

GOULBURN-MURRAY
WATER



Loddon Highlands
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 Loddon Highlands Water Supply Protection Area Groundwater Management Plan (the Plan) for the 2013/14 season.

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

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

This report provides an overview of the groundwater management activities in the Loddon Highlands Water Supply Protection Area and documents the successful implementation of the Plan during the 2013/14 season.

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



Gavin Hanlon
MANAGING DIRECTOR

Date

Executive summary

The Loddon Highlands Water Supply Protection Area (WSPA) Groundwater Management Plan (the Plan) was approved by the Minister for Water in November 2012.

The 2013/14 season marks the second year of successful implementation of the Plan.

Groundwater levels were marginally lower in 2013/14 compared to 2012/13, which may be attributed to reduced rainfall recharge.

Allocations in all zones of the Loddon Highlands WSPA reached 100 per cent in October 2013 following an initial seasonal allocation of 75 per cent in the Newlyn Zone.

Metered use in the Loddon Highlands WSPA was 30 per cent (6,229 ML) of licensed entitlement, which is lower than in 2012/13. However, this is within the typical range of seasonal use.

There was moderate trade activity during 2013/14. There were 19 temporary transfers of licence entitlement for a total of 1,133 ML. There were also two permanent transfers for a total of 120 ML.

Licence holders in the Loddon Highlands WSPA are entitled to carryover to a maximum of 15 per cent of licence entitlement. Licence holders have carried over 2,769 ML of entitlement into the 2014/15 season.

Groundwater monitoring and metering programmes continue to be successfully undertaken to support the implementation of the Plan.

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1 Introduction

1.1 Purpose

This report has been prepared to meet the requirements of Prescription 7 of the Loddon Highlands Water Supply Protection Area (WSPA) Groundwater Management Plan (the Plan) and section 32C of the *Water Act 1989* (the Act).

The annual report discusses the implementation of the Plan and provides an overview of groundwater management activities undertaken in accordance with the Plan from 1 July 2013 to 30 June 2014.

1.2 Water Supply Protection Area

The Loddon Highlands WSPA was declared in June 2010. It extends from Newlyn and Learmonth in the south to Dunolly in the north, and incorporates the townships of Creswick, Waubra, Clunes, Talbot and Maryborough.

The Loddon Highlands WSPA incorporates groundwater resources to all depths.

There are seven management zones in the Loddon Highlands WSPA: Talbot, Waubra, Ascot, Ullina, Newlyn, Blampied and Mollongghip (Figure 1).

1.3 Groundwater Management Plan

The Plan was approved by the Minister for Water in accordance with section 32A(6) of the Act on 21 November 2012.

The objective of the Plan is to make sure that groundwater resources in 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. manage the resources to protect groundwater users and the environment;
2. enable equitable access of groundwater resources to realise the potential for its use; and
3. provide effective and transparent communication of Plan objectives, management rules and resource status.

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.

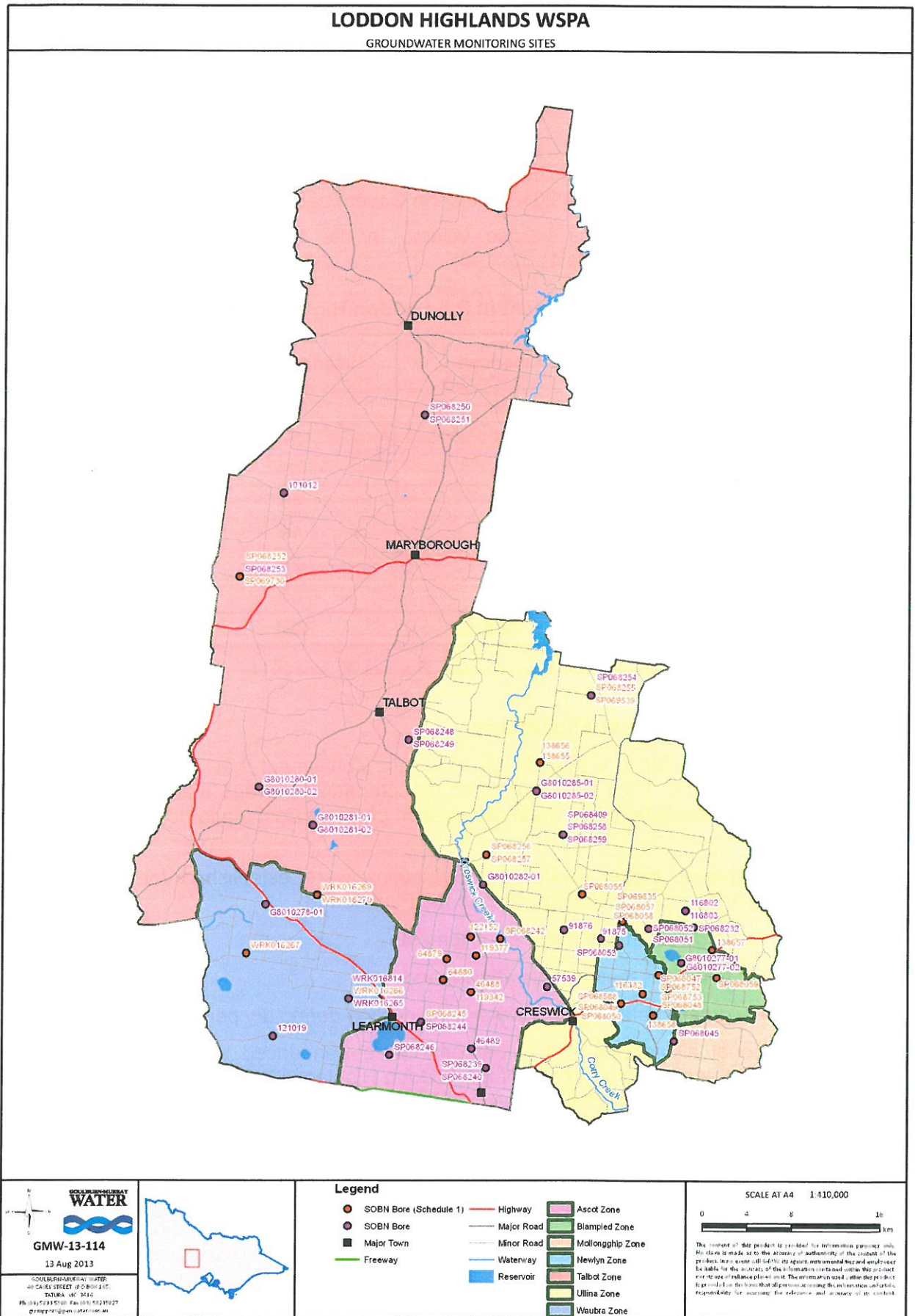


Figure 1 Loddon Highlands Water Supply Protection Area

2 Groundwater management

2.1 Licence volume

The Minister for Water declared the Permissible Consumptive Volume to be 20,697 ML/year in March 2013 (Victorian Government Gazette, 2013).

At 30 June 2014 the licence volume in the Loddon Highlands WSPA was 20,693.5 ML/year (Table 1).

Table 1 Licensed entitlement in the Loddon Highlands WSPA

Zone	Licences	Licensed bores	Licence volume (ML)
Ascot	65	104	7,068.2
Blampied	22	27	1,252.5
Mollongghip	3	7	318.0
Newlyn	27	48	3,133.6
Talbot	14	16	1,268.7
Ullina	20	27	2,921.2
Waubra	34	65	4,731.3
Total	185	294	20,693.5

NOTE: Data extracted from the Victorian Water Register 30 June 2014

2.2 Groundwater allocations

Allocations refer to a percentage of licence entitlement that may be extracted in a given season. They are determined by comparing average maximum groundwater recovery levels from key State observation bores against trigger levels outlined in the Plan.

Groundwater trigger levels and restrictions were established for the Blampied, Newlyn, Ascot and Waubra zones in the Plan due to:

- large volume of licence entitlement,
- historical seasonal drawdown, and
- greater rate of groundwater level decline during dry periods.

Seasonal allocations of 100 per cent were announced at the beginning of the 2013/14 season for all zones of the Loddon Highlands WSPA, except for the Newlyn Zone which had an initial allocation of 75 per cent.

Groundwater levels in the Newlyn Zone recovered further over spring and the allocation was revised up to 100 per cent in October 2013 (Figure 2).



Figure 2 Average maximum groundwater recovery levels to November 2013 compared to trigger levels

2.3 Groundwater use

Metered use in the Loddon Highlands WSPA in 2013/14 was 6,228.8 ML. This equates to 30 per cent of licence entitlement, which is within the historical range (Figure 3).

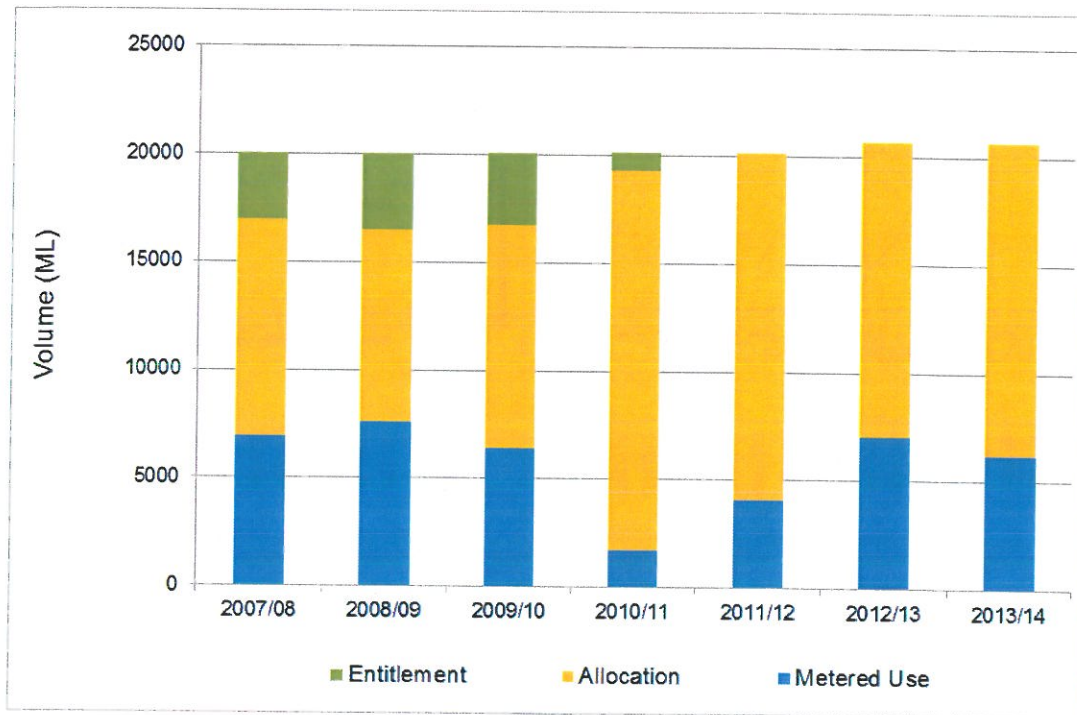


Figure 3 Metered usage in the Loddon Highlands WSPA

Metered usage was highest in the Ascot Zone, where 44 per cent (3,139.3 ML) of licence entitlement was used (Table 2).

Table 2 Metered usage in the Loddon Highlands WSPA in 2013/14

Zone	Metered use (ML)	% Licensed volume
Ascot	3,139.3	44%
Blampied	521.0	42%
Mollonghip	106.0	33%
Newlyn	977.9	31%
Talbot	187.0	21%
Ullina	112.5	15%
Waubra	1,185.1	25%
Total	6,228.8	30%

NOTE: Data extracted from GMW Irrigation Planning Module database 1 July 2014

2.4 Rainfall

Monthly rainfall data from the Bureau of Meteorology weather station at Clunes indicates annual rainfall in 2013 was around 100 mm below average.

Since high rainfall events in 2010 and 2011, the cumulative deviation from the mean monthly rainfall has had a declining trend, which highlights the dry conditions experienced during the 2013/14 season (Figure 4).

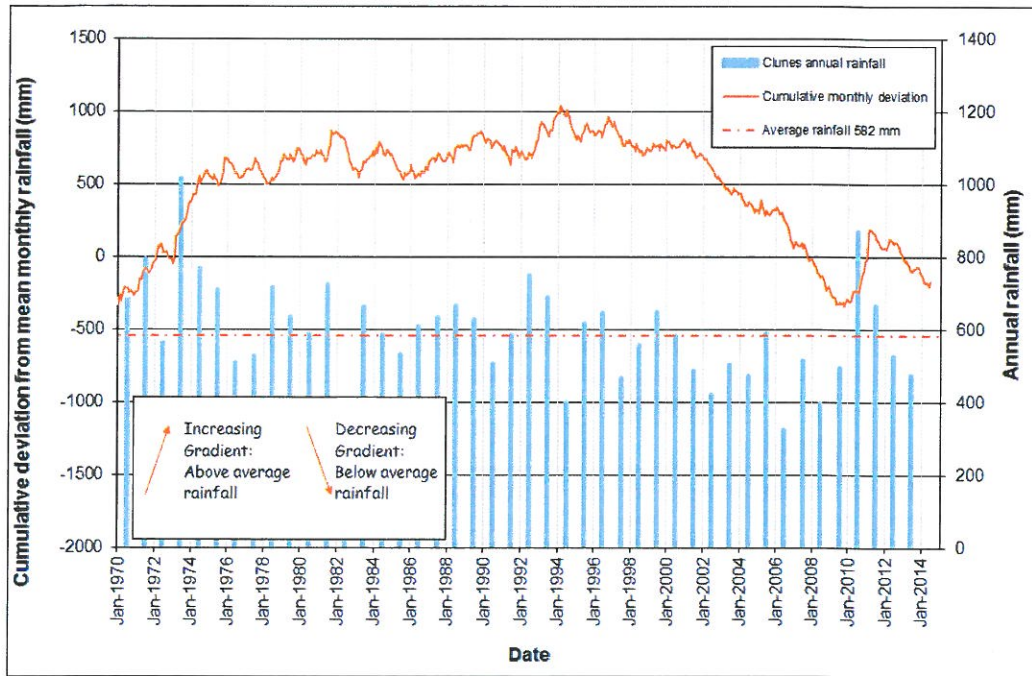


Figure 4 Monthly rainfall data for Clunes

2.5 Transfer of entitlement

The Plan allows groundwater licence holders to temporarily or permanently transfer licence entitlement. In 2013/14 there were 19 temporary transfer transactions for a total of 1,133.3 ML and two permanent transfer transactions for a total of 120 ML (Figure 5).

A decrease in the number and volume of temporary transfers compared to last season could be attributed to the introduction of carryover and the ability for licence holders to permanently secure licence entitlement through permanent trade.

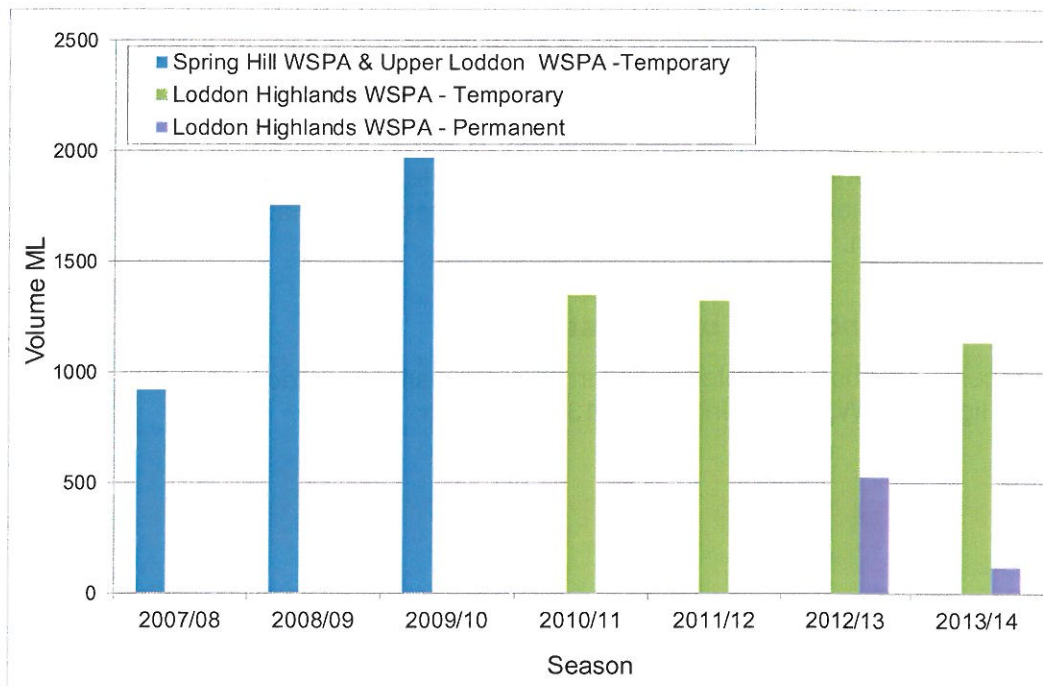


Figure 5 Transfer activity in the Loddon Highlands WSPA

The majority of temporary transfers occurred within the same management zone rather than between zones (Table 3). A total of 326 ML was transferred between zones: 106 ML from Newlyn to Mollongghip, 200 ML from Waubra to Talbot and 20 ML from Mollongghip to Newlyn (note licensed bores located within 2.5 km of each other across the internal zone boundary (refer Prescription 3(c) of the Plan)).

The two permanent transfers occurred all within the same zones: 90 ML of entitlement was transferred within the Blampied Zone and 30 ML within the Waubra Zone.

Table 3 Transfers in the Loddon Highlands 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)
Ascot	7	220	7	220	0	0	0	0
Blampied	2	23	2	23	1	90	1	90
Mollongghip	1	20	2	106	0	0	0	0
Newlyn	6	144.5	3	38.5	0	0	0	0
Talbot	0		1	200	0	0	0	0
Ullina	1	505.8	3	525.8	0	0	0	0
Waubra	2	220	1	20	1	30	1	30
Total	19	1,133.3	19	1,133.3	2	120	2	120

2.6 Carryover

Following an application from GMW, the Minister for Water declared that groundwater licence holders in the Loddon Highlands WSPA were authorised to take carryover from November 2012 (Victorian Government Gazette, 2012).

The maximum amount of entitlement that may be carried over by a licence holder in a water season is 15 per cent of their licence entitlement volume.

There was 2,792 ML of carryover available to licence holders in the Loddon Highlands WSPA in the 2013/14 season.

At the conclusion of the 2013/14 season, groundwater licence holders in the Loddon Highlands WSPA had a total of 2,769 ML of entitlement available to carry over into the 2014/15 season.

2.7 Domestic and stock bores installed

GMW received six bore completion reports for domestic and stock purposes in the Loddon Highlands WSPA during the 2013/14 season.

3 Monitoring program

3.1 Groundwater levels

The Department of Environment and Primary Industries (DEPI) monitored over 70 bores from the State Observation Bore Network on a quarterly basis in the Loddon Highlands WSPA (Figure 1).

GMW conducted monthly monitoring of 36 key State observation bores identified in Schedule 1 of the Plan (Appendix B). Groundwater recovery levels were generally lower in 2013/14 compared to 2012/13, which may be largely attributed to decreased rainfall recharge.

Seasonal drawdown of up to 9 m was observed in the Blampied Zone while Newlyn, Ullina and Waubra Zones experienced around 5 m of drawdown in 2013/14. In the Ascot Zone, where the greatest volume of groundwater was extracted, seasonal drawdown was up to 15 m. This is consistent with previous seasonal drawdown levels observed.

3.2 Groundwater quality

Groundwater quality testing was undertaken by taking samples from two nested State observation bore sites in the Loddon Highlands WSPA. Nested sites feature two or more bores in close proximity, each monitoring a different aquifer. The State observation bores used for water quality testing are located in the Talbot and Ullina Zones and monitor groundwater in both the Deep Lead and basalt aquifers.

Groundwater chemistry results are presented in Appendix C. The analysis indicates that groundwater salinity levels are higher in the basalt aquifers than the underlying Deep Lead aquifers at both sites (Table 4). Ongoing annual monitoring of these key bores will continue to enable trends in groundwater quality changes to be observed.

Table 4 Salinity of groundwater in key monitoring bores in the Loddon Highlands WSPA

Bore number	Zone	Screen depth below natural surface (m)	EC ($\mu\text{S/cm}$)
SP069539	Ullina	114.2-119.9 m (Deep Lead)	1,620
SP068255	Ullina	33.1-35.9 m (basalt)	6,830
SP069730	Talbot	92.2-97.8 m (Deep Lead)	2,180
SP068252	Talbot	57-60 m (basalt)	3,690

*Bores sampled in March 2014

GMW has also collected groundwater salinity data from licensed and monitoring bores owned by Central Highlands Water in the Newlyn, Ascot, Ullina, Waubra and Talbot Zones (Figure 6). The data indicates that groundwater salinity has been relatively stable across the WSPA since 2008.

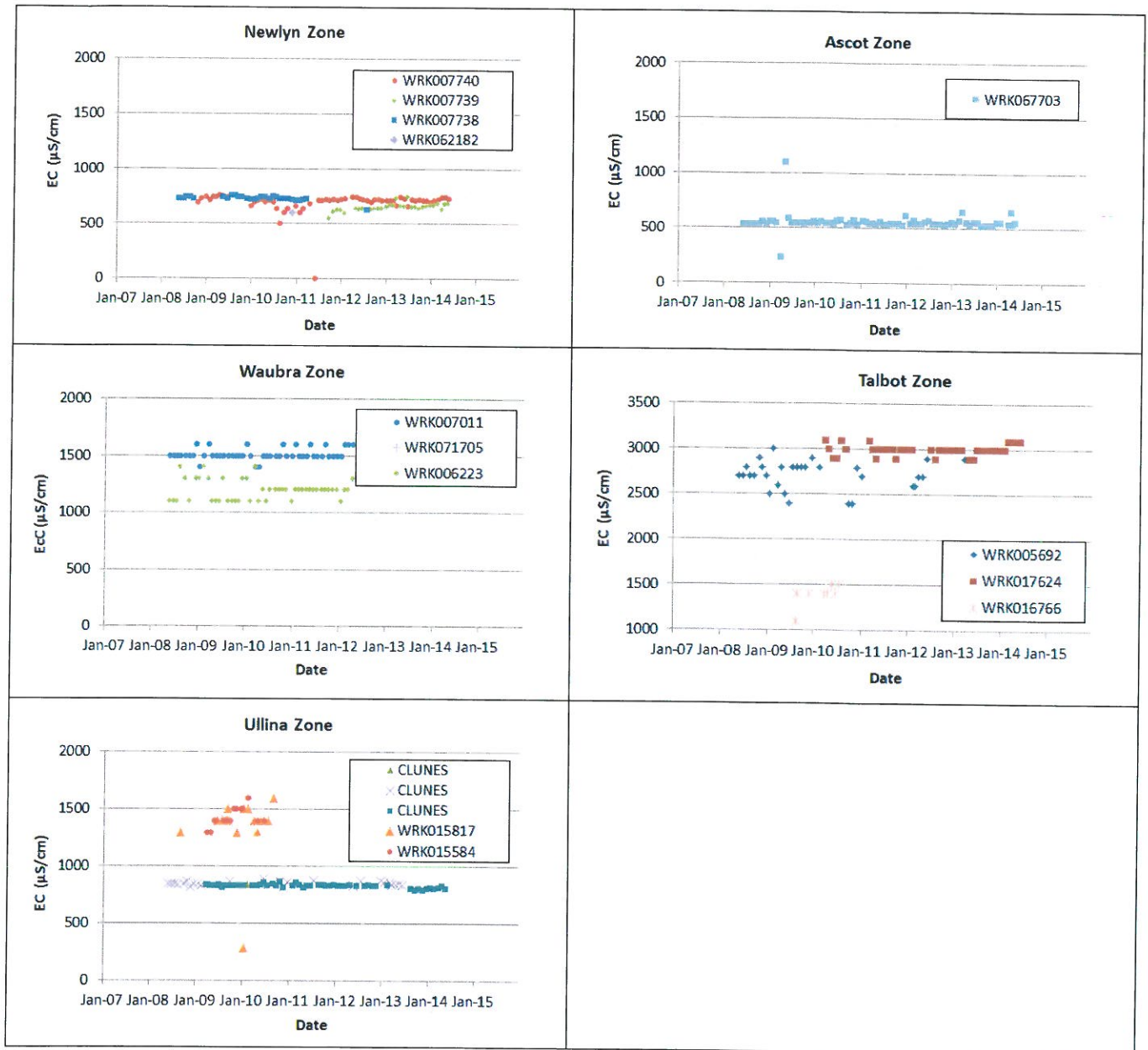


Figure 6 Salinity monitoring results from Central Highlands Water bores

3.3 Metering

All operational bores in the Loddon Highlands WSPA were metered as of 30 June 2014.

There were 34 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 466 meter reads undertaken.

Table 5 Metering activities in the Loddon Highlands WSPA in 2013/14

	Year to 30 June 2014
Number of meters installed	14
Meters which had maintenance	34
Total number of meters in WSPA	263
Number of meter reads in season	466

3.4 Licence compliance

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

There were eight 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 Loddon Highlands WSPA Consultative Committee to be a Groundwater Reference Committee to consult with on Plan implementation.

The Groundwater Reference Committee met on 10 September 2013. Key outcomes of the meeting included:

- Groundwater hydrographs now updated on GMW website in February, May, June, July, August September, October and November
- Groundwater salinity from private bores taken from Central Highlands Water urban supply bores satisfies the requirements of a target Prescription 5(b) to establish a targeted groundwater salinity monitoring program.

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 has 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>

Department of Sustainability and Environment, 2012. Loddon Highlands Water Supply Protection Area Groundwater Management Plan November 2012.

Department of Sustainability and Environment, Melbourne

Victorian Government, 2012. Victorian Government Gazette No. S389 Wednesday 21 November 2012. Victoria Government, Melbourne

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

Appendix A – Assessment of activities against Plan prescriptions

Prescription	Activity	Compliant
<p>Prescription 1: Carryover</p> <p>The Corporation shall:</p> <ol style="list-style-type: none"> 1. Apply to the Minister for Water to declare the availability of carryover in the Loddon Highlands WSPA up to a maximum of 15% of licence entitlement that will not be subject to restriction in the form of allocations. 2. Consult with the Groundwater Reference Committee about the need to alter the percentage of carryover. 	<p>The Minister for Water declared that licence holders in the Loddon Highlands WSPA may carryover up to 15% licence entitlement volume from November 2012.</p>	<p>Yes</p>
<p>Prescription 2: Triggers and restrictions</p> <p>The Corporation shall:</p> <ol style="list-style-type: none"> a) By 15 September each year determine the maximum seasonal groundwater recovery level in the relevant bore/s, or its replacement, and corresponding seasonal allocation as detailed in the Plan. b) Determine a seasonal allocation for the relevant zone based on the outcomes of a review of available data. The review will be undertaken when the 50% allocation is triggered in the Blampied, Newlyn or Ascot Zone. The Corporation shall consult with the Groundwater Reference Committee during the review. c) Determine a seasonal allocation for the Waubra Zone and consult with Groundwater Reference Committee. d) Announce seasonal allocations by listing them on its website; sending letters to all licence holders and placing public notices in local newspapers. e) Review allocations based on groundwater level readings to November each year and announce an increase if triggered. 	<p>GMW announced allocations of 100% for all zones of the Loddon Highlands WSPA in September 2013, except for the Newlyn Zone which received an initial allocation of 75%</p> <p>GMW reviewed allocations in the Newlyn Zone in October 2013 and announced an allocation increase to 100% of licence entitlement.</p>	<p>Yes</p>
<p>Prescription 3: Trading between zones</p>	<p>GMW processed 19 transactions for temporary transfer of licence and 2 transactions for permanent</p>	<p>Yes</p>

<p>The Corporation may approve a temporary or permanent transfer of groundwater licence entitlement under section 62 of the <i>Water Act 1989</i> provided section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> a) The permanent transfer of licence entitlement is between zones as specified in the Plan. b) The temporary transfer of licence entitlement is between zones as specified in the Plan. c) Despite (b) above, a temporary transfer of licence entitlement may be considered where bores are located within 2.5 km of each other across an internal zone boundary. d) Licence entitlement may be temporarily traded into, or out of, the Loddon Highlands WSPA provided that the PCV is not exceeded. 	<p>licence transfer in 2013/14.</p> <p>The majority of temporary transfers occurred within the same zone rather than between zones.</p> <p>Permanent transfers all occurred within the same zones.</p> <p>All transfers were compliant with Plan Prescription 3.</p>	<p>Yes</p>
<p>Prescription 4: Groundwater level interference</p> <p>The Corporation may approve an application to take and use groundwater under section 51 or a transfer under section 62 of the <i>Water Act 1989</i> provided that section 53 matters have been considered and the following conditions are satisfied:</p> <ul style="list-style-type: none"> a) Licence entitlement may be temporarily or permanently transferred up to 1,000 ML/yr within 2.5 km radius of a licensed bore. b) Where the licence entitlement within a 2.5 km radius of a licensed bore exceeds 1,000 ML/yr then: 	<p>GMW processed all groundwater licence applications in accordance with Plan Prescription 4.</p>	<p>Yes</p>
<p>(i). For temporary transfer of licence entitlement</p>	<ol style="list-style-type: none"> 1. Trade with usage in any one season limited to 115% of entitlement, whether it occurs through trade or carryover (this could include transferring from outside the 2.5 km radius); or 2. Trade from others within 2.5 km radius of the applicant's bore for usage to exceed 115% of entitlement; or 3. Assess the application to consider other relevant information such as historical use and, 	<p>Yes</p>

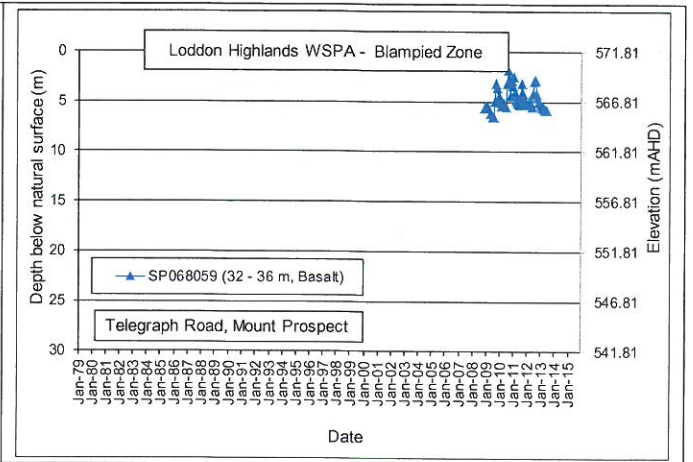
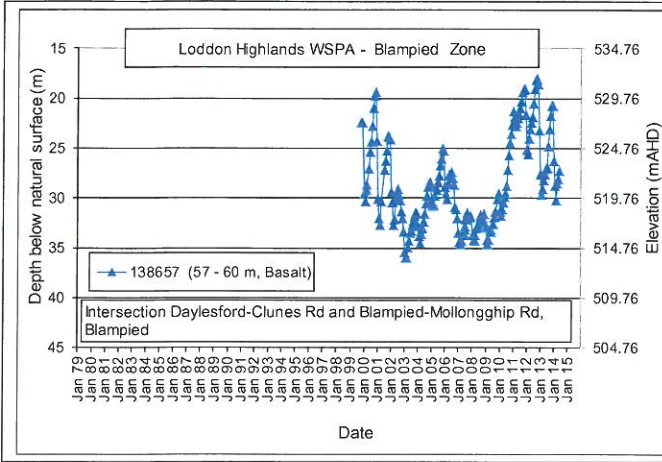
	<p>if required undertake detailed investigations, when seeking to use more than 115% of your licence entitlement to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius.</p>	
<p>(ii). For permanent transfer of licence entitlement</p>	<ol style="list-style-type: none"> 1. Trade from others within 2.5 km radius of the applicant's bore; or 2. Undertake detailed investigations to demonstrate no unacceptable impacts are likely to occur. This could include transferring from outside the 2.5 km radius. 	
<p>Prescription 5: Groundwater monitoring The Corporation shall:</p> <ol style="list-style-type: none"> (a) Obtain monthly groundwater level readings, where practicable, from State observation bores listed in Schedule 1 or their replacement (up to 288 readings per season). (b) Establish a targeted groundwater salinity monitoring program to collect and analyse groundwater samples from selected licensed bores each year. (c) Collect groundwater samples from selected State observation bores identified in Schedule 1 where practicable, or their replacement, and send them to a NATA accredited laboratory for analysis. 		
<p>Prescription 6: Metered licensed use The Corporation shall:</p> <ol style="list-style-type: none"> (a) Ensure that a meter is fitted to all operational licensed bores. (b) Read each meter at least twice each season. 		
<p>Prescription 7: Plan implementation</p>		
<p>GMW obtained monthly groundwater level readings from bores listed in Schedule 1 of the Plan where practicable. GMW sought the endorsement of the Groundwater Reference Committee to utilise groundwater salinity monitoring data provided by Central Highlands Water from their urban supply bores to fulfil the requirements of a targeted salinity monitoring program. GMW collected groundwater samples from nested State observation bores identified in Schedule 1 and sent them to a NATA accredited laboratory for analysis. GMW ensured that a meter was fitted to all operational licensed bores and read each meter in January/February and May/June during 2013/14.</p>		<p>Yes</p>
<p>GMW has prepared this annual report for the</p>		<p>Yes</p>

<p>The Corporation shall:</p> <ul style="list-style-type: none"> (a) By 30 September each year: <ul style="list-style-type: none"> (i). prepare an annual report on the administration and enforcement of the Plan for the Minister for Water and relevant agencies. (ii). mail a newsletter to groundwater licence holders, and domestic and stock users upon request, summarising the outcomes in the annual report. (b) Post on its website the Plan; annual report, newsletters and groundwater level monitoring results. (c) Meet with a Groundwater Reference Committee at least once each year to report on the implementation of the Plan and consider the need to review the Plan. (d) Undertake a review of the Plan after five years from its approval, or sooner if warranted by any prescription contained within the Plan. 	<p>2013/14 season on administration and enforcement of the Plan for the Minister for Water and relevant agencies and will send a newsletter to licence holders summarising the information in this report.</p> <p>GMW has posted on its website the Plan, this annual report and a season summary newsletter.</p> <p>GMW updates hydrographs of groundwater levels every three months on their website in accordance with the Plan.</p> <p>GMW appointed the former Groundwater Consultative Committee as a Groundwater Reference Committee to consult with on Plan implementation.</p>
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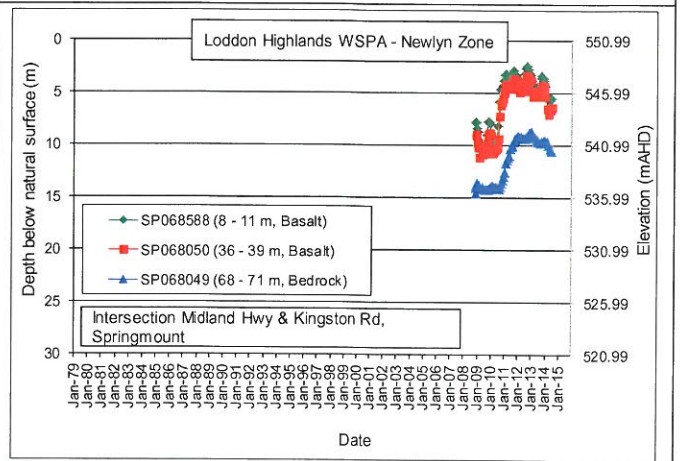
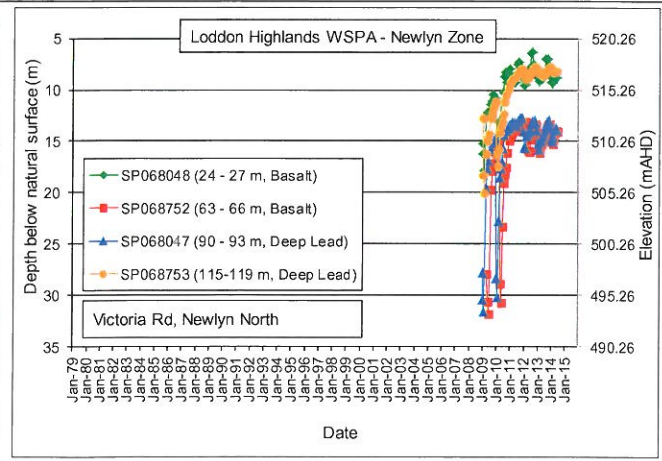
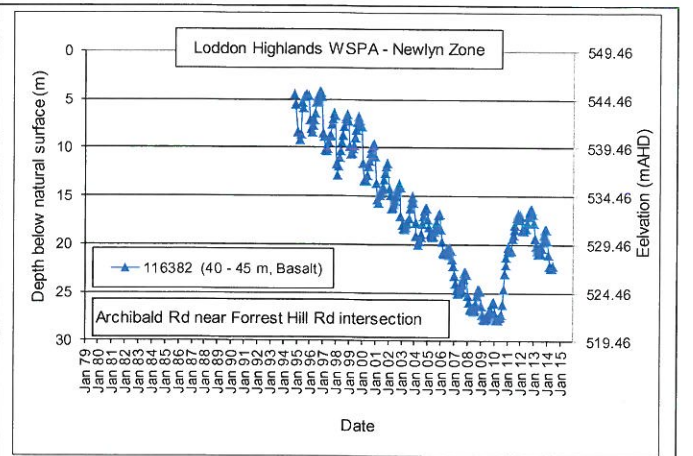
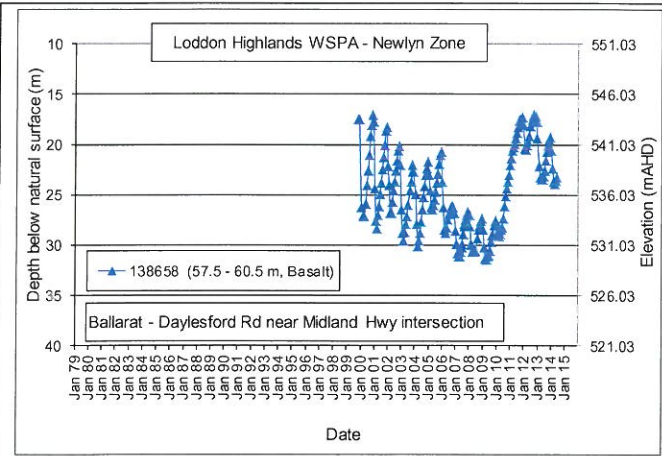
Appendix B – Hydrographs

Hydrographs for key monitoring bores listed in the Plan. Further groundwater level information from other State observation bores is available on the Visualising Victoria’s Groundwater website at <http://www.vvg.org.au/>.

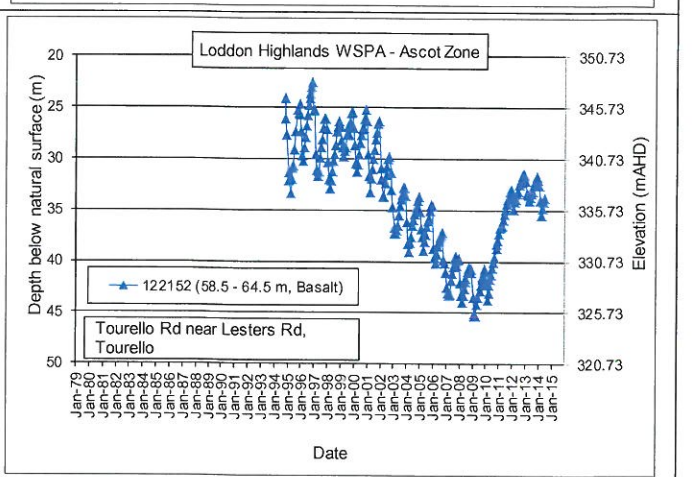
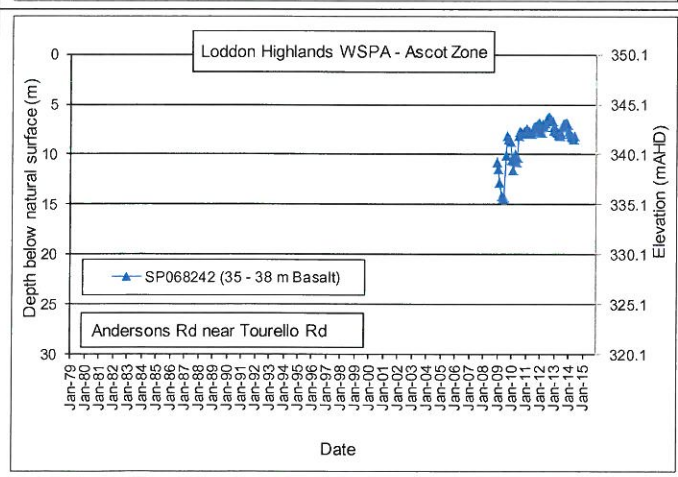
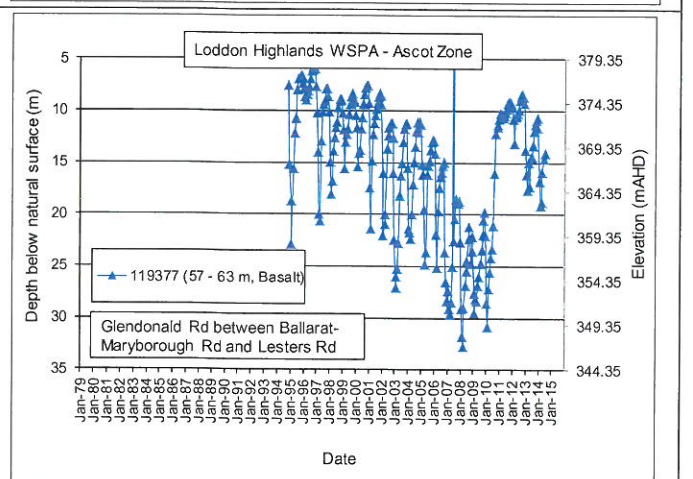
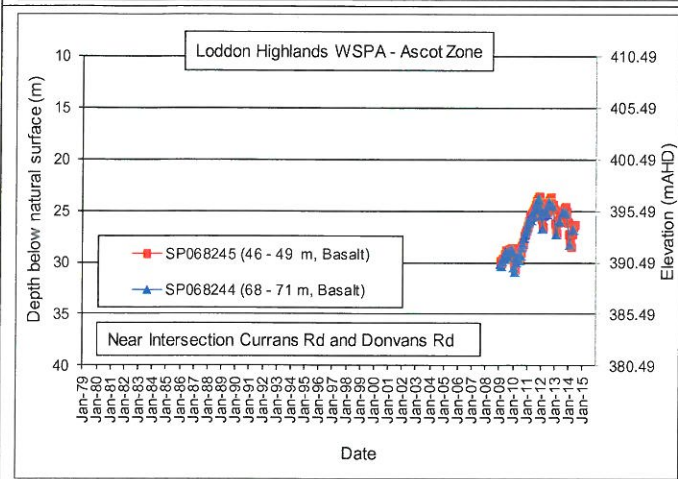
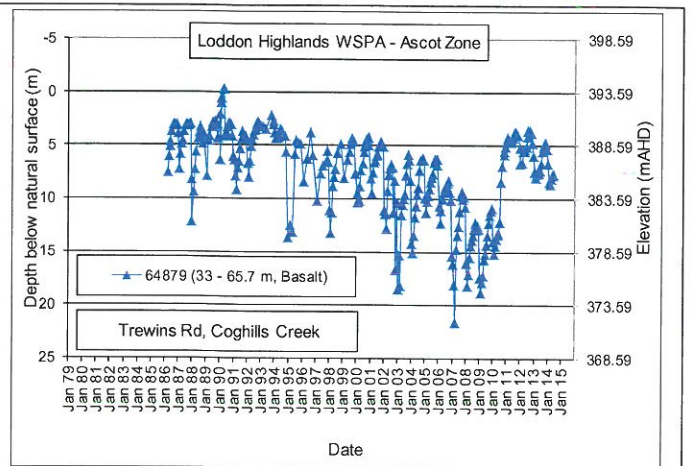
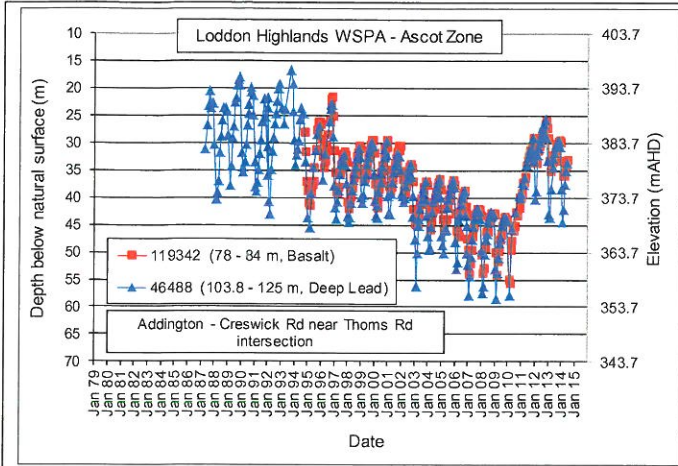
Zone 1104 – Blampied

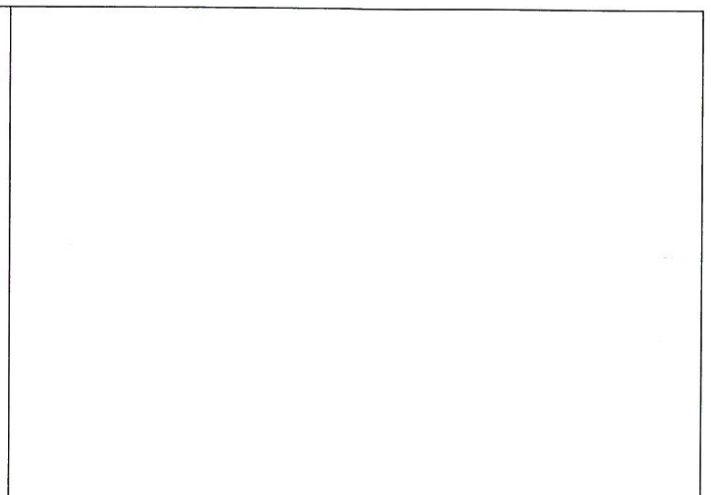
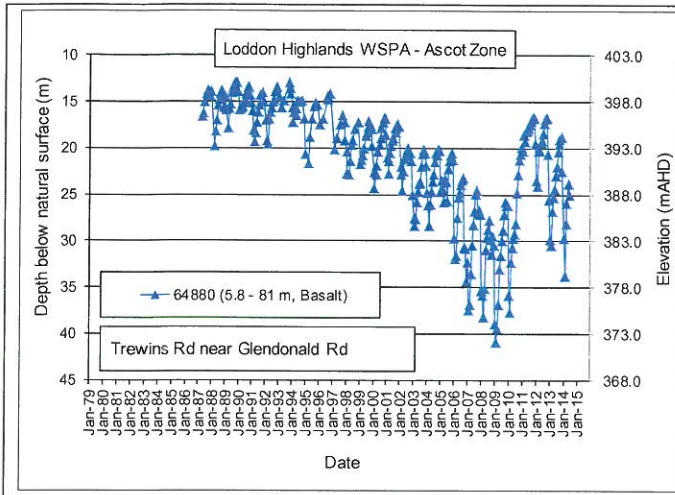


Zone 1107 - Newlyn

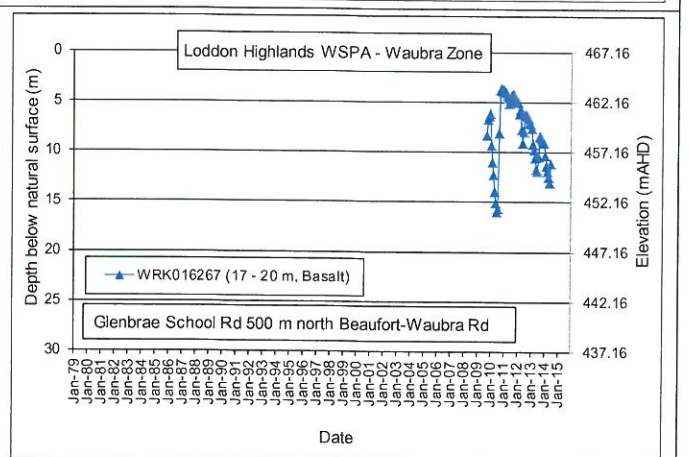
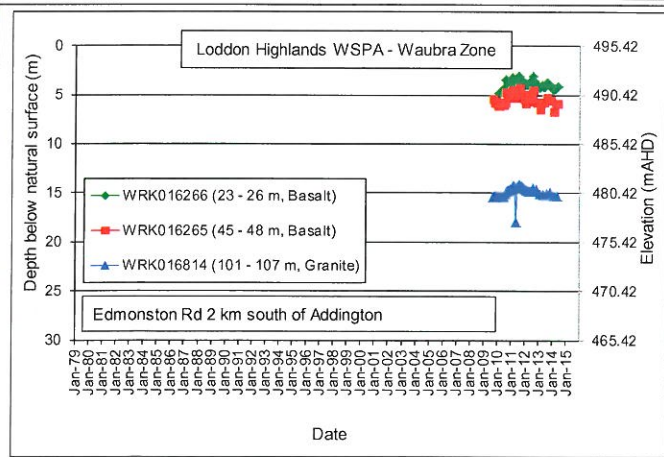
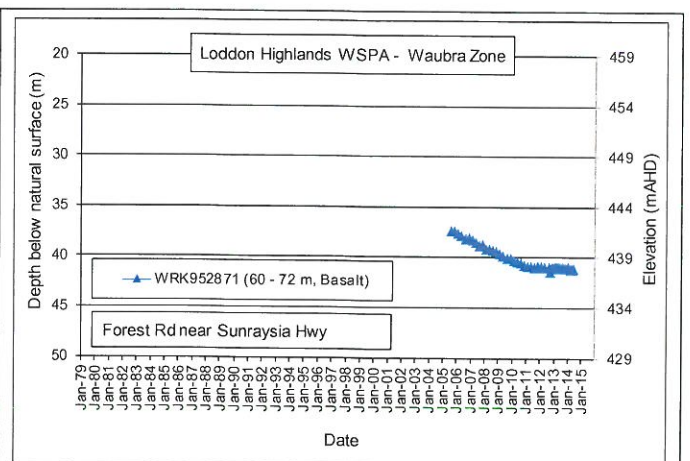
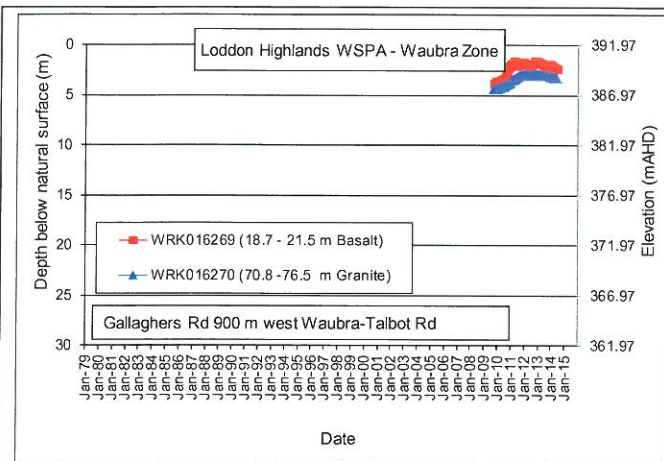


Zone 1102 – Ascot

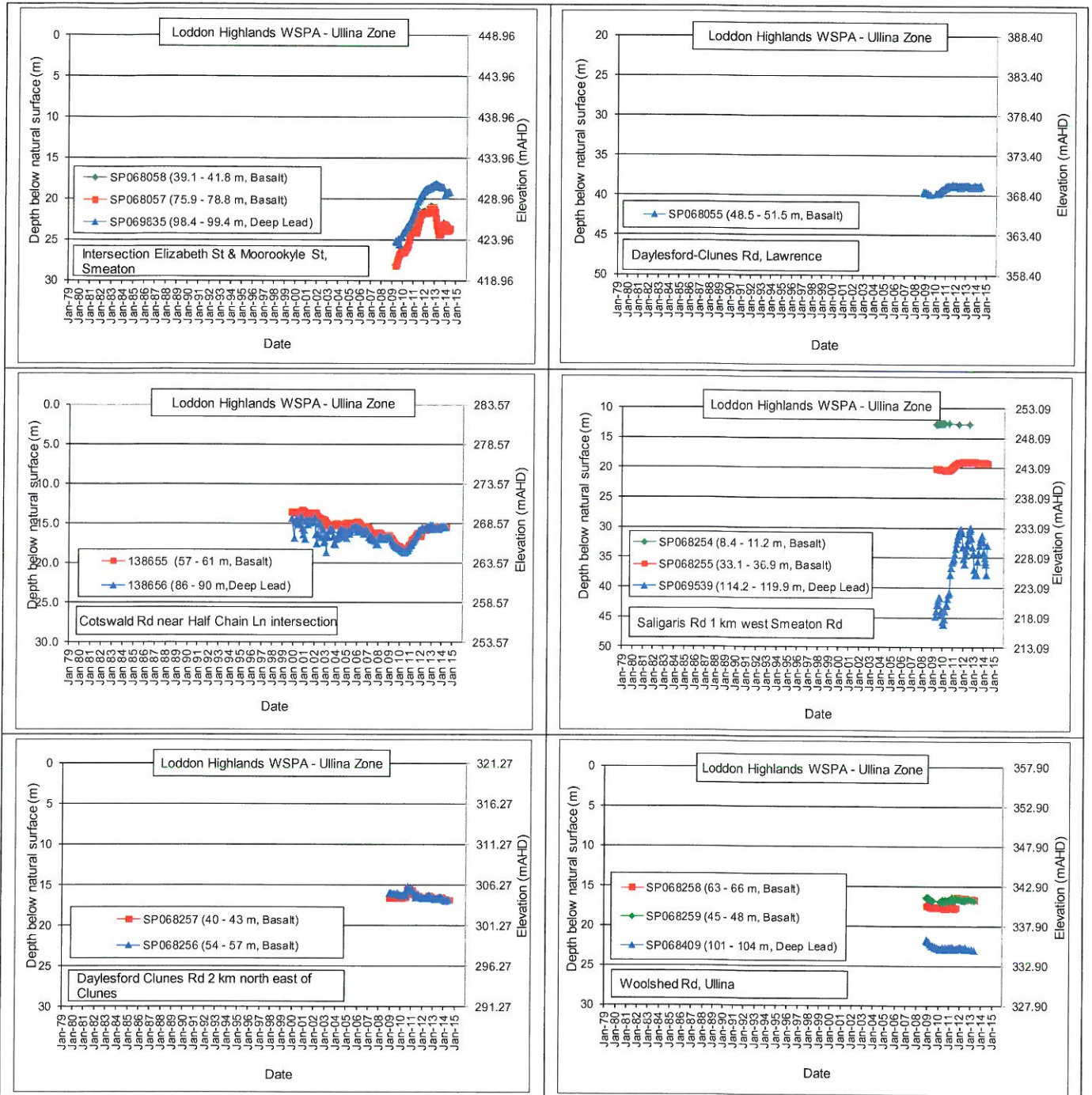




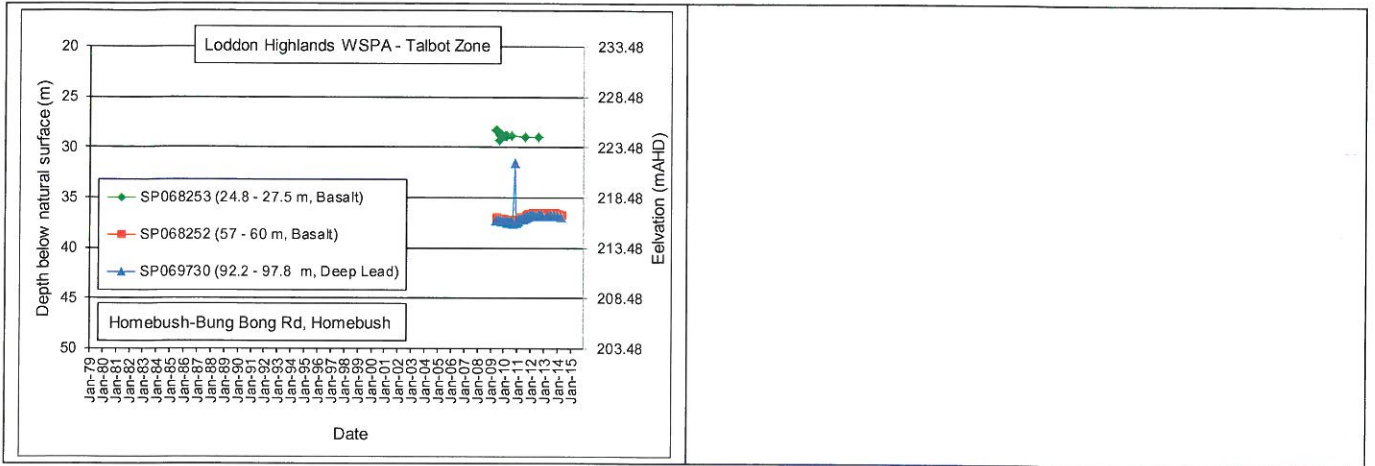
Zone 1106 - Waubra



Zone 1100 - Ullina



Zone 1101 - Talbot



Appendix C – Groundwater chemistry

Groundwater chemistry from nested State observation bores

	Bore	SP069539	SP068255	SP069730	SP068252
	Aquifer	Deep Lead	Basalt	Deep Lead	Basalt
Analyte	Date	13/03/2014	13/03/2014	12/03/2014	12/03/2014
pH Value	pH Unit	6.67	7.74	7.41	7.53
Electrical Conductivity @ 25°C	µS/cm	1620	6830	2180	3690
Total Dissolved Solids @180°C	mg/L	1060	5040	1280	2290
Turbidity	NTU	7	<0.1	194	<0.1
Bicarbonate Alkalinity as CaCO ₃	mg/L	380	231	269	293
Carbonate Alkalinity as CaCO ₃	mg/L	<1	<1	<1	<1
Hydroxide Alkalinity as CaCO ₃	mg/L	<1	<1	<1	<1
Total Alkalinity as CaCO ₃	mg/L	380	231	269	293
Sulfate as SO ₄ - Turbidimetric	mg/L	31	334	70	143
Chloride	mg/L	351	2150	574	1010
Calcium	mg/L	40	126	56	76
Magnesium	mg/L	70	376	91	165
Potassium	mg/L	8	14	5	8
Sodium	mg/L	200	800	228	400
Arsenic	mg/L	<0.001	<0.001	0.003	0.002
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	<0.001	0.003	<0.001	<0.001
Copper	mg/L	<0.001	0.002	<0.001	<0.001
Iron	mg/L	0.29	<0.05	<0.05	<0.05
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.084	<0.001	<0.001	<0.001
Nickel	mg/L	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.03	0.011	0.018	0.009
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Ammonia as N	mg/L	0.07	0.05	0.05	0.08
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	<0.01	4.19	1.49	3.98
Nitrite + Nitrate as N	mg/L	<0.01	4.19	1.49	3.98
Total Kjeldahl Nitrogen as N	mg/L	<0.1	<0.1	0.3	1.1
Total Nitrogen as N	mg/L	<0.1	4.2	1.8	5.1
Total Phosphorus as P	mg/L	0.06	0.08	0.2	0.32
Ionic Balance	%	4.27	0.11	6.22	3.25
Total Anions	meq/L	18.1	72.2	23	37.3
Total Cations	meq/L	16.7	72.4	20.3	35
Total Organic Carbon	mg/L	<1	1	1	1

