# South Australian–Victorian Border Groundwaters Agreement Review Committee



# Thirty-Third Annual Report

**To 30 June 2018**

**Adelaide and Melbourne**

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# PREFACE

The Border Groundwaters Agreement Review Committee's Annual Report for 2017–18 fulfils the requirement under clause 30(1) of the Border Groundwaters Agreement to report on its activities during the year to 30 June 2018. This report has been compiled with reference to reports from South Australia and Victoria.

Clause 30(2) requires the Review Committee to forward a copy of the report to the appropriate Minister in each government.

Section 11 of the Victorian *Groundwater (Border Agreement) Act 19*85, and section 13 of the South Australian *Groundwater (Border Agreement) Act 1985* provides that the relevant minister shall cause a copy of the annual report to be laid before the parliament within fourteen sitting days of the receipt of the report.

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# 1. The year in summary

Along the South Australian–Victorian border, groundwater is the only reliable water source. It is used extensively in both states for irrigation, industry and public water supplies, as well as livestock and domestic uses. While groundwater supplies are relatively secure, the Border Groundwaters Agreement Review Committee (Review Committee) has sought to continually improve the technical understanding of the resources to inform a review of the management prescriptions defined by the Agreement to maintain the ongoing sustainable and equitable use of groundwater along the South Australian–Victorian border.

During the year the Review Committee coordinated groundwater resource studies into groundwater declines in the central and southern parts of the Designated Area along the border. While the declines in the groundwater water levels are within the permissible rates, studies are needed to identify whether there are potential adverse impacts on sustainability and equitable use of the resources in the longer term. Groundwater in the Tertiary Limestone Aquifer is not being significantly replenished by modern recharge across most of the central region and the Review Committee considers this groundwater as a non-renewable resource for water allocation and management purposes. The Review Committee will be considering implications for management of the resource in 2018/19 when current studies are completed. The Review Committee has determined to keep the current management prescriptions unchanged in these parts of the Designated Area and will review them when considering the outcomes of the studies and the implications for future management.

The Review Committee is undertaking a comprehensive review of the Agreement; its usefulness, relevancy and suitability of the Agreement in terms of objectives for managing the groundwater resources along the border. The approach being taken is one of collaboration between the two Contracting Governments and members of the Review Committee. This review is considering the outcomes delivered by the Agreement, and how these can be improved to better protect groundwater sustainability into the future and maintain the principle of equitable sharing of the resource. The Review Committee will provide advice and recommendations to the two Contracting Governments for building on the current arrangements, to ensure the sustainability of the shared groundwater resource. The Review Committee intends to complete the review of the Agreement and provide recommendations during the 2018–19 year.

The Review Committee increased the Permissible Annual Volume for the Pliocene Sands Aquifer in Zone 11A during 2017–18 to enable expansion of the Murtho Salt Interception Scheme in the riparian area of the River Murray at the northern boundary of Zone 11A.

The volume of groundwater extraction for the year to 30 June 2018 in each management zone within the Designated Area was within the Permissible Annual Volume of extraction for each zone and Allowable Annual Volume of extraction for sub-zones.

# 2. About the Agreement and the Review Committee

## The South Australian–Victorian Border Groundwaters Agreement

The groundwater resources along the South Australian–Victorian border are shared between the states. In recognition of the need to cooperatively manage these resources, both states agreed to enter into the Border Groundwaters Agreement (the Agreement) in 1985. The Agreement was updated in 2006. .

The Agreement establishes a Designated Area, extending 20 kilometres either side of the border, and from the coast to the River Murray. The Agreement applies specifically to this area. The Designated Area is divided into 22 management zones with 11 zones in each state (Figure 1).

The Agreement provides that the available groundwater shall be shared equitably between both states and applies to all existing and future bores within the Designated Area. Bores that extract groundwater for domestic and livestock purposes are not subject to the Agreement.

Extraction licences or permits may not be granted or renewed within the Designated Area, other than in accordance with the management prescriptions set out in the Agreement. The prescriptions limit water extraction to a Permissible Annual Volume for total withdrawals from all aquifers, to a permissible rate of potentiometric surface lowering, and to a permissible level of salinity. The prescriptions also provide that, where appropriate, casing of new wells shall be sealed between aquifers to prevent inter-aquifer contamination.

The allocation of water is the responsibility of the licensing agencies in each state, in accordance with the relevant groundwater management plan or water allocation plan, prepared under the states' respective water resources legislation.

The approach taken by the states in developing management plans has included objectives to better quantify the resource, to establish appropriate mechanisms for allocating the resource or, if needed, to restrict the use of the resource. Plans are developed through consultative regional committees to maximise community and industry involvement in making and implementing the management arrangements.

The management areas relevant to the Designated Area are set out in Table 1. The location of the zones relevant to state water administration areas are shown in Figure 2.

**Table 1: Management areas relevant to the Designated Area**

| South Australia | Victoria |
|---|---|
| • Mallee Prescribed Wells Area<br>• Tatiara Prescribed Wells Area<br>• Lower Limestone Coast Prescribed Wells Area | • Murrayville Groundwater Management Area<br>• West Wimmera Groundwater Management Area<br>• Glenelg Water Supply Protection Area |

## Border Groundwaters Agreement Review Committee

The Review Committee[1], with membership from both states, is established under the Border Groundwaters Agreement as the operating body for the effective implementation and administration of the Agreement.

The Review Committee is required at intervals of not more than five years, to review the management prescriptions – that is, the Permissible Annual Volume of extraction, the extraction of Allowable Annual Volume for sub-zones, the permissible distance from the border for referral to the other state, the permissible rate of potentiometric surface lowering (drawdown), and the permissible level of salinity (if any such levels have been declared).

The schedule of reviews of the management prescriptions are as follows:

- Province 1 was required to be carried out during the 2018 but the Review Committee has determined this will be completed in 2018/19.

- Province 2 was carried out during 2017–18. The Review Committee determined to maintain the current prescriptions unchanged, while further detailed technical assessments of the Province 2 groundwater resources are completed and assessed.

- The review of Province 3 was completed in 2015–16 and is required to be reviewed by 2020–21.

The Agreement provides that the Review Committee shall have the power to alter the permissible distance, Permissible Annual Volume, Allowable Annual Volume, and to declare a period of restriction. The relevant state ministers have the power to alter the permissible rate of potentiometric surface lowering and the permissible level of salinity, on the recommendation of the Review Committee[2].

The Agreement provides that the Review Committee may also:

- coordinate, or cause to be carried out, surveys, investigations and studies concerning the use, control, protection, management or administration of the groundwater in the Designated Area.

- make recommendations to the Contracting Governments or to any authority, agency or tribunal of the Contracting Governments concerning any matter which, in the opinion of the Review Committee, may in any way affect the investigation, use, control, protection, management or administration of the groundwater within the Designated Area.

- review the Agreement and, if in its opinion, amendments thereto are necessary or desirable, make recommendations to the Contracting Governments accordingly.

The Review Committee met three times during the 2017–18 year:

| | | |
|---|---|---|
| 24 July 2017 | Meeting 134 | Adelaide |
| 2 November 2017 | Meeting 135 | Melbourne |
| 23 March 2018 | Meeting 136 | Teleconference |

[1] The Review Committee does not manage or control any public finances or assets.
[2] A full list of Government Gazette notices relating to the current prescriptions is provided in Appendix A of this report.

During the year membership of the Review Committee comprised:

| South Australia | | Victoria | |
|---|---|---|---|
| Ms S Carruthers | Member | Dr G Mitchell | Member |
| Mr N Power | Member | Mr R Nott | Member |
| Mr T Collins | Deputy member | Mr T McDevitt | Deputy member |

Ms Sandy Carruthers was appointed a member in September 2017 and elected President on 23 March 2018. Dr Grace Mitchell was President from 1 June 2017 to 23 March 2018.

# 3. General Information

## Groundwater resources in the South Australian–Victorian border region

There are two main aquifer systems along the border, comprising the Tertiary Confined Sand Aquifer and the overlying Tertiary Limestone Aquifer (Figure 3). A thin Pliocene Sands Aquifer overlies the Upper Tertiary Aquitard in parts of the Designated Area.

The Tertiary Limestone Aquifer is the principle source of groundwater throughout the Designated Area, with water being used for a range of purposes – municipal supplies for towns such as Murrayville, Pinnaroo, Penola and Mount Gambier, individual domestic and livestock water supplies, industry, and irrigation of agricultural crops and recreational grounds.

Groundwater salinity in the Tertiary Limestone Aquifer is mostly less than 3000 EC (about 1700 mg/L TDS) in the Designated Area, except in the north where it exceeds 30 000 EC (about 18 000 mg/L TDS).

In the Designated Area, the Tertiary Limestone Aquifer has been subdivided into three hydrogeological provinces as shown in Figure 4 and described below:

> Province 1 occurs largely in the Otway Basin and is characterised by Quaternary calcareous sandstone overlying the Tertiary Limestone Aquifer forming one unconfined aquifer system.
>
> Province 2 is in the Murray Basin where the Tertiary Limestone Aquifer is unconfined and either outcrops at the surface, or is overlain directly by the Pliocene Sands Aquifer.
>
> Province 3 is in an area of the Murray Basin where the Tertiary Limestone Aquifer is confined by the Upper Tertiary Aquitard. A thin Pliocene Sands Aquifer overlies the Upper Tertiary Aquitard in some parts of this province.

## Management approach

When the Agreement was established in 1985, the groundwater shares (Permissible Annual Volumes) between the two adjacent state Designated Area zones were equal. As more has been learnt about the groundwater resources and the risks to the resources from use, the limits have been amended to ensure the protection of the existing entitlements and the protection of resources from undue depletion or degradation.

In accordance with its role to advise the states, as outlined in the previous section, the Review Committee has taken the following management approach for each province.

Tertiary Limestone Aquifer – Province 1
The Tertiary Limestone Aquifer is a high yielding and renewable resource and is replenished by rainfall. Parts of Province 1 have experienced long-term declines in groundwater levels.

In 2008, following its Five-Year Management Review of Province 1 (Border Groundwaters Agreement Review Committee 2008), the Review Committee recommended that a new management approach was needed to achieve long term sustainability. The current mix of land use and groundwater extractions is out of balance (in that outflows and extractions exceed inflows) and is not sustainable in the long term. Without a change in the current land and/or water use, groundwater levels will continue to decline over parts of Province 1.

Plantation forest is a significant regional land use by area with a hydrological impact in most of the zones in Province 1 due to recharge interception and direct groundwater extraction from shallow water tables.

It was the view of the Review Committee at that time that this may require reductions in the area under plantation forests and the volume extracted via bores under groundwater entitlements. In the meantime, the Review Committee proposed a management strategy to address four key issues. These are:

- water accounting
- inter-aquifer connectivity
- sea-water intrusion
- aquifer depletion.

In respect to water accounting, the Review Committee recommended the states develop a consistent approach to account for the water used by plantation forests, a significant land use in Province 1. Plantation forest is a significant regional land use by area with a hydrological impact in most of the zones in Province 1 due to recharge interception and direct groundwater extraction from shallow water tables. The matter is being considered in the current review of the Agreement.

South Australia has implemented arrangements to account for plantation forests on water resources. After the adoption of the regional water allocation plan in 2013, forest managers in South Australia are now required to offset plantation forest hydrological impacts with a licensed water allocation. At the time, forest managers were considered to be existing users and were granted forest water licences for existing (or approved proposed) forest compartments to offset their impact on the regional groundwater. In the South Australian Zones 1A to 4A, the forest licensed impacts are approximately equal to the Permissible Annual Volumes that can be extracted via bores in the Tertiary Limestone Aquifer in those zones under the Agreement.

The Review Committee recommended that both states undertake studies into the risks arising from long term declines in groundwater levels. These included studies on the inter-connection between the Tertiary Confined Sand Aquifer on the Tertiary Limestone Aquifer, sea-water intrusion and aquifer depletion in the Lake Mundi area in Victoria. Lake Mundi is an area where the Tertiary Limestone Aquifer is thin. The states have finalised these studies and the Review Committee has sought to coordinate the consolidation of the outcomes of these into the review of groundwater resources in Province 1 in 2019.

Tertiary Limestone Aquifer – Province 2

Groundwater in the Tertiary Limestone Aquifer is not being significantly replenished by modern recharge across most of Province 2. As such, the groundwater resource is considered a non-renewable resource. The Review Committee formed this view during its management review of Province 2 in 2007 (Border Groundwaters Agreement Review Committee 2007) and advised the states of the need to develop a common policy for water allocation and long-term groundwater management on the basis that this is a non-renewable resource.

The Review Committee determined to retain the current prescriptions unchanged, until the technical assessments are completed and discussions held between the relevant management authorities.

In the area of concentrated extractions in Zones 5A, 6A, 5B and 6B, (which includes the Frances–Neuarpur area) groundwater levels are declining (up to ~0.2 m/y since 1996), mostly due to groundwater extraction. These groundwater level declines appear to be manageable in the short term, with respect to the capacity of the resource and a low risk of loss of supply to groundwater users over the next few years.

Tertiary Limestone Aquifer – Province 3

Groundwater Tertiary Limestone Aquifer in Province 3 is not being replenished by modern recharge, and has been managed as a non-renewable resource since 2001. The aquifer is confined and distant from recharge areas. Consequently, the aquifer does not respond to seasonal recharge from rainfall. Intensive groundwater development began after 2001, and the observed long-term water level trends and seasonal drawdowns are consistent with pressure response of pumping in a confined aquifer. A cone of depression in the groundwater pressure levels has formed, with its centre located at Peebinga, an area of intensive groundwater extraction.

Further drawdowns in groundwater levels are expected as groundwater extractions increase. Schemes are in place in both South Australia and Victoria to ensure people relying on groundwater bores for domestic and stock purposes can still access the resource. The impacts on domestic and livestock bores need to continue to be managed by the states.

There is no immediate risk of increased groundwater salinity, due to the lateral movement of saline groundwater or the vertical leakage of saline water from the Pliocene Sands Aquifer, however there is a need to continue to monitor.

There are no environmental assets or ecosystems associated with the confined aquifer which are compromised by the volumes being extracted under these management arrangements.

There is potential for localised “hot spots” of drawdown, which could increase the impact on domestic and livestock users, or increase the risks of dewatering the aquifer or accelerating water quality change. The states have implemented measures to prevent uncontrolled localised drawdowns arising from intense groundwater extraction.

Tertiary Confined Sand Aquifer

Management prescriptions for the Tertiary Confined Sand Aquifer in the Designated Area remain unchanged since 2001.

Pliocene Sands Aquifer

The Pliocene Sands Aquifer overlies the Tertiary Limestone Aquifer in the Murray Basin, mainly in the northern part of the Designated Area. The groundwater in the Pliocene Sands Aquifer is generally saline. In 2007, the Review Committee determined a Permissible Annual Volume for the Pliocene Sands Aquifer in Zone 11A to provide for salinity mitigation extractions for the Murtho Salt Interception Scheme. The scheme intercepts saline groundwater that would normally enter the River Murray. The Permissible Annual Volume has been further increased during 2017–18 to enable expansion of the salt interception scheme. This action aligns with the Murray–Darling Basin Plan.

## Permissible Annual Volumes and Allowable Annual Volumes

The Permissible Annual Volumes for each aquifer in each zone at 30 June 2018 are set out in Table 2.

### Table 2: Permissible Annual Volumes at 30 June 2018

| South Australia | | | | Victoria | | |
|---|---|---|---|---|---|---|
| Permissible Annual Volume | | | Zone | Zone | Permissible Annual Volume | |
| Pliocene Sands Aquifer (ML/y) | Tertiary Limestone Aquifer (ML/y) | Tertiary Confined Sand Aquifer (ML/y) | | | Tertiary Limestone Aquifer (ML/y) | Tertiary Confined Sand Aquifer (ML/y) |
| 7763 | 3700 | 0 | 11A | 11B | 1823 | 0 |
| | 14 000 | 320 | 10A | 10B | 6720 | 560 |
| | 11 595 | 570 | 9A | 9B | 5960 | 630 |
| | 5121 | 340 | 8A | 8B | 3500 | 330 |
| | 8259 | 350 | 7A | 7B | 5782 | 350 |
| | 8758 | 360 | 6A | 6B | 9943 | 360 |
| | 18 943 | 540 | 5A | 5B | 13 069 | 570 |
| | 22 102 | 710 | 4A | 4B | 14 000 | 300 |
| | 24 054 | 1900 | 3A | 3B | 16 500 | 1000 |
| | 25 000 | 2900 | 2A | 2B | 25 000 | 5100 |
| | 31 812 | 9200 | 1A | 1B | 45 720 | 14 500 |

The Allowable Annual Volumes for the sub-zones that have been determined for the Tertiary Limestone Aquifer in Zones 1A, 6A and 9A at 30 June 2018 are set out in Table 3. The locations of the sub-zones are shown in Figure 5.

### Table 3: Allowable Annual Volumes for the Tertiary Limestone Aquifer for year ending 30 June 2018

| South Australia<br>Allowable Annual Volumes | |
|---|---|
| Tertiary Limestone Aquifer (ML/y) | Sub-zone |
| 2400 | 9A North |
| 7760 | 9A South |
| 4658 | 6A South |
| 12 507 | 1A South |

## Allocations and volumes extracted

The allocations and the volumes extracted[3] for the Tertiary Limestone Aquifer are listed in Tables 4 and 5. Water extractions in all the management zones in 2017-18 were within the Permissible Annual Volumes.

### Table 4: Permissible Annual Volumes, number of licences, allocations and volumes extracted for the Tertiary Limestone Aquifer at 30 June 2018

| South Australia | | | | | Victoria | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tertiary Limestone Aquifer | | | | Zone | Zone | Tertiary Limestone Aquifer | | | |
| Permissible Annual Volume (ML/y) | Licensed Allocations | | | | | Permissible Annual Volume (ML/y) | Licensed Allocations | | |
| | Licences | Volume Allocated (ML) | Volume Extracted (ML) | | | | No. of Licences | Volume Allocated (ML) | Volume Extracted (ML) |
| 3700 | 8 | 3700 | 2258 | 11A | 11B | 1823 | 3 | 1600 | 1062 |
| 14 000 | 34 | 14 000 | 10 553 | 10A | 10B | 6720 | 23 | 6718 | 6620 |
| 11 595 | 10 | 10 160 | 7639 | 9A | 9B | 5960 | 3 | 5300 | 363 |
| 5121 | 25 | 6542 | 1342 | 8A | 8B | 3500 | 8 | 3430 | 603 |
| 8259 | 78 | 9133 | 3684 | 7A | 7B | 5782 | 14 | 5782 | 5291 |
| 8758 | 40 | 10 629 | 3970 | 6A | 6B | 9943 | 16 | 10 279 [2] | 7164 |
| 18 943 | 127 | 23 723 | 10 791 | 5A | 5B | 13 069 | 39 | 12 833 | 8606 |
| 22 102 | 173 | 30 983 [1] | 10 145 | 4A | 4B | 14 000 | 12 | 2880 | 358 |
| 24 054 | 238 | 32 476 | 10 435 | 3A | 3B | 16 500 | 5 | 515 | 99 |
| 25 000 | 80 | 26 907 | 14 387 | 2A | 2B | 25 000 | 44 | 23 047 | 4069 |
| 31 812 | 298 | 45 338 | 20 857 | 1A | 1B | 45 720 | 18 | 4409 | 2079 |

Note 1: The increase in water allocation of 663 ML is due to the inadvertent omission of frost mitigation water allocations in the 2016–17 report.
Note 2: The volume allocated in Zone 6B exceeded the Permissible Annual Volume due to a revised location of an existing bore that was previously considered outside the Zone. Victoria will proceed to adjust the PAV to reflect the existing entitlement.

### Table 5: Allowable Annual Volumes, number of licences, allocations and volumes extracted for the Tertiary Limestone Aquifer at 30 June 2018

| South Australia | | | | |
|---|---|---|---|---|
| Tertiary Limestone Aquifer | | | | Sub-Zone |
| Allowable Annual Volume (ML/y) | Licensed Allocations | | | |
| | Licences | Volume Allocated (ML) | Volume Extracted (ML) | |
| 2400 | 2 | 2400 | 1066 | 9A North |
| 7760 | 8 | 7760 | 6573 | 9A South |
| 4658 | 18 | 5321 | 1736 | 6A South |
| 12 507 | 58 | 20 085 | 12 341 | 1A South |

[3] Note that the 'volume extracted' is the volume of groundwater extracted under a permit/licence and does not take into account the volume extracted for domestic and stock use or the impacts of plantation forests. The Agreement does not apply to bores for domestic and stock purposes, or the impacts of plantation forests.

Most of the zones are fully committed in the Tertiary Limestone Aquifer, in that the volumes licensed have reached the Permissible Annual Volumes. In 2013, South Australia implemented the conversion of all area-based irrigation allocations to volumetric allocations and while not granting any new allocations it has resulted in allocations exceeding the Permissible Annual Volumes in eight zones and the Allowable Annual Volume in two sub-zones.

There is un-allocated water in the Tertiary Limestone Aquifer in Zones 1B, 3B and 4B. There is a moratorium on new licences and permanent transfers of groundwater entitlements in Zones 1B, 2B, 3B and part of Zone 4B under Victoria's water legislation.

The allocations and volumes extracted for the Tertiary Confined Sand Aquifer are listed in Table 6. A moratorium exists under the Victorian *Water Act 1989* on issuing groundwater licences for the Tertiary Confined Sand Aquifer in Zones 1B, 2B and 3B.

**Table 6: Permissible Annual Volumes, allocations and volumes extracted for the Tertiary Confined Sand Aquifer at 30 June 2018**

| **South Australia** | | | | | **Victoria** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tertiary Confined Sand Aquifer | | | | Zone | Zone | Tertiary Confined Sand Aquifer | | | |
| Permissible Annual Volume (ML/y) | Licensed Allocations | | | | | Permissible Annual Volume (ML/y) | Licensed Allocations | | |
| | No. of Licences | Volume Allocated (ML) | Volume Extracted (ML) | | | | No. of Licences | Volume Allocated (ML) | Volume Extracted (ML) |
| 0 | 0 | 0 | 0 | 11A | 11B | 0 | 0 | 0 | 0 |
| 320 | 0 | 0 | 0 | 10A | 10B | 560 | 0 | 0 | 0 |
| 570 | 0 | 0 | 0 | 9A | 9B | 630 | 0 | 0 | 0 |
| 340 | 0 | 0 | 0 | 8A | 8B | 330 | 0 | 0 | 0 |
| 350 | 0 | 0 | 0 | 7A | 7B | 350 | 0 | 0 | 0 |
| 360 | 0 | 0 | 0 | 6A | 6B | 360 | 0 | 0 | 0 |
| 540 | 0 | 0 | 0 | 5A | 5B | 570 | 0 | 0 | 0 |
| 710 | 1 | 102 | 41 | 4A | 4B | 300 | 0 | 0 | 0 |
| 1900 | 1 | 250 | 143 | 3A | 3B | 1000 | 0 | 0 | 0 |
| 2900 | 2 | 150 | 29 | 2A | 2B | 5100 | 0 | 0 | 0 |
| 9200 | 4 | 1704 | 804 | 1A | 1B | 14 500 | 0 | 0 | 0 |

The Permissible Annual Volume and volume extracted for the Pliocene Sands Aquifer are listed in Table 7.

It should be noted that the groundwater from the Pliocene Sands Aquifer is saline and the extractions relate to the interception of saline groundwater that would normally enter the River Murray. While there is no formal licenced water allocation, salt interception schemes operated by the Government of South Australia are consistent with the Murray–Darling Basin Plan and in accordance with the Agreement and the relevant Permissible Annual Volume. It is estimated that the extraction of 3821 ML of water from the Pliocene Sand Aquifer in Zone 11A, via the Murtho salt interception scheme, diverted a salt load of 95 000 tonne away from the River Murray.

**Table 7: Permissible Annual Volume, number of licences, volume allocated and volume extracted for the Pliocene Sands Aquifer at 30 June 2018**

| South Australia | | | | |
|---|---|---|---|---|
| Pliocene Sands Aquifer | | | | |
| Permissible Annual Volume (ML/y) | Licensed Allocations | | | Zone |
| | No. of Licences | Volume Allocated (ML) | Volume Extracted (ML) | |
| 7763 | 0 | 0 | 3821 | 11A |

While the Agreement does not apply to bores for domestic and livestock purposes, the large number of bores in the Designated Area indicates the important role groundwater plays for these purposes. The estimated number of domestic and livestock bores for each zone are listed in Table 8.

**Table 8: Number of domestic and livestock bores**

| South Australia | | Victoria | |
|---|---|---|---|
| Number of Domestic and Stock Bores[4] | Zone | Zone | Number of Domestic and Stock Bores[5] |
| 16 | 11A | 11B | 17 |
| 166 | 10A | 10B | 243 |
| 25 | 9A | 9B | 47 |
| 62 | 8A | 8B | 113 |
| 749 | 7A | 7B | 104 |
| 391 | 6A | 6B | 56 |
| 1370 | 5A | 5B | 162 |
| 896 | 4A | 4B | 339 |
| 1155 | 3A | 3B | 79 |
| 632 | 2A | 2B | 577 |
| 1648 | 1A | 1B | 625 |

## Permissible distance from the border

The permissible distance is the distance from the South Australia–Victoria border within which all applications for a permit or licence must be forwarded to the Review Committee for approval. The permissible distances at 30 June 2018 are specified in Table 9.

[4] The numbers of domestic and livestock bores are derived from spatial analysis of the state SAGEODATA borehole records. It does not necessarily indicate the bores in use.
[5] The numbers of domestic and livestock bores are best estimates made in 2004, based on the State database records.

### Table 9: Permissible distances at 30 June 2018

| South Australia | | | Victoria | | |
|---|---|---|---|---|---|
| Tertiary Confined Sand Aquifer Distance (km) | Tertiary Limestone Aquifer Distance (km) | Zone | Zone | Tertiary Limestone Aquifer Distance (km) | Tertiary Confined Sand Aquifer Distance (km) |
| 3 | 3 | 11A | 11B | 3 | 3 |
| 3 | 3 | 10A | 10B | 3 | 3 |
| 3 | 1 | 9A | 9B | 1 | 3 |
| 3 | 1 | 8A | 8B | 1 | 3 |
| 3 | 1 | 7A | 7B | 1 | 3 |
| 3 | 1 | 6A | 6B | 1 | 3 |
| 3 | 1 | 5A | 5B | 1 | 3 |
| 3 | 1 | 4A | 4B | 1 | 3 |
| 3 | 1 | 3A | 3B | 1 | 3 |
| 3 | 1 | 2A | 2B | 1 | 3 |
| 3 | 1 | 1A | 1B | 1 | 3 |

## Permissible potentiometric surface lowering

The Agreement provides for a rate of drawdown that must not be exceeded. The prescribed permissible potentiometric surface lowering rates for each zone are shown in Table 10.

### Table 10: Permissible potentiometric surface lowering rates at 30 June 2018

| South Australia | | Victoria | |
|---|---|---|---|
| Rate (m/y) | Zone | Zone | Rate (m/y) |
| 0.65 | 11A | 11B | 0.65 |
| 0.65 | 10A | 10B | 0.65 |
| 0.65 | 9A | 9B | 0.65 |
| 0.05 | 8A | 8B | 0.65 |
| 0.05 | 7A | 7B | 0.05 |
| 0.05 | Sub-zone 6A North | 6B | 0.20 |
| 0.20 | Sub-zone 6A South | | |
| 0.20 | 5A | 5B | 0.20 |
| 0.25 | 4A | 4B | 0.25 |
| 0.25 | 3A | 3B | 0.25 |
| 0.25 | 2A | 2B | 0.25 |
| 0.25 | 1A | 1B | 0.25 |

## Permissible salinity

The Agreement allows for the setting of permissible salinity levels. Following the technical reviews of Province 1, Province 2 and Province 3 (Border Groundwaters Agreement Review Committee 2013, 2017 and 2015 respectively) the Review Committee has determined that there is no need to recommend that permissible salinity levels should be set.

## Reports from the states

The Agreement requires that the Contracting Governments provide an annual report to the Review Committee detailing the number of permits or licences issued, volumes authorised, and details of potentiometric surface levels in each zone. In addition, the states also reported on other activities that related to groundwater management in the Designated Area, as follows.

Groundwater management plans

South Australia's volumetric conversion program, through water allocation plans and involving about 4000 volumetric irrigation licenses, resulted in the aggregated allocations exceeding the Permissible Annual Volume and Allowable Annual Volume in all zones in the Lower Limestone Coast Prescribed Wells Area. Effective July 2016, a range of reductions were incorporated in the current water allocation plan. This reduction program consists of staged reductions every two years through to 2022, however this program has been placed on hold by the State Government following its election in March 2018. This is in line with an election commitment to enable an independent expert review of the science underpinning the reductions set out by the 2013 *Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area*. The review is expected to be completed and reported to the South Australian Minister for Environment and Water by mid-2019. This expert's review report will provide another analysis for the Review Committee to consider in its technical assessment of Province 1.

Victoria introduced staged reductions in licence allocations in Zones 5B and 6B in 2010. These reductions have ceased following a review of the management plan for the West Wimmera Groundwater Management Area in 2018. Victoria also reviewed the management plan for the Murrayville Water Supply Protection Area and is developing new management arrangements for the Glenelg Water Supply Protection Area.

Investigations

The Department for Environment and Water undertook a study of the risk of sea water intrusion and is sponsoring a range of activities which includes groundwater modelling, a review of water table trends, a review of the condition of groundwater dependant ecosystems and the risks to these natural assets, and a review of sea water intrusion risks. The timing of these investigations has been scheduled to align with the review of the *Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area* and the output will be available to the Review Committee in the first half of 2019.

The Department of Environment, Land, Wand Planning commissioned a groundwater modelling project to investigate the groundwater resources of Province 2 and a review of groundwater quality information in the Designated Area. These studies will inform a review of groundwater resources in Province 1 and 2 in 2019.

Condition of the resource

Aggregate annual groundwater extractions in the Designated Area from the Tertiary Limestone Aquifer from 2006-07 to June 2018 are shown in the Figure 6 bar chart.

Groundwater levels are continuing to decline in parts of Province 2. However, there is some stabilisation becoming evident due to some reduced irrigation activity over the last two years. Ongoing declines in groundwater levels are evident in parts of Province 1, primarily due to plantation forest extractions and impacts on recharge, irrigation extractions and rainfall variability.

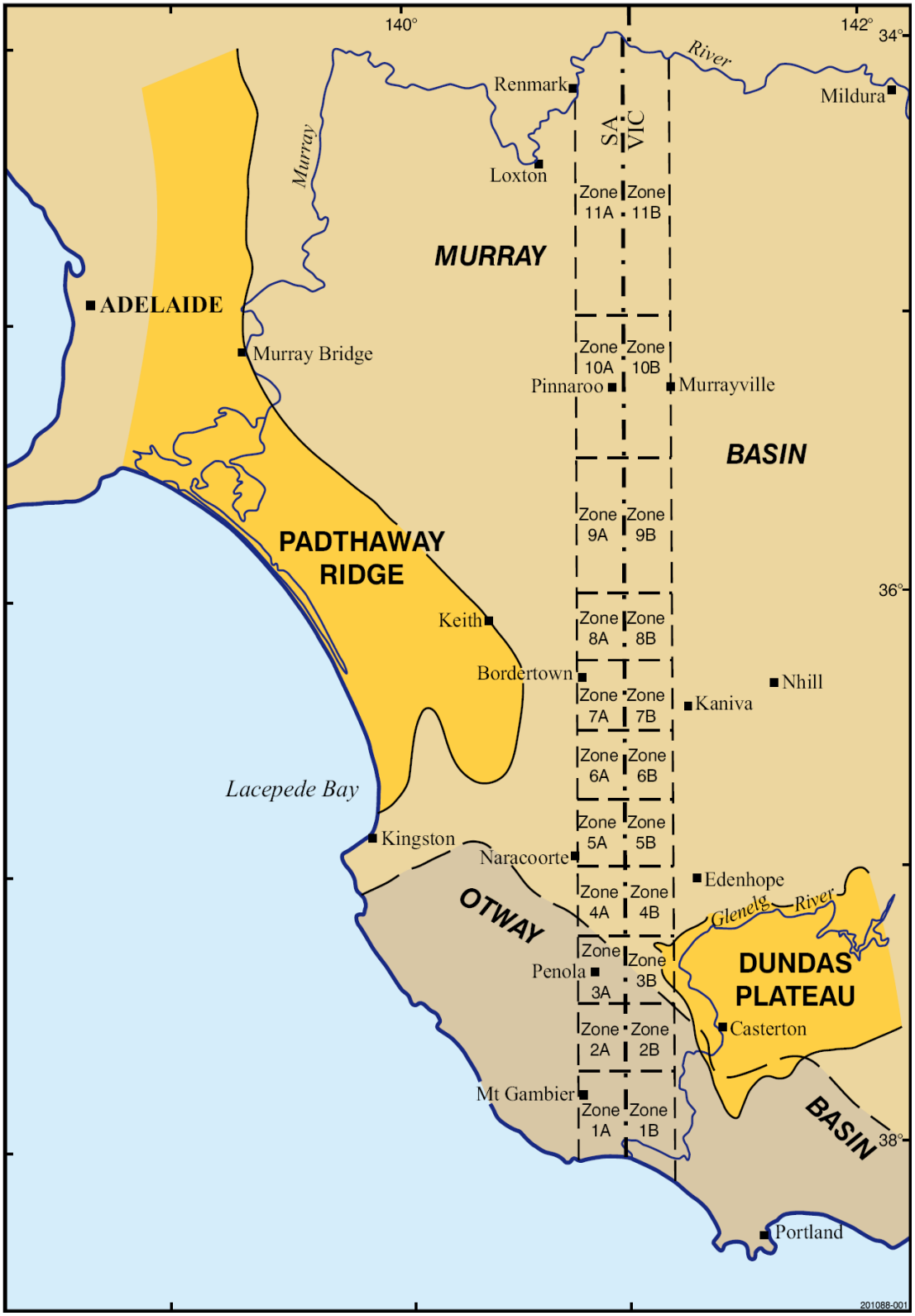
Details of the potentiometric level trends from representative observation bores for the Tertiary Limestone Aquifer and the Tertiary Confined Sand Aquifer are shown in Figures 7 and 8.

Groundwater monitoring

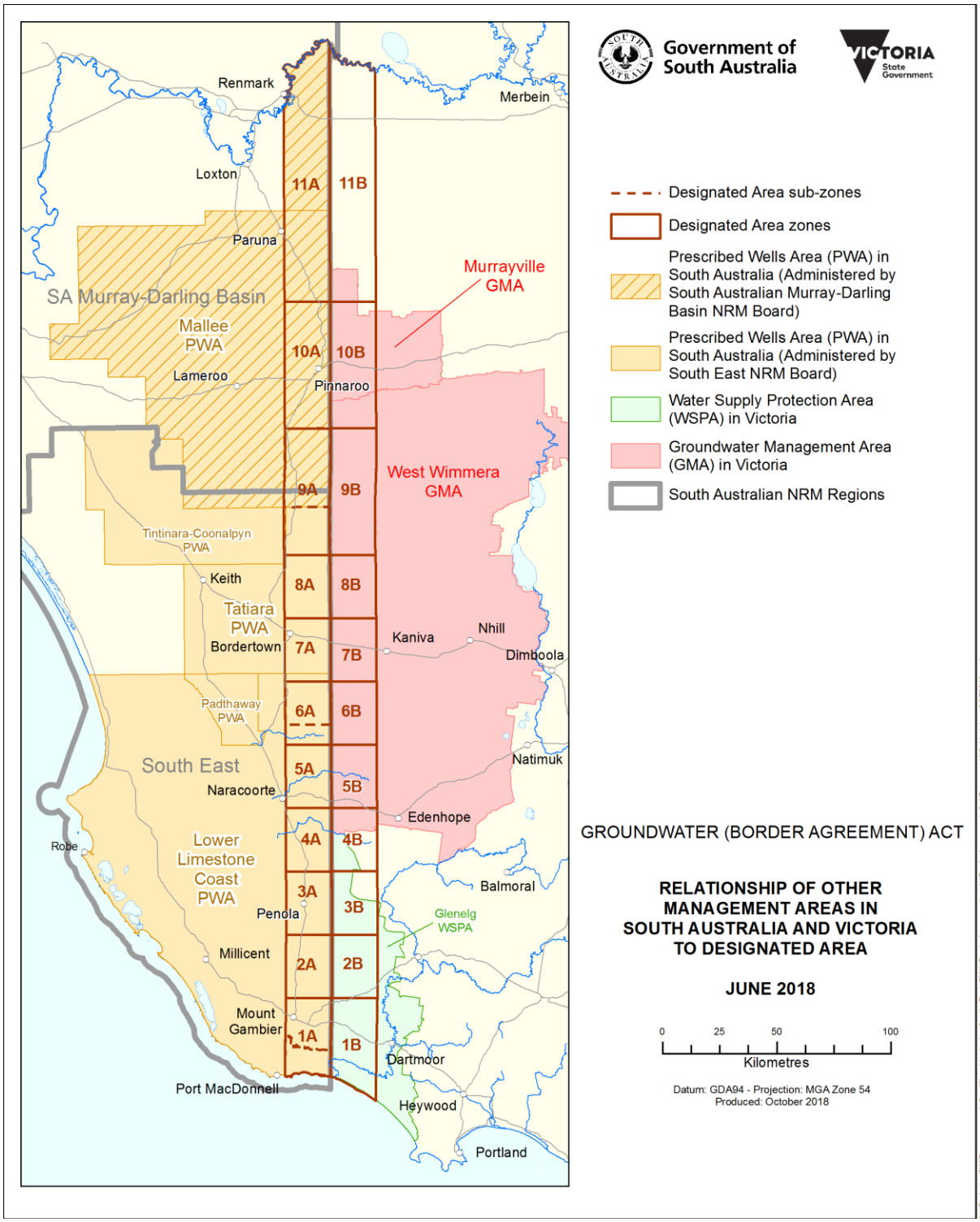
Following a review of the South Australian monitoring network, the Department for Environment and Water will continue to monitor a network of approximately 430 wells within the Designated Area with four observations a year.

# FIGURES

## Figure 1: Designated Area and zones



## Figure 2: Relationship of management areas in South Australia and Victoria to the Designated Area



## Figure 3: Hydrogeological provinces

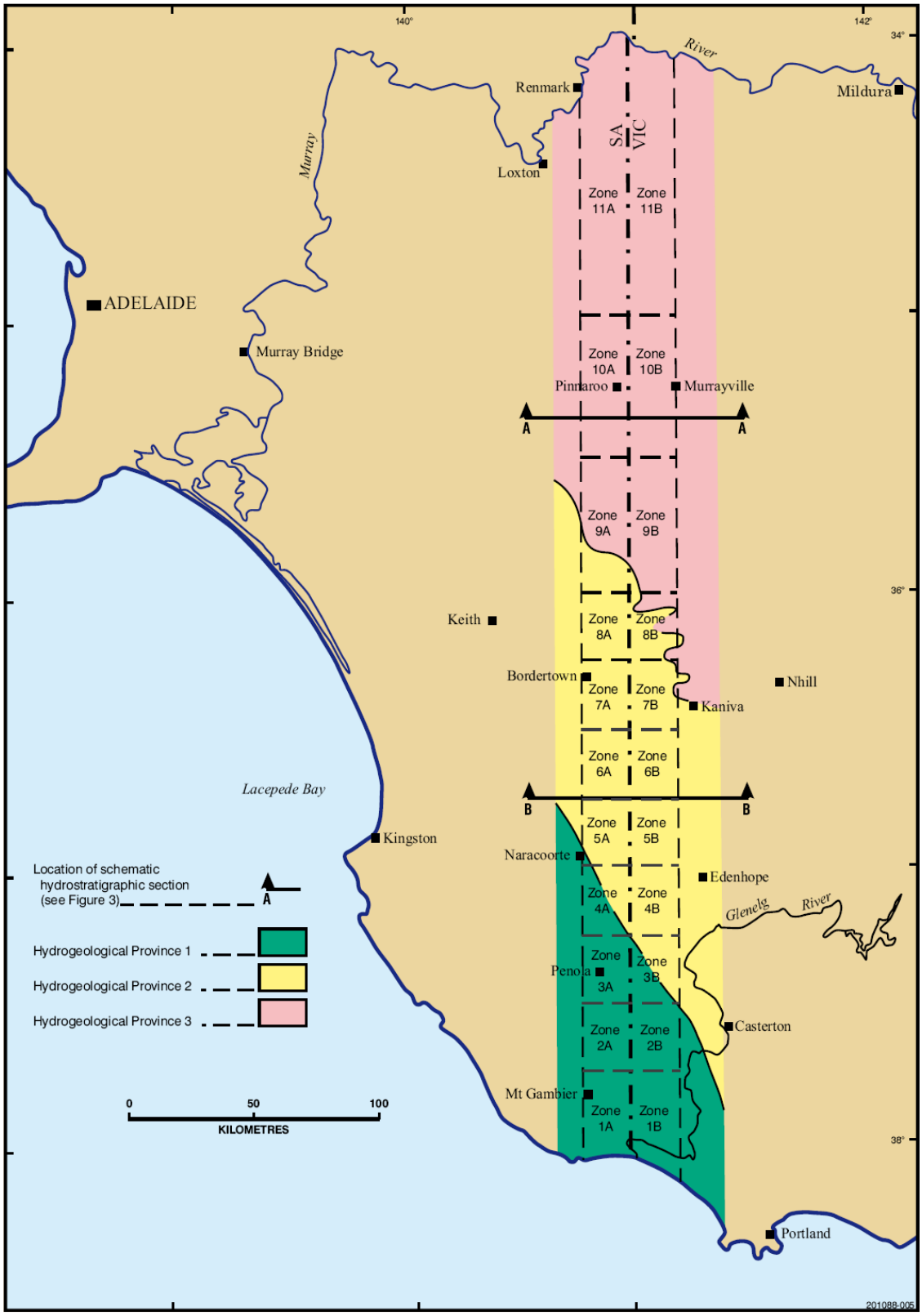
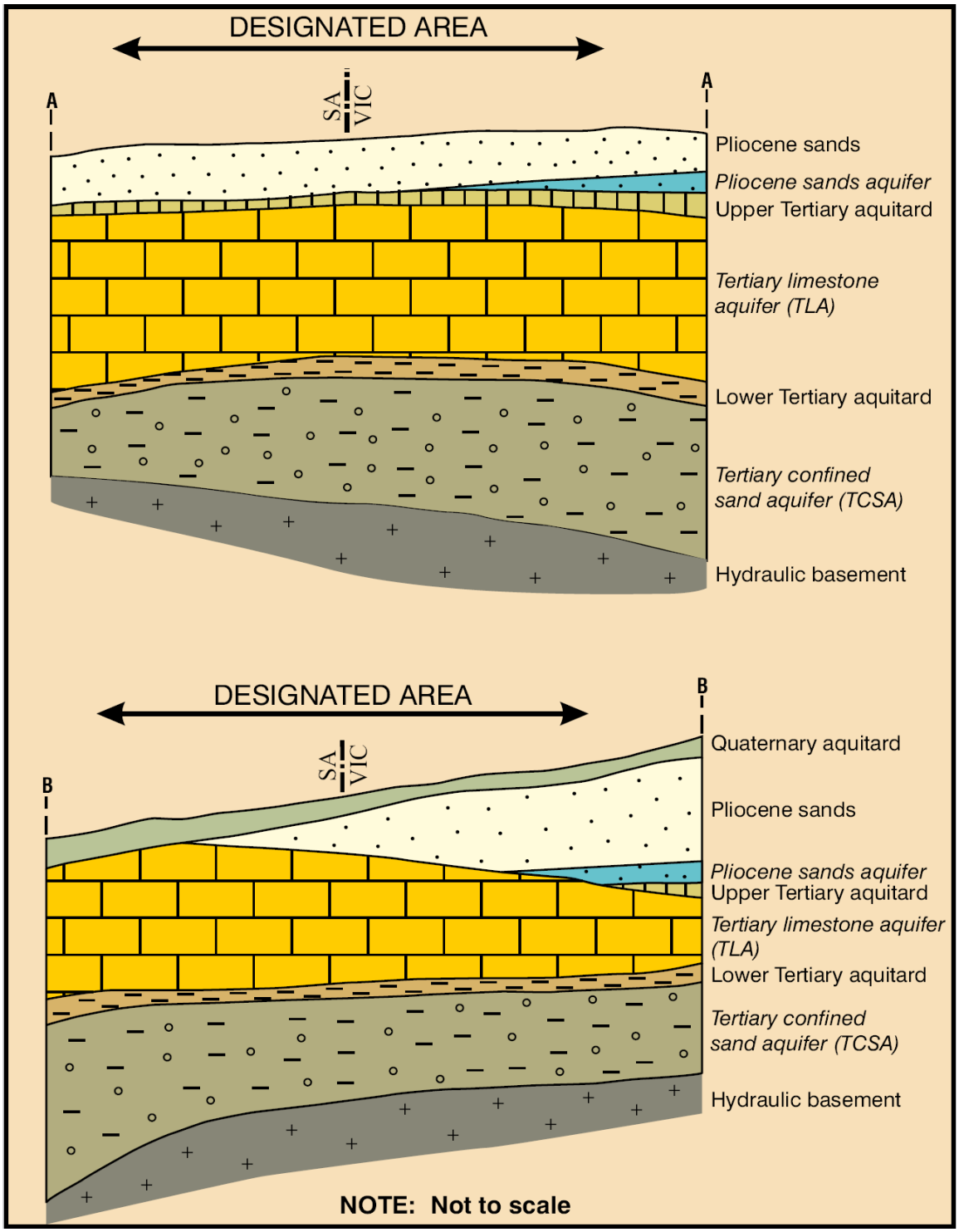
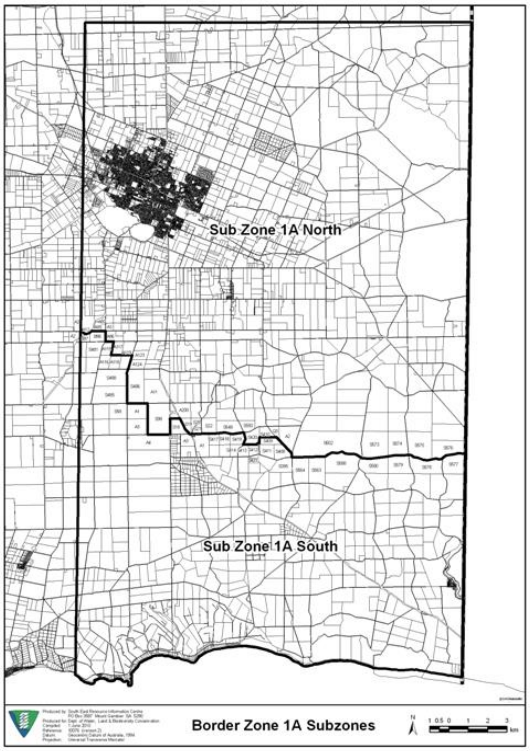


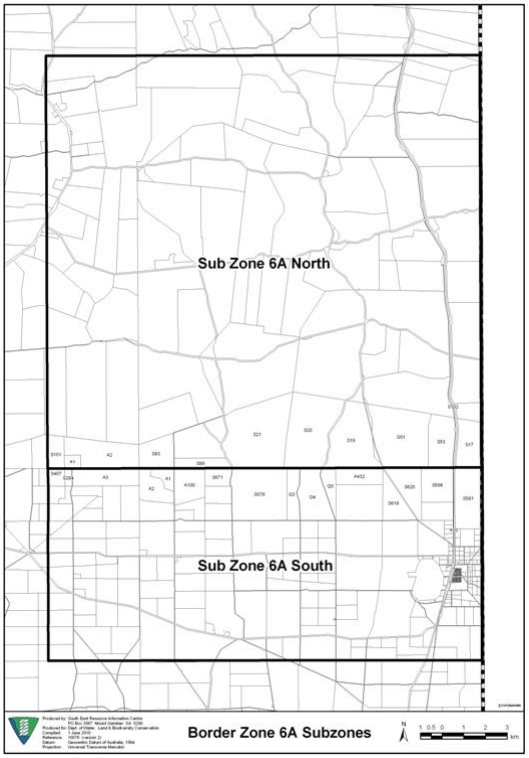
**Figure 4: Schematic hydrostratigraphic cross-sections relating to Figure 3**

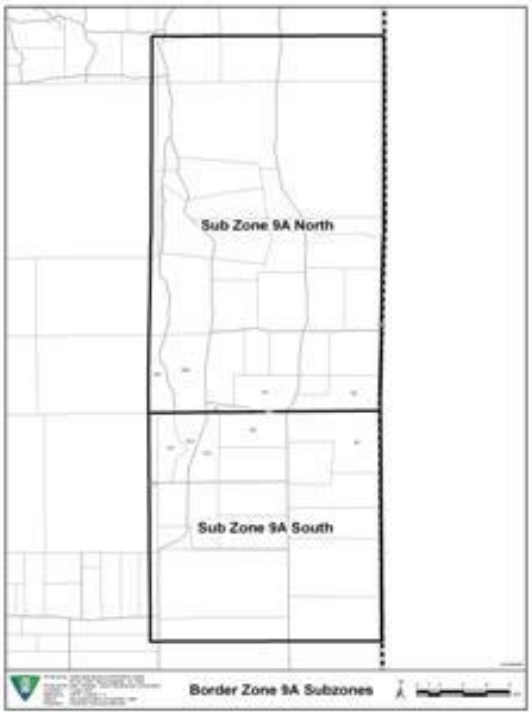
(Locations of the cross-sections are shown in Figure 3)



## Figure 5: Sub-zone boundaries for Zones 1A, 6A and 9A



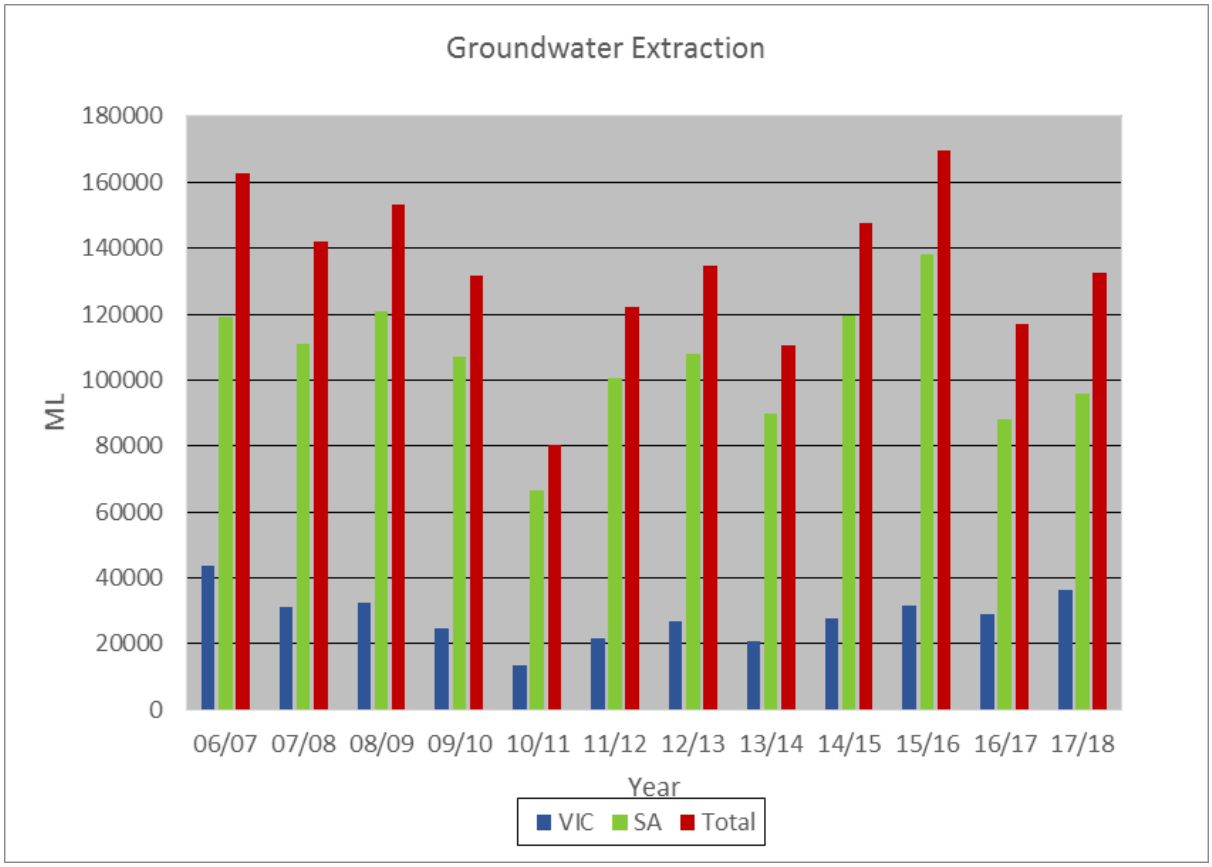




Boundaries of sub-zones are registered on:

Plan number 35/2010 (Zone 1A)
Plan number 34/2010 (Zone 6A)
Plan number 36/2010 (Zone 9A)

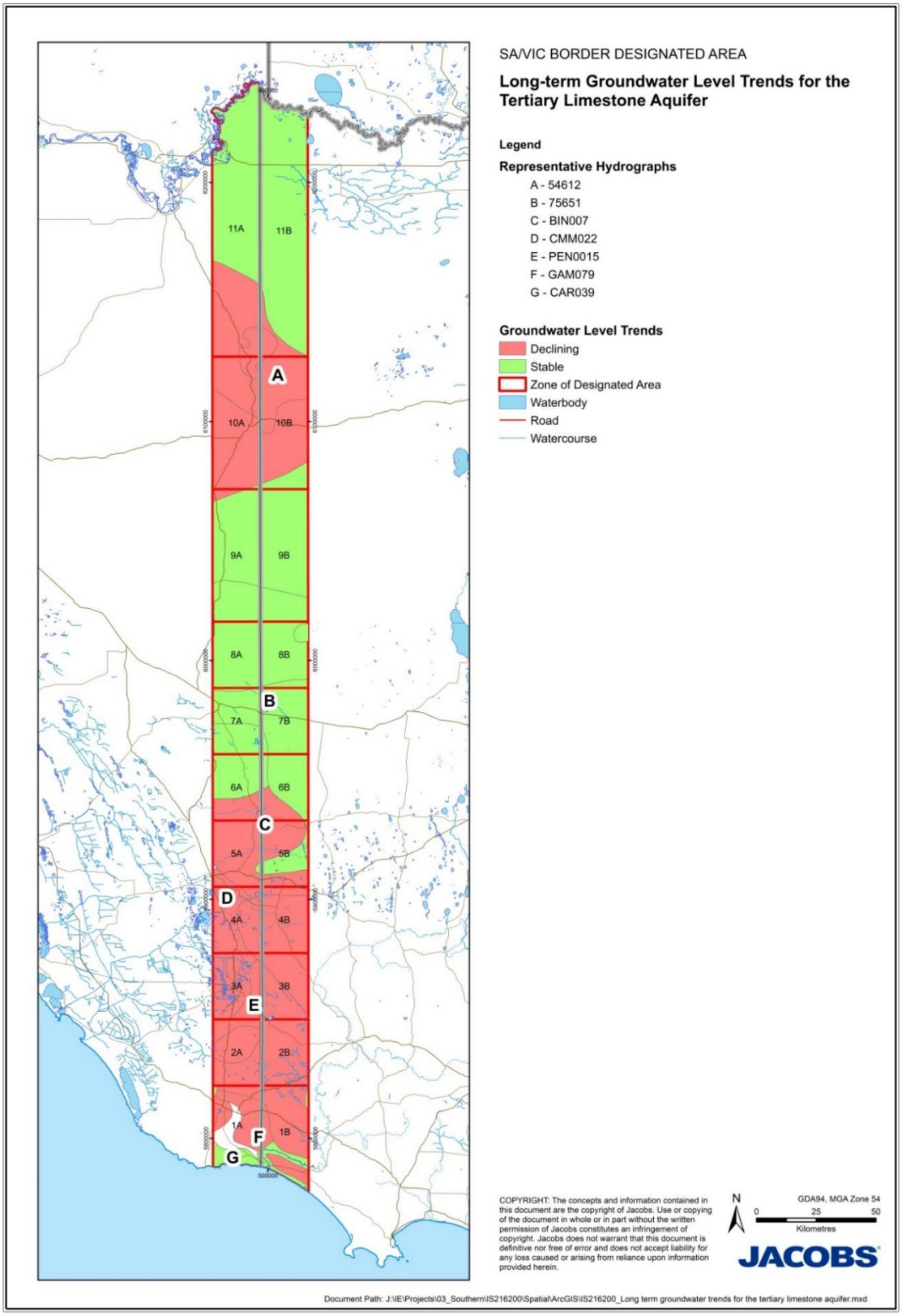
Plans can be viewed at Lands Services and Lands Titles office at
101 Grenfell Street, Adelaide

**Figure 6: Annual volume extracted from the Tertiary Limestone Aquifer since 2006–07**



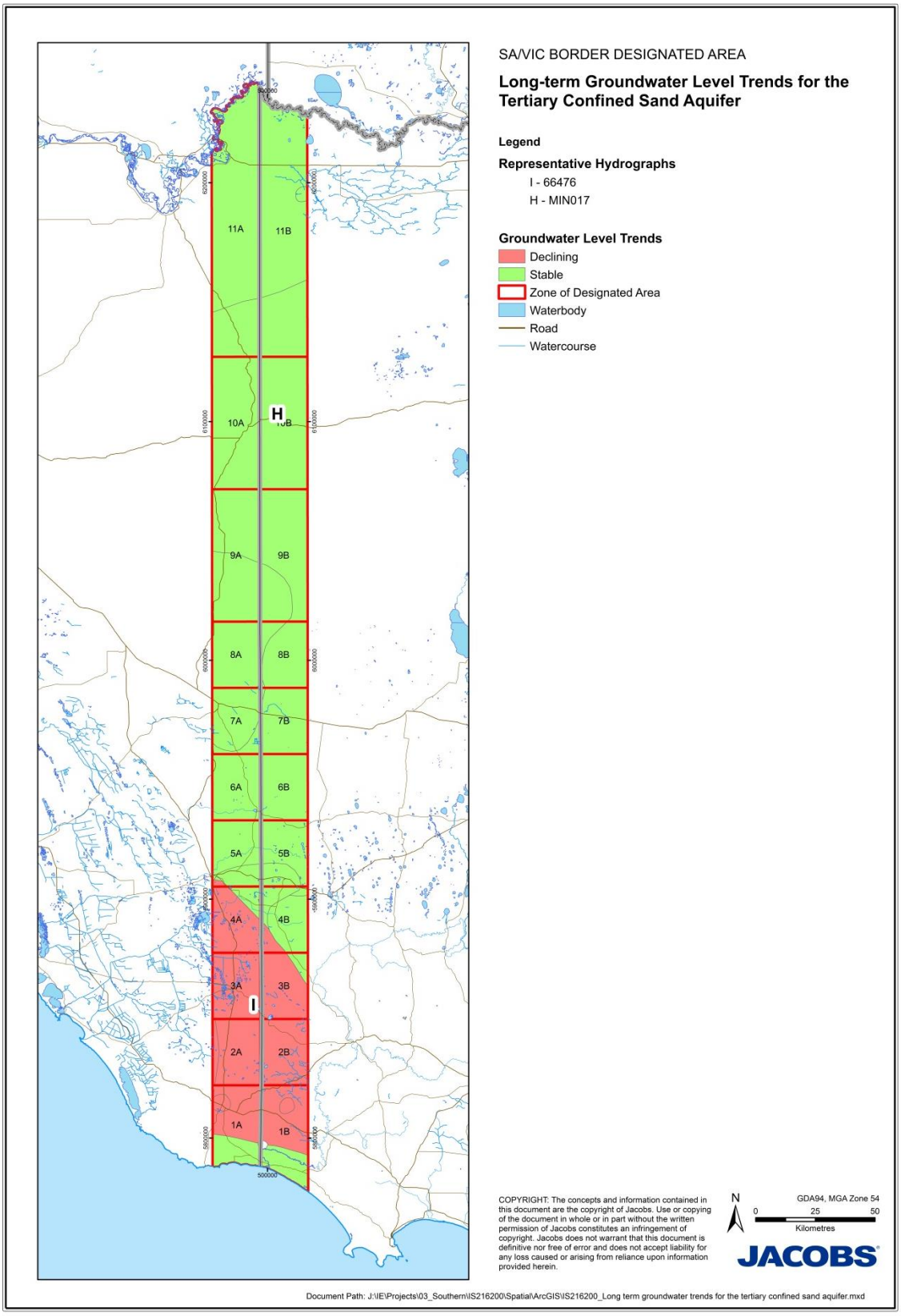

Note: 2006–07 was the first year that complete metered groundwater extraction records were obtained.

## Figure 7: Groundwater-level trends for the Tertiary Limestone Aquifer with some representative hydrographs

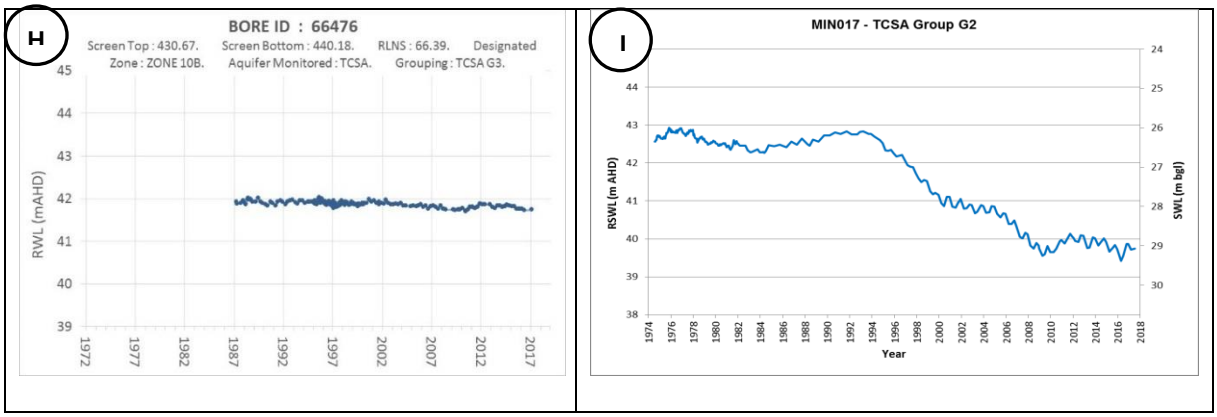


Sample of groundwater-level hydrographs as located in opposite map (Fig. 7)

## Figure 8: Groundwater-level trends for the Tertiary Confined Sand Aquifer with some representative hydrographs



Sample of groundwater-level hydrographs as located in opposite map (Fig. 8)



# GLOSSARY

**Aquifer** – A geological structure or formation or an artificial landfill permeated or capable of being permeated permanently or intermittently with water.

**Allowable Annual Volume** – The allowable volume of extraction specified for a particular sub-zone or aquifer within a sub-zone as has been determined by the Review Committee under clause 28(7) of the Agreement.

**Designated Area** – The area comprising part of the state of South Australia and part of the state of Victoria as specified in the First Schedule of the Act. This is an area 40 km wide and centred on the South Australia–Victoria Border and is the area to which the *Groundwater (Border Agreement) Act 1985* applies.

**EC** (ECU) – Electrical conductivity; 1 EC unit = 1 micro-Siemen per centimetre (µS/cm) measured at 25°C; commonly used as a measure of water salinity as it is quicker and easier than measurement by TDS.

**Management Prescriptions** – The prescriptions provided under the Border Groundwaters Agreement. That is; Permissible Annual Volume, Allowable Annual Volume, Permissible distance, Permissible potentiometric surface lowering, and Permissible salinity.

**Permissible Annual Volume** - The Permissible Annual Volume of extraction specified for a particular zone or aquifer in a particular zone in the Designated Area.

**Permissible distance** – The distance from the border in which all applications for licences must be referred to the Review Committee to determine whether the licence should be issued.

**Permissible potentiometric surface lowering** – An average annual rate of potentiometric surface lowering (drawdown) within a zone as prescribed under the Agreement or has been agreed by the minister for each Contracting Government.

**Permissible salinity** – A certain level of salinity within a zone as has been agreed by the minister for each Contracting Government.

**Prescribed Wells Area** – An area declared to be prescribed under the South Australian *Natural Resources Management Act 2004*. Prescription of a water resource requires that future management of the resource be regulated via an approved water allocation plan and extraction of water be licensed.

**TDS** – Total dissolved solids, measured in milligrams per litre (mg/L); a measure of water salinity.

**Tertiary Limestone Aquifer** – Comprises aquifers in the Murray Group, Heytesbury Group, Coomandook Formation, Bridgewater Formation and Padthaway Formation, called collectively the Tertiary Limestone Aquifer, the base of which is identified as marl or black carbonaceous silt, sand or clay.

**Tertiary Confined Sand Aquifer** – Comprise aquifers in the Wangerrip Group and Renmark Group, below the Tertiary Limestone Aquifer.

**Water Supply Protection Area** – An area declared under the Victorian *Water Act 1989* to protect the area's groundwater or surface water resources through the development of a management plan, which aims for equitable management and long-term sustainability.

# REFERENCES

Border Groundwaters Agreement Review Committee (2001). *Five Year Management Review Report 1996 – 2000.* September 2001.

Border Groundwaters Agreement Review Committee (2007). *Management Review of the Tertiary Limestone Aquifer in Province 2 of the Designated Area.* December 2007.

Border Groundwaters Agreement Review Committee (2008). *Management Review Tertiary Limestone Aquifer and Tertiary Confined Sand Aquifer in Province 1 of the Designated Area.* May 2008.

Border Groundwaters Agreement Review Committee (2010). *Management Review Tertiary Limestone Aquifer in Province 3 of the Designated Area.* January 2010.

Border Groundwaters Agreement Review Committee (2012). *Management Review of the Tertiary Limestone Aquifer in Province 2 of the Designated Area.* June 2012.

Border Groundwaters Agreement Review Committee (2013). *Management Review of the Tertiary Limestone Aquifer in Province 1 of the Designated Area.* April 2013.

Border Groundwaters Agreement Review Committee (2015). Thirtieth Annual Report to June 2015

Border Groundwaters Agreement Review Committee (2017). Thirty-Second Annual Report to June 2017

SKM (2012). Review of groundwater level trends in the SA-Vic Designated Area.

South East Natural Resources Management Board (2013). Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area

# APPENDICES

## APPENDIX A

**Notices in Government Gazette relating to the current amendments to the prescriptions**

The Agreement requires that notices of the amendments be made in papers circulating in the area and the Government Gazette. The amendments took effect from the date nominated in the notice. The list of the notices in Government Gazette since May 2008 relating to the current amendments to the prescriptions is provided below.

**South Australia**

| Publish date of Gazette | Notice |
|---|---|
| 22 May 2008 | Alteration of Permissible Annual Volumes for Zone 11A (sets a Permissible Annual Volume for the Parilla Sands Aquifer, Tertiary Limestone Aquifer and Tertiary Confined Sands Aquifer) (Note the Permissible Annual Volume for Tertiary Limestone Aquifer was superseded by the notice on 1 July 2010) |
| 15 October 2009 | Alteration of Permissible Annual Volume – Zone 6A |
| 15 October 2009 | Alteration of permissible distance – Zones 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A, 9A, 10A and 11A |
| 15 October 2009 | Notice of the alteration of Permissible Annual Volume – Zones 7A, 8A and 9A. (Note the Permissible Annual Volume for Zone 7A was superseded by the 1 July 2010 notice and Permissible Annual Volume for Zone 8A was superseded by 2 December 2010 notice) |
| 1 July 2010 | Sub-zoning of the Tertiary Limestone Aquifer in Zone 1A (also sets an Allowable Annual Volume for Sub-zone 1A South) |
| 1 July 2010 | Sub-zoning of Tertiary Limestone Aquifer in Zone 6A (also sets an Allowable Annual Volume Sub-zone 6A South and sets a permissible rate of potentiometric surface lowering for Sub-zones 6A South and 6A North) |
| 1 July 2010 | Sub-zoning of the Tertiary Limestone Aquifer in Zone 9A (also sets an Allowable Annual Volume Sub-zone 9A South and Sub-zone 9A North) |
| 1 July 2010 | Alteration of permissible rate of potentiometric surface lowering -Zone 5A |
| 1 July 2010 | Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zones 1A, 3A, 4A, 5A, 7A, 10A and 11A |
| 2 December 2010 | Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zone 8A |
| 30 January 2014 | Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zone 7A |
| 1 August 2017 | Noora Prescribed Wells Area revocation of declaration as a prescribed water resource |
| 21 June 2018 | Alteration of Permissible Annual Volume for the Pliocene Sands Aquifer in Zones 11A |

**Victoria**

| Publish date of Gazette | Notice |
|---|---|
| 15 October 2009 | Alteration of Permissible Annual Volume – Zones 7B and 8B |
| 15 October 2009 | Alteration of permissible distance – Zones 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B, 10B and 11B |
| 15 July 2010 | Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zone 8A |
| 15 July 2010 | Alteration of permissible rate of potentiometric surface lowering - Zones 5B and 6B |
| 23 November 2015 | Alteration of Permissible Annual Volume for the Tertiary Limestone Aquifer in Zones 5B and 6B |