

Gerangamete Groundwater Management Area

Groundwater licence No: BEE032496

2017–2018 Report

Executive Summary

This report has been prepared in accordance with Groundwater Extraction licence No. BEE032496 under which Barwon Water operates.

It presents a summary of the work completed by Barwon Water for the monitoring of groundwater and land levels in the Gerangamete groundwater field for the period July 1, 2017, to June 30, 2018 and includes information on:

- the extracted groundwater volume
- groundwater and land level data recorded
- an account of bore maintenance undertaken
- an indication of any analysis completed based on the monitoring data.

The major outcomes of the 2017–2018 program were:

- A total of 0.54 ML of groundwater was extracted during pump maintenance works
- Groundwater level decline and ground subsidence remain within licence trigger levels
- Groundwater levels recorded during 2017–2018 show a recovery trend.

Data collected from monitoring assets have informed a major update of the groundwater model to enable improved simulation of the groundwater system in the study area. The model now meets the highest ranking confidence level in accordance with the Australian Groundwater Modelling Guidelines. The model will be a key component in supporting the Barwon Downs licence renewal application.

Barwon Water has also committed to not operating the Barwon Downs Borefield except for maintenance purposes until the licence application process is complete.

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1. Introduction

Barwon Water operates the Gerangamete Groundwater Field to supplement surface water storages during dry periods. There are currently six production bores licensed to deliver 12.0 ML/day per bore. The bores deliver water to the Gerangamete Water Treatment Plant where it is pre-treated prior to pumping to the main transfer channel and eventual storage and full treatment at Wurdee Boluc. The licence came into operation on November 7, 2006, and is valid until June 30, 2019.

Under the terms of the licence, Barwon Water reports annually on groundwater extraction operations and provides information on groundwater levels. These are monitored through a network of observation bores, which indicate groundwater levels and rate of change in groundwater levels during pumping and recharge periods. Barwon Water also monitor and report on groundwater salinity, land subsidence and environmental observations.

This report provides details of the regional groundwater and land surface monitoring activities undertaken for the period 01 July, 2017, to 30 June, 2018, under Groundwater Licence No: BEE032496.

2. Regional hydrogeology and groundwater modelling

2.1. Regional hydrogeology

Current geological understanding indicates that the Barwon Downs Graben was developed between the uplifted Otway Block and Barongarook High during the middle cretaceous period.

The Graben itself is a complex structure characterised by a series of generally northeast – southwest trending intensely developed faulting and folding of tertiary sediments. The Graben is broadly demarcated by the Bamba fault to the southeast, Birregurra fault to the north and the aquifer outcrop areas in Barongarook High to the west and Bamba region in the northwest.

The Barongarook High is the main recharge area for the Barwon Downs Graben. The various geological formation of the Graben may be summarised below.

Table 1: Geological formation of the Barwon Downs Graben

Formation	Group	Period	
Newer Volcanic Viaduct Moorabool	Undifferentiated	Quaternary	

Formation	Group	Period	
Gellibrand Marl	Heysterbury	Quaternary	Aquitard
Clifton Formation		Tertiary	Minor aquifer
Demon Bluff (Narrawaturk Marl)	Nirranda	Tertiary	Aquitard
Eastern View	Wangerrip	Tertiary	Principal aquifer
Eumeralla	Otway	Cretaceous	Basement rocks

The principal aquifer in Barwon Downs is the Eastern View Formation. This is the basal tertiary unit of alluvial or fluvial deposits containing predominantly quartz, sand, gravel, minor clay and brown coal believed to be deposited during the Palaeocene and Eocene at the start of the tertiary. Tickell et al. (1991) states the lower, middle and upper Eastern View Formations are equivalent to the Pebble Point, Dilwyn and Mepunga Formations respectively. These formations have been renamed as there are significant lithological difference between these layers and the lateral equivalent layers found in the Port Campbell Embayment. The Pebble Point, Dilwyn, Mepunga and Pember Mudstone Formations represent deposits of marine or marginal marine environments. Constant process of deposition, erosion, and reworking of the deposits resulted in interbedded, moderately to poorly sorted, unconsolidated sand gravel, silt, clay and brown coal and an absence of a single continuous layer.

2.2. Groundwater modelling

Between 2016 and 2018, the model was expanded, re-built and re-calibrated to support the upcoming application for renewal of the groundwater extraction licence for the borefield which expires in 2019. The new model builds on earlier model versions, yet is a significant improvement so that it can be used with confidence to assess potential impacts associated with groundwater extraction.

The objectives of developing an updated groundwater model were to improve the ability of the existing groundwater model to assess potential future impacts related to groundwater pumping from the Barwon Downs borefield, and develop a tool to compare impacts that would have happened naturally due to climate influences in the absence of groundwater pumping with that of impacts caused by groundwater pumping over the past 30 years.

The Modflow USG software code has been used and this has allowed a spatially variable numerical grid to be developed allowing increased spatial refinement of the borefield and the rivers. Previous versions of the numerical model (SKM, 2001 and 2011) included five layers. In these previous versions, the Basement and the Pember Mudstone were not included. In 2016, Jacobs reviewed each formation as part of the model update and refined the stratigraphic conceptualisation using information collected from the new monitoring

bores. The extent and thickness of key formations were revised and two additional layers were added. Each of the major hydrogeological units present at the site is represented as an individual model layer. The layers are summarised in Table 2.

Table 2: Model layers for the Barwon Downs Graben

Model layer	Hydrostratigraphic units	Function
Layer 1	Gellibrand Marl	Aquitard
Layer 2	Clifton Formation	Minor Aquifer
Layer 3	Narrawatuk Marl	Aquitard
Layer 4	Mepunga/Dilwyn Formation	Major Aquifer
Layer 5	Pember Mudstone	Aquitard
Layer 6	Pebble Point Formation	Major Aquifer
Layer 7	Basement	Minor Aquifer

The revised groundwater model has a much broader focus than previous work that had concentrated primarily on undertaking a resource assessment to determine the availability of groundwater. The model is well calibrated at both a regional scale and local scale, and is now a more reliable representation of the hydrogeological setting and the rivers and creeks that interact with groundwater.

The groundwater model has attained the highest ranking in confidence level classification in accordance with the Australian Groundwater Modelling Guidelines (Barnett et al., 2012). It is considered to be fit-for-purpose to assess future groundwater behaviour and impacts that may occur from groundwater extraction.

3. Regional groundwater monitoring (Clause 1)

3.1. Monitored area

The monitoring network for the Gerangamete groundwater management area takes in the areas of Barongarook, Yeodene, Birregurra, Gerangamete, Barwon Downs, Deans Marsh and Bamba.

The following table indicates the bores monitored in the reporting period for each formation.

Table 3: Bore number and aquifer monitored

Model layer	Aquifer/Aquitard	Active Monitoring Bores	Inactive Monitoring Bores
Layer 1	Gellibrand Marl		
Layer 2	Clifton Formation	G18, G19, M22	
Layer 3	Narrawatuk Marl		
Layer 4	Mepunga/Dilwyn Formation	BA54, BA56, BA57, BA58, BD3, G11, G14, G17, G20, G22, G24, G28, M25, M27, M28, M29, M30, M31, W7, W9, YYG217, YYG218, YYG221, Y40, Y41, YEO20, YEO21, YEO37, YEO39, YEO40, YEO42, YEO44	G12, G25, W4, YEO38
Layer 5	Pember Mudstone		
Layer 6	Pebble Point Formation	BK69, E68, G11, G13, G14, G21, G23, M24, YEO19, YEO22, YEO23, YEO41	
Layer 7	Basement		

3.2. Groundwater levels (Clause 1.3 A)

Monitoring of the regional observation bore network continued during the 2017–18 year. The locations of the observations bores have been included in the map in Appendix A. Groundwater levels have been recorded at each of the observation bores quarterly and provided in the table in Appendix B. Water levels are referenced to a level on the casing at the surface. Levels below the surface are measured using an electronic piezometer tape, while pressure gauges are used to measure artesian pressures.

Measuring groundwater levels at the production bores has historically been an issue, with measurements dependent on well-head access, infrastructure arrangements and groundwater extraction. Works were conducted in 2016–17 to enable groundwater levels to be taken at these bores. The current measurement capabilities at the production bores are:

- GW2a** Able to measure artesian levels through a pressure gauge. Works will be completed in 2018–19 to allow sub-artesian levels to be read.
- GW3** Able to measure both artesian and sub-artesian levels
- GW4** Able to measure artesian levels through a pressure gauge. Works will be completed in 2018–19 to allow sub-artesian levels to be read.
- GW5** Able to measure both artesian and sub-artesian levels
- GW6** Able to measure both artesian and sub-artesian levels
- GW8** Able to measure both artesian and sub-artesian levels.

GW6 and GW8 had bore pumps installed from April 2016 – October 2017 for extraction of groundwater during an extended dry period in 2016. While extraction ceased in December 2016 the pumps were not removed until October 2017 when pump maintenance was completed. After the bore pumps were removed, recording of groundwater levels resumed.

3.3. Bore hydrographs (Clause 1.3 B)

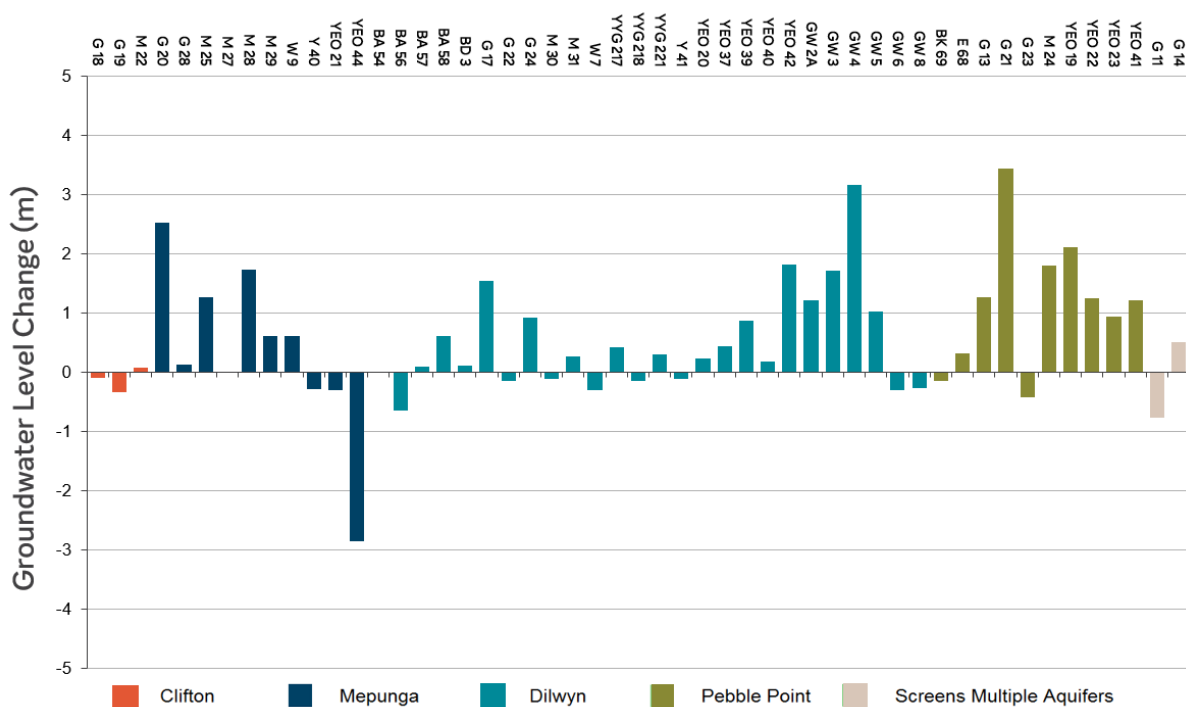
Observation bores in close proximity to the Gerangamete production borefield have shown a quick but expected drawdown and recovery response to periods of groundwater extraction. Observation bores that are further from the borefield tend to show a slower drawdown from groundwater extraction and then take longer to recover. Hydrographs have been prepared for each bore and are presented in Appendix C. Comments have been provided for observation bores where recorded levels weren't consistent with the expected levels.

3.4. Residual drawdown (Clause 1.3 C)

Figure 1 below shows that groundwater levels are continuing to recover after the groundwater extraction which took place in April – December, 2016. The observation bores in close proximity to the Gerangamete production Borefield (G20 & G21), as well as GW4 have shown the largest recovery. These recovery results are expected because the bores closest to borefield also showed the greatest drawdown from the groundwater extraction.

The change in groundwater levels over the past 12 months are illustrated in Figure 1 below. Readings are taken in May 2018 and compared to the June 2017 levels.

Figure 1: 2017/18 Residual drawdown



Notes:

1. GW6 & GW8 had bore pumps installed in June 2017 which prohibited groundwater levels from being taken. Readings in the table above were taken in January 2018 for these two bores.
2. G14 became artesian in June 2017 and did not have the appropriate fittings installed to enable pressure readings at that time. The results graphed were taken in January 2018 when the bore had the correct fittings to read artesian pressure.
3. G25 has been removed from the monitoring program due to bore failure (see section 3.5 Bore Failures)
4. YEO44 has shown short-term variability in the order of 3m+ in recent years, yet continues a longer-term recovery trend. This bore will be monitored in the coming year to determine if a bore condition assessment is required.

The contour maps provided in Appendix D depict the residual drawdown in groundwater levels since June, 1997. The contours are based on the difference in the groundwater levels measured in May 2018 compared to those levels recorded in 1997.

The baseline used for determining residual drawdown for this licensing period has been June 1997 because it represents the end of an extended period of no groundwater extraction and because it is prior to extended periods of groundwater extraction during September 1997 – July 2001, and May 2006 – August 2010. Prior to September 1997, groundwater extraction had occurred intermittently from 1982 – 1990 with a total extraction volume during that time of 25,858 ML. The majority of groundwater extraction during that period was undertaken March 1987 – February 1990, with a total of 20,559 ML.

For this 2017–18 report, the residual drawdown contours have been plotted for each groundwater formation separately. Each aquifer has been observed to have varying rates of recovery and different cones of depression, and so plotting the contours for each aquifer individually is the most accurate method of representing the drawdown within each formation. However, the ability to accurately represent drawdown contours within each formation is highly dependent on the number and distribution of the observation bores within each formation. Evenly distributed observation bores across the whole formation would provide greater confidence in the drawdown contour map.

It should be noted that observation bores Y40 and YEO20 have again been included in the contour mapping in Appendix D as they are again providing representative data following refurbishment and the redrilling in 2016/17. Further commentary on these observation bores has been provided in Section 3.5.

Bore Y41 has been excluded from the residual drawdown map for the Dilwyn formation as it was only constructed in 2006 and provides no comparative data back to 1997.

3.5. Bore failures (Clause 1.3 D)

There were no bore failures in 2017–18 and no condition assessments conducted in 2017–18. However, condition assessments were conducted on 3 bores in 2015–16, with the outcomes detailed below:

- G11** Recorded a constant decline in water levels over the reporting period. A condition assessment conducted in May 2016 identified extensive corrosion in this bore casing that required it to be refurbished. It was later refurbished in 2016–17 and is now producing reliable results. This condition assessment was mistakenly omitted from the previous annual reports and has now been included.
- Y40** Recorded large spikes in groundwater levels. This prompted a condition assessment to be conducted in 2015–16. The assessment indicated that the screens were likely to be blocked causing the erroneous readings and it was recommended that the bore be refurbished to clear the screens. This bore was subsequently refurbished in 2016–17 and is now providing representative groundwater levels.
- YEO20** Recorded the same groundwater levels for an extended period of time from 2013 – 2015. This indicated that the bore was blocked or the screens were not functioning properly. A condition assessment undertaken in 2015–16 indicated that this bore was completely blocked by tree roots preventing groundwater measurements from being taken. In 2016–17, YEO20 was deemed as an important bore for the future monitoring program so the blocked bore was decommissioned and a replacement bore was redrilled in the same location, with screening across the same intervals.

Several observation bores have also displayed signs of failure and will subsequently be decommissioned by DELWP. These bores are:

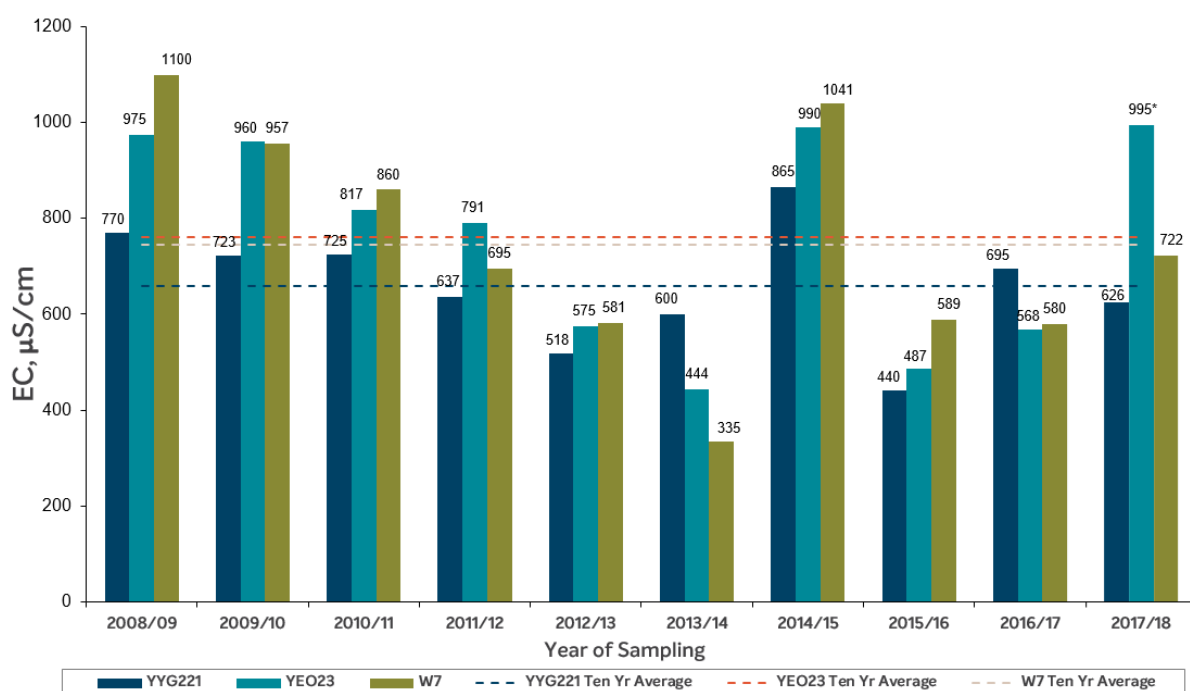
- YEO38** Displaying no variation in the potentiometric levels during borefield extraction and recovery periods and, as such, this bore is likely to have failed. This observation bore is no longer active as part of DELWP’s State Observation Bore Network (SOBN) and is not required as part of the expanded Barwon Downs monitoring program. Therefore, this bore will be removed from Barwon Water’s monitoring program and will be decommissioned by DELWP in due course.
- G25** Providing erroneous data that is inconsistent with other localised bores. This bore is on DELWP’s program for decommissioning and is no longer active as part of the SOBN. Jacobs conducted a review of the existing observation bore network in 2014. This review identified that one bore from BD3 or G25 was needed for the ongoing monitoring program. Since BD3 is producing reliable results it has been prioritised over G25. This bore was removed from Barwon Water’s monitoring program in June 2017.

- W4** The Jacobs observation bore review identified that W4 is not required as part of the ongoing Barwon Water monitoring program and was removed in 2015. This bore is also not required as part of the SOBN and has been decommissioned by DELWP.
- G12** The Jacobs observation bore review identified that G12 is not required as part of the ongoing Barwon Water monitoring program and was removed in 2014. This bore is also not required as part of the SOBN and has been decommissioned by DELWP.

4. Groundwater salinity (Clause 2)

Groundwater salinity was analysed 4 times during 2017–18, through Electrical Conductivity (EC) measurements of 3 observation bores. EC readings were taken by Barwon Water’s Operations staff by lowering an EC probe into the sub-artesian bore YEO23. Groundwater samples for the artesian bores (YYG221 and W7) were taken by opening the valve and releasing the sample into a testing jar before using the EC probe to test the sample. The results taken on the 30th May 2018 are shown for the 2017/18 year in Figure 2.

Figure 2: Electrical conductivity ($\mu\text{S}/\text{cm}$) monitoring results



Notes:

- The results shown for YEO23 were taken on the 30th May 2018. Other readings taken in 2017–18 were 798 $\mu\text{S}/\text{cm}$ on 9th October 2017, 654 $\mu\text{S}/\text{cm}$ on the 3rd January 2018 and 745 $\mu\text{S}/\text{cm}$ on the 8th March 2018.
- Ten-year Average Results: YYG221 = 660 $\mu\text{S}/\text{cm}$, YEO23 = 760 $\mu\text{S}/\text{cm}$, W7 = 746 $\mu\text{S}/\text{cm}$

As illustrated in Figure 2 the 2017–18 results taken for W7 and YYG221 are near the 10–year average results. Results taken for YEO23 on 30th May 2018 were the highest recorded levels in the past 10 years. However other monitoring conducted during 2017/18 indicated the average reading was 798 $\mu\text{S}/\text{cm}$, which would be reflective of the 10–year average. The EC readings continue to fluctuate from year-to-year with no discernible relation to groundwater extraction or low rainfall periods. Due to fluctuations in the salinity readings, Barwon Water will continue to monitor EC on an annual basis, which is above the required five-yearly condition as set out in the groundwater licence.

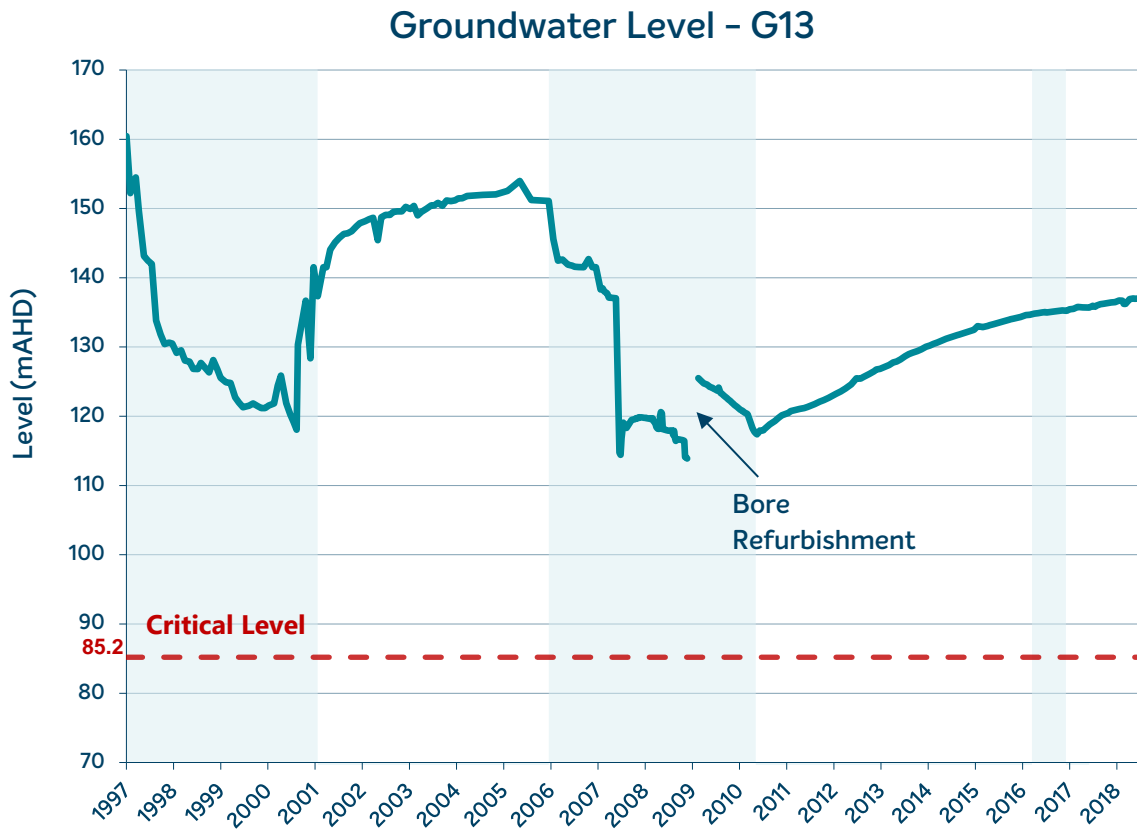
5. Water level decline (Clause 3)

5.1. Groundwater levels in critical bores (Clause 3.5A (i))

Groundwater level trends for each of the critical bores as listed in the licence are shown below. The level in each bore has remained above the critical level for the entire reporting period. If the groundwater levels in any of these four critical bores fall below the critical level, a number of key actions need to be taken by Barwon Water. These are:

- Notify Southern Rural Water within seven days
- Limit groundwater extraction to 34.4 ML/day
- Immediately undertake subsidence monitoring and every six months thereafter
- Increase observation bore readings from quarterly to monthly
- Provide monthly reports to Southern Rural Water mapping depth to potentiometric surface and potentiometric surface relative to AHD
- Provide a report to Southern Rural Water within 90 days that reviews predicted groundwater levels, assesses Geelong's water supply situation and a plan to manage future groundwater extractions.

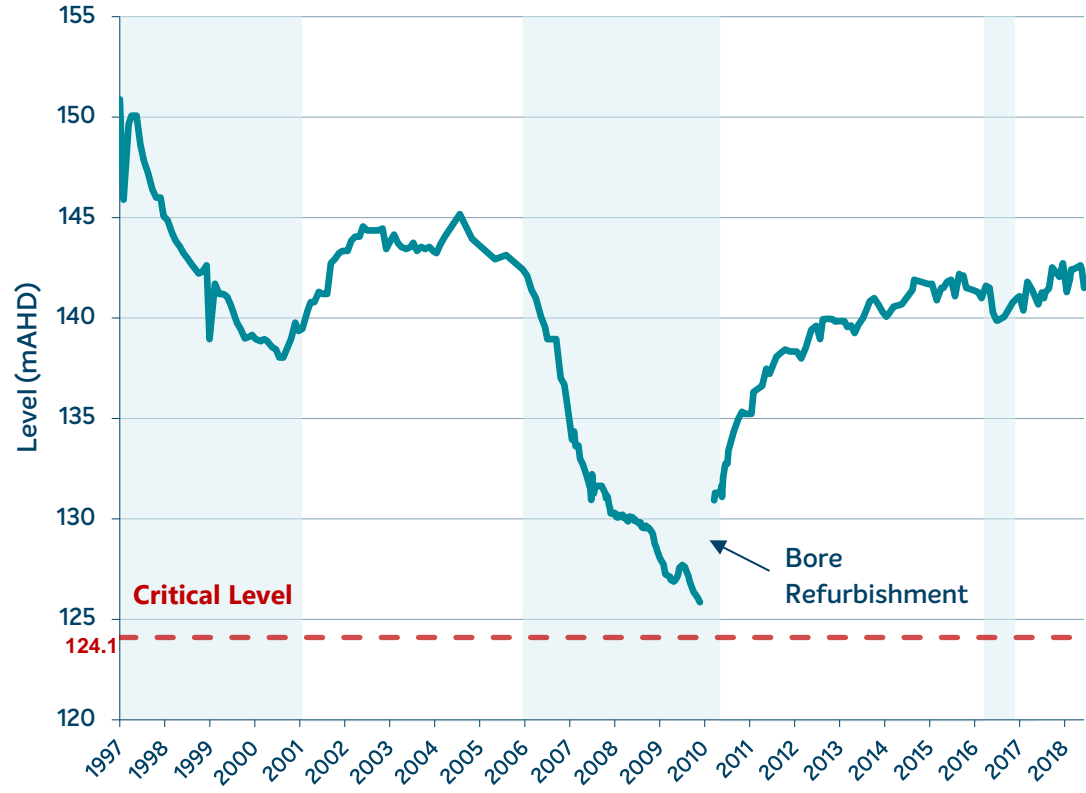
All actions are to be undertaken until the groundwater levels in all critical bores recover to above the critical level.



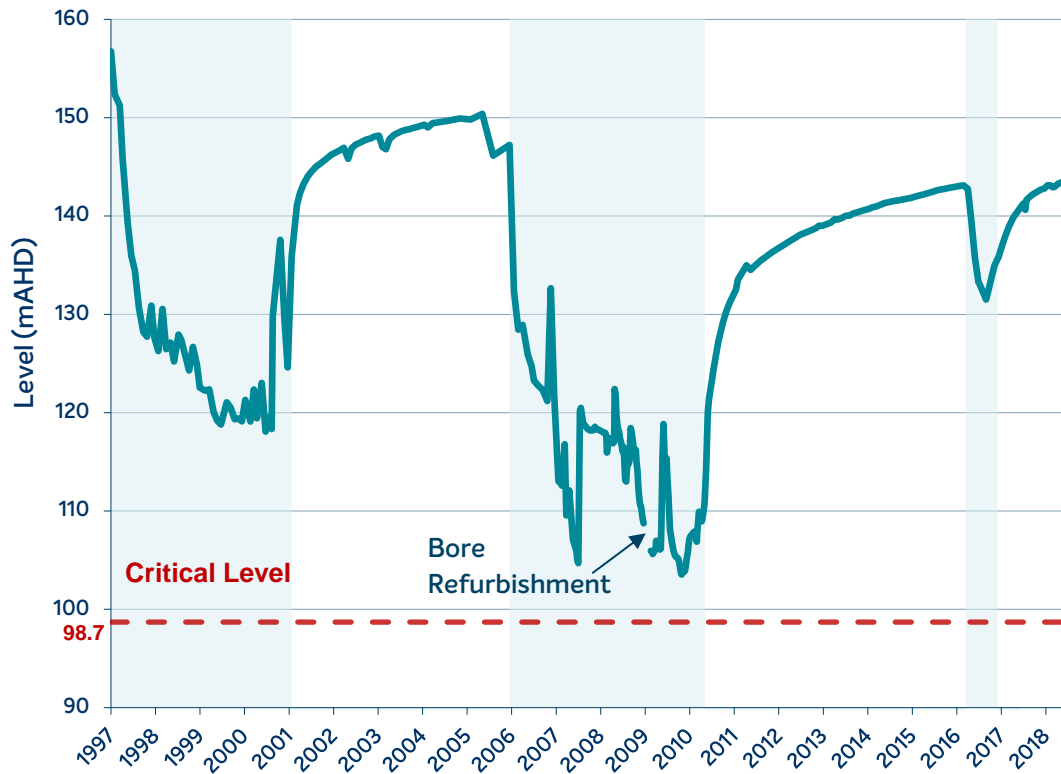
Notes:

1. Bore refurbishment – G13, M28 and G20 were all refurbished during 2009–2010. This refurbishment meant that for a short period of time data was unable to be collected for these observation bores.
2. Light blue shading depicts periods where groundwater extraction has occurred.

Groundwater Level - M28



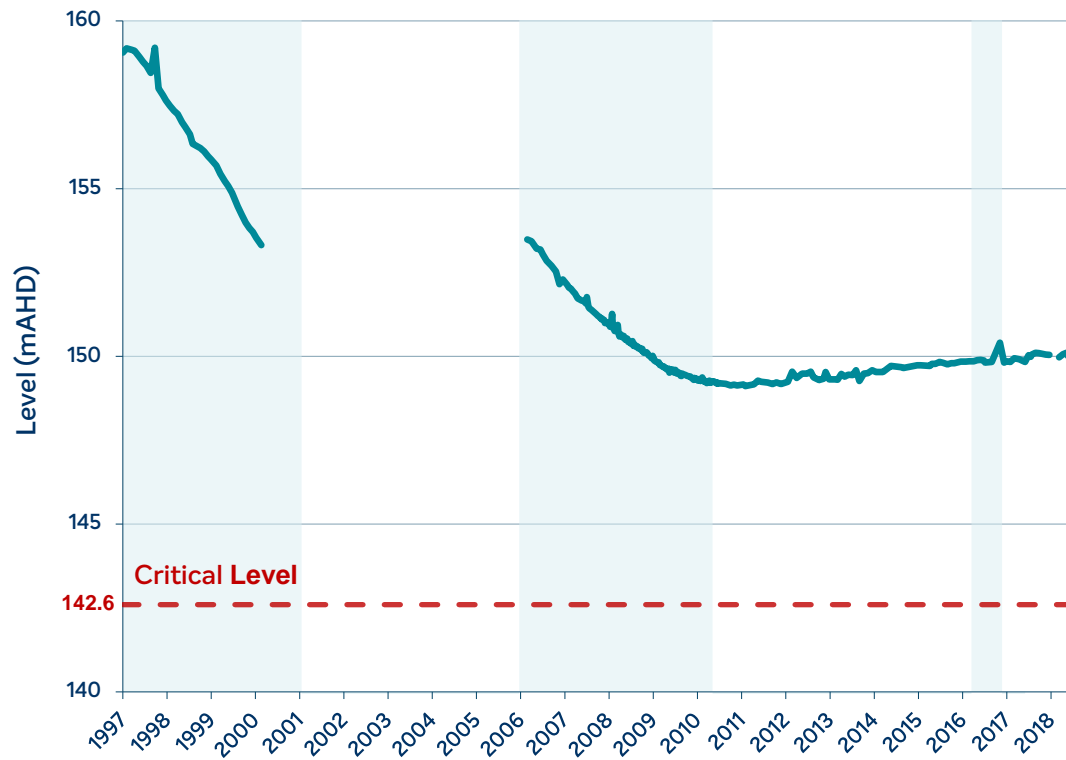
Groundwater Level - G20



Notes:

1. Bore refurbishment – G13, M28 and G20 have all been refurbished during 2009-10. This refurbishment meant that for a short period of time data was unable to be collected for these observation bores.
2. Light blue shading depicts periods where groundwater extraction has occurred.

Groundwater Level - YEO40



Notes:

1. YEO40 bore has an extended period of missing data from October, 2000, to June, 2006. YEO40 was part of the DELWP State Observation Bore Network and was decommissioned in October, 2000. A new observation bore was constructed by Barwon Water in June, 2006, to replace YEO40.
2. Light blue shading depicts periods where groundwater extraction has occurred.

6. Metering (Clause 4)

The Barwon Downs borefield extracted 0.54 ML of groundwater in 2017–2018 for pump maintenance. The bore pumps have since been removed from the bore holes and the borefield is currently offline.

Daily, monthly and annual extraction totals are included in Appendix E. The ten year extracted volume total is at 29,724 ML which is well below the licence limit of 80,000 ML.

7. Subsidence (Clause 5)

7.1. Land subsidence measurement (Clause 5.5 A)

Measurements were carried out and compared to 2003 readings for the subsidence-monitoring network specified in the fourth schedule of the Gerangamete groundwater licence. Surveying was conducted by Barwon Water's spatial services team and the results are presented on the following page in Table 4.

Positive values indicate an increase in ground levels compared to the readings taken in 2003, while a negative value indicates subsidence. The results indicate a slight subsidence in ground levels up until May, 2010.

After 2010, the ground levels at most observation points have shown a small recovery, while some levels have been observed to stabilise.

All ground levels have shown a subsidence well within the maximum allowable limit of 200 mm stipulated in the licence.

Table 4: Land Subsidence Monitoring – Variation from 2003 Readings

Ellipsoid Height Differences as compared to 2003 data (mm)																
Primary Control Station ID	June 2004	May 2005	May 2006	June 2007	Dec 2007	June 2008	July 2009	May 2010	July 2011	June 2012	June 2013	June 2014	June 2015	June 2016	June 2017	June 2018
20790040	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20880024	-8	-2	-8	-18	-16	-8	-21	-25	-25	-12	-23	-20	-21	-11	-19	-19
20590052	-6	0	+6	-3	-12	+7	+8	+8	+15	+8	+14	+1	+3	+13	+27	+11
39780106	-1	0	+3	-27	-9	-15	-16	-30	-14	-16	-30	-24	-25	-11	-19	-15
Monitoring Station ID																
32390045	-6	+1	-11	-42	-42	-36	-66	-75	-47	-42	-54	-42	-42	-47	-35	-39
32390046	+3	+1	-8	-20	-19	-20	-47	-50	-32	-25	-46	-32	-28	-37	-25	-27
26470027	-6	+2	-2	+6	-11	-22	-37	-45	-36	-39	-43	-42	-35	-32	-37	-36
26470032	-5	+5	-1	-43	-30	-36	-63	-63	-35	-40	-45	-42	-37	-42	-39	-40
26470033	-8	+3	-13	-40	-35	-36	-65	-76	-38	-39	-44	-38	-35	-46	-39	-36
26470036	+5	+10	+1	-32	-23	-30	-48	-63	-42	-38	-39	-33	-23	-33	-33	-24
39870025	-1	-4	-5	-15	-11	-17	-23	-34	-37	-31	-25	-29	-33	-27	-27	-21
39870026	-3	0	+2	-9	-6	-15	-22	-38	-37	-33	-31	-31	-35	-21	-28	-23
38090024	-4	-3	+12	+8	NA	0	-26	-25	-18	-30	-15	-36	-	-45	-38	-53
38090025	-5	-5	+9	-12	NA	-5	-30	-33	-28	-48	-23	-33	-35	-27	0	0
38090026	-5	0	+6	-15	NA	-6	-33	-31	-30	-41	-30	-33	-28	-31	-31	-33

8. Flow in Boundary Creek (Clause 6)

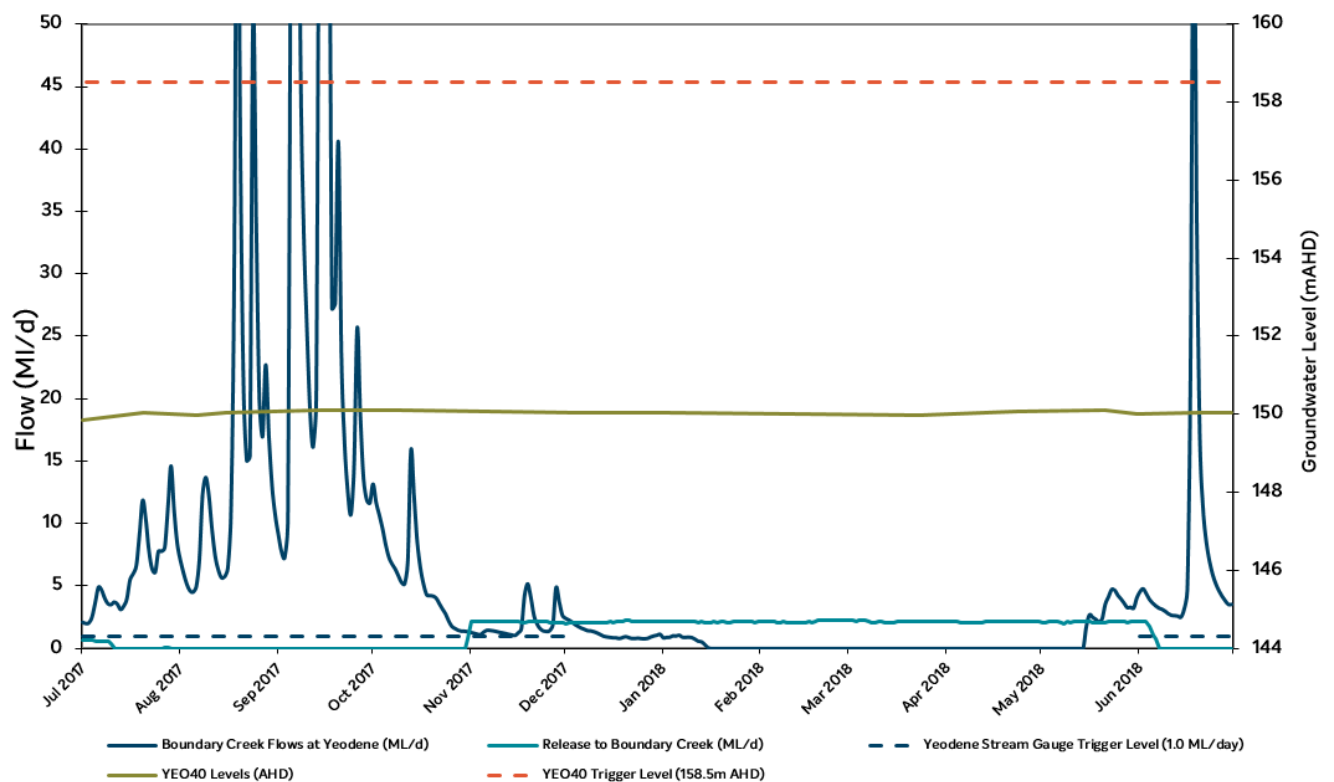
8.1. Discharge to Boundary Creek

Approximately 469 ML of water was released into Boundary Creek during the 2017–2018 year. The chart in figure 3 below shows the daily releases along with daily stream gauging on Boundary Creek (at the Yeodene gauge) and groundwater levels in bore YEO40. Under the Gerangamete groundwater licence Barwon Water must provide a flow of 2 ML/day to the headwaters of Boundary Creek until one of the following occurs:

1. The groundwater level in YEO40 recovers above the trigger level of 158.5m AHD or
2. The natural flow at the Yeodene stream gauge exceeds 1 ML/day any time between June 1 and November 30.

The raw flow data is included in Appendix F.

Figure 3: Flows and releases to Boundary Creek at Yeodene



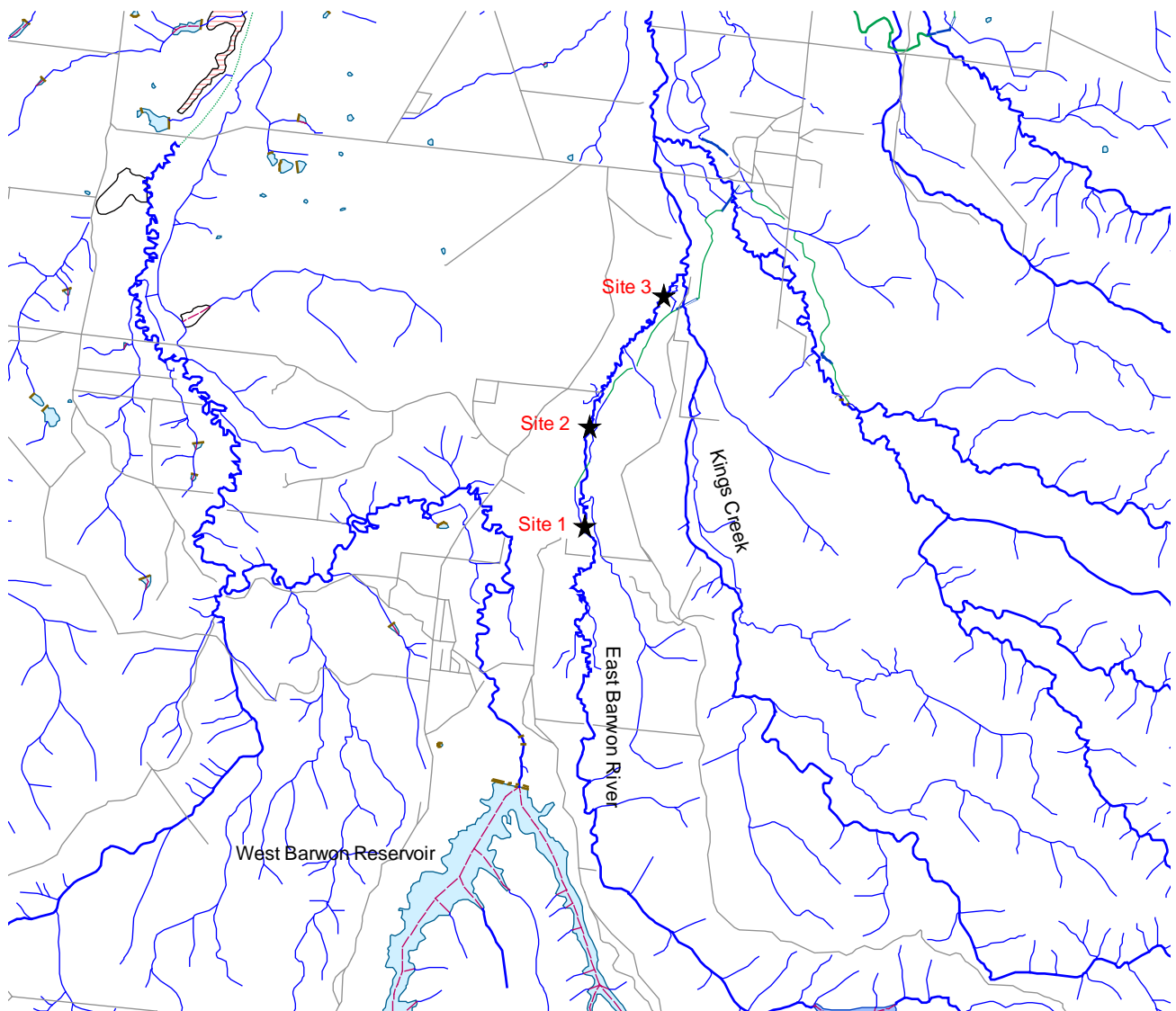
9. Protection of flow in the Barwon River and tributaries (Clause 9)

9.1. East Barwon River (Clause 9.1)

Flows in the East Barwon River are manually measured at six-monthly intervals in three locations as per the agreement with Southern Rural Water. The three locations are:

1. East Barwon gauge (Monitoring site 233253A)
2. Approximately 1km downstream of the East Barwon gauge
3. Approximately 250m upstream of the Kings Creek junction.

Figure 4: Stream Gauge sites on the East Barwon River



Flow gauging was conducted during the year to record the flows in the East Barwon River. Flows had ceased during the December gauging so therefore no flow was recorded. Vegetation growth continues to pose issues with obtaining measurements at these sites. Options are being investigated in order to prevent weed growth and improve flow measurements.

The results from the 2017–2018 flow measurements obtained are shown in the table below.

Table 5: Measured flows in East Barwon River

Measurement No.	Date	Flow at site (ML/d)			Borefield pumping?
		1	2	3	
1	October 2017	2.19	2.19	2.64	No
2	April 2018	2.4	1.2	2.2	No

The October 2017 gauging results show a similar trend to previous monitoring results which show there is a small increase in flow from upstream to downstream. However, the April 2018 results have a loss between site 1 and 2 but increased again at site 3. This loss is not consistent with the long-term results and the flow measurement at site 2 is likely to be affected by the weed growth.

9.2. Groundwater discharge to the West Barwon River (Clause 9.4 A)

A previous survey of the river profile between bores Y40 and Y41 (near Boundary Rd, Yaugher) shows that the invert (low point) of the river at this point is at approximately 140.2 m AHD.

Y41 was specifically installed to measure the depth of groundwater on the east side of the river in this same area. As indicated in Appendix B, water levels over the past twelve months have been 15.95 metres below the ground level of 142.735 metres AHD. Due to the groundwater level being 13.415m below the river level, this indicates groundwater was unable to discharge to the West Barwon River over the past 12 months.

The bore did not experience any failure in the past year and the monitoring trend suggests no further investigation is required at this time.

10. Community engagement (Clause 10)

10.1. Information (Clause 10.1 A)

This report will be made available to the public following acceptance from Southern Rural Water.

10.2. Engagement (Clause 10.2)

Barwon Downs Groundwater Community Reference Group

Barwon Water established a Community Reference Group (CRG) in 2013 to help scope the monitoring program and supporting technical studies to target areas of community concern as an input into the 2019 groundwater licence renewal process. The CRG's objectives were to:

- Advise on key community concerns about the Barwon Downs borefield to assist in further refinement of the monitoring and investigation program,
- Provide advice on engagement with the broader community in relation to the borefield, and
- Monitor implementation of the revised monitoring program.

The issues the CRG raised were an important contribution because it raised confidence that the right monitoring data would be captured to specifically target known areas of community concern. These were included in the new monitoring program.

Since 2013, the CRG met a total of 23 times and have also participated in the Barwon Downs borefield groundwater licence renewal process by attending community information sessions and workshops.

In May, 2018, the CRG presented their final report and recommendations. In the report, the CRG, indicated it supported Barwon Water applying for a renewed groundwater licence and its approach to the future management of the borefield.

This report was used in the development of the licence application.

To view the CRG's report, please visit:

<https://www.yoursay.barwonwater.vic.gov.au/27010/documents/78781>

Broader community and stakeholder consultation

In addition to consultation with the CRG, broader consultation was undertaken with the community and stakeholders through community information sessions, briefings with regulatory agencies and Landcare groups, updates to Barwon Water's Customer and Environmental Consultative Committees and three independently facilitated workshops.

The workshops, hosted in late 2017, provided participants the opportunity to engage with senior Barwon Water's Chairman and Managing Director about community concerns and outcomes regarding the borefield.

During the workshops, participants identified community outcomes for Barwon Water to consider and respond to.

At the conclusion of each workshop, a report was generated and provided to all participants and Barwon Water.

To view the workshop reports, please visit:

Workshop 1 – <https://www.yoursay.barwonwater.vic.gov.au/27010/documents/64470>

Workshop 2 – <https://www.yoursay.barwonwater.vic.gov.au/27010/documents/64805>

Workshop 3 – <https://www.yoursay.barwonwater.vic.gov.au/27010/documents/68667>

These reports were used as part of the development of the groundwater licence application.

Appendix A

Groundwater bores location plan



Appendix B

Quarterly groundwater levels

Groundwater levels relative to surface

Clifton Formation

Date	State/WMIS ID	64234	64235	82838
	Barwon Water ID	G 18	G 19	M 22
	Point of Reference	TOV	TOC	TOC
	9-Oct-17	1.53	-28.35	-17.24
	3-Jan-18	1.12	-28.43	-17.15
Date	8-Mar-18	1.02	-28.64	-17.32
	30-May-18	1.22	-29.00	-17.26

Mepunga Formation

Date	State/WMIS ID	64236	64244	82841	82843	82844	82845	102869	108915	109112	109135
	Barwon Water ID	G 20	G 28	M 25	M 27	M 28	M 29	W 9	Y 40	YEO 21	YEO 44
	Point of Reference	TOC	TOC	TOV	TOC	TOV	TOC	TOC	TOC	TOV	TOC
	9-Oct-17	-22.53	-37.87	-14.35	1.51	14.89	-27.05	-0.71	-36.14	5.81	-14.42
	3-Jan-18	-21.99	-37.88	-13.94	1.84	15.10	-26.99	-0.55	-36.05	6.12	-15.18
Date	8-Mar-18	-21.85	-38.07	-14.52	1.55	14.79	-27.18	-0.80	-36.20	5.10	-15.54
	30-May-18	-21.50	-37.71	-13.75	1.02	14.79	-26.85	-0.75	-36.20	5.30	-15.80

Dilwyn Formation

Date	State/WMIS ID	47771	47773	47774	47775	48249	64227	64230	64233	64238	64240	82846
	Barwon Water ID	BA 54	BA 56	BA 57	BA 58	BD 3	G 11	G 14	G 17	G 22	G 24	M 30
	Point of Reference	TOC ¹	TOC	TOP ²	TOP	TOC	TOP	TOV ³	TOP	TOC	TOC	TOC
	9-Oct-17	-12.89	-25.58	-14.81	-14.12	-35.46	-46.74		-30.23	-86.85	-30.43	-28.83
	3-Jan-18	-12.69	-25.64	-14.88	-13.91	-35.42	-47.11	2.75	-30.01	-86.81	-30.25	-28.64
Date	8-Mar-18	-13.40	-25.77	-15.00	-14.72	-35.43	-47.50	3.50	-30.82	-86.92	-30.76	-29.15
	30-May-18	-13.03	-25.82	-14.90	-14.15	-35.44	-47.47	3.26	-29.45	-87.02	-29.95	-28.98

Date	State/WMIS ID	82847	102868	107716	107717	107720		109111	109128	109130	109131	109133
	Barwon Water ID	M 31	W 7	YYG 217	YYG 218	YYG 221	Y41	YEO 20	YEO 37	YEO 39	YEO 40	YEO 42
	Point of Reference	TOC	TOV	TOP	TOP	TOV	TOC	TOC	TOC	TOC	TOC	TOC
	9-Oct-17	-23.24	30.50	-52.45	-34.14	7.55	-15.85	-24.86	-9.99	-9.83	-15.59	-62.05
	3-Jan-18	-23.15	30.29	-52.43	-34.11	7.96	-15.81				-15.64	-62.01
Date	8-Mar-18	-23.25	30.90	-52.56	-34.56	8.16	-16.15				-15.71	-62.95
	30-May-18	-23.16	30.09	-52.17	-34.50	7.85	-15.95		-10.14	-9.30	-15.67	-60.35

Date	WMIS ID	WRK040900	WRK040901	WRK040902	WRK040899	WRK040903	WRK040904
	State ID	64246	64247	64248	64245	56301/01	56301/02
	Barwon Water ID	GW2A	GW3	GW4	GW5	GW6	GW8
	Point of Reference	TOV	TOV	TOV	TOV	TOV	TOV
	9-Oct-17	2.09	-4.25		3.67		
Date	3-Jan-18	2.24	-3.99	16.22	4.08	2.44	1.97
	8-Mar-18	2.44	-3.97	16.72	3.57	2.62	1.94
	30-May-18	2.64	-3.43	16.83	4.08	2.14	1.70

Pebble Point Formation

	State/WMIS ID	48001	62578	64229	64237	64239	82840	109110	109113	109114	109132
	Barwon Water ID	BK 69	E 68	G 13	G 21	G 23	M 24	YEO 19	YEO 22	YEO 23	YEO 41
	Point of Reference	TOC	TOC	TOV	TOV	TOC	TOV	TOC	TOC	TOC	TOC
	Date										
	9-Oct-17	-25.60	-25.40	-5.02	-3.17	-71.25	-11.73	-30.60	-35.26	-16.03	-63.03
	3-Jan-18	-25.67	-25.28	-4.56	-2.96	-71.35	-11.31	-30.19	-34.92	-15.63	-62.70
	8-Mar-18	-25.86	-25.55	-5.05	-2.83	-71.72	-11.88	-30.06	-34.86	-15.96	-63.15
	30-May-18	-25.79	-25.45	-4.32	-0.54	-71.77	-10.80	-29.55	-34.80	-15.83	-62.47

Critical Monitoring Bore Readings

	State/WMIS ID	64229	64236	82844	109131
	Barwon Water ID	G 13	G 20	M 28	YEO 40
	Point of Reference	TOV	TOC	TOV	TOC
	Date				
	20-Jul-17	-5.33	-23.50	13.64	-15.65
	6-Aug-17	-5.46	-24.16	13.36	-15.70
	15-Aug-17	-5.30	-23.15	13.64	-15.63
	14-Sep-17	-5.10	-22.77	13.85	-15.58
	10-Oct-17	-5.02	-22.53	14.89	-15.59
	5-Dec-17	-4.84	-22.11	14.42	-15.63
	3-Jan-18	-4.80	-21.99	15.10	-15.64
	2-Feb-18	-4.56	-21.64	13.66	
	26-Feb-18	-4.58	-21.69	14.28	
	9-Mar-18	-5.05	-21.85	14.79	
	23-Mar-18				-15.71
	23-Apr-18	-4.36	-21.51	14.89	-15.62
	21-May-18	-4.26	-21.36	14.99	-15.58
	31-May-18	-4.32	-21.50	14.79	-15.67
	19-Jun-18	-4.30	-21.31	13.87	-15.63

Notes:

1: TOC - Top of casing

2: TOP - Top of Pipe

3: TOV - Top of Valve

YEO20, YEO37, YEO39 & YEO40: Operations staff were unable to access these bores at times during 2017/18. This prevented groundwater levels from being recorded.

GW4 & G14: These bores were artesian in October 2017 and did not have the right fittings to enable artesian readings to be taken. Fittings were installed in 2017/18 and now artesian pressure can be read.

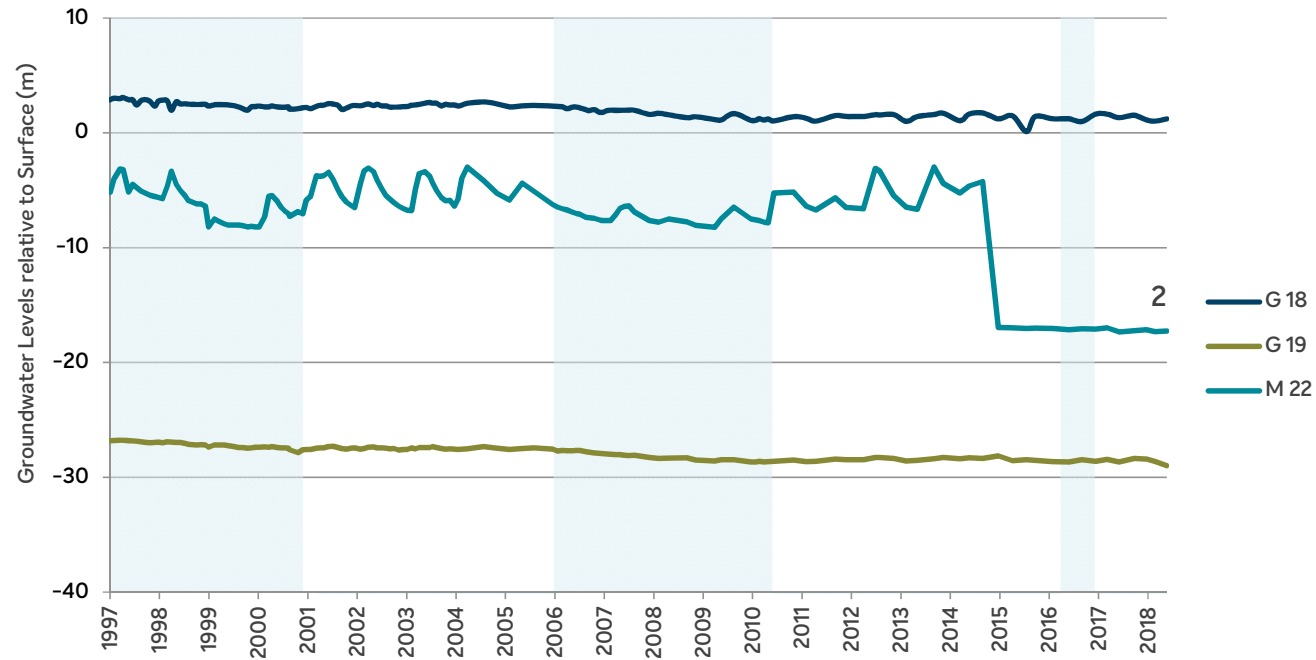
GW6 & GW8: These production bores had bore pumps installed from April 2016 - October 2017 for extraction of groundwater during an extended dry period in 2016. While extraction ceased in December 2016 the pumps were not removed until October 2017 when pump maintenance was completed. After the bore pumps were removed, recording of groundwater levels resumed.

Indicates a critical monitoring bore as listed in the Licence

Appendix C

Bore hydrographs

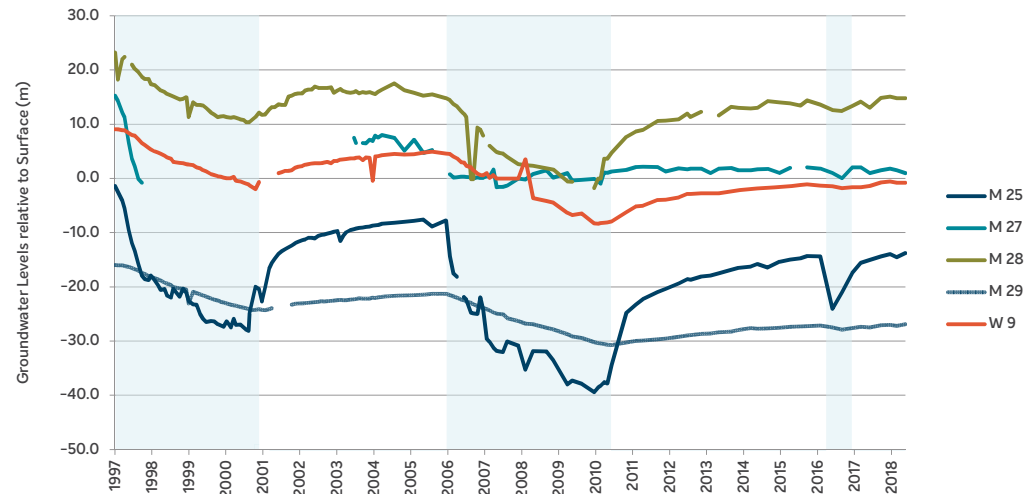
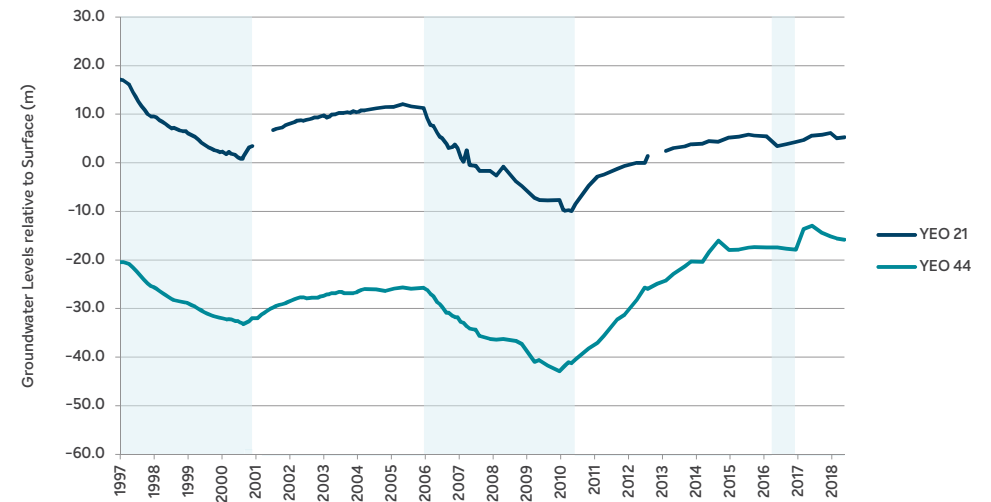
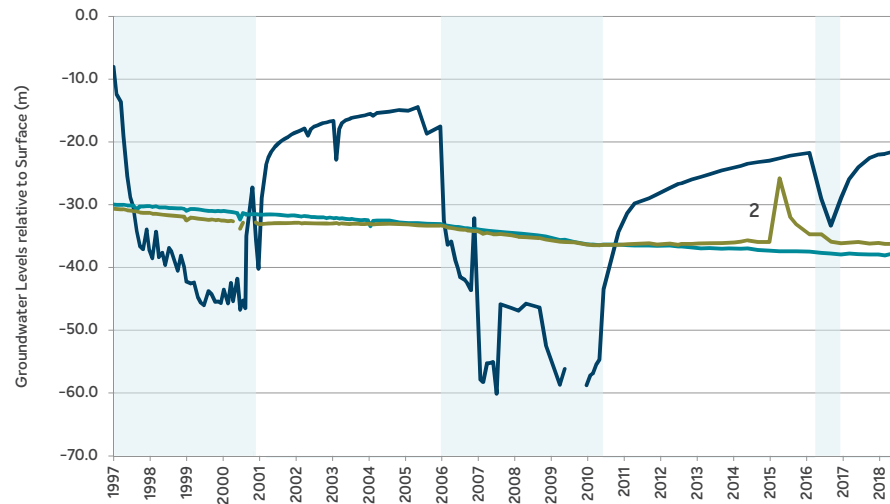
Clifton



Notes:

1. Light blue shading denotes periods of groundwater extraction
2. M22 was refurbished by DELWP in 2014-2015. The drop in groundwater levels observed in 2014-2015 are due to the refurbishment and this bore is now recording accurate levels.

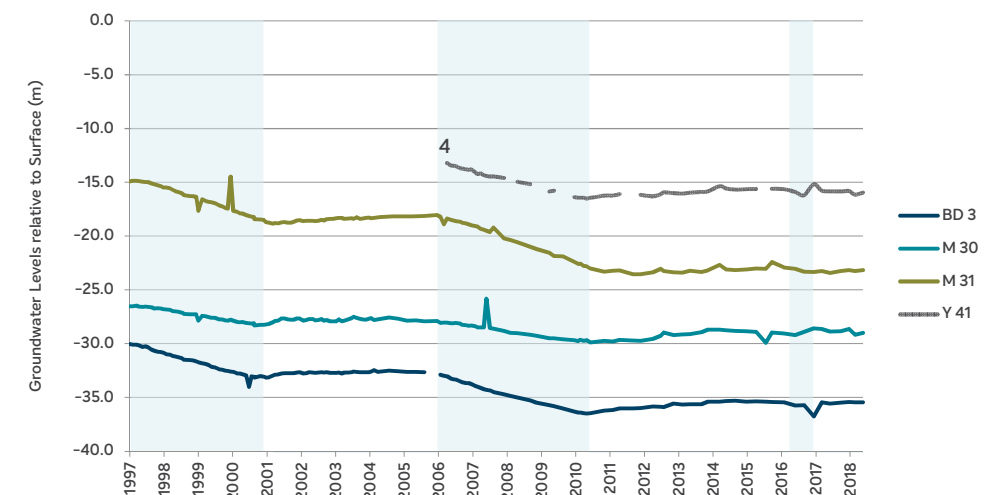
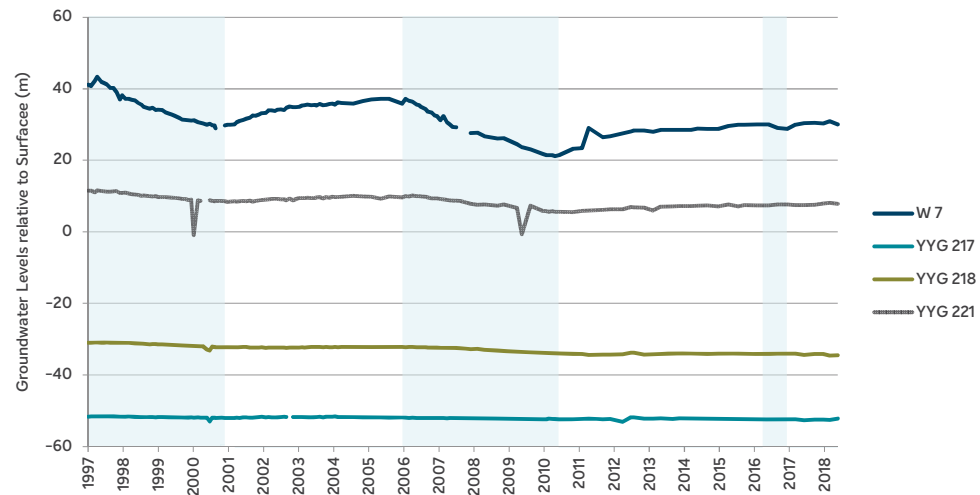
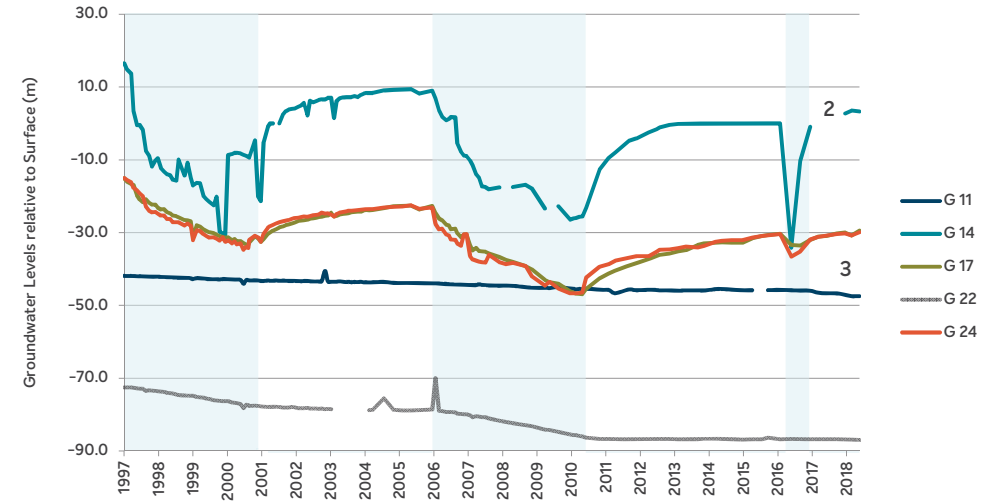
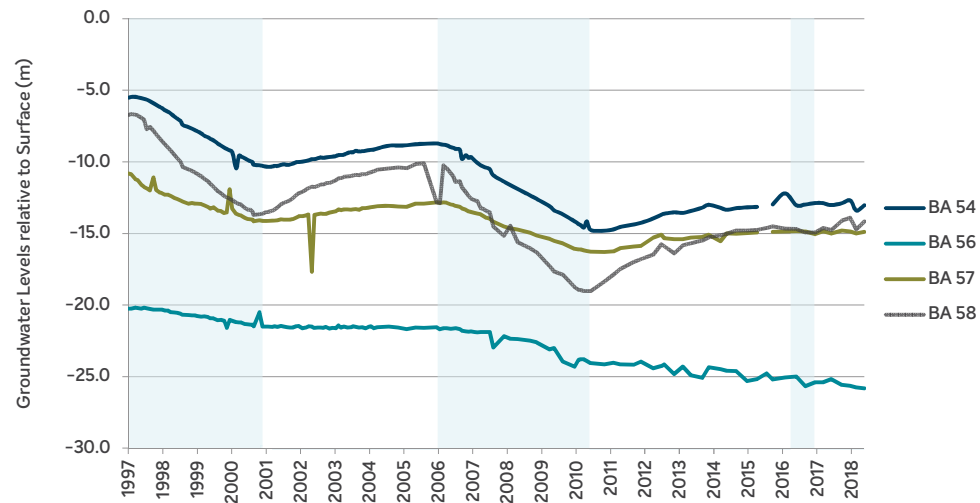
Mepunga



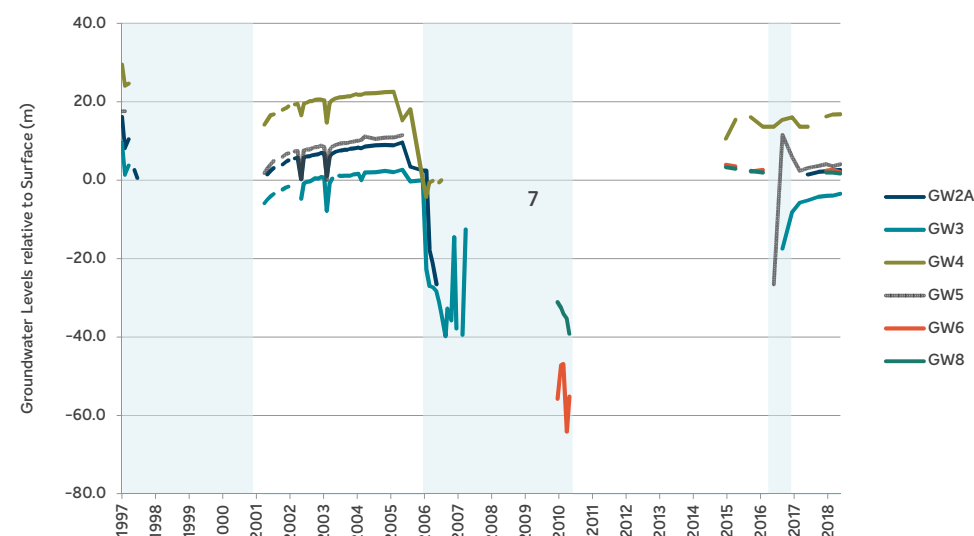
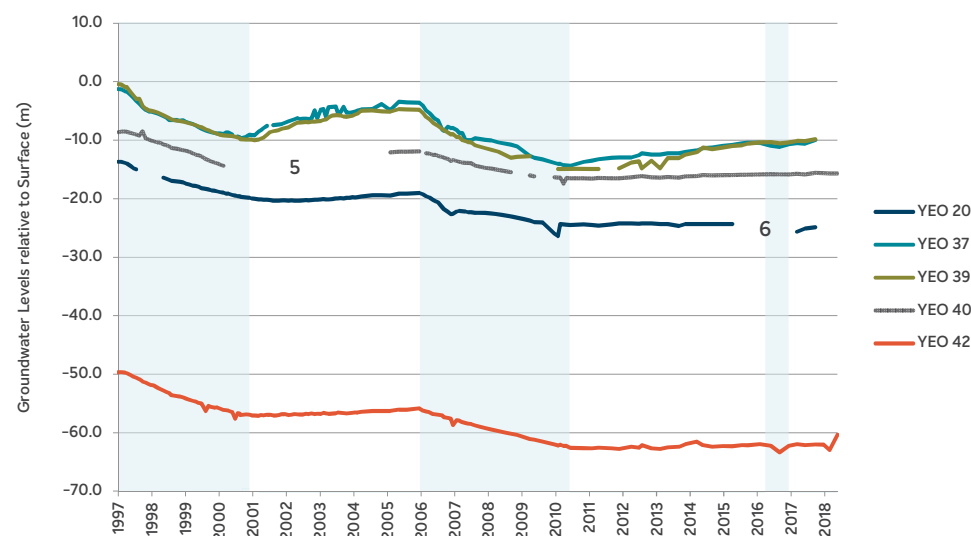
Notes:

1. Light blue shading denotes periods of groundwater extraction
2. A condition assessment was conducted on Y40 in 2015/16. This indicated that the screens are blocked causing erroneous readings. Y40 was refurbished in 2016/17 and is now providing representative results.

Dilwyn



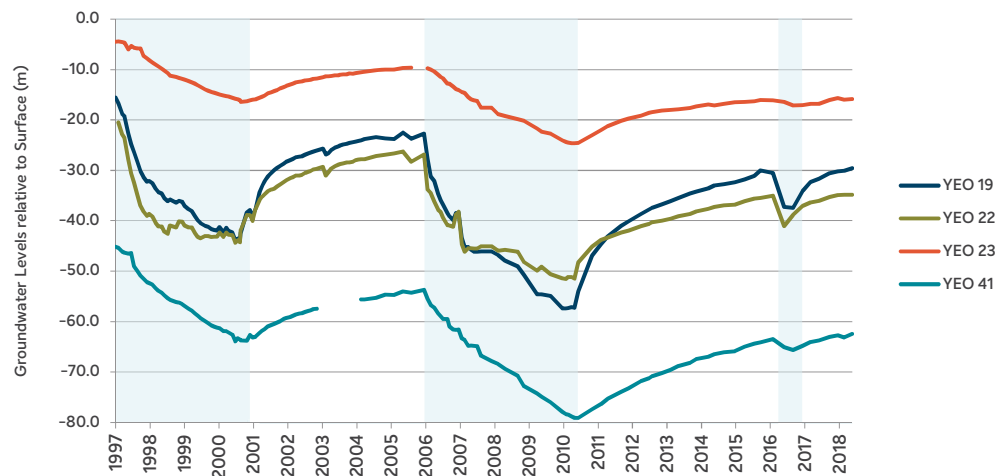
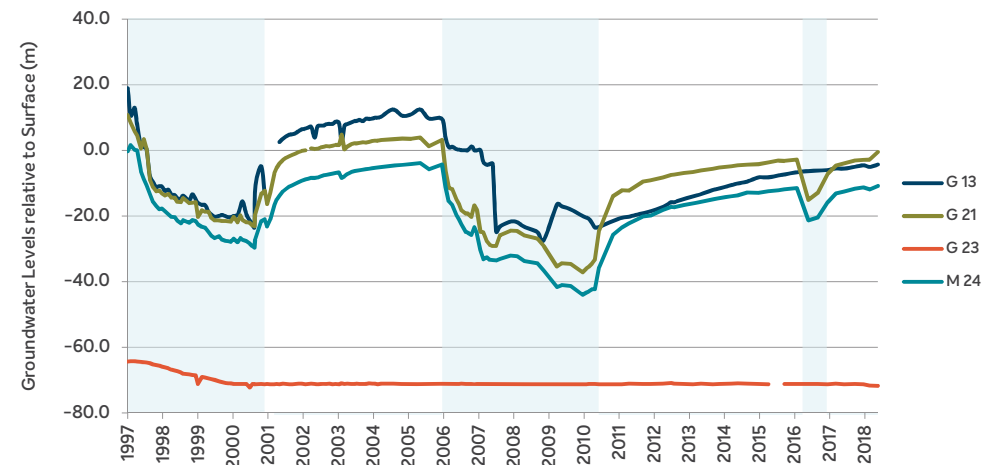
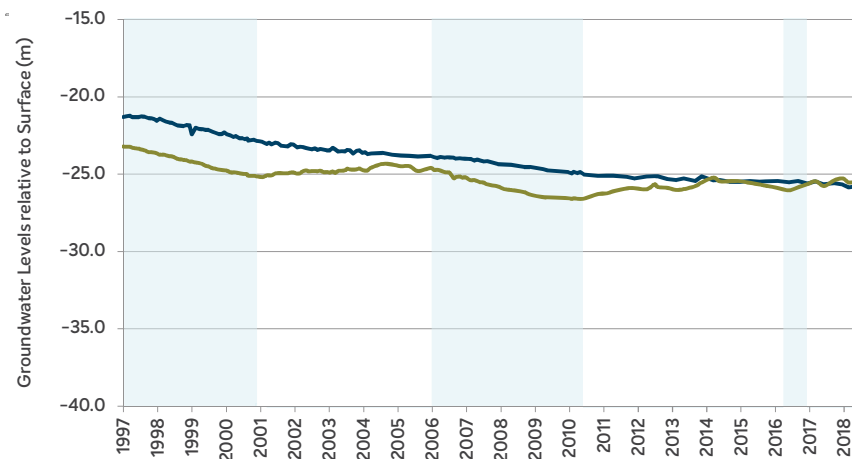
Dilwyn



Notes:

1. Light blue shading denotes periods of groundwater extraction
2. G14 was artesian for a period of time in 2017 and did not have the correct fittings to enable pressure readings to be taken. Fittings have now been installed to enable pressure readings to be taken.
3. G11 has recorded a constant decline in the groundwater levels over the whole reporting period. A condition assessment was conducted on this bore in 2015–2016 which indicated that it needed refurbishment. The refurbishment on G11 was completed in 2016–2017 and it is now providing reliable data.
4. Y41 was constructed in 2006 and therefore no data exists for this bore prior to then.
5. YEO40 has an extended period of missing data from October 2000 – June 2006. YEO40 was part of the DELWP State Observation Bore Network and was decommissioned in October 2000. A new observation bore was constructed by Barwon Water in June 2006 to replace YEO40.
6. YEO20 had a condition assessment conducted in 2015–2016 that showed it was completely blocked by tree roots. This bore has been decommissioned and a new bore has been redrilled in the same location. Readings on the new YEO20 bore commenced in June 2017. Site access prohibited some readings from being taken during 2017–2018 as operations staff were denied access to the landowners property.
7. Data collected for the groundwater production bores varies with well head access, infrastructure arrangements and extraction. Groundwater levels are now being recorded at all production bores.

Pebble Point



Notes:

1. Light blue shading denotes periods of groundwater extraction
2. BK69 has demonstrated a declining trend in groundwater levels. A condition assessment was conducted on this bore in 2015-2016 that confirmed that these readings were representative of the actual groundwater levels.

Appendix D

Relative residual drawdown 1997 to June 2018

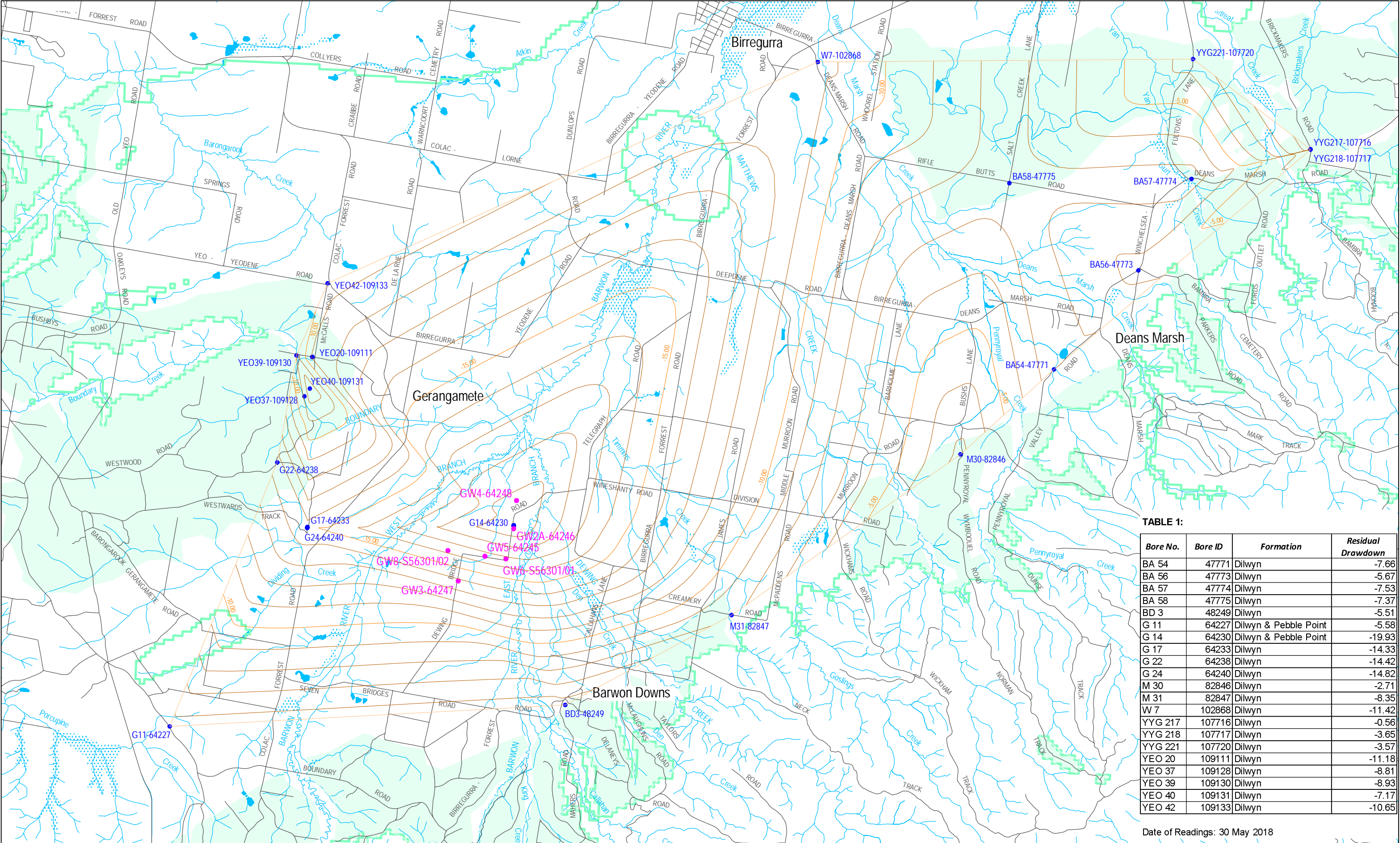


TABLE 1:			
Bore No.	Bore ID	Formation	Residual Drawdown
BA 54	47771	Dilwyn	-7.66
BA 56	47773	Dilwyn	-5.67
BA 57	47774	Dilwyn	-7.53
BA 58	47775	Dilwyn	-7.37
BD 3	48249	Dilwyn	-5.51
G 11	64227	Dilwyn & Pebble Point	-5.58
G 14	64230	Dilwyn & Pebble Point	-19.93
G 17	64233	Dilwyn	-14.33
G 22	64238	Dilwyn	-14.42
G 24	64240	Dilwyn	-14.82
M 30	82846	Dilwyn	-2.71
M 31	82847	Dilwyn	-8.35
W 7	102868	Dilwyn	-11.42
YYG 217	107716	Dilwyn	-0.56
YYG 218	107717	Dilwyn	-3.65
YYG 221	107720	Dilwyn	-3.57
YEO 20	109111	Dilwyn	-11.18
YEO 37	109128	Dilwyn	-8.81
YEO 39	109130	Dilwyn	-8.93
YEO 40	109131	Dilwyn	-7.17
YEO 42	109133	Dilwyn	-10.65

Date of Readings: 30 May 2018

NOTES

RELATIVE RESIDUAL DRAWDOWN CONTOURS 1m

RELATIVE RESIDUAL DRAWDOWN INDEX CONTOURS 5m

AQUIFER EXTENTS

NOT ALL BORES SHOWN ON PLAN WERE USED IN MODEL - SEE TABLE 1 FOR DATA USED. RELATIVE RESIDUAL DRAWDOWN TO PRE 1997 LEVELS.

PUMPING OCCURRED DURING 1997 - 2001 AND 2006 - 2010. PUMPING RECOMMENCED APRIL 2016.

THE RESIDUAL DRAWDOWN MAPS REPRESENT THE DRAWDOWN IN DEEP, CONFINED AQUIFERS. THIS IS NOT THE LOCAL WATER TABLE LEVEL.



BarwonWater

TECHNICAL & SPATIAL SERVICES

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TEL. 1300 656 007
www.barwonwater.vic.gov.au

GERANGAMETE GROUNDWATER MONITORING BORES
BARWON DOWNS AQUIFER - DILWYN FORMATION
RELATIVE RESIDUAL DRAWDOWN - 2018 COMPARED TO PRE-PUMPING (1997)


JOB No. 11384


SCALE IN METRES
SCALE 1 : 75 000

DRAWN
E.DELGROSSO
23/07/18

CHECKED

750 0 750 1500 2250 3000 3750 4500 5250 6000



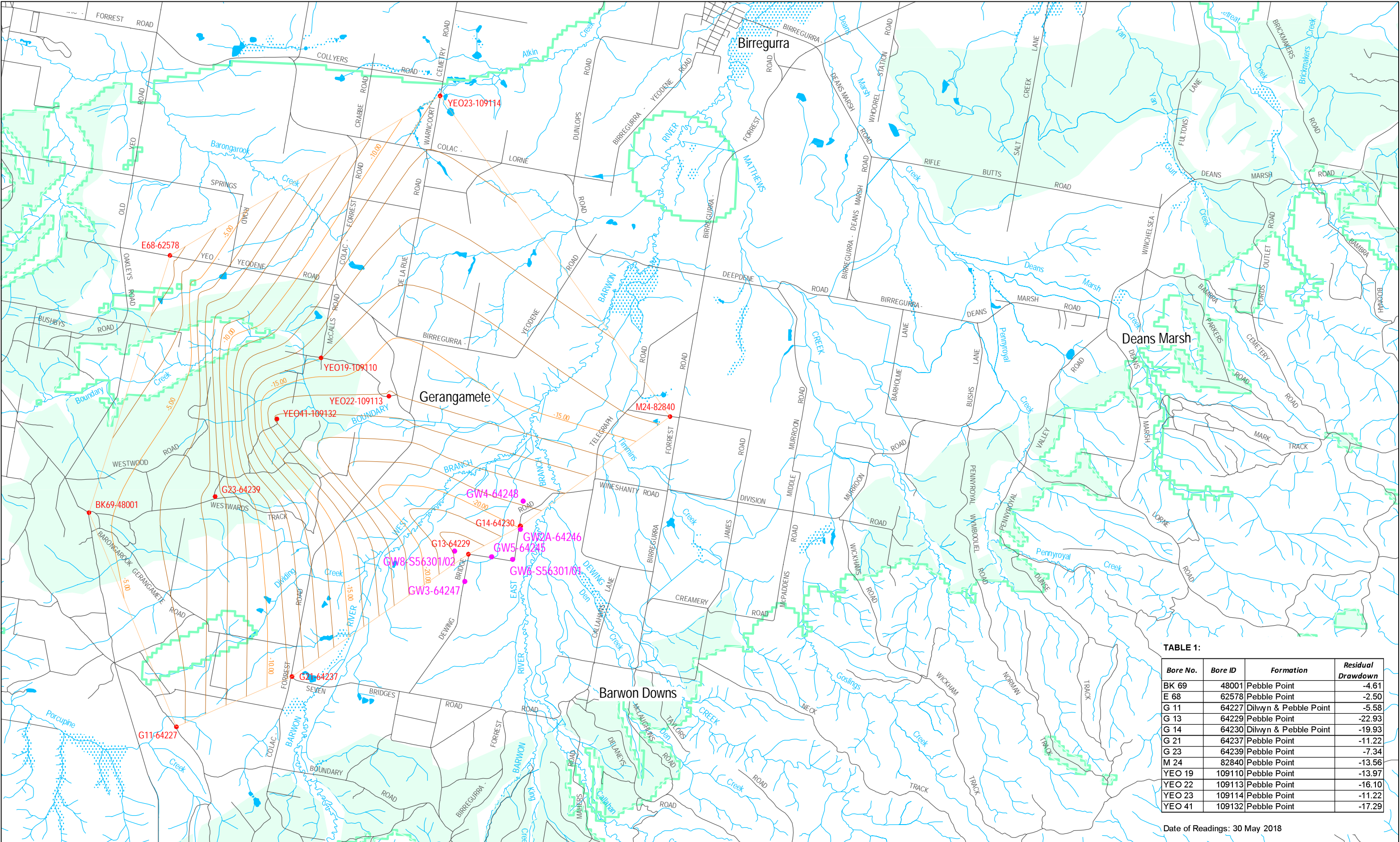


DATUMS

HEIGHT: AHD
MAP: MGA
ZONE: 54

11384-01

A:



NOTES

RELATIVE RESIDUAL DRAWDOWN CONTOURS 1m
RELATIVE RESIDUAL DRAWDOWN INDEX CONTOURS 5m
AQUIFER EXTENTS
NOT ALL BORES SHOWN ON PLAN WERE USED IN MODEL - SEE TABLE 1 FOR DATA USED. RELATIVE RESIDUAL DRAWDOWN TO PRE 1997 LEVELS.
PUMPING OCCURRED DURING 1997 - 2001 AND 2006 - 2010. PUMPING RECOMMENCED APRIL 2016.
THE RESIDUAL DRAWDOWN MAPS REPRESENT THE DRAWDOWN IN DEEP, CONFINED AQUIFERS. THIS IS NOT THE LOCAL WATER TABLE LEVEL.



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GERANGAMETE GROUNDWATER MONITORING BORES

BARWON DOWNS AQUIFER - PEBBLE POINT FORMATION


RELATIVE RESIDUAL DRAWDOWN - 2018 COMPARED TO PRE-PUMPING (1997)


JOB No. 11384

DRAWN E.DELGROSSO 23/07/18

CHECKED

SCALE IN METRES
SCALE 1 : 75 000





DATUMS

HEIGHT: AHD
MAP: MGA
ZONE: 54

11384-02
A:

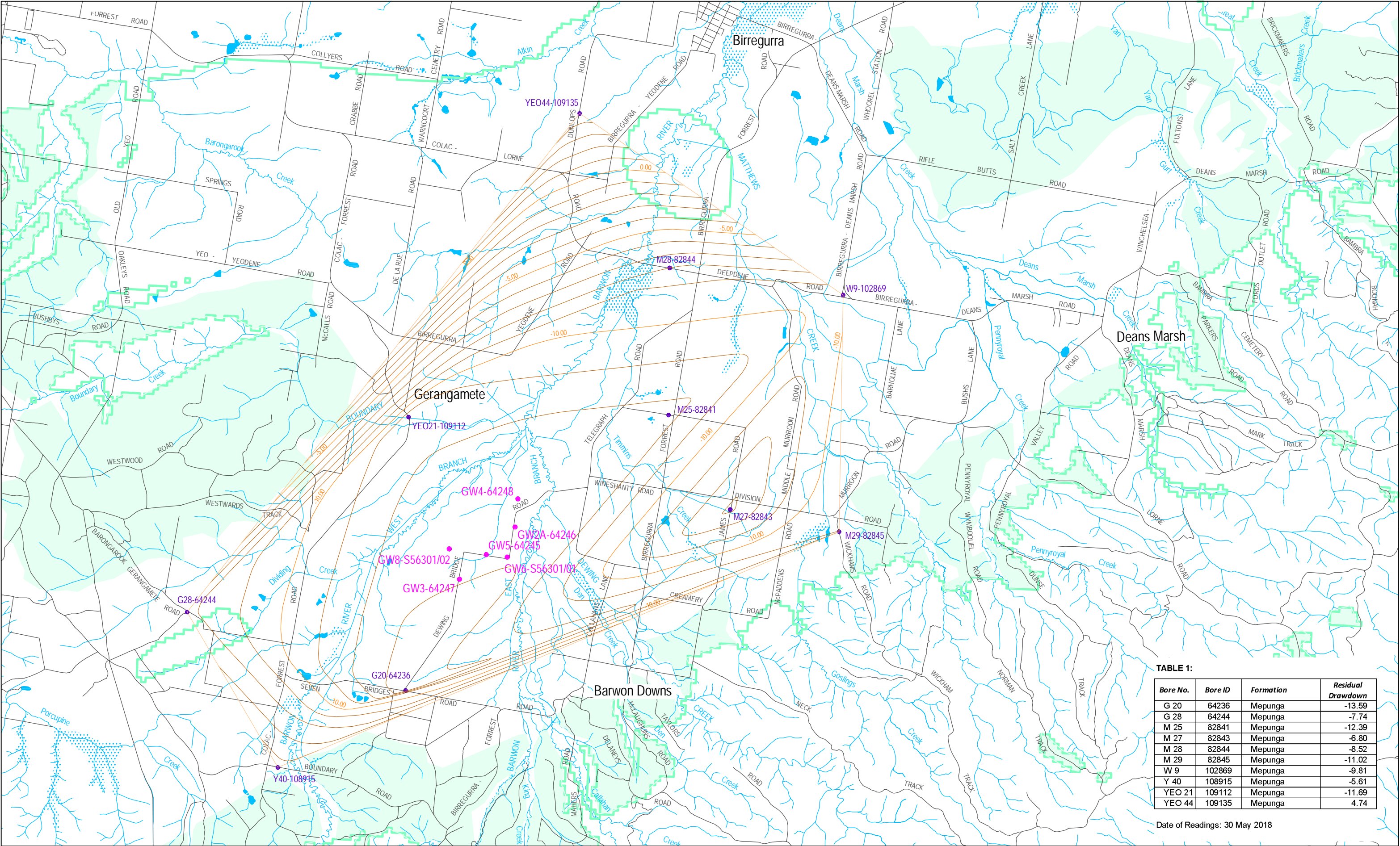


TABLE 1:			
Bore No.	Bore ID	Formation	Residual Drawdown
G 20	64236	Mepunga	-13.59
G 28	64244	Mepunga	-7.74
M 25	82841	Mepunga	-12.39
M 27	82843	Mepunga	-6.80
M 28	82844	Mepunga	-8.52
M 29	82845	Mepunga	-11.02
W 9	102869	Mepunga	-9.81
Y 40	108915	Mepunga	-5.61
YEO 21	109112	Mepunga	-11.69
YEO 44	109135	Mepunga	4.74

Date of Readings: 30 May 2018

NOTES

RELATIVE RESIDUAL DRAWDOWN CONTOURS 1m

RELATIVE RESIDUAL DRAWDOWN INDEX CONTOURS 5m

AQUIFER EXTENTS

NOT ALL BORES SHOWN ON PLAN WERE USED IN MODEL - SEE TABLE 1 FOR DATA USED. RELATIVE RESIDUAL DRAWDOWN TO PRE 1997 LEVELS.

PUMPING OCCURRED DURING 1997 - 2001 AND 2006 - 2010. PUMPING RECOMMENCED APRIL 2016.

THE RESIDUAL DRAWDOWN MAPS REPRESENT THE DRAWDOWN IN DEEP, CONFINED AQUIFERS. THIS IS NOT THE LOCAL WATER TABLE LEVEL.



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GERANGAMETE GROUNDWATER MONITORING BORES
BARWON DOWNS AQUIFER - MEPUNGA FORMATION
RELATIVE RESIDUAL DRAWDOWN - 2018 COMPARED TO PRE-PUMPING (1997)


JOB No. 11384

SCALE IN METRES
SCALE 1 : 75 000

DRAWN E.DELGROSSO
23/07/18

CHECKED

750 0 750 1500 2250 3000 3750 4500 5250 6000



DATUMS

HEIGHT: AHD
MAP: MGA
ZONE: 54

11384-03

A:

Appendix E

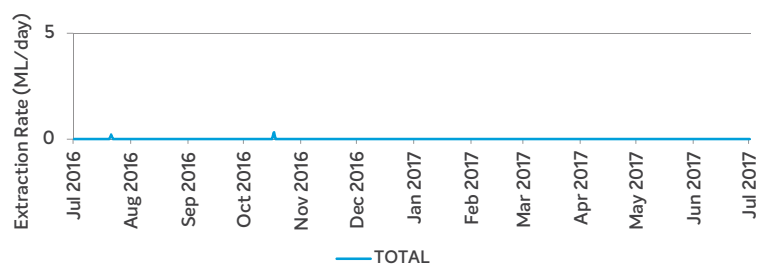
Groundwater extractions

Gerangamete Borefield – Groundwater Extraction 2017–2018

Date	Flow for month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.22	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL TOTAL												0.54
MAX. FLOW	0.22	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Year	Total annual	Progressive total
2008/09	12,437.7	12,438
2009/10	12,692.5	25,130
2010/11	1,144.3	26,274
2011/12	0.0	26,274
2012/13	0.0	26,274
2013/14	0.0	26,274
2014/15	0.0	26,274
2015/16	1,902.7	28,177
2016/17	1,546.4	29,724
2017/18	0.5	29,724
Ten year total		29,724
Licence cap total		80,000
Total amount left on licence cap		50,276

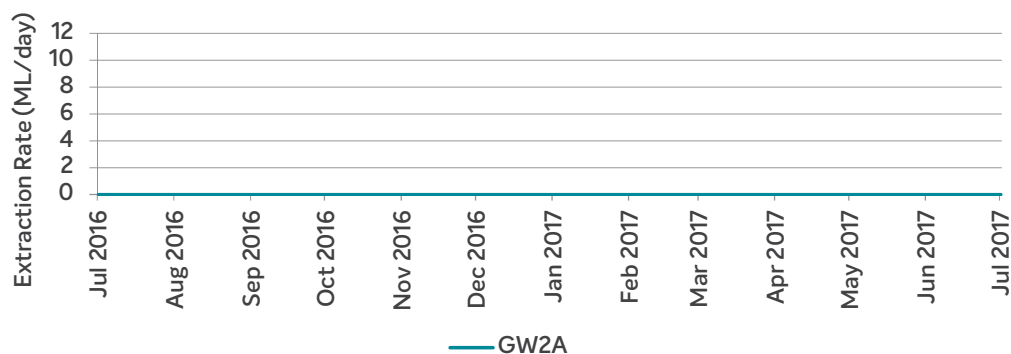
Total Extraction



Groundwater Bore GW2A - Extraction Rate 2017-2018

Date	Flow for month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANNUAL TOTAL												0.0
MAX. FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

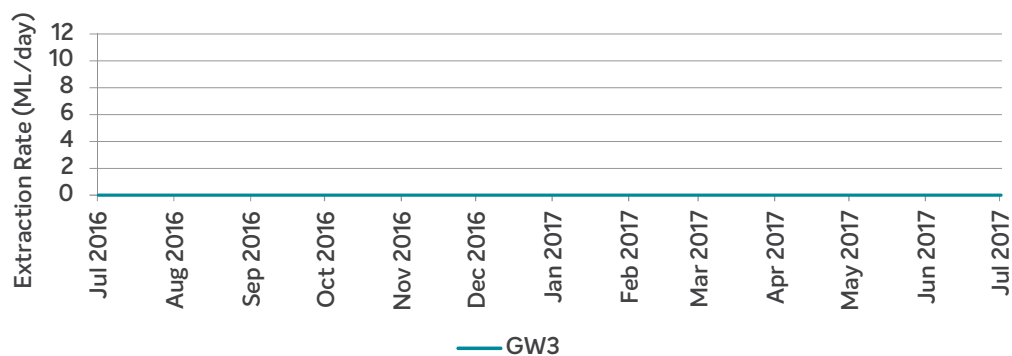
GW2A Extraction



Groundwater Bore GW3 - Extraction Rate 2017-2018

Date	Flow for month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANNUAL TOTAL												0.0
MAX. FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

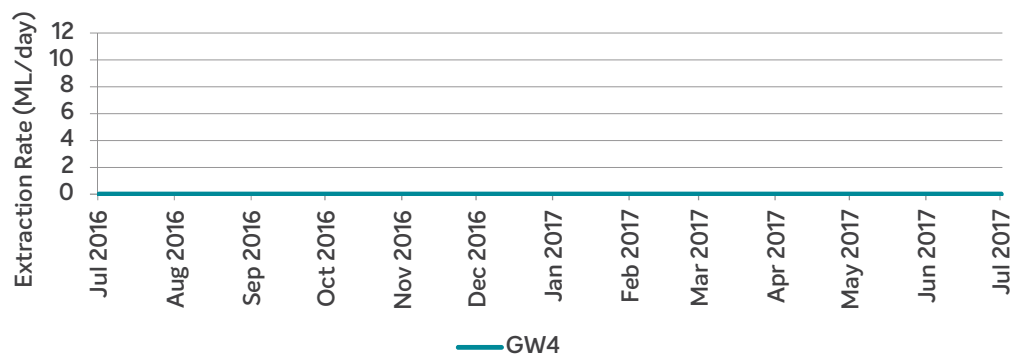
GW3 Extraction



Groundwater Bore GW4 - Extraction Rate 2017-2018

Date	Flow for Month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANNUAL TOTAL												0.0
MAX. FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GW4 Extraction



Groundwater Bore GW5 - Extraction Rate 2017-2018

Date	Flow for month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANNUAL TOTAL												0.0
MAX. FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

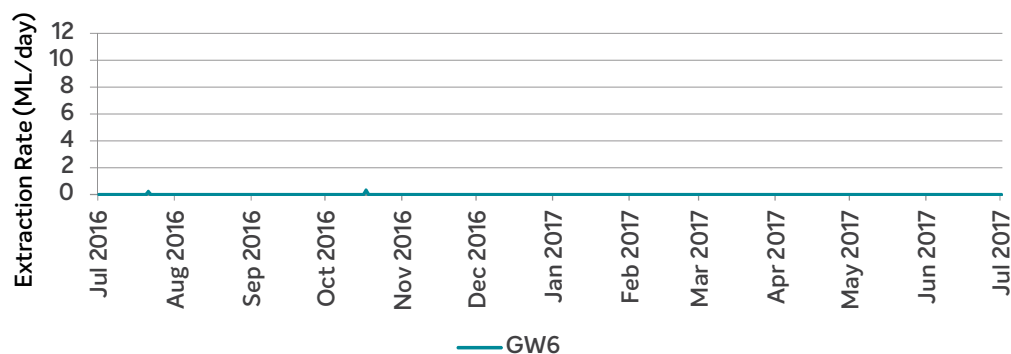
GW5 Extraction



Groundwater Bore GW6 - Extraction Rate 2017-2018

Date	Flow for month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.22	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL TOTAL												0.54
MAX. FLOW	0.22	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

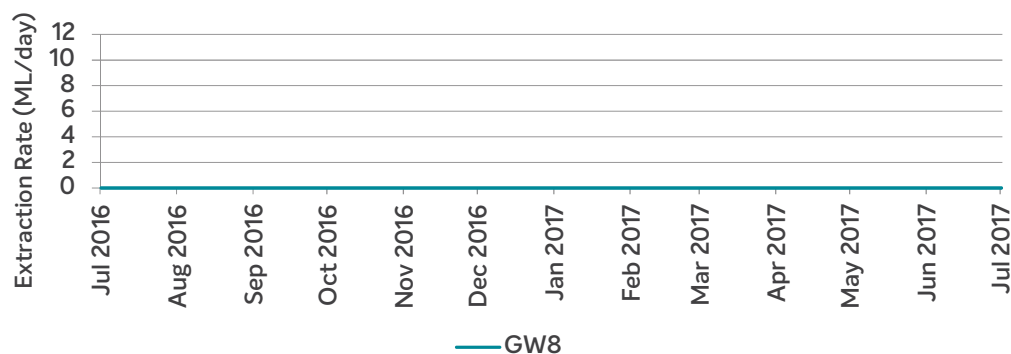
GW6 extraction



Groundwater Bore GW8 - Extraction Rate 2017-2018

Date	Flow for month (ML)											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
31	0.00	0.00		0.00		0.00	0.00		0.00		0.00	
MONTHLY TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANNUAL TOTAL												0.00
MAX. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVE. FLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GW8 Extraction



Appendix F

Releases to Boundary Creek

Flows in Boundary Creek at Yeodene Stream Gauge 233228 (ML/day)

Date	Jul 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018
1	2.1	7.0	9.1	13.2	1.3	2.4	0.9	0.0	0	0	0.0	4.6
2	2.0	6.0	7.8	11.7	1.2	2.3	0.9	0.0	0	0	0.0	4.8
3	2.1	5.2	7.3	10.7	1.2	2.1	0.9	0.0	0	0	0.0	4.4
4	2.5	4.6	9.9	9.6	1.1	1.9	1.0	0.0	0	0	0.0	3.9
5	3.7	4.5	68.0	8.3	1.3	1.8	1.0	0.0	0	0	0.0	3.6
6	4.9	5.0	172.4	7.3	1.5	1.6	1.1	0.0	0	0	0.0	3.4
7	4.7	7.1	92.1	6.8	1.5	1.5	0.9	0.0	0	0	0.0	3.2
8	4.0	12.3	48.1	6.4	1.4	1.4	0.9	0	0	0	0.0	3.1
9	3.6	13.7	33.9	5.8	1.4	1.4	0.9	0	0	0	0.0	3.0
10	3.5	12.2	26.1	5.3	1.3	1.3	0.9	0	0	0	0.0	2.8
11	3.7	9.5	19.3	5.2	1.3	1.2	0.8	0	0	0.0	0.0	2.7
12	3.6	7.4	16.1	6.9	1.2	1.1	0.6	0	0	0.0	0.0	2.6
13	3.1	6.3	19.8	15.9	1.1	1.0	0.6	0	0	0.0	0.0	2.6
14	3.4	5.7	65.2	12.2	1.1	0.9	0.3	0	0	0.0	0.0	2.5
15	4.0	5.8	68.8	8.6	1.0	0.9	0.1	0	0	0.0	1.8	3.2
16	5.5	6.4	160.2	6.5	1.3	0.9	0.0	0	0	0.0	2.7	4.7
17	6.0	10.9	76.9	5.2	1.6	0.9	0.0	0	0	0.0	2.5	22.2
18	6.6	29.5	27.2	4.3	4.2	0.8	0.0	0	0	0.0	2.3	63.1
19	9.1	70.6	27.6	4.2	5.2	0.9	0.0	0	0	0.0	2.1	34.1
20	11.9	39.3	40.6	4.2	4.1	1.0	0.0	0	0	0.0	2.4	16.5
21	10.4	20.7	23.3	4.0	2.6	0.9	0.0	0	0	0.0	3.5	11.1
22	7.8	15.0	16.4	3.6	2.0	0.8	0.0	0	0	0.0	4.1	8.6
23	6.4	15.4	12.6	3.2	1.6	0.8	0.0	0	0	0.0	4.7	7.0
24	6.1	50.7	10.7	2.8	1.4	0.8	0.0	0	0	0.0	4.7	5.9
25	7.8	34.1	14.7	2.2	1.4	0.8	0.0	0	0	0.0	4.3	5.2
26	7.8	19.9	25.7	1.8	1.4	0.8	0.0	0	0	0.0	4.0	4.6
27	8.1	17.0	18.6	1.6	1.9	0.8	0.0	0	0	0.0	3.6	4.2
28	11.2	22.7	13.6	1.5	4.9	0.9	0.0	0	0	0.0	3.3	3.8
29	14.6	17.1	11.9	1.4	3.7	1.0	0.0		0	0.0	3.3	3.5
30	11.0	13.1	11.7	1.4	2.7	1.1	0.0		0	0.0	3.2	3.5
31	8.4	10.7		1.4		1.1	0.0		0		4.1	
Total	189.44	505.38	1155.45	182.95	58.73	37.31	11.68	0.00	0.00	0.00	56.60	248.59

Release to Boundary Creek (ML/day)

Date	Jul 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018
1	0.7	0.0	0.0	0.0	2.1	2.0	2.1	2.2	2.3	2.2	2.0	2.1
2	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.3	2.2	2.1	2.1
3	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.1
4	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.2	2.1	2.2	1.8
5	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.2	2.1	2.2	1.1
6	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.3	2.1	2.2	0.7
7	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.2	2.1	2.1	0.0
8	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.0	0.0
9	0.6	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0
10	0.4	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0
11	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0
12	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0
13	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	0.0
14	0.0	0.0	0.0	0.0	2.1	2.1	2.0	2.1	2.1	2.2	2.1	0.0
15	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.0	2.1	2.2	2.1	0.0
16	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.2	2.1	0.0
17	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.2	2.2	2.1	0.0
18	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.1	2.1	2.2	2.1	0.0
19	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.1	2.2	2.1	0.0
20	0.0	0.0	0.0	0.0	2.1	2.3	2.1	2.3	2.2	2.2	2.1	0.0
21	0.0	0.0	0.0	0.0	2.1	2.3	2.1	2.3	2.1	2.2	2.1	0.0
22	0.0	0.0	0.0	0.0	2.1	2.2	2.1	2.3	2.2	2.2	2.1	0.0
23	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.2	2.2	2.1	0.0
24	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.2	2.2	2.1	0.0
25	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.2	2.2	2.1	0.0
26	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.2	2.1	2.1	0.0
27	0.0	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.2	2.1	2.1	0.0
28	0.1	0.0	0.0	0.0	2.1	2.1	2.1	2.3	2.2	2.1	2.1	0.0
29	0.0	0.0	0.0	0.0	2.1	2.1	2.1		2.2	2.1	2.1	0.0
30	0.0	0.0	0.0	0.0	2.1	2.1	2.1		2.1	2.2	2.1	0.0
31	0.0	0.0		0.8		2.1	2.2		2.2		2.1	
Total	6.00	0.00	0.00	0.77	63.53	65.46	65.66	61.01	66.88	64.19	65.32	9.90