UWIR Annual Review 2022-2023

PL 31, 32 & 47*

This UWIR Annual Update Report (Version 0.1.1) for PL 31, 32 & 47 *et al.*, Greater Kenmore and Bodalla Area, is issued by authority of Bridgeport Energy (Cooper Basin) Pty Ltd.

*includes PL 1063 & 1064

Tables, Figures & Appendices

Executive Summary & Statement of Material Change

The production of water from Kenmore, Bodalla and associated satellites (which make up the GKBA region) was approximately 25% lower than predictions made in the previous Bridgeport (2021) UWIR, with a relative decrease of 336.60 ML or 25.99% of the total estimated production.

The decrease in production will have a positive (reduced) effect on current and modelled water drawdown levels.

The production from Kenmore, Bodalla and surrounds during 2022/2023 has had:

- No material impact on water level decline in upper aquifers
- No material impact on water pressure in targeted aquifers
- No material impact on environmental values, including;
    - The Great Artesian Basin
    - Groundwater Dependent Ecosystems (including springs, wetlands)
    - Endangered Regional Ecosystems
- No material impact on other groundwater users (including livestock watering, drinking or non-potable water if present)
- No material impact on social or cultural values

The local use of groundwater for stock watering will not be impacted, as the bores which extract water for non-potable land use operate at significantly shallow depths (typically <200m), compared to the targeted formations across fields which are at a greater depth.

This review provides a summary of reduced volumes of produced water have been extracted over the period, and this will not have material effect on any figures, mapping, predictions, or conclusions prepared by Bridgeport in the previous UWIR (Bridgeport 2021).

1. Introduction

1.1 Background

This annual update of Underground Water Impact Report (UWIR) covers eight facilities within proximity, totalling 30 producing wells current as of July 2023. These tenements are collectively referred to as the Greater Kenmore and Bodalla Area (GKBA). Of the eight fields, two are considered main fields: Kenmore with 17 producing wells and Bodalla with 9 producing wells. There are numerous satellite fields supported by these larger camps, Blackstump (1 well), Marcoola (1 well), Bargie (0 wells

produced during the period), Byrock (0 wells produced during the period), Coolum (1 well) and Glenvale (1 well). Wells may come on or offline at different times for different reasons, and production may continue to change as a result. Bridgeport has held the GKBA asset since March 2017, submitting an annual report in 2017 (Bridgeport 2018a), the three-year report in 2018 (Bridgeport 2018b), with yearly updates in 2019 and 2020 (Bridgeport 2019, 2020). The most recent three-yearly report was submitted in 2021 (Bridgeport 2021).

A monitoring strategy proposed in Bridgeport (2021) was implemented and involved the monitoring of production data and shut-in tubing head pressure (SITP or SITHP).

1.2 Previous reporting

Previous UWIRs have been prepared for the former Department of Environment & Heritage Protection and the now Department of Environment and Science (DES). These include:

- UWIR for Beach energy Oil Fields, Eromanga Area, SWQ (Golder Associates, 2014)
- Annual review UWIR for Beach Energy oilfields, Eromanga area, SWQ (Beach Energy 2015)
- Annual review UWIR for Beach energy oilfields, Eromanga area, SWQ (Beach Energy 2016)
- UWIR 2017 for Beach Energy Oilfields, Eromanga Area, SWQ (2018) (Bridgeport Energy 2018a)
- UWIR 2018 – 2021 Greater Kenmore & Bodalla Area, 2018 (Bridgeport Energy 2018b)
- UWIR 2019 – 2020 Greater Kenmore & Bodalla Area, 2019 (Bridgeport 2019)
- UWIR 2020 – 2021 Greater Kenmore & Bodalla Area, 2020 (Bridgeport 2020)
- UWIR 2021 – 2024 Greater Kenmore & Bodalla Area, 2021 (Bridgeport Energy 2021)
- UWIR 2020 – 2021 Greater Kenmore & Bodalla Area, 2022 (Bridgeport 2022)

2. Legislative background

This UWIR annual update is prepared pursuant to Section 376 (1) (e) of the *Water Act 2000*:

> *(e) a program for—*
>
> > *(i) conducting an annual review of the accuracy of each map prepared under paragraph (b) (iv) and (v); and*
> >
> > *(ii) 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 or predictions used to prepare the maps;*

3. Bridgeport Energy Operations

3.1 Methods for measuring extracted water volumes

Bridgeport has developed a monitoring strategy that meets the requirements of Section 376 (f) of the *Water Act 2000*. This section provides specific details of how water related parameters are collected.

Bridgeport Energy's monitoring strategy is based on the following parameters:

- Formation water production
- Shut-in tubing head pressure (SITHP)

Since April 2017, Bridgeport has measured oil and water production, which is used to calculate the volume of water extracted per well then normalised to beam pump operating time. In the field, each well is manually flow tested into an isolated test tank. After a settlement period, the contents of the tank are volumetrically measured by means of a dip-stick and water-indicating paste. Volumes of both produced oil and water are obtained from this measurement as per section 378 (1) (a) (i) of the *Water Act 2000*:

- To calculate production rates for oil and water over time, total field volumetric oil and water calculations are recorded, as measured into the receiving tanks for oil.
- Daily water and oil production rates can also be normalised to the beam pump operation time, to provide accurate water/oil production per unit operation time across the field/s.

As a result, water production statistics from any period Bridgeport have operated the field, is available on a per-well basis. Information for the last 12 months is included in Appendix 1, whilst historical data is presented in the previous UWIR submission.

3.2 Methods for measuring extracted SITHP

Shut-in tubing head pressure (SITHP or SITP) is measured at the wellhead by the field operator on a quarterly basis. SITHP is the pressure of an oil or gas well when it is shut in and not flowing. It represents the pressure of the perforated formation minus the hydrostatic weight of the fluid column above (oil/water/gas) which is applied against the wellhead valves. A series of wells are chosen per field (Table 1) to represent the differing formations targeted for oil extraction. Shut-in wells are monitored as they provide the most accurate representation of average static reservoir pressure and are less impacted by pressure drawdown associated with pumping operations (e.g., vertical lift via beam pump).

*includes PL 1063 & 1064

Table 1: Shut-in wells in the Hutton (Kenmore and Bodalla) and Basal Jurassic (Bodalla) that will be monitored for shut-in well head pressure.

Kenmore (Hutton)	Bodalla (Hutton)	Bodalla (Basal Jurassic)
Kenmore - 5	Bodalla - 4	Bodalla - 5
Kenmore - 13	Bodalla – 8	Bodalla – 6
Kenmore - 18	Bodalla – 18	
Kenmore – 22		
Kenmore – 29		
Kenmore - 31		

4. Assessment of water extracted

4.1 Assessment of extracted water volumes

In the 2022/2023 production year between November 2022 and October 2023, a total of 1,295.12 ML of formation water was produced from all the tenements involved with this UWIR. Kenmore (976.87 ML) and Bodalla (271.77 ML) were the largest contributors to the total production, followed by the comparatively small Blackstump (43.71 ML) and all other Satellites (2.77 ML) (Table 2).

The total production from 2022/2023 for GKBA was lower than Bridgeport projections (2021), by 336.60 ML (25.99% less than predicted). Cycling of wells/shut-in wells contribute a greater proportion to the net difference. The actual versus predicted values varied per field include;

- Kenmore: produced -177.04 ML or 18.12% less than predicted.
- Bodalla: produced 162.38 ML or 59.75% less than predicted.
- Blackstump: produced 2.79 ML or 6.38% more than predicted.
- Satellites: (Bargie, Byrock, Coolum and Glenvale) produced 0.02 ML more than predicted.

Production from each well varies significantly within and between fields (Figure 2), as production can depend on planned (workovers) or unplanned (technical/mechanical breakdowns) events. Each fields largest contributing wells are explored individually in Figure 1, Figure 2, Figure 3, Figure 4 and Figure 5.

The largest contribution to total water production during 2023 was Kenmore 39, which contributes a significant portion of the total water from the field. This is followed by Kenmore 27, considering water from Kenmore 30 has declined during 2023 (Figure 3). The highest producing well in Bodalla is still Bodalla 14 (Figure 4). Satellite fields are comparatively miniscule in water production (Figure 5).

Note, the annual update has supplemented three months of production data (August, September and October) with the data from July, to allow a consistent 12 monthly comparisons.

4.2 Assessment of shut-in tubing head pressure

The shut-in tubing head pressure was monitored quarterly in eleven wells indicated in Bridgeport (2021) (Appendix 2). Changes to SITHP are consistent across several wells (Appendix 2). Considering the age of the dataset, Bridgeport expect increased consistency over the life of the monitoring program as data is gathered, and long term trends are developed.

No significant variation was seen, that would indicate a change in reservoir conditions, or be of material change which would indicate any significant changes to the mapping produced in the Bridgeport (2001) UWIR.

Table 2: Annual water extracted from the GKBA fields between November 2015 and October 2023. A "years" data is from November 1st the previous year through to the 31st of October the following year (e.g. 2015 data includes 1st November 2014 through to 31st October 2015). Three months from July to October 2023 have been estimated and are indicative only.

Year	Kenmore	Bodalla	Blackstump	Marcoola	Glenvale	Coolum	Bargie	Byrock	Total water extracted (ML)
2015	1,379.21	372.30	9.62	1.66	0.35	0.81	0.00	0.00	1,763.95
2016	1,469.76	336.24	0	0.90	0.26	0.25	0.00	0.00	1,807.41
2017	1,492.07	353.32	23.72	0.19	0.28	0.06	0.00	0.00	1,869.63
2018	1,117.47	287.16	40.67	1.34	0.96	0.29	0.01	0.00	1,447.88
2019	1,499.14	343.27	35.40	1.57	0.70	0.22	0.06	0.00	1,880.37
2020	1,164.97	331.59	31.34	1.55	0.76	0.22	0.03	0.00	1,527.95
2021	1,240.40	390.53	46.57	1.60	0.76	0.22	0.03	0.00	1,680.10
2022	1,215.21	329.49	43.61	1.47	0.91	0.26	0.02	0.00	1,588.30
2023	976.87	271.77	43.71	1.52	1.00	0.25	0.00	0.00	1,295.12
2021 - Predicted	1,163.10	417.88	42.01	1.40	0.69	0.24	0.25	0.00	1,625.58
2022 - Predicted	1,153.91	434.14	40.92	1.35	0.65	0.24	0.51	0.00	1,631.72
2023 - Predicted	1,148.65	427.80	39.96	1.31	0.60	0.24	0.52	0.00	1,619.08
Difference between 2023 actual & 2023 prediction (%)	-177 (-18%)	-162.38 (-59.75%)	+2.79 (+6.38%)	+0.17 (+11.11%)	+0.36 (+35.52%)	+0.01 (+2.95%)	-0.51 (-100%)	0 (0%)	

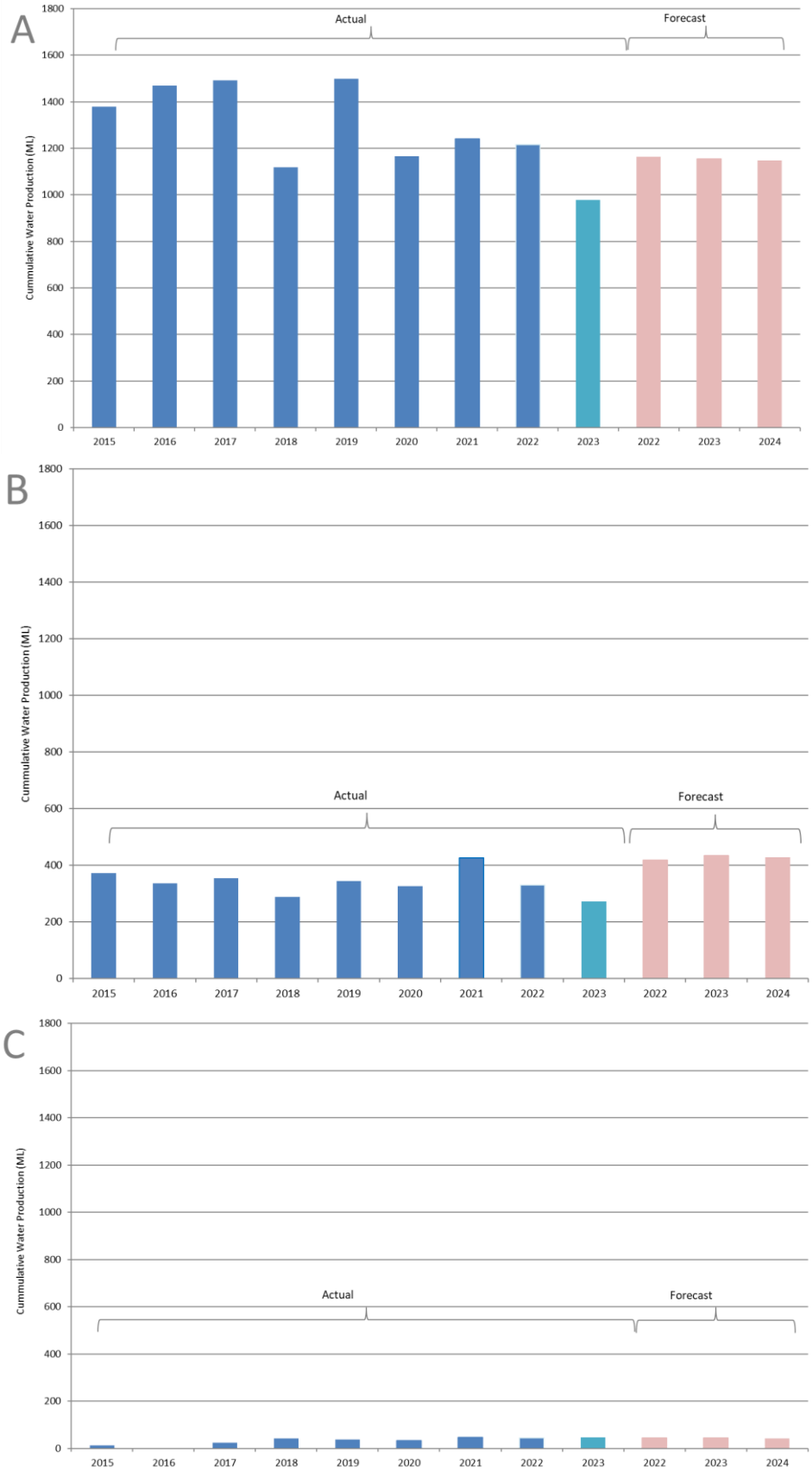

Figure 1: Cumulative water production (ML) per field at (A) Kenmore, (B) Bodalla,(C) Satellite fields, from records dating back to 2015, including three years of production forecasts using ValNav software till 2024 and the most recent 2023 production data (including 3 months forecast to November).

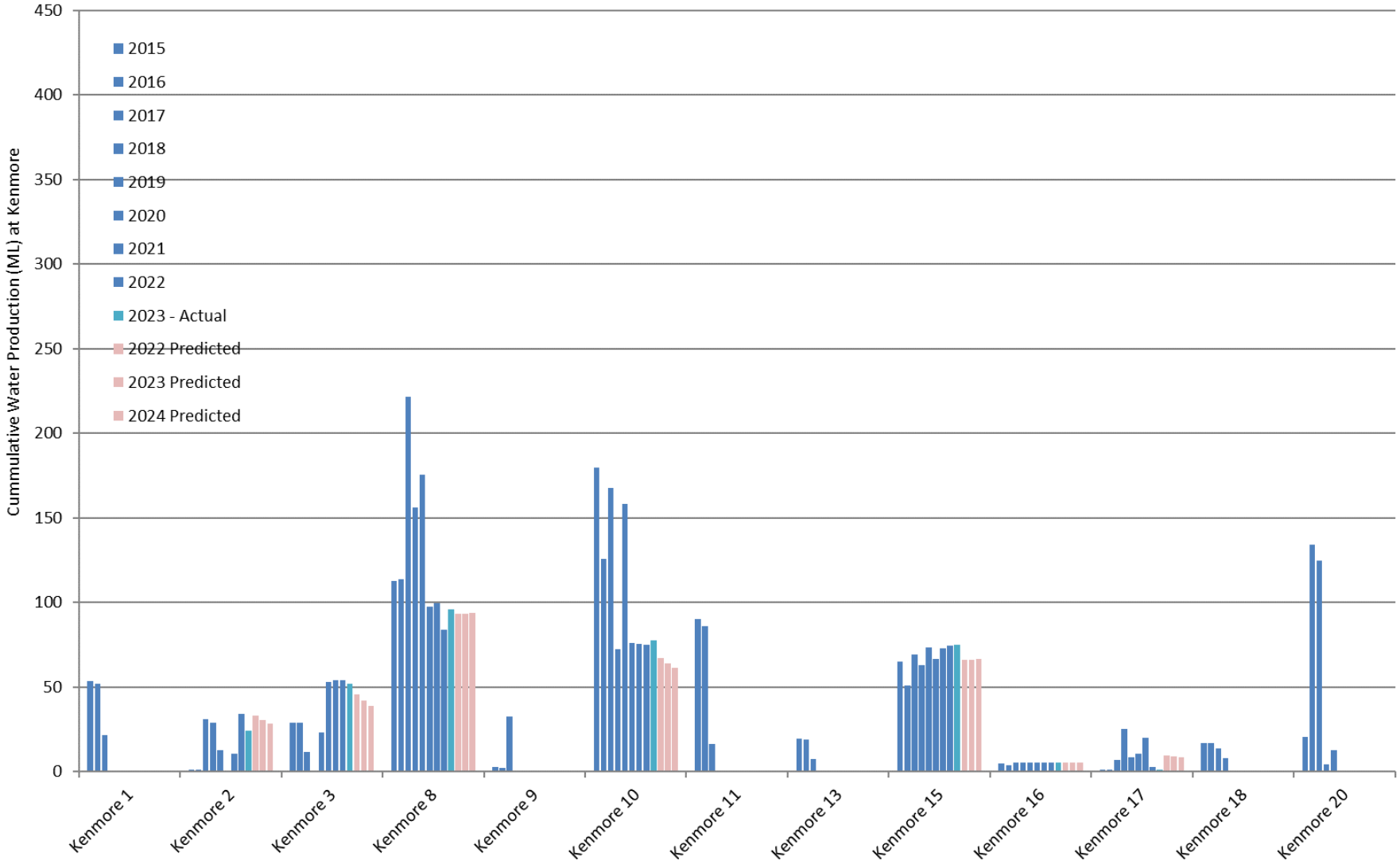

Figure 2: Annual water (ML) production from Kenmore 1 to Kenmore 20, 2015 to 2023.

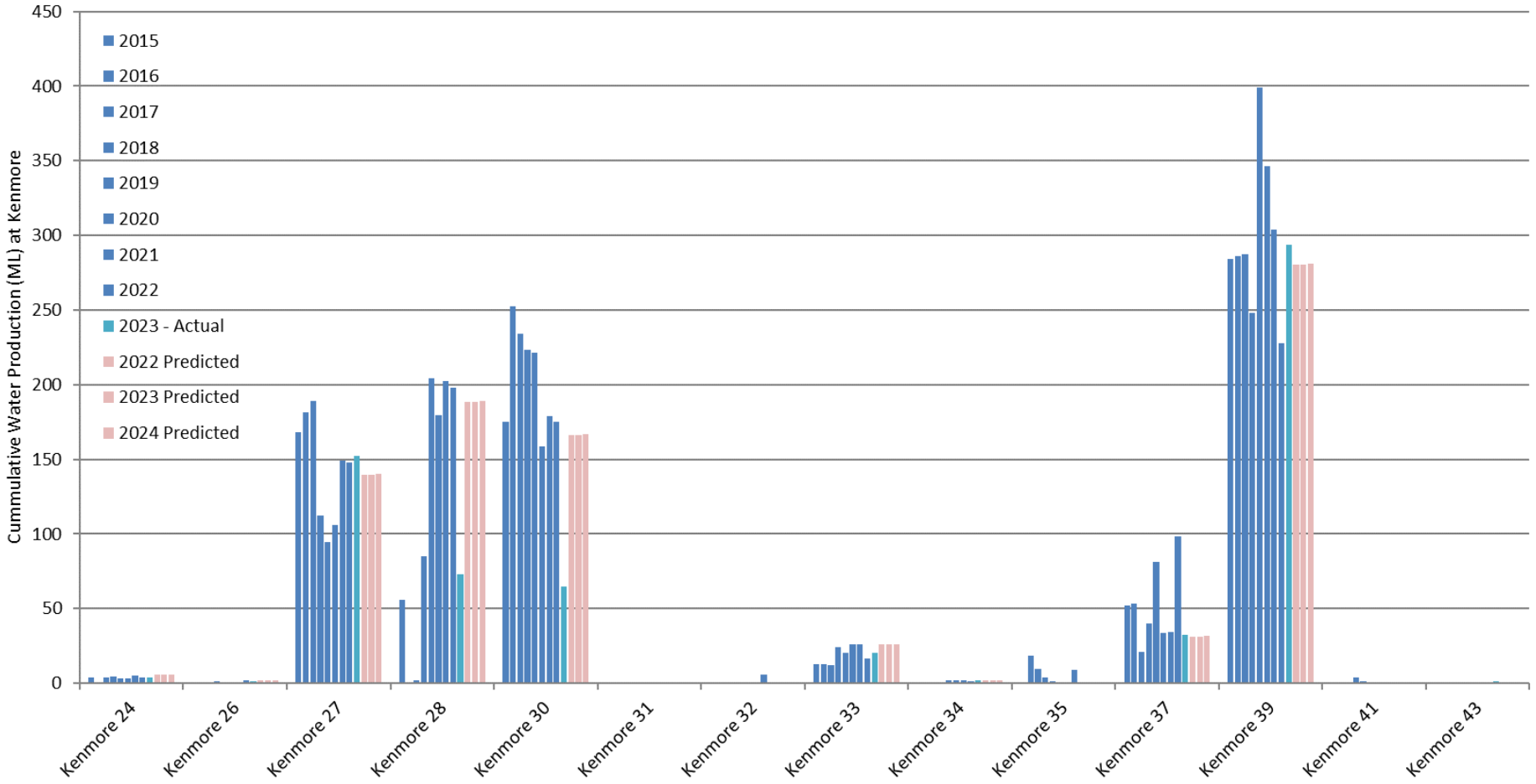

Figure 3: Annual water (ML) production from Kenmore 24 to Kenmore 43, 2015 to 2023.

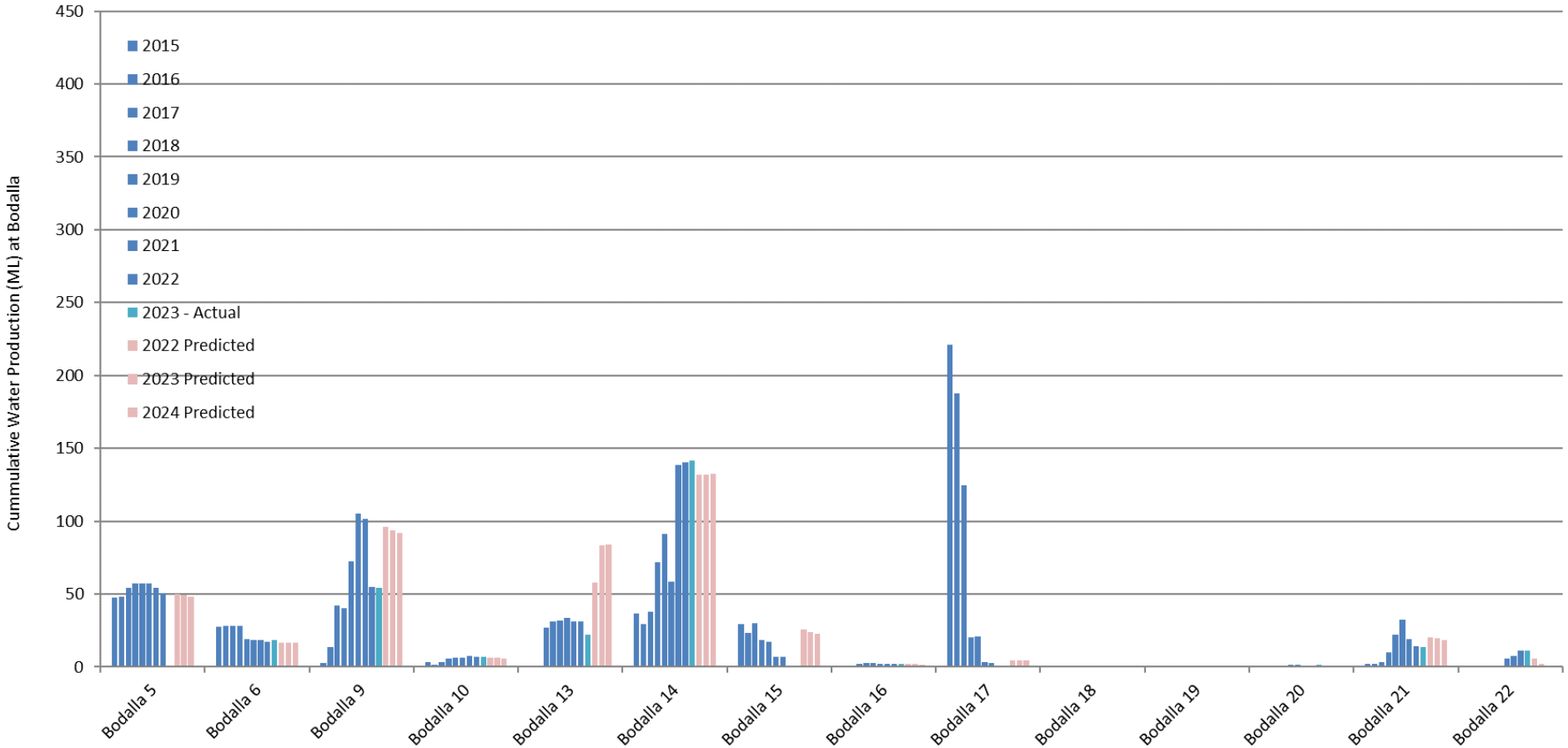

Figure 4: Annual water (ML) production from Bodalla 13 to Bodalla 22, 2015 to 2023.

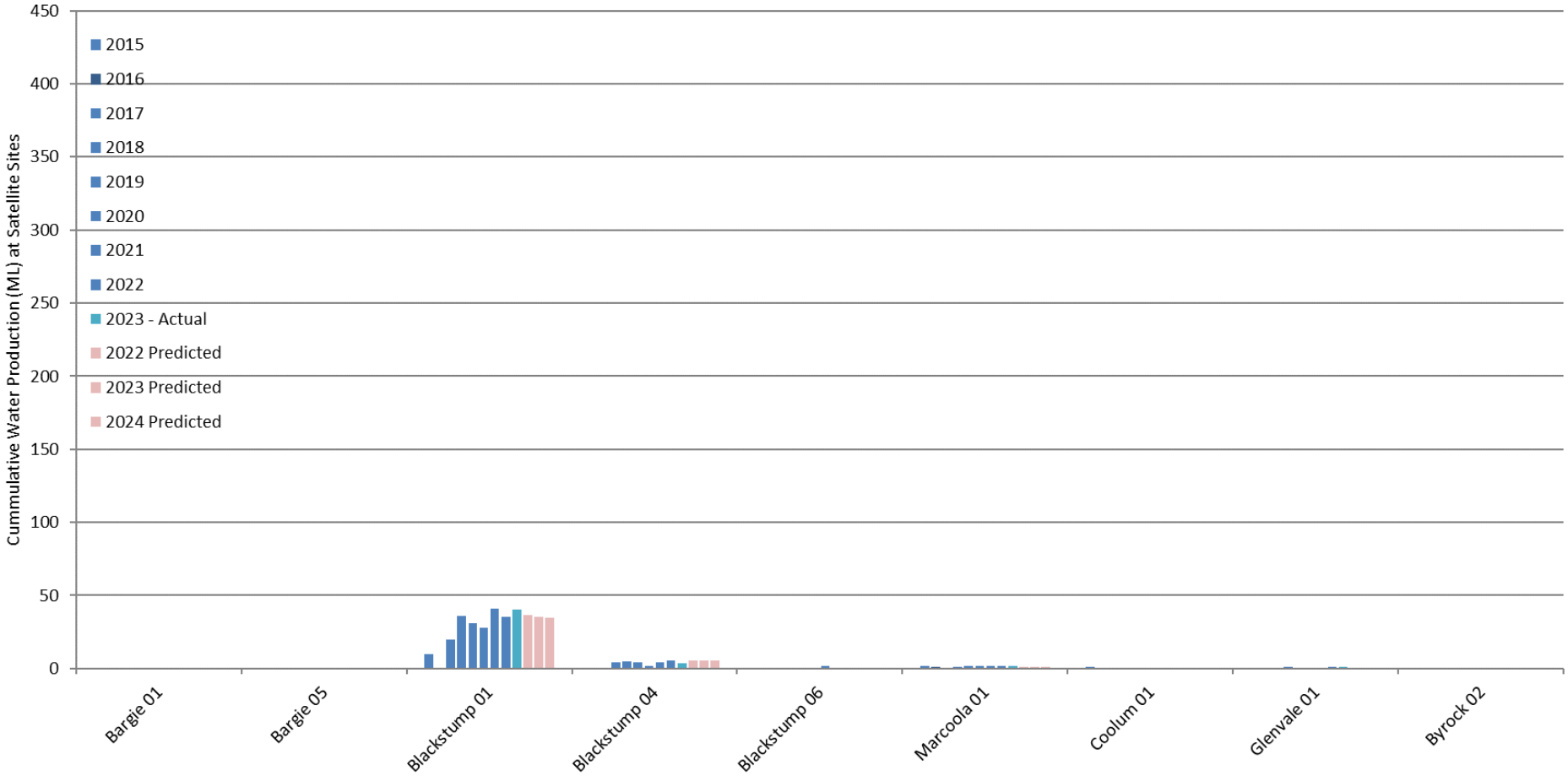

Figure 5: Annual water (ML) production per well at Bargie, Blackstump, Marcoola, Coolum, Glenvale and Byrock, 2015 to 2023.

5. Modelling Impact from Previous UWIR

A third-party contractor (Golder Associates) was approached to run an "AnAqSim" model that determined Immediately Affected Areas (IAA) and Long-term Affected Areas (LTAA) based on the most recent and predicted GKBA field production data and compare it to historic levels of water drawdown. The model required assumptions, limitations, calibration and data inputs. The process of model development and use is described in scientific detail in Bridgeport (2021). The model compared water drawdown from historic water production, and determined modelled drawdowns based on current and future predicted production estimates.

The detailed predicted water level decline under current Bridgeport production is represented in Figure 6. More detail on the model and results can be found in Bridgeport 2021. This model will not be re-run for the annual updates. The predictions will be assessed against actual production, and whether any difference in production will make any material difference to the mapping, data and scientific conclusions reached by Bridgeport and Golder Associates, as documented in Bridgeport (2021).

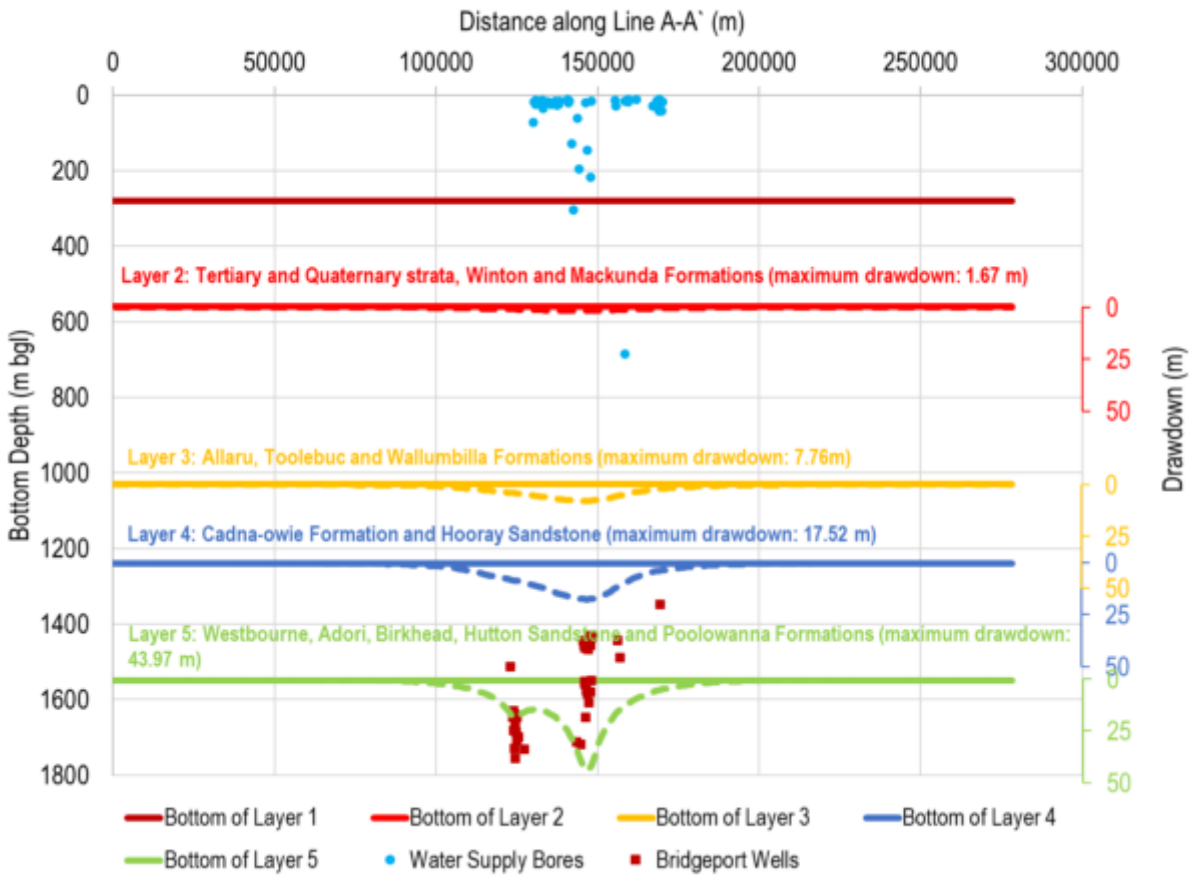

Figure 6: Modelled groundwater drawdown contours for current Bridgeport Energy production, run by Golder Associates and published in Bridgeport (2021). Further detail on models and results can be found in Bridgeport (2021).

Table 3: The calculated maximum drawdown in the Eromanga and Cooper Basin Formations targeted for production by Golder Associates, as detailed in Bridgeport (2018b and 2021).

Basin	Layer Description	Layer Number	1984-2014 drawdown (m)	2014-2018 drawdown (m) (during)	2018-2021 drawdown (m) (forecast)	2018-2021 drawdown (m) (during)	2021-2024 drawdown (m) (forecast)
Eromanga	Winton and Mackunda Formation	2	2.8 m	1.58 m	1.34 m	1.67 m	1.52 m
Eromanga	Allaru, Toolebuc and Wallumbilla Formations	3	13.2 m	7.53 m	6.40 m	7.76 m	7.04 m
Eromanga	Cadna-Owie Formation and Hooray Sandstone	4	29.8 m	17.55 m	14.99 m	17.52 m	15.82 m
Eromanga	Westbourne, Adori and Birkhead Formations/ Hutton Sandstone and Poolowanna Formation	5	98.1 m	66.12 m	53.73 m	60.93 m	53.3 m
Cooper	Tinchoo & Arraburry (Upper) Formation	1	-	-	-	-	-
Cooper	Arraburry & Arraburry (Lower) Formation	2	0.1 m	-	-	-	-
Cooper	Toolachee Formation	3	5.5 m	1.27 m	2.1 m	-	-

In the 2018 UWIR (Bridgeport 2018b), underground water level modelling using AnAqSIM program demonstrated a significant (>40%) decline in maximum water level drawdown in the targeted formations within the GKBA field. This decline was attributed to the lower production of total fluids from within target aquifers over the recent production period.

Another decrease in total water extraction was modelled at Kenmore and Bodalla between 2018 and up to 2022 (Bridgeport 2021). This had a small improvement on the relatively minor modelled maximum drawdown. As a result (combined with the fact production takes place at isolated, deep (1400 - 1800 meters) formations), the production from Kenmore, Bodalla and surrounds during 2021 UWIR period had;

- No material impact on water level decline in upper aquifers
- No material impact on water pressure in targeted aquifers
- No material impact on environmental values, including;
    - The Great Artesian Basin
    - Groundwater Dependent Ecosystems (including springs, wetlands)
    - Endangered Regional Ecosystems
- No material impact on other groundwater users (including livestock watering, drinking or non-potable water if present)
- No material impact on social or cultural values

The local use of groundwater for stock watering will not be impacted, as the bores which extract water for non-potable land use operate at significantly shallow depths (typically <200m), compared to the targeted formations across fields which are at a greater depth.

The information gathered as part of the monitoring program during 2022/2023 demonstrates no significant, negative impact to the modelled maximum drawdowns and mapping in Bridgeport (2021).

Conclusion

This annual update has considered the water produced and the SITHP recorded quarterly from the previous 12 months.

A reduction in total water extraction has occurred, in comparison to the predictions made in Bridgeport (2021). This is likely caused by wells being cycled more regularly, and several significant water producing wells going offline. This has led to a decline in estimated water production by 25% during the period.

This reduction in water production in comparison to predictions in the Bridgeport (2021) UWIR this year (2023) will not result in a material change in the information or predictions used to prepare maps, figures and conclusions in the Bridgeport (2021) UWIR. The reduction in water extracted would have a positive impact and lowering of modelled drawdowns.

References

Bridgeport Energy (2018a) UWIR 2017 Annual Report for Beach Energy oilfields, Eromanga Area, SWQ, pp. 1-21.

Bridgeport Energy (2018b) UWIR 2018 – 2021 Greater Kenmore & Bodalla Area, 2018, pp. 142.

Bridgeport Energy (2019) UWIR 2018 – 2019 Greater Kenmore & Bodalla Area, 2019, pp. 17.

Bridgeport Energy (2020) UWIR 2019 – 2020 Greater Kenmore & Bodalla Area, 2020, pp. 19.

Bridgeport Energy (2021) UWIR 2021 – 2024 Greater Kenmore & Bodalla Area, 2021, pp. 226.

Bridgeport Energy (2021) UWIR 2021 – 2024 Greater Kenmore & Bodalla Area, 2022, pp. 20.

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

Appendix 1 – Water Extraction Monitoring Data

Bridgeport Energy recorded monthly associated water production from GKBA wells in megalitres (ML). This is a volumetric estimate based on the wells monthly "up time" (time producing) versus the previous volumetric production test. This annual report has used predicted data for the last three months in the report, August, September, and October (taken from July, the most recent monthly production test representing current field conditions).
Total water produced from any well during any month of the year are summarised below.

	2022		2023									
Well Name	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**
Blackstump 01	19561	21078.12	20782.29	19880	21285.21	21300	22010	20183.23	22010	22010	22010	22010
Blackstump 04	3083.63	3186	3161.25	3024	3343.5	3240	1792.13	0	0	0	0	0
Bodalla 05	0	1897.5	0	0	0	0	0	0	0	0	0	0
Bodalla 06	9472.46	9788.2	9788.2	8620.59	9788.2	9406.67	9682.95	9472.46	9788.2	9788.2	9788.2	9788.2
Bodalla 09	20865.83	21247.4	30420.05	26927.19	30119.48	28979.37	29787.81	29601.25	30845	30845	30845	30845
Bodalla 10	3595	3844	3809.38	3377.71	3844	3544.33	3782	3714.83	3844	3844	3844	3844
Bodalla 13	5096.67	5456	5443.53	4794.17	1483.75	5499.25	18117	17770.5	18414	18414	18414	18414
Bodalla 14	63906.25	75885.42	76432.29	68255.21	75677.08	72812.5	74843.75	74479.17	77500	77500	77500	77500
Bodalla 16	1048.54	1002.6	1047.81	944.64	1069.69	1027.4	998.59	1044.17	1085	1085	1085	1085
Bodalla 20	618.84	650.34	632.01	545.13	645.75	616.44	632.41	619.28	651	651	651	651
Bodalla 21	7190	7425	7423	6435	7395	6425	7320	7190	7440	7440	7440	7440
Bodalla 22	5841.87	4594.69	0	0	0	4541.31	9076.58	8893.44	9238	9238	9238	9238
Coolum 01	135	139.5	139.5	126	139.5	101.25	99	135	139.5	139.5	139.5	139.5
Glenvale 01	480	496	496	448	496	400	566	570	589	589	589	589
Kenmore 01	47.92	23.25	60.21	56	59.92	59.92	61.92	59.63	62	62	62	62
Kenmore 02	17950	12316.67	11837.5	11033.33	11537.5	11966.67	12366.67	11983.33	12400	12400	12400	12400
Kenmore 03	28381.25	28569.27	28737.5	26441.67	28183.33	23255.21	17970.83	27629.17	29450	29450	29450	29450
Kenmore 08	52313.61	52660.18	52970.27	48738.49	51948.81	43010.98	33124.66	50927.34	54283.58	54283.58	54283.58	54283.58
Kenmore 10	39690.21	40762.92	41525.1	37234.27	40170.1	39944.27	41327.5	40141.88	41722.71	41722.71	41722.71	41722.71
Kenmore 15	38891.67	40029.17	38471.88	35858.33	37496.88	38891.67	40191.67	38918.75	40300	40300	40300	40300
Kenmore 16	2852.26	2935.69	2821.48	2629.8	2749.97	2852.26	2908.87	2858.22	2955.55	2955.55	2955.55	2955.55
Kenmore 17	278.13	526.87	250.63	204.38	166.25	303.75	176.25	401.25	840	840	840	840

Kenmore 24	2094.17	2151.04	2167.08	1960	2085.42	2097.08	2167.08	2097.08	2170	2170	2170	2170
Kenmore 26	686.15	628.54	336.88	477.6	83.85	494.37	468.49	1050	980	980	980	980
Kenmore 27	78091.58	80202.17	81701.79	73259.46	79035.79	78591.46	81313	78980.25	82090.58	82090.58	82090.58	82090.58
Kenmore 28	105825	110025	108375	99750	36450	0	0	0	0	0	0	0
Kenmore 30	93478.75	97188.75	95731.25	88112.5	32197.5	0	0	0	0	0	0	0
Kenmore 32	179.75	184.13	155.62	168	178.75	179.75	186	168.5	186	186	186	186
Kenmore 33	10560.58	10847.4	10869.46	9854.58	10516.46	10590	10178.17	10560.58	10943	10943	10943	10943
Kenmore 34	1047.08	1075.52	1082.08	980	1042.71	1048.54	1082.08	1044.17	1085	1085	1085	1085
Kenmore 37	17963.41	18082.42	18188.89	16735.79	17838.14	14769.08	11374.32	17487.39	18038.57	18038.57	18038.57	18038.57
Kenmore 39	160428.75	161491.56	162442.5	149465	159310	131900.63	101582.5	156177.5	166470	166470	166470	166470
Kenmore 43	0	0	0	0	0	102.5	365.75	359.5	363	363	363	363
Marcoola 01	840	612.5	868	476	840	812	793.33	840	868	868	868	868

Appendix 2 – Shut-In Tubing Head Pressure Data

Description: Shut-in tubing head pressure (SITHP or SITP) is measured at the wellhead by the field operator on a quarterly basis. SITHP is the pressure of an oil or gas well when it is shut in and not flowing. It represents the pressure of the perforated formation. To date, these values have not been used to estimate an approximate reservoir pressure by compensating for the hydrostatic weight of the fluid column (oil/water/gas), and simply represents the raw SITHP at a wellhead valve.

NA reflects the well may not have been available for test. At the initial development of the monitoring program, certain wells were chosen due to their perforation into a specific zone. Upon consultation with the Operations Team, some wells that were proposed initially could not be included. This was mainly due to operational requirements or considerations. Several of the proposed wells originally tested were then substituted for another well perforated into the same formation (hence NA on several wells in February). Wells may or may not be available for monitoring at given points. Reasons wells may be unavailable include, being brought back online for production, weather access, exclusion for workover, or other operational constraints. Another well will be substituted if this occurs.

		2022			2023		
Well Name	**Formation**	**21/02/2022**	**08/07/2022**	**14/11/2022**	**27/02/2023**	**31/05/2023**	**14/08/2023**
Bodalla South-4	Hutton	NA	89	94	86	4	**4**
Bodalla South-5	Basal Jurassic	52	32	30	31	31	**29**
Bodalla South-6	Basal Jurassic	NA	132	66	72	99	**46**
Bodalla South-8	Hutton	NA	553	554	558	470	**557**
Bodalla South-18	Hutton	NA	7	88	88	1	**9**
Kenmore-5	Hutton	NA	329	6	19	23	**63**
Kenmore-13	Hutton	40	68	71	74	90	**86**
Kenmore-18	Hutton	25	25	23	30	18	**38**
Kenmore-22	Hutton	52	52	52	53	63	**36**
Kenmore-29	Hutton	NA	46	35	39	66	**69**
Kenmore-31	Hutton	13	35	16	22	36	**42**