GOULBURN-MURRAY WATER

Shepparton Irrigation Region Water Supply Protection Area Groundwater Management Plan

Annual Report for the year ending

30 June 2012

Foreword

This is the annual report on the Groundwater Management Plan (the Plan) for the Shepparton Irrigation Region Water Supply Protection Area (SIR WSPA) covering the period 1 July 2011 to 30 June 2012. The report summarises the Plan's performance over the year, including a review of groundwater use, groundwater levels, compliance, metering activity and salinity information.

The Plan is unique in comparison to other groundwater management plans in Victoria in both its intent and the associated management measures. The primary objective of the Plan is to assist in the protection of the region's agricultural productivity and natural resources by encouraging and supporting regular and responsible pumping of groundwater to provide salinity control.

In recent years the risk to land productivity from high water tables has been very limited due to the extended drought. However, following the significant rainfall over the 2010/11 and 2011/12 period, shallow water tables have continued to rise across many parts of the Shepparton Irrigation Region (SIR), meaning the area at risk is increasing once again.

The extended drought and the return to wetter conditions last year have highlighted that improvements can be made to the way groundwater is managed in the SIR and that a new management framework is required that is better able to respond to this variability. Goulburn-Murray Water (G-MW) is continuing to work with key stakeholders on a programme which will lead to the development of an improved management framework. The annual report provides further information about this ongoing work.

This annual report will be submitted to the Minister for Water, the Goulburn Broken Catchment Management Authority and the North Central Catchment Management Authority. A notice identifying the availability of the report will be published in the Shepparton News.

A copy of this report will be available for inspection at the Shepparton, Rochester, Cobram and Tatura offices of G-MW, on the G-MW website (www.g-mwater.com.au), or upon request.

I encourage all groundwater users in the SIR WSPA to take the time to read this annual report.

Signed:

Tania Gallienon behalf of:
Gavin Hanlon
MANAGING DIRECTOR

Executive Summary

The primary objective of the Shepparton Irrigation Region Water Supply Protection Area (SIR WSPA) groundwater management plan is to support the implementation of the SIR Land and Water Salinity Management plan, which aims to protect the region's agricultural productivity and natural resources. The groundwater management plan encourages the responsible pumping of groundwater within 25m of the surface to provide salinity control, with a secondary objective of protecting groundwater resources and the rights of groundwater users.

2011/12 has seen a continuation of wet conditions with a significant rise in shallow groundwater levels across much of the SIR, and a considerable reduction in demand. Metered usage from licensed bores in the SIR WSPA for the 2011/12 season was 25,119 ML. This compares to the average annual usage over the period between 2002 and 2012 of 68,000 ML, with the peak usage of 109,247 ML in 2006/07.

Groundwater usage has decreased each year since 2006/07. During the extended drought the majority of reduced usage is attributed to the decline in shallow groundwater levels, such that many shallow spear point bores have been unable to access groundwater. The lower usage figures for 2010/11 and 2011/12, on the other hand, are a reflection of the reduction in demand for groundwater as the source of irrigation water following the return to wetter conditions throughout the region.

Water levels in the SIR WSPA are monitored through two monitoring programs. The Department of Sustainability and Environment (DSE) State Observation Bore Network has 97 bores monitored in the SIR WSPA. There are also 1,900 sites where groundwater levels have been monitored as part of the G-MW/ Department of Primary Industries shallow bore network.

In recent years, the risk to land productivity from high watertables has only been in small, isolated and contracting parts of the SIR. However, due to significant rainfall over in 2010/11 and 2011/12, shallow water tables have rapidly risen across areas of the SIR WSPA, meaning the area at risk is increasing once again. G-MW is continuing to monitor the shallow groundwater levels in the SIR.

Only 12% of licensees in the SIR WSPA returned a groundwater sample during 2011/12. This is the same as the 2010/11 period and a decrease on the reporting period 2009/10, which had a return rate of 16%. The decrease is attributed to the wet weather and associated lower demand for groundwater.

The groundwater management plan was developed at a time of high groundwater levels (late 1990s), when levels were expected to remain high or rise. The extended drought and return to wetter conditions last year highlighted that improvements can be made to the way groundwater is managed in the SIR and that a new framework is required that is better able to respond to this variability.

During 2011/12 G-MW continued to work with key stakeholders on two significant projects that will inform the future management of groundwater in the SIR.

The National Water Commission funded Groundwater Resource Management Framework project was completed. This project has enabled a greater understanding of the drivers affecting shallow groundwater usage and it has confirmed that the most appropriate resource management framework may be one based on a groundwater local management plan rather than the current statutory plan. Consideration is now being given to the process for the development of a new local management plan which will enable more appropriate management of the resource when groundwater levels are low and the resource is limited.

The SIR Salt and Water Balance Project aims to provide recommendations on a management framework that will assist in the mitigation of salinity by managing shallow groundwater.

The outputs from these two projects will form the basis for improved groundwater management arrangements in the Shepparton Irrigation Region.

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1. Description of Water Supply Protection Area

1.1 *Boundary*

A Water Supply Protection Area (WSPA)[1] is an area declared under the *Water Act 1989* to protect groundwater resources in areas of intensive use. The Shepparton Irrigation Region (SIR) was declared as a WSPA in September 1995. It is located in Northern Victoria and extends from Yarrawonga in the north-east to Murchison in the south and across to Tennyson and Echuca in the West (Figure 1).

1.2 *Land use*

The area covered by the groundwater management plan is 674,000 ha. Around 300,000 ha are irrigated in most years. In the past the area has been predominately used for dairying, but in recent years there has been some movement out of this industry. Other industries include pome and stone fruit, seed crops, lucerne, forage crops and vegetables.

1.3 *Geology*

The geology of the region can be defined as alluvial deposits overlying bedrock. The alluvial deposits are divided into three principal geological units:

- The Shepparton Formation;
- The Calivil Formation; and
- The Renmark Group.

The Shepparton Formation overlies the Calivil/Renmark aquifer and forms the uppermost geological formation over most of the region. It is predominantly comprised of alluvial silts and clays interspersed with meandering channels of sands and gravels, typically up to 5 metres thick, and often discontinuous. The aquifers of sand and gravel are locally capable of supplying significant quantities of water. However, due to the highly variable characteristics of the Shepparton Formation, the occurrence of good quality groundwater available in useful quantities is highly irregular.

The Renmark Group and Calivil Formation (often considered one hydrogeological unit) are unconsolidated gravels and sands which lie unconformably upon basement rock. These sediments were deposited along broad valleys by ancient rivers flowing from the highlands onto the plain. In the Riverine plains of Northern Victoria, the Renmark Group/ Calivil Formation form three major aquifers (commonly referred to as “Deep Leads”) that generally follow the courses of today’s Murray, Campaspe and Goulburn Rivers. These aquifers broaden toward the north and west and merge to form a continuous sheet under much of the south-eastern Murray Basin.

1.4 *Overall management of the resource*

The SIR WSPA was declared to manage groundwater resources within 25 metres of surface. The groundwater resource below 25 metres is managed separately. In the Murray Valley the resource is managed under the Katunga WSPA Groundwater Management Plan. In the Campaspe and Goulburn

[1] *These areas have also previously been referred to as a Groundwater Supply Protection Area (GSPA)*

catchments the resource is managed under the Lower Campaspe Valley WSPA[2] and Mid-Goulburn Groundwater Management Area arrangements respectively.

[2] *Effective from 1 August 2010, the Campaspe Deep Lead WSPA was abolished and its groundwater management plan was revoked. A new Lower Campaspe Valley WSPA was declared and it is being managed under interim management arrangements until the new management plan is approved*.

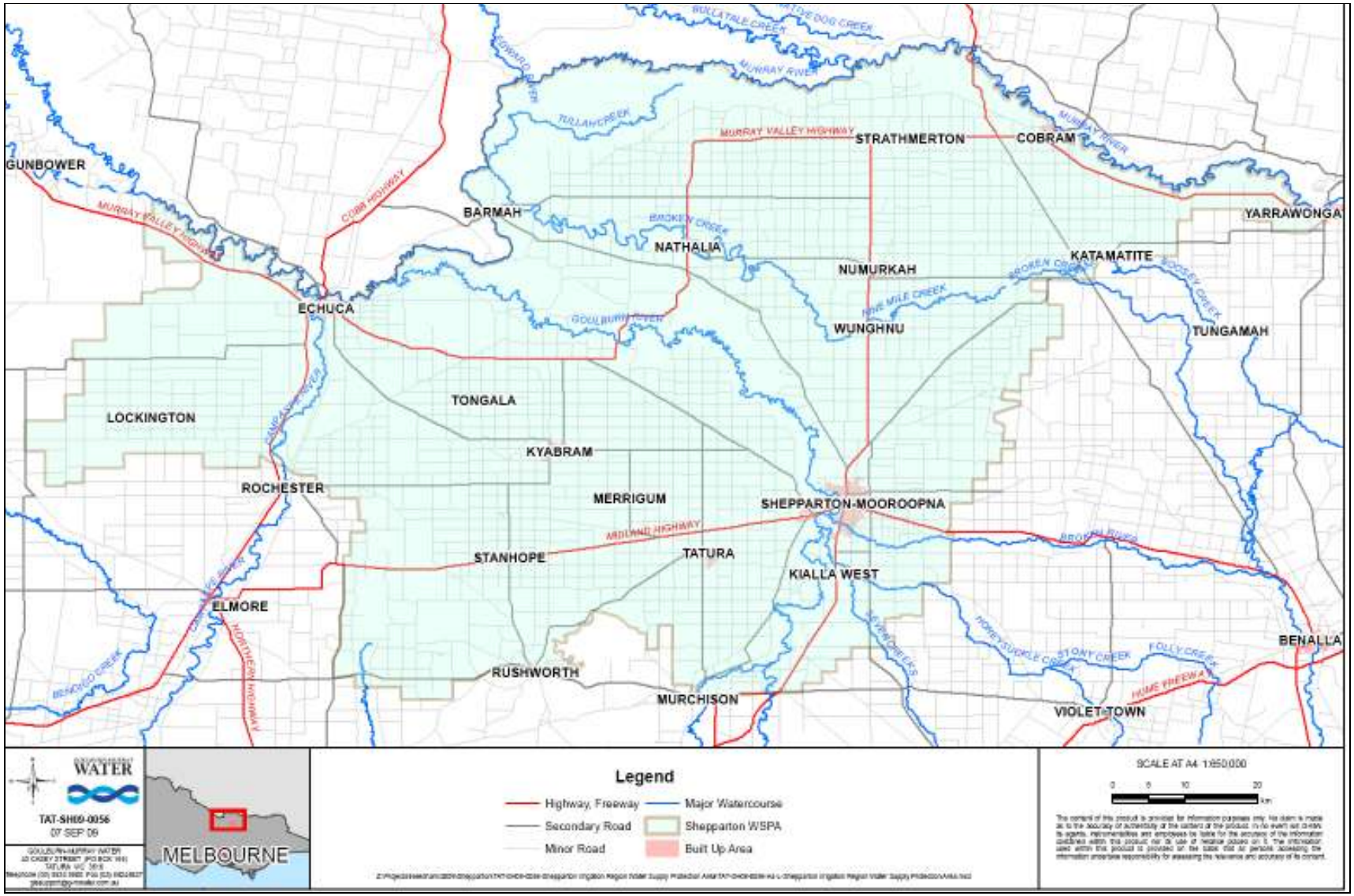


Figure 1 - Shepparton Irrigation Region (SIR) WSPA boundary

2. Purpose of the Groundwater Management Plan

When an area is declared a WSPA, a Groundwater Management Plan must be developed and implemented. The process for developing a management plan is specified in the *Water Act 1989* (the "Act"). The SIR WSPA Groundwater Management Plan (the Plan) was approved by the Minister responsible for the Act in 1999. No review date is specified in the Plan.

The Plan is unique when compared to other groundwater management plans in Victoria in both its intent and management measures. It was developed to augment the SIR Land and Water Salinity Management Plan (the Salinity Plan). Section 2 of the Plan states:

> "*The primary objective of this Plan is to support the implementation of the Salinity Plan which aims to protect the Region's agricultural productivity and natural resources. It will do this by encouraging and supporting regular and responsible pumping of groundwater to provide salinity control while protecting both the groundwater resource and the rights of groundwater resource users."*

Other groundwater management plans have been developed to manage the potential overuse of groundwater resources that could result in excessive declines in groundwater levels within those WSPAs covered by such plans. The SIR WSPA Groundwater Management Plan is considered to be of limited value for groundwater resource management because it does not have a Permissible Consumptive Volume (PCV) to cap the issuing of new entitlement or mechanisms to control water usage (i.e. set allocations) on a seasonal basis. Also the variability of the upper Shepparton Formation and lack of contiguous aquifers (as discussed in section 1.3 of this report) means there are difficulties managing groundwater as a transferable and tradable resource in most areas of the SIR.

A monitoring and metering program provides the information necessary to manage the groundwater in the WSPA. However, groundwater level monitoring is not undertaken with the specific aim of tracking where excessive declines in groundwater levels are occurring. Rather monitoring is undertaken to allow watertable and salinity control works to be targeted in the high watertable areas.

As explained in section 1.4, the SIR WSPA overlies several deep lead aquifers (Murray Valley and Campaspe) which are protected within separate WSPAs (Katunga and Lower Campaspe Valley respectively) and have their own management arrangements.

3. Plan implementation

3.1 *Usage*

3.1.1 Usage volume

The total metered usage of licensed bores in SIR WSPA for the 2011/12 season was 25,119 ML (Table 1). The location of all licensed (metered and un-metered) bores is shown Figure 2 while the recorded 2011/12 usage for each extraction point (presented as a range) is shown in Figure 3. The metering program and how usage is calculated is explained in section 3.4.

Groundwater usage has continued to decrease since the 109,247 ML recorded in 2006/07 (Figure 4). As will be discussed in section 3.1.2 there are a number of possible contributing factors for this.

Table 1 - Groundwater use in 2011/12 compared to the previous two years

Parameter	At 30 June 2010	At 30 June 2011	At 30 June 2012
Number of groundwater licences[3]	1,398	1,221	1,185
Total licence entitlement volume[4]	235,591 ML/yr	209,770 ML	204,859 ML/yr[5]
Total entitlement of bores with metered use	128,858 ML/yr	101,920.9 ML/yr	102,607 ML/yr
Total number of meters	993	850	849[6]
Total metered volume used	49,701 ML (610 verified bores)	16,721 ML (471 verified bores)	25,119 ML (477 verified bores)[7]
Total metered use as a percentage of total licence entitlement volume	21%	8%	12%
Total metered use as a percentage of total entitlement of bores with verified use	38%	16%	24%
Number of licences with estimated volumes	0	0	0
Total estimated volume used	0 ML	0 ML	0ML
Total use	49,701 ML	16,721 ML	25,119 ML

[3] *Includes all section 51 licences- issued for irrigation and dewatering purposes*
[4] *Total volume of groundwater allocated under licence (excludes Domestic & Stock)*
[5] *This volume has continued to reduce due to the dewatering components of irrigation licences being removed, a large number of licence cancellations and data corrections.*
[6] *Meter data is now sourced from the Maximo asset management data system*
[7] *The change in the number of verified bores is due to bores with metered usage of 0ML this season not being reported.*

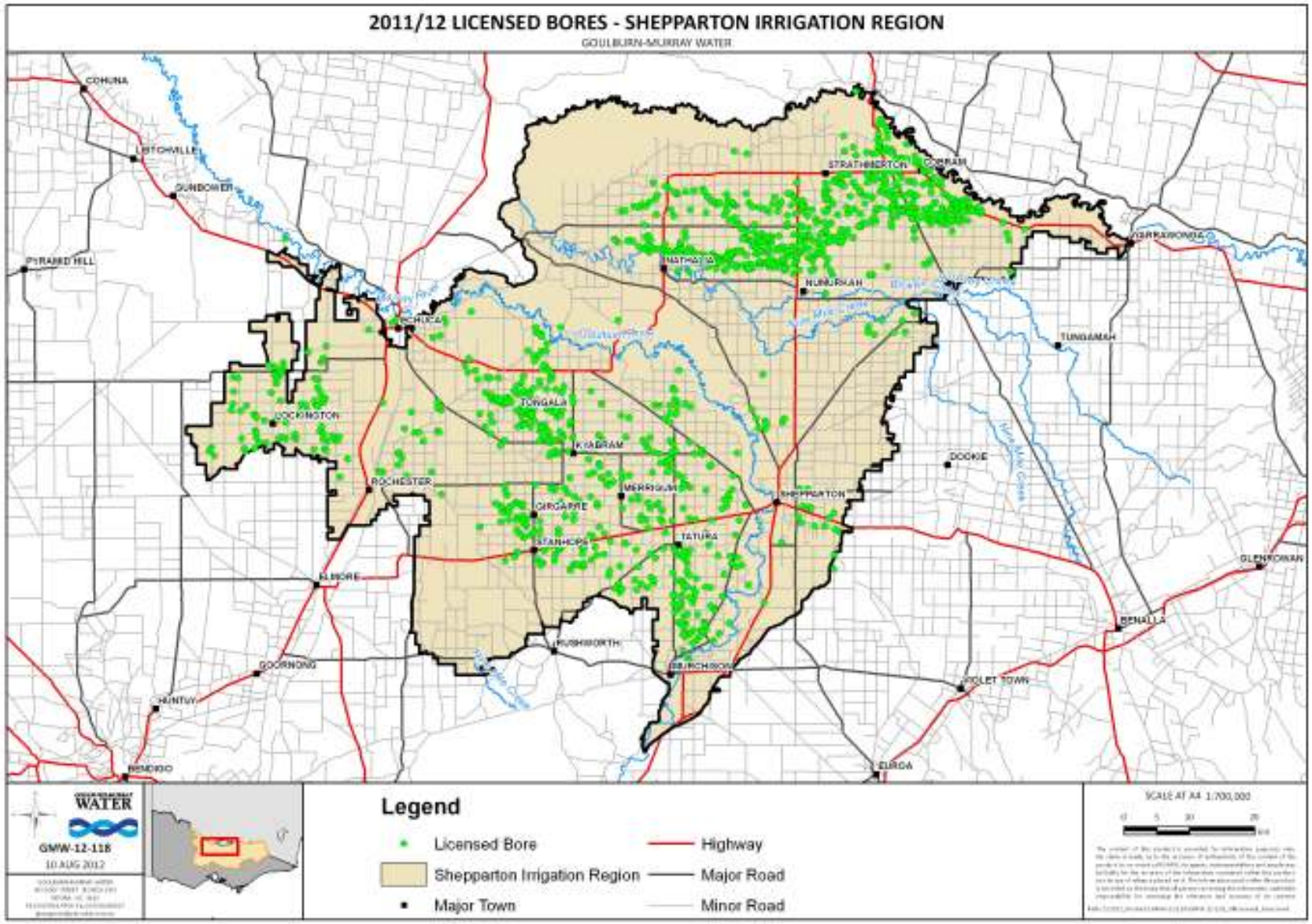


Figure 2 - Location of licensed bores within the SIR WSPA

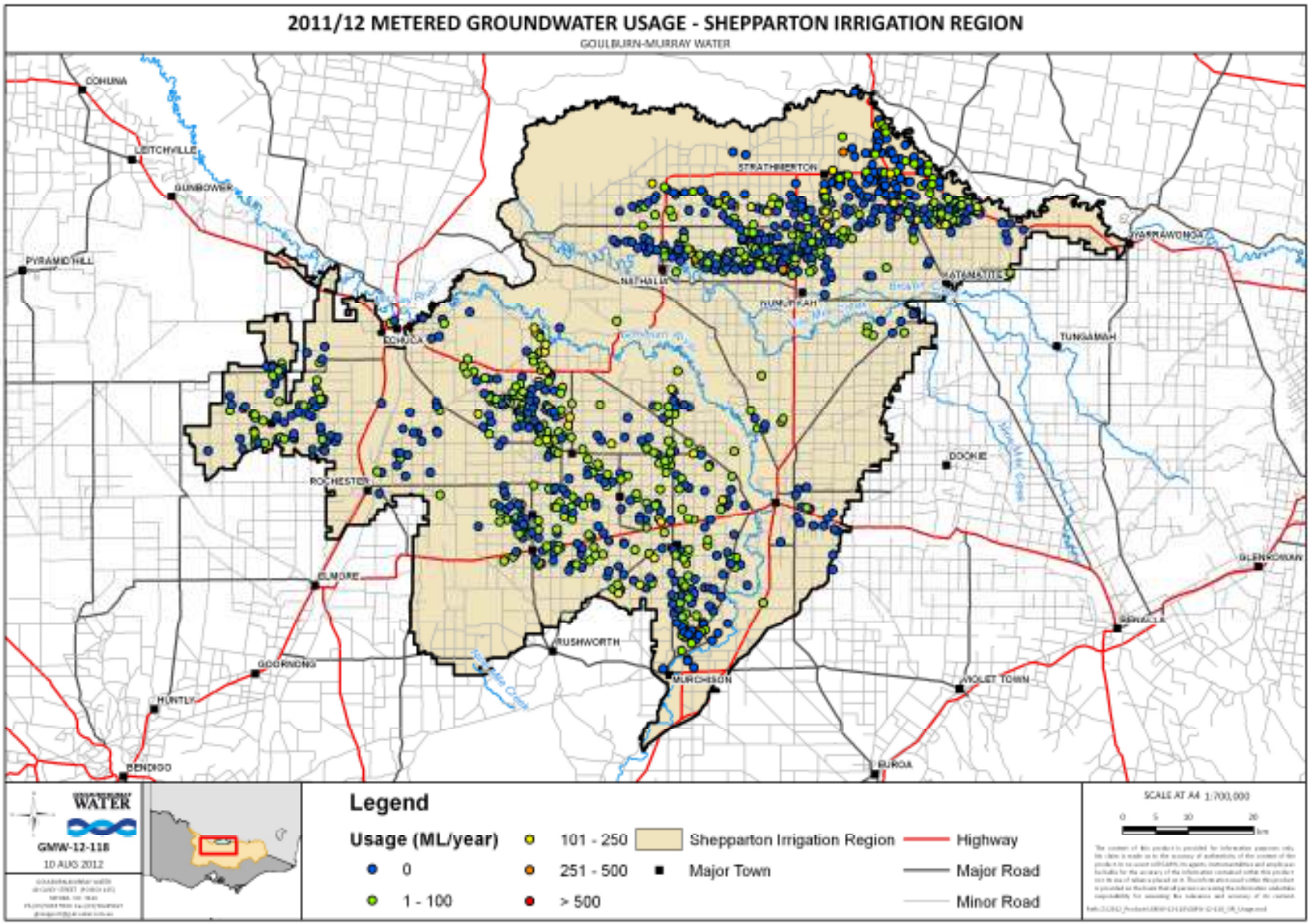


Figure 3 - Metered usage for individual extraction points in the SIR WSPA for 2011/12

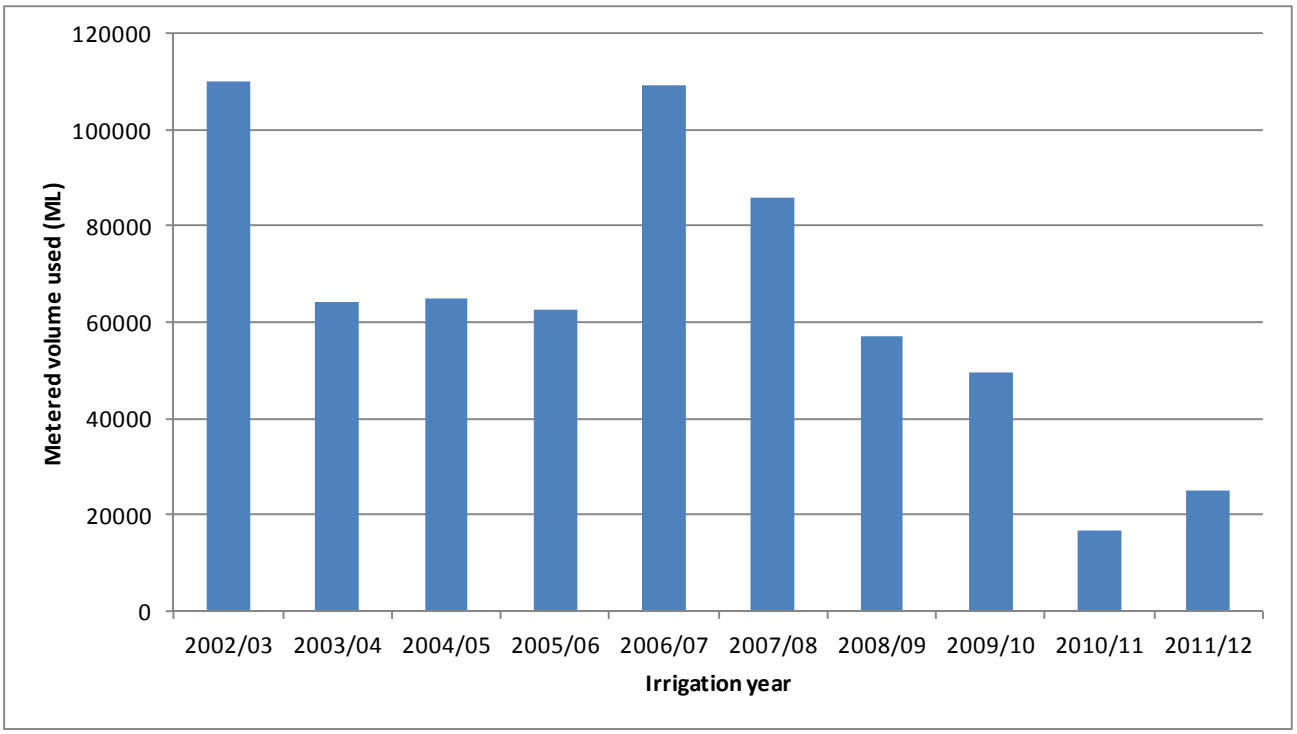


Figure 4 - Annual metered usage for each season since 2002/2003

3.1.2 Factors affecting usage

During the recent extended drought, groundwater usage in the SIR decreased significantly, partly as a result of low groundwater levels restricting access to groundwater users with shallow bores.

Rainfall during 2010/11 and 2011/12 was significantly higher than the long term average. The subsequent lower demand is believed to be the main factor leading to reduced usage of 25,119 ML in 2011/12.

Rainfall across the region through the 2011/12 season was 600.2 mm, as recorded at the Kyabram DPI site. This is a continuation of the high rainfall that occurred at the end of the last year, which has also resulted in rising groundwater levels in many parts of the SIR, as described in section 3.1.4.

In the 2011/12 season the Murray surface water system reached 100% of high reliability water shares by 15 November 2011. The Goulburn system reached 100% of high reliability by 3 October 2011. These were no low reliability allocations for either system. Increased surface water availability is a contributing factor to the low groundwater usage, as gravity surface water usage has been more cost effective than pumping groundwater.

Shallow groundwater levels are expected to continue to rise over the 2012/13 season if the wetter conditions continue, and will be aided by having more surface water available for irrigation. The August 2011 water table map confirms that groundwater levels had begun to rise in many parts of the SIR, as shown in section 3.1.4 .

3.1.3 Overuse and compliance

A total of 11 licences were investigated for overuse in the SIR WSPA. This is a decrease in the number of overuse cases compared to previous years, which is likely to be due to the overall reduction in groundwater usage compared to previous years.

In response to this overuse, warning letters have been sent out to the licence holders in question. If the overuse is continued over the next season, further action will be taken, which could lead to legal proceedings. The target for managing licensed use remains at zero use in excess of entitlement, however G-MW recognises that managing use within entitlement in the SIR WSPA must also include consideration of the catchment management objectives of the Plan.

There were four other compliance cases that are in various stages of investigation within the SIR WSPA during the 2011/12 season, relating to other licensing and metering compliance issues.

3.1.4 August shallow water table levels

The Plan specifies that the August groundwater levels from the DPI/G-MW shallow bore network (discussed in section 3.5.1) are used annually to produce a shallow water table map. The August period is chosen as this is generally the month with the highest water table levels, showing the areas at greatest risk to salinity. The 2010 and 2011 water table maps are shown in Figure 5.

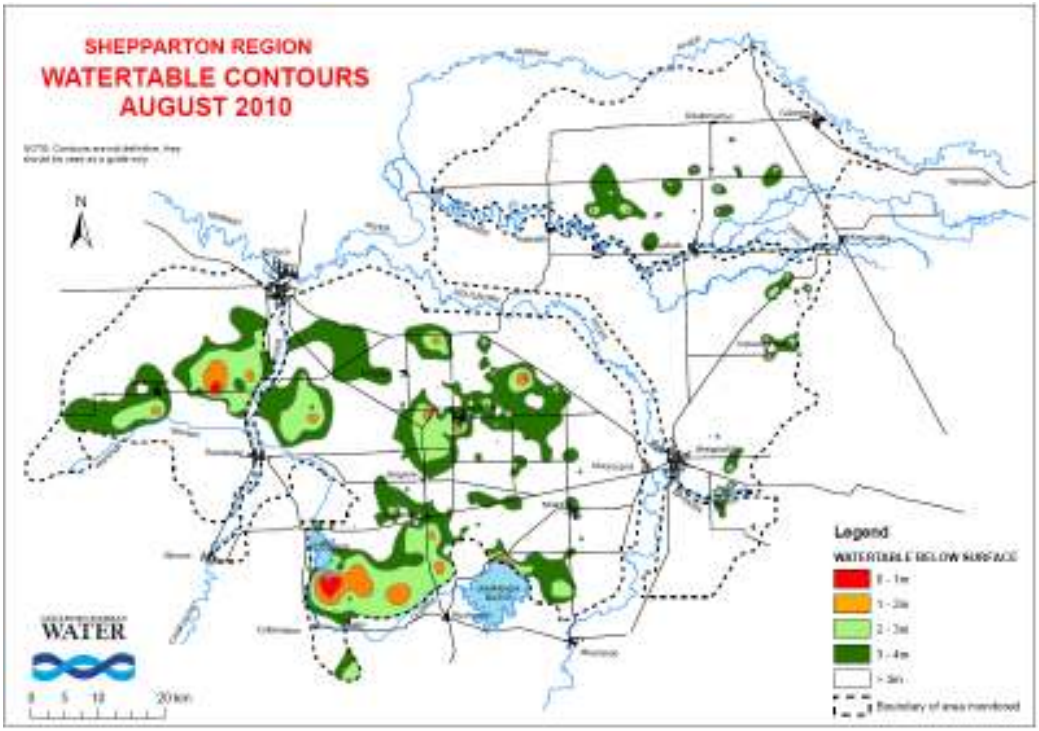
In August 2011 shallow water table levels were generally within three metres of the ground surface across 22.4% (126,371 ha) of the monitored area of the SIR WSPA, compared to around 6.1% (41,357 ha) in August 2010. The changing area covered by the contours is shown over the years in Figure 6. From this figure, it can be observed that in 2011/12 shallow water levels recovered, leading to a substantial increase in the areas where the water table level is within 3 m of ground surface.

Nearly all districts across the SIR WSPA experienced a water table increase in areas bounded by 2m and 3m water table contours between August 2010 and August 2011. The area within 0-2 m depth to water table has increased from 7,778 ha to 29,077 ha. The area within 0- 3 m depth to water table has increased from 41,357 ha in 2010 to 126,371 ha in 2010.

It is clear that risk to land productivity in some regions of the SIR WSPA is rising again, and the need for water table control measures in these affected areas is likely to increase. The rise in the water table within the SIR WSPA is attributed to the significant increase in rainfall recharge over the past two years. During the 2011/12 season, total rainfall was 600.2mm, compared to the long term average annual rainfall of 444.2mm (at Kyabram).

Hydrographs from five monitoring bores are presented in *Appendix 1- Representative Hydrographs.* These hydrographs show shallow watertable behaviour over the year, with level rises evident in four of the five bores.

a) August 2010



b) August 2011

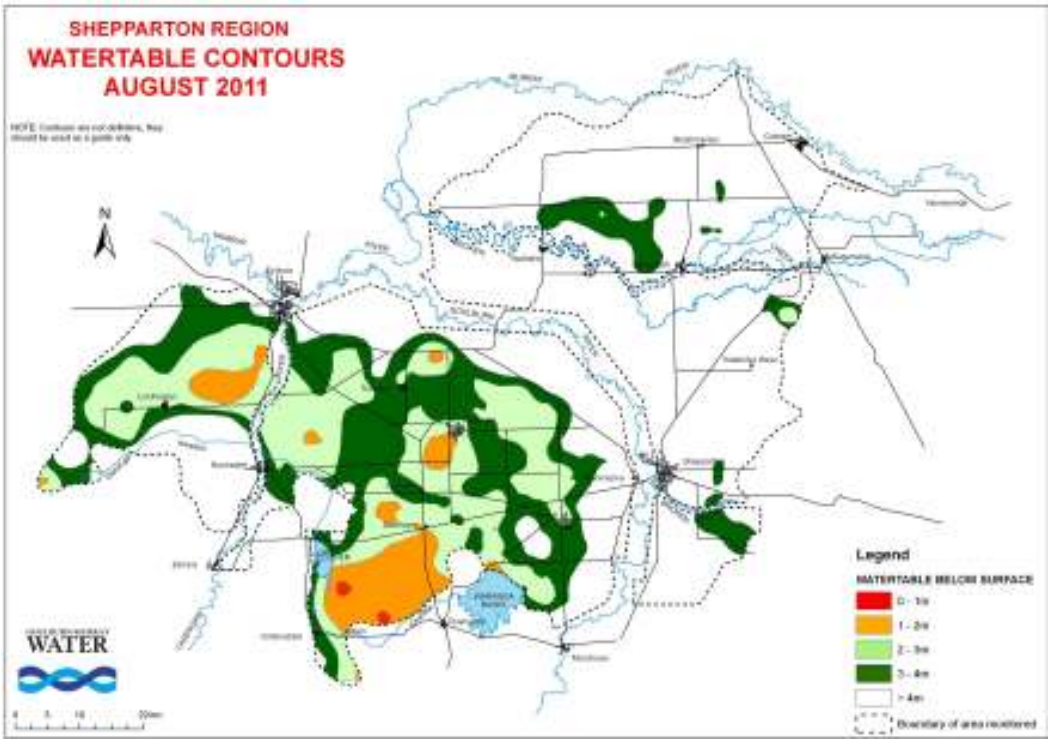


Figure 5 - Watertable contour maps for 2010 (a) and 2011 (b)

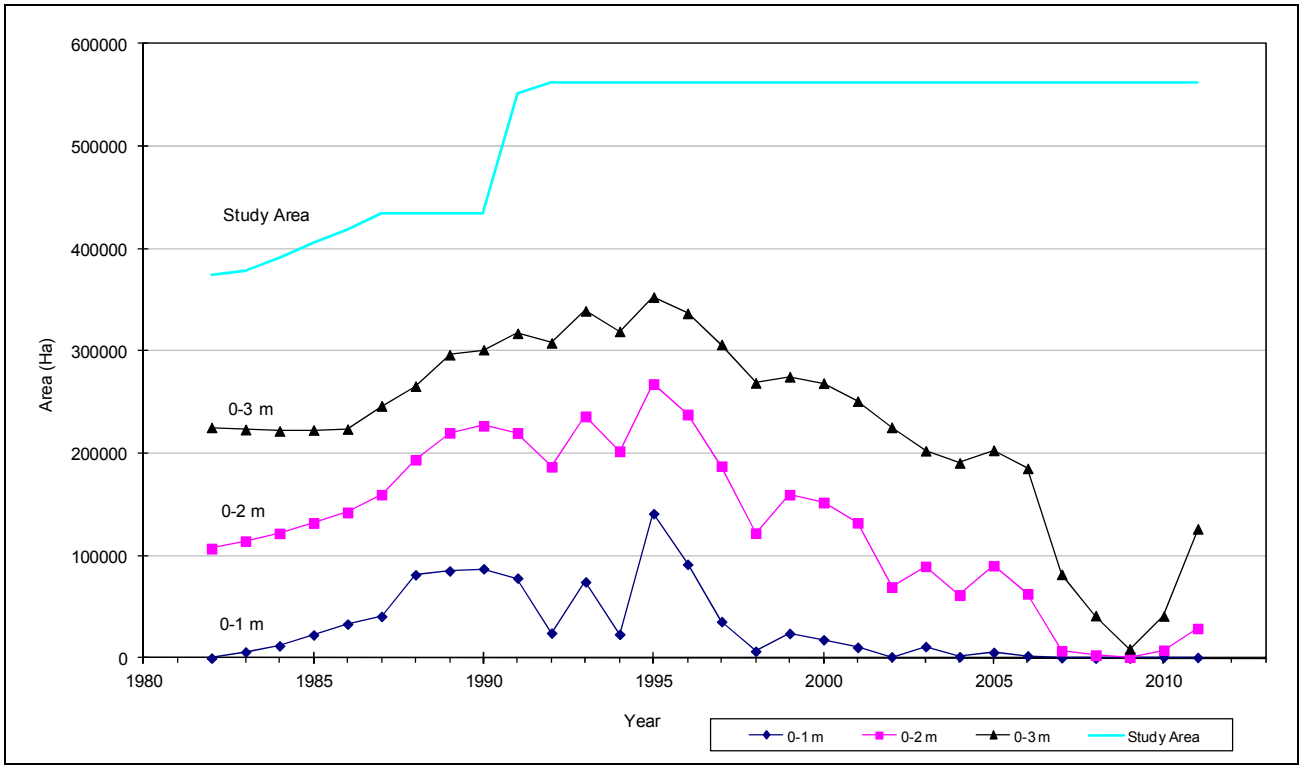


Figure 6- Watertable contour area in hectares over time (Source: 2011 water table study, G-MW)

3.2 *Licence transfers*

Transfer of licence groundwater entitlement (temporary or permanent) is not permitted in the SIR WSPA.

3.3 *Licensing activities*

Over the 2011/12 season, 25 SIR irrigation and dewatering licenses were renewed. 21 licenses were also cancelled during the year, either as part of the renewal process, or due to the licences no longer being required. Licensing activities are summarised in Table 2 below.

Table 2 - Licensing activities for 2011/12

Activity	No.
New licences issued	2
Licence alterations	18
Licences revoked	0
Licence cancellations	21
Licence amalgamations	0
Licence renewals	25

The State Dairy Shed Water Licence Transition Program is complete and aims to ensure that licence volumes reflect the historic water use within dairies. All operating dairies are now required to have a section 51 licence for the commercial use of water in the dairy.

3.4 *Metering*

3.4.1 Meter Readings

Metering can provide a number of benefits, these include:

- improved management of the resource
- ensuring that access to water is equitable and licensees stay within their annual allocation.
- greater on-farm water efficiency information and cost savings

However, it is also becoming apparent that the benefits of metering within the SIR may not be so clear cut, given the fragmented nature of the aquifer, and the opportunistic nature of the resource. It is proposed that the benefits of metering will be considered in more detail, as management arrangements in current plan are improved and replaced by a more contemporary groundwater management plan (this is discussed further in Section 4).

Section 11.2 of the Plan outlines requirements in relation to installation, maintenance and reading of meters.

Under the requirements of the Plan, all private dewatering bores and bores licensed to extract greater than 20 ML/year must be metered. All new licences are to be metered irrespective of the amount of licensed volume.

Meters in the SIR WSPA were read in the months of May/June. Metered usage for each bore was calculated by subtracting the start meter reading from the end of season reading. All metered usage was verified, and no usage was estimated.

3.4.2 Data storage

For effective management of the groundwater resource, data management systems are required to allow the storage and retrieval of large quantities of data. Metering data is stored and maintained by G-MW, within its Irrigation Planning Module system.

3.4.3 Meter installation and maintenance

In accordance with the Plan, all licensed irrigation bores with an annual usage of more than 20 ML[8] installed prior to 1 July 1999 have had funding provided for the supply and fitting of a G-MW approved volumetric flow meter.

In 2011/12, four new meters were installed, and none are currently awaiting installation. This may change when the final details of the Dairy Shed Water Licence Transition Program are confirmed. Twenty three defective meters were identified and repaired, no meters were replaced in 2011/12 (table 3).

[8] 20 ML is the annual groundwater usage defined as the upper limit for low capacity bores in the SIR and is a figure endorsed by the former SIR Groundwater Management Plan Working Group in 2000.

Table 3 - Meter installation and maintenance activities 2011/12

Activity	Total at 30 June 2012
Number of new meters installed	4
Meters requiring maintenance	23
Meters replaced	0

3.5 *Groundwater level monitoring*

Monitoring of groundwater levels enables G-MW to:

- assess annual and long term impacts on water levels from groundwater pumping;
- monitor regional and local seasonal drawdown;
- examine interrelationships between groundwater trends with other aquifers and surface water systems;
- undertake future resource assessments; and
- assess potential management issues.

However, as discussed in section 2 of this report, groundwater level monitoring in the SIR WSPA is not only about resource management but also about identifying high risk, high watertable areas to enable targeted watertable and salinity control works to occur.

3.5.1 Monitoring sites

The SIR WSPA is monitored by the:

1. G-MW/DPI shallow bore network - 1900 sites are monitored under this program (specifically to assess watertable trends and develop an annual watertable contour map)

2. State Observation Bore Network (SOBN) bores (Figure 7)- 97 SIR WSPA bores are currently monitored under this program

This is different to groundwater level monitoring in most other groundwater management units, which have monitored programs comprising bores mainly within the State Observation Bore Network (SOBN).

3.5.2 Level readings

Shallow observation bore monitoring is undertaken by a sub-contractor, with an annual monitoring run completed to enable production of the August watertable map use (see section 3.1.4). There is also quarterly or half yearly monitoring in place for a selected subset of these bores.

The 97 SOBN bores in the SIR WSPA are monitored and maintained by a sub-contractor on behalf of the Department of Sustainability and Environment (DSE). These bores are monitored on a quarterly basis.

3.5.3 Data storage

For the both monitoring programs, data is entered into the Groundwater Management System (GMS). This state-wide database is managed by DSE. The levels for all monitoring bores are entered into this

database within 30 days after reading so that the data can be accessed and interpreted by resource managers.

3.5.4 Maintenance program

The G-MW/DPI shallow bore network is maintained by G-MW according to an agreed work schedule.

SOBN Bores are visually inspected during monitoring and any maintenance required is noted on the electronic monitoring run field sheets kept by the sub-contractors. During the reporting period, no long-term maintenance issues were identified. Maintenance such as painting the bores or clearing the site is undertaken as required by the sub-contractor.

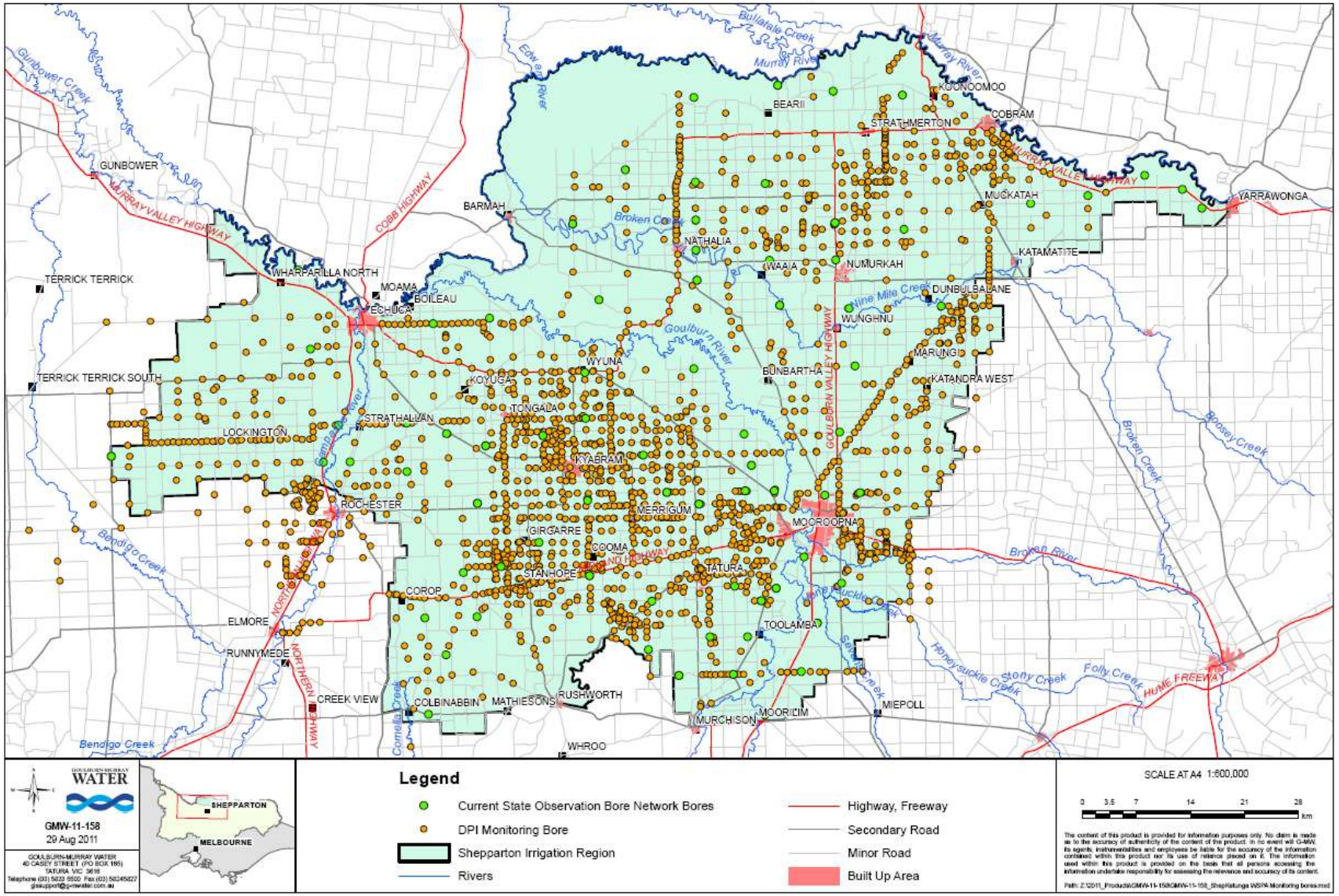


Figure 7 - Location of DPI/G-MW and State Observation Bore shallow monitoring bores in the SIR WSPA

3.6 *Salinity monitoring*

3.6.1 Monitoring program

Regular analysis of groundwater from bores is required so that potential future salinity issues and trends can be identified. As part of its long term groundwater salinity monitoring program, G-MW conducted a salinity sample mail-out to registered owners of all licensed shallow (i.e. <25m deep) bores in the SIR WSPA in February 2012. A sample bottle was sent along with a pre-paid return envelope and a letter requesting that a groundwater sample be collected during operation of the bore and returned to G-MW for salinity determination.

3.6.2 Results

From a total of 1,217 sample bottles sent out to licence holders, 151 samples were returned between January and June 2012; a return rate of 12%. The low amount of samples returned during the season is a continuation of a downward trend, however this year the reduced number is most likely to be due to significant reduction in groundwater demand and low bore use. Previously, the number of bores operating and pumped volumes had been reducing due to declining groundwater levels (i.e. a greater number of bores not being able to access groundwater) and this was considered to be a key contributing factor for the non-return of samples.

The spatial distribution of groundwater salinity sample results for 2011/12 is presented in Figure 8. It highlights that groundwater salinity in the SIR WSPA is highly variable due to the complex nature of the ‘shoe-string sands’ aquifers that comprise the upper Shepparton Formation.

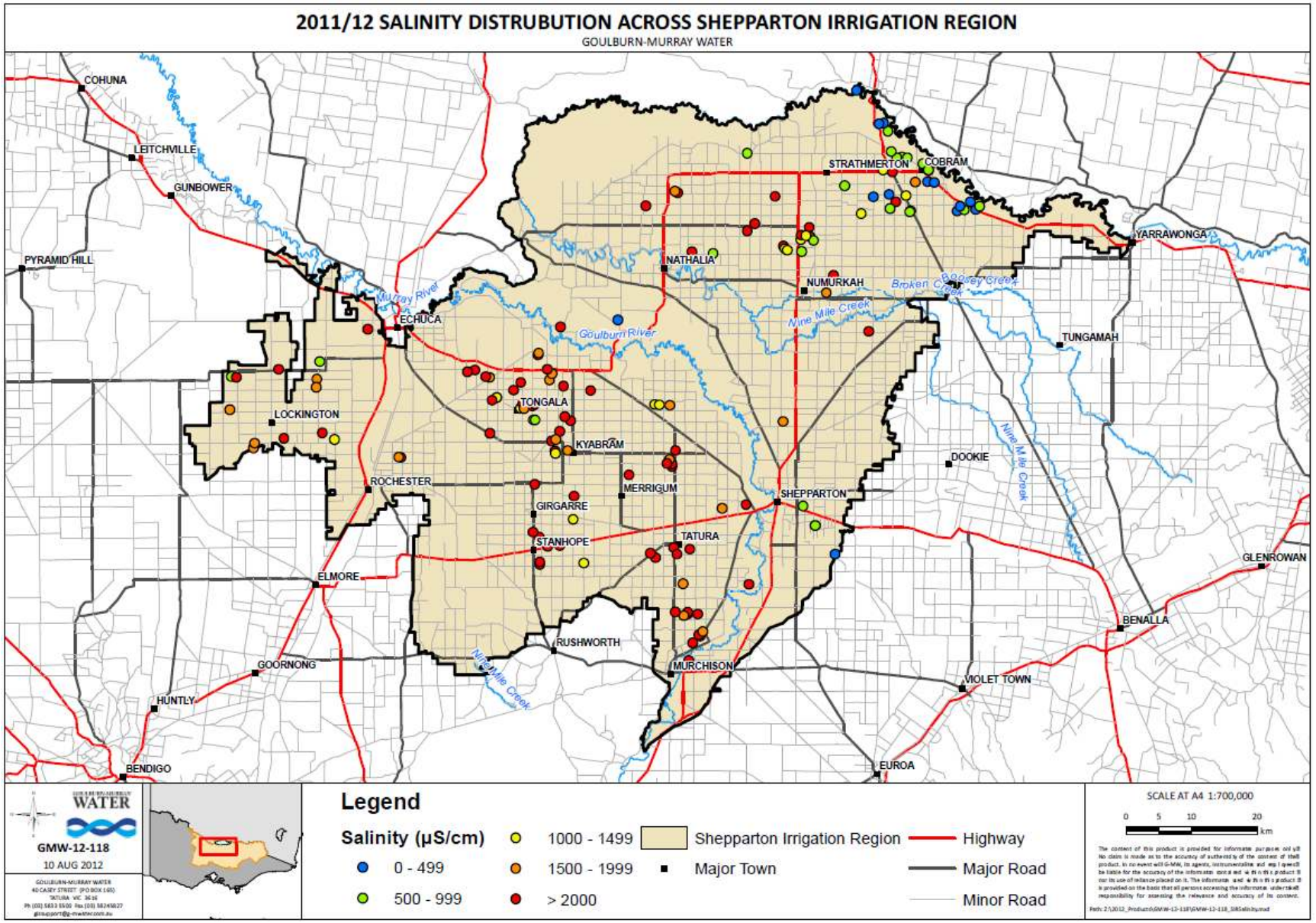


Figure 8 – Distribution and EC ranges of returned groundwater salinity samples from licensed bores in SIR WSPA

4. Future management considerations

2010/11 saw a significant shift in behaviour within the SIR WSPA, from a strong declining trend during the previous 4 years, to a period of groundwater level recovery. This recovery has continued in 2011/12, and has occurred due to recharge from above average rainfall. The return to wetter conditions, and the resulting increased surface water availability, has significantly reduced the demand for groundwater.

During the recent prolonged drought, the groundwater resources of the SIR were put under significant stress, and many groundwater users could not access groundwater; particularly those with shallow spear point systems. Consequently it has been recognised that the Plan is of limited value for future groundwater resource management because it does not have mechanisms to allow shallow groundwater to be adaptively managed in response to changing seasonal and climatic conditions.

G-MW is currently working with key stakeholders on the basis of two significant projects which will inform the future management of groundwater in the SIR.

The Groundwater Resource Management Framework project, funded under the *Raising National Standards Program* of the National Water Commission, has helped to understand the drivers affecting shallow groundwater usage and has identified a more appropriate framework for managing shallow groundwater resources. This project has confirmed that the most appropriate resource management framework is a local management plan rather than the current statutory plan. Developing, reviewing or amending a local management plan does not require undertaking a statutory process. It is therefore a more flexible, adaptable and cost efficient management option. Shallow groundwater in the SIR is a largely opportunistic and unpredictable resource and it is important that a planning framework can adapt to changing resource availability and conditions.

Consideration is now being given to the process to develop a new local management plan which will enables the resource to be managed when groundwater levels are low and the resource access is limited.

The SIR Salt and Water Balance Project is being undertaken as part of the Goulburn Broken Catchment Management Authority's (GBCMA) SIR Catchment Implementation Strategy, within funding from the GBCMA and DSE. It aims to provide recommendations on a revised salt management framework and a suite of tools that will assist in mitigating salinity by managing shallow groundwater. The framework will consider the combined impacts of unpredictable climate, land use change and modified watertable accessions arising from the transfer of water entitlements as well as the modernisation of farm and regional irrigation infrastructure.

The outputs from these two projects will form the basis for improved and contemporary groundwater management arrangements in the Shepparton Irrigation Region. G-MW is aiming to have a new management framework in place by the commencement of Water Plan 4 (2016/17).

Acknowledgement

As acknowledged in the footnotes, various maps, graphs and discussion presented in this report referring to the watertable have been sourced from the Shepparton Irrigation Region Catchment Implementation Strategy (SIRCIS) Groundwater and Salt management program August 2011 watertable study report prepared by G-MW.

Appendix 1- Representative Hydrographs