



# Loddon Highlands Water Supply Protection Area Groundwater Management Plan

Annual Report

For year ending 30 June 2019

# Document History and Distribution

## Versions

Version	Date	Author(s)	Notes
Draft v1	6 August 2019	Jock Richardson	Document creation and drafting
Draft v2	23 August 2019	Scott Ridges	Document edits and review
Draft v3	28 August 2019	Jock Richardson	Document edits post review
Draft v4	29 August 2019	Stephanie Chapple	Review consistency of all 2019 reports
Draft v5	2 September 2019	Jock Richardson	Document edits post review
Draft v6	9 September 2019	Jock Richardson	Document edits post review by Matthew Pethybridge
Draft v7	13 September 2019	Jock Richardson	Document edits post review by Andrew Shields and DELWP
Final	19 September 2019	Jock Richardson	Prepare document for final approval

## Distribution

Version	Recipient(s)	Date	Notes
Draft v1	Scott Ridges	22 August 2019	Peer review
Draft v3	Stephanie Chapple	28 August 2019	Consistency review
Draft v5	Matthew Pethybridge	2 September 2019	Review and endorsement
Draft v5	Patrick O'Halloran (DELWP)	2 September 2019	Review and comment
Draft v6	Andrew Shields Acting Head of Water Resources	10 September 2019	Review and endorsement
Draft v7	Mark Bailey Acting General Manager Water Delivery	16 September 2019	Review and endorsement
Final	Charmaine Quick Managing Director	19 September 2019	Review and approval
Final	The Hon. Lisa Neville MP Minister for Water	26 September 2019	
Final	Mr Brad Drust Chief Executive Officer, North Central Catchment Management Authority	26 September 2019	

# Foreword

Goulburn-Murray Water (GMW) is pleased to present the annual report for the Loddon Highlands Water Supply Protection Area Groundwater Management Plan (the Plan) for the 2018/19 water year.

GMW is responsible for the implementation, administration and enforcement of the Plan which was approved by the Minister administering the *Water Act 1989* (the Minister) on 21 November 2012.

This report has been prepared in accordance with section 32C of the *Water Act 1989* (the Act).

This report provides an overview of the groundwater management activities administered under the Plan during the 2018/19 water year.

A copy of this report is available for inspection at the Tatura office of GMW, or for download from the GMW website.



Charmaine Quick

MANAGING DIRECTOR

23/9/19

Date

# Executive summary

The Loddon Highlands Water Supply Protection Area Groundwater Management Plan (the Plan) was approved on 21 November 2012 by the Minister for Water.

The 2018/19 water year marks the seventh year of operation of the Plan.

In September 2018, GMW announced that licence holders in five of the seven management zones of the Loddon Highlands Water Supply Protection Area (WSPA) had access to 100 per cent of their licence volume for the 2018/19 water year; and licence holders in two management zones, Blampied and Newlyn, would have restricted access with an initial allocation of 75 per cent. In October 2018, GMW subsequently announced that the Blampied Zone allocation increased to 100 per cent as a result of continued groundwater recovery in the Blampied Zone trigger bore.

Recorded use in the Loddon Highlands WSPA in 2018/19 was 9,106.5 ML, or 44 per cent of the total licensed volume, which was the second highest since the Plan was approved.

There was moderate trade activity during the 2018/19 water year; 18 temporary licence transfers totalling 575 ML and four permanent transfers totalling 82 ML/year.

Licence holders in the Loddon Highlands WSPA are entitled to carryover up to a maximum of 15 per cent of their unused licensed volume for use in the subsequent water year. A total of 2,865.3 ML has been carried over for use in the 2019/20 water year.

A second consecutive year of below-average rainfall (i.e. 2018/19 following 2017/18) was recorded at Clunes within the Loddon Highlands WSPA. The cumulative impacts of these drier conditions, combined with the larger volumes of groundwater abstraction, resulted in lower groundwater recovery levels than those recorded in 2016/17 and 2017/18 across much of the Loddon Highlands WSPA.

Groundwater monitoring and metering programmes continue to be successfully undertaken to support the objectives of the Plan.

GMW undertook a detailed review of the Plan in 2018 and has sought feedback from the Groundwater Reference Committee and other stakeholders.

# Contents

Document History and Distribution .....	2
Foreword.....	3
Executive summary .....	4
1 Introduction .....	6
1.1 Purpose .....	6
1.2 Water Supply Protection Area.....	6
1.3 Groundwater Management Plan .....	6
2 Groundwater Management.....	8
2.1 Licensed volume .....	8
2.2 Groundwater allocations .....	8
2.3 Groundwater use.....	11
2.4 Rainfall .....	12
2.5 Licence transfers.....	13
2.6 Carryover .....	15
2.7 Metering .....	15
2.8 Licence compliance.....	15
2.9 Domestic and stock bore licences .....	15
3 Monitoring Program .....	16
3.1 Groundwater levels .....	16
3.2 Groundwater quality .....	18
4 Future Management Considerations .....	20
4.1 Groundwater Reference Committee .....	20
4.2 Management Plan review .....	20
5 References .....	21
Appendix A – Assessment of activities against Plan prescriptions .....	22
Appendix B – Hydrographs for key monitoring bores.....	25
Appendix C – Groundwater chemistry results .....	30

# 1 Introduction

## 1.1 Purpose

This report has been prepared to meet the requirements of Prescription 7 of the Loddon Highlands Water Supply Protection Area Groundwater Management Plan (the Plan) and section 32C of the Water Act 1989 (the Act).

The report provides an overview of groundwater resource status and summarises the groundwater management activities undertaken in accordance with the Plan during the 2018/19 water year (1 July 2018 to 30 June 2019).

## 1.2 Water Supply Protection Area

The Loddon Highlands Water Supply Protection Area (WSPA), declared in June 2010, extends from Newlyn and Learmonth in the south to Dunolly in the north and includes the townships of Creswick, Waubra, Clunes, Talbot and Maryborough.

The Loddon Highlands WSPA incorporates groundwater resources to all depths.

There are seven management zones in the Loddon Highlands WSPA: Ullina Zone (1100), Talbot Zone (1101), Ascot Zone (1102), Mollonghip Zone (1103), Blampied Zone (1104), Waubra Zone (1106) and Newlyn Zone (1107), as shown in Figure 1.

## 1.3 Groundwater Management Plan

The Plan, which applies to the management of groundwater resources within the area of the Loddon Highlands WSPA, was approved on 21 November 2012 by the Minister for Water, in accordance with section 32A(6) of the *Water Act 1989* (the Act).

The objective of the Plan is to make sure that groundwater resources within the WSPA are managed in an equitable and sustainable manner. More specifically, the Plan seeks to:

- Manage groundwater resources to protect groundwater users and the environment.
- Enable equitable access of groundwater resources to realise the potential for its use.
- Provide effective and transparent communication of Plan objectives, management rules and resource status.

Goulburn-Murray Water (GMW) is responsible for the implementation, administration and enforcement of the Plan. A summary of GMW's activities in accordance with Plan prescriptions is presented in Appendix A.

A copy of the Plan can be downloaded from GMW's website: <https://www.g-mwater.com.au/>



## 2 Groundwater Management

### 2.1 Licensed volume

The Minister declared the Permissible Consumptive Volume of 20,697 megalitres per year (ML/year) for the Loddon Highlands WSPA in March 2013 (Victorian Government Gazette, 2013).

At 30 June 2019 licensed entitlement volume in the Loddon Highlands WSPA was 20,501.6 ML/year (Table 1). This has remained unchanged since 30 June 2018.

**Table 1 Groundwater licensed volume in the Loddon Highlands WSPA in 2018/19**

Management zone	Licences	Licensed bores	Licensed entitlement volume (ML/year)
Ullina Zone – 1100	20	28	2,982.2
Talbot Zone – 1101	11	12	1,195.7
Ascot Zone – 1102	69	108	7,067.2
Mollonghip Zone – 1103	3	7	333.0
Blampied Zone – 1104	19	27	1,252.5
Waubra Zone – 1106	30	60	4,702.8
Newlyn Zone – 1107	26	50	2,968.2
<b>Total</b>	<b>178</b>	<b>292</b>	<b>20,501.6</b>

Note: Data extracted from the Victorian Water Register as at 1 July 2019.

### 2.2 Groundwater allocations

Annual groundwater allocations in the Loddon Highlands WSPA are determined by comparing average maximum groundwater recovery levels from key State observation bores against trigger levels outlined in Prescription 3 of the Plan.

Annual allocations are to be announced by 15 September of each year based on groundwater level readings measured in August of the same year. Allocations may be reviewed based on groundwater levels to November and allocations may be increased if there is sufficient recovery.

The State observation bores used to determine seasonal allocations in each management zone are listed in Table 2 and shown in Figure 1.

**Table 2 State observation bores used to determine annual allocations in the Loddon Highlands WSPA**

Management zone	Bore number
Ascot Zone – 1102	64879, 64880, 122152, 119377, 119342
Blampied Zone – 1104	138657
Waubra Zone – 1106	WRK016266, WRK016267, WRK016269
Newlyn Zone – 1107	138658, 116382

Trigger levels have been established in the Ascot, Blampied, Newlyn and Waubra management zones under the Plan because of:

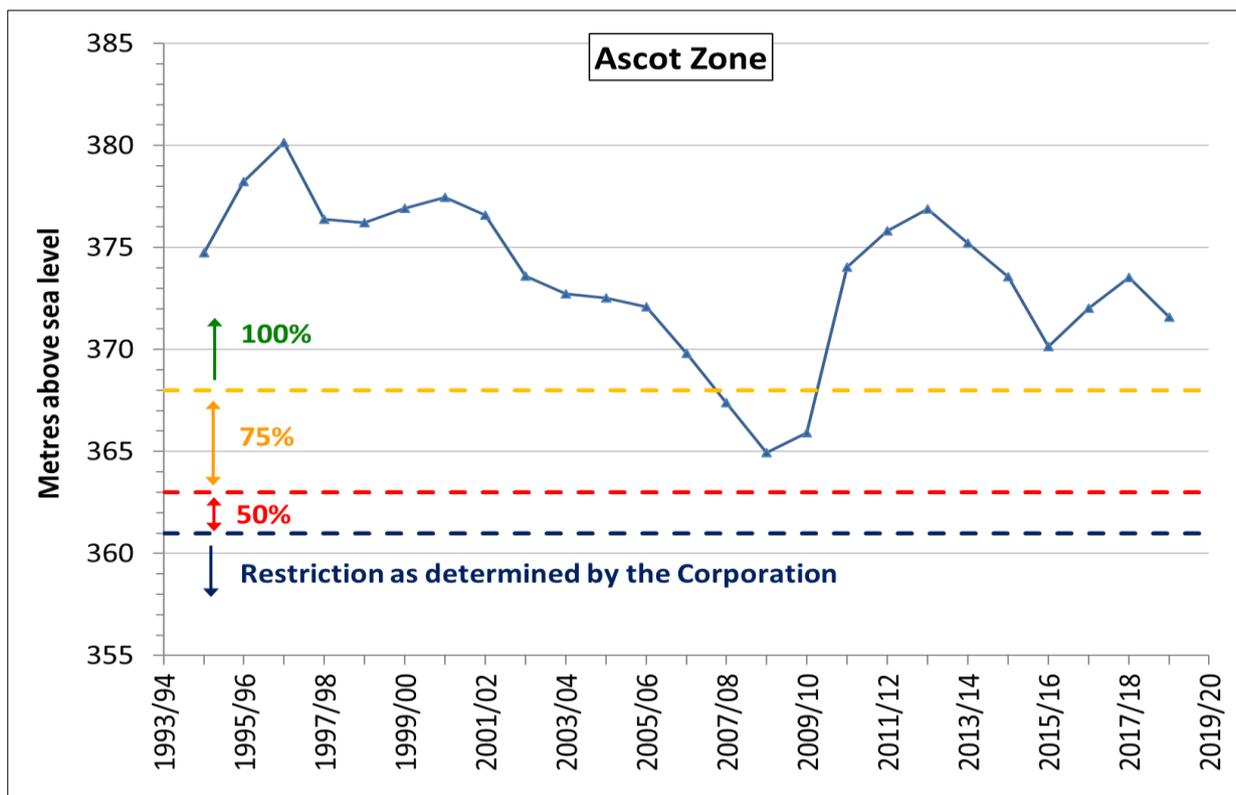
- high density of licences
- historical seasonal drawdown
- greater rates of groundwater level decline during dry periods.

GMW announced initial allocations for the 2018/19 water year on 14 September 2018. Five of the seven management zones started the water year with an allocation of 100 per cent of licensed entitlement volume. The Blampied and Newlyn zones were subject to restrictions on the take and use of groundwater, with allocations of 75 per cent of licensed entitlement volume (refer Figure 2 to Figure 5).

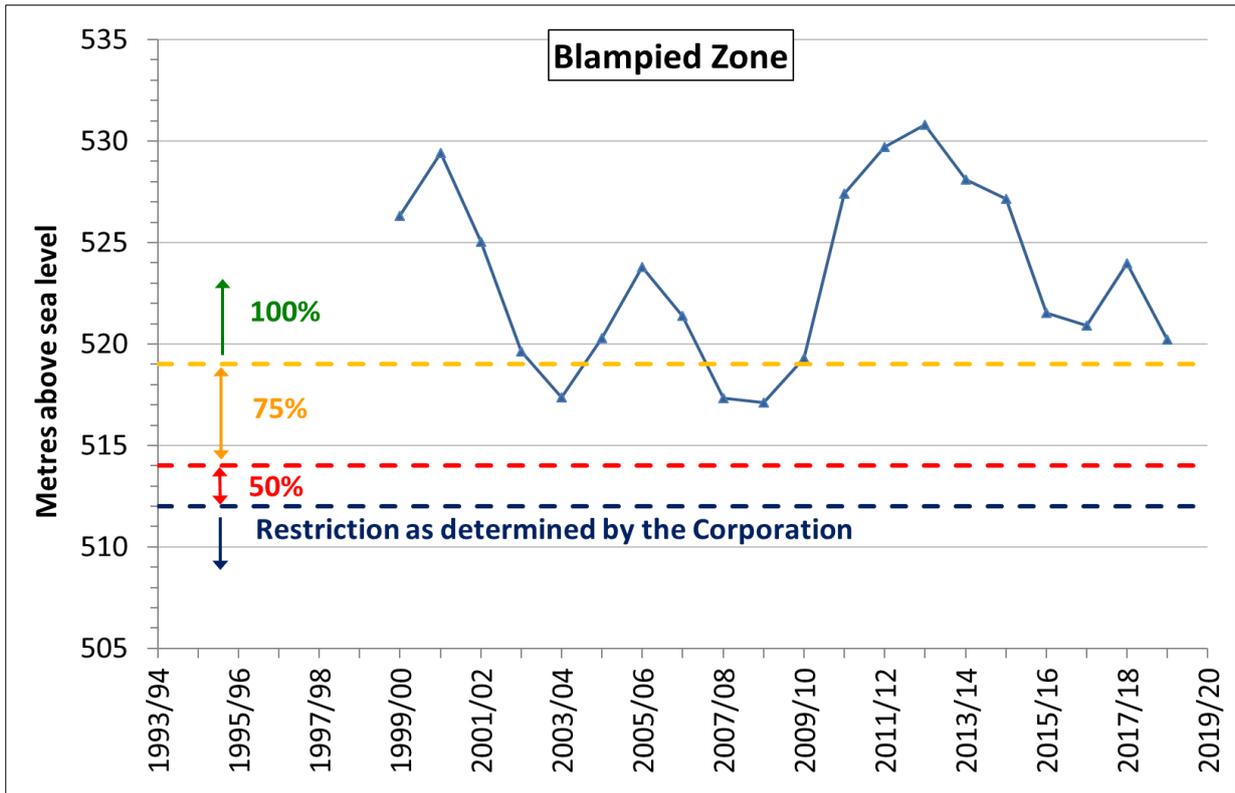
In September 2018 the level in the Blampied Zone trigger bore had sufficiently recovered to enable an allocation of 100 per cent for the remainder of the season. GMW announced this revised allocation for the Blampied Zone on 19 October 2018.

The allocation remained unchanged for the Newlyn Zone as there was not sufficient recovery in the Newlyn Zone trigger bores to enable a higher allocation.

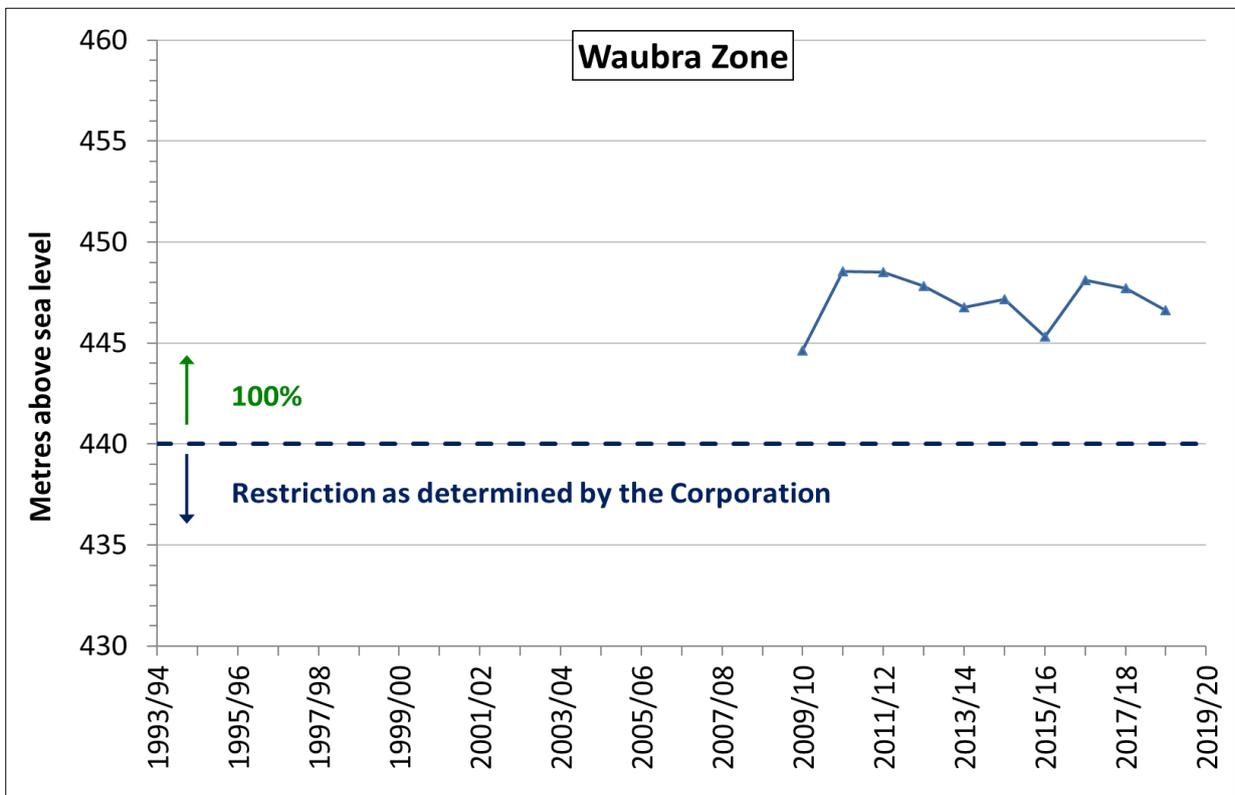
Groundwater recovery levels in the above-mentioned monitoring bores are on a declining trend. If this trend continues further restrictions may be imposed in future water years.



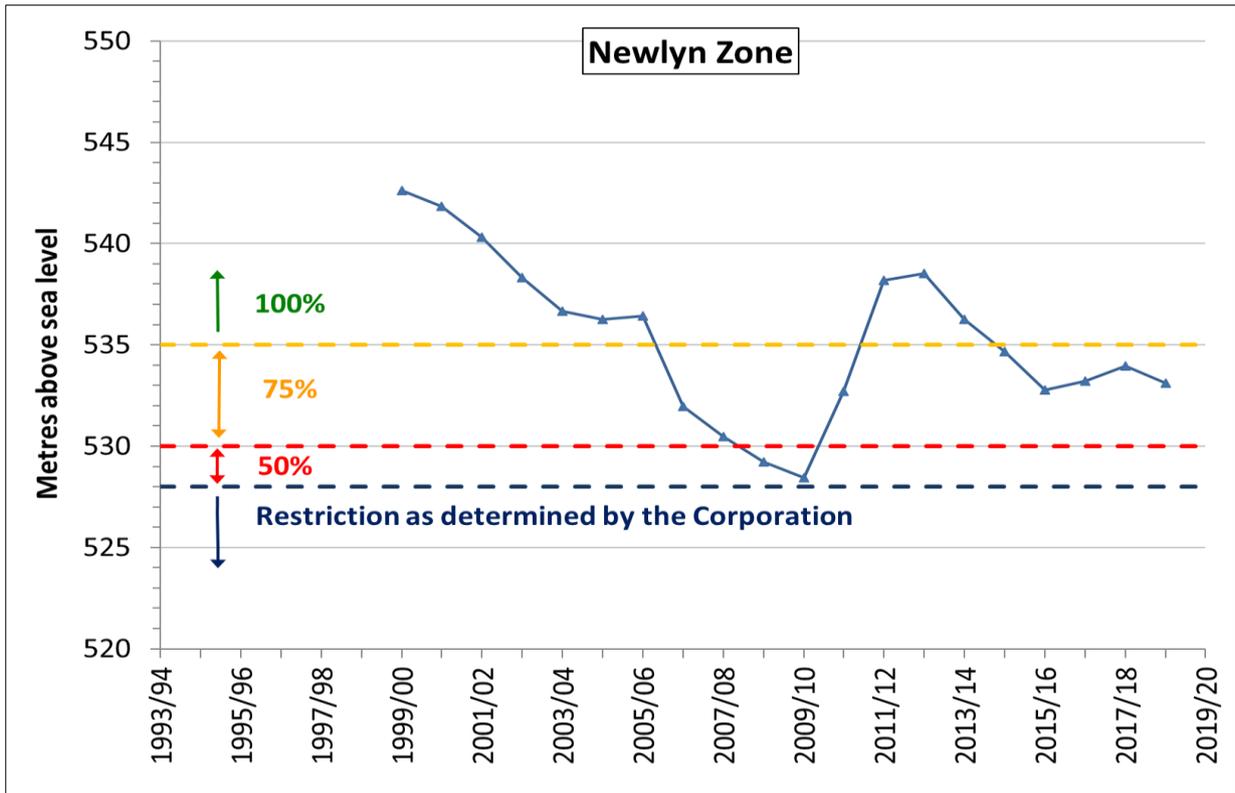
**Figure 2 Trigger levels to determine allocations in the Ascot Zone of the Loddon Highlands WSPA**



**Figure 3 Trigger levels to determine allocations in the Blampied Zone of the Loddon Highlands WSPA**



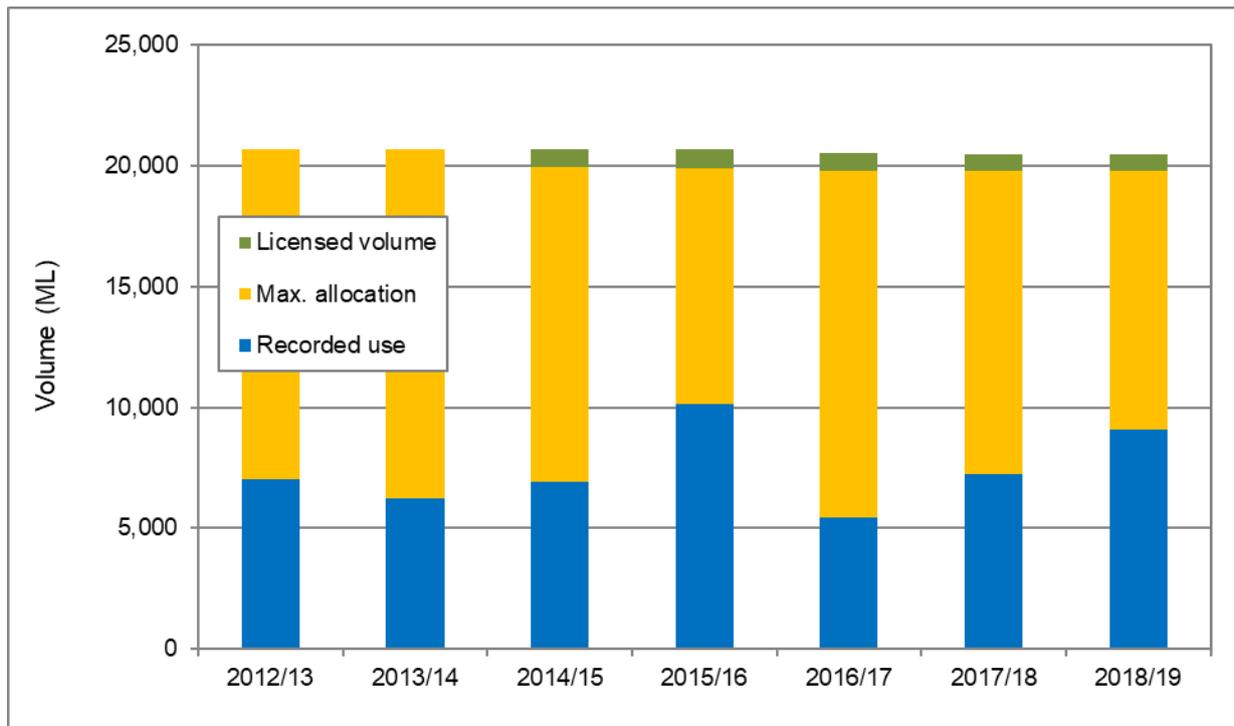
**Figure 4 Trigger levels to determine allocations in the Waubra Zone of the Loddon Highlands WSPA**



**Figure 5 Trigger levels to determine allocations in the Newlyn Zone of the Loddon Highlands WSPA**

### 2.3 Groundwater use

Recorded use in the Loddon Highlands WSPA in 2018/19 was 9,106.5 ML, or 44 per cent of the total licensed entitlement volume, which was the second highest use since the Plan was implemented in 2012/13 (Figure 6). Note that recorded use refers to metered and deemed use.



**Figure 6 Total licensed volume, allocation and recorded use in the Loddon Highlands WSPA**

Recorded use was highest in the Ascot Zone, where most licensed volume is held. Licence holders in the Blampied Zone used the greatest percentage of licensed volume (Table 3).

**Table 3 Recorded use in the Loddon Highlands WSPA in 2018/19**

Management zone	Licensed volume (ML/year)	Recorded use (ML)	Proportion of total licensed volume used
Ullina Zone – 1000	2,982.2	514.4	17%
Talbot Zone – 1101	1,195.7	444.2	37%
Ascot Zone – 1102	7,067.2	4,190.6	59%
Molongghip Zone – 1103	333.0	117.0	35%
Blampied Zone – 1104	1,252.5	897.8	72%
Waubra Zone – 1106	4,702.8	1,885.9	40%
Newlyn Zone – 1107	2,968.2	1,056.6	36%
<b>Total</b>	<b>20,501.6</b>	<b>9,106.5</b>	<b>44%</b>

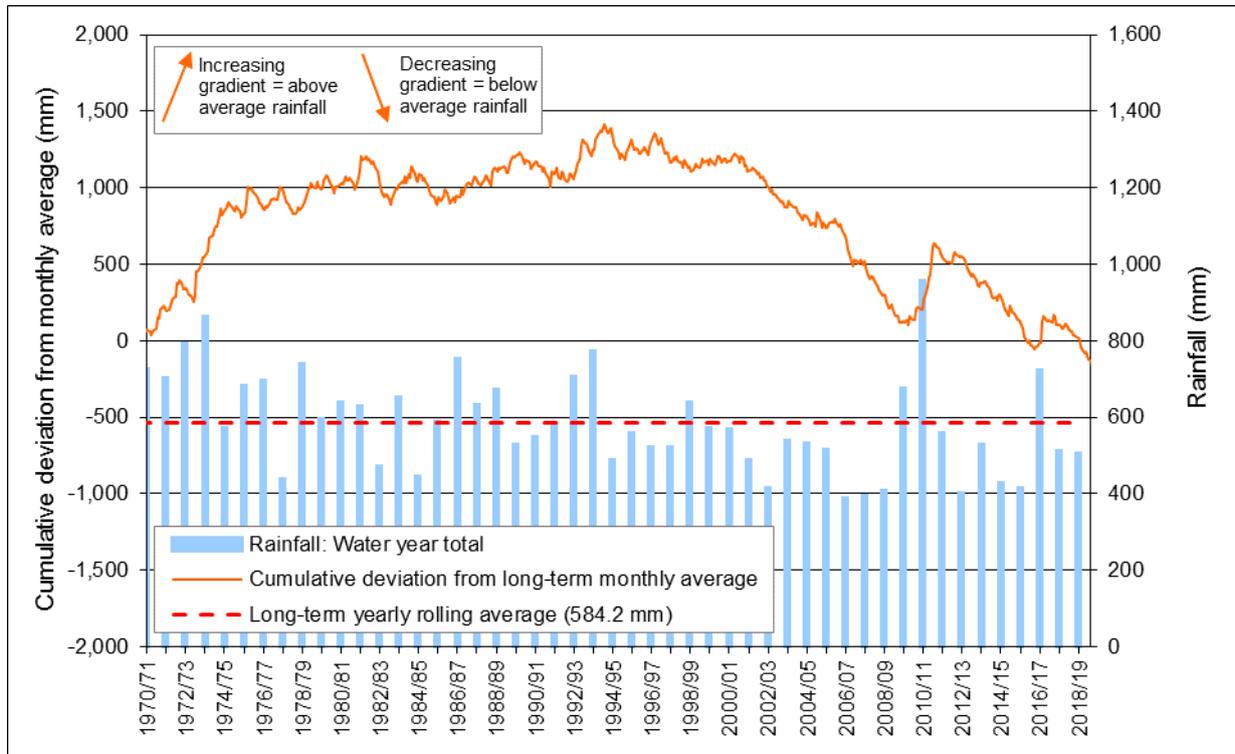
Note: Data extracted from Irrigation Planning Module on 4 July 2019.

## 2.4 Rainfall

Historic rainfall data sourced from the Bureau of Meteorology (BoM) weather station at Clunes is presented in Figure 7 as an indicator of climate trends across the Loddon Highlands WSPA.

The data show that annual rainfall was generally above average in the early 1970s and remained relatively steady through the 1980s and 1990s. Between 1999/2000 and 2008/09 annual totals were below-average (Millennium Drought) until rainfall conditions improved in 2010.

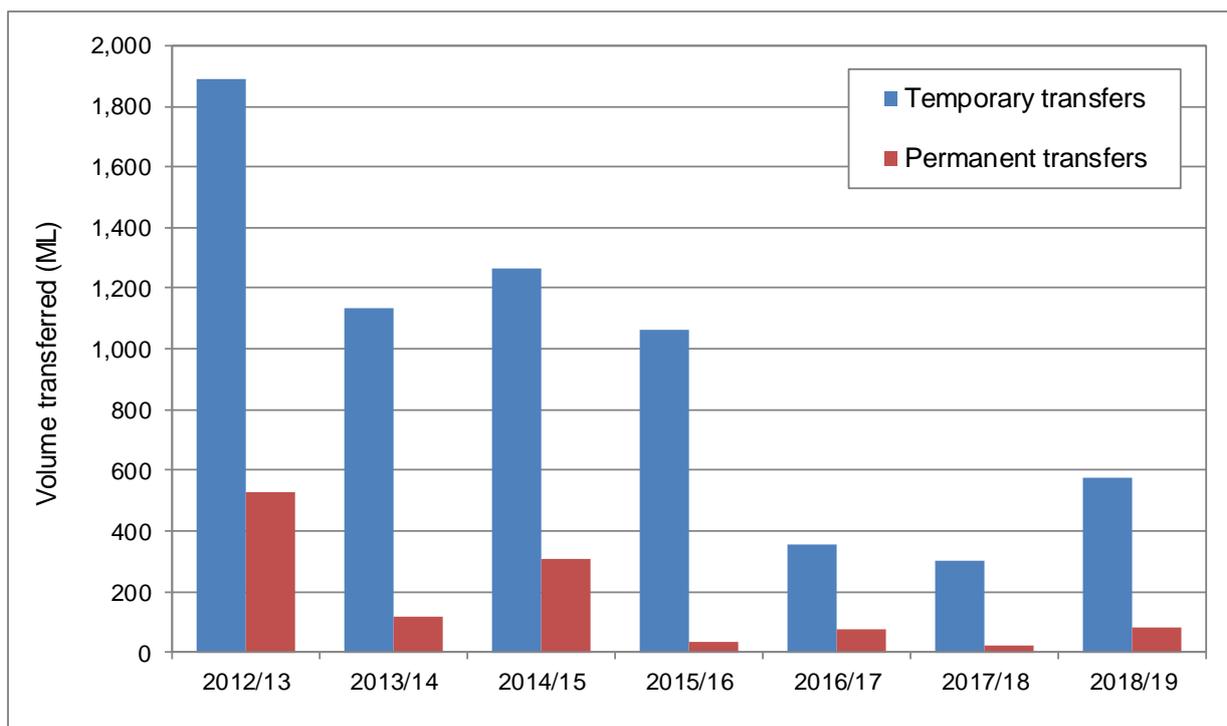
With the exception of the 2016/17 water year, annual rainfall totals have been below average since the Plan was approved, resulting in reduced recharge to groundwater systems within the Loddon Highlands WSPA.



**Figure 7 Rainfall recorded at Clunes (BoM weather station 088015) in the Loddon Highlands WSPA**

## 2.5 Licence transfers

The Plan allows groundwater licence holders to temporarily or permanently transfer licensed volume. During the 2018/19 water year there were 18 temporary transfer transactions for a total of 575 ML/year and four permanent transfer transactions for a total of 82 ML/year (Figure 8).



**Figure 8 Total licensed volumes transferred in the Loddon Highlands WSPA**

The majority of transfers occurred between licence holders within the same management zones (Table 4).

There was four temporary transfers between management zones: 70 ML was transferred from the Ullina Zone into the Talbot Zone; 60 ML from Newlyn Zone to Mollonghip Zone; 45 ML from Newlyn Zone to Ullina Zone; and 30 ML from Mollonghip Zone to Newlyn Zone.

There were three permanent transfers between licence holders within the same management zone (Ascot Zone) and one permanent transfer between management zones: 5 ML/year was transferred from the Newlyn Zone to the Mollonghip Zone.

**Table 4 Licence transfers in the Loddon Highlands WSPA in 2018/19**

Management zone	Temporary transfers				Permanent transfers			
	Transfer from		Transfer to		Transfer from		Transfer to	
	No. of transfer	Volume (ML/yr)	No. of transfer	Volume (ML/yr)	No. of transfer	Volume (ML/yr)	No. of transfer	Volume (ML/yr)
Ullina Zone – 1000	1	70.0	1	45.0	0	0.0	0	0.0
Talbot Zone – 1101	0	0.0	1	70.0	0	0.0	0	0.0
Ascot Zone – 1102	7	205.0	7	205.0	3	77.0	3	77.0
Mollonghip Zone – 1103	1	30.0	1	60.0	0	0.0	1	5.0
Blampied Zone – 1104	5	138.0	5	138.0	0	0.0	0	0.0
Waubra Zone – 1106	2	27.0	2	27.0	0	0.0	0	0.0
Newlyn Zone – 1107	2	105.0	1	30.0	1	5.0	0	0.0
<b>Total</b>	<b>18</b>	<b>575.0</b>	<b>18</b>	<b>575.0</b>	<b>4</b>	<b>82.0</b>	<b>4</b>	<b>82.0</b>

## 2.6 Carryover

The Minister declared that groundwater licence holders in the Loddon Highlands WSPA were authorised to carryover up to a maximum of 15 per cent of licence volume in November 2012 (Victorian Government Gazette, 2012).

In 2018/19 there was a total of 2,930.1 ML carried over by licence holders in the Loddon Highlands WSPA. At the conclusion of the 2018/19 water year, groundwater licence holders in the Loddon Highlands WSPA carried over 2,865.3 ML into the 2019/20 water year.

## 2.7 Metering

There were 234 metered service points, as well as one unmetered and 44 deemed service points in the Loddon Highlands WSPA as at 30 June 2019. There were 213 meter-related activities undertaken during the 2018/19 water year, including inspections, maintenance, battery replacements and one new meter install (Table 5).

All meters were read at least twice during the 2018/19 water year.

**Table 5 Metering activities in the Loddon Highlands WSPA in 2018/19**

Metering activity	Year ending 30 June 2019
Total number of meters	234
Total number of meter reads	468
Meters installed or replaced	1
Meters inspection events	207
Meter maintenance events	5

## 2.8 Licence compliance

There were no prosecutions or convictions relating to groundwater matters in the Loddon Highlands WSPA during the 2018/19 water year.

There were five instances of alleged overuse (i.e., licensed volume exceedance) and one instance of alleged unlicensed take and use of groundwater without consent identified in 2018/19. These incidents are being investigated and GMW will taken action in accordance with GMW's Risk-Based Compliance and Enforcement Framework.

## 2.9 Domestic and stock bore licences

Domestic and stock use is not required to be licensed, as it is a private right under section 8 of the Act provided that water is used in accordance with the constraints imposed by the Act.

The installation of a bore for domestic and stock use requires a bore construction licence. Upon completion of a bore, a bore completion report is required to be submitted to GMW and details are recorded in the Water Measurement Information System at <http://data.water.vic.gov.au/monitoring.htm>.

During the 2018/19 water year in the Loddon Highlands WSPA there were: 55 domestic and stock bore construction licences issued by GMW and the Victorian Water Register (combined); and six domestic and stock bore completion reports received and processed by GMW.

# 3 Monitoring Program

## 3.1 Groundwater levels

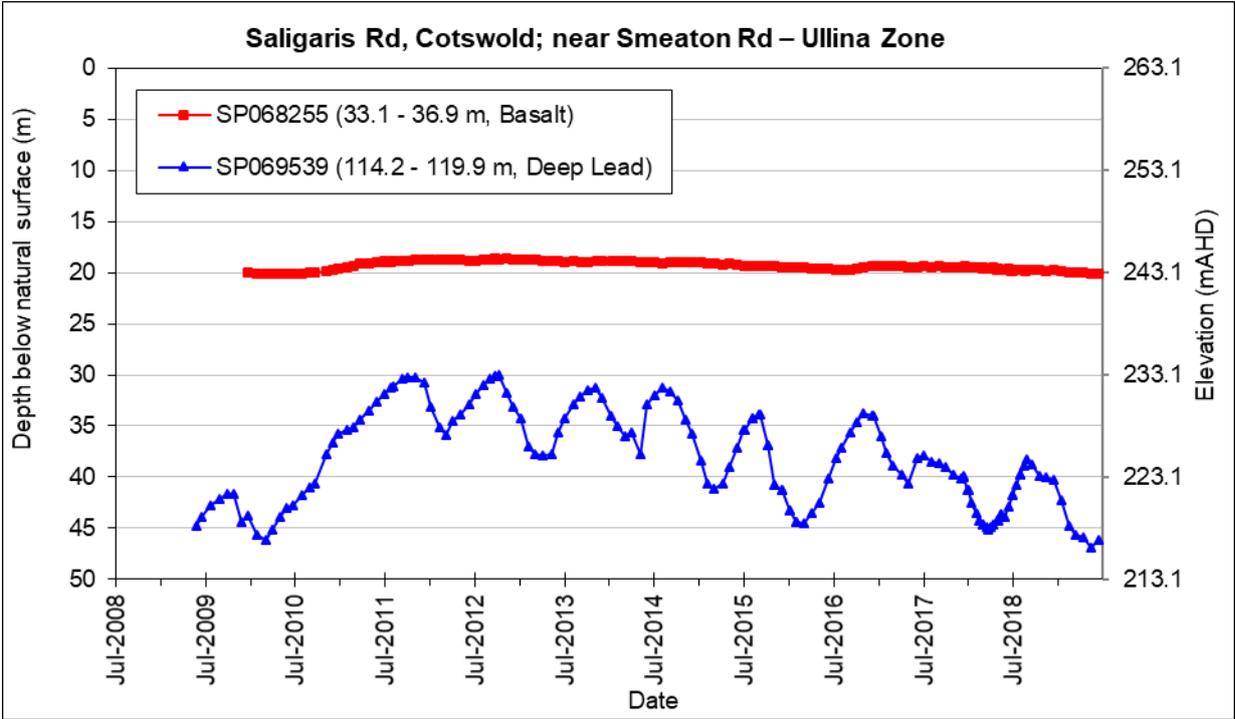
During the 2018/19 water year a total of 59 State observation bores, located within the Loddon Highlands WSPA, were monitored by GMW and the Department of Environment, Land, Water and Planning (Figure 1). This figure includes the 34 key bores listed in Schedule 1 of the Plan, where practicable (Appendix B).

Of the 59 bores, 50 were monitored remotely using telemetry equipment, with measurements recorded hourly; and 9 were monitored manually, with measurements recorded on a monthly or quarterly basis.

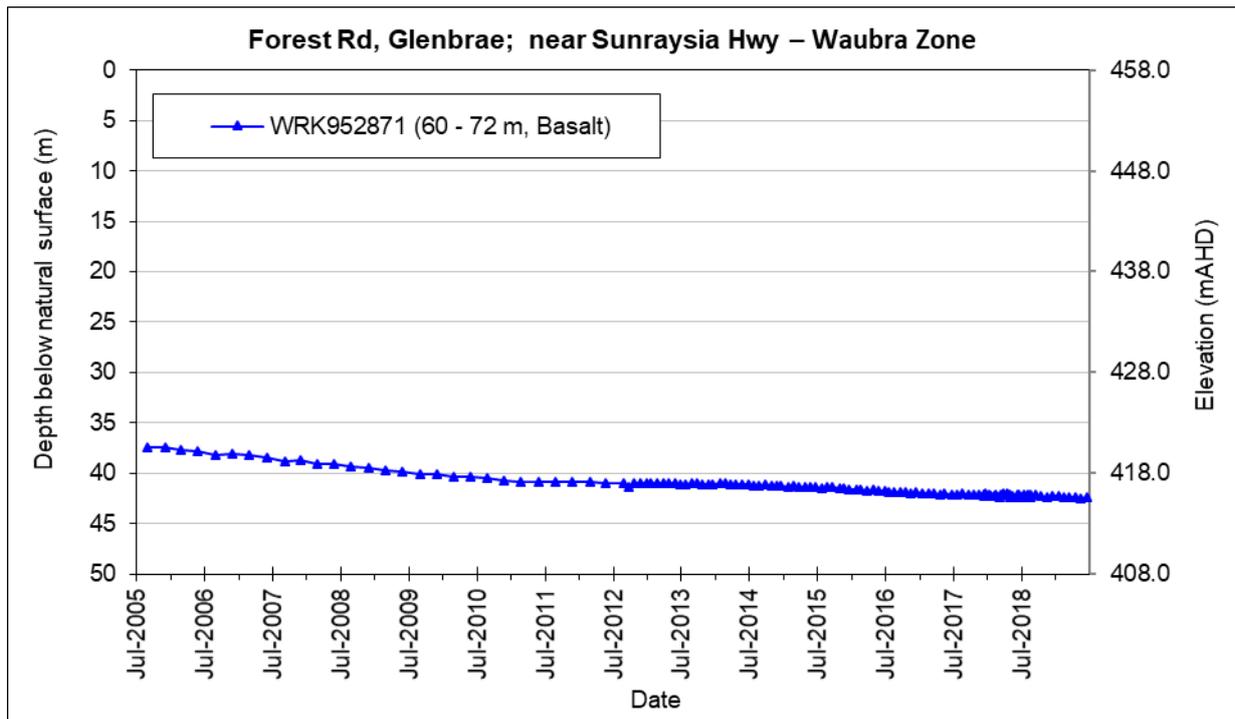
Groundwater recovery levels were relatively steady during the late 1980s and early 1990s. From the mid-1990s to 2009 groundwater recovery levels declined, largely in response to below-average rainfall during the Millennium Drought. Groundwater levels responded strongly to above-average rainfall in 2010/11.

Groundwater levels have generally declined since approval of the Plan in 2012 which is interpreted by GMW to be largely in response to reduced rainfall recharge due to drier than average conditions across the period since the Plan inception.

Groundwater levels recorded in bores at Saligaris Road, Cotswold (Basalt and Deep Lead aquifers) and Forest Road, Glenbrae (Basalt aquifer) were at their lowest on record during the 2018/19 water year (Figure 9 and Figure 10, respectively). All other groundwater levels remain within historical ranges.

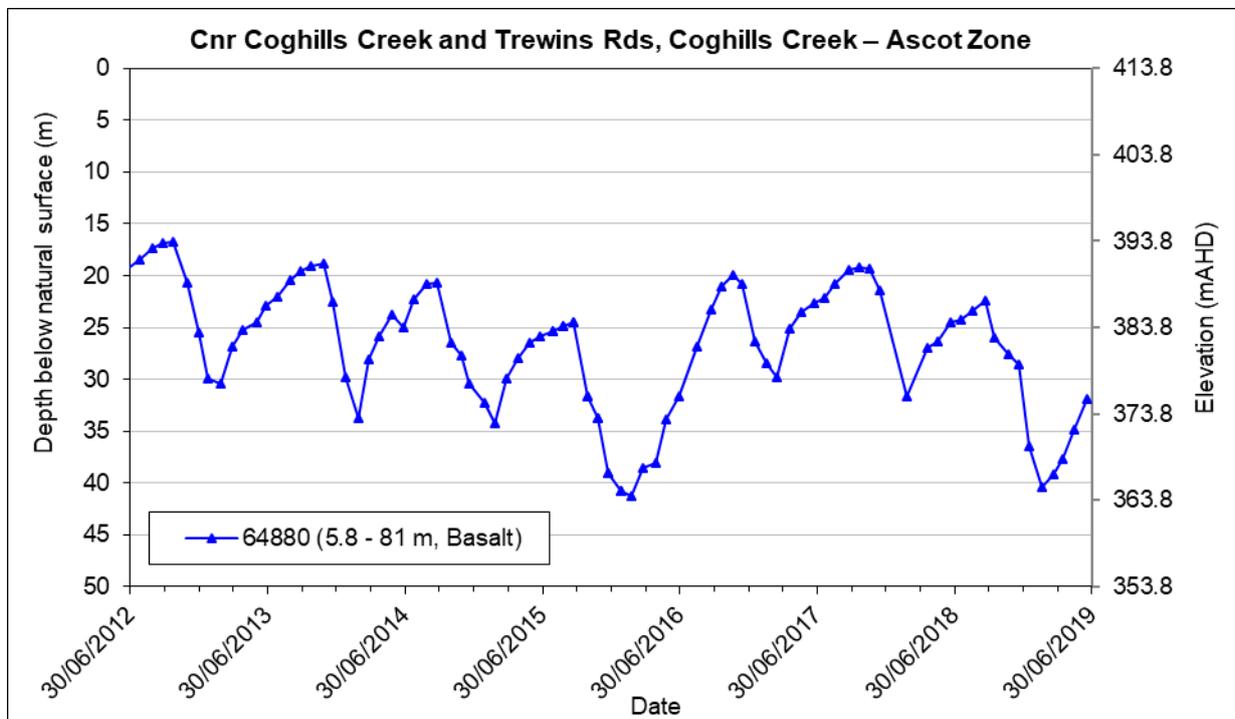


**Figure 9 Groundwater monitoring in the Ullina Zone at Cotswold – July 2008 to June 2019**



**Figure 10 Groundwater monitoring in the Waubra Zone at Glenbrae – July 2005 to June 2019**

Seasonal drawdown during the 2018/19 water year was typically less than 10 m across the Loddon Highlands WSPA. In the Ascot Zone, where the greatest volume of groundwater was abstracted, drawdown up to 18 m was recorded in bore 64880 at Coghills Creek (Figure 11).

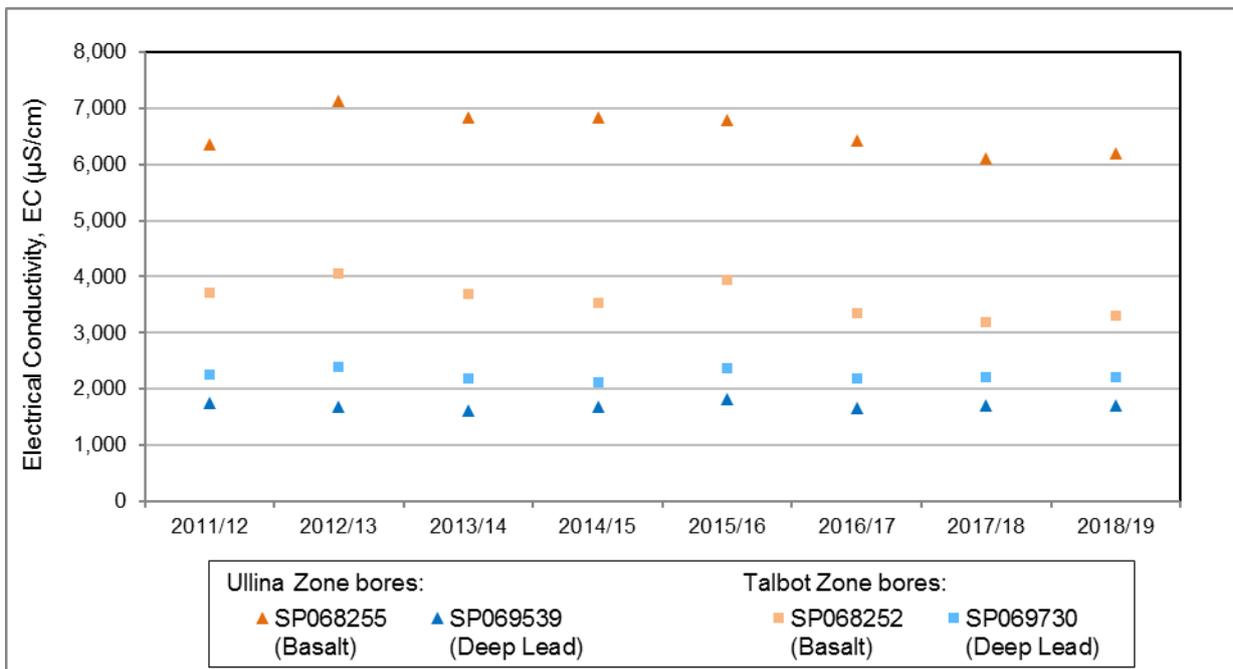


**Figure 11 Groundwater monitoring in the Ascot Zone at Coghills Creek – July 2012 to June 2019**

### 3.2 Groundwater quality

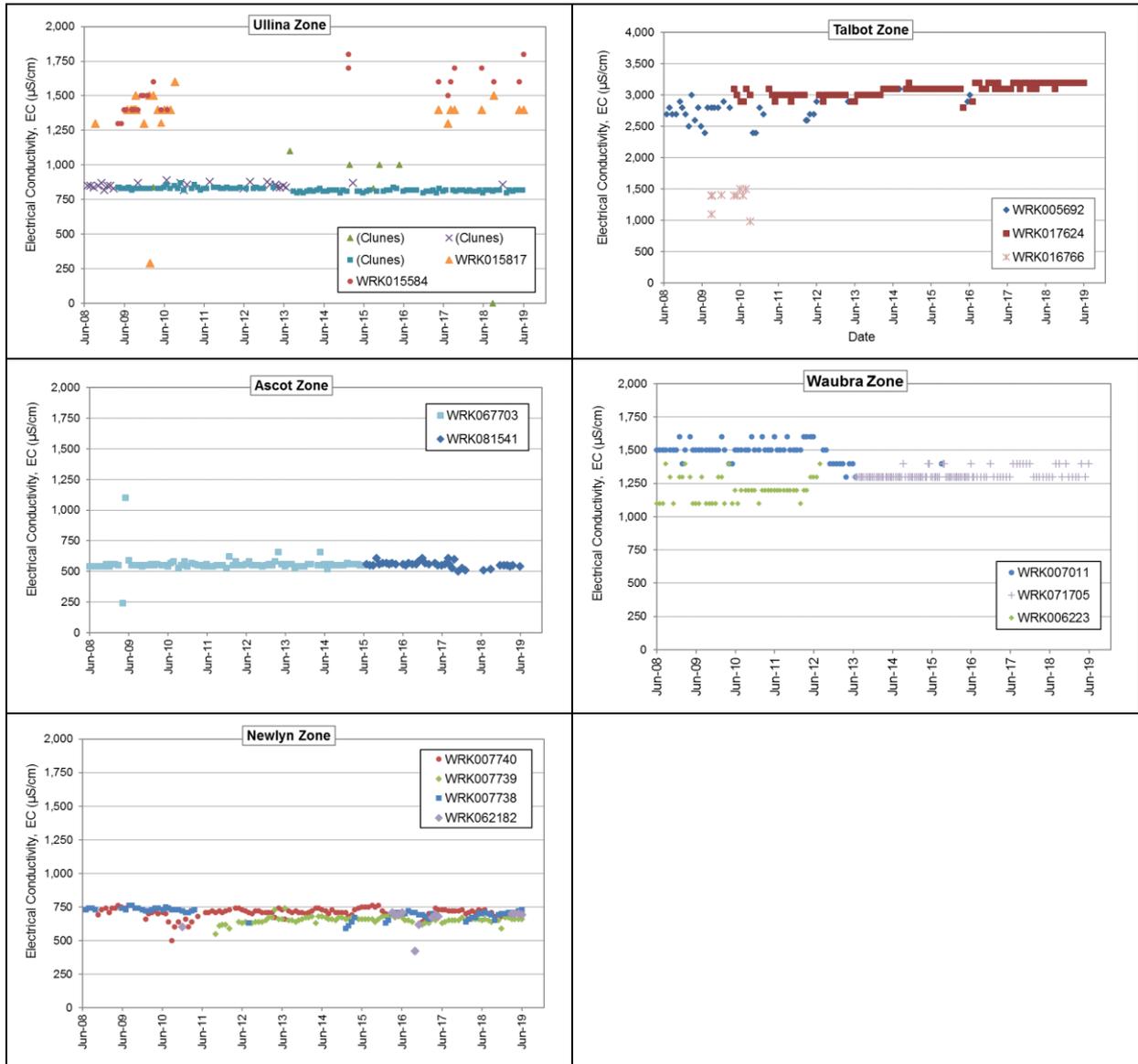
Groundwater quality monitoring was undertaken by collecting samples from two nested State observation bore sites in the Loddon Highlands WSPA. Nested sites feature two or more bores in close proximity, each monitoring a different aquifer. The State observation bore sites used for water quality testing are located in the Talbot and Ullina management zones and monitor groundwater in both the Deep Lead and basalt aquifers.

Analytical chemistry results for these bores are presented in Appendix C. Time series groundwater salinity results, presented in Figure 12, indicate that groundwater salinity levels continue to be higher in the basalt aquifers than the underlying Deep Lead aquifers at both sites. Ongoing annual monitoring of these bores will enable natural variance to be established and any trends in groundwater quality to be observed.



**Figure 12 Salinity of groundwater in key monitoring bores in the Loddon Highlands WSPA**

Groundwater salinity data from Central Highlands Water (CHW) licensed and monitoring bores has also been used to assess changes in groundwater quality in the Loddon Highlands WSPA. Data were obtained from CHW bore fields at Forest Hill in the Newlyn Zone, Learmonth (Ascot Zone), Clunes (Ullina Zone), Waubra (Waubra Zone) and Bung Bong (Talbot Zone) (Figure 13). The data indicate that groundwater salinity levels are relatively stable and within historical ranges.



**Figure 13 Groundwater salinity monitoring results from Central Highlands Water bores located in the Loddon Highlands WSPA**

# 4 Future Management Considerations

## 4.1 Groundwater Reference Committee

The Groundwater Reference Committee, appointed in accordance with Prescription 7(c) of the Plan, met on 18 September 2018.

Key points of discussion included:

- Timing of meetings
- Improving public access to groundwater level information
- Resource condition
- Plan implementation
- Review of the Plan

## 4.2 Management Plan review

GMW undertook a detailed review of the Plan in 2018, in accordance with Prescription 7(d) of the Plan.

Key recommendations of the Plan review included:

1. Develop a local management plan to manage groundwater resources at a catchment scale; and, once endorsed, seek to abolish the Plan.

The development of a local management plan should build on the successful components of the Plan by adopting opportunities for improvement, including:

- Provide an annual allocation announcement in July and increase as per current arrangements
  - Revise trigger levels to include monitoring bores that were installed in the late 2000s
  - Free up trading rules by establishing caps for each management zone
  - Simplify the rules that manage the density of licence volume
  - Investigate opportunity to use telemetry to monitor metered use throughout the year
  - Investigate opportunities to streamline administrative tasks to create efficiencies
2. Undertake investigations to determine if the Newlyn Zone trigger level should be revised.

Consideration should be given to:

- Including additional monitoring bores
- The interaction between groundwater and surface water
- Conjunctive management opportunities (e.g. no groundwater restrictions if Bullarook System allocations as above a certain percentage)

GMW presented the findings of the Plan review to the Groundwater Reference Committee, at its meeting on 18 September 2018; and sought feedback on the review document from the committee and the Department of Environment, Land, Water and Planning (DELWP).

GMW will consult further with DELWP and the Groundwater Reference Committee during 2019/20 to determine an appropriate approach to long term planning outcomes recommended by the Plan review.

## 5 References

Bureau of Meteorology (BoM), 2019. *Climate Statistics for Australian Sites – Clunes station number 088015*. Retrieved on 1 August 2019 from:

[http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p\\_nccObsCode=139&p\\_display\\_type=dataFile&p\\_stn\\_num=088015](http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=088015)

Department of Sustainability and Environment, 2012. *Loddon Highlands Water Supply Protection Area Groundwater Management Plan*. Department of Sustainability and Environment, Melbourne

Victorian Government, 2012. *Victorian Government Gazette No. S389 Wednesday 21 November 2012*. Victoria State Government, Melbourne

Victorian Government, 2013. *Victorian Government Gazette No. G10 Thursday 7 March 2013*. Victoria State Government, Melbourne

# Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant
<b>PRESCRIPTION 1 Carryover</b>		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> <li>a) Apply to the Minister for Water to declare the availability of carryover in the Loddon Highlands WSPA up to a maximum of 15% of licence entitlement that will not be subject to restriction in the form of allocations.</li> <li>b) Consult with the Groundwater Reference Committee about the need to alter the percentage of carryover.</li> </ul>	<p>The Minister declared that licence holders in the Loddon Highlands WSPA may carryover up to 15 per cent licensed volume from November 2012.</p>	<p>Yes</p>
<b>PRESCRIPTION 2 Triggers and restrictions</b>		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> <li>a) By 15 September each year determine the maximum seasonal groundwater recovery level in the relevant bore/s, or its replacement, and corresponding seasonal allocation as detailed in the Plan.</li> <li>b) Determine a seasonal allocation for the relevant zone based on the outcomes of a review of available data. The review will be undertaken when the 50% allocation is triggered in the Blampied, Newlyn or Ascot Zone. The Corporation shall consult with the Groundwater Reference Committee during the review.</li> <li>c) Determine a seasonal allocation for the Waubra Zone and consult with Groundwater Reference Committee.</li> <li>d) Announce seasonal allocations by listing them on its website; sending letters to all licence holders and placing public notices in local newspapers.</li> <li>e) Review allocations based on groundwater level readings to November each year and announce an increase if triggered.</li> </ul>	<p>GMW announced allocations, based on groundwater recovery levels recorded in August 2018, for the 2018/19 water year on 14 September 2019.</p> <p>Initial allocations were 75 per cent for the Blampied and Newlyn zones and 100 per cent for all other management zones.</p> <p>In September 2018 the level in the Blampied Zone trigger bore had sufficiently recovered to trigger an allocation of 100 per cent for the remainder of the season. GMW announced this revised allocation for the Blampied Zone on 19 October 2018.</p> <p>The allocation remained unchanged for the Newlyn Zone as there was not sufficient recovery in the Newlyn Zone trigger bores to trigger a higher allocation.</p> <p>GMW announced all allocations by listing them on its website, sending letters to all licence holders and placing public notices in local newspapers.</p>	<p>Yes</p>

Prescription	Activity	Compliant				
<b>PRESCRIPTION 3 Trading between zones</b>						
<p>The Corporation may approve a temporary or permanent transfer of groundwater licence entitlement under section 62 of the <i>Water Act 1989</i> provided section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> <li>a) The permanent transfer of licence entitlement is between zones as specified in the Plan.</li> <li>b) The temporary transfer of licence entitlement is between zones as specified in the Plan.</li> <li>c) Despite (b) above, a temporary transfer of licence entitlement may be considered where bores are located within 2.5 km of each other across an internal zone boundary.</li> <li>d) Licence entitlement may be temporarily traded into, or out of, the Loddon Highlands WSPA provided that the PCV is not exceeded.</li> </ul>	<p>In 2018/19, GMW processed 18 transactions for temporary transfer of licensed volume, totalling 575 ML and four transactions for permanent transfer of licensed volume, totalling 82 ML/year.</p> <p>All transfers were compliant with Prescription 3.</p>	<p>Yes</p>				
<b>PRESCRIPTION 4 Groundwater level interference</b>						
<p>The Corporation may approve an application to take and use groundwater under section 51 or a transfer under section 62 of the <i>Water Act 1989</i> provided that section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> <li>a) Licence entitlement may be temporarily or permanently transferred up to 1,000 ML/yr within 2.5 km radius of a licensed bore.</li> <li>b) Where the licence entitlement within a 2.5 km radius of a licensed bore exceeds 1,000 ML/yr then: <table border="1" data-bbox="188 842 1341 1315"> <tbody> <tr> <td data-bbox="188 842 472 1174">(i). For temporary transfer of licence entitlement</td> <td data-bbox="472 842 1341 1174"> <ul style="list-style-type: none"> <li>1. Trade with usage in any one season limited to 115% of entitlement, whether it occurs through trade or carryover (this could include transferring from outside the 2.5 km radius); or</li> <li>2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or</li> <li>3. Assess the application to consider other relevant information such as historical use and, if required undertake detailed investigations, when seeking to use more than 115% of your licence entitlement to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</li> </ul> </td> </tr> <tr> <td data-bbox="188 1174 472 1315">(ii). For permanent transfer of licence entitlement</td> <td data-bbox="472 1174 1341 1315"> <ul style="list-style-type: none"> <li>1. Trade from others within 2.5 km radius of the applicant's bore; or</li> <li>2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</li> </ul> </td> </tr> </tbody> </table> </li> </ul>	(i). For temporary transfer of licence entitlement	<ul style="list-style-type: none"> <li>1. Trade with usage in any one season limited to 115% of entitlement, whether it occurs through trade or carryover (this could include transferring from outside the 2.5 km radius); or</li> <li>2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or</li> <li>3. Assess the application to consider other relevant information such as historical use and, if required undertake detailed investigations, when seeking to use more than 115% of your licence entitlement to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</li> </ul>	(ii). For permanent transfer of licence entitlement	<ul style="list-style-type: none"> <li>1. Trade from others within 2.5 km radius of the applicant's bore; or</li> <li>2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</li> </ul>	<p>GMW processed all groundwater licence applications in accordance with Prescription 4.</p>	<p>Yes</p>
(i). For temporary transfer of licence entitlement	<ul style="list-style-type: none"> <li>1. Trade with usage in any one season limited to 115% of entitlement, whether it occurs through trade or carryover (this could include transferring from outside the 2.5 km radius); or</li> <li>2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or</li> <li>3. Assess the application to consider other relevant information such as historical use and, if required undertake detailed investigations, when seeking to use more than 115% of your licence entitlement to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</li> </ul>					
(ii). For permanent transfer of licence entitlement	<ul style="list-style-type: none"> <li>1. Trade from others within 2.5 km radius of the applicant's bore; or</li> <li>2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</li> </ul>					

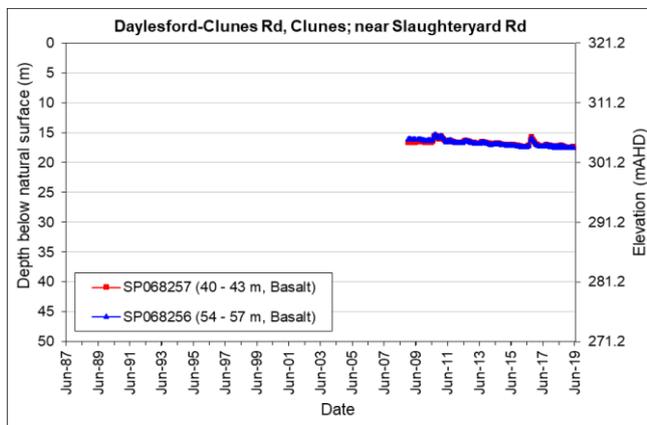
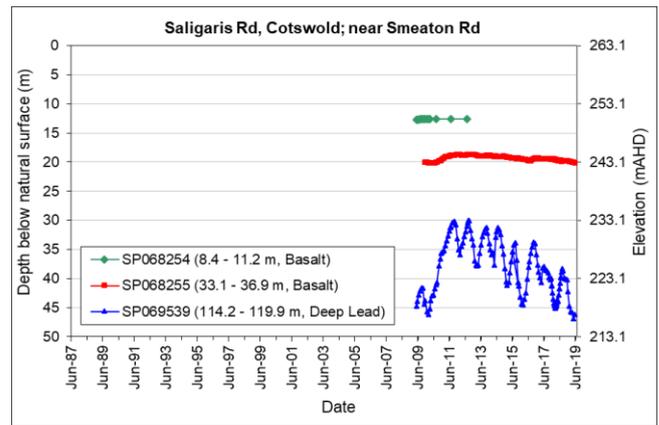
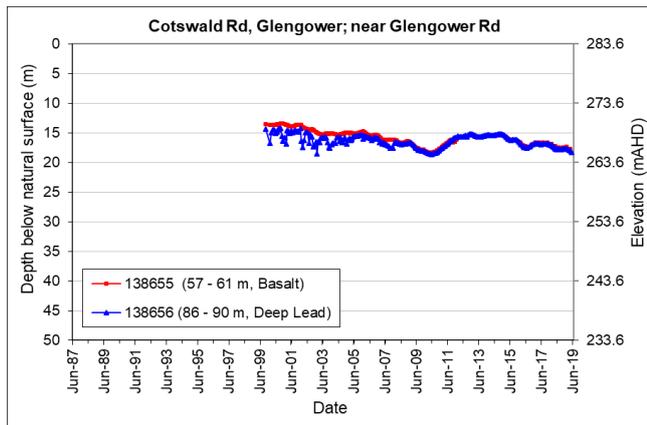
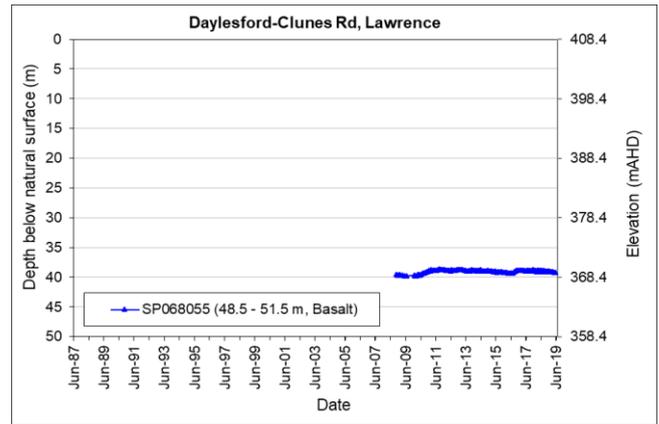
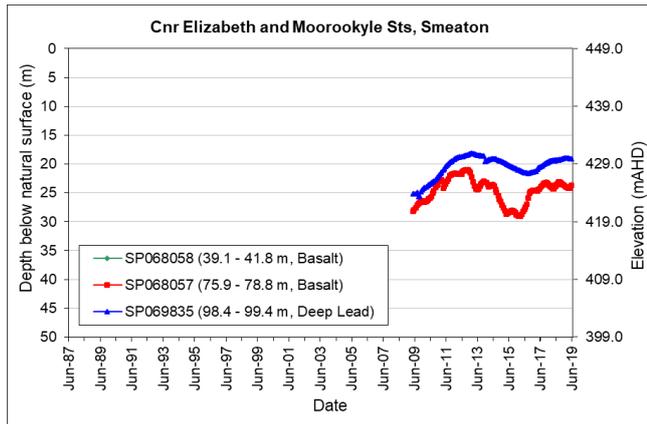
Prescription	Activity	Compliant
<b>PRESCRIPTION 5 Groundwater monitoring</b>		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> <li>(a) Obtain monthly groundwater level readings, where practicable, from State observation bores listed in Schedule 1 or their replacement (up to 288 readings per season).</li> <li>(b) Establish a targeted groundwater salinity monitoring program to collect and analyse groundwater samples from selected licensed bores each year.</li> <li>(c) Collect groundwater samples from selected State observation bores identified in Schedule 1 where practicable, or their replacement, and send them to a NATA accredited laboratory for analysis.</li> </ul>	<p>GMW obtained monthly groundwater level readings from bores listed in Schedule 1 of the Plan, where practicable.</p> <p>GMW used groundwater salinity monitoring data provided by Central Highlands Water from their urban supply bores to fulfil the requirements of a targeted salinity monitoring program.</p> <p>GMW collected groundwater samples from nested State observation bores identified in Schedule 1 and sent them to a NATA accredited laboratory for analysis.</p>	Yes
<b>PRESCRIPTION 6 Metered licensed use</b>		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> <li>(a) Ensure that a meter is fitted to all operational licensed bores.</li> <li>(b) Read each meter at least twice each season.</li> </ul>	GMW ensured that use was accounted for each operational licensed bore and read each meter in January/February and May/June during 2018/19.	Yes
<b>PRESCRIPTION 7 Plan implementation</b>		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> <li>(a) By 30 September each year: <ul style="list-style-type: none"> <li>(i). prepare an annual report on the administration and enforcement of the Plan for the Minister for Water and relevant agencies.</li> <li>(ii). mail a newsletter to groundwater licence holders, and domestic and stock users upon request, summarising the outcomes in the annual report.</li> </ul> </li> <li>(b) Post on its website the Plan; annual report, newsletters and groundwater level monitoring results.</li> <li>(c) Meet with a Groundwater Reference Committee at least once each year to report on the implementation of the Plan and consider the need to review the Plan.</li> <li>(d) Undertake a review of the Plan after five years from its approval, or sooner if warranted by any prescription contained within the Plan.</li> </ul>	<p>GMW prepared this annual report on the administration and enforcement of the Plan during the 2018/19 water year; for the Minister and relevant agencies. GMW also sent a newsletter to licence holders summarising the information in this report.</p> <p>GMW has posted on its website: the Plan, this annual report and a water year summary newsletter.</p> <p>GMW updates a selection of hydrographs of groundwater levels on its website every month.</p> <p>GMW met with the Groundwater Reference Committee on 18 September 2018 to discuss the implementation of the Plan.</p> <p>GMW undertook a comprehensive review of the Plan in 2018.</p>	Yes

# Appendix B – Hydrographs for key monitoring bores

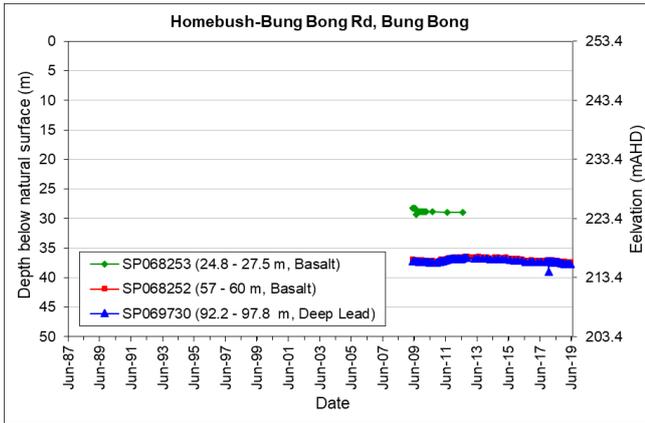
Hydrographs are provided for key monitoring bores listed in Schedule 1 of the Plan.

Further groundwater level information from other State observation bores is available on the Water Measurement Information System at <http://data.water.vic.gov.au/monitoring.htm>

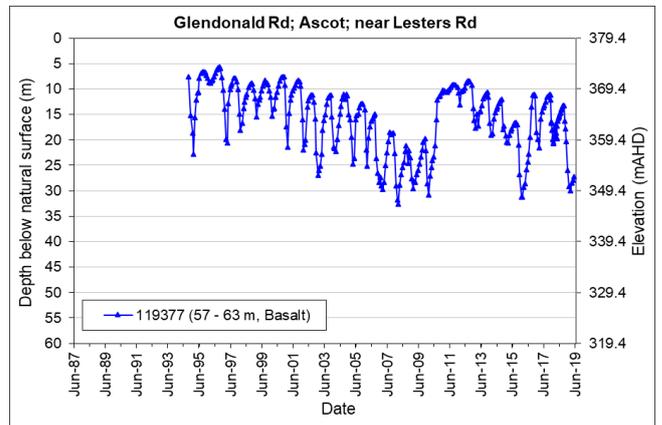
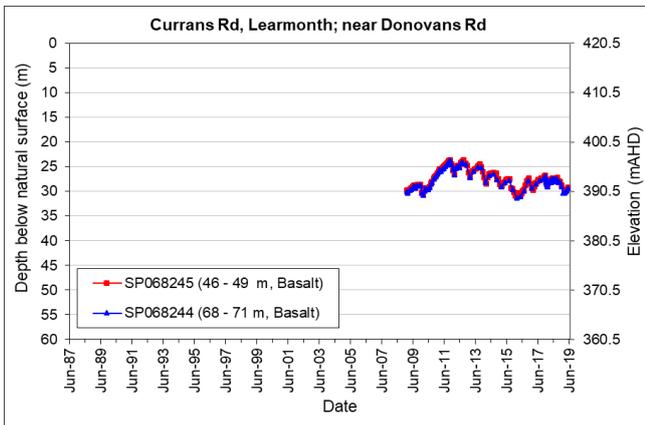
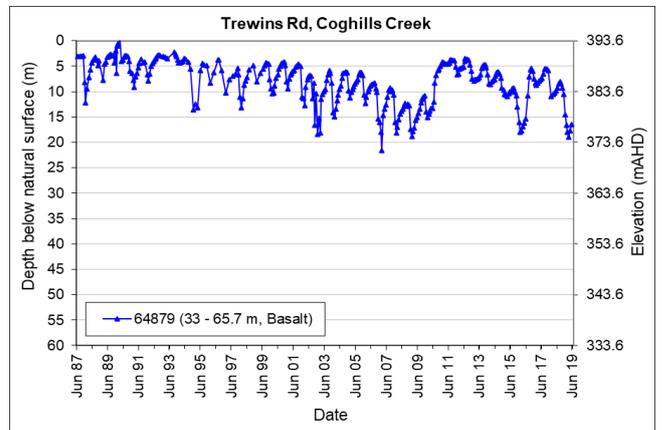
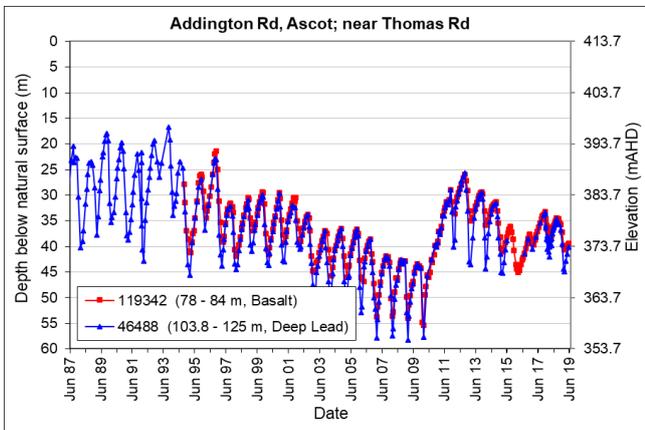
## Ullina Zone – 1100

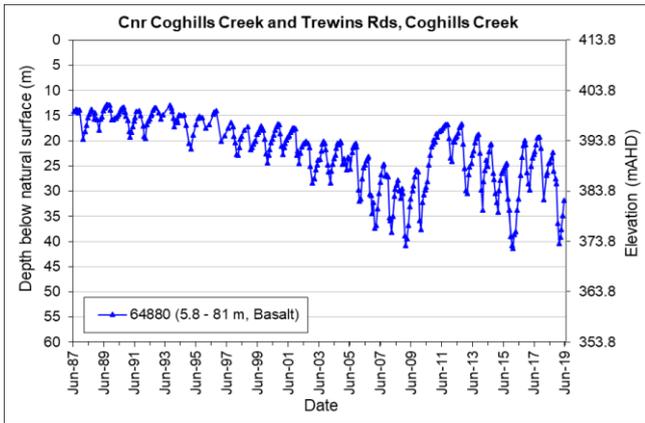
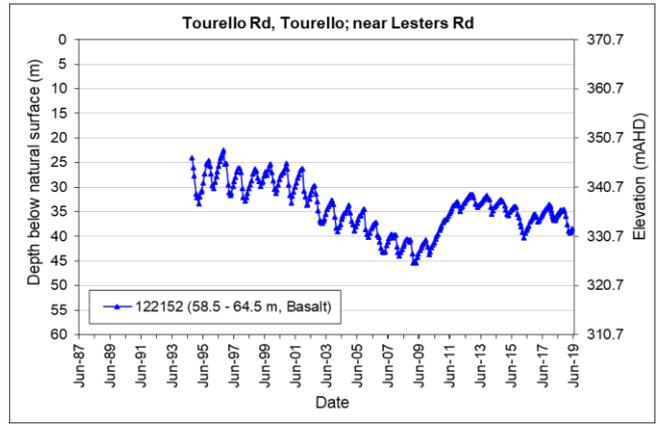
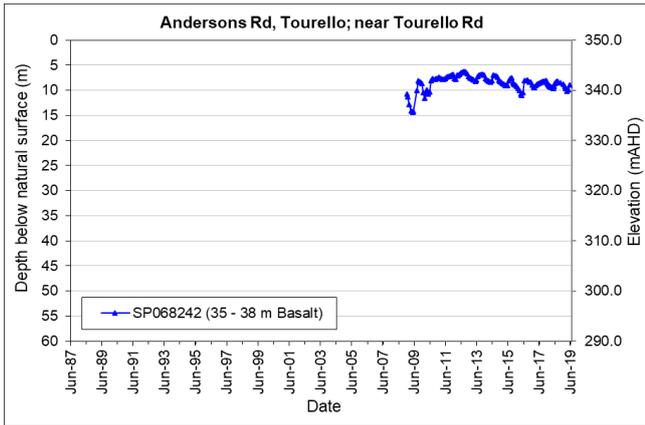


Talbot Zone – 1101

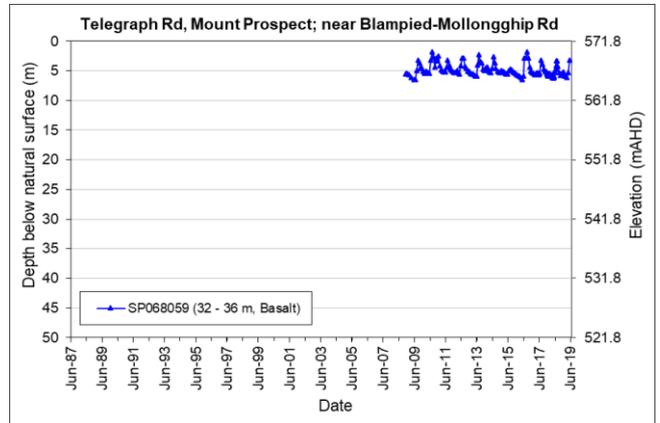
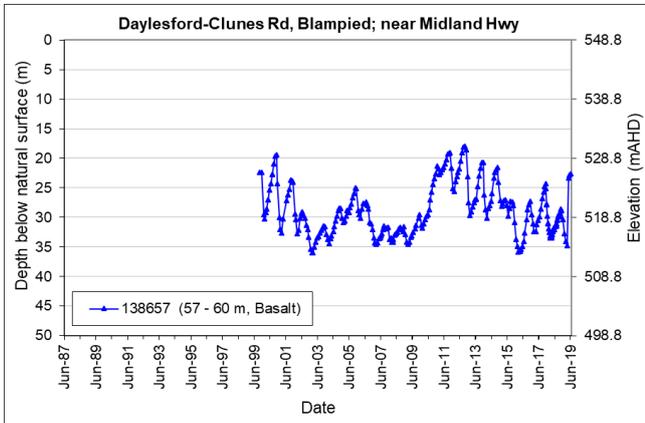


Ascot Zone – 1102

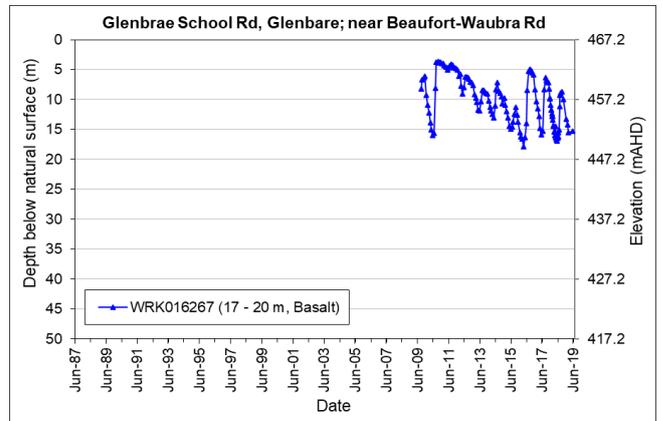
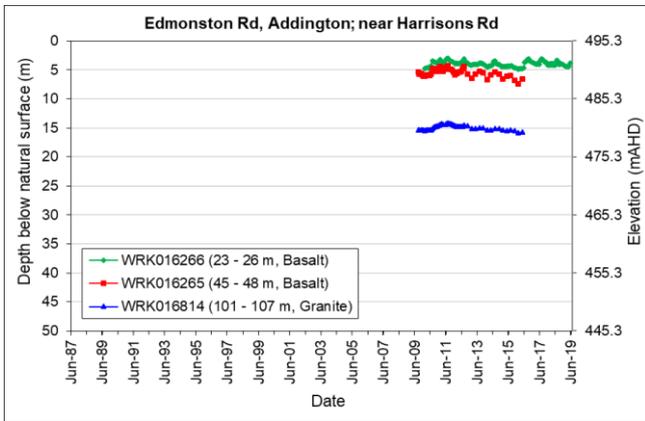
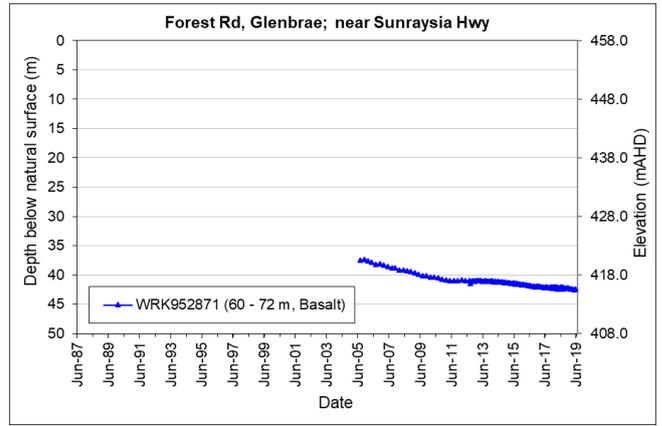
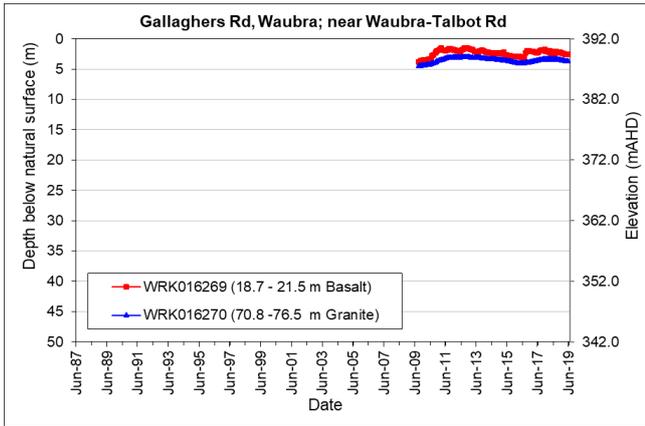




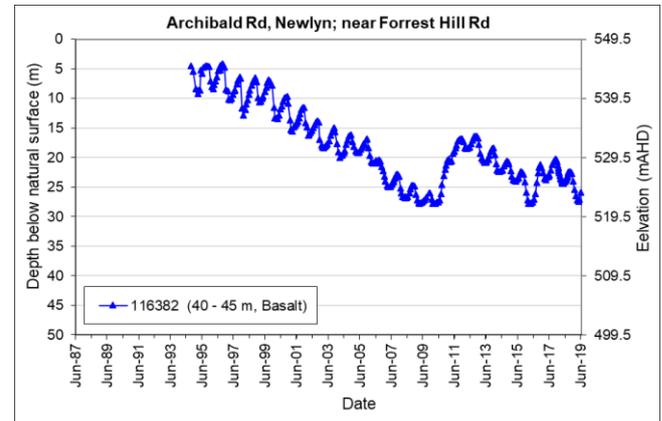
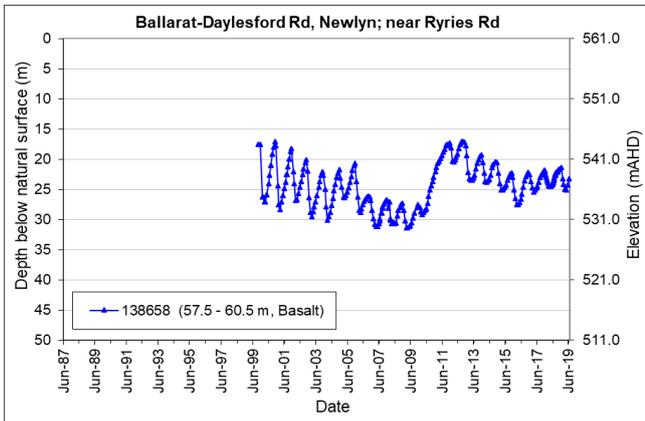
**Blampied Zone – 1104**

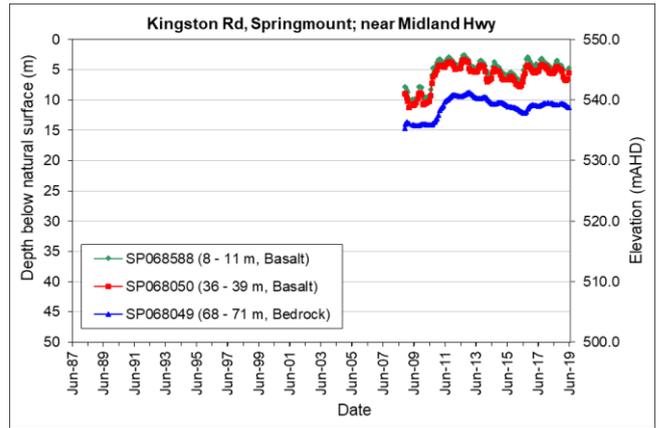
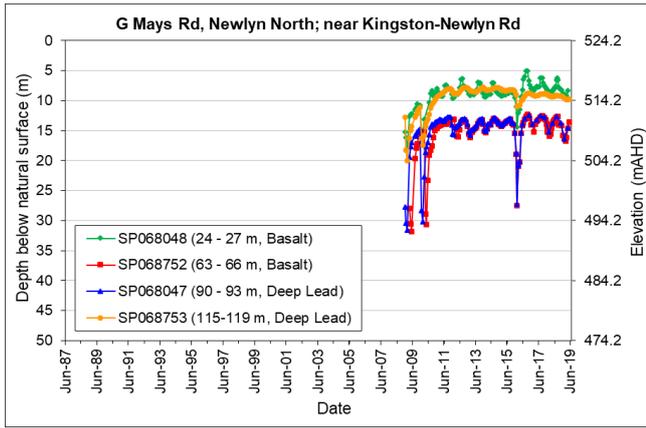


Waubra Zone – 1106



Newlyn Zone – 1107





# Appendix C – Groundwater chemistry results

		Bore:	SP068255	SP069539	SP068252	SP069730
		Aquifer:	Basalt	Deep Lead	Basalt	Deep Lead
		Date:	1/11/2018	1/11/2018	1/11/2018	1/11/2018
Analyte	Unit					
Electrical conductivity @ 25°C	µS/cm		6,200	1,700	3,300	2,200
pH sediment	–		7.8	6.7	7.6	7.5
Turbidity	ppm		0.2	3	<0.1	<0.7
Total Dissolved Solids	NTU		3,200	750	1,700	1,200
Alkalinity (Bicarbonate), as CaCO <sub>3</sub>	mg/L		240	370	280	260
Alkalinity (Carbonate), as CaCO <sub>3</sub>	mg/L		<2	<2	<2	<2
Alkalinity (Hydroxide), as CaCO <sub>3</sub>	mg/L		<2	<2	<2	<2
Total Alkalinity, as CaCO <sub>3</sub>	mg/L		240	370	280	260
Calcium, as Ca	mg/L		100	35	84	58
Chloride, as Cl	mg/L		1800	290	800	460
Magnesium, as Mg	mg/L		290	67	150	94
Potassium, as K	mg/L		12	7.7	6.3	5.1
Sodium, as Na	mg/L		630	190	340	220
Ammonia, as N	mg/L		0.2	<0.1	<0.1	<0.1
Nitrate, as N	mg/L		3.9	0.04	4.6	1.7
Nitrite, as N	mg/L		<0.01	<0.01	<0.01	<0.01
Total Kjeldahl Nitrogen, as N	mg/L		0.2	0.3	<0.1	<0.1
Total Combustible Nitrogen, as N	mg/L		4.1	0.3	4.7	1.7
Sulphate, as SO <sub>4</sub>	mg/l		250	29	140	70
Total organic carbon (TOC)	mg/L		1.4	1.9	1.2	1.9
Arsenic, as As	mg/L		<0.001	<0.001	0.002	0.002
Cadmium, dissolved (ICP-MS)	mg/L		<0.0002	<0.0002	<0.0002	<0.0002
Chromium, dissolved (ICP-MS)	mg/L		0.002	<0.001	0.002	0.002
Copper, dissolved (ICP-MS)	mg/L		0.003	<0.001	0.004	0.014
Iron, dissolved as Fe	mg/L		<0.01	0.18	<0.01	<0.01
Lead, dissolved (ICP-MS)	mg/L		<0.001	<0.001	<0.001	<0.001
Manganese, dissolved as Mn	mg/L		<0.001	0.085	<0.001	<0.001
Mercury, as Hg	mg/L		<0.0001	<0.0001	<0.0001	<0.0001
Nickel, dissolved (ICP-MS)	mg/L		<0.001	<0.001	<0.001	<0.001
Phosphorus, total as P	mg/L		0.06	0.26	0.16	0.15
Zinc, dissolved (ICP-MS)	mg/L		0.037	0.008	0.035	0.035