

Loddon Highlands Water Supply Protection Area Groundwater Management Plan

Annual Report

For year ending 30 June 2023

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Excellence



Honesty



Accountability

OFFICIAL



Courage



Caring

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 2022/2023 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* on 21 November 2012.

This report has been prepared in accordance with section 32C of the *Water Act 1989*. It provides an overview of the groundwater management activities administered under the Plan between 1 July 2022 and 30 June 2023.

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



Charmaine Quick
MANAGING DIRECTOR

Date: 25/09/2023

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 2022/23 water year marks the eleventh year of operation of the Plan.

In July 2022, Goulburn-Murray Water (GMW) announced that licence holders in all seven management zones of the Loddon Highlands Water Supply Protection Area (the WSPA) would have access to 100 per cent of their licence entitlement volume for the 2022/23 water year.

Recorded use in the WSPA in 2022/23 was 4,722.9 ML, or 23 per cent of the total licence entitlement volume, which was the second lowest (behind 2020/21) since the Plan was implemented.

Transfer activity for licence entitlement volume was low during the 2022/23 water year; seven temporary licence transfers, totalling 538.0 ML/yr, and one permanent transfers totalling 10 ML/yr. Licence holders in the WSPA carried over a total of 2,982.1 ML of unused entitlement for use in the 2023/24 water year.

Groundwater monitoring, metering programs and compliance activities continue to be successfully carried out to support the objectives of the Plan.

There are currently no plans to undertake another formal review of the Plan.

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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* (DSE, 2012) (the Plan) and section 32C of the *Water Act 1989* (the Act). It provides an overview of groundwater resource status within the Loddon Highlands Water Supply Protection Area (the WSPA) and summarises the groundwater management activities undertaken in accordance with the Plan during the 2022/23 water year (1 July 2022 to 30 June 2023).

1.2 Water Supply Protection Area

The 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 – refer Figure 1. It incorporates management of groundwater resources to all depths.

Groundwater resources in the WSPA are managed and reported under seven management zones – Ullina Zone (1100), Talbot Zone (1101), Ascot Zone (1102), Mollonghip Zone (1103), Blampied Zone (1104), Waubra Zone (1106) and Newlyn Zone (1107) – shown in Figure 1.

1.3 Groundwater Management Plan

The Plan, which applies to the management of groundwater resources within the area of the WSPA, was approved on 21 November 2012 by The Hon. Peter Walsh MP, Minister for Water in accordance with section 32A(6) of 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 the GMW website, www.gmwater.com.au.

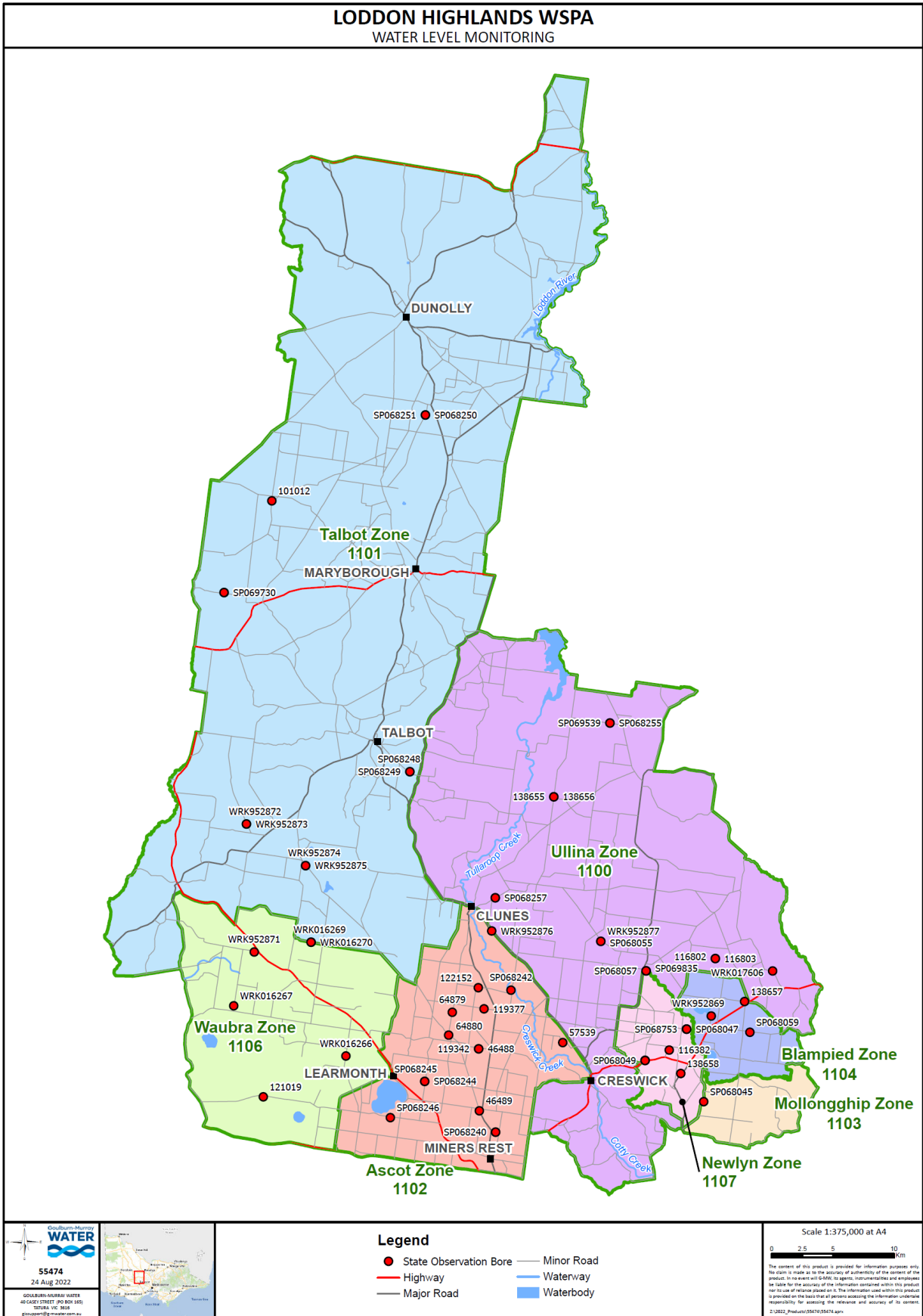


Figure 1 Loddon Highlands Water Supply Protection Area

2 Groundwater Management

2.1 Licence entitlement volume

A permissible consumptive volume of 20,697 megalitres per year (ML/yr) for the WSPA was declared by the then-Minister for Water in March 2013 (Victorian Government, 2013).

At 30 June 2023, the total licence entitlement volume in the WSPA was 20,482.6 ML/yr. This is 19 ML/yr lower than for the 2021/22 water year as a result of a 19 ML/yr cancellation in the Talbot Zone. The number of licences in each management zone is summarised in Table 1, as well as the total number of licensed bores and the sum of licence entitlement volume.

Table 1 Groundwater licences by management zone in the Loddon Highlands WSPA

Management zone	Licences	Licensed bores	Sum of licence entitlement volume (ML/yr)
Ullina Zone (1100)	26	31	3,009.2
Talbot Zone (1101)	12	13	1,176.7
Ascot Zone (1102)	68	100	7,042.2
Molongghip Zone (1103)	3	7	353.0
Blampied Zone (1104)	19	28	1,252.5
Waubra Zone (1106)	30	60	4,702.8
Newlyn Zone (1107)	27	47	2,946.2
Total	185	286	20,482.6

Note: Data extracted from the Victorian Water Register on 1 July 2023.

2.2 Groundwater allocations

Annual groundwater allocations are determined by comparing average maximum groundwater recovery levels from key State observation bores against trigger levels outlined in Prescription 3 of the Plan. This relates to four of the seven management zones (Ascot, Blampied, Waubra and Newlyn) because of:

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

The State observation bores used to determine seasonal allocations in the four management zones are listed in Table 2, and shown in Figure 1.

Table 2 State observation bores used for the determination of 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

Prescription 2 of the Plan requires annual allocations to be determined and announced by 15 September of each year, based on groundwater level readings measured between 1 July and 30 August of the same year. If an allocation is announced at less than 100 per cent, it shall be reviewed based on groundwater level readings to 30 November; an increase will be announced if there is sufficient further rise in levels (recovery).

GMW announced allocations for the 2022/23 water year on 14 July 2022. Licence holders in the four management zones began the water year with an allocation of 100 per cent of licence entitlement volume (Figure 2 and Figure 3).

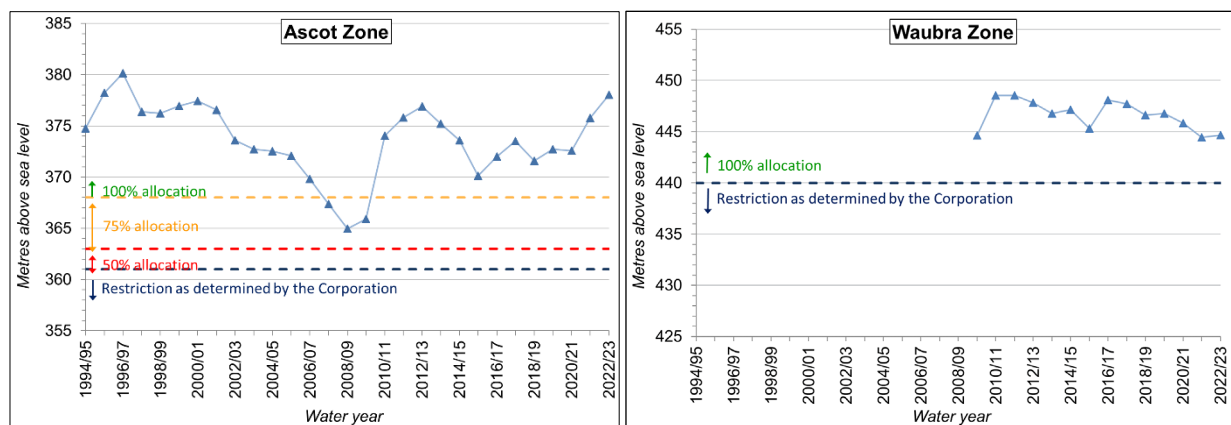


Figure 2 Trigger graphs for determining allocations in the Ascot Zone (left) and Waubra Zone (right), 1993/94 to 2022/23

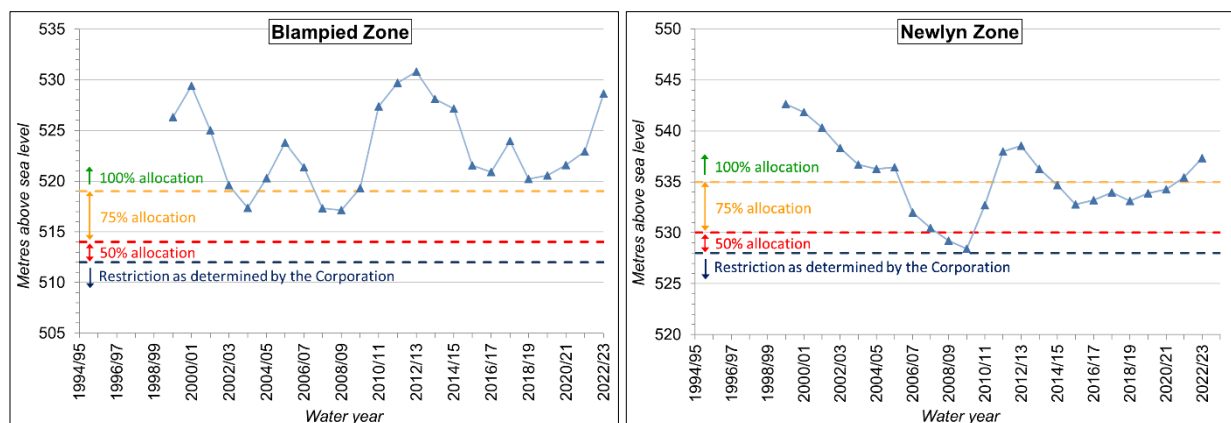


Figure 3 Trigger graphs for determining allocations in the Blampied Zone (left) and Newlyn Zone (right), 1994/95 to 2022/23

2.3 Rainfall

Long-term rainfall data, sourced from the Bureau of Meteorology weather station at Clunes (BOM, 2023), is presented in Figure 4 as an indicator of climate trends across the WSPA.

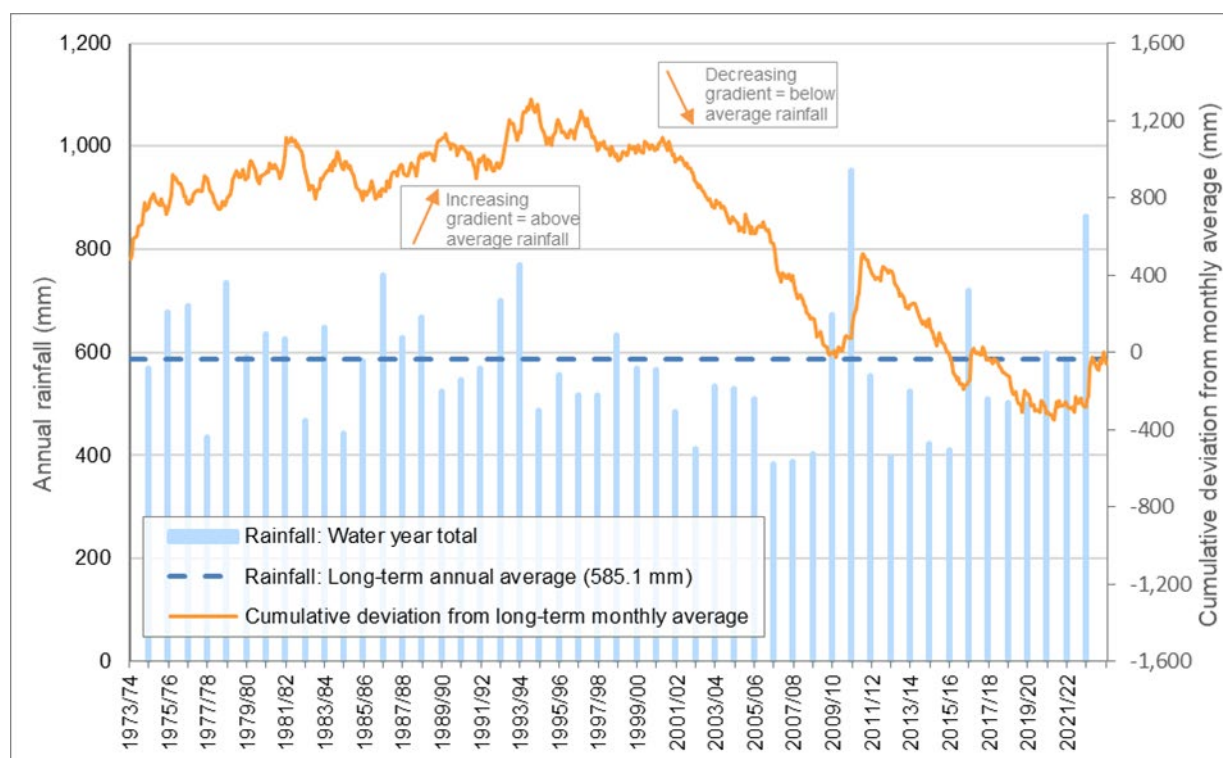


Figure 4 Rainfall recorded at Clunes, July 1974 to June 2022

Annual (water year) rainfall was generally above the long term average (585.1 mm) between the mid-1970s and the mid-1990s. Between 1999/2000 and 2008/09, annual totals were below average (Millennium Drought) until rainfall conditions improved in 2009/10 and 2010/11.

Between 2012/13 (when the Plan was implemented) and 2019/20, annual rainfall totals at Clunes were below average (398–525 mm), with the exception of 2016/17 (720 mm). This trend resulted in reduced recharge to aquifers within the WSPA, which was reflected in a continued pattern of resource decline and resulted in reduced allocations in the Newlyn Zone.

A total of 864.6 mm was recorded in Clunes during the 2022/23 water year, following 580.8mm in 2021/22. The 2022/23 total rainfall was the highest since the 2010/11 water year total of 954 mm.

2.4 Groundwater use

Total recorded use in the WSPA in 2022/23 was 4,722.9 ML, or 23 per cent of the total licence entitlement volume (Figure 5). This is slightly less than the 2021/22 total (5,040.8 ML), and is the second lowest total since the Plan was implemented. Increased rainfall received over the last three water years is likely a contributor to these lower use volumes (Figure 5).

Note: Recorded use refers to metered and deemed use.

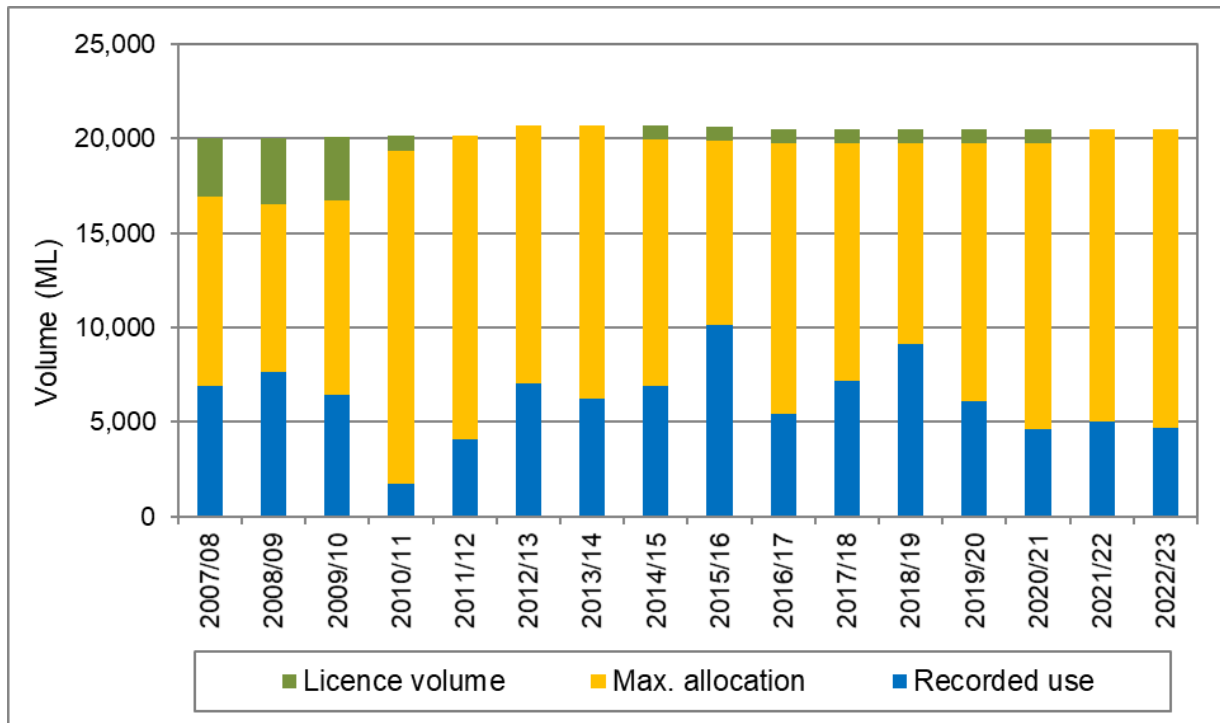


Figure 5 Annual recorded use volumes compared to licence entitlement and allocation volume in the Loddon Highlands WSPA

Recorded use by management zone is provided in Table 3. In 2022/23, the volume of recorded use was highest in the Ascot Zone (2,286.0 ML), where the largest proportion of licence entitlement volume was held. Recorded use, as a proportion of total licence entitlement volume, was greatest in the Blampied Zone (39 per cent) and lowest in the Ullina Zone (5 per cent).

Table 3 Breakdown of recorded use and licence entitlement volumes for 2022/23

Management zone	Total licence entitlement volume (ML/yr)	Recorded use (ML)	Proportion of total licence entitlement volume used
Ullina Zone (1100)	3,006.2	164.2	5%
Talbot Zone (1101)	1,179.7	293.3	25%
Ascot Zone (1102)	7,040.2	2286.0	32%
Molongghip Zone (1103)	353.0	40.0	11%
Blampied Zone (1104)	1,252.5	485.7	39%
Waubra Zone (1106)	4,702.8	757.5	16%
Newlyn Zone (1107)	2,946.2	696.2	24%
Total	20,480.6	4,722.9	23%

Note: Data extracted from the Victorian Water Register on 1 July 2023.

2.5 Licence transfers

The Plan allows groundwater licence holders to temporarily or permanently transfer licence entitlement volume. Transfers completed during the 2022/23 water year are provided in Table 4.

Figure 6 compares the total volume of completed transfers for each water year since the Plan was implemented (2012/13).

Table 4 Licence entitlement transfers completed during 2022/23

Management zone	Permanent transfers				Temporary transfers			
	Transfer from		Transfer to		Transfer from		Transfer to	
	No. of transfers	Volume (ML/yr)	No. of transfers	Volume (ML/yr)	No. of transfers	Volume (ML)	No. of transfers	Volume (ML)
Ullina Zone (1100)	1	10.0	1	10.0	1	1.0	-	-
Talbot Zone (1101)	-	-	-	-	-	-	1	1.0
Ascot Zone (1102)	-	-	-	-	3	384.0	3	384.0
Molongghip Zone (1103)	-	-	-	-	-	-	-	-
Blampied Zone (1104)	-	-	-	-	2	123.0	2	123.0
Waubra Zone (1106)	-	-	-	-	-	-	-	-
Newlyn Zone (1107)	-	-	-	-	1	30.0	1	30.0
Total	1	10.0	1	10.0	7	538.0	7	538.0

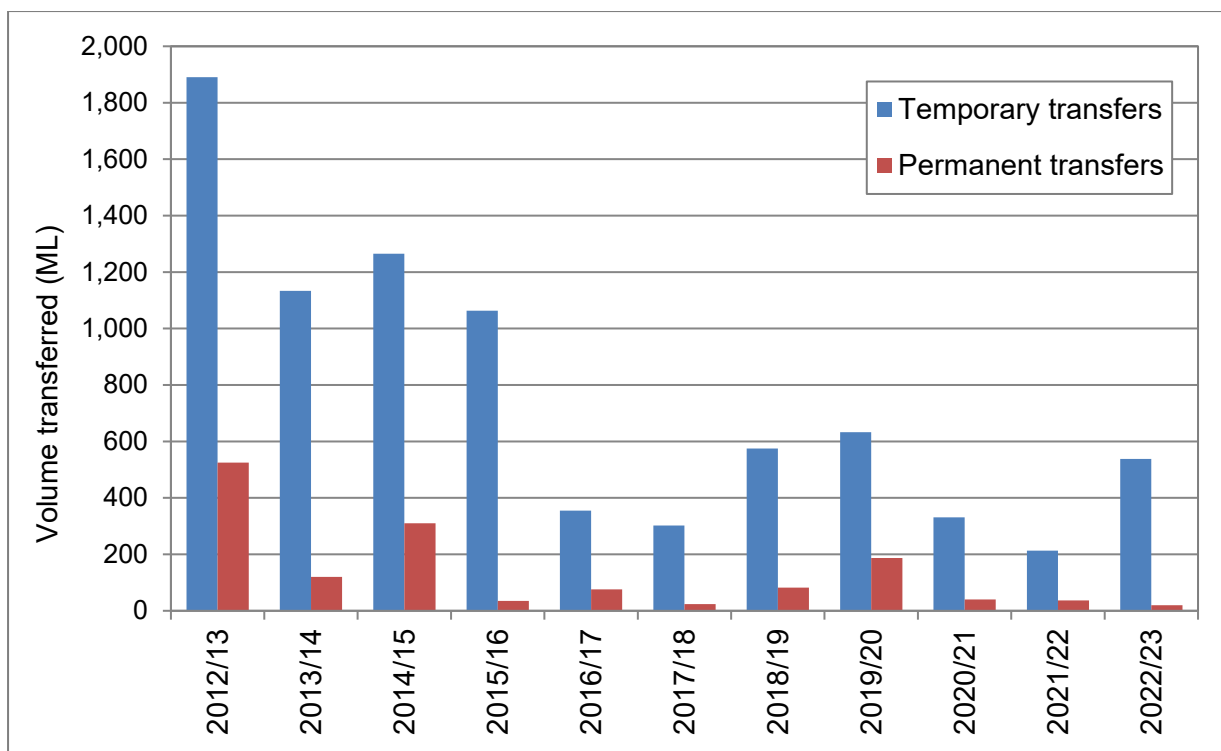


Figure 6 Annual totals of licence entitlement transfers in the Loddon Highlands WSPA since 2012/13

During the 2022/23 water year there was one permanent transfer, totalling 10.0 ML/yr, and seven temporary transfers, totalling 538.0 ML (Table 4). This is the lowest number and volume of permanent transfers to occur in a water year since the Plan was implemented (Figure 6).

All temporary and permanent transfers occurred between licence holders within the same management zones except one temporary (1 ML/yr) transfer from Ullina to Talbot zone (Table 4).

2.6 Carryover

In November 2012, the then-Minister for Water declared that groundwater licence holders in the WSPA were authorised to carryover up to a maximum of 15 per cent of unused licence entitlement volume for use in the subsequent water year (Victorian Government, 2012).

There was a total of 3,028.7 ML carried over by licence holders in the WSPA for use in the 2022/23 water year. At the conclusion of 2022/23, a total of 2,982.1 ML was carried over for use in 2023/24.

2.7 Metering

At 30 June 2023, there were 289 active service points in the WSPA, comprising 230 metered, 58 deemed and one unmetered service points. All meters were read at least twice during the 2022/23 water year. There were eight maintenance events for meters recorded in GMW's asset management system during 2022/23.

2.8 Licence compliance

The Victorian Government and GMW have a zero-tolerance approach to unauthorised take of non-urban water. GMW is responsible for ensuring water users in northern Victoria comply with their licence conditions. All incidents of non-compliance are investigated by GMW and action is taken in accordance with GMW's *Risk-Based Compliance and Enforcement Framework*.

More information can be found on the GMW website, at www.gmwater.com.au/water-resources/water-use-compliance.

No prosecutions or convictions relating to groundwater matters in the WSPA occurred during the 2022/23 water year.

2.9 Domestic and stock bore licences

Domestic and stock (D&S) 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. It is not regulated under the Plan.

The installation of a bore for D&S use requires a bore construction licence, in accordance with section 67 of the Act. Upon completion of a bore, a 'bore completion report' is required to be submitted to GMW and details are recorded in the Victorian state groundwater database (currently known as the *Water Measurement Information System*).

During the 2022/23 water year, 21 licences to construct a D&S bore were issued by GMW and the Victorian Water Register (combined) within the WSPA.

3 Monitoring Program

3.1 Groundwater levels

During the 2022/23 water year, a total of 59 State observation bores, located within the WSPA, were monitored by GMW and the Department of Energy, Environment and Climate Action (DEECA) – refer Figure 1 for locations. This total includes the 34 key bores specified in the Plan. Of the 59 bores, 44 were monitored remotely using telemetry equipment, with measurements recorded hourly; the remainder were monitored manually, with measurements recorded on a monthly or quarterly basis.

Water level data for these bores are presented as hydrographs in [Appendix B](#).

Groundwater recovery levels were relatively steady during the late 1980s and early 1990s; declined from the mid-1990s to 2009, largely in response to below-average rainfall throughout the Millennium Drought; and recovered strongly in response to above-average rainfall in 2009/10 and 2010/11.

Groundwater levels across all monitored aquifers have generally declined since the Plan was approved (late 2012), consistent with reduced rainfall recharge which is a result of drier-than-average rainfall conditions during the reported period – refer discussion in section 2.3.

In 2022/23, groundwater levels recorded in monitoring bores at Cotswald Road, Glengower (Ullina Zone), and Forest Road, Glenbrae (Waubra Zone) recovered slightly after being at their lowest level on record in July 2020 and August 2021, respectively (Figure 7). This is likely result of increased rainfall received in the area since these times.

These are positive signs from a resource management perspective. However, the levels recorded in a shallower monitoring bore (upper Basalt aquifer) at a different location in Glenbrae (Waubra Zone) has continued to indicate a state of decline since June 2020 (Figure 8). GMW will keep a close watch on groundwater levels in the Waubra Zone and investigate further if required.

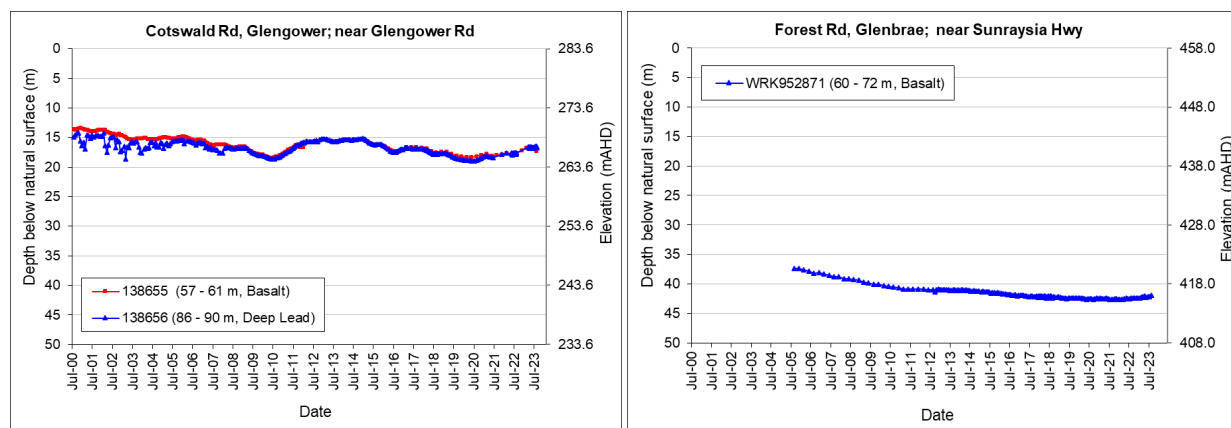


Figure 7 Groundwater level monitoring at sites in Glengower (left) and Glenbrae (right) – July 2012 to June 2023 (DEECA, 2023)

During the 2022/23 water year, the magnitude of annual drawdown¹ was typically less than 6.0 m across the WSPA. In the Ascot Zone, where the greatest volume of groundwater was abstracted (Table 3), drawdown up to 10.49 m was recorded in bore 64880 (Figure 8) and 4.61 m in bore 64879, both located at Coghills Creek.

¹ 'Magnitude of annual drawdown' is the difference between the shallowest and deepest recorded levels within a water year.

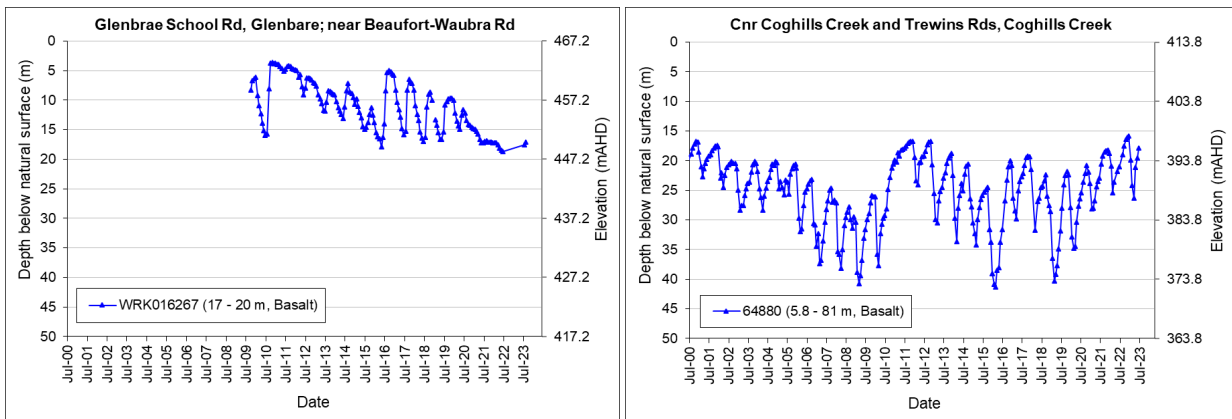


Figure 8 Groundwater level monitoring at sites in Glenbrae (left) and Coghills Creek (right) – July 2012 to June 2023 (DEECA, 2023)

3.2 Groundwater quality

State observation bores

Prescription 5 of the Plan requires GMW to collect groundwater samples from four State observation bores (specified in Schedule 1 of the Plan), once per year, and have the samples analysed by an accredited laboratory for salinity (salt concentration), as well as major ions, phosphorus and metals. The bores are located at two nested² sites – one pair of bores in the Ullina Zone, at Cotswold; and one pair in the Talbot Zone, at Bung Bong – refer Figure 9. At each site, there is one bore monitoring the Deep Lead aquifer and one bore monitoring the basalt aquifer.

In October 2022 samples were collected from the four observation bores and sent to an ALS Ltd laboratory for analysis of salinity, as well as a suite of general water quality analytes. The full suite of results are tabulated in [Appendix C](#).

Groundwater salinity results, obtained annually since 2011/12, are presented in Figure 9. This data indicate that groundwater salinity has historically been higher in the basalt aquifers compared to the underlying Deep Lead aquifers, at both sites. Despite this, basalt aquifer salinities have declined over the data period (11 years), whereas Deep Lead salinities have remained stable.

Ongoing annual monitoring of these bores will enable a greater understanding of natural variance and observation of any trends in groundwater quality over time.

² Nested sites feature two or more bores in close proximity, each monitoring a different aquifer (or section of an aquifer).

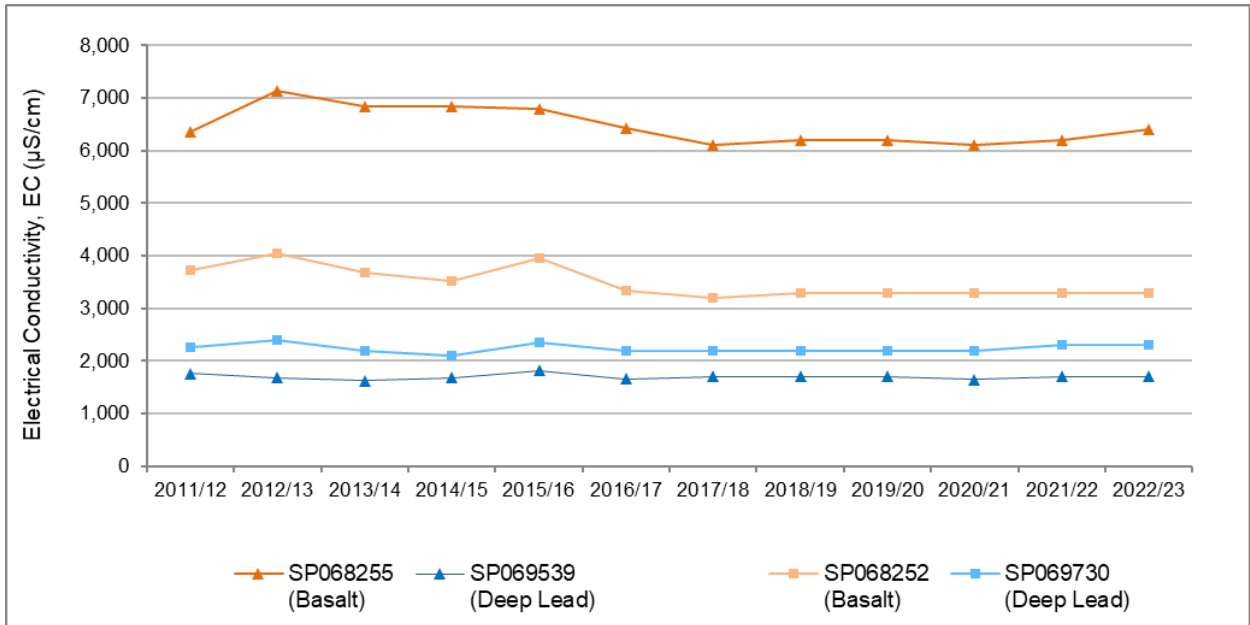


Figure 9 Annual groundwater salinity results for key observation bores in the Loddon Highlands WSPA, since 2011/12 (DEECA, 2023)

Targeted sampling of private bores

Salinity data collected by Central Highlands Water (CHW) from some of its observation bores has also been used to monitor changes in groundwater salinity across the WSPA.

Data collected during 2022/23 were obtained from CHW bore fields at Cotswold in the Ullina Zone, Bung Bong (Talbot Zone), Learmonth (Ascot Zone), Waubra (Waubra Zone) and Forest Hill (Newlyn Zone). The 2022/23 data are presented, with previous data collected from the same sites, in Figure 10.

The data indicates that groundwater salinities have remained stable (since 2008) in the basalt aquifer at the Learmonth, Waubra and Forest Hill sites, which are all located in upland areas of the WSPA. Salinity measurements for these sites has typically ranged between 500 and 1,500 microSiemens per centimetre ($\mu\text{S}/\text{cm}$)³ over the 15-year period.

At the Cotswold site, which is located lower in the catchment, groundwater samples are collected from two bores, screened within deep sandy sediments which underlie the basalt aquifer. The salinity in the deeper of the two bores (WRK015584) has been fairly inconsistent and generally trending up; however the 2022/23 result (1,800 $\mu\text{S}/\text{cm}$) sits below this trend. The second bore has been more consistent (no particular trend) over the 15 years, mostly ranging between 1,300 and 1,500 $\mu\text{S}/\text{cm}$.

The Bung Bong site is located within two kilometres of the western boundary of the WSPA, and approximately half way between the southern and northern boundaries. At this location the hydrogeology is contrasting from the other CHW sites – narrow basalt flows which have infilled south-north orientated paleovalleys (compared to more widespread basalt plains); and sedimentary bedrock dominating the surface geology to the east and west.

Groundwater quality at this Bung Bong site is also contrasting – salinity in the basalt aquifer has ranged between 2,400 and 3,400 $\mu\text{S}/\text{cm}$ since July 2008 and has increased by 36.7 $\mu\text{S}/\text{cm}$ each water year on average. Of 43 samples collected from two bores at the site, the average of the results was 3,253.5 $\mu\text{S}/\text{cm}$ to 2022/23.

³ MicroSiemens per centimetre ($\mu\text{S}/\text{cm}$) is a common unit for electrical conductivity, a measurement of salt concentration in solution at 25°C.

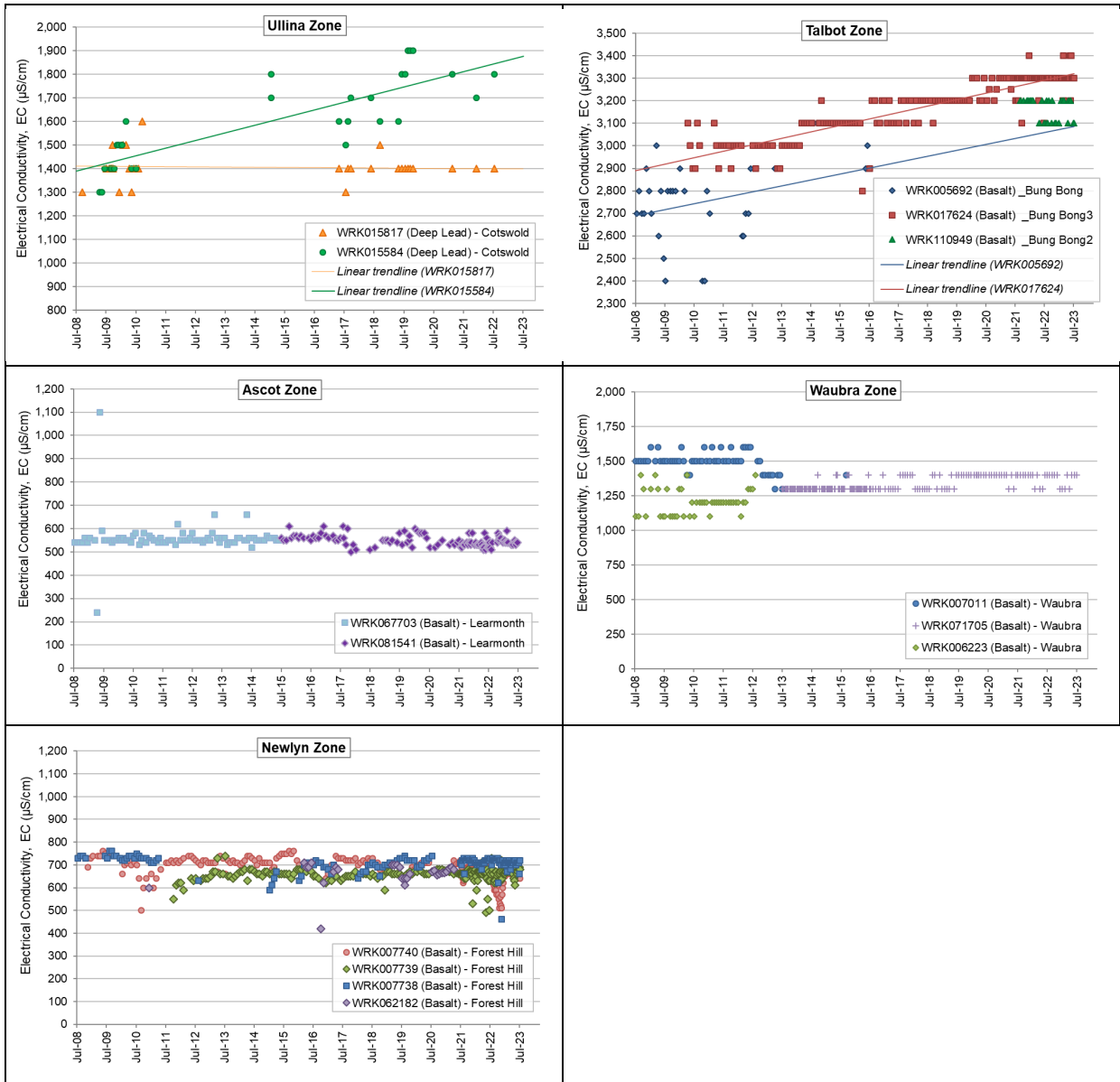


Figure 10 Groundwater salinity monitoring data from Central Highlands Water sites located in the Loddon Highlands WSPA since July 2008

4 Administration and Engagement

4.1 Groundwater Reference Committee

GMW last met with the Loddon Highlands Groundwater Reference Committee via video-conference on 25 January 2022. This was the ninth meeting of the committee since its establishment.

As a result of a change of scheduling, GMW will next meet with reference committee in the latter half of 2023 to report on the implementation of the Plan and consider the need to review the Plan. Details of this meeting will be included in next water year's annual report.

4.2 Plan review

GMW will meet with the Groundwater Reference Group during 2023/24 to present a summary of the 2022/23 water year and discuss any need to review the Plan.

5 References

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Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant
PRESCRIPTION 1 Carryover		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> 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. b) Consult with the Groundwater Reference Committee about the need to alter the percentage of carryover. 	<p><i>The Minister declared that licence holders in the WSPA may carryover up to 15 per cent licence entitlement volume from November 2012.</i></p>	<p>Yes</p>
PRESCRIPTION 2 Triggers and restrictions		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> 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. 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. c) Determine a seasonal allocation for the Waubra Zone and consult with Groundwater Reference Committee. d) Announce seasonal allocations by listing them on its website; sending letters to all licence holders and placing public notices in local newspapers. e) Review allocations based on groundwater level readings to November each year and announce an increase if triggered. 	<p><i>GMW announced allocations for the 2022/23 water year on 14 July 2022; these were based on groundwater recovery levels recorded up to 1 July 2022.</i></p> <p><i>Allocation was announced at 100 per cent for all management zones.</i></p> <p><i>GMW announced all allocations by publishing them on its website, sending letters to all licence holders and placing public notices in local newspapers.</i></p>	<p>Yes</p>

Prescription	Activity	Compliant				
PRESCRIPTION 3 Trading between zones						
<p>The Corporation may approve a temporary or permanent transfer of groundwater licence entitlement under section 62 of the Water Act 1989 provided section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> a) The permanent transfer of licence entitlement is between zones as specified in the Plan. b) The temporary transfer of licence entitlement is between zones as specified in the Plan. 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. d) Licence entitlement may be temporarily traded into, or out of, the Loddon Highlands WSPA provided that the PCV is not exceeded. 	<p><i>In 2022/23, GMW approved 7 transactions for temporary transfer of licence entitlement volume, totalling 538.0 ML; and 1 transaction for permanent transfer of licence entitlement volume, totalling 10.0 ML/yr.</i></p> <p><i>All transfers were compliant with Prescription 3.</i></p>	Yes				
PRESCRIPTION 4 Groundwater level interference						
<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"> a) Licence entitlement may be temporarily or permanently transferred up to 1,000 ML/yr within 2.5 km radius of a licensed bore. 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="230 890 1171 1369"> <tbody> <tr> <td data-bbox="230 890 454 1217">(i). For temporary transfer of licence entitlement</td> <td data-bbox="454 890 1171 1217"> <ul style="list-style-type: none"> 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 2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or 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. </td> </tr> <tr> <td data-bbox="230 1217 454 1369">(ii). For permanent transfer of licence entitlement</td> <td data-bbox="454 1217 1171 1369"> <ul style="list-style-type: none"> 1. Trade from others within 2.5 km radius of the applicant's bore; or 2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius. </td> </tr> </tbody> </table> 	(i). For temporary transfer of licence entitlement	<ul style="list-style-type: none"> 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 2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or 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. 	(ii). For permanent transfer of licence entitlement	<ul style="list-style-type: none"> 1. Trade from others within 2.5 km radius of the applicant's bore; or 2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius. 	<p><i>GMW processed all groundwater licence applications in accordance with Prescription 4.</i></p>	Yes
(i). For temporary transfer of licence entitlement	<ul style="list-style-type: none"> 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 2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or 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. 					
(ii). For permanent transfer of licence entitlement	<ul style="list-style-type: none"> 1. Trade from others within 2.5 km radius of the applicant's bore; or 2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius. 					

Prescription	Activity	Compliant
PRESCRIPTION 5 Groundwater monitoring		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> (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). (b) Establish a targeted groundwater salinity monitoring program to collect and analyse groundwater samples from selected licensed bores each year. (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. 	<p><i>GMW obtained regular (hourly, monthly or quarterly) groundwater level readings from bores listed in Schedule 1 of the Plan, where practicable.</i></p> <p><i>GMW used groundwater salinity monitoring data provided by Central Highlands Water, from its monitoring bores, to fulfil the requirements of a targeted salinity monitoring program.</i></p> <p><i>GMW facilitated the collection of groundwater samples from nested, State observation bores identified in Schedule 1, and sent them to a NATA⁴ accredited laboratory (ALS Limited) for analysis.</i></p>	Yes
PRESCRIPTION 6 Metered licensed use		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> (a) Ensure that a meter is fitted to all operational licensed bores. (b) Read each meter at least twice each season. 	<p><i>GMW ensured that groundwater use was accounted for each operational, licensed bore; and read each meter in January/February and May/June during the 2022/23 water year.</i></p>	Yes
PRESCRIPTION 7 Plan implementation		
<p>The Corporation shall:</p> <ul style="list-style-type: none"> (a) By 30 September each year: <ul style="list-style-type: none"> (i) prepare an annual report on the administration and enforcement of the Plan for the Minister for Water and relevant agencies. (ii) mail a newsletter to groundwater licence holders, and domestic and stock users upon request, summarising the outcomes in the annual report. (b) Post on its website the Plan; annual report, newsletters and groundwater level monitoring results. (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. (d) Undertake a review of the Plan after 5 years from its approval, or sooner if warranted by any prescription contained within the Plan. 	<p><i>In the first quarter of 2022/23, GMW prepared an annual report on the administration and enforcement of the Plan during the 2021/22 water year. GMW emailed the report to the Minister for Water and the North Central Catchment Management Authority on 28 September 2022.</i></p> <p><i>GMW also prepared a newsletter summarising the information in the report; a copy was mailed to all licence holders.</i></p> <p><i>GMW posted on its website: the Plan; the 2021/22 annual report and newsletter; and a selection of hydrographs of groundwater levels which GMW updated monthly throughout most of 2022/23.</i></p> <p><i>At the request of the Reference Committee, GMW will next meet with reference committee in the latter half of 2023. GMW will schedule a meeting with the Reference Committee between October and November 2023. Meetings are being held later – after the Annual Reporting period in order to communicate maximum groundwater recovery information and future allocation scenarios. Information on this year’s allocations was provided to all reference committee members prior to the end of</i></p>	Yes

⁴ NATA refers to the National Association of Testing Authorities, Australia

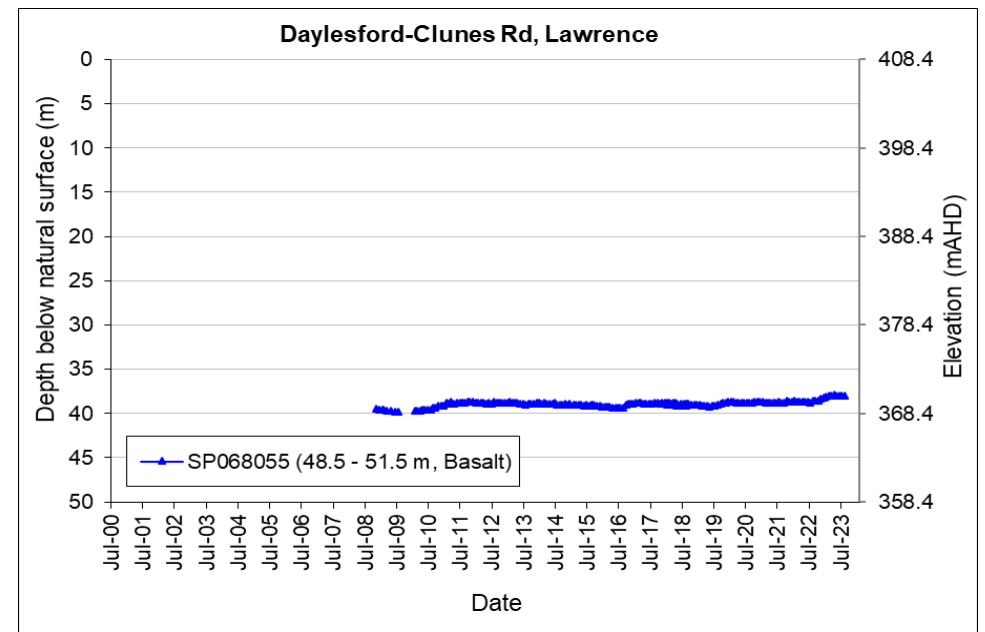
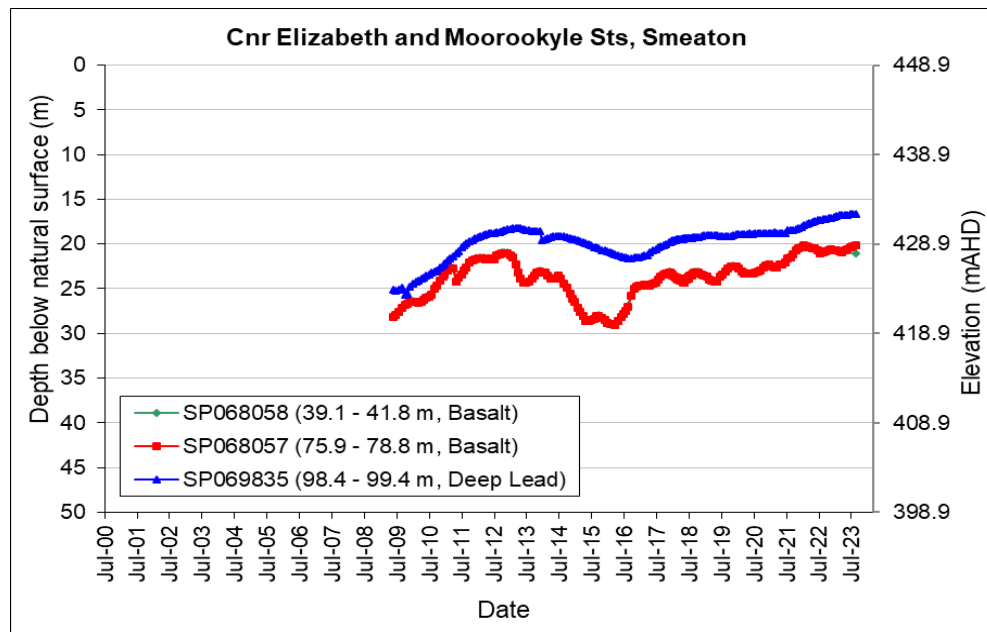
Prescription	Activity	Compliant
	<p><i>the water year and any formal announcements being made and opportunity provided for comment and none was received.</i></p> <p><i>GMW has also provided a presentation to the Loddon Campaspe Groundwater Water Services Committee from which several of the representatives are members of the WSPA Reference Committee.</i></p> <p><i>GMW undertook a comprehensive review of the Plan in 2018.</i></p>	

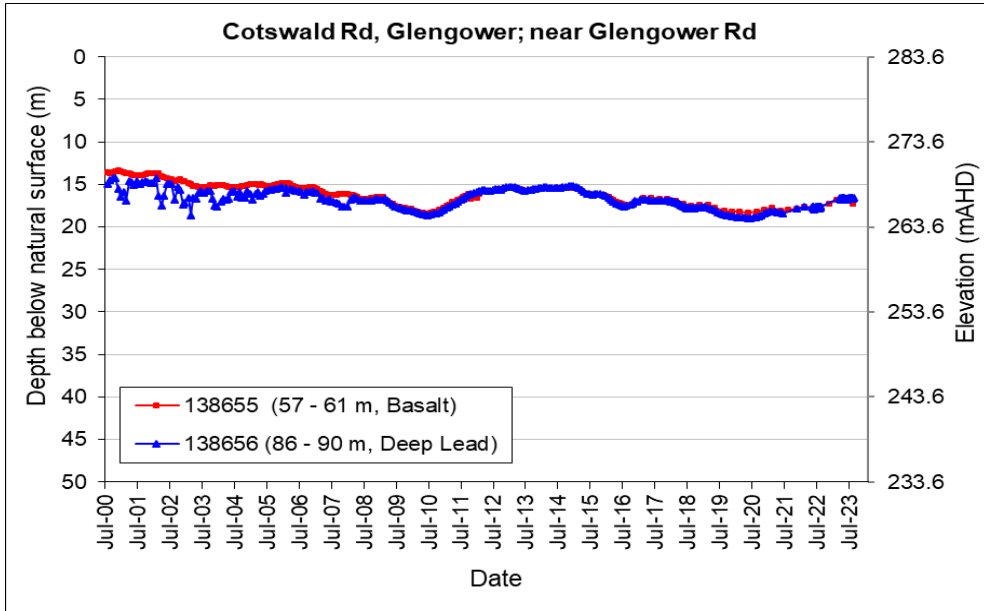
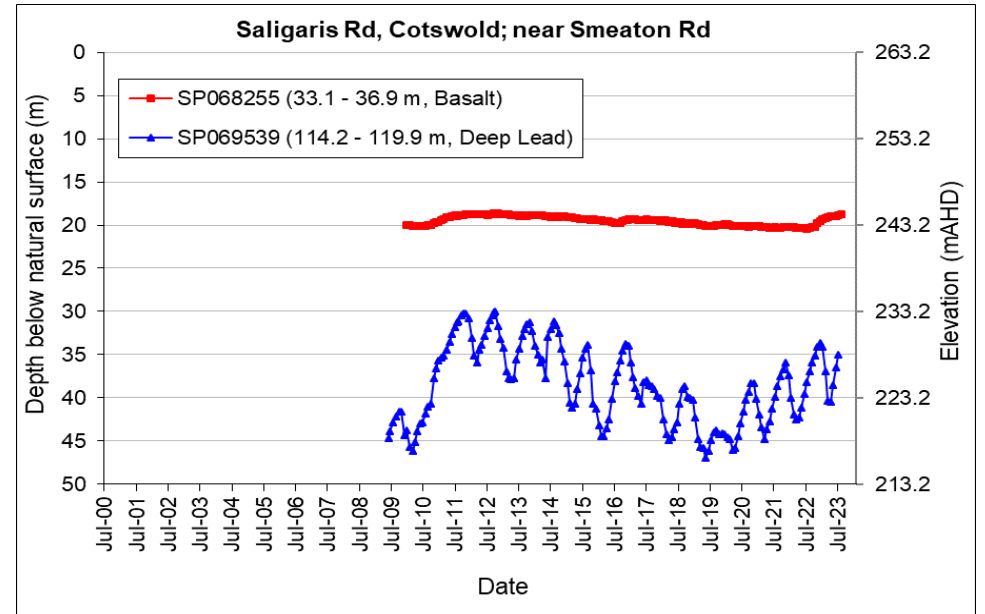
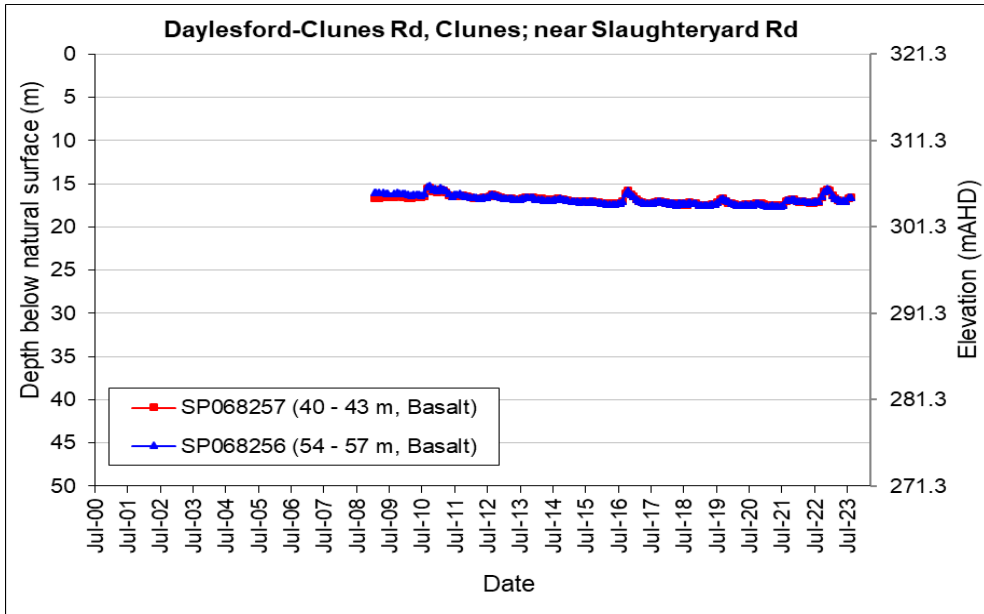
Appendix B – Groundwater level data

Hydrographs for key monitoring bores listed in Schedule 1 of the Plan. For sites that have hourly records, only one level per month is presented in the hydrographs – 12:00 PM on the 15th day (or the closest available).

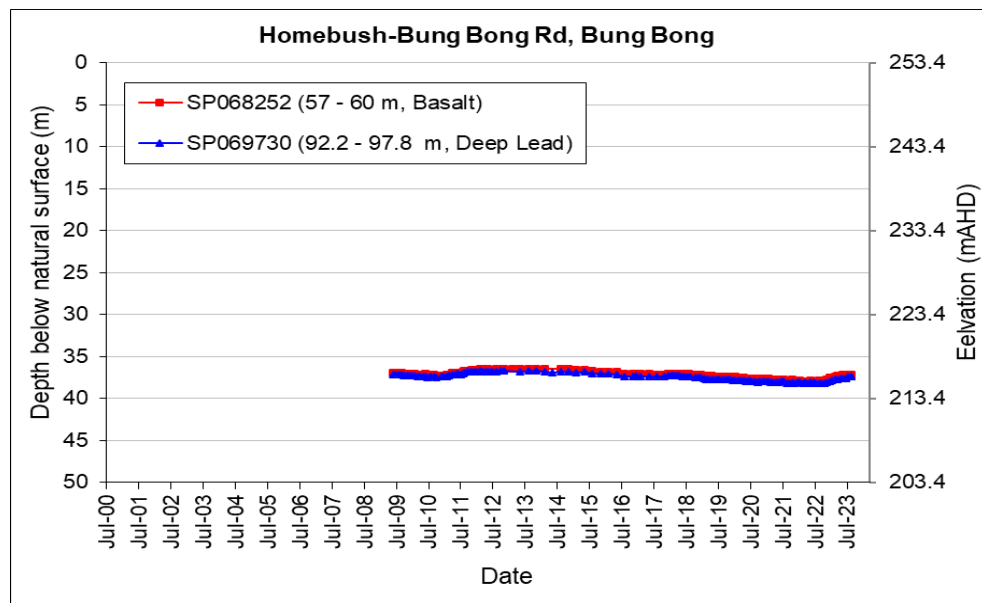
All data was sourced from the *Water Measurement Information System (WMIS)* in August 2023 (DEECA, 2023). All hydrographs show the time period July 2000 to June 2023 – further groundwater level information is available on the WMIS website, at <https://data.water.vic.gov.au>

Ullina Zone (1100)

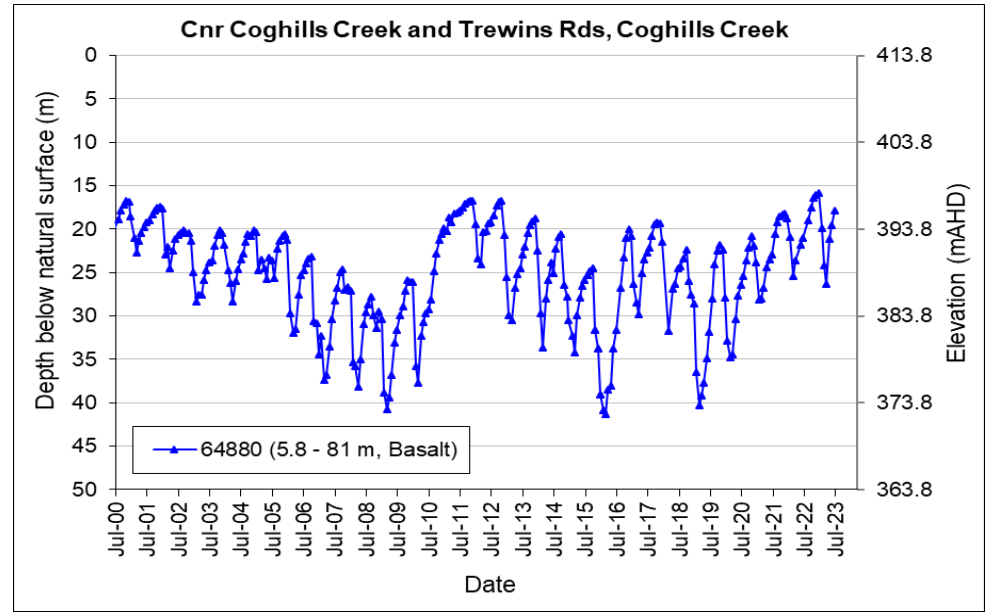
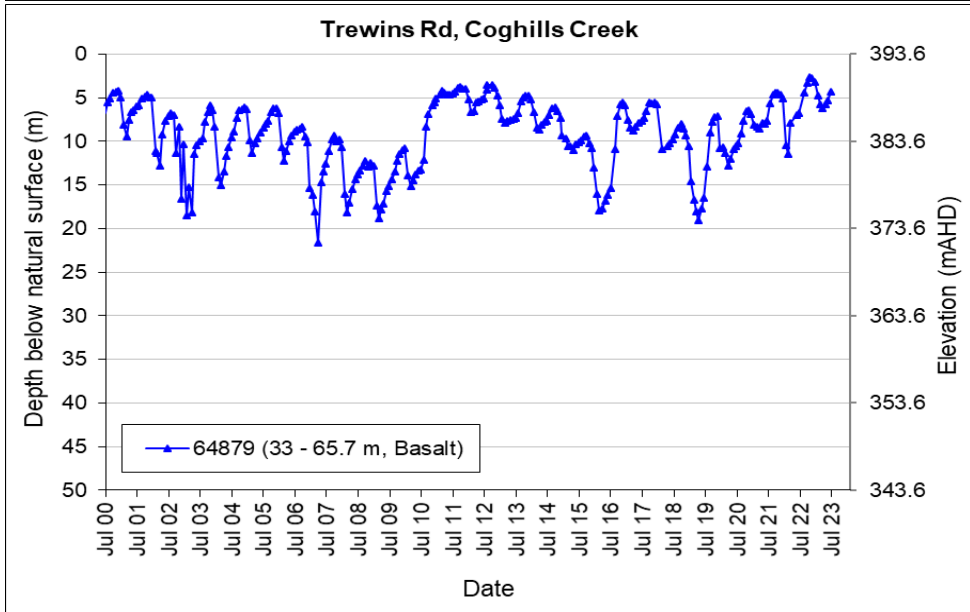
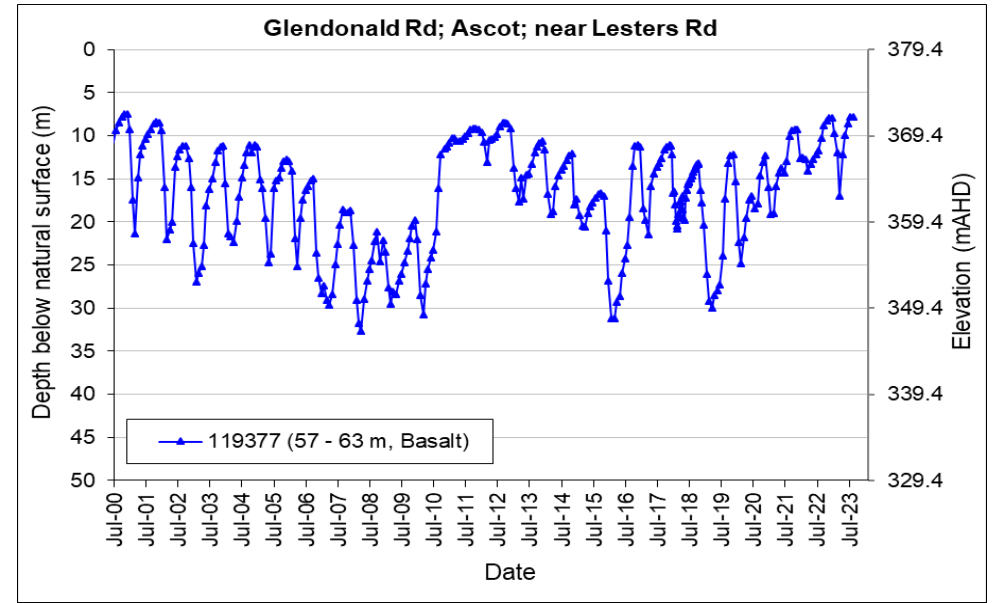
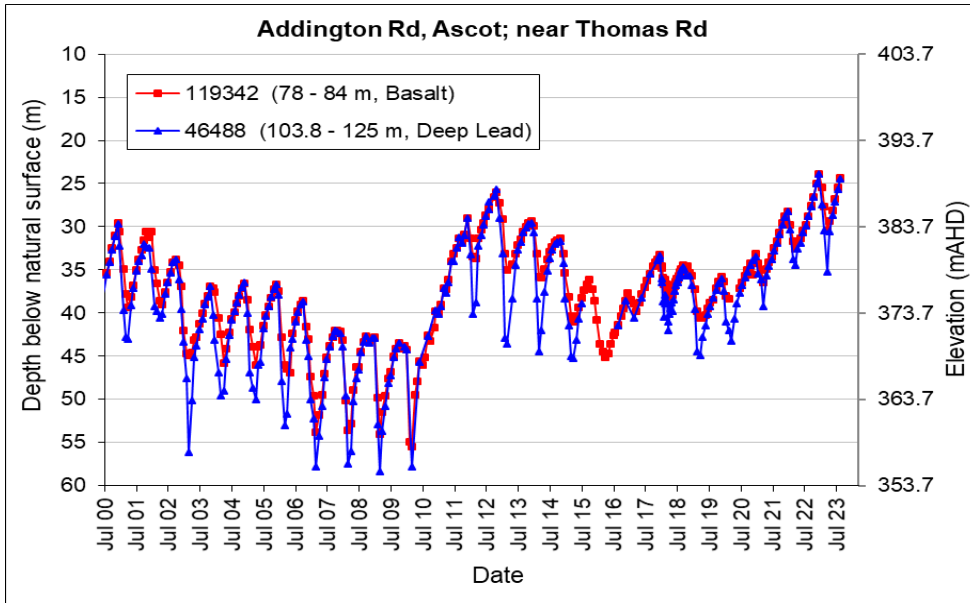


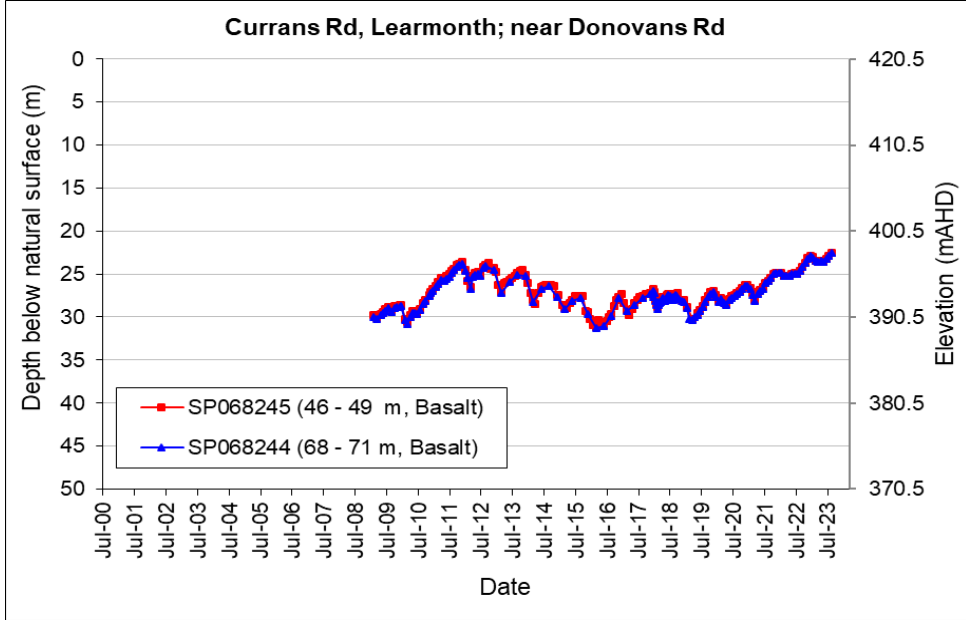
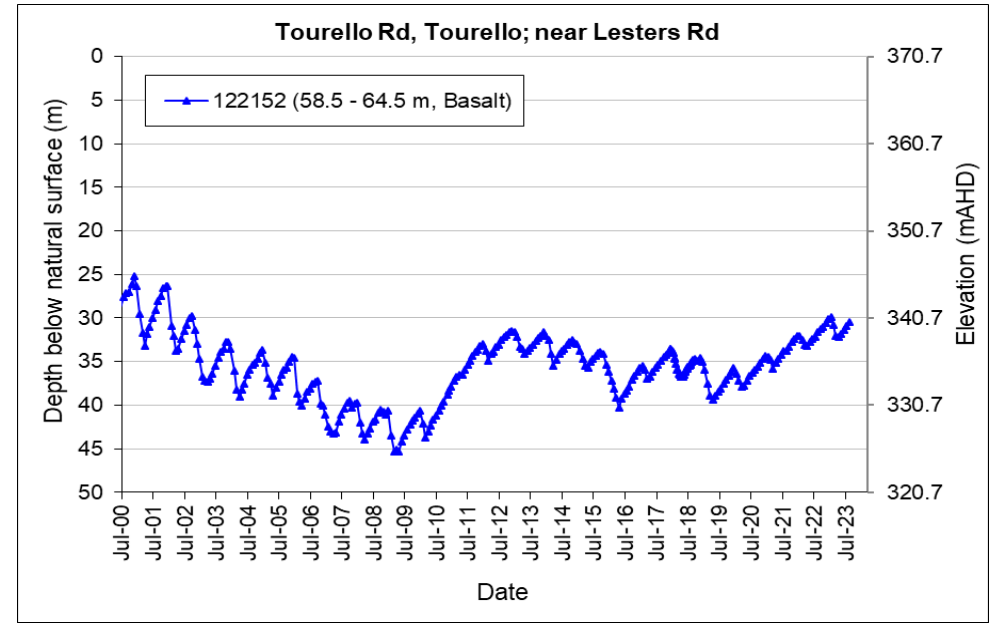
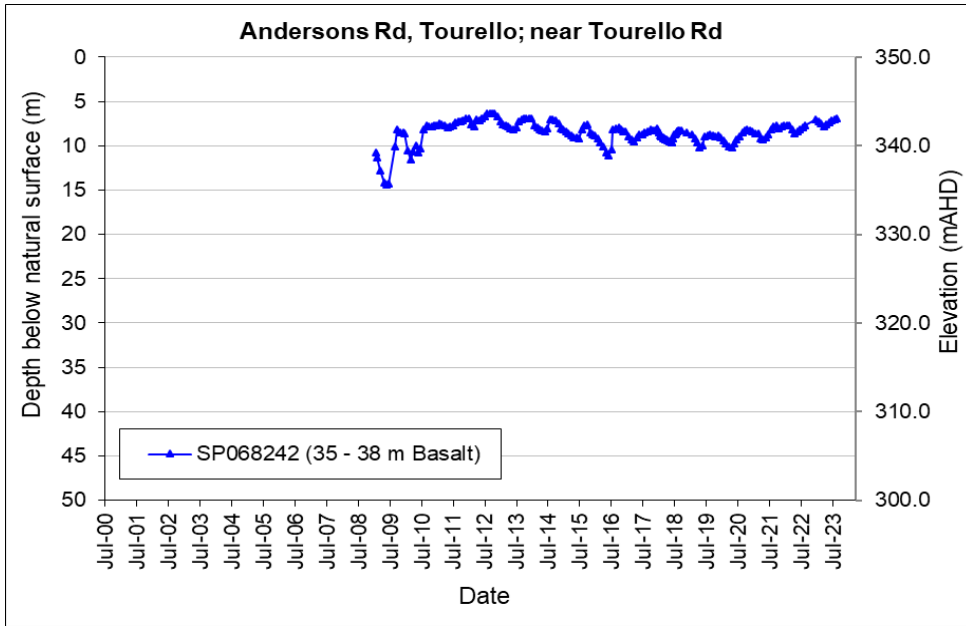


Talbot Zone (1101)

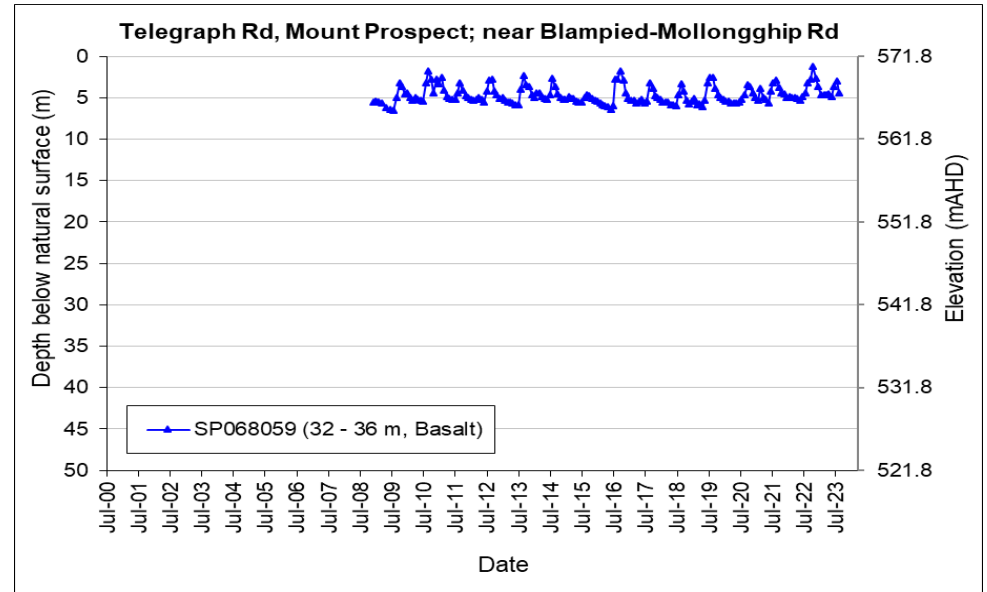
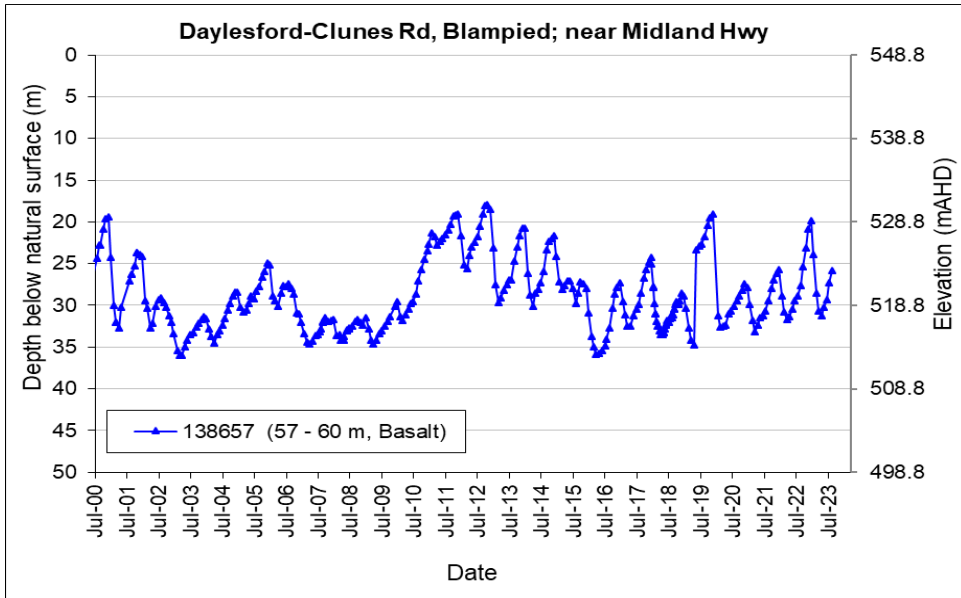


Ascot Zone (1102)

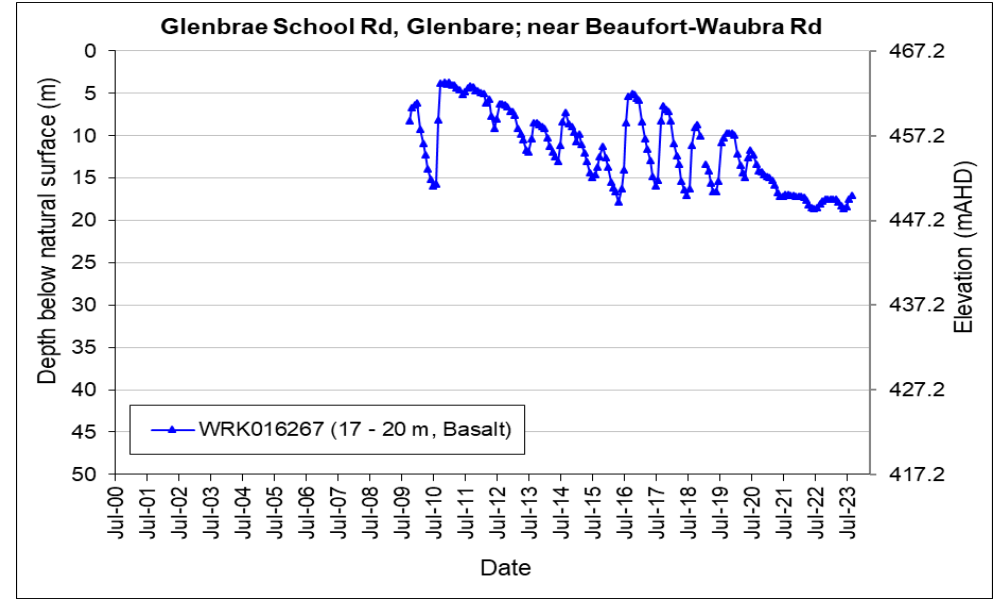
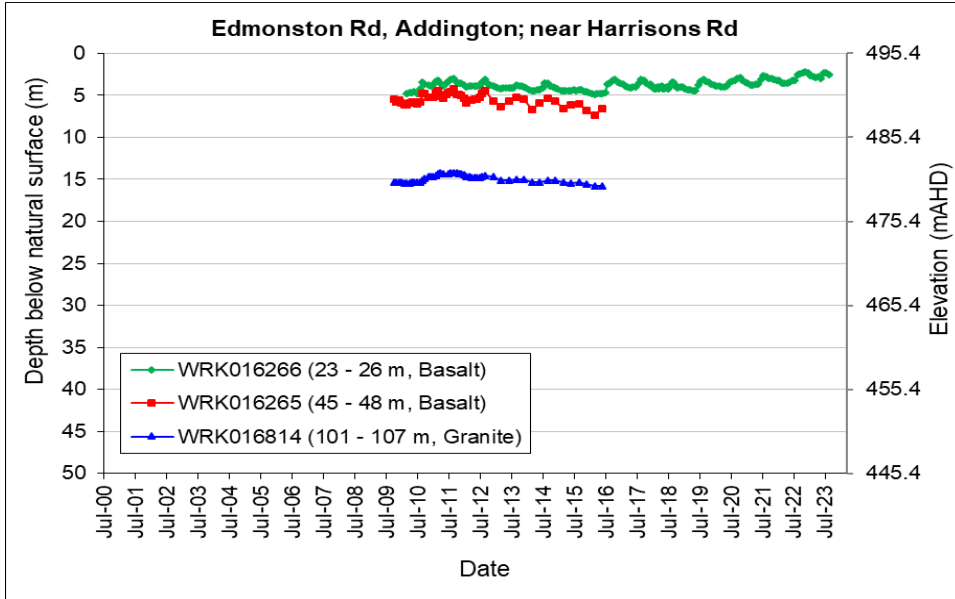
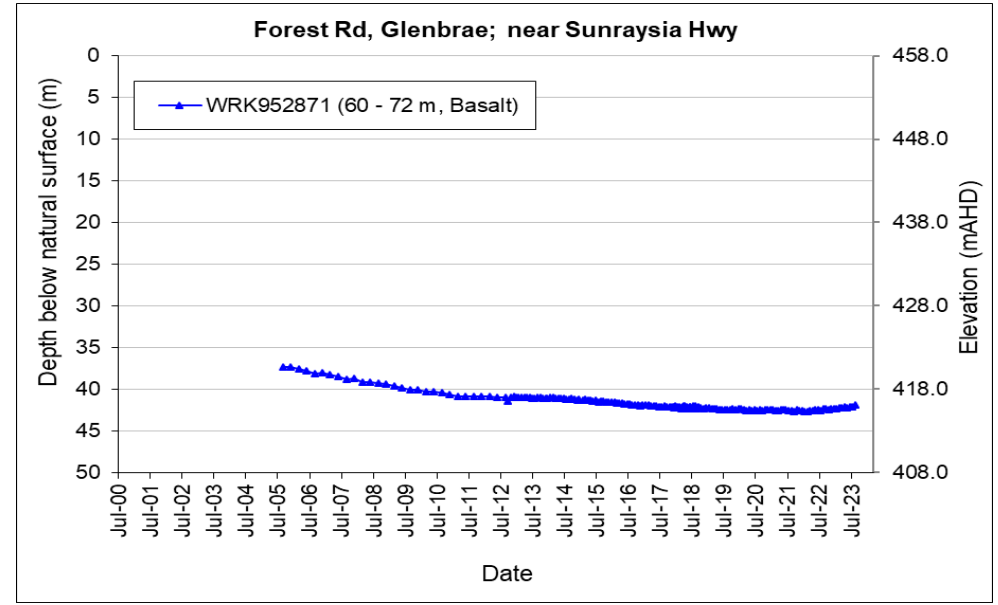
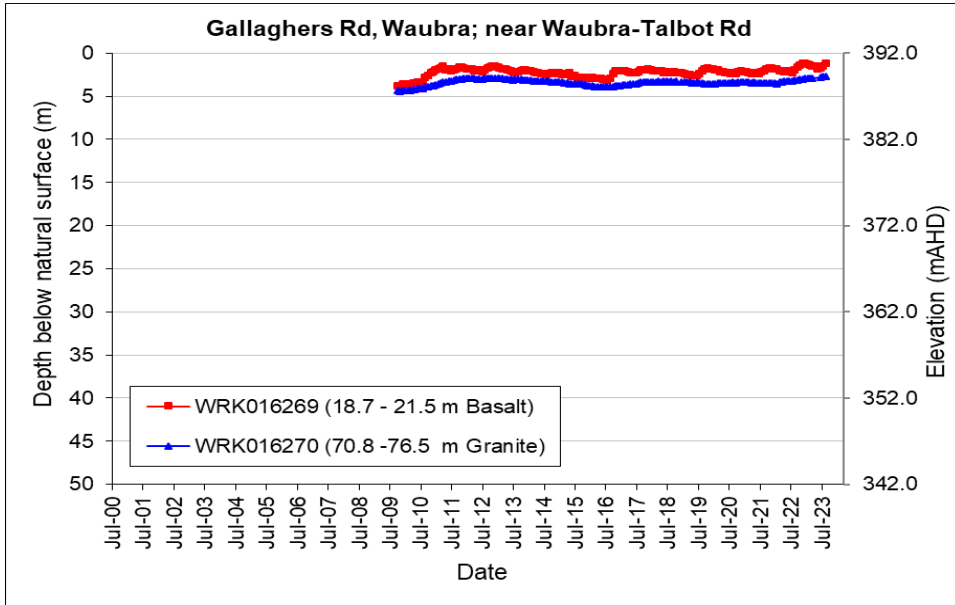




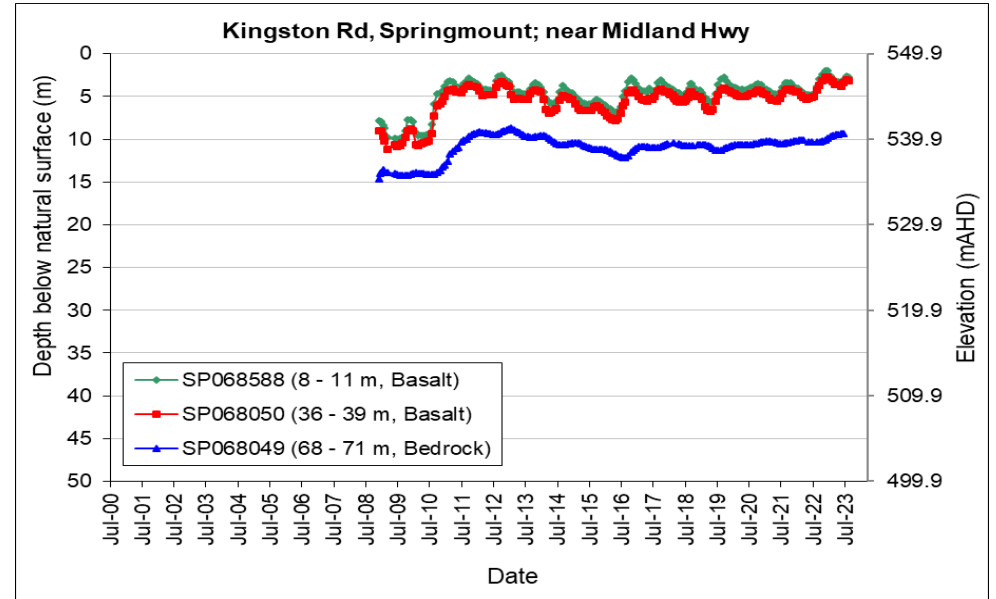
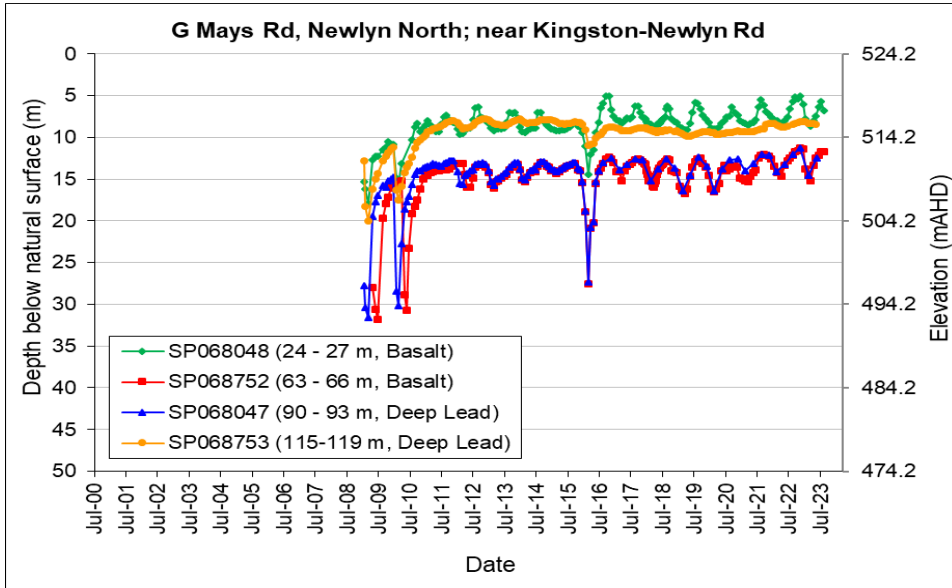
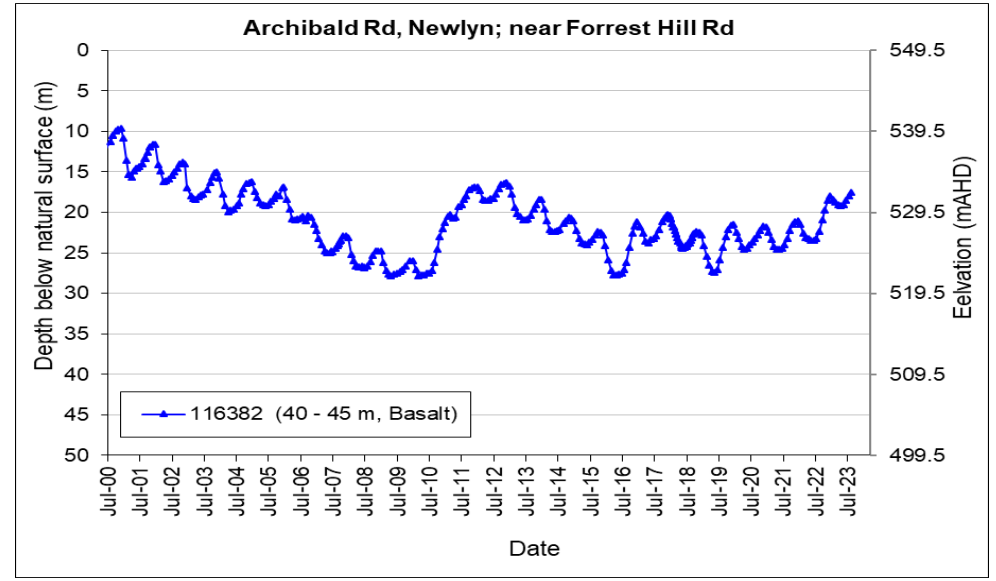
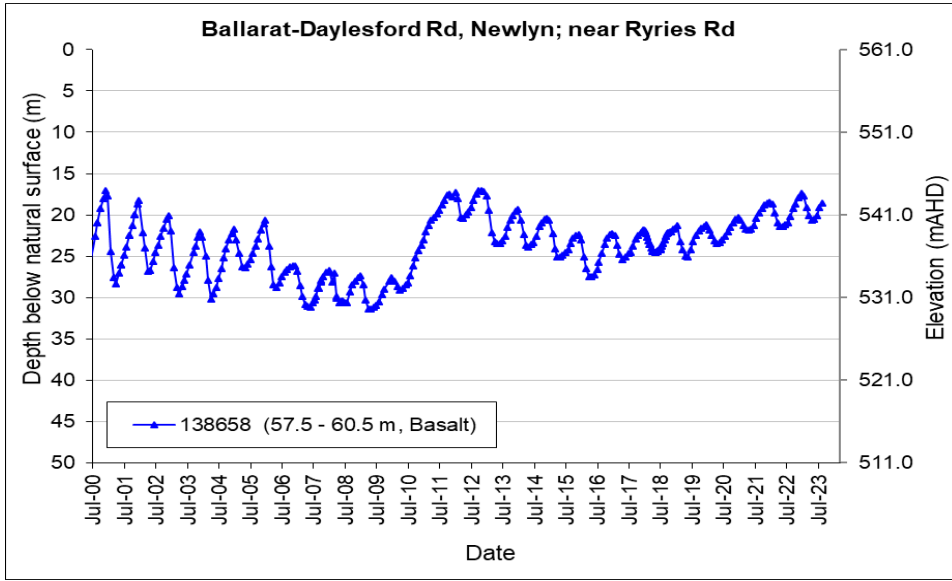
Blampied Zone (1104)



Waubra Zone (1106)



Newlyn Zone (1107)



Appendix C – Groundwater quality results

Analytical chemistry results for key State observation bores sampled during the 2022/23 water year. All data sourced directly from laboratory reports completed by *ALS Limited* (ALS, 2023). Further information is available on the *Water Measurement Information System* website, at <https://data.water.vic.gov.au>.

		Bore:	SP068252	SP068255	SP069539	SP069730
		Aquifer:	Basalt	Basalt	Deep Lead	Deep Lead
		Date:	25/11/2022	24/10/2022	24/10/2022	25/10/2022
Analyte	Unit					
Conductivity @ 25°C	µS/cm		3300	6400	1700	2300
pH	pH units		7.8	8.1	7	7.8
Ionic balance	%		4.32	6.28	3.08	-0.57
Total Anions	meq/L		32	65	17	20
Total Cations	meq/L		29	57	16	20
Ion Balance - TDS (EC) vs TDS	-		0.6	0.6	0.5	0.5
Bicarbonate Alkalinity, CaCO ₃	mg/L		280	240	380	250
Carbonate Alkalinity, as CaCO ₃	mg/L		<2	<2	<2	<2
Hydroxide Alkalinity, as CaCO ₃	mg/L		<2	<2	<2	<2
Total Alkalinity, as CaCO ₃	mg/L		280	240	380	280
Calcium, as Ca	mg/L		75	110	41	56
Chloride, as Cl	mg/L		830	1900	310	470
Potassium, as K	mg/L		6.7	12	8	5.4
Sodium, as Na	mg/L		320	600	190	220
Ammonia, as N	mg/L		<0.1	0.3	0.3	<0.1
Nitrite, as N	mg/L		<0.002	-	-	<0.002
Nitrate, as N	mg/L		4.6	-	-	2
Sulphate, as SO ₄	mg/L		130	310	36	74
Total Kjeldahl Nitrogen, as N	mg/L		<0.01			0.07
Total Combustible Nitrogen, as N	mg/L			4.5	0.3	
Arsenic, as As	mg/L		<0.01	<0.001	<0.001	<0.01
Iron, dissolved as Fe	mg/L		<0.2	<0.01	0.34	<0.2
Mercury, as Hg	mg/L		<0.001	<0.0001	<0.0001	<0.001
Magnesium, as Mg	mg/L		140	310	67	93
Manganese, dissolved as Mn	mg/L		<0.01	<0.001	0.086	<0.01
Total Dissolved Solids, 180C	mg/L		1900	3900	880	1200
Total Organic Carbon	mg/L		0.6	1	0.7	0.6
Turbidity, NTU	NTU		0.2	0.2	1.5	5
Phosphorus, total as P	mg/L		0.13	0.09	0.14	0.13
Lead, dissolved (ICP-MS)	mg/L		<0.01	<0.001	<0.001	<0.01
Nickel, dissolved (ICP-MS)	mg/L		<0.01	<0.001	<0.001	<0.01
Cadmium, dissolved (ICP-MS)	mg/L		<0.0002	<0.0002	<0.0002	<0.002
Chromium, dissolved (ICP-MS)	mg/L		<0.01	0.001	<0.001	<0.01
Copper, dissolved (ICP-MS)	mg/L		<0.01	<0.001	0.002	<0.01
Zinc, dissolved (ICP-MS)	mg/L		0.01	0.007	0.025	0.02