Mid-Loddon Groundwater Management Area Local Management Rules

Annual Report

For year ending 30 June 2017

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Foreword

Goulburn–Murray Water (GMW) is pleased to present the annual report for the Mid-Loddon Groundwater Management Area Local Management Rules (the Rules) for the 2016/17 season.

This report provides an overview of the groundwater management activities in the Mid-Loddon Groundwater Management Area and documents the successful operation under the Rules in the 2016/17 season.

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

Matt Pethybridge

MANAGER GROUNDWATER AND STREAMS

Date 2/10/2017

Executive summary

The Mid-Loddon Groundwater Management Area (GMA) Local Management Rules (the Rules) were endorsed by Goulburn-Murray Water in July 2009. The 2016/17 season marks the eighth year of operation under the Rules.

Allocations were 100% in all zones of the Mid-Loddon GMA in 2016/17. Metered use was 12,285 ML, which is 36% of licence entitlement.

There were 5 temporary transfers for a total of 450 ML and 1 permanent transfer for a total of 2 ML/yr in 2016/17. All of the temporary transfers occurred in the Laancoorie-Serpentine Zone and the permanent transfer occurred in the Moolort Zone.

Licence holders in the Mid-Loddon GMA are entitled to carryover a maximum of 30% of their licence entitlement. A total of 9,913 ML has been carried over into 2017/18.

Groundwater recovery levels have fallen since the wet conditions experienced in 2010/11, but are within historical ranges.

Groundwater monitoring and metering programs continue to be successfully implemented to support the objectives of the Rules.

Contents

1 Introduction

1.1 Purpose

This annual report has been prepared to meet requirements of the Mid-Loddon Groundwater Management Area (GMA) Local Management Rules (the Rules) (GMW, 2009).

This report provides an overview of groundwater management activities undertaken in accordance with the Rules from 1 July 2016 to 30 June 2017.

1.2 Groundwater Management Area

The Mid-Loddon GMA extends from Tullaroop Reservoir in the south to Mitiamo in the north, and includes the townships of Carisbrook, Bridgewater and Serpentine.

The Mid-Loddon GMA incorporates groundwater resources to all depths.

There are three management zones in the Mid-Loddon GMA, which are the Moolort, Laanecoorie-Serpentine and Jarklin Zones (Figure 1).

1.3 Local Management Rules

The Local Management Rules were approved for implementation on 1 July 2009.

The Rules aim to ensure groundwater resources in the Mid-Loddon GMA are managed in an equitable and sustainable manner. More specifically, the Rules seek to:

1. provide all groundwater users with access to the resource, including domestic and stock users;
2. enable development of the groundwater resources to realise the potential for its use in the region;
3. provide environmental benefits through management of groundwater resources and maintain the integrity of the aquifer system;
4. manage groundwater interference and intensively pumped areas to protect existing authorised users and the environment from unacceptable drawdown levels;
5. establish transparent trigger levels and restrictions;
6. provide mechanisms such as transfer of licence entitlement and carryover to allow flexible and adaptive management in response to changing demands, such as climatic conditions; and
7. establish an effective monitoring program and provide periodic communications that will inform groundwater users of the status of the resource.

Goulburn-Murray Water (GMW) is responsible for the implementation of the rules. An assessment of GMW's activities against the Rules is presented in Appendix A.

A copy of the rules can be downloaded from the GMW website http://www.g-mwater.com.au/.

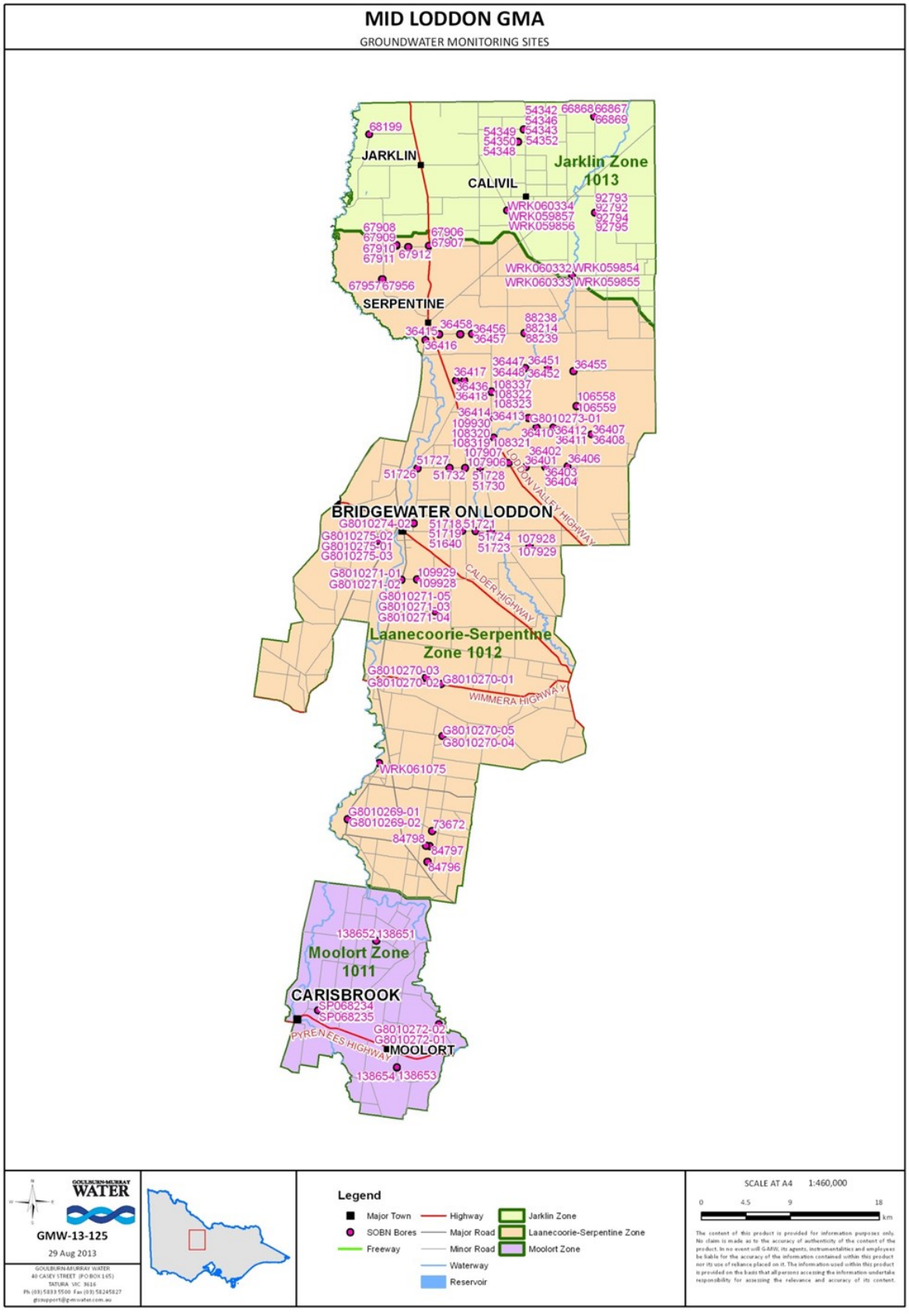


Figure 1 Mid-Loddon Groundwater Management Area

2 Groundwater management

2.1 Licence volume

The Minister for Water declared the Permissible Consumptive Volume in the Mid-Loddon GMA to be 34,037 ML/year in March 2013 (VGG, 2013).

At 30 June 2017 the licence volume in the Mid-Loddon GMA was 33,927.1 ML/year (Table 1).

Table 1 Licence entitlement in the Mid-Loddon GMA

Zone	Licences	Licensed bores	Licence volume (ML)
Moolort	23	30	3,845.4
Laanecoorie-Serpentine	65	78	27,234.7
Jarklin	15	18	2,847
Total	103	126	33,927.1

NOTE: Data extracted from the Victorian Water Register 30 June 2017

Licence entitlement as at 30 June 2016 was 33,927.1 ML/yr, and remained unchanged in 2016/17

2.2 Groundwater allocations

Allocations are a percentage of licence entitlement that may be extracted in a given season. They are determined by comparing the three year rolling average of the annual maximum groundwater recovery levels from State observation bore 88214 against the trigger level (Figure 11).

In September 2016 an allocation of 100% was announced for all groundwater licence holders in the Mid-Loddon GMA for 2016/17.

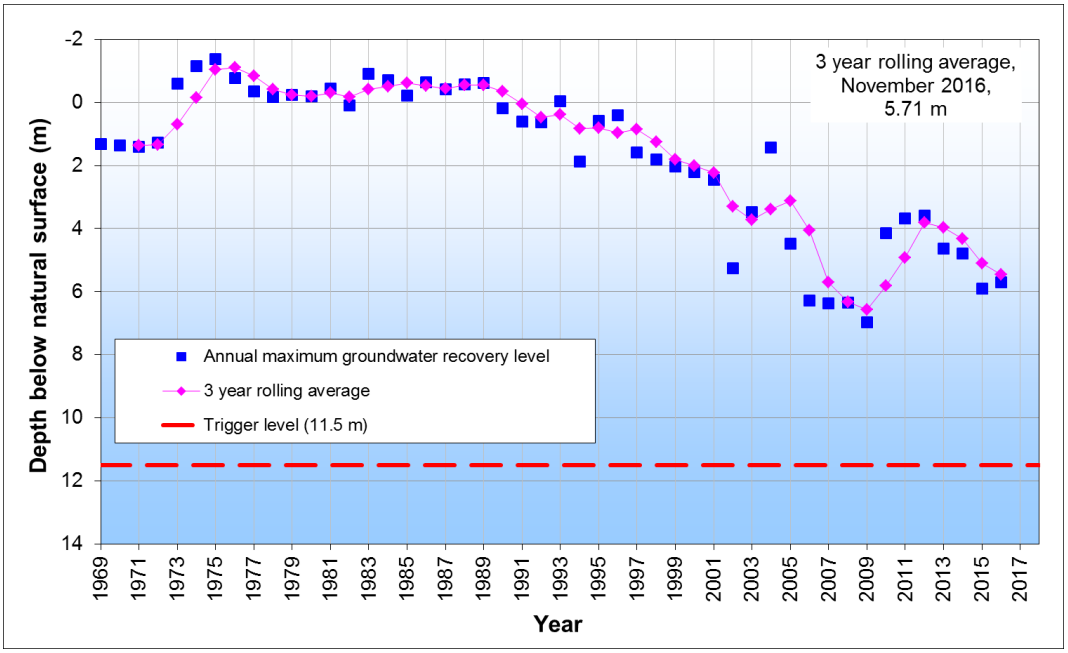


Figure 2 Groundwater levels in bore 88214 compared to the trigger level

2.3 Groundwater use

Metered use in the Mid-Loddon GMA in 2016/17 was 12,285.2ML, or 36% of licence entitlement. This is less than is used on average (Figure 3).

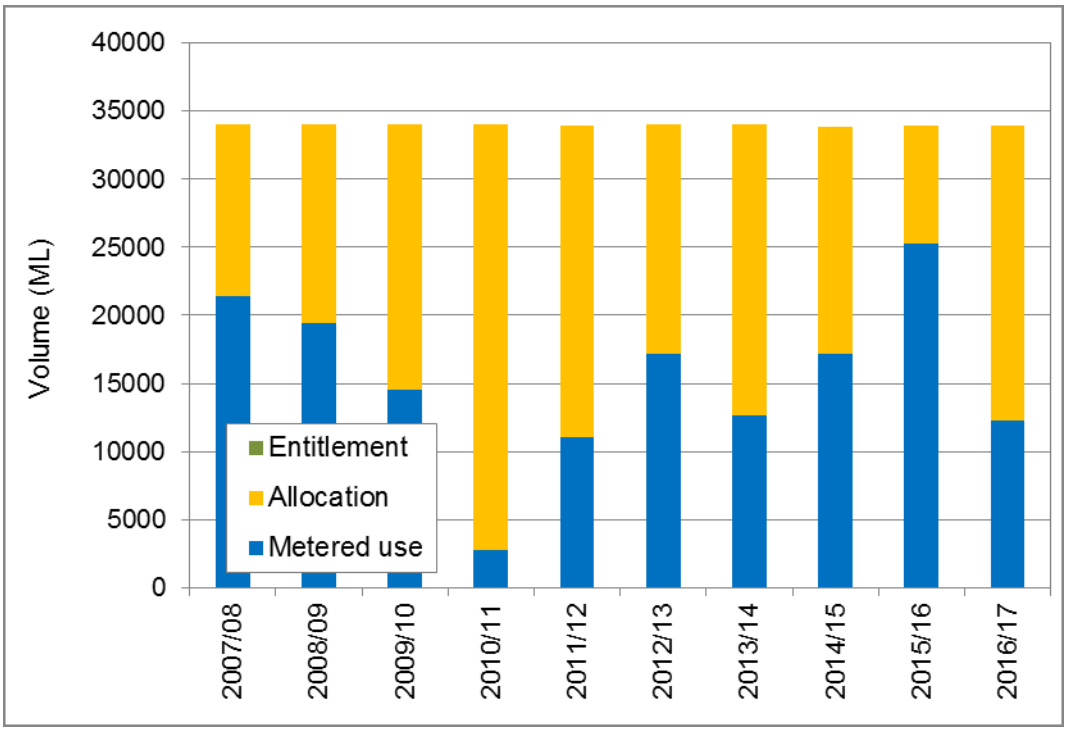


Figure 3 Metered use in the Mid-Loddon GMA

Metered use was highest in the Laanecoorie-Serpentine Zone, where most of the entitlement is held. Licence holders in the Moolort Zone used the greatest percentage of licence entitlement (Table 2).

Table 2 Metered use in the Mid-Loddon GMA in 2016/17

Zone	Licence volume (ML)	Metered use (ML)	% Licensed volume used
1011 Moolort	3,845.4	1,800.9	47%
1012 Laanecoorie-Serpentine	27,234.7	9,788.9	36%
1013 Jarklin	2,847.0	695.4	24%
Total	**33,927.1**	**12,285.2**	**36%**

2.4 Rainfall

Rainfall data from the Bureau of Meteorology (BoM) weather station at Bridgewater indicates that rainfall has generally been below average since the Rules have been implemented (Figure 4). Notable exceptions include the high rainfall events in 2010/11 which resulted in widespread flooding. Above average rainfall was also recorded in 2016/17.

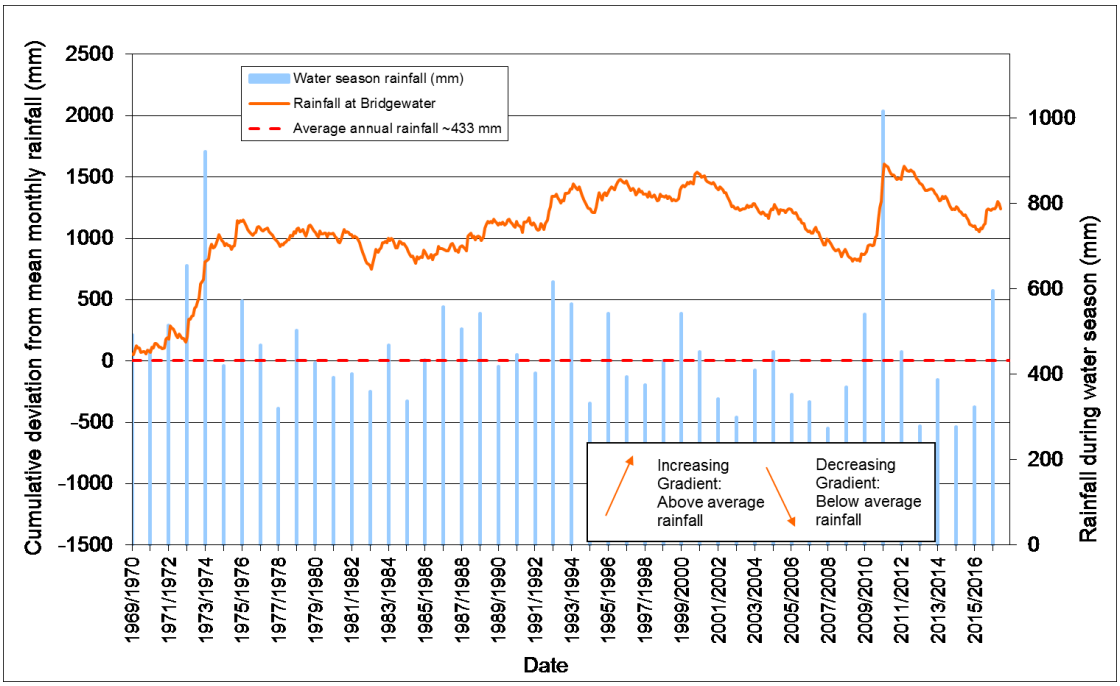


Figure 4 Monthly rainfall data for Bridgewater Post Office (BoM station 081058)

2.5 Transfer of entitlement

The Rules allow groundwater licence holders to temporarily or permanently transfer licence entitlement.

There were 5 temporary licence transfers for a total of 450 ML; and 1 permanent licence transfer for 2 ML/yr in 2016/17 (Figure 5).

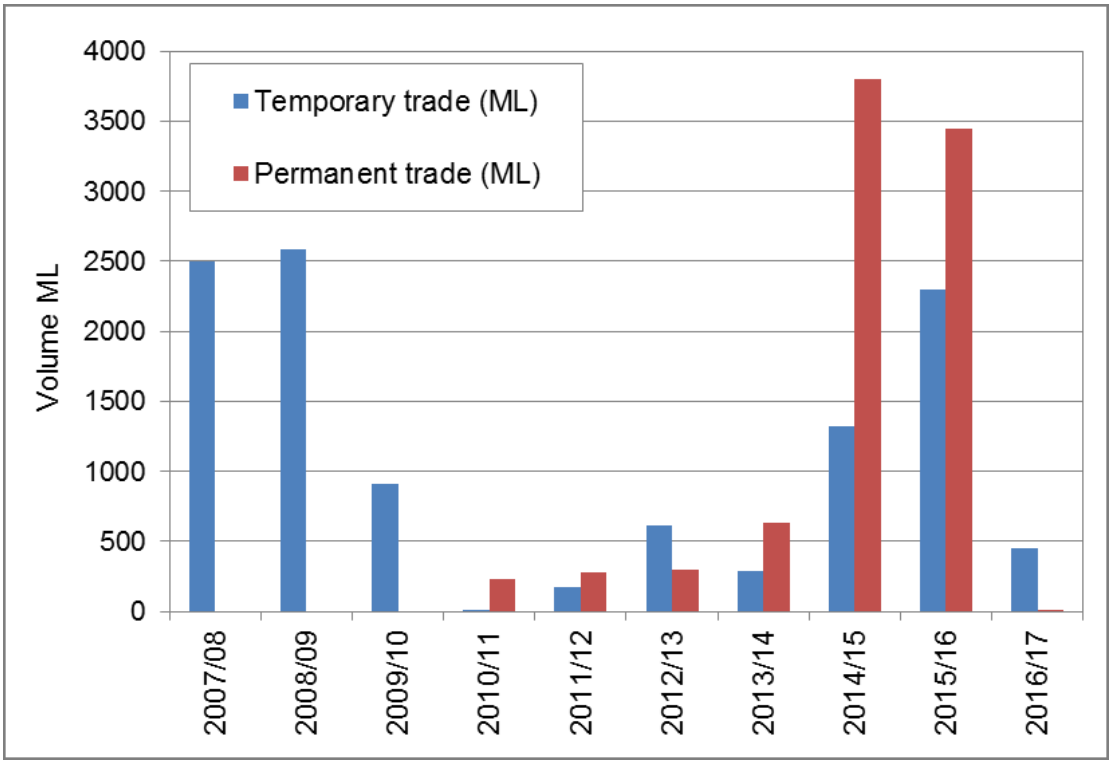


Figure 5 Licence transfer activity in the Mid-Loddon GMA

All of the temporary transfers occurred within the Laanercoorie-Serpentine Zone. (Table 3). There was one permanently transfer of 2 ML/yr within the Moolort Zone.

Table 3 Licence transfers in the Mid-Loddon GMA 2016/17

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)
1011 Moolort	0	0	0	0	1	2	1	2
1012 Laanecoorie-Serpentine	5	450	5	450	0	0	0	0
1013 Jarklin	0	0	0	0	0	0	0	0
Total	**5**	**450**	**5**	**450**	**1**	**2**	**1**	**2**

2.6 Carryover

Licence holders in the Mid-Loddon GMA are permitted to carryover up to a maximum of 30% of their licence entitlement for use in the next season.

There was 8,572 ML of carryover available to licence holders in the Mid-Loddon GMA in the 2016/17 season.

At the conclusion of the 2016/17 season, groundwater licence holders in the Mid-Loddon GMA were able to carryover 9,913.1 ML into the 2017/18 season.

2.7 Domestic and stock bores installed

There were 10 applications made for a licence to construct a bore for domestic and stock purposes in the 2016/17 season in the Mid-Loddon GMA with 3 bore completion reports received and processed by GMW.

3 Monitoring program

3.1 Groundwater levels

The Department of Environment, Land, Water and Planning (DELWP) monitored 58 bores in the Mid-Loddon GMA on a quarterly basis in February, May, August and November as part of the State Observation Bore Network (Figure 1). GMW conducted monthly monitoring of 25 key State observation bores identified in Schedule 1 of the Rules (Appendix B).

The monitoring record indicates that groundwater levels rose during the wet period in the early 1970's and remained high until the mid 1990s. The increase in the seasonal fluctuations represents an increase in groundwater extraction over time. From the mid 1990s to 2009 groundwater recovery levels (i.e. highest groundwater level each year) fell, largely in response to reduced rainfall recharge. Groundwater levels recovered strongly in response to the wet conditions experienced in 2010/11. Since 2011 groundwater recovery levels have been declining in response to reduced rainfall recharge.

Groundwater drawdowns levels in 2016/17 were generally less than previous seasons due to reduced demands on the resource and levels have remained within historical ranges.

In the Moolort Zone groundwater recovery levels have fallen around 4 m between 2011 and 2016 at nested bores 138654 and 138653 (Figure 6). Seasonal drawdown of around 10.8 m was observed in deep lead bore 138653 at Locks Lane in 2016/17 where there is a higher density of groundwater pumping. In comparison, groundwater levels from nested bores 138652 and 138652 indicate that groundwater recovery levels have remained relatively steady and seasonal drawdown is less than 5 m.

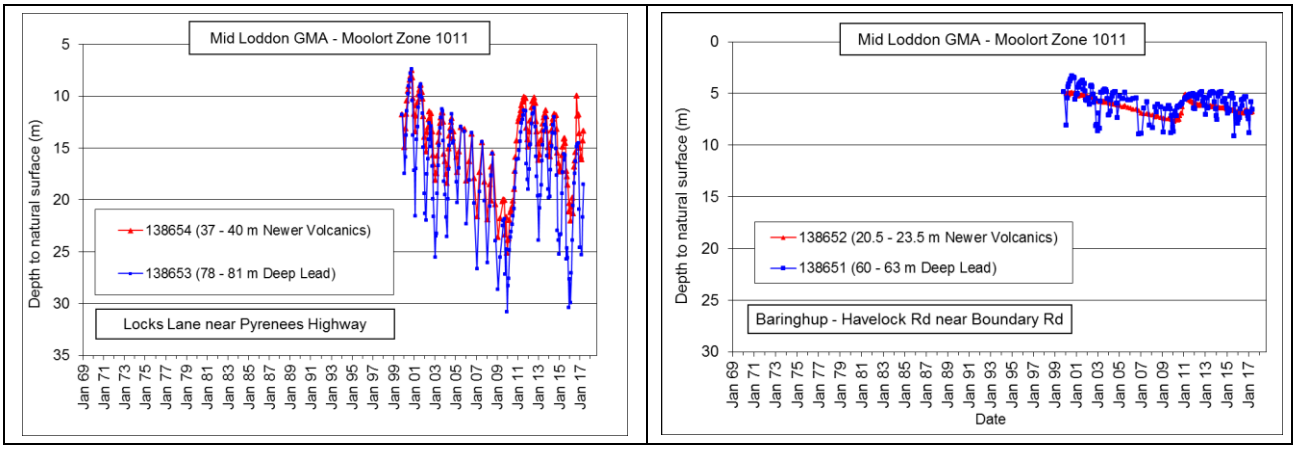


Figure 6 Groundwater levels in the Moolort Zone

In the Laanecoorie-Serpentine Zone groundwater recovery levels have fallen 2.5 m between 2011 and 2016. Seasonal drawdown of around 7.9 m was observed in deep lead bore 88214 on Rothackers Road in 2016/17, which is an area of intensive groundwater pumping (Figure 7). Elsewhere, seasonal drawdown is typically less than 5 m.

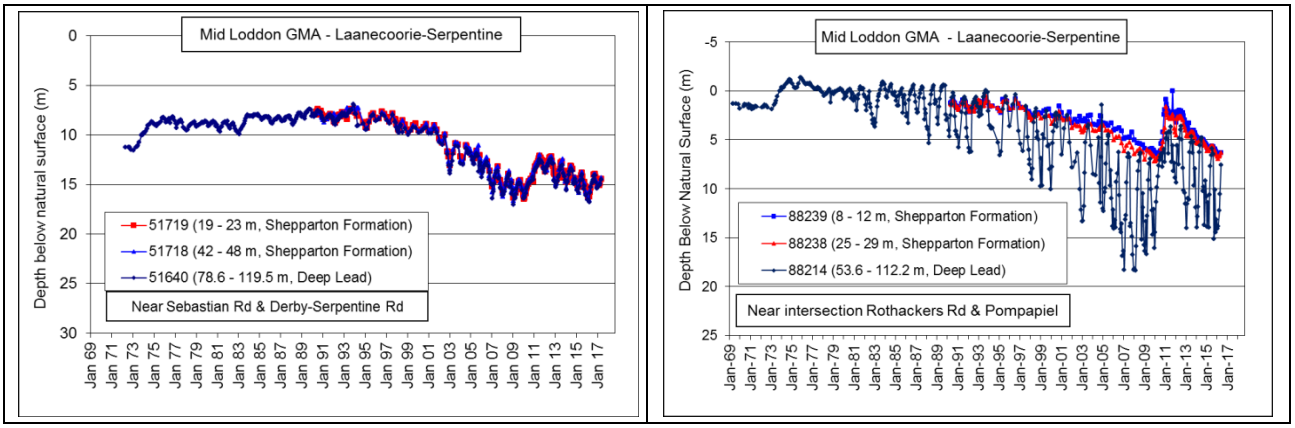


Figure 7 Groundwater levels in the Laanecoorie-Serpentine Zone

In the Jarklin Zone, groundwater recovery levels have fallen 1.4 m between 2011 and 2016 (Figure 8). Lower groundwater levels in this area can provide improved drainage and reduced waterlogging and land salinity problems.

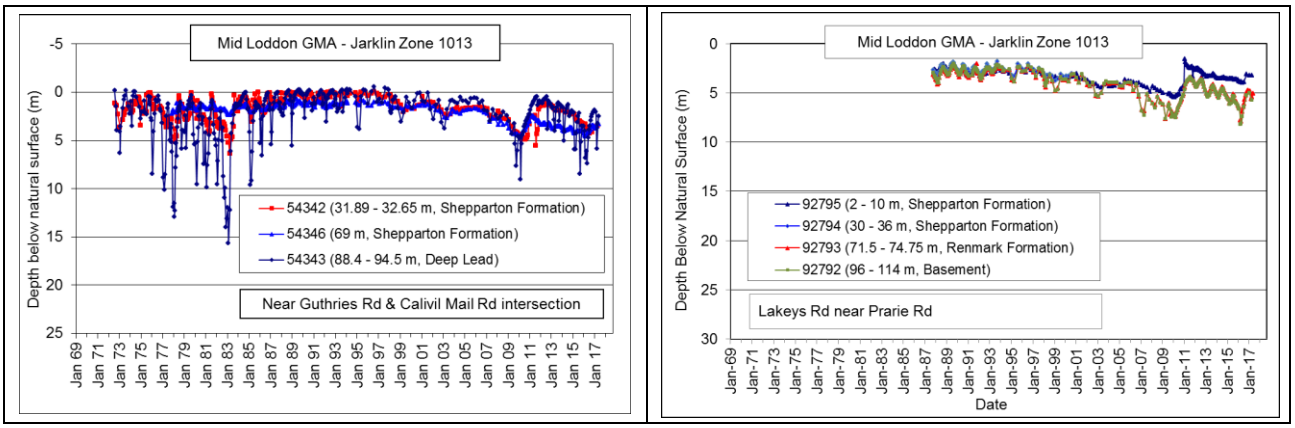


Figure 8 Groundwater levels in the Jarklin Zone

Groundwater levels from key State observation bores along a north-south section show that the aquifer response is consistent with historical observations (Figure 9).

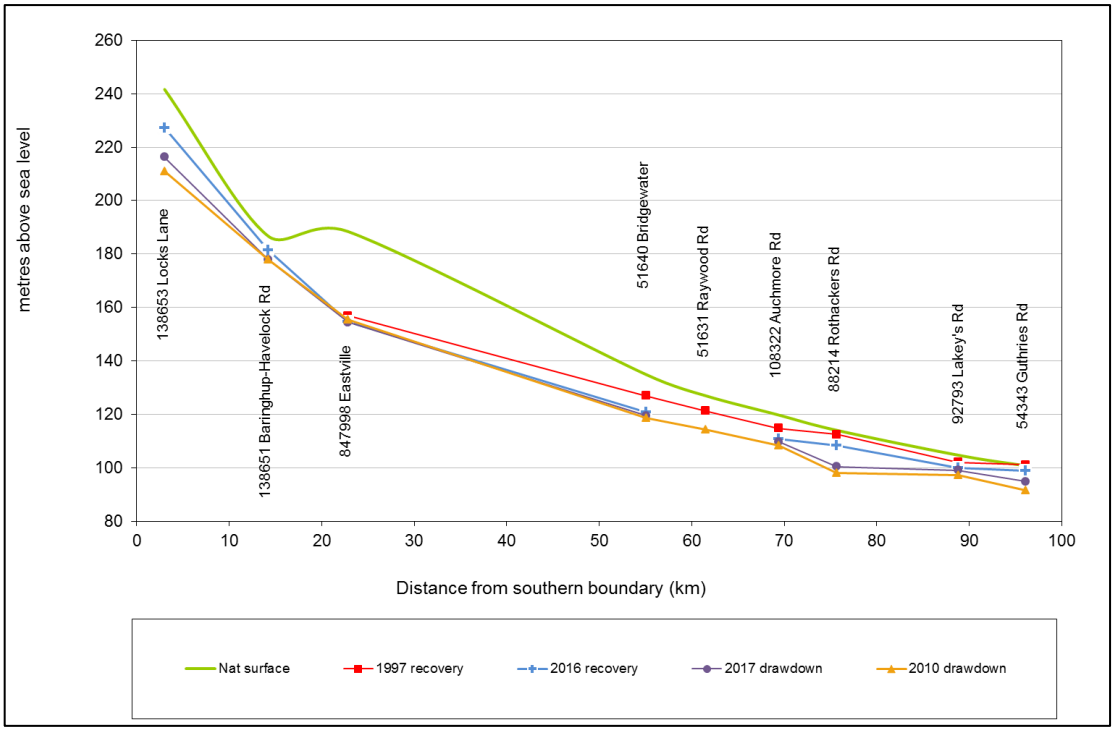


Figure 9 Groundwater level along a north-south section of the Mid-Loddon GMA

3.2 Groundwater quality

Sampling from State observation bores

Groundwater quality has been recorded from State observation bores 88214 in the Laanecoorie-Serpentine Zone and WRK059856 in the Jarklin Zone. Both bores are screened in the Deep Lead aquifer. Issues have been reported with the reliability of the water level readings of bore 53434 in the Jarklin Zone, so bore WRK059856 has been sampled as a replacement. The data indicates that groundwater salinity levels are relatively stable (Figure 10). Ongoing annual sampling of these key bores will enable any trends in groundwater quality to be observed.

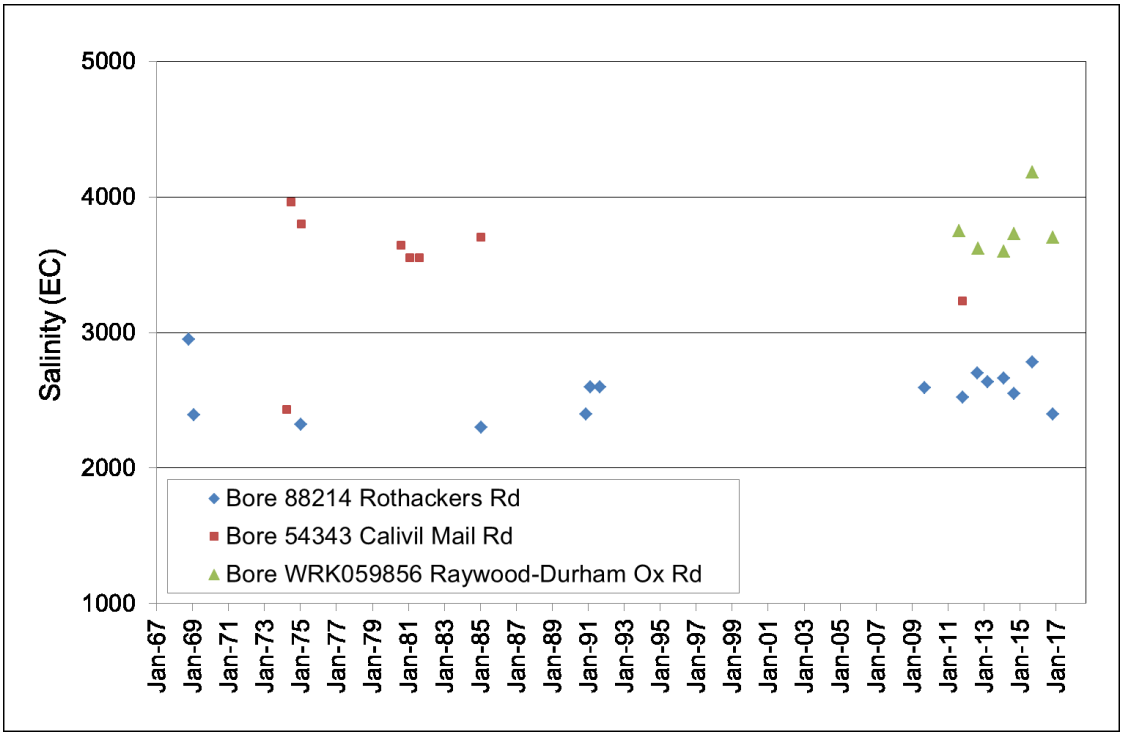


Figure 10 Groundwater salinity in key monitoring bores in the Mid-Loddon GMA

Sampling from private bores

GMW provides all groundwater licence holders in the Mid-Loddon GMA with a sample bottle and a reply paid envelope to submit a groundwater sample for salinity analysis. In the 2016/17 season, 143 sample bottles were sent out and 21 samples (15%) were returned for analysis.

Groundwater salinity in each zone is within expected ranges (Table 4). The data suggests that groundwater is more saline in the north. Continued return of samples assists with identifying any trends in groundwater salinity. A greater return rate would further improve the spatial and temporal understanding of groundwater salinity in the Mid-Loddon GMA.

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.

Table 4 Salinity results from private bores

Zone	Number of samples returned	Salinity range EC (µS/cm)
1011 Moolort	4	1,626 – 3,410
1012 Laanecoorie-Serpentine	14	615 – 5,840
1013 Jarklin	3	3,620 – 3,960

3.3 Metering

There were 127 active meters in the Mid-Loddon GMA as of 30 June 2017. There were 8 meters that required maintenance activity across the WSPA in 2016/17 (Table 6). All meters were read at least twice during the 2016/17 water year.

Table 5 Metering activities in the Mid-Loddon GMA in 2016/17

Metering activity	Year ending 30 June 2017
Number of meters installed	1
Number of meters replaced	4
Meter maintenance events	1
Total number of meters in WSPA	127
Total number of meter reads	254

3.4 Licence compliance

There were no prosecutions or convictions relating to groundwater matters in the Mid-Loddon GMA in 2016/17.

There were 5 incidents of unauthorised take and use of groundwater. These incidents have been investigated and GMW has taken action in accordance with the National Framework for Compliance and Enforcement of Systems for Water Resource Management (DSEWPC, 2012). This includes verbal and written notification not to take water without authorisation; a direction to apply to transfer entitlement to account for use; and providing information on groundwater licence transfer options.

4 Future management considerations

4.1 Groundwater Reference Committee

GMW met with the Mid-Loddon Groundwater Reference Group on 6 September 2016 to report on the resource status, discuss groundwater trading in area of intensive groundwater pumping and progress on the review of the Rules.

4.2 Review of Local Management Rules

Rule 12(d) of the Mid-Loddon GMA Local Management Rules states that the Corporation will undertake a review of the Plan after 5 years from approval (June 2009). GMW has commenced the review and will engage with the Mid-Loddon community in 2017/18 to explore opportunities for improvement.

5 References

BoM, 2017, Climate Statistics for Australian Sites – Bridgwater (Post Office) station number 081058. Bureau of Meteorology. Retrieved 22 August 2017, http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=081058

Goulburn-Murray Water, 2009. Mid-Loddon Groundwater Management Area Local Management Rules. Goulburn-Murray Water, Tatura, Victoria.

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

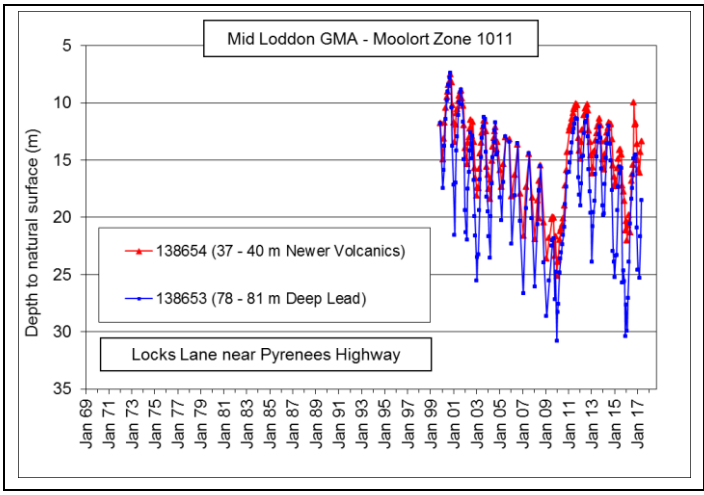
Appendix A – Assessment of activities against Rules

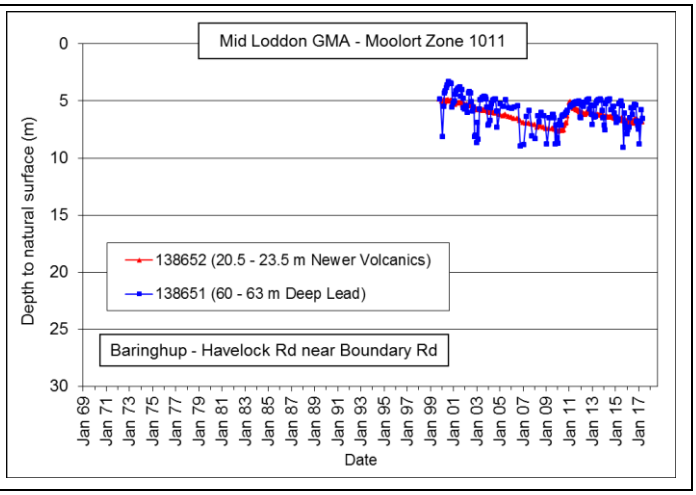
Rule	Activity	Compliant?
1. Cap on licence entitlement	The Minister for Water declared the Permissible Consumptive Volume in the Mid-Loddon GMA to be 34,037 ML/year in March 2013.	Yes
2. Managing groundwater interference	GMW processed all groundwater licence applications in accordance with Rule 2 and section 40 of the Act.	Yes
3. Managing intensity of groundwater extraction	GMW processed all groundwater licence applications in accordance with Rule 3.	Yes
4. Managing groundwater levels	GMW announced allocations of 100% for all groundwater licence holders in September 2016. GMW announced allocations by listing them on their website, sending letters to all licence holders and placing public notices in local newspapers.	Yes
5. Transfer of groundwater licence entitlement	GMW processed 5 transaction for temporary transfer and 1 transaction for permanent transfer in 2016/17. All transfers were compliant with conditions in Rule 5.	Yes
6. Carryover	Carryover up to 30% of licence volume was available to licence holders.	Yes
7. Monitoring groundwater levels	GMW obtained monthly readings from State observation bores listed in Schedule 1 of the Rules where practicable.	Yes
8. Monitor groundwater salinity	Groundwater salinity was analysed from State observation bores 88214 and WRK059856. Bottles were sent to all licensed groundwater users and salinity measured in returned samples. Licence holders were advised of the results.	Yes
9. Record meter readings	Meters are fitted to all operational bores in the Mid-Loddon GMA. Meters were read in January/February and May/June during 2016/17.	Yes
10. Annual reporting	GMW has prepared this annual report for the 2016/17 season and posted it on its website.	Yes
11. Provide effective communication	GMW met with the Mid-Loddon Groundwater Reference Group on 6 September 2016 to report on the resource status, discuss groundwater trading in area of intensive groundwater pumping and progress on the review of the Rules.	Yes
12. Review of local management rules	A review of the Mid-Loddon GMA Local Management Rules is currently being undertaken	Yes

Appendix B – Hydrographs

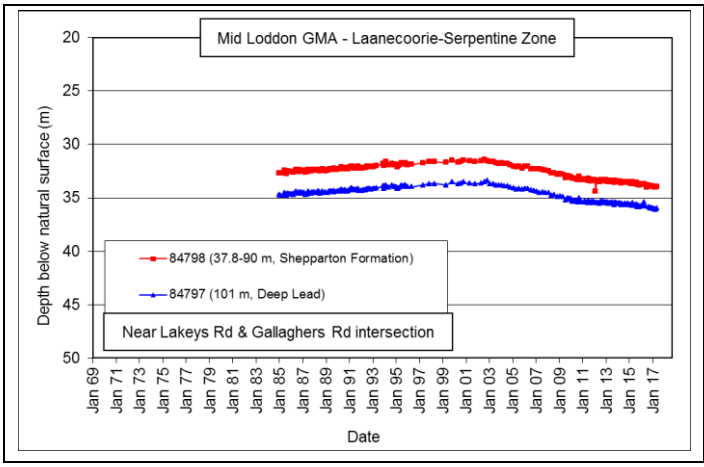
Hydrographs for key monitoring bores. Groundwater level information on other State observation bores can be obtained from the Water Measurement Information System website at http://data.water.vic.gov.au/monitoring.htm

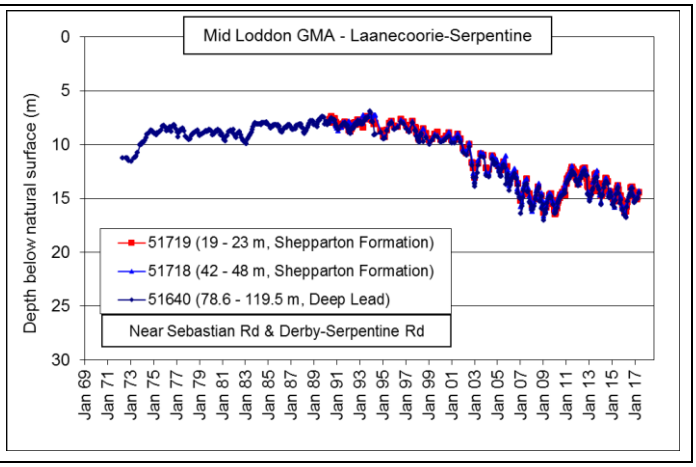
Moolort Zone 1011

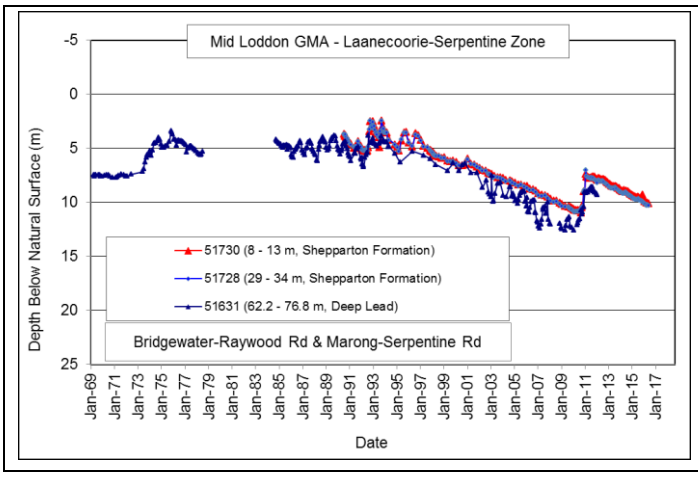


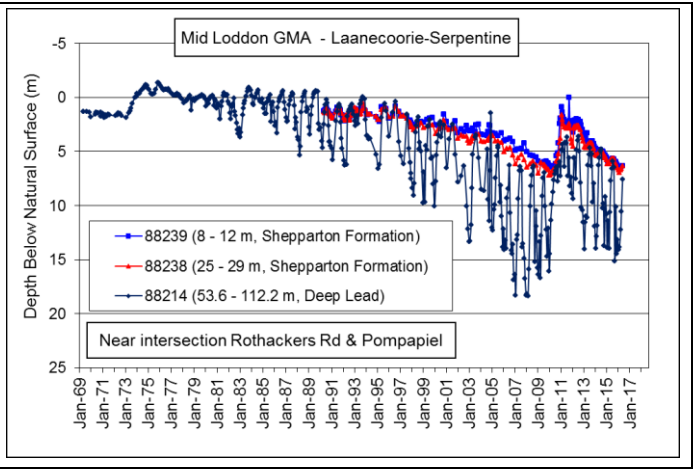


Laanecoorie-Serpentine Zone 1012

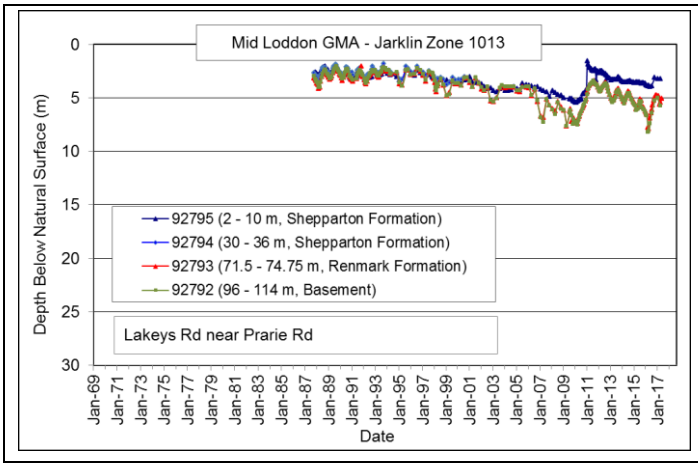


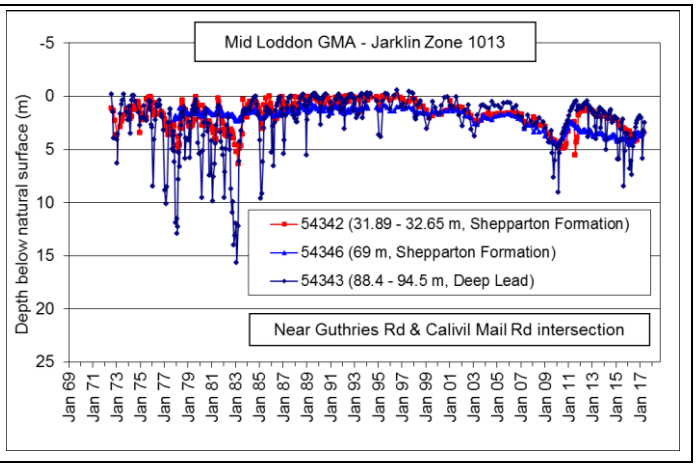






Jarklin Zone 1013





Appendix C – Groundwater chemistry

Groundwater chemistry from nested State observation bores

Analyte	Bore	88214	WRK059856
	Date	30/11/2016	30/11/2016
Conductivity (µS/cm)	µS/cm @ 25°C	2400	3700
pH Colour	Units	8.8	7
Total Alkalinity as CaCO3 (mg/l)	mg/l	17	2
Bicarbonate Alkalinity as CaCO3 (mg/l)	mg/l	190	200
Dissolved Oxygen (ppm)	ppm	0.26	0.24
Sulphate as SO4 (mg/l)	mg/l	67	200
Total Alkalinity, as CaCO3	mg/L	200	200
Calcium, as Ca	mg/L	13	44
Chloride, as Cl	mg/L	620	950
Hydroxide Alkalinity, as CaCO3	mg/L	2	2
Potassium, as K	mg/L	7.3	8.2
Sodium, as Na	mg/L	350	460
Ammonia, as N	mg/L	<0.1	<0.1
Nitrate, as N	mg/L	<0.01	<0.01
Total Kjeldahl Nitrogen, as N	mg/L	<0.1	<0.1
Total Nitrogen, as N	mg/L	<0.1	<0.1
Arsenic, as As	mg/L	0.001	0.003
Iron, dissolved as Fe	mg/L	<0.01	0.56
Mercury, as Hg	mg/L	<0.001	<0.001
Magnesium, as Mg	mg/L	54	73
Manganese, dissolved as Mn	mg/L	0.051	<0.1
Total Dissolved Solids, 180C	mg/L	1200	1900
Turbidity, NTU	NTU	5.6	5.5
Phosphorus, total as P	mg/L	0.05	0.05
total organic carbon (TOC)	mg/L	0.5	0.5
Lead, dissolved (ICP-MS)	mg/L	<0.001	<0.001
Nickel, dissolved (ICP-MS)	mg/L	<0.001	<0.001
Cadmium, dissolved (ICP-MS)	mg/L	<0.001	<0.001
Chromium, dissolved (ICP-MS)	mg/L	<0.001	<0.001
Copper, dissloved (ICP-MS)	mg/L	<0.001	<0.001
Zinc, dissolved (ICP-MS)	mg/L	<0.001	0.004