



Shepparton Irrigation Region Groundwater Management Area

Local Management Plan

June 2015



Cover images (Left to Right):

Examples of values at risk and/or benefiting from shallow groundwater, which includes dairy and perennial horticulture, land showing the effects of salinisation from high water tables, and groundwater control measures (public pump).

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Executive Summary

This groundwater local management plan (the Plan) defines the objectives and rules for licensing and managing shallow groundwater in the Shepparton Irrigation Region Groundwater Management Area (SIR GMA).

The Plan supports management of groundwater resources from the ground surface down to a depth of 25 m and overlays the Murray Valley, Shepparton, Central Goulburn and Rochester Irrigation Areas.

Consultation with groundwater users, the community and key stakeholders identified that the previous approach to groundwater management was inflexible, complicated and expensive. There was a need for more relevant, adaptive, and lower cost management. Consultation has played an important role in the development of the new Plan.

There are significant economic, social, and environmental values in the SIR GMA influenced by shallow groundwater, which can act as both a threat and a resource.

Shallow groundwater is a threat to catchment values. Land salinisation and waterlogging from high water tables are significant threats to agricultural productivity and the environment across the SIR GMA. Private groundwater pumping for irrigation provides salinity control and is a key part of any future salinity mitigation program.

Shallow groundwater also provides an important opportunistic resource in dry periods, although this can be unreliable due to low water levels in shallow bores.

The Plan seeks to strike the right balance between encouraging groundwater use as a salinity control measure, and protecting existing users and the environment from new groundwater developments. The Plan achieves this through the introduction of a number of simple rules governing how groundwater can be used and is licensed in the SIR GMA.

The key objectives of the Plan are to:

- protect, as far as practicable, existing groundwater user rights and the environment;
- encourage shallow groundwater users to retain and use their groundwater licences, to help counter the impacts of shallow saline groundwater; and
- reduce management complexity and cost in line with customer and stakeholder expectations.

No cap on groundwater entitlement is defined in the Plan in order for new licences to be developed to maximise the opportunity for pumping of shallow groundwater. This will assist with the management of shallow water table impacts.

New groundwater entitlement will be available to applicants subject to an assessment of local impacts. In order to simplify the assessment process and to provide greater protection to existing licence holders a new approach to assessing risk at the initial application stage has been defined (see Rule 1).

Groundwater take and use licences may be issued in the SIR GMA for a period of up to 15 years (the maximum available under the *Water Act 1989*).

There are no management zones or water sharing arrangements in this Plan, recognising the fragmented and opportunistic nature of the resource. Groundwater trading is not sensible or desirable in the SIR GMA and not supported under this Plan.

It is widely accepted that the costs of metering groundwater use in the SIR GMA outweigh the benefits. Meter reading, maintenance and replacement of meters will no longer be necessary in the SIR GMA; existing meters will remain in place and licence holders can use them if required.

GMW will maintain a subset of meters to estimate groundwater use for the SIR GMA (see Rule 2). This will address the State metering policy and the Murray-Darling Basin Plan requirements to estimate total usage.

In the absence of large scale metering, a new process has been established through consultation with groundwater users and stakeholders on how to manage situations of potential bore interference (see Rule 3).

Previous management arrangements focussed on the requirement to blend groundwater with lower salinity water from other sources (mainly channel water). Blending saline groundwater prior to its application on land is still an appropriate method of reducing on site impacts; however, there is no longer a management plan rule to require this. Groundwater users will be encouraged to understand and manage their own risks, supported by information provided by government agencies.

Groundwater level monitoring costs are shared by GMW and its customers, and the Goulburn Broken Catchment Management Authority (GBCMA). Water level and salinity monitoring are essential management activities and GMW will provide an opportunity for shallow groundwater licence holders to submit a salinity sample for analysis once every year (see Rule 4).

An annual newsletter (see Rule 5) summarising management issues will be available to customers once per year and this will include the outcomes of an annual review of the Plan to determine the need for any changes (see Rule 6).

Quick Reference Guide to the Plan rules

This section lists the Plan rules for quick reference. The reader should refer to the relevant chapter of the Plan for more information about the Rule.

Rule 1: Applications for additional groundwater entitlement (page 21)

Goulburn-Murray Water may request a hydrogeological assessment to support an application for a new or increased groundwater licence where:

- an application is within 1000 m of an existing licensed bore; and/or
- an application poses a significant potential risk to a domestic and stock bore, or a groundwater dependent ecosystem, or other relevant feature.

Rule 2: Estimating groundwater use (page 22)

Goulburn-Murray Water will, on an annual basis:

- Read and maintain a subset of meters on licensed shallow groundwater bores;
- Use these meter readings to estimate groundwater use for the Shepparton Irrigation Region Groundwater Management Area; and
- Support the meter subset with targeted customer surveys as required.

Rule 3: Bore Interference (page 23)

Goulburn-Murray Water will undertake an initial investigation of a complaint of bore interference if the complaint relates to loss of access due to the pumping activities of a neighbouring bore.

If Goulburn-Murray Water believes that bore interference may have occurred then a more detailed site based investigation can be initiated.

In order to initiate a more detailed investigation a fee will be payable by the complainant. This fee will be partially refunded if an interference claim is upheld. Where there is no evidence of loss of access due to interference the investigation will cease and no refund will be made

Rule 4: Monitoring groundwater salinity (page 26)

Goulburn-Murray Water will support annual groundwater user salinity sampling by:

- Providing a sample bottle and reply paid envelope to each groundwater licence holder to collect a groundwater sample from their licensed bore/s and return them to GMW for salinity analysis;
- Measuring the groundwater salinity of returned sample/s, and providing the licence holder with results; and
- Entering the groundwater salinity results into the State groundwater database.

Rule 5: Annual newsletter (page 27)

Goulburn-Murray Water will, by 1 November of each year, prepare an annual newsletter for the Shepparton Irrigation Region Groundwater Management Area which will include:

- The most recent water table map;
- Groundwater use estimates;
- Information on the risk from shallow groundwater salinity; and
- The need for any changes to the Plan.

Goulburn-Murray Water will make the newsletter available on its website in November each year and posted to customers.

Rule 6: Review of the Plan (page 27)

Goulburn-Murray Water will consider the need for any amendments to the Plan annually in conjunction with the preparation of an annual newsletter.

If amendments to the Plan are proposed that directly affect groundwater licences and licence conditions Goulburn-Murray Water will consult groundwater users and key stakeholders in the Shepparton Irrigation Region Groundwater Management Area on any such proposed changes.

Endorsement

This groundwater Local Management Plan (the 'Plan') provides simple groundwater licensing rules and management arrangements for the shallow groundwater resources of the Shepparton Irrigation Region Groundwater Management Area (SIR GMA).

The Plan seeks to strike the right balance between enabling groundwater use and protecting existing users and the environment from new groundwater developments. Maintaining and encouraging shallow groundwater use is an essential part of the broader catchment strategy to manage the risk of high water tables; a climate and irrigation driven outcome that can have potentially devastating outcomes for the region.

Two years of consultation and preparatory work with community representatives, customers and stakeholders, including the Department of Environment, Land, Water and Planning (DELWP), the Goulburn Broken Catchment Management Authority (GBCMA), the Murray-Darling Basin Authority (MDBA), the Murray Groundwater Group and the former National Water Commission has been undertaken to develop this Plan.

This consultation included the identification of customer and stakeholder views through social research to assist in developing the Plan. The benefits of this consultation are illustrated through the development of a simple and flexible management approach that will minimise costs for customers, encourage licence and bore retention to mitigate risks from saline groundwater, and protect existing groundwater users and the environment.

Goulburn-Murray Water (GMW) will actively work with customers, local communities and other stakeholders to ensure the Plan is communicated and implemented successfully.



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Goulburn-Murray Water Rural Water Corporation

3 June 2015

Acknowledgements

Goulburn-Murray Water (GMW) would like to express its appreciation to the Goulburn Broken Catchment Management Authority (GBCMA) and the Shepparton Irrigation Region Groundwater and Salt Management Working Group, whose advice and feedback was instrumental in guiding the management changes for shallow groundwater.

GMW recognises the value of local knowledge and would like to express its appreciation to the SIR GMA groundwater reference group (the Reference Group). The Reference Group comprised groundwater users and stakeholders as follows:

Bruce Macague	Landholder, Rochester
Ian Klein	Landholder, Shepparton
Ray Sellwood	Landholder, Central Goulburn
Jason Andrew	Landholder, Murray Valley
Richard Anderson	Victorian Farmers' Federation
Carl Walters	Goulburn Broken Catchment Management Authority
Maggie Xipolitos	Department of Environment, Land ,Water and Planning
Helen Reynolds	Goulburn Valley Environment Group
Heather du Vallon	Shepparton Irrigation Region Groundwater and Salt Management Working Group

The Reference Group was supported by the GMW project team, which included Matt Hudson, Krystle Gillingham, Dale McGraw and Stephen Gemmill.

Additionally, thanks go to the Salinity team at GMW, in particular to Terry Hunter, for guidance and support received in the development of this plan.



Shepparton Irrigation Region Groundwater Management Area Reference Group

Glossary

Term/Acronym	Description
Act	Water Act 1989 (Victoria)
Aquifer	An underground layer of rock or sand or other geological unit that contains water
Basin Plan	The Murray-Darling Basin Plan
D&S	Domestic and stock
DELWP	Department of Environment, Land ,Water and Planning
Groundwater entitlement	Licensed volume of groundwater specified as megalitres per year
GBCMA	Goulburn Broken Catchment Management Authority
GDE	Groundwater dependent ecosystem. An ecosystem that relies on access to groundwater for some or all of its water needs to maintain function
GMA	Groundwater Management Area
GMW	Goulburn-Murray Water Rural Water Corporation
Groundwater licence	Licence issued to take and use groundwater under section 51 of the Act
Groundwater reference group	A group of stakeholder representatives consulted during the development and implementation of the Plan
km	Kilometre
L/sec	Litres per second
m	Metre
Permissible Consumptive Volume (PCV)	Permissible Consumptive Volume is the total volume of groundwater that the Minister has declared may be taken from a defined area in a time period.
the Plan	The Shepparton Irrigation Region Groundwater Management Area Local Management Plan
Trade	The transfer of a groundwater entitlement
ML	Megalitre or one million litres
Season	Period of 12 months commencing 1 July
SIR	Shepparton Irrigation Region
Zone	A part of a Groundwater Management Area defined for management purposes

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1 Introduction

1.1 Background

This groundwater local management plan (the Plan) defines the objectives and rules for licensing and managing shallow groundwater in the Shepparton Irrigation Region Groundwater Management Area (SIR GMA).

It is now widely recognised that the previous approach to shallow groundwater management in the SIR was inflexible, overly complicated and expensive; for what is a fragmented and generally opportunistic resource.

The need for more relevant, more flexible and lower cost management was identified through extensive consultation with the community, stakeholders and users of shallow groundwater. This process resulted in the revocation of the previous statutory management plan by the Minister for Water in February 2014.

The Plan implements the groundwater management framework described in Victoria's Sustainable Water Strategies and meets requirements of the Murray-Darling Basin Plan.

1.2 The Shepparton Irrigation Region Groundwater Management Area

The SIR GMA covers an area of approximately 500,000 hectares of northern Victoria and incorporates the Central Goulburn, Murray Valley, Rochester and Shepparton Irrigation areas. It extends from Echuca in the west to Yarrawonga in the east, with the Murray River as the northern boundary. The southern boundary extends to Murchison, and generally follows the irrigation area boundaries (Figure 1). The SIR GMA is located in the south of the Murray-Darling Basin.

Roughly 60% of the SIR GMA is irrigated and it is a hub of agricultural production supporting a food processing industry valued at more than \$1.4 billion annually (Monticello cited in GBCMA 2014). Major industries include dairy, horticulture and mixed cropping.

The SIR GMA has experienced significant changes over the past 35 years, both in terms of climate, land use and irrigation infrastructure. Above average rainfall during the 1970s and 1980s supported significant growth in agricultural development and production, however this was tempered by the emergence of a widespread rise in shallow water tables in the 1990s (Figure 3 and Figure 4) leading to land salinization and water logging, which posed a serious risk to agricultural productivity and the environment.

Significant investment, both in terms of management arrangements and supporting infrastructure were developed to mitigate the risks posed by shallow groundwater. Management arrangements included the SIR Land & Water Salinity Management Plan (GBSPPAC, 1989) and the development of Victoria's first Water Supply Protection Area and the associated SIR Groundwater Management Plan (GMW, 1997).

From the late-1990s, the SIR experienced a ten-year period of below average rainfall, which resulted in low surface water allocations. This saw watertables decline and resulted in a shift in groundwater user values, with shallow groundwater considered more of a resource than a threat.

Above average rainfall in 2010 and 2011 resulted in watertables rising again (Figure 7), reigniting concerns of salinity impacts to land productivity.

The ongoing modernisation of irrigation infrastructure in the Goulburn-Murray Irrigation District will result in a more efficient, but significantly reduced irrigation network. This will change the irrigation footprint; however, how this will affect shallow groundwater in the future is unclear and will need to be monitored.

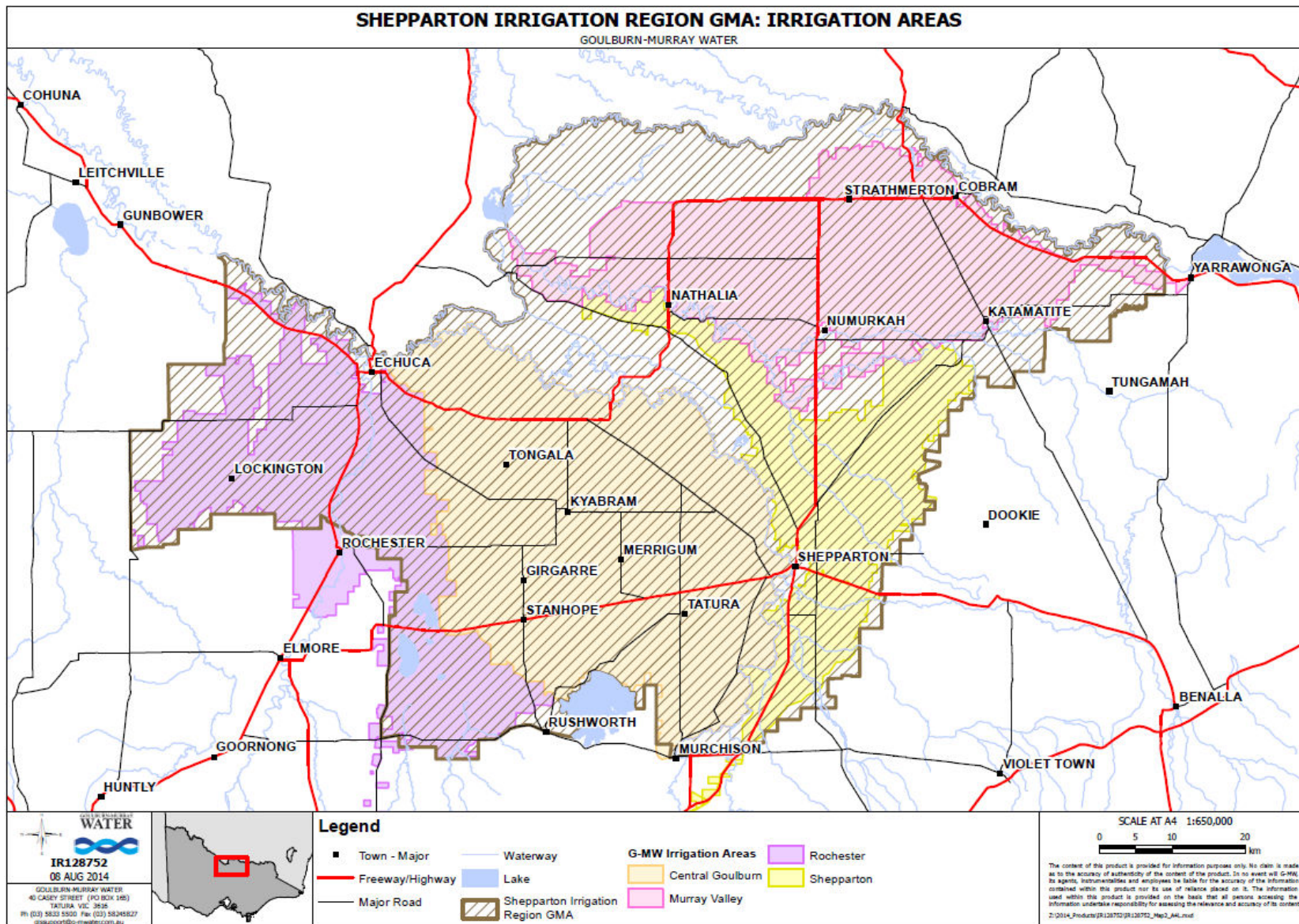


Figure 1 Shepparton Irrigation Region Groundwater Management Area and GMW irrigation areas

1.3 The role of the Shepparton Irrigation Region Groundwater Management Area Local Management Plan

GMW is responsible for licensing the take and use of groundwater (as a delegate of the Minister for Water). GMW is also responsible for the development and implementation of groundwater local management plans. These plans meet requirements of Victoria's Sustainable Water Strategies and the Basin Plan.

These local management plans are developed in line with guidelines approved by the Minister for Water (DEPI, 2014), and typically define:

- the water system to which a plan applies;
- groundwater values and threats posed by groundwater use (and in the case of the SIR GMA the threat from shallow groundwater);
- groundwater management objectives;
- management zones;
- rules to apply to licensing, including caps on entitlement, access and trading rules and any water sharing arrangements;
- monitoring and metering; and
- communication and reporting.

The primary role of the Plan is to provide clear rules for the community, licence holders and other stakeholders to ensure shallow groundwater in the SIR GMA is licensed and managed in a sustainable and equitable way. GMW recognises that groundwater resources in the SIR GMA differ from other management areas and this is reflected in the licensing and resource management arrangements (Section 5).

Sustainable irrigation is an important driver of management in the SIR GMA (GBCMA, 2014). Key to this objective is that the productive value of irrigation is maximised, and at the same time the impact of irrigation on the catchment is minimised.

Irrigation in the SIR GMA is mainly supplied by surface water via an extensive gravity driven channel system fed by large water storages.

Although groundwater is a relatively small component of irrigated water use, groundwater pumping and groundwater management plays a significant role in sustainable irrigation. This is due to the potential impacts of shallow water tables that can affect agricultural productivity, and catchment environmental values.

The Plan is one of many plans, strategies and policies that contribute to sustainable irrigation. Figure 2 illustrates the key elements that contribute to sustainable irrigation in the SIR GMA. Further information about these strategies, plans and policies is available by contacting GMW or the GBCMA.

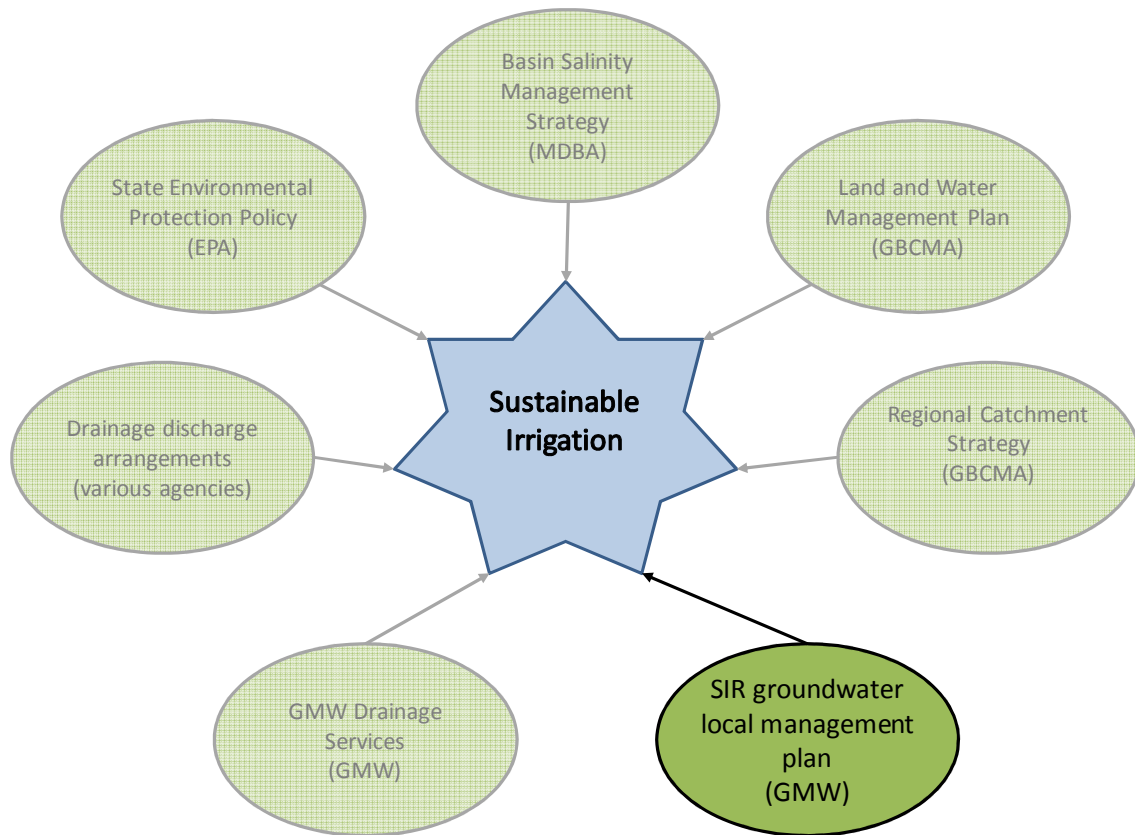


Figure 2 Key elements that contribute to sustainable irrigation in the Shepparton Irrigation Region

1.4 The Plan development process

An extensive process of engagement and consultation with shallow groundwater users and key stakeholders preceded the development of the Plan.

This process included social research (URS et al. 2011) based on a series of interviews with shallow groundwater licence holders, to better understand user behaviour and their expectations of groundwater management.

A reference group of shallow groundwater users and community representatives was set up to act as a sounding board and assist with the development of the Plan.

The reference group included representatives from:

- the GBCMA Groundwater and Salt Management Community Working Group,
- GMW customer water service committees,
- the Victorian Farmers Federation, and
- the Department of Environment, Land, Water and Planning.

The consultation process has been instrumental in supporting the need for change, and identifying the principles for future management arrangements.

1.5 Plan objectives

Management objectives are informed by feedback received from SIR GMA groundwater users and the Reference Group. Objectives were developed after considering catchment values and how these might rely on, or be impacted by, shallow groundwater.

The management objectives for the Plan are to:

- protect, as far as practicable, existing groundwater user rights and the environment;
- encourage shallow groundwater users to retain their groundwater licences and pumping infrastructure;
- encourage the responsible pumping of shallow groundwater to help reduce the impact of this brackish water on crop productivity and the environment.
- reduce management complexity and cost in line with customer and stakeholder expectations;
- be available and understandable to all stakeholders; and
- align with governing policy and legislation.

These objectives were identified with the knowledge that the shallow groundwater resources are fragmented and generally of low reliability (opportunistic). In addition, the recent drought, and subsequent floods highlighted that the objectives and the management rules in the Plan should consider, and be applicable to, both wet and dry climate conditions.

2 The shallow groundwater system

2.1 Geology

The geology of the SIR GMA is dominated by the Shepparton Formation; a series of clays, silts, sands and gravels. These sediments were deposited by ancient (Quaternary) river and lake systems over an extensive floodplain.

The Shepparton Formation comprises mostly low permeability clays and silts, with isolated lenses of sand and gravel. These lenses are variable with the lateral range of each aquifer extending no more than 700 m in most instances (GHD, 2010). The thickness of these lenses ranges from less than 5 m to 20 m, with thicker deposits occurring along the courses of ancient streambeds, and thinner deposits at the margins.

This Plan identifies the groundwater licensing and resource management arrangements for the shallow groundwater resources of the SIR, from the ground surface down to a depth of 25 m.

The Shepparton Formation continues below 25 m, and extends to a depth of over 100 m in the north of the SIR GMA (along the Murray Valley). Older (Tertiary) river sediments (mainly sands and gravels) occur below the Shepparton Formation. Below 25 m, groundwater is managed by other resource management plans.

2.2 Groundwater

The current understanding of the behaviour of the shallow SIR groundwater system is based on over 30 years of groundwater monitoring, groundwater investigations, bore drilling and test pumping; as well as information provided by drillers and groundwater users. The hydrology and hydrogeology of the shallow groundwater system has recently been reassessed as part of the SIR Salt and Water Balance Project (GBCMA, in progress).

The key features of the shallow groundwater system are:

- The sand and gravel aquifers are fragmented (not connected), and vary considerably in thickness and in extent across the SIR GMA. As a result, groundwater levels and groundwater flow vary on a local scale, with short flow systems that depend on the extent of the local aquifers. This means that pumping in one location may not impact on neighbouring aquifers water level, and water quality can vary over short distances.
- The dominant factors influencing groundwater levels across the SIR GMA are climate and irrigation. Irrigation wets the catchment allowing rainfall to recharge the water table.
- High water tables will develop in wet and average climate conditions. It is only during extended dry periods that shallow groundwater levels fall across the SIR.
- The combined effect of irrigation and rainfall produces a groundwater mound beneath the irrigated areas. Groundwater levels are typically between 0-7 m below natural surface in these areas. Water tables tend to be deeper further away from irrigated areas (typically more than 7 m).

Regular water table maps of the SIR have been produced since 1982. These maps show the depth below ground level of the water table. Six of these maps are shown below in Figures 3 to 8 to illustrate the changing nature of shallow groundwater levels over the past three decades.

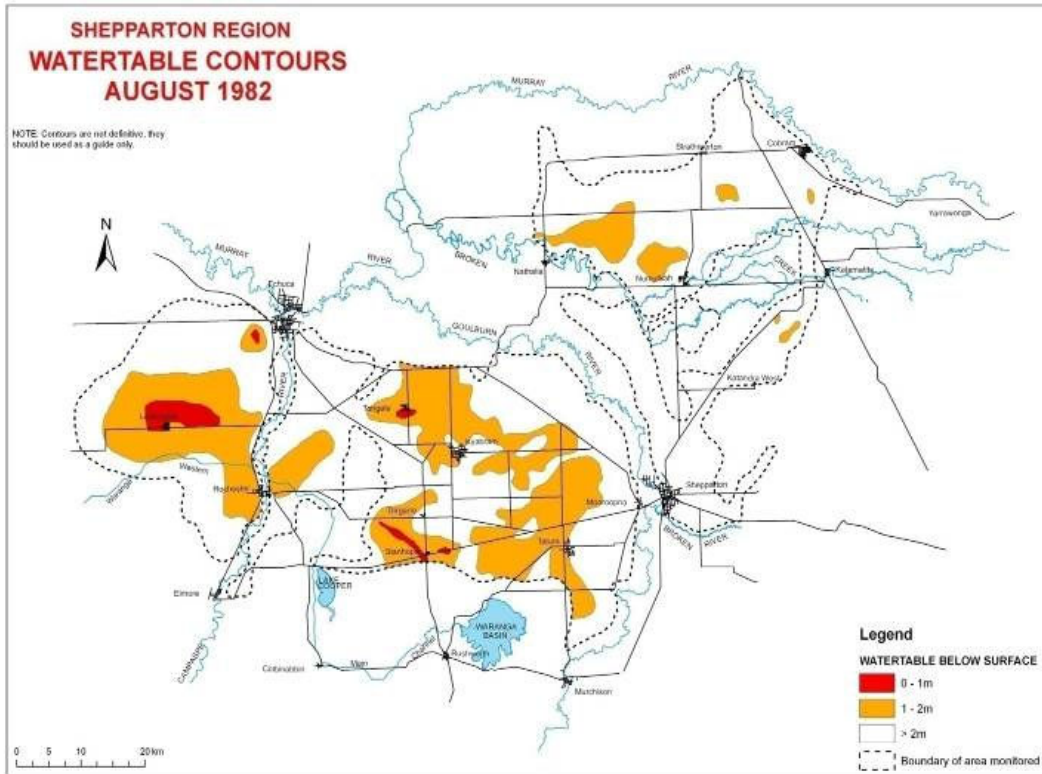


Figure 3 Shepparton Irrigation Region – (1982) Shallow water tables during the rise from the late 1970s into the 1980s (GBCMA, 2013)

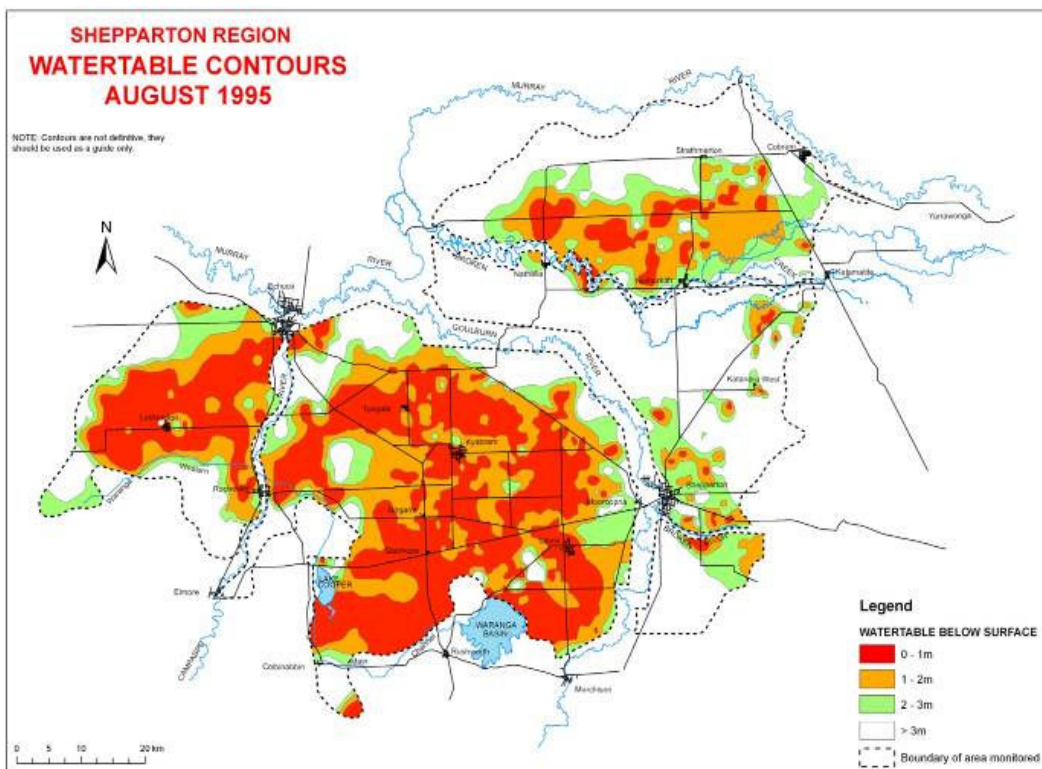


Figure 4 Shepparton Irrigation Region– (1995) Shallow water tables at the height of the wet period cover much of the Shepparton Irrigation Region (GBCMA, 2013)

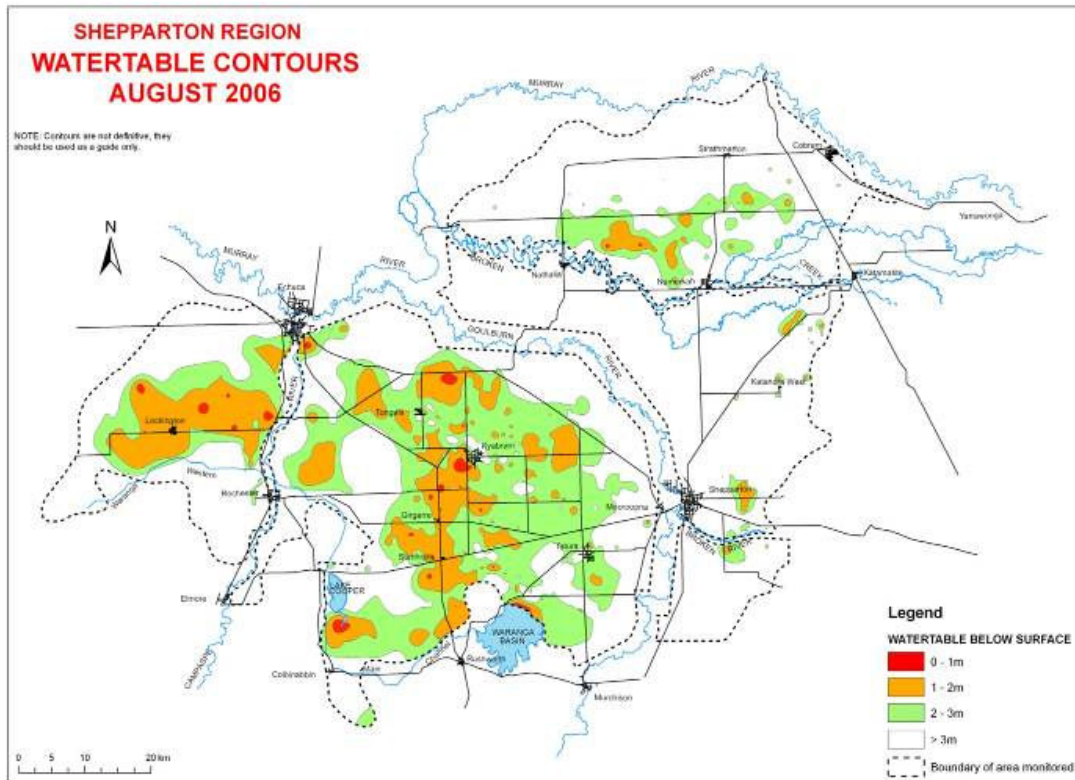


Figure 5 Shepparton Irrigation Region – (2006) Water tables in decline as the millennium drought is established (GBCMA, 2013)

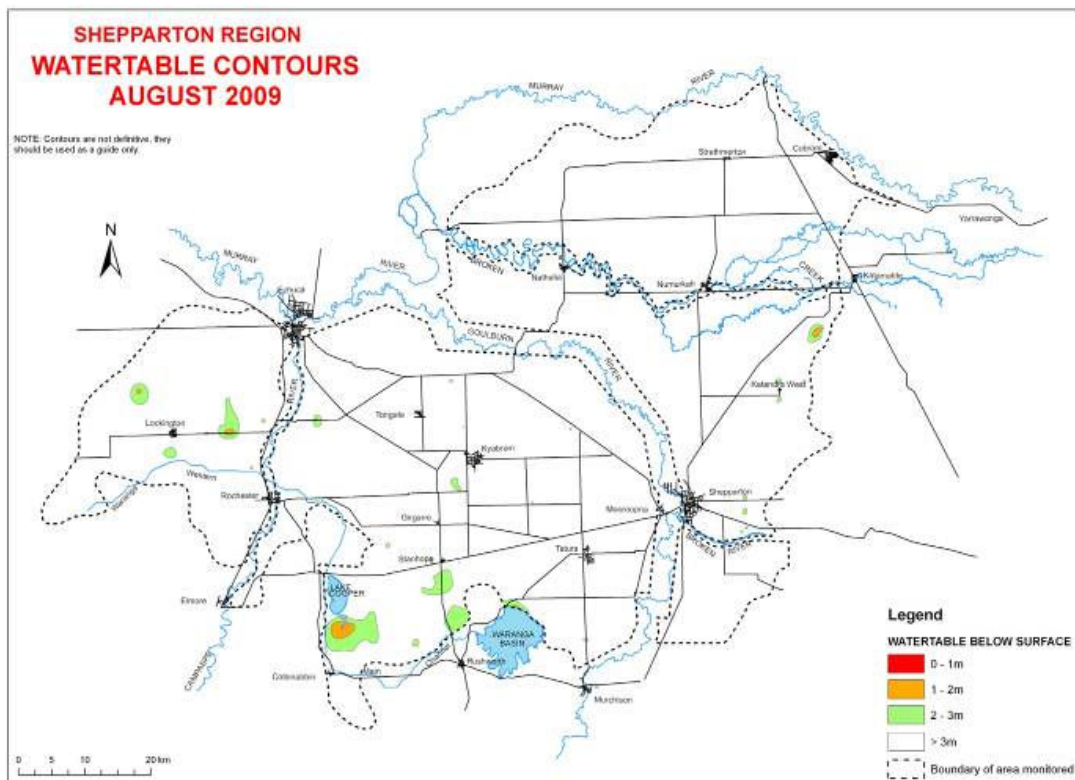


Figure 6 Shepparton Irrigation Region– (2009) Shallow water tables largely absent at the end of the drought (GBCMA, 2013)

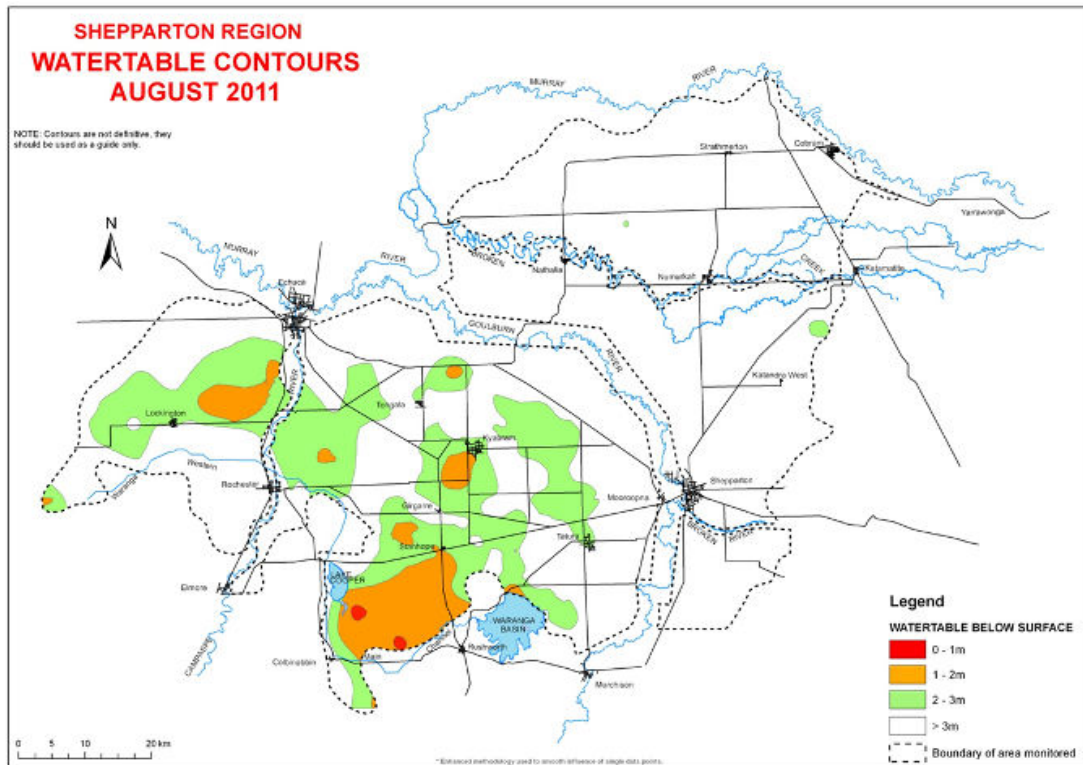


Figure 7 Shepparton Irrigation Region– (2011) Shallow water tables re-emerge following wet years of 2010 and 2011 (GBCMA, 2013)

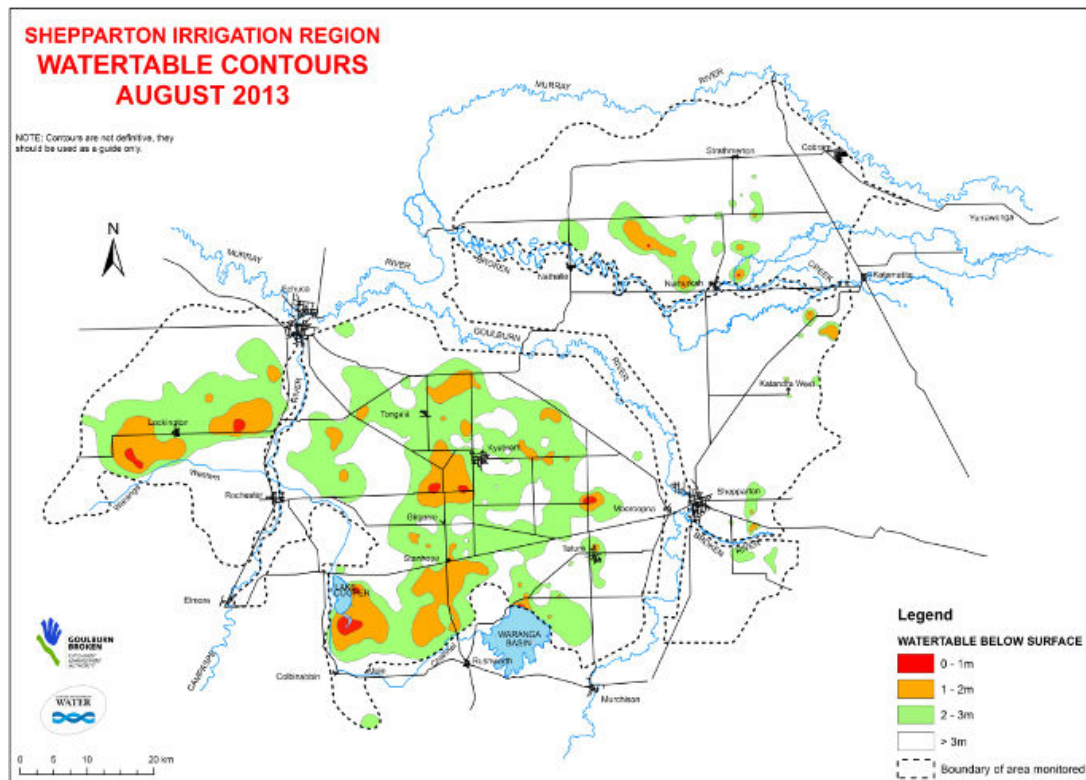


Figure 8 Shepparton Irrigation Region – (2013) Continuation of rising water tables (GBCMA, 2013)

2.3 Groundwater quality

Groundwater quality in the sand and gravel aquifers within the Shepparton Formation is variable, with salinity ranging from an electrical conductivity (EC) of less than 1000 EC to over 20,000 EC. The majority of privately pumped groundwater utilises groundwater at the lower end of this range (typically 1000 EC – 4000 EC). The variable quality is a reflection of the fragmented nature of the resource, with salt being concentrated in isolated aquifers.

Each year GMW provides groundwater licence holders in the SIR with the opportunity to submit a groundwater sample to GMW for salinity testing. Figure 9 shows a map of groundwater salinity results for the 2013/14 season. The map illustrates the variable nature of salinity across the SIR GMA.

Shallow groundwater is used predominantly for irrigation, but it is also used for other commercial purposes, and for D&S use (groundwater use is discussed further in section 5.6).

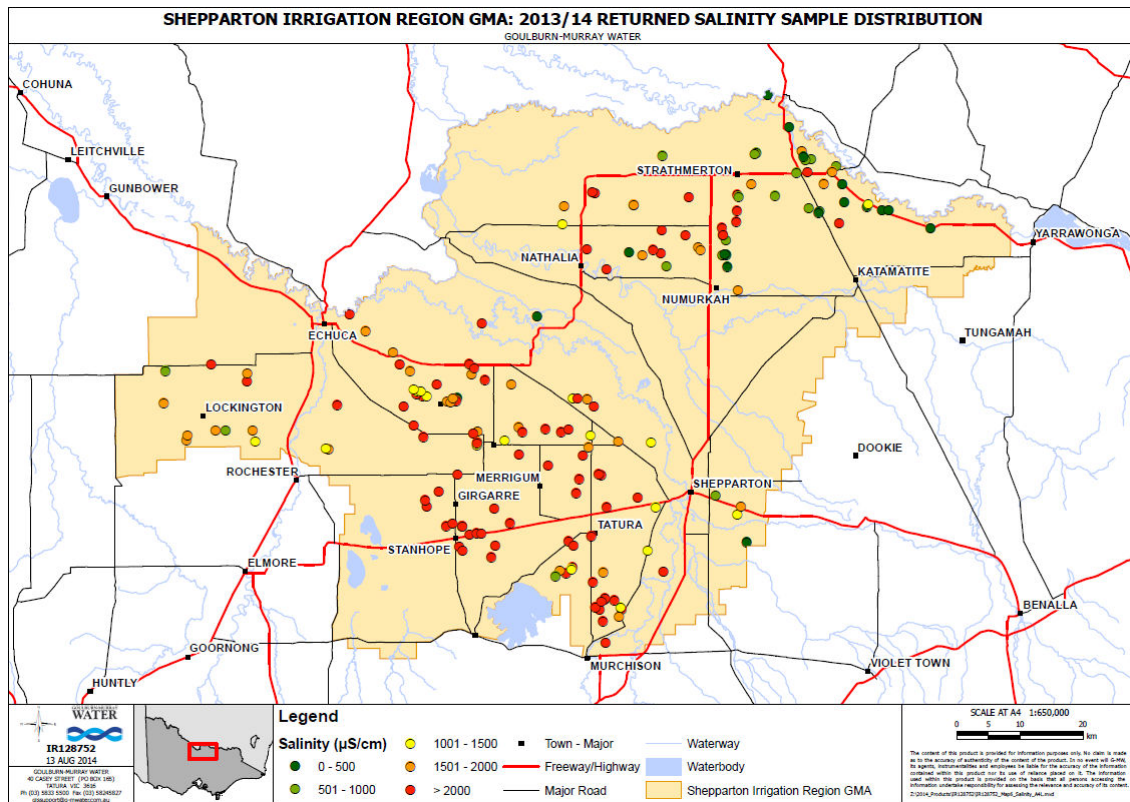


Figure 9 Shallow groundwater salinity samples results in 2013/14 from licensed pumping bores in the Shepparton Irrigation Region Groundwater Management Area

2.4 Bore yields

Bore yields across the Shepparton Formation are variable, and depend on whether any sand and gravel aquifers are encountered during drilling. Bore yields from the sand and gravel aquifers within the Shepparton can often exceed 1 ML/day, however yields can be unreliable due to falling water levels, either because of drought or where limited aquifers are dewatered.

Many bore systems in the SIR GMA are shallow spear point systems, typically penetrating down to less than 12m below the surface. Changes in water levels of a few metres can result in a loss of access to these systems. This was a widespread issue during the extended dry period (1997-2010).

2.5 Overview of the groundwater system

The key features of the shallow groundwater system are shown in Figure 10 below:

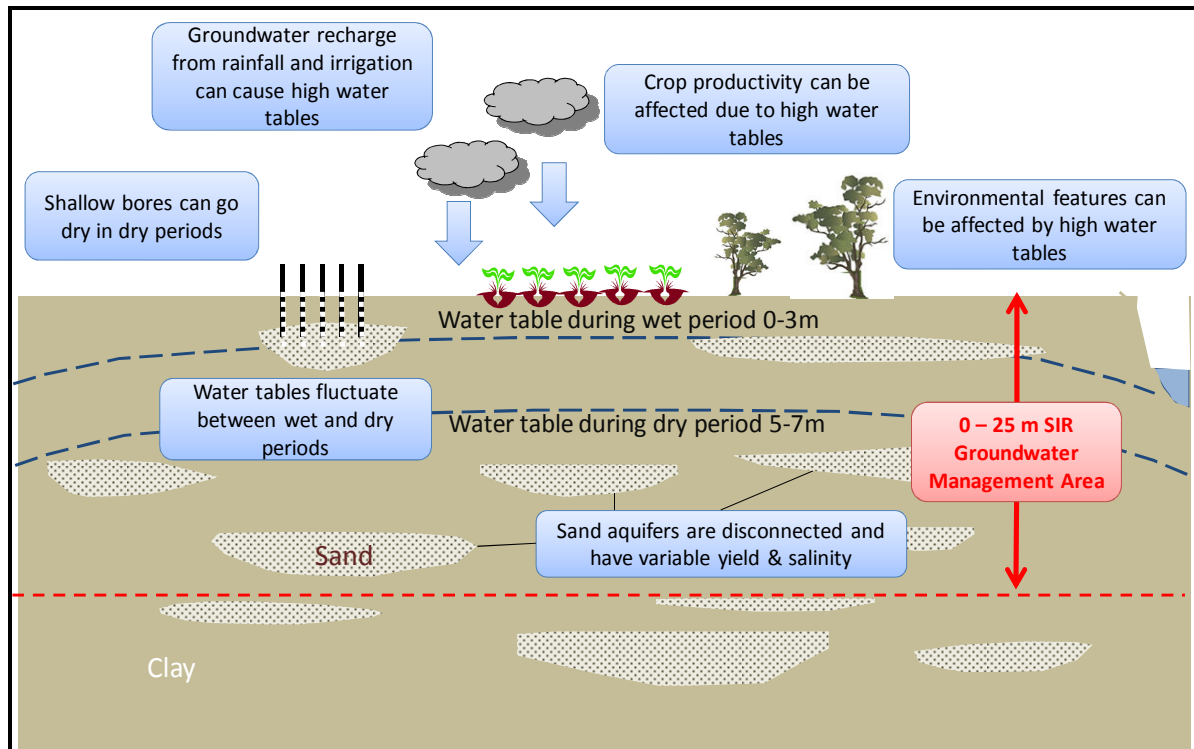


Figure 10 Key features of the shallow groundwater system in the Shepparton Irrigation Region Groundwater Management Area

3 Shallow groundwater is a resource and a threat

The SIR GMA supports a wealth of economic, social and environmental values. Shallow groundwater can be a major threat to these values, but it can also provide a useful resource value.

3.1 Catchment values

3.1.1 Economic values

The SIR GMA is a major source of agricultural production and food processing. These industries are highly valued for the economic wealth and prosperity they provide to the community, and to the State. Industries include dairy farming and food manufacture, mixed cropping, and horticultural plantings.



Dairy farming in the Shepparton Irrigation Region Groundwater Management Area



Orchard in the Shepparton Irrigation Region Groundwater Management Area

3.1.2 Social values

Employment in the SIR GMA is largely dependent on a profitable irrigated farm sector. It is essential to the social fabric of the region that irrigated farming continues to prosper within the SIR GMA. In turn, the future of the SIR GMA depends on a healthy natural resource base to support agriculture and increases in production efficiencies.

There are significant social values related to traditional owners' cultural and spiritual connections to the land, evidenced by the large number of Aboriginal cultural heritage sites located in this area (GBCMA 2013).

Shallow groundwater also provides D&S supplies, particularly in areas where acceptable water quality occurs.

3.1.3 Environmental values

The dominant environmental values in the SIR GMA are associated with the large river systems, which include the Murray, Goulburn, and Campaspe Rivers and the Broken River and Creek. The Barmah and Lower Goulburn National Parks are part of these river systems and are highly valued for their biodiversity and recreational assets. It is known that in some locations shallow groundwater discharges to these river systems, however this is a very small component of river flow, compared to the releases from regulated storages, which support these rivers. Shallow groundwater may also support riparian vegetation along some of these rivers, where water tables are high, particularly after river flooding.

In addition to the major river systems, there are also over 140 priority environmental sites across the SIR GMA, comprising a mix of aquatic and terrestrial ecosystems including wetlands, waterways, woodlands and grasslands. These ecosystems are home to a range of native plants and animals, some of which are rare and endangered. These sites are not dependent on shallow groundwater; rather shallow water tables (within 2 m of the surface) can pose a significant threat to the health of these ecosystems.



Potential groundwater threatened site in the Shepparton Irrigation Region Groundwater Management Area - Kanyapella Basin



Potential groundwater threatened site in the Shepparton Irrigation Region Groundwater Management Area - Millewa Nature Conservation Reserve

3.2 Threat from high water tables

Shallow groundwater can be a significant threat to many of the key values present in the SIR, most notably because of land salinisation, and waterlogging.

Salinisation has resulted due to the removal of deep rooted native vegetation in the SIR GMA and its replacement largely by shallow rooted crops and pasture. This has resulted in a significant reduction in plant water use and increased quantities of water being added to groundwater via irrigation. As groundwater levels rise, naturally-occurring salts (principally sodium chloride) are dissolved and brought towards the surface, where salt is concentrated by evaporation.

Waterlogging occurs where the soil surface area becomes saturated. Soil pores (spaces) are full of water and excess water cannot drain away.

Salinisation and water logging associated with shallow watertables are a significant threat to economic, social and environmental values catchment values. Key threats include:

- Salinisation and waterlogging, which can directly impact on agricultural productivity. Productivity losses in the order of 10-20% were seen in the SIR in the mid-1990s (At today's prices this would represent a loss of over \$100 million per year);
- Productivity losses and uncertainty over future impacts, which affect confidence in the agricultural sector, with potentially serious impacts on jobs and communities;
- Waterlogging, which results in damage to infrastructure, including roads and drain; and
- Risk to high value environmental sites from the effects of salinisation when water tables are close to the ground surface.



Canola crop showing effects of salinisation



Trees killed by salinisation (Tatura)

3.3 Shallow groundwater resources

Shallow groundwater provides a significant resource, particularly in dry periods and when surface water is restricted.

There are currently 1,064 licensed groundwater bores in the SIR GMA with a total groundwater entitlement of around 195,684 ML (April 2015), which is the highest volume of entitlement in any groundwater management unit in northern Victoria. The major use of shallow groundwater is for irrigation, however it is also used for commercial and D&S purposes.

3.4 Adaptive management

The dominant influence of shallow groundwater is as a threat to catchment values however it is also a valued resource, particularly in dry periods.

Salinity risk is managed through a broad program of works funded by DELWP and the GBCMA. Ongoing shallow groundwater salinity mitigation programs have focussed on the following activities:

- public groundwater pumps;
- tile drains;
- surface drains;
- on-farm water efficiency programs; and
- encouraging private pumping of groundwater.

Recent work undertaken by GMW has confirmed the need for mitigation programs. It has also recognised that we cannot predict future climate and shallow groundwater levels, and therefore an adaptive management framework is required.

This management approach focuses on having the right assets in the right places, operating at the right time. This requires ongoing monitoring of salinity risk, with actions responding to the level of risk identified at any one time.

This Plan supports management efforts to mitigate salinity risk from shallow groundwater. It also directly supports an adaptive management program by simplifying groundwater resource management arrangements and reducing costs, thereby encouraging licence holders to retain their licences. Private groundwater pumping for salinity control is a key part of any future salinity mitigation programs.

Public groundwater pumps provide salinity and watertable control where private groundwater pumping is not feasible. Public groundwater pumping is focused in areas of higher groundwater salinity and this pumping also helps to protect the water quality of nearby private groundwater pumps. Private and public groundwater pumping provide integrated salinity mitigation across the SIR.



Salinity control pump site CG23 north of Byrneside



Salinity control pump site CG1 north of Kyabram

4 Groundwater licences and use

4.1 Groundwater licensing

Bore construction and groundwater extraction are managed by GMW in accordance with the licensing regime defined in the *Water Act 1989*, and in associated Ministerial policies.

A works licence must be obtained from GMW to drill and construct a bore. Groundwater bores must be drilled by a licensed driller. The Australian Drilling Industry Association (www.adia.com.au) provides contact details of its members.

A take and use licence must be obtained from GMW to extract groundwater for irrigation, commercial, dewatering and urban use. A range of matters will be considered when assessing the application, including the potential impacts to existing authorised uses and the environment.

If groundwater is used exclusively for domestic and stock purposes, a take and use licence is not required.

More information on groundwater licensing, including fees and charges, is available on GMW's website <http://www.g-mwater.com.au/>.

4.2 Groundwater entitlement and use

The 1,064 bores, licensed to extract 195,684 ML of licence entitlement per year, are used for irrigation, industrial, dairy and commercial purposes across the SIR GMA. The distribution of bores is shown in Figure 11, with the largest concentrations in the Murray Valley and Central Goulburn Irrigation Areas.

There are approximately 1,300 D&S bores in the SIR. However this number cannot be verified, as older D&S bores may not be recorded, and a proportion of recorded bores may no longer exist.

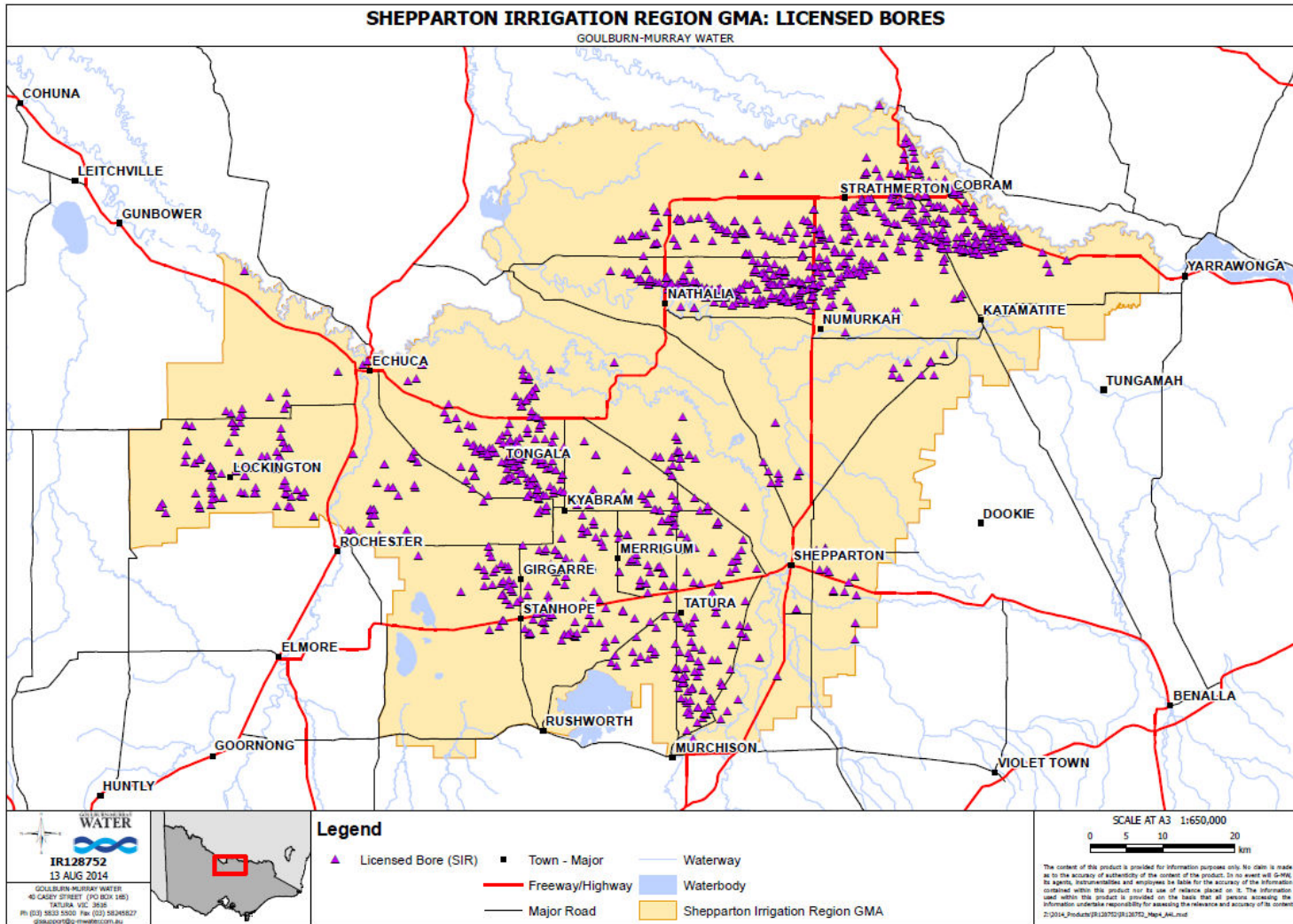


Figure 11 Distribution of licensed bores in the Shepparton Irrigation Region Groundwater Management Area

The amount of groundwater entitlement held in the SIR GMA has declined significantly over the period since the end of the recent drought (from 2009/10 onwards) mainly due to shallow licence holders handing back their licences (Figure 12). Customer feedback on this issue has confirmed there are a number of reasons for this, in particular:

- The high cost of management relative to the nature of the resource ; and
- The low reliability of the resource and the marginal water quality.

The decline in licence entitlement and the reduction in shallow pumping capacity is a particular concern as it reduces the opportunity for shallow groundwater pumping to mitigate salinity risks during high water table periods. This concern is one of the key drivers for simplifying management arrangements through this Plan, and reducing management costs.

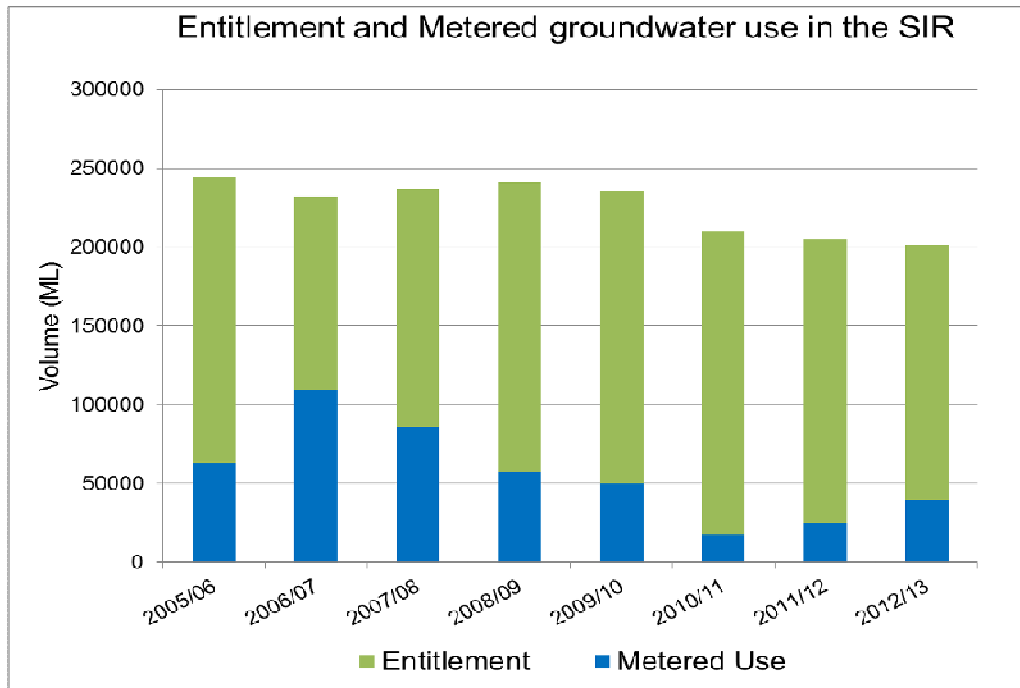


Figure 12 Entitlement and metered groundwater use in the SIR since 2005

5 Groundwater management

5.1 The Groundwater Management Area

The extent of the SIR GMA is shown in Figure 13. The Plan manages groundwater resources from the ground surface down to a depth of 25 m and covers four gravity irrigation districts (Figure 1).

The SIR GMA is located within the Goulburn-Broken Groundwater Catchment (Figure 14). Groundwater Catchment Units are areas which define connected groundwater resources. The Basin Plan defines the SIR GMA as a Sustainable Diversion Limit Unit.

The SIR GMA boundary has been modified slightly from the previous Water Supply Protection Area boundary to align with neighbouring groundwater management units.

It is proposed that the SIR GMA boundary be extended to include the Campaspe West Salinity Management Area (GMW 2014) however this decision is subject to the outcomes of a more extensive consultation process that will be initiated following the completion of this Plan. If there is general support for this approach following consultation with local users and key stakeholders, including the Murray-Darling Basin Authority, then the Campaspe West Salinity Management Area will be incorporated into the SIR GMA.

5.2 Limits on groundwater entitlement

There will continue to be no limit on the total volume of shallow groundwater entitlement available in the SIR GMA. No Permissible Consumptive Volume is recommended so as to allow new groundwater licences to be issued and to maximise the opportunity for pumping shallow groundwater, which assists with the mitigation of shallow watertable impacts. New entitlement is available to applicants subject to an assessment of local impacts.

The Basin Plan includes limits on groundwater extraction defined for the SIR GMA¹. A groundwater Sustainable Diversion Limit (SDL) of 244,100 ML is specified in the Basin Plan for the SIR GMA. This limit has been set at a high level, based on a historic level of entitlement, and in recognition that the main purpose of groundwater management in the SIR is to support the mitigation of impacts from high water tables, rather manage resource extraction. Compliance with the SDL is based on average usage over a period of 5 or 10 years. It is highly unlikely that the SDL will be a constraint in the SIR GMA based on historical use and the resource capability of the shallow aquifers.

¹ The area used to define the Basin Plan SDL area for the SIR GMA is the area of the previous Water Supply Protection Area

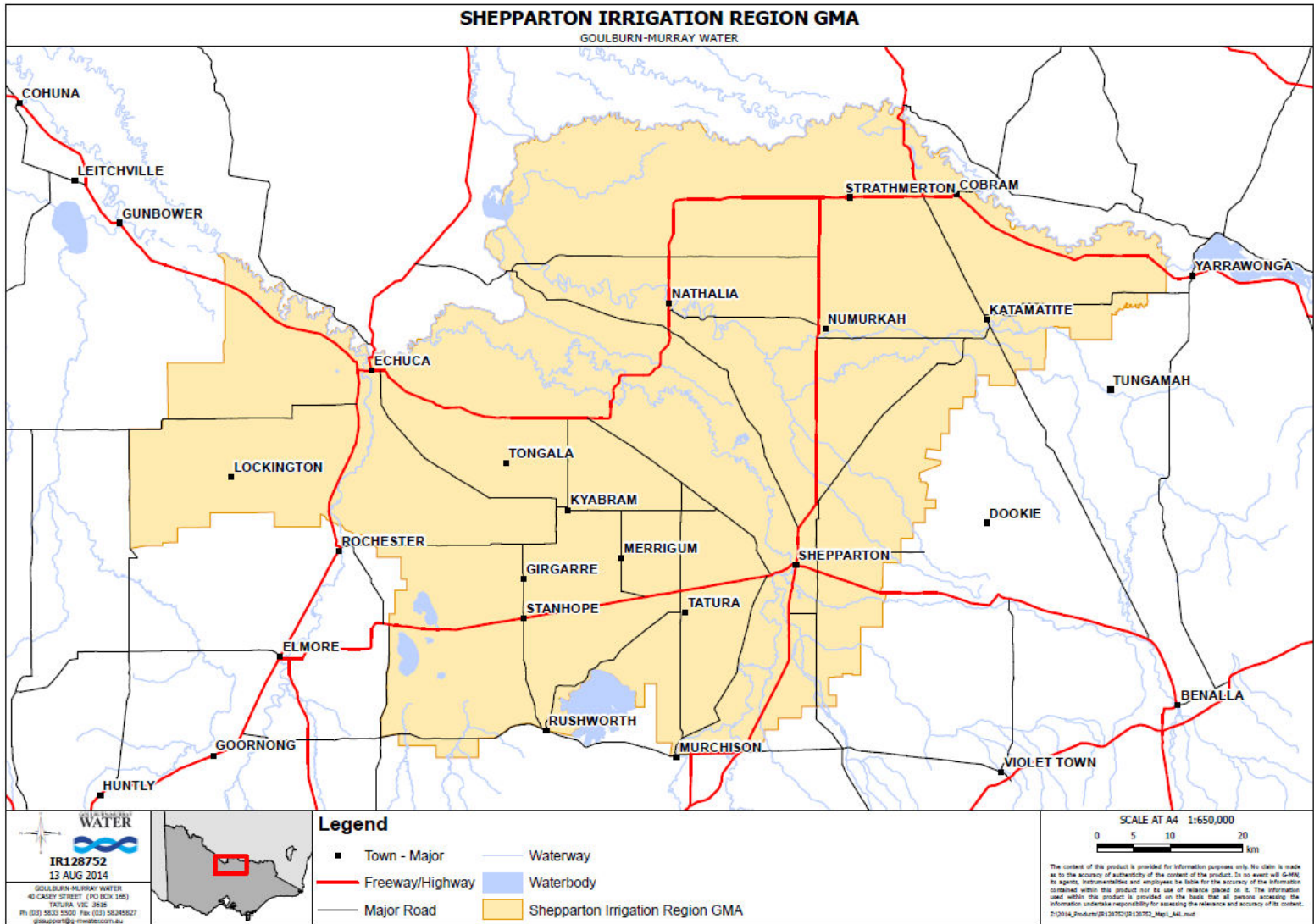


Figure 13 Shepparton Irrigation Region Groundwater Management Area

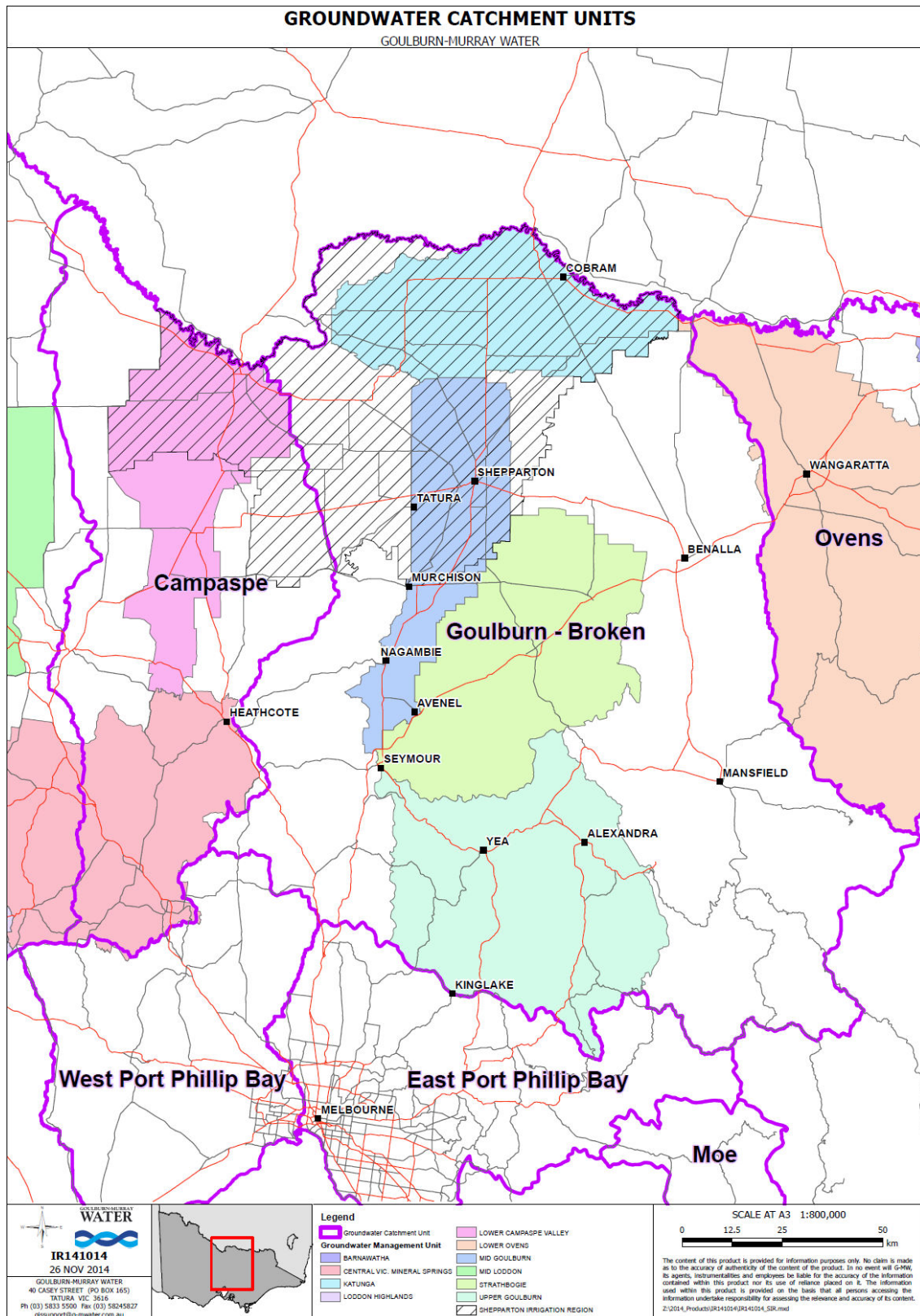


Figure 14 SIR Groundwater Management Area in relation to Groundwater Management Units in the Goulburn-Broken groundwater catchment

5.3 New licence applications

Applications for new groundwater licences are encouraged, particularly where there is a risk to catchment values from high water tables. Licence applications will be subject to an assessment of the potential impacts on neighbouring bores and the environment, so that neighbouring values, including existing licensed groundwater bores, are protected.

Take and use licences may be issued for up to 15 years with conditions relating to the location and depth from which groundwater can be extracted, the annual volume of water that can be taken and the rate at which pumping can occur.

The licence assessment process has two stages, one prior to bore construction and one upon receipt of an application for a take and use licence.

Many bores in the SIR GMA are shallow; with a relatively small amount of available drawdown (water above the pump intake is often only 2-3 m). This means that calculating impacts on surrounding users and the environment can be difficult, especially at the initial application stage (prior to bore construction). This preliminary assessment of risk can be uncertain, it is time consuming, and can result in high fees before there is any understanding of resource viability.

For these reasons, and to provide a greater degree of protection to existing licensed groundwater users a simpler process to screen licence applications is proposed. If an application for a new or increased licence is received within 1000 m of an existing licensed bore, then a detailed hydrogeological assessment may be required. For applications at a distance greater than 1000 m, then a detailed hydrogeological assessment may not be required (unless there are D&S bores nearby or groundwater dependent environmental features at risk).

Rule 1: Applications for additional groundwater entitlement

Goulburn-Murray Water may request a hydrogeological assessment to support an application for a new or increased groundwater licence where:

- an application is within 1000 m of an existing licensed bore; and/or
- an application poses a significant potential risk to a domestic and stock bore, or a groundwater dependent ecosystem, or other relevant feature

The 1000 m distance will enable the following improvements to the licensing process:

- a greater degree of protection to existing groundwater users;
- greater clarity at an early stage to prospective licence applicants on the risks associated with bore construction and licence application; and
- a simpler process for GMW and customers at the initial bore construction application stage.

5.4 Estimating groundwater use

There are approximately 900 metered bores in the SIR GMA, and metering costs have in the past comprised the largest component of annual fees and charges to SIR GMA groundwater customers. In the SIR GMA meters have not been used historically for billing or groundwater trade.

There are no usage based triggers or restrictions, and our understanding of groundwater resource condition relies on monitoring of groundwater levels (rather than metered use).

For these reasons maintenance and replacement of meters will no longer be necessary in the SIR GMA. Meter reading will no longer be undertaken by GMW, other than for a small

subset of meters retained to enable usage to be estimated. Existing meters will remain in place and used by licence holders if required.

By removing the requirement for meters, customers will benefit by receiving significant cost savings. A key benefit from lower fees and charges is that more groundwater customers will be encouraged to retain their shallow groundwater licences and pumping infrastructure. This will maximise the opportunities for pumping for salinity risk mitigation, which meets a key objective of this Plan.

An approach for estimating total groundwater use in the SIR GMA is required as part of the State's metering policy and to enable compliance with the Murray-Darling Basin Plan. GMW's approach for estimating groundwater use is shown in Rule 2.

Rule 2: Estimating groundwater use

Goulburn-Murray Water will, on an annual basis:

- Read and maintain a subset of meters on licensed shallow groundwater bores;
- Use these meter readings to estimate groundwater use for the Shepparton Irrigation Region Groundwater Management Area; and
- Support the meter subset with targeted customer surveys as required

5.5 Managing groundwater access

The shallow aquifer system in the SIR GMA is known to be a low reliability resource in many areas. Existing licensed users may not be able to access groundwater depending on the nature of a particular local aquifer, local water table levels, or due to bore and pumping infrastructure limitations. This 'low' reliability is generally accepted by shallow groundwater users so long as licence holders operate within their groundwater licence limits.

Groundwater level interference can occur when the drawdown cone around a pumping bore intersects a neighbouring bore (as shown in Figure 15). The impacts from groundwater pumping are site specific and will depend on a range of factors including, pumping rate and duration, distance to neighbouring bores, and local aquifer characteristics.

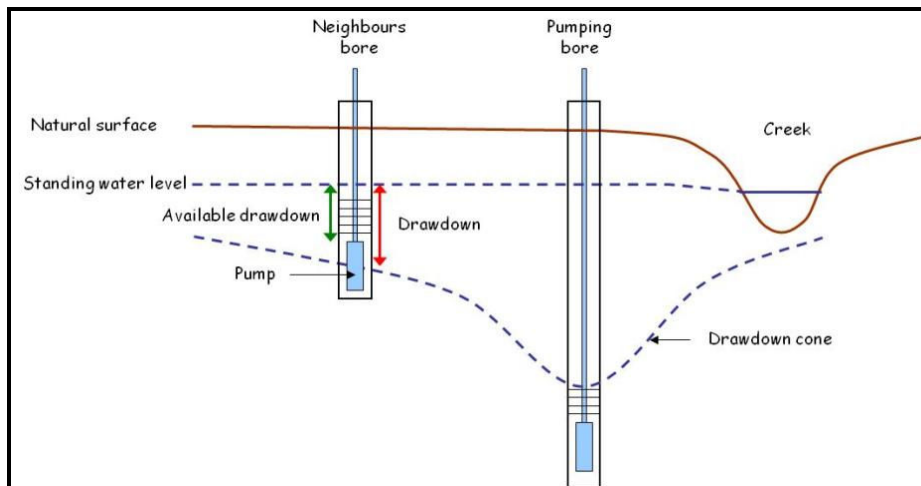


Figure 15 Groundwater interference

Groundwater pumping in excess of an approved licence volume is rare, however it does have the potential to impact on neighbouring groundwater bores. In the absence of metering, a new process was developed through consultation with groundwater users and stakeholders to manage situations where a complaint is raised about potential interference.

If a suitable case is made for an investigation to be undertaken, then GMW may investigate a claim of bore interference. The costs of investigation will be split between an individual who raises a complaint, and by all groundwater licence holders who will contribute a small amount each year to support investigations.

If GMW determines that interference has occurred and/or that licence volumes may have been exceeded, then a meter may be installed on the bore(s) in question to ensure licence compliance occurs in the future. This process is summarised below in Rule 3.

Rule 3: Bore Interference

Goulburn-Murray Water will undertake an initial investigation of a complaint of bore interference if the complaint relates to loss of access due to the pumping activities of a neighbouring bore.

If Goulburn-Murray Water believes that bore interference may have occurred then a more detailed site based investigation can be initiated.

In order to initiate a more detailed investigation a fee will be payable by the complainant. This fee will be partially refunded if an interference claim is upheld. Where there is no evidence of loss of access due to interference the investigation will cease and no refund will be made.

5.6 Using shallow groundwater

High watertable levels and associated salinity impacts pose major threats to agricultural production and environmental assets in the SIR GMA. Private pumping of shallow groundwater for irrigation is a key salinity mitigation action, however much of the pumped water has elevated levels of salinity. This has the potential to reduce agricultural productivity, and impact on land use and soil structure. Any impacts that may occur are generally limited to the land being irrigated.

Previous management arrangements focussed on the requirement to blend groundwater with lower salinity water from other sources (mainly channel water). Blending saline groundwater prior to the application on land is still an appropriate method of reducing on site impacts; however there is no longer a management plan rule to require this.

Key reasons for this change in management approach are:

- In the drought, surface water was severely restricted and in many cases shallow groundwater was the only source of water available. Enforcing blending in these circumstances is not desirable or practical.
- Work undertaken as part of the SIR Salt & Water Balance Project has determined that the risks to the land of applying shallow groundwater without blending are relatively low, and should any soil structure problems on the irrigated land occur (as a result of sodicity) then these may be remediated.
- Extensive social research was undertaken as part of a National Water Commission project to explore options for a new SIR groundwater resource management framework. This research determined that shallow groundwater users have a good understanding of the potential risks of irrigating with saline water and actively seek to manage these risks.

This new management approach recognises that farmers will be required to understand and manage their own risks of applying shallow groundwater to land.

There is a wealth of information already available regarding best practice use of shallow groundwater. This information and further advice is available from your local GBCMA, DELWP or GMW office, or from a qualified agronomist.

5.7 Salinity threat information website

A salinity threat information website, funded by DELWP, is in development by GMW in collaboration with GBCMA and DELWP, and aims to improve agency and landholder decision-making about the threat of groundwater salinity across the SIR.

The website will provide landholders with access to consistent, reliable and validated decision-making data and mapping tools to assist in understanding, identifying and managing their salinity threat.

The website will provide resources to help landholders to understand the threat posed by shallow groundwater levels at an individual property level and across the region. The website will also provide valuable information about application of shallow saline groundwater to land and provide an understanding to landholders of the risks that this may pose to productivity if not managed appropriately.

6 Monitoring

6.1 Groundwater levels

Monitoring of shallow groundwater levels has been taking place in the SIR since the 1970s. Water table mapping commenced in the early 1980s, largely in response to the emerging shallow groundwater salinity threat.

Groundwater level monitoring has been essential:

- in helping to identify and communicate the risk from shallow saline groundwater;
- to understanding the status and availability of groundwater resources;
- in enabling management decisions on public pump infrastructure; and
- to support assessment of new licence applications.

The current program has recently been reviewed by GMW and the GBCMA from both a catchment management and a groundwater resource management perspective. The network has been rationalised from 4,000 shallow groundwater bores to around 1,500 bores (Figure 16). The data collected from these bores are vital for the production of annual water table maps for the SIR GMA.

The current SIR groundwater monitoring arrangements provide a comprehensive, integrated and flexible program that is able to respond to a range of climatic, irrigation and pumping conditions, and a range of associated management issues, including licensing, resource management, and salinity risk management.

Monitoring is funded by GMW (and customers) and the Goulburn Broken Catchment Management Authority. Approximately 40 of the monitoring bores are part of the State observation bore network and are owned and maintained by DELWP.

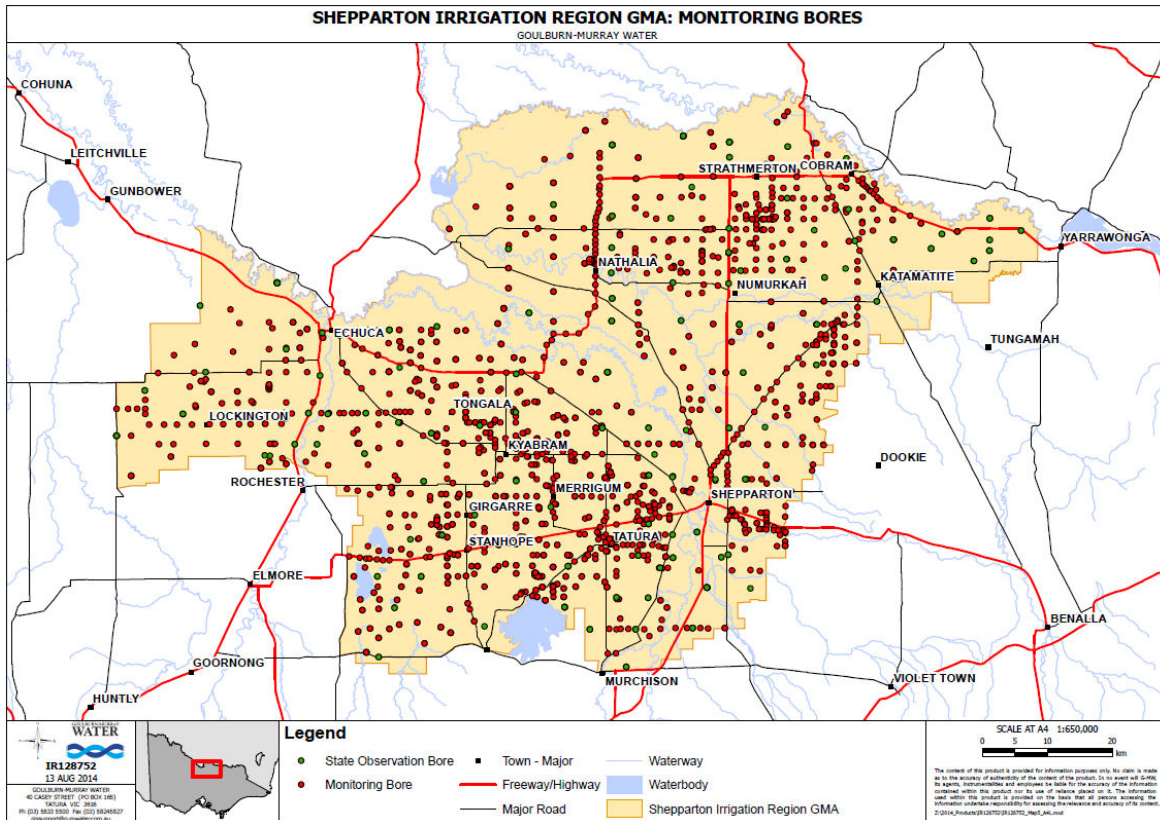


Figure 16 Shepparton Irrigation Region monitoring bore locations

GMW will continue to make use of the ongoing data available through the current monitoring bore network.



Groundwater monitoring bores

6.2 Groundwater quality

Groundwater salinity is a key risk in the SIR GMA and, whether through application of saline water during irrigation, or from rising saline watertables, the impacts on crop productivity may be significant. It is important for groundwater users to understand the salinity concentrations of water from their bores.

Licence holders have an opportunity to submit a groundwater sample to GMW for analysis as part of the annual mail out program. The salinity mail out program provides customers access to information about the salinity of groundwater being used, and the risks posed by using saline water. Each year GMW will send a sample bottle to all licensed customers with information about how to collect a sample. GMW will test all returned samples for salinity and notify licence holders of results. The results will also be stored in the State groundwater database.

All licence holders are strongly encouraged to participate in the program by returning a sample annually.

Rule 4: Monitoring groundwater salinity

Goulburn-Murray Water will support annual groundwater user salinity sampling by:

- Providing a sample bottle and reply paid envelope to each groundwater licence holder to collect a groundwater sample from their licensed bore/s and return them to GMW for salinity analysis;
- Measuring the groundwater salinity of returned sample/s, and providing the licence holder with results; and
- Entering the groundwater salinity results into the State groundwater database.

7 Plan Implementation

7.1 Annual newsletter

GMW will prepare an annual newsletter for the Plan. This newsletter will summarise groundwater management across the region and enable GMW to keep customers and stakeholders informed about groundwater in the SIR GMA. It will also allow communication about periods of high watertable risk. The newsletter will be available on the GMW website, and posted to customers.

Rule 5: Annual newsletter

Goulburn-Murray Water will, by 1 November of each year, prepare an annual newsletter for the Shepparton Irrigation Region Groundwater Management Area which will include:

- The most recent water table map;
- Groundwater use estimates;
- Information on the risk from shallow groundwater salinity; and
- The need for any changes to the Plan.

Goulburn-Murray Water will make the newsletter available on its website in November each year and posted to customers.

7.2 Review of the Plan

Over time, this Plan will need to be adapted in response to policy changes in groundwater management and as GMW and customers identify improvements.

When preparing the annual newsletter, GMW will consider and identify the need to make amendments to the Plan.

Any changes to the Plan must be based on a sound technical understanding of the issues and may be subject to consultation. If proposed changes are likely to affect customers' licensed access to water then Goulburn-Murray Water may undertake consultation through one or more of the following:

- a mailout to licensed users;
- community meetings;
- public notices in local newspapers;
- consultation with the relevant water services committees.

Rule 6: Review of the Plan

Goulburn-Murray Water will consider the need for any amendments to the Plan annually in conjunction with the preparation of an annual newsletter.

If amendments to the Plan are proposed that directly affect groundwater licences and licence conditions Goulburn-Murray Water will consult groundwater users and key stakeholders in the Shepparton Irrigation Region Groundwater Management Area on any such proposed changes.

8 List of References

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