Angas Bremer PWA

Murray Group Limestone aquifer

2015 Groundwater level and salinity status report

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

Department of Environment, Water and Natural Resources
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	

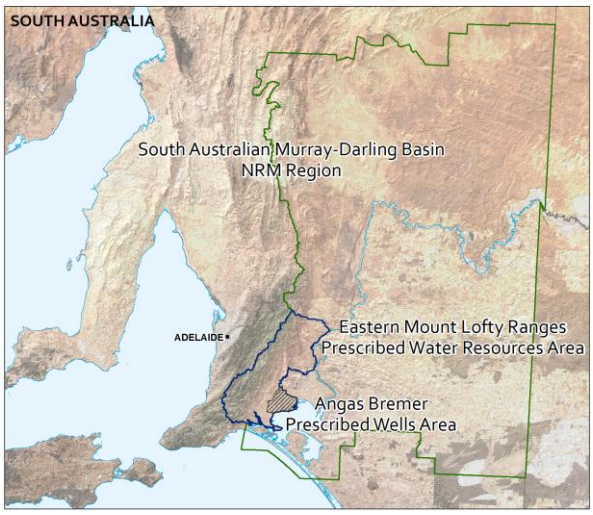
ISBN 978-1-925369-77-9

Preferred way to cite this publication

DEWNR, 2016, *Angas Bremer PWA Murray Group Limestone aquifer 2015 Groundwater level and salinity status report,* Government of South Australia, through the Department of Environment, Water and Natural Resources, Adelaide

Download this document at www.waterconnect.sa.gov.au

2015 Summary



The Angas Bremer Prescribed Wells Area (PWA) is located on the western side of Lake Alexandrina, approximately 60 km south-east of Adelaide. It is located within the boundary of the Eastern Mount Lofty Ranges Prescribed Water Resources Area (PWRA), which lies within the South Australian Murray-Darling Basin NRM Region. It is a regional-scale resource for which groundwater resources are prescribed under South Australia's Natural Resources Management Act 2004. Water management policy for the Angas Bremer PWA has been incorporated into the Water Allocation Plan for the Eastern Mount Lofty Ranges and provides for the sustainable management of the groundwater resources.

There are three aquifer formations underlying the Angas Bremer PWA, namely: the Quaternary aquifer; confined Murray Group Limestone (MGL) aquifer; and Renmark Group aquifer. All licensed groundwater extractions occur from the MGL aquifer, which is the focus of this report.

The MGL aquifer is up to 100 m thick and varies in composition from soft clayey limestone, hard sandy limestone to soft bryozoal limestone layers. The direction of groundwater flow is generally south-east towards Lake Alexandrina. Irrigation water is obtained mainly from the fossiliferous limestone member, which can be cavernous in some areas. Well yields vary from about 5 L/s in the north to over 15 L/s in the south, with yields up to 40 L/s in some places.

Despite being a confined aquifer that does not receive direct recharge from rainfall, the intensity and timing of rainfall and subsequent extraction practices can have an effect on groundwater pressure levels and salinity in the MGL aquifer. For example, if the region experienced above-average rainfall during typically dry summer months, this could result in less groundwater being extracted from the aquifer for irrigation, and therefore smaller declines (or possibly rises) in groundwater levels and stable or decreasing salinity.

The Langhorne Creek rainfall station (BoM Station 24515) is located within the Angas Bremer PWA and recorded 385 mm of rainfall in the 2014–15 water-use year. This is just 4 mm less than long-term average annual rainfall (1900 to 2015) of 389 mm and 42 mm less than five-year average annual rainfall (2010–11 to 2014–15) of 427 mm (Figs. 1 and 2). However, monthly rainfall data show a temporally uneven spread of rainfall with January (66 mm—the highest for the past 50 years), April and May recording above-average rainfall, and the remaining months recording totals below their long-term average. Though the five-year average annual rainfall is greater than the long-term average, a trend of declining rainfall over the past five years is evident (Fig. 2).

In 2014–15, licensed extractions totalled 2315[1] ML, an increase of 39% from the previous water-use year and 11% above the five-year average of 2096 ML (Fig. 2). This includes water that has been stored in the aquifer by irrigators over previous years via managed aquifer recharge (MAR). The increase in groundwater extraction in 2014–15 is likely to be due to the below-average rainfall during most of the irrigation season. The total volume of managed aquifer recharge to the MGL aquifer in the 2014–15 water-use year was 905[1] ML, which represents a 25% decrease from 2013–14 (Fig. 4).

In the Angas Bremer PWA, monitoring well hydrographs show seasonal fluctuations to varying degrees and, prior to the marked reduction in groundwater extraction in the early-1990s, groundwater pressure level trends that were stable or declining. The early-1990s reductions were in response to the increased availability of River Murray water allocations sourced from Lake Alexandrina, which resulted in a substantial recovery in groundwater pressure levels. Recovery continued until the 2006 drought, when groundwater extractions increased due to the decreasing availability of River Murray water from Lake Alexandrina (due to access and salinity problems) and pressure levels declined.

In the five years to 2015, all 35 monitoring wells show a trend of rising groundwater pressure levels (Fig. 5). The widespread rises, which range between 0.02 and 0.3 m/y with a median of 0.1 m/y, are attributed to the reduced demand on groundwater resources following the recovery of Lake Alexandrina, coupled with the high rates of managed aquifer recharge.

[1] The licensed groundwater use and managed aquifer recharge volumes for the 2014–15 water-use year are based on the best data available as of February 2016 and may be subject to change, as some extraction volumes are in the process of being verified.

Increases in salinity in the MGL aquifer have been identified as the main threat to the long-term sustainability of irrigation in the Angas Bremer PWA. Downward leakage from the overlying brackish to saline Quaternary aquifer is the predominant cause of salinity increases, and is driven by hydraulic head differences between the two aquifers. The rate of downward leakage is generally higher during and following periods of high extraction, both at the regional scale and locally where large drawdowns occur around individual irrigation wells. However, short-term salinity monitoring (i.e. over the past 10 years) shows stable or decreasing salinities, probably due to aquifer freshening as a direct result of MAR (injection of low-salinity water), and indirectly through a reduced rate of inter-aquifer leakage. Pockets of low-salinity groundwater are likely to be localised effects of MAR schemes.

Each year, irrigators in the Angas Bremer PWA submit a salinity sample from their irrigation wells to the Department of Environment, Water and Natural Resources (DEWNR) for analysis. Results of the analyses have been included in this report to augment measurements from DEWNR's salinity monitoring network (Fig. 6). While the salinity concentrations are mostly greater than 1500 mg/L, which is generally considered to be the salinity tolerance level for most crop types, these are typical for the MGL aquifer in this region.

In the five years to 2015, salinity has decreased in 50% of wells, while the remaining 50% show stable salinities (Fig. 7).

The Water Allocation Plan (WAP) for the EMLR PWRA region has identified resource condition indictors that apply to the MGL aquifer within the Angas Bremer PWA. These limits are designed to give early warning of unfavourable trends in salinity that may affect other users of the resource. As stated in the WAP, the water resources to be monitored in the Angas Bremer PWA are the two zones (Zone A and Zone B) where the groundwater salinity is 2500 mg/L or less, as identified in the Angas Bremer PWA Groundwater Level and Salinity Status Report 2007. If an increase in groundwater salinity of 1.5% or more per year for three consecutive years across at least 50% of monitoring wells occurs, then an investigation is triggered. As no wells within the monitored zones have had three consecutive years of salinity increases greater than 1.5%, the resource conditions limits have not been exceeded.

To determine the status of the MGL aquifer for 2015, the trends in groundwater pressure 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 Murray Group Limestone aquifer of the Angas Bremer 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 Murray Group Limestone aquifer is based on:

- all monitoring wells show a five-year trend of rising groundwater pressure level
- all monitoring wells show 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 *Angas Bremer PWA Groundwater Level and Salinity Status Report 2009–10*, 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 Angas Bremer PWA, please visit Groundwater Data on WaterConnect.

For further details about the Angas Bremer PWA, please see the *Water Allocation Plan for the Eastern Mount Lofty Ranges* on the Natural Resources South Australian Murray-Darling Basin website.

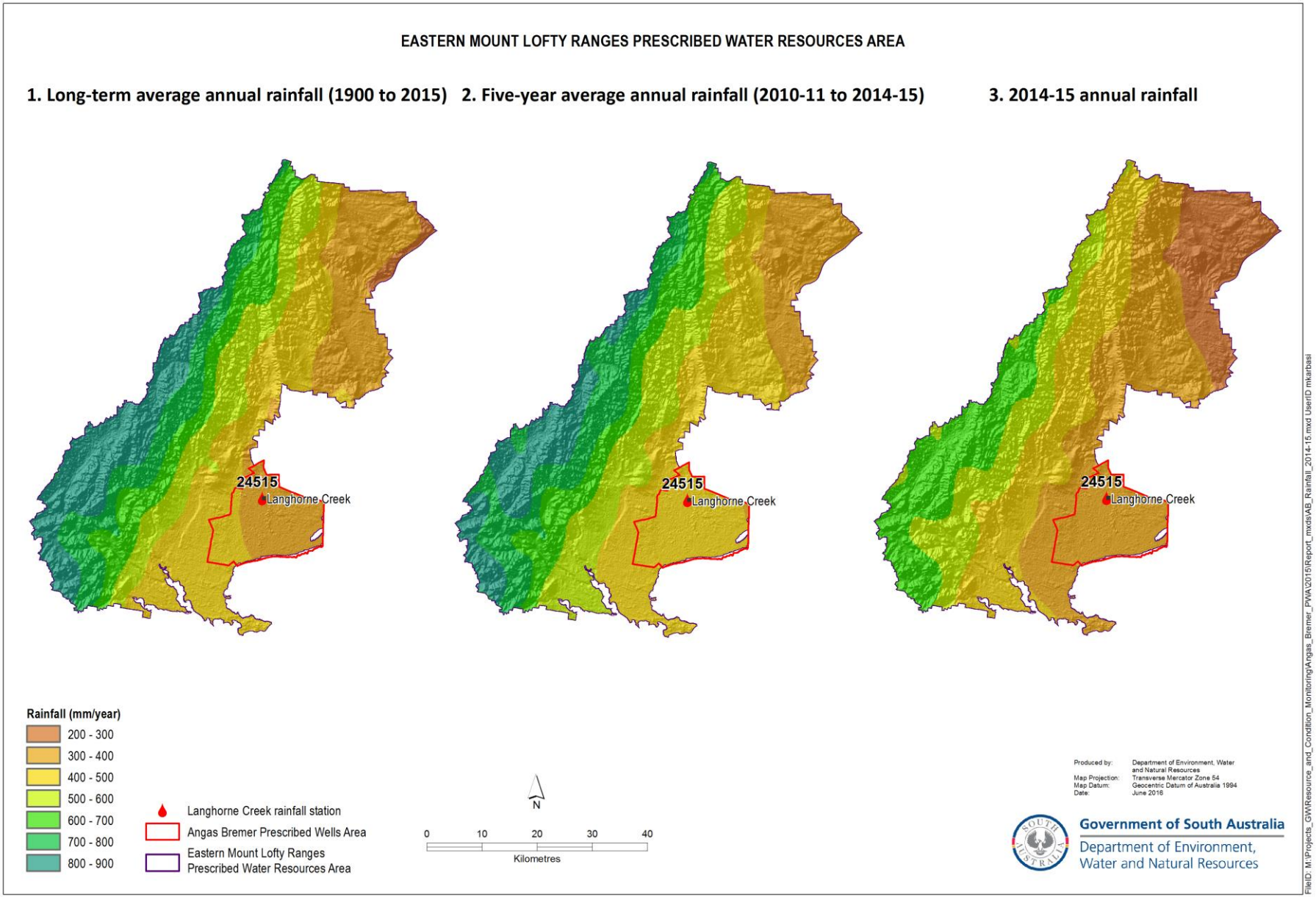


Figure 1. (1) Long-term and (2) five-year average annual rainfall, and (3) annual rainfall for the 2014–15 water-use year in Angas Bremer Prescribed Wells Area[2]

[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.

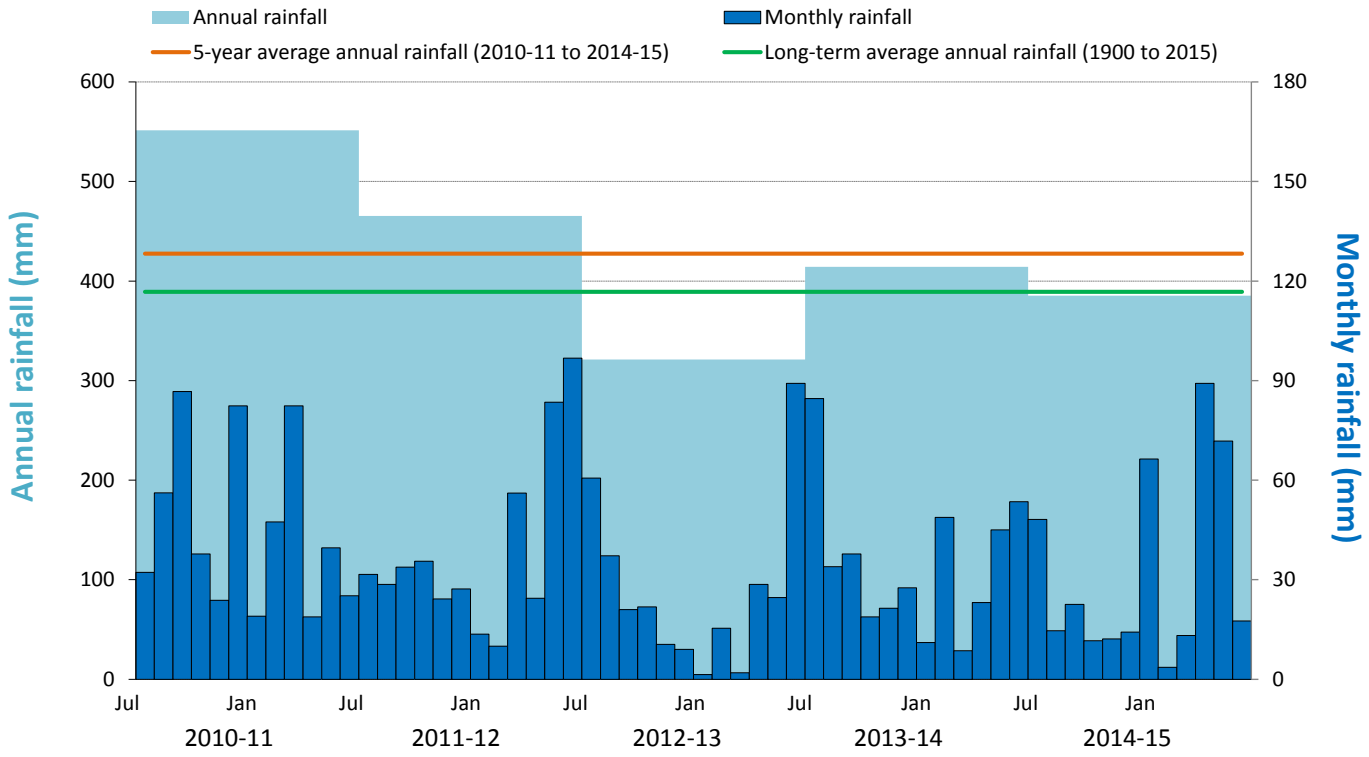


Figure 2. Annual (July–June) and monthly rainfall for the past five water-use years, and the five-year and long-term average annual rainfall recorded at Langhorne Creek (BoM Station 24515)[3]

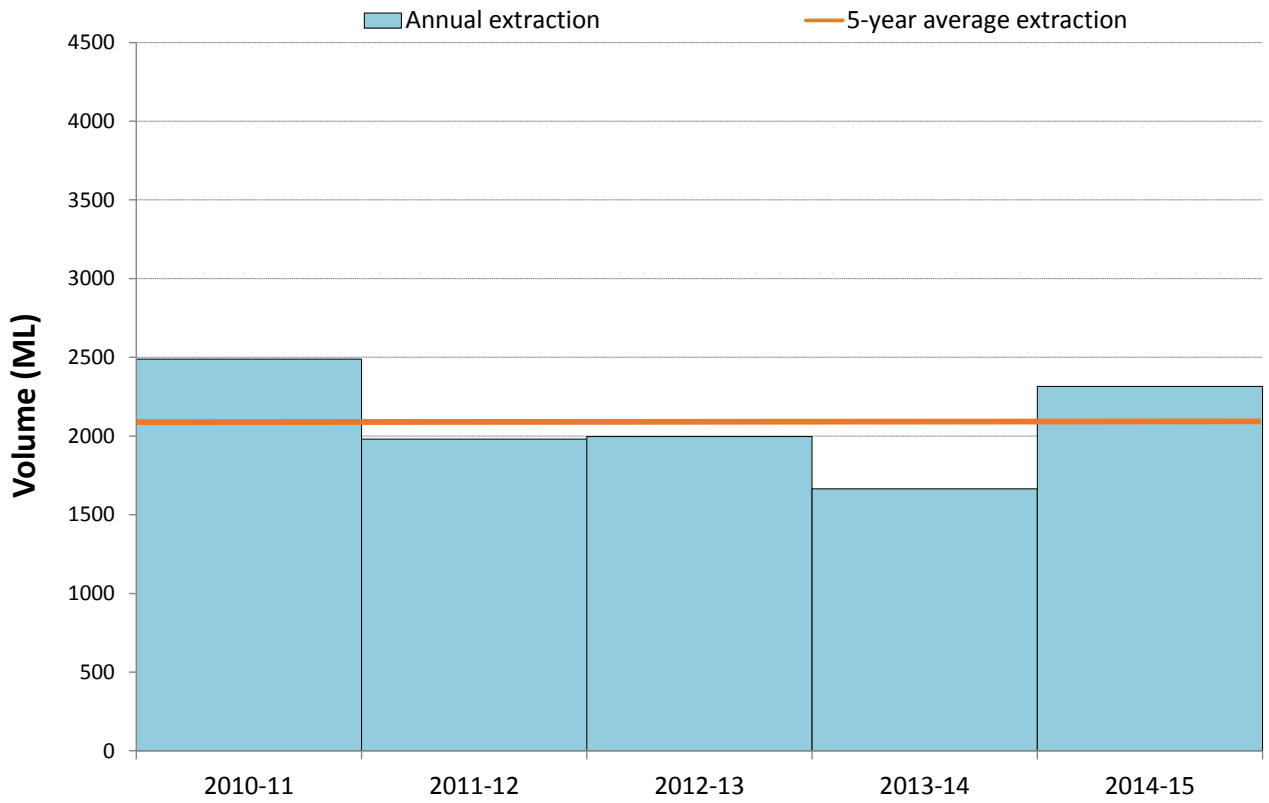


Figure 3. Licensed groundwater extraction volumes[4] for the past five water-use years, for the Murray Group Limestone aquifer in the Angas Bremer Prescribed Wells Area

[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.

[4] The licensed groundwater use and managed aquifer recharge volumes for the 2014–15 water-use year are based on the best data available as of February 2016 and may be subject to change, as some extraction volumes are in the process of being verified.

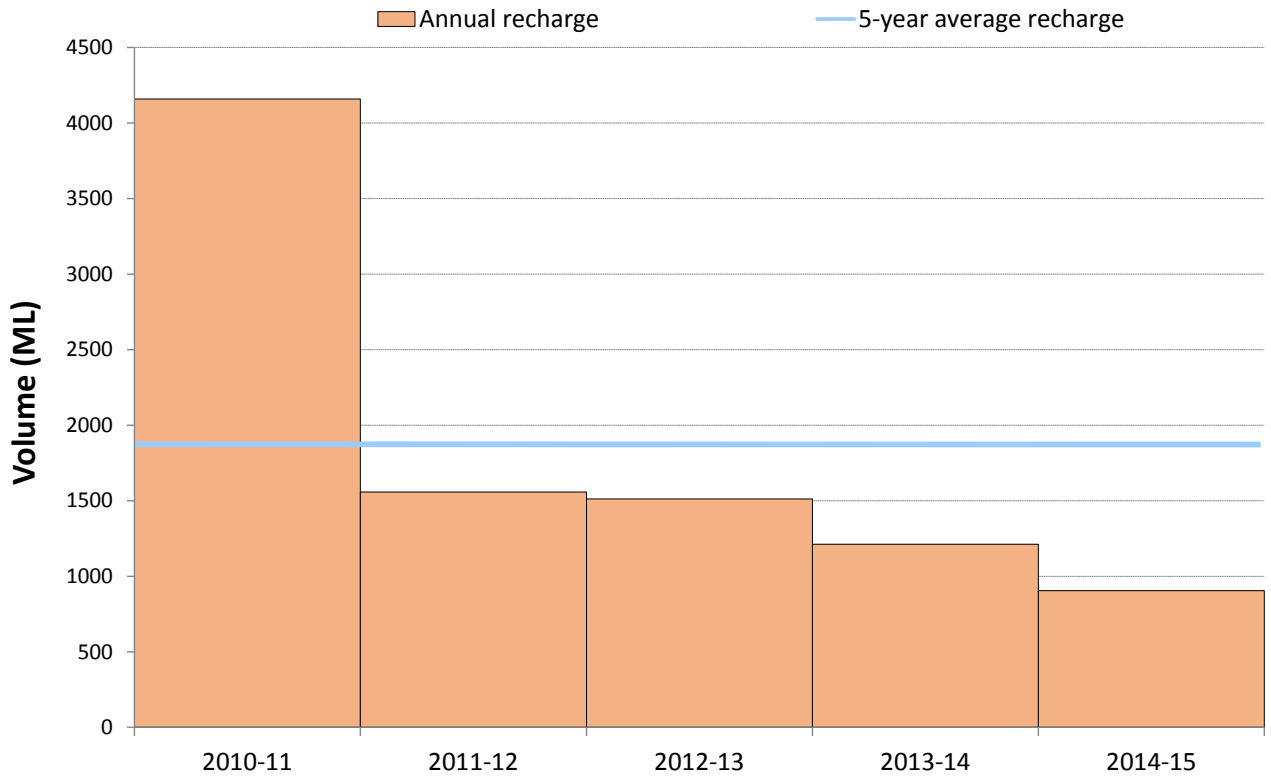


Figure 4. Managed aquifer recharge volumes[5] for the past five water-use years, for the Murray Group Limestone aquifer in the Angas Bremer Prescribed Wells Area

[5] The licensed groundwater use and managed aquifer recharge volumes for the 2014–15 water-use year are based on the best data available as of February 2016 and may be subject to change, as some extraction volumes are in the process of being verified.

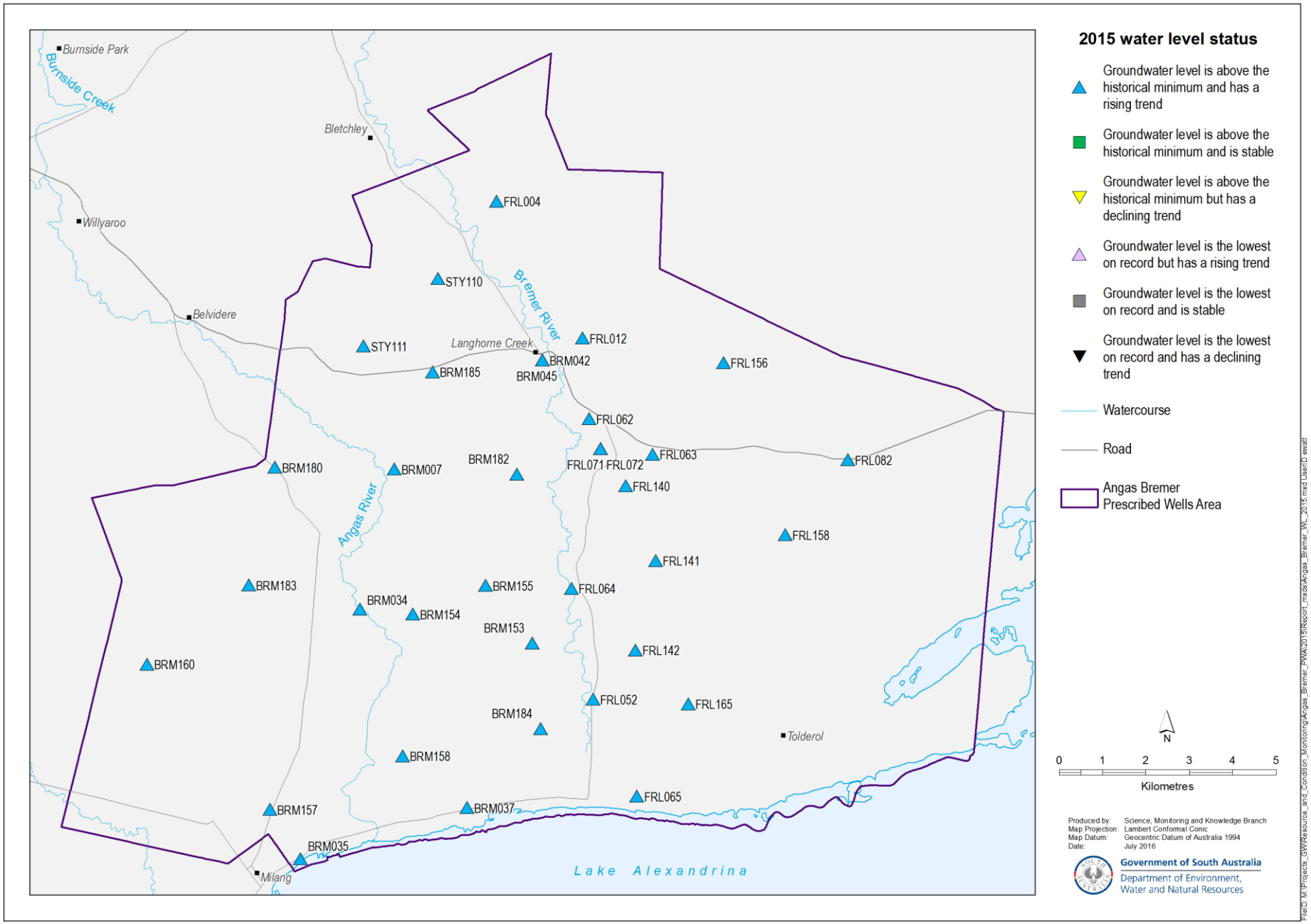


Figure 5. 2015 status of groundwater pressure levels in the Murray Group Limestone aquifer (Angas Bremer Prescribed Wells Area) based on the 5-year trend from 2011 to 2015

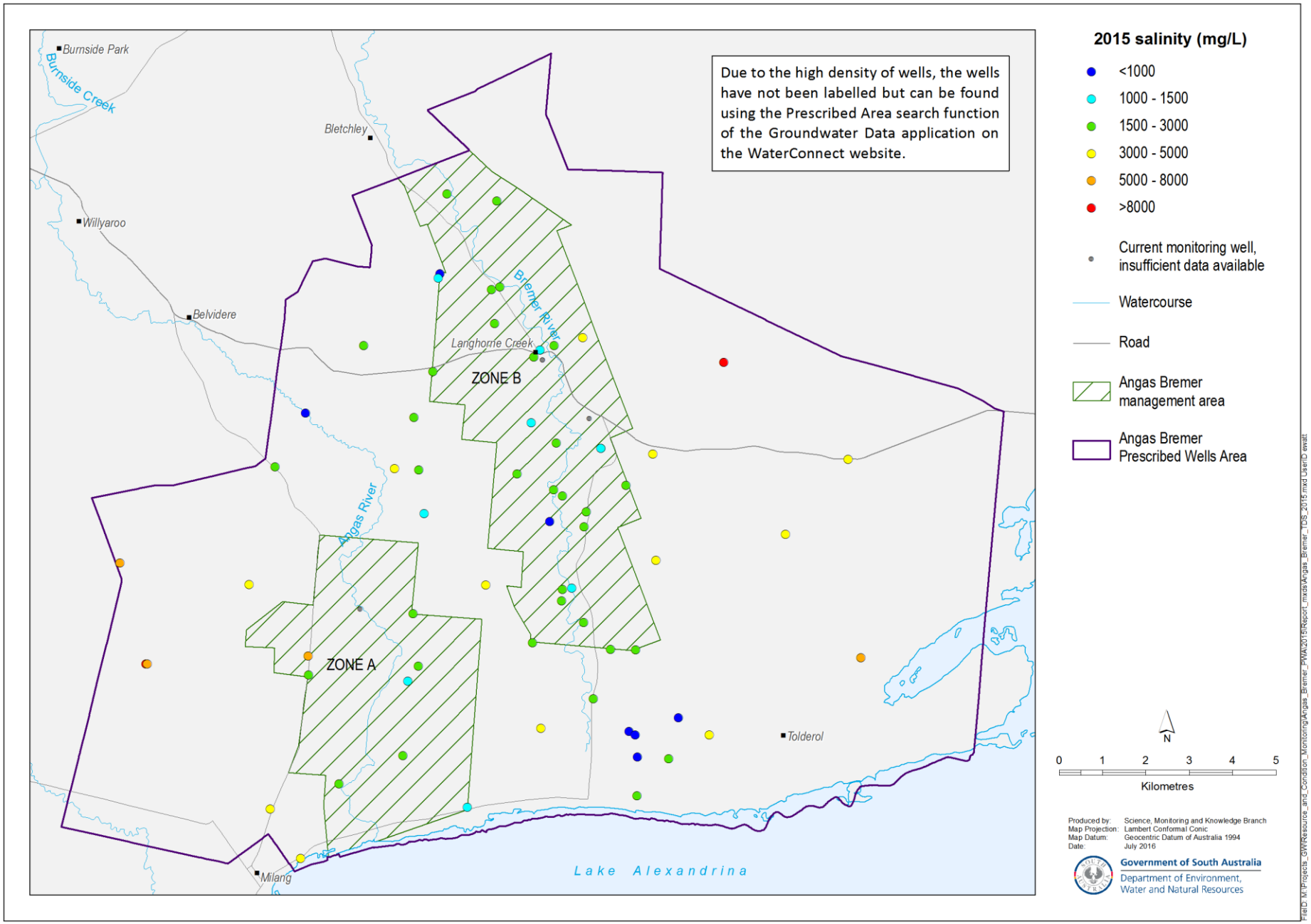


Figure 6. 2015 groundwater salinity of the Murray Group Limestone aquifer (Angas Bremer Prescribed Wells Area)

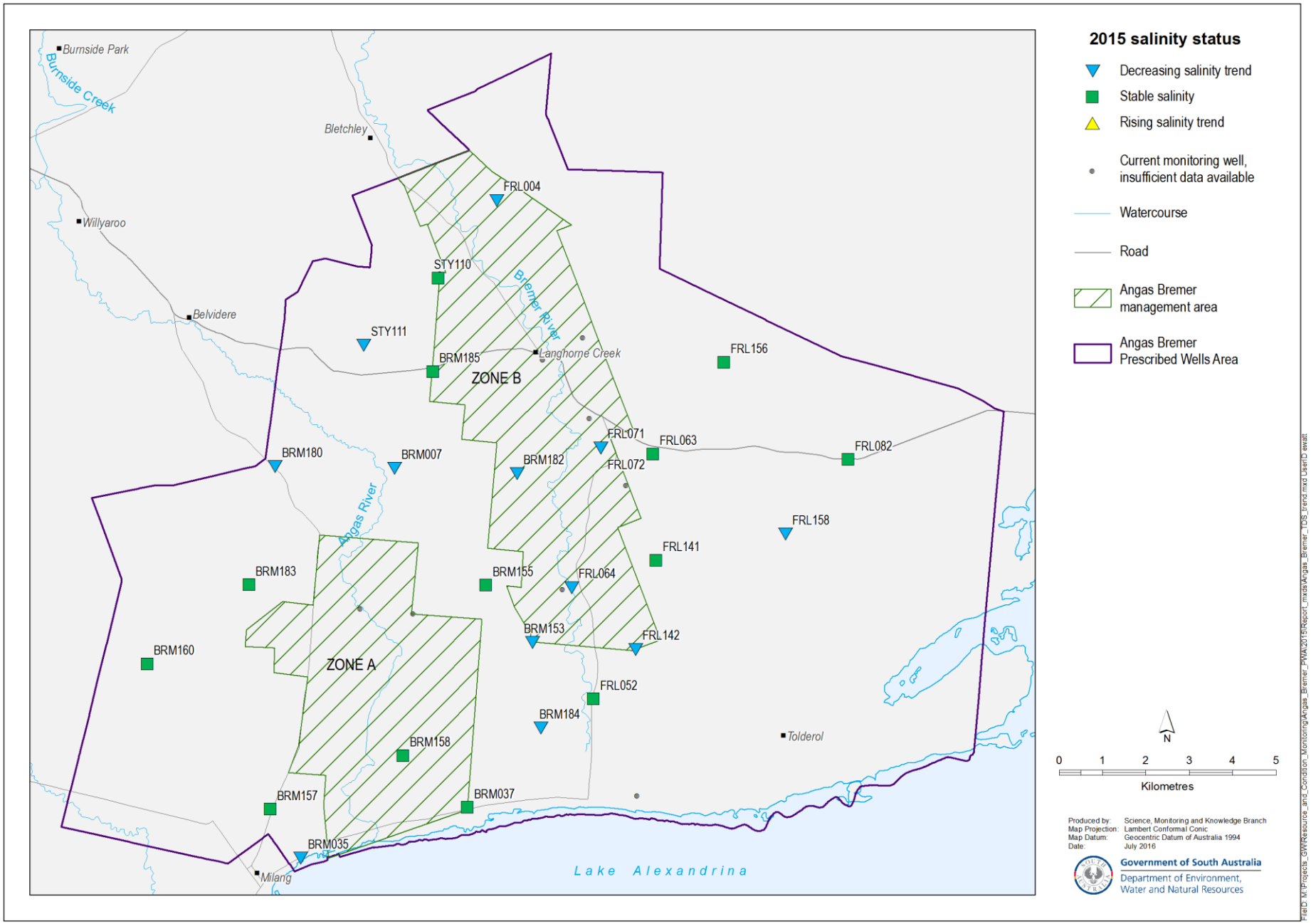


Figure 7. 2015 status of salinity in the Murray Group Limestone aquifer (Angas Bremer Prescribed Wells Area) based on the 5-year trend from 2011 to 2015

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