

Padthaway PWA

Unconfined aquifer

2014 Groundwater level and salinity status report



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2014 Summary



The Padthaway Prescribed Wells Area (PWA) is located in the Upper South East of South Australia, approximately 250 km south-east of Adelaide, in the South East NRM Region. It is a regional-scale resource for which groundwater is prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan provides for the sustainable use of the groundwater resources.

The Padthaway PWA is underlain by sediments of the Murray Basin and can be divided topographically into two discrete landforms, each with different hydrogeological characteristics and different groundwater management issues. The low-lying Padthaway Flat lies to the west, with the Naracoorte Range to the east. Both regions are underlain by two aquifer systems—an unconfined aquifer comprising various Quaternary and Tertiary limestones and an underlying confined Tertiary sand aquifer.

The Quaternary-aged Padthaway, Coomandook and Bridgewater Formations form the unconfined aquifer on the Padthaway Flat. The Bridgewater Formation also forms the unconfined aquifer in the Naracoorte Range. The Tertiary-aged Gambier Limestone underlies the Bridgewater formation in the ranges but is not typically used as an aquifer. The main source of recharge to the unconfined aquifer is the direct infiltration of rainfall and groundwater generally flows in a south-westerly direction but changes to north-westerly in the south of the PWA.

Trends in groundwater levels and salinity in the Padthaway PWA are primarily climate driven—below-average rainfall results in a reduction in recharge to the aquifers. Below-average summer rainfall can also result in increasing irrigation extractions, and these two elements can cause the groundwater levels to fall and salinity to increase. Conversely, increases in rainfall results in increases in recharge, decreases in irrigation extractions and groundwater levels may rise and salinity stabilise or decline. The response of groundwater levels to rainfall varies between the Padthaway Flat and the Naracoorte Range, primarily due to the depth of the watertable. Levels are more responsive to rainfall on the low-lying flat as the watertable is shallow. In the ranges, the watertable is more than 10 m below the ground surface resulting in a delayed response, with a lag time dependent on the depth to the watertable and the permeability of the sediments.

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. The Marcollat rainfall station (number 26017) is located in the north-west of the PWA and recorded 354 mm of rain in 2014. This is about 167 mm below the long-term average annual rainfall for this station. While June and July recorded rainfall above their long-term monthly average, all other months, with the exception of January, recorded rainfall significantly below their average (Fig. 1).

Groundwater extractions (excluding stock and domestic use) for the Tertiary Limestone aquifer in the Padthaway PWA for 2013–14 totalled 25 374 ML¹, which represents an increase of 2230 ML (10%) from the previous water-use year (Fig. 2).

From 1970 to 2004, a gradual rise in groundwater levels of 1–2.5 m has been recorded by observation wells in the Naracoorte Range. This has been followed by a slight decline in levels, with some recovery seen since 2010. Observation wells on the Padthaway Flat reveal a decline in levels between 1970 and 1978, then a gradual rise until 1992–94 followed by another decline until 2008, with a recovery of levels since 2009.

In 2014, most of the 41 observation wells with available data (68%) show a decline in the maximum recovered groundwater level when compared to 2013 water level data (Fig 3). Declines ranged from 0.1–0.58 m, with a median of 0.26 m. Just the one observation well with sufficient data recorded a rise in the maximum recovered groundwater level, which was 0.58 m. Negligible change in the groundwater level (rise or fall is less than 0.10 m) was recorded in about 29% of observation wells with available data. As the saturated thickness of the unconfined aquifer is generally only 6–14 m, it is important to maintain a sustainable level of groundwater

¹ The licensed groundwater use for the 2013–14 water-use year is based on the best data available as of June 2015 and will be subject to change, as approximately ten percent of South East annual water use reports had not been submitted at the time of printing and groundwater extracted for forestry is not included. As such, the total licensed groundwater use will be higher than the volume presented in this report.

extraction to avoid a long-term decline in aquifer storage. The decline in groundwater levels in the Padthaway Flat management area during 2014 is likely to be due to the increased extractions and below-average rainfall.

Groundwater salinity trends in the shallow unconfined aquifer are influenced by rainfall patterns and the efficiency of various irrigation practices and are therefore quite variable. Some observation wells show long-term trends of rising salinity, others declining salinity, while most wells display periods of both.

In 2014, the groundwater salinity measurements ranged between 969 and 8170 mg/L, which is similar to 2013 records. Of the 28 observation wells with available data, most wells (77%) recorded a change in salinity of less than 5% when compared to 2013 salinity data. Nearly 43% of observation wells recorded salinity greater than 1500 mg/L (Fig. 4).

The unconfined aquifer of the Padthaway PWA has been assigned a yellow status for 2014:

2014 Status



“Gradual adverse changes indicating low risk to the resource in the medium term”

This means that gradual adverse changes in the resource status have been observed over the 12-month reporting period. If these conditions were to continue, they are unlikely to lead to a change in the current beneficial uses of the groundwater resource (e.g. drinking water, irrigation or stock watering) for at least 15 years.

The 2014 status for the unconfined aquifer is supported by:

- an overall decline in the maximum recovered groundwater level in 2014 when compared to 2013 water level data.

To view descriptions for all status symbols, please visit [WaterConnect](#).

To view the *Padthaway PWA Groundwater Level and Salinity Status Report 2011*, which includes background information on hydrogeology, location of rainfall stations and relevant groundwater-dependent ecosystems, please visit [WaterConnect](#).

To view or download groundwater level and salinity data from observation wells within the Padthaway PWA, please visit [Groundwater Data](#) on WaterConnect.

For further details about the Padthaway PWA, please see the *Water Allocation Plan for the Padthaway Prescribed Wells Area* on the Natural Resources South East [website](#).

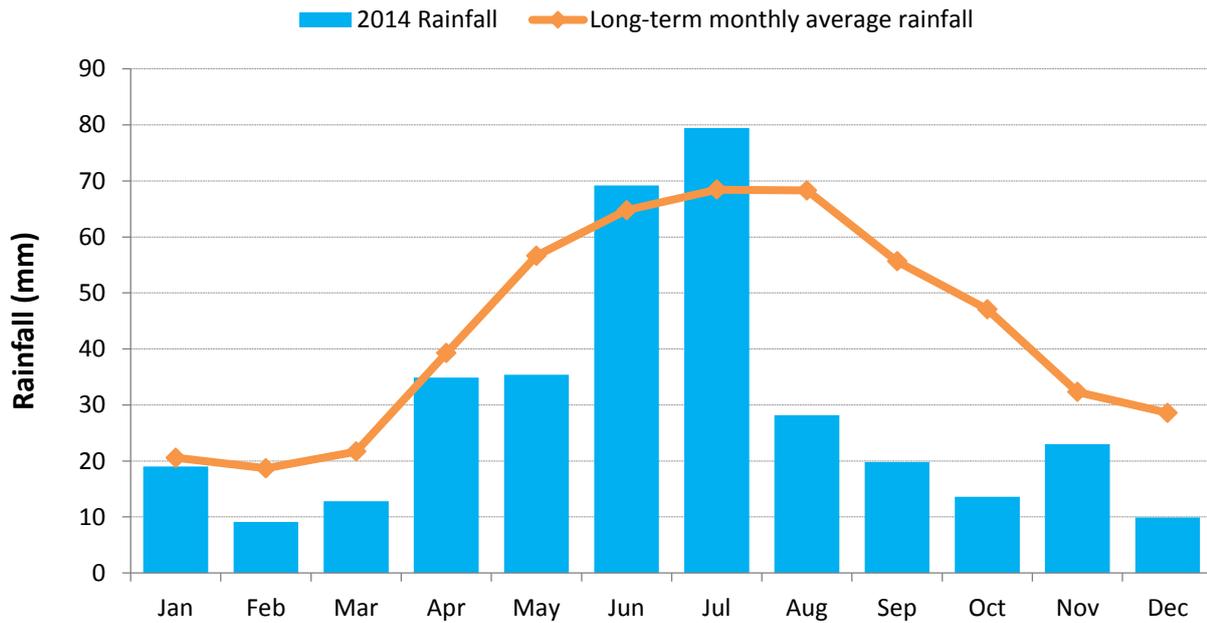


Figure 1. Monthly rainfall (mm) for 2014 and the long-term average monthly rainfall (mm) at the Marcollat rainfall station² (number 26017) in the Padthaway Prescribed Wells Area

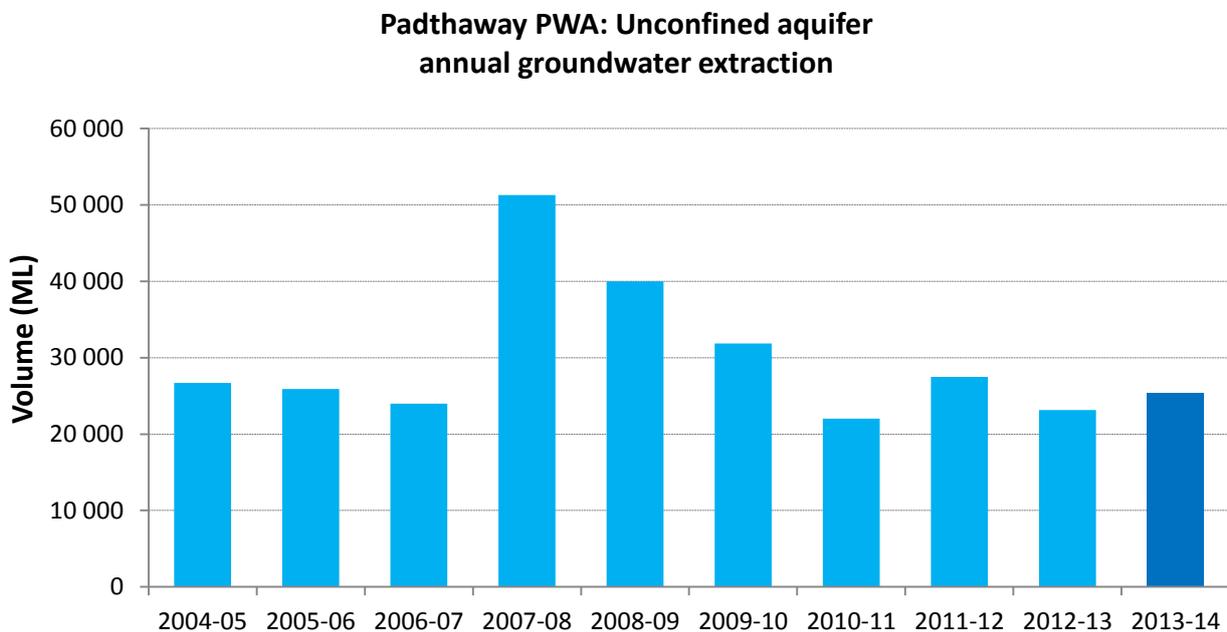


Figure 2. Historical licensed groundwater use³ from the unconfined aquifer in the Padthaway Prescribed Wells Area

² 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.

³ Groundwater extracted for forestry not included.

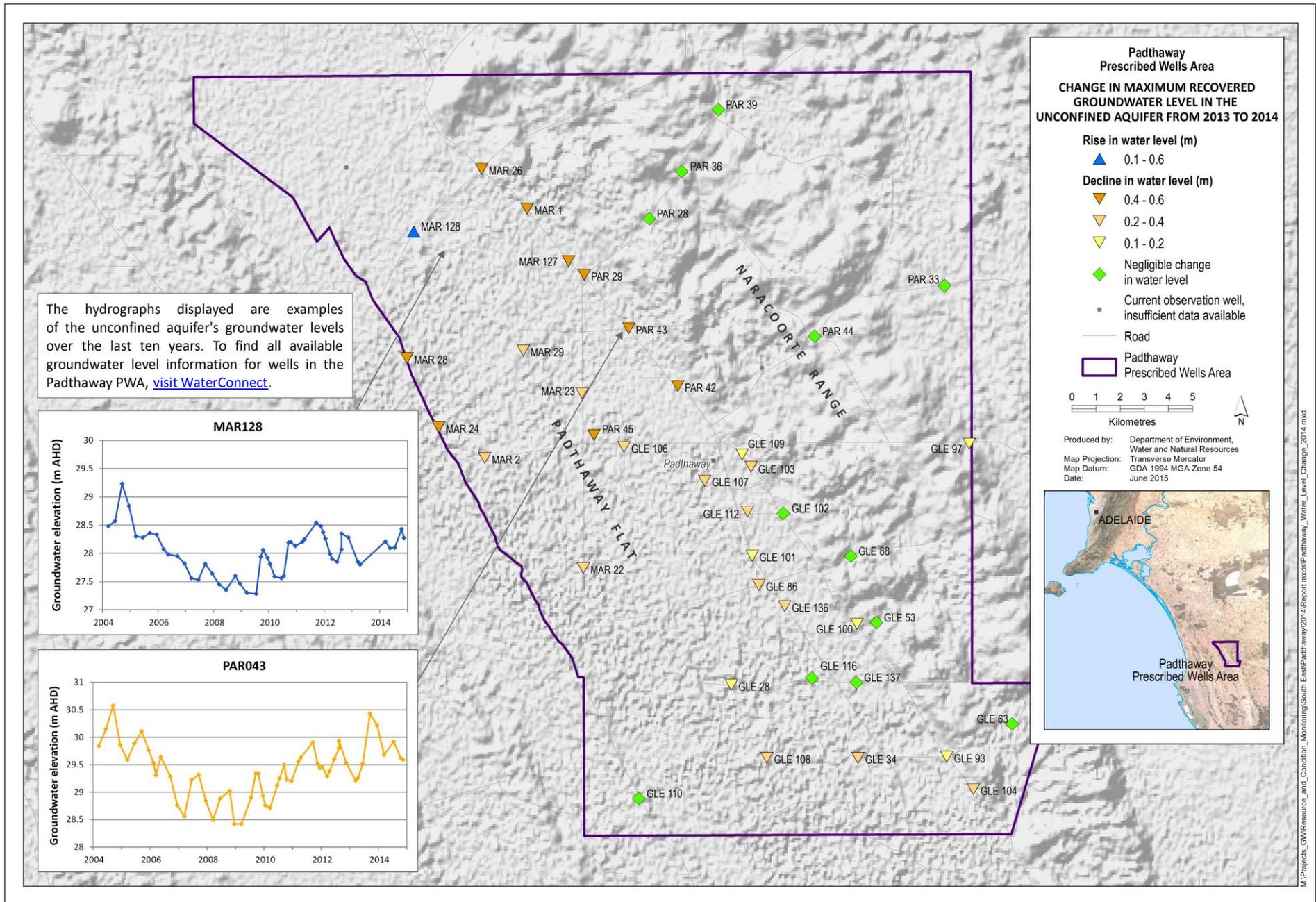


Figure 3. Overall changes in maximum recovered groundwater levels of the unconfined aquifer in the Padthaway Prescribed Wells Area from 2013 to 2014

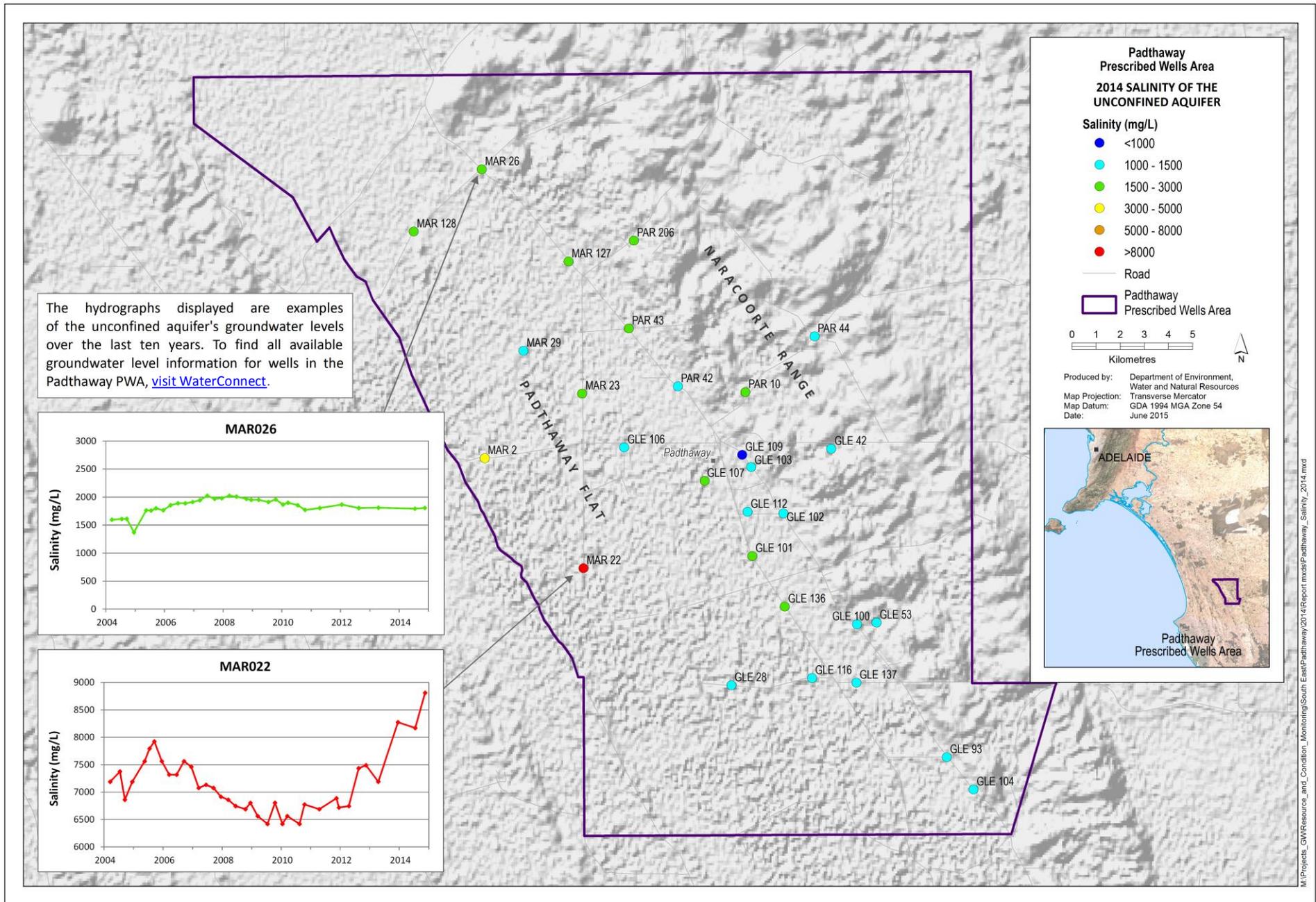


Figure 4. Groundwater salinity of the unconfined aquifer in the Padthaway Prescribed Wells Area for 2014