

# Katunga 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 *Groundwater Management Plan for the Katunga Water Supply Protection Area* (the Plan) for the 2022/2023 water year.

GMW is responsible for implementation and administration of the Plan, which was approved by the Minister administering the *Water Act 1989* on 24 July 2006.

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](http://www.gmwater.com.au).



Charmaine Quick

MANAGING DIRECTOR

Date: 25/09/2023

# Executive summary

The *Groundwater Management Plan for the Katunga Water Supply Protection Area* (the Plan) was approved on 24 July 2006 by the Minister for Water.

In 2017, a consultative committee appointed by the Minister for Water, in accordance with section 32G of the *Water Act 1989*, recommended amendments to the Plan. The Minister approved the amendments on 22 August 2017, including: a new method for determining restrictions, simplification of trading rules, salinity monitoring requirements and the establishment of a groundwater reference group.

During the 2022/23 water year, and for the fourth time since the Plan was amended in 2017, licence holders had their access restricted to 70 per cent of their licence entitlement volume. Restrictions were implemented in accordance with the Plan.

Recorded use in the 2022/23 water year was 9,091.1 ML, or 15 per cent of the total licence entitlement volume. This is a 10 per cent reduction in recorded use compared with the 2021/22 water year.

Permanent licence transfer activity during the 2022/23 water year was slightly higher than last season (six transfers, totalling 342 megalitres). However, the sustained, high level of temporary licence transfer activity, which commenced in 2018/19, continued in 2022/23 (21 transfers for a total of 3,799 ML/yr).

Groundwater monitoring and metering programmes continue to support the implementation of the Plan. The five year rolling average of maximum recovery levels, which is calculated to determine licence restrictions under the amended Plan, has started to stabilise, after five years of continuous decline.

Goulburn-Murray Water met with the Katunga Groundwater Reference Group for the fifth time since the Plan was amended, at GMW's Cobram office, on 15 November 2022. There are currently no plans to undertake a 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 *Groundwater Management Plan for the Katunga Water Supply Protection Area* (DSE, 2006) (the Plan) and section 32C of the *Water Act 1989* (the Act). It provides an overview of groundwater resource status within the Katunga Water Supply Protection Area (the WSPA) and summarises the groundwater management activities carried out under the Plan during the 2022/23 water year (1 July 2022 to 30 June 2023).

## 1.2 Water Supply Protection Area

The WSPA is located in the valleys of the Murray and Goulburn rivers, extending from Yarrawonga in the east to Barmah East in the west and from the River Murray in the north to Kaarimba and Youanmite in the south. Larger townships located within the WSPA include Numurkah, Cobram, Nathalia, Katunga and Katamatite – refer Figure 1.

The WSPA has an upper-vertical extent (boundary) of 25 metres below the ground surface. Above this boundary, groundwater resources are considered to be part of a separate management unit – the Shepparton Irrigation Region Groundwater Management Area.

Groundwater resources in the WSPA are managed and reported under three management zones – North Western Dryland Zone (1061), Numurkah-Nathalia Zone (1062) and Cobram Zone (1063) – shown in Figure 1.

## 1.3 Groundwater Management Plan

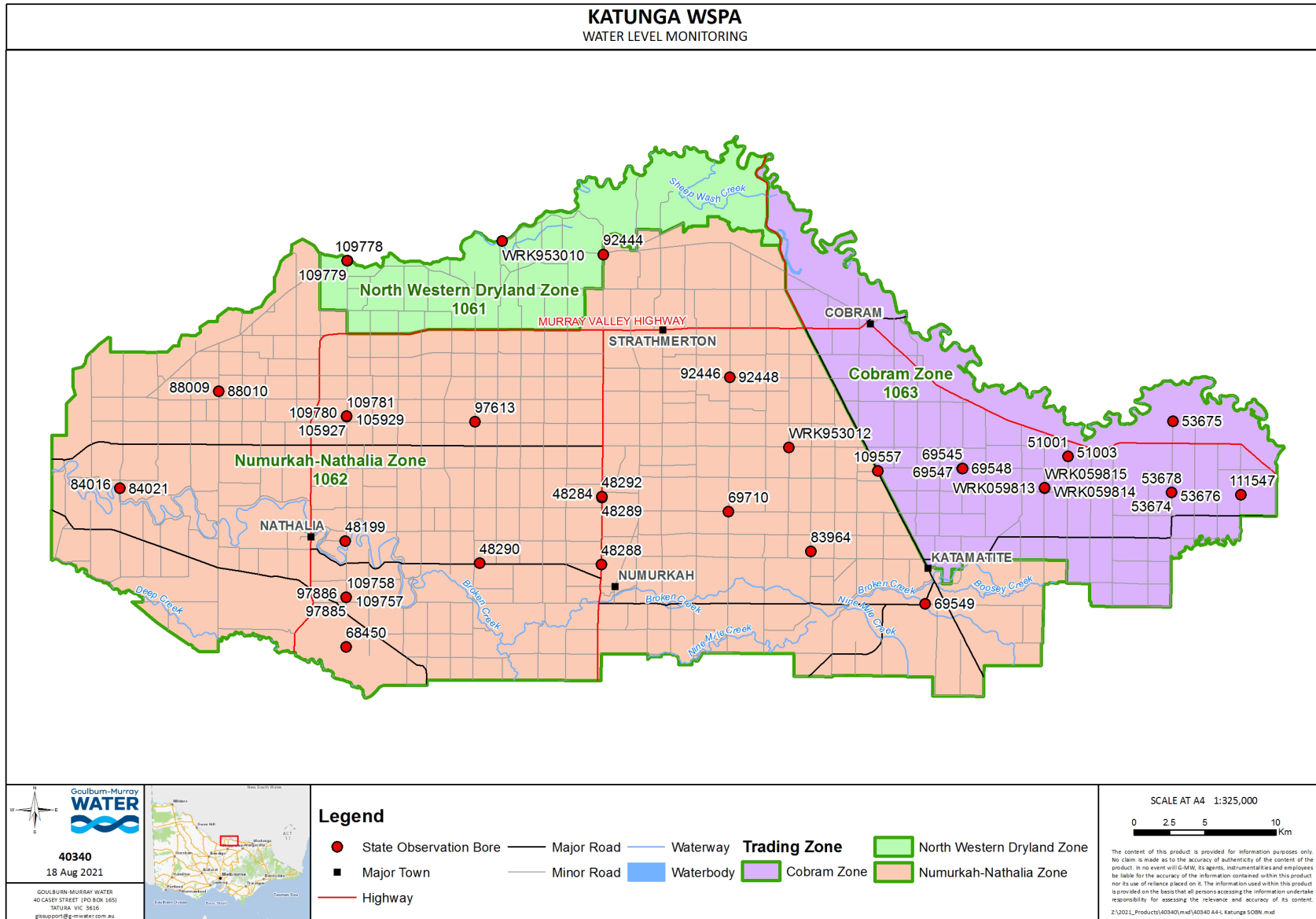
The Plan, which applies to the management of groundwater resources within the areal and depth extents of the WSPA, was approved on 24 July 2006 by The Hon. John Thwaites MP, Minister for Water, in accordance with section 32A(6) of the Act.

In 2017, a consultative committee appointed by then Minister for Water, The Hon. Lisa Neville MP, in accordance with section 32G of the Act recommended amendments to the Plan. Minister Neville approved the amendments on 22 August 2017, including a new method for determining restrictions, simplification of trading rules, salinity monitoring requirements and the establishment of a groundwater reference group.

The objective of the Plan is to make sure that groundwater resources within the WSPA are managed in an equitable and sustainable manner. When allocations are made under the Plan, all groundwater licence holders in the WSPA are treated in the same manner.

The Plan enables annual allocations to be set to manage groundwater extraction. The intent of the annual allocation process is to maintain groundwater access for groundwater users. Goulburn-Murray Water (GMW) is responsible for the implementation, administration and enforcement of the Plan. An assessment summary of GMW's activities in accordance with prescriptions in the Plan is presented in [Appendix A](#).

A copy of the Plan can be downloaded from the GMW website: [www.gmwater.com.au](http://www.gmwater.com.au)



**Figure 1 Katunga Water Supply Protection Area**

# 2 Groundwater Management

## 2.1 Licence entitlement volume

A permissible consumptive volume of 60,577 megalitres per year (ML/yr) for the WSPA was declared by the Minister for Water in March 2013 (Victorian Government, 2013).

At 30 June 2023, the total licence entitlement volume in the WSPA was 60,200.9 ML/yr. 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 Katunga WSPA**

Management zone	Licences	Licensed bores	Sum of licence entitlement volume (ML/yr)
North Western Dryland Zone (1061)	20	22	4,989.2
Numurkah-Nathalia Zone (1062)	179	201	34,521.7
Cobram Zone (1063)	69	79	20,690.0
<b>Total</b>	<b>268</b>	<b>302</b>	<b>60,200.9</b>

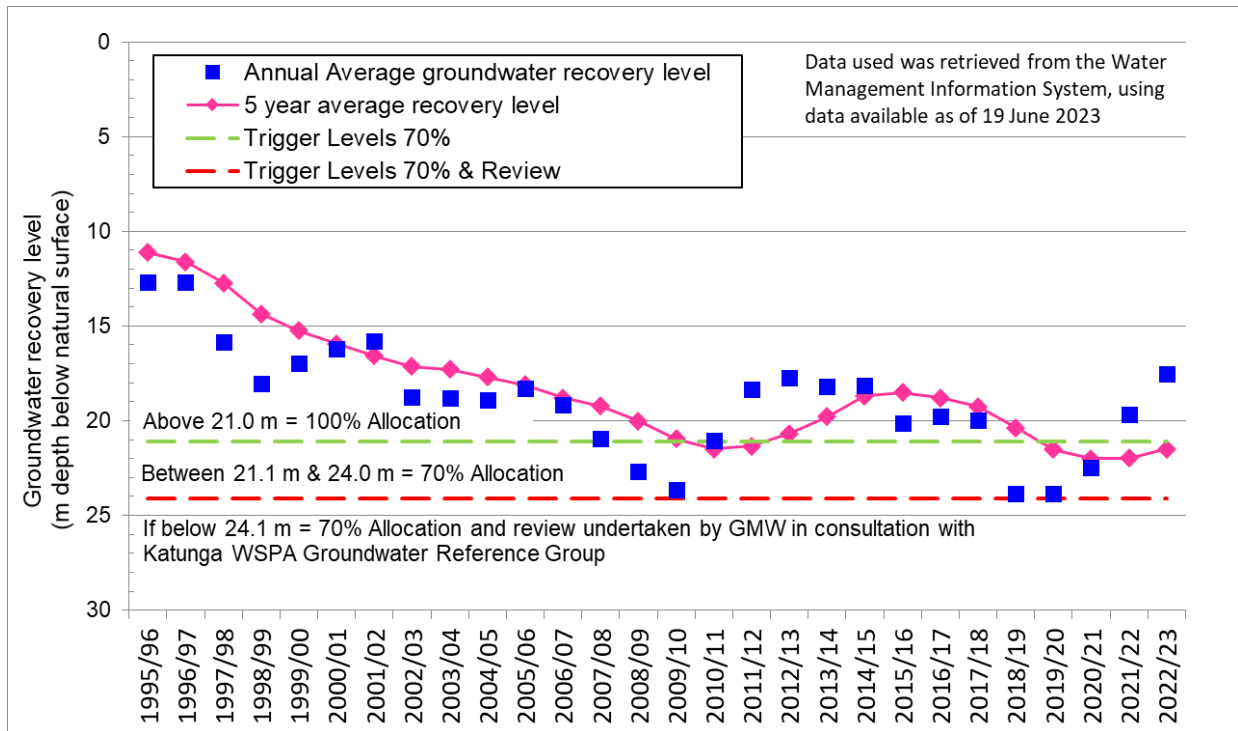
Note: Data extracted from the Victorian Water Register on 1 July 2023.

## 2.2 Groundwater allocations

Following amendments to the Plan in 2017, the method for determining annual groundwater allocations was revised – *refer Prescription 2 of the Plan*. Annual allocations are now determined by calculating the average of the annual maximum recovery levels of seven key monitoring bores (listed in Schedule 1 of the Plan) from the preceding five water years (known as the ‘five year rolling average’). The allocation is determined by comparing the five year rolling average to trigger levels specified in the Plan – *refer Table 2 and Figure 2 below*.

**Table 2 Trigger levels for the determination of annual allocations in the Katunga WSPA**

Trigger level, depth below natural surface (m)	Allocation
21.0 and above	100%
21.1 to 24.0	70%
Below 24.1	70%, and review undertaken by GMW in consultation with Katunga Groundwater Reference Group



**Figure 2 Trigger graph for determination of annual allocations for the Katunga WSPA**

Table 3 presents the maximum groundwater recovery level measured in each of the seven key monitoring bores in 2022/23, and the preceding water years, back to 2017/18; the annual averages of those maximum levels; and the five year rolling averages calculated in June 2021 (2021/22) and June 2022 (2022/23) which were used to determine the annual allocations for the 2022/23 and 2023/24 water years, respectively.

Level monitoring records for these seven bores are provided as hydrographs in [Appendix B](#).



**Table 3 Calculation of five year rolling averages for determination of annual allocations for the 2022/23 and 2023/24 water years**

Bore details		Maximum groundwater recovery level recorded in each water year					
Site ID	Screen depth	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
48282	118-133	20.47	20.29	22.48	21.87	19.07	16.72
51001	110-118	20.41	28.80	26.48	22.64	19.64	17.07
69545	109-111	19.50	24.10	23.10	20.79	17.80	15.70
69710	122-124	19.64	23.97	24.04	22.76	20.08	18.34
83964	112-114	21.38	24.52	24.56	24.51	21.63	19.47
92446	134-135	19.92	23.86	24.06	22.89	20.09	17.90
97613	137-139	18.60	21.56	22.41	21.86	19.42	17.35
<b>Annual average:</b>		19.99	23.87	23.89	22.47	19.68	17.51
<b>Five year rolling averages:</b>						21.98	21.48

Note: all levels in this table are given in metres (m) depth below the natural ground surface at each site

### 2022/23 allocation

In June 2022, GMW determined an annual allocation of 70 per cent of licence entitlement volume for the 2022/23 water year. The allocation was announced on 25 June 2022 by publication on the GMW website, advertisement in local newspapers (*Shepparton News* and *Country News*) and a letter posted to licence holders in the WSPA.

The five year rolling average of maximum recovery levels recorded in the seven key monitoring bores was 21.98 m (depth below natural surface) which was between the 21.0 m trigger level and the 24.0 m trigger level (Table 3).

### 2023/24 allocation

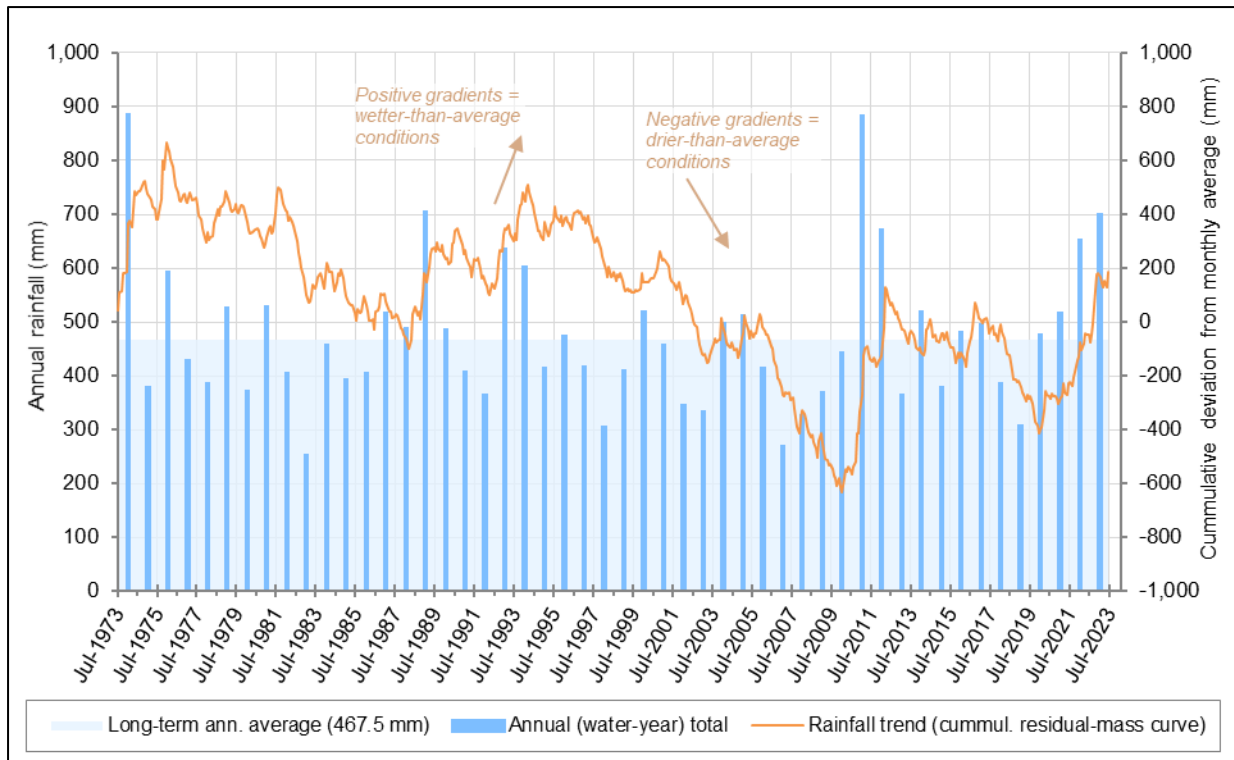
In June 2023, GMW determined an allocation of 70 per cent of licence entitlement volume for the 2023/24 water year. The allocation was announced in June 2023 by publication on the GMW website, advertisement in local newspapers (*Shepparton News*, *Cobram Courier* and *Numurkah Leader*) and a letter posted to licence holders in the WSPA.

In this instance, the five year rolling average was 21.48 m (depth below natural surface) which was again between the 21.0 m and 24.0 m trigger levels (Table 3).

## 2.3 Rainfall

Long-term rainfall data, sourced from the Bureau of Meteorology weather station at Cobram (BOM, 2023), are presented in Figure 3, as an indicator of trends across the WSPA.

A total of 698 mm was recorded in Cobram during the 2022/23 water year, which is 230.5 mm more than the long-term average (467.5 mm) from July 1958 to June 2023 inclusive. The cumulative residual-mass rainfall curve shows that the wetter than average rainfall trend, which commenced in January 2020 following three years of drier than average conditions, continued to strengthen during 2022/23.

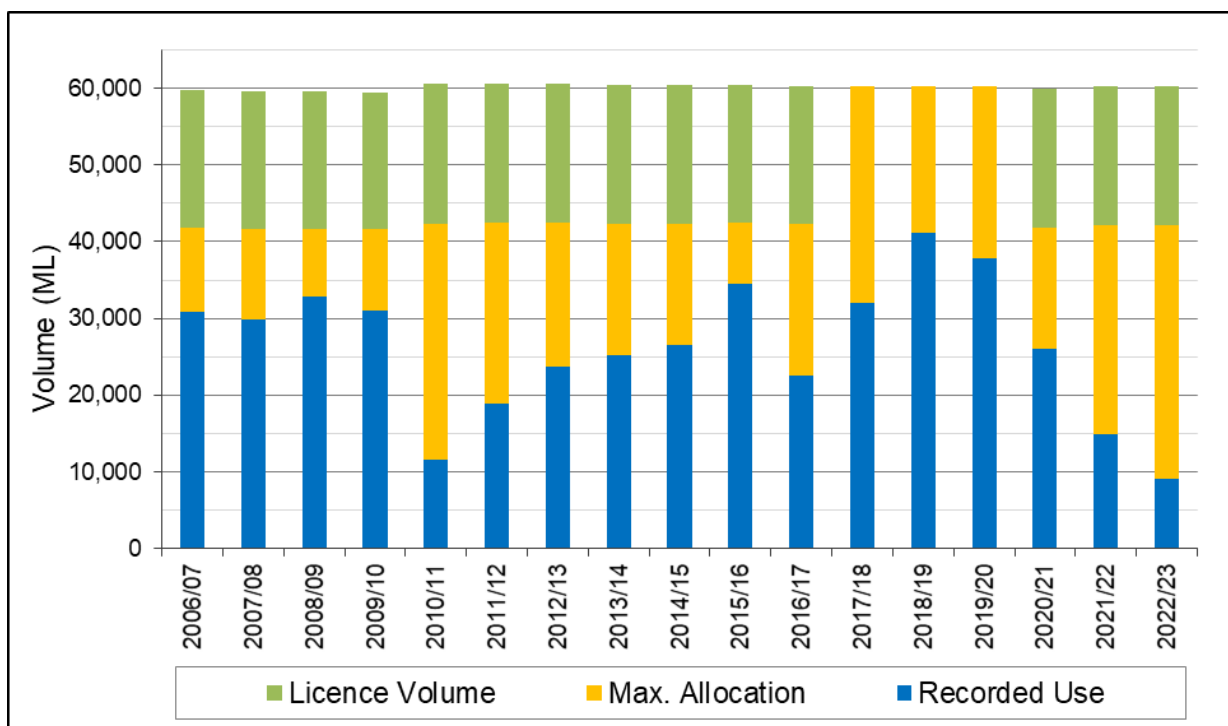


**Figure 3 Rainfall recorded at Cobram, July 1973 to June 2023**

## 2.4 Groundwater use

Total recorded use in the WSPA in 2022/23 was 9,091.1 ML, or 15 per cent of the total licence entitlement volume (Figure 4). This is 10 percentage points less than the volume used in 2021/22 and the lowest recorded use since the Plan was implemented. Increased rainfall and surface water availability in 2022/23 were likely significant contributors to reduced deep lead groundwater use relative to previous years.

*Note: recorded use refers to metered and deemed use.*



**Figure 4 Annual recorded use volumes compared to licence entitlement and allocation volumes in the Katunga WSPA since 2006/07**

Recorded use by management zone is provided in Table 4. Recorded use as a proportion of the sum of licence entitlement volume was greatest in the Numurkah-Nathalia Zone (18 per cent) and lowest in the Cobram Zone (15 per cent).

**Table 4 Recorded use and licence entitlement volume by management zone for 2022/23**

Management zone	Sum of licence entitlement volume (ML/yr)	Recorded use (ML)	Proportion of sum of licence entitlement volume used
North Western Dryland Zone (1061)	4,989.2	738.7	15%
Numurkah-Nathalia Zone (1062)	34,521.7	6,174.9	18%
Cobram Zone (1063)	20,690.0	2,177.5	11%
<b>Total</b>	<b>60,200.9</b>	<b>9,091.1</b>	<b>15%</b>

Note: Use data extracted from Irrigation Planning Module on 25 July 2023.

## 2.5 Licence transfers

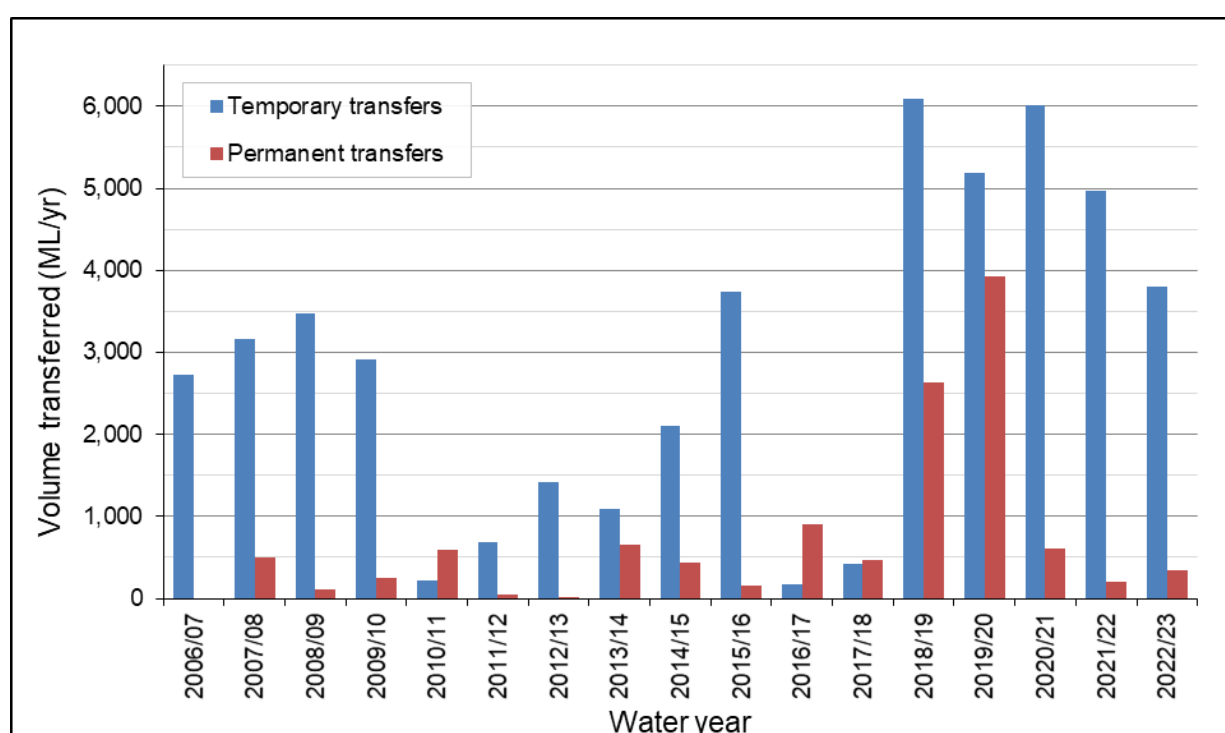
The Plan allows groundwater licence holders to temporarily or permanently transfer licence entitlement volume. A summary of transfers completed during the 2022/23 water year is provided in Table 5. Figure 5 compares the total volume of completed transfers for each water year since the Plan was implemented, in the 2006/07 water year.

During the 2022/23 water year there were six permanent transfers totalling 342.0 ML/yr and 21 temporary transfers totalling 3,799.0 ML. These totals equate to a doubling of permanent trades and 28 per cent decrease in temporary trades compared with the 2021/22 water year.

**Table 5 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/yr)	No. of transfers	Volume (ML/yr)
North Western Dryland Zone (1061)	-	-	-	-	1	200.0	-	-
Numurkah-Nathalia Zone (1062)	4	180.0	5	332.0	15	2,875.0	18	3,659.0
Cobram Zone (1063)	2	162.0	1	10.0	5	724.0	3	140.0
<b>Total</b>	<b>6</b>	<b>342.0</b>	<b>6</b>	<b>342.0</b>	<b>21</b>	<b>3,799.0</b>	<b>21</b>	<b>3,799.0</b>

Note: Data extracted from the Victorian Water Register on 28 July 2023.



**Figure 5 Annual totals of licence transfers in the Katunga WSPA, since 2006/07**

## 2.6 Metering

At 30 June 2023 there were 306 active service points in the WSPA comprising 204 metered, 101 deemed and one unmetered service points. All meters were read at least twice during the 2022/23 water year. There were 15 maintenance events for meters recorded in GMW's asset management system during 2022/23.

## 2.7 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. Relevant actions, if required, are 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](http://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.

## 2.8 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.

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, 43 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

Prescription 5 of the Plan requires that groundwater levels are monitored in seven State Observation Bores Network (SOBN) bores, specified in Schedule 1 of the Plan. Level monitoring records for these bores are presented as hydrographs in Appendix B. Locations of all SOBN bores in the WSPA that were routinely monitored during the 2022/23 water year, are shown in Figure 1.

## 3.2 Groundwater salinity

### State observation bores

Prescription 6 of the Plan requires GMW to collect water samples from nine SOBN bores, once per year; and have the samples analysed for salinity (salt concentration) by an accredited laboratory. The locations of the bores are shown in Figure 1.

In December 2022 samples were collected from the nine specified bores, as well as one additional SOBN bore (ID 97613) screened in the Calivil Formation at Yalca. The samples were analysed by ALS Limited for salinity as well as a suite of general water quality analytes. All results are publicly available on the *Water Measurement Information System* website, <https://data.water.vic.gov.au>.

The salinity results of the 2022/23 samples, as well as details about the 10 bores, are presented in Table 6. These data indicate that groundwater encountered within the WSPA can range from 300 to more than 8,000 microSiemens per centimetre ( $\mu\text{S}/\text{cm}$ )<sup>1</sup> and groundwater in the upper extent of the Shepparton Formation can be as high as 35,352  $\mu\text{S}/\text{cm}$ .

*Note: aquifers less than 25 m depth are outside the bounds of the WSPA, as described in section 1.2 of this report. They are included in the WSPA salinity monitoring program as a point of comparison between the shallow and deep resources.*

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<sup>1</sup> 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.

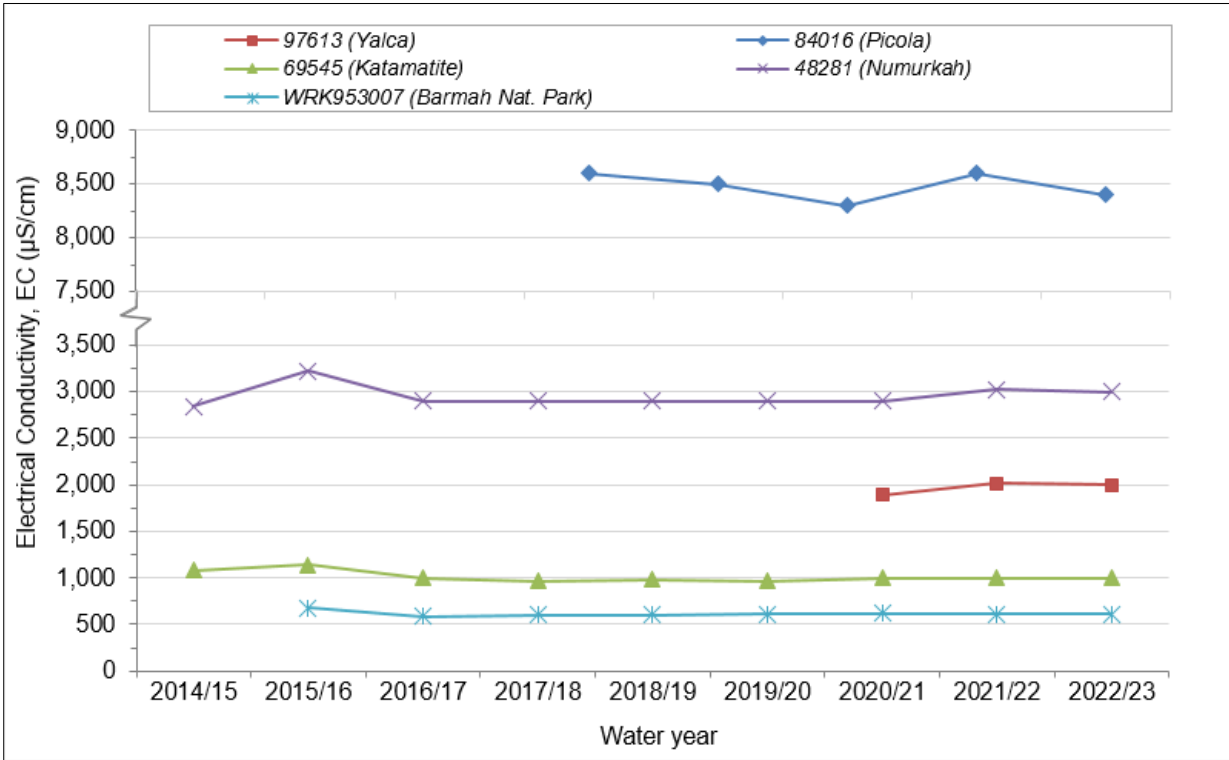
**Table 6 Groundwater salinity results for bores sampled in 2022/23 in the Katunga WSPA**

Management zone	Location	Bore ID	Depth of bore screen (m)	Aquifer screened	Salinity, as electrical conductivity ( $\mu\text{S/cm}$ )
North Western Dryland Zone (1061)	Barmah National Park	WRK953007	84 - 90	Calivil Formation	610
		WRK953008	36 - 39	Shepparton Formation	630
Numurkah-Nathalia Zone (1062)	Numurkah	48281	109 - 116	Calivil Formation	3,000
		48288*	10 - 16*	Shepparton Formation	3,100
	Yalca	97613	137 - 139	Calivil Formation	2,000
	Picola	84016	129 - 146	Calivil Formation	8,200
		84021*	4.5 - 14.5*	Shepparton Formation	34,000
Cobram Zone (1063)	Katamatite	69545	109 - 110.5	Calivil Formation	1,000
		69547	73.5 - 75.5	Shepparton Formation	300
		69548*	4 - 22*	Shepparton Formation	430

\*Aquifers less than 25 m depth are outside the bounds of the WSPA and are used as a comparison only

Annual salinity results from a subset of the bores (those screened in the Calivil Formation aquifer) are presented in Figure 6. These data suggest that, despite the large range of salinities across different parts of the WSPA, the salinity of groundwater in the Calivil Formation has remained relatively stable since 2014/15 (when sampling of these bores began).

Annual salinity results for all of the 10 bores are presented in [Appendix C](#).



**Figure 6 Annual groundwater-salinity results of Calivil Formation monitoring bores in the Katunga WSPA (ALS, 2023)**

Continued sampling of the same set of bores going forward will allow for improved evaluation of water-quality trends over time.

**Private bores**

Prescription 6 of the Plan also requires GMW to provide a sample bottle to any groundwater user (licensed or for domestic and stock) in the WSPA who requests one and to test the salinity of returned samples. In 2022/23, no requests for sample bottles were received.



# 4 Administration and Engagement

## 4.1 Groundwater Reference Group

After the amendments to the Plan were approved, a groundwater reference group comprising local landowners and representatives of key stakeholder agencies (Goulburn Valley Water and Goulburn Broken Catchment Management Authority), was formed.

GMW met with the Katunga Groundwater Reference Group via video-conference on 15 November 2022. This was the fifth meeting of the group, which has met annually since inception. Key items of discussion included:

- Actions from the previous meeting
- Summary of 2021/22 water year
- Resource condition update
- Outlook for the 2022/23 water year
- Discussed the temporary transfer prescription within the plan
- Discussed the licence application process, including the hydrogeological reporting that GMW requests for high risk applications
- DEECA Groundwater Management 2030 (GM2030) update
- Whether a review of the Plan is required
- Discussed changing the schedule for the annual reference group meeting

## 4.2 Plan review

GMW will next meet with the Groundwater Reference Group in February 2024 to present a summary of the 2022/23 water year and discuss any need to review the Plan.

## 5 References

ALS, 2023. *Certificate of Analysis – Batch No. 22-72913 – Final Report 57061*. Laboratory report completed for DEECA. ALS Limited, Scoresby – 29 December 2022.

Bureau of Meteorology (BOM), 2023. *Climate Data Online – Cobram station number 080109*. Retrieved in August 2023 from:

[http://www.bom.gov.au/jsp/ncc/cdio/wData/wdata?p\\_nccObsCode=139&p\\_display\\_type=dataFile&p\\_stn\\_num=080109](http://www.bom.gov.au/jsp/ncc/cdio/wData/wdata?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=080109)

Victorian Department of Environment, Energy and Climate Action (DEECA), 2023. *Water Measurement Information System*. Data retrieved in August 2023 from: <https://data.water.vic.gov.au>

Victorian Department of Sustainability and Environment (DSE), 2006. *Groundwater Management Plan for the Katunga Water Supply Protection Area*. Consolidated version incorporating amendment made in 2017. Department of Sustainability and Environment, Melbourne.

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

*Water Act 1989* (Vic), viewed 30 June 2023,  
[http://classic.austlii.edu.au/au/legis/vic/consol\\_act/wa198983/](http://classic.austlii.edu.au/au/legis/vic/consol_act/wa198983/)

Aquifers less than 25 m depth (shallow) are outside the bounds of the WSPA, as described in section 1.2 of this report. The data related to bores screened in the shallow Shepparton Formation are included in this report as a point of comparison with the deeper aquifers managed under the WSPA.

## Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant								
<b>PRESCRIPTION 1 – Limit on groundwater licences</b>										
<p>GMW must not approve an application for a groundwater licence if the approval of the application would cause:</p> <p>a) the total licensed volume within a 2 km radius of the proposed extraction site exceeding 3,700 ML/year; or</p> <p>b) the following zone limits to be exceeded.</p> <table border="1"> <thead> <tr> <th>Management zone</th> <th>Zone limit (ML/yr)</th> </tr> </thead> <tbody> <tr> <td>North Western Dryland Zone (1061)</td> <td>6,500</td> </tr> <tr> <td>Numurkah-Nathalia Zone (1062)</td> <td>No limit</td> </tr> <tr> <td>Cobram Zone (1063)</td> <td>25,000</td> </tr> </tbody> </table>	Management zone	Zone limit (ML/yr)	North Western Dryland Zone (1061)	6,500	Numurkah-Nathalia Zone (1062)	No limit	Cobram Zone (1063)	25,000	<p><i>No applications were approved that contravened this prescription.</i></p>	Yes
Management zone	Zone limit (ML/yr)									
North Western Dryland Zone (1061)	6,500									
Numurkah-Nathalia Zone (1062)	No limit									
Cobram Zone (1063)	25,000									
<b>PRESCRIPTION 2 – Restrictions on taking groundwater</b>										
<p>By 15 September 2017, and by 1 July each year thereafter GMW will:</p> <p>a) determine the rolling average of the maximum annual groundwater recovery levels from the preceding 5 irrigation years for bores listed in Schedule 1 and announce a corresponding allocation for the subsequent irrigation season as detailed below:</p> <table border="1"> <thead> <tr> <th>Trigger level, depth below natural surface (m)</th> <th>Allocation</th> </tr> </thead> <tbody> <tr> <td>21.0 and above</td> <td>100%</td> </tr> <tr> <td>21.1 to 24.0</td> <td>70%</td> </tr> <tr> <td>Below 24.1</td> <td>70% and review undertaken by GMW in consultation with Katunga Groundwater Reference Group</td> </tr> </tbody> </table> <p>b) Announce allocations by listing them on its website, sending letters to all licence holders and placing public notices in local newspapers.</p>	Trigger level, depth below natural surface (m)	Allocation	21.0 and above	100%	21.1 to 24.0	70%	Below 24.1	70% and review undertaken by GMW in consultation with Katunga Groundwater Reference Group	<p><i>The annual allocation for the 2022/23 water years was determined in accordance with the Plan methodology and a 70 per cent allocation was announced on 25 June 2022.</i></p> <p><i>All licence holders were informed by mail posted. Allocation information was also published on the GMW website and advertised in local newspapers, Shepparton News and Country News.</i></p>	Yes
Trigger level, depth below natural surface (m)	Allocation									
21.0 and above	100%									
21.1 to 24.0	70%									
Below 24.1	70% and review undertaken by GMW in consultation with Katunga Groundwater Reference Group									

*Aquifers less than 25 m depth (shallow) are outside the bounds of the WSPA, as described in section 1.2 of this report. The data related to bores screened in the shallow Shepparton Formation are included in this report as a point of comparison with the deeper aquifers managed under the WSPA.*

Prescription	Activity	Compliant
<b>PRESCRIPTION 3 – Transfer of a groundwater licence</b>		
<p><b>3.1</b> GMW may approve a permanent transfer of a groundwater licence provided relevant matters have been considered and:</p> <ul style="list-style-type: none"> <li>a) zone limits in Prescription 1 will not be exceeded; and</li> <li>b) the total licensed volume within 2 km of an applicant’s bore will be less than 3,700 ML/year; or</li> <li>c) where the total licensed volume within 2 km of an applicant’s bore is equal to or greater than 3,700 ML/year, the permanent transfer is from other licence holders within a 2 km radius of the applicant’s bore.</li> </ul>	<p><i>All applications were assessed with regard to this prescription.</i></p>	<p>Yes</p>
<p><b>3.2</b> GMW may approve a temporary transfer of a groundwater licence provided relevant matters have been considered and:</p> <ul style="list-style-type: none"> <li>a) zone limits in Prescription 1 will not be exceeded; and</li> <li>b) the total licensed volume within 2 km of an applicant’s bore will be less than 3,700 ML/year; or</li> <li>c) where the total licensed volume within 2 km of an applicant’s bore is equal to or greater than 3,700 ML/year – <ul style="list-style-type: none"> <li>i. the applicant’s licensed volume in one water season will not exceed 125% of their permanent licensed volume prior to any temporary trade occurring; or</li> <li>ii. the temporary transfer is from other licence holders within a 2 km radius of the applicant’s bore</li> </ul> </li> </ul>	<p><i>All applications were assessed with regard to this prescription.</i></p>	<p>Yes</p>
<b>PRESCRIPTION 4 – Metering of licensed take</b>		
<p>GMW will:</p> <ul style="list-style-type: none"> <li>a) ensure that a meter is fitted to new licensed bores;</li> <li>b) read each meter at least once a year and record take in appropriate database(s); and</li> <li>c) if GMW is unable to measure the volume of water taken through a meter it may: <ul style="list-style-type: none"> <li>i. make an estimate of take; or</li> <li>ii. request the licence holder to provide a meter reading</li> </ul> </li> </ul>	<p><i>All new bores have meters installed.</i></p> <p><i>Meter readings were recorded at least once in 2022/23.</i></p>	<p>Yes</p>

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Prescription	Activity	Compliant
<b>PRESCRIPTION 5 – Groundwater level monitoring</b>		
<p><b>5.1</b> GMW will:</p> <ul style="list-style-type: none"> <li>a) obtain groundwater levels from bores used for allocation assessments (listed in Schedule 1) on a monthly basis. If a bore used for allocation assessments becomes defective an alternative bore may be monitored and the defective bore should be decommissioned. The alternative bore will be selected by consensus between DEECA and GMW.</li> <li>b) undertake water level monitoring at appropriate locations throughout the Katunga WSPA to: <ul style="list-style-type: none"> <li>i. assess annual and long-term impact on water levels from groundwater pumping;</li> <li>ii. monitor regional and local seasonal drawdown; and</li> <li>iii. monitor the impacts of groundwater pumping generally across the Katunga WSPA and in areas of high intensity groundwater pumping.</li> </ul> </li> </ul>	<p><i>Groundwater levels for allocation assessments were obtained monthly.</i></p> <p><i>Water-level monitoring is undertaken at appropriate locations in the WSPA.</i></p>	Yes
<p><b>5.2</b> DEECA will manage the State observation bore network so that:</p> <ul style="list-style-type: none"> <li>a) continuous regional baseline monitoring is maintained to provide sufficient information to identify changes in groundwater resource availability and condition;</li> <li>b) State observation bores are properly maintained; and</li> <li>c) data collected from the bores is entered into the groundwater database, within 30 days after it has been collected.</li> </ul>	<p><i>Baseline monitoring is being supported by DEECA.</i></p> <p><i>State observation bores are maintained by DEECA.</i></p> <p><i>Data collected from the bores were entered into the groundwater database by DEECA.</i></p>	Yes
<b>PRESCRIPTION 6 – Groundwater salinity monitoring</b>		
<p>GMW must:</p> <ul style="list-style-type: none"> <li>a) sample bores specified in Schedule 1 and have the samples analysed at an accredited laboratory for salinity once a year;</li> <li>b) enter salinity measured in bores referred to in Schedule 1 to the State groundwater database; and</li> <li>c) provide a sample bottle to any groundwater user in the Katunga WSPA who requests 1, test the salinity level of returned samples and provide the results to the groundwater user.</li> </ul>	<p><i>Bores specified in Schedule 1 were sampled and analysed for salinity in December 2022.</i></p> <p><i>Salinity results were entered into the State groundwater database.</i></p> <p><i>No groundwater users in the WSPA requested a sample bottle in 2022/23.</i></p>	Yes
<b>PRESCRIPTION 7 – Annual reporting</b>		
<p>By 30 September each year GMW will prepare an annual report on the enforcement and administration of the Plan. The report will be provided to the Minister and the Goulburn Broken Catchment Management Authority and made publicly available on GMW's website.</p>	<p><i>An annual report was prepared by GMW and provided to the Minister for Water and the Goulburn Broken Catchment Management Authority on 28 September 2022.</i></p> <p><i>The annual report was also published on GMW's website.</i></p>	Yes

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# Appendix B – Groundwater level data

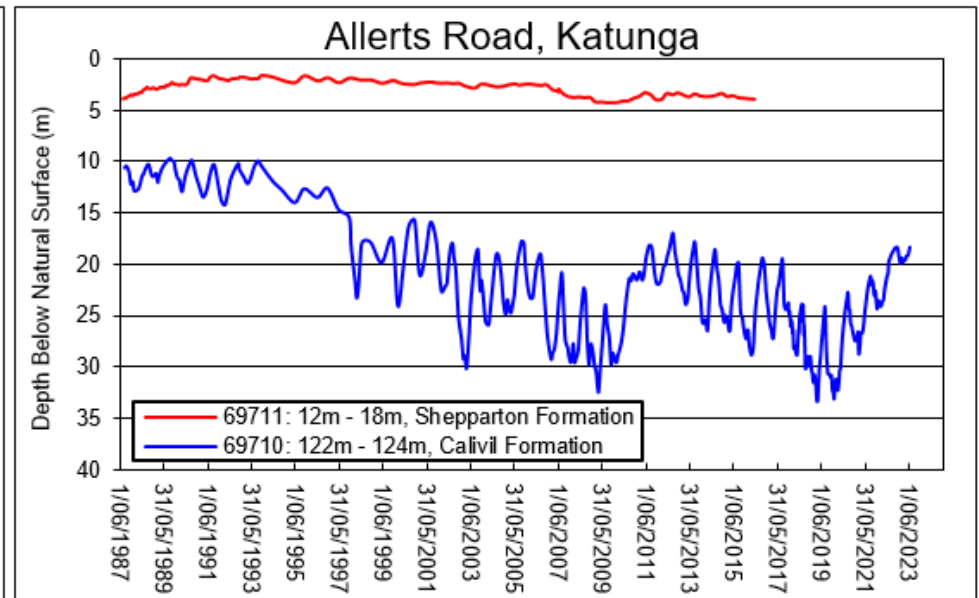
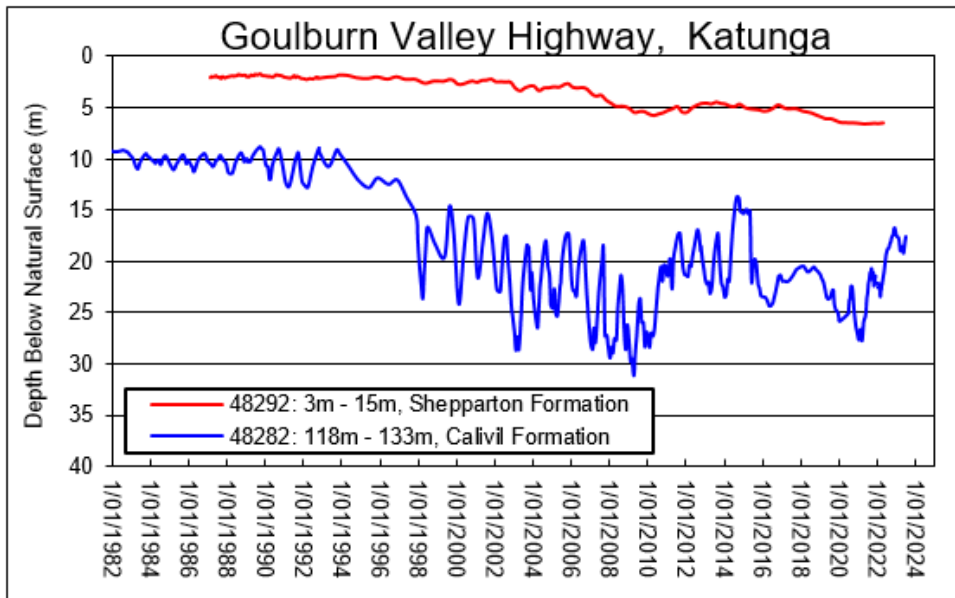
## Schedule 1 bores

Groundwater level data for key monitoring bores listed in Schedule 1 of the Plan. Note: monitoring of some of the shallow bores has ceased.

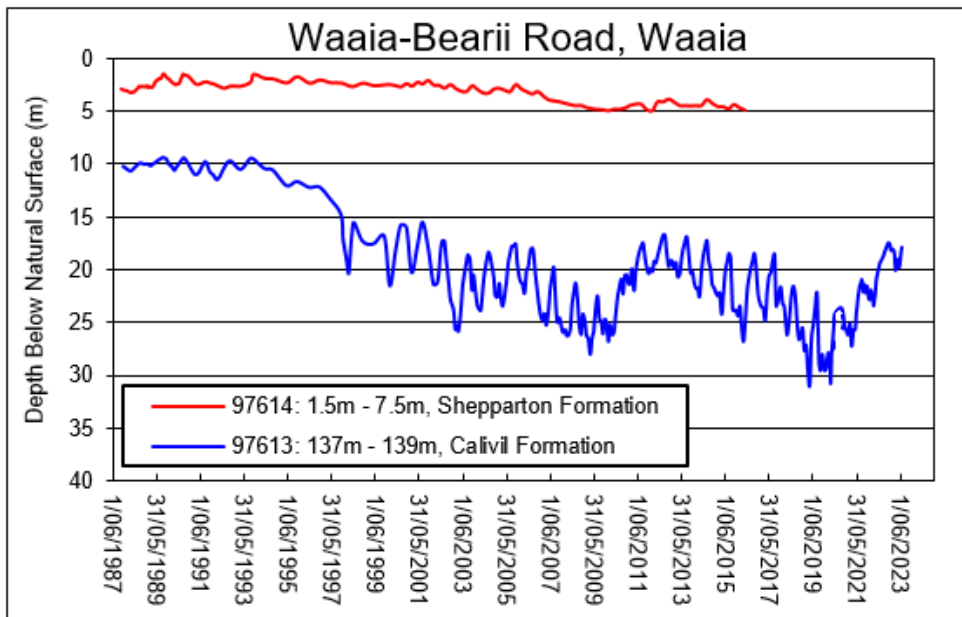
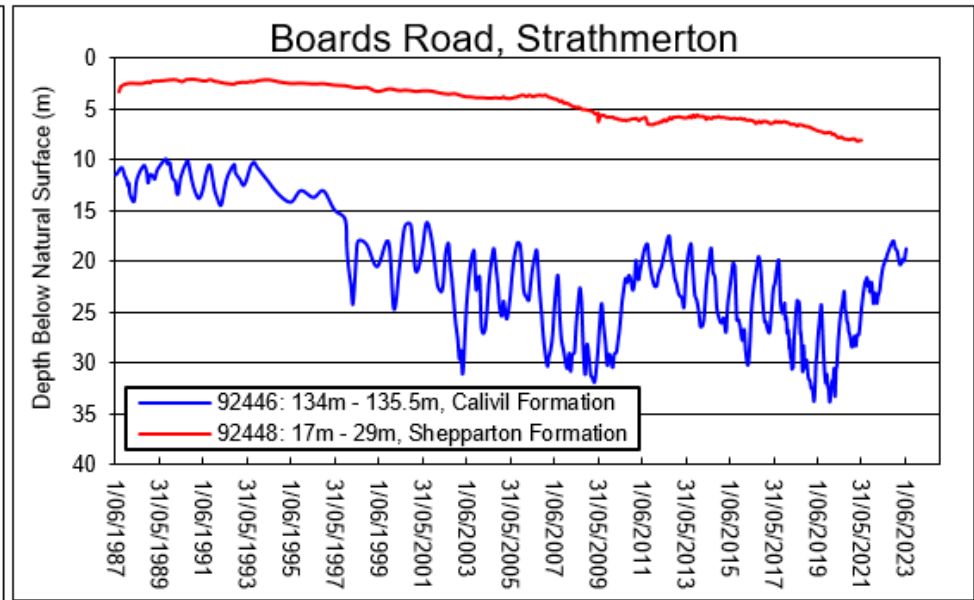
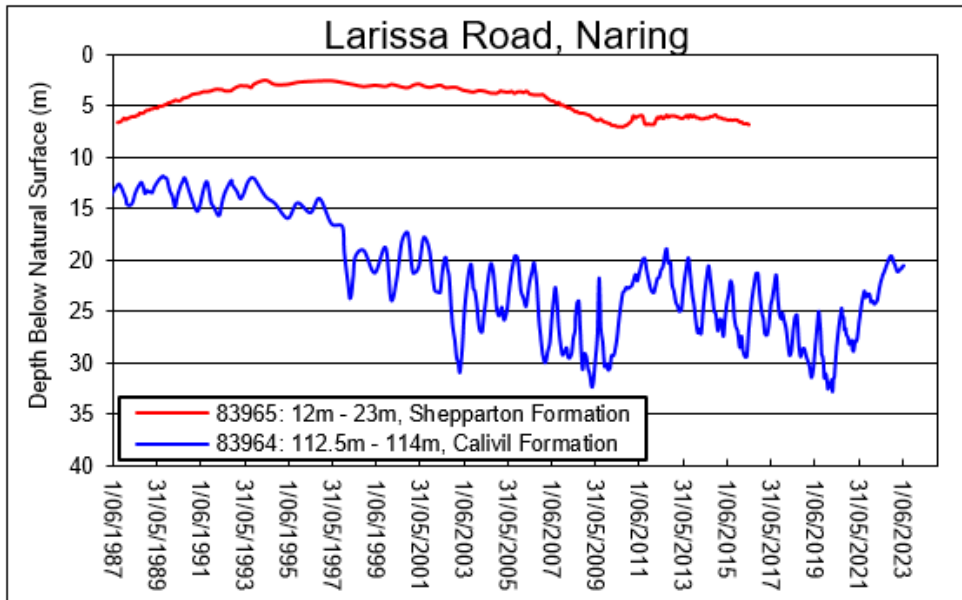
All data have been sourced from the *Water Measurement Information System (WMIS)* (DEECA, 2023). Further information is available on the WMIS website, at <https://data.water.vic.gov.au>.

Please note that the data presented here are not continuous. Data points which make up these curves are at either monthly or quarterly intervals. Since November 2017, some sites have been converted to remote-read which has allowed for hourly levels to be recorded. For those sites, only one level per month is presented in the hydrographs – 12:00 PM on the 15th day (or closest available).

### Numurkah-Nathalia Zone (1062)

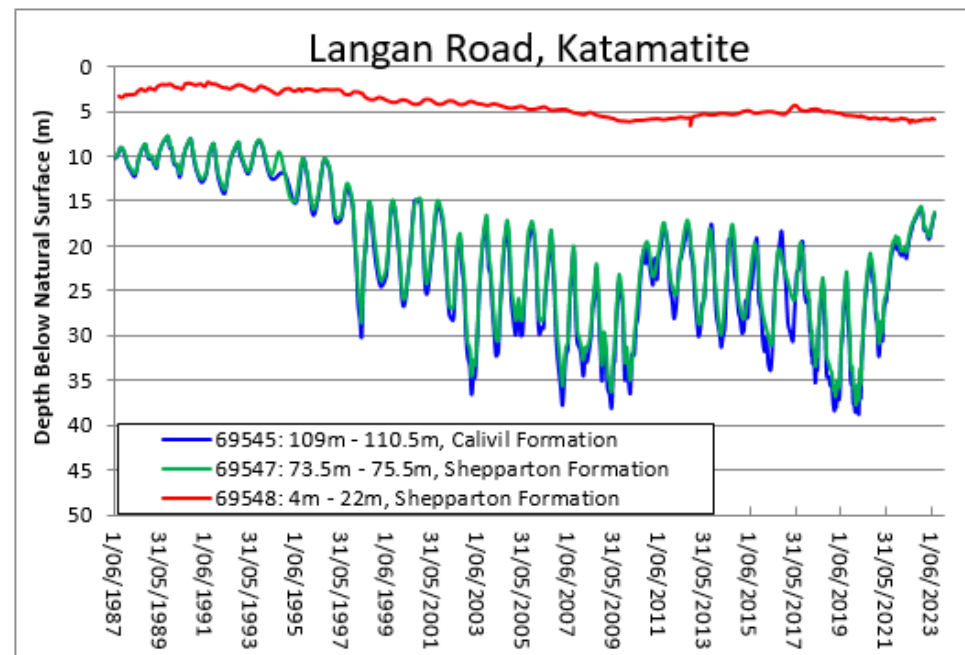
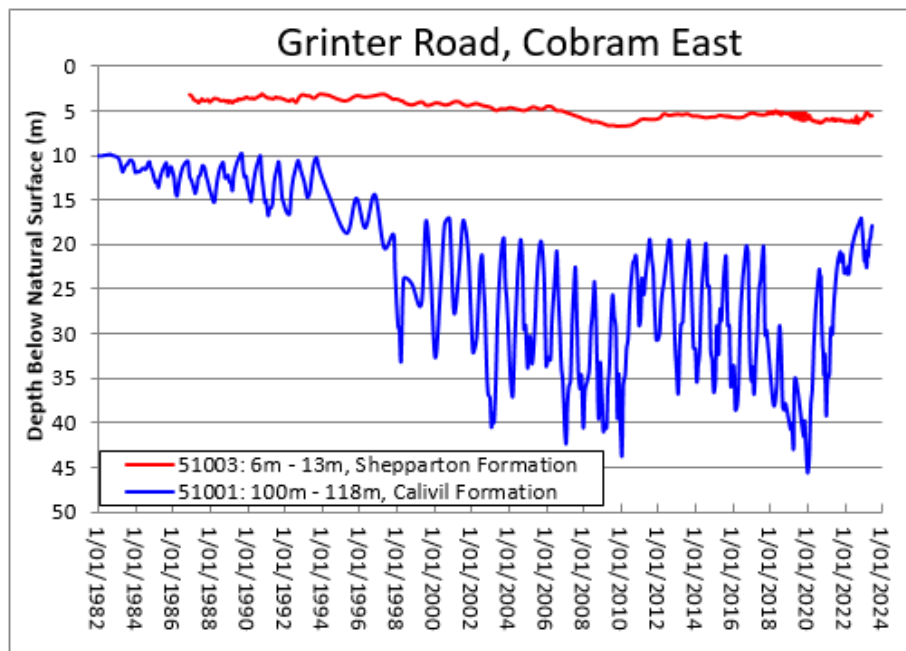


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### Cobram Zone (1063)





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## Appendix C – Groundwater quality results

### Analytical chemistry results for 2022/23

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>.

		<b>Bore:</b>	<b>WRK953007</b>	<b>WRK953008</b>	<b>48281</b>	<b>48288</b>	<b>84016</b>	<b>84021</b>	<b>69545</b>	<b>69547</b>	<b>69548</b>
		<b>Aquifer:</b>	Calivil Formation	Shepparton Formation (lower)	Shepparton Formation	Shepparton Formation (upper)	Calivil Formation	Shepparton Formation (upper)	Calivil Formation	Shepparton Formation (lower)	Shepparton Formation (upper)
		<b>Date:</b>	26/10/2022	26/10/2022	26/10/2022	26/10/2022	6/12/2022	6/12/2022	19/10/2022	19/10/2022	19/10/2022
<b>Analyte</b>	<b>Unit</b>										
pH	pH units		6.8	6.9	6.4	6.4	8.8	6.0	7.0	7.0	6.6
Total Kjeldahl Nitrogen, as N	mg/L		1.8	0.2	0.6	0.3	1.9	1.0	0.1	0.1	0.8
Phosphorus, total as P	mg/L		3.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1
Total Organic Carbon	mg/L		0.5	0.5	0.9	2.2	2.5	3.4	0.5	0.5	0.8
Total Dissolved Solids, at 180°C	mg/L		410	430	1700	1800	3500	21000	540	190	270
Electrical Conductivity, at 25°C	µS/cm		610	630	3000	3100	8200	34000	1000	300	430
Turbidity, NTU	NTU		0.3	0.7	5	0.9	7.5	11	8.4	1.6	3.3
Chloride, as Cl	mg/L		67	46	850	730	2800	14000	200	23	32
Sulphate, as SO <sub>4</sub>	mg/L		53	54	190	170	5	3200	52	18	15

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		<b>Bore:</b>	<b>WRK953007</b>	<b>WRK953008</b>	<b>48281</b>	<b>48288</b>	<b>84016</b>	<b>84021</b>	<b>69545</b>	<b>69547</b>	<b>69548</b>
		<b>Aquifer:</b>	Calivil Formation	Shepparton Formation (lower)	Shepparton Formation	Shepparton Formation (upper)	Calivil Formation	Shepparton Formation (upper)	Calivil Formation	Shepparton Formation (lower)	Shepparton Formation (upper)
		<b>Date:</b>	26/10/2022	26/10/2022	26/10/2022	26/10/2022	6/12/2022	6/12/2022	19/10/2022	19/10/2022	19/10/2022
<b>Analyte</b>	<b>Unit</b>										
Bicarbonate Alkalinity, as CaCO <sub>3</sub>	mg/L		170	220	110	340	74	550	150	98	140
Carbonate Alkalinity, as CaCO <sub>3</sub>	mg/L		<2	<2	<2	<2	2	<2	<2	<2	<2
Hydroxide Alkalinity, as CaCO <sub>3</sub>	mg/L		<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Alkalinity, as CaCO <sub>3</sub>	mg/L		170	220	110	340	74	550	150	98	140
Anionic Strength	meq/L		6	7	30	31	81	5	4	3	10
Cationic Strength	meq/L		5	6	24	27	72	4	4	3	10
Ion Balance - relative difference	%		8.27	7.65	10.5	6.7	5.58	6.95	-1.35	6.65	0.34
Ion Balance - TDS (EC) vs TDS	unitless		0.7	0.7	0.6	0.6	0.4	0.6	0.6	0.6	0.5
Total Nitrogen, as N	mg/L		<0.1	0.1	1.9	1.6	2.2	<1	0.1	0.1	2.6
Ammonia, as N	mg/L		<0.1	<0.1	0.1	<0.1	1.6	0.3	<0.1	<0.1	<0.1
Nitrate + Nitrite, as N	mg/L		1.8	0.2	0.6	1.6	1.9	1	0.1	0.1	5.4
Nitrate, as N	mg/L		0.01	0.1	0.01	1.3	0.01	0.01	0.01	0.01	4.6
Nitrite, as N	mg/L		<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/L		<0.001	0.003	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Cadmium	mg/L		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Copper	mg/L		<0.001	<0.001	<0.001	0.005	<0.001	0.005	<0.001	<0.001	0.01
Iron	mg/L		<0.01	0.02	<0.01	<0.01	0.02	0.06	0.61	0.09	<0.01
Lead	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L		0.001	0.01	0.2	0.001	0.001	16	0.2	0.001	0.001
Mercury	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L		<0.001	<0.001	<0.001	0.002	<0.001	0.1	0.001	0.1	<0.001
Zinc	mg/L		0.021	0.005	0.024	0.051	<0.001	0.12	0.02	0.015	0.015
Calcium	mg/L		5.8	6.3	27	53	54	540	8.7	1.1	6.8
Magnesium	mg/L		10	9.6	51	64	54	1100	15	2.3	13

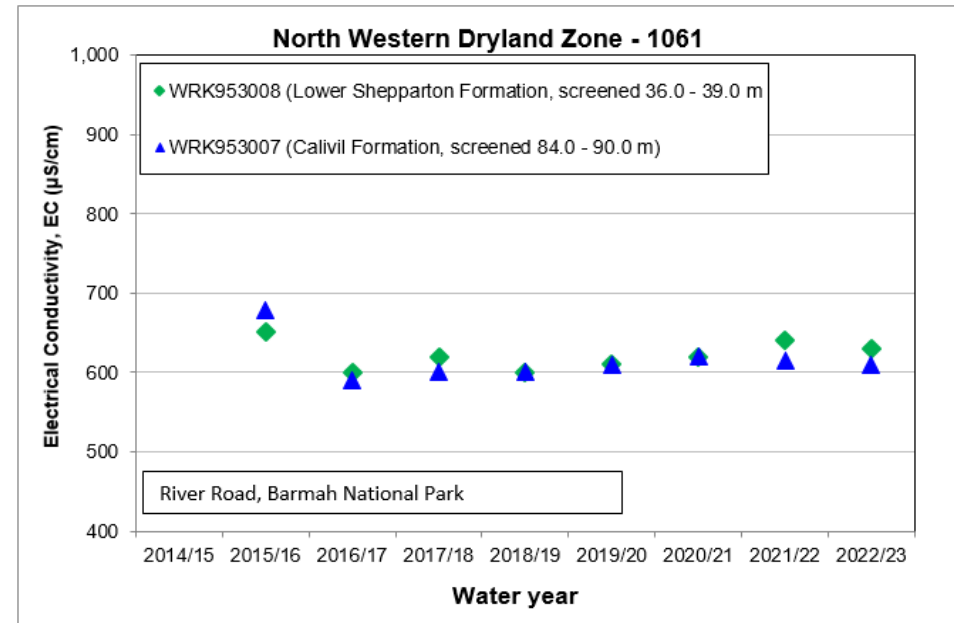
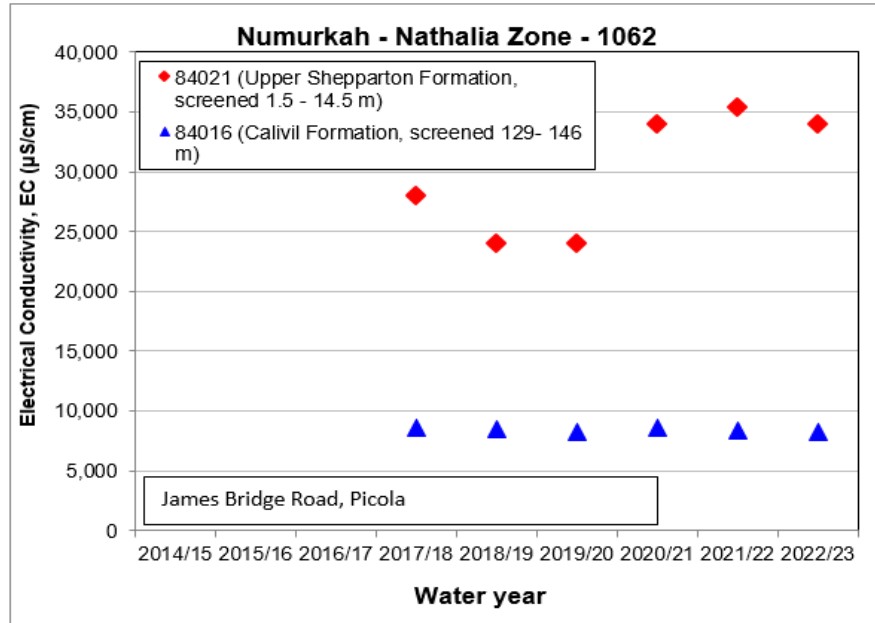
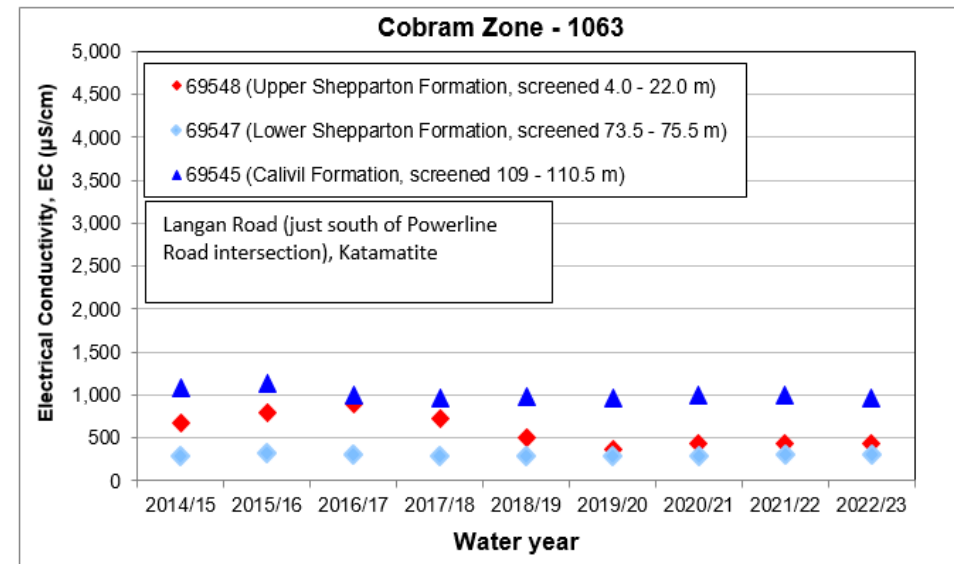
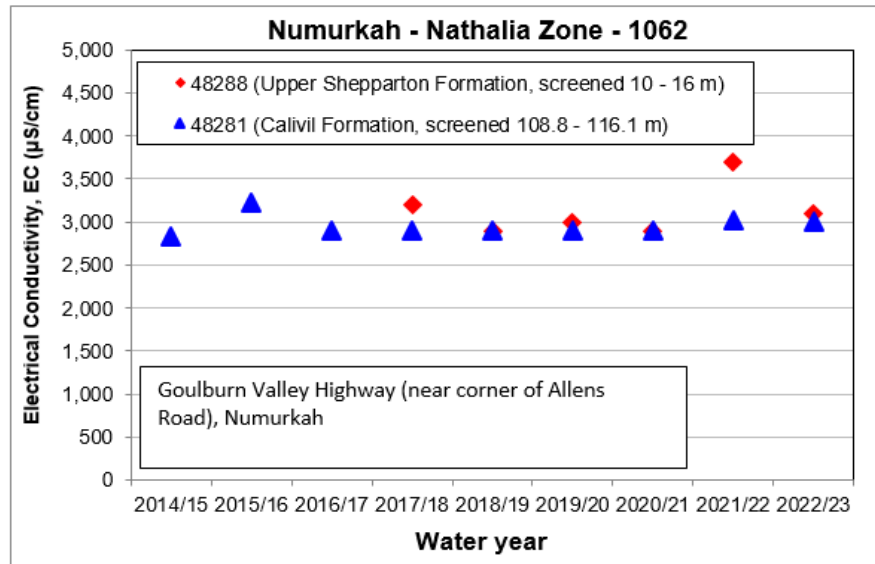
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		<b>Bore:</b>	<b>WRK953007</b>	<b>WRK953008</b>	<b>48281</b>	<b>48288</b>	<b>84016</b>	<b>84021</b>	<b>69545</b>	<b>69547</b>	<b>69548</b>
		<b>Aquifer:</b>	Calivil Formation	Shepparton Formation (lower)	Shepparton Formation	Shepparton Formation (upper)	Calivil Formation	Shepparton Formation (upper)	Calivil Formation	Shepparton Formation (lower)	Shepparton Formation (upper)
		<b>Date:</b>	26/10/2022	26/10/2022	26/10/2022	26/10/2022	6/12/2022	6/12/2022	19/10/2022	19/10/2022	19/10/2022
<b>Analyte</b>	<b>Unit</b>										
Potassium	mg/L		1.5	1.5	4	7	22	19	2.7	1.7	7.5
Sodium	mg/L		110	110	410	490	1700	4900	160	52	52

Note: Some results may be below detection limits, but these limits are not available from data source.

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### Historic groundwater salinity data for key monitoring bores



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