayember Formation	20/04/2016	-44.91	252.46
158888~	Moolayember Formation	5/07/2016	-44.97	252.4
158888~	Moolayember Formation	23/11/2016	-44.9	252.47
158888~	Moolayember Formation	20/04/2017	-44.92	252.45
158888~	Moolayember Formation	3/10/2019	-44.64	252.73
158888~	Moolayember Formation	26/04/2020	-44.91	252.46
158888~	Moolayember Formation	19/06/2020	-44.93	252.44
158888~	Moolayember Formation	13/08/2020	-44.88	252.49
158888~	Moolayember Formation	13/10/2020	-44.91	252.46
158888~	Moolayember Formation	12/01/2022	-44.97	252.4
158888~	Moolayember Formation	20/02/2022	-44.9	252.47
158888~	Moolayember Formation	26/05/2022	-44.92	252.45
158888~	Moolayember Formation	28/06/2022	-45	252.37
158888~	Moolayember Formation	25/08/2022	-45.02	252.35
165104~	Clematis Group	25/05/2015	-46.73	250.62
165104~	Clematis Group	26/07/2015	-46.66	250.69
165104~	Clematis Group	10/09/2015	-46.72	250.63
165104~	Clematis Group	29/11/2015	-46.71	250.64
165104~	Clematis Group	27/02/2016	-46.67	250.68
165104~	Clematis Group	20/04/2016	-46.7	250.65
165104~	Clematis Group	7/09/2019	-46.65	250.7
165104~	Clematis Group	26/04/2020	-46.77	250.58
165104~	Clematis Group	19/06/2020	-46.78	250.57
165104~	Clematis Group	13/08/2020	-46.77	250.58
165104~	Clematis Group	13/10/2020	-46.8	250.55
165104~	Clematis Group	12/01/2022	-46.85	250.5
165104~	Clematis Group	20/02/2022	-46.77	250.58

165104~	Clematis Group	26/05/2022	-46.77	250.58
165104~	Clematis Group	28/06/2022	-46.8	250.55
165104~	Clematis Group	25/08/2022	-46.81	250.54
22367	Undifferentiated	1/11/1965	-25.91	262.89
93819	Clematis Group	5/07/2001	-8	NA
93822	Moolayember Formation	8/08/2001	-16	277.65
93827	Undifferentiated	18/08/2001	-33	NA
96545	Moolayember Formation	21/03/1995	-30	262.52
118164	Undifferentiated	25/08/2003	-54	NA
118169	Moolayember Formation	6/04/2004	-50	NA
118253	Moolayember Formation	17/02/2003	-48	NA
118253	Undifferentiated	17/02/2003	-42	NA
118371	Clematis Group	8/06/2004	-7	NA
132701	Tertiary - unconfined	21/09/2009	-14	NA
132701	Moolayember Formation	21/09/2009	-42	NA
132701	Clematis Group	21/09/2009	-38	NA
146685	Undifferentiated	13/08/2013	-54	234
146685	Clematis Group	13/08/2013	-12.6	275.4
146795	Clematis Group	2/10/2013	-30.4	279.6
158888	Moolayember Formation	30/07/2014	-45.12	252.25
163079	Undifferentiated	12/12/2013	-13	274
163079	Undifferentiated	12/12/2013	-18	269
163100	Undifferentiated	15/02/2013	-30	NA
163100	Clematis Group	15/02/2013	-17.5	NA
163503	Clematis Group	5/10/2015	-7.9	NA
163506	Moolayember Formation	9/07/2015	-6.8	NA
163553	Clematis Group	15/08/2015	-18	NA
165967	Moolayember Formation	18/10/2019	-36	NA
184715	Clematis Group	6/05/2021	-36	NA
190671	Undifferentiated	29/10/2021	-28	NA
190672	Undifferentiated	31/10/2021	-40	NA
190726	Undifferentiated	5/03/2022	-52	NA
93822#[1]	Moolayember Formation	10/10/2012	-60.71	232.94
118169#	Moolayember Formation	25/05/2013	-46.95	253.85
93059#	Moolayember Formation	26/05/2013	-9.8	273.2
93059	Moolayember Formation	24/10/1992	-12.19	270.81
163503#	Clematis Group	29/11/2017	-7.93	NA
163506#	Moolayember Formation	29/11/2017	-7.49	NA
118371#	Clematis Group	29/11/2017	-6.9	NA
39801#	Moolayember Formation	27/04/2018	-28.78	NA
96545#	Moolayember Formation	27/03/2018	-26.02	266.5
Kade's Bore#	Moolayember Formation	27/03/2018	-26.73	NA
96545#	Moolayember Formation	18/10/2019	-29.32	263.2
Carmichael House Bore#	Moolayember Formation	18/10/2019	-27.11	NA
Kade's Bore#	Moolayember Formation	18/10/2019	-28.79	NA
16896#	Moolayember Formation	18/10/2019	-29.14	239.41
16896#	Moolayember Formation	29/08/2020	-9.96	253.64
96545#	Moolayember Formation	29/08/2020	-26.6	265.92
Carmichael House Bore#	Moolayember Formation	29/08/2020	-26.76	NA
Kade's Bore#	Moolayember Formation	29/08/2020	-26.67	NA
Groundwater Bores within 20km Gunn -outside 744				
5964	Undifferentiated	1/01/1914	-39.6	NA
5966	Undifferentiated	1/01/1915	-24.4	NA
16197	Undifferentiated	28/11/1965	-36.6	279.6

16197#	Undifferentiated	22/10/2012	-59.03	257.17
32473	Undifferentiated	1/09/1969	-18.3	NA
93768	Undifferentiated	2/04/2001	-33	269.6
93768#	Undifferentiated	26/11/2012	-42.25	260.35
32567	Undifferentiated	4/10/1969	-21.3	NA
Groundwater Bores within 20km Albany -outside 744				
17981	Undifferentiated	19/04/1968	-24.4	NA
39802	Undifferentiated	9/04/1951	-36	NA
132941~	Rewan Formation	2/05/2014	-42.4	252.23
132941~	Rewan Formation	6/05/2014	-42.4	252.23
132941~	Rewan Formation	26/05/2014	-42.38	252.25
132941~	Rewan Formation	4/08/2014	-42.4	252.23
132941~	Rewan Formation	23/09/2014	-42.4	252.23
132941~	Rewan Formation	17/11/2014	-42.4	252.23
132941~	Rewan Formation	4/02/2015	-42.4	252.23
132941~	Rewan Formation	24/03/2015	-42.38	252.25
132941~	Rewan Formation	28/05/2015	-42.43	252.2
132941~	Rewan Formation	26/07/2015	-42.35	252.28
132941~	Rewan Formation	7/09/2015	-42.35	252.28
132941~	Rewan Formation	23/11/2015	-42.35	252.28
132941~	Rewan Formation	26/02/2016	-42.35	252.28
132941~	Rewan Formation	17/04/2016	-42.35	252.28
132941~	Rewan Formation	2/07/2016	-42.41	252.22
132941~	Rewan Formation	22/11/2016	-42.29	252.34
132941~	Rewan Formation	19/04/2017	-42.39	252.24
132941~	Rewan Formation	3/10/2019	-42.17	252.46
132941~	Rewan Formation	26/04/2020	-42.42	252.21
132941~	Rewan Formation	19/06/2020	-42.39	252.24
132941~	Rewan Formation	13/08/2020	-42.4	252.23
132941~	Rewan Formation	13/10/2020	-42.41	252.22
132941~	Rewan Formation	12/01/2022	-42.46	252.17
132941~	Rewan Formation	20/02/2022	-42.45	252.18
132941~	Rewan Formation	26/05/2022	-42.43	252.2
132941~	Rewan Formation	28/06/2022	-42.46	252.17
132941~	Rewan Formation	25/08/2022	-42.48	252.15
158073~	Betts Creek Beds[2]	8/09/2019	-46.6	248.48
158073~	Betts Creek Beds[2]	24/04/2020	-46.54	248.54
158073~	Betts Creek Beds[2]	19/06/2020	-46.55	248.53
158073~	Betts Creek Beds[2]	13/08/2020	-46.52	248.56
158073~	Betts Creek Beds[2]	13/10/2020	-46.51	248.57
158073~	Betts Creek Beds[2]	12/01/2022	-46.58	248.5
158073~	Betts Creek Beds[2]	20/02/2022	-46.49	248.59
158073~	Betts Creek Beds[2]	26/05/2022	-46.49	248.59
158073~	Betts Creek Beds[2]	28/06/2022	-46.57	248.51
158073~	Betts Creek Beds[2]	25/08/2022	-46.62	248.46
158075~	Betts Creek Beds[2]	8/11/2011	-36.79	245.1
158075~	Betts Creek Beds[2]	21/06/2012	-36.76	245.13
158075~	Betts Creek Beds[2]	20/05/2013	-36.73	245.16
158075~	Betts Creek Beds[2]	1/05/2014	-36.91	244.98
158075~	Betts Creek Beds[2]	26/05/2014	-36.98	244.91
158075~	Betts Creek Beds[2]	1/08/2014	-36.9	244.99
158075~	Betts Creek Beds[2]	23/09/2014	-36.94	244.95
158075~	Betts Creek Beds[2]	18/11/2014	-36.89	245
158075~	Betts Creek Beds[2]	4/02/2015	-36.89	245

158075~	Betts Creek Beds[2]	24/03/2015	-36.93	244.96
158075~	Betts Creek Beds[2]	24/05/2015	-36.95	244.94
158075~	Betts Creek Beds[2]	26/07/2015	-36.89	245
158075~	Betts Creek Beds[2]	9/09/2015	-36.89	245
158075~	Betts Creek Beds[2]	26/11/2015	-36.89	245
158075~	Betts Creek Beds[2]	27/02/2016	-36.88	245.01
158075~	Betts Creek Beds[2]	20/04/2016	-36.93	244.96
158075~	Betts Creek Beds[2]	6/07/2016	-36.98	244.91
158075~	Betts Creek Beds[2]	22/11/2016	-36.81	245.08
158075~	Betts Creek Beds[2]	19/04/2017	-36.9	244.99
158075~	Betts Creek Beds[2]	18/08/2019	-36.78	245.11
158075~	Betts Creek Beds[2]	24/04/2020	-36.92	244.97
158075~	Betts Creek Beds[2]	19/06/2020	-36.92	244.97
158075~	Betts Creek Beds[2]	13/08/2020	-36.88	245.01
158075~	Betts Creek Beds[2]	13/10/2020	-36.88	245.01
158075~	Betts Creek Beds[2]	12/01/2022	-37	244.89
158075~	Betts Creek Beds[2]	20/02/2022	-36.96	244.93
158075~	Betts Creek Beds[2]	19/04/2022	-37.01	244.88
158075~	Betts Creek Beds[2]	28/06/2022	-37.02	244.87
158075~	Betts Creek Beds[2]	25/08/2022	-37.03	244.86
158076~	Betts Creek Beds[2]	20/05/2013	-39.51	242.55
158076~	Betts Creek Beds[2]	6/05/2014	-39.6	242.46
158076~	Betts Creek Beds[2]	26/05/2014	-39.62	242.44
158076~	Betts Creek Beds[2]	1/08/2014	-39.6	242.46
158076~	Betts Creek Beds[2]	23/09/2014	-39.58	242.48
158076~	Betts Creek Beds[2]	18/11/2014	-39.55	242.51
158076~	Betts Creek Beds[2]	4/02/2015	-39.5	242.56
158076~	Betts Creek Beds[2]	24/03/2015	-39.58	242.48
158076~	Betts Creek Beds[2]	24/05/2015	-39.6	242.46
158076~	Betts Creek Beds[2]	25/07/2015	-39.58	242.48
158076~	Betts Creek Beds[2]	8/09/2015	-39.55	242.51
158076~	Betts Creek Beds[2]	25/11/2015	-39.55	242.51
158076~	Betts Creek Beds[2]	23/02/2016	-39.49	242.57
158076~	Betts Creek Beds[2]	19/04/2016	-39.55	242.51
158076~	Betts Creek Beds[2]	6/07/2016	-39.61	242.45
158076~	Betts Creek Beds[2]	18/08/2019	-39.54	242.52
158076~	Betts Creek Beds[2]	24/04/2020	-39.73	242.33
158076~	Betts Creek Beds[2]	19/06/2020	-39.76	242.3
158076~	Betts Creek Beds[2]	13/08/2020	-39.77	242.29
158076~	Betts Creek Beds[2]	12/01/2022	-39.91	242.15
158076~	Betts Creek Beds[2]	20/02/2022	-39.88	242.18
158076~	Betts Creek Beds[2]	19/04/2022	-39.94	242.12
158076~	Betts Creek Beds[2]	28/06/2022	-39.92	242.14
158076~	Betts Creek Beds[2]	25/08/2022	-39.92	242.14
158077~	Betts Creek Beds[2]	9/11/2011	-39.76	242.22
158077~	Betts Creek Beds[2]	21/06/2012	-39.73	242.25
158077~	Betts Creek Beds[2]	20/05/2013	-39.61	242.37
158077~	Betts Creek Beds[2]	1/03/2014	-39.55	242.43
158077~	Betts Creek Beds[2]	1/05/2014	-39.58	242.4
158077~	Betts Creek Beds[2]	1/07/2014	-39.5	242.48
158077~	Betts Creek Beds[2]	1/09/2014	-39.55	242.43
158077~	Betts Creek Beds[2]	24/11/2014	-39.49	242.49
158077~	Betts Creek Beds[2]	4/02/2015	-39.51	242.47
158077~	Betts Creek Beds[2]	24/03/2015	-39.56	242.42

158077~	Betts Creek Beds[2]	24/05/2015	-39.55	242.43
158077~	Betts Creek Beds[2]	26/07/2015	-39.54	242.44
158077~	Betts Creek Beds[2]	9/09/2015	-39.51	242.47
158077~	Betts Creek Beds[2]	26/11/2015	-39.43	242.55
158077~	Betts Creek Beds[2]	27/02/2016	-39.5	242.48
158077~	Betts Creek Beds[2]	19/04/2016	-39.55	242.43
158077~	Betts Creek Beds[2]	6/07/2016	-39.6	242.38
158077~	Betts Creek Beds[2]	22/11/2016	-39.49	242.49
158077~	Betts Creek Beds[2]	19/04/2017	-39.52	242.46
158077~	Betts Creek Beds[2]	18/08/2019	-39.47	242.51
158077~	Betts Creek Beds[2]	24/04/2020	-39.66	242.32
158077~	Betts Creek Beds[2]	19/06/2020	-39.68	242.3
158077~	Betts Creek Beds[2]	13/08/2020	-39.66	242.32
158077~	Betts Creek Beds[2]	13/10/2020	-39.68	242.3
158077~	Betts Creek Beds[2]	12/01/2022	-39.82	242.16
158077~	Betts Creek Beds[2]	20/02/2022	-39.8	242.18
158077~	Betts Creek Beds[2]	19/04/2022	-39.85	242.13
158077~	Betts Creek Beds[2]	28/06/2022	-39.85	242.13
158077~	Betts Creek Beds[2]	25/08/2022	-39.84	242.14
158261~	Clematis Sandstone	1/03/2014	-57.64	250.14
158261~	Clematis Sandstone	1/05/2014	-57.66	250.12
158261~	Clematis Sandstone	1/07/2014	-57.5	250.28
158261~	Clematis Sandstone	1/09/2014	-57.61	250.17
158261~	Clematis Sandstone	22/11/2014	-57.61	250.17
158261~	Clematis Sandstone	5/02/2015	-57.71	250.07
158261~	Clematis Sandstone	25/03/2015	-57.64	250.14
158261~	Clematis Sandstone	25/05/2015	-57.65	250.13
158261~	Clematis Sandstone	25/07/2015	-57.57	250.21
165540~	Clematis Sandstone	18/11/2019	3.42	250.77
165540~	Clematis Sandstone	25/04/2020	3.23	250.58
165540~	Clematis Sandstone	19/06/2020	3.18	250.53
165540~	Clematis Sandstone	16/08/2020	3.26	250.61
165540~	Clematis Sandstone	14/10/2020	3.16	250.51
165541~	Clematis Sandstone	18/11/2019	-5.59	243.69
165541~	Clematis Sandstone	25/04/2020	-5.58	243.7
165541~	Clematis Sandstone	19/06/2020	-5.56	243.72
165541~	Clematis Sandstone	16/08/2020	-5.57	243.71
165541~	Clematis Sandstone	14/10/2020	-5.68	243.6
165541~	Clematis Sandstone	9/01/2022	-5.57	243.71
165541~	Clematis Sandstone	20/02/2022	-5.48	243.8
165541~	Clematis Sandstone	21/04/2022	-5.7	243.58
165541~	Clematis Sandstone	26/06/2022	-5.56	243.72
165541~	Clematis Sandstone	24/08/2022	-5.51	243.77
165542~	Moolayember Formation	9/10/2019	-12.64	236.44
165542~	Moolayember Formation	25/04/2020	-12.75	236.33
165542~	Moolayember Formation	19/06/2020	-12.7	236.38
165542~	Moolayember Formation	16/08/2020	-12.67	236.41
165542~	Moolayember Formation	14/10/2020	-12.8	236.28
165542~	Moolayember Formation	9/01/2022	-12.83	236.25
165542~	Moolayember Formation	20/02/2022	-12.76	236.32
165542~	Moolayember Formation	21/04/2022	-12.8	236.28
165542~	Moolayember Formation	26/06/2022	-12.79	236.29
165542~	Moolayember Formation	24/08/2022	-12.83	236.25
190088~	Clematis Sandstone	22/06/2020	-57.49	248.78

190088~	Clematis Sandstone	16/08/2020	-57.31	248.96
190088~	Clematis Sandstone	16/10/2020	-57.35	248.92
190088~	Clematis Sandstone	12/01/2022	-57.44	248.83
190088~	Clematis Sandstone	22/02/2022	-57.4	248.87
190088~	Clematis Sandstone	29/05/2022	-57.4	248.87
190088~	Clematis Sandstone	28/06/2022	-57.43	248.84
190088~	Clematis Sandstone	26/08/2022	-57.47	248.8
190596~	Moolayember Formation	25/04/2020	-0.33	237.88
190596~	Moolayember Formation	19/06/2020	-0.36	237.85
190596~	Moolayember Formation	16/08/2020	-0.44	237.77
190596~	Moolayember Formation	24/02/2021	-0.32	237.89
190596~	Moolayember Formation	21/04/2021	-0.5	237.71
190596~	Moolayember Formation	7/06/2021	-0.34	237.87
190596~	Moolayember Formation	16/08/2021	-0.33	237.88
190596~	Moolayember Formation	26/10/2021	-0.33	237.88
190596~	Moolayember Formation	9/01/2022	-0.34	237.87
190597~	Moolayember Formation	28/10/2019	-0.32	240.3
190597~	Moolayember Formation	25/04/2020	-0.58	240.04
190597~	Moolayember Formation	19/06/2020	-0.5	240.12
190597~	Moolayember Formation	16/08/2020	-0.55	240.07
190597~	Moolayember Formation	24/02/2021	-0.51	240.11
190597~	Moolayember Formation	21/04/2021	-0.5	240.12
190597~	Moolayember Formation	7/06/2021	-0.49	240.13
190597~	Moolayember Formation	16/08/2021	-0.48	240.14
190597~	Moolayember Formation	26/10/2021	-0.48	240.14
190597~	Moolayember Formation	9/01/2022	-0.68	239.94
190598~	Moolayember Formation	25/04/2020	-0.58	238.96
190598~	Moolayember Formation	19/06/2020	-0.51	239.03
190598~	Moolayember Formation	16/08/2020	-0.44	239.1
190598~	Moolayember Formation	25/02/2021	-0.53	239.01
190598~	Moolayember Formation	21/04/2021	-0.52	239.02
190598~	Moolayember Formation	7/06/2021	-0.5	239.04
190598~	Moolayember Formation	16/08/2021	-0.43	239.11
190598~	Moolayember Formation	9/01/2022	-0.46	239.08
190599~	Moolayember Formation	25/04/2020	-0.78	238.39
190599~	Moolayember Formation	19/06/2020	-0.61	238.56
190599~	Moolayember Formation	16/08/2020	-0.67	238.5
190599~	Moolayember Formation	25/02/2021	-0.76	238.41
190599~	Moolayember Formation	21/04/2021	-0.65	238.52
190599~	Moolayember Formation	7/06/2021	-0.61	238.56
190599~	Moolayember Formation	16/08/2021	-0.58	238.59
190599~	Moolayember Formation	9/01/2022	-0.83	240

~Water Monitoring Bore - actual measurement type only

#Baseline Assessed

[1] Purging of the bore was not able to be undertaken before SWL was measured.

[2] Equivalent Formation relevant to ATP744