Musgrave PWA

Polda lens

2015 Groundwater level and salinity status report

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

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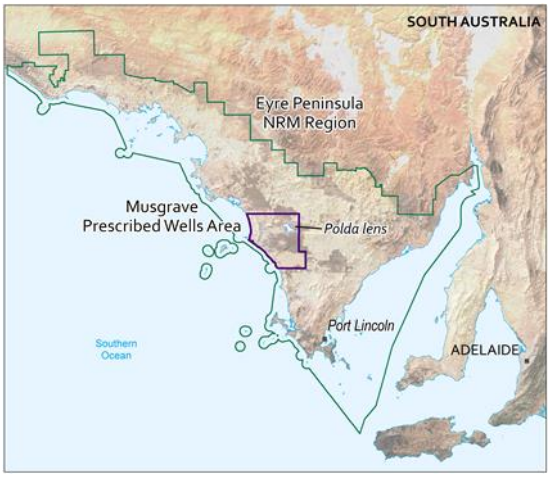
2015 Summary



The Musgrave Prescribed Wells Area (PWA) is situated in central Eyre Peninsula, approximately 120 km north-west of Port Lincoln in the Eyre Peninsula NRM Region. It is prescribed under South Australia's *Natural Resources Management Act 2004* and a water allocation plan provides for the sustainable use of the groundwater resources. The Polda lens is situated in the north-east of the Musgrave PWA.

Within the Musgrave PWA there are three main sedimentary sequences containing groundwater that overlie basement rocks: the Quaternary limestone aquifer, the underlying Tertiary sands aquifer, and deeper Jurassic sediments that reside within the Polda Trough. The Quaternary limestone aquifer is the focus of this report and comprises a generally thin veneer of aeolianite sediments of the Bridgewater Formation and is continuous across the PWA. Areas within the Quaternary limestone aquifer defined by salinity of less than 1000 mg/L, such as the Polda lens, are described as fresh groundwater lenses in the current water allocation plan. The main source of recharge to the Quaternary limestone aquifer is the direct infiltration of rainfall and groundwater flow is predominantly in a westerly to south-westerly direction toward the Southern Ocean.

Groundwater levels and salinites in the Musgrave PWA are highly responsive to recharge from rainfall and trends in groundwater level or salinity 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 extractions, and these two elements can cause the groundwater levels to fall and salinities to increase. Conversely, above-average rainfall can result in increases in recharge, decreases in extractions and groundwater levels may rise and salinities stabilise or decline. Historical rainfall data indicate that trends of above or below-average rainfall can last for up to 25 years, and that high-intensity rainfall can result in greater and more-rapid water level (i.e. recharge) responses.

The Lock (Terrah Winds) rainfall station (BoM Station 18165) is located 15 km south-east of the Polda lens where annual rainfall totalled 232 mm for the 2014–15 water-use year, well below the long-term annual average rainfall of 375 mm (1900–2015) and the five-year average of 420 mm (Figs. 1 and 2). The 2014–15 annual rainfall is the third lowest on record for Lock and despite the high rainfall in 2013–14, a trend of declining rainfall over the past five years is evident (Fig. 2). Long-term seasonal rainfall patterns show generally higher rainfall during the winter months and lower rainfall over summer. Notable seasonal variations over the past five years include the unusually wet spring and summer of 2010–11, the wet summer of 2011–12, the dry spring of 2012–13, and the wet summer and autumn–winter of 2013–14. The 2014–15 water-use year has been particularly dry, with seven months recording less than half their long-term monthly-average rainfall, although April recorded nearly 250% above its average.

Licensed groundwater extractions occur predominantly from the fresh groundwater lenses within the Quaternary limestone aquifer. Metered licensed extractions from the Polda lens totalled 585 kL in 2014–15, which was slightly less than the previous water-use year (Fig. 3). This volume of extraction equates to 36% of the allocation volume allowed under the Notice of Prohibition and less than 1% of the total licensed extractions within the Musgrave PWA for 2014–15. Now that the new *Water Allocation Plan for the Southern Basins and Musgrave Prescribed Wells Areas* has been adopted, the Notice of Prohibition will be revoked and the allocation volume for extracting groundwater from Polda lens will increase.

A long-term decline in groundwater levels of up to 3 m was recorded in the Polda lens from 1980 to 2008. This decline correlates with below-average rainfall recorded in the region during this period. Above-average annual rainfall since 2009, along with consistently reduced extraction volumes under the Notice of Prohibition, has resulted in an average rise of 1.5 m in groundwater levels throughout most of the lens.

In the five years to 2015, groundwater levels in 68% of Polda monitoring wells show a rising trend, 8% are stable and the remaining 24% show a declining trend (Fig. 4). Rises in groundwater levels range between 0.02 and 0.11 m/y (median 0.09 m/y) and are observed mainly in the south-west of the lens. Declines in groundwater levels range between 0.03 and 0.08 m/y (median 0.05 m/y) and are observed in the northern extent of the lens and beyond. Most wells outside the lens boundary show a rising trend in groundwater levels.

Long-term monitoring data show rises in salinity in most wells between the mid to late-1990s. In mid-2009, salinities generally reached a maximum as a result of a prolonged period of intensive extraction and below-average rainfall, reduced recharge and declining groundwater levels. Since the second half of 2009, monitoring wells within the Polda lens show signs of groundwater freshening, which is likely to be in response to increased recharge following above-average rainfall.

In 2015, salinity measurements range between 400 and 3000 mg/L, although two wells located outside the lens extent show salinities of around 13 000 mg/L (Fig. 5). Within the Polda lens, 81% of monitoring wells show salinities below 1000 mg/L.

In the five years to 2015, 83% of Polda salinity monitoring wells show a trend of decreasing or stable salinity (Fig. 6). This includes four of five wells that show salinities greater than 1000 mg/L. The remaining 17% of wells show a rising trend. Most of the wells outside the lens extent show a trend of stable salinity.

To determine the status of the Polda lens for 2015, the trends in groundwater levels and salinities over the past five years (2011 to 2015, inclusive) were analysed. This is a new approach, in contrast to the year-to-year assessments that have been used in past *Groundwater level and salinity status reports*. Please visit the Frequently Asked Questions on the *Water Resource Assessments* page on WaterConnect for more detail on the current method of evaluating the status of groundwater resources.

The Polda lens of the Musgrave PWA has been assigned a green status for 2015:

2015 Status  Positive trends have been observed over the past five years

The 2015 status of the Polda lens is based on:

- most monitoring wells (76%) showing a five-year trend of rising or stable groundwater levels
- most monitoring wells (83%) showing a five-year trend of stable or decreasing salinity.

To view descriptions for all status symbols, please visit the *Water Resource Assessments* page on WaterConnect.

To view the *Musgrave PWA Polda lens groundwater level and salinity status report 2011*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, please visit the *Water Resource Assessments* page on WaterConnect.

To view or download groundwater level and salinity data from monitoring wells within the Musgrave PWA, please visit Groundwater Data on WaterConnect.

For further details about the Musgrave PWA, please see the *Water Allocation Plan for the Musgrave Prescribed Wells Area* on the Natural Resources Eyre Peninsula website.

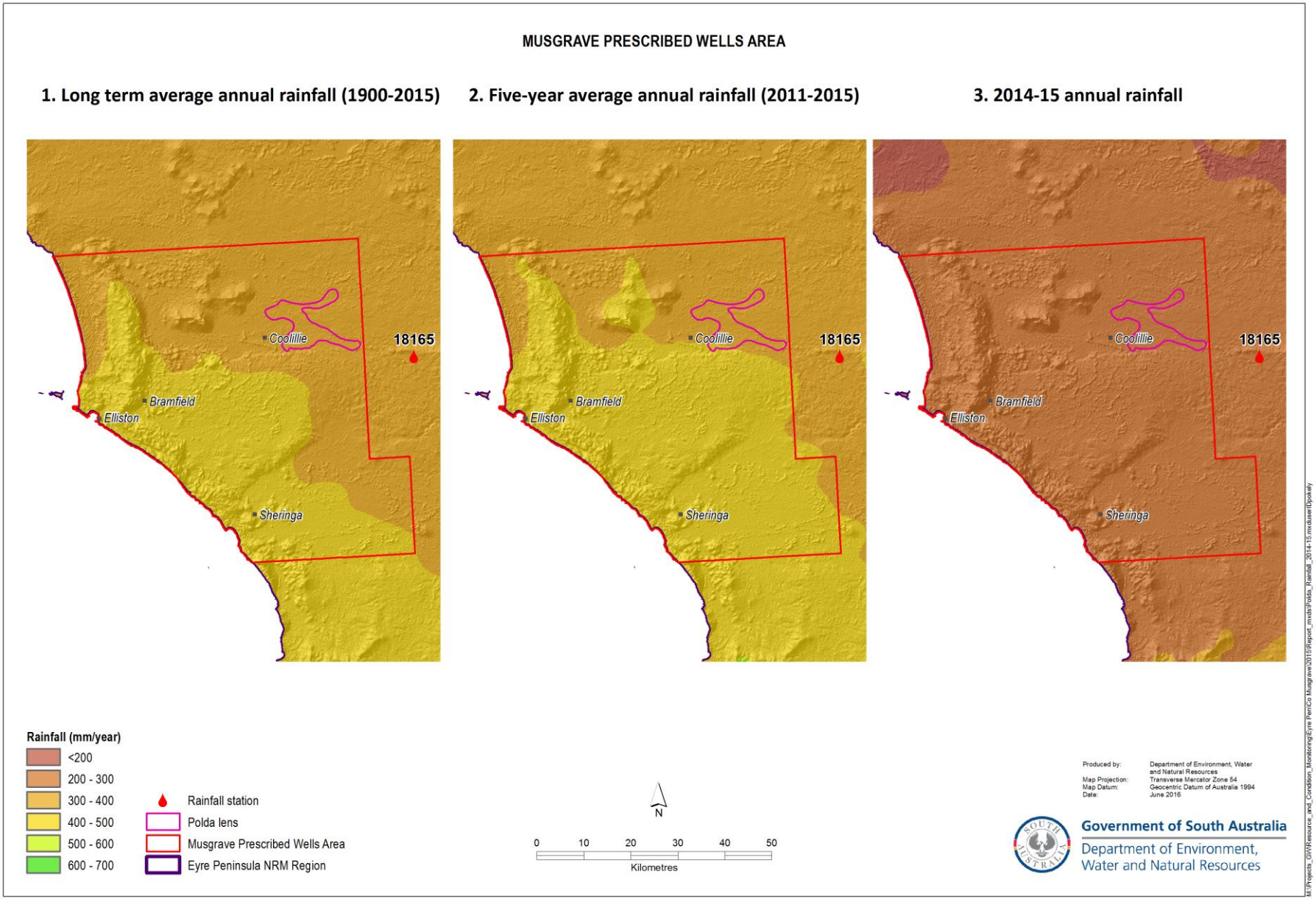


Figure 1. (1) Long-term and (2) five-year average annual rainfall, and (3) annual rainfall for the 2014–15 water-use year in the Musgrave Prescribed Wells Area[1]

[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.

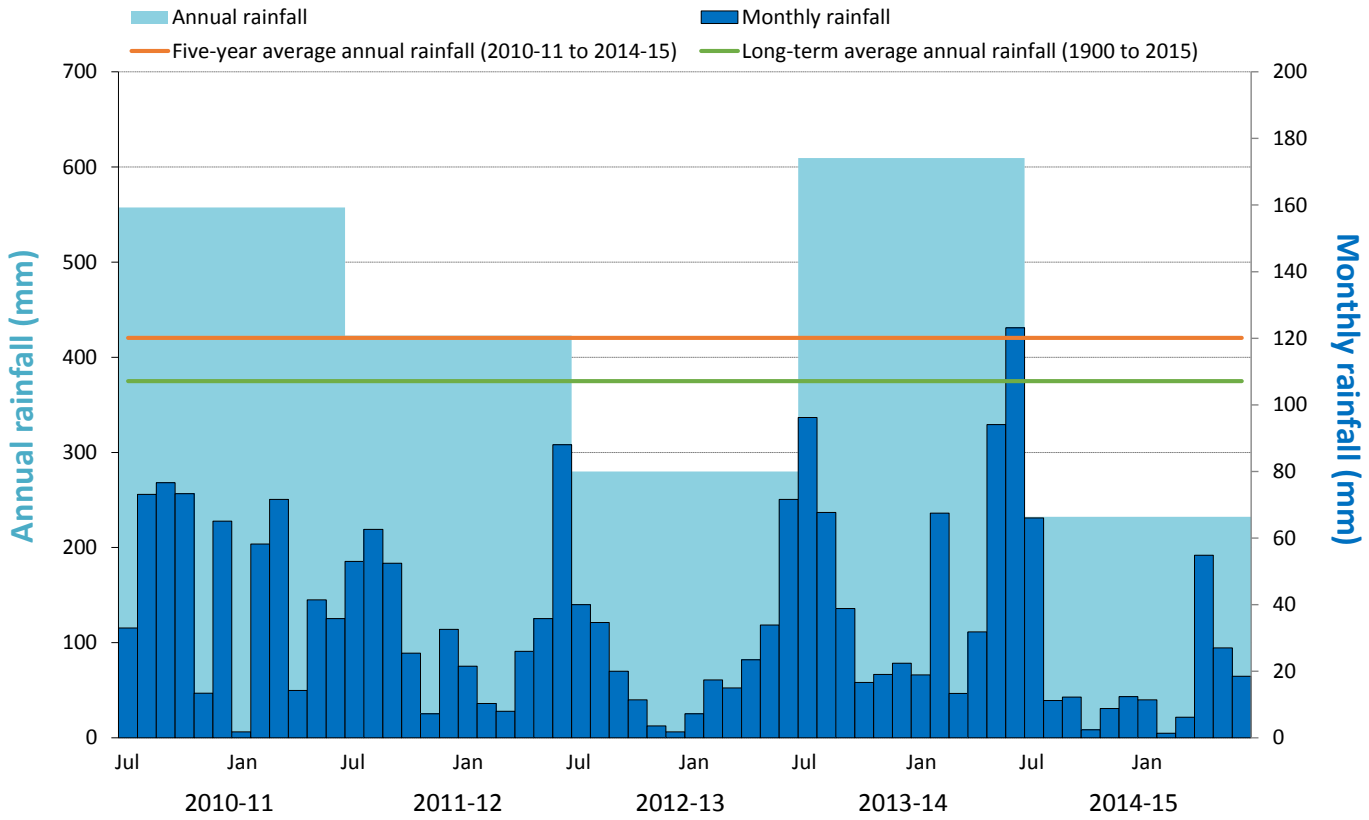


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Terrah Winds (BoM Station 18165)[2]

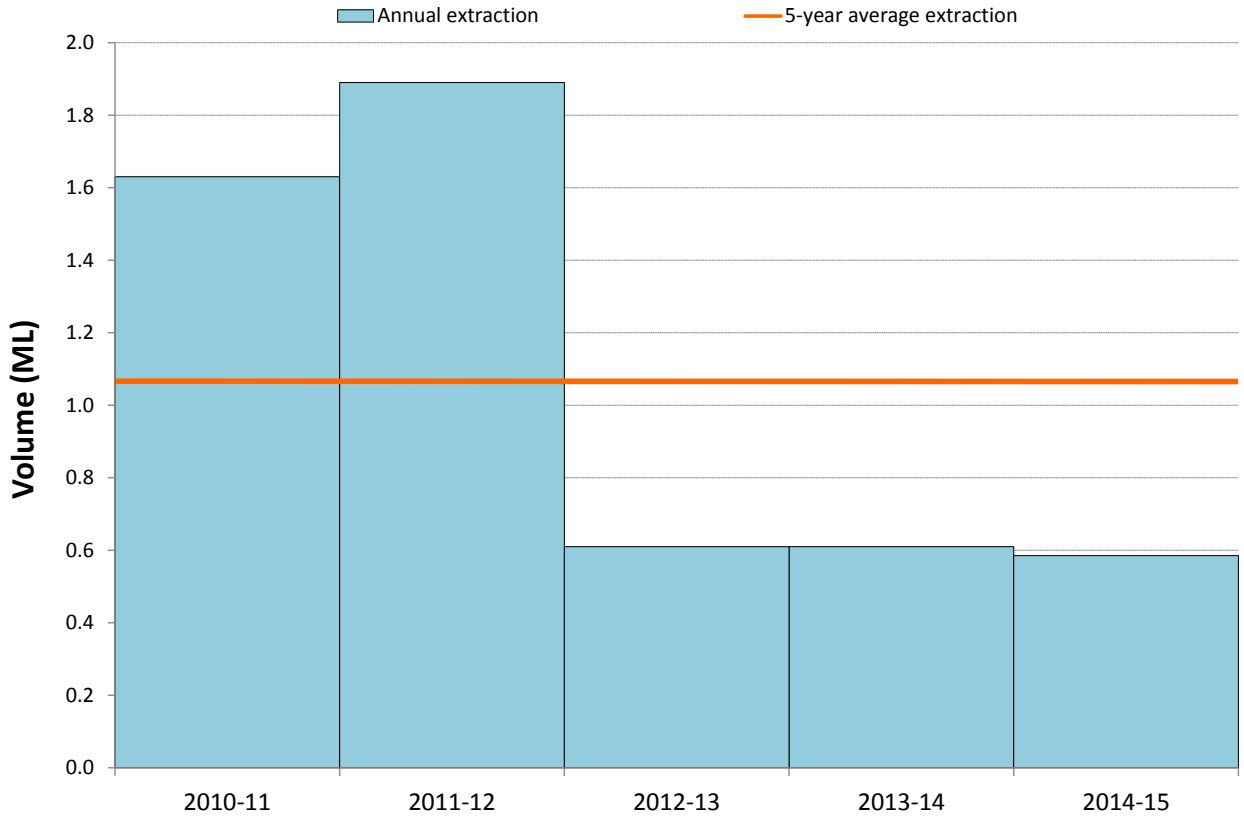


Figure 3. Licensed groundwater extraction volumes for the past five water-use years, from the Polda lens in the Musgrave Prescribed Wells Area

[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.

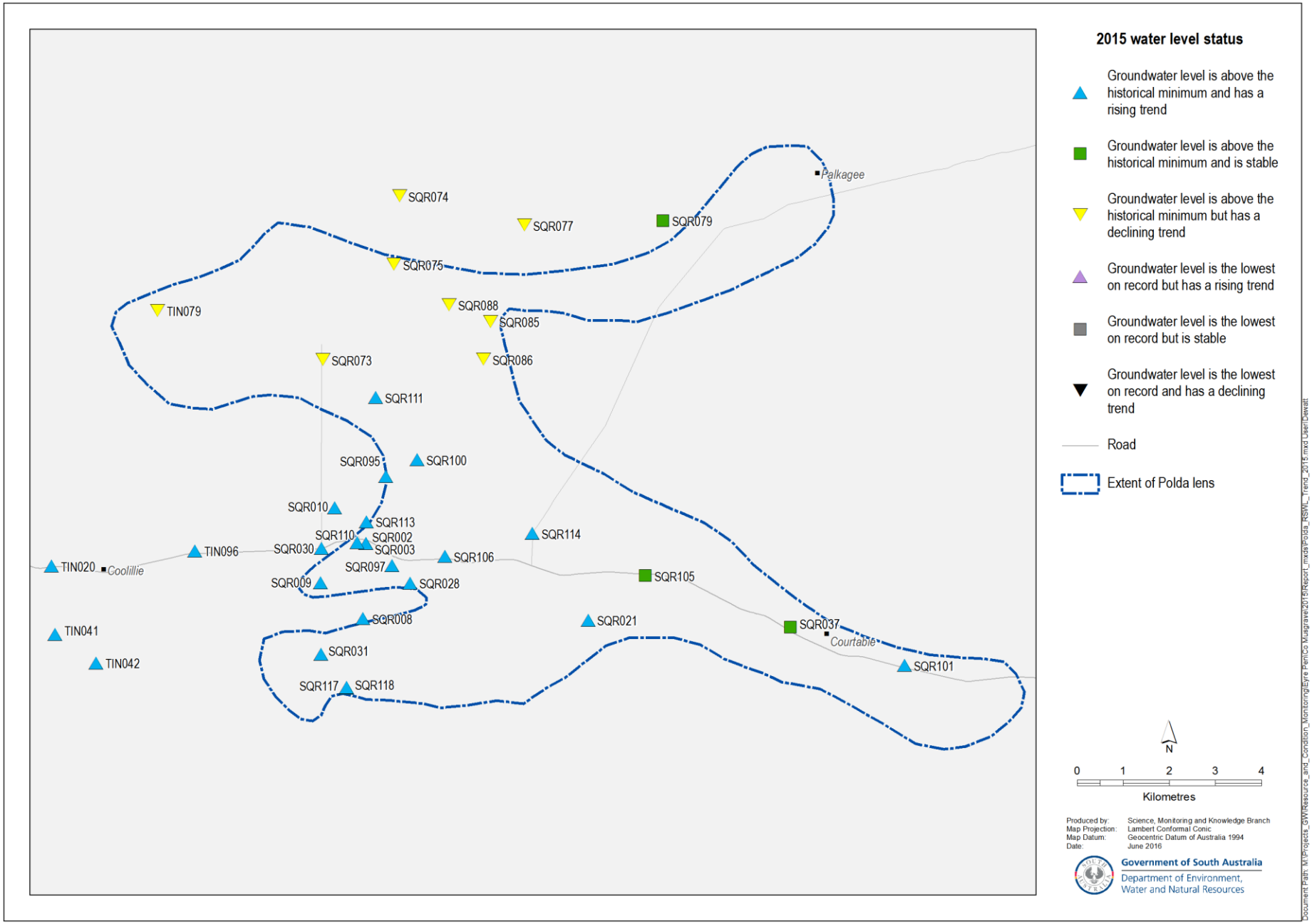


Figure 4. 2015 status of groundwater levels in the Polda lens (Musgrave Prescribed Wells Area) based on the five-year trend from 2011 to 2015

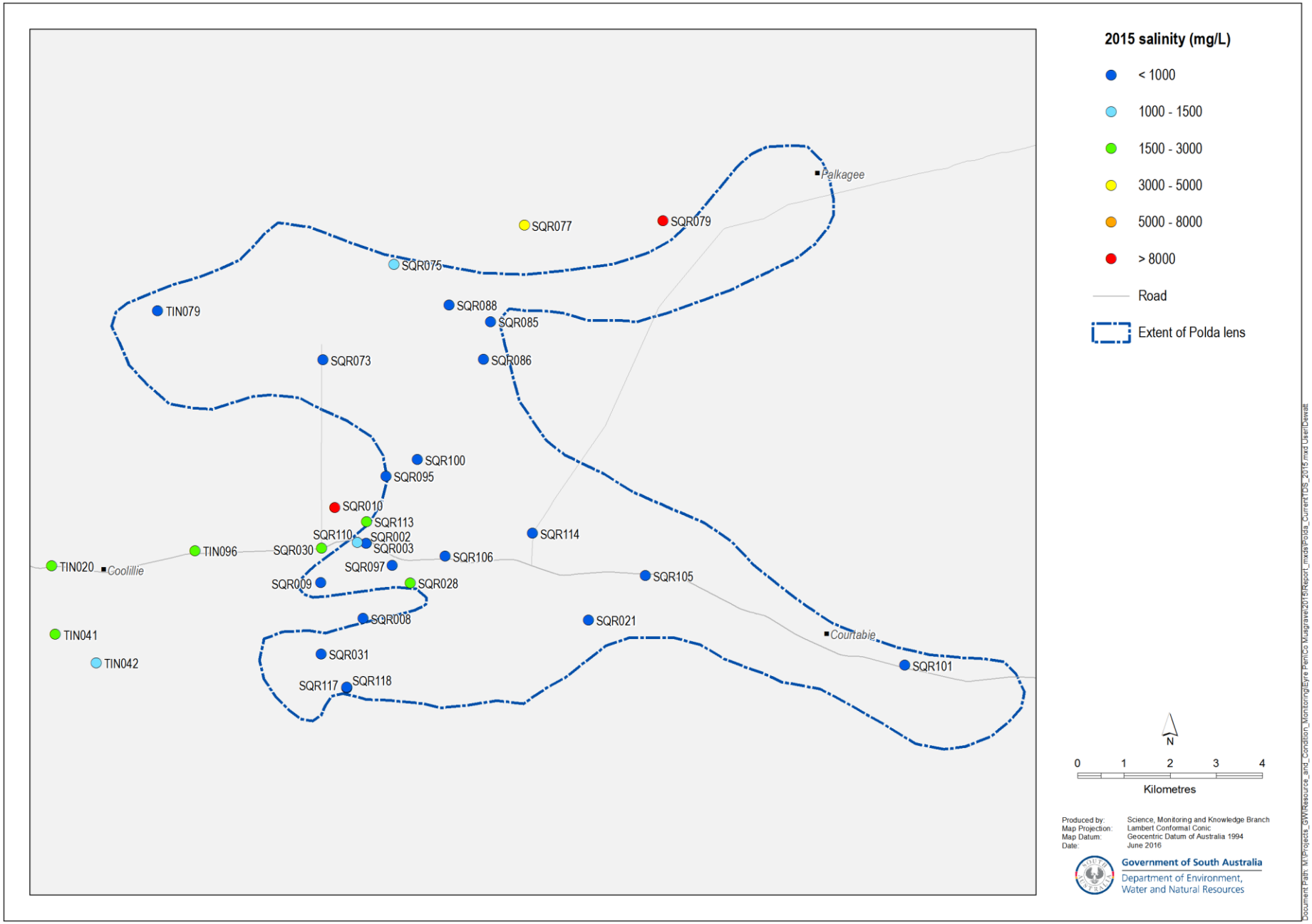


Figure 5. 2015 groundwater salinity of the Polda lens (Musgrave Prescribed Wells Area)

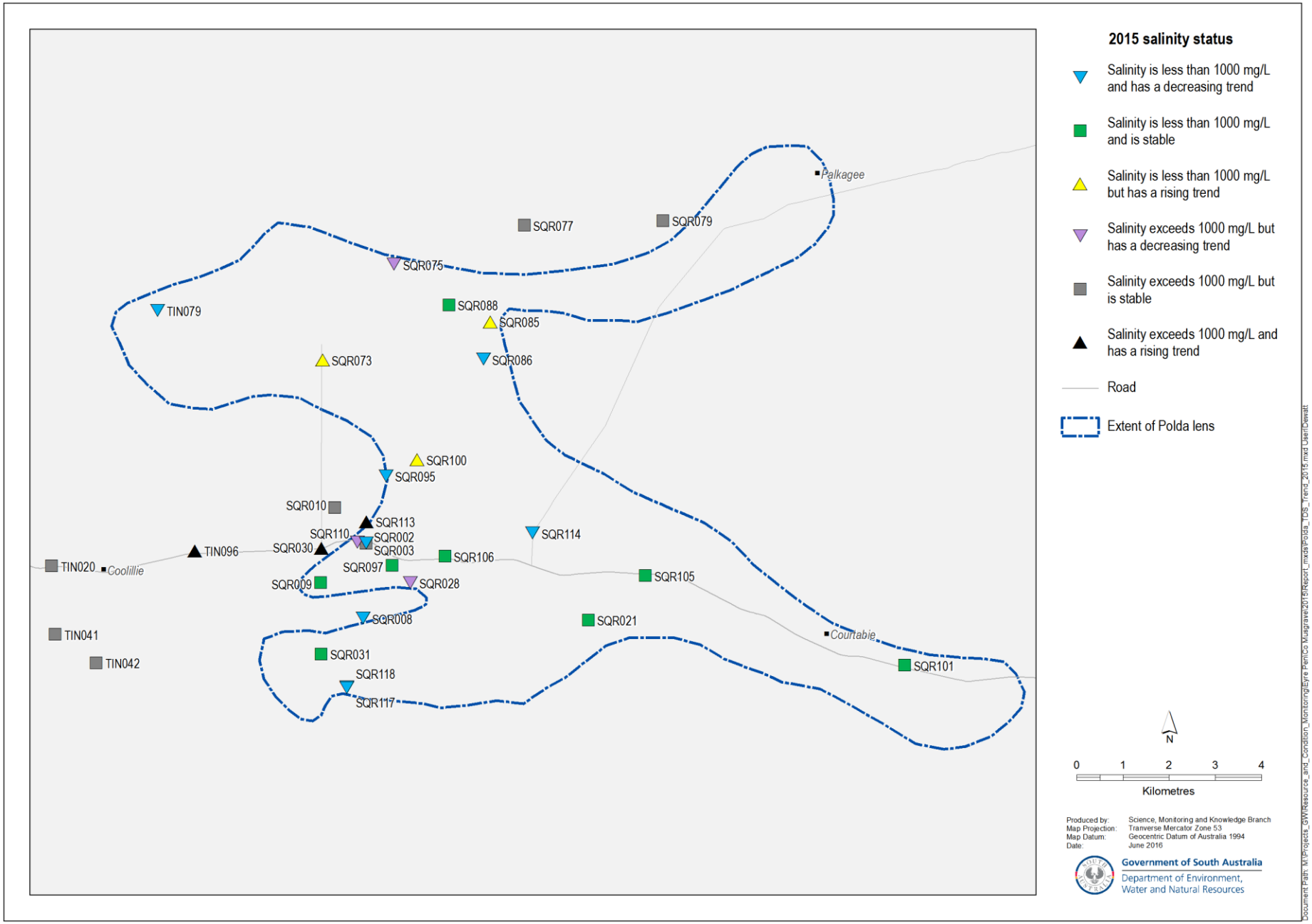


Figure 6. 2015 status of groundwater salinity in the Polda lens (Musgrave Prescribed Wells Area) based on the five-year trend from 2011 to 2015

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