

NOTES

DATA CLEANING METHOD

There are limitations associated with water trade information reported in the state-based registers, specifically the timeliness and accuracy of reported prices. To filter out outlier prices and generate robust statistics about market activity, Aither uses a proprietary and tested data cleaning method. Aither uses its data cleaning programs to analyse Aither's southern Murray–Darling Basin water trade database which includes over 300,000 individual allocation and entitlement trade records.

There continues to be potential for further improvements in water markets data and in the efficient operation of water markets. In addition, state water registers remain unable to separately report transfers between environmental holdings or related parties, which complicates analysis of allocation and entitlement trade volume and price.

ROUNDING ERRORS

Rounding errors may result in slightly different numbers being presented in this report as can be calculated from raw data and calculations.

IRRIGATION CORPORATION TRADE DATA

A significant volume of water trade occurs within irrigation corporations, for which detailed data – especially in relation to prices of trades – is not generally publicly available in a timely manner. Due to these data availability and transparency issues, Aither has excluded trades within irrigation corporations from all analysis within this report unless explicitly identified.

AITHER ENTITLEMENT INDEX

Like indices used in commodity and equity markets, the Aither Entitlement Index (AEI) provides a simple overall snapshot of how the major water entitlements in the southern MDB are performing. Updated monthly and freely available, water market participants can use the AEI to benchmark the capital value performance of water portfolios and investments over time.

The following dot points explain the AEI's scope and method.

- **Scope:** The AEI tracks the performance (capital value) of a group of major water entitlement types across the southern MDB. The AEI covers the following entitlement types: NSW Murray HS; NSW Murray GS; NSW Murrumbidgee HS; NSW Murrumbidgee GS; VIC 7 Murray (Barmah to SA) HRWS; VIC 7 Murray (Barmah to SA) LRWS; VIC 1A Greater Goulburn HRWS; VIC 1A Greater Goulburn LRWS; VIC 6 Murray (Dart to Barmah) HRWS; VIC 6 Murray (Dart to Barmah) LRWS; SA Murray (Class 3) HS.
- **Timing:** The AEI is calculated on a monthly basis and is indexed to 100 in July 2008. The index commenced from this date as this is when sufficiently reliable data became available.
- **Prices:** Historical monthly entitlement prices are calculated as volume-weighted averages from state water register data. Since June 2015, Aither has used prices based on monthly entitlement valuations that we undertake in-house.
- **Index method:** The computation of the AEI uses a Tornqvist-Theil Price Index method. The AEI is not an accumulation index.

NOTES

TABLE NOTES

Table 1: Aither has applied a cleaning methodology to remove outlier and \$0 trades before calculating volume-weighted average prices.

Table 2: All reported trades are included in all calculations. Total net trade calculations will not necessarily equal zero because some connected systems are not included in this analysis. Victorian data includes an adjustment for pooled accounts and reflects information available on the public Victorian Water Register.

Table 3: Trades with a reported price greater than \$0 per ML are included in all calculations. Total net trade calculations will not necessarily equal zero because some connected systems are not included in this analysis. Victorian data includes an adjustment for pooled accounts and reflects information available on the public Victorian Water Register.

Table 4: Outlier entitlement trades have been excluded from price calculations. All reported trades are included in calculations of number and volumes of trade regardless of reported price. Trade within irrigation corporations is not included in calculations in this table.

Table 5: Estimated environmental entitlements are based on Commonwealth Environmental Water Holder reported portfolio. Size of market calculations are based on total entitlement on issue minus estimated environmental entitlements multiplied by the volume-weighted average price for a given entitlement type.

Table 6: All reported trades are included in calculations of number and volumes of trade. Estimated turnover value calculations are based on total volume transferred multiplied by annual volume-weighted average price for a given entitlement type. Liquidity calculations exclude water allocated to entitlements held by environmental water holders (see note in Table 4). Returns are presented in gross terms; they do not account for any fees or charges associated with holding entitlements or trading allocations. In zones which received 0 per cent water allocation for the 2016-17 water year, no returns are recorded because it was not possible to trade water allocations not received (carryover water would be an exception, but this has been excluded for simplicity). Return calculations do not include capital appreciation. Trade within irrigation corporations is not included in calculations in this table.

FIGURE NOTES

Figure 1: For the purposes of this report and Aither's analysis, we have defined the southern Murray–Darling Basin as comprising of the Vic Goulburn, Vic Murray, NSW Murray, NSW Murrumbidgee and SA Murray.

Figure 4: Weather stations used are as follows: Albury Airport AWS 72160; Deniliquin Airport AWS 74258; Mildura Airport 76031; Renmark Irrigation 24003; Shepparton Airport 81125; and Yanco Agricultural Institute (Leeton) 74037.

Figure 5: Major headwater storages include Burrinjuck (Murrumbidgee), Blowering (Murrumbidgee), Dartmouth (Murray), Hume (Murray) and Lake Eildon (Goulburn).

Figure 6, 9: Estimated water allocated to purchased Commonwealth environmental water is based on known environmental water purchases. Additional water purchases and water recovered through efficiency measures are not included in this figure. Figures only include entitlement and allocation announcements, and do not include carryover water.

Figure 7: Excludes existing carryover and distributions from irrigation corporations.

Figure 8: For a full description of the underlying data and assumptions, please see Aither, 2019b. These estimates are based on underlying ABS data, and supplemented with known additional plantings and assumed growth profiles.

Figure 11, 12: Aither has applied a cleaning methodology to remove outlier and \$0 trades before calculating volume-weighted average prices. No trades are excluded on the basis of reported price from volume calculations. Trade within irrigation corporations is not included in calculations in this figure. Only 'within' and 'into' allocation trades have been included in volume and price calculations. 'Out of' allocation trades have been excluded on the basis that it would double count trades between zones. Combined Murray includes Zones 6, 7, 10 and 11. Combined Goulburn includes Zones 1 and 3.

Figure 13: Aither has applied a cleaning methodology to remove outlier and \$0 trades before calculating volume-weighted average prices. No trades are excluded on the basis of reported price from volume calculations. Only 'within' and 'into' allocation trades have been included in volume and price calculations. 'Out of' allocation trades have been excluded on the basis that it would double count trades between zones.

Figure 15, 16, 17: Aither has applied a cleaning methodology to remove outlier and \$0 trades before calculating volume-weighted average prices. No trades are excluded on the basis of reported price from volume calculations.

Authors: Kai Wakerman Powell, Erin Smith, Edmund Delves and Chris Olszak

For more information about this report:

Chris Olszak (Director)
chris.olszak@aither.com.au

© 2019 Aither Pty Ltd. All rights reserved.

This document has been prepared on the basis of information available to Aither Pty Ltd at the date of publication. Aither Pty Ltd makes no warranties, expressed or implied, in relation to any information contained in this document. This document does not purport to represent investment, commercial, financial or legal advice, and should not be relied upon as such. Aither Pty Ltd does not accept responsibility or liability for any loss, damage, cost or expense incurred or arising by reason of any party using or relying on information provided in this document. Any party that uses information contained in this document for any purpose does so at its own risk.

The information contained in this document must not be reproduced or used, in whole or in part, for any purpose without the express written permission of Aither Pty Ltd.

Images courtesy of the Earth Science and Remote Sensing Unit, NASA Johnson Space Center (<http://eol.jsc.nasa.gov>).

A I T H E R