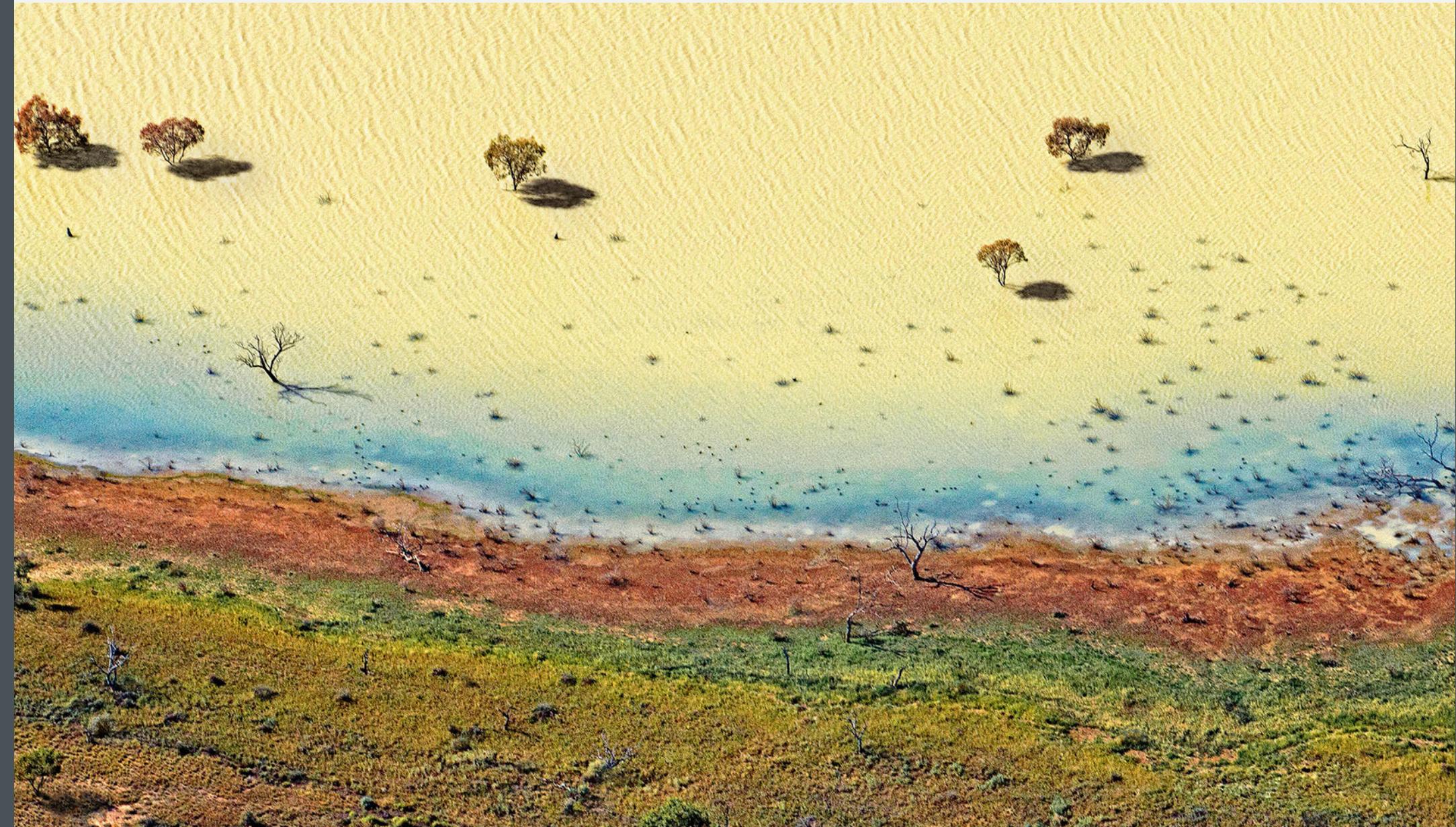


A I T H E R

WATER MARKETS REPORT
2014-15 review and 2015-16 outlook



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PURPOSE

Aither uses its experience in the design, implementation and operation of Australia's water markets to help improve decision making by governments, regulators and market participants in both the public and private sectors. We have prepared this report to provide our clients with information regarding recent water markets activity and drivers.

This report may also help other interested parties to improve their understanding of Australia's water markets, and provide an indication of the types of analysis and insight Aither is able to provide.

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SUMMARY

Aither's Water Markets Report 2014-15 (the Report) provides an overview of water market activity in major water trading zones in the southern Murray-Darling Basin (sMDB) for the 2014-15 water year. The Report also compares results with the 2013-14 water year and comments on the outlook for 2015-16.

During 2014-15, there was a substantial increase in prices for both water entitlements and allocations, with prices for both also increasing rapidly towards the end of the year.

- In 2014-15, water allocation prices began as low as \$70 per megalitre (ML) but finished as high as \$155 per ML, with annual averages of between \$105 per ML and \$125 per ML.
- Spot market prices were as high as \$160 per ML in June 2015 with forward contracts as high as \$170 per ML. These prices were substantially higher than those in 2013-14, which had averages of between \$60 and \$80 per ML.
- In 2014-15, prices for different types of sMDB water entitlements increased by between 5 per cent and 32 per cent compared to 2013-14, based on register data.
- Recent water entitlement sales suggest that market prices in June 2015 were 10 to 45 per cent higher than prices reported in the registers (the discrepancy is due to time lag in registering transfers and other factors).

The combined value of market turnover for the major water entitlement classes in the sMDB in 2014-15 was close to \$400 million. Liquidity amongst different entitlements varied from 1 per cent for Murrumbidgee High Security, to 17 per cent for Victorian Murray Low Reliability Water Shares.

Increasing water allocation prices are being driven by deterioration in total water availability and expectations about the forward seasonal outlook.

Aither's water allocation price modelling suggests that allocation prices may increase to around \$300 per ML in 2014-15, under an extreme dry scenario.

Increases in water allocation and entitlement prices are also being driven by changes in the composition of irrigated agricultural production, including major shifts from rice to cotton in the Murrumbidgee, and increased horticultural developments in the Murray and Murrumbidgee (largely nuts).

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

1.0

INTRODUCTION



1.0 Introduction

1.1 Background

1.2 Scope

1.1 BACKGROUND

Water markets in Australia have developed substantially over the past two decades. They are now an established part of agricultural, urban and environmental water policy and management. Water markets are helping balance competing demands for Australia's scarce water resources and delivering more efficient water investment, allocation and use. They provide business flexibility and risk management benefits, and help deliver important public policy outcomes. They are also increasingly viewed as providing an attractive investment opportunity.

Market information and analysis supports improved understanding of how water markets work – including by illustrating trends in market activity and highlighting potential opportunities. It can also help to inform decision making, such as helping to determine if, when, or how to participate in water trade, or when it may be necessary to alter policy settings.

With the 2014-15 water year recently completed, now is an opportune time to review outcomes for the year past, compare these with the previous year, and consider the outlook for 2015-16.

1.2 SCOPE

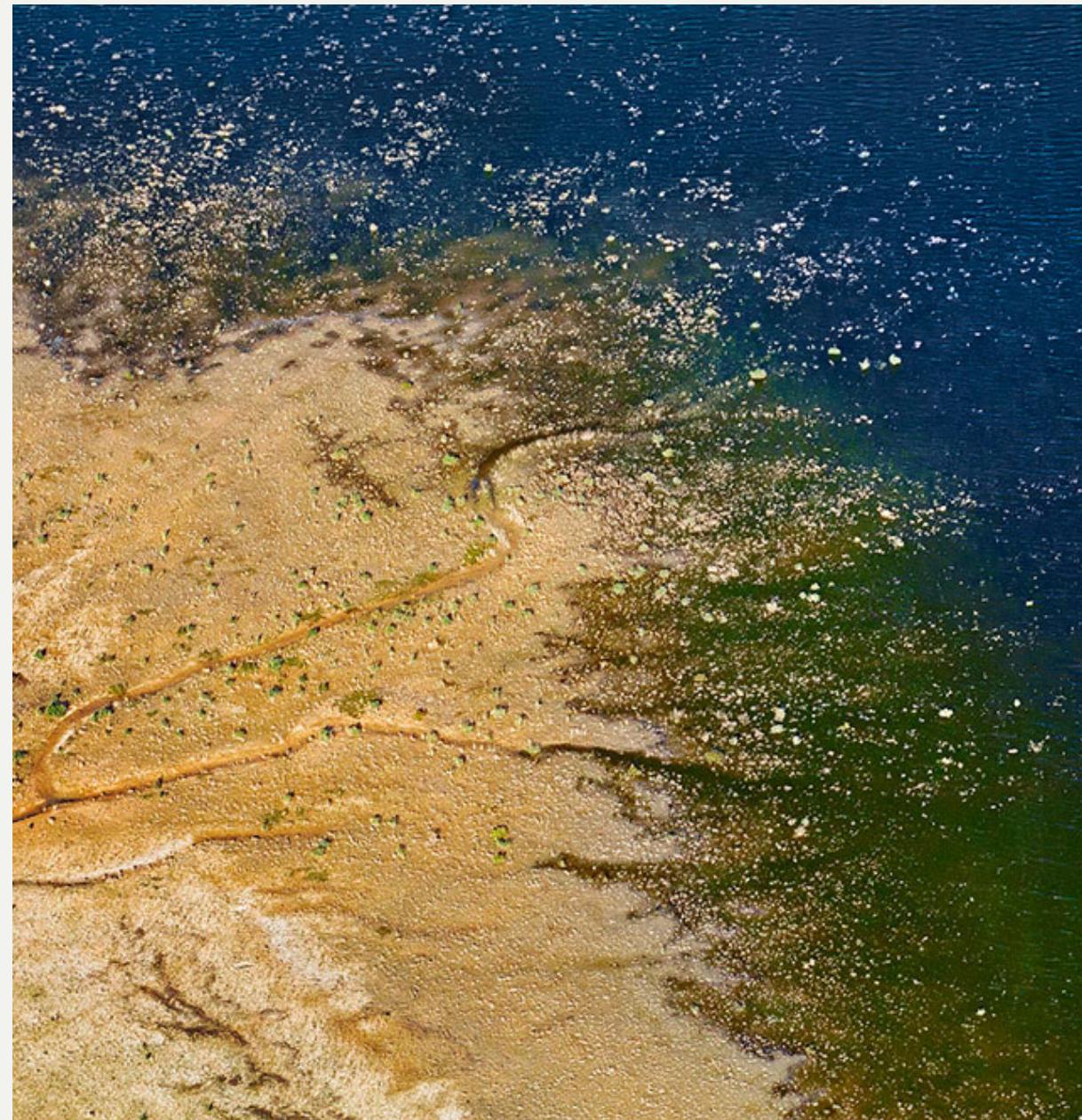
This Report focuses on outcomes in the southern Murray-Darling Basin (sMDB). It provides a general summary of activity in the major sMDB markets, with additional supporting analysis and commentary. It is not designed to be a comprehensive analysis of all market segments or issues. Broadly, the Report:

- presents allocation market activity and prices for 2014-15, discusses allocation market performance and key drivers, and compares outcomes with previous years (Section 2)
- presents entitlement market activity and prices for 2014-15, discusses entitlement market performance, presents information on market size, liquidity and financial yields, and compares outcomes with previous years (Section 3)
- provides an outlook regarding potential outcomes for the 2015-16 water year in the sMDB (Section 4)
- provides a brief background on the purpose, use, operation and key drivers of activity in Australia's water allocation and water entitlement markets (see Appendix A).

Analysis is constrained to major surface water trading zones in New South Wales, Victoria, and South Australia, and excludes some market segments (such as within New South Wales irrigation corporations) due to data availability issues.¹

2.0

ALLOCATION MARKETS



2.0 Allocation markets

2.1 Allocation trade activity and prices in 2014-15

2.2 Price comparisons with 2013-14

2.3 Allocation market performance

2.4 Allocation seasonal drivers in 2014-15

2.5 Water allocations to entitlements

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2.1 ALLOCATION TRADE ACTIVITY AND PRICES IN 2014-15

In the major trade zones considered here, there was a total of 2,218 Gigalitres (GL) of within zone allocation water transfers in 2014-15 (Table 1).²

Vic 6 Murray (Dart to Barmah), Vic 7 Murray (Barmah to SA), NSW Murray and NSW Murrumbidgee zones were net exporters, while Vic 1A Greater Goulburn and SA Murray were net importers of water. Vic 1A Greater Goulburn, Vic 7 Murray (Barmah to SA) and NSW Murrumbidgee had the highest volumes of within zone transfers.

Allocation trade prices in 2014-15 were broadly consistent across zones (which is generally expected for connected zones when trade rules or other constraints are not binding), with the exception of NSW Murrumbidgee (which traded at a discount) and the SA Murray (which traded at a premium). Annual prices increased substantially on 2013-14 prices, with prices increasing sharply towards the end of the 2014-15 year for most zones (Table 2).

TABLE 1 ALLOCATION TRANSFER NUMBERS AND VOLUMES, MAJOR SOUTHERN MURRAY-DARLING BASIN ZONES, 2014-15 (ML)

Zone	Within		Into		Out of		Net change volume
	No.	Vol.	No.	Vol.	No.	Vol.	
Vic 1A Greater Goulburn	2,455	577,480	1,011	196,604	868	181,880	14,724
Vic 6 Murray (Dart to Barmah)	528	150,303	531	95,911	439	160,772	-64,861
Vic 7 Murray (Barmah to SA)	2,366	300,766	1,161	483,699	949	764,068	-280,369
NSW Murray	843	207,705	382	126,234	350	254,569	-128,335
NSW Murrumbidgee	736	757,245	272	63,810	299	139,893	-76,083
SA Murray	321	224,787	148	753,031	402	205,866	547,165
Total	7,249	2,218,286	3,505	1,719,288	3,307	1,707,047	12,241

Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

TABLE 2 ANNUAL VOLUME WEIGHTED AVERAGE ALLOCATION PRICES MAJOR SOUTHERN MURRAY-DARLING BASIN ZONES, 2013-14 AND 2014-15

Zone	VWAP 2013-14 (\$/ML)	VWAP 2014-15 (\$/ML)
Vic 1A Greater Goulburn	\$75	▲ \$118
Vic 6 Murray (Dart to Barmah)	\$79	▲ \$114
Vic 7 Murray (Barmah to SA)	\$74	▲ \$117
NSW Murray	\$68	▲ \$112
NSW Murrumbidgee	\$57	▲ \$104
SA Murray	\$67	▲ \$125

Source: New South Wales Water Register 2014 and 2015, South Australian Water Register 2014 and 2015, and Victorian Water Register 2014 and 2015.

Note: Please see pages 40 and 41 for a full list of notes.

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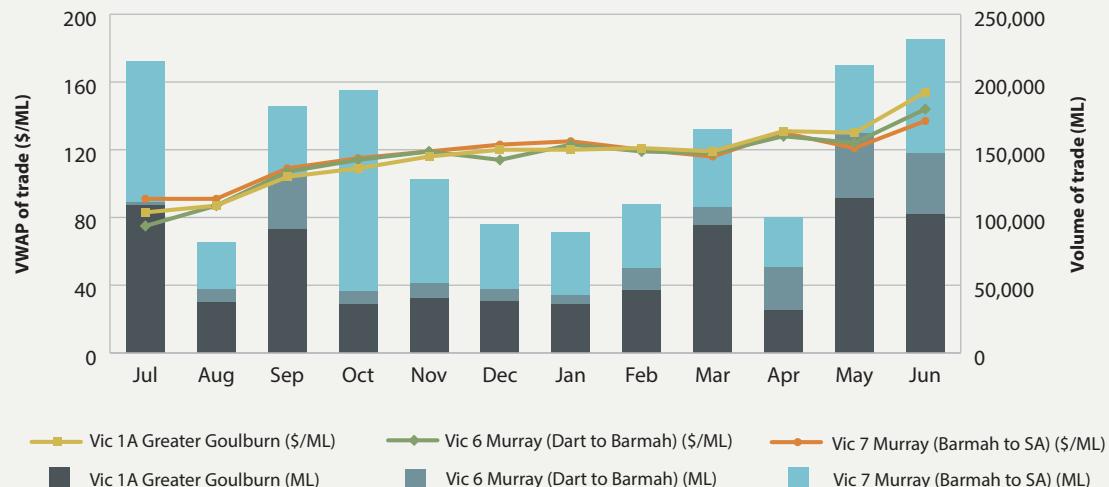
2.6 Longer-term comparisons

2.1.1 VICTORIA

In Victoria, transfer volumes were highest at the beginning and end of the year, however, the volume of transfers was also high during spring (Figure 1). June had the highest transfer volume of all months, which may be driven by demand for carryover and expectations about water availability in 2015-16.

Prices began substantially higher than the end of 2013-14, and increased gradually throughout the year finishing around 70 per cent higher than they began the year – increasing from around \$85 per ML to around \$145 per ML.

Spot prices in late June were suggested to be higher than this, at around \$150 to \$160 per ML. Price increases are likely to have been driven by deteriorating water availability and a poor 2015-16 seasonal outlook, as well as increased demand from higher value crops in some regions – including interstate. In addition, there was increased demand for carryover late in the year, which was not fully met by supply.



Source: Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 1 ALLOCATION TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR VICTORIAN ZONES, 2014-15

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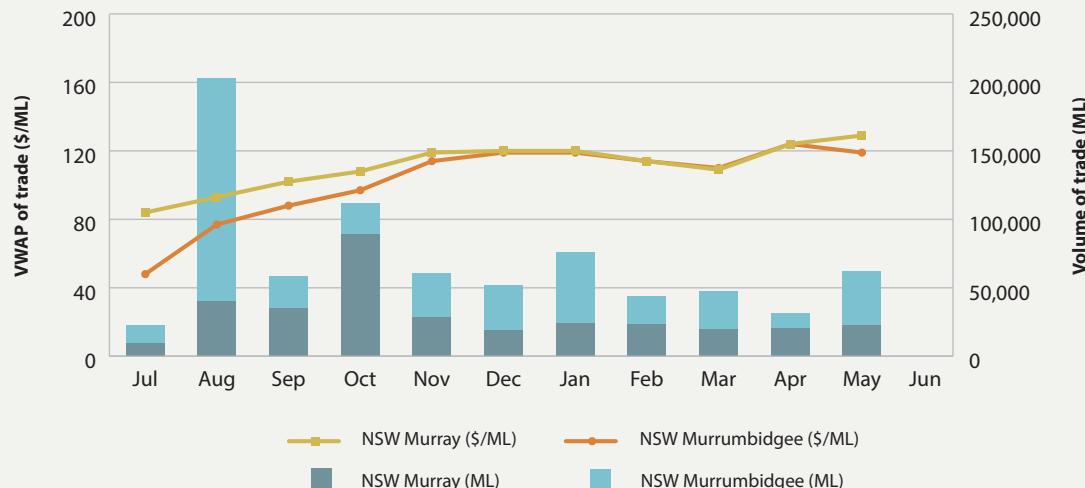
2.6 Longer-term comparisons

2.1.2 NEW SOUTH WALES

In New South Wales, the distribution of transfer volumes was relatively even throughout the year (notwithstanding August), with notable increases in October, January and May (Figure 2).

Opening and early season prices were quite divergent between the two zones, which is likely to be the result of temporary restrictions on trade out of the Murrumbidgee to manage hydrological constraints. Thereafter, prices followed a very similar and convergent increasing trend throughout spring and into summer, before declining slightly into autumn. Prices then increased slightly in April and May to finish around twice as high as they began the water year.

Market prices in late May were suggested to be higher than register data shows, at around \$130 to \$140 for water delivered into New South Wales. Price drivers in New South Wales are similar to those noted for Victoria - due to new demand for cotton and nut production.



Source: New South Wales Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 2 ALLOCATION TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR NEW SOUTH WALES ZONES, 2014-15

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2.4 Allocation seasonal drivers in 2014-15

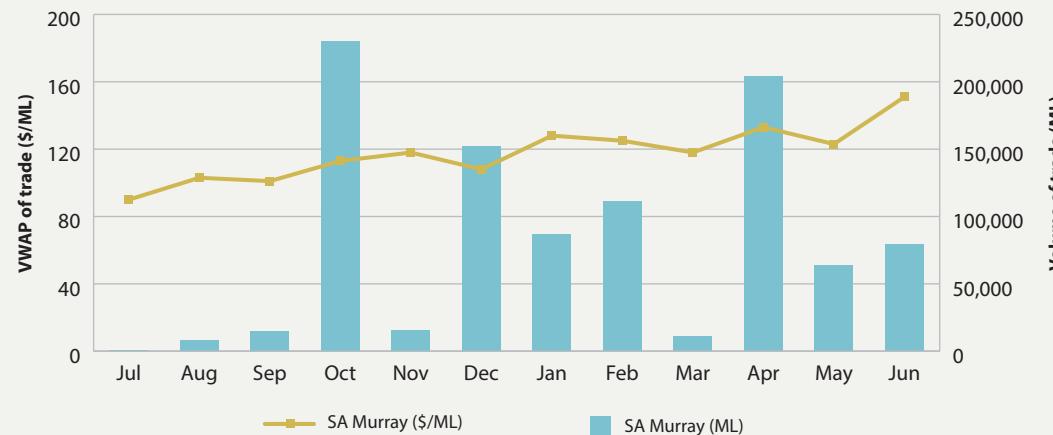
2.5 Water allocations to entitlements

2.6 Longer-term comparisons

2.1.3 SOUTH AUSTRALIA

In South Australia, there were notably large transfer volumes in October as well as April (Figure 3).

There were also strong transfer volumes throughout the summer months. Prices began strongly at around \$90 per ML and increased steadily throughout the year to finish around 30 per cent higher than they began (based on register data). However, in late June 2015, spot prices were around \$150 to \$160 per ML for allocation water delivery into South Australia. As for zones already discussed in Victoria and New South Wales, this is likely to be driven by expectations around deteriorating water availability and the seasonal outlook, with some additional underlying demand factors playing a role.



Source: South Australian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 3 ALLOCATION TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, SOUTH AUSTRALIA, 2014-15

Box 1: Allocation market data issues

Water registers do not currently distinguish between allocation trades that involve unrelated parties, from those that involve the same or related parties. Related party transfers may involve related farmers or agricultural enterprises (e.g. the same company), environmental water holders or investors. Related parties use allocation trade as a way to move allocation water between separate entitlement holdings or from one physical location to another, as this is generally the only method available to do so.

However, this complicates reported trade data. It means many trades have a \$0 price declared and creates difficulties interpreting the true extent of trade volumes (because transfers between related parties cannot be easily excluded). Trades with \$0 prices reported can also be due to traders not wanting to disclose prices, but also due to traders temporarily hiring another party's entitlement in order to transfer allocation water to it for carryover purposes.

Because publicly available data does not separately report transfers between related parties, Aither reports all volumes transferred. However, to ensure accurate reporting of prices, Aither applies price filtering rules in the calculation of prices. Improved data collection and reporting that would address these issues is highly desirable, as current data has the ability to mislead market participants and policymakers regarding the true size, liquidity and value of water markets.

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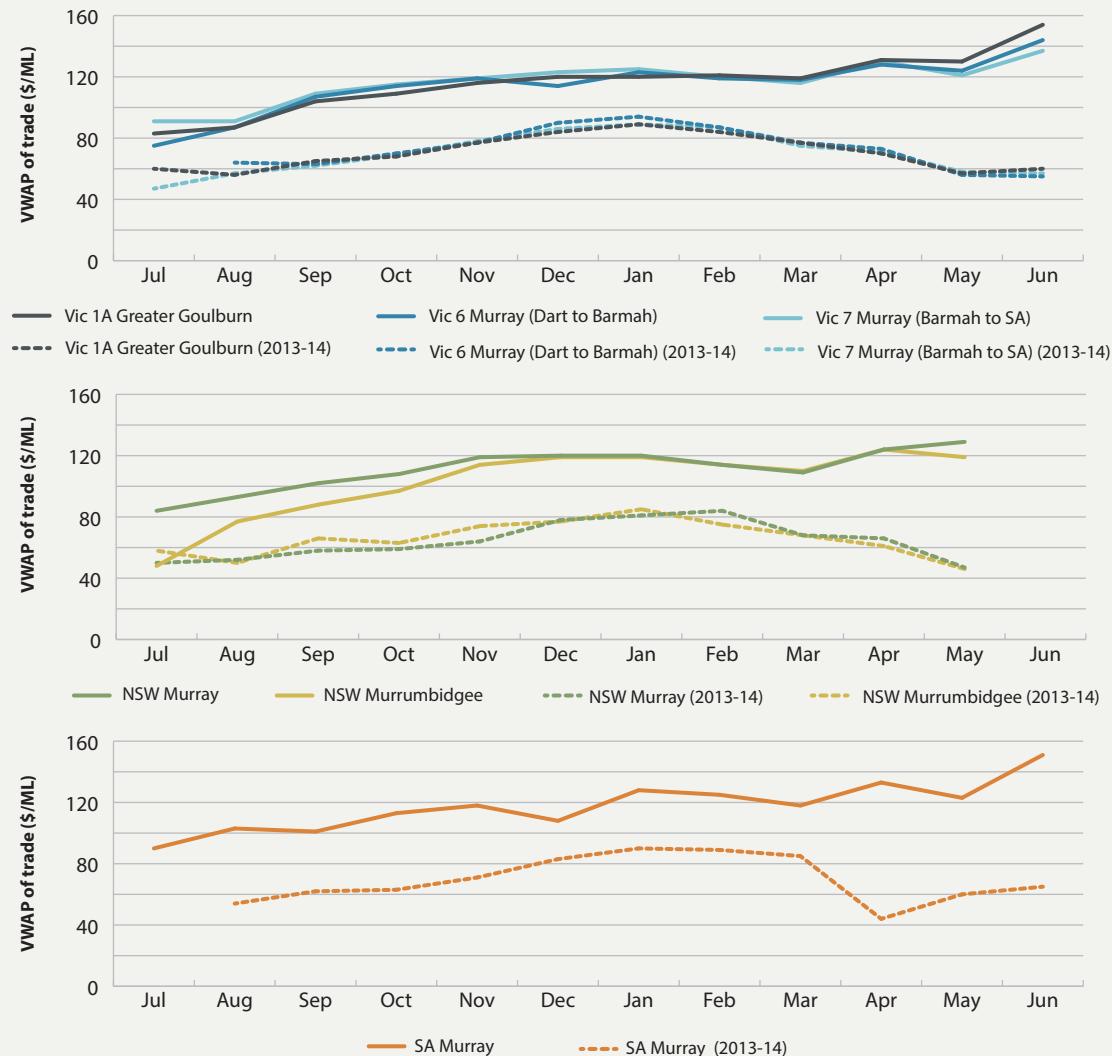
2.5 Water allocations to entitlements

2.6 Longer-term comparisons

2.2 PRICE COMPARISONS WITH 2013-14

As illustrated in Table 2, annual allocation prices in 2014-15 increased considerably on 2013-14 levels. Depending on the zone, increases of between 45 and 90 percent were observed. Figure 4 suggests monthly price trends throughout the early to middle stages of 2014-15 were similar to 2013-14, however, beyond that, trends differ.

Across all zones in 2013-14, prices declined in the second half of the water year, declining to near start of year levels. In 2014-15, prices increased throughout the second half of the water year. While slight declines were evident in May 2015 for many zones, prices on the whole finished significantly higher than they began.



Source: Victorian Water Register 2014 and 2015, New South Wales Water Register 2014 and 2015, and South Australian Water Register 2014 and 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 4 COMPARISON OF MONTHLY VOLUME WEIGHTED AVERAGE ALLOCATION PRICES, MAJOR VICTORIAN, NEW SOUTH WALES AND SOUTH AUSTRALIAN ZONES, 2013-14 AND 2014-15

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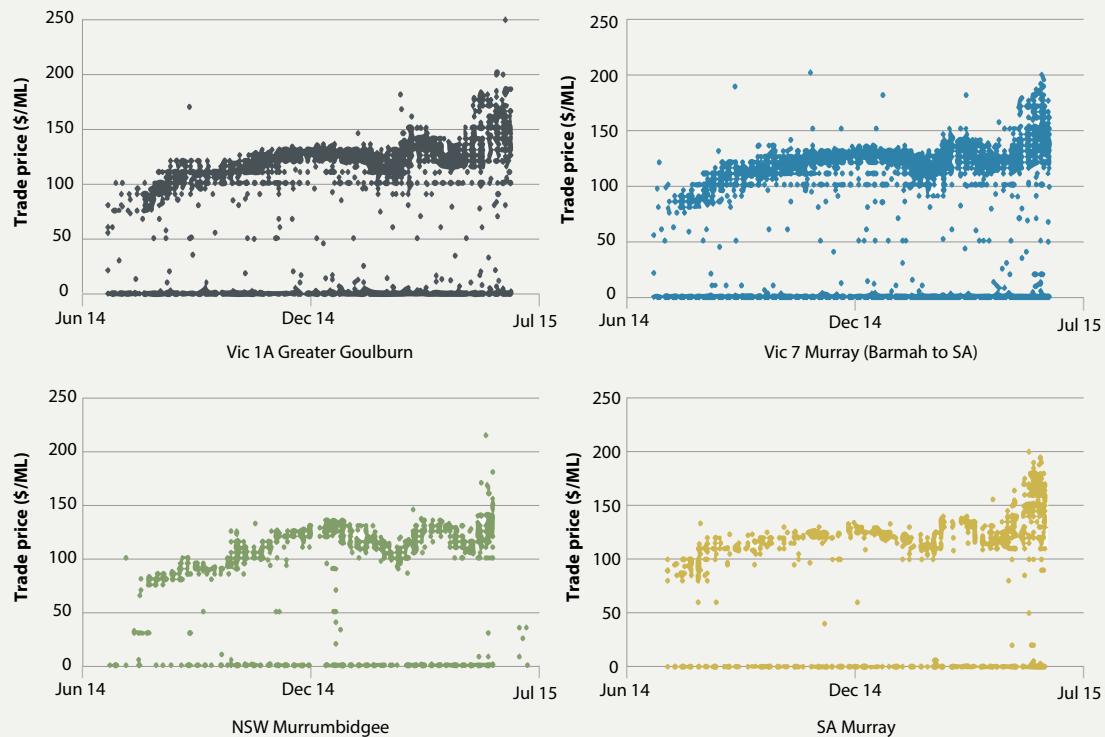
2.6 Longer-term comparisons

2.3 ALLOCATION MARKET PERFORMANCE

Figure 5 provides an illustration of price dispersion by plotting and comparing the distribution of prices for four trading zones to give a spread across different states in the sMDB. Data presented in Figure 5 suggests trade in some zones is not operating at optimal efficiency, with a large spread of prices observed at any point in time over the past water year. Notably, price spreads for all zones increased dramatically at the end of the year, which is likely to reflect uncertainty about how severe the seasonal water availability outlook had become for the 2015-16 water year, as well as strategies by market participants to mitigate future price risk.

Box 2: Efficiently operating markets - price convergence

In an efficiently operating market, a single price should be achieved for the same good at any one point in time. In water allocation markets, price convergence should tend to occur within the same trading zone, but not necessarily to the same extent between connected zones. This lack of convergence between connected zones can be due to timing and deliverability issues – including whether trading rules or hydrological constraints are binding at a given point in time. Convergence does not occur between disconnected zones as water cannot be physically transferred between water users.



Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 5 COMPARISON OF ALLOCATION PRICE DISPERSION VIC 1A GREATER GOULBURN, VIC 7 MURRAY (BARMAH TO SA), NSW MURRUMBIDGEE AND SA MURRAY, 2014-15

2.0 Allocation markets

2.1 Allocation trade activity and prices in 2014-15

2.2 Price comparisons with 2013-14

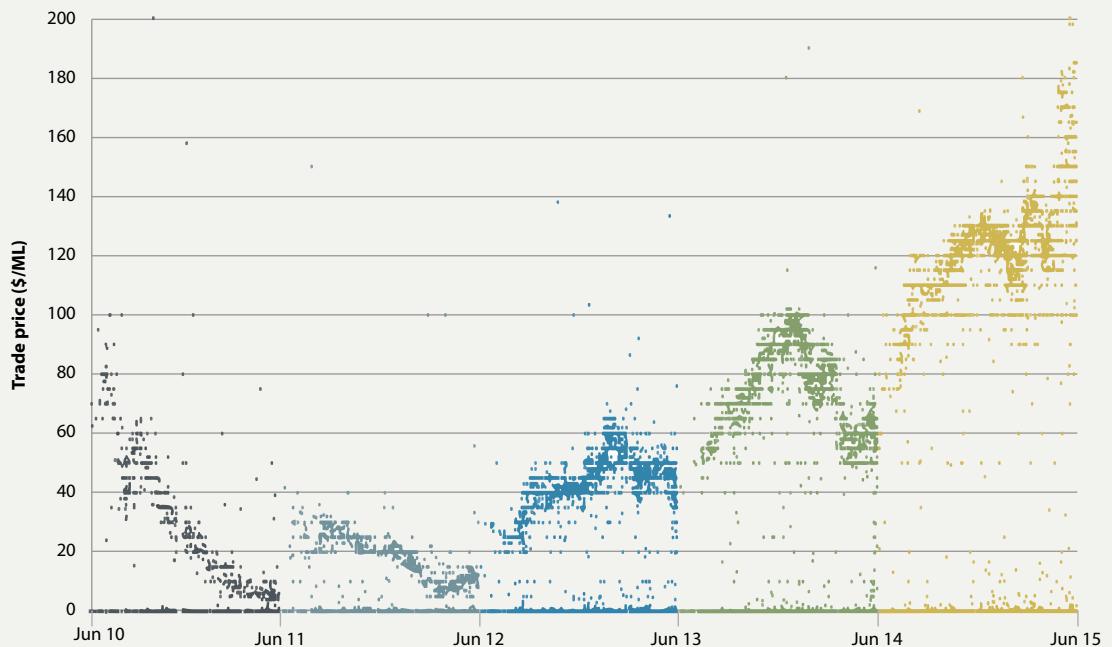
2.3 Allocation market performance

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Over time, it appears there has been some variation in allocation price dispersion, although there is no trend towards improving market efficiency overall. Figure 6 suggests the least price dispersion may have occurred during years of highest water availability (2010-11 and 2011-12). This may reflect strong consensus amongst market participants of the value of water in those years.



Source: Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 6 VIC 1A GREATER GOULBURN ALLOCATION PRICE DISPERSION, 2010-11 TO 2014-15

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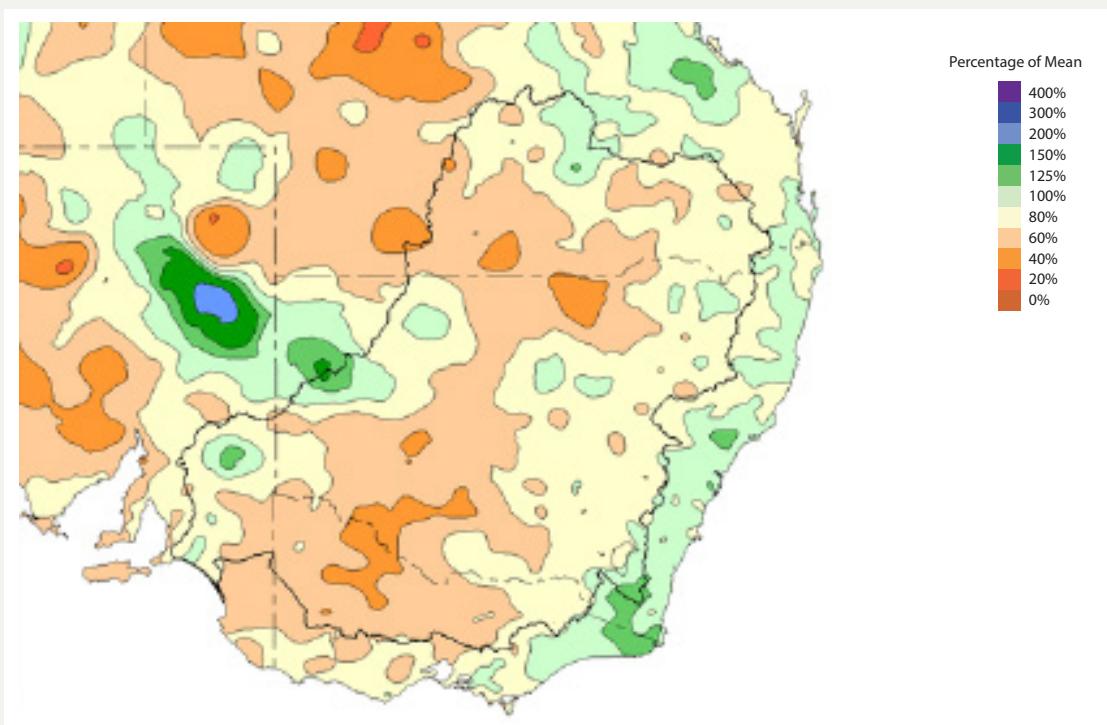
2.6 Longer-term comparisons

2.4 ALLOCATION SEASONAL DRIVERS IN 2014-15

Climatic conditions are the main driver of seasonal allocation prices. Rainfall directly influences both irrigation water availability (supply) and irrigation water requirements (demand).

2.4.1 RAINFALL

In 2014-15, with some minor exceptions, the MDB had average to below average rainfall, and the sMDB in particular had almost uniformly average or below average rainfall (Figure 7).



Source: Bureau of Meteorology 2015.

FIGURE 7 PERCENTAGE OF ANNUAL MEAN RAINFALL IN THE MURRAY-DARLING BASIN, 2014-15

2.0 Allocation markets

2.1 Allocation trade activity and prices in 2014-15

2.2 Price comparisons with 2013-14

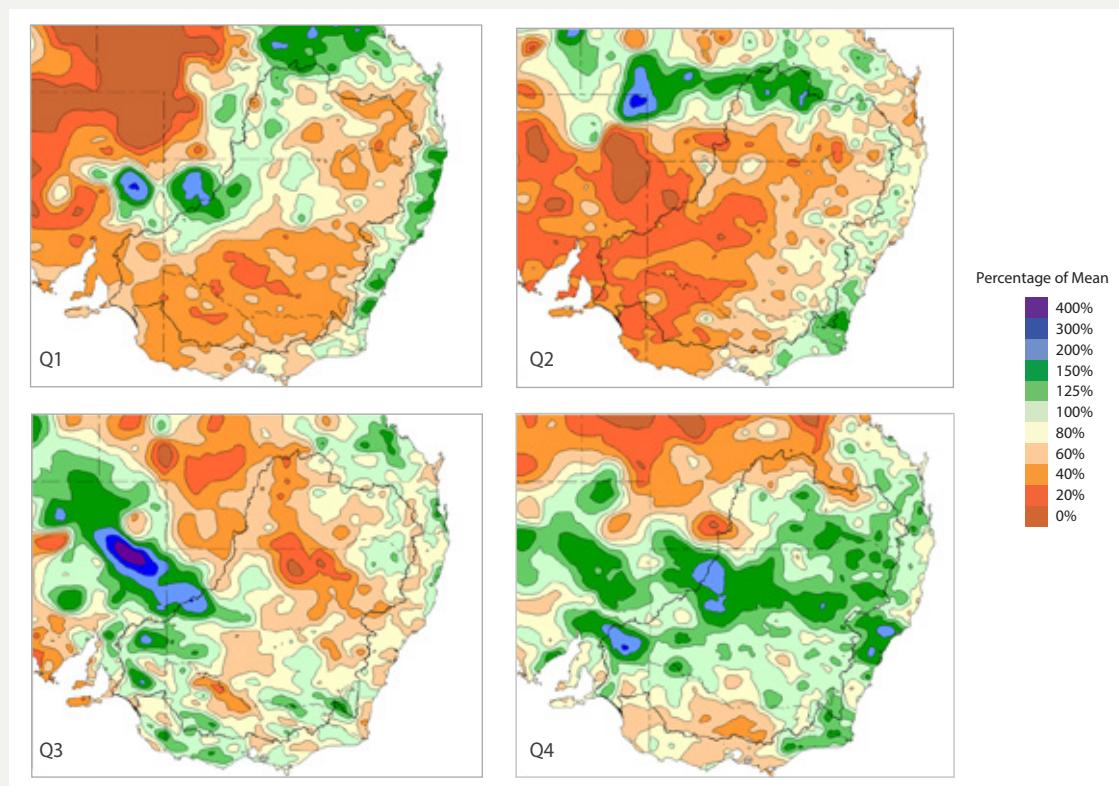
2.3 Allocation market performance

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When broken down into quarterly periods (Figure 8), there was slightly above average rainfall in the last two quarters in some parts of the sMDB, while the first two quarters were drier than average. Below average rainfall across much of the sMDB is likely to have contributed to the upward allocation price movements observed throughout 2014-15. Minor increases in rainfall towards the end of the season are unlikely to have been enough to counter expectations about the poor seasonal outlook for 2015-16, and arrived after irrigation water demand is highest.



Source: Bureau of Meteorology 2015.

FIGURE 8 PERCENTAGE OF QUARTERLY MEAN RAINFALL IN THE MURRAY-DARLING BASIN, 2014-15

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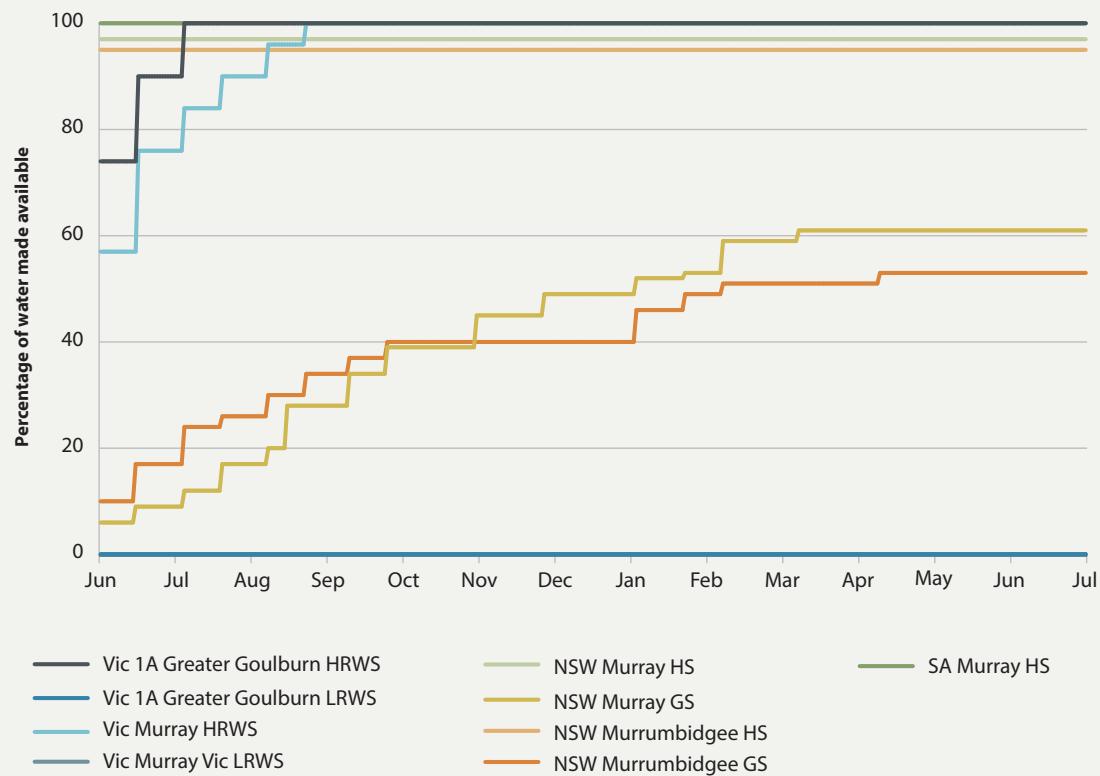
2.5 WATER ALLOCATIONS TO ENTITLEMENTS

In terms of water allocated to different entitlements, start of season allocations were generally good for most higher reliability products, or they moved to high levels relatively quickly (e.g. Vic Murray and Vic 1A Greater Goulburn).

The fact that NSW Murray and NSW Murrumbidgee GS allocations did not reach the same levels as in 2013-14 highlights the relative decline in water availability in 2014-15. Victorian lower reliability products did not receive any allocations in 2014-15 (consistent with recent years), while the SA Murray began at 100 per cent (Figure 9).

End of season allocations for 2014-15 were as follows:

- Vic 1A Greater Goulburn HRWS - 100%
- Vic 1A Greater Goulburn LRWS - 0%
- Vic Murray HRWS - 100%
- Vic Murray Vic LRWS - 0%
- NSW Murray HS - 97%
- NSW Murray GS - 61%
- NSW Murrumbidgee HS - 95%
- NSW Murrumbidgee GS - 53%
- SA Murray - 100%



Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

FIGURE 9 WATER ALLOCATIONS TO MAJOR SOUTHERN MURRAY-DARLING BASIN ENTITLEMENTS, 2014-15

2.0 Allocation markets

2.1 Allocation trade activity and prices in 2014-15

2.2 Price comparisons with 2013-14

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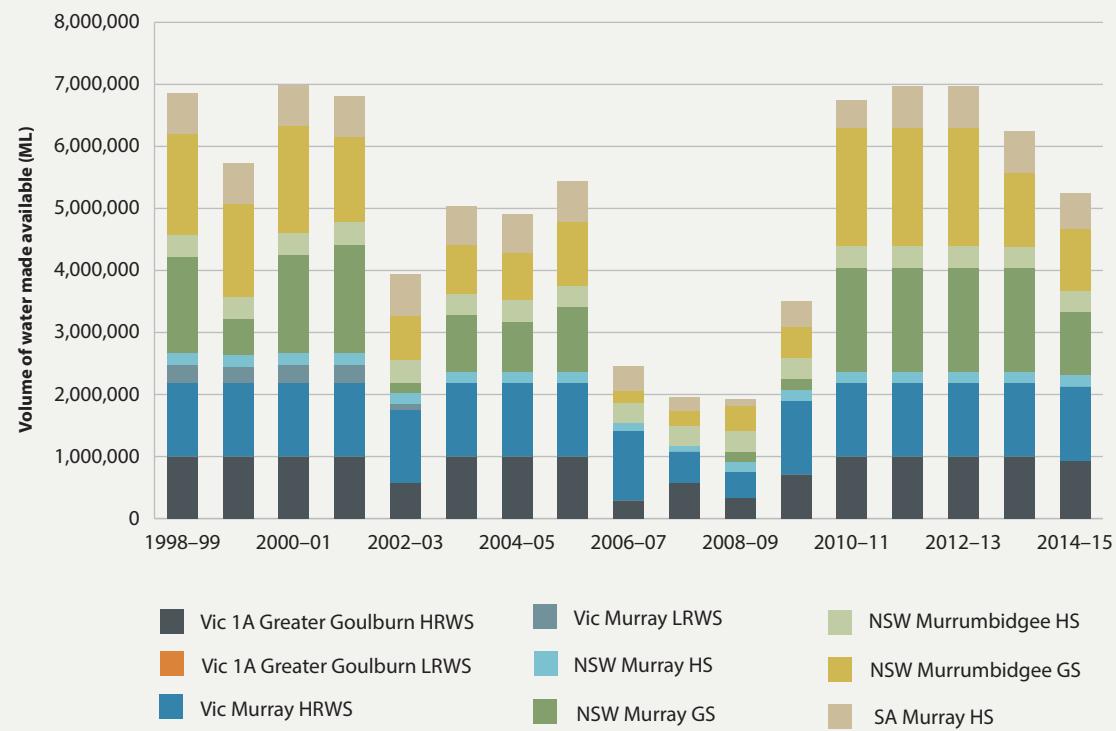
2.4 Allocation seasonal drivers in 2014-15

2.5 Water allocations to entitlements

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2.6 LONGER-TERM COMPARISONS

Water availability in 2014-15 could be considered relatively average (Figure 10). Total water allocated to major entitlement types in the sMDB was lower than in flood and high water availability years (2010-11 to 2012-13), but more than double the volumes allocated in the most recent drought years (2007-08 and 2008-09). The reduction in water allocated to New South Wales general security entitlements is also evident. Water availability has been generally declining over the last two years off the back of near record high water availability. This trend has contributed to the generally increasing allocation prices observed over the same period, and since the record low prices in 2011-12.



Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 10 WATER ALLOCATED TO ENTITLEMENTS FOR MAJOR SOUTHERN MURRAY-DARLING BASIN ENTITLEMENTS, 1998-99 TO 2014-15

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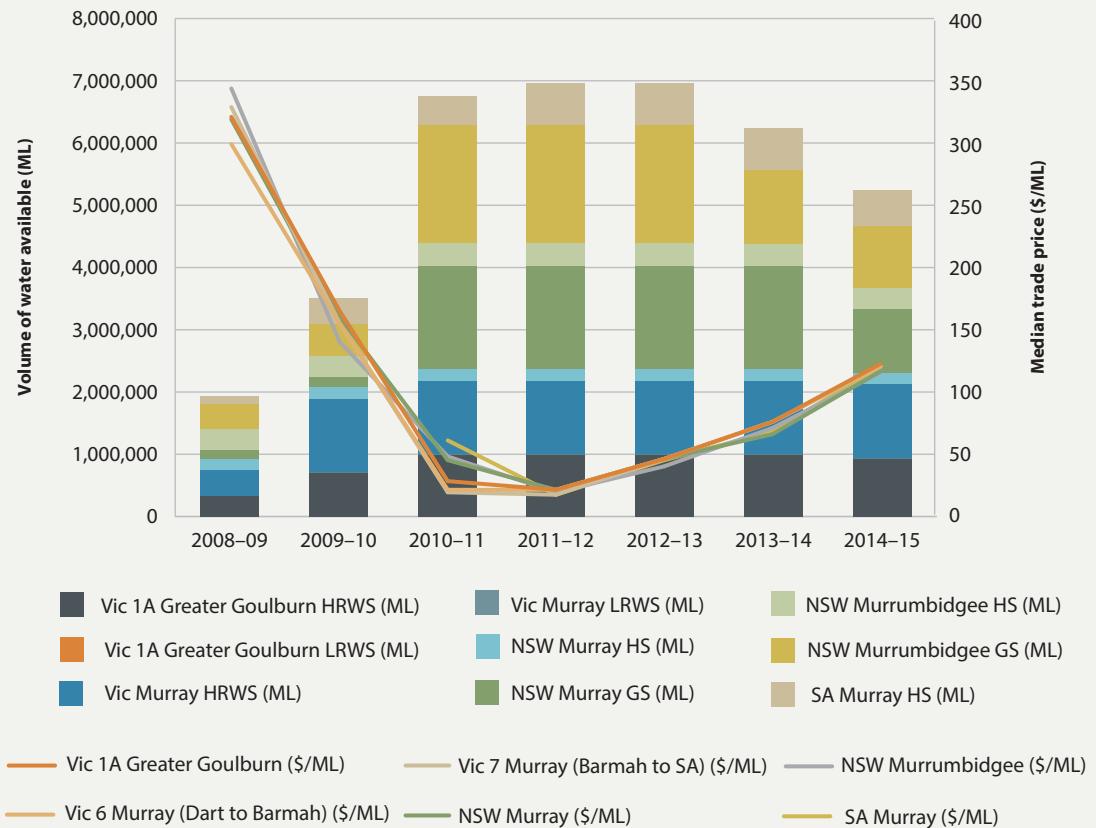
Figure 11 reinforces the strong correlation between allocation levels and allocation prices. Allocation prices have been gradually trending upwards since 2011-12, but that increase intensified in 2014-15 with a more marked reduction in water allocated from 2013-14 to 2014-15, than was the case from 2012-13 to 2013-14.

Box 3: Environmental water

Governments have been active participants in the water market to secure more water for the environment. Entitlement buybacks have been a primary focus with Commonwealth Government acquisitions increasing from zero in 2007-08 to 1,356 GL across the MDB as of May 2015.

To deliver water to environmental assets, water allocations are frequently transferred between environmental water holders' entitlements using allocation trade as a transfer mechanism. These 'trades' are technically 'transfers' and occur between accounts of environmental parties, and can be between or within trading zones.

Such transfers can represent a significant proportion of reported allocation trade volumes. For example in 2010-11, 'within-environment' transfers represented 48 per cent of Victoria's total allocation trade (NWC 2013). These transfers are not reported separately in state registers, which complicates reporting and analysis of allocation trade volumes. Separate reporting of such transfers would substantially improve analysis and interpretation of water market outcomes.



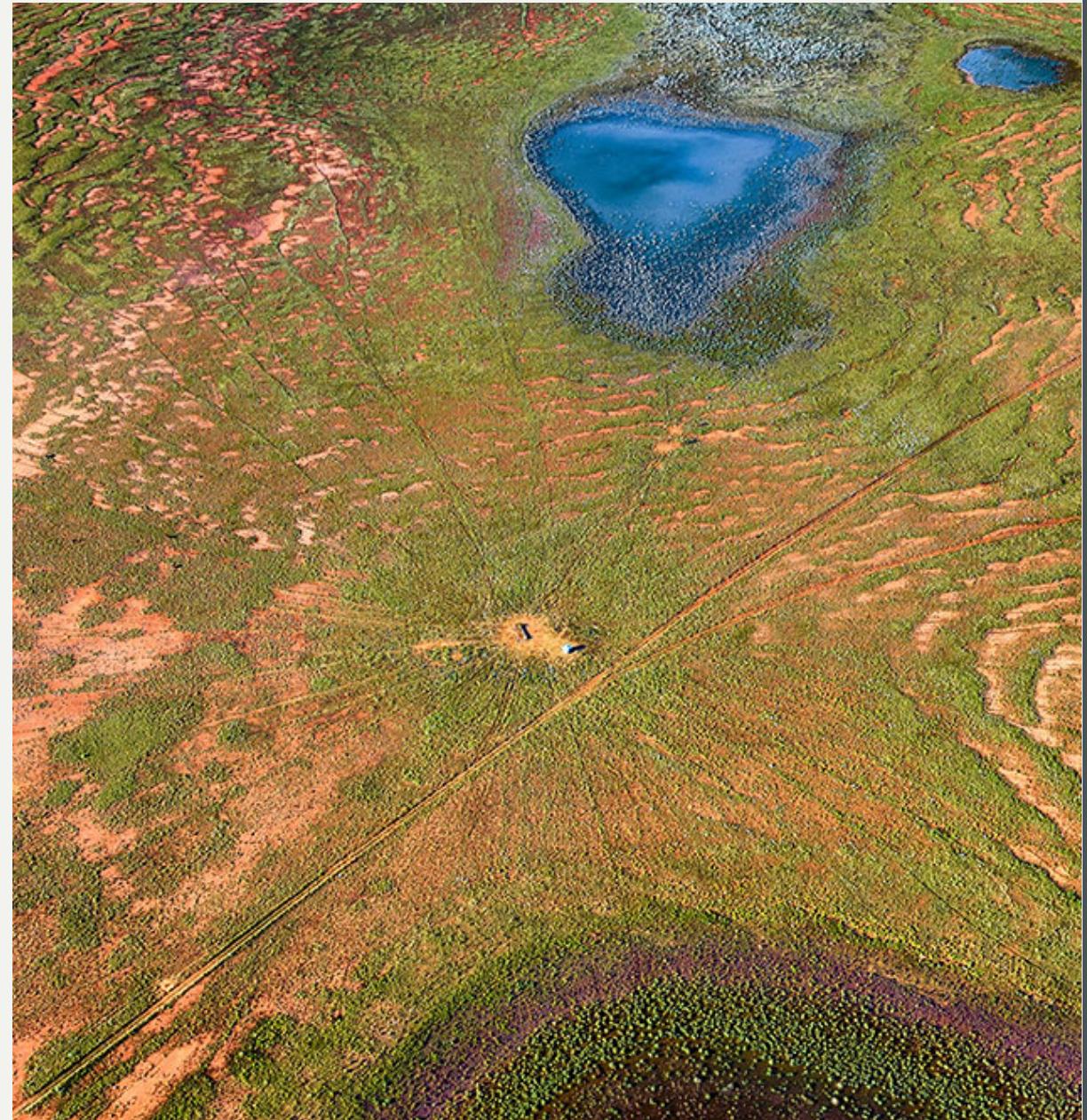
Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 11 TOTAL WATER ALLOCATED AND ANNUAL MEDIAN ALLOCATION PRICES, MAJOR SOUTHERN MURRAY-DARLING BASIN SYSTEMS, 2008-09 TO 2014-15

3.0

ENTITLEMENT MARKETS



3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

For the entitlement classes considered here, there was a total of approximately 311 Gigalitres (GL) transferred in 2014-15 (interstate entitlement trades are not reported) (Table 3). By volume, the most active zones were the NSW Murrumbidgee, Vic 1A Greater Goulburn, and SA Murray. Annual prices in 2014-15 increased substantially in comparison to 2013-14 levels, in some zones price increases of over 30 per cent were observed.

At times there can be a marked difference between water register prices and current market prices due to the time lag between parties agreeing contracts and registering trades and incorrect price reporting for transfers combined with land sales. In late June 2015, market prices were suggested to be substantially higher than either annual or June prices derived from state registers – from 10 to 45 per cent higher than annual, or 2 to 35 per cent higher than June register prices.

TABLE 3 ENTITLEMENT TRANSFER VOLUMES AND VOLUME WEIGHTED AVERAGE PRICES MAJOR SOUTHERN MURRAY-DARLING BASIN ENTITLEMENTS, 2013-14 AND 2014-15

Entitlement location and class	No.	Volume (ML)	Annual VWAP (\$/ML)		Change in price
			2013-14	2014-15	
Vic 1A Greater Goulburn HRWS	925	51,388	\$1,367	▲ \$1,588	16%
Vic 1A Greater Goulburn LRWS	358	17,943	\$189	▲ \$228	21%
Vic 6 Murray (Dart to Barmah) HRWS	280	24,920	\$1,297	▲ \$1,398	8%
Vic 6 Murray (Dart to Barmah) LRWS	120	10,355	\$177	▲ \$225	27%
Vic 7 Murray (Barmah to SA) HRWS	843	36,703	\$1,398	▲ \$1,608	15%
Vic 7 Murray (Barmah to SA) LRWS	135	8,797	\$203	▲ \$241	19%
NSW Murray HS	70	6,803	\$1,695	▲ \$1,925	14%
NSW Murray GS	59	29,948	\$782	▲ \$1,006	29%
NSW Murrumbidgee HS	19	4,912	\$1,608	▲ \$2,129	32%
NSW Murrumbidgee GS	74	64,795	\$816	▲ \$963	18%
SA Murray HS	342	54,873	\$1,654	▲ \$1,738	5%
Total	3,225	311,436			

Source: New South Wales Water Register 2014 and 2015, South Australian Water Register 2014 and 2015, and Victorian Water Register 2014 and 2015.

Note: Please see pages 40 and 41 for a full list of notes.

Box 4: Issues related to timeliness and accuracy of entitlement price data

There are limitations associated with price information reported in the state registers, specifically the timeliness and accuracy of reported prices. Timeliness is an issue because there can be long time periods between exchange of contracts and transfer registration. This creates challenges in using register reported prices as an indication of prevailing market prices; there can be a considerable difference between prices reported in the water register and current market prices.

In relation to the accuracy of reported prices, there is a tendency for market participants to misreport the actual price associated with a trade, particularly when the transfer of an entitlement volume is associated with the sale of land and separate prices for land and water are not revealed. In contrast to \$0 prices being reported for allocation transfers, the reporting of \$0 prices for entitlement trade is more likely to be driven by privacy or commercial concerns, particularly in smaller markets where parties concerned may be easily identifiable.

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

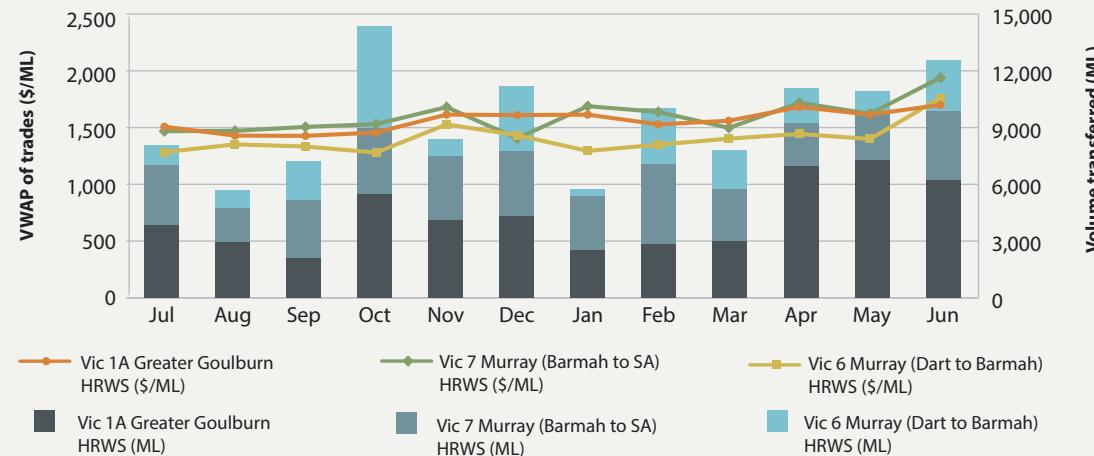
3.4 Comparison with 2013-14

3.1.1 VICTORIA

Entitlement transfer volumes were generally steady in Victoria through the course of 2014-15, with notably higher volumes transferred in October for both low and high reliability products. A very gradual increase in prices for higher reliability products is evident over the course of the year, with all products ending the year with higher values (Figure 12). Register data suggests a more substantial increase in prices for low reliability products from the start to the end of the year, with greater volatility in prices observed throughout (Figure 13).

Broker data suggests that prices in June 2015 were substantially higher than indicated by register data, with Vic 1A Greater Goulburn HRWS trading at around \$2,200 to \$2,300 per ML, and Vic 6 Murray (Dart to Barmah) HRWS trading at around \$1,950 to \$2,100. Lower reliability products were also suggested to be trading at higher prices than reported in the public registers, at around \$250 to \$300 per ML.

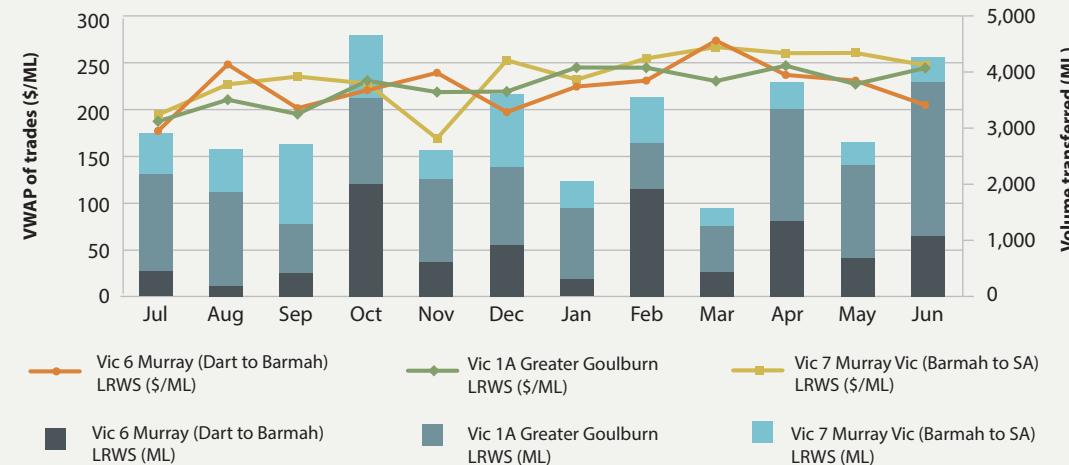
Entitlement price increases are likely driven by a number of factors - including changing expectations about longer-term water availability, the risk tolerance of different enterprises (including those relying on annual purchases of allocation water), as well as underlying demand changes (such as new high-value nut and cotton enterprises). Other supply factors may also play a role, such as reduced total water availability due to environmental water recovery).



Source: Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 12 ENTITLEMENT TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR VICTORIAN HIGH RELIABILITY WATER ENTITLEMENTS, 2014-15



Source: Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 13 ENTITLEMENT TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR VICTORIAN LOW RELIABILITY WATER ENTITLEMENTS, 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

3.1.2 NEW SOUTH WALES

In 2014-15, there was greater variation in transfer volumes in New South Wales than Victoria, and much greater variation between high and general security. High security transfer volumes peaked in September, February and June, whereas general security peaked in July, with strong volumes also recorded in September and October.

Prices for high security products were variable throughout the course of the year, but both products had higher prices at the end than at the beginning of the year. Prices for NSW Murrumbidgee GS finished slightly down on start of year prices. NSW Murray GS prices trended up slightly overall.

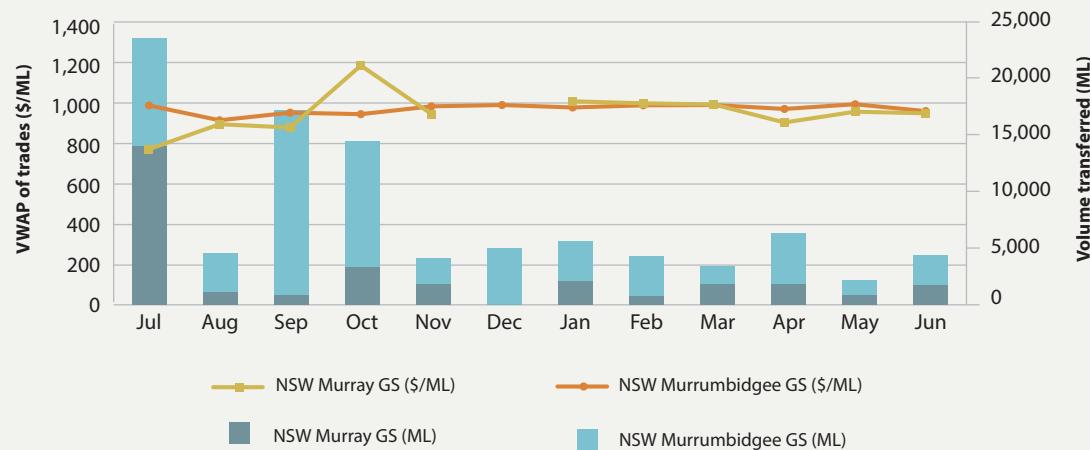
Current market prices in June 2015 were suggested to be substantially higher than register prices would suggest – from \$2,450 to \$2,500 for NSW Murray HS and \$2,600 to \$2,650 for NSW Murrumbidgee HS, and up to \$1,200 for NSW Murray GS and \$1,350 for NSW Murrumbidgee GS. Similar drivers as noted for Victoria are likely to be driving price increases in New South Wales, however, increased cotton production (including new cotton enterprises in the Murrumbidgee that require certain output volumes to ensure viability) may be playing a more specific role.



Source: New South Wales Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 14 ENTITLEMENT TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR NEW SOUTH WALES HIGH SECURITY WATER ENTITLEMENTS, 2014-15



Source: New South Wales Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 15 ENTITLEMENT TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR NEW SOUTH WALES GENERAL SECURITY WATER ENTITLEMENTS, 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

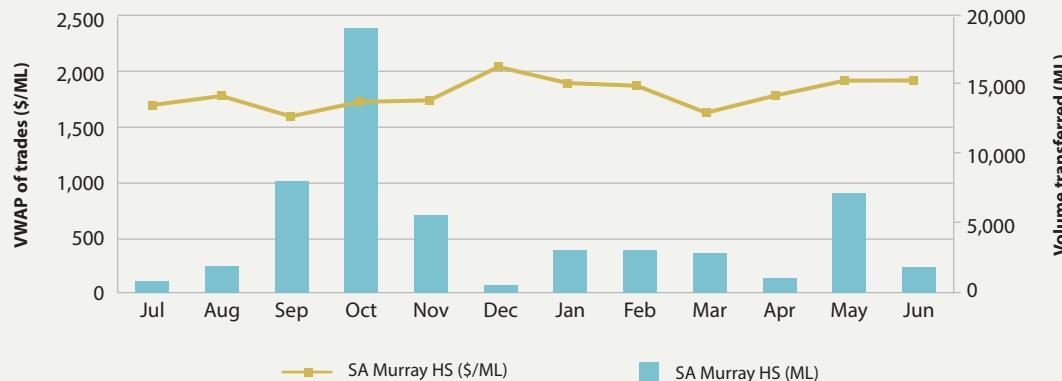
3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

3.1.3 SOUTH AUSTRALIA

In South Australia, entitlement transfer volumes peaked in October, with relatively high volumes also transferred in September, November and May. Prices varied between around \$1,600 and \$2,100, and while prices peaked in December, they were higher at the end of the year than the beginning. Similar to Victoria and New South Wales, market prices in June 2015 were reported to be higher than register prices, with SA Murray HS suggested to be trading at \$2,100 to \$2,200 per ML.



Source: South Australian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 16 ENTITLEMENT TRANSFER VOLUMES AND MONTHLY VOLUME WEIGHTED AVERAGE PRICES, MAJOR SOUTH AUSTRALIAN HIGH SECURITY WATER ENTITLEMENTS, 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

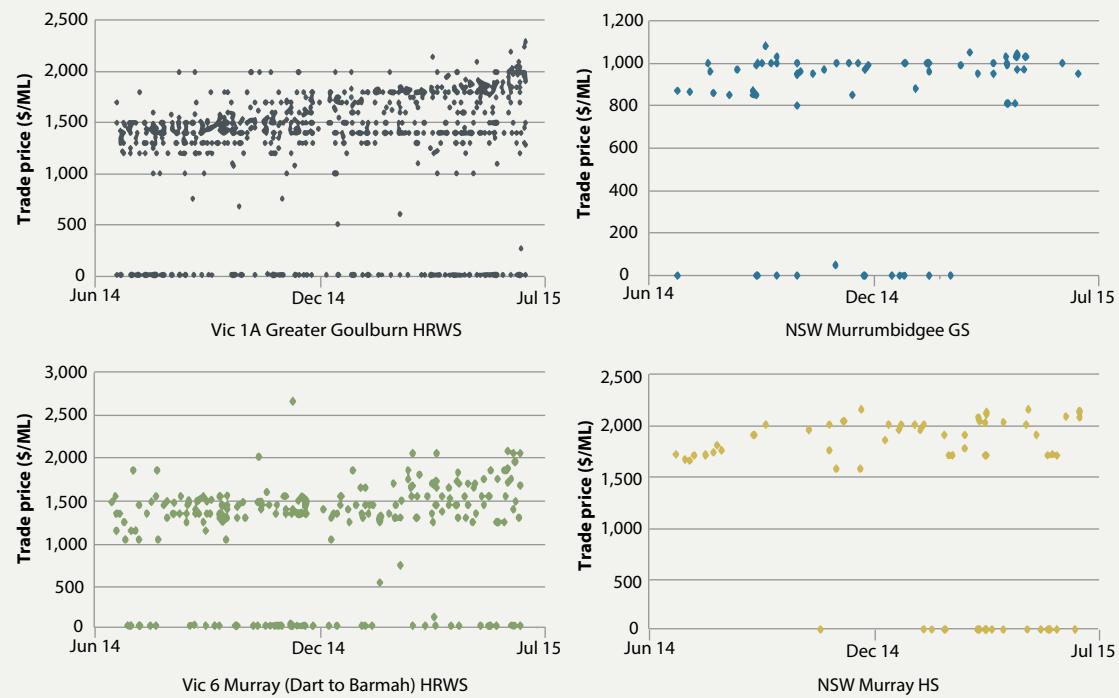
3.4 Comparison with 2013-14

3.2 ENTITLEMENT MARKET PERFORMANCE

As noted in Box 2, an efficiently operating entitlement market would exhibit a single price achieved for the same product at a given point in time. As is shown for a number of trading zones in Figure 17, this is not the case. This is likely to be driven by a number of factors – including the availability, accuracy and timing of price information, the absence of a single market clearing mechanism, and broader information asymmetry.

3.2.1 PERFORMANCE IN 2014-15

Figure 17 illustrates price dispersion of prices for four entitlement types that provide a geographic spread across states and higher and lower reliability entitlement types. Data suggests trade in some areas or classes is not operating at optimal efficiency, with large price spreads (such as Vic 1A Greater Goulburn HRWS where there were spreads of over \$1,000 per ML in any given month). Spreads for Vic 1A Greater Goulburn HRWS and Vic 6 Murray (Dart to Barmah) HRWS increased at the end of the water year, which (similar to allocation markets but to a lesser extent), may reflect uncertainty about the severity of the seasonal water availability outlook, or the desire of some participants to minimise exposure to increasing allocation prices. The small number of trades in New South Wales entitlement classes makes it harder to make judgements on price dispersion, but they are generally of tighter distribution.



Source: New South Wales Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 17 COMPARISON OF VIC 1A GREATER GOULBURN HRWS, VIC 6 MURRAY (DART TO BARMAH) HRWS, NSW MURRUMBIDGEE GS AND NSW MURRAY HS ENTITLEMENT PRICE DISPERSION, 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

3.2.2 PERFORMANCE OVER TIME

Figure 18 shows the distribution of entitlement prices over time for Vic 1A Greater Goulburn HRWS. There appears to be a slight tightening of the distribution of reported prices over time – especially in 2013-14. However, the distribution has increased towards the end of 2014-15.



Source: Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 18 VIC 1A GREATER GOULBURN HRWS PRICE DISPERSION, 2010-11 TO 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

3.3 ENTITLEMENT MARKET SIZE AND VALUE

3.3.1 MARKET SIZE AND VALUE

A substantial proportion of the size and value of the Australian entitlement market is contained within the sMDB. As is shown in Table 4, major entitlement assets in the sMDB systems have an estimated combined value of around \$6.9 billion based on 2014-15 prices. This estimate excludes entitlements held on behalf of the environment.

Box 5: Environmental entitlements and the market

A substantial volume of water entitlement has been recovered by governments on behalf of the environment in recent years. This has mostly been purchased in the market while some has been recovered through infrastructure investments that deliver water savings. These entitlements are now held and managed by governments or statutory bodies, charged with using the water to improve environmental outcomes. As part of this role, these managers have traded allocation water. While entitlement sales by holders are possible, these can only occur under specific conditions – to date no entitlement sales have been made by the Commonwealth. As a result, many market participants do not consider environmental entitlements to be part of the market (as they are generally not available for trade, or might only be available under limited and specific circumstances). Given this, estimates of the size or value of the entitlement market need to be conscious of the entitlements held on behalf of the environment, and ideally report them separately.

TABLE 4 ENTITLEMENTS ON ISSUE, PRICES AND ESTIMATES OF MARKET VALUE, MAJOR SOUTHERN MURRAY-DARLING BASIN ENTITLEMENT CLASSES, 2014-15

Entitlement location and class	Total entitlement on issue (EOI) (ML)	Estimated environmental entitlements (ML) ^{1,2}	Price (VWAP \$/ML)	Estimated value of assets (million) ³
Vic 1A Greater Goulburn HRWS	924,140	303,583	\$1,588	\$986
Vic 1A Greater Goulburn LRWS	406,639	197,211	\$228	\$48
Vic 6 Murray (Dart to Barmah) HRWS	300,951	81,250	\$1,398	\$307
Vic 6 Murray (Dart to Barmah) LRWS	124,973	65,016	\$225	\$13
Vic 7 Murray (Barmah to SA) HRWS	897,066	241,053	\$1,608	\$1,055
Vic 7 Murray (Barmah to SA) LRWS	169,750	63,365	\$241	\$26
NSW Murray HS	187,747	23,243	\$1,925	\$317
NSW Murray GS	1,673,643	489,021	\$1,006	\$1,192
NSW Murrumbidgee HS	359,412	6,629	\$2,129	\$751
NSW Murrumbidgee GS	1,891,995	341,134	\$963	\$1,494
SA Murray HS	564,756	174,436	\$1,738	\$679
Total	7,501,071	2,118,335		\$6,866

Source: Victorian Water Register 2015, New South Wales Water Register 2015, South Australian Water Register 2015, CEWH 2015, VEWH 2015 and OEH 2015.

Note: Please see pages 40 and 41 for a full list of notes.

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

3.3.2 MARKET LIQUIDITY AND YIELD

The combined value of market turnover for the major entitlement classes in the sMDB in 2014-15 was close to \$400 million (Table 5). SA Murray HS and Vic 1A Greater Goulburn HRWS experienced the highest turnover value in 2014-15. Liquidity (annual turnover value over total asset value) amongst these products varied from 1 per cent in NSW Murrumbidgee HS to 17 per cent in Vic 6 Murray (Dart to Barmah) LRWS.

Entitlements can deliver a financial yield to their holders in a similar way to shareholders in companies receiving annual dividends. Yield can be determined by comparing the value of the entitlement class with the total value of the allocations made to it. Assuming an entitlement holder sold all allocations received at the annual volume weighted average allocation price for the trade zone, gross annual average yields to entitlements would have been between 5 per cent and 8 per cent in 2014-15 (for entitlements that received allocations).

TABLE 5 ENTITLEMENT MARKET TURNOVER AND LIQUIDITY MAJOR SOUTHERN MURRAY-DARLING BASIN ENTITLEMENT CLASSES, 2014-15

Entitlement location and class	Number of transfers	Total volume transferred (ML)	Estimated turnover value (million) ¹	Liquidity ²	Yield (average annual) ³
Vic 1A Greater Goulburn HRWS	925	51,388	\$82	8%	7%
Vic 1A Greater Goulburn LRWS	358	17,943	\$4	9%	Zero allocation ⁴
Vic 6 Murray (Dart to Barmah) HRWS	280	24,920	\$35	11%	8%
Vic 6 Murray (Dart to Barmah) LRWS	120	10,355	\$2	17%	Zero allocation ⁴
Vic 7 Murray (Barmah to SA) HRWS	843	36,703	\$59	6%	7%
Vic 7 Murray (Barmah to SA) LRWS	135	8,796	\$2	8%	Zero allocation ⁴
NSW Murray HS	70	6,803	\$13	4%	6%
NSW Murray GS	59	29,948	\$30	3%	7%
NSW Murrumbidgee HS	19	4,912	\$10	1%	5%
NSW Murrumbidgee GS	74	64,795	\$62	4%	6%
SA Murray HS	342	54,873	\$95	14%	7%
Total	3,225	311,436	\$395		

Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

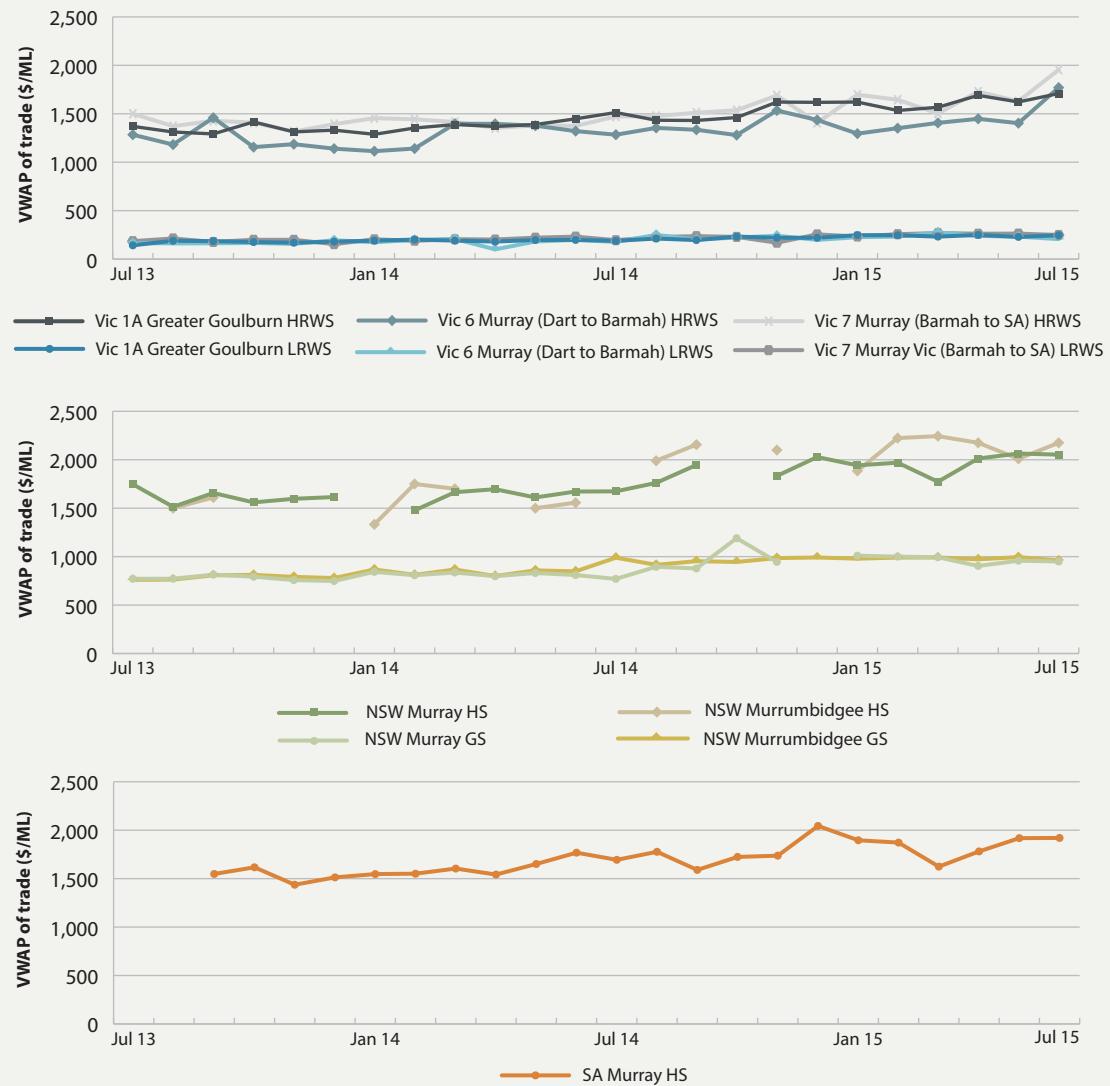
3.4 Comparison with 2013-14

3.4 COMPARISON WITH 2013-14

3.4.1 ENTITLEMENT PRICES

As was noted in Aither's 2013-14 Water Markets Report, entitlement prices were suggested to be increasing at the end of the 2013-14 water year, but this was not evident in water register data at that time. Register data for 2014-15 establishes that prices have indeed increased, and monthly prices over the 24 month period demonstrate a gradual increasing trend, with a slightly greater increase towards the latter part of 2014-15. This is evident across Victoria, New South Wales and South Australia.

The register data presented in Figure 19 suggests a more marked increase in prices for higher reliability products towards the end of 2014-15. However, in June 2015, market prices suggested a more significant upward trend at the end of the year for both low reliability and general security entitlements. For example, there is evidence that June 2015 spot prices for Victorian Low Reliability or New South Wales General Security were up to 35 per cent higher than reported on state registers.



Source: Victorian Water Register 2014 and 2015, New South Wales Water Register 2014 and 2015, and South Australian Water Register 2014 and 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 19 MONTHLY TRADE PRICES, MAJOR VICTORIAN, NEW SOUTH WALES AND SOUTH AUSTRALIAN ENTITLEMENTS, 2013-14 AND 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

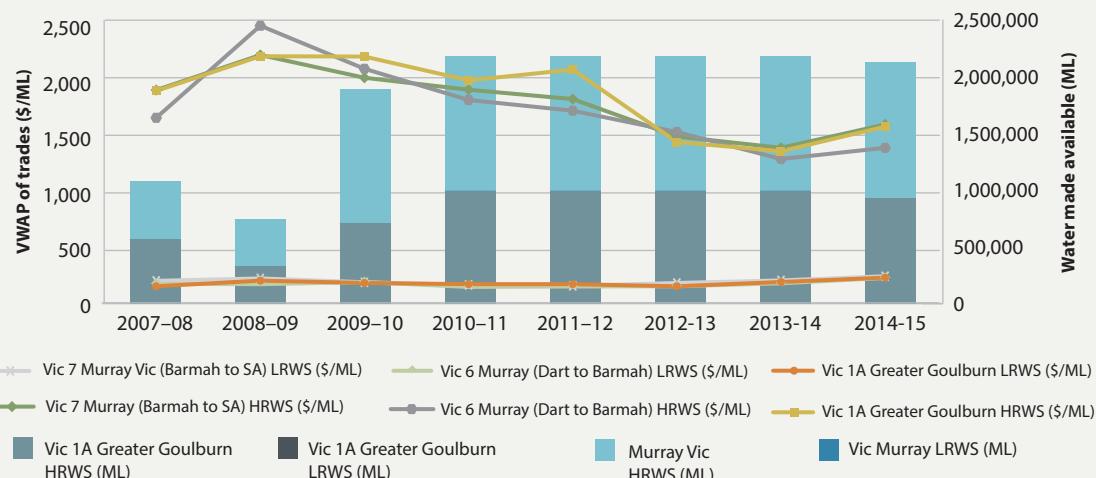
3.4 Comparison with 2013-14

3.4.2 LONGER-TERM ENTITLEMENT PRICE CHANGE

In theory, the value of entitlements should reflect an understanding of the long-term average annual allocation to different entitlements and the benefits this provides. However, prices for entitlements have varied substantially – including to an extent with annual water availability factors (relatively higher prices in drought years and declines thereafter).

However, as is evident in recent results, it is also likely that entitlement prices are being driven by medium-term expectations about water availability – such as current indications that south eastern Australia is entering a drying cycle, and the potential for increased yields from entitlements that this presents (given higher allocation prices). The corollary of this is that intolerance for allocation price risk may also be driving existing allocation-dependent enterprises to secure entitlements.

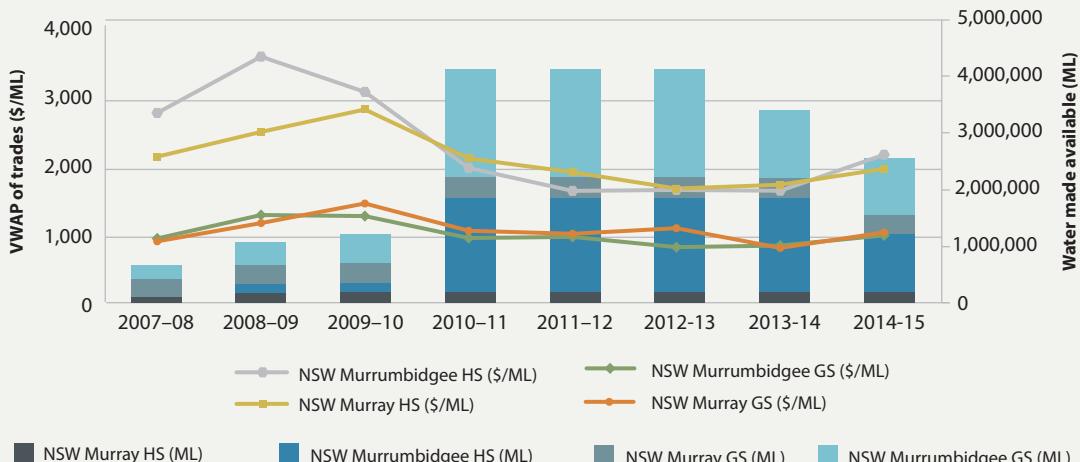
Figure 20 (Victoria) and Figure 21 (New South Wales) both show decreasing higher reliability entitlement prices from 2010-11 (wet years) until most recent years where water availability has begun to decrease again. In 2014-15, New South Wales showed the most evident drop in available water corresponding to increasing prices for higher reliability water entitlements.



Source: Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 20 ANNUAL ENTITLEMENT PRICES AND WATER ALLOCATED FOR MAJOR VICTORIAN ENTITLEMENTS, 2007-08 TO 2014-15



Source: New South Wales Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 21 ANNUAL ENTITLEMENT PRICES AND WATER ALLOCATED FOR MAJOR NEW SOUTH WALES ENTITLEMENTS, 2007-08 TO 2014-15

3.0 Entitlement markets

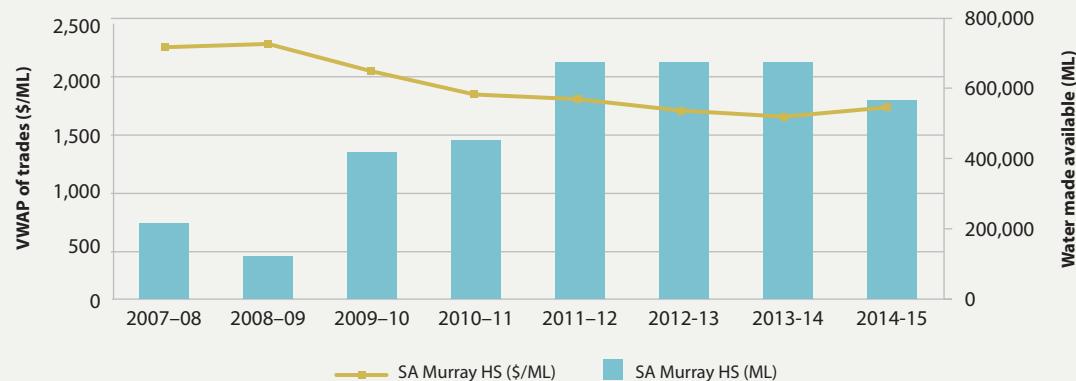
3.1 Entitlement trade activity and prices in 2014-15

3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

Figure 22 shows that in South Australia there was a similar decrease of higher reliability entitlement prices from 2010-11 (wet years) until most recent years. However, the increase in price in recent years (based on decreasing water availability) is not as pronounced as seen in New South Wales.



Source: South Australian Water Register 2015 and NWC 2011.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 22 ANNUAL ENTITLEMENT PRICES AND WATER ALLOCATED FOR MAJOR SOUTH AUSTRALIAN ENTITLEMENTS, 2007-08 TO 2014-15

3.0 Entitlement markets

3.1 Entitlement trade activity and prices in 2014-15

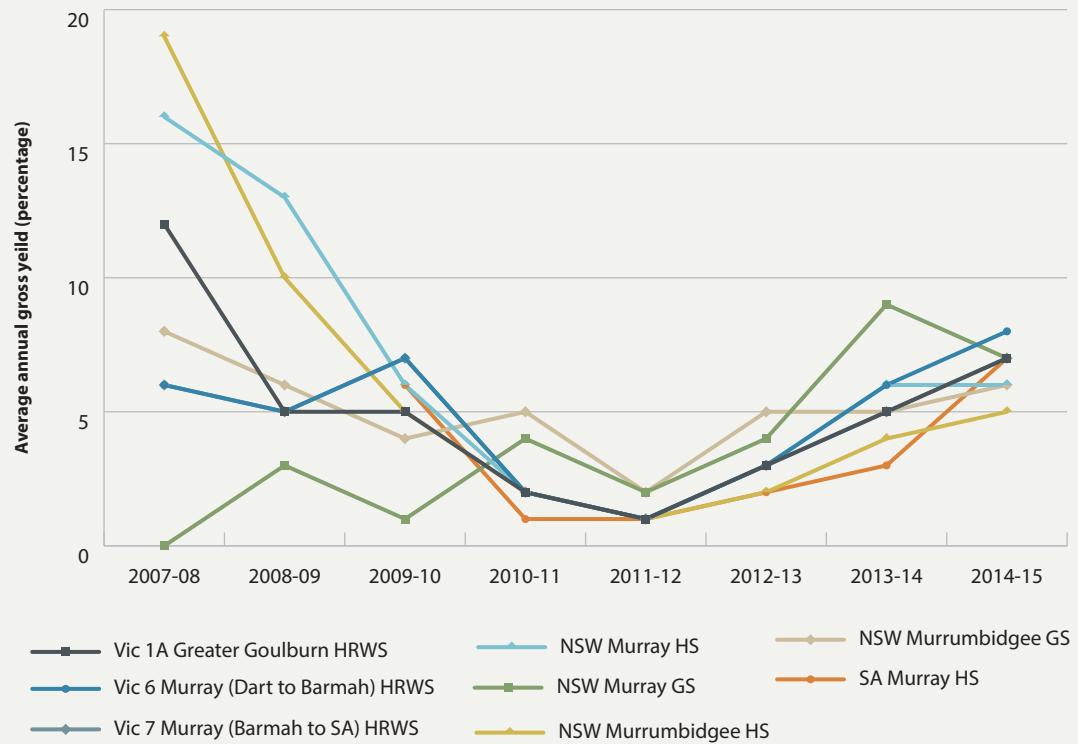
3.2 Entitlement market performance

3.3 Entitlement market size and value

3.4 Comparison with 2013-14

3.4.3 FINANCIAL YIELDS

There has been substantial variation in financial yields since 2007-08. Financial yields to higher security entitlement types have generally been highest in drought years and lowest in years of high water availability. With low entitlement values and increasing allocation prices, financial yields have improved in recent years (Figure 23).



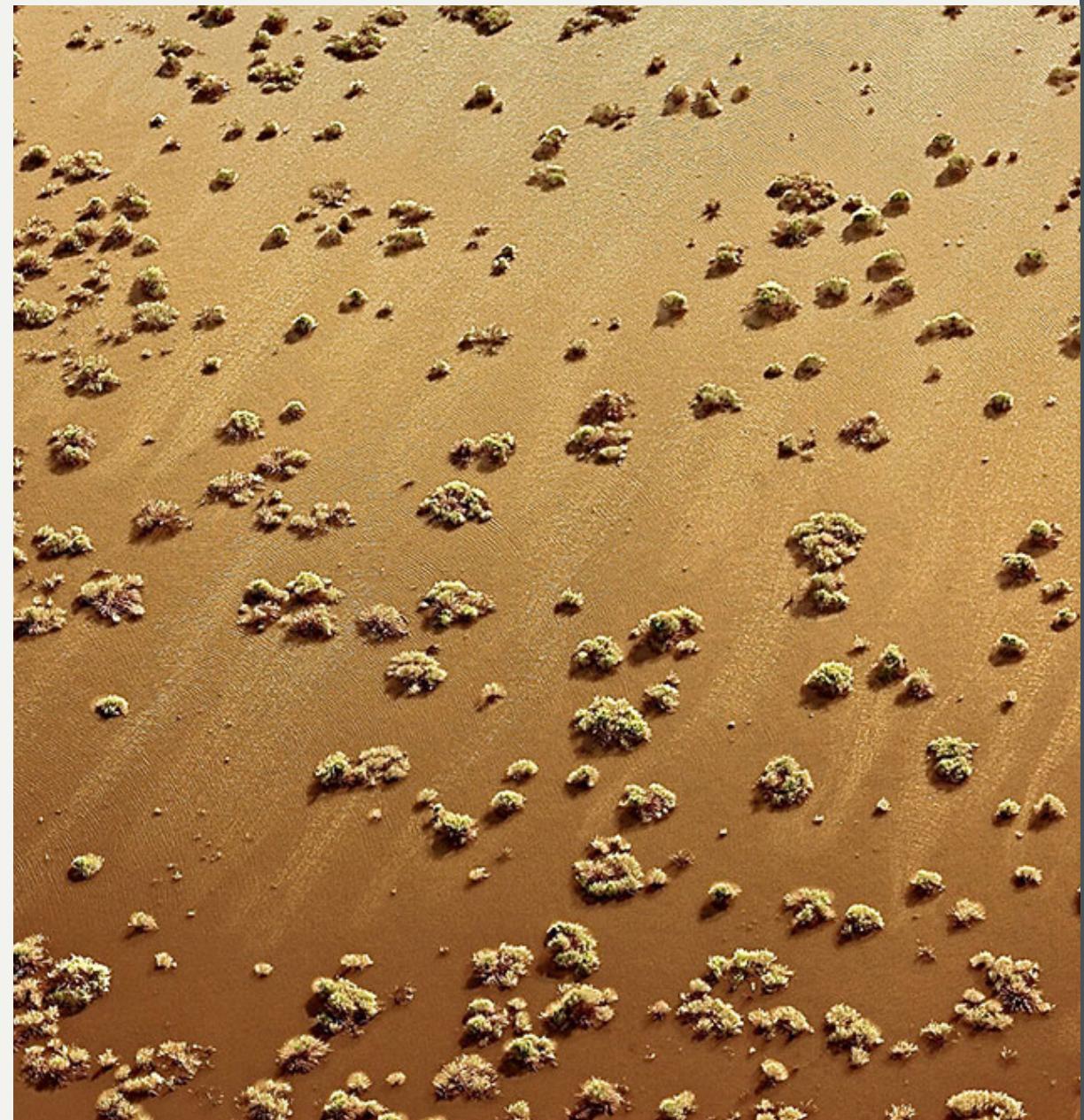
Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

Note: Please see pages 40 and 41 for a full list of notes.

FIGURE 23 AVERAGE GROSS FINANCIAL YIELDS TO MAJOR SOUTHERN MURRAY-DARLING BASIN ENTITLEMENTS, 2007-08 TO 2014-15

4.0

OUTLOOK FOR 2015-16



4.0 Outlook for 2015-16

4.1 Water availability

4.2 Allocation price forecast

4.3 Entitlement market outlook

4.1 WATER AVAILABILITY

There is a level of uncertainty in the early outlooks for 2015-16. Strengthening of El Niño conditions could potentially impact annual rainfall and cause higher temperatures during late spring or early summer across the Murray-Darling Basin (BoM 2015). If impacts are realised, climatic influences have the potential to reduce available water, push prices higher and increase trade activity for both allocations and entitlements.

4.1.1 ALLOCATION DETERMINATIONS

Opening allocations for 2015-16 were generally lower than for 2014-15 – only NSW Murrumbidgee HS and SA Murray HS opened with the same determination as the previous year. Vic 1A Greater Goulburn HRWS, Vic Murray HRWS and NSW Murray HS entitlements, which are generally highly secure, were allocated substantially less in 2014-15 than the previous year – which is a strong indication that water resource managers are concerned about future water availability.

As at June 2015, neither the New South Wales Office of Water (NOW) nor the Victorian Water Resource Manager (VWRM) were predicting that conditions would improve dramatically over the early stages

of the 2015-16 season. Specifically, water resource managers (VWRM 2015, NOW 2015) were predicting that:

- Vic 1A Greater Goulburn LRWS and Vic Murray LRWS are expected to remain at 0 per cent for the foreseeable future.
- NSW Murray GS is expected to remain at 0 per cent at least until November 2015.
- NSW Murrumbidgee GS is expected to reach 37 per cent by November 2015.

TABLE 6 OPENING WATER YEAR ALLOCATIONS, 2013-14 AND 2014-15

Entitlement location and class	July 2014	July 2015
Vic 1A Greater Goulburn HRWS	74%	▼ 42%
Vic 1A Greater Goulburn LRWS	0%	— 0%
Vic Murray HRWS	57%	▼ 35%
Vic Murray LRWS	0%	— 0%
NSW Murray HS	97%	▼ 80%
NSW Murray GS	6%	▼ 0%
NSW Murrumbidgee HS	95%	— 95%
NSW Murrumbidgee GS	10%	▼ 8%
SA Murray HS	100%	— 100%

Source: New South Wales Water Register 2015, South Australian Water Register 2015 and Victorian Water Register 2015.

4.0 Outlook for 2015-16

4.1 Water availability

4.2 Allocation price forecast

4.3 Entitlement market outlook

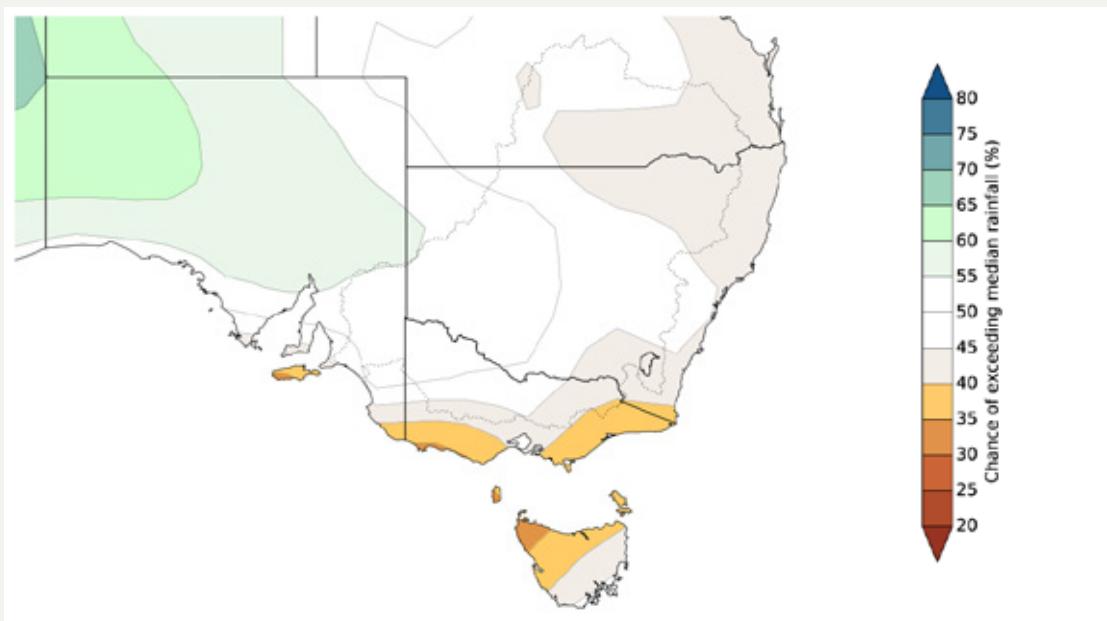
4.1.2 RAINFALL

The Bureau of Meteorology's July to September 2015 rainfall outlook for the sMDB is for a generally drier period, with a 40 to 50 per cent chance of rainfall exceeding the median (see Figure 24). This may result in a drier than average end to winter and less rainfall in spring, which could further restrict increases to water allocations leading into the summer growing season.

4.1.3 EL NIÑO

A contributing factor to the drier conditions predicted for the first few months of the 2015-16 water year is the prevailing El Niño episode (which typically reduces winter and spring rainfall in south eastern Australia).

Although the strength of the El Niño episode does not necessarily correlate to less rainfall, the current El Niño episode is predicted to strengthen over the coming months maintaining the increased likelihood of drier conditions until at least the end of 2015 (BoM 2015).



Source: Bureau of Meteorology 2015.

FIGURE 24 RAINFALL OUTLOOK SOUTH EASTERN AUSTRALIA, JULY TO SEPTEMBER 2015

4.0 Outlook for 2015-16

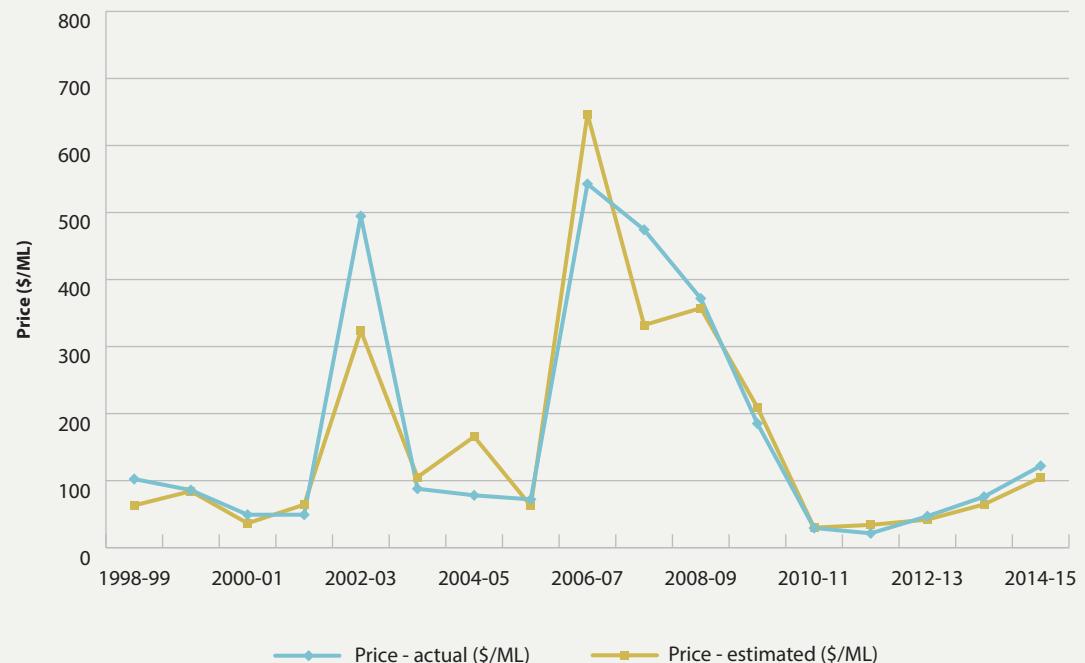
4.1 Water availability

4.2 Allocation price forecast

4.3 Entitlement market outlook

4.2 ALLOCATION PRICE FORECAST

Aither's proprietary water allocation price model predicts median allocation prices in the sMDB for future water years. Figure 25 shows the close correlation between actual allocation prices over the past 15 years and the prices estimated by Aither's model. In particular, the model has performed exceptionally well in estimating allocation prices since 2010-11.



Source: Aither 2015.

FIGURE 25 PERFORMANCE OF AITHER MODEL RELATIVE TO ACTUAL ALLOCATION PRICES

4.0 Outlook for 2015-16

4.1 Water availability

4.2 Allocation price forecast

4.3 Entitlement market outlook

Using this model, Aither has estimated expected allocation prices for the sMDB for the 2015-16 water year. Based on a range of different water availability scenarios, the predicted median allocation prices for 2015-16 are provided in Table 7. The scenarios have been adopted from seasonal determination outlooks provided by NOW and the NVWRM.

TABLE 7 ESTIMATED MEDIAN WATER ALLOCATION PRICE, 2015-16

Water availability Scenario	Predicted median price (\$/ML)
Extreme dry	\$300
Dry	\$160
Average	\$120

Source: Aither 2015.

As shown in Table 7, the median annual allocation price for 2015-16 under a 'dry' scenario (which, as of June 2014, was roughly where inflows have been tracking) is predicted to finish at around \$160 per ML (or a 40 per cent increase on 2014-15 prices). This is a reasonable estimate based on expectations of continued dry seasonal conditions and expected growth in the demand for water allocations to support new cotton and horticultural developments in the sMDB in particular. These new agricultural developments are primarily higher value crops with fixed water demands and a higher

willingness to pay for water, which could place upward pressure on allocation prices.

If an 'extreme dry' scenario eventuates, prices could increase to around \$300 per ML (see Table 7). Under this scenario, allocations to entitlements in major sMDB trading zones could be similar to that experienced during the most recent drought. With early season allocation prices just below \$200 per ML, it may be that conditions somewhere between dry and extreme dry are expected by market participants. In either case, significant rainfall is likely to be required to substantially reduce allocation prices.

4.0 Outlook for 2015-16

4.1 Water availability

4.3 ENTITLEMENT MARKET OUTLOOK

The expected decline in water availability over the longer-term, particularly the predicted strengthening of the current El Niño event, is likely to result in heightened demand for high reliability water entitlements. Accordingly, entitlement trading volumes may increase in 2015-16 as irrigators and other water users enter the market to attempt to secure a greater share of available water for coming seasons.

As discussed previously in relation to allocation markets, the demand for water for higher-value crops is set to increase substantially given investment in new developments of almonds, walnuts and hazelnuts.

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APPENDIX A - ABOUT AUSTRALIA'S WATER MARKETS

Australia's water markets comprise of two distinct but related markets – the entitlement market, and the allocation market. There is no single national market for these products, but rather a number of individual separate markets. Where hydrological connectivity exists, such as in the southern connected Murray-Darling Basin, trade between these markets is possible.

- Water entitlements are ongoing rights to receive a share of available water resources in a consumptive pool. They are analogous to a land property right, are generally secure and mortgageable in the same way, and have substantial value. Each catchment typically has a small number of entitlement 'classes', and generally all entitlements within a given class are homogenous.
- Water allocations are the volumes of water allocated to water entitlement holders during the water year (1 July to 30 June). They are a physical good analogous to a commodity, and are extracted from water courses and applied as inputs to production or the environment. Their value per unit varies within, and between years.

ALLOCATION MARKET

PURPOSE, USE AND OPERATION

The allocation market provides the ability to trade physical water between parties for use, further trade, or carry over. Allocation trade can generally only occur between parties that are hydrologically connected such that water can be delivered between them (or substituted by other water from a shared storage).

The water allocation market is mainly used by irrigated agricultural producers (including rice, dairy, horticulture, cotton and others), and environmental water managers. Producers use the market to sell water excess to requirements, or buy additional water in during dry periods or when temporarily expanding production. Environmental water holders may similarly buy or sell when they have short term surpluses or deficits.

State government regulators determine annual allocations based on entitlement characteristics (which determine priority and how much water is allocated to individuals), and market rules to manage issues such as connectivity between systems and transmission losses. State government, either directly or via their water utilities, play a key role in facilitating allocation trade, including ensuring compliance with rules and regulations, and by approving and processing trades. Parties seeking to trade allocations may utilise intermediaries such as privately-owned water brokers or cooperatively-owned pool exchanges.

KEY DRIVERS OF MARKET OUTCOMES

The amount of water allocated to entitlement holders each year is a key driver of allocation market outcomes (including prices and volumes traded), because it strongly influences the total amount of water available for use or trade. When allocations are low, water is scarce and prices are high, and the opposite is true when allocations are high. Allocation levels reflect broader water availability, including rainfall and inflows in relevant catchments, and volumes held in storages. Other key drivers in allocation markets include conditions in markets for irrigated agricultural products, and conditions in substitute input markets.

THE ENTITLEMENT MARKET

PURPOSE, USE AND OPERATION

An entitlement specifies an annual volumetric share of available resources in a given catchment or water system, which the holder will receive as water allocations, subject to rainfall, inflows water held in storage and other factors. The entitlement market enables the trade in the ongoing right to receive these water allocations. Entitlements can be held by virtually any party in any location, but water use is tied to site-specific regulatory controls, and inter valley or interstate trade is contingent upon hydrologic connectivity and other factors. The nature of entitlements differs significantly between those catchments with large amounts of water storage infrastructure (called 'regulated' systems) and those without ('unregulated' systems). Most entitlements within the Murray-Darling Basin are regulated.

The entitlement market is also largely used by irrigated agricultural producers, but is increasingly being used by investors, water utilities (including urban suppliers) and environmental water holders. These users use the market to modify their long term arrangements for facilitating production, or meeting environmental requirements or urban demand. Trade in entitlement is often also driven by the need to manage risk associated with securing supply, and may also occur due to changes in business strategy or structure (such as retiring debt).

Similar to the allocation market, state government agencies govern the operation of the entitlement market, including rules and regulations regarding how and where trade can occur. Depending on the jurisdiction, other agencies (such as land titles or property registration agencies) will be involved, given entitlements nature as a secure property right. Third parties (such as brokers and conveyancers) often play a role in facilitating entitlement trade.

KEY DRIVERS OF MARKET OUTCOMES

The value (and price) of water entitlements is largely determined by their reliability characteristics, which differ between each entitlement class. Higher reliability entitlements provide greater water allocations over the long-term, and more consistently provide water allocations each year. Generally these two characteristics are linked. Entitlements with a high reliability will typically be priced highly. This reflects both their increased allocations and the premium placed on water supply security by industries such as horticulture that cannot afford

to experience high variability in supply. In investment terms, entitlement reliability directly influences the likelihood that yields can be achieved in the short and long term.

Trade in entitlements is related to longer term production decisions and the characteristics of different irrigated agricultural enterprises, including their tolerance for risk. Producers who may be expanding or contracting production drive market activity, as do investors or larger scale enterprises that may hold entitlements and facilitate new models of irrigation farming based on trading annual allocations rather than holding entitlements. Purchases of water on behalf of the environment have also driven market activity in recent years.

AITHER'S WATER MARKETS EXPERTISE

Aither is an economics, policy and strategic advisory firm committed to delivering value and results for our clients. With specialist expertise and experience that extends across multiple disciplines and sectors, we translate our leading thinking into practical advice, empowering our clients to make better decisions about the issues that matter.

Aither's team are water market experts. Over the last decade, we have worked closely with government and industry on the design, implementation and analysis of Australia's water markets. We understand the real risks and opportunities and provide an independent and credible voice.

Our specialist water markets services include:

- policy development and analysis
- water trading strategies
- portfolio management advice
- transactional due diligence
- quantitative economic modelling of entitlement values
- assessments of regulatory risks and opportunities
- assessments of drivers and trends in water markets.

A feature of our approach is our use of bespoke water market modelling tools which we have developed to inform both policy and investment.



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ENDNOTES

- 1 While water trade is possible and occurs in many areas throughout Australia, the vast majority of trade by volume and value occurs in the southern connected Murray-Darling Basin. Some of this trade also occurs within private irrigation districts, for which detailed data is not generally freely publically available.
- 2 Water 'transfers' include all recorded trades in public water registers (such as \$0 trades). Water 'trades' refer to transfers of water between entities where a 'valid' price or volume has been recorded in the public water register.

TABLE NOTES

- Table 1 Transfers with a reported price of \$0 are included in all calculations.
- Table 2 Volume Weighed Average Price (VWAP) calculates the average price weighted by the volume traded at each price. Trades with prices reported as less than \$5 and more than \$350 are excluded from VWAP calculations. Only 'within' and 'into' allocation trades have been used in the calculation of prices. 'Out of' allocation trades have been excluded on the basis that it would double count trades between zones.
- Table 3 Excludes entitlement transfers within irrigation corporations. Outlier transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations for higher reliability products, lower than \$50 and higher than \$2,000 for lower reliability products in New South Wales and lower than \$50 and higher than \$500 for lower reliability products in Victoria.
- Table 4
 - 1) Estimated environmental entitlements are based on the reported holdings of the Commonwealth Environmental Water Holder, the Victorian Environmental Water Holder, the Living Murray (TLM) and the New South Wales Office of Environment and Heritage. Bulk water environmental water holdings in Victoria have been excluded from estimated environmental entitlements as they are not included in total entitlement on issue calculations.
 - 2) Environmental water holders do not always publicly distinguish between entitlements held in Vic Murray 6 (Dart to Barmah) and Vic Murray 7 (Barmah to SA). To estimate the environmental entitlements held by zone, the proportional split between purchases secured for Vic Murray 6 (Dart to Barmah) and Vic Murray 7 (Barmah to SA) under the Restoring the Balance in the Murray-Darling Basin Program (as at May 2015) was used as a proxy to determine the split of total environmental entitlement held for the two zones respectively.
 - 3) Estimated value of assets calculations are based on total entitlement on issue minus estimated environmental entitlements multiplied by volume weighted average price for a given entitlement class.
- Table 5 Excludes entitlement transfers within irrigation corporations.
1) Estimated turnover value calculations are based on total volume transferred multiplied by annual volume weighted average price for a given entitlement class.
2) Liquidity calculations exclude water allocated to entitlements held by environmental water holders (see note in Table 5).
3) Yields are presented in gross terms; they do not account for any fees or charges associated with holding entitlements or trading allocations.
4) In zones which received 0 per cent water allocation for the 2014-15 water year, no yields 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).

FIGURE NOTES

- Figure 1 Volumes include transfers with \$0 reported prices. Trades with reported prices of less than \$5 and more than \$350 are excluded from price calculations (in this case two additional outliers of \$7.85 per ML were excluded from May price calculations). Only 'within' and 'into' allocation transfers 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 2 Volumes include transfers with \$0 reported prices. Trades with reported prices of less than \$5 and more than \$350 are excluded from price calculations. Only 'within' and 'into' allocation transfers and 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. An abnormally high volume of water transferred in August (a close to 400,000 ML within zone allocation transfer associated with supplementary water access licenses) has been removed from the data presented in this figure. While some transfers were recorded on the New South Wales Water Register for June 2015, the trade season for Murrumbidgee, Murray and Lower Darling closes on 31 May each year, so these trades have been excluded from the figure.
- Figure 3 Volumes include transfers with \$0 reported prices. Trades with reported prices of less than \$5 and more than \$350 are excluded from price calculations. Only 'within' and 'into' allocation transfers and 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 4 Trades with reported prices of less than \$5 and more than \$350 are excluded from price calculations. Only 'within' and 'into' allocation trades have been included in price calculations. 'Out of' allocation trades have been excluded on the basis that it would double count trades between zones.
- Figure 5 Transfers with reported prices greater than \$250 per ML are not shown in the above figure to improve scale and legibility.
- Figure 6 Transfer outliers with prices greater than \$200 per ML are not shown to improve scale and legibility.
- Figure 10 Includes water allocated to entitlements held by environmental water holders.
- Figure 11 Includes water allocated to entitlements held by environmental water holders. However, for reference, 737,300 ML of available water in 2014-15 was allocated to entitlements purchased by the Commonwealth Government (based on purchases secured under the Restoring the Balance in the Murray-Darling Basin Program as at 31 May 2015). Assuming this water was not traded, it would have in theory reduced total water available in the past water year by 14 per cent on that shown in the above figure – bringing the total water available closer to 2006-10 levels. Prices reported are annual medians (\$ per ML).
- Figure 12 Volumes include transfers with \$0 reported prices. Outlier transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations for higher reliability products.
- Figure 13 Volumes include transfers with \$0 reported prices. Outlier transfers with reported prices lower than \$50 and higher than \$500 are excluded from price calculations for lower reliability products.
- Figure 14 Volumes include transfers with \$0 reported prices. Outlier transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations for higher reliability products. Gaps in data series represent months where no 'valid' trade prices were recorded in public registers.
- Figure 15 Volumes include transfers with \$0 reported prices. Outlier transfers with reported prices lower than \$50 and higher than \$2,000 for lower reliability products are excluded from price calculations.
- Figure 16 Volumes include transfers with \$0 reported prices. Outlier transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations.
- Figure 17 No outliers have been removed from the dataset and all transfers recorded on the public registers are shown in the above figure.
- Figure 18 Transfer outliers with prices greater than \$3,500 per ML are not shown to improve scale and legibility.
- Figure 19 Trades with reported prices of less than \$50 and more than \$2,500 are excluded from price calculations. Gaps in data series represent months where no 'valid' trade prices were recorded in public registers or where there are data gaps.
- Figure 20 Total available water includes water allocated to entitlements held by environmental water holders. Transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations for higher reliability products and lower than \$50 and higher than \$500 for lower reliability products.
- Figure 21 Total available water includes water allocated to entitlements held by environmental water holders. Transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations for higher reliability products and lower than \$50 and higher than \$2,000 for lower reliability products.
- Figure 22 Total available water includes water allocated to entitlements held by environmental water holders. Transfers with reported prices lower than \$500 and higher than \$3,500 are excluded from price calculations for higher reliability products. Annual prices between 2007-08 and 2009-10 are means (sourced from the National Water Commission Water Markets Report Series) not VWAPs due to raw trade data not being available for analysis.
- Figure 23 Financial yields 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 2014-15 water year, no financial yields are recorded.