

Marne Saunders PWRA

Fractured rock aquifers

2014 Groundwater level and salinity status report



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2014 Summary



The Marne Saunders Prescribed Water Resources Area (PWRA) is located on the eastern side of the Mount Lofty Ranges, about 60 km north-east of Adelaide in the South Australian Murray-Darling Basin NRM Region. It is a regional-scale resource for which surface water and groundwater are prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan provides for sustainable management of the water resources.

The Marne Saunders PWRA consists of two tributary catchments of the River Murray and can be divided into two distinct groundwater regions: the Hills Zone to the west (the focus of this report) and the Plains Zone in the east. The Hills Zone comprises the consolidated basement rock of the Mount Lofty Ranges, consisting of micaceous and feldspathic sandstones and siltstones of the Cambrian-aged Kanmantoo Group. The metamorphic rocks form fractured rock aquifers that are generally tight and impermeable with few fractures and joints to store and transmit groundwater; consequently, boreholes produce low well yields (2 L/s).

The movement of groundwater within the catchment generally follows topographic contours, flowing from high points to low points where discharge into streams occurs. Groundwater also moves eastward from the Ranges and discharges to the sedimentary aquifers of the Plains Zone. Recharge to the fractured rock aquifers of the Hills Zone occurs by rainfall percolation through the soil profile or exposed bedrock.

Trends in groundwater levels and salinity in the fractured rock aquifers of the Marne Saunders PWRA 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.

Rainfall is highest in the Hills Zone at the western edge of the PWRA, declining rapidly towards the east in the rain shadow of the Mount Lofty Ranges. Data from the Mount Pleasant rainfall station (number 23737) were chosen for the analysis of rainfall trends in the Hills Zone. The long-term monthly average rainfall is graphed in orange with the 2014 monthly rainfall graphed in blue (Fig. 1). In 2014, the total annual rainfall was 687 mm, which is 19 mm above the long-term (1889–2014) annual average of 668 mm. Notable features of the rainfall chart for 2014 include the February rainfall, which was more than six times higher than the long-term February average, the June and July rainfall, which were around 50% higher than average, and the considerably below-average rainfall from August to the end of the year.

Metered extractions from the fractured rock aquifers have declined steadily since peaking during the drought in 2006–07, in response to increased rainfall and therefore, lower demand for groundwater resources. Extractions increased again in 2011–12 and 2012–13. In 2013–14 the total extraction was 322 ML, a 27% decrease from 2012–13 (Fig. 2) and represents 23% of the total groundwater extraction in the Marne Saunders PWRA.

Due to the nature of the unconfined fractured rock aquifers, water level responses can be highly variable. Over the past five years groundwater level trends have been stable to slightly declining.

In 2014, rises in the maximum recovered groundwater level ranging from 0.15 to 1.0 m, with a median of 0.32 m, were recorded in seven observation wells (64% of total), when compared with 2013 groundwater level data. Declines of 0.36 m and 0.52 m were recorded in two observation wells (18% of total), while two wells recorded negligible change in water levels, where the change in the maximum recorded water level between 2013 and 2014 was less than 0.05 m. Overall, there was a median 0.24 m rise in water levels in the fractured rock aquifers. These responses are predominantly caused by rainfall trends, as extraction volumes are considered too low and dispersed to affect regional water levels.

During the past 10 years, salinity has overall been stable (Fig. 4). Irrigators in the Marne Saunders PWRA are required to submit a water sample from their wells to DEWNR for salinity analysis every year. In 2014, a range of salinities from 757 to 5628 mg/L were

recorded, with 89% of the 36 monitored wells recording salinity of less than 3000 mg/L (Fig. 4). Of the 29 wells with data from both 2013 and 2014 available for comparison, 16 wells (55%) showed stable salinity where the rise or decline was less than 5%. Nine wells (31%) recorded a decrease in salinity of 9–46% and 4 wells (14%) recorded an increase of 8–14%. However, it should be noted that for all wells except two, the 2013 and 2014 salinity data are the only recent salinity measurements.

The fractured rock aquifers of the Marne Saunders Prescribed Water Resources Area has been assigned a green status for 2014:

2014 Status



“No adverse changes, 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 12-month reporting period. Continuation of these conditions favours a very low likelihood of negative impacts on the beneficial uses of the resource (e.g. drinking water, irrigation or stock watering).

The 2014 status for fractured rock aquifers is supported by:

- most wells recording stable or increasing maximum recovered groundwater level in 2014 when compared with 2013 data
- most wells recording stable or decreasing groundwater salinity in 2014 when compared with 2013 data.

To view descriptions for all status symbols, please visit the *Water Resource Assessments* page on [WaterConnect](#).

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

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

For further information about the Marne Saunders PWRA, please see *The Water Allocation Plan for the Marne Saunders Prescribed Water Resources Area* on the Natural Resources SA Murry-Darling Basin [website](#).

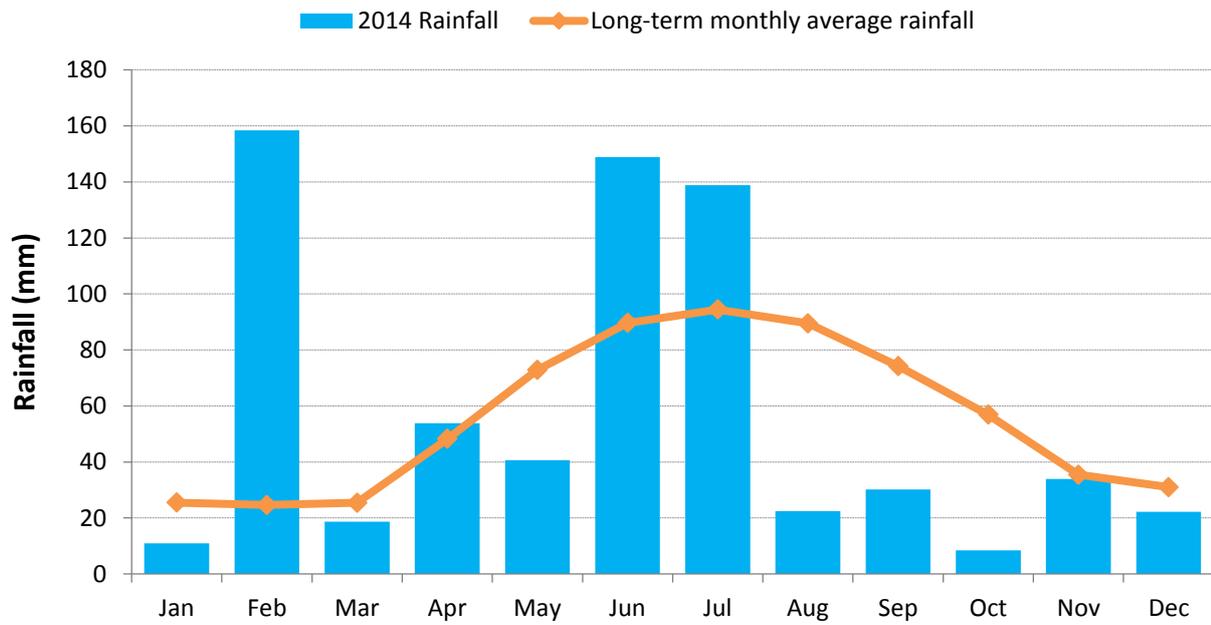


Figure 1. Monthly rainfall (mm) for 2014 and the long-term average monthly rainfall (mm) at the Mount Pleasant rainfall station¹ (number 23737) in the Hills Zone of the Marne Saunders Prescribed Water Resources Area

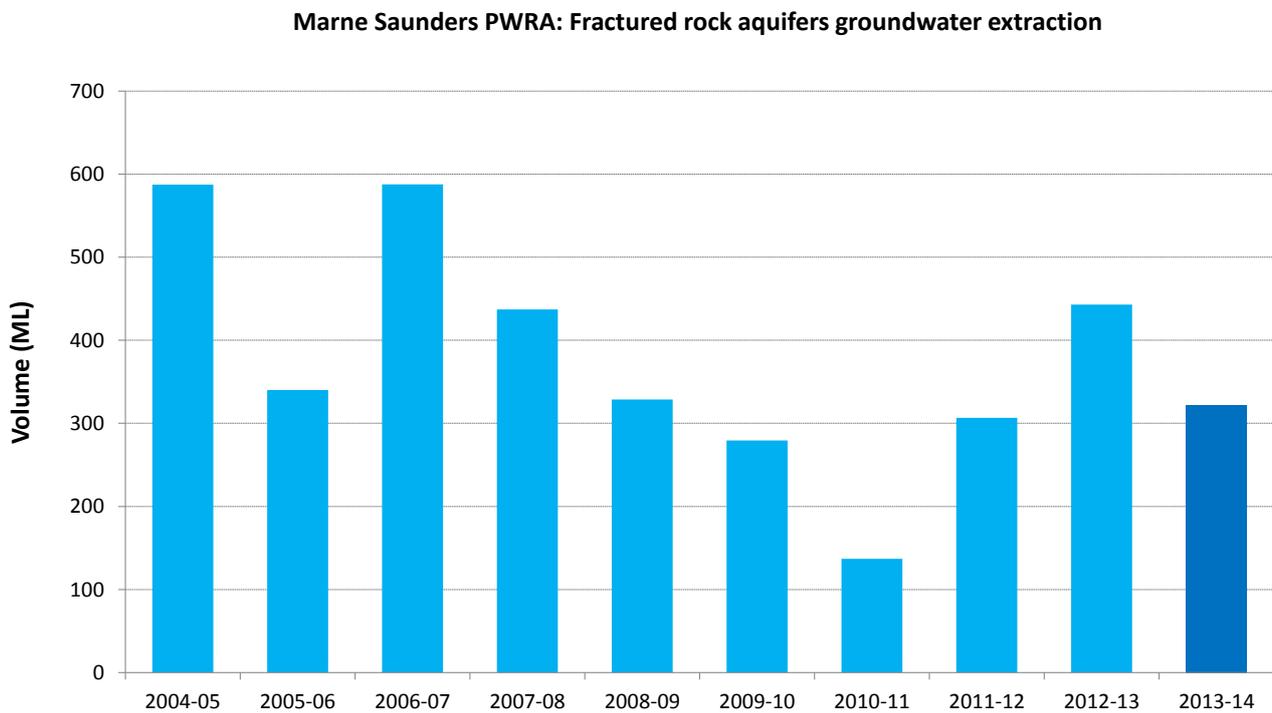


Figure 2. Historical licensed groundwater use from the fractured rock aquifers in the Marne Saunders Prescribed Water Resources Area

¹ 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.

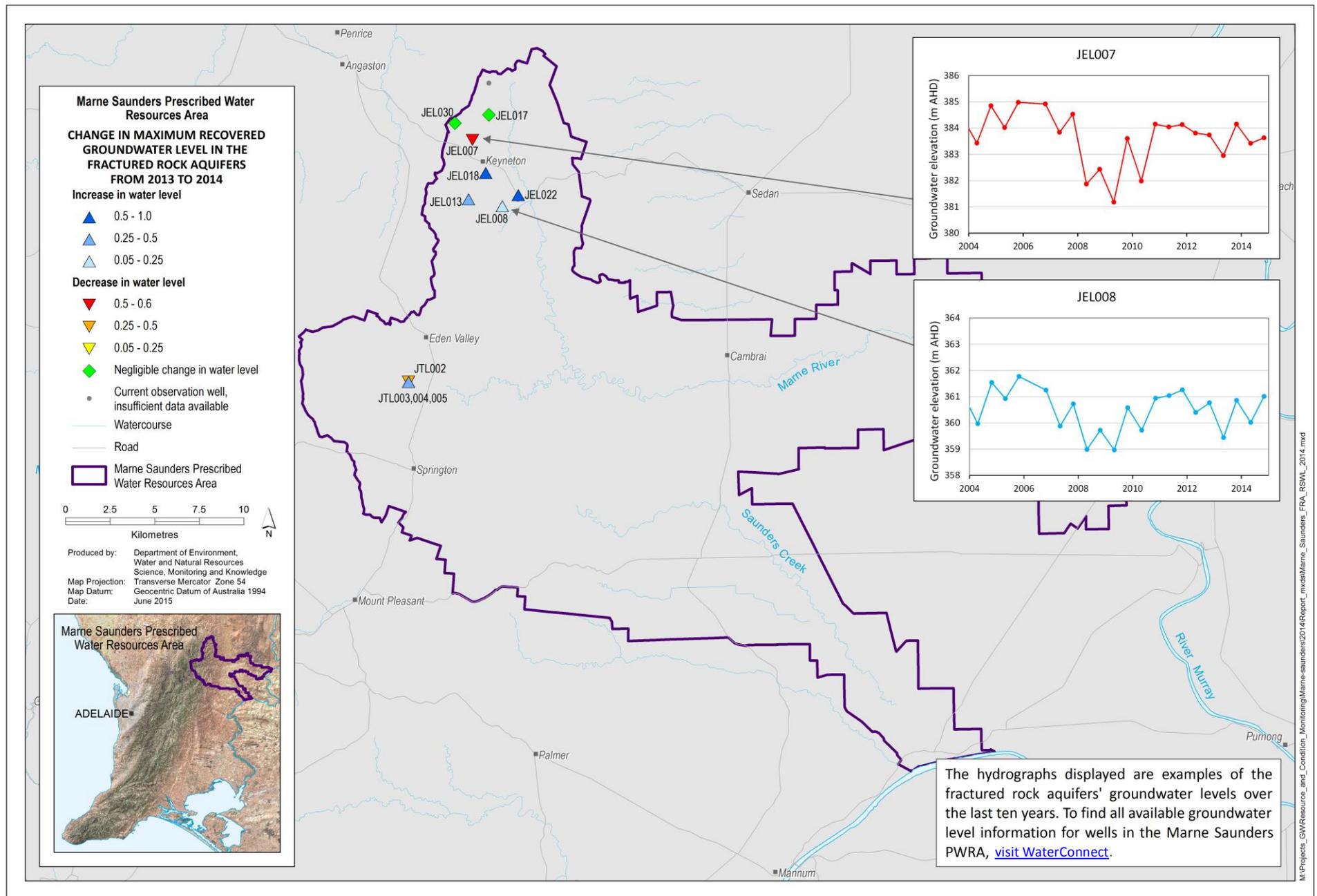


Figure 3. Overall changes in maximum groundwater levels of the fractured rock aquifers in the Marne Saunders Prescribed Water Resources Area from 2013 to 2014

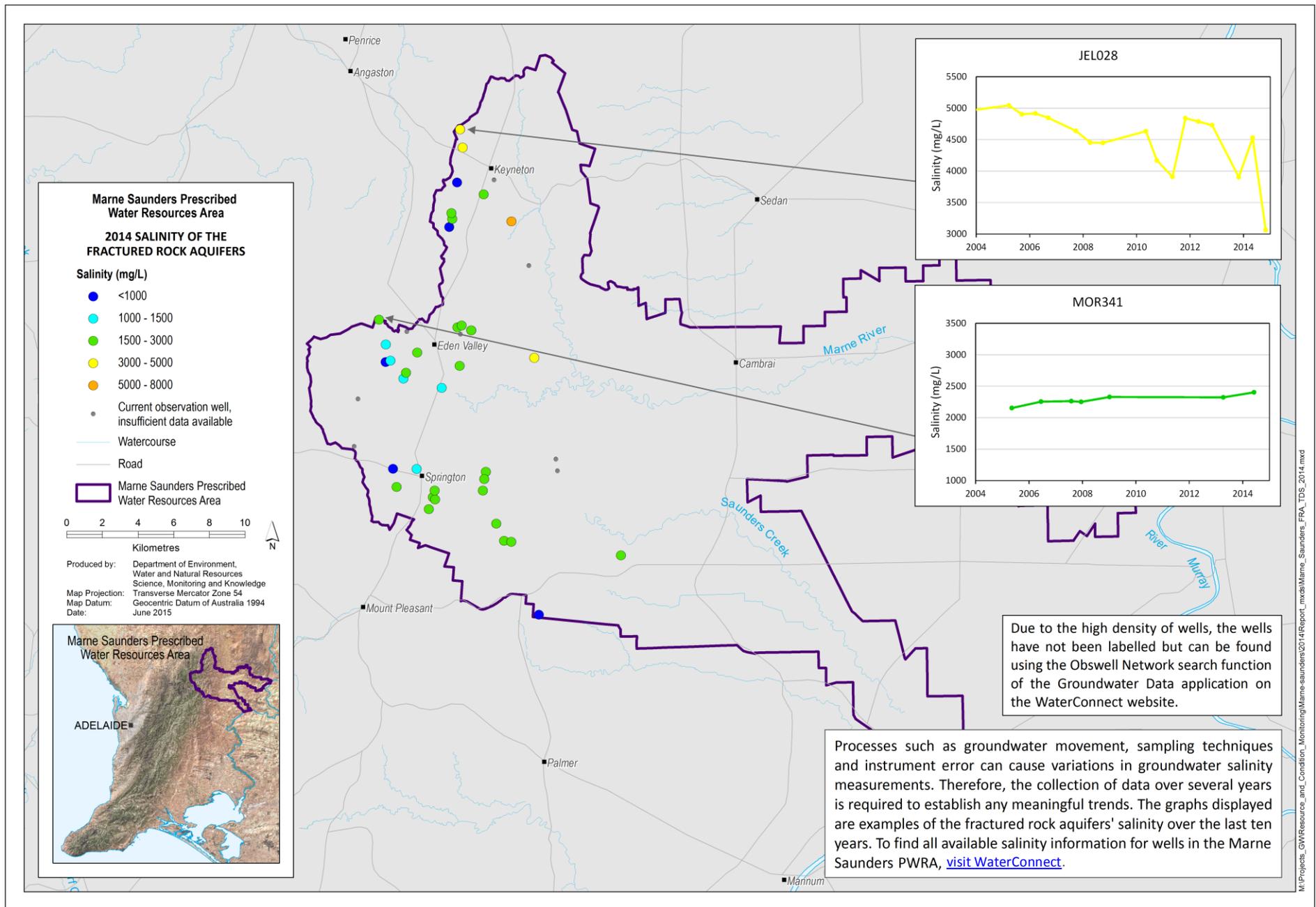


Figure 4. Groundwater salinity of the fractured rock aquifers in the Marne Saunders Prescribed Water Resources Area for 2014