UWIR 2021-2024

PL 98 - Inland Oilfield

Bridgeport (Eromanga) Pty Ltd
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Registered Operator Number: 663384

Document Revision and Issue Status

Revision	Date Reviewed	Reviewers	Signature
Version 02	16 November 2022	Barry Smith	
Version 01.1	14 October 2022	Ben Hamilton	

This UWIR Report (Version 01) for PL 98 Inland Oilfield is issued by authority of Bridgeport Energy Pty Limited, under the authority of the Bridgeport Chief Technical Officer.

26/04/2023

Barry Smith, Chief Technical Officer

Bridgeport Energy Pty Limited

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Acronym	Definition
ANZECC	Australia New Zealand Environment and Conservation Council
ALARP	May be As Low As Reasonably Possible
ALS	Australian Laboratory Services
AS/NZS	Australia New Zealand Standard
BTEX	Benzene, Toluene, Ethyl-benzene and Xylene
DEHP	The then Department of Environment & Heritage Protection
DES	Department of Environment and Science
DNRM	Department of Natural Resources and Mines
EA	Environmental Authority
ESA	Environmentally Sensitive Area
EPM	Equivalent Porous Medium
GAB	Great Artesian Basin
GDE	Groundwater Dependent Ecosystem
IAA	Immediately Affected Area
ML	Mega litres
NATA	National Association of Testing Authorities
LTAA	Long-Term Affected Area
NATA	National Association of Testing Authorities
OWC	Oil Water Contact
OWK	Oilwells Inc. Of Kentucky
PL	Petroleum Lease
STB	Stock Tank Barrel
SET	Senior Executive Team
SWL	Connate water saturation
TDS	Total Dissolved Solids
UWIR	Underground Water Impact Report
WOR	Water Oil Ratio

Executive Summary

This report outlines potential impacts from petroleum related extraction on groundwater and associated ecological and social values relating to the State of Queensland's water resources.

The Inland Oilfield is situated 120 km west of Windorah and is currently under production, where groundwater is extracted as a by-product of oil production.

To assess the risk of groundwater extraction on a range of values, this Underground Water Impact Report (UWIR) has been prepared using historic and future predicated production rates, and includes the results from scientific modelling (including production data, geological layers, quantifiable variables and assumptions etc.) that determines water level drawn down in the geological layers around the Inland oil wells.

Modelling can help indicate the historic and future potential drawdown of pressure as a result of water extraction. In the model, geology is separated into layers, with an upper Layer most accessible and applicable to landholders and environmental values (also being the layer furthest away from production). In this upper-most Layer, modelling shows a historic drawdown of 0.07 m during 2011 up to 2021 using historic production, and 0.11 m maximum future drawdown using future predicted extraction volumes. In the Layer targeted by petroleum production (~1,600 m deep), historic drawdown was 7.88 m, increasing to 8.81 m for future production estimates.

Geological separation and impermeable boundary layers in geology, the relatively small production extraction rates compared to the reservoir volume, as well as the very low-pressure drawdowns predicted by the modelling lead Bridgeport to conclude there would likely be no environmental impacts to groundwater, groundwater users, groundwater dependent ecosystems, environmental values and other water related criteria surrounding PL 98 Inland. A standard risk assessment was used to determine the likelihood of impacts from water extraction. The risk assessment determined no direct impact to groundwater, groundwater users, groundwater dependent ecosystems, environmental values and other water related criteria.

<u>Bridgeport concludes there would be no direct impact to landholders, or any other value related to groundwater as the result of extraction from PL 98 Inland.</u>

Statement of Compliance

Since the previous submission by Bridgeport in 2018, there has been limited material change in the information, predictions or impacts from production and extraction of groundwater. However, in this UWIR, a material change is the inclusion of a detailed model developed to inform and quantify water pressure drawdown at PL 98 Inland Oilfield.

Legislation

The following legislation was used to determine and prepare the contents of this UWIR include:

- Water Act (2000) [reprint current from 1st December 2020 to date, accessed 25th March 2021 at 15:04)
- Underground Water Impact Reports and Final Reports – ESR/2016/2000 Version 3.02 Effective 05 JUL 2007 (formerly EM1089) [https://environment.des.qld.gov.au/management/activities/non-mining/water/groundwater#underground_water_impact_report; accessed 25th March 2021 at 15:04; https://environment.des.qld.gov.au/__data/assets/pdf_file/0036/88398/rs-gl-uwir-final-report.pdf]

As per the instructions in the *Underground water impact reports final reports Guideline* (DES 2017), "*An UWIR must contain the information that has been outlined in each of the following parts of this guideline*", including;

- Part A: Information about underground water extractions resulting from the exercise of underground water rights
- Part B: Information about aquifers affected, or likely to be affected
- Part C: Maps showing the area of the affected aquifer(s) where underground water levels are expected to decline
- Part D: An assessment of the impacts of the environmental values from the exercise of underground water rights
- Part E: A water monitoring strategy

- Part F: A spring impact management strategy
- Part G (a): For a CMA, assignment of responsibilities to resource tenure holders (N/A)
- Part G (b): Final reports

To ensure Bridgeport have complied with the above requirements, Bridgeport have chosen to itemise the Parts and include the relevant requirements (as sections) of the relevant legislation as they have been laid out in DES (2017).

Project Setting

Bridgeport operate PL 98 Inland Oilfield, located 120 km west of Windorah and approximately 230 km east of Birdsville. The oilfield consists of 12 currently producing wells. Coordinates of the Inland field are 25°32’34.16”E, 141°37’57.54”E. All wells are within three kilometres of the Inland Camp (Figure 1).

Table 1: Bridgeport Energy Inland Oilfield Setting Summary.

Oilfield Name	Oilfield Type	PL Number	Number of Wells currently producing (at October 2021)
Inland	Conventional Oilfield	PL 98	12

The infrastructure at Inland consists of a small demountable camp, office, workshop, unsealed access roads, beam-pumps, flow lines, a production manifold, separation tanks, oil storage tanks, load out facilities, skimmer, laydown yard, and a series of ponds for the treatment of production water.

Bridgeport (Eromanga) Pty Ltd is the holder of the tenement, which is a subsidiary of Bridgeport Energy Pty Limited. Bridgeport will be used herein to describe the operator.

Figure 1: The location of PL 98 (Inland) highlighted yellow, in an area approximately 230 km to the east of Birdsville and 120 km west of Windorah.

Part A*: Underground water extractions

Requirements under section 376(a) of the Water Act
To meet the requirements under section 376(a) of the Water Act, an UWIR must include the following: *1. The quantity of underground water produced or taken from the area because of the exercise of underground water rights; and* *2. An estimate of the quantity of water to be produced or taken because of the exercise of underground water rights for a three-year period starting on the consultation day of the report.*

*Part A refers to Section 5.1.1 (page 12) of the guideline (DES 2017).

Bridgeport has developed a monitoring strategy that meets the requirements of Section 376(a)(1) of the Water Act. This section provides specific details of how water related parameters are collected, including water produced or taken as part of exercising underground water rights.

Bridgeport's monitoring strategy is based on three primary parameters:

- Formation water production
- Reservoir oil/water level depth
- Water quality

The volumetric measurements of oil and produced water are required from an operational point-of-view, to aid in the process of facility optimisation. This includes tracking productivity so that separation processes are optimised, processing capacity is increased, and oil production is maximised.

Since April 2011, oil and water production has been measured, which can be used to calculate the volume of water extracted per well and standardised to beam pump operating time. Each well is flow tested into an isolated test tank at different intervals. After a settlement period, the contents of the tank are volumetrically measured by means of a dipstick and water-indicating paste. Volumes of both produced oil and water are obtained from this measurement.

Volumetric oil and water calculations are recorded to calculate production rates for oil and water over time.

Daily water and oil production rates (total fluid rates) are also correlated to the beam pump operation time daily, to provide a more accurate water/oil production per unit operation time across the field/s.

As a result, historical water production statistics are available for the field and on a per-well basis (Appendix 2). Consequently, Bridgeport has a detailed understanding of extraction rates throughout its operatorship history.

Methods for measuring underground water level

Another parameter that Bridgeport monitors is the depth of underground water levels. Since a significant portion of the requirements under S376 of the Water Act pertain directly to the relationship between water extraction and underground water level depth, Bridgeport has adopted two methods of evaluating water depth.

The first is through analysis of current wells and their production status. Underground water levels tend to rise as oil is depleted. Consequently, when an existing well “waters out” (ceases to produce oil and only produces water), it is inferred that in the immediate localised area, the underground water level has risen to the depth of the well’s perforations. For the wells drilled at Inland, this is some 1400 m from surface.

The second of these is through identification of the oil/water contact (OWC) via petrophysical analysis as new wells are drilled. When new wells are drilled; the oil-water contact at the time of drilling is identified by log analysis through independent third-party contractors. Since the depth of the oil/water contact is defined as the top of the aquifer, identification infers aquifer water level. Maintaining records of these parameters helps define the original reservoir water level as well as how water level depth might change over the production life of the field, as water displaces oil. The geological attributes of the targeted formations does not allow the consistent determination of the OWC however and is discussed in detail below.

Cumulative assessment of water extracted

From November 2010 to August 2018, a total of 1,198.04 ML of water was extracted from Inland. From November 2018 to October 2021 Bridgeport extracted 589.36 ML. Total water extraction has remained relatively constant annually, averaging 162 ML per year (Table 2).

Table 2: Annual water extracted from the Inland field between November 2011 and October 2021.

Year	Total water extracted (ML)
2011	70.60
2012	155.54
2013	149.49
2014	146.77
2015	140.85
2016	181.72
2017	198.24
2018	154.83
2019	189.19
2020	212.42
2021	187.75
Total	1,787.40

Cumulative water production per well (in ML) between November 1st 2010 and October 31st 2021 at Inland oilfield is quantified in Table 3. Wells vary within towards the total production significantly across Inland (Table 3). The largest contribution to total water production is Inland 11, which is the most significant producer, totalling 57.64% of the total water from all Inland production. The next largest contributor is Inland 08 (9.22%), Inland NE1 (7.56%) and Inland 9 (5.72%).

A years' data is reported from November 1st the previous year, through to the 31st of October that year, to allow reporting (e.g. 2015 data includes 1st November 2014 through to 31st October 2015).

Table 3: Cumulative water (ML) extracted from each well at Inland between 2011 and 2021.

Well	Cumulative water (ML)	Cumulative portion (%)
Inland 01	0	0.00
Inland 02	0	0.00
Inland 03	10.04	0.56
Inland 04	1.53	0.09
Inland 05	1.05	0.06
Inland 07	89.42	5.00
Inland 08	164.80	9.22
Inland 09	102.28	5.72
Inland 10	3.75	0.21
Inland 11	1,030.28	57.64
Inland 12	28.45	1.59
Inland 13	27.60	1.54
Inland 14	22.95	1.28
Inland 15	35.42	1.98
Inland 16A	24.66	1.38
Inland 17	19.72	1.10
Inland 18	10.97	0.61
Inland 19	77.25	4.32
Inland 20	2.04	0.11
Inland NE1	135.19	7.56
Total	**1,787.4 ML**	

Annual water production (ML) per well across the Inland oilfield is presented Table 2 and Figure 2. Extraction quantities vary on a per well basis, for example, Inland 8, 9 and 11 have remained relatively consistent over the previous 10 years, whilst Inland 7 has declined, whilst Inland NE1 has increased over time. Other wells contribute relatively minor amounts to the overall Inland production, and small annual variations contribute far less to overall field production.

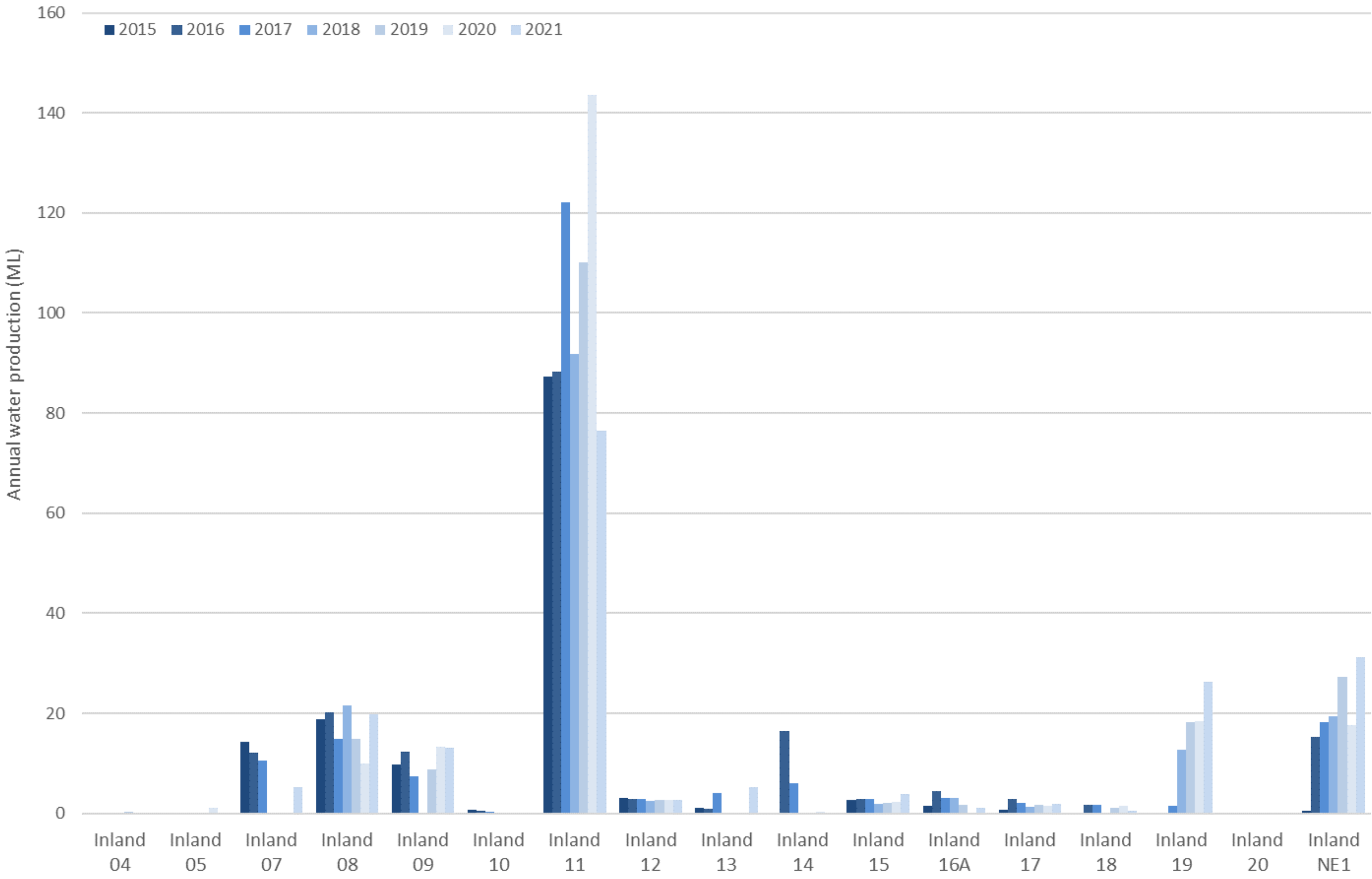


Figure 2: Annual water (ML) production per well at Inland, from 2011 to 2021.

Previous Production Estimates

In the previous UWIR (Bridgeport 2018), Bridgeport provided a prediction of three future years of production based on extrapolation by a qualified Senior Reservoir Operations Engineer. At Inland in 2019, Bridgeport produced 189.2 ML of water, an increase or 26.1% or 39.2 ML) against the predicted 150.0 ML. In 2020, Bridgeport produced 212.4 ML compared to the predicted 151.9 ML, an increase of 60.5 ML (or 39.9%). In the final year of this reporting period, 2021, Bridgeport produced 187.8 ML compared to the predicted 152.3 ML, an increase of 35.5 ML (or 23.3%) (Table 4).

Table 4: A comparison between the predicted water production from each year from the Bridgeport Inland UWIR (2018-2021).

Type	Year	Inland Total (ML)
Predicted	**2019**	150.01
Actual	**2019**	189.19
Predicted	**2020**	151.89
Actual	**2020**	212.42
Predicted	**2021**	152.26
Actual	**2021**	187.75

Future Production Estimates

Section 376(1)(ii) requires an estimate of the quantity of water to be produced or taken because of the exercise of the relevant underground water rights.

Where there was sufficient and consistent production history, the method of decline curve analysis (DCA) was applied in ValNav software, which is an industry-based reservoir engineering application. As most of the wells have been producing for many years, DCA was undertaken on a well-by-well basis for each of Bridgeport's producing fields. Varity of methods includes DCA of historical oil production, total liquid production and water cut/water oil ratio (WOR) trends.

Bridgeport predicts the annual water production will average 246.4 ML from Inland between 2022 and 2024 (Table 5). Bridgeport predict 248.86 ML in 2022, 246.29 ML in 2023 and 244.1 ML in 2024.

Bridgeport acknowledges that ageing oilfields produce an increased volume of water as a percentage cut from all fluids extracted. There are several options which can extend the production from fields, including re-perforating other oil producing formations, continued exploration, drilling, optimisation and various stimulation techniques. It is predicted total water extraction will remain relatively constant in the next three years, as there are not significant changes forecast to production wells.

Table 5: Actual and predicted water extraction (ML) from the Inland oilfield from 2011 to 2024.

Year	Total extracted (ML)
2011	70.60
2012	155.54
2013	149.49
2014	146.77
2015	140.85
2016	181.72
2017	198.24
2018	154.83
2019	189.19
2020	212.42
2021	197.25
2022	248.86
2023	246.29
2024	244.10
Combined Total	2,536.16

The total water production from the last three years (2019, 2020 and 2021) has been compared to the future estimated predictions out until 2024 (Table 5 and Figure 3).

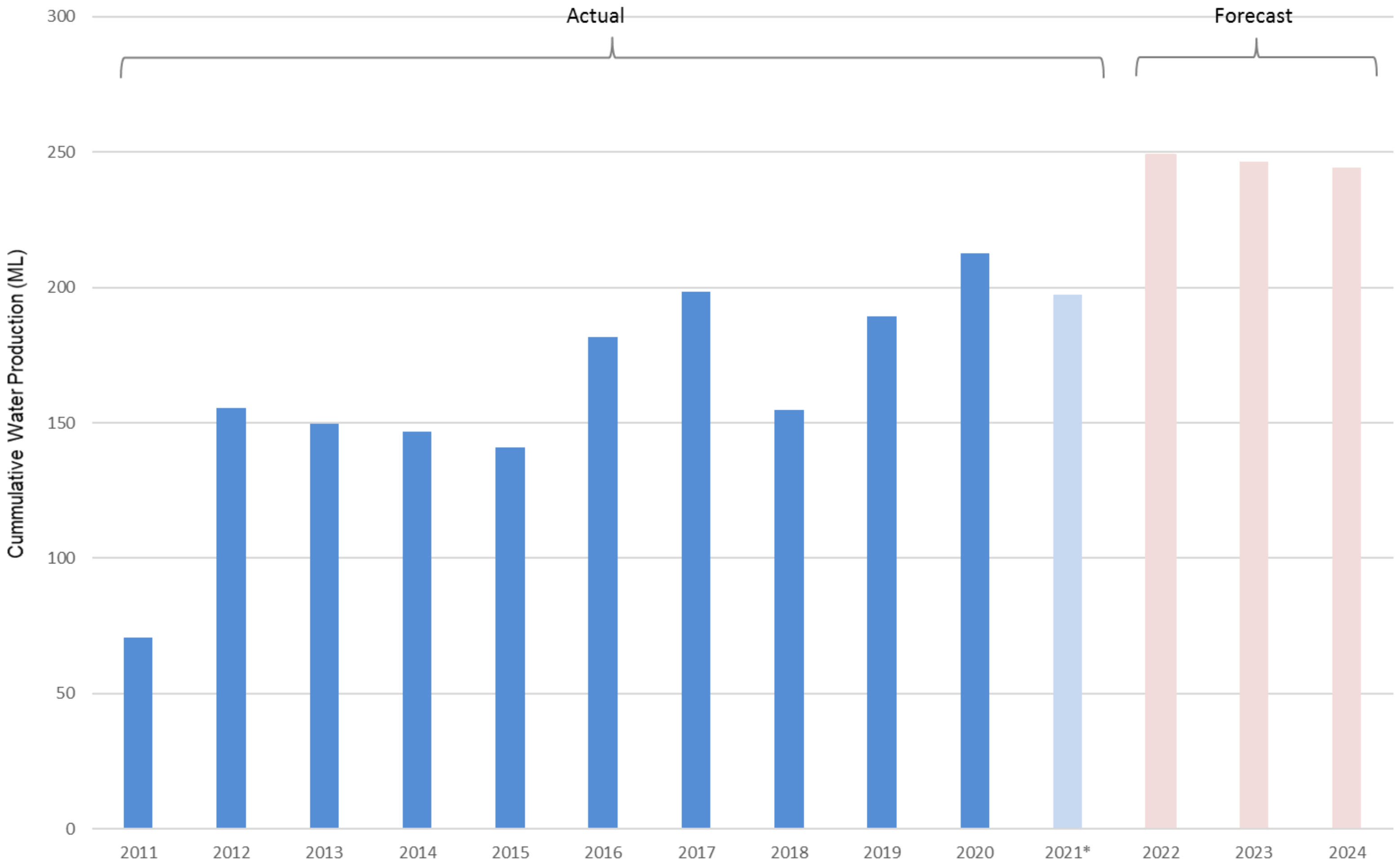


Figure 3: Cumulative water production (ML) at Inland, including three years of production forecasts till 2024.

Production Comparisons

Bridgeport focuses on the production and extraction from confined aquifers associated with geological traps that hold petroleum. At each field, the total volumes extracted is a key consideration and monitored as described above. Bridgeport analysed the impacts from the Greater Kenmore and Bodalla Area (GKBA, another Bridgeport owned and operated field) using a reservoir model run by Golder Associates (Golder Associates, 2021, see GKBA 2021 UWIR). The model found all production extraction had extremely limited drawdowns in only the isolated reservoir related to petroleum extraction, with no apparent propagation vertically due to geological sealing units. Propagation of impacts vertically were only limited to the immediate geological layers within the model due to the effectiveness of the vertical seals. Modelling did not extend to the near surface layers, which are the primary target of private landholders for livestock watering bores and not in pressure communication with the petroleum reservoirs.

The total annual water extracted under associated water rights since 2011 at Inland is approximately 10% of the water extracted from GKBA respectively (Figure 4). The significant difference in water extraction volume, along with the fact the water is extracted from a similar depth, under similar conditions, with similar geological boundaries that restrict the movement of liquids vertically, limits the propagation of water level drawdown at Inland, water production from the Birkhead/Hutton will result in no drawdown in the unconfined aquifer that is in the near surface Winton Formation.

These assumption and hypothesis will be tested by running a model, which will quantify the water pressure drawdown in the associated and surrounding aquifers.

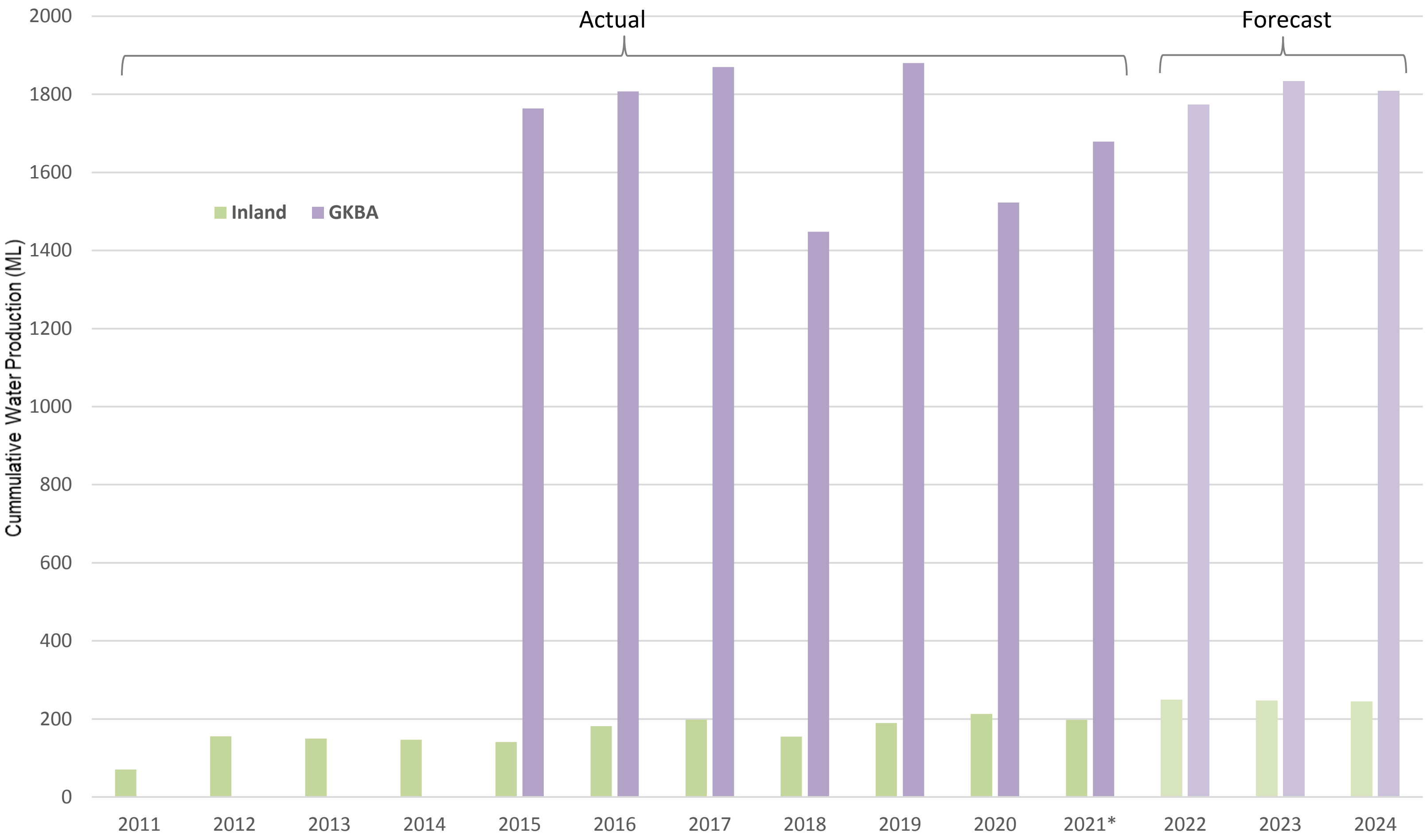


Figure 4: Cumulative water production at Inland compared to the Greater Kenmore & Bodalla Area (ML), including three years of production forecasts till 2024.

Part B*: Aquifer information and underground water flow

Requirement under sections 376(b)(i) to 376 (b)(iii) of the Water Act
For each aquifer affected, or likely affected, by the exercise of the relevant underground water rights, an UWIR must include: *1. A description of the aquifer;* *2. An analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers; and* *3. An analysis of the trends in water level change for the aquifer because of the exercise of underground water rights.*

*Part B refers to Section 5.1.2 (page 13) of the guideline (DES 2017).

Location

PL 98 Inland is located 120 km west of Windorah, and approximately 230 km east of Birdsville. Coordinates of Inland are 25°32’34.16”E, 141°37’57.54”E.

Geological setting

PL 98 is located within the Great Artesian Basin, and within the Cooper Basin and overlying Eromanga Basin. The Cooper Basin covers a total area of 130,000 km^2 in central and eastern Australia and is described as arid with a uniform climate. It contains a wide diversity of land and ecosystem values that are defined by geological, geomorphological, and hydrological influences. The Eromanga Basin extends over one million square kilometres across western Queensland, north western New South Wales, north eastern South Australia and south-east Northern Territory.

The Eromanga Basin is overlain by the Lake Eyre Basin, a succession of Tertiary and Quaternary age sediments occurring extensively throughout central Australia. In the north east of South Australia, the Lake Eyre, Eromanga Basin sediments were deposited during the Jurassic-Cretaceous period and reach a maximum thickness between 1200 m and 2700 m over the Cooper Basin. These sediments were deposited under fluvial, lacustrine and (later) shallow-marine conditions, and are broadly continuous across the basin. These sediments are gently folded in some areas and contain a succession of aerially extensive sandstone formations that serve as oil reservoirs and regional aquifers. The Eromanga Basin is the largest part of the basin that constitutes the Great Artesian Basin (GAB). The Eromanga Basin lies within South Australia, Queensland and New South Wales. Beneath, and entirely covered by the Eromanga Basin, is the Permo – Triassic Cooper Basin, a failed rift system limited in its distribution by bounding faults and pinch-out edges.

The tectonic history of the Cooper and Eromanga basins is complex and has been characterised by several periods of rift-related subsidence and compressional uplift and erosion. This history has resulted in the Cooper Basin being subdivided into numerous large-scale sub-troughs separated by fault-bounded ridges.

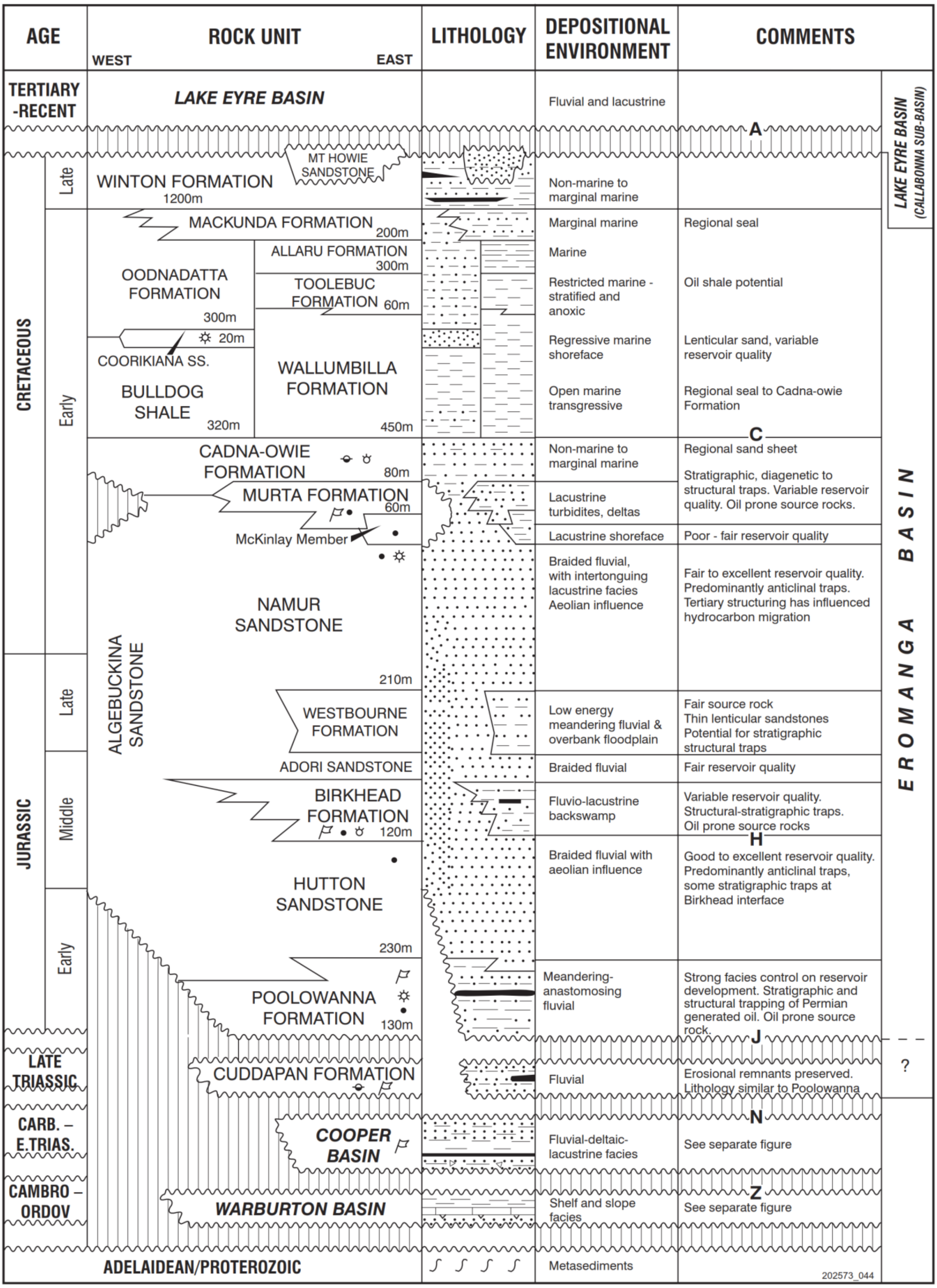


Figure 5: Stratigraphic column of the Eromanga Sequence, Inland targets the Birkhead/Hutton.

Hydrogeological setting

PL 98 is located within the Great Artesian Basin (GAB). The aquifers of the GAB are composed of predominantly continental sandstones, confined by aquitards of both fluvial and marine mudstone and siltstone of Jurassic and Cretaceous age. The geological basins within the GAB share a similar depositional history and tectonic evolution. However, slight differences in the rates of subsidence and deposition are caused by structures inherited from older, underlying basins, especially in the Eromanga and Surat basins. These structural elements create the depocentres, ridges, and troughs that are the foundation for the hydrogeologic basin observed today (CSIRO, 2012). The Water Plan (Great Artesian Basin) 2006 established 25 management areas and within these areas established several management units. In September 2017 the Water Plan (Great Artesian Basin) 2006 was superseded by the Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017. The current plan area is divided into groundwater units and the groundwater units are further divided into groundwater sub-areas. In PL 98 primary extraction occurs from within the Hutton groundwater unit and the Eromanga Hutton sub-area. A description of each Formation follows:

McKinlay Member and Namur Sandstone (Eromanga South Hooray sub-area, formally Central 3 – not producing)

The formations in Eromanga South Hooray sub-area are described in the *Hydrogeological Framework Report for the Great Artesian Basin Water Resource Plan Area 2005* as follows:

> “The Hooray sandstone and its hydrogeological equivalents are generally the shallowest major artesian aquifer intercepted by water bores in the GAB in Queensland. The Late Jurassic Hooray Sandstone aquifer is defined only within the Eromanga Basin.” (p15).
>
> “Basin margin facies of the Jurassic and early Cretaceous sandstones and siltstones occur in the Eromanga (Namur Sandstone, McKinlay member and Murata Formation). These basin margin facies are hydrogeologically equivalent to the Hooray Sandstone aquifer.” (p15).

The Murta Member is a very fine to fine grained sandstone with interbedded hard siltstone. The sandstone is subangular to subrounded, moderate to well sorted with a moderate to abundant clay matrix. Moderate amounts of silica cement are present and it is moderately hard with poor porosity. The Eromanga South Hooray sub-area ranges in thickness from approximately 120-130 m.

The McKinlay Member is a fine to medium grained siltstone with minor firm siltstone. The sandstone is subangular to subrounded, moderately sorted with occasionally carbonaceous laminae. There is a moderate clay matrix that is slightly calcareous and moderate silica cement. The formation is moderately hard, with poor to occasionally fair porosity.

The Namur Member is sandstone with interbedded siltstone. The sandstone varies from very fine to coarse. It’s moderately sorted with clay matrix and moderate silica and calcareous cement and ranges from friable to moderately hard. Poor to fair with occasional good porosity has been observed. This siltstone is argillaceous with firm with moderately to abundant carbonaceous material.

Elevations and relative position

The McKinlay Member and Namur Sandstone are Late Jurassic to Early Cretaceous sediments (Figure 6). The depth ranges across the lease from 1071-1120 mSS. Within the Inland Oilfield the range is 1071-1097 mSS. The Namur formation ranges in top depth across the lease from 1088-1149 mSS and within the Inland Oilfield, the range is 1088-1111 mSS.

Location of water bores screened within these aquifers

There is one shut-in oil well in the Inland Oilfield which has been classified in the DERM/DEHP database as water bore #100199. This well was shut-in in June 2002 and abandoned in September 2002. This well was drilled to a total depth of 1865 m in the Nappamerri Formation. It has in the past produced from the Hutton Sandston and the Namur Sandstone Member. The next closest shut-in oil well that appears in the DERM database is water bore #23099 (Morney 1). This well is approximately 11 km to the north north-west of the field. The well was plugged back to 230 m, so it would not be accessing zones below. The closest converted oil well is water bore #22946 (Curalle 1), is over 50 km to the southwest from the Inland Oilfield, which is considered to be too far to detect changes in any of the aquifers.

In general, "...the majority of bores occur in the northern, western and southeastern boundaries where the formation is at shallower depth....[as] due to the considerable expense to drill to such depth..." as is found in the central region where PL 98 is situated (Queensland DRNM 2005, p118).

Location of any significant faults that intersect aquifer

The Inland Oilfield is bounded on the northwest flank by a major thrust fault which does not intersect surface sediments, approximately 330 m from Inland 1 (Figure 6). Inland 5 is the only well to have perforated the McKinlay Formation. Inland NE 1 tested the Murta/McKinlay but was never completed over this interval. The well is approximately 640 m from the main fault. A number of minor crestal faults may provide a degree of compartmentalisation of the Eromanga South Hooray units.

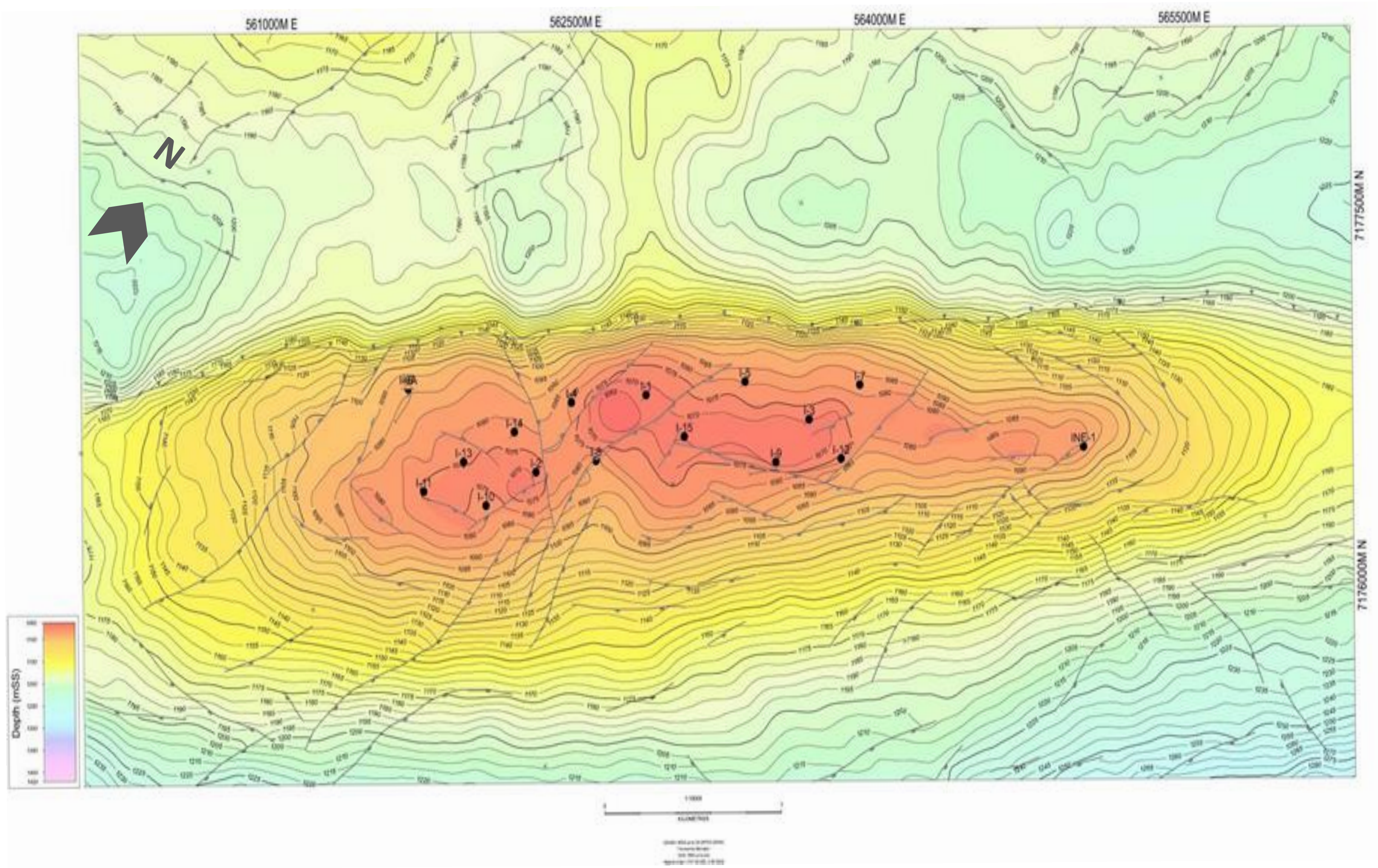


Figure 6: The depth structure of the McKinlay Formation.

Available data on current underground water levels

The McKinlay was perforated in February 2003 in Inland 5. At this time the field was managed by the previous operator IOR Exploration. The records that were supplied to Bridgeport indicate that from February 2003 to August 2008, the McKinlay produced a total of 1987 bbls/0.32 ML of water, before being shut-in.

The Namur was perforated in Inland 1 at completion of the well in 1994. Namur production was co-mingled with the Hutton Sandstone (production of fluid from two or more separate zones through a single pipe and where production from individual zones therefore cannot be measured, see Appendix 2). In March 2002, the Namur was isolated behind a packer and production was solely from the Hutton Sandstone.

Inland 3 perforated the Namur and as it flowed only water, the formation was shut-in immediately and no further production occurred.

Inland-9 tested the Namur and recovered oil-cut muddy water and water. The zone was not completed after casing was run and no further water production occurred.

The oil/water contact, and therefore the water level, for these reservoirs are not clear as the reservoirs have not undergone significant oilfield development. It appears that the lowest known oil is the base of the perforation in Inland 5, which is 1255.8 mMD/1090.8 mSS. As all tests recovered some oil, the free water level is not known.

Given that very little fluid production has come from this reservoir and that the overall extent of Eromanga South Hooray is enormous, it is concluded that the aquifer water levels, referred to in S376 (b)(iv), will remain unchanged in the area of the lease.

Birkhead Formation (Adori Injune Creek sub-area, formally Central 4 – currently producing)
The Birkhead Formation type sections outcrop in the Adori Injune Creek sub-area and are described in the *Hydrogeological Framework Report for the Great Artesian Basin Water Resource Plan Area 2005* as follows:

> "Birkhead Formation comprises siltstone, fine sandstone, mudstone and minor coal. It obtains a maximum thickness of 130 m and is absent in the west and south of the Eromanga Basin over the Thargomindah and Cunnamulla shelves (Senior et al, 1978), and west of the Nebine Ridge. The sandstones are generally clayey and the formation acts primarily as a confining bed, providing only small supplies of poor quality water" (p13).

The Birkhead Formation is interbedded sandstone and siltstone. The sandstone is very fine to fine grained, subangular to sub-rounded, moderate to well sorted. There is moderate to abundant clay matrix and friable to moderately hard. There is carbonaceous material, feldspars and lithic throughout with poor to fair porosity observed. The siltstone is firm and carbonaceous, occasionally sandy in part. In PL 98, the thickness of the Adori Injune Creek unit is approximately 90-100 m.

Elevations and relative position
The top of the Birkhead Formation sits within the Mid to Late Jurassic stratigraphic position (Figure 7). Within PL 98, the Birkhead formation ranges in depth across the oilfield from 1317-1379 mSS. The primary section that is produced ranges in top depth of 1396-1425 mSS.

Location of water bores screened within these aquifers
There is no water well in the Inland Oilfield perforated into the Birkhead Formation.

Location of any significant faults that intersect aquifer
The Inland Oilfield is bounded on the northwest flank by a major thrust fault, approximately 500 m from Inland 2, 200 m from both Inland 4 and Inland 7, 170 m from Inland 5 and 590 m

from Inland 11 (Figure 7). A number of minor crestal faults may provide a degree of compartmentalisation for the Birkhead sand units (Figure 7).

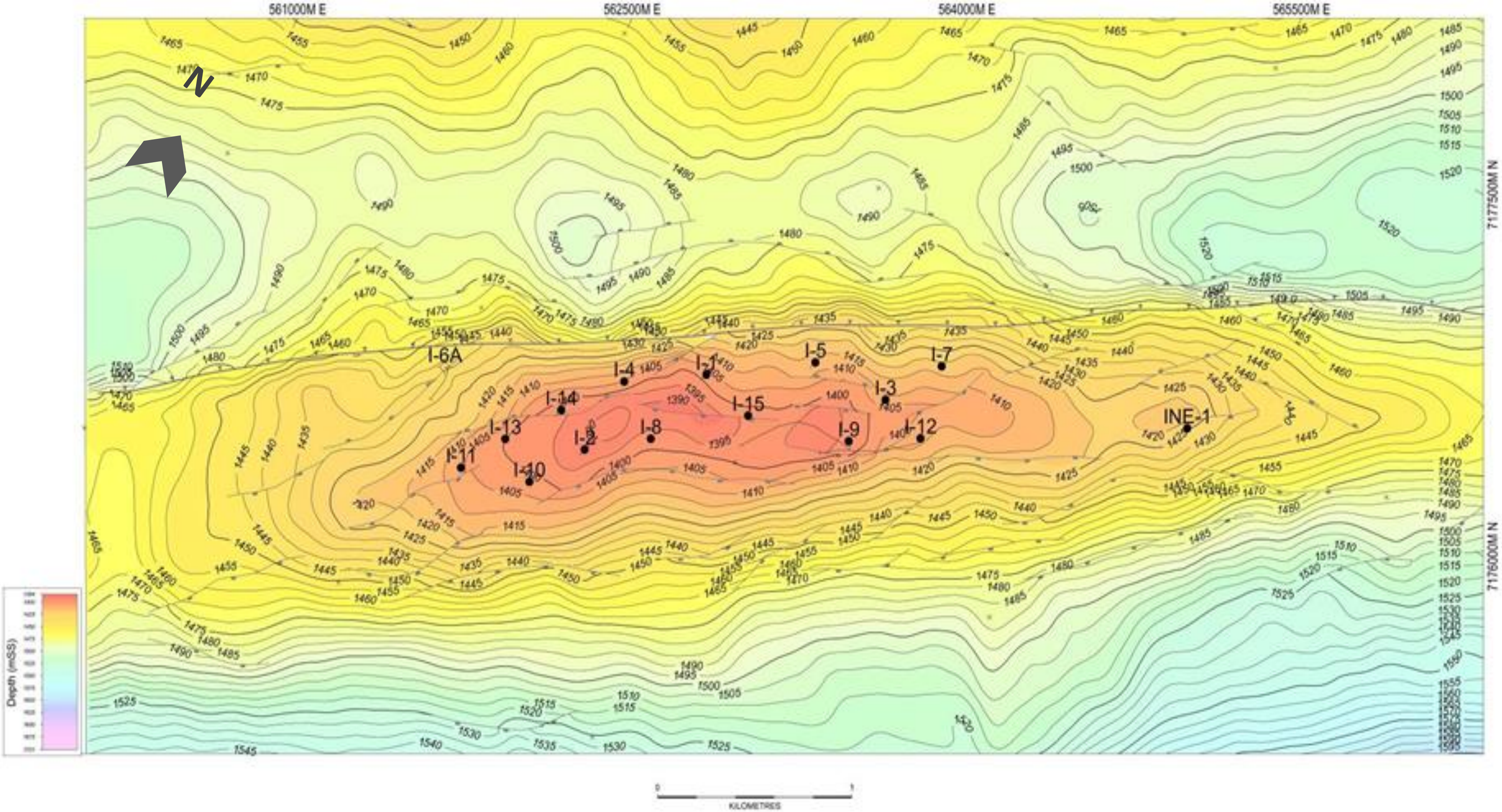


Figure 7: The depth structure of the Birkhead Formation.

Available data on current underground water levels

> "There is only limited extraction from the Injune Creek Group and Hutton Sandstone. Both units extend beneath the majority of the management unit, excluding the northwest and southeast corners. However, the depth to these units precludes most drilling due to the expense and the existing bores are generally converted historical oil bores." (Queensland DNRM 2005, p118)

The Birkhead Formation first produced oil in November 1996 from Inland 5, which was comingled with oil from the Hutton Sandstone until 2002. At that time, a bridge plug was set, isolating the Hutton from production. The Birkhead Formation continued to produce until February 2003, when another bridge plug was set above the Birkhead. It continued to produce from the McKinlay until 2006 when it was shut-in. The Birkhead sand was perforated for Inland 7 upon drilling completion in February 1997. Inland 7 has since produced comingled volumes with the Hutton Sandstone. Inland 11 perforated the Birkhead and comingled production with the Hutton in 2001 upon completion, it remains producing to date.

When Hutton Sandstone watered out in June 2006, the lower Birkhead sand was perforated in both Inland 2 and Inland 4 immediately after a bridge plug. Inland 2 was then shut-in in November 2006. In August 2008, both Inland 2 and 4 were fracced in the lower Birkhead sand. Inland 4 featured predominantly oil (~5 barrels/~0.001 ML of water per day) whereas Inland 2 was shut-in when it watered out December 2008. The majority of the fluids produced from the Birkhead are from Inland 4. This is the only well to be solely completed over the Birkhead. Other wells that have perforations in the Birkhead produce very minor amounts of oil and water, although it is not possible to determine precise volumes, as these flow from the wells with dual zone perforations (co-mingled wells, Appendix 2).

The upper-most water level in the lower Birkhead oil reservoir is estimated to be between 1419-1428 mSS. This depth range is interpreted from the upper-most perforation at Inland 5 and the lowest known perforation in Inland 7. Based on the continual production of water and oil from the Birkhead formation, the water in the reservoir shows no sign of pressure depletion from the production of oil and associated water.

Given the large volume and good connectivity of the Birkhead aquifer system in the vicinity of PL 98, it is expected that as Birkhead oil is produced, formation water will enter the reservoir and therefore the water level will rise. Hence, no aquifer depletion as referred to in S376 (b)(iv) is expected.

Hutton Sandstone (Eromanga Hutton, formally Central 5 – currently producing)

The formations in Eromanga Hutton sub-area are described in the *Hydrogeological Framework Report for the Great Artesian Basin Water Resource Plan Area 2005* as follows as S376(b)(i):

> "The Hutton Sandstone is comprised of fine to coarse grained quartzose sandstone, lithic sandstone, siltstone and mudstone deposited from rivers and lakes (Senior et al, 1978; Radke et al, 2000). In the outcrop areas the sandstone is often partly silicified and ferruginised or with kaolinitic clay infilling pores (Kellett et al, 2003). The lower part of the Hutton Sandstone is generally finer grained, containing more mudstone and siltstone than the upper part, which is a much more uniform sandstone (Green, 1997).
>
> In the northern part of the Eromanga Basin, this unit was the beginning of the sedimentary sequence and sits unconformably on the basement of the Galilee basin sediments (Senior et al, 1978; Kellett et al, 2003). The Hutton Sandstone attains maximum thickness of approximately 250 m in the central Eromanga Basin and the Taroom Trough. This unit is absent over elevated basement in the north and northwest and thins towards the southern margin of the Cooper Basin.
>
> The Hutton Sandstone contains good to excellent aquifers with yields up to 50 L/s of good quality water. Recharge areas are on the eastern margins Eromanga Basin and

other eastern margins of the Surat Basin (Habermehl, 1980; Exon, 1976).” (Queensland DNRM, 2005, p11).

Elevations and relative position

The Early to Mid-Jurassic Hutton Sandstone top depth is between 1411-1471 mSS (stratigraphic position visible in Figure 8). Within the Inland Oilfield the range is 1411-1447 mSS.

Location of water bores screened within these aquifers

“There is only limited extraction from the Injune Creek Group and Hutton Sandstone. Both units extend beneath the majority of the management unit, excluding the northwest and southeast corners. However, the depth to these units precludes most drilling due to the expense and the existing bores are generally converted oil bores” (Queensland DNRM 2005, p118).

Location of any significant faults that intersect aquifer

The Inland Oilfield contains a number of smaller faults that may compartmentalize the field. The major fault is closest to Inland 6, 103 m away, and is furthest from Inland 10 at a distance of 657 m (Figure 8).

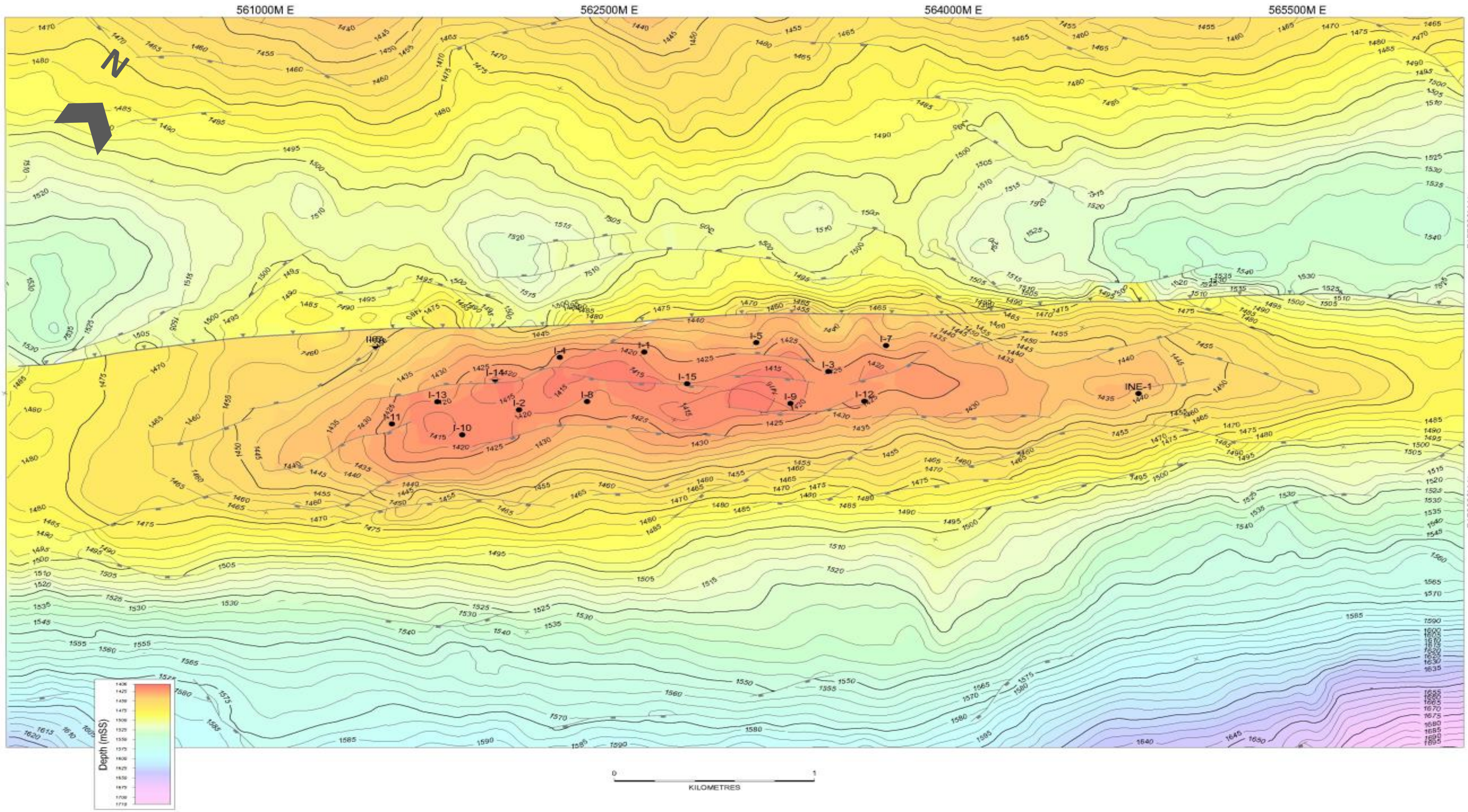


Figure 8: The depth structure of the Hutton Sandstone.

Available data on current underground water levels

All wells in the Inland Oilfield were completed in the Hutton. Beal 1, which is the northeast of the permit, and Inland 6/6A were plugged and abandoned with no production from any reservoir. Inland 14 and Inland 20 were completed, but there has been no production from these wells.

The oil/water contact, and therefore the water level is estimated to be approximately 1488 mSS. The reservoir/aquifer shows no signs of pressure depletion due to oil production. Over time, the water level naturally rises as the oil is produced out of the reservoir. And because there is a substantial volume of water in the Hutton Sandstone that has access to the Inland Oilfield, no water depletion is expected. On a regional aquifer scale, the impact of fluid production on the Hutton Sandstone is expected to be minimal. Figure 9 shows the accumulation of oil (as it is less dense than water) occupying a relatively small volume of the Hutton Sandstone Formation. However, volumes cannot be accurately determined as the Inland Field occupies a small part of the basin aquifer and it is isolated from other producing oilfields in the Cooper Basin. Within PL 98 and other tenements, water coning of 2-5 m as a result of well bore drawdown occurs in the near well bore environment, which is a normal part of oil production that equalises after the well is shut in.

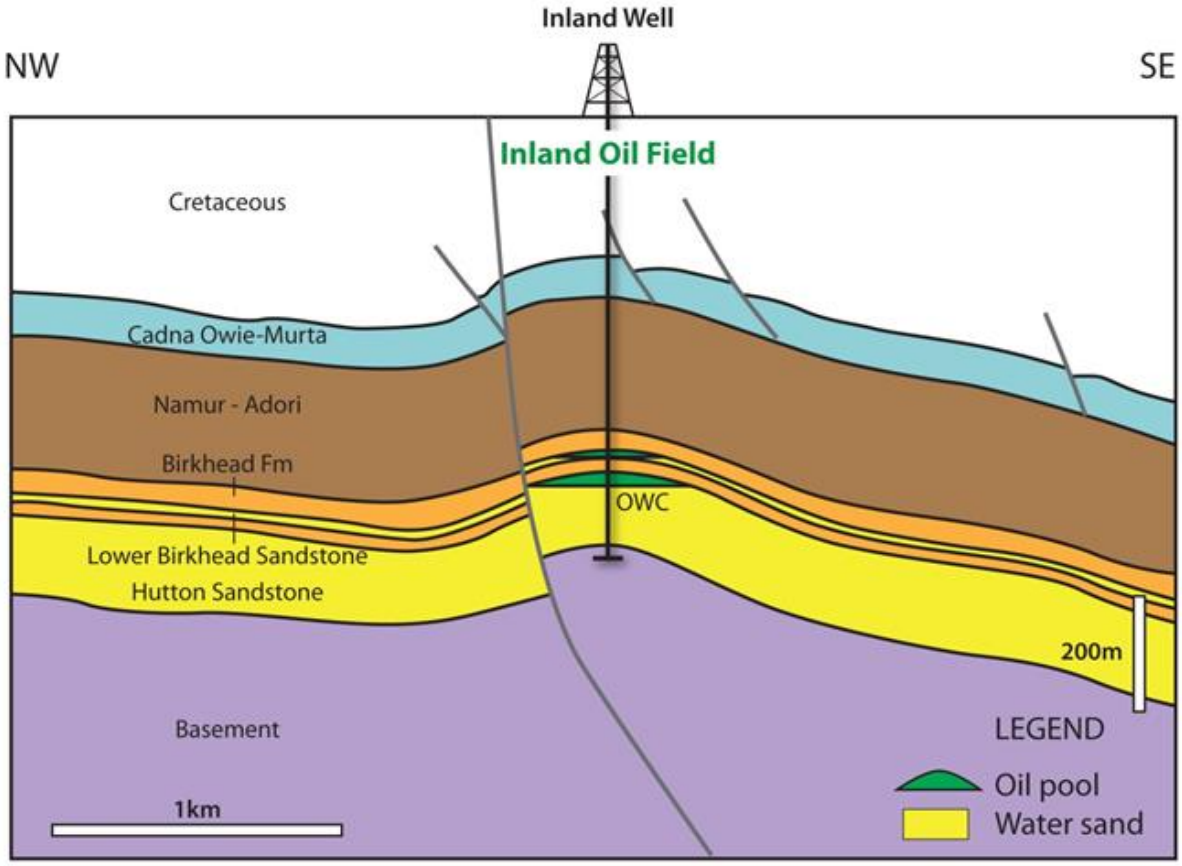


Figure 9: A conceptual diagram of the oil contact beneath the Inland Oilfield, with fault line.

Underground water flow and aquifer interactions

Bridgeport continues to interpret historic data and new data when new wells are drilled, to develop an understanding of the relationship and interaction between petroleum reservoirs and water aquifers. Bridgeport has identified faulting on the flanks and crest of the Inland structure and some communication between reservoirs may naturally occur as evidenced by the occurrence of oil in various stratigraphic levels. However, the affected strata lie within a depth range of 1000-1500 m.

“Water quality in all the units is generally more saline than experienced closer to the Basin margins. The residence time in the aquifer and the influence of water from the underlying Cooper Basin has reduced water quality” (Queensland DRNM 2005, p118).

McKinlay Member and Namur Sandstone (Eromanga South Hooray sub-area, formally Central 3 – not producing)

The Hooray Sandstone extends over the whole management area, however the majority of bores occur in the northern, western and southeastern boundaries where the formation occurs at shallower depths. However, these depths can still be nearly 1000 m and many of the bores are ex-oil bores due to the considerable expense to drill to such depths. The unit provides water of varying quality with high heads and yields of up to 60L/s, averaging around 15L/s. The water supplies for Thargomindah Township come from this unit (Queensland DNRM 2005, p118).

"In the Central Eromanga Depocentre (Cooper Basin Region) the combined Namur Sandstone, McKinlay member and Murta Formation are laterally continuous with the Hooray Sandstone. These formations are restricted to subsurface and are recharged from connecting Hooray Sandstone in the east and Algebuckina Sandstone in the west. Confined aquifers are found in all three members, which are connected." (Queensland DNRM 2005, p17).

The McKinlay Formation was tested in Inland 5 and Inland NE 1. In Inland 5, the test covered primarily the Murta Formation and only the upper-most of the McKinlay was included. In Inland NE 1, the test interval was primarily in the McKinlay and only the base Murta was included. This test recovered oil, watery mud and mud and no water sample was available for testing.

The Murta Member provides a top seal for the McKinlay and Namur reservoirs. The Murta is predominantly siltstone with a few fine to very fine-grained sand stringers. Above the Murta is the base Cadna-owie Formation, which is a regional seal unit in the Copper-Eromanga Basin. The DRNM report (2005) states "These formations are restricted to subsurface and are recharged from connecting Hooray Sandstone in the east and the Algebuckina Sandstone to the west. Confined aquifers are found in all three members, which are connected." (Queensland DRNM 2005, p17). However, there are there are intra formational seals interpreted form log character with the Eromanga South Hooray reservoirs within the Inland Oilfield.

The Westbourne Formation lies between the Namur and Adori sandstone and it has a very thick sealing silting at its top. This provides a base seal for the Namur and McKinlay sandstones ensuring no communication with deeper reservoirs. Table 6 below presents the some of the key properties of the water analyses for the various well's recoveries from the Namur Member. The full chemical analyses for these samples are in Bridgeport archives. Note these are samples that have been produced in a drill stem test and have interacted with oil and drilling fluid. These drill stem test recoveries are not representative of true groundwater chemistry as they may be contaminated by drilling muds. After drilling, no water quality samples are taken at individual well heads. Water sampling typically occurs post oil separation processes, after water is delivered to the evaporation ponds.

Table 6: Key parameters tested from wells perforating the Eromanga South Hooray sub-area, when initially drilled.

Well	pH	Resistivity @25C (ohm.m)	Conductivity @25C (µS/cm)	Total Cations (meq/L)	Total Anions (meq/L)	Total Dissolved Solids (mg/L)
Inland 1	7.8	0.22	45,700	464.50	466.80	29,248
Inland 9	7.1	0.92	10,860	125.73	118.85	6,950

Birkhead Formation (Adori Injune Creek sub-area, formally Central 4 – currently producing)

There are no water analyses on the Birkhead Formation in PL 98.

"The sandstones are generally clayey and the formation acts primarily as a confining bed, providing only small supplies of poor quality water" (Queensland DRNM 2005, p13).

The Birkhead is a relatively poor quality reservoir. The formation is generally of low porosity and permeability, so the contribution to the total oil and water production of the field to date is minimal. Most oil and water production is from the Hutton Sandstone with only minor water production from the Birkhead. Based on drilling and production data it is not possible to determine with certainty the degree of communication between the Birkhead and the Hutton formations. Well data in the field suggests that reservoir seals provide an element of separation between known oil reservoirs. Given that the underlying Hutton Sandstone was drained of oil in the Inland 4 area, the low level of water production from the Lower Birkhead reservoir in that well suggests that there is a high degree of isolation of the Birkhead and Hutton oil pools in this area.

Hutton Sandstone (Eromanga Hutton, formally Central 5 – currently producing)

There is only limited extraction from the Injune Creek Group and Hutton Sandstone. Both units extend beneath the majority of the management unit, excluding the northwest and southeast corners. However, the depth to these units precludes most drilling due to the expense and the existing bores are generally converted oil bores (Queensland DRNM 2005, p118).

The table below presents the water analyses for various well recoveries from the Hutton Sandstone. The full chemical analyses for these samples are in Bridgeport archives. Note these are samples that have been produced in a drill stem test and have interacted with oil and drilling fluid. They are therefore not representative of true groundwater chemistry drill stem test recoveries which are contaminated by drilling muds. After drilling, no water quality samples are taken at individual well heads, but more so after all water has mixed, post oil separation processes, and delivered to evaporation ponds.

Table 7: Key parameters tested from wells perforating the Eromanga Hutton sub-area, when initially drilled.

Well	pH	Resistivity @25C (ohm.m)	Conductivity @25C (µS/cm)	Total Cations (meq/L)	Total Anions (meq/L)	Total Dissolved Solids (mg/L)
Inland 1	7.1	0.18	55600	475.8	470.7	35584
Inland 2	4.7	0.28	36200	372.0	363.3	23168
Inland 3	6.6	1.72	5800	77	77.2	3712
Inland NE 1	7	1.64	6110	63.03	66.78	3910

Underground water level trend analysis

Information about the formations within Inland Oilfield (including water level depths) has been acquired through the drilling of development wells. Most production is from the Hutton Sandstone. It is not possible to determine or quantify the extent of communication between the Birkhead and the Hutton Sandstone with the information using the information that Bridgeport collates. Well data in the field suggests that reservoir seals provide an element of separation between known oil reservoirs. As new wells are drilled, Bridgeport can gain more quantitative data relating to oil-water contact and water level height.

Well histories

The table below does not cover the entire history of each well prior to Bridgeport ownership, as documentation is difficult to find in some instances. Accurate recent history is displayed.

Table 8: Individual well histories at PL 98 Inland.

Well	Status	Formation	History
Inland 1	Suspended	Hutton	Completed in July 1994 in the Namur Formation and the Hutton Sandstone March 1999, a swab test over the Namur –found not to be producing Namur was re-perforated in January 2001 and in February 2001, the Namur was tested and flowed 211 bpd with 100% water cut March 2002, the Namur was isolated in the annulus and the Hutton reopened May 2002 Hutton Test: 797 bpd 99.6% water cut June 2002 a downhole fault could not be resolved September 2002 the well was abandoned
Inland 2	Suspended	Hutton	Drilled in 1995 and completed in May 1995 over the Hutton 2002, the watered out June 2006, plug set over the Hutton and the well was perforated in the Birkhead Shut in November 2006 August 2008 fracked December 2008 shut in
Inland 3	Suspended	Hutton	Completed June 1995 over the Hutton Sandstone December 1995, Namur perforated. February 2013 parted rod, July well shut in
Inland 4	Online/Plugged	Birkhead/Hutton	Completed February 1996 in the Hutton Sandstone In 2001, watered out In June 2006, Hutton was plugged off and Birkhead was perforated. Extremely low productivity. In August 2008, fraccing was conducted to increase productivity from the Birkhead. Still producing to date
Inland 5	Shut in/Plugged	McKinlay/Hutton	Completed 1996 in the Birkhead and Hutton sandstones Watered out in 2002 February 2003 – Bridge plug was set plugging off the Birkhead and Hutton and the McKinlay formation was perforated 2006 production stopped: Records of oil rate of 15 bopd and little water prior. Both oil and water rates drop to 0. No reasons found in the IOR records. Field staff advised that the well keeps pumping off
Inland 6/6A	P&A'd	-	Completed and side-tracked in November 1996 Plugged and abandoned November 1996
Inland 7	Online	Birkhead/Hutton	Completed in 1997 in both Birkhead and Hutton May 2013 work over, tubing and rods were replaced

Well	Status	Formation	History
			Shut in September 2017
Inland 8	Online	Hutton	Completed and completed in 1997 in the Hutton Sandstone January 2001 the water cut went from 90% down to 75% after 6 months A series of work-overs throughout 2013 and 2014 to keep Inland-8 pumping Work over in 2017 to replace broken polished rod
Inland 9	Online	Hutton	Horizontal well completed in April 2000 in the Hutton 2017 hole in the tubing. Worked over to replace new tubing string Shut in August 2017
Inland 10	Shut in	Hutton	Completed March 2001 in the Hutton Workovers in 2005 and 2012 Still producing to date Workover (acid wash) October 2016 Shut in, for economical reasons March 2017
Inland 11	Online	Birkhead/Hutton	Completed February 2001 in the Birkhead and Hutton Workover to replace ESP in 2013 Still producing to date
Inland 12	Online	Hutton	Horizontal well drilled and completed in June 2002 Workovers in 2006 and 2013 Still producing to date
Inland North East 1	Online	Birkhead/Hutton	Completed August 2002 in the Hutton Production rate declined rapidly Due to low productivity, this well was shut in October 2013 2017 workover to replace faulty downhole pump
Inland 13	Online	Namur/Birkhead/ Hutton	Completed May 2004 in the Hutton This well was watered out and been shut in. Awaiting re-completion in the Birkhead. 2017 completed in the Namur formation
Inland 14	Shut in	Hutton	December 2006 completed in the Hutton Suspended ever since due to no production Re-completed in the Hutton attic and brought back online in September 2015 March 2017 shut in as watered out
Inland 15	Online	Hutton	Completed 2006 in the Hutton Workovers in 2007, 2009, 2013 and 2014 Still producing to date
Inland 16A	Online	Hutton	Completed in April 2013 over the Hutton sandstone Productivity has declined rapidly due to suspected formation damage

Well	Status	Formation	History
			Still producing to date
Inland 17	Online	Hutton	Completed in March 2013 over the Hutton sandstone Productivity has declined rapidly due to suspected formation damage On production every 2 days due to low productivity Workover (acid wash) October 2016
Inland 18	Shut in	McKinlay/Hutton	Completed in December 2013 over the Hutton sandstone Productivity has been low ever since completion due to suspected formation damage Currently shut in awaiting workover scheduled in 2015 to resume production Workover completed November 2015 and well producing January 2016.
Inland 19	Online	Hutton	Drilled in June 2017
Inland 20	Suspended	Hutton	Completed in January 2014. No production. Re-completed in February 2014 and produced only water.

An analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers;

Bridgeport does not collect quantitative data on the movement of underground water into and from other aquifers. Bridgeport focusses on the volumes of crude oil and water extracted, as well as reservoir pressure of hydrocarbon producing reservoirs. Bridgeport does not have wells or resources that target or isolate other aquifers that are not associated with petroleum, and therefore monitoring capability is limited.

Information to inform this section has been sourced from the Ecological and Bioregional Assessment Program, compiled by Department of the Environment and Energy, Bureau of Meteorology, CSIRO, and Geoscience Australia (Evans et al. 2020). The program was designed to provide independent geological and environmental scientific advice on bioregions, one of which includes the Cooper Basin (and covers Greater Kenmore and Bodalla Area). The assessment of hydrogeology was informed using data from petroleum related activities. Bridgeport has attempted to summarise key points from Evans et al. 2020 (access at;

https://www.bioregionalassessments.gov.au/sites/default/files/gba-coo-stage2-appendix_hydrogeology_final.pdf; as of 2021) that highlight movement to and from targeted aquifers.

The Cooper Basin report also covers the entire Eromanga Basin (that comprises a portion of the Great Artesian Basin (GAB)). Evans et al. (2020) state "From bottom to top these include the artesian GAB aquifers (e.g. Hutton Sandstone and Cadna-owie–Hooray aquifer), the Rolling Downs aquitard and the Winton–Mackunda partial aquifer". Both the Rolling Downs aquitard and the Westbourne aquitard separate artesian GAB aquifers from shallow aquifers. In the deeper artesian GAB aquifers, hydraulic gradients and therefore flow rates are likely near stagnant.

The primary source of groundwater (for landholder bores) occurs from the Winton-Mackunda aquifer, which is topographically controlled. There are a lower number of bores that target depths below the Winton-Mackunda aquifer. Those that do, would typically target resources such as gas, coal and oil. Petroleum fields likely contribute to localised depressurization (especially on the western flank of the Cooper Basin) leading to variable hydraulic head levels. Other attributes may also influence hydraulic head, including progress of petroleum production over time, reservoir compartmentalisation, permeability and re-charge. Evans et al. (2020) concludes that pressure and salinity suggests there is some degree of connectivity between artesian aquifers of the Eromanga and Cooper Basins, and that hydrochemistry and dissolved gas concentrations may indicate some connectivity between deep and shallow system components. However, the "uncoupled nature of both deep fault sets, and polygonal fault systems is one impediment for direct connectivity pathways to the near-surface unconfined aquifers".

Evans et al. (2020) are conscious of the lack of data and assumptions made from both limited temporal and spatial sample points, and conclusions drawn from data from wells that only target specific uses (e.g. petroleum). A feature throughout Evans et al. (2020) is the acknowledgement of a lack of considerable data and knowledge gaps. One of the considerations was the lack of data from points other than petroleum wells targeting hydrocarbons. Petroleum wells have unique caveats, considering they target only specific top zones or peaks of a specific aquifer. The knowledge gap also extends to the shallower Winton-Mackunda aquifer, as few are regularly tested, nor are the perforation or open producing depths known.

Bridgeport acknowledge that the key focus of petroleum operations limits the ability to infer the movement to and from other aquifers. Hydrocarbon reservoirs, are by their nature, capped by impermeable geological layers, which limit the movement of both hydrocarbons and water. These structures are deliberately targeted for resource extraction. Conclusions about lateral or vertical movement would be dependent on pressure gradients, which in turn may be influenced by historic and ongoing production. A lack of wells and perforations in alternate reservoirs limits the conclusions Bridgeport can make about reservoir interactions. Bridgeport is of the view that the best summary of groundwater interactions between aquifers in the Cooper Basin can be found in a report that encompasses a more complete data set and provides independent research, such as that by Evans et al. (2020). This report is likely the most recent and comprehensive analysis of groundwater movement in the region. The report can be found here;

https://www.bioregionalassessments.gov.au/sites/default/files/gba-coo-stage2-appendix_hydrogeology_final.pdf.

The target reservoirs from which oil and water are co-produced are separated from other aquifers by thick regional to basin scale aquicludes and therefore there is no movement from or to other aquifers. A regional cross-section demonstrates the sedimentary section in key wells across Bridgeport permit areas (Figure 10). The section from the Mackunda, down to the top Cadna-owie is a series of primarily marine shales approximately 600 metres thick. This unit forms an effective aquiclude trapping hydrocarbons below and separating the target oil bearing sands below the Cadna-owie from the shallow groundwater aquifers above the Mackunda, which are used by landowners and water users regionally. For this reason, there is no local inflow or outflow to or from these aquifers. Empirical data does inform the model and is described in the UWIR.

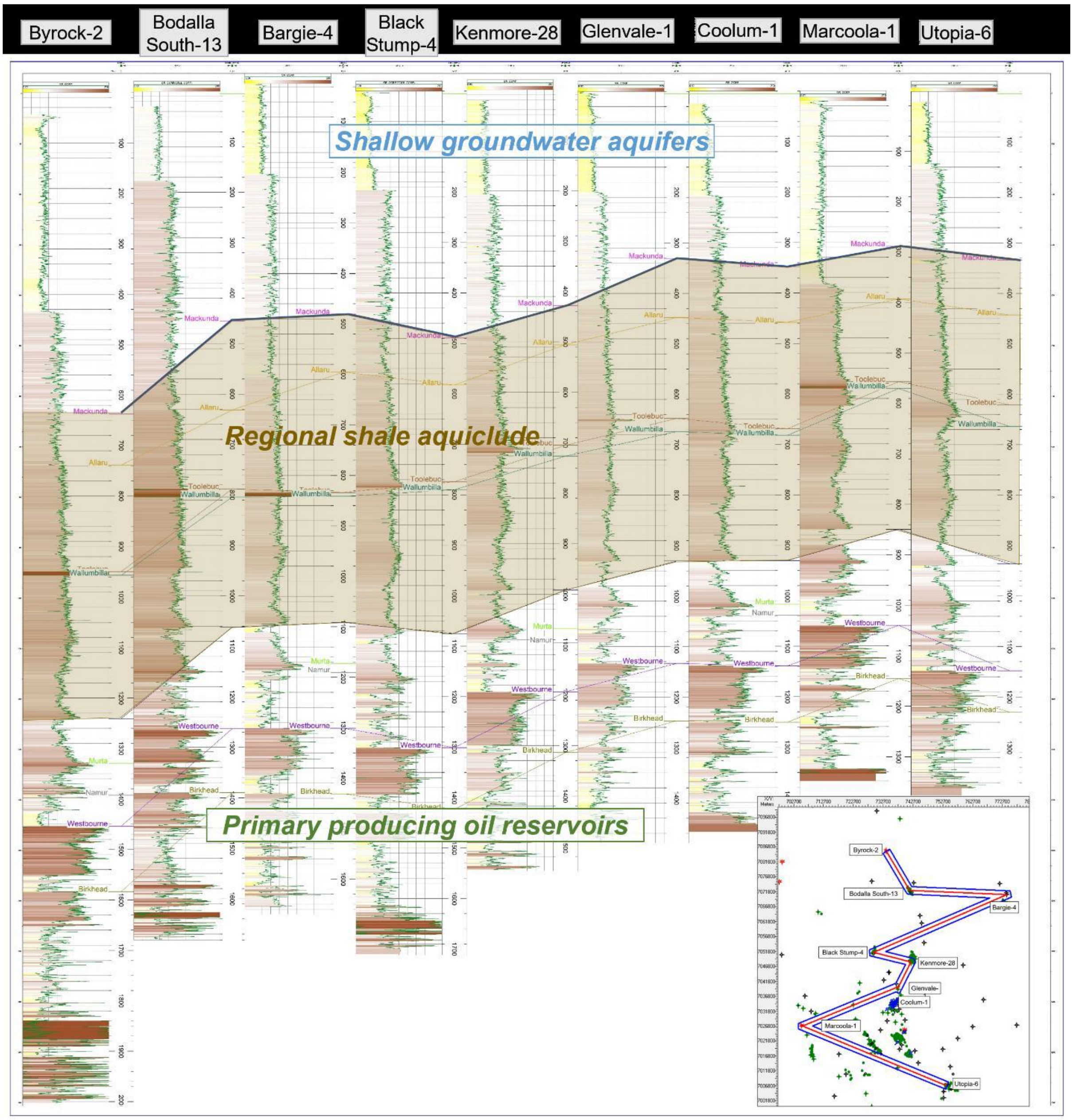


Figure 10: Gamma ray log cross section, correlated with depth from Byrock-2 to Utopia-6 (which covers Bridgeport operated tenements), showing the amount of shale and sand through the geological formations.

Localised Impact, connectivity and impact pathway summary

The Principal Geoscientist and Reservoir Engineer summarises the localised impacts of petroleum extraction, the connectivity of reservoirs and potential impact pathways between reservoirs as follows;

The target reservoirs in the region area are Early Cretaceous and Jurassic sandstones. These reservoirs have both local intra formational and regional formational seals. These lacustrine and fluvial sediments are in turn overlain by a thick Cretaceous Marine Shale sequence that was deposited over a 20-million-year period.

The marine shale sequence is approximately 500m thick in the Inland area, acting as a regional aquiclude, separating the shallow aquifer reservoirs from those that have been targeted for oil extraction and thus preventing the vertical movement of water.

The effectiveness of this aquiclude is evidenced in the trapping of the oil and water at depth in the oilfields of the permit area over the last 60 million years.

A fine scale, tenement level approach within this basin and these specific tenements would not be achievable, due to the distinct lack of finer scale granularity in quantitative information given the age of all wells drilled, the lower proportion of new wells drilled compared to those existing, and information required to continue production. Gathering such data would be inordinately costly given the context of this UWIR, including the basin-scale of the resource, the physical separation/disconnection from the Eromanga reservoir to the shallow groundwater aquifers targeted by landholders, the age and existing extraction from the fields, the existing information within the accepted model and the summary of the geology by Bridgeport's Principal Geoscientist above. The information Beach Energy and Bridgeport provides to the third party to build the appropriately scaled model (that has been previously accepted) is likely at the finest possible scale. Neither Beach Energy nor Bridgeport have data from any other well which is perforated into another target aquifer, who's primary purpose is not the extraction of oil. Dedicated wells would be required to monitor the other aquifers and this has not historically been a licence requirement due to the nature of conventional oil reservoirs in the Eromanga Basin, i.e. there is no connection and/or impact on near surface aquifers. Coal Seam Gas (CSG) fields can and do have an impact on shallow aquifers and that is the reason that dedicated monitoring bores have become licence conditions for such fields. However, this is not appropriate for the fields in question.

Part C*: Predicted water level declines for affected aquifers

Requirements under sections 376(b)(iv) to 376(e) of the Water Act
To meet the requirements of the Water Act, an UWIR must include the following: 1. *Maps showing the IAA and the LTAA (sections 376(b)(iv) and 376(b)(v) of the Water Act* 2. *A description of the methods used to produce these maps (section 376(c) of the Water Act)* 3. *Information about all water bores in the IAA (including the number of bores in the area, maps showing the location of these bores and the authorised use of each bore) (section 376(d) of the Water Act); and* 4. *A program for conducting an annual review of the accuracy of maps produced and giving the chief executive a summary of the outcome of each review, including a statement of whether there has been a material change in the information of predictions used to prepare the maps (section 376(e) of the Water Act).*

*Part C refers to Section 5.1.3 (page 15) of the guideline (DES 2017).

Maps showing the IAA and the LTAA (sections 376(b)(iv) and 376(b)(v) of the Water Act

A description of the methods used to produce these maps (section 376(c) of the Water Act)

This data and text has been provided based on previous modelling. The model and methods have not been changed; only new extraction data has changed to draw conclusions on pressure draw down. For a more comprehensive publication on model development, data input, assumptions and variables are available in Beach Energy (2014).

Information about all water bores in the IAA (including the number of bores in the area, maps showing the location of these bores and the authorised use of each bore) (section 376(d) of the Water Act); and

Golder Associates originally developed a model for water extraction for Beach Energy and their Eromanga oilfields in August 2014 (Beach Energy 2014). The model is suitable, and Bridgeport contracted Golder Associates to re-run the same analytical model with updated production data in 2018 and again in 2021/22.

The analytical model was re-run under identical conditions and a comparison of the results reflect an accurate representation of water levels over time, under different extraction conditions, and therefore suits the purposes of the UWIR. The method used to develop the IAA and LTAA maps and model are described below.

The model has been developed to provide indicative potential drawdown levels of the targeted aquifers, using all relevant and accurate data. Some of the relevant modelling data includes quantitative details on geological mapping and formation details, tenure locations, groundwater levels and historical and predicted water and oil production.

Bridgeport outlines the model, its calibration, assumptions and all other details below. The following sections heavily references the description of the model from the Beach Energy (2014) UWIR, which was written by Golder Associates in 2014.

The same model was used recently in the Bridgeport UWIR for the Greater Kenmore and Bodalla Area (GKBA). The model development, testing, analysis and results were accepted by the Department of Environment and Science in July 2022 (DES, 2022).

AnAqSIM Software

The groundwater impact assessment estimation was conducted using an analytical software program called AnAqSim (version 2011-2). AnAqSim is analytical software capable of superimposing multiple analytical calculations (using flow equation calculations) to yield a composite solution consisting of equations for head and discharge as a function of location and time. Whilst the analytical equations are written in two-dimensions, three-dimensional flow may be simulated using simple planar multiple levels. In multi-level calculations, the resistance to vertical flow is accounted for in the vertical leakage between levels.

AnAqSim is not a high complexity numerical modelling software, such as MODFLOW or FeFlow. It is indicative in its level of complexity and output. However, AnAqSim is significantly better than many traditional analytical methods, and appropriate for the use in a UWIR and the determination of an IAA and LTAA.

It was necessary to simplify the conceptual hydrogeological model to comply with the capabilities of the analytical calculations (equations). Whilst this did not permit the analysis of basin structure and geometry, it did provide a representative vertical distribution of strata (‘layers’) and representative levels.

Up to five planar layers with corresponding initial groundwater levels are permitted in the software. To evaluate the potential impact in each basin, analysis was divided into two separate calculation exercises:

1) Eromanga Basin: including tertiary and quaternary sediments overlying Cretaceous to early Jurassic strata, namely the GAB aquifers: and

2) Cooper Basin: containing the deeply confined Permian and Triassic strata, namely the older pre-GAB aquifers.

The separate calculations are show in Table 12 and Table 13 respectively.

The division into two separate domains permitted the allocation of five layers in the Eromanga Basin, as a separate hydraulic system, excluding the underlying Cooper Basin strata. It was anticipated that the impact from extraction in the Cooper Basin would not impact beyond the top of the Tinchoo Formation (i.e. the top of the Cooper Basin) due to the thickness of the low permeability layers and the small abstraction rate (one well).

If no impact was predicted by the analysis at the top of the Cooper Basin, then it was considered reasonable to omit this from the overlying Eromanga Basin calculations.

Assumptions and Limitations

The following assumptions and limitations are inherent to the analytical modelling process:

Calculations for both basins were undertaken in steady state conditions (i.e. not time varying) to investigate the worst-case scenario for groundwater impact estimation. This is considered a worst-case scenario as there is no time varying or limiting extraction from the strata. A steady state solution effectively calculates the response to continued extraction until there is no further (i.e. greater) drawdown effect from extraction. On this basis, two scenarios were investigated in the calculations as it is considered most suited for a steady state calculation of this resolution:

- Immediate Effected Area: was considered to be the average historical annual rate of water plus oil production: and
- Long-term Effected Area: was considered to be the immediate Effected Area rates plus the average predicted annual rate for the next three years of water plus oil production.

Other extractors (e.g. non-Bridgeport wells, for example in the Tintaburra field) were not considered in the calculation, as they are outside of the scope of this study, and no data is available.

Layering in the analysis was maximised when replicating the strata, either to represent all the units in the strata or until the maximum permitted number of layers was reached in the software. Combining adjacent strata in a model is referred to as equivalent porous medium (EPM) modelling. EPM modelling assigns a single value for each hydraulic parameter of the grouped adjacent strata such that the bulk behaviour is represented in the analysis. This was considered reasonable simplification given the availability of hydraulic parameter data, particularly at increasing depths in both areas.

The top layer for each model was assigned as a dummy layer in order to set up the observed heads. This zone was then replicated below (layer 2 in each model) as confined to represent the actual aquifer conditions present. Where no groundwater level data was available in the vicinity of the site, inferred values were used, typical for this kind of deeply confined basin.

The necessary combination of layers (considering these are interbedded high and low permeability layered strata) as a single equivalent porous medium layer results in a worst-case scenario as the bulk hydraulic connectivity of the model layer may not capture some of the lower permeability aquitards present in the basin.

AnAqSim provides the calculated drawdown for the top of each layer (no results are available for each subdivision). The model calculates the drawdown as water head pressure. Where the formations are artesian, the calculated drawdown corresponds to a water pressure decline (unless the extent of the pressure decline is such that the bore reaches sub-artesian conditions). In non-artesian formations (as in the upper formations targeted for water supply by the community), the drawdown corresponds to a decrease of water level. The model is therefore designed to provide indicative worst-case scenario results.

Bridgeport consider the lack of difference in annual extraction predictions will not cause any significant change to groundwater level of the producing Hutton Sandstone aquifer/reservoir unit during (yearly) the period of the UWIR. The Hutton Sandstone at Inland occurs at a depth of approximately -1,430 mSS.

Methodology for measurement and calculation of oil and water extraction volumes

Measurement

Oil and water extracted from each formation is measured via a total fluid test. The desired well is tested for a period, with all formation fluids collected in a dedicated test tank. The formation fluid is allowed to settle out to facilitate the separation process. A water finding chemical (paste stick) is used to find the water-oil contact point and volumes of water and oil are determined from the tank dipstick and measured total volume in the tank as per API procedures. The water oil rates are then converted to a 24-hour test rate, and this test rate is then used on a day to day basis for determining the quantity of oil and water extracted from each formation. These well tests are repeated to confirm results and periodically (generally quarterly) re-tested to update the extraction rates throughout the months and years and can be adjusted for any potential mechanical downtime.

The above method is used at Kenmore. Bodalla uses a combination of the above method and utilises a pressure vessel to separate the oil and water with rates being recorded via a water meter. The oil rate is determined via the amount recovered in the production tank during the test period. The remaining oilfields are mainly single well fields and oil water rates are updated whenever the site is attended to check stocks.

The quantity of water and oil for each well in each formation has been predicted by assuming the most recent oil water rates and applying these for the next three years. The oil rate will decrease over this period due to natural decline; however, the water rate will increase slightly to account for this natural decline in oil rate. As the formations are naturally recharged, the formation pressure is not expected to decrease greatly meaning that the formation fluid extraction rate should be approximately stable for the next three years.

Calculation for Model

Monthly oil and monthly water production volumes in megalitres (ML) was provided by Bridgeport to Golder Associates, split per tenement and per well. The data was provided for all wells that are currently and have historically extracted either groundwater and/or oil at any period in the previous three years.

A monthly average for each well for oil, water and oil + water over the operation of the well was then calculated and converted to m^3/month. These values were then divided by 30 days to produce the rate used by the model (m^3/day) (see Average Extraction Rates for Modelling).

In the model, each well that has currently and historically extracted water and/or oil has, therefore, been modelled with its own individual extraction rate. The value used in the modelling is the average rate for oil plus water as removal of any liquid, specifically oil at the beginning of a wells production life, may result in a depressurisation of the aquifer and possible leakage of groundwater from overlying aquifers used by the community.

Future production rates were supplied by Bridgeport for each well which is planned to continue production over the coming 3 years. No material increase to production is planned.

In order to produce a material change, significant infrastructure would be required, which is unrealistic and unplanned.

This approach enabled the worst-case scenario to be modelled for both the historic production and predicted future production, as it does not take into account wells that may have only been in production for a few years, i.e. only pulling the piezometric surface down minimally in their short duration, but instead applies a constant rate of extraction, calculating maximum drawdown that would occur at that pumping rate over an infinite amount of time. An example of this is Kenmore 4 which was only in production during the 1980's allowing the piezometric surface to re-equilibrate.

Assumptions of the calibration process for the sensitivity analysis

Calibration was used to refine the hydraulic parameters used in the model, particularly where there was a paucity of observed results from field or laboratory testing (e.g. the cap rock).

The section "Observed groundwater levels and calibration targets" discusses the calibration process of fitting modelled groundwater head to a representative groundwater head in each model layer. Calibration was achieved by altering the hydraulic parameters and groundwater flux rates in unpumped conditions, to produce the calibrated model.

All parameters were varied within likely ranges, as determined from available site investigation data, published values and reasonable representative values for each type of strata, as outlined in Section "Rationale for selection of hydraulic parameters".

Throughout calibration, statistical analysis was undertaken on the results to assess the "goodness of fit" of the models results compared to the calibration targets. This process anecdotally informed the subsequent sensitivity analysis in that changes to the vertical hydraulic conductivity had the greatest impact on the distribution of head pressures throughout the model.

Assumptions relating to sensitivity analysis that were derived from the calibration process included demonstrating that the necessary grouping of strata was reasonable, as discussed in Section "Justification for the layering in AnAqSim". This was corroborated though achieving a reasonable fit between modelled and observed groundwater head distribution using reasonable hydraulic parameter values for each layer. Grouping similar hydro stratigraphical units in this way is a common technique to simplify the actual strata present where similar hydraulic parameters are expected for the strata within the grouping.

It was important to establish the accuracy of this assumption during calibration, for example, the single layer in the models used to represent the cap rock truly represented multiple layers of strata present in the Basins. Without reasonable calibration being achieved, this assumption may not have been considered valid and the layering in the model may have required revision. However, as a reasonable vertical head distribution was obtained using reasonable parameters, this was not considered necessary.

Changing the vertical hydraulic conductivity of the cap rock by an order of magnitude during sensitivity analysis was considered reasonable as an upper bound of the range of likely values, as partly derived from calibration modelling.

As the model was run in steady state, there was no requirement to investigate the storage coefficient of the strata.

Groundwater impact calculation input parameters

This section discusses the input parameters necessary for the groundwater impact calculation.

The simplified geological layering used in the calculation for the Eromanga Basin and Cooper Basin is shown in Table 12 and Table 13 respectively. This simplified layering grouped similar adjacent stratum together where appropriate, to reduce the observed stratigraphy into no more than five layers.

Rationale for selection of hydraulic parameters

The following section outlines how the hydraulic parameters in Table 12 and Table 13 that were inferred or derived from supporting information, along with a discussion on the assumptions associated with these parameters.

Thickness of aquifer

The thickness of the aquifer was determined from the details provided on 'Well formation Well Cards' supplied by Beach Energy in 2014. The well cards provided the top and bottom elevations for each formation encountered, for each well drilled in all relevant tenements. Geological cross sections were drawn from a combination of the data off Beach Energy well cards. Data obtained from (the then) Department for Environment and Heritage Protection (DEHP) suggested that the elevations from the two different sources strongly agree with one another, providing a high degree of confidence. For the purposes of modelling, the average elevation of the top and base of each formation was used.

Table 9: Hydraulic Parameters.

Basin	Formation	Hydraulic Classification	Hydraulic Conductivity (m/d)		Porosity (fraction)
			Min.	Max.	
Eromanga Basin	Quaternary and Tertiary Alluvium	Aquifer	-	-	-
	Winton Formation	Major Aquifer	-	-	-
	Mackunda Formation Allaru Mudstone Toolebuc Formation Wallumbilla Formation	Aquifer with confining bed	-	-	-
	Cana-Owie Formation	Aquifer and Aquitard (part)	-	-	-
	Hooray Sandstone	Major Aquifer	4.3×10^{-4}	1.96[4]	0.19[3]
	Westbourne Formation Adori Sandstone and Birkhead Formation	Confining bed/Reservoir Aquifer Water bearing/Reservoir	8.0×10^{-7} [2] 2.8×10^{-5}[3]	2.5×10^{-4} [2] 2.3×10^{1}[3]	0.2 [2] 0.05 to 0.23[3]
	Hutton Sandstone	Major Aquifer/ Reservoir	3.5×10^{-1} 5.7×10^{-5}[3]	9.8×10^{-3} 2.3×10^{1}[3]	[3] 0.01 to 0.24
	Poolowanna Formation	Major Aquifer/Reservoir	1×10^{-7} [2] 2.8×10^{-4}[3]	3.7×10^{-3} [2] 1.59[3]	0.18 [2] 0.11 to 0.19[3]
Cooper Basin	Tinchoo / Arrabury Formations	Primarily confining beds	-	-	-
	Toolachee Formation	Major Aquifer/Reservoir	2.0×10^{-3} [1]	4.3×10^{-3}	0.15 0.1 to 0.15[3]

Sources include (1) Government of South Australia Primary Industries and Resources, SA. Petroleum and Geothermal in South Australia – Cooper Basin, 2009. (2) Alexander, E.M, Reservoirs and Seals of the Eromanga Basin (undated) (3) historical information provided by Beach and (4) DEHP pumping data.

Table 10: Eromanga Basin Analytical Calculation Parameters.

Layer	Top Elevation (mAHD)	Bottom Elevation (mAHD)	Average Head (mAHD)	Horizontal Hydraulic Conductivity (m/d)	Vertical Hydraulic Conductivity (m/d)	Average Abstraction per Well (m^3/d)	Number of Beach Energy Wells	Hydraulic Properties
TOP OF MODEL – ground level								
1: UPPER: Tertiary and Quaternary strata, Winton Formation and Mackunda Formation (UNCONFINED)	160 (Ground level) [1&2]	-120 [1&2]	154 [1&2]	$5.0x10^{-2}$ [3]	$5.0x10^{-4}$ [3]	0 [2]	0	Aquifer
2: LOWER: Tertiary and Quaternary strata, Winton Formation and Mackunda Formation (CONFINED)	-120 [1&2]	-400 [1&2]	154 [1&2]	$5.0x10^{-2}$ [3]	$5.0x10^{-4}$ [3]	0 [2]	0	Aquifer
3: Allaru, Toolebuc and Wallumbilla Formations	-400 [1&2]	-870 [1&2]	162 [1]	$1.0x10^{-2}$ [3]	$1.0x10^{-4}$ [3]	0 [2]	0	Aquitard
4: Cadna-owie Formation and Hooray Sandstone	-870 [1&2]	-1080 [1&2]	255 [1]	$1.0x10^{-3}$ [4]	$1.0x10^{-5}$ [4]	0 [2]	0	Aquifer and Aquitard (part)
5: Westbourne, Adori and Birkhead Formations and Hutton Sandstone and Poolowanna Formation	-1080 [1&2]	-1390 [1&2]	480 [2]	$1.2 x10^{-1}$ [2]	$1.0x10^{-4}$ [4]	126.8 (See Appendix F for individual well abstraction rates) [2] *	65	Aquifer
BASE OF MODEL – major unconformity at base of Eromanga Basin								

Table 11: Cooper Basin Analytical Calculation Parameters.

Layer	Top Elevation (mAHD)	Bottom Elevation (mAHD)	Average Head (mAHD)	Horizontal Hydraulic Conductivity (m/d)	Vertical Hydraulic Conductivity (m/d)	Average Abstraction per Well (m^3/d)	Number of Beach Energy Wells	Hydraulic Properties
TOP OF MODEL – ground level								
1: UPPER: Tertiary and Quaternary strata, Winton Formation and Mackunda Formation (UNCONFINED)	160 (Ground level) [1&2]	-120 [1&2]	154 [1&2]	$5.0x10^{-2}$ [3]	$5.0x10^{-4}$ [3]	0 [2]	0	Aquifer
2: LOWER: Tertiary and Quaternary strata, Winton Formation and Mackunda Formation (CONFINED)	-120 [1&2]	-400 [1&2]	154 [1&2]	$5.0x10^{-2}$ [3]	$5.0x10^{-4}$ [3]	0 [2]	0	Aquifer
3: Allaru, Toolebuc and Wallumbilla Formations	-400 [1&2]	-870 [1&2]	162 [1]	$1.0x10^{-2}$ [3]	$1.0x10^{-4}$ [3]	0 [2]	0	Aquitard
4: Cadna-owie Formation and Hooray Sandstone	-870 [1&2]	-1080 [1&2]	255 [1]	$1.0x10^{-3}$ [4]	$1.0x10^{-5}$ [4]	0 [2]	0	Aquifer and Aquitard (part)
5: Westbourne, Adori and Birkhead Formations and Hutton Sandstone and Poolowanna Formation	-1080 [1&2]	-1390 [1&2]	480 [2]	$1.2 x10^{-1}$ [2]	$1.0x10^{-4}$ [4]	126.8 (See Appendix F for individual well abstraction rates) [2] *	65	Aquifer
BASE OF MODEL – major unconformity at base of Eromanga Basin								

Sources include (1) DEHP database (2) Beach Reports/Beach DST/ Beach groundwater monitoring and extraction data (3) inferred value (4) literature value *total extraction from all strata was grouped into a single model layer in both basins (Eromanga Basin extraction was from Layer 5 and Cooper Basin extraction was from Layer 3) Section "Justification for the layering in AnAqSim" and Section "Assigning abstraction in the calculation" discussed the justification for the selected layering.

^The bottom elevation of the model is based on the depth of the extraction well and not the base of the Toolachee formation. Model assumes horizontal flow only in the reservoir.

Average Head

The average head for all formations in the Eromanga basin, up to and including the Hooray Sandstone were primarily calculated from historical data in the (previously known as) DEHP database. This historical data in considered applicable as the purpose of this UWIR assessment is to assess the total impacts to groundwater from Bridgeport's' current extraction operations, and therefore provides a baseline to the assessment.

Sufficient data existed for the head in Layer 1 and Layer 2, with 237 water level measurements available across the study area (Golder Associates, 2014, Appendix D, Groundwater Elevation Data – Shallow Units), primarily from the DEHP database. Of these 237 measurements, 4 measurements were included from Beach Energy's gauging of surrounding bores in April 2011. These more recent water level measurements tie in well with those supplied by DEHP for this layer. Although there is significantly less coverage available for Layer 3 (10 data points) and Layer 4 (4 data points), the data that is available for each layer is generally within the same range of one another and fits well with the anticipated conceptual model i.e. with increasing depth there is an increase in the elevation of groundwater, attributed to the increase in overburden pressure and the confined nature of the aquifers/reservoirs.

No data was available in the (previously known as) DEHP database for Layer 5 (the target formations of Beach Energy's operations), likely due to the depth of the formations. Head data for this layer was, however, available from DSTs undertaken by Beach Energy (or previous operators) during drilling and installation of the wells (Appendix D, DST and Groundwater Elevation Data). A total of 87 measurements were used to calculate the average head of Layer 5. Again, the measurements obtained from the DSTs are generally within the same range of one another and fit well with the anticipated conceptual model, providing a high degree of certainty in the measurements.

Limited data was available within the study area from both the DEHP database and Beach Energy's records on the groundwater elevations in the deeper Cooper Basin. No data was available for Layer 1 and Layer 2. The average head was therefore inferred, and as a result, there is a high degree of uncertainty associated with these numbers.

Only 2 DST results were available for the Toolachee Formation (Layer 3), with a difference of 206 m AHD between them. There is, therefore, also a high degree of uncertainty associated with these numbers.

Horizontal hydraulic conductivity

No hydraulic conductivity data was available through literature review, the DEHP database or Beach Energy's data for Layer 1 and Layer 2 of the Eromanga Basin model. The values were therefore inferred based on the lithology. A value of 5 x 10^{-2} m/day was used for Layer 1 and Layer 2, composed primarily of sandstone, siltstone and shale, which is typical of a mid-range value for a sandstone (Freeze and Cherry, 1979). There is uncertainty associated with this value due to the lack of site-specific data.

In addition, no data was available for Layer 3. A value of 1 x 10^{-2} m/day was inferred for the Allaru Mudstone, Toolebuc Formation and Wallumbilla Formation, which comprise predominantly mudstones, siltstones, and fine-grained sandstones. Again, this value is typical of a mid-range hydraulic conductivity for a sandstone. This value was inferred as the sandstone units present within Layer 3 are thought to be where the majority of groundwater flow would occur. There is uncertainty associated with this value due to the lack of site-specific data.

No data from Beach Energy was available for specific hydraulic conductivity results in Layer 4. A range of literature values along with pumping test data from DEHP was, however, available for the Hooray Sandstone. These range from 4.3 x 10^{-4} to 1.96 m/day. A value in the lower end of the literature range was chosen to consider the less permeable Cadna-owie Formation contained within the layer (1 x 10^{-3} m/day). There is less uncertainty associated with these values in comparison to those used for Layer 1 to Layer 3.

Both literature values and site-specific values for units within Layer 5 were available. The literature values range from 8 x 10^{-7} to 2.5 x 10^{-4} m/day, however, do not include values for the Poolowanna Formation. The site-specific values, obtained from intrinsic permeability data, flow test data, tenement specific reports and measurements on core plugs (all supplied by Beach Energy) were available for all units in Layer 5. The site-specific values ranged from

2.8×10^{-5} to 22.7 m/day (Golder Associates, 2014, Appendix D). A geometric mean based on the site-specific data of all 5 layers was used for the purposes of modelling (0.12 m/day). This value is within the higher end of permeabilities for a sandstone unit, which is as expected as Layer 5 comprises the sandstone oil reservoirs targeted by Bridgeport. As all geological units have been used from site-specific values, there is greater certainty associated with the values of hydraulic conductivity assigned to this layer.

No literature or site-specific values for hydraulic conductivity were available for the Tinchoo and Arrabury Formations in the Cooper Basin. Limited drilling has been undertaken by Beach Energy or other operators in the Cooper Basin, with only one production well currently and historically installed in the Cooper Basin. Values for the Tinchoo and Arrabury Formations (Layer 1 and Layer 2) have therefore been inferred. There is uncertainty associated with this value due to the lack of site-specific data.

No site-specific values are available for the Toolachee Formation. Literature values are presented above (Table 9, Table 10, Table 11) and range from 2×10^{-3} to 4.3×10^{-3} m/day. A mid-range value of these literature values has been used (3.9×10^{-3} m/day). This value is considered appropriate in the absence of site-specific data and falls with the mid-range of hydraulic conductivities of a sandstone unit.

Vertical hydraulic conductivity

In the absence of published site investigation values, the vertical hydraulic conductivity of the units was generally assumed to be 1% of the horizontal hydraulic conductivity. Due to the interbedded nature of the sandstone bodies in the study area and the presence of vertical barriers to hydrocarbon migration (and therefore groundwater) in the form of laterally extensive siltstone, shale and mudstone units, as previously described, it is considered that vertical groundwater flow is negligible. A value of 1% is therefore considered conservative. Although no site-specific data is available, the presence of hydrocarbon seals indicates the resistance to vertical groundwater movement.

Additional anisotropy was introduced for Layer 5 (Westbourne, Adori and Birkhead Formations and Hutton Sandstone and Poolowanna Formation) of 0.1%. This was considered representative of the likely anisotropy of this stratum.

Cooper Basin anisotropy was assumed to be 10% throughout the model. This value was considered conservative for stratum at this depth and was adopted in-light of the limited hydraulic data available in this basin.

Average abstraction per well

The average abstraction rate per well was calculated based on historical volumes measured by previous operators, including Beach Energy and now Bridgeport, for individual wells on a monthly basis, along with monthly predicted volumes for the next three years of operation. A detailed methodology as to how the volumes were calculated is provided above. As extraction volumes are provided per well, per month, per geological unit over the life of the well there is minimal uncertainty associated with the extraction rates assigned in the model.

More uncertainty is associated with the three-year predicted future rates as the volumes are predictions only.

Number of abstraction wells

The number of abstraction wells was based on the number of current and historic abstraction wells since operations began, and as supplied by both Beach Energy and Bridgeport.

The role of Departmental (registered) monitoring Bores

As discussed in the previous section, information obtained on bores from the (previously known as) DEHP database, along with those supplied by Beach Energy (and subsequently Bridgeport) were used to produce geological cross sections across the study area. Elevations of the tops of each unit were taken from both the DEHP data and well data supplied by Beach Energy. This enabled the validation of elevations obtained from Beach Energy well card information to calculate the aquifer thicknesses.

Data obtained from DEHP was relied upon for the calculation of average head data, specifically for the more shallow units included in Layer 1, Layer 2 and Layer 3 in the Eromanga

Basin model (as previously discussed in Section "Rationale for selection of hydraulic parameters" above), due to the lack of availability of data from Beach Energy on the more shallow units. However, no DEHP data was available for the deeper target formations, whereby, data from Beach Energy was used.

Pumping test data (transmissivity values) were available for limited geological units from DEHP. These values were predominantly for the Hooray Sandstone, but also the Etonvale Formation and the Adavale Group Equivalent, the latter two being in the Adavale Basin, below the Cooper Basin, and therefore irrelevant to this assessment. The values obtained from DEHP pumping test data for the Hooray Sandstone were used in Table 9, Table 10 and Table 11.

The role of departmental bores in model calibration and review is covered in Section "Sensitivity Analysis", but primarily involves the use of observed groundwater SWLs obtained for the more-shallow units.

Extent of calculation and boundary conditions

The extent of the Cooper Basin and Bridgeport Energy tenements was used in conjunction with the distribution of the relevant extraction wells to form the extent of the calculation domain. This included a buffer to ensure the boundary conditions did not influence the results.

Boundary conditions were set as lines of zero flux (i.e., no flow boundaries) and located at sufficient distance from the area of interest to be far field boundaries.

The upper and lower extents of the model were assigned as head dependant flux and flux conditions respectively. This permitted the increasing groundwater level with depth conditions by creating the head elevation at the top of the model and a small flux at the base.

In the Eromanga Basin, the value assigned to the head dependant flux was 154 m AHD at the top of the model (to represent the approximated observed water table in the upper layer). The flux at the base of the model was calibrated at 2.5 x 10^{-5} m/d (equivalent to 9.1 mm/year recharge to the base of the model). This was necessary to simulate the observed or likely increasing hydraulic pressure with depth in both basins.

For the Cooper Basin, the upper model boundary had a head dependant flux set at 315 m AHD, to replicate inferred heads, and a flux at the base of 2 x 10^{-5} m/d (equivalent to 7.3 mm/year recharge to the base of the model). The value for the flux at the base of the model was achieved through the calibration process that matched modelled groundwater levels to the approximated observed and inferred groundwater levels.

The extent of the Eromanga Basin calculation can be seen in Beach (2014) and the extent of the Cooper Basin calculation domain can be seen Beach (2014).

No recharge was applied to any model due to the use of the head dependant flux on the upper surface of the model.

Water Production volumes used for the calculation

The water extraction rates for the model were defined as follows:

- The average historical observed water (plus oil) extraction rate represents the Immediate Effected Area; and
- The average historical observed water (plus oil) extraction rates plus the average predicted annual rate for the next three years was used to represent the Long-term Effected Area.

A summary of the extraction rates used in the original modelling is as follows:

Eromanga Basin

- For the Eromanga Basin immediately affected area an average extraction rate (equivalent to the observed historical average extraction) of 120.2 m^3/day was adopted for the wells (with a range of 1.2 m^3/d to 594.2 m^3/d);
- For the Eromanga Basin long term affected area an extraction rate (equivalent to the long-term average extraction) of 124.9 m^3/day was adopted over the 42 wells (with a range of 1.0 m^3/d to 673.3 m^3/d).

- Although the maximum and average extraction is slightly higher in the long term affected area, the total extraction is less because there are fewer wells.

Cooper Basin

- For the Cooper Basin immediately affected area an extraction rate (equivalent to the observed historical average extraction) of 1.2 m^3/day was adopted for the single well used in the model;
- For the Cooper Basin predictive model long term affected area an extraction rate (equivalent to the long-term average extraction) of 1.6 m^3/day was adopted for the single well used in the model.
- The values for historical and predicted extraction were similar for both basins.

Justification for the layering in AnAqSim

The Eromanga Basin was grouped into five EPM layers according to the hydraulic properties of the strata, combining adjacent strata with broadly similar hydraulic properties as well as combining the observed target stratum for oil and gas extraction. Combining target extraction layers was necessary to maintain numerical stability in the analysis.

Layer 1: The shallowest major aquifers in the study area (i.e., those aquifers most heavily developed for water supply, including the unconfined shallow Quaternary, Tertiary, Winton and Mackunda Formation aquifers) were grouped as a single hydro stratigraphic unit, with the entire unit then split into an upper and lower layer in the model (Layer 1 comprising the upper layer). No abstraction was assigned to this upper layer in the model as this upper portion contained the head dependant flux boundary.

Layer 2: consisted of the lower half of the Quaternary, Tertiary and Winton and Mackunda Formation. These have been split into the upper two layers in order to investigate the potential impact of the deeper oil and gas extraction.

Layer 3: consisted of the underlying Allaru, Toolebuc and Wallumbilla Formations. These formations are generally considered to collectively act as an aquitard with very little groundwater abstraction and no oil or gas extraction in the Eromanga Basin.

Layer 4: combined the Cadna-owie Formation and Hooray Sandstone. Oil and gas wells are often screened in both these formations, and they exhibit similar geological characteristics, both being generally thinly interbedded sandstone and siltstone with occasional coarse grained, brecciaed or pebble beds.

Layer 5: consisted of the Westbourne, Adori and Birkhead Formation aquifers and aquitards as well as the underlying Hutton Sandstone and Poolowanna Formation. Oil and gas extraction wells are often screened over a combination of these strata generally comprising interbedded siltstone, shale, fine sandstone and occasional coal seams. The Hutton Sandstone and Poolowanna Formation were considered to be more permeable and accounted for the highest extraction rate by Beach Energy (and subsequently Bridgeport) operations by an order of magnitude. The Hutton Sandstone and Poolowanna Formation are therefore the main targets for oil extraction.

The Base of the model was formed by the base of the Eromanga Basin, which is marked by a major unconformity. Underlying the Eromanga Basin are the aquitards of the Tinchoo and Arrabury Formations. It was considered suitable to separate the Cooper Basin into a separate model due to the hydraulic separation of the two basins as well as the low average extraction from the underlying Cooper Basin.

The Cooper Basin was grouped into three layers, with the upper layer being split into two layers with identical properties. This was to permit the response of pumping to be observed in the Tinchoo and Arrabury Formations. The layers were configured as follows:

Layer 1: the upper portion of the Tinchoo and Arrabury Formations comprise Layer 1. This had the head dependant flux boundary condition applied to the top in order to replicate the inferred groundwater levels. Layer 1 was assigned identical hydraulic properties to the underlying Layer 2 Tinchoo and Arrabury Formations.

Layer 2: represented the lower half of the Tinchoo and Arrabury Formation aquitards. No oil or gas extraction was identified to target these strata. These are generally interbedded siltstone and fine sandstone with low permeabilities.

Layer 3: represented the Toolacheee Formation at the base of the Cooper Basin. This was not utilised for water supply and only a single Beach Energy (and now Bridgeport) extraction well extracts from these strata.

Note that although AnAqSim allows the division of a layer in two sections, the calculated results are provided for the full layer (no results available for each subdivision).

Assigning abstraction in the calculation

Abstraction was assigned to a single layer in each basin model. This was considered a reasonable simplification to represent the behaviour, given the EPM model approach adopted in this analysis. Extraction well details were interrogated to give a single extraction target in each basin. In the Eromanga Basin model, the Westbourne, Adori and Birkhead Formations, Hutton Sandstone and Poolowanna Formation were grouped together as the bottom layer of the model and therefore also combined the abstraction from these strata into the single layer.

In the Cooper Basin, as the single extraction was considered to be at a low rate, it was considered sufficient to investigate this in a separate model and investigate the potential impact at the top of the Cooper Basin.

To simulate an immediately impacted area and a long term impacted area in steady state analysis, average historical and average predicted abstraction rates were analysed respectively, using observed and predicted oil and water extraction data provided by Beach Energy (and subsequently Bridgeport) (refer to Section “Water production volumes for the calculations”).

The grouping of the strata in the software and treating adjacent grouped strata as an EPM removed the necessity to establish the target formation beyond the defined layers within the software. This is because abstraction can only be assigned to defined software layers and not specific target depths or strata within an individual layer. This allowed a much coarser definition of assigning the extraction target formation. Golder considered that this was an acceptable assumption as the software does not allow for further refinement; the EPM approach already provided a bulk representative behaviour of the adjacent grouped strata. As the focus of impact is the strata generally overlying the extraction targets, this was deemed to be a suitable methodology.

Observed groundwater levels and calibration targets

Groundwater levels in the shallow aquifers and those that are utilised for groundwater abstraction or monitored by DEHP (now DES) were generally obtained from the DEHP (now DES) groundwater database.

Hydrostatic pressure data was available for strata targeted for oil extraction. This was obtained from Beach Energy, with representative groundwater levels presented in Table 12, where available. The selected value for groundwater level is derived from numerous spatially distributed wells and from a range of elevations and depths across the basins (relevant to the layer). As the calculation required the layers to be horizontal and planar, the groundwater levels were also set at simplified representative levels.

Where no groundwater level data was available (Tinchoo and Arrabury in the Cooper Basin), it was necessary to use a representative value derived from likely groundwater pressure extrapolated from adjacent layers.

Calibration was undertaken on both calculations using observed/inferred groundwater levels verses calculated groundwater levels in unpumped conditions. The bottom flux and hydraulic conductivity values were altered until a satisfactory fit was achieved. A plot of modelled verses observed groundwater level for the Eromanga Basin is given in Figure 11.

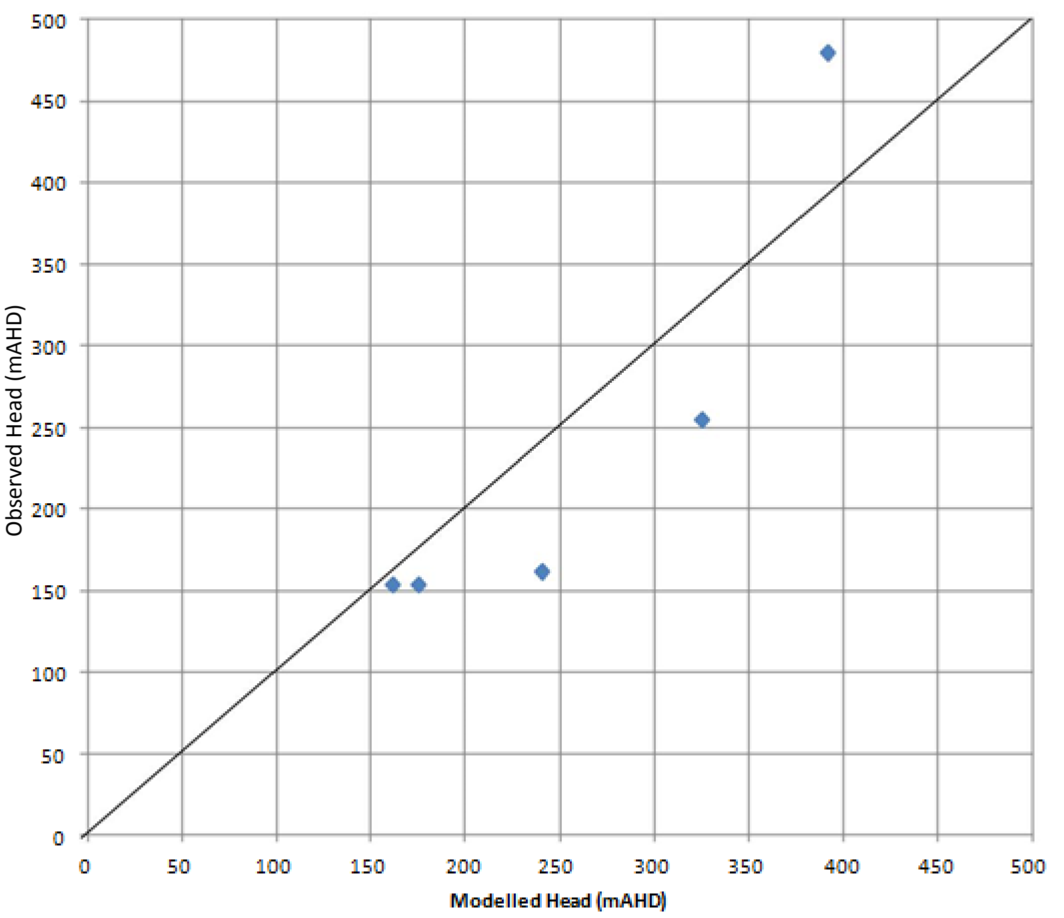


Figure 11: Eromanga Basin: Observed versus modelled groundwater level.

A reasonable fit between modelled and observed groundwater head was achieved in using the parameters given in Table 12.

Table 12: Cooper Basin: Tabulated Observed versus modelled groundwater level.

Calibration Target	Observed Groundwater Level (mAHD)	Modelled Groundwater Level (mAHD)	Residual (m)
OBH Layer 1	Not known	345	n/a
OBH Layer 2	Not known	410	n/a
OBH Layer 3	622	446	176

Both models were considered to contain representative head values sufficient for the purposes of the impact assessment, and able to demonstrate the potential impact of pumping. This is because the likely groundwater gradient was achieved and the resultant drawdown is the important factor in this analysis, this is not impacted by the initial pressure head.

Modelling extent is demonstrated in Figure 12.

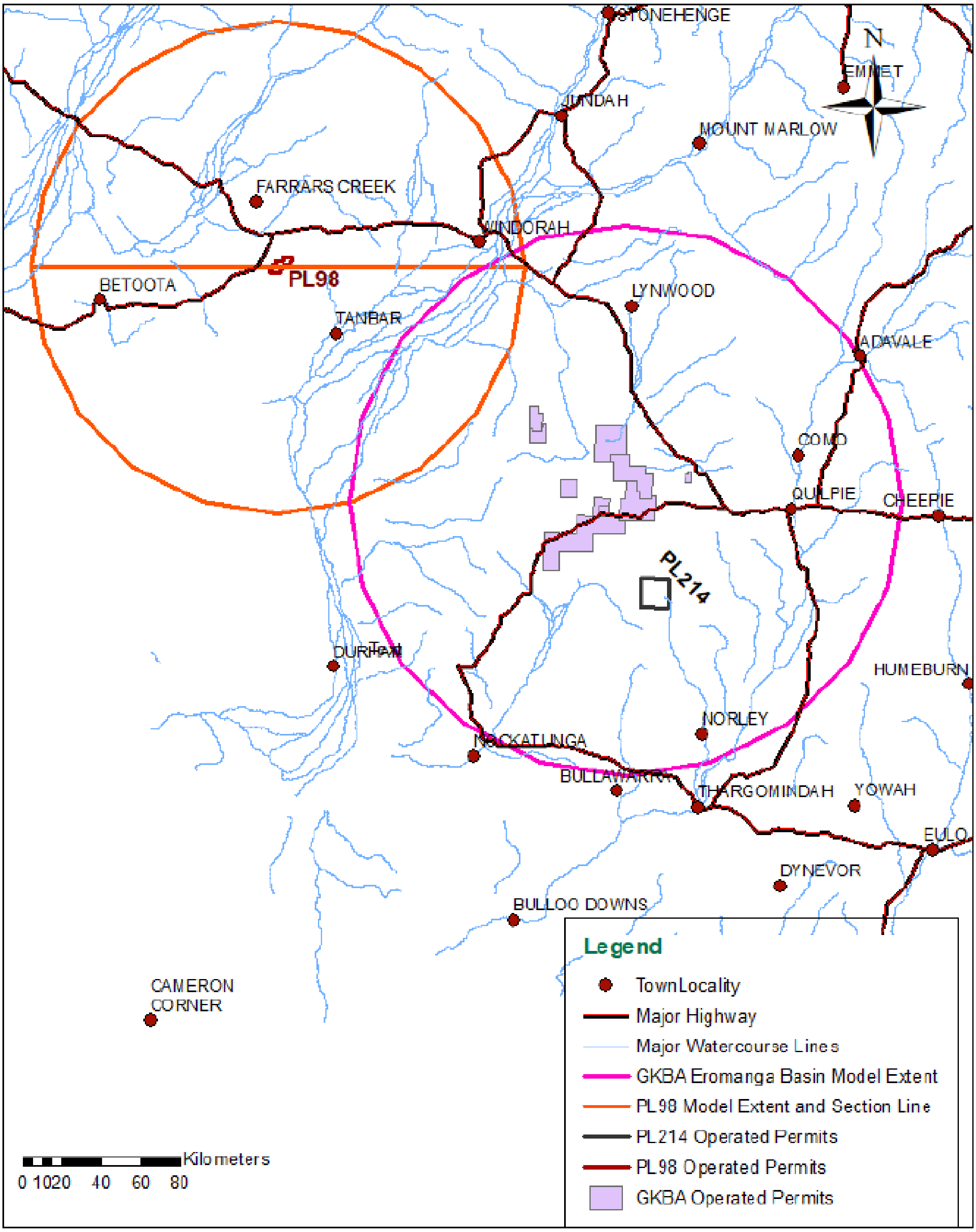


Figure 12: Extent of the Basin model used for PL 98, including locations for the hydraulic head calculations.

Results

Sensitivity Analysis

Calibration modelling and sensitivity analysis were undertaken on both the Cooper Basin and Eromanga Basin models, taking into consideration the MDBC (2000) guidelines and the more up to date Australian Groundwater Modelling Guidelines (Barnett et. al. 2012). Hydraulic Parameter sensitivity analysis involved increasing the vertical hydraulic conductivity of the cap rock (overlying aquitard layer above of the extraction targets) by an order to magnitude. All other input parameters in the model remained the same as the calculated impact scenarios described above.

Sensitivity analysis was undertaken in a targeted manner for a number of reasons. The rationale for the selection of the cap rock as well as the vertical hydraulic conductivity as the key parameters to be investigated during sensitivity analysis can be summarised for both models, as follows:

Calibration modelling anecdotally corroborated Golder’s hydrogeological assessment that the key calibration parameter was the vertical hydraulic conductivity of the cap rock.

Horizontal hydraulic conductivity was not considered likely to have a significant impact on the results as it is the potential for vertical propagation of groundwater depressurisation through the model layers that would result in a modelled impact on the features of interest (i.e. private bores, springs and groundwater dependant ecosystems). This is because the vertical distance between the target formations for oil extraction and the potentially impacted features is considered to be large. It is the vertical hydraulic conductivity and depth of the target formations that were considered to have a greater influence on the vertical propagation of hydraulic depressurisation, rather than horizontal hydraulic conductivity.

Sensitivity analysis on the cap rock was deemed appropriate as there was a paucity of hydraulic data for these strata. This is likely to be a result of this layer not being a target formation for groundwater, oil or gas in this area of the Eromanga Basin, as discussed in Section “Assumptions for calibration process for the sensitivity analysis”. Hydraulic parameter values were obtained for most other strata within the model domain; therefore, the cap rock was considered the least well constrained in terms of its hydraulic characteristics and should therefore be evaluated using sensitivity analysis.

The presence of oil in the Eromanga Oilfields demonstrated that the cap rock was an effective aquitard, as without it, oil would have migrated towards the surface over geological time. It is this layer that was therefore the key driving force in the flow dynamics of the system, and it is this layer that should determine the rate and scale of the propagation a depressurisation effect through the model. Increasing the hydraulic conductivity of model layers overlying the cap rock would not significantly influence the result as the limiting factor in the propagation of potential impacts would still be from the low permeability cap rock.

Altering the hydraulic parameters of the target formation (i.e. below the cap rock) was not considered to be beneficial to achieving a greater impact in the model as it would likely have impacts. These impacts included;

Increasing the hydraulic conductivity of the target formation should reduce the maximum depressurisation in the vicinity of the extraction wells while increasing the radius of influence of the depressurisation. Acting on the base of the low permeability cap rock, this would likely result in a reduced impact above the cap rock. This is because the magnitude of depressurisation would be reduced, therefore reducing the potential propagation of the depressurisation through the cap rock. Given that there are no identified features of interest in close proximity to the trigger level drawdown zone, this was not considered to be significant.

Decreasing the hydraulic conductivity of the target formation may result in unrealistically low hydraulic conductivity values such that the observed yield would not be obtained from the modelled wells. Reducing the hydraulic conductivity of the target formation was therefore considered unrealistic as site observation of the yield of the wells, some extracting since 1984, constrained a lower limit for the target formations and any significant decrease through sensitivity analysis was considered unrealistic.

Hydraulic sensitivity analysis

Analysis of the sensitivity of the groundwater impact estimation scenario result to changes in the vertical hydraulic conductivity of the cap rock was undertaken. To provide a conservative approach to sensitivity analysis, the vertical hydraulic conductivity was increased by an order of magnitude, as follows:

SA1: Hydraulic Parameter Sensitivity Analysis on the Cooper Basin: Layer 1 and Layer 2 (upper and lower portions of the Tinchoo and Arraburry Formation) vertical hydraulic conductivity increased to 1×10^{-4} m/d; and

SA2: Hydraulic Parameter Sensitivity Analysis on the Eromanga Basin: Layer 3 (the grouped layer consisting of the early to late Cretaceous Allura Mudstone, Toolebuc Formation and Wallumbilla Formation) vertical hydraulic conductivity increased to 1×10^{-3} m/d.

Sensitivity analysis steady state calibration

The sensitivity analysis models (SA1 and SA2) were calibrated in the same manner as the groundwater impact estimation scenario. Results from the final calibrated steady state calculations for all sensitivity scenarios are tabulated in Table 13.

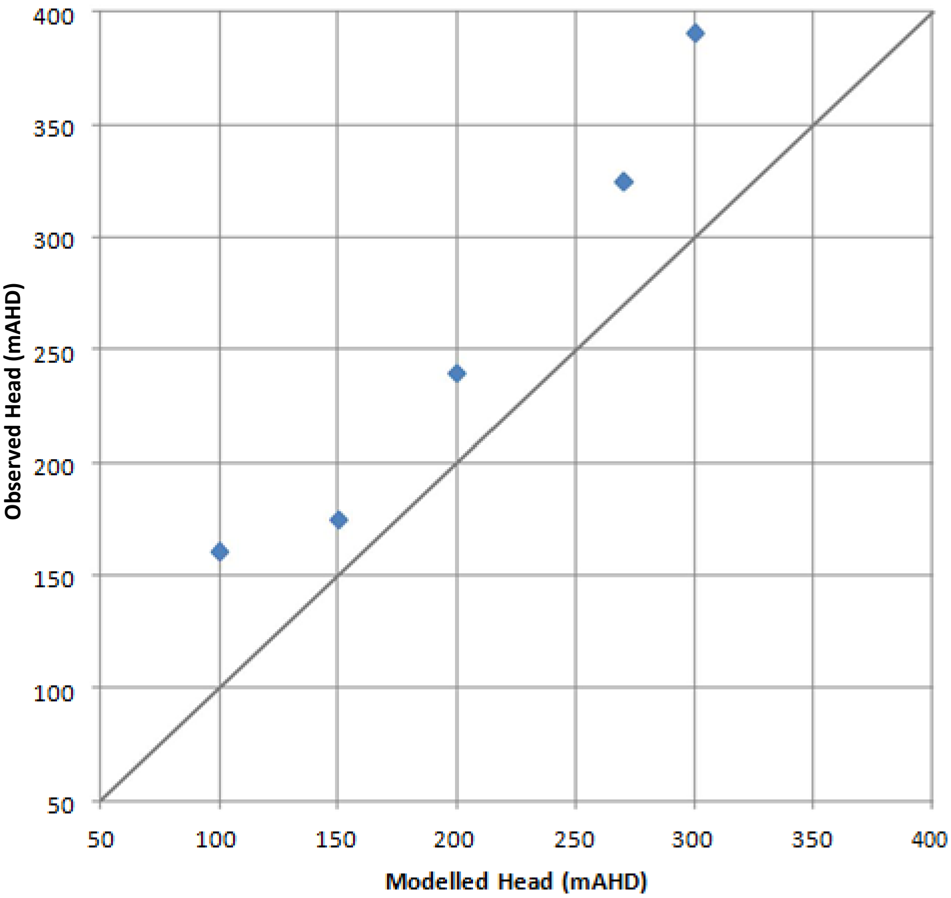


Figure 13: Eromanga Basin SA2: Observed versus modelled groundwater level.

The Cooper Basin SA2 calibration results are shown in tabulated form in Table 13 along with the SA1 calibration results, where possible.

Table 13: Sensitivity analysis calibration.

Model Layer (and modelled groundwater level [mAHD])		Observed Groundwater Level (mAHD)		Sensitivity Analysis versus Observed Groundwater Level Residual (m)	
SA1 Cooper Basin	SA2 Eromanga Basin	Cooper Basin	Eromanga Basin	SA1 Cooper Basin	SA2 Eromanga Basin
Layer 1: 618	Layer 1: 161	Not known	100	n/a	61
Layer 2: 624	Layer 2: 175	Not known	150	n/a	25
Layer 3: 624	Layer 3: 240	622	200	2	40
-	Layer 4: 325	-	270		55
-	Layer 5: 391	-	300		91

These calibration results were considered suitable to conduct the sensitivity analysis modelling.

Results of sensitivity analysis modelling

The calibrated models were run using the long-term scenarios and in steady state to give a conservative, worst case scenario. There were Figures in the original research (not included here), which were graphically represented sensitivity analysis. They included the following;

Cooper Basin:

- a drawdown of less than 5 m is predicted in all layers by the sensitivity analysis

Eromanga Basin:

- Modelled Groundwater Drawdown Contours in Layer 2
- Modelled Groundwater Drawdown Contours in Layer 3
- Modelled Groundwater Drawdown Contours in Layer 4
- Modelled Groundwater Drawdown Contours in Layer 5

Note: all contours shown are one metre contours.

Information about all water bores in the IAA (including the number of bores in the area, maps showing the location of these bores and the authorised use of each bore) (section 376(d) of the Water Act); and Bridgeport Energy has used the Registered water bores (DNRM and private) data, held within the Groundwater and Inland Waters layer of the Queensland Governments Queensland Globe GIS website to identify groundwater bores near GKBA tenements. This information was accessed 2018 (Bridgeport 2018), and again in 2021. No changes were observed to data within Bridgeport tenements.

The extent of the search was within a 20 km radius from the centre of the facility, which is a significantly larger area compared with the IAA and LTAA.

A majority of nearby (<25 km) wells accessed the Winton Formation. The majority of these wells (

Table 16) are drilled to a depth not exceeding 100 m. In general, groundwater take within this management area is relatively limited, as these are not actively pumped. Some wells in

Table 16 have also been abandoned and decommissioned since drilling.

It is highly unlikely the extraction of water from Bridgeport targeted formations (> 1400 m below ground) would influence shallower formations <100 m deep due to geological barrier to free flow factors limiting the movement of water between such depths. Bridgeport also protects shallower aquifers and reservoirs by installing cemented steel casing in our production wells, and testing and validating the integrity of the boreholes using wireline logging assessment. There is an also extremely restrictive geological boundaries between the lower targeted formations and higher freshwater targeted aquifers. The total water and oil production are also greatly reduced, on overall decline compared to historical extraction figures, with less total volume coming from less wells in each field.

Many individual bores are located around the small township of Eromanga, to the west of Kenmore. Because all bores within Eromanga are a similar distance from the main field of Kenmore, instead of measuring everyone bore separately, a generic distance for 19.08 km was given for each.

Modelling Results

The modelled maximum drawdowns within PL 98 are represented in Table 14.

The shallow model Layers 2 (Quaternary, including Winton) and Layer 3 (Toolebuc) had extremely minimal drawdowns. Layer 2 had modelled declines of 0.07 and 0.11 m, whilst Layer 3 had modelled declines of 0.51 and 0.69 m, from historic and future predicted production volumes respectively.

The closest layers to production extraction targes are the Layer 4 and Layer 5 of the Cadna-owie, Hooray Sandstone and the Westbourne. Layer 4 showed a maximum drawdown of 1.85 m from historic production, reaching 2.25 m drawdown under forecast production rates. The largest drawdowns were in Layer 5 (in the targeted formations) of 7.88 m under historic conditions, increasing to 8.81 m under forecast production (Table 14).

Table 14: Maximum drawdown/depressurisation for PL 98 Inland.

Layer number	Layer description	Maximum drawdown (m), 2011-2021	Maximum drawdown (m) 2022 - 2024
2	Quaternary, Tertiary, Winton and Mackunda Formations	0.07	0.11
3	Allaru, Toolebuc and Wallumbilla Formations	0.51	0.69
4	Cadna-owie Formation and Hooray Sandstone	1.85	2.25
5	Westbourne, Adori and Birkhead Formations/Hutton Sandstone and Poolwanna Formation	7.88	8.81

These are graphically represented in a cross-section map across the tenement. Layers 2 and Layer 3 are represented in Figure 14 and Figure 15, Layers 4 and Layer 5 are represented in Figure 16 and Figure 17.

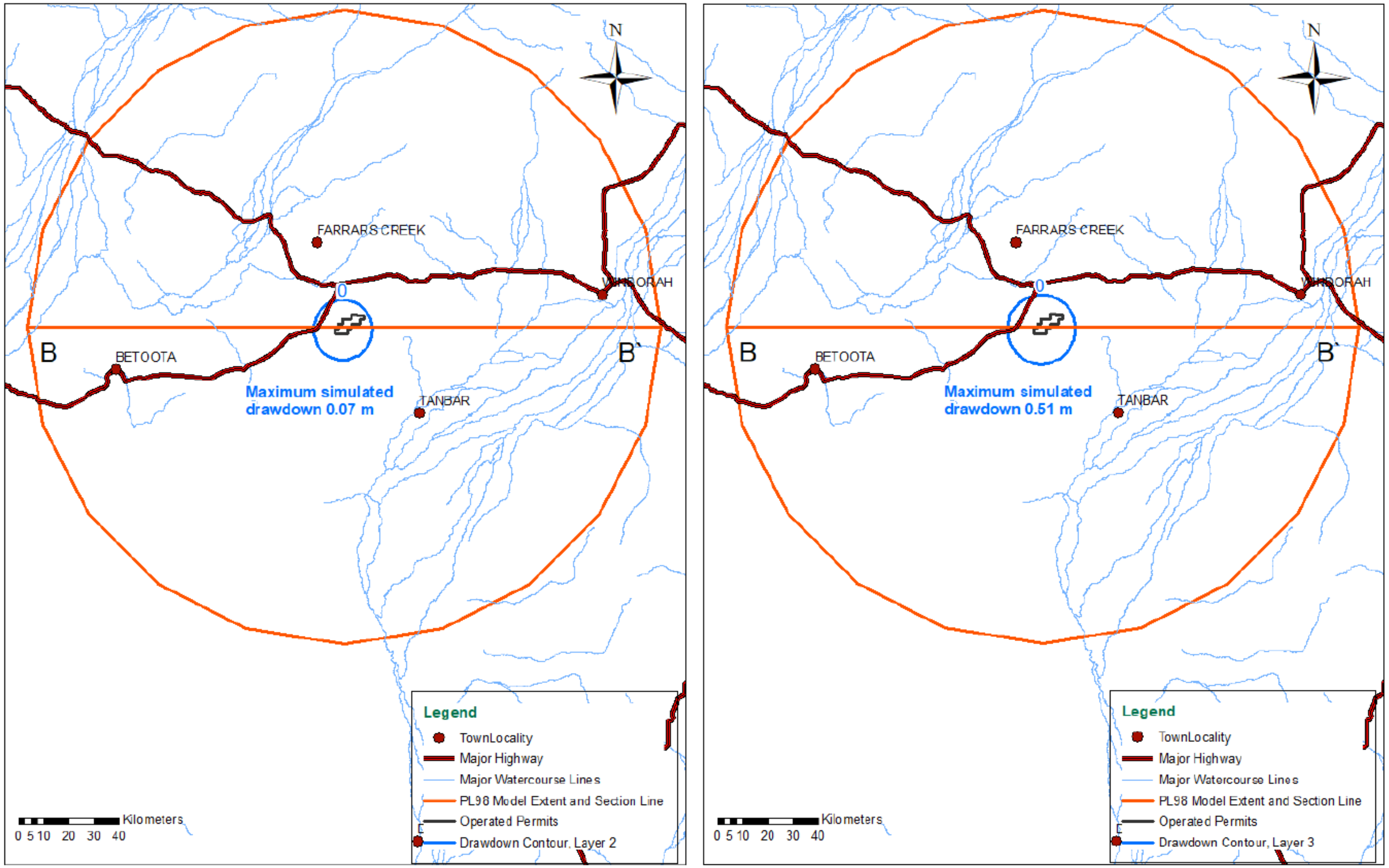


Figure 14: Maximum calculated pressure drawdown in Layer 2 and Layer 3 for the period of 2011 to 2021 at PL 98 Inland.

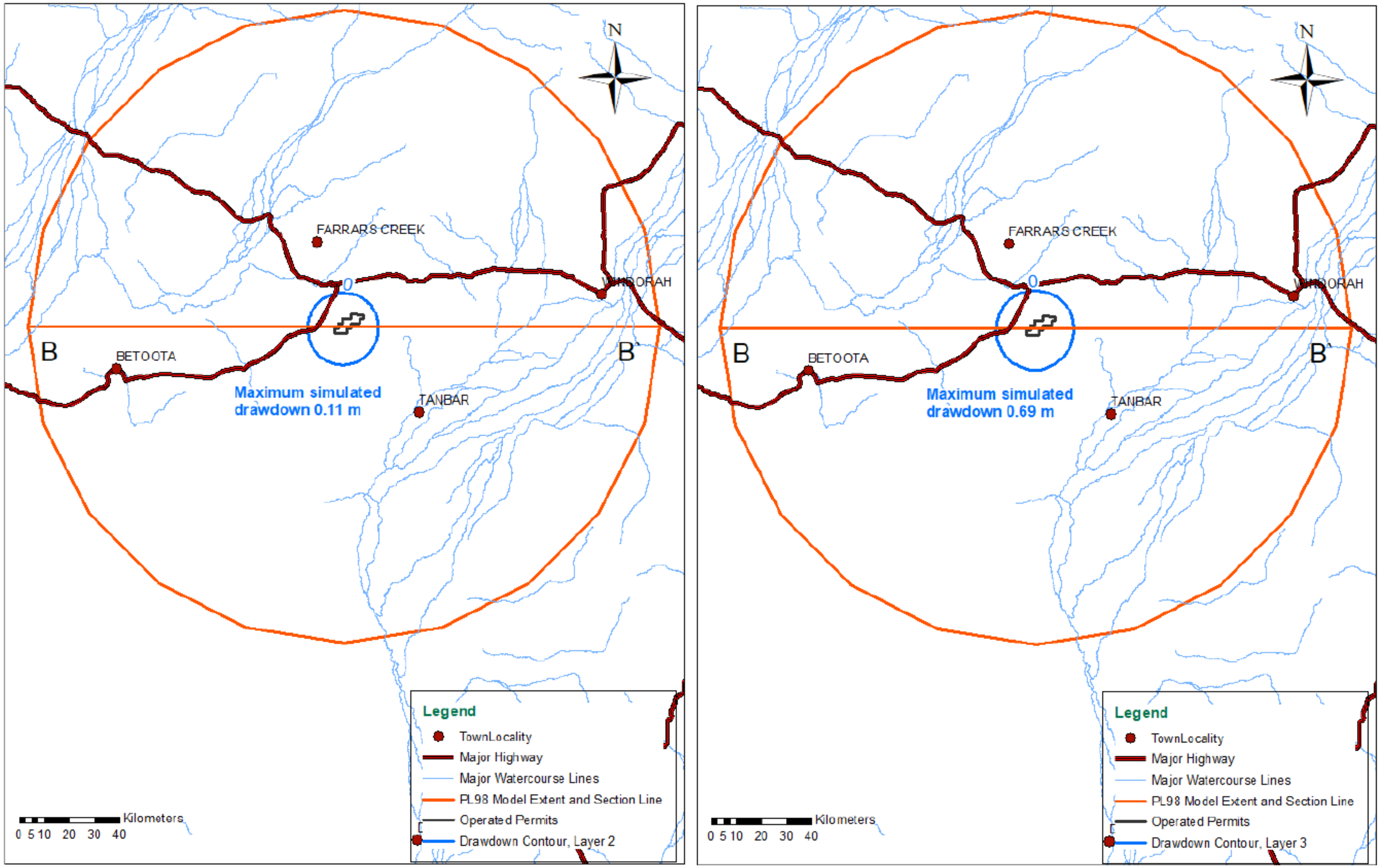
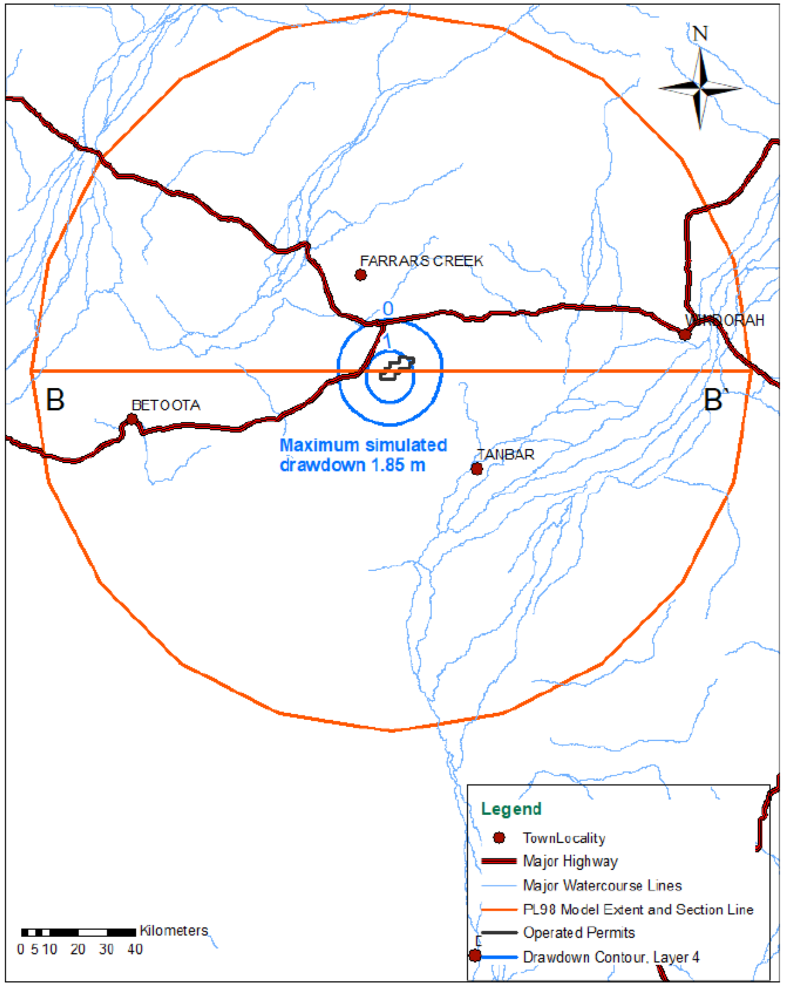


Figure 15: Maximum calculated depressurisation drawdown in Layer 2 and Layer 3 for the period of 2022 to 2024.



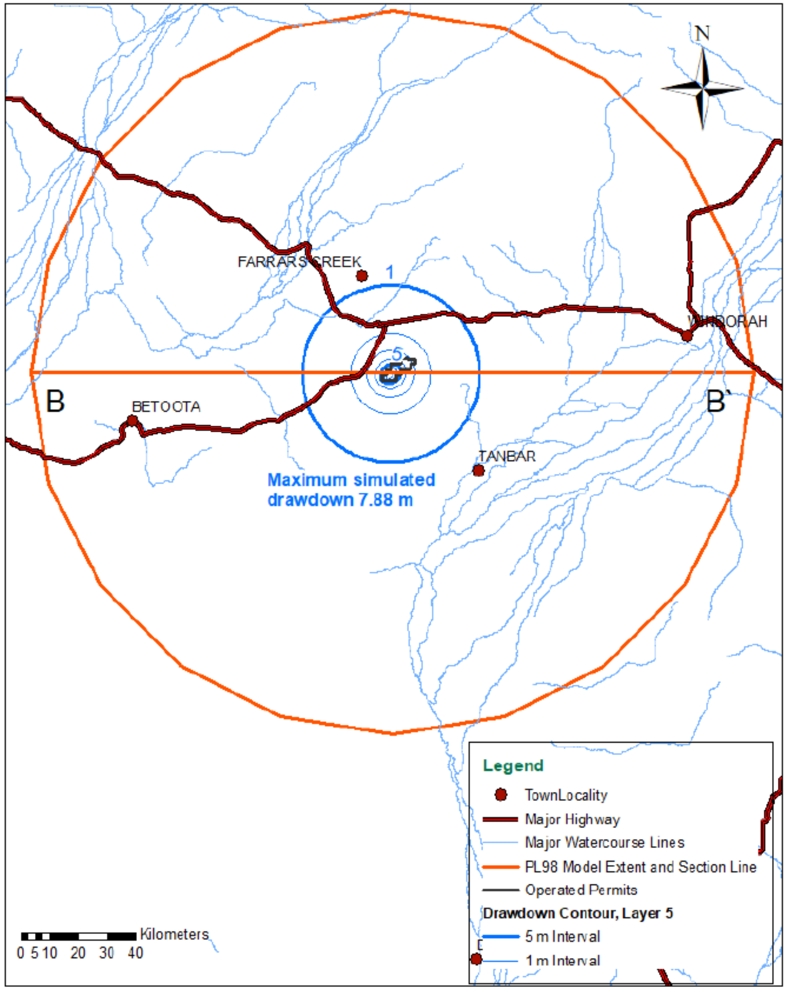


Figure 16: Maximum calculated depressurisation drawdown in Layer 4 and Layer 5 for the period of 2011 to 2021.

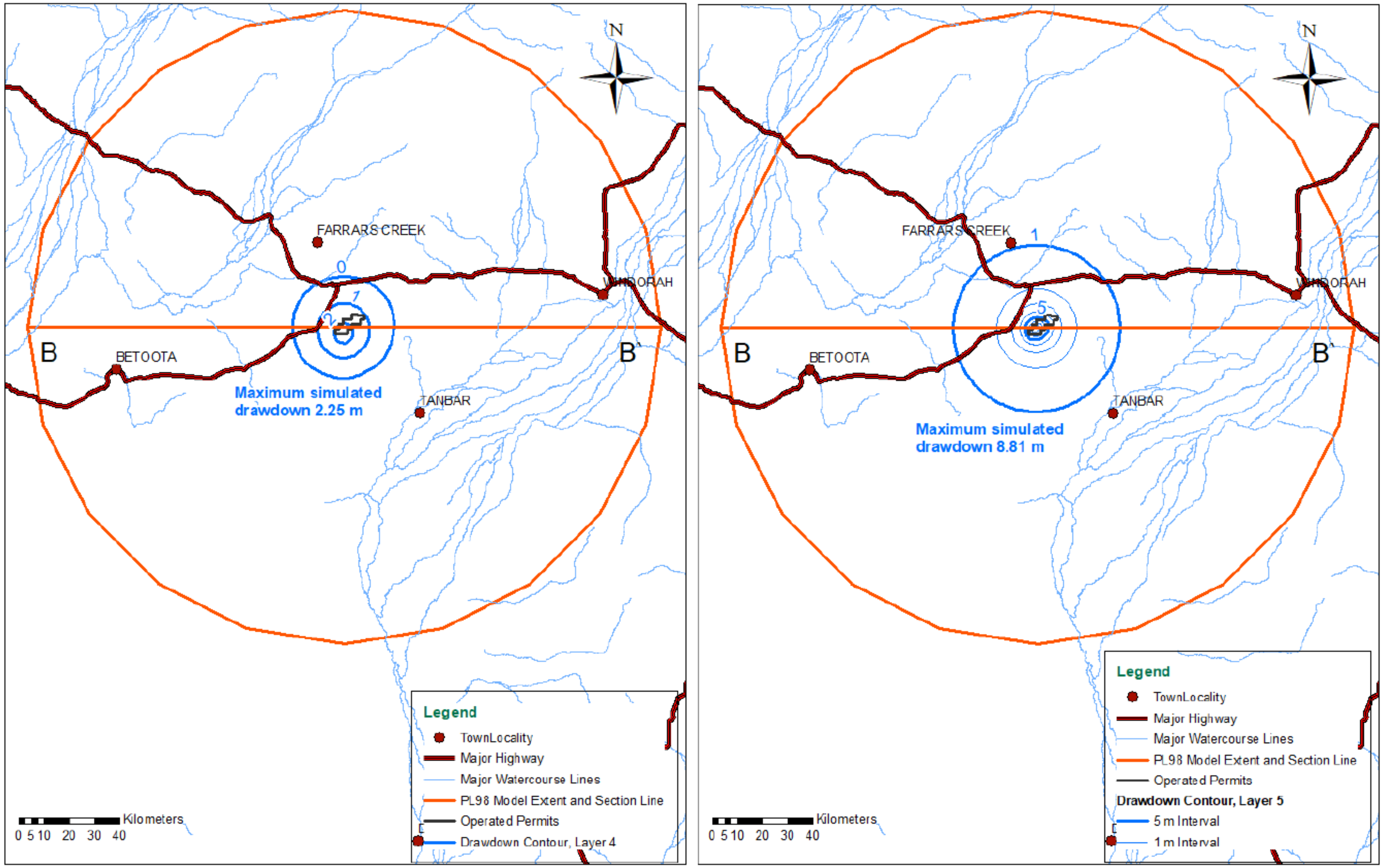


Figure 17: Maximum calculated depressurisation drawdown in Layer 4 and Layer 5 for the period of 2022 to 2024.

Another graphical representation of depressurisation/drawdown within the modelled layers can be demonstrated in the following format. Figure 18 does not include depth as the Y axis, Figure 19Figure 18 arranges the Layers in depth.

Figure 18: Calculated groundwater levels along the cross section (2011 to 2021).

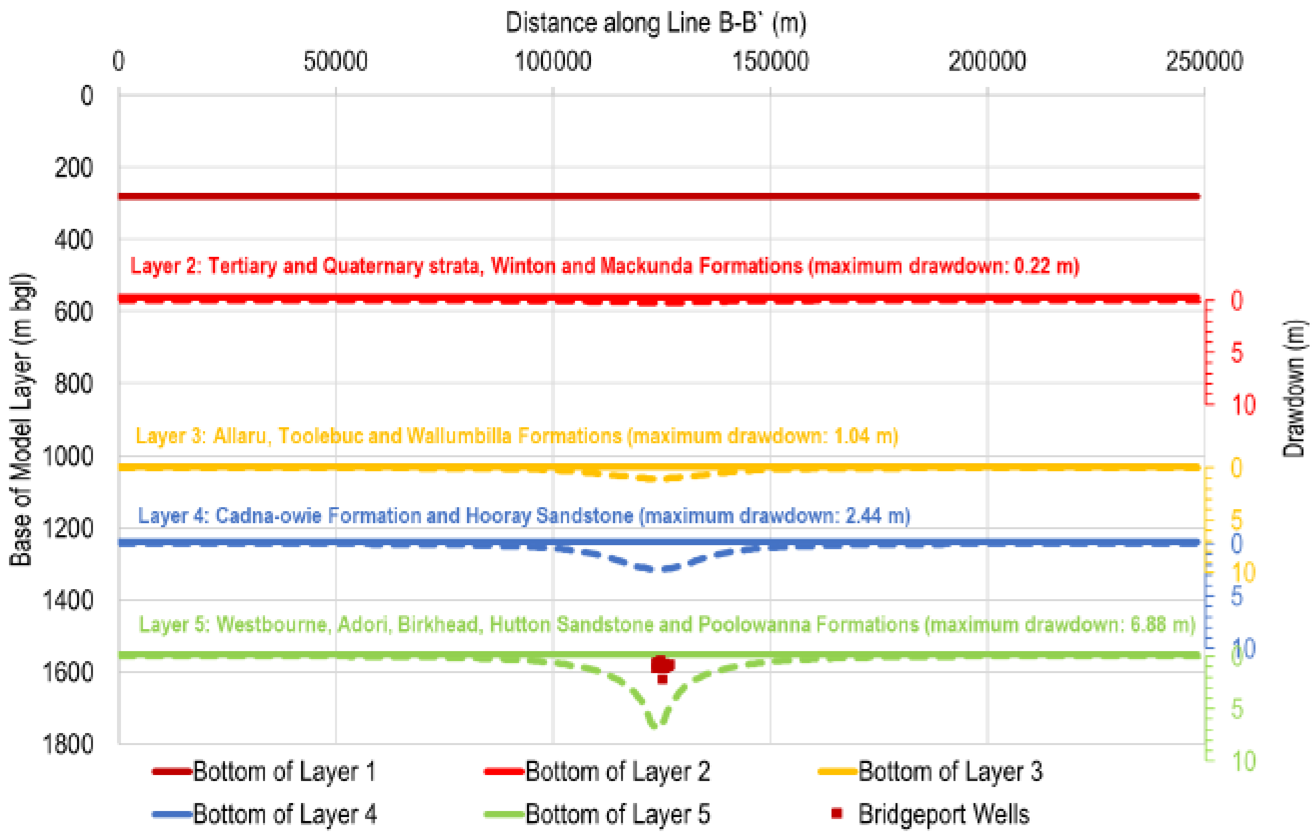


Figure 19: Calculated groundwater levels along the cross section (2011 to 2021).

Information about all water bores in the IAA (including the number of bores in the area, maps showing the location of these bores and the authorised use of each bore) (section 376(d) of the Water Act)

The bore trigger threshold is defined in DES (2017) as a decline in water level of 5 m in bores of a consolidated aquifer, and a 2 m water level decline in bores in an unconsolidated aquifer. All Bridgeport targeted aquifers are confined, and the surface aquifer targeted by landholders are unconfined.

To contextualise for the Department, a bore summary was undertaken, where all bore metadata was collated within a 20 km radius was taken from the centre of Inland. The Queensland Governments database for quantitative data was used to determine the average total depth of each bore. To create an accurate representation, plugged and abandoned wells and petroleum wells are included in the summary table (

), but were excluded from the average depth calculations (Table 16).

There was a total of 32 wells from the centre of the Inland field, 16 of which were abandoned or destroyed. The remaining 17 wells (which had available depth data) averaged 68.14 m deep, and their primary purpose would be livestock watering. The points in Figure 21 show all bores as per Queensland Globe, with some being abandoned and destroyed, whilst others are still active or unknown.

The average landholder bore within a 20 km radius of the Inland field is 68.14 m deep (Table 15).

Table 15: Average depth of bores within a 20 km radius from the centre of Inland, after removing all hydrocarbon targeting wells and Abandoned and Destroyed wells.

Tenement	Average Bore Depth (m)
Inland	68.14 m

None of the bores within a 20 km radius of the PL 98 Inland tenement (reviewed in Table 12) are perforated below 185.6 m. This 185.6 m deep well is Tanbury SRF Job 1764, perforated into the Winton Formation and still used as a water bore. Other wells, such as Toledo Job 275 at perforated deeper (365.76 m) but are abandoned.

Considering the layers of the model and where landholder bores target, there are no Layers within the model, relevant to landowners, that are predicted to be drawn down as a result of the petroleum activity. Only two of four Layers observed a decline greater than the bore trigger thresholds for a consolidated aquifer (Layer 3 and 4, of which Layer 3 was marginal). These Layers only contains bores related to petroleum extraction.

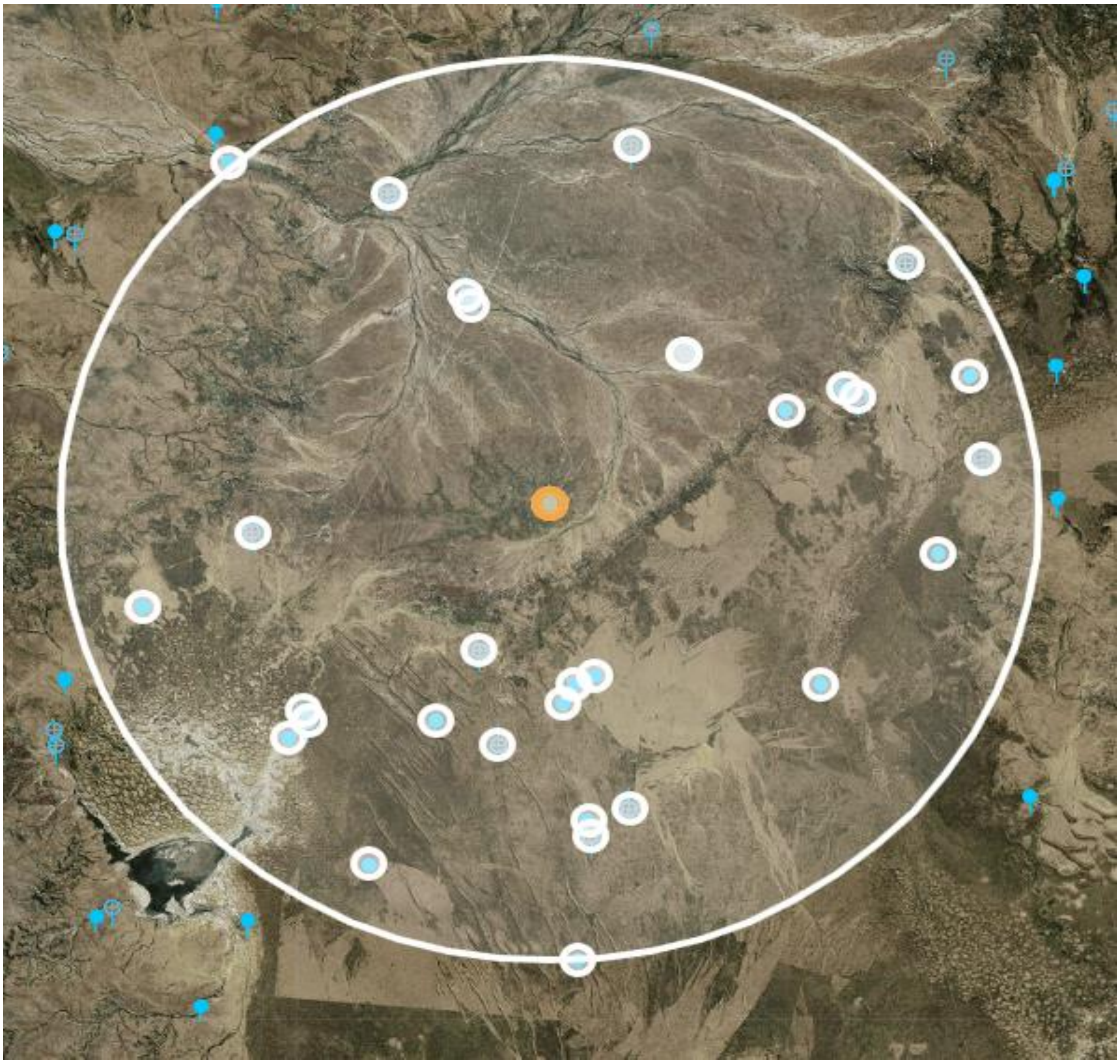


Figure 20: All wells within a 20km radius from the main Inland Field (Queensland Government GIS database "Queensland Globe").

Table 16: Details of the water bores that occur within a 20 km radius from the centre of Inland.

Bore Identification #	Location	Drilled Date	Aquifer Screen	Depth/ Thickness	Distance from Inland Field	Name	Remark	Likely Use
1955	-25.42181172, 141.81565656	01/01/1926	Sub-artesian facility, Winton Formation	61.90 m	22.37 km	Canterbury South (2)	Abandoned and Destroyed	
5096	-25.36347914, 141.67510232	01/01/1936	Sub-artesian facility, Winton Formation	365.76 m	20.50 km	Toledo Job 275	Abandoned and Destroyed	
5395	-25.47820053, 141.84815636	Unknown	Sub-artesian facility, Winton Formation	61.00 m	23.42 km	5 Mile	Existing	Water bore
5396	-25.48875645, 14179093527	01/12/1937	Sub-artesian facility, Winton Formation	61.00 m	14.00 km	No. 6 Bore	Abandoned and Destroyed	
5400	-25.59403718, 141.42538425	01/01/1936	Sub-artesian facility, Winton Formation	61.00 m	21.09 km	Rayments	Existing	Water bore
6125	-25.65931445, 141.49955077	01/01/1913	Sub-artesian facility, Winton Formation	10.60 m	19.04 km	Half Mile Well	Existing	Water bore
7740	-25.48486761, 141.78399088	28/10/1939	Sub-artesian facility, Winton Formation	96.32 m	13.40 km	Unknown	Abandoned and Destroyed	
7925	-25.55681442, 141.4809389	21/01/1940	Sub-artesian facility, Winton Formation	64.60 m	15.26 km	Cumbaroo Bore	Abandoned and Destroyed	
8047	-25.61598016, 141.59732735	01/01/1938	Sub-artesian facility, Winton Formation	118.90 m	6.80 km	Cuddapan	Abandoned and Destroyed	
12318	-25.520145, 141.85426788	08/07/1953	Sub-artesian facility, Glendower Formation	54.90 m	21.70 km	Waverney Bore	Abandoned and Destroyed	
12522	-25.72264746, 141.5403845	29/10/1953	Sub-artesian facility, Glendower Formation	28.35 m	21.66 km	Beefwood	Existing	Water bore
12593	-25.66292465, 141.60677209	09/03/1954	Artesian, controlled flow, Glendower Formation	21.90 m	13.57 km	Unknown	Abandoned and Destroyed	
12598	-25.47347797, 141.89232249	01/01/1953	Sub-artesian facility, Winton Formation	185.60 m	11.70 km	Tanbury SRF Job 1764	Existing	Water bore
13114	-25.65125877, 141.50982843	10/03/1955	Sub-artesian facility, Winton Formation	39.60 m	15.30 km	Unknown	Abandoned and Destroyed	

13544	-25.65098038, 141.5748279	11/12/1957	Sub-artesian facility, Glendower Formation	31.70 m	11.30 km	No.8	Existing	Water bore
13743	-25.6287576, 141.65593782	19/06/1958	Sub-artesian facility, Glendower Formation	36.90 m	8.50 km	No.9	Existing	Water bore
14029	-25.70847998, 141.65427195	10/02/1960	Sub-artesian facility, Winton Formation	39.60 m	18.16 km	Unknown	Abandoned and Destroyed	
16489	-25.63236878, 141.64566017	30/05/1965	Sub-artesian facility, Winton Formation	122.22 m	8.60 km	6 Mile	Existing	Water bore
23099	-25.4434799, 141.5931591	13/04/1981	Artesian, controlled flow, Pre-Permian	1970.80 m	11.66 km	Dio Morney 1	Existing, plugged and abandoned	Oil & Gas
23695	-25.69486872, 141.67427159	06/09/1987	Metasediments	2493.30	17.58 km	Dio Cuddapan 1	Abandoned and Destroyed	Oil & Gas
36307	-25.63292344, 141.77149216	01/08/1970	Sub-artesian facility, Unknown	37.50 m	15.80 km	McFarlands Bore	Unknown	Water bore
51052	-25.3873689, 141.55093711	01/07/1975	Sub-artesian facility	No records	19.21 km	No name	Abandoned and Destroyed	
51804	-25.70097998, 141.652883	01/01/1983	Sub-artesian facility, Unknown	35.00 m	17.25 km	New No.9	Existing	Water bore
51805	-25.77042457, 141.6478837	01/01/1983	Sub-artesian facility, Unknown	33.36 m	25.14 km	Welks	Existing	Water bore
69179	-25.46709036, 141.70232484	Unknown	Sub-artesian facility	No records	8.20 km	Waverney	Abandoned and Destroyed	
69562	-25.4957012, 141.75399123	28/02/1989	Glendower Formation	68.00 m	10.30 km	Mosquito	Existing	Water bore
93025	-25.6425259, 141.6401501	03/06/1996	Sub-artesian facility	145.00 m	9.50 km	Basin Hole Bore	Existing	Water bore
100199	-25.5420909, 141.6331661	04/07/1994	Hutton Formation	1809.29 m	0.00 km	IOR Inland 1	Shut-in oil well, existing	Oil & Gas
100226	-25.43792434, 141.59038141	22/01/1994	Artesian, Winton Formation	1458.00 m	12.00 km	IOR Morney 2	Morney 1: plugged back to 230 m,	Oil & Gas

							Abandoned and Destroyed	
118622	-25.5676695, 141.8316163	17/12/2004	Sub-artesian facility	72.00 m	17.70 km	Boundary	Existing	Water bore
163901	-25.37194924, 141.46887129	23/07/2017	Sub-artesian facility	132.00 m	25.38 km	House Bore	Existing	Water bore
163986	-25.64556067, 141.50737563	22/09/2017	Sub-artesian facility	30.00 m	13.62 km	Unknown	Existing	Water bore

A program for conducting an annual review of the accuracy of maps produced and giving the chief executive a summary of the outcome of each review, including a statement of whether there has been a material change in the information of predictions used to prepare the maps (section 376(e) of the Water Act).

Bridgeport provides the following detail to form the basis of a groundwater monitoring strategy (same as below), which includes parameters, locations and frequency to help define and inform the program. This program will be used to monitor against historic conditions, and data will inform assumptions made by this UWIR (e.g. the IAA and LTAA) for each subsequent yearly period that data is collected. Considering the on-going consistency of field production, field life and physical factors relating to the reservoir and those above it, little material change is predicted. This however will be monitored and submitted to the chief executive annually, with appropriate data, interpretation and statements.

The monitoring will be as follows;

Regional Groundwater Monitoring (~all well target depth TD)

The requirement to develop a monitoring strategy (s378) is detailed in the following section. The plan considers and matches the monitoring plans put forth by Beach Energy and Bridgeport in other UWIRs, matching best practice and suitable to historic brown fields operations.

Shut-in wellhead pressure will be monitored in across the fields in a series of wells. Shut-in tubing head pressure (SITHP) is taken and extrapolated to determine reservoir pressure (and therefore water level).

Well selection is based on position within the field, as well as target formation. There are six wells perforated in the Hutton which can be tested at Inland. Two wells are perforated into the McKinlay (Table 17).

Table 17: Shut-in wells in the Hutton (Inland) that will be monitored for shut-in well head pressure.

Inland (Hutton)	Inland (McKinlay)
Inland – 1	Inland - 5
Inland – 2	Inland - 18
Inland – 3	
Inland – 10	
Inland – 14	
Inland – 20	

Frequency of Measurements

Shut-in tubing head pressure will be monitored quarterly. Any influence on the groundwater system is extremely slow acting, which supports this monitoring schedule.

Significant changes in the reservoir pressure can infer changes in well bore conditions or reservoir conditions. The SITHP will be assessed against the previous monitoring figures every quarter, to be reported in the annual updates.

Each annual update and three yearly report will include;

- A summary of the previous (12 or 36 months) monitoring data
- Assessment of monitoring program (applicability, improvements)
- Results review

Rationale for Strategy

The Cooper-Eromanga Basin is extremely large, extremely slow acting hydrogeological groundwater basin. The overall extraction from the Inland field has been deemed to be low, with little to no influence on groundwater dependent ecosystems or regional groundwater users. The following parameters and frequency are deemed appropriate for the scale of monitoring and have been justified through the analysis of these risks' allocations (as detailed in sections above).

Changes in predictions

Any material change in predictions would equate to a significant increase in current and predicted production. There is no material limit to the extraction of oil and water from a petroleum tenement. If any significant change was to occur, it would require a significant and material change to the physical infrastructure at the facility (which is not planned). Bridgeport would include any increased production and extraction into the subsequent reporting, modelling and water drawdown predictions, but no physical change would occur to day to day operations.

Notification

To address s378(1)(d), Bridgeport will notify the Office (the Office of Groundwater Impact Assessment (OGIA)) about the implementation of the proposed strategy. This notification will include;

- A summary of the Water Monitoring Strategy
- The rationale for the strategy
- Commencement date of the strategy
- Frequency of the strategy
- Where further information on the strategy can be obtained
- Information will be emailed to ogia@rdmw.qld.gov.au

Summary

Rationale: A monitoring strategy such as that put forward, that matches industry best practice, and suits the level of impact low extraction has on water related environmental considerations, will allow for accurate determination of potential impacts.

Part D*: Impacts on environmental values

Requirements under sections 376(da) and 376 (db) of the Water Act
To meet the requirements of the Water Act, an UWIR must include the following; 1. *A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);* 2. *An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground wa ter rights (section 376(db) of the Water Act)-* i. *For a three-year period starting on the consultation day for the report; &* ii. *Over the projected life of the resource tenure.*

*Part D refers to Section 5.1.4 (page 17) of the guideline (DES 2017).

To better describe the Bridgeport potential impacts on Environmental Values (EVs), an analysis tool was developed using templates from Work Health and Safety & Environment templates used in other Bridgeport areas (such as Production). The use of matrices provides a better understanding and classification of the potential risk to EVs and provides the Department of Environment and Science clarity on how Bridgeport has come to conclusions around impacts. The following table represents Bridgeport's EV risk allocation framework. The use of the framework is simply to define the Likelihood and Consequence, to determine the Level of Risk (Table 18).

Table 18: Bridgeport Energy Risk Allocation Framework applied to Environmental Values.

EV Risk Allocation Framework						
Likelihood		Consequence				
		Insignificant	Minor	Moderate	High	Catastrophic
A	Almost certain	Medium	High	Extreme	Extreme	Extreme
B	Likely	Medium	High	High	Extreme	Extreme
C	Possible	Low	Medium	High	Extreme	Extreme
D	Unlikely	Low	Low	Medium	High	Extreme
E	Rare	Low	Low	Low	Medium	High
F	Incapable of occurring	No risk	No risk	No risk	No risk	No risk

Consequence Rating		
Level	Description	Definition
Insignificant	Almost Certain	No unauthorised adverse impact on environment values
Minor	Likely	Temporary and minor unauthorised effect on environmental values – non reportable environmental harm
Moderate	Possible	Serious temporary or minor permanent unauthorised damage to environmental values – reportable incident with local attention
High	Unlikely	Significant unauthorised harm to environmental values - reportable incident with adverse national publicity
Catastrophic	Rare	Major unauthorised event causing significant unauthorised harm to environmental values, loss of company credibility with stakeholders and likely prosecution

Likelihood Rating**		
Level	**Description**	**Definition**
A	**Almost Certain**	(1) Reasonably expected to occur within a month (2) Will likely occur in most circumstances
B	**Likely**	(1) Likely to occur within the next year (2) Probably occur in the near future
C	**Possible**	(1) Likely to occur over ten years (2) Might occur at some time
D	**Unlikely**	(1) Not specifically expected to occur but may occur sometime (2) May occur in exceptional circumstances
E	**Rare**	(1) Foreseeable but not normally expected to occur (2) May occur in exceptional circumstances
F	**Incapable of occurring**	(1) Incapable of occurring regardless of time (2) Impossible to occur physically
**Please note this table is a guide to determining the likelihood rating. The frequency may change depending on the risk type and the context in which it occurs.		

Environmental Risks		
Level of Risk	**Authority to approve the risk**	**Action Required**
Extreme	Senior Executive Team (SET) Board of Director must be made aware	Unacceptable Risk – STOP or DO NOT START the action until controls are established to reduce the risk to an acceptable level. Establish permanent control measures and review for effectiveness. The highest level of management must be made aware.
High	Operations Manager sign off Board of Director must be made aware	Activity may only proceed if: likelihood is tolerable; personnel are competent; risks are adequately assessed; legal and mandatory requirements are met;
Medium	SSM to sign off Manager must be made aware	Acceptable – apply adequate safeguards and review for effectiveness. Monitor for changes which may cause escalation of risk level.
Low	No approval but must document risk in the UWIR	Acceptable – apply safeguards as considered necessary. Monitor for changes which may cause escalation of risk level.
No risk	No approval but must document risk in the UWIR	Acceptable – apply safeguards as considered necessary. Monitor for changes which may cause escalation of risk level.

Bridgeport used the definition of environmental values (EVs) as provided by legislation and other Government policies, procedures or departments as outlined below.

Environment Protection Act (1994) define EVs as;

> (a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety;
>
> (b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

The Environmental Protection (Water) Policy (2009) also has an EV definition,

> *"those qualities of the waterway that make it suitable to support particular aquatic ecosystems or human use".*

The Department of Environment and Science (2019) also have an apt definition;

> *"EVs for water are the qualities that make it suitable for supporting aquatic ecosystems and human water uses."*

Environmental values are scheduled into the Environment Protection (EPP) (Water and Wetland Biodiversity) Policy 2019 through a legislative process. These EVs are described in Schedule 1 of the EPP (Water and Wetland Biodiversity Policy 2019).

In Queensland, all tidal and non-tidal waters, including wetlands, lakes and groundwater have EVs, as described in the Environmental values and water quality objectives under the Environmental Protection (Water and Wetland Biodiversity) Policy document (Department of Environment and Science, 2019).

A short list of Environmental Values includes;

- Aquatic Ecosystem Health
- Agricultural uses (e.g. stock watering and irrigation)
- Recreational uses (e.g. swimming, wading, boating, fishing and aesthetics)
- Drinking water (raw water supply)

- Industrial uses (e.g. mining, mineral refining and processing) and
- Cultural and spiritual values.

Using the Department of Environment and Sciences' website, a basic map of the EPP (Water and Wetland Biodiversity) scheduled data was accessed. The interactive map was also accessed. Further, the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Schedule 1 was accessed, to summarise the type and presence of EVs.

The two mapping resources reveal the absence of spatial data for EVs over the Bridgeport Inland tenement, the focus of this UWIR. The Inland field is within a project area classified in these mapping resources as "future programs", which implies a current lack of development of spatial layers relating to EVs, which are likely to be added at a later date, if applicable. Likewise, the live spatial data services reveal an absence of layers over the project area, focussing heavily on the eastern coast. The actual Schedule also does not include definitions relating to the Inland tenement. There is no close EPP (Water and Wetland Biodiversity) Overview Map region relating to the Inland tenement, as per the basic map of EPP (Water and Wetland Biodiversity) scheduled data (Queensland Water Quality Guidelines, Department of Environment and Science 2018).

Regardless, the absence of spatial data and the mapping classification within the EPP (Water and Wetland Biodiversity) Guideline for the specific region relating to Inland was merely highlighted above to demonstrate our attempt to use specific Queensland Government resources, and why they do not feature further in this process. Bridgeport summarised and described the EVs relevant to the exercise of water rights associated with Inland tenement in Table 19. Later, Bridgeport assessed these as per the Risk Allocation Framework in Table 18, in reference to UWIR requirements and physical conditions around Inland.

Table 19: Environmental Values as described in Healthy waters for Queensland: Environmental values, management goals and water quality objectives—frequently asked questions (by the DES), as well as in the EPP (Water and Wetland Biodiversity) Schedule 2.

Section	Environmental Value	Definition
D.1	**Aquatic ecosystem**	'A community of organisms living within or adjacent to water, including riparian or foreshore area'. (EPP (Water and Wetland Biodiversity), schedule 2). The intrinsic value of aquatic ecosystems, habitat and wildlife in waterways and riparian areas, for example, biodiversity, ecological interactions, plants, animals, key species (such as turtles, platypus, seagrass and dugongs) and their habitat, food and drinking water. Waterways include perennial and intermittent surface waters, groundwaters, tidal and non-tidal waters, lakes, storages, reservoirs, dams, wetlands, swamps, marshes, lagoons, canals, natural and artificial channels and the bed and banks of waterways. (This EV incorporates the 'wildlife habitat' EV used in the South East Queensland Regional Water Quality Management Strategy (SEQRWQMS)).
D.2	**High ecological/conservation value waters**	'Waters in which the biological integrity of the water is effectively unmodified or highly valued.'
D.3	**Slightly disturbed waters**	'Waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators'.

D.4	**Moderately disturbed waters**	'Waters in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree.'
D.5	**Highly disturbed waters**	'Waters that are significantly degraded by human activity and have lower ecological value than high ecological value waters or slightly or moderately disturbed waters.'
D.6	**Irrigation**	Suitability of water supply for irrigation, for example, irrigation of crops, pastures, parks, gardens and recreational areas.
D.7	**Farm water supply/use**	Suitability of domestic farm water supply, other than drinking water. For example, water used for laundry and produce preparation.
D.8	**Stock watering**	Suitability of water supply for production of healthy livestock.
D.9	**Human consumers of aquatic foods**	The suitability of the water for producing aquatic foods for human consumption such as fish, crustaceans and shellfish from natural waterways.
D.10	**Primary recreation**	Means a use that involves the following types of contact with the water—full body contact, frequent immersion by the face and trunk, frequent contact with spray by the face where it is likely some water will be swallowed or inhaled, or come into contact with ears, nasal passages, mucous membranes or cuts in the skin e.g. diving, swimming, surfing.
D.11	**Secondary recreation**	Means a use that involves the following types of contact with the water—contact in which only the limbs are regularly wet, and other contact, including the swallowing of water, is unusual (examples—boating,

		fishing, wading) or occasional inadvertent immersion resulting from slipping or being swept into the water by a wave.
D.12	**Visual recreation**	Means a use that does not ordinarily involve any contact with the water—for example angling from the shore, sunbathing near water.
D.13	**Drinking water supply**	Suitability of the water for supply as drinking water having regard to the level of treatment of the water.
D.14	**Industrial use**	Suitability of water supply for industrial purposes, for example, food, beverage, paper, petroleum and power industries, mining and minerals refining/processing. Industries usually treat water supplies to meet their needs.
D.15	**Cultural and spiritual values**	Means scientific, social or other significance to the present generation or past or future generations, including Aboriginal People or Torres Strait Islanders. This includes custodial, spiritual, cultural and traditional heritage, hunting, gathering and ritual responsibilities, symbols, landmarks and icons (such as waterways turtles and frogs). • lifestyles (such as agriculture and fishing).
D.16	**Environmentally Sensitive Areas**	ESAs are areas of habitat, described as important for key ecological functions in legislation (e.g. Nature Conservation Act 1994, Marine Parks Act 2004, etc.). ESAs are split into two categories, Category A and Category B, and the appropriate formal definition can be found in the Environment Protection Regulation (2019).

D.1 Aquatic ecosystem

Definition: 'A community of organisms living within or adjacent to water, including riparian or foreshore areas'. (EPP (Water and Wetland Biodiversity), schedule 2). The intrinsic value of aquatic ecosystems, habitat and wildlife in waterways and riparian areas, for example, biodiversity, ecological interactions, plants, animals, key species (such as turtles, platypus, seagrass and dugongs) and their habitat, food and drinking water. Waterways include perennial and intermittent surface waters, groundwaters, tidal and non-tidal waters, lakes, storages, reservoirs, dams, wetlands, swamps, marshes, lagoons, canals, natural and artificial channels and the bed and banks of waterways. (This EV incorporates the 'wildlife habitat' EV used in the South East Queensland Regional Water Quality Management Strategy (SEQRWQMS)).

UWIR requirements

D.1.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.1.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act) -

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

To determine the extent of watercourse, wetlands, springs (including other relevant environmental values and layers) or river improvement trust asset areas on PL 98, the following layers, including water course areas, pondage, major water course lines, groundwater dependent ecosystems (areas, watercourses and springs), water plans (waterholes and lakes), pondage, active springs, directory of important wetlands, groundwater dependent ecosystems – springs, high ecological significance wetlands, water course identification map (watercourses), MSES (high ecological significance wetlands) and the River Improvement Trust Areas were downloaded from the Queensland Governments resources and overlaid on the boundaries of each petroleum tenement.

There are no water courses which flow through or near the PL 98 Inland tenement. The nearest major watercourse line is 17 km the north-west from the centre of petroleum related activities. There are no other watercourses, wetlands, GDEs or springs within the boundary of PL 98. There is pondage in PL 98, known as low-hazard category dams licenced as environmentally relevant activities (ERA) for the evaporation of produced water. There is a singular waterhole 27 km to the south-west of the petroleum related activities within PL 98, which also sits within a wetland (Figure 21).

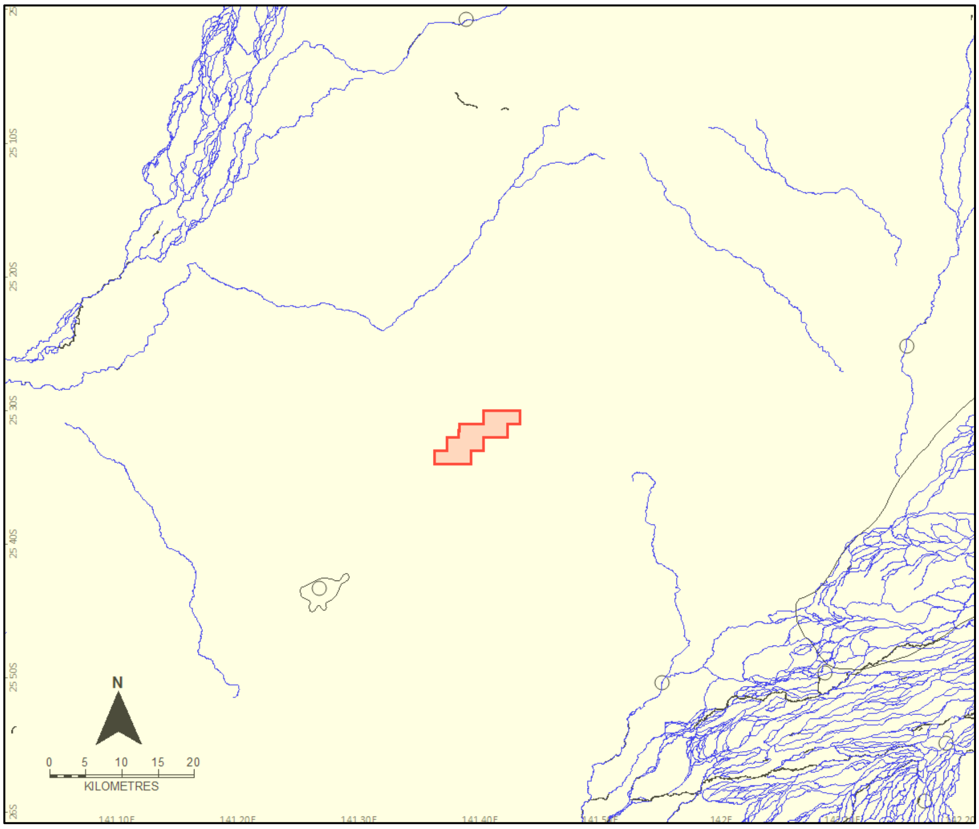


Figure 21: Aquatic shapefiles and layers from the Queensland Government over PL 98 Inland.

The aquatic features around the tenement areas are in a generally degraded state. They are characterised by little to no riparian vegetation, with mature trees only. Mature trees are tall enough to withstand constant grazing. Young, new recruitment find it difficult once climatic conditions reduce groundcover and animals forage on alternate, unprotected new trees and shrubs. Waters are open to livestock (both domestic and feral), including cattle, sheep, kangaroos, goats, pigs and horses) with vegetation constantly grazed to a literal bare soil condition for large portions of the year.

Any aquatic feature near Inland is ephemeral, in that they only contain water when the region receives large rainfall, and it only lasts a short time. There are no ecosystems which rely on groundwater, and the region (known as Channel Country) is known for the large influx of rainfall, quick flooding and quick retreat of surface waters.

Any potential impacts from operations would likely include small impacts from localised spills of hydrocarbon or chemicals and impacts from produced water discharge (which will be covered in a Section D.8).

These features/descriptions do not preclude Bridgeport's' right to take water from having an impact on aquatic EVs but is provided with the aim to set a realistic context to the land in which we operate.

Note, this information will be relevant to subsequent EVs, but will not be repeated in each section. A reference back to this section will be provided.

Bridgeport Risk Allocation

D.1.1. Bridgeport have assessed the likelihood of aquatic ecosystem environmental values being impacted by the previous exercise of underground water rights as a Likelihood of D, or Unlikely, with the explanation being (1) Not specifically expected to occur but may occur sometime. The consequence of impact is Minor, leading to a Low consequence level of risk. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are limited aquatic ecosystems within or in proximity to, Bridgeport petroleum production that would be influenced by the exercise of underground water rights for the remaining life of the project.

D.1.2.i. Bridgeport have assessed the likelihood of aquatic ecosystem environmental values being impacted by the exercise of underground water rights for the next three years as a Likelihood of D, or Unlikely, with the explanation being (1) Not specifically expected to occur but may occur sometime. The consequence of impact is Minor, leading to a Low consequence level of risk. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are limited aquatic ecosystems within or in proximity to, Bridgeport petroleum production that would be influenced by the exercise of underground water rights for the remaining life of the project.

D.1.2.ii. Bridgeport have assessed the likelihood of aquatic ecosystem environmental values being impacted by the exercise of underground water rights for the remainder of the project life as a Likelihood of D, or Unlikely, with the explanation being (1) Not specifically expected to occur but may occur sometime. The consequence of impact is Minor, leading to a Low consequence level of risk. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are limited aquatic ecosystems within or in proximity to, Bridgeport petroleum production that would be influenced by the exercise of underground water rights for the remaining life of the project.

D.2 High ecological/conservation value waters

Definition: 'Waters in which the biological integrity of the water is effectively unmodified or highly valued.'

UWIR requirements

D.2.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.2.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no waters of high ecological values or conservation value waters within or nearby to Bridgeport tenements relating to Inland. All environmental values related to highly disturbed waters.

See section D.1 Aquatic ecosystem above, for a comprehensive summary of the ecological/conservation waters values.

Bridgeport Risk Allocation

D.2.1. Bridgeport have assessed the likelihood of high ecological/conservation water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no high ecological or conserved ecosystems within or in proximity to Bridgeport petroleum production that wold be influenced by previous exercise of underground water rights.

D.2.2.i. Bridgeport have assessed the likelihood of high ecological/conservation water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no high ecological or conserved ecosystems within or in proximity to Bridgeport petroleum production that will occur in the next three-year period.

D.2.2.ii. Bridgeport have assessed the likelihood of high ecological/conservation water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no high ecological or conserved ecosystems within or in proximity to Bridgeport petroleum production that will occur over the life of the project.

D.3 Slightly disturbed waters

Definition: 'Waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators'.

UWIR requirements

D.3.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.3.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no slightly disturbed ecological water values within or nearby to Bridgeport's Inland tenement. All environmental values related to highly disturbed waters.

See section D.1 Aquatic ecosystem above, for a comprehensive summary of the ecological/conservation waters values.

Bridgeport Risk Allocation

D.3.1. Bridgeport have assessed the likelihood of slightly disturbed water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no high ecological or conserved ecosystems within or in proximity to Bridgeport petroleum production that wold be influenced by previous exercise of underground water rights.

D.3.2.i. Bridgeport have assessed the likelihood of slightly disturbed water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no high ecological or conserved ecosystems within or in proximity to Bridgeport petroleum production that will occur in the next three-year period.

D.3.2.ii. Bridgeport have assessed the likelihood of slightly disturbed water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no high ecological or conserved ecosystems within or in proximity to Bridgeport petroleum production that will occur over the life of the project.

D.4 Moderately disturbed waters

Definition: 'Waters in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree.'

UWIR requirements

D.4.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.4.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no moderately disturbed waters within or nearby to Bridgeport's Inland tenement. All environmental values related to highly disturbed waters.

See section D.1 Aquatic ecosystem above, for a comprehensive summary of the ecological/conservation waters values.

Bridgeport Risk Allocation

D.4.1. Bridgeport have assessed the likelihood of moderately disturbed water values being impacted by the previous exercise of underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no moderately disturbed waters within or in proximity to Bridgeport petroleum production that would be influenced by previous exercise of underground water rights.

D.4.2.i. Bridgeport have assessed the likelihood of moderately disturbed water values being impacted by the preceding three years of exercising underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no moderately disturbed waters within or in proximity to Bridgeport petroleum production that would be influenced by the exercise of underground water rights for the next three years.

D.4.2.ii. Bridgeport have assessed the likelihood of moderately disturbed water values being impacted by the preceding life if the project exercising underground water rights as a Likelihood of F, or incapable of occurring, with the explanation being impacts are (2) Impossible to occur. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are no moderately disturbed waters within or in proximity to Bridgeport petroleum production that would be influenced by the exercising of underground water rights for the remainder of the project’s life.

D.5 Highly disturbed waters

Definition: 'Waters that are significantly degraded by human activity and have lower ecological value than high ecological value waters or slightly or moderately disturbed waters.'

UWIR requirements

D.5.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.5.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

The water values within or nearby Bridgeport's Inland tenement meet the definition of highly disturbed waters. The lack of environmental values within or near the Inland tenement precludes direct impacts. The most common possible impacts would be from incidental spilling of chemicals or petroleum related products, as well as the release of water for stock use (see D.8 below). The limited environmental features mapped as occurring within or near Bridgeport tenements are far removed from actual petroleum assets. For example, the important wetland and associated waterhole is ~27 km from any physical activity related to petroleum production. It is highly unlikely there would be any physical impact from petroleum related activities. The depth from which Bridgeport extract water, the volume of water extracted compared with GKBA, and the highly disturbed water values not reliant on subsurface water reservoirs, would preclude impacts to surface waters from extraction.

Bridgeport Risk Allocation

D.5.1. Bridgeport have assessed the likelihood of highly disturbed water values being impacted by the previous exercise of underground water rights as a Likelihood of D or Unlikely, with the explanation being impacts are (2) May occur in exceptional circumstances. The consequence of impact is Minor, leading to a Low consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are very few highly disturbed waters within or in proximity to Bridgeport petroleum production. And what highly disturbed water features there are, are not reliant on water reservoirs related to or impacted by water extracted in the process of producing petroleum by previous exercise of underground water rights.

D.5.2.i. Bridgeport have assessed the likelihood of highly disturbed water values being impacted by the future three-year exercise of underground water rights as a Likelihood of D or Unlikely, with the explanation being impacts are (2) May occur in exceptional circumstances. The consequence of impact is Minor, leading to a Low consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are very few highly disturbed waters within or in proximity to Bridgeport petroleum production. And what highly disturbed water features there are, are not reliant on water reservoirs related to or impacted by water extracted in the process of producing petroleum over the next three-year period of exercising underground water rights.

D.5.2.ii Bridgeport have assessed the likelihood of highly disturbed water values being impacted by the future exercise of underground water rights over the life of the project as a Likelihood of D or Unlikely, with the explanation being impacts are (2) May occur in exceptional circumstances. The consequence of impact is Minor, leading to a Low consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. continued monitoring) and escalate risk level if appropriate.

The risk and consequence levels determined by Bridgeport are based on the fact there are very few highly disturbed waters within or in proximity to Bridgeport petroleum production. And what highly disturbed water features there are, are not reliant on water reservoirs related to or impacted by water extracted in the process of producing petroleum over the remaining project of exercising underground water rights.

D.6 Irrigation

Definition: Suitability of water supply for irrigation, for example, irrigation of crops, pastures, parks, gardens and recreational areas.

UWIR requirements

D.6.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.6.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

The predominant land use during and after petroleum operations will be broad acre marginal/extensive sheep and cattle grazing of remnant native vegetation. There will be no pasture or cropping. There are no irrigation projects at Inland. No gardens, parks, pasture or recreational areas and their irrigation is affected by the exercise of groundwater extraction.

Bridgeport Risk Allocation

D.6.1. Bridgeport have assessed the likelihood of irrigation environmental values being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no irrigation programs whose water quality values that would be impacted by previous operators exercising underground water rights. The physical environment, habitat types, landforms, soil type, current and future land use precludes irrigation.

D.6.2.i. Bridgeport have assessed the likelihood of irrigation environmental values being impacted by the exercise of underground water rights for the next three years as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no irrigation programs whose water quality values would be impacted by exercising underground water rights over the next three years. The physical environment, habitat types, landforms, soil type, current and future land use precludes irrigation.

D.6.2.ii. Bridgeport have assessed the likelihood of irrigation environmental values being impacted by the exercise of underground water rights for the life of the project as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no irrigation programs whose water quality values would be impacted by exercising underground water rights over the life of the project. The physical environment, habitat types, landforms, soil type, current and future land use precludes irrigation.

D.7 Farm water supply/use

Definition: Suitability of domestic farm water supply, other than drinking water. For example, water used for laundry and produce preparation.

UWIR requirements

D.7.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.7.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no domestic farm facilities that consume water from Bridgeport operations, or are affected by the exercise of water extraction within Bridgeport tenements.

Bridgeport Risk Allocation

D.7.1. Bridgeport have assessed the likelihood of farm water supply/use values being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no farms that are dependent on water supply or water quality values that would be impacted by previous exercise of underground water rights.

D.7.2.i. Bridgeport have assessed the likelihood of farm water supply/use values being impacted by the following three years of exercising of underground water rights as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no farms that are dependent on water supply or water quality values that would be impacted by future exercise of underground water rights for three years.

D.7.2.ii. Bridgeport have assessed the likelihood of farm water supply/use values being impacted by the exercising of underground water rights for the remainder of the project life as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no farms that are dependent on water supply or water quality values that would be impacted by future exercise of underground water rights for remainder of the project’s life.

D.8 Stock watering

Definition: Suitability of water supply for production of healthy livestock.

UWIR requirements

D.8.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.8.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

A majority of wells that are installed to provide livestock watering access the Winton Formation. The majority of these wells are drilled to a depth not exceeding 100 m. In general, groundwater take within this management area is relatively limited, as these are not actively pumped. Many bores have also been abandoned and decommissioned since drilling.

It is highly unlikely the extraction of water from Bridgeport targeted formations (> 1400 m below ground) would influence shallower formations < 100 m deep due to geological barriers to free flow factors limiting the movement of water between such depths. Bridgeport also protects shallower aquifers and reservoirs by installing cemented steel casing in our production wells, and testing and validating the integrity of the boreholes using wireline logging assessment/sono-log recordings. There is an also extremely restrictive geological boundaries between the lower targeted formations and higher freshwater targeted aquifers.

Bridgeport Risk Allocation

D.8.1. Bridgeport have assessed the likelihood of livestock water supply/use values being impacted by the previous exercise of underground water rights as a Likelihood of E, or Rare, with the explanation being (1) Foreseeable but not normally expected to occur. The consequence of impact is Minor, leading to a Low risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no impacts to livestock from previous exercise of underground water rights, barriers both natural (geological) and engineered (concrete and steel) casing preventing resource extraction from impacting the much higher and distinct targeted aquifers of landholders.

D.8.2.i. Bridgeport have assessed the likelihood of livestock water supply/use values being impacted by the future three years of exercising underground water rights as a Likelihood of E, or Rare, with the explanation being (1) Foreseeable but not normally expected to occur. The consequence of impact is Minor, leading to a Low risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no impacts to livestock from previous exercise of underground water rights (no change to the proposed activities which previously occurred either), barriers both natural (geological) and engineered (concrete and steel casing) preventing resource extraction from impacting the much higher and distinct targeted aquifers of landholders.

D.8.2.ii. Bridgeport have assessed the likelihood of livestock water supply/use values being impacted over the remaining life of the project, and its exercising underground water rights as a Likelihood of E, or Rare, with the explanation being (1) Foreseeable but not normally expected to occur. The consequence of impact is Minor, leading to a Low risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no impacts to livestock from previous exercise of underground water rights (no change to the proposed activities which previously occurred either), barriers both natural (geological) and engineered (concrete and steel) casing preventing resource extraction from impacting the much higher and distinct targeted aquifers of landholders.

D.9 Human consumers of aquatic foods

Definition: The suitability of the water for producing aquatic foods for human consumption such as fish, crustaceans and shellfish from natural waterways.

UWIR requirements

D.9.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.9.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

The predominant land use during and after petroleum operations will be broad acre marginal/extensive sheep and cattle grazing of remnant native vegetation. There is no aquaculture, mariculture, or freshwater fisheries within or in proximity to the Bridgeport Inland tenement.

Bridgeport Risk Allocation

D.9.1. Bridgeport have assessed the likelihood of irrigation aquatic food values being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no aquaculture programs whose water quality values would be impacted by previous operators exercising underground water rights.

D.9.2.i. Bridgeport have assessed the likelihood of aquatic food values being impacted by the exercise of underground water rights for the next three years as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no aquaculture programs whose water quality values would be impacted by exercising underground water rights over the next three years.

D.9.2.ii. Bridgeport have assessed the likelihood of aquatic food values being impacted by the exercise of underground water rights for the life of the project as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no aquaculture programs whose water quality values would be impacted by exercising underground water rights over the life of the project.

D.10 Primary recreation

Definition: Means a use that involves the following types of contact with the water—full body contact, frequent immersion by the face and trunk, frequent contact with spray by the face where it is likely some water will be swallowed or inhaled, or come into contact with ears, nasal passages, mucous membranes or cuts in the skin e.g. diving, swimming, surfing.

UWIR requirements

D.10.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.10.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no primary recreation activities that take place within or near the Bridgeport's Inland tenement. There is no immersive swimming, frequent bodily contact, inhalation or contact with products related to or impacted by, the exercise of underground water rights.

Bridgeport Risk Allocation

D.10.1. Bridgeport have assessed the likelihood of primary recreation values being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no primary recreational areas in any proximity to areas impacted by previous operators exercising underground water rights.

D.10.2.i. Bridgeport have assessed the likelihood of primary recreation values being impacted by the following three-year period exercising of underground water rights as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there will be no primary recreational areas in any proximity to areas impacted by operators exercising underground water rights over the next three years.

D.10.2.ii. Bridgeport have assessed the likelihood of primary recreation values being impacted by exercising of underground water rights for the life of the project as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there will be no primary recreational areas in any proximity to areas impacted by operators exercising underground water rights, at any time during the life of the project.

D.11 Secondary recreation

Definition: Means a use that involves the following types of contact with the water—contact in which only the limbs are regularly wet, and other contact, including the swallowing of water, is unusual (examples—boating, fishing, wading) or occasional inadvertent immersion resulting from slipping or being swept into the water by a wave.

UWIR requirements

D.11.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.11.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no secondary recreation activities that take place within or near the Bridgeport Inland tenement. There is no boating, fishing or wading commonly occurring, nor occasional incidental contact with products related to or impacted by, the exercise of underground water rights.

Bridgeport Risk Allocation

D.11.1. Bridgeport have assessed the likelihood of secondary recreation values being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no secondary recreational areas in any proximity to areas impacted by previous operators exercising underground water rights.

D.11.2.i. Bridgeport have assessed the likelihood of secondary recreation values being impacted by the following three-year period exercising of underground water rights as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there will be no secondary recreational areas in any proximity to areas impacted by operators exercising underground water rights over the next three years.

D.11.2.ii. Bridgeport have assessed the likelihood of secondary recreation values being impacted by exercising of underground water rights for the life of the project as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there will be no secondary recreational areas in any proximity to areas impacted by operators exercising underground water rights, at any time during the life of the project.

D.12 Visual recreation

Definition: Means a use that does not ordinarily involve any contact with the water—for example angling from the shore, sunbathing near water.

UWIR requirements

D.12.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.12.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no visual recreation activities that take place within or near the Bridgeport Inland tenement. There is no recreational activities or amenities near these tenements, especially none that are related to or impacted by, the exercise of underground water rights. There is no incidental tourism, as this field is isolated on private property.

Bridgeport Risk Allocation

D.12.1. Bridgeport have assessed the likelihood of visual values being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no visual recreational areas in any proximity to areas impacted by previous operators exercising underground water rights.

D.12.2.i. Bridgeport have assessed the likelihood of visual recreation values being impacted by the following three-year period exercising of underground water rights as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there will be no visual recreational areas in any proximity to areas impacted by operators exercising underground water rights over the next three years.

D.12.2.ii. Bridgeport have assessed the likelihood of visual recreation values being impacted by exercising of underground water rights for the life of the project as a Likelihood of F, or Incapable of Occurring, with the Explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there will be no visual recreational areas in any proximity to areas impacted by operators exercising underground water rights, at any time during the life of the project.

D.13 Drinking water supply

Definition: Suitability of the water for supply as drinking water having regard to the level of treatment of the water.

UWIR requirements

D.13.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.13.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

Having regard for the treatment of water, no water is sourced from or near the Inland tenement. Any local landholder bores are extremely shallow, and access water from bores less than 50 m deep, far removed from the greater than 1,300 m petroleum wells (as detailed in appropriate sections earlier in this document), and such wells are not impacted.

Bridgeport Risk Allocation

D.13.1. Bridgeport have assessed the likelihood of drinking water being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no drinking water or treatment facilities whose water quality values that would be impacted by previous operators exercising underground water rights.

D.13.2.i. Bridgeport have assessed the likelihood of drinking water being impacted in the next three years as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no drinking water or treatment facilities whose water quality values that would be impacted by exercising underground water rights for a further three years.

D.13.2.ii. Bridgeport have assessed the likelihood of drinking water being impacted over the remaining life of the project as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no drinking water or treatment facilities whose water quality values that would be impacted by exercising underground water rights for the remaining years of the project.

D.14 Industrial use

Definition: Suitability of water supply for industrial purposes, for example, food, beverage, paper, petroleum and power industries, mining and minerals refining/processing. Industries usually treat water supplies to meet their needs.

UWIR requirements

D.14.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.14.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

There are no alternate industries in or near the Bridgeport tenements that relate to this UWIR. There are no food or beverage manufacturers, no power producers, light or commercial industrial groups. The predominant land use during and after petroleum operations will be broad acre marginal/extensive sheep and cattle grazing of remnant native vegetation. There will be no pasture, cropping or (very likely) any other commercial activities.

Bridgeport Risk Allocation

D.14.1. Bridgeport have assessed the likelihood of industrial uses being impacted by the previous exercise of underground water rights as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no industrial uses or programs whose water quality values would be impacted by previous operators exercising underground water rights.

D.14.2.i. Bridgeport have assessed the likelihood of irrigation industrial uses being impacted by the exercise of underground water rights for the next three years as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no industrial uses or programs whose water quality values would be impacted by exercising underground water rights over the next three years.

D.14.2.ii. Bridgeport have assessed the likelihood of industrial use values being impacted by the exercise of underground water rights for the life of the project as a Likelihood of F, or Incapable of Occurring, with the explanation being (2) Impossible to occur physically. The consequence of impact is Insignificant, leading to a No risk consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring) and escalate risk level if appropriate. This conclusion is appropriate because there are currently no there are currently no industrial uses or programs whose water quality values would be impacted by exercising underground water rights over the life of the project.

D.15 Cultural and spiritual values

> **Definition:** Means scientific, social or other significance to the present generation or past or future generations, including Aboriginal people or Torres Strait Islanders.
>
> • custodial, spiritual, cultural and traditional heritage, hunting, gathering and ritual responsibilities
>
> • symbols, landmarks and icons (such as waterways, turtles and frogs)
>
> • lifestyles (such as agriculture and fishing).

UWIR requirements

D.15.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.15.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

Bridgeport Energy's Inland tenement overlays a single Native Title claim by the Mithaka People. Their claim is represented by a classification by the Aboriginal and Torres Strait Islander Partnerships Tribunal Number (QC6033/2002). The Native Title claims are represented graphically over the Inland tenement in Figure 22.

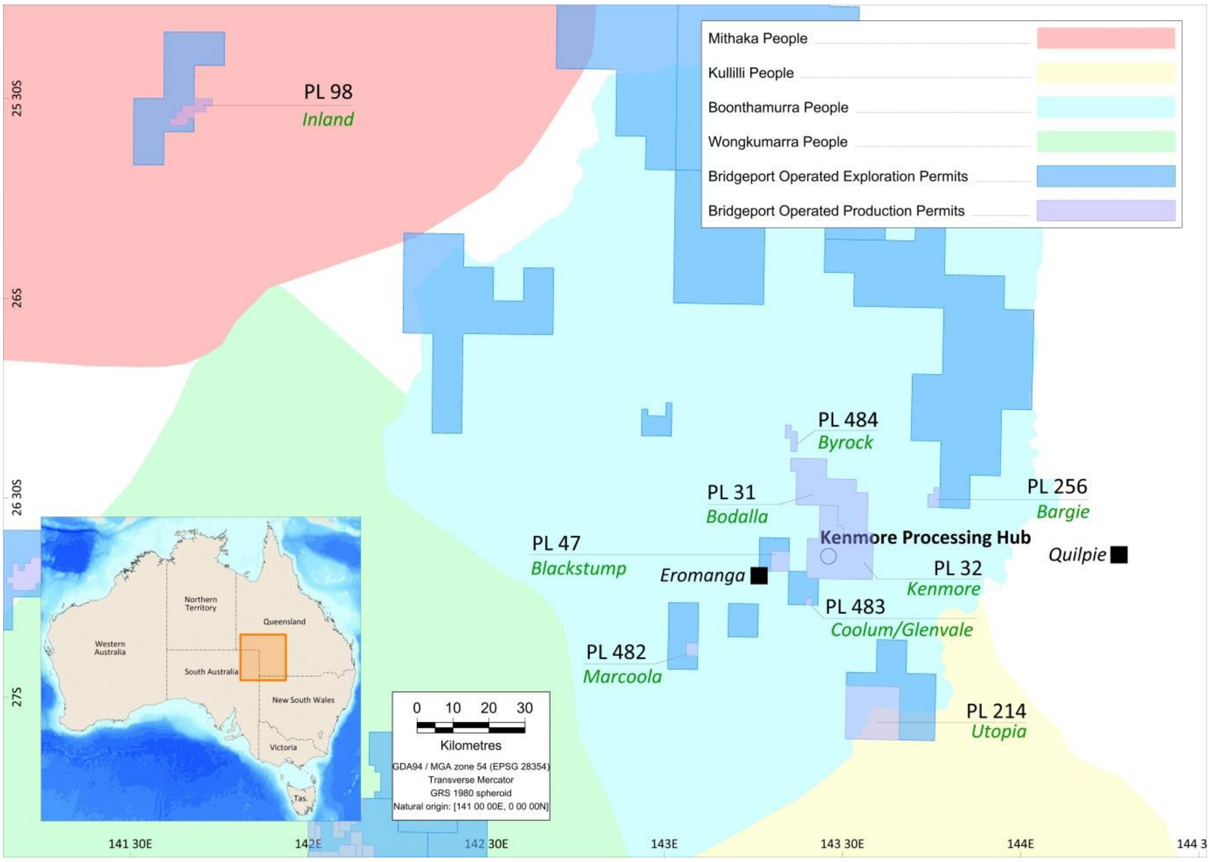


Figure 22: The Native Title claim to the Inland PL 98 tenement is the Mithaka People (light red).

Bridgeport Energy have a Native Title Policy that guides staff and contractors on their awareness and treatment of Aboriginal culture heritage, as well as a Cultural Heritage Management Plan with the Mithaka People that guide our working relationship and decisions on key areas of interest to both parties.

Regardless of these technical/legal agreements, Bridgeport are aware of the potential for cultural heritage points and areas to reside within the area of our lease, and potentially outside the direct leases and into areas potentially impacted by our water extraction. Bridgeport are actively engaged with protecting this cultural heritage wherever possible.

The potential impacts to cultural heritage as a result of exercising underground water rights, in the past and into the future, would primarily be the physical disturbance to surface cultural heritage, including physical objects/features (e.g. artefacts). This physical disturbance is avoided by applying industry best-practice and the processes agreed to by the Mithaka

People, for cultural clearance prior to any disturbance to undisturbed/previously uncleared areas.

These impacts could potentially occur any time physical disturbance is undertaken on Bridgeport tenements, which includes the three-year period and the projected life of the resource tenure.

To describe some of the registered physical cultural heritage recorded on the Inland tenement, a group tenement search was requested and provided by the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register. All tenement searches were requested with a 5 km radius buffer around the tenement boundary.

Table 20: Tenement Search request by Queensland Government Department of Aboriginal and Torres Strait Islander Partnerships.

Tenement	A&TSI Cultural Heritage Site Points	A&TSI Cultural Heritage Polygons	Figure Reference
PL 98	No	No	Figure 23

There were no cultural heritage bodies, no Designated Landscape Areas (DLA) and no Registered Cultural Heritage Study Areas recorded in this tenement's boundaries (or within the buffer zone).

Bridgeport are aware of other significant Aboriginal cultural heritage features could be within the region. Water extraction does not nor will affect these directly or indirectly, for either the three-year period or for the life of the tenure. No physical harm comes to these features as a result of the current petroleum activities or the associated water extraction.

A Register of National Estate (RNE) was a register of places throughout Australia, including Commonwealth heritage places of local and state significance. Sections within the *Environment Protection and Biodiversity Conservation Act* (1999) and the *Australian Heritage Council Act 2003* referring to the RNE have since been repealed and the register closed. Within the closed register, you can still search lists including the National Heritage Register, World

Heritage Register, and the Commonwealth Heritage Register. There were no identified areas of heritage within the register around the closest township, which is Quilpie.

The following cultural heritage points have been registered and are provided by the Aboriginal and Torres Strait Islander Cultural Heritage Database and Register.

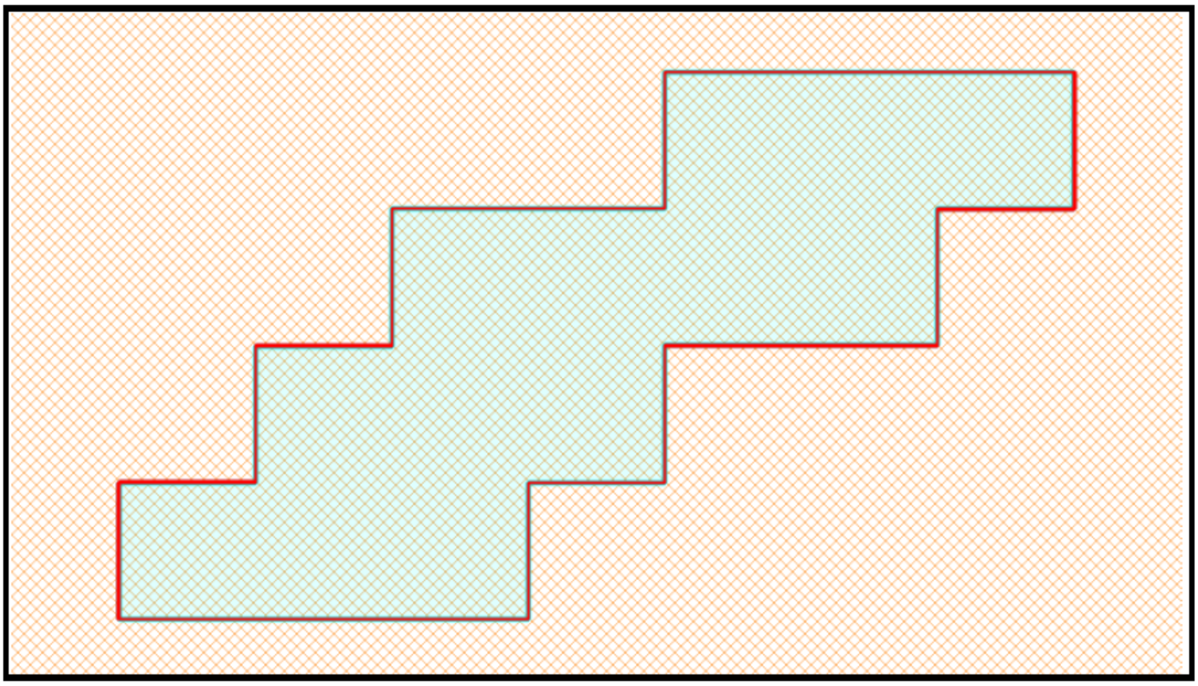


Figure 23: Cultural heritage points around the PL 98 boundary, 5 km buffer zone.

The above description of physical places of cultural significance indicate there are very limited areas of cultural importance/value (that have been registered) in relation to the surface area of these tenements and surrounding areas. This does not mean there are no culturally significant areas, and any new disturbance to ground is still cleared by the appropriate Mithaka Peoples representative.

The impact to these cultural values for the remainder of project life has been and will be reduced by appropriate Aboriginal Cultural Heritage clearance and management procedures prior to physical disturbance.

Bridgeport Risk Allocation

D.15.1. Bridgeport have assessed the likelihood of Cultural and spiritual values being impacted by the previous exercise of underground water rights as a Likelihood of E, or Rare, with the explanation being (1) Foreseeable but not normally expected to occur. The consequence of impact is High, leading to a Medium consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring), review for effectiveness and escalate risk level if appropriate. This conclusion is appropriate because there has been appropriate safeguards in place to review cultural and spiritual values prior to any physical activity taking place (e.g. cultural heritage clearance by appropriate Native Title groups).

D.15.2.i. Bridgeport have assessed the likelihood of Cultural and spiritual values being impacted by the exercise of underground water rights for the following three years as a Likelihood of E, or Rare, with the explanation being (1) Foreseeable but not normally expected to occur. The consequence of impact is High, leading to a Medium consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring), review for effectiveness and escalate risk level if appropriate. This conclusion is appropriate because there has and always will be appropriate safeguards in place to review cultural and spiritual values prior to any additional physical activity taking place (e.g. cultural heritage clearance by appropriate Native Title groups).

D.15.2.ii. Bridgeport have assessed the likelihood of Cultural and spiritual values being impacted by the exercise of underground water rights for the life of the project as a Likelihood of E, or Rare, with the explanation being (1) Foreseeable but not normally expected to occur. The consequence of impact is High, leading to a Medium consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring), review for effectiveness and escalate risk level if appropriate. This conclusion is appropriate because there has and always will be appropriate safeguards in place to review cultural and spiritual values prior to any additional physical activity taking place (e.g. cultural heritage clearance by appropriate Native Title groups) for the remainder of the project life.

D.16 Environmental Sensitive Areas (ESAs)

Definition: ESAs are areas of habitat, described as important for key ecological functions in legislation (e.g. Nature Conservation Act 1994, Marine Parks Act 2004, etc.). ESAs are split into two categories, Category A and Category B, and the appropriate formal definition can be found in the Environment Protection Regulation (2019).

UWIR requirements

D.16.1. A description of the impacts of environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights (section 376(da) of the Water Act);

D.16.2. An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights (section 376(db) of the Water Act);

i. For a three-year period starting on the consultation day for the report; &

ii. Over the projected life of the resource tenure.

Description

Bridgeport used the Queensland Governments' Department of Environment and Sciences' website to update (2021) the geographic extent of the Inland tenement boundary in relation to environmentally sensitive areas (ESAs).

1: Environmentally Sensitive Areas (ESAs) – non-mining resource activities

Environmentally sensitive areas (ESAs) are defined in the *Environmental Protection Regulation (2019)* (Schedule 19, Part 1, Section 2), and can be related to EVs. There are multiple Categories of ESA, category A and B. The most applicable ESAs relating to Bridgeport tenements (including PL 98) include;

(a) any of the following areas under the Nature Conservation Act (1992)

i. a coordinated conservation area (e.g. conservation park, national park, marine park etc.);

ii. an area of critical habitat or major interest identified under a conservation plan;

iii. an area subject to an interim conservation order;

(b) an area subject to the following conventions to which Australia is a signatory

i. the 'Convention on the Conservation of Migratory Species of Wild Animals' (Bonn, 23 June 1979);

ii. the 'Convention on Wetlands of International Importance, especially as Waterfowl Habitat' (Ramsar, Iran, 2 February 1971);

iii. the 'Convention Concerning the Protection of the World Cultural and Natural Heritage' (Paris, 23 November 1972);

(e) the following under the Queensland Heritage Act 1992

i. a place of cultural heritage significance;

ii. a Queensland heritage place, unless there is an exemption certificate issued under that Act;

(f) an area recorded in the Aboriginal Cultural Heritage Register established under the Aboriginal Cultural Heritage Act 2003, section 46, other than the area known as the 'Stanbroke Pastoral Development Holding', leased under the Land Act 1994 by lease number PH 13/5398;

(g) a feature protection area, State forest park or scientific area under the Forestry Act 1959;

(h) a declared fish habitat area under the Fisheries Act 1994;

(j) an endangered regional ecosystem identified in the database known as the 'Regional ecosystem description database' published on the department's website.

The Queensland Government Department of Environment and Sciences' Maps of environmentally sensitive areas webpage has a feature where maps can be downloaded with ESAs, relevant to specific resource authority boundaries (in this instance, petroleum leases). Bridgeport downloaded Petroleum lease maps [https://environment.des.qld.gov.au/management/maps-of-environmentally-sensitive-areas] accessed in 2021.

These maps have a single ESA category within the boundaries of the Inland tenements, that is the “Of concern Regional Ecosystems (remnant biodiversity status)” layer, which is categorised as Category C. A regional ecosystem is classified as category C under the Environment Protection Act (1994) if remnant vegetation is 10-30% of its pre-clearing extent across the bioregion. This Category C mapping is considered indicative only.

The largest contributor to the general ecosystems, biology and vegetation remaining across these tenements is climate, rainfall and existing land use. The low general rainfall, extremely dry and extreme climate reduce the abundance and diversity of the species and habitats that can survive across the region. Further restricting the ecosystems that are present, their health and abundance is heavily impacted by the surrounding and predominant land use, broad acre grazing. Broad acre grazing is where large, unrestricted acreage is freely opened to extreme numbers of domestic hard-hooved animals such as cattle and sheep. The un-controlled and vast nature of the land, as well as the readily accessible watering points for domestic animals, allows introduced species such as horses, goats and pigs to thrive, who also heavily impact the surrounding ecosystems negatively, by over grazing, destructive grazing and habitat destruction.

As evidenced by these maps, no category A (e.g. National or Conservation Parks) or Category B (e.g. heritage, special habitat) areas occur within or in proximity to the Inland tenement.

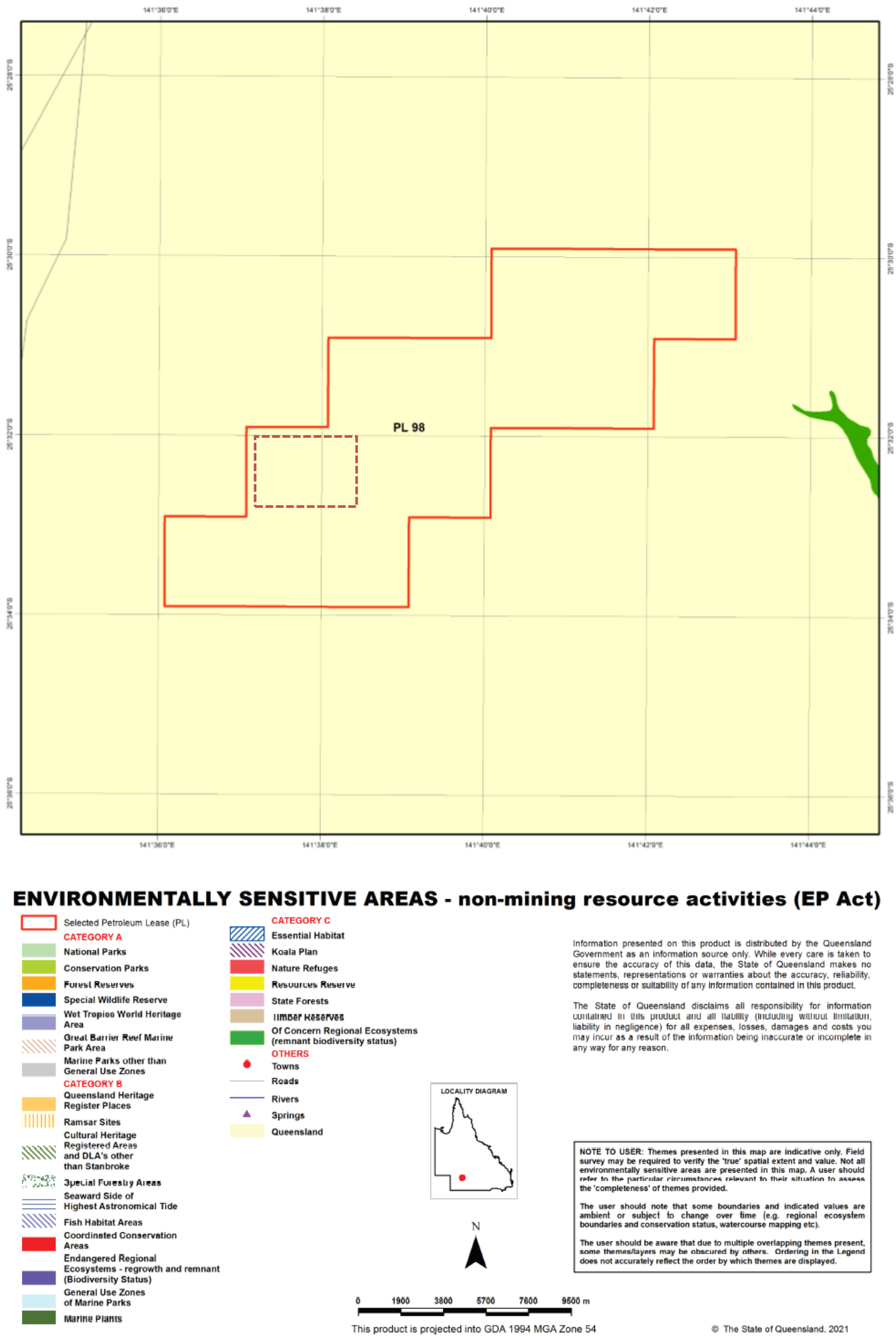


Figure 24: Environmentally sensitive areas around the petroleum lease PL 98.

In order to provide the Department an indication of the much broader context in which water extraction and petroleum related activities occur, several of the most relevant ESAs were explored using shapefiles downloaded from Queensland Government's QSpatial webpage [http://qldspatial.information.qld.gov.au/catalogue/custom/index.page] and added to a graphic below. The following layers were downloaded and compared in context against the Inland tenement (Figure 25) for this UWIR.

Shapefiles include:

- Coordinated conservation areas – Queensland
- Special wildlife reserves
- Nature refuges – Queensland
- Protected areas of Queensland
- Ramsar sites
- Fish habitat areas

None of these layers overlap with the Bridgeport Inland tenement (Figure 25). There is over 150 km between Inland production facility and the Protected Area ESA. None of these layers would affect or potentially affected by the water extraction within Inland.

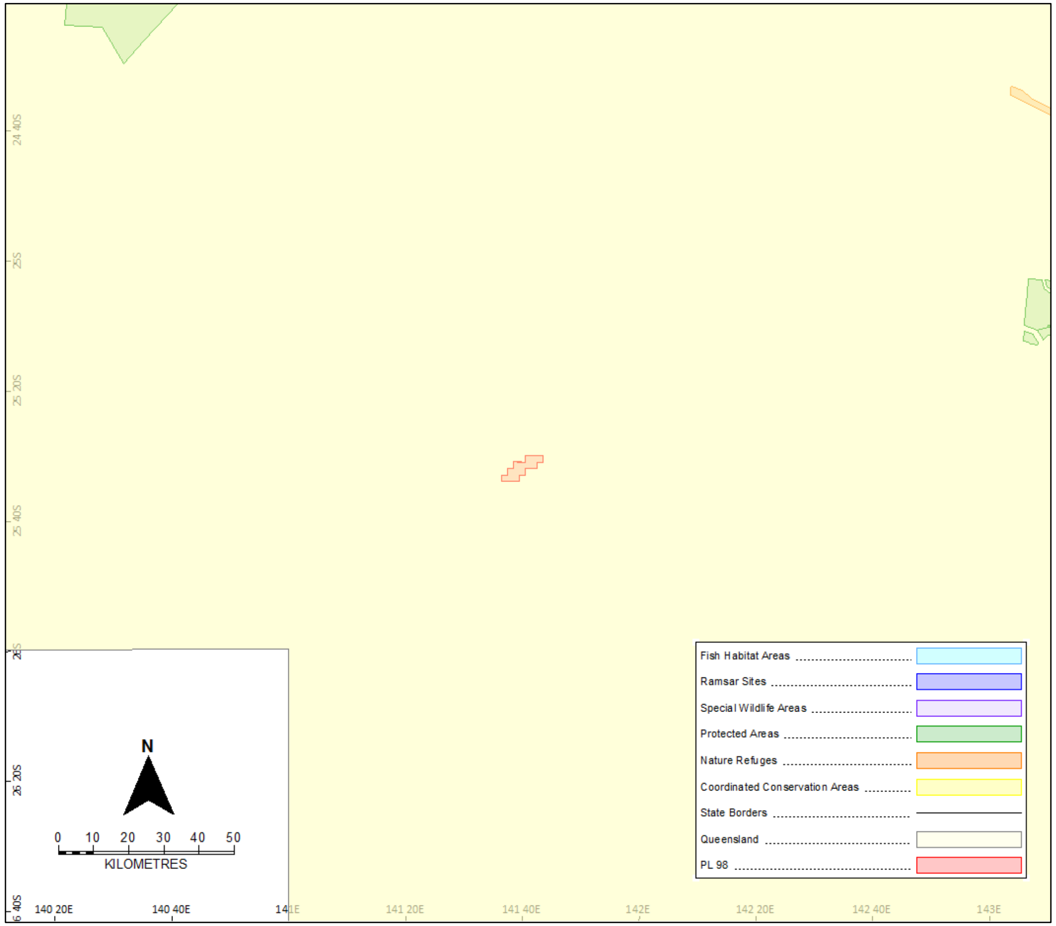


Figure 25: Relevant conservation layer ESAs compared to the Inland tenement boundary, none of which overlap, or occur within a 100 km radius.

Additional descriptions of environmentally relevant activities and or layers have been extracted for the Inland tenement from the Queensland Government.

2: Environmentally Sensitive Areas (Category A, B & C Vegetation) under the Environmental Protection Regulation (2008)

At the PL 98 Inland tenement, there are few habitat types. This is because the majority of the surface area has been previously disturbed (cleared) and the ongoing continued land use is marginal extensive grazing.

To provide a description of the land and ecosystems on which our petroleum activities occur, we use mapping data from the State of Queensland. The State has mapped broad regional ecosystems, defined by vegetation communities that are consistently associated with a combination of geology, landform and soil type. Within these regional ecosystems, there can be numerous vegetation types. Bridgeport describe the vegetation communities, and then the broad vegetation groups (BVGs) that are mapped (summarised in the following tables).

Within PL 98 Inland, the regional ecosystems include; (16c) *Eucalyptus coolabah* (Coolibah) or *E. microtheca* or *E. largiflorens* (black box) or *E. tereticornis* (blue gum) woodlands, (26a) *Acacia cambagei* (gidgee) or *A. georginae* (Georgina gidgee) or *A. argyrodendron* (blackwood) open-forests to tall shrublands, (30b) Tussock grasslands dominated by *Astrebla* spp. (Mitchell grass) or *Dichanthium* spp. (bluegrass) often with *Iseilema* spp. on undulating downs or clay plains, (24a) *Acacia* spp. low woodlands to tall shrublands on residuals, (31a) Open forblands to open tussock grasslands which may be composed of *Atriplex* spp. (Saltbush), *Sclearolaena* spp. (burr), *Asteraceae* spp. and/or short grasses on alluvial plains, (31b) short grass/forbe associations on stony downs, and (non-rem) or non-remnant (basically no defined remnant) vegetation groups. References to these groups can be found in The Vegetation of Queensland, Descriptions of Broad Vegetation Groups (Version 4.0) by Nelder et al. (2019).

Within these regional ecosystems, there are broad vegetation groups (BVGs) which are too numerous to mention. They predominantly included *Eucalyptus camaldulensis* (Coolabah), *E. ochrophloia* (Yapunyah), *Acacia aneura* (Mulga) and *A. cambagei* (Gidgee). A detailed summary of each vegetation group is summarised in Table 21.

Table 21: Regional ecosystems in PL 98, including Major Vegetation Group (MVG), broad vegetation group (BVG) and component regional ecosystems.

BVG (BVG1M)	BVG Short Description	Regional Ecosystem	Component Regional Ecosystem Short Description	Vegetation Management Act Class	Biodiversity Status
5.9.2	*Senna artemisioides* subsp. *helmsii* +/- *Senna artemisioides* subsp. *oligophylla* +/- *Acacia georginae* +/- *Acacia* spp. open shrubland on Cambrian limestone	26a	Open forbelands to open tussock grasslands	Least Concern	No concern at present
5.9.3	Astrebla spp. +/- short grasses +/- forbs open herbland on Cretaceous sediments	30b	Tussock grasslands	Least Concern	No concern at present
5.3.21a	*Astrebla* spp. +/- short grasses +/- forbs open herb land on Cretaceous sediments	26a	Open forbelands to open tussock grasslands	Least Concern	No concern at present
		16a	Open forests and woodlands dominated by *Eucalyptus*		
5.3.7	*Eucalyptus coolabah* +/- *Lysiphyllum gilvum* +/- *Acacia stenophylla* +/- *Acacia cambagei* low open woodland on major channels	30b	Tussock grasslands	Least Concern	No concern at present
5.5.4	*Acacia sibirica* +/- *Acacia aneura* +/- *Corymbia* spp. open shrubland on Quaternary sediments	24a	Low woodlands to tall shrublands dominated by *Acacia* spp. on residuals	Least Concern	No concern at present
		31a	Open forbelands to open tussock grasslands		

The majority of the surface area within Bridgeport Energy tenements is dominated by the Least Concern open forbelands, tussock grasslands and low woodlands.

This geospatial information was accessed and retrieved from the Queensland Spatial Catalogue [http://qldspatial.information.qld.gov.au/catalogue] and edited in available software to further clarify the location of our physical assets.

3: Matters of Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act* (1999)

To determine Matters of Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act* (1999), the Australian Federal Governments Protected Matters Interactive Search Tool (*the tool)* was used. A radius was extended from a central coordinate within the PL 98 Inland tenement, to cover a 15 km search radius from the central point. The tool provides information and details of all matters of national environmental significance overlapping the user defined search area. This includes threatened species, and those listed under the *Environmental Protection and Biodiversity Conservation Act* (1999). The tool lists all matter which "*may occur in, or may relate to*" the search area, so this resource is an indicative tool only. Regarding threatened species, the tool compares the search area to known distribution ranges for each species, categorised as "Species or species habitat *likely* to occur" and "Species or species habitat *may* occur" within the search area. The species listed below may or may not occur within Bridgeport tenements, and local knowledge should be applied with the information from the tool.

The search using the MNES tool details Wetlands of National Environmental Significance and Wetlands of International Importance (Ramsar). There is one wetland in proximity to PL 98 Inland, 150 - 200 km upstream of the tenement. The wetland is known as Coongie Lakes.

Table 22: A list of Wetlands of International Importance (Ramsar listed), surrounding PL 98 Inland.

Wetland		
Wetland Name	**Status**	**Proximity**
Coongie Lakes	Ramsar Listed	150 - 200 m (Upstream)

To Bridgeport's knowledge, there has been no record of a threatened species observed on PL 98. Threatened species and their status under the *Environment Protection and Biodiversity Conservation Act* (1999). A list of the threatened species distributions which may occur within and surrounding PL 98 are listed in Table 23. The list includes birds, mammals, vegetation, fish and reptiles. To our knowledge, none of these species occur within PL 98 and the petroleum operations do not impact on this habitat.

Table 23: A list of Threatened Species surrounding PL 98 Inland.

Species		
Species Name	**Status**	**PL 98**
Birds		
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered	√
Grey Falcon *(Falco hypoleucos*)	Vulnerable	√
Painted Honeyeater (*Grantiella picta*)	Vulnerable	√
Plains-wanderer (*Pedionomus torquatus*)	Critically Endangered	√
Night Parrot (*Pezoporus occidentalis*)	Endangered	√
Australian Painted Snipe (*Rostratila australis*)	Endangered	√
Mammals		
Kowari, Brushy-tailed Rat (*Dasuroides byrnie*)	Vulnerable	√
Greater Bilby (*Macrotis lagotis*)	Vulnerable	√
Dusky Hopping-Mouse (*Notomys fuscus*)	Vulnerable	√
Yellow-footed Rock Wallaby (*Petrogale xanthopus celeris*)	Vulnerable	√
Vegetation		
Waddi (*Acacia peuce*)	Vulnerable	√
Sea Heath (*Frankenia plicata*)	Endangered	√
Brigalow (*Sclerolaena walker*)	Vulnerable	√

The region is less important for migratory species, as the evaporation ponds are quite limited in surface area. However, there are some listed migratory species which may occur on or near the Inland tenement (as listed under the EPBC Act) (Table 24).

Table 24: A list of Listed Migratory Species surrounding PL 98 Inland.

Species		
Species Name	**Status**	**PL 98**
Marine Birds		
Fork-tailed Swift (*Apus pacificus*)	Threatened	√
Terrestrial Birds		
Grey Wagtail (*Motacilla cinereal*)	Threatened	√
Yellow Wagtail (*Motacilla flava*)	Threatened	√
Wetland Birds		

Common Sandpiper (*Actitis hypoleucos*)	Threatened	√
Sharp-tailed Sandpiper (*Calidris acuminata*)	Threatened	√
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered	√
Pectoral Sandpiper (*Calidris melanotos*)	Threatened	√

The EPBC Act also lists other species, including the threatened species. In the case of the Inland field site, and the 15 km radius from the central point, there are numerous marine species which are listed in Table 25.

Table 25: A list of Threatened Species surrounding PL 98 Inland.

Species		
Species Name	**Status**	**PL 98**
Birds		
Common Sandpiper (*Actitis hypoleucos*)	Threatened	√
Fork-tailed Swift (*Apus pacificus*)	Threatened	√
Great Egret (*Ardea alba*)	Threatened	√
Cattle Egret (*Ardea ibis*)	Threatened	√
Sharp-tailed Sandpiper (*Calidris acuminate*)	Threatened	√
Curlew Sandpiper (*Calidris ferruginea*)	Threatened	√
Pectoral Sandpiper (*Calidris melanotos*)	Threatened	√
Black-eared Cuckoo (*Chrysococcyx osculans*)	Threatened	√
Rainbow Bee-eater (*Merops ornatus*)	Threatened	√
Grey Wagtail (*Motacilla cinerea*)	Threatened	√
Painted Snipe (*Rostratula benghalensis (sensu lato)*)	Threatened	√

There are also numerous invasive species which occur within the area of PL 98 (Table 26). The most observed include the Pig (*Sus scrofa*).

Table 26: A list of Invasive Species surrounding PL 98 Inland.

Invasive Species	
Species Name	**Type of Presence**
Birds	
House Sparrow (*Passer domesticus*)	Species or species habitat may occur within area
Common Starling (*Sturnus vulgaris*)	Species or species habitat may occur within area
Mammals	
Cattle (*Bos taurus*)	Species or species habitat may occur within area
Dromedary Camel (*Camelus dromedaries*)	Species or species habitat may occur within area
Domestic Dog (*Canis lupus*)	Species or species habitat may occur within area
Donkey (*Equus asinus*)	Species or species habitat may occur within area
Horse (*Equus caballus*)	Species or species habitat may occur within area
Cat (*Felis catus*)	Species or species habitat may occur within area

Rabbit (*Oryctolagus cuniculus*	Species or species habitat may occur within area
Pig (*Sus scrofa*)	Species or species habitat may occur within area
Red Fox (*Vulpes Vulpes*)	Species or species habitat may occur within area
Vegetation	
Prickly Acacia (*Acacia nilotica* subsp. *Indica*)	Species or species habitat may occur within area
Buffel Grass (*Cenchrus ciliaris*)	Species or species habitat may occur within area
Parkinsonia (*Parkinsonia aculeatea*)	Species or species habitat may occur within area

This geospatial/distribution information was accessed from the Australian Governments Department of Environment and Energy's Protected Matters Search Tool website (accessed on 17/08/2020 [http://www.environment.gov.au/webgis-framework/apps/pmst/pmst-coordinate.jsf]).

*Environment Protection and Biodiversity Conservation Act 1999.

4: Matters of State Environmental Significance (MNES) under the Environmental Offsets Regulation (2014)

There are no areas that trigger an Offset requirement (Spatial Catalogue layer: MSES_Legally_secured_offset_area__vegetation_offsets.shp) within the boundaries of PL 98.

5: Areas of regional interest under the Regional Planning Interest Act 2014

To determine areas of regional interest under the Regional Planning Interest Act 2014, three layers were surveyed, including Queensland Regional planning interests' Priority living areas, Priority agricultural areas and Strategic Environmental Areas shape files. None of these planning interests overlap PL 98 Inland.

6: Endangered, vulnerable, rare or near threatened wildlife species under the Nature Conservation Act 1992

To determine areas of endangered, vulnerable, rare or near threatened wildlife species under the Nature Conservation Act 1992, layers from the Queensland Spatial Catalogue, including protected areas of Queensland and Nature Refuges Queensland were applied.

None were present within PL 98 Inland.

7: Watercourse, wetlands, springs (including relevant environmental values) or river improvement trust asset areas

Watercourses, wetlands and springs are discussed in appropriate Sections above.

Table 27: Summary of important environmental features of PL 98 Inland, using spatial layering from the DES.

Category	PL 98	GIS data used to determine relevance*
1: Environmentally Sensitive Areas (ESAs) – non-mining resource activities	☑ No ☐ Yes	Queensland Government Department of Environment and Sciences' Maps of environmentally sensitive areas webpage
2: Category A environmentally sensitive areas (ESA) under the Environmental Protection Regulation (2008)	☑ No ☐ Yes	Vegetation_management_regional_ecosystem_map_(Restricted to Eromanga/Cooper Basin)
2: Category B & C environmentally sensitive areas (ESA) under the Environmental Protection Regulation 2008	☑ No ☐ Yes	MSES___Regulated_vegetation___category_B_endangered_or_of_concern.shp) MSES___Regulated_vegetation___category_C_endangered_or_of_concern.shp)
3: Matters of Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act* (1999)	☐ No ☑ Yes	Australian Federal Governments Protected Matters Interactive Search Tool, that provides indicative ranges.
4: Matters of State Environmental Significance (MNES) under the Environmental Offsets Regulation (2014)	☑ No ☐ Yes	Matters of state environmental significance - Legally secured offset area - offset register – Queensland.
5: Areas of regional interest under the *Regional Planning Interest Act* 2014	☑ No ☐ Yes	Regional_planning_interests_Priority_living_area Regional_planning_interests_Priority_agricultural_area Regional_planning_interests_Strategic_environmental_area
6: Endangered, vulnerable, rare or near threatened wildlife species under the *Nature Conservation Act* 1992	☑ No ☐ Yes	Protected_areas (estate) Protected_areas (nature refuges) Nature Conservation Act Protected Plant Species
7: Watercourse, wetlands, springs (including relevant environmental values) or river improvement trust asset areas	☑ No ☐ Yes	Watercourse areas Major watercourse lines Groundwater Dependent Ecosystems (Watercourses) Pondage Water plan (waterholes and lakes) Active Springs Directory of important wetlands Groundwater Dependent Ecosystems (Springs) MSES (high ecological significance wetlands) Watercourse identification map (watercourses) River Improvement Trust Areas (Queensland)

Bridgeport Risk Allocation

D.16.1 Bridgeport have assessed the likelihood of environmentally sensitive areas being impacted by the previous exercise of underground water rights as a Likelihood of E, or Rare, with the explanation being (2) May occur in exceptional circumstances. The consequence of impact is Moderate, leading to a Low consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring), review for effectiveness and escalate risk level if appropriate. This conclusion is appropriate because there are no environmentally sensitive areas that would be impacted on or near Bridgeport tenements, and there has been appropriate safeguards in place to review environmentally sensitive areas prior to any physical activity taking place.

D.16.2.i. Bridgeport have assessed the likelihood of environmentally sensitive areas being impacted by the exercise of underground water rights for the following three years as a Likelihood of E, or Rare, with the explanation being (2) May occur in exceptional circumstances. The consequence of impact is Moderate, leading to a Low consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring), review for effectiveness and escalate risk level if appropriate. This conclusion is appropriate because there are no environmentally sensitive areas that would be impacted on or near Bridgeport tenements, and there has been appropriate safeguards in place to review environmentally sensitive areas prior to any physical activity taking place, and these are not likely to change in the coming three years.

D.16.2.ii. Bridgeport have assessed the likelihood of environmentally sensitive areas being impacted by the exercise of underground water rights for the remaining project period as a Likelihood of E, or Rare, with the explanation being (2) May occur in exceptional circumstances. The consequence of impact is Moderate, leading to a Low consequence level. Actions required from this risk allocation include applying relevant safeguards (e.g. monitoring), review for effectiveness and escalate risk level if appropriate. This conclusion is appropriate because there are no environmentally sensitive areas that would be impacted on or near Bridgeport tenements, and there will likely be no significant change to ESAs in the future of the project.

Environmental Value Conclusions

The PL 98 Inland tenement occurs in a rugged part of south-western Queensland. The land has been influenced by broad scale agricultural land grazing for decades, and as a result, in conjunction with a tough climate, has limited environmental values across a broad area, but also in proximity to petroleum production assets. Whenever there are environmental features and values, these features do not rely on groundwater (e.g. are not groundwater dependent ecosystems). Considering the licenced extraction of water occurs from an isolated region sub 1400 m below the surface, it is geologically and artificially (engineered concrete and steel) separate from the primarily water target in the Winton Formation (sub 100m), which maybe more relevant to any environmental values. As a result, the likelihood of environmental values being impacted are rare, unlikely or incapable of occurring (Table 28).

Table 28: Important environmental sensitive areas and the associated likelihood, consequence and associated environmental risk to Inland, using justifications in individual sections above.

Section	Environmental Value	UWIR Requirement	Likelihood	Consequence	Environmental Risk
D.1	**Aquatic ecosystem**	**D.1.1**	Unlikely	Minor	Low
		D.1.2.i	Unlikely	Minor	Low
		D.1.2.ii	Unlikely	Minor	Low
D.2	**High ecological/conservation value waters**	**D.2.1**	Incapable of occurring	Insignificant	No Risk
		D.2.2.i	Incapable of occurring	Insignificant	No Risk
		D.2.2.ii	Incapable of occurring	Insignificant	No Risk
D.3	**Slightly disturbed waters**	**D.3.1**	Incapable of occurring	Insignificant	No Risk
		D.3.2.i	Incapable of occurring	Insignificant	No Risk
		D.3.2.ii	Incapable of occurring	Insignificant	No Risk
D.4	**Moderately disturbed waters**	**D.4.1**	Incapable of occurring	Insignificant	No Risk
		D.4.2.i	Incapable of occurring	Insignificant	No Risk
		D.4.2.ii	Incapable of occurring	Insignificant	No Risk
D.5	**Highly disturbed waters**	**D.5.1**	Unlikely	Minor	Low
		D.5.2.i	Unlikely	Minor	Low
		D.5.2.ii	Unlikely	Minor	Low
D.6	**Irrigation**	**D.6.1**	Incapable of occurring	Insignificant	No Risk
		D.6.2.i	Incapable of occurring	Insignificant	No Risk
		D.6.2.ii	Incapable of occurring	Insignificant	No Risk
D.7	**Farm water supply/use**	**D.7.1**	Incapable of occurring	Insignificant	No Risk
		D.7.2.i	Incapable of occurring	Insignificant	No Risk
		D.7.2.ii	Incapable of occurring	Insignificant	No Risk

D.8	**Stock watering**	**D.8.1**	Rare	Minor	Low
		D.8.2.i	Rare	Minor	Low
		D.8.2.ii	Rare	Minor	Low
D.9	**Human consumers of aquatic foods**	**D.9.1**	Incapable of occurring	Insignificant	No Risk
		D.9.2.i	Incapable of occurring	Insignificant	No Risk
		D.9.2.ii	Incapable of occurring	Insignificant	No Risk
D.10	**Primary recreation**	**D.10.1**	Incapable of occurring	Insignificant	No Risk
		D.10.2.i	Incapable of occurring	Insignificant	No Risk
		D.10.2.ii	Incapable of occurring	Insignificant	No Risk
D.11	**Secondary recreation**	**D.11.1**	Incapable of occurring	Insignificant	No Risk
		D.11.2.i	Incapable of occurring	Insignificant	No Risk
		D.11.2.ii	Incapable of occurring	Insignificant	No Risk
D.12	**Visual recreation**	**D.12.1**	Incapable of occurring	Insignificant	No Risk
		D.12.2.i	Incapable of occurring	Insignificant	No Risk
		D.12.2.ii	Incapable of occurring	Insignificant	No Risk
D.13	**Drinking water supply**	**D.13.1**	Incapable of occurring	Insignificant	No Risk
		D.13.2.i	Incapable of occurring	Insignificant	No Risk
		D.13.2.ii	Incapable of occurring	Insignificant	No Risk
D.14	**Industrial use**	**D.14.1**	Incapable of occurring	Insignificant	No Risk
		D.14.2.i	Incapable of occurring	Insignificant	No Risk
		D.14.2.ii	Incapable of occurring	Insignificant	No Risk
D.15	**Cultural and spiritual values**	**D.15.1**	Rare	High	Medium
		D.15.2.i	Rare	High	Medium
		D.15.2.ii	Rare	High	Medium

D.16	**Environmentally Sensitive Areas**	**D.16.1**	Rare	Moderate	Low
		D.16.2.i	Rare	Moderate	Low
		D.16.2.ii	Rare	Moderate	Low

Part E*: Water monitoring strategy

Requirements under section 378 of the Water Act
To meet the requirements of the Water Act, an UWIR must include the following; 1. *A rationale for the strategy* 2. *A timetable for strategy* 3. *The parameters to be measured* 4. *The locations for taking measurements* 5. *The frequency of the measurements* 6. *A program for the responsible tenure holder or holders to undertake a baseline assessment for each water bore that is outside the area of a resource tenure, but within the predicted LTAA; and* 7. *A program for reporting to the OGIA about the implementation of the monitoring strategy.*

*Part E refers to Section 5.1.5 (page 22) of the guideline (DES 2017).

Bridgeport provides the following detail to form the basis of a groundwater monitoring strategy, which includes parameters, locations and frequency to help define and inform the program.

Regional Groundwater Monitoring (~all well target depth TD)

The requirement to develop a monitoring strategy (s378) is detailed in the following section. The plan considers and matches the monitoring plans put forth by Beach Energy and Bridgeport in other UWIRs, matching best practice and suitable to historic brown fields operations.

Shut-in wellhead pressure will be monitored in across the fields in a series of wells. Shut-in tubing head pressure (SITHP) is taken and extrapolated to determine reservoir pressure (and therefore water level).

Well selection is based on position within the field, as well as target formation. There are six wells perforated in the Hutton which can be tested at Inland. Two wells are perforated into the McKinlay (Table 29).

Table 29: Shut-in wells in the Hutton (Inland) that will be monitored for shut-in well head pressure.

Inland (Hutton)	Inland (McKinlay)
Inland – 1	Inland - 5
Inland – 2	Inland - 18
Inland – 3	
Inland – 10	
Inland – 14	
Inland – 20	

Production volume monitoring strategy

Production monitoring occurs regularly through the production separator and testing facilities. Production from a single well is isolated into a test tank, where a volumetric measure is recorded over a period of time (usually 24 hours). Once this measure is taken, production per hour can be calculated, and applied to the well for all uptime hours over any given period. Wells are regularly tested on an ad-hoc or as needs basis. This data can then be compiled over any required timeframe.

Frequency of Measurements

Shut-in tubing head pressure will be monitored quarterly. Any influence on the groundwater system is extremely slow acting, which supports this monitoring schedule.

Significant changes in the reservoir pressure can infer changes in well bore conditions or reservoir conditions. The SITHP will be assessed against the previous monitoring figures every quarter, to be reported in the annual updates.

Each annual update and three yearly reports will include;

- A summary of the previous (12 or 36 months) monitoring data
- Assessment of monitoring program (applicability, improvements)
- Results review

Rationale for Strategy

The Cooper-Eromanga Basin is extremely large, extremely slow acting hydrogeological groundwater basin. The overall extraction from the Inland field has been deemed to be low, with little to no influence on groundwater dependent ecosystems or regional groundwater users. The following parameters and frequency are deemed appropriate for the scale of monitoring and have been justified through the analysis of these risks' allocations (as detailed in sections above).

Summary

Rationale: A monitoring strategy such as that put forward, that matches industry best practice, and suits the level of impact low extraction has on water related environmental considerations, will allow for accurate determination of potential impacts.

Part F*: Spring impact management strategy

Requirements under section 379 of the Water Act
To meet the requirements of the Water Act, an UWIR must include the following: 1. *The details of the spring, including its location;* 2. *An assessment of the connectivity between the spring and the aquifer(s) over which the spring is located:* 3. *The predicted risk to, and likely impact on, the ecosystem and cultural and spiritual values of the spring because of the decline in water level of the aquifer over which the spring is located;* 4. *A strategy for preventing or mitigating the predicted impacts outlined above; or if a strategy for preventing or mitigating the predicted impacts is not included, the reason for not including the strategy;* 5. *A timetable for implementing the strategy; and* 6. *A program for reporting to OGIA about the implementation of the strategy.*

*Part F refers to Section 5.1.6 (page 23) of the guideline (DES 2017).

There are no Great Artesian Basin (GAB) Springs within the boundaries of the Inland tenement. The nearest GAB Spring is located 200 km to the south-west of Inland. Considering the volumes extracted, lack of drawdown from modelling, distance to spring, it is considered there is no connectivity between this spring and the aquifers which are potentially impacted by Bridgeport and its extraction.

No other Groundwater Dependent Ecosystem (GDE) has been identified within the boundaries of PL 98 Inland, or nearby.

The predicted risk and impact to springs is therefore zero, given their complete absence from areas related to resource extraction, including within or near the tenement boundaries of PL 98 Inland or the LTAA/IAA/drawdown.

Part G (a)*: For a CMA assign responsibility to resource tenure holders

Requirements under section 365, 369, 374 *et. al.* of the Water Act
If OGIA is responsible for preparing the UWIR or final report, the UWIR must: *1. Propose a responsible tenure holder for each report obligation; and* *2. For each IAA, propose a responsible tenure holder who must comply with any make good obligations for water bores within the IAA.* *Report obligations may include obligations relating to Part E and F of the UWIR.*

*Part G refers to Section 5.1.7 (page 27) of the guideline (DES 2017).

Under the Water Act, a Cumulative Management Area (CMA) can be declared where there are multiple resource tenures operating, who may have a cumulative impact on groundwater resulting from their resource extraction.

The Queensland Chief Executive has declared the Surat Cumulative Management Area under the Water Act (2000). The GKBA tenures (PL 31, 32 & 47, PL 256, PL 482, PL 483 and PL 484), as well as Inland (PL 98) and Utopia (PL 214) are not within this declared Cumulative Management Area, or any other declared CMA. The Surat Cumulative Management Area is the only CMA in Queensland. Therefore, there is no responsible tenure holder nor obligation related to a CMA for this UWIR.

Part G (b): Final Reports

Requirements under section 377 of the Water Act
In addition, a final report must include the following additional information to meet the requirements of the Water Act: 1. *A summary about underground water bores in the LTAA (including the number of bores and the location and authorised use or purpose of each bore);* 2. *A summary about how the make good obligations of the responsible tenure holder for each water bore to which the final report relates have been compiled with by the holder over the term of the tenure;* 3. *A summary of the make good obligation of the responsible tenure holder for each water bore that have not yet been compiled with by the holder and a plan about how these obligations will be complied with; and* 4. *Statements about any matters outlined in previous strategies that have not yet been complied with, along with a timetable of planned actions to address these outstanding matters.*

*Part G refers to Section 6.1 (page 28) of the guideline (DES 2017).

A summary about underground water bores in the LTAA (including the number of bores and the location and authorised use or purpose of each bore);

No bores were identified in the IAA/LTAA, due to the relatively minor modelled drawdown occurring in formations isolated from landholder bores, which focus on unconfined shallow aquifers.

A summary about how the make good obligations of the responsible tenure holder for each water bore to which the final report relates have been compiled with by the holder over the term of the tenure;

There are no make good obligations that the responsible tenure holder has identified to be complied with, as no bores sit within an IAA or LTAA.

A summary about how the make good obligations of the responsible tenure holder for each water bore to which the final report relates have been compiled with by the holder over the term of the tenure;

There are no make good obligations that the responsible tenure holder has not yet complied with.

Statements about any matters outlined in previous strategies that have not yet been complied with, along with a timetable of planned actions to address these outstanding matters.

There were no matters outlined in previous strategies that have not yet been complied with. There is therefore no timetable or planned actions to address any outstanding matters.

Part H*: Additional Information, including public consultation

Requirements under section 382(3) of the Water Act
To meet the requirements under section 382(3) of the Water Act, a public notice must state the following; - *A description of the area to which the report relates;* - *That copies of the report may be obtained from the responsible entity;* - *How the copies may be obtained;* - *That written submissions on the report may be given;* - *That submissions must be given to the responsible entity:* - *That a copy of the submission must be given to the Chief Executive* - *A day that is at least 20 business days after the notice is published by which submissions may be made; and* - *Where the submissions may be given.*

*Part H refers to Section 4.5 (page 11) of the guideline (DES 2017).

Bridgeport has undertaken public consultation that follows the requirements of the Underground water impact reports and final reports Guideline (DES 2017).

A description of the area to which the report relates;

The public consultation notice included a brief description of the area to which the report relates;

> *e.g. "…Bridgeport Energy Pty Ltd has developed an underground water impact report (UWIR) for its operations within PL 98 and PL 214 located in the Eromanga Basin, in an area around Eromanga (PL 214) and Windorah (PL 98)".*

A map of the region, including main roads, main town names, highlighted tenements and rivers (a feature many people use in the region) to also graphically represent the area to which the report relates were included (Figure 26).

That copies of the report may be obtained from the responsible entity;

The public consultation notice included a statement on where the report may be obtained;

> *e.g. "You have the opportunity to review and comment on this UWIR. From October 2022 you can access the UWIR by visiting Bridgeport Energy Pty Ltd at: www.bridgeport.net.au. You can also phone (02) 8960 8403 to arrange for hard copy to be posted to you"*

How the copies may be obtained;

The public consultation notice included a statement on how the copies could be obtained;

> *e.g. "…you can access the UWIR by visiting Bridgeport Energy Pty Ltd at: www.bridgeport.net.au. You can also phone (02) 8960 8403 to arrange for hard copy to be posted to you"*

That written submissions on the report may be given;

The public consultation notice included a statement on written submissions;

> *e.g. "Written submissions on any of the UWIR may be made to Bridgeport Energy Pty Ltd and mailed to: Attn: Ben Hamilton, Bridgeport Energy, Level 7, 111 Pacific Highway Sydney, NSW, 2060"*

That submissions must be given to the responsible entity;

The public consultation notice included a statement on how submissions must be given to the responsible entity;

> *e.g. "Written submissions on any of the UWIRs may be made to Bridgeport Energy Pty Ltd and mailed to: Attn: Ben Hamilton, Bridgeport Energy, Level 7, 111 Pacific Highway Sydney, NSW, 2060"*

That a copy of the submission must be given to the Chief Executive;

The public consultation notice included a statement on how all submissions must be given to the chief executive;

e.g. "Please note that as required by Section 382(3)(d) of the Water Act, copies of all received submissions must be provided to the chief executive. These submissions will be considered as part of the assessment process for the UWIR".

A day that is at least 20 business days after the notice is published by which submissions may be made;

The public consultation notice included a statement on a date, which was at least 20 business days after the publication notice, by which submissions could be made;

e.g. "Your submission must be: -In writing, and -Received by COB 18th of November 2022"

Where the submissions may be given;

The public consultation notice included a statement on where the submission may be given;

e.g. "Written submissions on any of the UWIRs may be made to Bridgeport Energy Pty Ltd and mailed to: Attn: Environment & Compliance Department, Bridgeport Energy, Level 7, 111 Pacific Highway Sydney, NSW, 2060"

The classic public advertisement (18 cm x 13 cm full colour ad) occurred across multiple issues of an appropriate paper to the area, the Warrego Watchman. The Shires in which the Warrego Watchmen is circulated include Bulloo, Balonee, Murweh, Paroo and Quilpie Shires. Relevant towns to Bridgeport operations, in which the publication is distributed include Quilpie, Charleville and Eromanga. The publication is now run fortnightly.

During the planned public advertisement campaign, the Warrego Watchman staff informed Bridgeport that the newspaper would cease publication of all physical formats until calendar year 2023. The Warrego Watchman instead offered a digital advertisement, which Bridgeport accepted. This digital advertisement campaign included the identical Public Notice (Figure 26) being placed in multiple online locations owned by The Warrego Watchman. The identical public notice was published on their social media facebook™ page titled South West Newspaper Company, and on their webpage (https://www.warregowatchman.com.au).

A close-up copy of the PROOF as provided by the Warrego Watchman (and how they are expected to appear) are included below.

Figure 26: The proposed PROOF as provided by the Warrego Watchman.

PUBLIC NOTICE
Pursuant to Section 382 of the Water Act 2000
Release of UNDERGROUND WATER IMPACT REPORT

In accordance with the requirements of Section 381 and Section 382 of the Water Act 2000 (Water Act), Bridgeport Energy Pty Ltd has developed an underground water impact report (UWIR) for its operations within PL 98 and PL 214, located in the Eromanga Basin, in an area near Eromanga (PL 214) and Windorah (PL 98).

You have the opportunity to review and comment on this UWIR.
From October 2022 you can access the UWIR by visiting Bridgeport Energy Pty Ltd at:
www.bridgeport.net.au

You can also phone (02) 8960 8403 to arrange for a hard copy to be posted to you.
Written submissions on any of the UWIRs may be made to Bridgeport Energy Pty Ltd and mailed to:

Attn: Environment & Compliance Department
Bridgeport Energy, Level 7, 111 Pacific Highway, Sydney NSW 2060

Your submission must be:
• In writing • Received by COB Friday 18th November 2022

Please note that as required by Section 382(3)(d) of the Water Act, copies of all received submissions must be provided to the chief executive. These submissions will be considered as part of the assessment process for the UWIR.

For more information please phone (02) 8960 8403

The total number of business days the public consultation ad has been featured in the physical The Warrego Watchman will be 10 business days (a single fortnightly run from Wednesday 19th October). The online digital advertisement took place from the 2nd of November for two additional weeks (10 business days), for a public advertisement period of 20 business days.

A draft UWIR was available online [http://bridgeport.net.au] from 19/10/2022 up to 16/11/2022, after the end of the public notices in the Warrego Watchman.

Bridgeport considers the publication of the Public Notice in the South West Newspaper Co and the online media platforms of the same company, as appropriate. The South West Newspaper Co’s Warrego Watchman was considered a relevant entity, appropriately distributed in the relevant areas and being of interest to the local community. It is one of the only remaining printed distribution methods remaining. As suggested in the previous UWIR< and now demonstrated in these examples, DES should consider altering the guideline to offer alternatives to printed media. Relevant regional areas are seeing a dramatic decline in print media, and it being rapidly replaced by online and social media platforms. Section 382 (3) must change to reflect this.

Bridgeport used the standard template provided DES for the public advertisement.

Requirements under section 383(1 & 2) of the Water Act
To meet the requirements under section 383(1 & 2) of the Water Act, the responsible entity must; *Before giving the chief executive a UWIR;* - *Consider each properly made submission about the report;* - *Prepare a summary of the submissions;* *In the UWIR submission, summarise;* - *The properly made submission about the report;* - *How the responsible entity addressed the submissions, and* - *Any changes the responsible entity has made to the report because of the submissions.*

During the public advertisement period, Bridgeport received no submissions on the PL 98 UWIR. This includes no submissions via mail, phone or email.

Bridgeport did not need to address within nor change the report, because there were no submissions.

References

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Beach Energy (2016) Annual review - Underground water impact report for Beach Energy oilfields, Eromanga area, SWQ (2016) pp. 1 – 9.

Bridgeport Energy (2017) UWIR 2017 Annual Report for Beach Energy oilfields, Eromanga Area, SWQ, pp. 1-21.

Bridgeport Energy (2018) UWIR 2018 Annual Update, Bridgeport Energy, Sydney Australia.

Bridgeport Energy (2019) UWIR 2019 Annual Update, Bridgeport Energy, Sydney Australia.

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Department of Environment and Science (2017) Underground water impact reports and final reports Guideline, pp. 1-34. Queensland.

Department of Environment and Science (2018) Mapping procedural guide, Environmental Protection Policy (Water) 2009 Management intent and water type mapping methodology, March 2018, pp. 1-18. Queensland.

Department of Environment and Science (2019) Environmental values and water quality objectives; Under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019, pp. 1-4. Queensland.

Department of Environment and Science (2022) Notice of approval of Underground Water Impact Report, pp. 1 – 3. Queensland.

Evans TJ, Martinez J, Lai ÉCS, Raiber M, Radke BM, Sundaram B, Ransley TR, Dehelean A, Skeers N, Woods M, Evenden C and Dunn B (2020) Hydrogeology of the Cooper GBA region. Technical appendix for the Geological and Bioregional Assessment.

Program: Stage 2. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Freeze, RA and Cherry JA (1979) Groundwater, Prentice-Hall, the University of Michigan, United States.

Golder Associates (2014) Underground water impact report for Beach energy oilfields, Eromanga area, SWQ, pp. 1 – 341, South Australia.

Golder Associates (2018) Technical Memorandum: Update of groundwater impact assessment for the Eromanga area, SWQ, report prepared for Bridgeport Energy Pty Ltd.

Golder Associates (2021) Technical Memorandum: Update of groundwater impact assessment for the Eromanga area, SWQ, report prepared for Bridgeport Energy Pty Ltd.

Legislation

Environmental Protection Act 1994 (Reprint current from 1st January 2018) (Queensland)

Environmental Protection (Water) Policy 2009 (Reprint current from 6th December 2016) under the Environmental Protection Act 1994 (Queensland)

Environment Protection (Water and Wetland Biodiversity) Policy 2019, Reprint current from 2 October 2020 to date (accessed 29th March 2021 at 13:27)

Environment Protection Regulation (2019)

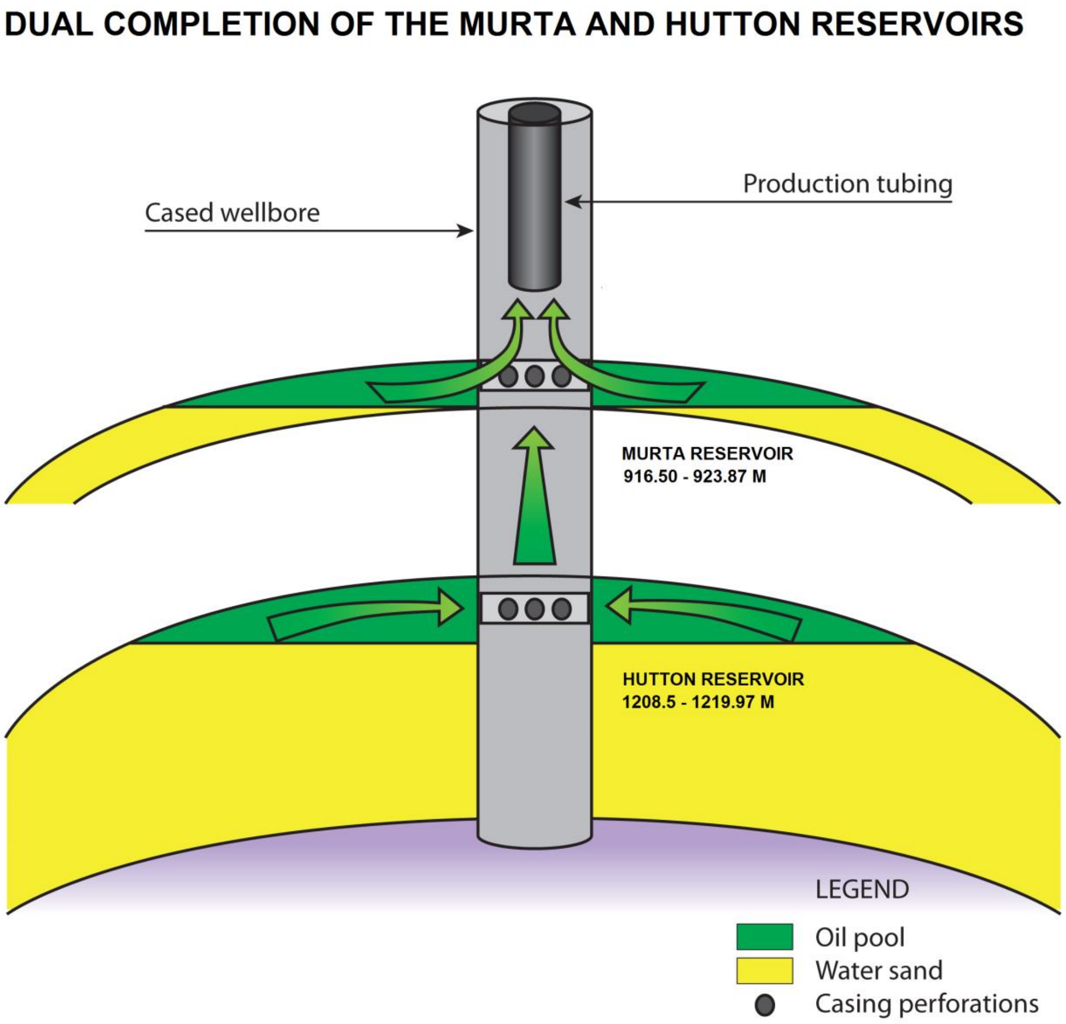
Nature Conservation Act 1994

Marine Parks Act 2004

Petroleum and Gas (Production and Safety) Act 2004 (2021) (Queensland)

Water Act 2000 (Reprint current from 2nd July, 2018) (Queensland)

Appendix 1: Dual-Completion Well



Appendix 2: Data

		November	December	January	February	March	April	May	June	July	August	September	October	
	Well Name	2020	2020	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021	Annual (ML)
2019	Inland 01													
	Inland 02													
	Inland 03													
	Inland 04	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.03	**0.23**
	Inland 05													
	Inland 07								0.42	1.23	1.23	1.08	1.23	**5.19**
	Inland 08	1.63	1.61	1.68	1.52	1.69	1.63	1.68	1.62	1.69	1.68	1.64	1.68	**19.75**
	Inland 09	1.07	1.12	1.12	1.01	1.13	1.09	1.13	1.08	1.13	1.13	1.02	1.13	**13.16**
	Inland 10													
	Inland 11	5.72					1.59	9.41	11.58	12.30	11.82	11.87	12.16	**76.46**
	Inland 12	0.22	0.21	0.23	0.21	0.22	0.22	0.23	0.22	0.23	0.23	0.22	0.23	**2.68**
	Inland 13							1.02	0.75	0.29	1.10	1.07	1.10	**5.32**
	Inland 14													
	Inland 15							0.39	0.57	0.65	0.74	0.72	0.72	**3.79**
	Inland 16A								0.13	0.25	0.27	0.26	0.27	**1.19**
	Inland 17	0.15	0.16	0.16	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	**1.90**
	Inland 18	0.15	0.16	0.16	0.05									**0.53**
	Inland 19	2.05	2.26	2.26	2.03	2.26	2.18	2.24	2.18	2.26	2.26	2.14	2.20	**26.31**
	Inland 20													
	Inland NE1	2.71	2.80	2.76	2.53	2.78	2.66	2.45	2.69	2.80	2.80	1.81	2.44	**31.24**
	Total	**13.72**	**8.34**	**8.38**	**7.50**	**8.25**	**9.53**	**18.74**	**21.43**	**23.01**	**23.46**	**22.01**	**23.36**	**187.75**

		November	December	January	February	March	April	May	June	July	August	September	October	
	Well Name	2019	2019	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	Annual (ML)
2020	Inland 01													
	Inland 02													
	Inland 03													
	Inland 04	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.12**
	Inland 05												1.05	**1.05**
	Inland 07													
	Inland 08					0.08	1.58	1.62	1.65	1.71	1.68	1.62		**9.93**
	Inland 09	1.09	1.13	1.13	1.05	1.13	1.09	1.12	1.08	1.12	1.13	1.09	1.09	**13.24**
	Inland 10													
	Inland 11	12.33	12.75	12.74	11.81	12.49	12.22	11.34	11.73	12.35	11.94	9.50	12.38	**143.58**
	Inland 12	0.23	0.23	0.23	0.23	0.23	0.22	0.23	0.22	0.22	0.23	0.22	0.23	**2.73**
	Inland 13													
	Inland 14		0.28											**0.28**
	Inland 15	0.26		0.28	0.25	0.27	0.27	0.28	0.19	0.27	0.22	0.03		**2.31**
	Inland 16A													
	Inland 17	0.13	0.13	0.13	0.12	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	**1.53**
	Inland 18	0.15	0.15	0.16	0.03		0.07	0.16	0.16	0.14	0.18	0.16	0.16	**1.52**
	Inland 19	2.07	2.12	2.11	1.90	2.04	1.88	2.02	2.06	1.16			1.05	**18.40**
	Inland 20													
	Inland NE1						1.40	2.56	2.68	2.79	2.79	2.71	2.80	**17.73**
	Total	**16.27**	**16.80**	**16.80**	**15.40**	**16.36**	**18.86**	**19.47**	**19.91**	**19.90**	**18.31**	**15.46**	**18.89**	**212.42**

		November	December	January	February	March	April	May	June	July	August	September	October	
	Well Name	2020	2020	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021	Annual (ML)
2021	Inland 01													
	Inland 02													
	Inland 03													
	Inland 04	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.03	**0.23**
	Inland 05													
	Inland 07								0.42	1.23	1.23	1.08	1.23	**5.19**
	Inland 08	1.63	1.61	1.68	1.52	1.69	1.63	1.68	1.62	1.69	1.68	1.64	1.68	**19.75**
	Inland 09	1.07	1.12	1.12	1.01	1.13	1.09	1.13	1.08	1.13	1.13	1.02	1.13	**13.16**
	Inland 10													
	Inland 11	5.72					1.59	9.41	11.58	12.30	11.82	11.87	12.16	**76.46**
	Inland 12	0.22	0.21	0.23	0.21	0.22	0.22	0.23	0.22	0.23	0.23	0.22	0.23	**2.68**
	Inland 13							1.02	0.75	0.29	1.10	1.07	1.10	**5.32**
	Inland 14													
	Inland 15							0.39	0.57	0.65	0.74	0.72	0.72	**3.79**
	Inland 16A								0.13	0.25	0.27	0.26	0.27	**1.19**
	Inland 17	0.15	0.16	0.16	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	**1.90**
	Inland 18	0.15	0.16	0.16	0.05									**0.53**
	Inland 19	2.05	2.26	2.26	2.03	2.26	2.18	2.24	2.18	2.26	2.26	2.14	2.20	**26.31**
	Inland 20													
	Inland NE1	2.71	2.80	2.76	2.53	2.78	2.66	2.45	2.69	2.80	2.80	1.81	2.44	**31.24**
	Total	**13.72**	**8.34**	**8.38**	**7.50**	**8.25**	**9.53**	**18.74**	**21.43**	**23.01**	**23.46**	**22.01**	**23.36**	**187.75**