

# **South Australian–Victorian Border Groundwaters Agreement Review Committee**



## **Twenty Eighth Annual Report**

**To 30 June 2013**

**Adelaide and Melbourne**

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## PREFACE

The Border Groundwaters Agreement Review Committee's Annual Report for 2012–13 fulfils the requirement under clause 30(1) of the Border Groundwaters Agreement to report on its activities during the year to 30 June 2013. 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 1985*, 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 use and urban water supply, as well as farm stock and domestic use.

While groundwater supplies are relatively secure for the short term, the Border Groundwaters Agreement Review Committee (Review Committee) has sought to improve the technical understanding and management responses affecting the ongoing sustainable and equitable use of groundwater along the border.

Substantial progress has been made in respect to studies to address the immediate threats of declining trends in groundwater in Province 1, in particular; sea-water intrusion along the South Australian coast, aquifer depletion at Lake Mundi and inter-aquifer connectivity. This information is now being considered by the Review Committee.

The Review Committee undertook the five year review of the management prescriptions in Province 1 during the year and determined to retain the current management prescriptions, unchanged. These prescriptions relate to the permissible distance from the state border, the permissible annual volume of extraction, permissible rate of potentiometric surface lowering and permissible levels of salinity.

Both states continued work on developing a common policy for managing groundwater resources in Province 2 based on advice that the resource be considered a non-renewable. The Review Committee facilitated the discussions.

The draft water allocation plan for the ‘Lower Limestone Coast Prescribed Wells Area’ (South Australia) was released for comment in March 2013. The Committee prepared and provided comment on the draft plan in respect to the objectives of the Groundwater (Border Agreement) Act 1985 and the Border Groundwaters Agreement, that is:

- protection of groundwater and guard against the undue depletion or degradation
- cooperative management; and
- equitable sharing of the resource.

## 2. About the Agreement and the Review Committee

### The South Australian–Victorian Border Groundwaters Agreement

The groundwater resource along the South Australian–Victorian border is shared between the states. In recognition of the need to cooperatively manage these resources, the two states entered into the Border Groundwaters Agreement (the Agreement) in 1985. The Agreement was updated in 2006 and both states have agreed to a full review of the Agreement and its operation.

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 Designated 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 the two states and applies to all existing and future bores within the Designated Area. Bores that extract groundwater for domestic and stock purposes are not covered by 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 use to a Permissible Annual Volume for total withdrawals from all aquifers or each aquifer, 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 committees to maximise community and industry involvement in making and implementing the 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   |
|---|--|
| Noora Prescribed Wells Area<br>Mallee Prescribed Wells Area<br>Tatiara Prescribed Wells Area<br>Lower Limestone Coast Prescribed Wells Area | Murrayville Water Supply Protection Area<br>West Wimmera Groundwater Management Area<br>Glenelg Water Supply Protection Area |

## Border Groundwaters Agreement Review Committee

The Review Committee<sup>1</sup>, 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, the Allowable Annual Volume for sub-zones, the permissible distance, the permissible rate of potentiometric surface lowering (drawdown) and the permissible level of salinity (if any such levels have been declared). The review of Province 1 was carried out this year. The next reviews are; 2015 – Province 3, 2017 – Province 2.

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<sup>2</sup>.

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 two times during the year:

|                 |           |
|-----------------|-----------|
| 26 October 2012 | Adelaide  |
| 19 April 2013   | Melbourne |

During the year membership of the Review Committee comprised:

| South Australia |               | Victoria    |               |
|-----------------|---------------|-------------|---------------|
| Mr A Johnson    | member        | Mr R Nott   | member        |
| Dr L Mensforth  | member        | Dr J Cooke  | member        |
| Mr H Hopton     | deputy member | Mr A Spall  | member        |
|                 |               | Mr N Binney | deputy member |

Dr J Cooke was President until his resignation as member on 10 December 2012. Mr A Spall was President from the 19 April 2013.

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<sup>1</sup> The Review Committee does not manage or control any public finances or assets.

<sup>2</sup> A full list of Government Gazette notices relating to the current prescriptions is provided in Appendix A of this report.

### 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 area.

The Tertiary Limestone Aquifer is the principal source of groundwater throughout the Designated Area, with water being used for a range of purposes – municipal supplies for towns such as Mount Gambier, individual domestic and stock 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 (Gambier Limestone) forming one unconfined aquifer system

Province 2 is located in the Murray Basin where the Tertiary Limestone Aquifer (Murray Group Limestone) 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 (Murray Group Limestone) 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

At the outset of the Agreement in 1984 the groundwater shares (Permissible Annual Volumes) between the two adjacent state Designated Area zones were equal. As more has been learned 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 the resource 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 are experiencing long-term declines in groundwater levels. 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. The estimated quantity of water utilised by plantation forestry is a significant component of the regional water balance being some three times that used for irrigation purposes in Province 1. Without a change in the current land and water use, groundwater levels will continue to decline over parts of Province 1.



In 2008, following its management review of Province 1 (Border Groundwaters Agreement Review Committee 2008), the Review Committee recommended that a new management approach is needed to achieve long term sustainability. It was the view of the Review Committee at that time that this may require reductions in the area under plantation forestry 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.

Both states are addressing the need to account for plantation forestry on water resources. The Review Committee proposed that an integrated water accounting system encompassing all major water users is essential. It recommended the states develop a consistent approach to account for the water used by plantation forests.

There are two issues of immediate concern to be resolved with the declines observed in 2008. These were: the potential for sea-water intrusion along the South Australian coast, and the other is the effect of the declines on groundwater users in the shallow and thin aquifer around the Lake Mundi area in Victoria. The Review Committee recommended that each of the states undertake studies into the risks and measures to address any adverse impacts. As a precaution the Review Committee divided Zone 1A into two sub-zones to help prevent any further intensification of extractions in Sub-zone 1A South.

#### *Inter-aquifer connectivity*

The deeper Tertiary Confined Sand Aquifer is exhibiting declines similar to those observed in the Tertiary Limestone Aquifer even though there is little water being extracted from the Tertiary Confined Sand Aquifer. This may indicate a higher degree of connection between the two aquifers than previous models indicated. The Review Committee recommended that the states undertake studies on the interaction of the aquifers to determine whether the two aquifers should be managed together or separately.

The National Water Commission provided funding to the governments of South Australia and Victoria to undertake a joint project to investigate the inter-aquifer connectivity of the Tertiary Limestone Aquifer and Tertiary Confined Sand Aquifer in Province 1. The final project report was provided to the National Water Commission by the two state departments in June 2012.

The results of the project indicate that there is a moderate to very good hydraulic connection between the Tertiary Confined Sand Aquifer and the Tertiary Limestone Aquifer. In doing so, the project has achieved its principal objective. The results point to the two aquifers being more highly connected than previously understood. This information and implications for managing groundwater is now being considered by the Review Committee.

#### *Sea-water intrusion*

The Review Committee received a draft of a technical report prepared by the Department for Environment, Water and Natural Resources addressing its recent investigation into sea-water intrusion. The Review Committee is undertaking a technical assessment of the report prior to its release.

During the year the Review Committee undertook the five year review of the management prescriptions in Province 1. The Review Committee determined to retain the current management prescriptions, unchanged, until it has considered the implications of the technical studies.

#### Tertiary Limestone Aquifer – Province 2

Groundwater in 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 for water allocation and management purposes.

In the area of concentrated extractions in Zones 5A, 6A, 5B and 6B (Frances and Neuarpur) groundwater levels are declining due to extraction (~0.2 m/y since 1996). These declines in groundwater levels appear to be manageable, with respect to the capacity of the resource in the short term. However, as part of its management review of Province 2 in 2007 (Border Groundwaters Agreement Review Committee 2007) the Review Committee advised the states of the need to develop a common policy for the long-term management and use of groundwater on the basis that this is a non-renewable resource.

In the northern part of Province 2 (northern part of Zone 7A, Zone 8A, Sub-zone 9A South and the northern part of Zone 6B, Zones 7B, 8B and 9B) the groundwater level trends are generally stable reflecting the limited development and extraction. The extraction ‘threshold point’ between stable water level trends and declining levels is not able to be quantified. As a precaution against further declines, the Review Committee:

- reduced the Permissible Annual Volumes for Zones 7A, 7B, 8A, and 8B to the allocated volumes for each zone at that time
- established sub-zones in Zone 6A and set an Allowable Annual Volume at the level of current allocations for Sub-zone 6A South.

The Review Committee continues to seek discussion between the relevant regional management authorities towards developing a common policy approach for managing the groundwater as a non-renewable resource.

#### Tertiary Limestone Aquifer – Province 3

Groundwater 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 has formed with its centre located at Peebinga, an area of intensive groundwater extraction.

The Tertiary Limestone Aquifer is responding as expected to the level of use, in terms of drawdown and salinity. The full potential response of the aquifer is yet to be realised as groundwater extraction in Victoria has been less than the Permissible Annual Volume. Further drawdown in groundwater levels are anticipated if groundwater extractions increase.

There is no immediate risk of increased groundwater salinity due to either the lateral movement of saline groundwater or the vertical leakage of saline water from the Pliocene Sands Aquifer. There is a need to continue monitoring salinity in the aquifer.

There is potential for localised increased drawdown, which if developed would impact on the users of groundwater for domestic and stock groundwater purposes, increase the risks of partial dewatering of the aquifer or accelerating water quality change. As part of its

management review of Province 3 in 2010 (Border Groundwaters Agreement Review Committee 2010) the Review Committee recommended that the states adopt management measures to prevent uncontrolled localised drawdown 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 Sand Aquifer in Zone 11A to provide for salinity mitigation extractions for the Murtho Salt Interception Scheme. The scheme intercepts groundwater that would enter the Murray River.

### **Permissible Annual Volumes and Allowable Annual Volumes**

The Permissible Annual Volumes for each aquifer in each zone at 30 June 2013 are set out in Table 2.

**Table 2: Permissible Annual Volumes at 30 June 2013**

| 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) |
| 2144                          | 3700                              | 0                                     | 11A  | 11B      | 1823                              | 0                                     |
|                               | 14000                             | 320                                   | 10A  | 10B      | 6720                              | 560                                   |
|                               | 11595                             | 570                                   | 9A   | 9B       | 5960                              | 630                                   |
|                               | 5121                              | 340                                   | 8A   | 8B       | 3500                              | 330                                   |
|                               | 8259                              | 350                                   | 7A   | 7B       | 5782                              | 350                                   |
|                               | 8758                              | 360                                   | 6A   | 6B       | 10811                             | 360                                   |
|                               | 18943                             | 540                                   | 5A   | 5B       | 12201                             | 570                                   |
|                               | 22102                             | 710                                   | 4A   | 4B       | 14000                             | 300                                   |
|                               | 24054                             | 1900                                  | 3A   | 3B       | 16500                             | 1000                                  |
|                               | 25000                             | 2900                                  | 2A   | 2B       | 25000                             | 5100                                  |
|                               | 31812                             | 9200                                  | 1A   | 1B       | 45720                             | 14500                                 |

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 2013 are set out in Table 3. The locations of these sub-zones are shown in Figure 5.

**Table 3: Allowable Annual Volumes for the Tertiary Limestone Aquifer for year ending 30 June 2013**

| South Australia                   |          |
|-----------------------------------|----------|
| Allowable Annual Volumes          |          |
| Tertiary Limestone Aquifer (ML/y) | Sub-zone |
| 2400                              | 9A North |
| 7760                              | 9A South |
| 4658                              | 6A South |
| 12507                             | 1A South |

### Allocations and volumes extracted

The allocations and the volumes extracted<sup>3</sup> for the Tertiary Limestone Aquifer are listed in Tables 4 and 5.

**Table 4: Permissible Annual Volumes, number of licences, allocations and volumes extracted for the Tertiary Limestone Aquifer at 30 June 2013**

| 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                             | 16                   | 3700 <sup>4</sup>     | 2947                  | 11A             | 11B                   | 1823                             | 3                     | 1600               | 854  |
| 14000                            | 49                   | 10756 <sup>5</sup>    | 9607                  | 10A             | 10B                   | 6720                             | 23                    | 6718               | 4714 |
| 11595                            | 11                   | 10910                 | 8986                  | 9A              | 9B                    | 5960                             | 3                     | 5500               | 723  |
| 5121                             | 41                   | 6974                  | 1303                  | 8A              | 8B                    | 3500                             | 7                     | 3180               | 18   |
| 8259                             | 98                   | 9266                  | 4839                  | 7A              | 7B                    | 5782                             | 15                    | 5782               | 2217 |
| 8758                             | 50                   | 8761                  | 5290                  | 6A              | 6B                    | 10811                            | 17                    | 9943               | 5028 |
| 18943                            | 129                  | 18943                 | 14372                 | 5A              | 5B                    | 12201                            | 41                    | 12969 <sup>6</sup> | 5652 |
| 22102                            | 174                  | 22116                 | 13264                 | 4A              | 4B                    | 14000                            | 12                    | 2880               | 386  |
| 24054                            | 260                  | 24052                 | 9776                  | 3A              | 3B                    | 16500                            | 6                     | 515                | 76   |
| 25000                            | 128                  | 19976                 | 11759                 | 2A              | 2B                    | 25000                            | 43                    | 24127              | 4734 |
| 31812                            | 349                  | 31885                 | 25619                 | 1A              | 1B                    | 45720                            | 15                    | 4409               | 2432 |

<sup>3</sup> 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.

<sup>4</sup> Volumetric conversion of area-based allocations to volumetric allocations completed under the water allocation plan adopted on 2 May 2012.

<sup>5</sup> Volumetric conversion of area-based allocations to be completed by 30 June 2014 under policies of the water allocation plan adopted on 2 May 2012.

<sup>6</sup> In Zones 5B and 6B, improved location procedures, identified the location of two licensed bores (comprising 868 ML of entitlement) previously considered to within Zone 6B, are now identified as being located in Zone 5B. The total volume allocated for zones 5B and 6B have been amended accordingly.

**Table 5: Allowable Annual Volumes, number of licences, allocations and volumes extracted for the Tertiary Limestone Aquifer at 30 June 2013**

| South Australia                |                      |                       |                       |          |
|--------------------------------|----------------------|-----------------------|-----------------------|----------|
| Tertiary Limestone Aquifer     |                      |                       |                       | Sub-Zone |
| Allowable Annual Volume (ML/y) | Licensed Allocations |                       |                       |          |
|                                | Licences             | Volume Allocated (ML) | Volume Extracted (ML) |          |
| 2400                           | 3                    | 2400                  | 839                   | 9A North |
| 7760                           | 8                    | 7760                  | 8147 <sup>7</sup>     | 9A South |
| 4658                           | 18                   | 4563                  | 2403                  | 6A South |
| 12507                          | 65                   | 12507                 | 11891                 | 1A South |

Many of the zones are fully committed in the Tertiary Limestone Aquifer, in that the volumes licensed have reached the Permissible Annual Volumes. There is un-allocated water in the Tertiary Limestone Aquifer in Zones 2A, 1B, 3B and 4B. The un-allocated water in Zone 2A is held in the South Australian minister's reserve. 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.

As detailed in the 2009-10 annual report, the Review Committee, at the request of South Australia, amended the Permissible Annual Volume for Zones 11A and 10A set an Allowable Annual Volume for Sub-zone 9A North to enable the volumetric conversion of licences. Volumetric conversion has been completed in Zone 11A, whilst other adjustment are proposed by June 2014.

**Table 6: Permissible Annual Volumes, allocations and volumes extracted for the Tertiary Confined Sand Aquifer at 30 June 2013**

| 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                    | 63                    | 1                     | 4A   | 4B       | 300                              | 0                    | 0                     | 0                     |
| 1900                             | 2                    | 1181                  | 224                   | 3A   | 3B       | 1000                             | 0                    | 0                     | 0                     |
| 2900                             | 3                    | 1455                  | 45                    | 2A   | 2B       | 5100                             | 0                    | 0                     | 0                     |
| 9200                             | 4                    | 1421                  | 1006                  | 1A   | 1B       | 14500                            | 0                    | 0                     | 0                     |

<sup>7</sup> That extractions exceed the Permissible Annual Volumes is due to licensees exercising carryover provisions. Licence holders are authorised to carry over up to 20% of unused allocations into the next water year. Carryover water that is taken is recorded against carryover water before any licensed volume.

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.

The allocation and volume extracted for the Pliocene Sands Aquifer are listed in Table 7.

**Table 7: Permissible Annual Volume, number of licences, volume allocated and volume extracted for the Pliocene Sands Aquifer at 30 June 2013**

| South Australia                  |                      |                       |                       |      |
|----------------------------------|----------------------|-----------------------|-----------------------|------|
| Pliocene Sands Aquifer           |                      |                       |                       |      |
| Permissible Annual Volume (ML/y) | Licensed Allocations |                       |                       | Zone |
|                                  | No. of Licences      | Volume Allocated (ML) | Volume Extracted (ML) |      |
| 2144                             | 1                    | 2144                  | 0                     | 11A  |

While the Agreement does not apply to bores for domestic and stock 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 stock bores for each zone is listed in Table 8.

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

| South Australia                                 |      | Victoria |   |
|---|------|----------|---|
| Number of Domestic and Stock Bores <sup>1</sup> | Zone | Zone     | Number of Domestic and Stock Bores <sup>2</sup> |
| 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   |

Note 1: The numbers of domestic and stock bores are derived from spatial analysis of the state SAGEODATA borehole records. It does not necessarily indicate the bores in use

Note 2: The numbers of domestic and stock bores are best estimates made in 2004, based on state database records.

## Permissible distance from the border

The permissible distance is the distance from the 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 2013 are specified in Table 9.

**Table 9: Permissible distances at 30 June 2013**

| South Australia                      |                                  |      | Victoria |                                  |                                      |
|--------------------------------------|----------------------------------|------|----------|----------------------------------|--------------------------------------|
| Tertiary<br>Confined<br>Sand Aquifer | Tertiary<br>Limestone<br>Aquifer | Zone | Zone     | Tertiary<br>Limestone<br>Aquifer | Tertiary<br>Confined<br>Sand Aquifer |
| Distance<br>(km)                     | Distance<br>(km)                 |      |          | Distance<br>(km)                 | Distance<br>(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 2013**

| South Australia |                      | Victoria |               |
|-----------------|----------------------|----------|---------------|
| Rate<br>(m/y)   | Zone                 | Zone     | Rate<br>(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<br>6A North | 6B       | 0.20          |
| 0.20            | Sub-zone<br>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 reviews of Province 1, Province 2 and Province 3 (Border Groundwaters Agreement Review Committee 2010, 2012 and 2013) 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 a number of other activities that related to groundwater management in the Designated Area, as follows.

### South Australia – Volumetric licence conversion

The South Australian Government is continuing its program to convert water licences from area-based to volume-based with the release of the draft water allocation plan for the Lower Limestone Coast Prescribed Wells Area in March 2013.

### Plantation forestry and impacts on groundwater

Victoria commenced a program to monitor and track water use outside the entitlement system.

### Groundwater level monitoring review

Both South Australia and Victoria continued to review the groundwater monitoring network.

### Condition of the resource

Victoria completed its program of installing meters on bores in 2003, while South Australia adopted meters in 2006. 2006/07 was the first year that complete metering records were obtained. Figure 6 is a chart showing the annual water use for the since 2004/05.

Groundwater levels remained at about the same level as last year for most parts of the Designated Area.

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



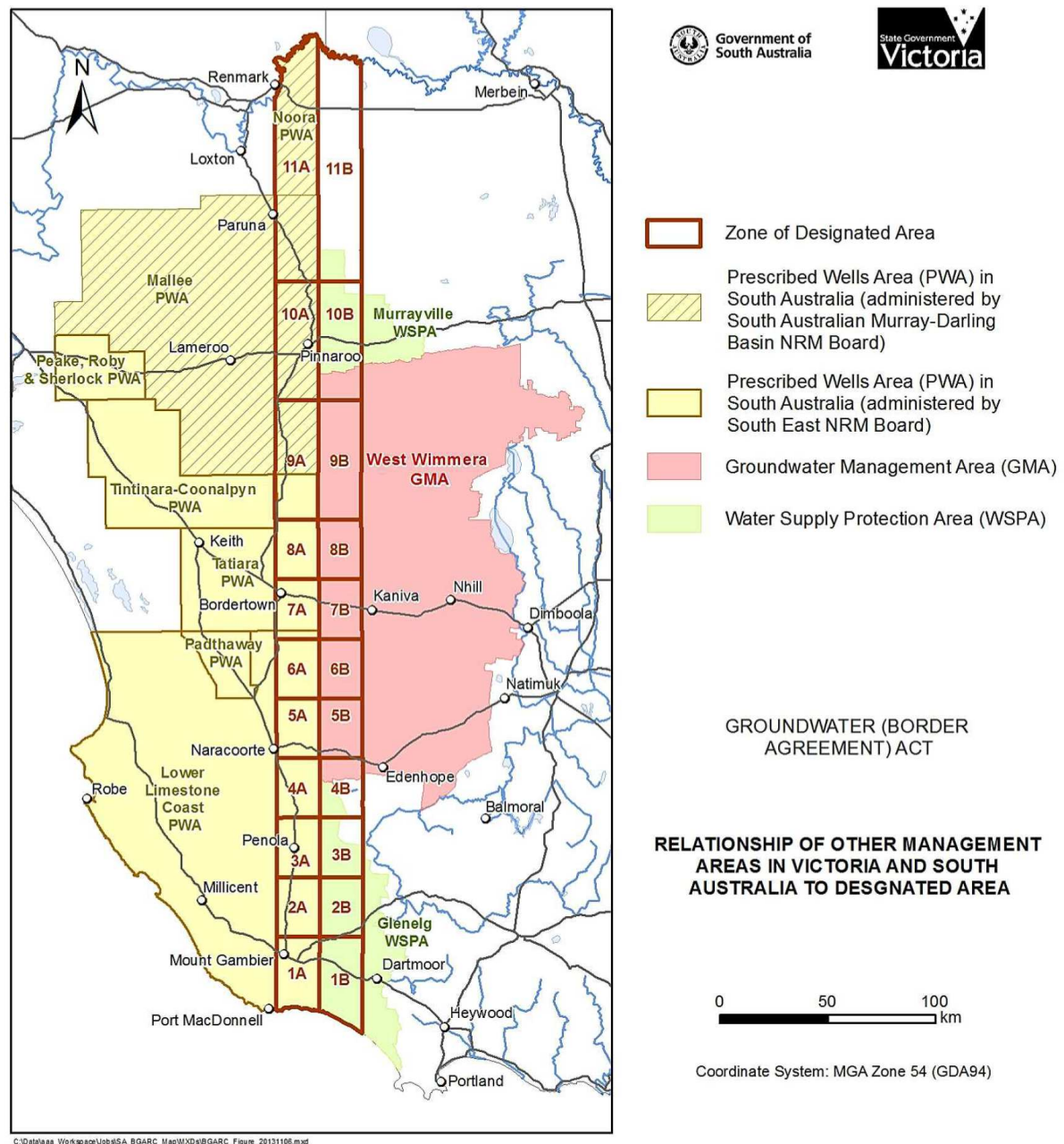


## FIGURES

Figure 1: The Designated Area and zones

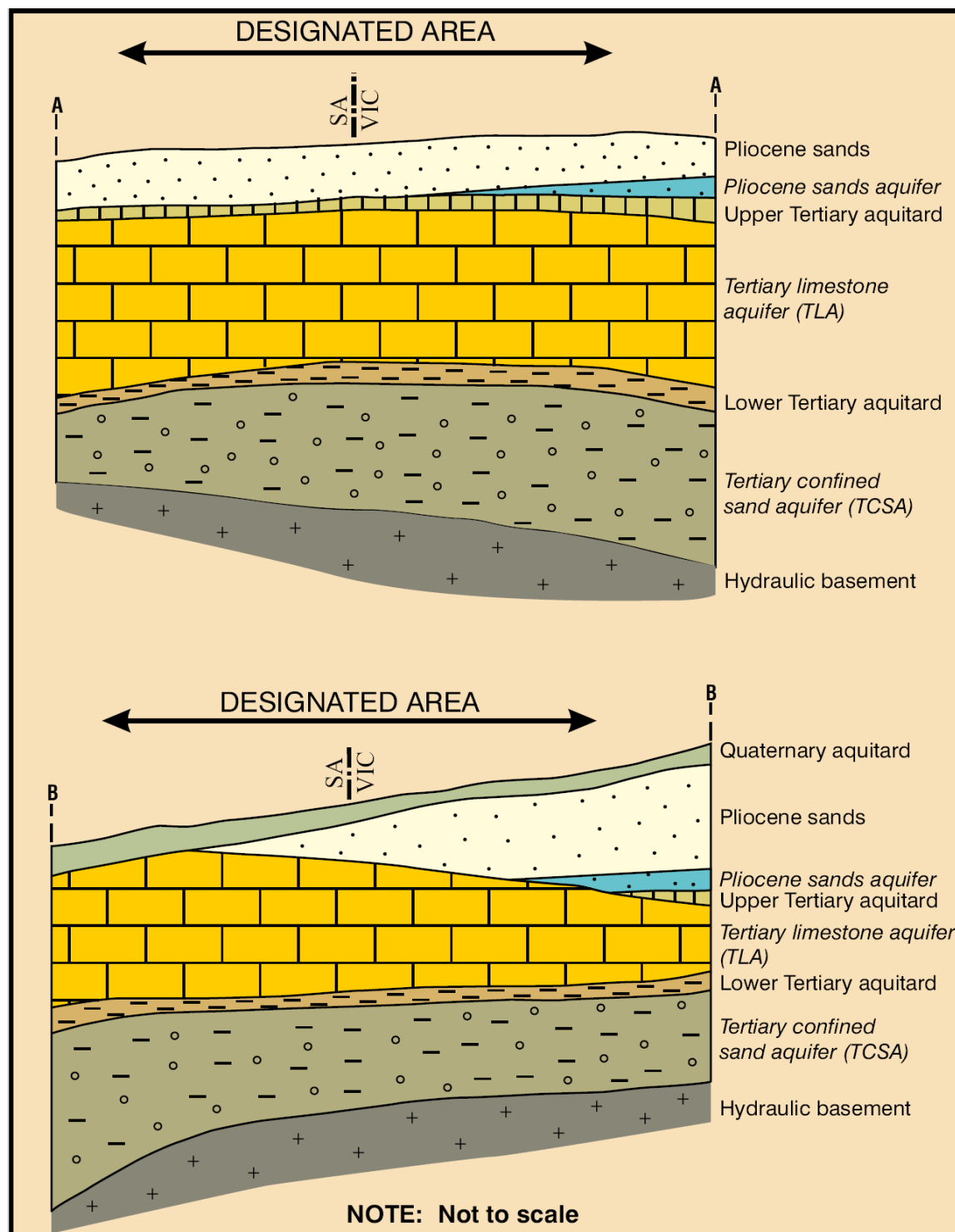


**Figure 2: Relationship of management areas in South Australia and Victoria to the Designated Area**

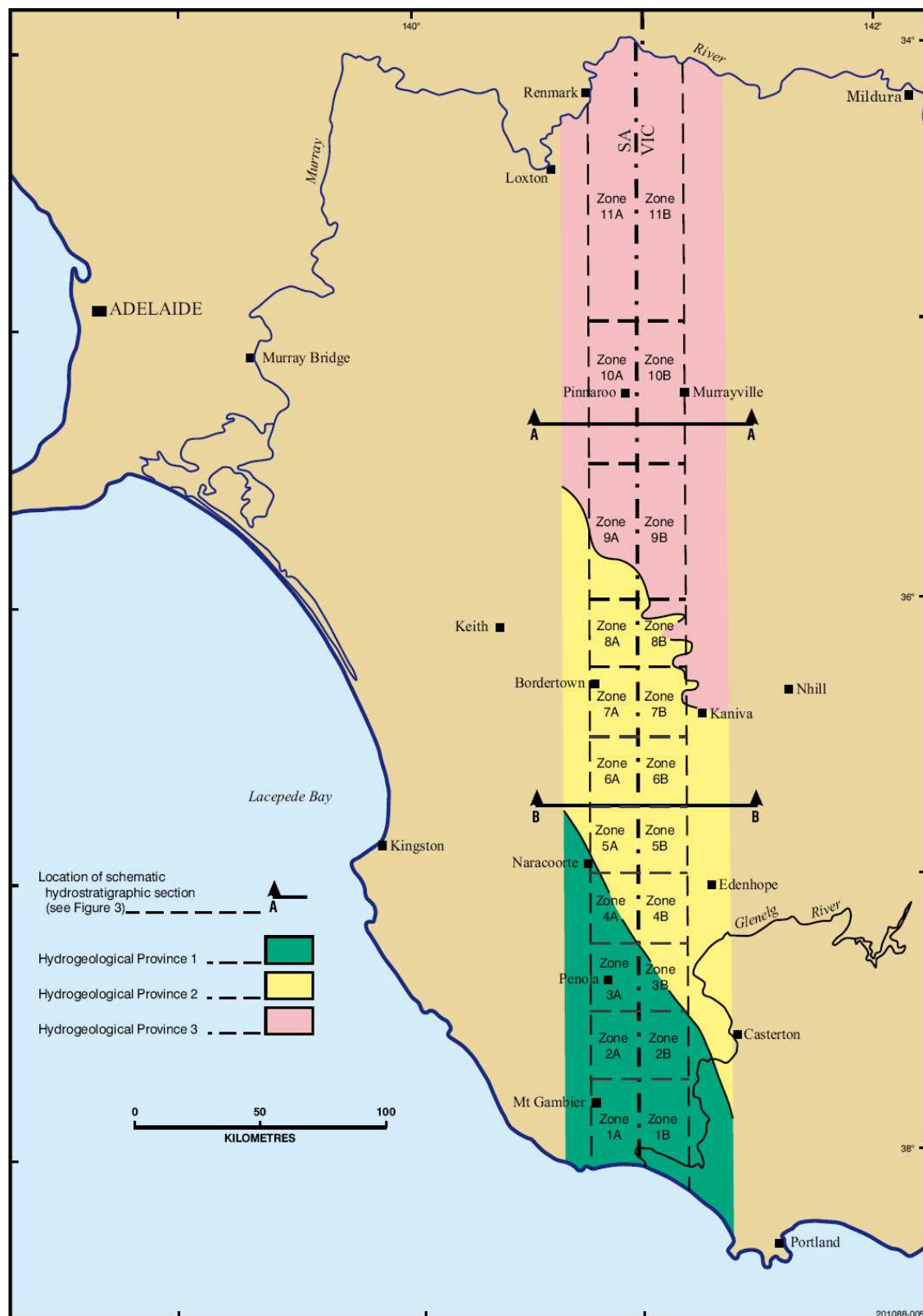


**Figure 3: Schematic hydrostratigraphic cross-sections relating to Figure 4**

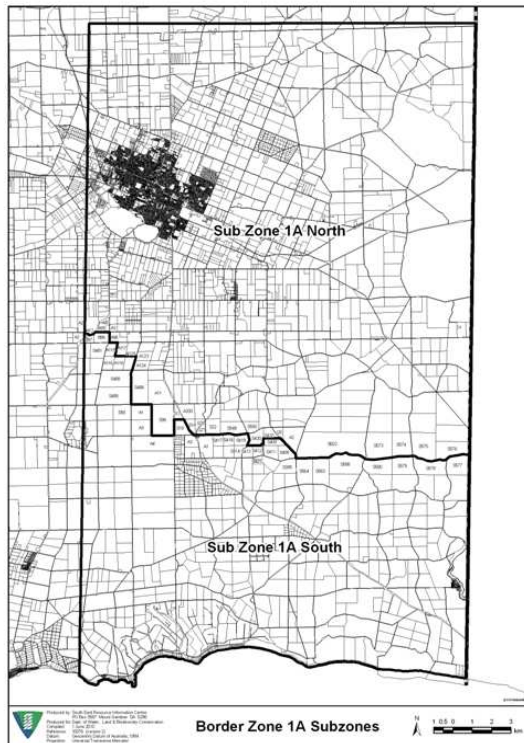
(The locations of the cross-sections are shown in Figure 4)



**Figure 4: Hydrogeological provinces**



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

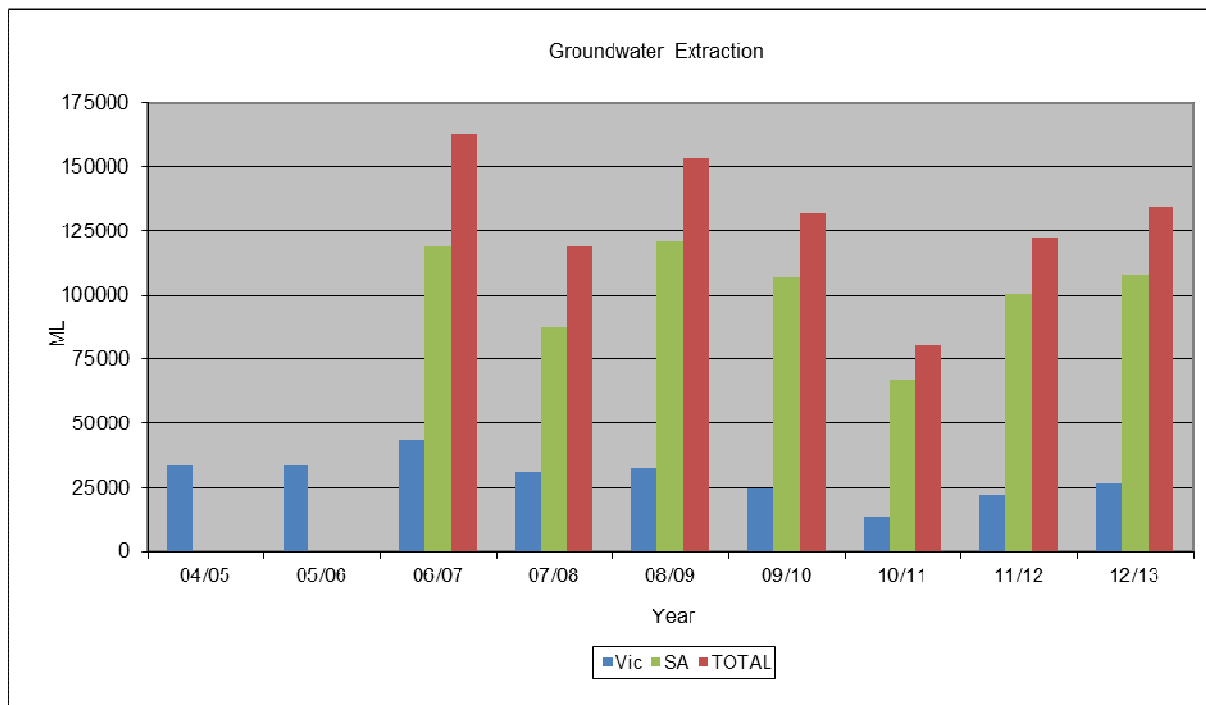


Boundaries of sub-zones are registered on :

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

Plans can be viewed at Lands Titles Office at  
101 Grenfell Street Adelaide

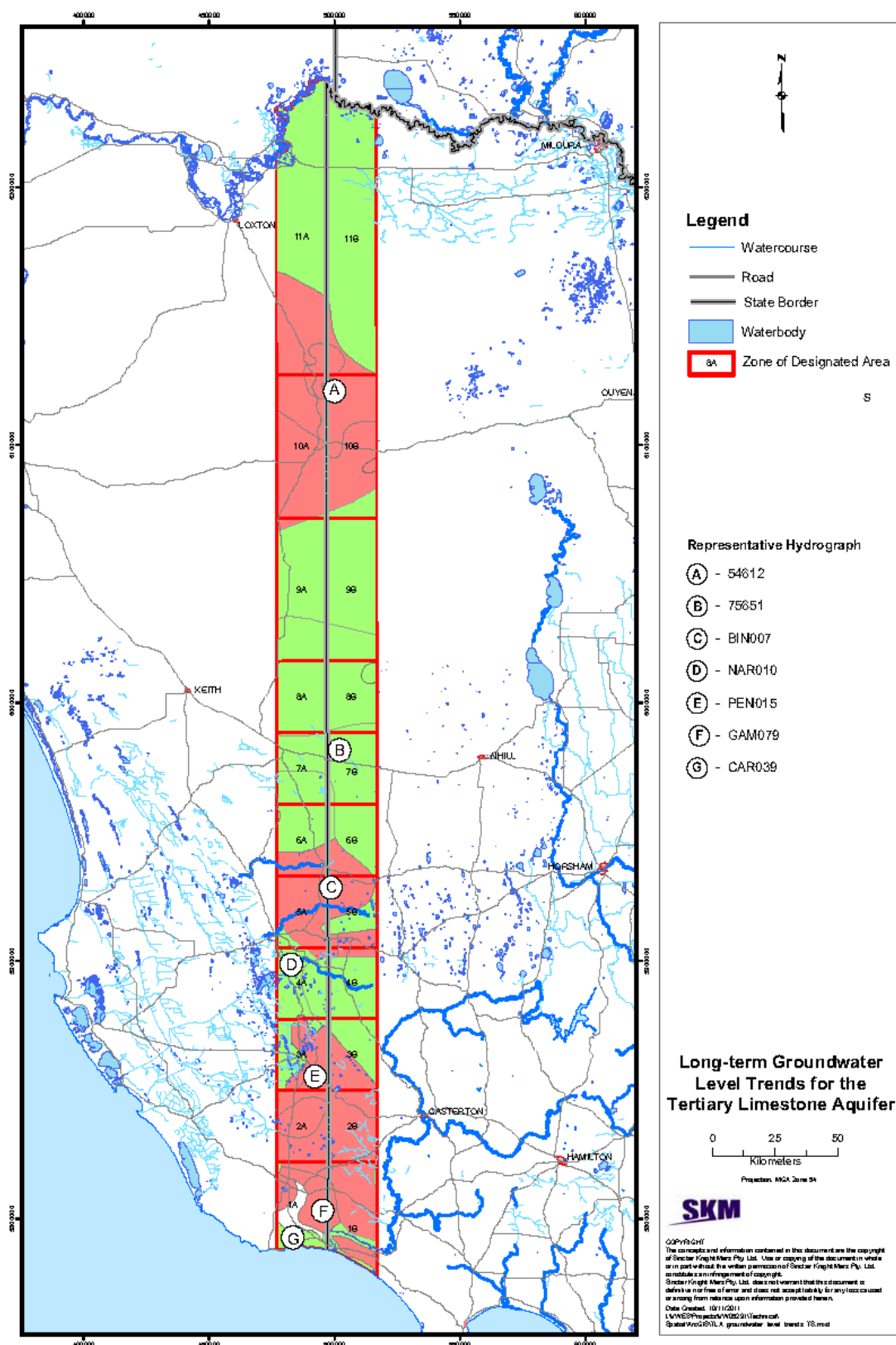
**Figure 6: Annual volume extracted from the Tertiary Limestone Aquifer since 2004/05**



Note: Victoria completed its program of installing meters on bores in 2003, South Australia in 2006. 2006/07 was the first year that complete metering records were obtained.

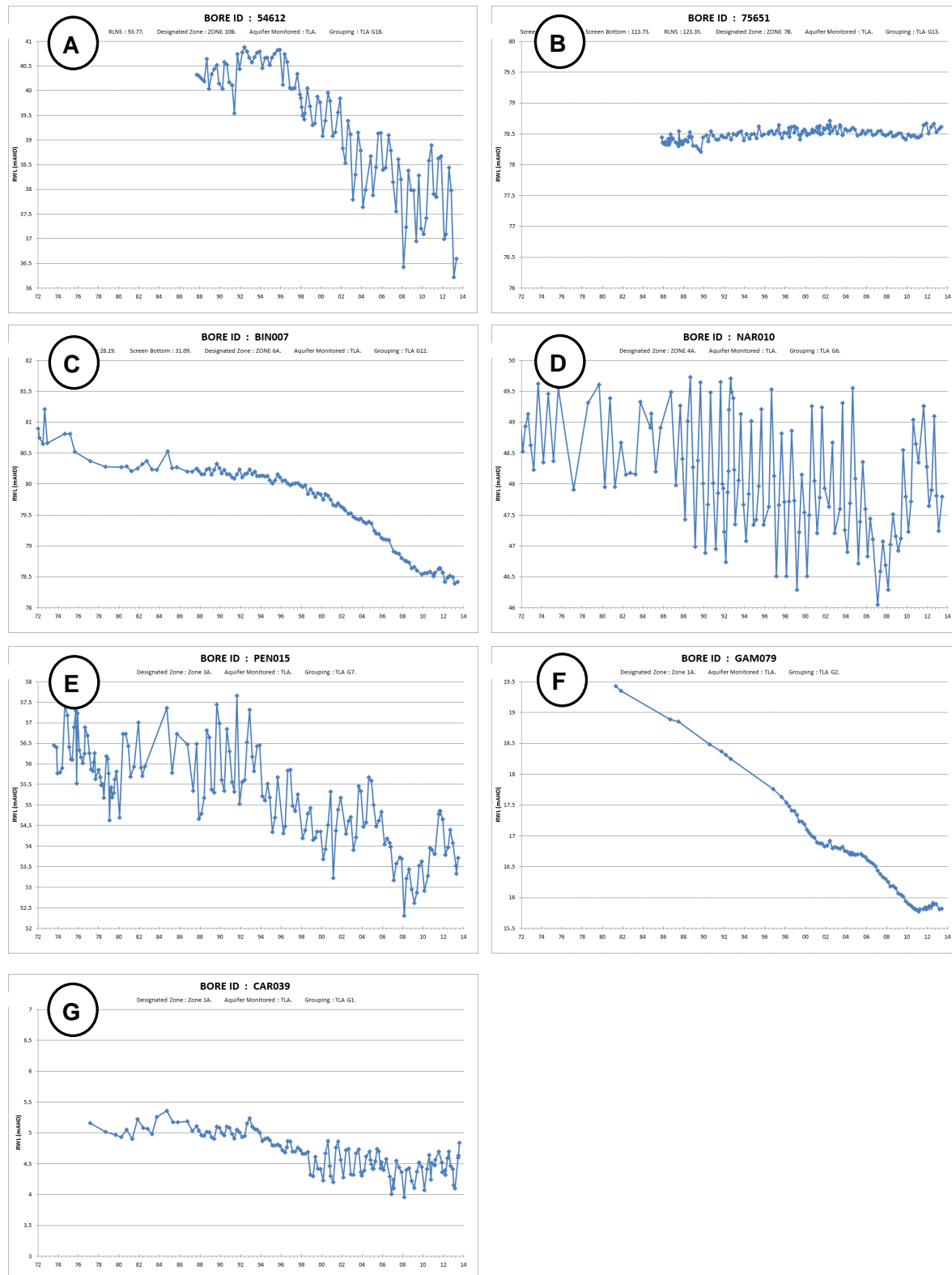


**Figure 7: Groundwater-level trends for the Tertiary Limestone Aquifer with some representative hydrographs**

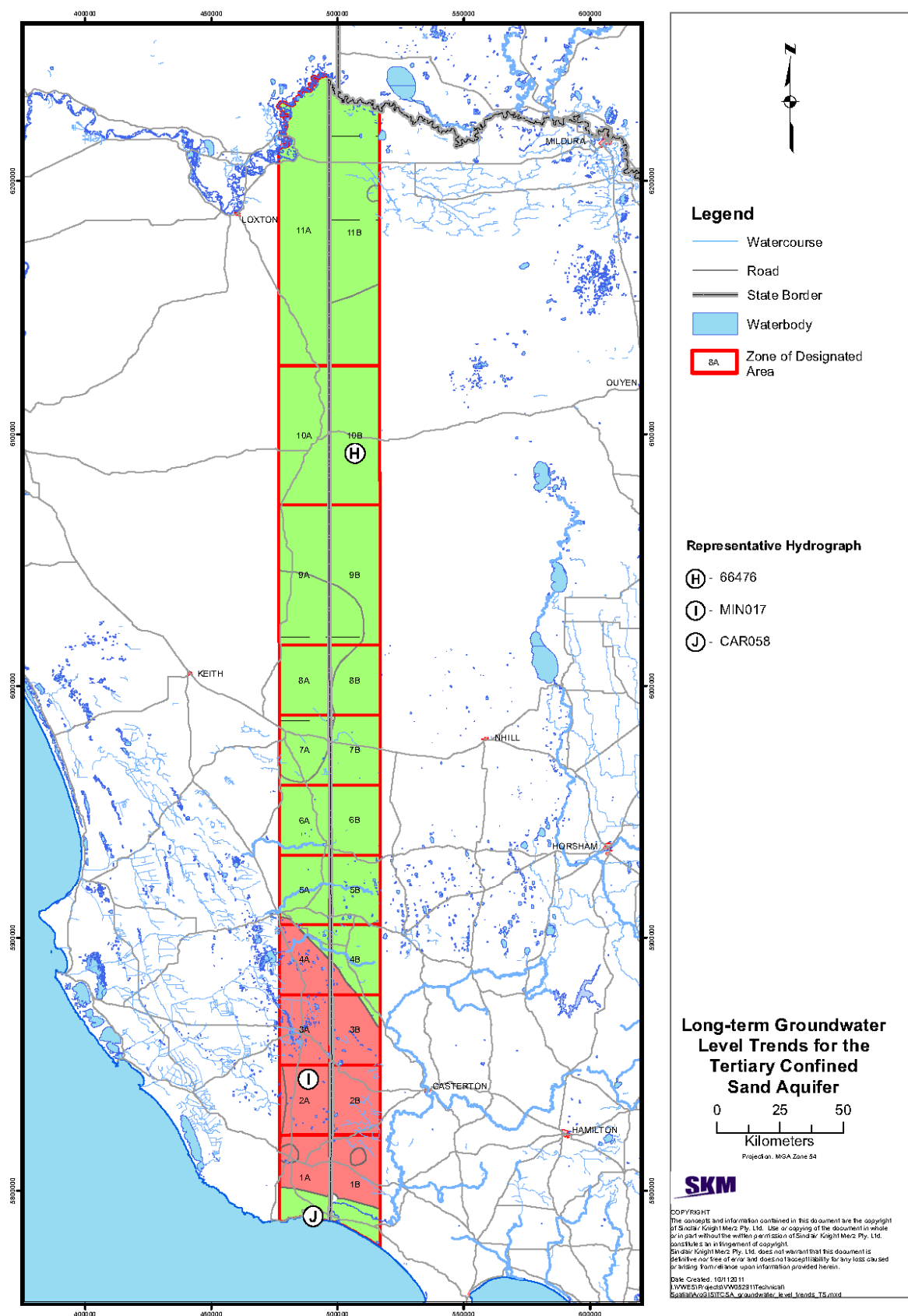




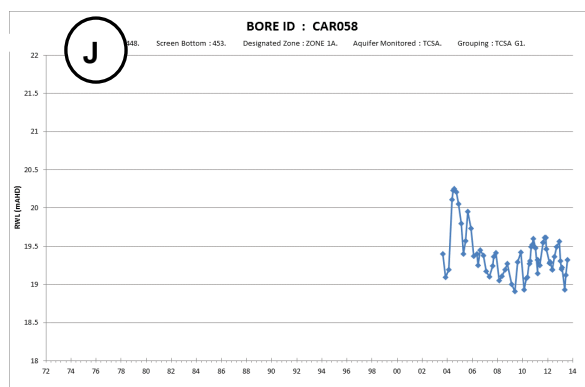
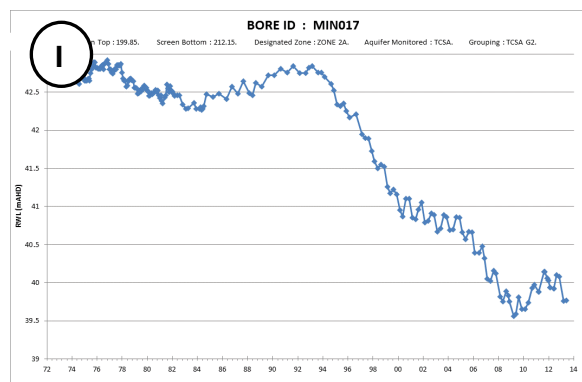
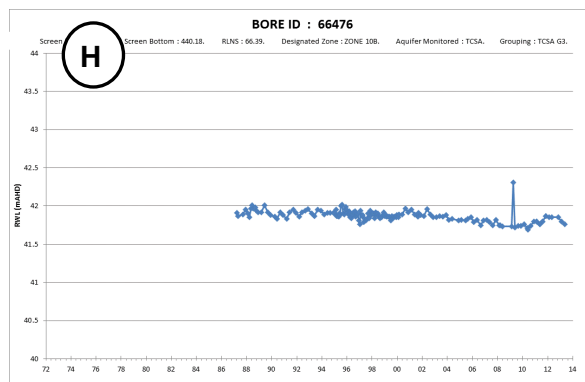
Sample of groundwater level hydrographs as located in opposite map (Fig. 7)



**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 ( $\mu\text{S}/\text{cm}$ ) measured at 25°C; commonly used as a measure of water salinity as it is quicker and easier than measurement by TDS.

**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.

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

## APPENDICES

### APPENDIX A

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

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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 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  |

##### 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 - Zones 5B and 6B                                  |
| 15 July 2010            | Alteration of permissible rate of potentiometric surface lowering - Zones 5B and 6B        |



