



Lower Campaspe Valley  
Water Supply Protection Area  
Groundwater Management Plan

Annual Report

June 2014

## **Foreword**

Goulburn-Murray Water (GMW) is pleased to present the annual report for the Lower Campaspe Valley Water Supply Protection Area (WSPA) Groundwater Management Plan (the Plan) for the 2013/14 season.

GMW is responsible for implementation and administration of the Plan, which was approved by the Minister for Water in October 2012.

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

This report provides an overview of groundwater management activities in the Lower Campaspe Valley WSPA and documents the successful implementation of the Plan during the 2013/14 season.

A copy of this report is available for inspection at the Tatura office or it can be downloaded from the GMW website.



Gavin Hanlon  
MANAGING DIRECTOR

Date:

## **Executive summary**

The Lower Campaspe Valley Water Supply Protection Area (WSPA) Groundwater Management Plan (the Plan) was approved by the Minister for Water in October 2012.

The Plan was successfully introduced in the 2012/13 season and has been effectively implemented during the 2013/14 season.

Groundwater level monitoring indicates that seasonal recovery is strong and levels are within observed historical ranges. Groundwater levels are relatively steady in the Echuca and Barnadown Zones, and have declined by around 2 m in the Elmore-Rochester and Bamawm Zones compared to recent years.

Allocations in all zones of the Lower Campaspe Valley WSPA were 100 per cent for 2013/14.

Metered usage in the Lower Campaspe Valley WSPA was 48 per cent (26,534 ML) of licence entitlement. This is within the range of historic use.

Less licence transfer activity occurred during 2013/14 than the previous year. There were 15 temporary transfers for a total of 1,861 ML with one trade for 30 ML to a licence holder outside of the WSPA. There were also three permanent transfers for a total of 471 ML.

Licence holders have carried over 13,689 ML of entitlement into the 2014/15 season.

The groundwater monitoring and metering program continues to be successfully applied to support the implementation of the Plan.

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## 1 Introduction

### 1.1 Purpose

This report has been prepared to meet requirements of the Lower Campaspe Valley Water Supply Protection Area (WSPA) Groundwater Management Plan (the Plan) and section 32C of the *Water Act 1989* (the Act). It reports the implementation of the Plan during the 2013/14 season.

### 1.2 Water Supply Protection Area

The Lower Campaspe Valley WSPA was declared in June 2010. It extends from Lake Eppalock in the south to Echuca in the north and includes the towns of Axedale, Goornong, Elmore, Lockington and Rochester.

There are four management zones within the Lower Campaspe Valley WSPA comprising the Barnadown, Elmore-Rochester, Bamawm and Echuca (Figure 1).

The WSPA includes groundwater resources to all depths except where it is overlain by the Campaspe West Salinity Management Plan Area and the region to the north of the Waranga Western Channel including the Shepparton Irrigation Region WSPA. In these areas, the Plan only applies to the management of groundwater resources greater than 25 m depth.

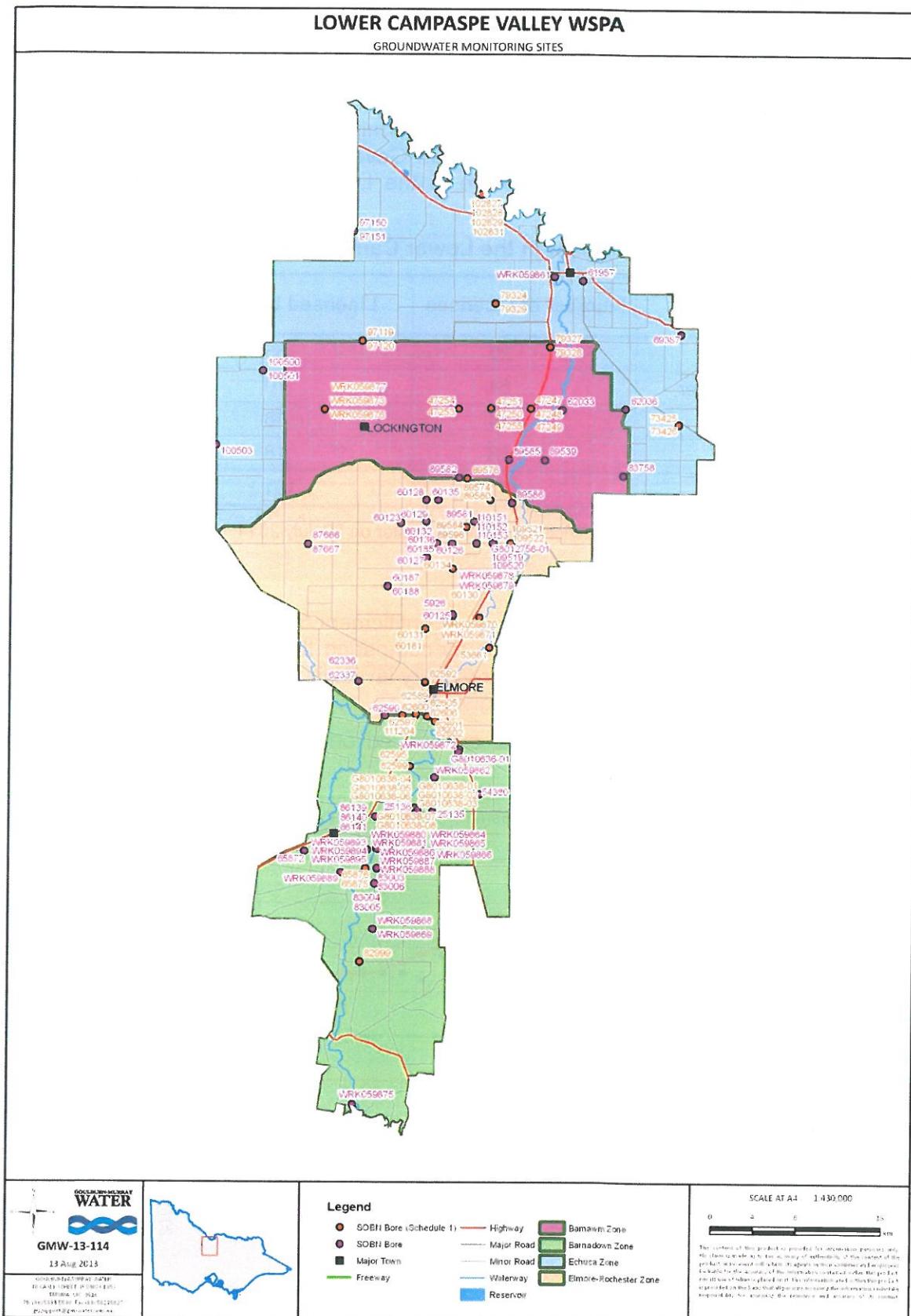
### 1.3 Groundwater Management Plan

The Plan was approved by the Minister for Water in accordance with section 32A(6) of the Act on 17 October 2012.

The objective of the Plan, as defined in section 32A(1) of the Act, is to make sure that groundwater resources of the WSPA are managed in an equitable manner so as to ensure the long term sustainability of those resources. More specifically, the Plan seeks to:

1. protect existing groundwater users and the environment by managing groundwater levels and the potential for change in groundwater salinity;
2. enable equitable development of groundwater resources to realise the potential for its use in the region; and
3. communicate the Plan's objectives, management rules and resource status with stakeholders and the wider community.

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 Plan prescriptions is presented in Appendix A.



**Figure 1 Lower Campaspe Valley Water Supply Protection Area State observation bores**

## 2 Groundwater management

### 2.1 Licence volume

The Minister for Water declared the Permissible Consumptive Volume to be 55,875 ML/year in March 2013 (Victorian Government Gazette, 2013). At 30 June 2014 the licence entitlement volume in the Lower Campaspe Valley WSPA was 55,875 ML (Table 1).

**Table 1 Licence entitlement in the Lower Campaspe Valley WSPA**

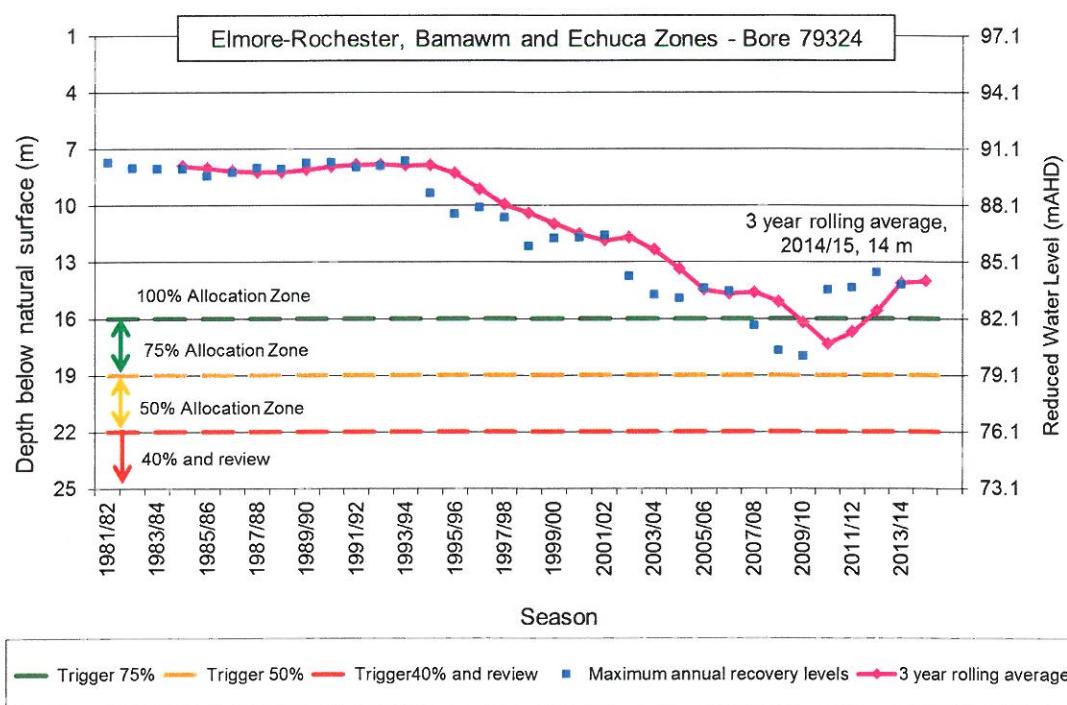
Zone	Number of Licences	Licensed bores	Licence volume (ML)
Barnadown	20	55	7,999
Elmore-Rochester	58	70	16,336
Bamawm	44	48	26,629
Echuca	18	18	4,911
<b>Total</b>	<b>140</b>	<b>191</b>	<b>55,875</b>

NOTE: Data extracted from the Victorian Water Register on 29 July 2014

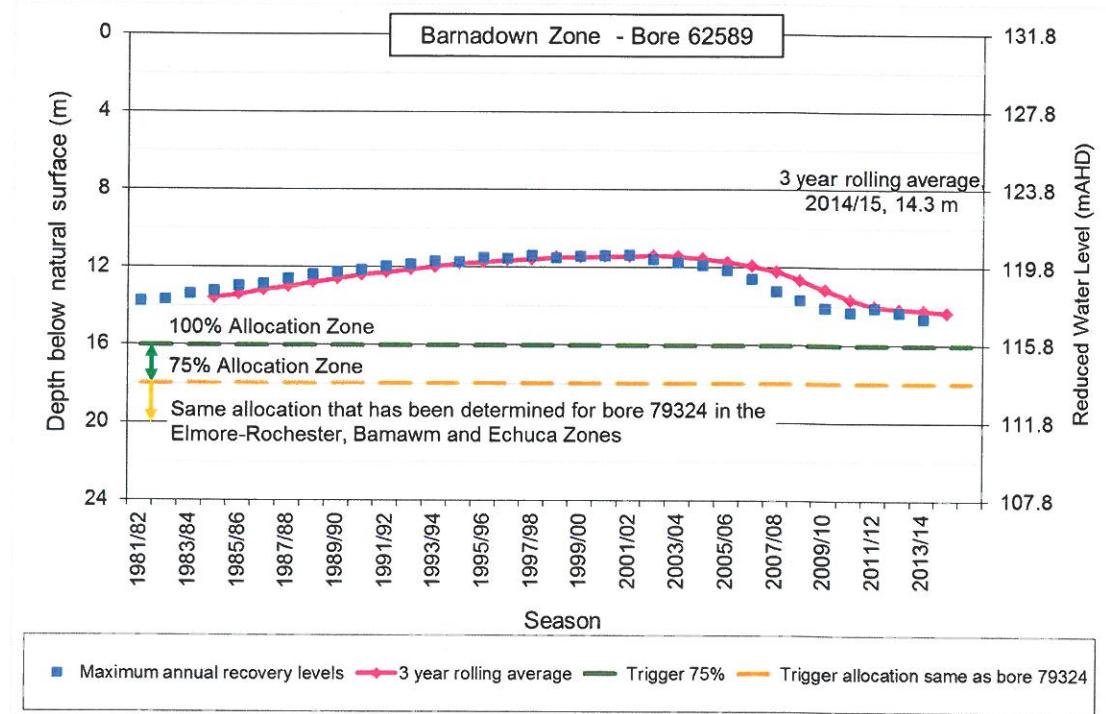
### 2.2 Groundwater allocations

Allocations are a percentage of licence entitlement that may be extracted in a given season. Allocations are determined by comparing the three year rolling average of the maximum annual groundwater recovery levels in bores 62589 and 79324 with the Plan trigger levels (Figure 2 and Figure 3).

Allocations of 100 per cent were announced on 1 July 2013 for all management zones for the 2013/14.



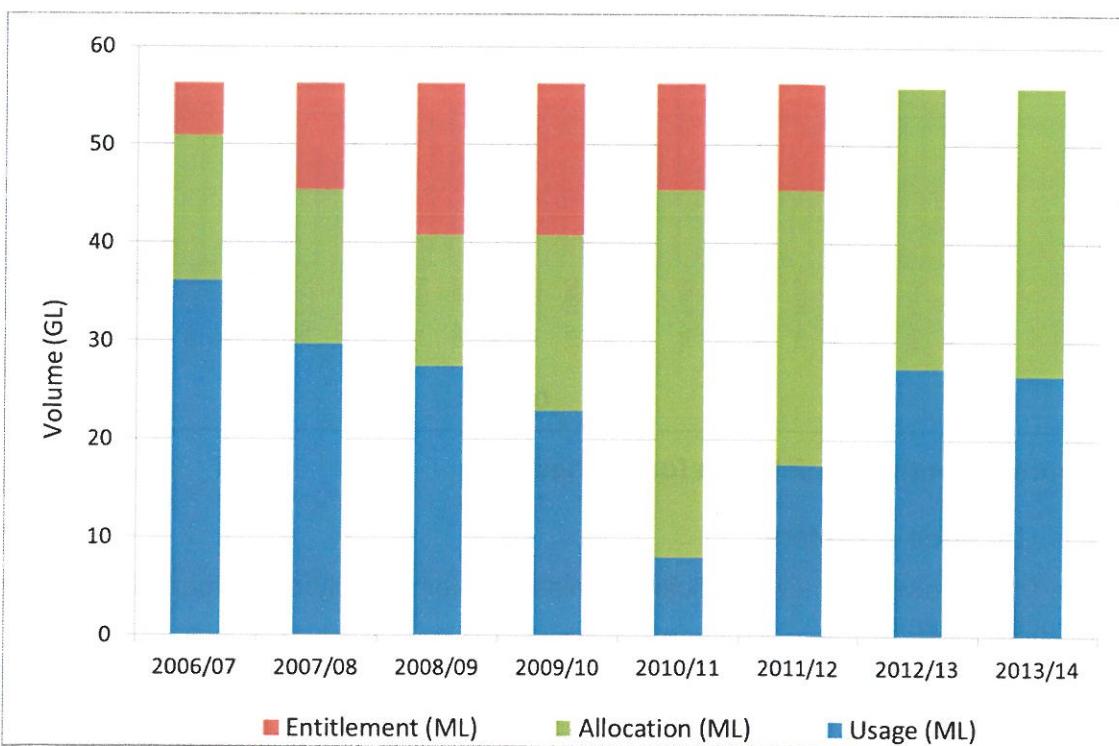
**Figure 2 Trigger levels to determine allocations in the Elmore-Rochester, Bamawm and Echuca Zones**



**Figure 3 Trigger levels to determine allocations in the Barnadown Zone**

## 2.3 Groundwater use

Metered use in the Lower Campaspe Valley WSPA in 2013/14 was 26,534 ML, which equates to 48 per cent of licence entitlement. This is within the range of historic use (Figure 4).



**Figure 4 Metered usage in the Lower Campaspe Valley WSPA**

Metered use was highest in the Bamawm Zone. However, licence holders in the Elmore-Rochester Zone used a greater percentage of licence entitlement (Table 2).

**Table 2 Metered usage in the Lower Campaspe Valley WSPA 2012/13**

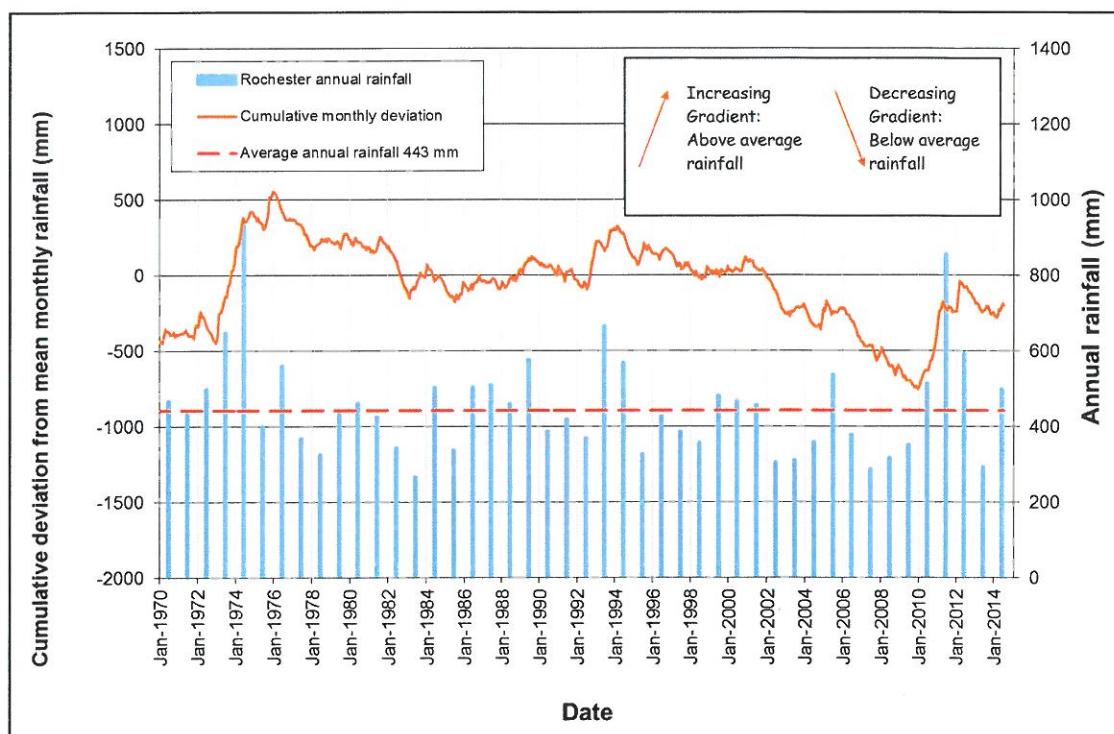
Zone	Metered use (ML)	% Licence entitlement
Barnadown	3,803	48%
Elmore-Rochester	9,358	57%
Bamawm	11,137	42%
Echuca	2,237	46%
<b>Total</b>	<b>26,535</b>	<b>48%</b>

NOTE: Data extracted from GMW Irrigation Planning Module 30 June 2014

## 2.4 Rainfall

Monthly rainfall data from the Bureau of Meteorology weather station at Rochester indicates annual rainfall during the 2013/14 season was above average.

Since high rainfall events in 2010 and 2011, the cumulative monthly deviation from the mean monthly rainfall has remained steady (Figure 5).



**Figure 5 Monthly rainfall data for Rochester**

## 2.5 Licence transfers

The Plan allows groundwater licence holders to temporarily or permanently transfer licence entitlement.

In 2013/14 there were 15 temporary transfers for a total of 1,861 ML (Table 3). While most temporary transfers were within zones, there was 622 ML transferred out of the Bamawm Zone into the Elmore-Rochester Zone (427 ML) and Echuca Zone (165 ML). One trade for 30 ML was to a licence holder outside of the WSPA.

There were three permanent transfers in the Lower Campaspe Valley WSPA for a total of 471 ML. This included a 300 ML permanent transfer from the Bamawm Zone to the Elmore-Rochester Zone. The additional two trades were traded within the Elmore-Rochester Zone.

**Table 3 Transfers in the Lower Campaspe Valley WSPA in 2013/14**

Zone	Temporary				Permanent			
	Transfer from		Transfer to		Transfer from		Transfer to	
	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)	No. of transfer	Volume (ML)
Barnadown	1	315	1	315	0	0	0	0
Elmore-Rochester	4	354	8	781	2	171	3	471
Bamawm	10	1,192	2	570	1	300	0	0
Echuca	0	0	3	165	0	0	0	0
<b>Total</b>	<b>15</b>	<b>1,861</b>	<b>14</b>	<b>1,831</b>	<b>3</b>	<b>471</b>	<b>3</b>	<b>471</b>

## 2.6 Carryover

Following an application from GMW, the Minister for Water declared that groundwater licence holders in the Lower Campaspe Valley WSPA are authorised to carry over unused entitlement up to 25 per cent of licence entitlement volume (Victorian Government Gazette, 2012).

The volume carried over into 2013/14 was 12,297 ML. At the conclusion of the 2013/14 season, groundwater licence holders in the WSPA had a total of 13,689 ML of entitlement available to carry over and use in the 2014/15 season.

## 2.7 Domestic and stock bores installed

GMW received nine bore completion reports for domestic and stock purposes in the Lower Campaspe Valley WSPA during the 2013/14 season.

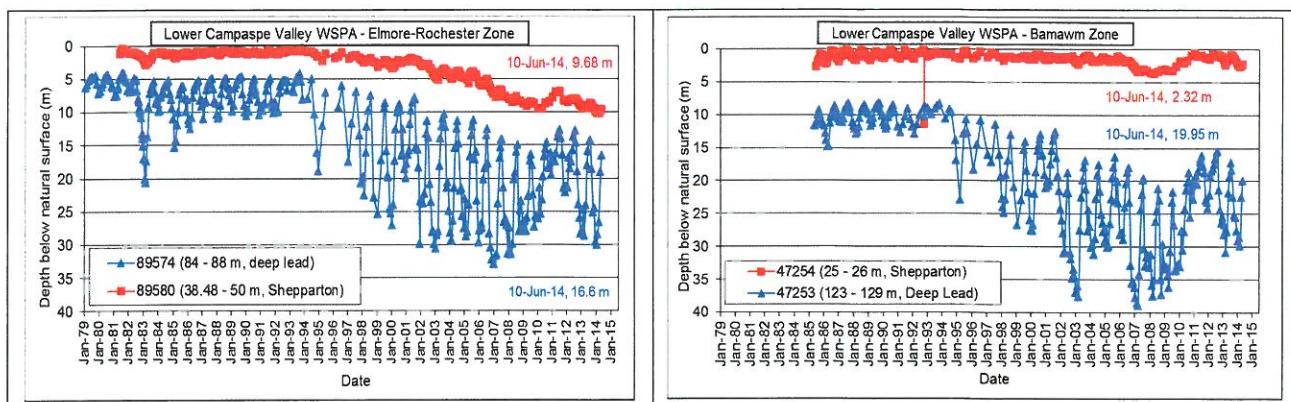
### 3 Monitoring program

#### 3.1 Groundwater levels

The Department of Environment and Primary Industries (DEPI) monitored groundwater levels in more than 100 State observation bores across the Lower Campaspe Valley WSPA on a quarterly basis (Figure 1). GMW conducted monthly infill monitoring of 60 State observation bores in accordance with Schedule 1 of the Plan (Appendix B).

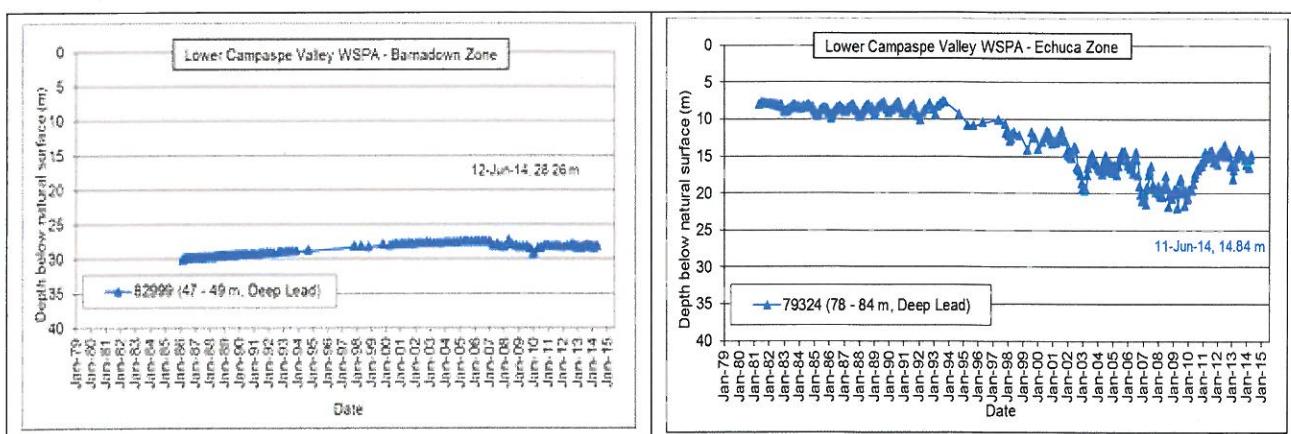
Groundwater level monitoring indicates that seasonal recovery is strong and levels are within observed historical ranges.

In the Elmore-Rochester and Bamawm Zones, groundwater recovery levels declined in 2013/14 compared to recent years. Seasonal drawdown of up to 15 m was observed in intensively pumped areas (Figure 6).



**Figure 6 Groundwater levels in the Elmore-Rochester and Bamawn Zones**

Groundwater levels remained relatively stable across the Barnadown and Echuca zones in 2013/14, with seasonal drawdown of up to 3 m observed in some areas (Figure 7).



**Figure 7 Groundwater levels in Barnadown and Echuca Zones**

#### 3.2 Groundwater salinity

##### 3.2.1 Sampling of State observation bores

Groundwater samples from nested State observation bores were sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. Nested sites feature two or more monitoring bores in close proximity, each monitoring a

different aquifer. The State observation bores used for water quality testing are located in the areas of intensive groundwater pumping west of Rochester and at the northern margins of the Lower Campaspe Valley WSPA.

Groundwater salinity results are presented in Table 4. The results have been compared to earlier measurements of groundwater salinity (Appendix C). The results are similar to recent years, which suggest that results for bores 102828 and 73426 in the early 1990s may have been erroneous. Periodic analysis of groundwater quality will enable any trends to be identified with greater confidence.

**Table 4 Groundwater salinity levels in key monitoring bores (March 2014)**

Bore number	Zone	Screen depth below natural surface (m)	Salinity (EC $\mu$ S/cm)
102827	Echuca	108 - 114	4,490
102828	Echuca	160 - 167	9,900
102829	Echuca	70 - 74	4,160
73425	Echuca	87 - 89	10,900
73426	Echuca (SIR)	6 - 18	9,190
WRK059873	Bamawm	82 - 87	3,630
WRK059876	Bamawm	91 - 97	3,020
WRK059877	Bamawm	34 - 37	3,910
47250	Bamawm	73 - 85	1,810
47251	Bamawm	22 - 27	3,820
89584	Elmore-Rochester	84 - 88	5,490
89596	Elmore-Rochester	2 - 14	Bore dry

### 3.2.2 Groundwater user salinity sampling

GMW sent 207 sample bottles and a reply paid envelope to licence holders, and domestic and stock users upon request, to collect a groundwater sample from their bore for analysis. There were 44 (21 per cent) samples returned for analysis.

GMW measured the groundwater salinity, advised the bore owner of the result and recorded the result in the State groundwater database. The results are shown spatially in Figure 8 and suggest that groundwater salinity level is less saline between Goornong and Elmore and more saline in the northern parts of the Lower Campaspe Valley WSPA.

A higher and more consistent sample return rate would assist with spatially assessing any changes in groundwater salinity over time. Groundwater users are strongly encouraged to participate in this program so that they can identify any changes in groundwater salinity at their bore that might impact on their business.

### 3.2.3 Targeted sampling of licensed bores

GMW has enlisted six licence holders to participate in the targeted groundwater salinity monitoring program to assist with future analysis. A total of 10 bores were been sampled in 2013/14. This program seeks to ensure that samples are consistently collected each year from bores located in strategic locations that will provide a reliable data set to aid in understanding any changes in groundwater salinity over time.

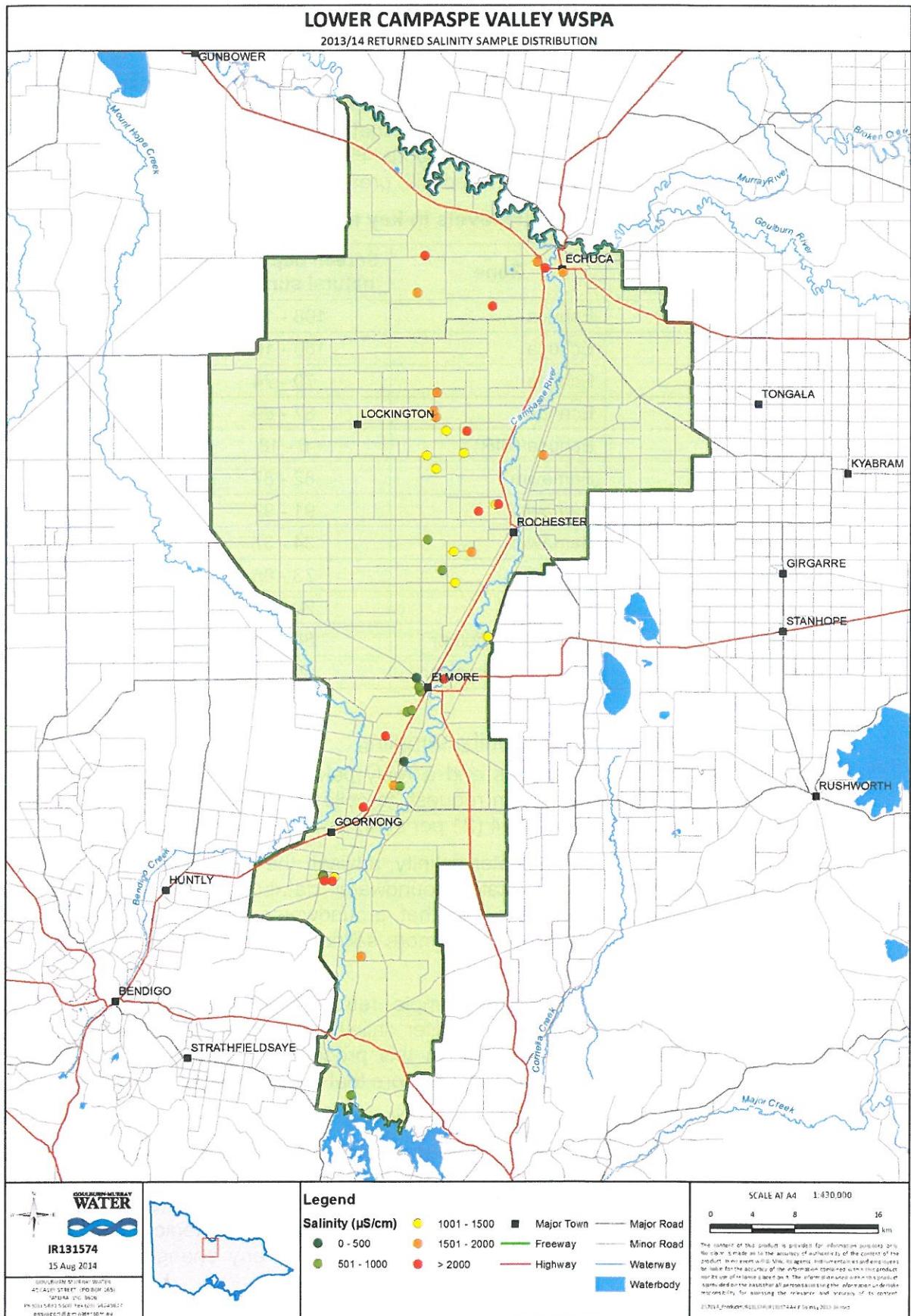


Figure 8 Location of returned samples analysed for groundwater salinity

### 3.3 Metering

All operational bores in the Lower Campaspe Valley WSPA were metered as of 30 June 2014. There were 38 meters which had maintenance undertaken on them across the WSPA (Table 5). All meters were read at least twice throughout the 2013/14 season, with a total of 290 meter reads undertaken.

**Table 5 Metering activities in the Lower Campaspe WSPA in 2013/14**

	Year to 30 June 2014
Number of meters installed	14
Meters which had maintenance	38
Total number of meters in WSPA	145
Number of meter reads in season	290

### 3.4 Licence compliance

There were no prosecutions or convictions relating to groundwater matters in the area.

There were four incidents where the transfer of licence entitlement was approved subsequent to the take and use of water. These incidents have been investigated and GMW has taken action to encourage users to trade earlier in the season to ensure compliance. GMW manages compliance in accordance with the National Framework for Compliance and Enforcement of Systems for Water Resource Management (DSEWPC, 2012).

## **4 Future management considerations**

### **4.1 Groundwater Reference Committee**

GMW appointed the former Lower Campaspe Valley WSPA Consultative Committee to be a Groundwater Reference Committee to consult on the Plan's implementation.

The Groundwater Reference Committee met on 23 October 2013. Key outcomes of the meeting included:

- GMW to prepare fact sheet on groundwater trading
- GMW to consider customer meeting in August each year
- GMW to follow up on options to assist with facilitating groundwater trading
- GMW to send out sample bottles earlier than last year, preferably by Christmas
- Establish link between Groundwater Reference Committee and GMW Water Services Committee

### **4.2 SOBN review**

The State Observation Bore Network (SOBN) is owned and managed by the Department of Environment and Primary Industries (DEPI) who currently monitor around 2,300 bores across Victoria on a quarterly basis to provide valuable information on groundwater resources.

GMW use the SOBN to collect additional monitoring data from selected bores across its region to inform resource management decisions.

DEPI recently undertaken a detailed review of the SOBN. The aim of the review was to identify opportunities to make the network more cost effective, and to reassess management arrangements. Following DEPI's review of the network, GMW has been asked to review its own monitoring priorities and future monitoring needs.

GMW will seek its customers views on future groundwater monitoring needs through the Water Services Committees and Groundwater Reference Committees.

## **5 References**

Australian Government Department of Sustainability, Environment, Water, Population and Communities, 2012. National Framework for Compliance and Enforcement of Systems for Water Resource Management. Viewed 28 August 2014, <http://www.environment.gov.au/system/files/resources/d4367a3b-28a9-430d-a869-2effbda8a447/files/ris-water-compliance-enforcement.pdf>

Goulburn-Murray Water, 2013. Lower Campaspe Valley Water Supply Protection Area Groundwater Targeted licensed bore sampling. Unpublished report by Goulburn-Murray Water, Tatura. Document reference number 3503975.

Lower Campaspe Valley Water Supply Protection Area Groundwater Management Plan October 2013. Department of Environment and Primary Industries, Melbourne

Victorian Government, 2012. Victorian Government Gazette No. G43 25 October 2012. Victoria Government, Melbourne

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

## Appendix A – Assessment of Activities Against Plan Prescriptions

Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant
<p>Prescription 1: Triggers and Restrictions</p> <p>By 1 July each year the Corporation will:</p> <ul style="list-style-type: none"> <li>(a) Determine the rolling average of the maximum annual groundwater recovery levels from the preceding three seasons for the relevant bore, or its replacement, and announce a corresponding allocation for the subsequent season for zones as detailed in the Plan.</li> <li>(b) Announce seasonal allocations by listing them on its website; sending letters to all licence holders and placing public notices in local newspapers.</li> <li>(c) Not apply restrictions to any water authorised to be taken in a subsequent water season (carryover).</li> </ul>	<p>GMW determined the rolling average of the maximum annual groundwater recovery levels from the preceding three seasons and announced allocations of 100 per cent in all management zones on 1 July 2014.</p> <p>GMW announced allocations by listing them on their website, sending letters to all licence holders and placing public notices in local newspapers.</p>	Yes
<p>Prescription 2: Trading rules</p> <p>The Corporation may approve a transfer of a groundwater licence under section 62 of the Water Act 1989 provided section 53 matters have been considered and it accords with the following:</p> <ul style="list-style-type: none"> <li>(a) Transfer of licence entitlement can occur between zones as specified in the Plan</li> <li>(b) Despite (a) above, if the groundwater level falls to a depth of 18 metres below the natural surface in bore 62589 a licence may be transferred between the Barnadown Zone and other zones</li> <li>(c) Limits on the maximum licence volume in each zone as specified in the Plan are not exceeded.</li> </ul>	<p>GMW processed 15 temporary transfers for a total of 1,861 ML and three transactions for permanent transfers for a total of 1,041 ML 2013/14.</p> <p>GMW processed all groundwater licence applications in accordance with Prescription 2(a) and (c).</p>	Yes
<p>Prescription 3: Intensive groundwater pumping</p> <p>The Corporation may approve an application to take and use groundwater under section 51 or a transfer under section 62 of the Water Act 1989 provided that section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> <li>(a) For a permanent transfer, the total licence entitlement of bores within a 4 km radius of an applicant's bore is less than 7.5 GL/yr.</li> </ul>	<p>GMW processed all groundwater licence applications in accordance with Plan prescription 3.</p>	Yes

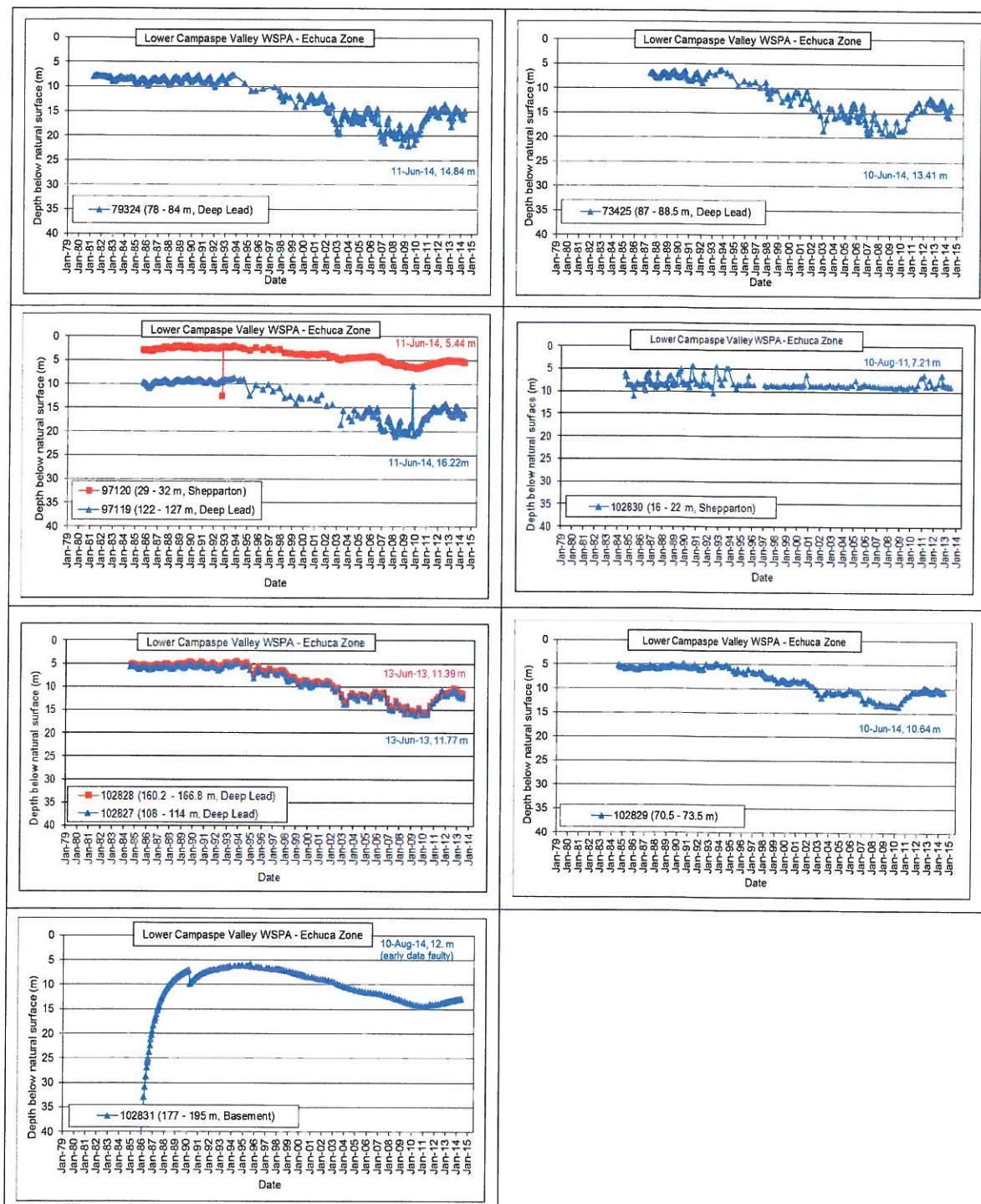
<ul style="list-style-type: none"> <li>(b) Where summed licence entitlement exceed the limits specified in (a) above, then a licence holder's usage is to be limited to 125 per cent of entitlement in one water season whether it occurs through either temporary transfer of entitlement or carryover.</li> <li>(c) Usage may exceed 125 per cent of entitlement as specified in (b) above through temporary or permanent transfer of entitlement from others within the 4 km radius.</li> </ul>	<p><b>Prescription 4: Monitoring groundwater levels</b></p> <p>The Corporation will:</p> <ul style="list-style-type: none"> <li>(a) Obtain monthly groundwater level readings (up to 480 readings per season) from key State observation bores from the list in Schedule 1, or their replacement, where practicable.</li> <li>(b) Install at least one new observation bore in the Coonambidgal Formation to better inform groundwater interaction with the Campaspe River.</li> </ul>	<p>GMW obtained monthly groundwater level readings from bores listed in Schedule 1 of the Plan where practicable.</p> <p>A new observation bore is still to be installed in the Coonambidgal Formation.</p>	<p>GMW provided a sample bottle to licence holders and domestic and stock users upon request. GMW measured the groundwater salinity in returned samples, advised bore owners of the result and entered the results into the State groundwater database.</p> <p>GMW enlisted six land holders to participate in the target sampling of licensed bores. A total of 10 bores were sampled in 2013/14. .</p> <p>GMW collected groundwater samples from nested State observation bores identified in Schedule 1 where practicable and sent them to a NATA accredited laboratory for analysis.</p> <ul style="list-style-type: none"> <li>(iii) Measuring groundwater salinity in all returned sample bottles and providing the bore owner with the results.</li> <li>(iv) Entering the groundwater salinity results into the State groundwater database.</li> </ul> <p>(b) Establish a targeted groundwater salinity monitoring program to collect and analyse groundwater samples from selected licensed bores each year.</p> <p>(c) Collect groundwater samples from selected State observation bores identified in Schedule 1 where practicable, or their replacement</p>
<p><b>Prescription 6: Metered licensed use</b></p>			<p>All operational licensed bores are metered.</p>

The Corporation will: <ul style="list-style-type: none"> <li>(a) Ensure that a meter is fitted to all operational licensed bores.</li> <li>(b) Read each meter at least once a year and enter readings into the Water Register.</li> </ul>	Meters were read in February/March and May/June 2014 and data entered into the Water Register.
Prescription 7: Plan implementation The Corporation will: <ul style="list-style-type: none"> <li>(a) Post on its website the Plan; annual reports and newsletters; groundwater levels; and rolling average for trigger bores.</li> <li>(b) Mail a newsletter in October each year to groundwater licence holders, and domestic and stock users upon request, in the Lower Campaspe Valley WSPA and relevant agencies stating the resource position and summarising outcomes in the annual report.</li> <li>(c) Meet with the Groundwater Reference Committee at least once each year to report on the groundwater resource status and implementation of the Plan and consider the need to review the Plan.</li> <li>(d) Undertake a comprehensive review of the Plan after five years from</li> </ul>	<p>GMW has posted on their website the Plan, annual reports, groundwater level and rolling average for trigger bores.</p> <p>GMW mailed out a newsletter to groundwater licence holders, and domestic and stock users upon request, in December 2013 to report on the groundwater resource status and implementation of the Plan.</p> <p>GMW met with the former Consultative Committee appointed to draft the Plan in October 2013 and engaged them as the Groundwater Reference Committee to consult on Plan implementation.</p>

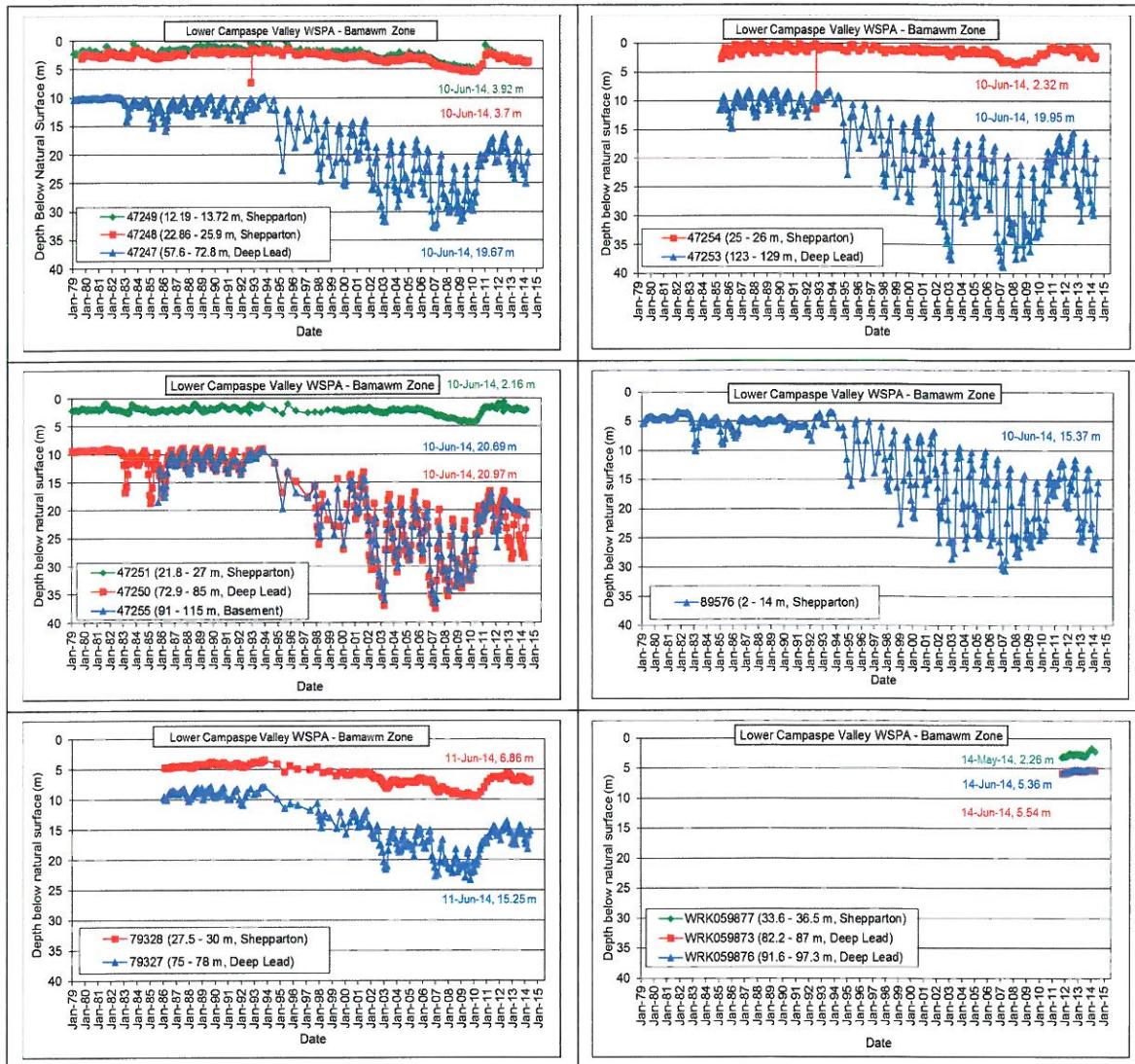
## Appendix B – Hydrographs

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

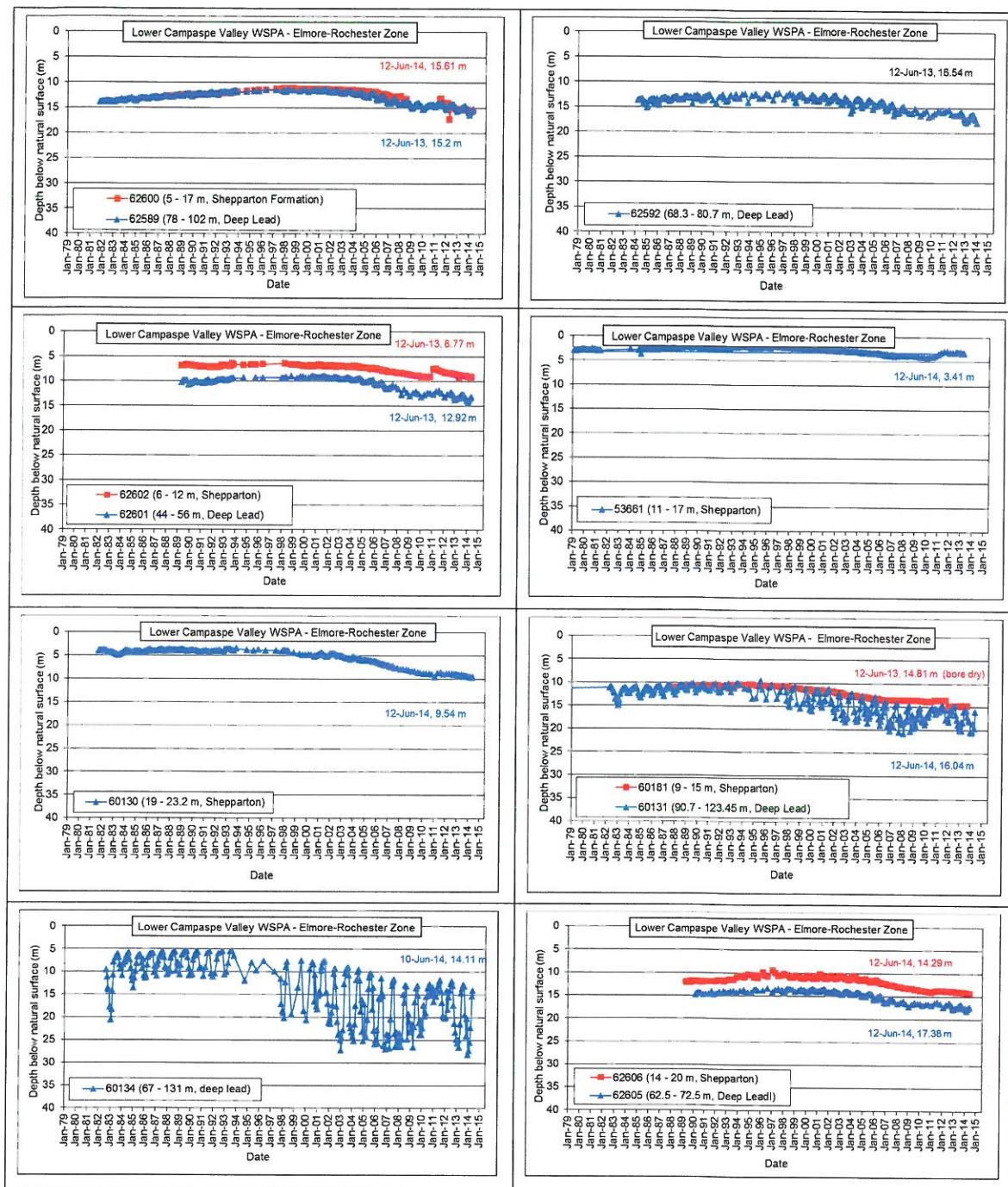
### Echuca Zone

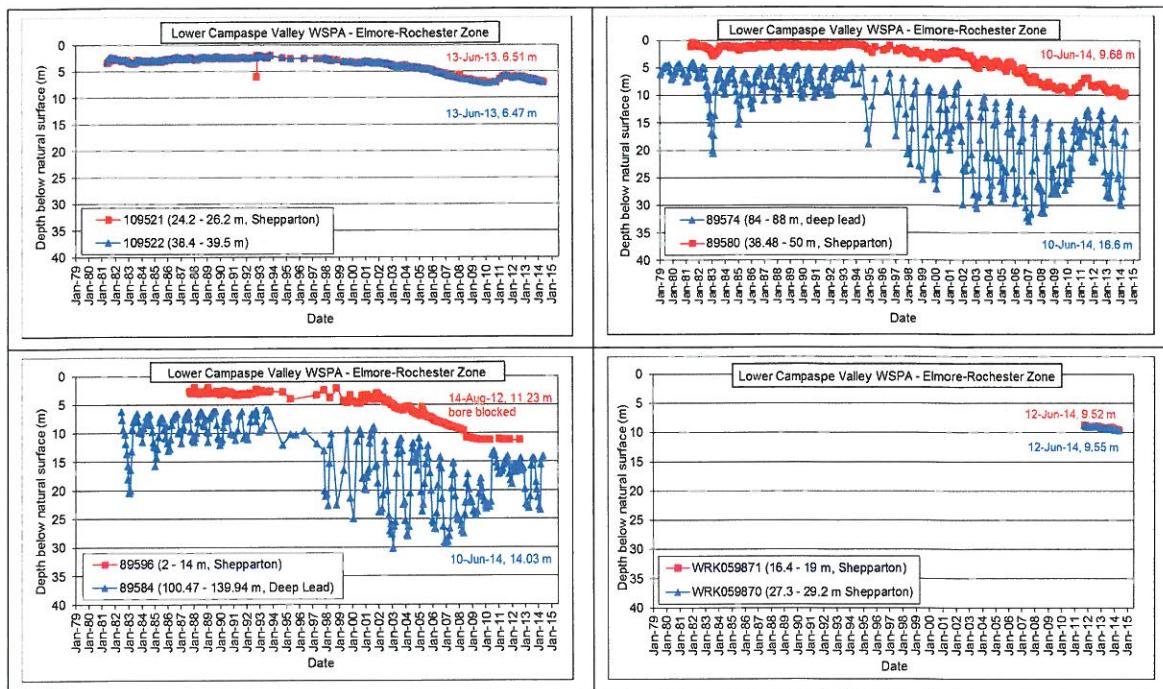


## Bamawm Zone

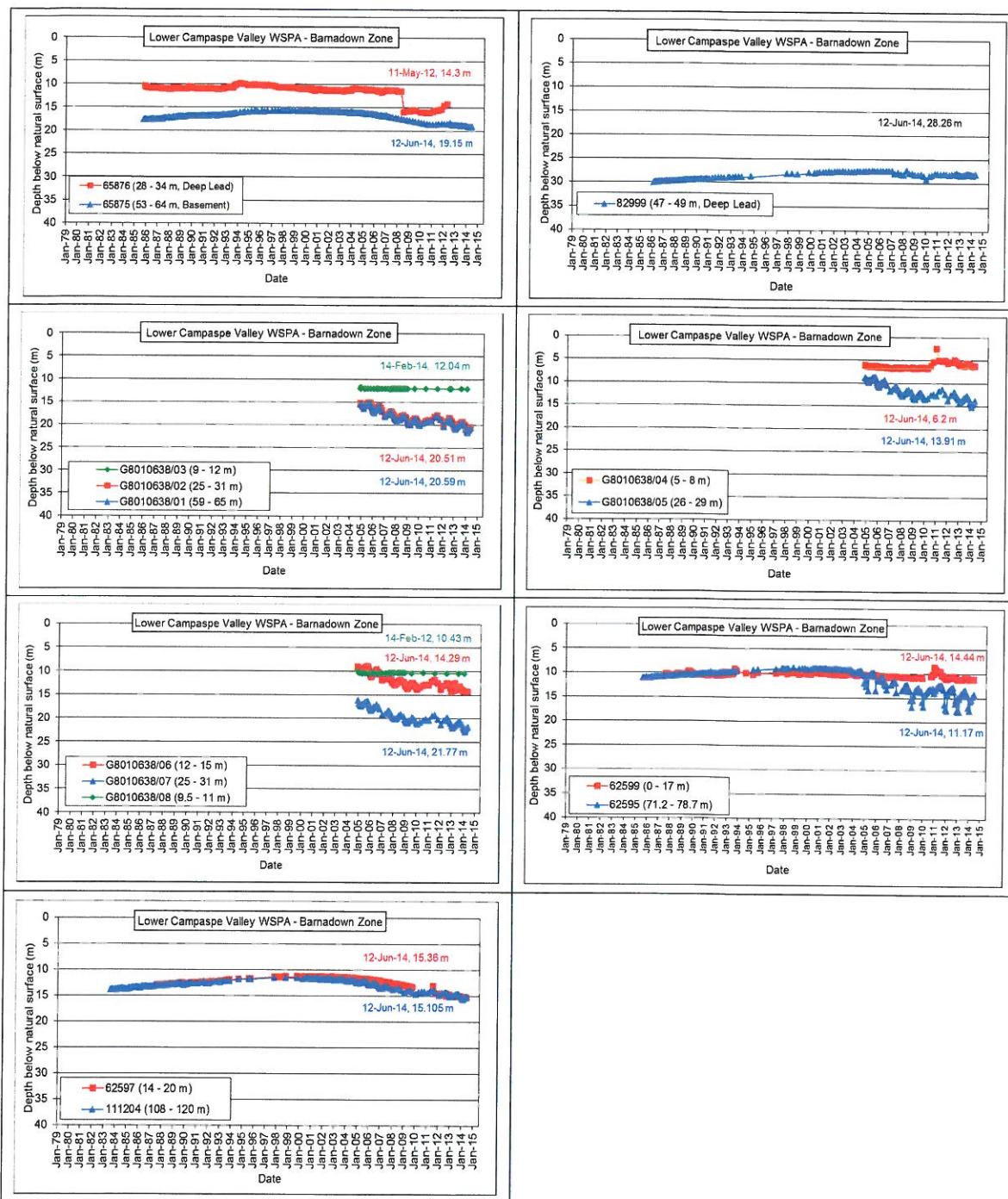


## Elmore-Rochester Zone



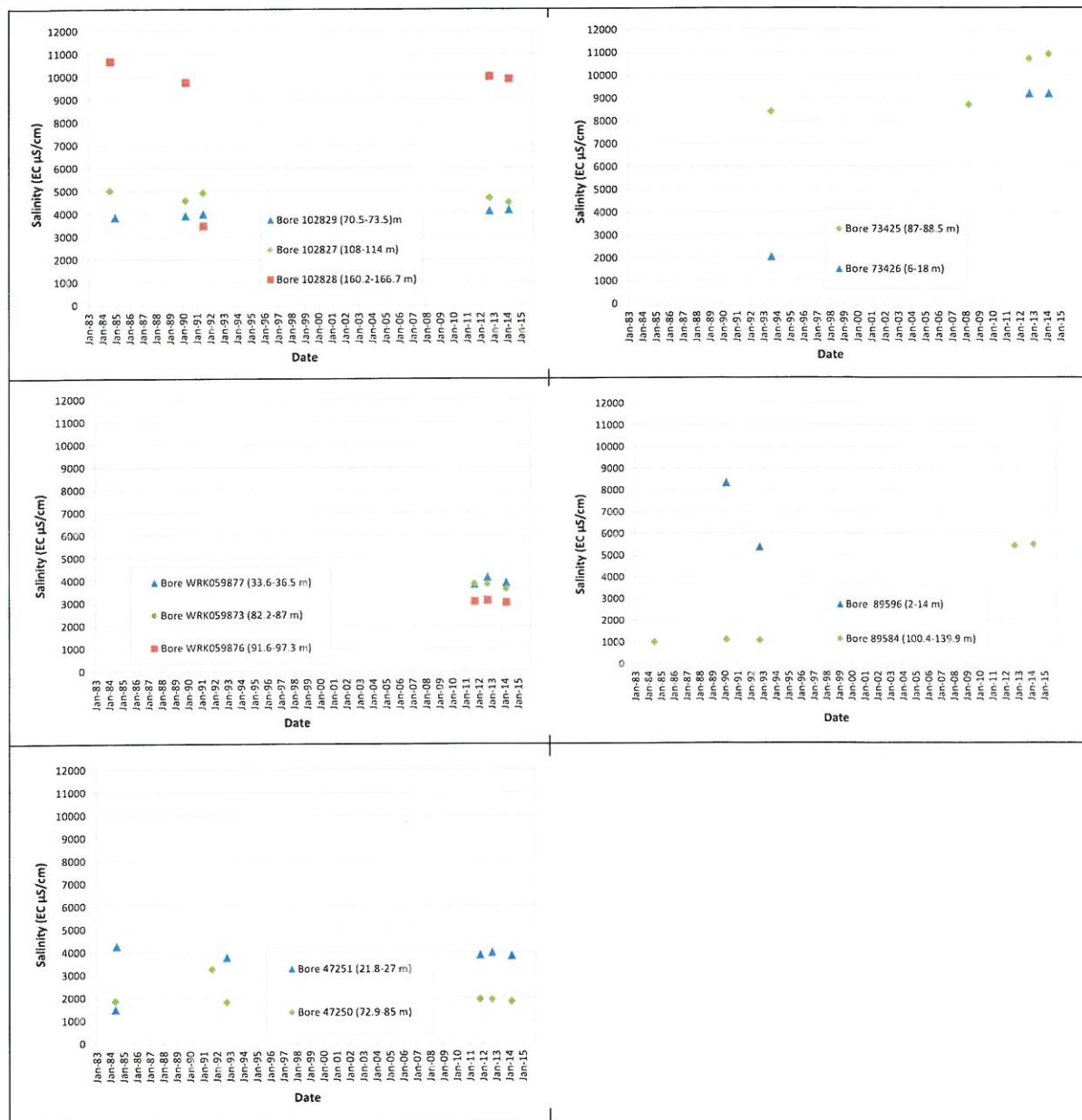


## Barnadown Zone



## Appendix C – Groundwater Chemistry

Historical groundwater salinity from State observation bores listed in Schedule 1 of the Plan



### Groundwater quality results from State observation bores listed in Schedule 1 of the Plan

Analyte	Bore	102828	102827	102829	WRK 059873	WRK 059876	WRK 059877	47251	47250	73425	73426	89584
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	72	60	181	138	170	152	91	44	195	45	<1
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	36	55	<1	<1	<1	<1	40	32	<1	<1	<1
Hydroxide Alkalinity as CaCO <sub>3</sub>	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Alkalinity as CaCO <sub>3</sub>	mg/L	108	115	181	138	170	152	131	77	195	45	<1
Sulfate as SO <sub>4</sub> - Turbidimetric	mg/L	108	<1	295	163	4	196	160	8	559	852	3
Chloride	mg/L	3410	1330	1070	1020	872	1050	1080	550	3810	3000	1850
Calcium	mg/L	19	2	35	69	43	52	10	6	127	117	89
Magnesium	mg/L	206	53	82	101	62	89	54	24	284	223	131
Potassium	mg/L	14	10	8	10	8	12	13	6	13	8	6
Sodium	mg/L	1660	788	678	518	424	626	684	293	1850	1600	339
Arsenic	mg/L	<0.001	0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	<0.001	0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.002	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.004	0.002
Iron	mg/L	0.14	0.2	0.07	6.1	0.91	<0.05	0.13	0.12	0.3	0.12	512
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.103	0.038	0.03	0.408	0.141	0.003	0.043	0.024	0.139	0.007	21.1
Nickel	mg/L	0.001	<0.001	0.089	0.002	0.003	0.002	<0.001	<0.001	0.001	0.004	0.006
Zinc	mg/L	<0.005	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	0.022	<0.005	0.096
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Ammonia as N	mg/L	0.43	0.11	<0.01	0.14	0.18	0.02	0.31	0.38	0.18	0.03	0.2
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	0.02	<0.01	0.01	0.02	0.02	0.78	<0.01	0.01	<0.01	2.22	<0.01
Nitrite + Nitrate as N	mg/L	0.02	<0.01	0.01	0.02	0.02	0.78	<0.01	0.01	<0.01	2.22	<0.01
Total Kjeldahl Nitrogen as N	mg/L	0.5	0.3	<0.1	0.6	1.9	0.2	2.5	2.9	2.2	2	0.4
Total Nitrogen as N	mg/L	0.5	0.3	<0.1	0.6	1.9	1	2.5	2.9	2.2	4.2	0.4
Total Phosphorus as P	mg/L	0.03	0.02	0.03	0.05	0.35	0.05	0.04	0.05	0.04	0.05	0.03
Ionic Balance	%	5.32	1.06	2.26	0.56	4.05	0.95	1.96	6.34	5.36	4.72	5.11
Total Anions	meq/L	101	39.8	39.9	34.9	28.1	36.7	17.2	123	103	52.2	
Total Cations	meq/L	90.5	39	38.2	34.5	25.9	37.5	35	15.2	110	94	57.9
Total Organic Carbon	mg/L	2	<1	1	2	4	<1	<1	2	3	1	2

