LOWER LIMESTONE COAST PWA

UNCONFINED AQUIFER

Groundwater Level and Salinity Status Report

2013

Government of South Australia
Department of Environment, Water and Natural Resources

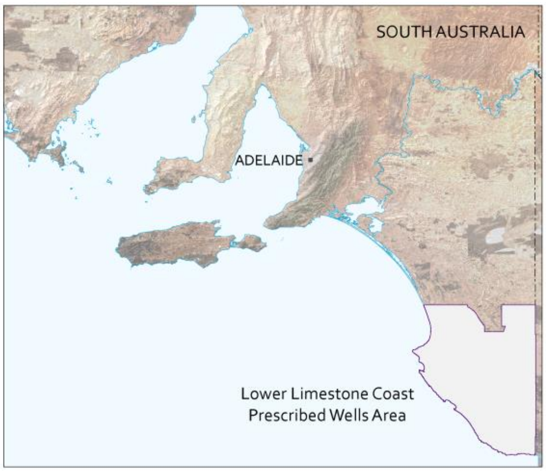
Department of Environment, Water and Natural Resources
25 Grenfell Street, Adelaide
GPO Box 1047, Adelaide SA 5001

Telephone	National (08) 8463 6946	
	International	+61 8 8463 6946
Fax	National(08) 8463 6999	
	International	+61 8 8463 6999
Website	www.environment.sa.gov.au	

ISBN 978-1-922174-96-3

This document is available online at http://www.waterconnect.sa.gov.au

2013 SUMMARY



The Lower Limestone Coast Prescribed Wells Area (PWA) is located in the South East of South Australia, the northern boundary is approximately 300 km south-east of Adelaide. It is a regional-scale resource for which groundwater is prescribed under South Australia's *Natural Resources Management Act 2004*. Three water allocation plans—Comaum–Caroline, Lacepede Kongorong and Naracoorte Ranges—provide for the sustainable use of the groundwater resources was replaced with a single water allocation plan for the Lower Limestone Coast PWA in November 2013.

The Lower Limestone Coast PWA is predominantly underlain by Tertiary sediments of the Gambier Basin, with a continuous transition to similar sediments of the Murray Basin in the northern portion of the PWA. Most of the region is characterised by a low-lying coastal plain that gently rises to 70 m above sea level in the eastern and north-eastern parts of the PWA. The northern and central parts of the Lower Limestone Coast PWA are characterised by north-west trending remnants of old coastal dunes separated by inter-dunal flats. There are two aquifer systems located in the region—an unconfined aquifer comprising Quaternary and Tertiary limestone and an underlying confined Tertiary sand aquifer. The Quaternary-aged Padthaway, Coomandook and Bridgewater Formations form the unconfined aquifer in the northern and central parts of the PWA. In the south of the PWA, the Tertiary-aged Gambier Limestone forms the unconfined aquifer. Beneath the highlands, the unconfined aquifer is contained within the Tertiary-aged Murray Group limestone aquifer, which is in the Murray Basin and is equivalent to the Gambier Limestone of the Gambier Basin. The main source of recharge to the unconfined aquifer is the direct infiltration of rainfall and groundwater flow occurs from the topographic high of the Dundas Plateau located in western Victoria. From there, groundwater flows through the PWA in a radial direction westward and southward to the coast.

Groundwater extractions (excluding stock and domestic use) for the Tertiary Limestone aquifer in the Lower Limestone PWA for 2012-13 totalled 230,107 ML which represents an increase of 44,810 ML (24%) from the previous year (Fig. 1).

Analysis of climatic trends in the South East has revealed a general drying trend since the early 1950s. This is reflected in most groundwater hydrographs and a strong relationship has been demonstrated between decreases in average annual rainfall and declining water levels measured in observation wells for both the confined and unconfined aquifers over the last 40 years. Trends identified at the Mount Gambier Aero rainfall station (number 26021), located about 8 km north of Mount Gambier are indicative of changes in rainfall patterns across the PWA. This station recorded 844 mm of rain in 2013, which is more than 120 mm above the long-term average annual rainfall. The months of July, August and October received rainfall significantly above its long-term monthly average, but January and February recorded well below-average rainfall and was slightly below or about average for the rest of the months (Fig. 2).

Long-term observations of the unconfined aquifer reveal relatively stable groundwater level trends on the inter-dunal flats, with the maximum recovered water levels displaying a broad relationship with rainfall trends. Below-average rainfall coupled with intensive, licensed groundwater extraction and commercial forest plantations has contributed to a consistent decline in groundwater levels on the coastal plain since 1993. Wetter conditions from 2009 to 2013 have led to rise in groundwater levels across the coastal plains and inter-dunal flats. In the highlands to the north, long-term observations show rising groundwater levels due to increased recharge caused by the widespread clearance of native vegetation. This rising trend persisted for several years after the prolonged period of below-average rainfall that commenced in 1993; however, the majority of observation wells display a declining trend after the year 2000 or later. This is likely caused by the lag time for recharge to the aquifer by rainfall infiltration as the water table is deep in this area.

In 2013, 71% of the 423 groundwater level observation wells with available data display a rise in the maximum recovered groundwater level of up to 1.62 m (observation well HIN038) when compared to 2012 water level data (Fig. 3). Fall in water level was observed in 133 wells (~27%) with a maximum decline of 0.93m recorded in observation well MTN014 and water level was stable in nine wells (~2%). The median rate of change across the entire monitoring network was a rise of 0.13 m. Rises in groundwater levels occurred primarily along the coastal plain and inter-dunal flats where the water table is the shallowest. Declines in groundwater levels predominantly occurred along the eastern border of the PWA, with the largest declines recorded between Naracoorte and Penola. The Donovans Management Area shows a rise in water levels in the shallow observation wells. The risk of seawater intrusion caused by declining water levels in the deeper units of the aquifer close to the coast continues to be assessed. These declines can be exacerbated by intensive inland extraction from the deeper units of the aquifer. Since 2012, water levels in these wells appear to be stable, however are at levels that are likely to cause a gradual inland migration of the sea water interface, and thus represent an ongoing risk to the resource in the near-coast region. The overall rise in groundwater levels across the Lower Limestone Coast PWA during the reporting period is the likely result of above-average rainfall which appear to have compensated for the increased rates of groundwater extraction.

Over large areas of the PWA where stresses on the unconfined aquifer such as intensive irrigation or land use change are absent, long-term salinity trends are reasonably stable. However, trends of increasing salinity have been observed locally in areas of flood irrigation through the recycling of salt by irrigation drainage water and areas of intensive groundwater extraction and native vegetation clearance.

Generally, the water in the unconfined aquifer is of good quality, with 84% of monitored wells recording groundwater salinity of less than 1500 mg/L in 2013 (Fig. 4). Salinity above 1500 mg/L is predominantly found across the northern half of the PWA. About 49% of the observation wells recorded an increase in water salinity when compared to 2012 data. Wells that recorded a decrease in salinity are located primarily on the Inter-dunal flats and those that recorded an increase are found predominantly in the highlands.

Due the vast area, the different land uses and the geomorphology of the Lower Limestone Coast PWA, the unconfined aquifer has divided into three resource groupings and a status has been assigned to each for 2013.

Coastal plain and inter-dunal flats

On the coastal plain and inter-dunal flats, the unconfined aquifer of the Lower Limestone Coast PWA has been assigned a green status for 2013:

2013 STATUS

"No adverse trends, indicating negligible risk to the resource"

This means that the groundwater status was observed to be stable (i.e. no significant change) or improving over the reporting period. Continuation of these trends favours a very low likelihood of negative impacts on beneficial uses such as drinking water, irrigation or stock watering. The 2013 status for the unconfined aquifer on the coastal plain and inter-dunal flats of the Lower Limestone Coast PWA is supported by:

- An overall rise in the maximum recovered groundwater level in 2013 when compared to 2012 water level data
- An overall decrease in groundwater salinity in 2013 when compared to 2012 salinity data.

The highland area

In the highland area along the eastern border of the PWA, the unconfined aquifer of the Lower Limestone Coast PWA has been assigned a yellow status for 2013:

2013 STATUS "Adverse trends indicating low risk to the resource in the medium term"

This means that the observed adverse trends are gradual and if continued, will not lead to a change in the current beneficial uses of the groundwater resource for at least 15 years. The 2013 status for the unconfined aquifer in the highland area of the Lower Limestone Coast PWA is supported by:

- An overall decline in the maximum recovered groundwater level in 2013 when compared to 2012 water level data
- An overall increase in groundwater salinity in 2013 when compared to 2012 salinity data.

The Donovans Management Area

In the Donovans Management Area, the unconfined aquifer of the Lower Limestone Coast PWA has been assigned a yellow status for 2013:

2013 STATUS "Adverse trends indicating low risk to the resource in the medium term"

This means that the observed adverse trends are gradual and if continued, will not lead to a change in the current beneficial uses of the groundwater resource for at least 15 years. The 2012 status for the unconfined aquifer in the Donovans MA of the Lower Limestone Coast PWA is supported by:

- Groundwater water levels observed in coastal wells are low enough to potentially cause the gradual inland movement of seawater in the lower part of the aquifer.

To view the *Lower Limestone Coast PWA groundwater level and salinity status report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, visit WaterConnect.

To view descriptions of all status symbols, click here.

For further details about the Lower Limestone Coast PWA, please see the Draft Lower Limestone Coast Water Allocation Plan.

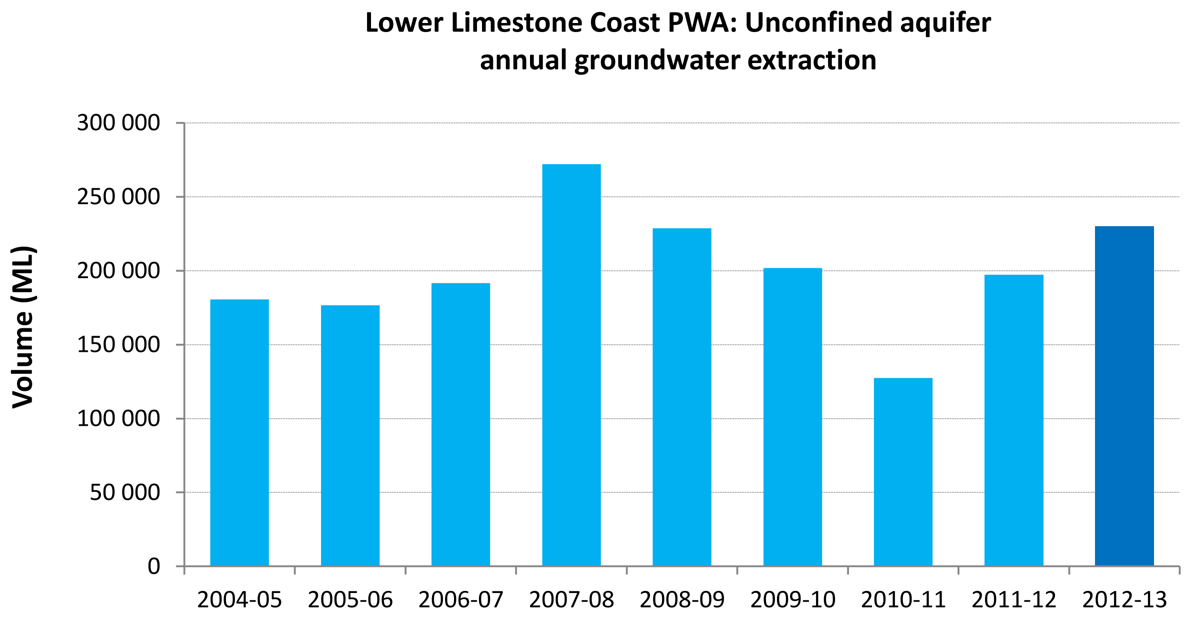


Figure 1. Historical licensed groundwater use for the Lower Limestone Coast PWA

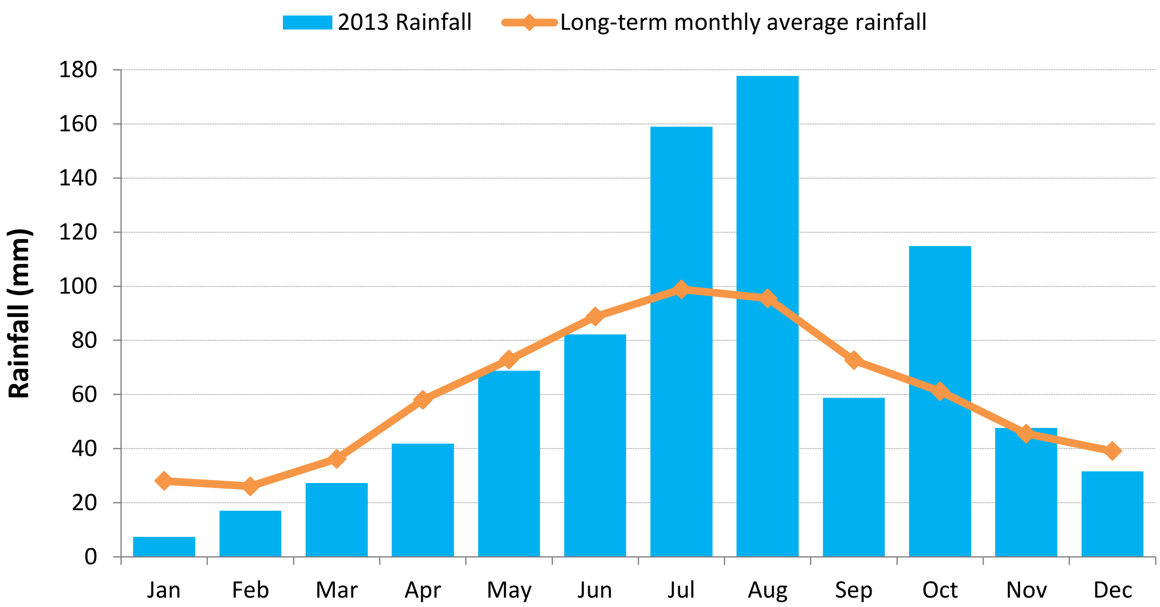


Figure 2. Monthly rainfall (mm) for 2013 and the long-term average monthly rainfall (mm) at the Mount Gambier Aero rainfall station (number 26021) in the Lower Limestone Coast PWA

Rainfall data used in this report is sourced from the SILO Patched Point Dataset, which uses original Bureau of Meteorology daily rainfall measurements and is available online at www.longpaddock.qld.gov.au/silo.

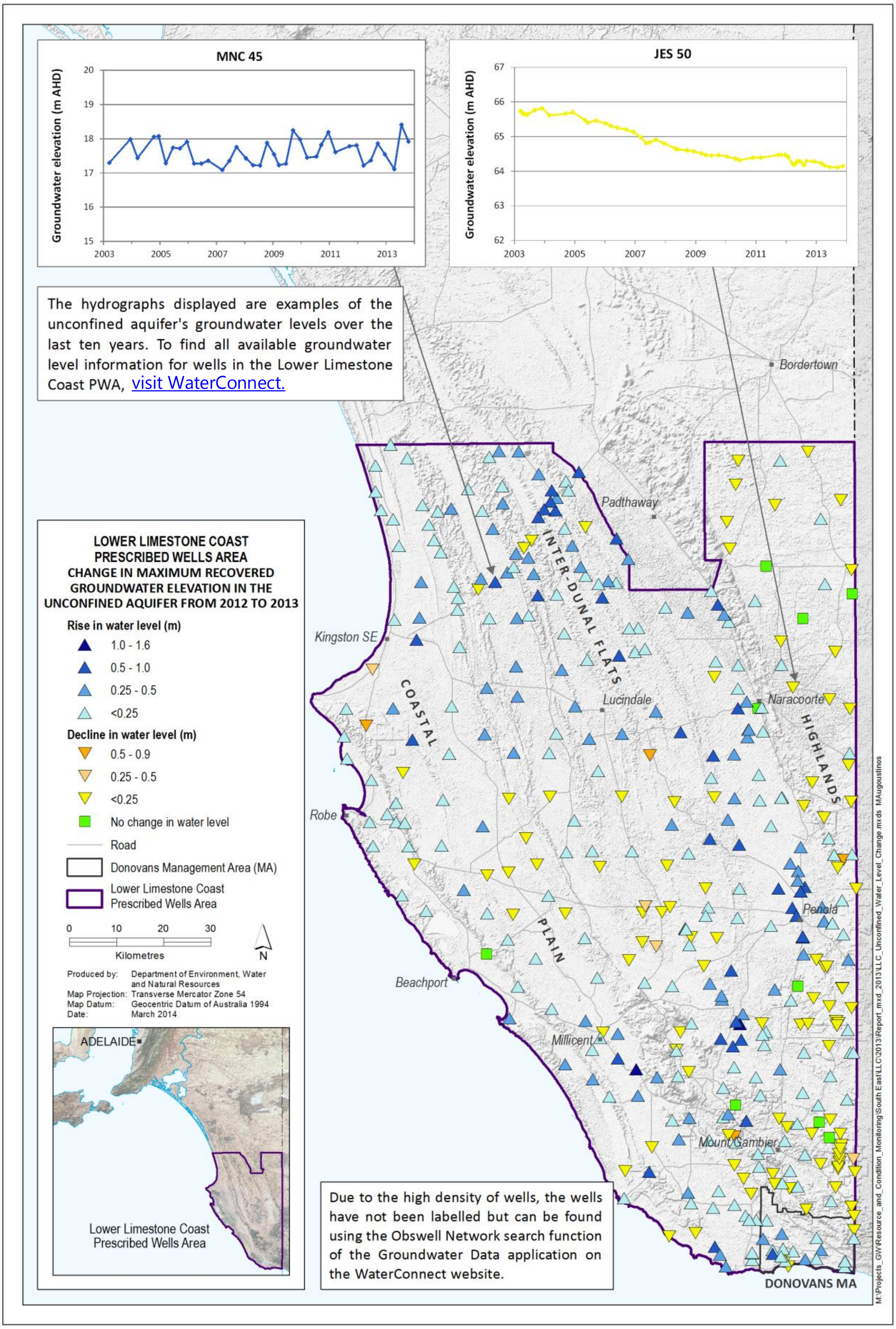


Figure 3. Overall changes in maximum groundwater levels in the unconfined aquifer of the Lower Limestone Coast PWA from 2012 to 2013

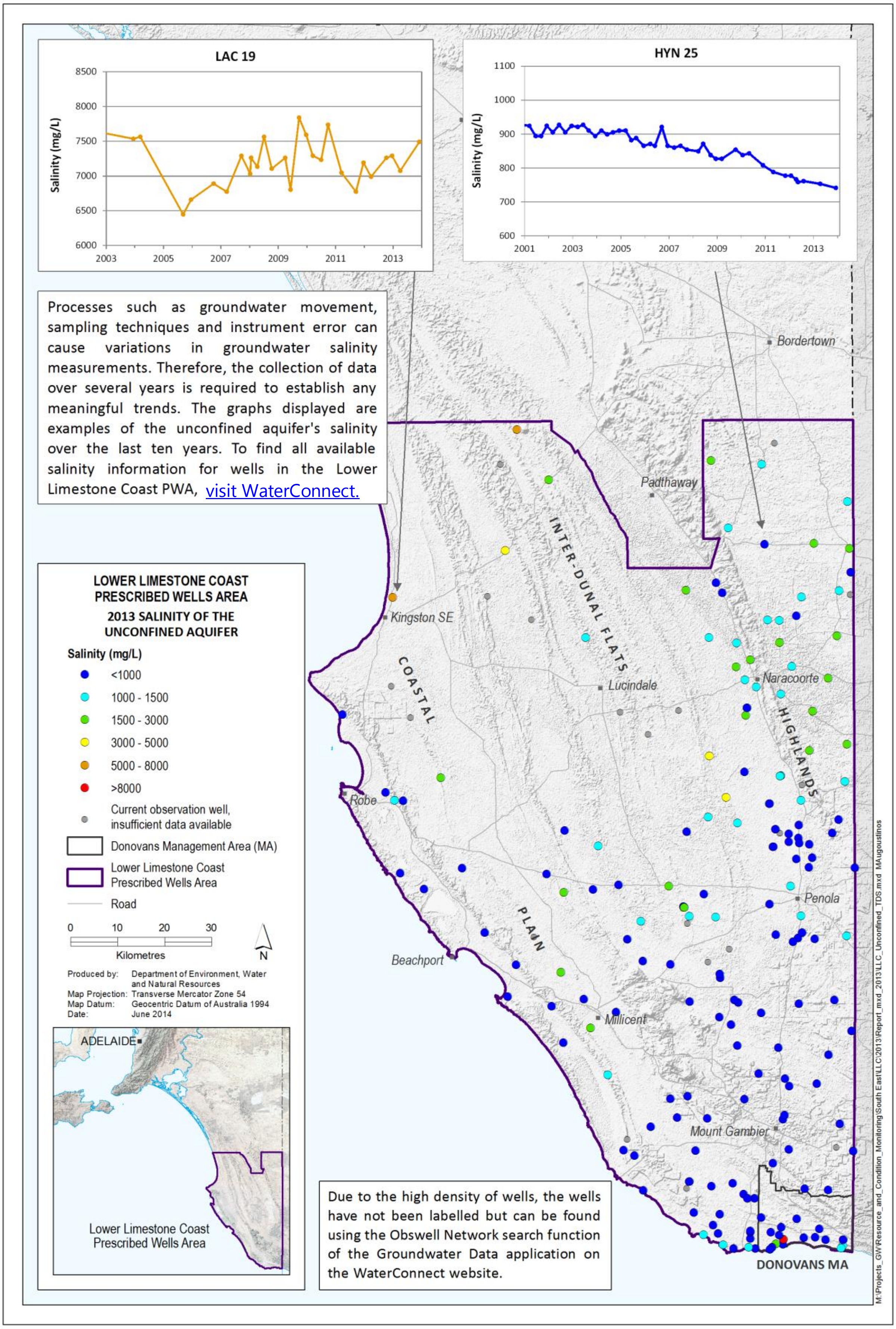


Figure 4. Groundwater salinity of the unconfined aquifer in the Lower Limestone Coast PWA for 2013