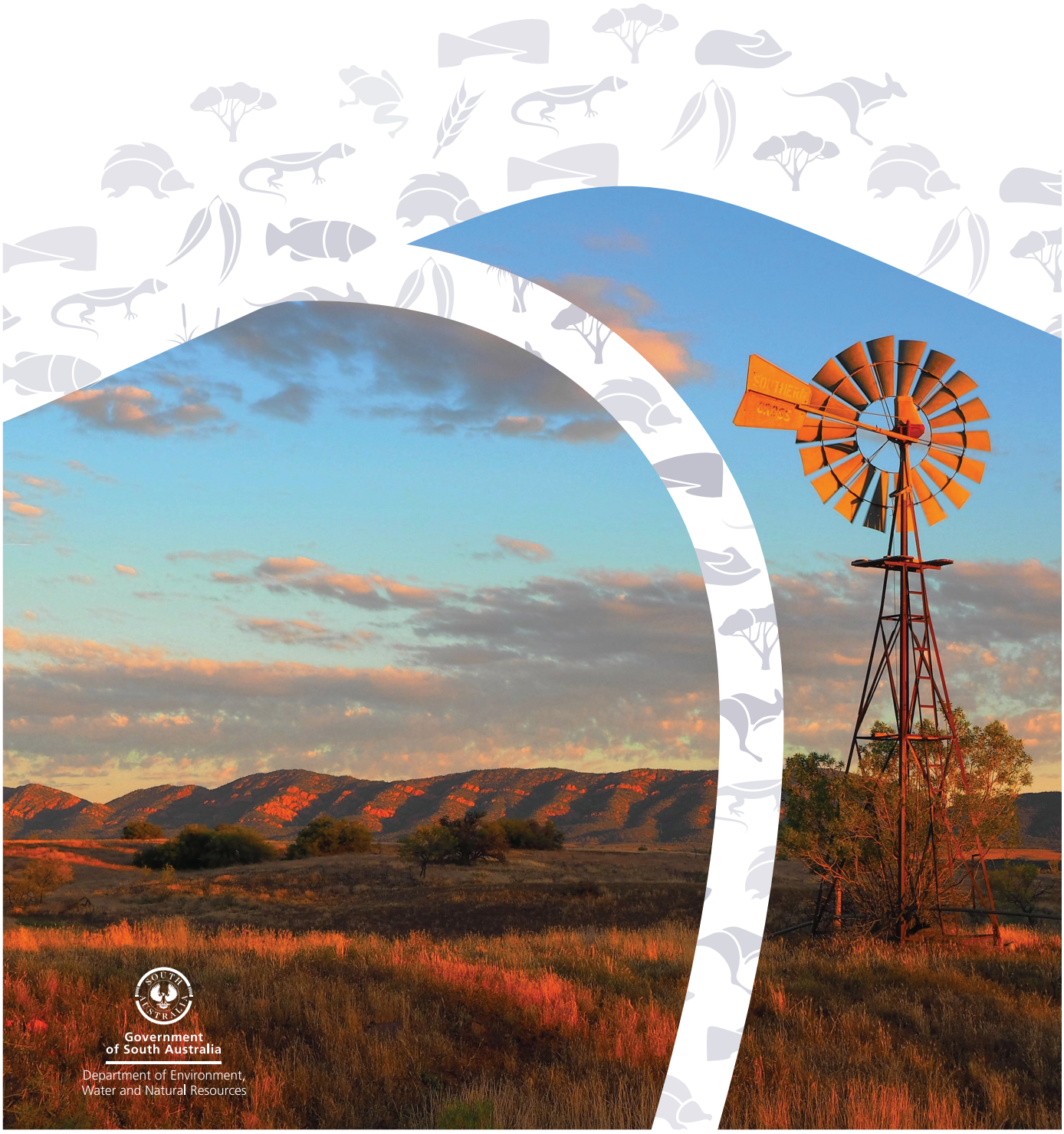
Clare Valley PWRA
Fractured rock aquifer

2016 Groundwater level and salinity status report



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ISBN 978-1-925510-80-5

Preferred way to cite this publication

DEWNR (2017). *Clare Valley PWRA fractured rock aquifer 2016 Groundwater level and salinity status report,* Government of South Australia, Department of Environment, Water and Natural Resources, Adelaide.

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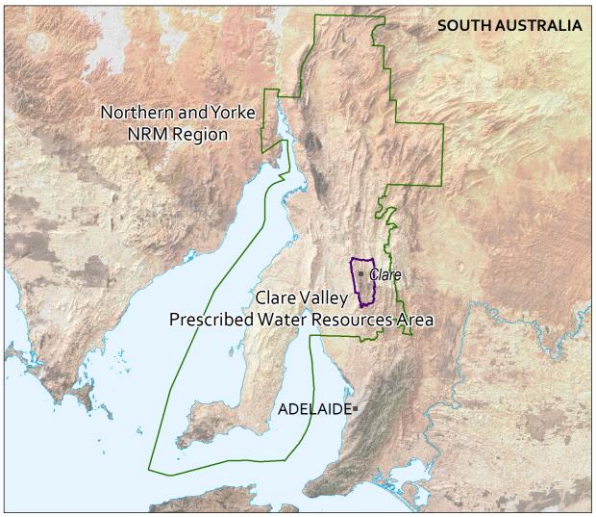
Regional setting



The Clare Valley Prescribed Water Resources Area (PWRA) is located approximately 130 km north of Adelaide, within the Northern and Yorke Natural Resources Management Region. It is a regional-scale resource for which groundwater, surface water and watercourse water are prescribed under South Australia's *Natural Resources Management Act 2004*. A water allocation plan provides for the sustainable management of the groundwater resource.

There are two groundwater systems within the Clare Valley region: (1) a Quaternary alluvial aquifer occurs at shallow depths of less than 15 m in valley floors and provides only a small portion of the groundwater resource (mainly in the vicinity of Stanley Flat); and (2) an extensive fractured rock aquifer (FRA) that underlies the Quaternary aquifer. It is the FRA that is the main groundwater system in the Clare Valley and is the focus of this report. Both aquifers are recharged by local rainfall.

The FRA, which provides groundwater for irrigation in the Clare Valley, comprises the Mintaro Shale, Saddleworth Formation, Undalya Quartzite and the Skillogalee Dolomite. Fracturing in the region is considered to be continuous and groundwater can flow across geological units. Within the FRA, the fractures act as conduits for groundwater flow. The groundwater yield of any particular well is dependent on the size, spacing and orientation of the fractures intercepted. The FRA can be divided into two zones: a relatively permeable zone in the upper 20–40 m, within which fractures are closely spaced (generally <0.5 m); and a deeper, low-permeability regional zone within which the size and spacing of fractures tends to decrease with depth.

Trends in groundwater levels and salinity in the Clare Valley 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.

2016 Status

The fractured rock aquifer of the Clare Valley PWRA has been assigned a green status for 2016:

2016 Status  Positive trends have been observed over the past five years

The 2016 status for the fractured rock aquifer is based on:

- most monitoring wells (76%) show a five-year trend of rising or stable groundwater levels
- most monitoring wells (64%) show a five-year trend of decreasing or stable groundwater salinity.

Rainfall

There are two rainfall stations within the Clare Valley PWRA. To provide with the best available data both of the rainfall stations are presented in this report. The Clare (Calcannia) rainfall station (BoM Station 21075), which can be found close to the northern boundary of the PWRA, recorded 518 mm of rainfall in the 2015–16 water-use year. This is 6% less than the long-term average annual rainfall and five-year average annual rainfall of 551 mm and 543 mm, respectively (Figs 1 and 2). The Watervale rainfall station (BoM Station 21054), located in the southern part of the area, recorded 613 mm of rainfall in the 2015–16 water-use year, which is 5% less than long-term average annual rainfall of 646 mm (1900–2016) and commensurate with the five-year average of 606 mm (Figs 1 and 3).

Although both rainfall stations recorded above-average rainfall in at least two of the past five years, a trend of declining rainfall is evident when compared with the long term average (Figs 2 and 3).

Water use

Licensed groundwater extractions across the Clare Valley PWRA totalled 845[1] ML in 2015–16. This is a 10% decrease from the previous water-use year, and 4% less than the five-year average of 875 ML (Fig. 4).

Groundwater levels

In the five years to 2016, the majority of monitoring wells (73%) show a trend of rising groundwater levels, with another 3% showing stable water levels (Fig. 5). The remaining monitoring wells show a trend of declining groundwater levels, with 8% showing their lowest level in 2016. Wells that show a decline in water level are often located in close proximity to those that show a rise. This follows an historical pattern of groundwater levels being influenced by local-scale variations in hydrogeological conditions and extraction regimes, and highlights the general non-uniform nature of fractured rock aquifers.

Groundwater salinity

Across the Clare Valley, the freshest groundwater generally occurs in locations with higher topography and higher rainfall, although in areas of dense groundwater development, such as Watervale and Mintaro, the groundwater salinity can vary considerably between adjacent wells. In 2016, all 17 monitoring wells show salinities ranging from less than 1000 mg/L to 3000 mg/L (Fig. 6). In the five years to 2016, 35% of monitoring wells show an increasing trend in salinity (Fig. 7). The remaining wells show stable salinities (59%) or a decreasing trend (6%). Four out of 17 wells show salinities greater than 1500 mg/L, which is the threshold salinity tolerance for most crop types, although historically all of these wells have consistently shown salinities above this threshold.

[1] The licensed groundwater use for the 2015–16 water-use year are based on the best data available as of February 2017 and may be subject to change, as some extraction volumes are in the process of being verified.

More information

To determine the status of the fractured rock aquifer in the Clare Valley PWRA for 2016, the trends in groundwater levels and salinities over the past five years (2012 to 2016, inclusive) were analysed 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.

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

To view the *Clare Valley PWRA Groundwater Level and Salinity Status Report 2009–10*, which includes background information on hydrogeology, rainfall and relevant groundwater-dependent ecosystems, please visit WaterConnect.

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

For further details about the Clare Valley PWRA, please see the *Water Allocation Plan for the Clare Valley Prescribed Water Resources Area* on the Natural Resources Northern and Yorke website.

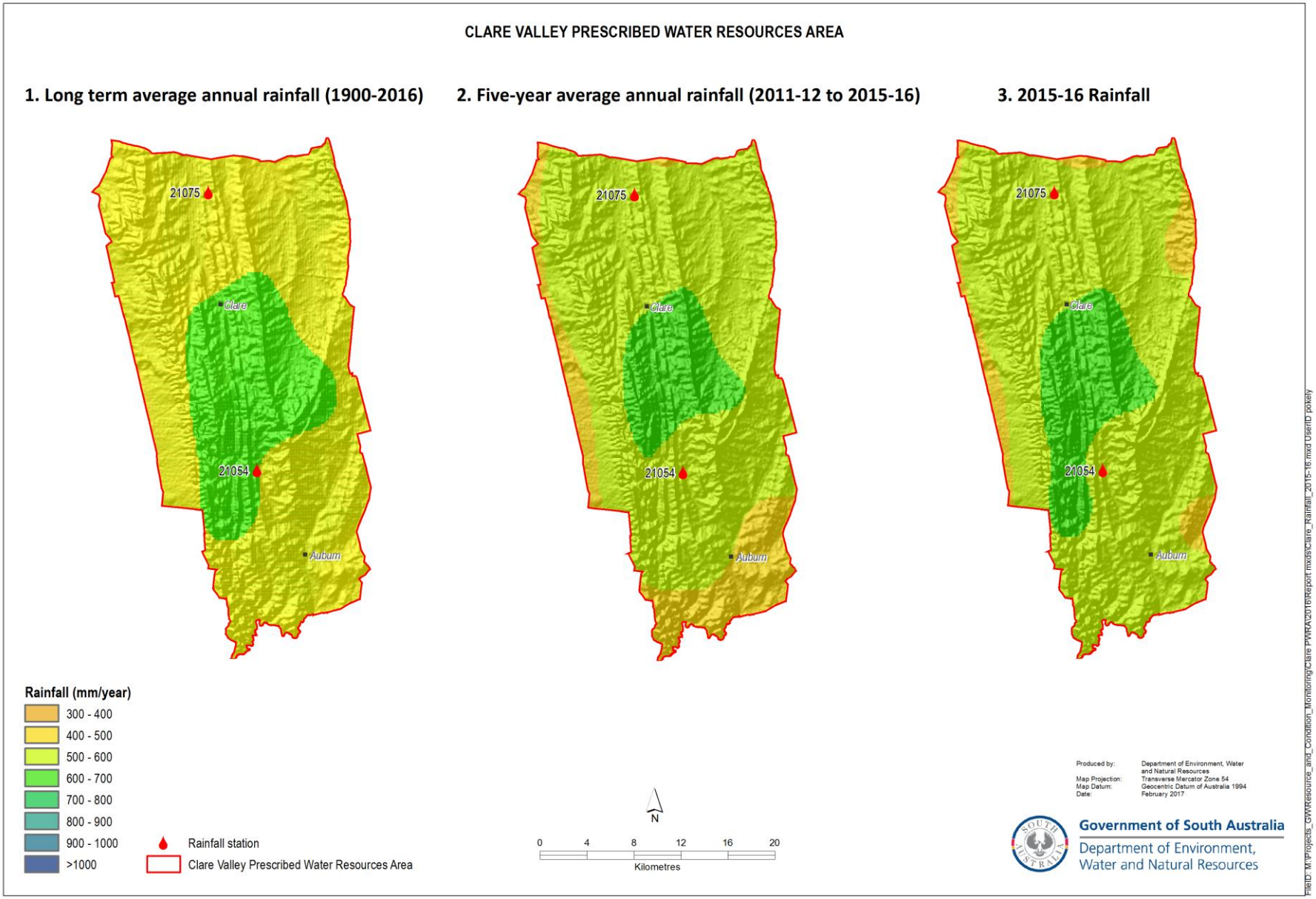


Figure 1. (1) Long-term and (2) ten-year average annual rainfall and (3) annual rainfall for the 2015–16 water-use year in the Clare Valley PWRA[2]

[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.

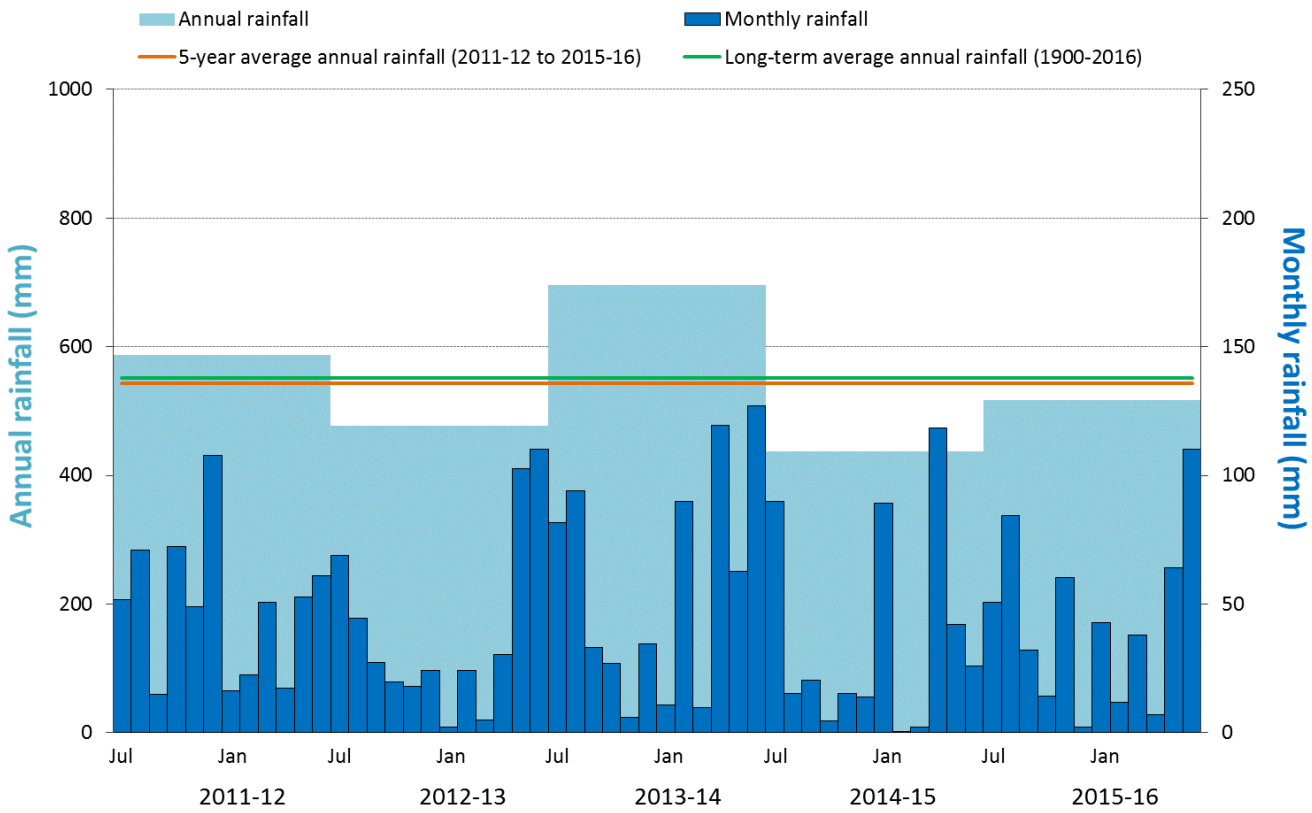


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Clare (Calcannia) (BoM Station 21075)[3]

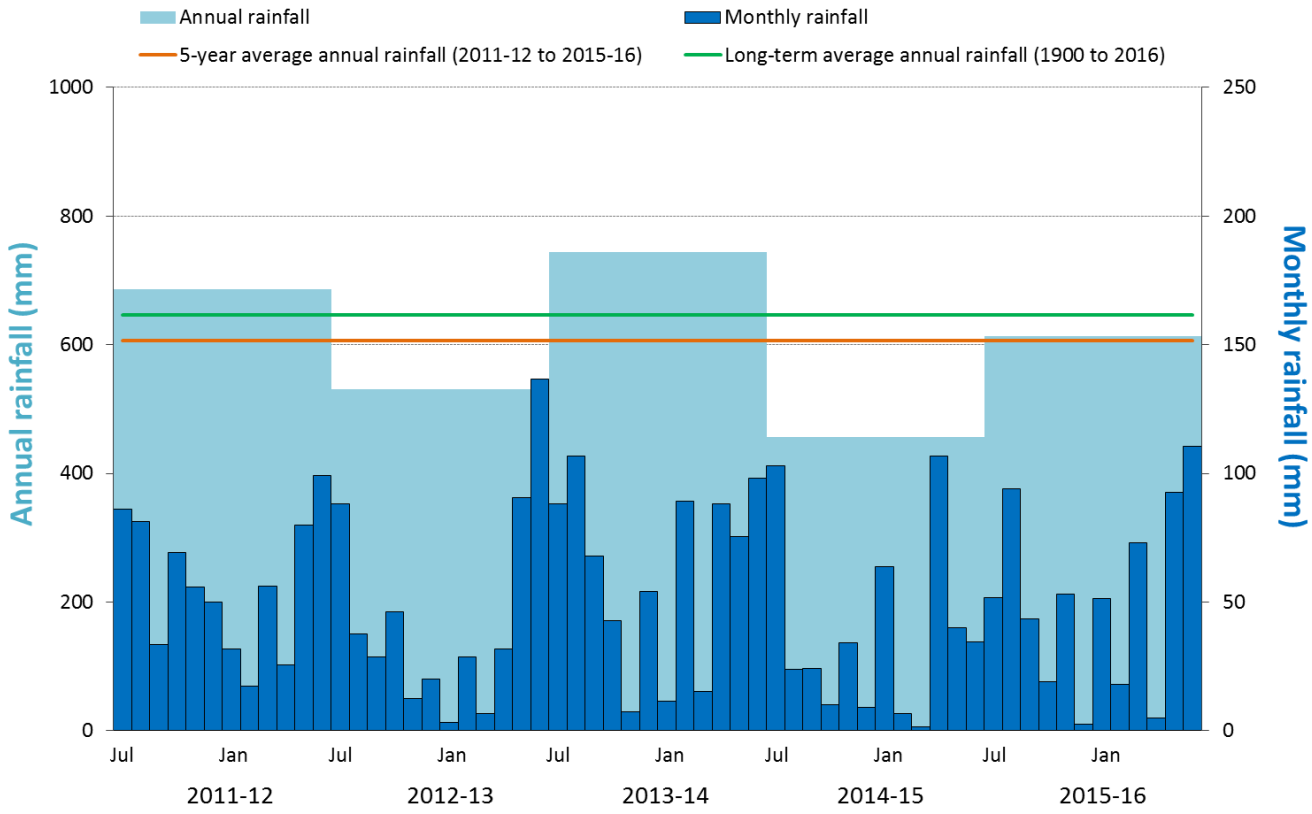


Figure 3. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Watervale (BoM Station 21054)[3]

[3] 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.

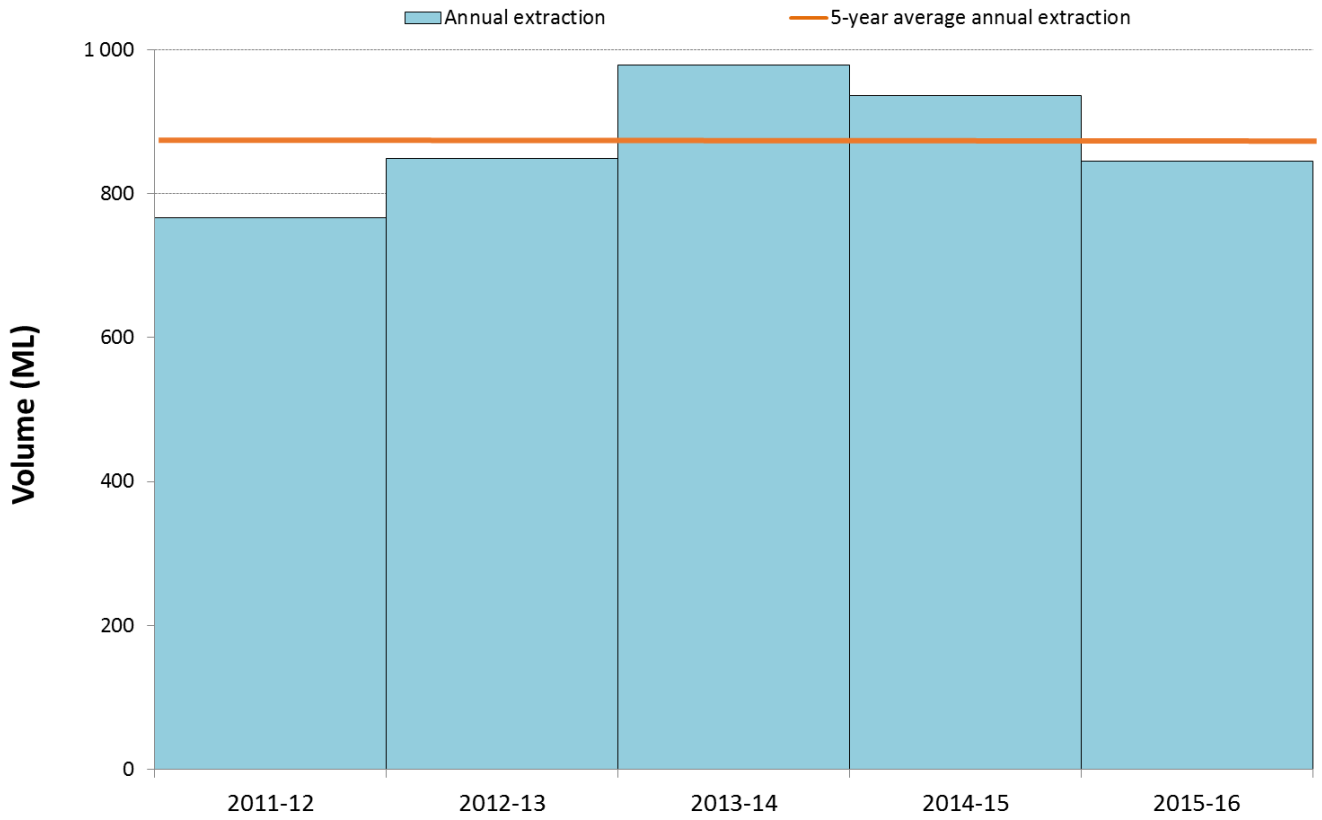


Figure 4. Licensed groundwater extraction volumes for the past five water-use years from the fractured rock aquifer in the Clare Valley PWRA[4]

[4] The licensed groundwater use s for the 2015–16 water-use year are based on the best data available as of February 2017 and may be subject to change, as some extraction volumes are in the process of being verified.

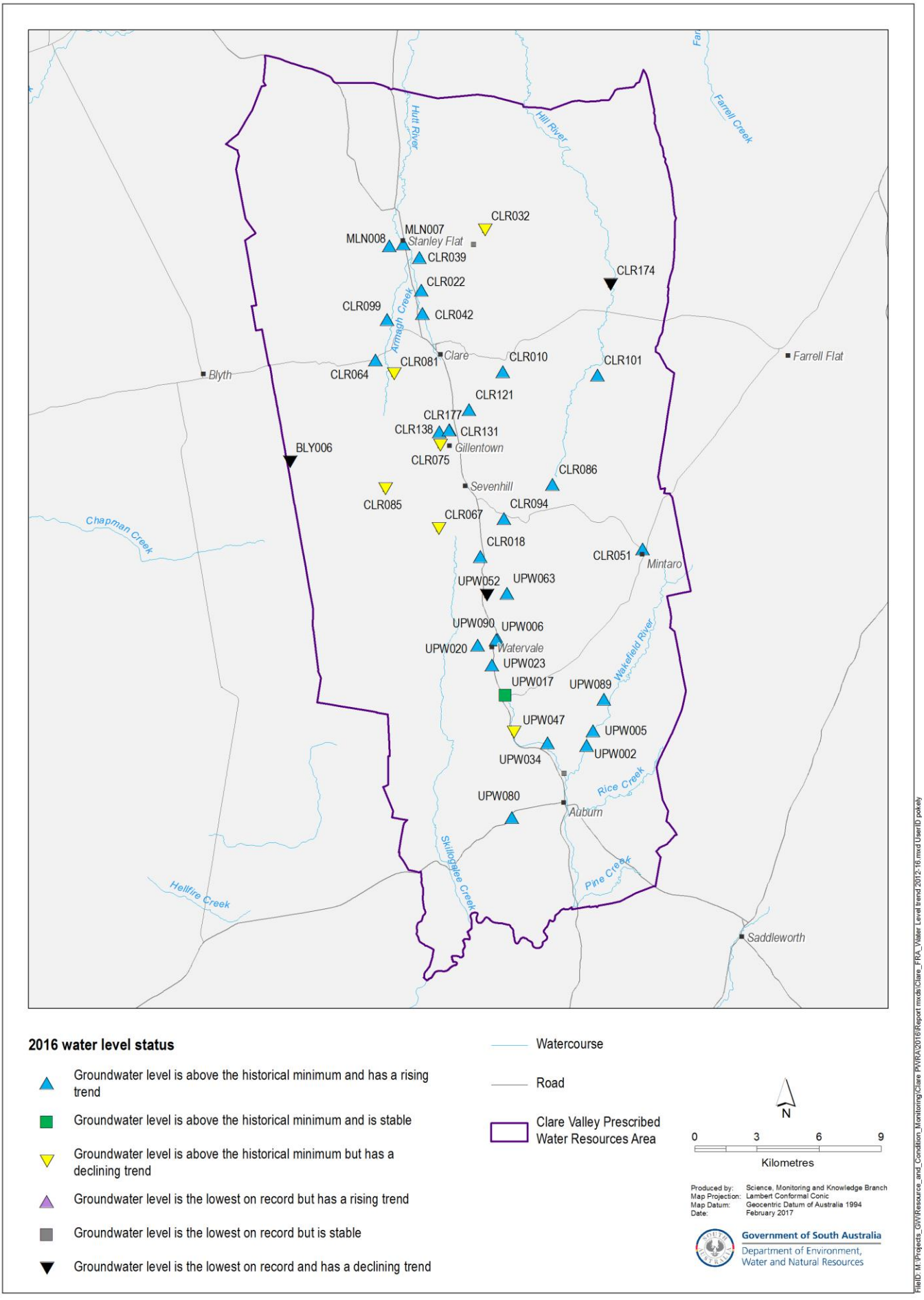


Figure 5. 2016 status of groundwater levels in the fractured rock aquifer (Clare Valley PWRA), based on the five-year trend from 2012 to 2016

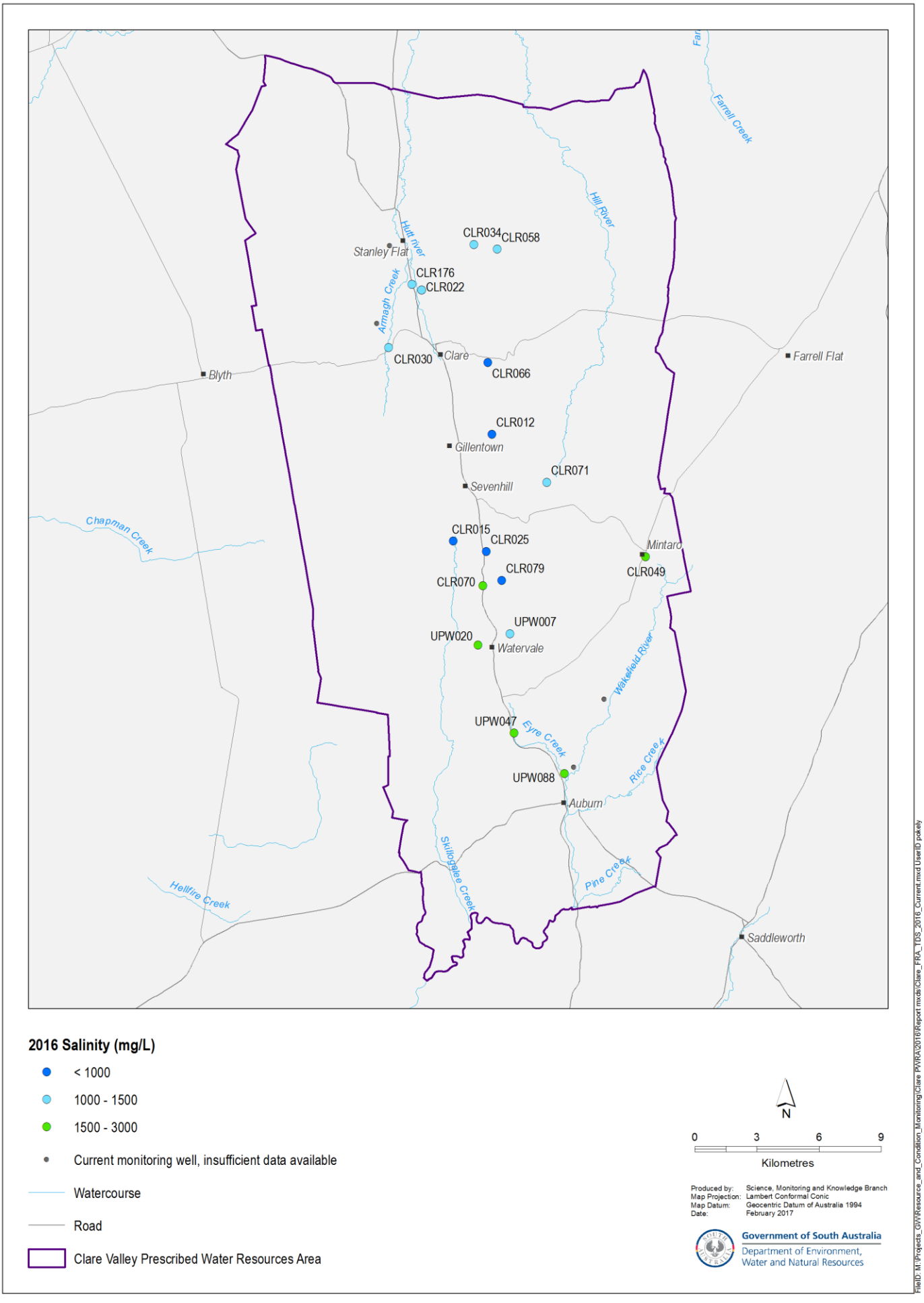


Figure 6. 2016 groundwater salinity of the fractured rock aquifer (Clare Valley PWRA)

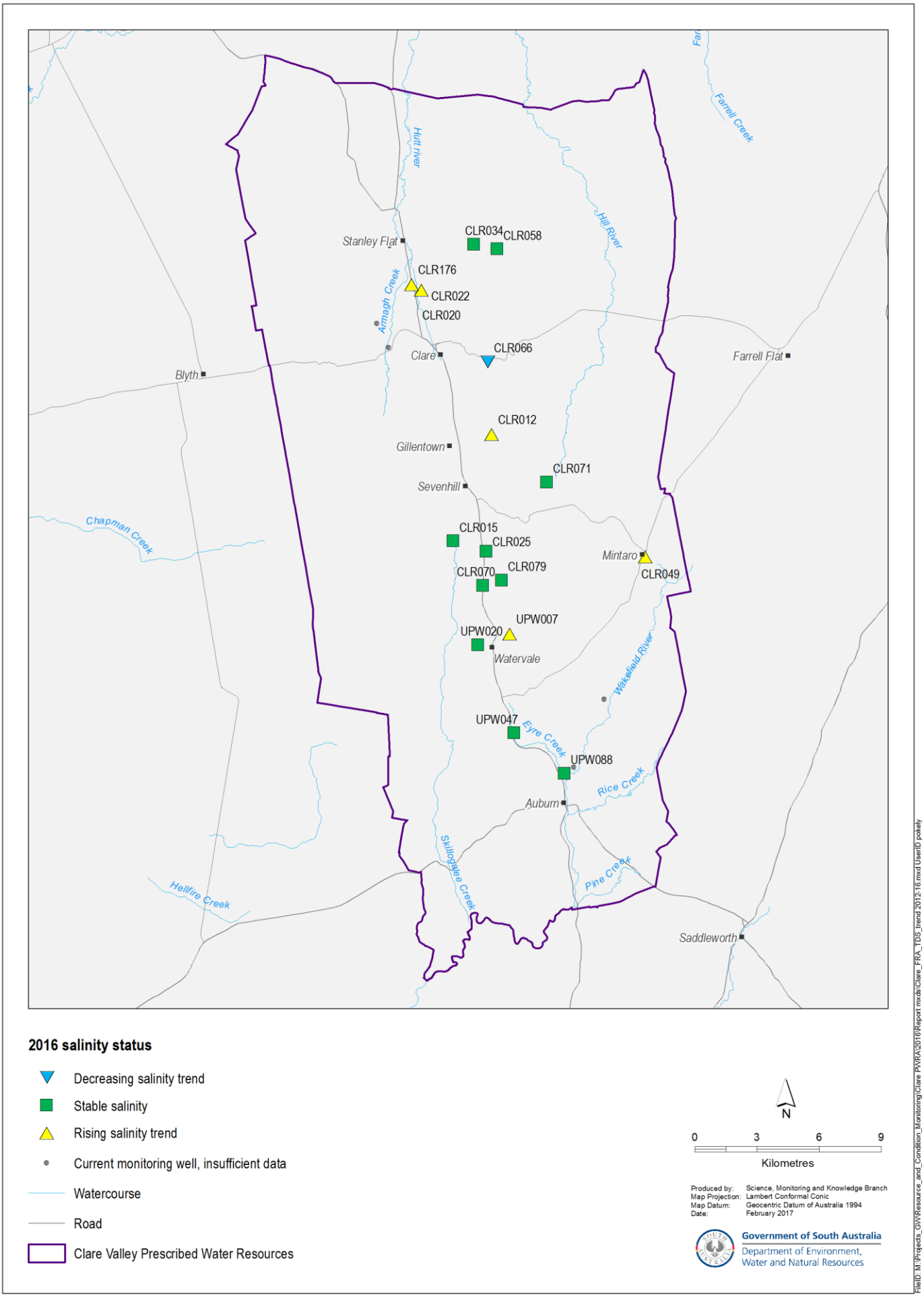


Figure 7. 2016 status of groundwater salinity in the fractured rock aquifer (Clare Valley PWRA), based on the five-year trend from 2012 to 2016

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