GWMWater

Murrayville Local Management Plan (Groundwater)

Annual Report 2022-23

Executive summary

GWMWater presents the annual report for the Murrayville Groundwater Management Area (GMA) Local Management Plan (LMP) for the 2022/23 season. This report provides an overview of groundwater use and management activities in the Murrayville Groundwater Management Area (GMA) during 2022/23.

The Local Management Plan is the primary reference for groundwater management in the Murrayville GMA. In addition to outlining the management objectives and the groundwater resource, the Local Management Plan also documents the rules and key information relevant to groundwater management in the area.

The Local Management Plan also outlines the program for the monitoring of groundwater levels and quality, the method for assessing rates of groundwater level drawdown, and for implementing restrictions, should they be necessary in future.

Metered extraction in the Murrayville GMA was 5,156 ML for the 2022/23 season, or 53 per cent of the total licensed entitlement volume. The volume extracted during 2022/23 is consistent with the average annual volume of extraction over the past 20 years.

The monitoring of groundwater levels, use and water quality does not indicate any significant changes in the condition of the resource or water usage patterns. The groundwater levels remain within the drawdown thresholds prescribed in the Local Management Plan.

The water resource continues to be managed in accordance with the Local Management Plan and the resource condition is consistent with the objectives outlined in the Plan.

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1. Introduction

1.1 Purpose

This report provides an overview of groundwater management activities undertaken in the accordance with the Murrayville Groundwater Management Area Local Management Plan (LMP) for the 2022/23 season.

1.2 Groundwater Management Area

The Murrayville Groundwater Management Area (GMA). The GMA covers 1,916km^2 centred on the town of Murrayville and abuts the border with South Australia. Groundwater from the Upper Mid-Tertiary Limestone Aquifer (Murray Group Limestone) is the sole source of usable water for domestic and stock, town supply and irrigation in the area.

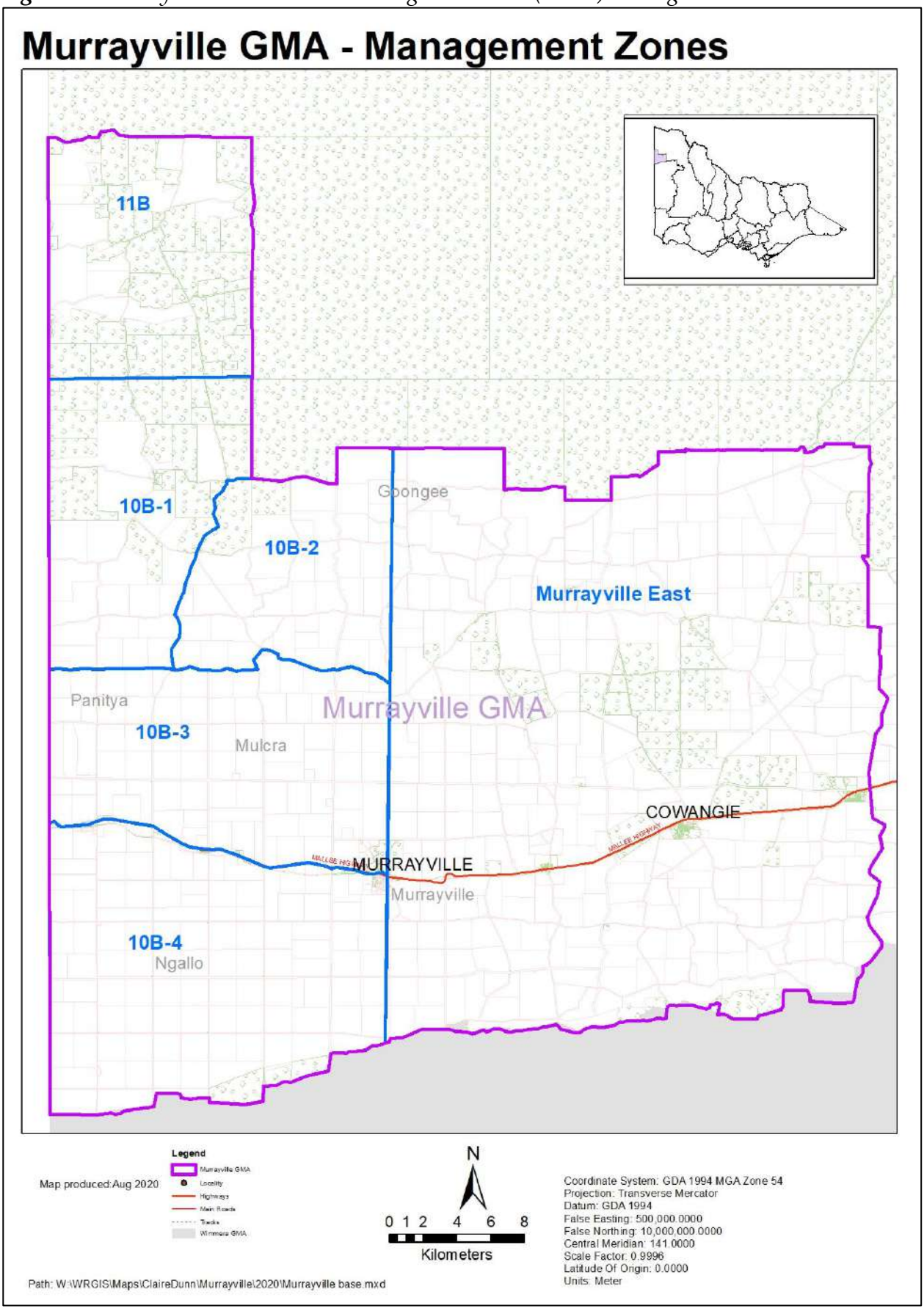
There are six management zones in the Murrayville GMA (Figure 1). Zones 10B-1, 10B-2, 10B-3 and 10B-4 of the Murrayville GMA combine to form Border Zone 10B; Zone 11B is within Border Zone 11B, and Murrayville East zone is outside of the Border Designated Area.

1.3 Local Management Plan

The Murrayville GMA Local Management Plan (LMP) describes the framework for managing groundwater resources in the Murrayville GMA. The LMP documents rules and information relating to the take and use of groundwater in the Murrayville GMA. The LMP can be accessed via the GWMWater website www.gwmwater.org.au.

The key objective of the Murrayville LMP is to ensure the equitable sharing of available water between licensed users, while protecting the environment and acknowledging its non-renewable nature, ensuring as much as practicable, the long-term sustainability of the water resource.

***Figure 1**: Murrayville Groundwater Management Area (GMA) Management Zones*



2. Groundwater Management

2.1 Licence entitlement

The Permissible Consumptive Volume for the Murrayville GMA is 11,005 ML/year. The current total licence entitlement volume in the GMA is 9,754.8 ML. Licence information is summarised in Table 1. There is one less licence in Zone 11B due to a licence amalgamation during the year, however there was no change in the total volume licensed in the zone.

The Permissible Annual Volume for Border Zone 10B is 6,720 ML, therefore the combined total volume licensed for zones 10B-1 to 10B-4 must not exceed this volume.

***Table 1**: Licence entitlement in the Murrayville GMA (at 30 June 2023)*

Zone	Number of Licences	Volume licensed ML	Zone limit ML
11B	2	1,600	1,720
10B-1	3	2,265	2,265
10B-2	2	1,120	1,370
10B-3	12	2,005	2,140
10B-4	6	1,327.8	2,830
Murrayville East	13	1,437	2,412
Total	**39**	**9,754.8**	

2.2 Groundwater use

Each active irrigation and commercial bore is fitted with a meter approved by GWMWater to measure extraction. Groundwater users are encouraged to actively monitor their extraction volume throughout the season. GWMWater uses metering data and extraction information for water resource management and licence compliance purposes. Annual extraction volumes are uploaded to the Victorian Water Register by 30 June each year.

In most cases, meters are read mid-way through the irrigation season (January) as well as at the end of the irrigation season (May-June). Licensees are provided with mid-season and end of season water usage statements, which provides an opportunity for users to compare their records with data collected by GWMWater, and against their permitted volume of take.

To access additional water during the season, licensees must secure water from another licence holder by way of trade or transfer. Any such trade or transfer must be approved by GWMWater prior to the taking of additional water volumes.

Figure 2 illustrates the total extraction compared to previous years, while Table 2 provides a summary of extraction by zone for 2022/23. Table 3 is a summary of groundwater use by zone since 2017/18.

In 2022/23, the total metered groundwater extraction in the Murrayville GMA was 5,156 ML, or 53 percent of the total licensed volume. As illustrated in Figure 2, the total licenced extraction in 2022/23 was similar to the annual average of 5,125 ML (calculated since 2001), and approximately 1,000 ML less than last year.

Figure 2 *Groundwater usage over time in the Murrayville GMA*

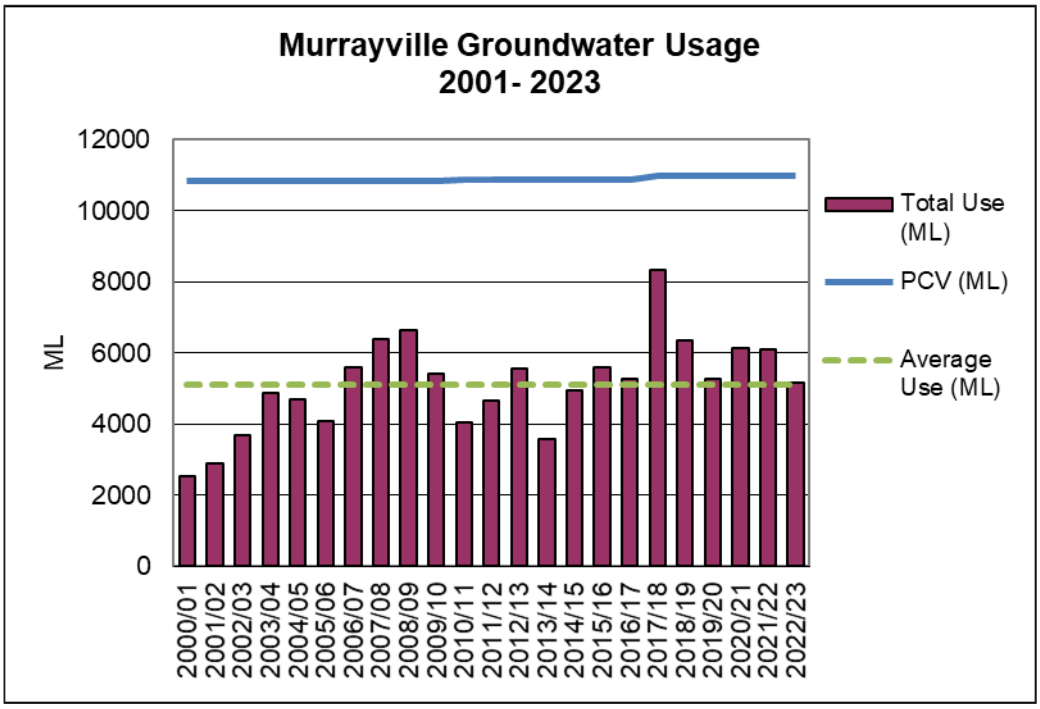


Table 2: *2022/23 Licensed Groundwater Extraction by Zone*

Zone	Volume Extracted 2022/23 ML	Volume licensed (30 June 2023) ML	Available volume 2022/23 *(incl. carryover & temp trades)* ML	% Use vs Available Volume 2022/23	Zone limit ML
11B	1,507	1,600	*1,600*	94%	1,720
10B-1	1,167	2,265	*2,860*	40%	2,265
10B-2	1,142	1,120	*1,148*	99%	1,370
10B-3	943	2,005	*2,693*	30%	2,140
10B-4	367	1,327.8	*1,331*	27%	2,830
Murrayville East	29	1,437	*1,868*	1%	2,412
Total	**5,156**	**9,754.8**	***11,502***		

Table 3: *Summary of groundwater use by management zone since 2017/18*

Zone	Annual Use (ML)					
	2017/18	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**
Murrayville 11B	1062	1215	874	1654	1493	1507
Murrayville 10B-1	2206	1540	1009	1505	1340	1167
Murrayville 10B-2	1952	688	1129	1004	1655	1142
Murrayville 10B-3	1951	1592	1516	1394	1075	943
Murrayville 10B-4	510	552	512	553	502	367
Murrayville East	650	780	243	41	35	29
TOTALS	**8330**	**6368**	**5283**	**6151**	**6101**	**5156**

Figure 3 illustrates monthly rainfall recorded at Bureau of Meteorology site 76038 in Murrayville during the period July 2022 to June 2023. The recorded monthly rainfall as compared to average monthly rainfall provides an indication of the potential influence rainfall has had on groundwater use during the year. This is further illustrated in Figure 4 which provides a comparison between annual usage and annual rainfall over the past 20 years.

Figure 3 *Actual (2022/23) and average monthly rainfall for Murrayville*

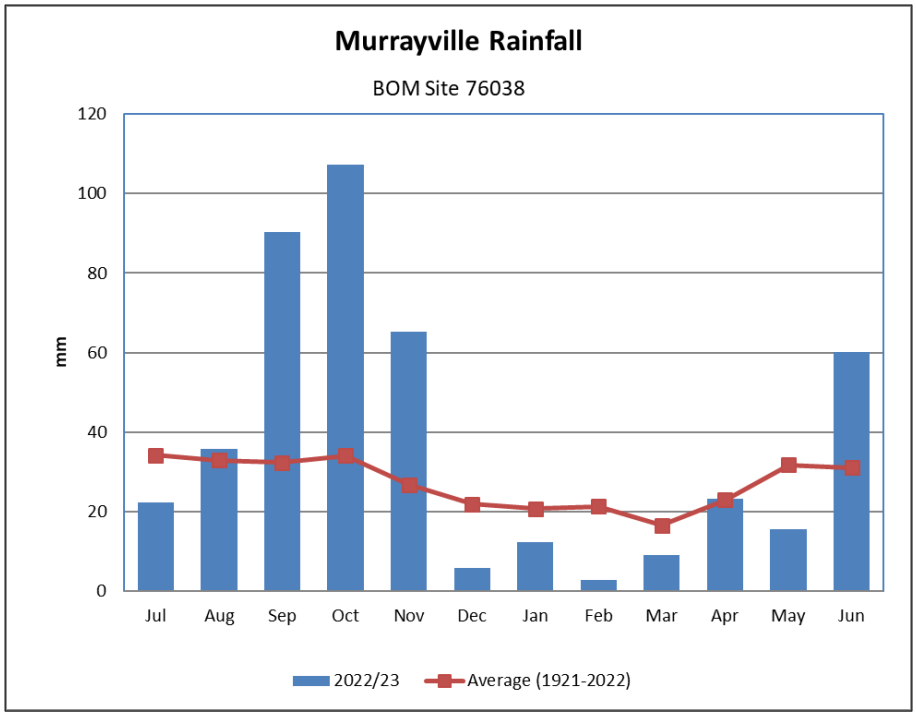
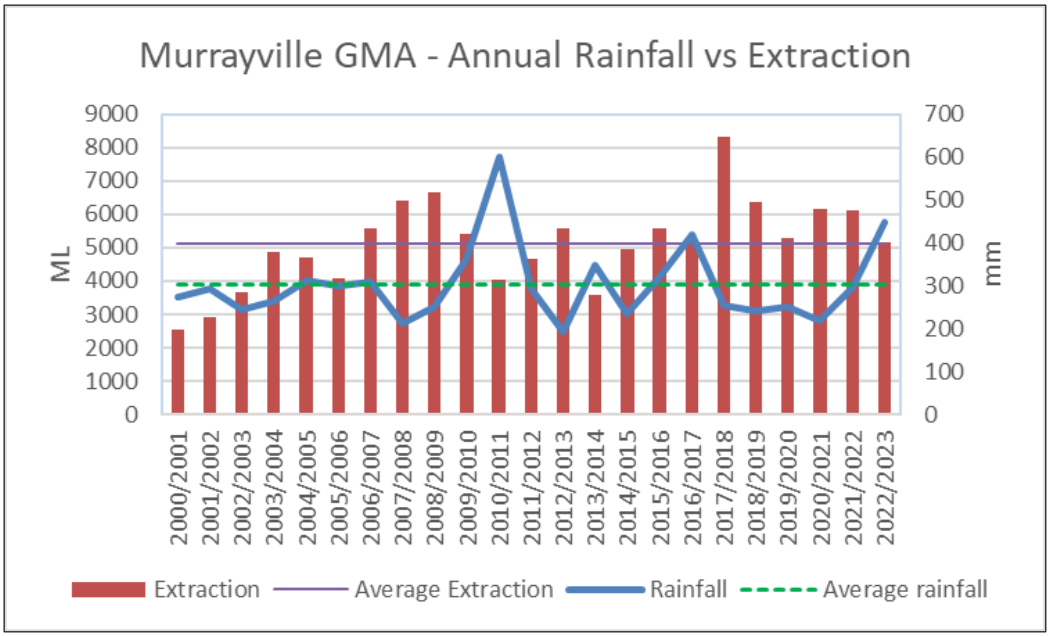


Figure 4 *Annual use compared with annual rainfall for Murrayville*



2.3 Accessing additional water – trade (temporary and permanent) and carryover

Licensees have the ability to apply for a transfer of entitlement (trade) from another licensee to secure additional water should they require it, either on a temporary or permanent basis. Approval of transfer applications is subject to assessment, trade rules and zone limits. Five temporary transfers (trades) of licence entitlement were processed during 2022/23.

Carryover of unused water to the following season is permitted in the Murrayville GMA, up to a maximum of 30% of licensed entitlement. Carryover water is not transferrable to other licensees. While there was a considerable volume of carryover water available for use during 2022/23, no licence holders in the GMA utilised carryover volumes.

2.4 Compliance and Enforcement

The Victorian Government has committed to a zero tolerance approach for unauthorised water take. Unauthorised take typically occurs when water users draw beyond what they have in their account – even if they have the intention of balancing it up later.

Meter reading and compliance checks are conducted by GWMWater throughout the year. Where a licence holder fails to comply with licence conditions, GWMWater investigates the matter, taking any necessary action, in line with the GWMWater Compliance and Enforcement Strategy (available at www.gwmwater.org.au/ces).

There were no confirmed instances of non-compliance detected in the Murrayville GMA during 2022/23.

2.5 Domestic and stock bores

Landholders can apply for a licence to construct a domestic and stock bore via the Victorian Water Register (http://waterregister.vic.gov.au/).

There were three licences issued for the construction of new domestic and stock bores in the Murrayville GMA in 2022/23.

2.5.1. Reimbursement for works to domestic and stock bores

The Murrayville Local Management Plan allows for landholders to apply to GWMWater for reimbursement for works required to domestic and stock bores, should they be affected by falling groundwater levels resulting from licensed groundwater extraction.

There were no instances of landholders seeking reimbursement for the lowering or deepening of domestic and stock pumps, mills or bores in 2022/23, which is expected since the observed seasonal drawdown has been within the range previously experienced.

3. Monitoring Program

3.1 Groundwater quality monitoring

GWMWater undertakes water quality sampling of more than 40 domestic and stock bores located throughout the GMA. This sampling has been undertaken annually since 2008. A map illustrating the sampling data is illustrated in Appendix 1. Graphs of bores grouped by Parish are also illustrated. The salinity data is loaded into the Victorian Water Measurement Information System (WMIS) and is accessible to the public. There are also a number of observation bores that are sampled regularly for salinity, as part of the Victorian State Observation Bore Network; this data is also uploaded to WMIS.

Analysis of groundwater samples collected during 2022/23 showed no discernible increase in the salinity level of water in most of the bores tested. Two of the bores in the Danyo and Duddo areas have shown a slight increase in the observed salinity levels in recent years, which will be monitored closely over the next few years (see Appendix 1).

3.2 Groundwater extraction monitoring

As discussed in Section 2.2, each active commercial and irrigation bore is metered, and seasonal extraction volume is confirmed by GWMWater annually in June. The meters installed provide high accuracy measurement, and enable data files to be interrogated to identify any potential faults or discrepancies which may require further investigation.

In 2022/23, the total volume of water extracted by licensed users in the Murrayville GMA was 5,156 ML (see Section 2.2).

3.3 Groundwater level monitoring

Water level monitoring is undertaken by a contractor on behalf of the Department of Energy, Environment and Climate Action (DEECA) and GWMWater. Data is transferred to the Victorian Water Measurement Information System (WMIS) which can be accessed at http://data.water.vic.gov.au . Observation bores are monitored on a quarterly basis. There are also a number of bores which have data loggers installed and can record and transmit data daily.

A map illustrating the locations of selected monitoring observation bores is provided in Appendix 2. This illustrates the geographic extent of monitoring in the GMA, with particular concentration of observation bores in areas where extraction is more intense.

3.4 Impact of use on observed groundwater levels

The location of selected observation bores in relation to the areas irrigated during the 2022/23 season are illustrated in Appendix 2. The groundwater levels as measured at selected bores within the observation bore network are also illustrated in Appendix 2.

The observed groundwater level response in terms of maximum drawdown and seasonal fluctuation generally corresponds to the volume of groundwater extraction in the zones of the GMA and the proximity to active irrigation bores.

The annual groundwater level oscillations represented in the hydrographs was similar to that observed in the previous 5-6 seasons with the exception of Zone 10B-2 (Goongee bores) and Zone 10B-1 (Panitya North bores), where the seasonal drawdown was not as great. For the 10B-2 Goongee bores this was likely to have been due to the reduced volume extracted in zone 10B-2 which was 500 ML less than 2021/22 (see Table 3). For 10B-1 Panitya North this is likely due to a combination of less activity adjacent to Zone 10B-1 in South Australia compared to 2021/22 (from satellite imagery) and less extraction in 10B-1 (being 200ML less than the previous year).

The recovery level (the groundwater level measured prior to the onset of irrigation) observed in the majority of the observation bores this year was similar to that observed 10-15 years ago.

3.5 Resource condition assessment

3.5.1. Resource threshold

The Murrayville LMP outlines the means of assessing drawdown against the resource condition threshold (0.65m/year). The assessment examines the average annual change in groundwater level and applies a five year rolling average. The five year average avoids any overly reactive response due to seasonal factors, and averaging bores removes bias which may arise from using a single bore.

To comply with the resource condition threshold, the annual change in groundwater level should not show a decline of more than 0.65m/year for more than two consecutive years (based on the five year rolling average). The annual groundwater decline is determined from the level to which groundwater levels recover prior to the irrigation season (usually in September-October), and this is compared with the groundwater recovery level in the prior year. For this reason, the recovery level in response to extraction during 2021/22 is used for the current assessment of resource condition, as data was not yet available for recovery levels following the 2022/23 season (peak recovery level is measured prior to the onset of extraction for irrigation).

As illustrated by the *Average change in groundwater level* graphs in Appendix 3, the 0.65m threshold has not been approached in recent years in any of the zones assessed.

Overall, the annual change graphs for all zones indicate a clear decrease in the five year average annual drawdown since around 2011/2012 compared to earlier years.

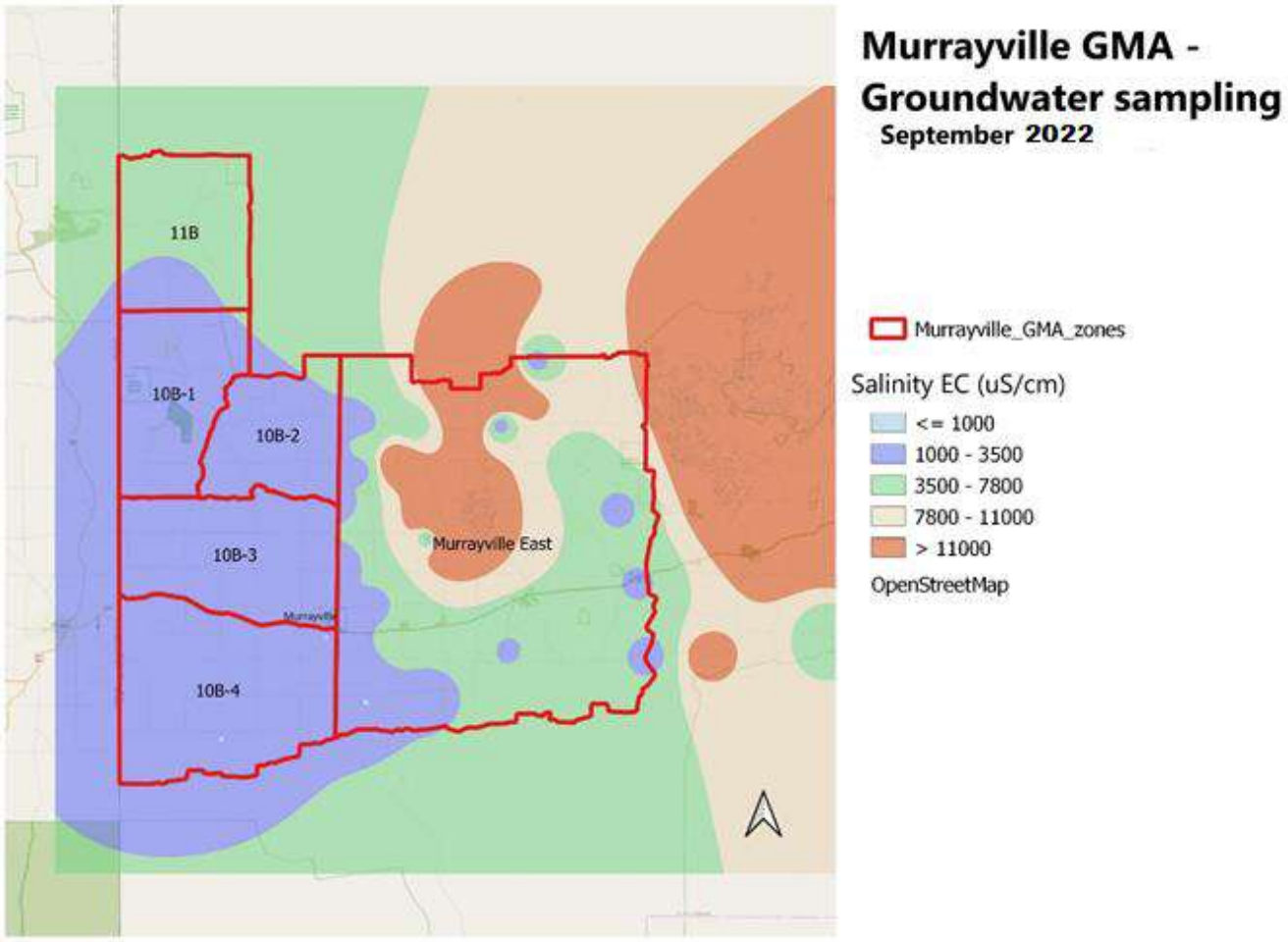
Fluctuations in the Panitya North (Zone 10B-1) graph appear to correlate with the annual extraction both sides of the South Australia-Victoria border varying from year to year, and the timing of the onset of the irrigation season not allowing groundwater levels to fully recover prior to the onset of extraction. Where slight declines in groundwater levels have occurred in Panitya North (Zone 10B-1) they remain well within the permitted drawdown limit (0.65 m/yr).

The annual change graphs for the remaining zones show stable to slightly increasing groundwater levels, including the relatively well utilised zones of Manya North (11B) and Goongee (10B-2).

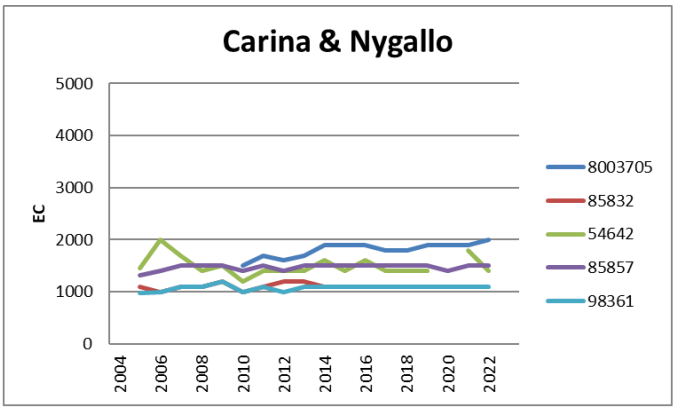
Consistent with the Murrayville LMP, groundwater level trends have been assessed against the resource condition threshold. As none of the assessment areas are approaching or have exceeded the threshold, there is no need for GWMWater to consider any form of seasonal restriction for 2024/25.

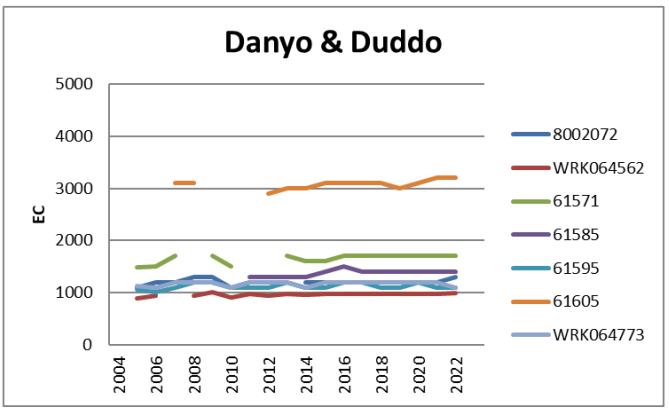
Appendix 1 – Water Quality Monitoring

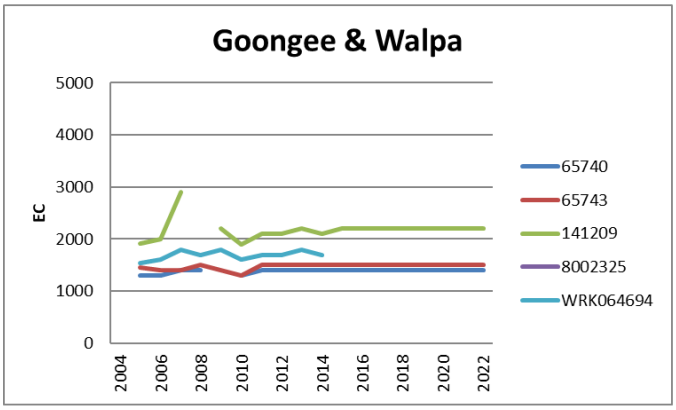
Groundwater Salinity – Spring 2022, from annual water quality sampling of D&S bores

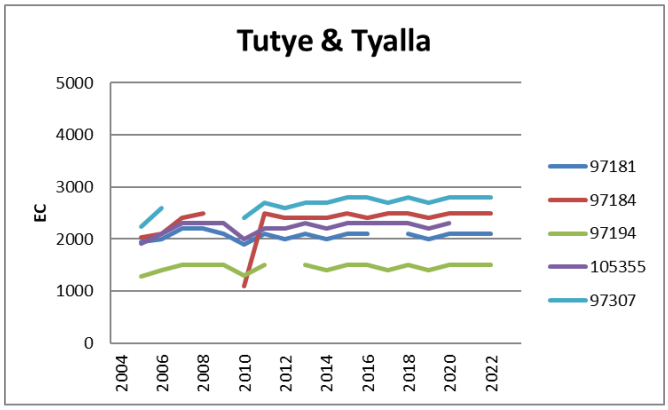


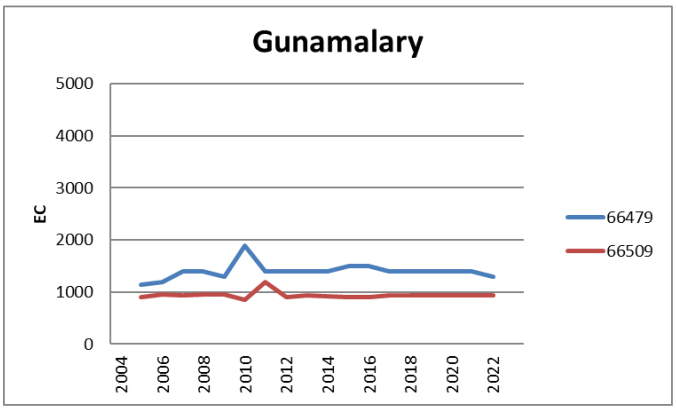
D&S annual sampling salinity data (graphed by parish)

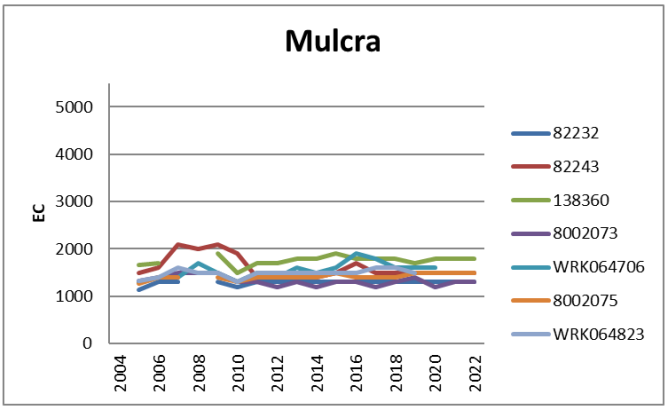


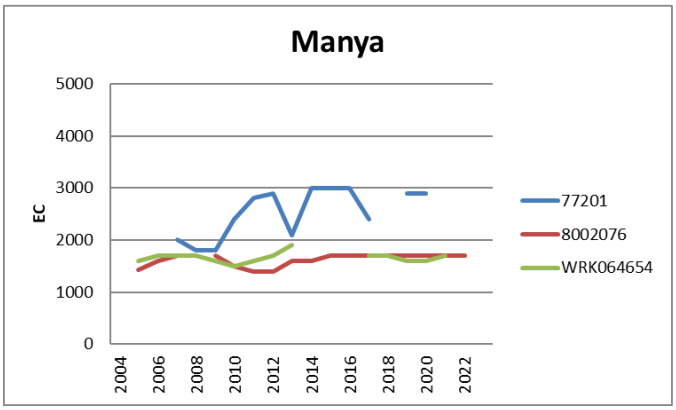


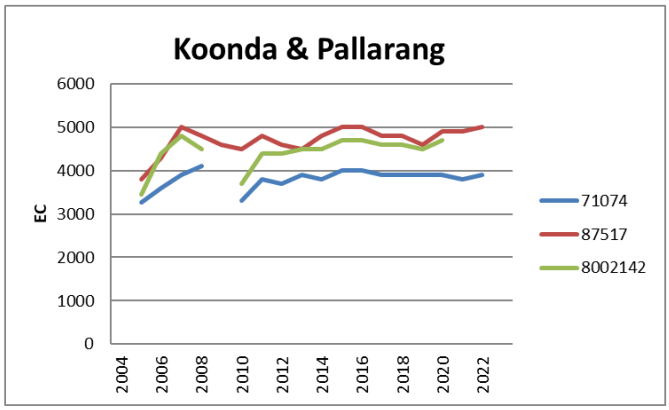




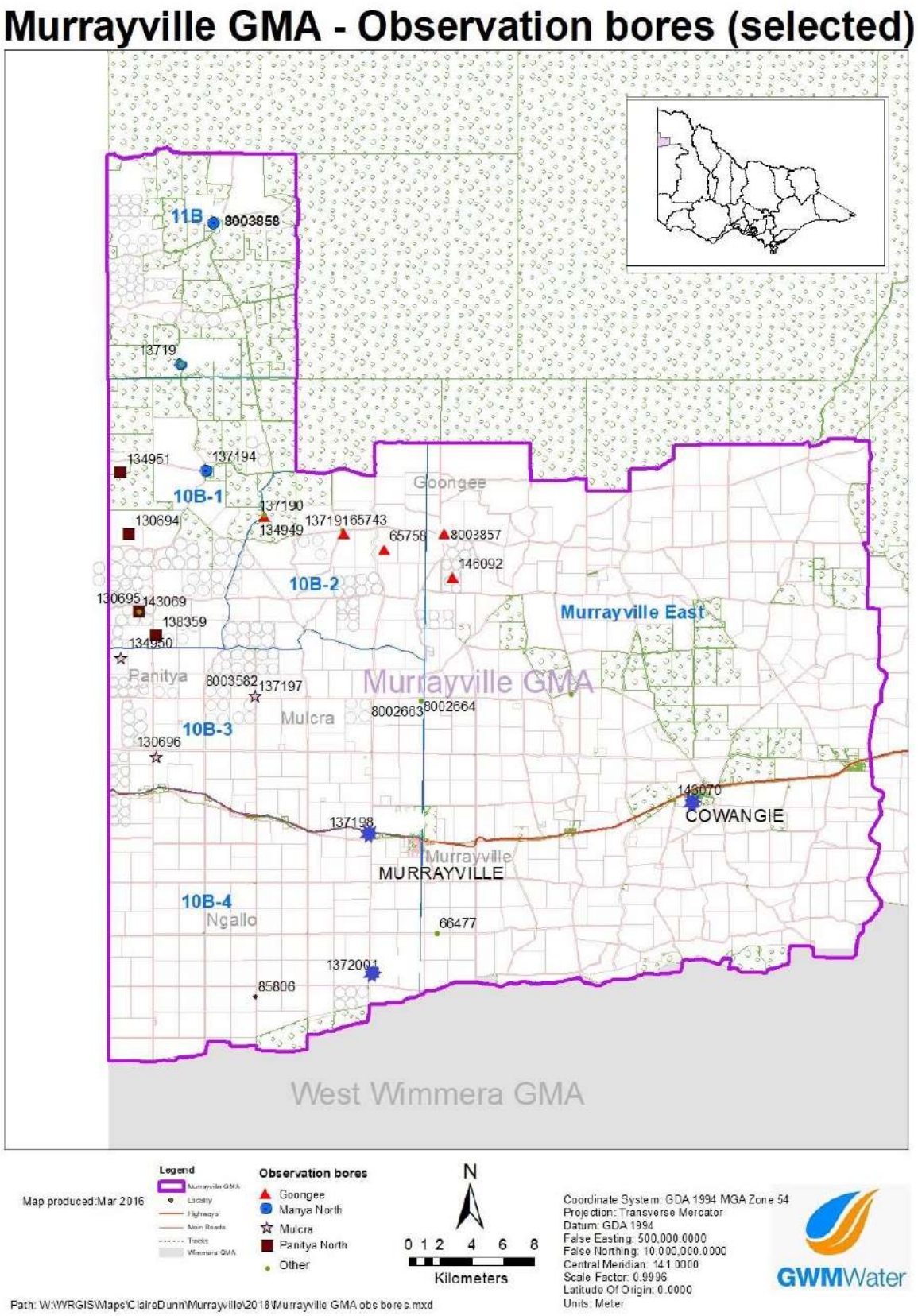




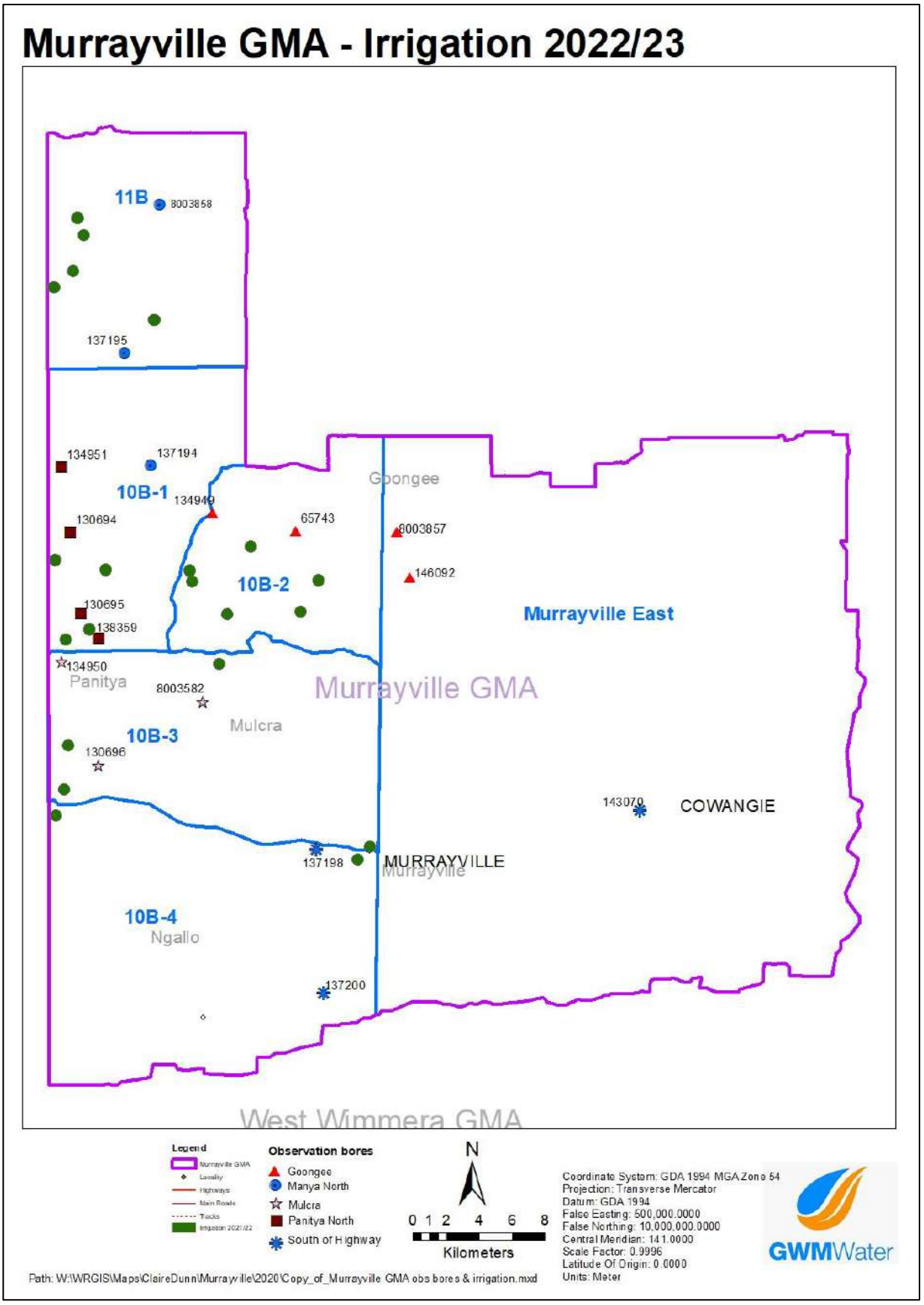




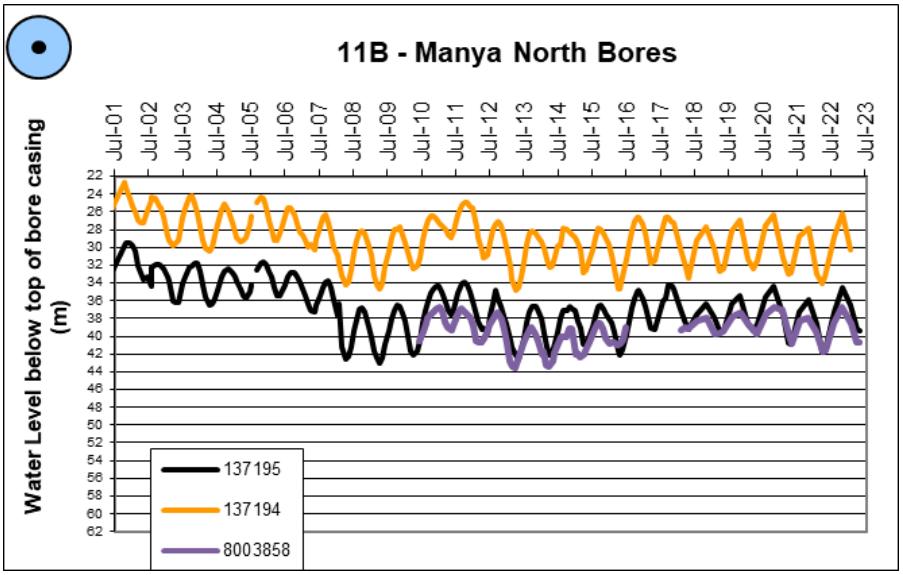
Appendix 2 – Water level monitoring network

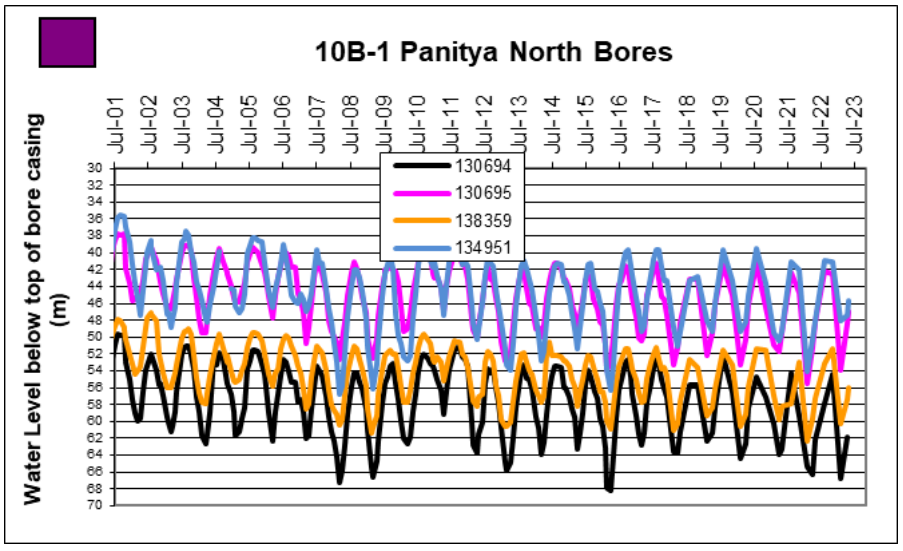


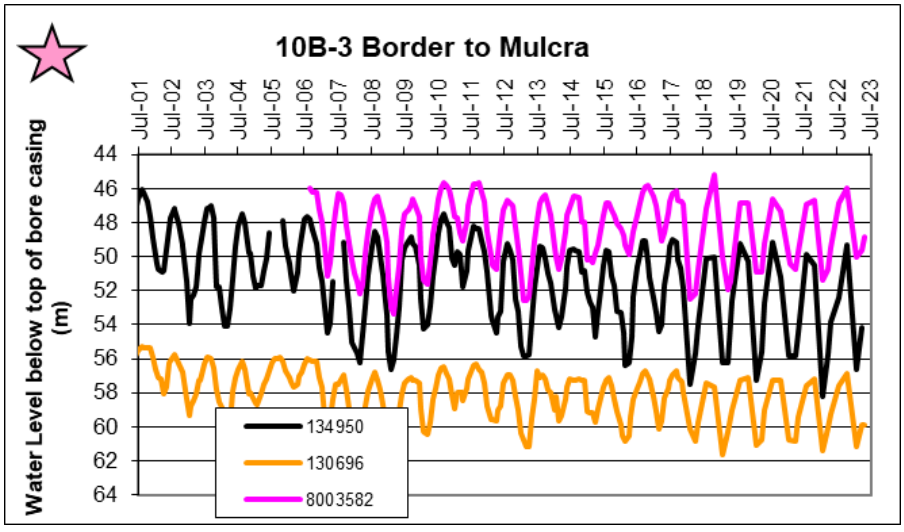
Selected Observation Bores and Irrigation

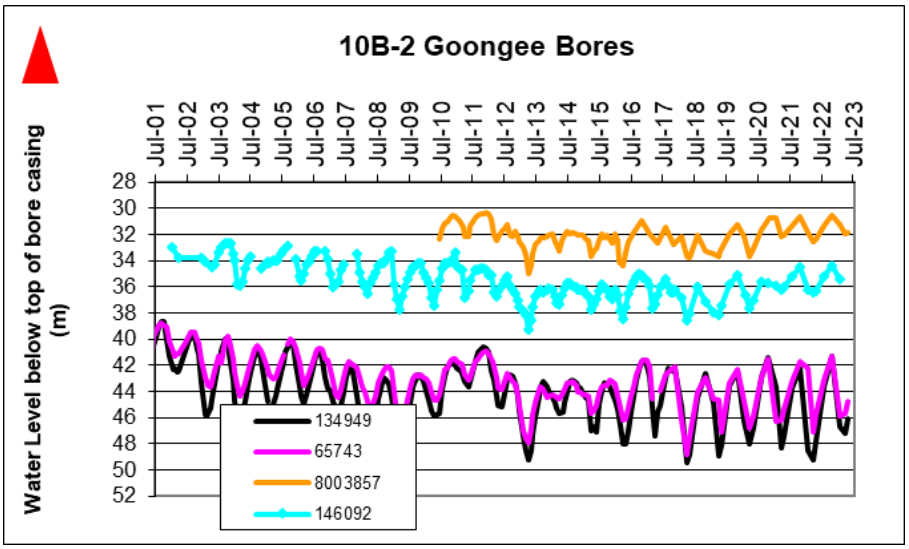


Groundwater levels as measured in selected observation bores.
Measurements taken in August, November, February, April and May.








10B-2 Goongee Bores
Water Level below top of bore casing (m)
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Jul-03
Jul-04
Jul-05
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Jul-08
Jul-09
Jul-10
Jul-11
Jul-12
Jul-13
Jul-14
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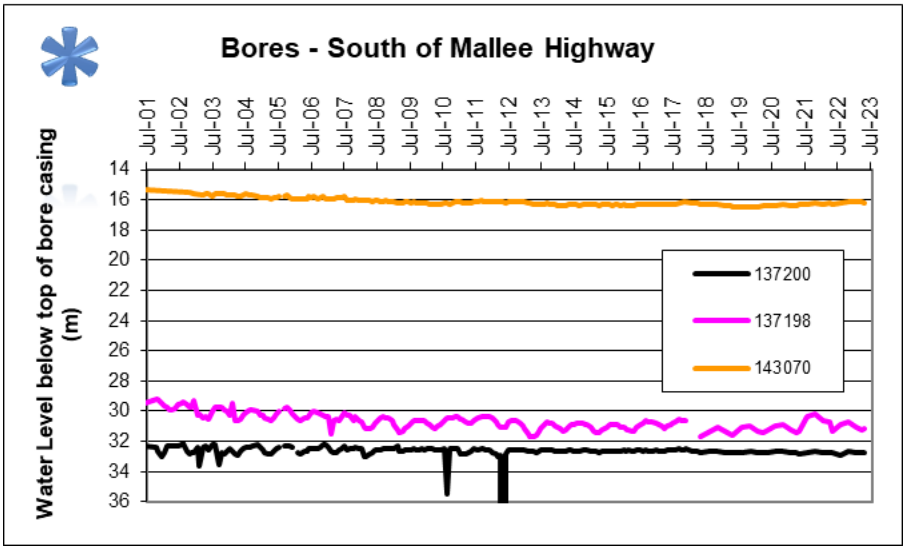
Bores - South of Mallee Highway
Water Level below top of bore casing (m)
Jul-01
Jul-02
Jul-03
Jul-04
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Jul-08
Jul-09
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Jul-11
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Appendix 3 – Resource Condition Threshold

The Local Management Plan (LMP) for the Murrayville GMA has an objective to manage the rate of decline in groundwater levels, allowing a maximum residual drawdown of 6.5 metres in the ten years to 2026.

The Local Management Plan (LMP) for the Murrayville GMA includes a resource condition threshold which was developed as a means of interpreting changes in groundwater levels which may influence the ability to achieve the LMP's objective to manage the rate of decline in groundwater levels. The threshold is a warning trigger for management intervention such as restrictions. The annual change in water level graphs form the basis for assessment against the threshold.

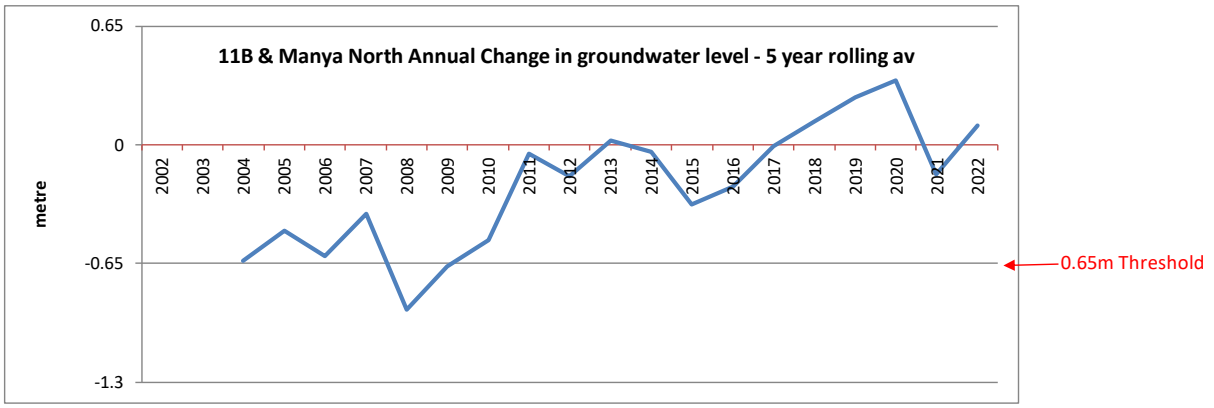
The confined nature of the aquifer means that groundwater levels can exhibit large seasonal drawdown fluctuations in response to pumping. It is because of this factor that the change in groundwater levels each year are assessed at the 'recovery level', being the groundwater level observed prior to the onset of the following irrigation season; usually in spring.

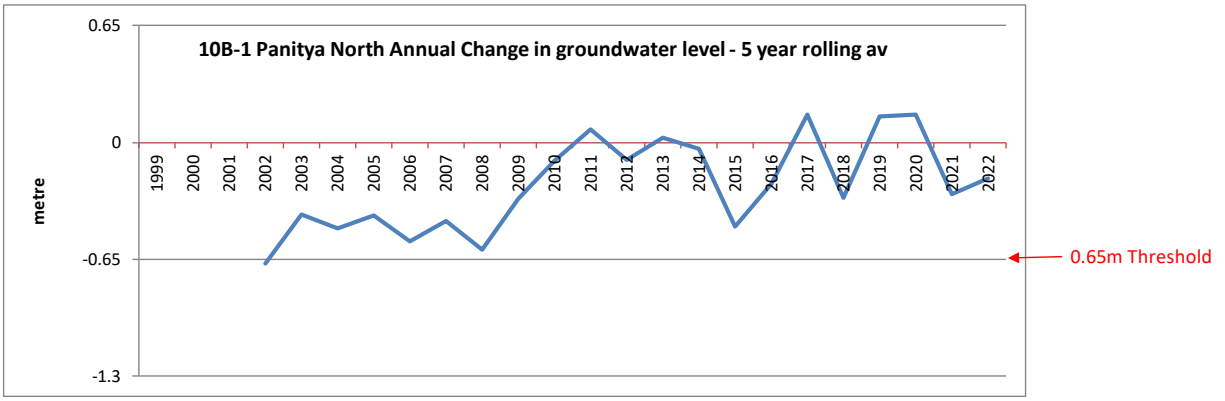
Interpreting the *Annual Change in Water Level* graphs

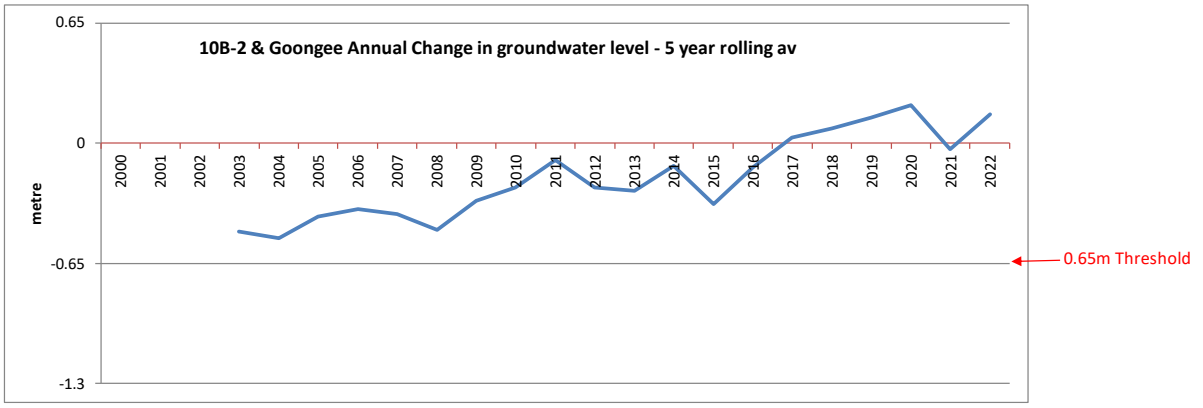
- Generally, those values above the 0 metre (red) line indicate groundwater levels are recovering.
- Values below the 0 metre line indicate groundwater levels are declining.
- The threshold line at -0.65 metres is a warning trigger, and sustained annual declines in excess of -0.65 metres per year may necessitate restrictions.
- Annual declines which are not more than -0.65m are within the acceptable drawdown threshold.

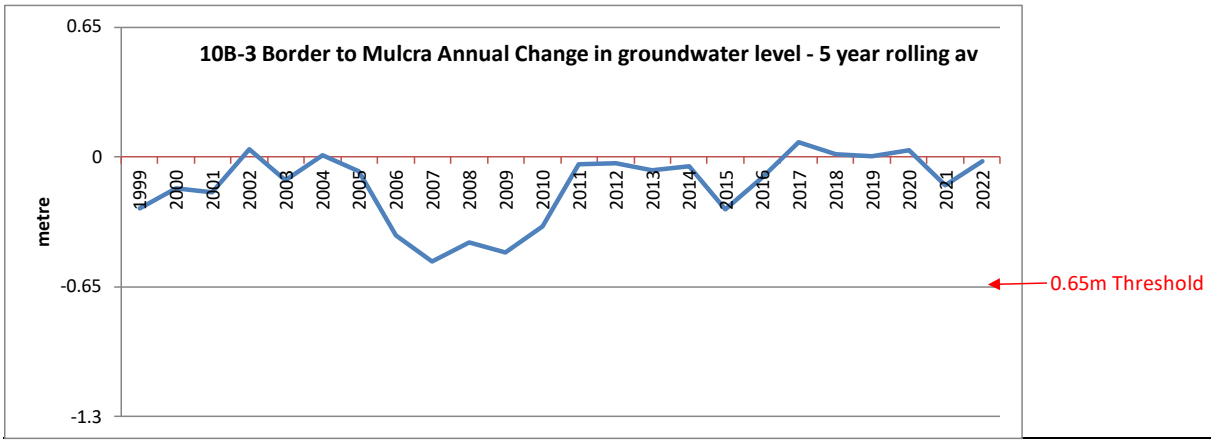
These Annual Change graphs are indicating a lesser decline in groundwater level for this reporting period and as such the observed annual declines remain within the acceptable drawdown threshold.

Average change in groundwater level graphs.
The 0.65m threshold has not been reached in any of the resource condition assessment areas in recent years (based on the five year rolling average).



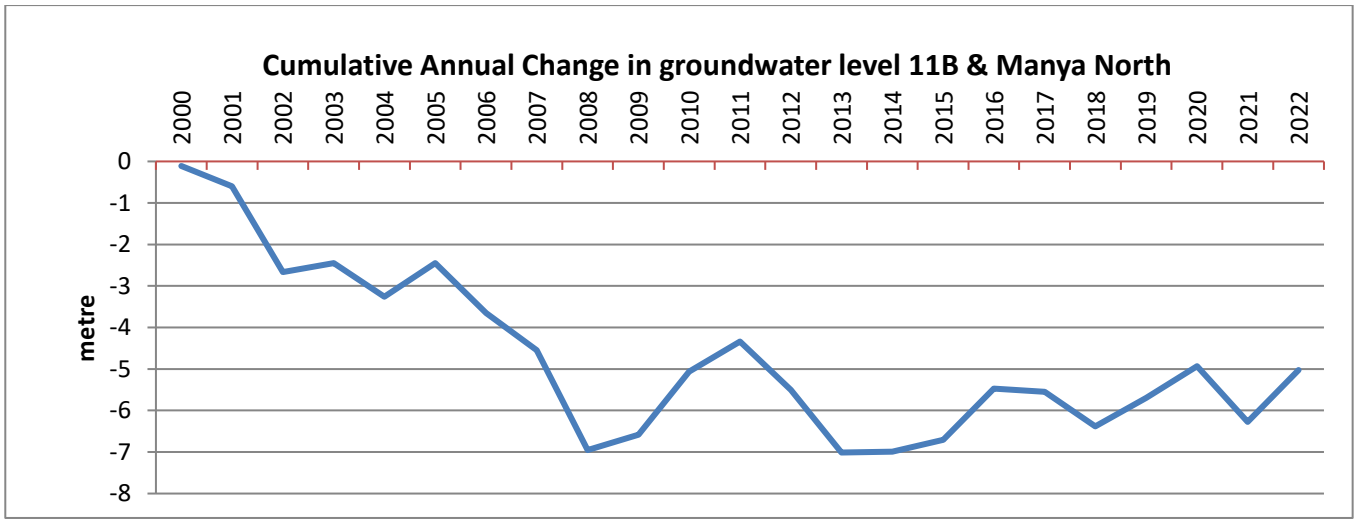


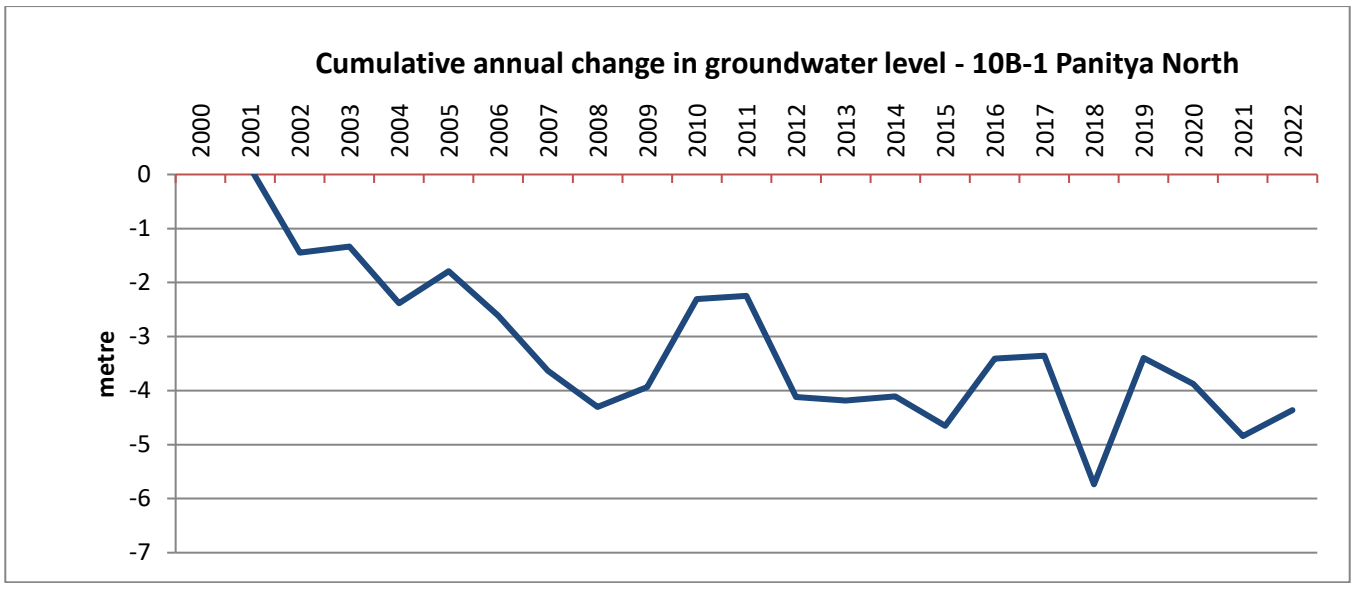


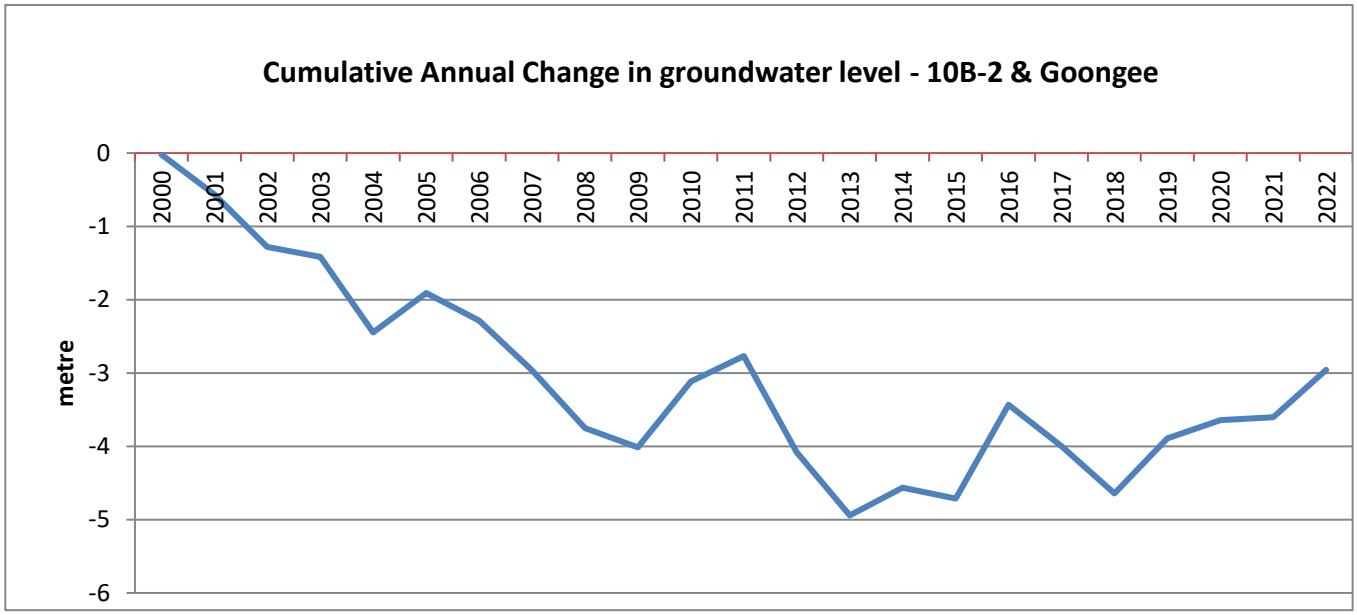


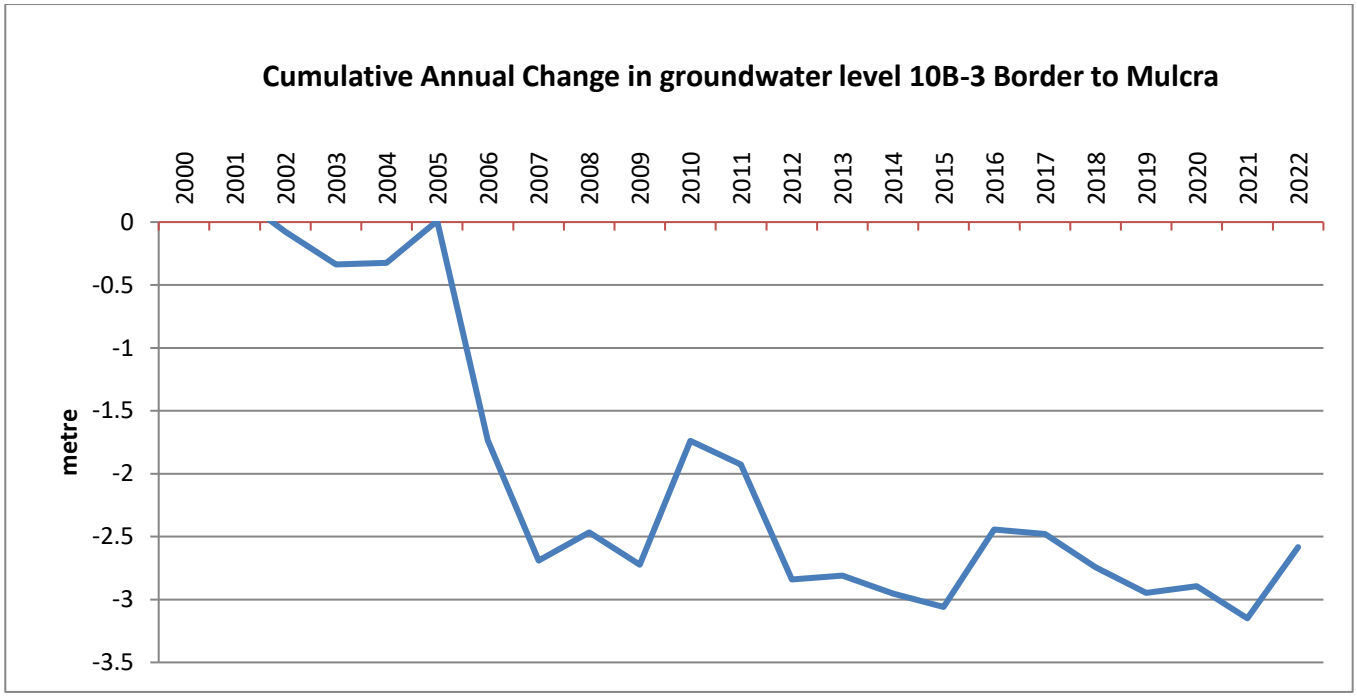
The cumulative effect of the observed annual change in groundwater levels since 2000 is reflected in the graphs below.

Summary - Cumulative change in groundwater level (or residual drawdown/recovery) in the recent planning period since 2018:
11B & Manya North = +0.52m
10B-1 Panitya North = -1.00m
10B-2 & Goongee = +1.03m
10B-3 Border to Mulcra = -0.10m






Cumulative Annual Change in groundwater level - 10B-2 & Goongee
metre
0
-1
-2
-3
-4
-5
-6
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022


Cumulative Annual Change in groundwater level 10B-3 Border to Mulcra
metre
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022