07
Appendices
Appendix A – Irrigator engagement with water markets

Key Points

Entitlement trade

- Irrigators’ engagement with entitlement markets in the Southern Basin (measured as having bought or sold an entitlement at least once) has been increasing over time. Between 2000–01 and 2015–16, the percentage of irrigators reporting at least one entitlement trade increased from less than 10% to just under 50%.
- However, as at 2016, approximately half of irrigators reported never having traded an entitlement, and only a small proportion (less than 10%) reported having bought and sold entitlements within the previous 5 years.

Allocation trade

- Irrigators’ engagement with allocation markets in the Southern Basin (measured as having bought or sold an allocation at least once) has also been increasing over time. Between 2000–01 and 2015–16, the percentage of irrigators reporting at least one allocation trade increased from less than 15% to more than 75%.
- However, as at 2016, approximately 25% of irrigators reported never having traded an allocation, and only a small proportion (less than 15%) reported having bought and sold allocations within the previous 5 years.

Some key differences in irrigators’ use of entitlement and allocation trade

- Irrigators in the Southern Basin are significantly more engaged with entitlement and allocation markets than irrigators in the Northern Basin. Between 2008–09 and 2017–18, Southern Basin irrigators were, on average, 4.8 times more likely to have conducted a water allocation trade, and 7.9 times more likely to have conducted a water entitlement trade compared with irrigators in the Northern Basin.
- The sale of water entitlements over 2006–07 to 2014–15, particularly by dairy farmers in the Southern Basin, has resulted in an increase in the proportion these irrigators relying on water allocation purchases from 2011–12 onwards as drier conditions returned.
- The flexibility of annual cropping irrigators, such as rice farmers, allows them to more easily switch from using/buying water allocations in wetter years, to not using/selling water allocations in drier years. These irrigators tend to demonstrate more variable and higher level of net allocation trade over time.
- In contrast, the more constant water needs of permanent plantings, such as nut and fruit plantations, means horticultural farmers have less flexibility to trade temporary water, and so demonstrate a more stable and lower level of net allocation trade over time.

Leases and newer water products

- Available evidence indicates that a small minority of irrigators across the whole Basin (less than 7% as at 2018) use water from leased entitlements. The evidence indicates that:
  - irrigators with larger holdings of permanent water rights are more likely to use leases than irrigators with smaller holdings of permanent water rights
  - where smaller irrigators use leases, they are more likely to lease from friends and relatives, their own self-managed super fund, or from other irrigators
- where larger and corporate irrigators use leases, they are more likely to use longer-term leases sourced from commercial operators, either as part of leasing land or as a stand-alone lease from an investor.

- Available evidence indicates that only a very small proportion of irrigators use carryover parking or forward contracts.

**Irrigator views on the benefits of water trading**

- Irrigators have become increasingly negative about water trading over the last 20 years. The proportion of irrigators believing that water trading was a ‘good idea’ or ‘good for farming’ has declined from 3 quarters of irrigators in the GMID in 1999 to less than 30% of irrigators in the Southern Basin by 2016.

- Over the same period, the proportion of irrigators believing that water trading was not a ‘good idea’ or not ‘good for farming’ has increased from just 14% of irrigators in the GMID in 1999 to over 50% of irrigators in the Southern Basin in 2016.

- A high proportion of irrigators (85% in 2016) in the Southern Basin disagreed with the idea that non-farm entities should be allowed to buy water, while almost half (48% in 2016) disagreed that retired farmers should be allowed to retain and trade water.

**Irrigator views on the ease of trading and confidence in water markets**

- Majorities of irrigators in 2015 and 2016 expressed positive views on the ease of making temporary and permanent trades, being able to access the information needed to trade, and feeling confident in trading water for their farm. However, relatively significant minorities of irrigators also expressed opposing views on each of these issues, with:
  - 12% to 18% of irrigators not agreeing that trading temporary or permanent water was easy
  - 17% to 19% not agreeing that the information needed to trade water was easy to access
  - 25% to 28% not agreeing that they felt confident in using water trading.

- Irrigators expressed low levels of confidence in the fairness of water markets, and water market rules in 2015 and 2016, with:
  - only 23% to 32% of irrigators agreeing that water markets were fair for all users
  - only 16% to 26% of irrigators expressing confidence in water market rules.

- Majorities of irrigators in 2015 and 2016 expressed confidence in the security of their water rights, while a quarter or more did not (32% and 24%). However, only a quarter or less of irrigators agreed that entitlements held by the government were subject to the same rules and charges as other participants’ entitlements (13% and 26% in 2015 and 2016 respectively), while more than 4 in ten disagreed that these entitlements were treated equally.

**Views held by irrigators who trade and do not trade**

- Irrigators who engaged in water entitlement and allocation trade in the Southern Basin had significantly more positive attitudes to water trading, to investors owning water, to environmental water recovery and the Basin Plan, and less traditional attitudes to farming, relative to irrigators who did not trade.

This appendix describes:

- irrigator numbers across the Basin

- the type and level of irrigator engagement with different types of water markets, including water allocation and entitlement markets, leases and newer water products such as carryover parking and forward contracts

- irrigator attitudes to water markets and water trading, and possible associations between these attitudes and an irrigator’s decision to trade or not trade water.
A.1 ACCC analysis of water trade, ownership and account data

The ACCC has undertaken an analysis of water trade, ownership and accounts data provided by the Basin States to construct a dataset on water ownership by each participant group in the different water sources which comprise the Southern Connected Basin (box A.1 provides an overview of the ACCC’s methodology).

Box A.1: ACCC methodology to derive statistics on water ownership and trading activity by participant group

There is limited data publicly available on the type and quantity of permanent water rights owned by the participant groups, across the Basin or by trading zone or catchment. Similarly, there is little data publicly available on water market activity by participant group, with the exception of government environmental water holders.

The Inquiry has acquired registry data from Basin States and IIOs, and undertook work to classify water access entitlement owners, water account holders, and water traders into the participant groups identified in chapter 4 and this Appendix.

The following steps were undertaken to assign a participant group category to all water entitlement owners, allocation account holders, and water traders (buyers and sellers) appearing in Basin State registry data; and to water traders (buyers and sellers) appearing in IIO registry data:

1. First, use publicly available information to identify generate lists of known participants belonging to the following groups: EWHs, IIOs, Traditional Owners groups\(^{1362}\), Urban, Industrial and Recreational users and other government entities such as water authorities and shire or town councils.

2. Second, use information obtained by the inquiry to identify and categorise certain key participants, such as ‘Institutional Investors’ and ‘Agribusinesses’, and allocating all superannuation funds (except those already assigned to the ‘Institutional Investor’ category) to the category of ‘non-Institutional Investors’. Note that the ‘Agribusiness’ category includes certain agribusinesses individually identified by the ACCC, and pastoral companies; agribusiness which use water but have not yet been specifically identified by the ACCC form part of the ‘Other-water user’ category.

3. Third, generate lists of identifying terms for inclusion in an algorithm; for example, ‘School’, ‘City’, ‘Council’ were some of the terms used to assign a name to the category of ‘urban’; ‘Department’ and ‘Minister’ were some of the terms used to assign a name to the category of ‘government’; ‘aboriginal’ and ‘indigenous’ were some of the terms used to assign a name to the category of ‘traditional owner groups’, etc.

4. Use water account data provided by Basin States to derive a ‘water use’ field, which records whether a participant has any usage recorded against their name.

5. Using the results of Steps 1–3, implement an algorithm to assign a category to all names.

6. Manual quality checking of initial algorithm assignments; iterative adjustment of algorithm to improve categorisation (based on expert judgement and key acceptance criterion such as all known IIOs, large investors, agribusiness, environmental water holders and government entities correctly assigned).

\(^{1362}\) Note that the ‘Traditional Owners groups’ category includes entities such as Aboriginal Land Councils, Aboriginal Associations, Tribal Councils and Aboriginal Corporations. No attempt has been made to identify individual persons as belonging to this group.
7. Noting the potential for a participant to appear in multiple Basin State datasets under slightly different names, and for a set of related parties with different names to participate in water markets effectively as a single unit, we designed a clustering algorithm to identify clusters of participants based on their entitlement and account holdings. For example, if Jane and John Smith co-held a water share in NSW, and the same John Smith had an allocation bank account in his name only, the algorithm would identify these 2 parties as a ‘Smith’ cluster.

8. Manual quality checking of clustering results; for example, manually breaking up very large clusters (relatively few of which occurred), and ‘sense checking’ where clusters involving names to several different categories appeared (for example, if a Cluster involved 3 names that had been assigned at Step 6 as ‘investor’, ‘environmental water holder’ and ‘government’, manual assessment of this result would occur, and the clustering results adjusted if needed, for example, by breaking apart that cluster into several sub-clusters.

9. Use trade and usage data to assign a category to the cluster level, by taking the individual level assignment from the final stage of Step 6, such that the category assigned at the cluster level is taken to be the category assigned to the name with the largest trade volume within the cluster.

10. Deploy the cluster categorisation to analyse market activity and entitlement ownership by participant group.

The ACCC acknowledges that this classification work involves uncertainty due to data issues and the exercise of expert judgement, and notes that all results arising from this work should be interpreted as indicative.

A.2 Snapshot of irrigator numbers across the Basin

In 2018–19 (the latest year for which ABS data is available), it is estimated there were just under 9000 agricultural businesses irrigating land across the Murray Darling Basin. Of these, an estimated 6785 operated in the Southern Basin and 1935 in the Northern Basin.

Figure A.1 compares the estimated number of farms irrigating different crops in the Northern and Southern Basins in 2018–19. It shows that almost one quarter of irrigated farms in the Northern Basin grew cotton in 2018–19 (444 of 1935 farms). This was significantly more than the 149 cotton irrigators in the Southern Basin. It also shows that approximately 21% of irrigated farms in the Northern Basin (411 farms) grew pasture and cereal crops for grazing, and 16% (318 farms) grew cereal grain and seed (including wheat, oats, maize. In 2018–19, no farms in the northern Basin grew rice; reflecting the poor water availability in that year.

In the Southern Basin, approximately 40% of irrigated farms (2716 of 6 farms) reported growing pasture and cereal crops for grazing in 2018–19. Approximately 27% (1838 farms) grew grapevines, 19% (1278 farms) irrigated fruit and nut tree plantations and berry fruits, and 2% (149 farms) grew cotton. Just 1% (52 farms) reported growing rice.
Table A.1 reports the estimated numbers of farms in the Murray Darling Basin growing different crop types reporting to have irrigated land in 2018–19 by natural resource management (NRM) region. This table shows that the Condamine NRM region had the highest proportion of the Northern Basin’s irrigated farms in 2018–19 (22% or 431 of 1935 farms in the Northern Basin). Irrigated farms in the Condamine NRM regions predominantly grew a mix of cotton, cereal grain and seed, and pasture and crops for grazing. The distribution of irrigated farms in the other Northern Basin NRM regions included:

- the North West New South Wales NRM region with 20% or 395 of all Northern Basin farms, most commonly growing cotton
- the Central West NRM region with 17% or 332 farms, growing a mix of cotton, cereal grain and seed, and pasture and crops for grazing
- the Queensland Murray Darling Basin and the Western NRM regions, with 12% and 15%, respectively (or 235and 284 farms respectively). Farms in the Queensland Murray Darling Basin NRM regions most commonly grew a mix of cotton and horticulture, while farms in the Western NRM regions predominantly produced grapes and horticulture
- the Central Tablelands NRM region with 13% or 258 of all Northern Basin farms, predominantly irrigating permanent crops of fruit and nut trees, berry fruits and grapes.

In the Southern Basin, the Goulburn Broken NRM region contains the highest proportion of the Southern Basin’s irrigated farms, with 25% or 1679 of the 6785 farms in the Southern Basin. In 2018–19 these most commonly grew pasture and cereal crops for grazing. The distribution of irrigated farms in the other Southern Basin NRM regions included:

- the South Australian Murray Darling Basin NRM regions with 17% or 1180 farms, irrigating mainly permanent plantings of grapevines and fruit and nut trees
- the North Central NRM region with 17% or 1135 farms of all Southern Basin farms, mostly growing pasture and cereal crops for grazing
- the Riverina NRM region with 15% or 1016 farms, predominantly irrigating permanent plantings but also growing a mix of cereals, pasture and cotton
- the Murray NRM region with 12% or 814 farms, mostly growing pasture and cereal crops for grazing, and cereal grains and seed
- the Mallee NRM region with 9% or 642 farms, predominantly irrigating permanent plantings of grapevines, fruit and nut trees and berry fruits.
<table>
<thead>
<tr>
<th>NRM Region*</th>
<th>Cotton</th>
<th>Fruit, nut trees, berry fruits</th>
<th>Grapevines</th>
<th>Cereal grain, seed (wheat, oats, maize)</th>
<th>Pastures &amp; cereal crops for silage (d)</th>
<th>Pasture &amp; cereal crops for grazing</th>
<th>Rice</th>
<th>Vegetables</th>
<th>Total no. of farms irrigating**</th>
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<td>444</td>
<td>123</td>
<td>89</td>
<td>318</td>
<td>79</td>
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<td>Central Tablelands</td>
<td>51</td>
<td>70</td>
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<td>65</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>86</td>
<td>4</td>
<td>2</td>
<td>63</td>
<td>13</td>
<td>118</td>
<td>-</td>
<td>-</td>
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<td>Condamine</td>
<td>117</td>
<td>7</td>
<td>129</td>
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<td>82</td>
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<td>47</td>
<td>15</td>
<td>27</td>
<td>10</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>8</td>
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<tr>
<td>Goulburn Broken</td>
<td>227</td>
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<td>157</td>
<td>277</td>
<td>1,116</td>
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<td>-</td>
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<td>Murray</td>
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<td>711</td>
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<td>-</td>
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<td>13</td>
<td>120</td>
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<td>-</td>
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<tr>
<td>Riverina</td>
<td>141</td>
<td>318</td>
<td>284</td>
<td>233</td>
<td>24</td>
<td>163</td>
<td>34</td>
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<td>1,016</td>
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<tr>
<td>SA MDB</td>
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<td>786</td>
<td>5</td>
<td>10</td>
<td>114</td>
<td>-</td>
<td>-</td>
<td>59</td>
<td>1,180</td>
</tr>
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</table>

Source: ABS 4618.0 – Water Use on Australian Farms, 2017–18.
Notes: NRM Region = Natural Resource Management Region. *NRM boundaries do not perfectly overlap with MDB Boundaries. NRM regions have been chosen to achieve the best matched based on geography and how well the sum of the NRM regions compare to the aggregate ABS “MDB” NRM Region. **Numbers across rows may exceed the total number of farms irrigating as some agricultural businesses report grow more than one food type. ***The “Western” NRM regions cut across the northern and Southern Basin, and is also partially outside the MDB. For the purposes of deriving estimates for Northern MDB and Southern MDB, “Western” is treated as Northern MDB. The ABS has a minimum threshold (by value of operations) for reporting so some very small agricultural businesses who irrigate may be excluded.
Figure A.2 shows that water access entitlements comprise a substantial proportion of the capital assets of most irrigated farms, but this varies by sector (figure A.2). ABARES data shows that on average for the Southern Basin, water entitlements comprise around 41% of capital assets for horticulture farms, 36% for dairy farms, and 35% for rice farms, as at 2018–19. Importantly, for some farms, the value of entitlements held is equal to or even exceeds the value of land assets.

**Figure A.2:** Average proportion of capital assets by asset class, by farm type, 2006–07 to 2018–19

Source: ABARES irrigation survey.

Notes: Average per farm. For horticulture: average of 3 regions (Goulburn, Murray, Murrumbidgee); for rice: average of 2 regions (Murray and Murrumbidgee); for dairy: average of 2 regions (Murray and Goulburn-Broken). Data for rice not available for 2012–13.

### A.3 The type and level of irrigator engagement with different types of water markets

Water market engagement generally refers to the extent to which an irrigator buys or sells a particular water product, including water access entitlements, water allocations, leases, carryover parking or forward contracts.

As noted in chapter 4, the type and level of water market engagement by an irrigator can vary depending on a diverse range of drivers, including:

- **market-based drivers:** including current and future trends or changes in commodity prices, demand for agricultural products, seasonal weather or longer term climate conditions etc. that can impact water use and water availability (demand and supply) and so drive a decision to buy and sell a water product at a given time.
- **institutional and infrastructure drivers:** including trading and operational rules and physical constraints that can impact if, when and how an irrigator can buy or sell water
- **government policy drivers:** including policies governing access to carryover and interventions such as water buybacks or irrigation infrastructure subsidies that can alter the incentives for an irrigator to engage in certain types of water ownership and trade
- **an irrigator’s individual circumstances and characteristics:** including the characteristics of the irrigator’s business (for example, their farm type, size, location, profitability, debt levels, access to capital), the types of risks they face and their attitudes to managing risk, their access to and use of government programmes, and characteristics of the irrigator themselves, which can include:
  - their ability to collect, process and use market related information (that is, do they have the experience, skills and knowledge to trade, the time and money to meet the informational transaction costs of trading, or access to a water market intermediary to advise or act of their behalf?)
  - their future plans (that is, do they intend to expand, adjust or exit their business?)
  - their attitudes to and confidence in water markets and trading (that is, do they have confidence in water markets and the security of their water rights, or are they uncertain or expect the rules to change?).

Based on various measures outlined below, significant numbers of irrigators are engaging with allocation and entitlement markets across the Basin and the level of this engagement has increased significantly over time. However, the available data also indicates that a relatively significant proportion of irrigators either do not use allocation or entitlement markets at all, or uses them infrequently. Evidence also indicates that only a small proportion of irrigators used leases and even fewer irrigators use the newer water products such as forward contracts and carryover parking. This section summarises the extent to which irrigators engage and do not engage with water markets in the Basin. It makes findings on irrigator engagement with each type of water product and asks questions to inform further analysis.

### A.4 Irrigator engagement with allocation and entitlement trade

One of the highest level indicators of irrigator engagement with water markets is whether they have ever traded an entitlement or allocation. Figure A.3 reports the percentage of surveyed irrigators in the Southern Basin who stated that they had conducted at least one entitlement trade, or at least one allocation trade. The figure also shows the volume of entitlements and allocations traded over time.

Figure A.3 shows that a higher proportion of irrigators in the Southern Basin report having traded allocations than report having traded an entitlement in every year of the time series. It also shows that the proportion of irrigators reporting to have engaged in both types of trade has been increasing year on year. Between 2000–01 and 2015–16, the percentage of irrigators reporting at least one entitlement trade increased from less than 10% to just under 50%. Over the same time period, the percentage of irrigators reporting at least one allocation trade increased from less than 15% to more than 75%.

Figure A.3 shows that the proportion of irrigators reporting a temporary trade increased rapidly with the introduction of National Water Initiative reforms in 2004, while the proportion of irrigators reporting a permanent trade increased with the implementation of the Water for the Future program (water buyback scheme) in 2007–08.
Alternative indicators of water market engagement that measure irrigator trading behaviour over shorter periods of time can give additional detail on the level of irrigator engagement with allocation and entitlement markets.

Figure A.4 reports the proportion of irrigators in the Southern Basin who stated they had purchased or sold an entitlement or allocation, done both, or done neither, in the 5 years before being surveyed in 2007–08 and 2014–15. Similar to figure A.3, figure A.4 shows that a higher proportion of irrigators reported trading (purchasing or selling) water allocations in the previous 5 years than reported trading (purchasing or selling) water entitlements.

For entitlement trade, figure A.4 shows that a higher proportion of irrigators reported selling an entitlement than purchasing an entitlement in both years surveyed. It also shows an increase in all types of entitlement trade between the 2 time periods (that is, the proportion of irrigators reporting to have purchased, sold, and purchased and sold an entitlement in the previous 5 years). Between 2007–08 and 2014–15, the proportion of irrigators reporting they had purchased an entitlement in the previous 5 years increased from 7% to 20%, the proportion of irrigators reporting they had sold an entitlement increased from around 8% to 34%, while the proportion who purchased and sold increased from 1% to 8%.

The increase in the proportion of irrigators reporting entitlements trade between 2008–09 and 2014–15 coincides with the end of Millennium Drought and the implementation of the government buyback of water entitlements under the Restoring the Balance Programme.

Corresponding to the increase in entitlement trade, figure A.4 also shows a decrease in the proportion of irrigators reporting no entitlement trade (neither purchasing nor selling) in the previous 5 years from 85% of irrigators to 58% between 2007–08 and 2014–15. While this data is indicative of irrigators’ increasing their engagement with entitlement markets, it also highlights that as at 2015, almost 6 out of 10 irrigators in the Southern Basin reported not having bought or sold a water entitlement in the previous 5 years.
For allocation trade, figure A.4 shows that in both years surveyed, a higher proportion of irrigators purchased an allocation in the previous 5 years than sold an allocation. In addition, between 2007–08 and 2014–15, the proportion of irrigators who reported purchasing an allocation decreased slightly, while the proportion reporting selling an allocation increased significantly. This may be reflective of the fact that more irrigators had to enter the temporary market to buy water during the Millennium Drought period prior to 2008, compared with the 5 year period prior to 2015 where water was more available.

Figure A.4 also shows that the proportion of irrigators reporting to have purchased and sold allocations in the last 5 years increased from 11% to 15%, and that there was a corresponding decrease in the proportion of irrigators reporting no engagement with allocation markets (the proportion of irrigators reporting they had neither purchased nor sold an allocation in the previous 5 years falling from 24% to 17% of irrigators). As with the entitlement trade data above, while this is indicative of irrigators’ increasing engagement with allocation markets, it also highlights that as of 2015, 17% of irrigators in the Southern Basin reported not having bought or sold temporary water in the previous 5 years.

Figure A.5 shows irrigator trade behaviour in the Southern Basin within a water year in 3 separate years. It reports the proportion of irrigators who stated they had purchased or sold an entitlement, an allocation, and used carryover in 2009–10, 2010–11 and 2014–15. It should be emphasised that there are many factors that can cause entitlement and allocation trade to change year on year and these results should be interpreted with caution.

Figure A.5 shows that a higher proportion of irrigators reported trading (purchasing or selling) allocations compared with entitlements within each of the 3 years surveyed.

For entitlement trade, figure A.5 (consistent with figure A.4) shows that in each of the 3 years surveyed, a higher proportion of irrigators reported selling a water entitlement compared with buying an entitlement. It also shows that between 2009–10 and 2014–15, the proportion of irrigators who reported trading an entitlement increased (with the proportion reporting a purchase increasing from 1% to 6%, and that reporting a sale increasing from 6% to 10%). Only 2% or less of irrigators reported purchasing and selling an entitlement in any one of the 3 years surveyed.

The relative infrequency of irrigators engaging in entitlement trade is highlighted in figure A.5, with between 87% and 90% of irrigators reporting no entitlement trade within any one of the 3 years surveyed.
For allocation trade, figure A.5 shows that between 9% and 33% of surveyed irrigators reported purchasing an allocation in a given year, while between 12% and 33% reported selling an allocation in one of these years. 5% or less of irrigators reported both purchasing and selling an allocation in the same year, and between 41% and 75% of irrigators reported engaging in no allocation trade in any one of the 3 years surveyed.

The figure also shows a majority of irrigators reported carrying water over in each of the years surveyed. However, the proportion of irrigators reporting use of carryover declined from 77% in 2009–10 to 54% in 2014–15.

**Figure A.5:** Proportion of irrigators using trade or carryover in a given year, Southern Basin

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Purchase Only</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Sell Only</td>
<td>54%</td>
<td>54%</td>
<td>38%</td>
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<tr>
<td>Buy and Sell</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Buy or Sell</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>


**A.4.1 Findings**

Irrigators’ engagement with entitlement markets in the Southern Basin has been increasing over time. Between 2000–01 and 2015–16, the percentage of irrigators reporting at least one entitlement trade increased from less than 10% to just under 50% by 2015–16. However, as at 2015–16, approximately half of irrigators reported never having traded an entitlement, and only a small proportion (less than 10%) reported having both bought and sold entitlements within the previous 5 years.

Irrigators’ engagement with allocation markets in the Southern Basin has been increasing over time. Between 2000–01 and 2015–16, the percentage of irrigators reporting at least one allocation trade increased from less than 15% to more than 75% by 2015–16. However, as at 2015–16, approximately 25% of irrigators reported never having traded an allocation, and only a small proportion (less than 15%) reported having both bought and sold allocations within the previous 5 years.

**Irrigators in the Southern Basin use entitlement and allocation trade much more than irrigators in the Northern Basin**

Research compared the level of irrigator engagement with allocation and entitlement markets in the Northern and Southern Basin by measuring the average number of allocation and entitlement transactions per irrigation business from 2008–09 to 2017–18 (table A.2). They found that irrigation businesses in the Southern Basin were, on average, 4.8 times more likely to have conducted a water allocation trade, and 7.9 times more likely to have conducted a water entitlement trade.
Table A.2: Comparison of key factors influencing irrigator participation in entitlement and allocation markets in the Northern and Southern Basins, various time periods between 2006–07 and 2017–18

<table>
<thead>
<tr>
<th>Factor influencing water market engagement</th>
<th>Northern Basin</th>
<th>Southern Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual average allocation trade rate per business</td>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>Average entitlement trade rate per business</td>
<td>0.26</td>
<td>0.51</td>
</tr>
<tr>
<td>Regulated Entitlements on issue</td>
<td>53%</td>
<td>85%</td>
</tr>
<tr>
<td>Unregulated Entitlements on issue</td>
<td>32%</td>
<td>4%</td>
</tr>
<tr>
<td>Groundwater Entitlements on issue</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Share of Groundwater of Total Farm Water Extractions</td>
<td>17%</td>
<td>10%</td>
</tr>
<tr>
<td>Share of On-farm dam storage (floodplain harvesting) of Total Farm Water Extractions</td>
<td>32%</td>
<td>3%</td>
</tr>
<tr>
<td>Share of Irrigation channels of Total Farm Water Extractions</td>
<td>12%</td>
<td>64%</td>
</tr>
<tr>
<td>Share of Surface water of Total Farm Water Extractions</td>
<td>44%</td>
<td>25%</td>
</tr>
<tr>
<td>Number of irrigators</td>
<td>3,039</td>
<td>10,898</td>
</tr>
<tr>
<td>Annual irrigation water volumetric/usage charges per ML extracted</td>
<td>$12</td>
<td>$28</td>
</tr>
<tr>
<td>Area irrigated per business (ha)</td>
<td>124</td>
<td>84</td>
</tr>
<tr>
<td>Water extraction monitored</td>
<td>25–51%</td>
<td>77–84%</td>
</tr>
<tr>
<td>Cotton industry use of water</td>
<td>79%</td>
<td>6%</td>
</tr>
<tr>
<td>Cereals/rice industry use of water</td>
<td>13%</td>
<td>34%</td>
</tr>
<tr>
<td>Pasture industry use of water</td>
<td>6%</td>
<td>32%</td>
</tr>
<tr>
<td>Fruit/nut/vegetables industry use of water</td>
<td>1%</td>
<td>28%</td>
</tr>
</tbody>
</table>


Notes: Based on means of a variety of years, depending on data available from ABS water use on farms, BOM data. ‘Trade’ means bought or sold an allocation/entitlement. See Wheeler and Garrick (2020) for exact time-periods, data sources and definitions used for the Northern and Southern Basin.

Wheeler and Garrick (2020) compared a range of institutional and demographic factors across the Northern and Southern Basin and identified a number of key differences that they propose explain this difference in north–south water market participation by irrigators (table A.2). These included:

- greater hydrological connectivity and storage in the Southern Basin
- greater amount of unregulated water entitlements in the Northern Basin compared with the Southern Basin (32% and 4% respectively)
- greater reliance on groundwater as an irrigation source in the Northern Basin compared with the Southern Basin (17% and 10% respectively)
- greater use of on-farm irrigation storage from flood plain harvesting in the Northern Basin compared with the Southern Basin (32% versus 3% respectively)
- higher water usage charges in the Southern Basin compared with the Northern Basin (133% higher per mega litre extracted in the south compared to the north)
- greater number of irrigators in the Southern Basin compared with the Northern Basin (3.6 times more)
- lower average irrigated area per business in the southern (a third less) than the Northern Basin
- higher monitoring of water extractions in the Southern Basin (77–84% of water extractions are monitored) compared to the Northern Basin (25–51% extractions are monitored)
- greater water use homogeneity in the Northern Basin (cotton industry uses on average 79% of extractable water) than Southern Basin (cereals/rice, pasture and fruit/nut/vegetables all extract around a third each of the total water) (Wheeler and Garrick 2020).
A.4.2 Findings

Irrigators in the Southern Basin use entitlement and allocation markets much more frequently than irrigators in the Northern Basin. Between 2008–09 and 2017–18, Southern Basin irrigators were, on average, 4.8 times more likely to have conducted a water allocation trade, and 7.9 times more likely to have conducted a water entitlement trade compared with irrigators in the Northern Basin.

Irrigator engagement in entitlement and allocation markets differs by farm type

Figure A.6 reports ABARES population estimates on the proportion of farms who reported selling water entitlements, by farm type from 2006–07 to 2018–19. This figure shows that from 2006–07 to 2018–19, a relatively small proportion of irrigators of all farm types in the Basin sold water entitlements each year. Dairy farmers, on average, had the highest proportion of reported entitlement sales per year while cotton farms had the lowest. An average of 6% of dairy farms, 5% of horticulture farms, 3% of rice farms and 4% of cotton farms sold entitlements each year.

The same ABARES survey data found that lower proportions of irrigators, on average, reported buying entitlements each year relative to selling. On average, 3% of dairy farms, 3% of irrigated broadacre farms and around 1% of horticulture farms bought entitlements each year.

Figure A.6: Proportion of farms reporting sales of water entitlements, by farm type, Murray–Darling Basin, 2006–07 to 2018–19


Figure A.7 reports the estimated proportion of farms, by farm type, in the Southern Basin reporting selling temporary water in a given year, from 2006–07 to 2018–19. Figure A.8 reports the estimated proportion of farms, by farm type, in the Southern Basin reporting buying temporary water in a given year, over the same period of time.

These figures together show that the proportion of irrigation farms trading (buying or selling water allocations) tends to fluctuate closely in line with changes in water availability, with allocation trade lower in wet years (2009–10 and 2010–11), and higher in dry years (pre 2009–10 and post 2010–11), as water is increasingly reallocated to higher value uses as availability declines.

These figures also show how the type of water trading an irrigator undertakes can vary depending on the crop they are growing. From 2006–07 to 2008–09, as water became scarcer during the end of the Millennium Drought, the proportion of rice and dairy farms selling water allocations increased as these...
farms increasingly reduced output and sold water to generate income (figure A.7), while the proportion of horticulture farms buying water allocations increased as they were needed to continue watering their permanent plantings (figure A.8). As water availability increased in 2009-10 and 2010-11, the proportion of irrigators of all farm types buying and selling water decreased as allocations accruing to their permanent water rights increased.

Further, figure A.8 provides some evidence of the longer term impact on allocation markets of the high rate of water entitlement sales by dairy farmers from 2007-08 to 2011-12 (as reported in figure A.6 above). The figure shows that from 2012-13 onwards as water availability in the Basin began to decrease again, the proportion of dairy farmers buying water allocations increased dramatically as dairy farmers who had previously sold their permanent water rights increasingly purchased water allocations on the temporary market. Figure A.8 shows that this impact on the allocation market has been ongoing, as the proportion of dairy farmers buying allocations from 2012-13 to 2018-19 remained above that of dairy farmers buying allocations during the last years of the Millennium Drought from 2006-07 to 2009-10.

**Figure A.7:** Proportion of farms selling temporary water, by farm type, 2006–07 to 2018–19, selected Southern Basin regions

![Proportion of farms selling temporary water, by farm type, 2006–07 to 2018–19, selected Southern Basin regions](image)


Notes: For Horticulture: average of 3 regions (Goulburn, Murray and Murrumbidgee); for Rice: average of 2 regions (Murray and Murrumbidgee), no data for 2012–13; for dairy: average of 2 regions (Murray and Goulburn-Broken).
Figure A.8: Proportion of farms buying temporary water, by farm type, 2006–07 to 2018–19, selected Southern Basin regions

Notes: Data for select Southern Basin regions. For Horticulture: average of 3 regions (Goulburn, Murray and Murrumbidgee); for Rice: average of 2 regions (Murray and Murrumbidgee), no data for 2012–13; for dairy: average of 2 regions (Murray and Goulburn–Broken).

Figure A.9, which reports the average volumes of water traded (sold and purchased) per farm, by farm type, in the Southern Basin in a given year, provides further evidence on how engagement with allocation market differs by farm type.

Figure A.9: Temporary trades, average per farm (ML), by farm type, 2012–13 to 2018–19, selected Southern Basin regions

Notes: For Horticulture: average of three regions (Goulburn, Murray and Murrumbidgee); for Rice: average of two regions (Murray and Murrumbidgee), no data for 2012–13; for dairy: average of two regions (Murray and Goulburn–Broken).

Figure A.9 shows that over the 7 years surveyed, dairy farmers, on average, have been large net buyers of allocations in the Southern Basin. This is consistent with the analysis of figure A.7 and figure A.8.
above, and submissions to the inquiry that state that dairy farmers have become more reliant on temporary water markets after sales of water entitlements in past years.\textsuperscript{1364}

Figure A.9 also shows that while rice farmers, on average, have also been net buyers of temporary water over the years surveyed, there has been an increase in average allocation sales in later years. This possibly reflects the ability of rice farmers to more easily respond to higher water prices by choosing to sell their water rather than producing. In contrast, horticultural farmers, on average, demonstrate the lowest level of net trade per farm and the least variability in trade, which could be indicative of the more stable and less flexible water demands of permanent plantings, or that these farmers adopt a more risk-averse strategy by choosing to hold entitlements which reflect their average water needs, rather than rely on markets.

\section*{A.4.3 Findings}

The sale of water entitlements over 2006–07 to 2011–12, particularly by dairy farmers in the Southern Basin, has resulted in an increase in the proportion of some irrigators relying on water allocation purchases as drier conditions returned to the Basin from 2011–12 onwards.

The flexibility of annual cropping irrigators, such as rice farmers, allows them to more easily switch from using/buying water in wetter years, to not using/selling water in drier years. These irrigators tend to demonstrate more variable allocation trade behaviours over time.

In contrast, the more constant water needs of permanent plantings, such as nut and fruit plantations, means horticultural farmers have less flexibility to trade temporary water, and so tend to demonstrate more stable allocation trade behaviours over time.

\section*{A.5 Irrigators use of other water products}

There is a range of water market products such as leases of water entitlements, carryover parking and forward contracts that can be useful tools for securing water while managing price and supply risks. Irrigators have been leasing entitlements from family, friends and other irrigators for many years. However, reforms to water ownership have facilitated the growth of non-landholding investors who hold portfolios of permanent and temporary water and sell a variety of water market products including carryover parking, single or multi-year leases and forward contracts.

There is limited data on the extent to which irrigators are making use of leases and these newer water market products. This section summarises the available information on the type and level of irrigator engagement with these water products.

\subsection*{A.5.1 Leases}

Surveys of irrigators have found that only a small minority of irrigators use water from leased entitlements (less than 7\% of irrigators across the whole Basin in 2018).\textsuperscript{1365} Of all irrigators in the Basin surveyed in 2018 who reported using water for irrigation:

\begin{itemize}
  \item 64\% reported using only water sourced from their own entitlements
  \item 28\% reported using water from their own entitlements and allocations purchased on the temporary market
  \item 1.4\% reported using water from their own entitlements and from entitlements they leased from others
  \item 3.6\% reported using water from own entitlements, leased entitlements, and allocations purchased on the temporary market
\end{itemize}


3.2% reported using no water from their own entitlements (all water from purchases on the temporary market and/or leased entitlements).

Information on irrigators’ use of leases also comes from semi-structured qualitative interviews undertaken in 2018 with 64 key trade stakeholders in the Basin. These results suggest that:

- most irrigators and many agribusinesses did not use leases
- the use of leases was strongly associated with the amount of water owned, with smaller irrigators with less permanent water ownership being less likely to use leases than irrigators with larger water holdings
- where a smaller irrigator did use a lease, they are more likely to lease from friends and relatives, from their own self-managed super accounts, or from other irrigators
- larger and corporate irrigators who use leases are more likely to use longer-term leases sourced from commercial operators, either as part of leasing land or as a stand-alone water lease from non-landholder investors.

A.5.2 Finding

A minority of irrigators across the whole Basin (less than 7%) use water from leased entitlements. The available evidence indicates that:

- irrigators with larger holdings of permanent water rights are more likely to use leases than irrigators with smaller holdings on permanent water rights
- where smaller irrigators use leases, they are more likely to lease from friends and relatives, from a self-managed super fund, or from other irrigators
- where larger and corporate irrigators use leases, they are more likely to use longer-term leases sourced from commercial operators, either as part of leasing land or as a stand-alone lease from an investor.

Carryover parking and forward contracts

Carryover parking involves the renting of carryover capacity to a counterparty from one water accounting period to the next, while forward contracts involve the sale of rights to future volumes of water at one or more specific dates at fixed prices. A forward contract may be for one or more years (that is, single-year or multi-year forwards).

There is limited data available on the level of irrigators’ use of carryover parking and forward contracts. The ACCC’s analysis of this limited data indicates that while relatively significant volumes of water are being transferred under carryover parking and forward contracts, the number of irrigators using these water products is likely to be very small.

ACCC analysis of trading activity undertaken by the water investors in Victoria in 2018–19 shows that these investors took in approximately 17GL of water from irrigators under carryover parking contracts and returned approximately 10 GL to irrigators that year. The same analysis showed that these same investors provided just over 50 GL of water under forward contracts in Victorian in 2018–19.

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1368 Chapter 5, figure 5.13.
Other analysis undertaken by ACCC consultants, of a sample of trade data from a large Southern Basin water broker\textsuperscript{1369}, found that over the 3 years from 2016–17 to 2018–19, the broker mediated a total of 40 carryover parking contracts and 48 forward contracts for irrigators supplied by various counter parties, including other irrigators, investors, IIOs other (unidentified) parties.\textsuperscript{1370} This analysis, which indicates a relatively small number of carryover parking and forward contracts are being used by irrigators, has been supported by recent academic research on this topic.\textsuperscript{1371}

\textbf{A.5.3 Finding}

ACCC analysis indicates that only a very small proportion of irrigators use carryover parking or forward contracts.

Chapter 5 includes analysis of the role of investors in providing these water products.

\textbf{A.6 Irrigator attitudes to water trading and water markets}

Stakeholders at public forums and in submissions have expressed to the ACCC a range of positive and negative views on issues directly and indirectly related to water markets and water trading.

Some of these attitudes relate to support or opposition to the idea of water trading in principle, the ease or difficulty of the trading process and the level of confidence people have in water markets and trading rules.

A range of attitudes have been expressed on the reforms that have been implemented over the years to create the current regulatory arrangements governing water ownership and trading. This includes reforms to separate water from land allowing water to be traded independently from land, the relaxing of trade restrictions on out-of-area trade, changes to allow non-land holders to buy and trade permanent and temporary water, and the compliance and enforcement mechanisms used by State and Commonwealth governments.

Stakeholders have also expressed divergent views on various government policies that indirectly impact water trading and water markets, including government reforms to establish the Basin Plan, the setting of the Sustainable Diversion Limits (SDL), and programmes to recover water for the environment through the buyback of water entitlements and on-farm infrastructure grants.\textsuperscript{1372}

The ACCC has commissioned analysis of data collected in a number of surveys undertaken across the Basin between 1998 and 2018 to gain a clearer and representative understanding of what views irrigators hold of water markets and trading.

The surveys were undertaken by researchers at the Centre for Global Food and Resources at the University of Adelaide, and the Health Research Institute at the University of Canberra (box A.2). These surveys, amongst other things, asked irrigators about their views and attitudes on:

- water markets
- the process of trading
- water market rules and regulations
- Basin water policy more generally.

This section presents some of the key results from the analysis of this attitudinal data. It also examines associations between attitudes and whether an irrigator engages or does not engage in water trading.

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\textsuperscript{1369} The broker was responsible for approximately 11\% of all non-zero-price Basin allocation trade volumes in 2018–19.


\textsuperscript{1372} Submissions to the inquiry can be found on the ACCC’s water inquiry webpage at: \url{www.accc.gov.au/focus-areas/inquiries-ongoing/murray-darling-basin-water-markets-inquiry/submissions}
Box A.2: Water inquiry consultancies on irrigator engagement with water markets

The ACCC commissioned 2 consultants to undertake and report on analysis of data from surveys of Basin irrigators collected between 1998 and 2018. The aim of the work was to gain a clearer and more representative understanding of irrigators’ water ownership and trading behaviours, and their attitudes to water trading and water markets.

The Centre for Global Food and Resources at the University of Adelaide has conducted various surveys of irrigators across the Basin from 1998 to 2016. These surveys, amongst other things, asked irrigators about their water ownership, water trading and farm management behaviours, and included a limited number of attitudinal questions.

The Health Research Institute at the University of Canberra undertakes an annual survey – the Regional Wellbeing Survey – of people in Australian regional areas. The 2015 and 2016 surveys, amongst other things, asked Basin irrigators about their water use, water ownership and water trading, and farm management behaviours. They also asked irrigators to indicate to what extent they agreed or disagreed with various statements related to the process of trading water, their confidence in water markets and water market rules, and the security of their permanent water rights.

The University of Canberra consultancy also identified the following ways in which future studies based on irrigator surveys could be improved, to better understand how irrigators and other water market participants engage in and experience water trade:

- Survey non-irrigator water market participants
- Examine use of greater diversity of market mechanisms
- Examine attitudes toward engaging in trade as well as recent trading history
- Include larger samples of specific types of traders
- Engage in more regular data collection
- Examine both the processes and outcomes of water trading
- Examine market participants’ objectives for water trading.

The ACCC has incorporated relevant data and analysis from the consultants’ reports into its interim and final reports. The full consultant reports are available from the ACCC’s website https://www.accc.gov.au/focus-areas/inquiries-ongoing/murray-darling-basin-water-markets-inquiry/accc-commissioned-research.

A.6.1 Irrigators’ views on water trading

Researchers from the Centre for Global Food and Resources (CGFR) at the University of Adelaide have asked irrigators in various areas of the Basin for their views on water trading over a number of years.

Figures A.10 and A.11 present data from 4 questions asked in irrigator surveys conducted in Northern Victoria in 1999, and more widely across the Southern Basin in 2011 and 2016.
Figure A.10: Irrigators’ attitudes towards water trading in 1999 (GMID), 2011 (sMDB) and 2016 (sMDB)


Note: The question for 1999 is ‘Please indicate to which extent you agree with the statements using a 1 to 5 scale with 1 being strongly disagree and 5 strongly agree’ and the statement is ‘Water trade is a very good idea’. The question for 2010 and 2015 is ‘Using the scale strongly disagree (1) to strongly agree (5) could you respond to the following?’ and the statement is ‘I believe water trading has been a good thing for farming’ For clearer illustration, Likert scale answers from 1 to 5 were converted to Disagree (1 and 2), Neutral (3) and Agree (4 and 5). GMID = Goulburn-Murray Irrigation District, Victoria. sMDB = Southern Basin.

Figure A.11: Irrigators’ attitudes towards water trading and water markets, Southern Basin, 2016 (n=1000)


Note: The exact question is ‘Using the scale strongly disagree (1) to strongly agree (5) could you respond to the following?’ The statements are exactly the same as appeared in the figure. For clearer illustration, Likert scale answers from 1 to 5 were converted to Disagree (1 and 2), Neutral (3) and Agree (4 and 5).

Figure A.10 shows that almost 3 quarters of irrigators (73%) in the GMID in 1999 agreed (agreed or strongly agreed) with the statement that ‘water trading was a good idea’ while only 14% disagreed (disagree or strongly disagree). In 2011, less than half of irrigators (46%) in the Southern Basin agreed with the statement that ‘water trading had been good for farming’ while 41% disagreed. In 2016, the positive attitude to water trading declined further with only 28% of irrigators in the Southern Basin in
2015 agreeing that ‘water trading had been good for farming’ while a majority (56%) disagreed with that statement.

Figure A.11 shows that in 2016, the same year that a majority of irrigators in the Southern Basin expressed a negative view on the benefits to farmers of water trading, a strong majority of irrigators (85%) also did not support non-farm entities being allowed to buy water, while almost half of irrigators (48%) did not support retired farmers being allowed to retain and trade water.

### A.6.2 Findings

Irrigators in the Southern Basin appear to have become more negative about the idea of water trading over time, with more than half of irrigators surveyed in 2016 believing that water trading had not ‘been good for farming’.

A very high proportion of irrigators in the Southern Basin appear to not support the idea that non-farm entities (investors) should be allowed to buy water, with 85% of irrigators surveyed in 2016 not supporting the proposition.

Approximately half of irrigators in the Southern Basin appear to not support the idea that retired farmers should be allowed to retain and trade water.

**Irrigators’ views on the process of water trading and their confidence in water markets**

In the 2015 and 2016 Regional Wellbeing Surveys, irrigators across the Basin were asked to select to what degree they agreed or disagreed with statements related to different aspects of water trading and water markets, including whether irrigators:

- found it easy to trade permanent and temporary water and access the information needed to trade
- felt that water markets were fair and they had confidence in market rules
- felt that environmental water entitlements were subject to the same rules as other entitlements
- felt that their permanent water rights were secure (figure A.12).
**Figure A.12 Attitudinal statements in the Regional Well Being Survey**

<table>
<thead>
<tr>
<th>Thinking about your personal experience, do you agree or disagree that:</th>
<th>Strongly DISAGREE</th>
<th>Strongly AGREE</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>My rights to access water (when it is available) are secure</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is easy to trade temporary water if I want to</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is easy to trade permanent water entitlements if I want to</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The water trade market is fair for all users</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel confident to use water trading as part of my farm management</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It’s easy to access the information I need to make water trading decisions</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water entitlements held by the government are subject to the same rules and charges as other participants in the water market</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water market rules are stable</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What are the biggest challenges or issues you face when trading water, if any?

Source: Health Research Institute, University of Canberra, Regional Wellbeing Survey 2015 and 2016.

Figures A.13 and A.14 present the results from these surveys using 4 categories of disagree, neither agree or disagree, agree, and don’t know. Overall, the pattern of the views were similar in each year. Views were slightly more positive in 2016 compared to 2015 with the increase in positivity for some views being statistically significant. Key results from figures A.13 and A.14 are summarised below.

A majority of irrigators across the Basin in 2015 and 2016 agreed that trading temporary water was easy. However, some irrigators in both years did not agree that temporary trade water was easy:
- 65% and 71% of irrigators in 2015 and 2016 respectively, agreed that it was easy to trade temporary water.
- 17% and 12% of irrigators in 2015 and 2016 respectively, did not agree that it was easy to trade temporary water.

A majority of irrigators across the Basin in 2015 and 2016 also agreed that trading permanent water was easy. However, some irrigators in both years did not agree that permanent trade was easy:
- 57 cent and 63% of irrigators in 2015 and 2016 respectively, agreed that it was easy to trade permanent water.
- 18% and 14% of irrigators in 2015 and 2016 respectively, did not agree that it was easy to trade permanent water.

A majority of irrigators in 2015 and 2016 agreed that the information needed to trade water was easy to access. However, some irrigators in both years did not agree with this statement.

- 53% of irrigators in 2015 agreed that it was easy to access the information they needed to trade, while 59% and 64% of irrigators in 2015 and 2016 respectively, agreed that they knew how to access the information they needed to trade.
- 19% of irrigators in 2015 did not agree that information was easy to access, while 17% and 16% of irrigators in 2015 and 2016 respectively, did not agree that they knew where to access the information needed to trade.

Around half of irrigators in 2015 and 2016 felt confident in trading water as part of their farm management. However, a quarter or more of irrigators did not:

- 48% and 53% of irrigators in 2015 and 2016 respectively, agreed that they felt confident in using trade as part of their farm management.
- 28% and 25% of irrigators in 2015 and 2015 respectively, did not express confidence in using water trading as part of their farm management.

Less than a third of irrigators across the Basin in 2015 and 2016 expressed confidence in the fairness of water markets or in water market rules:

- Only 23% and 32% of irrigators in 2015 and 2016 respectively, agreed that the water market was fair for all users.
- Only 16% and 26% of irrigators in 2015 and 2016 respectively, agreed that market rules were stable, while 22% of irrigators in 2015 agreed that recent changes to rules had increased their confidence in water markets.1374
- 48% and 37% of irrigators in 2015 and 2016 respectively, did not agree that water markets were fair for all users.
- 49% and 43% of irrigators in 2015 and 2016 respectively, did not agree that market rules were stable, while 48% in 2015 did not agree that recent rule changes had increased their confidence in water markets.1375

While a majority of irrigators in 2015 and 2016 expressed confidence in the security of their permanent water access rights, between a quarter and a third or irrigators did not:

- 54% and 60% of irrigators in 2015 and 2016 respectively, agreed that their rights to access water were secure.
- 33% and 24% of irrigators in 2015 and 2016 respectively, did not express confidence in the security of their permanent water access rights.

However, only a quarter or less of irrigators in 2015 and 2016 agreed that entitlements held by the government were subject to the same rules and charges as other participants’ entitlements, while more than 4 in ten irrigators disagreed:

- Only 17% and 26% of irrigators in 2015 and 2016 respectively, agreed that entitlements held by the government were subject to the same rules and charges as other participants’ entitlements.
- 44% and 41% of irrigators in 2015 and 2016 respectively, did not agree that government and non-government held entitlements received equal treatment.

1374 This question was not asked in 2016.
1375 This question was not asked in 2016.
### Figure A.13: Irrigator views about water markets – Basin irrigators, 2015

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s easy to access the information I need to make water trading decisions</td>
<td>17%</td>
<td>11%</td>
<td>53%</td>
<td>14%</td>
</tr>
<tr>
<td>I know how to access the information I need to make water trading decisions</td>
<td>17%</td>
<td>11%</td>
<td>59%</td>
<td>14%</td>
</tr>
<tr>
<td>Water market rules are stable</td>
<td>49%</td>
<td>12%</td>
<td>16%</td>
<td>23%</td>
</tr>
<tr>
<td>Water entitlements held by the government are subject to the same rules and charges as other participants in the water market</td>
<td>44%</td>
<td>7%</td>
<td>18%</td>
<td>32%</td>
</tr>
<tr>
<td>Changes to the rules for water trading in the last few years have increased my confidence in the water market</td>
<td>48%</td>
<td>13%</td>
<td>22%</td>
<td>17%</td>
</tr>
<tr>
<td>It is easy to trade permanent water entitlements if I want to</td>
<td>28%</td>
<td>13%</td>
<td>48%</td>
<td>12%</td>
</tr>
<tr>
<td>The water trade market is fair for all users</td>
<td>48%</td>
<td>13%</td>
<td>23%</td>
<td>16%</td>
</tr>
<tr>
<td>It is easy to trade temporary water if I want to</td>
<td>18%</td>
<td>10%</td>
<td>57%</td>
<td>16%</td>
</tr>
<tr>
<td>I feel confident to use water trading as part of my farm management</td>
<td>17%</td>
<td>8%</td>
<td>65%</td>
<td>11%</td>
</tr>
<tr>
<td>My rights to access water (when it is available) are secure</td>
<td>33%</td>
<td>10%</td>
<td>54%</td>
<td>3%</td>
</tr>
</tbody>
</table>


### Figure A.14: Irrigator views about water markets – Basin irrigators, 2016

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s easy to access the information I need to make water trading decisions</td>
<td>16%</td>
<td>11%</td>
<td>64%</td>
<td>9%</td>
</tr>
<tr>
<td>Water entitlements held by the government are subject to the same rules and charges as other participants in the water market</td>
<td>43%</td>
<td>14%</td>
<td>26%</td>
<td>17%</td>
</tr>
<tr>
<td>Water market rules are stable</td>
<td>41%</td>
<td>5%</td>
<td>26%</td>
<td>17%</td>
</tr>
<tr>
<td>I feel confident to use water trading as part of my farm management</td>
<td>25%</td>
<td>11%</td>
<td>54%</td>
<td>10%</td>
</tr>
<tr>
<td>The water trade market is fair for all users</td>
<td>37%</td>
<td>16%</td>
<td>32%</td>
<td>15%</td>
</tr>
<tr>
<td>It is easy to trade permanent water entitlements if I want to</td>
<td>14%</td>
<td>11%</td>
<td>63%</td>
<td>11%</td>
</tr>
<tr>
<td>It is easy to trade temporary water if I want to</td>
<td>12%</td>
<td>10%</td>
<td>71%</td>
<td>8%</td>
</tr>
<tr>
<td>My rights to access water (when it is available) are secure</td>
<td>24%</td>
<td>14%</td>
<td>60%</td>
<td>3%</td>
</tr>
</tbody>
</table>


Note: In comparison to figure A.13, several questions were not asked in the 2016 survey.

### A.6.3 Findings

Most irrigators expressed positive views on the ease of making temporary and permanent trades, being able to access the information needed to trade, feeling confident in trading water, and in the security of their permanent rights. However, some irrigators expressed opposing views on each of these issues, including:

- 12 to 18% of irrigators not agreeing that trading temporary or permanent water was easy
- 17 to 19% not agreeing that the information needed to trade water was easy to access
- 25 to 28% not agreeing that they felt confident in using water trading
- 24 to 33% not agreeing that their rights to access water were secure.
In contrast to the relatively positive views on the ease of trading permanent and temporary water, irrigators express low levels of confidence in the fairness of water markets, water market rules, and the treatment of government owned water entitlements, with only 23% to 32% of irrigators believing that water markets were fair for all users.

**Some attitudes vary significantly between irrigators that trade and those that do not**

There is limited data on if or how an irrigator’s attitudes to water trading, water markets or water policy may affect whether they engage or do not engage in water trading. To examine this, the ACCC asked its consultants to analysed irrigator survey data from 1999 to 2016 to see if there were significant differences between the attitudes of trading and non-trading irrigators.

Figure A.15 compares various attitudes on water trading and water policy held by irrigators who traded and did not trade allocations in the GMID in 1999. The figure shows that irrigators, on average, who engaged in allocation trading held more positive attitudes to water trading. Allocation traders were, on average, significantly more likely to agree than non-traders with the statements that ‘trade is good because it allows farmers to leave the industry’, ‘permanent trade is necessary’ and ‘water trading is a good idea’.

**Figure A.15: Irrigators’ attitudes in 1999 towards water trading and water markets, 1998–99, GMID**

![Diagram comparing attitudes](image)


Note: *, ** and *** represents significant differences between trader and non-traders at the 0.10, 0.05 and 0.01 significance level, respectively. GMD = Goulburn-Murray Irrigation District, Victoria.

Figure A.16 compares attitudes towards water trading and behaviour held by irrigators in 2011 who traded and did not trade allocations and entitlements in Southern Basin in 2009–10.

The figure shows that, on average, irrigators who engaged in allocation trade held more positive attitudes to water trading. Allocation traders were, on average, significantly more likely to agree than non-traders with the statements that ‘trading allows me to cope with uncertainty’ and ‘closely track market prices’. Irrigators who engaged in entitlement trade also held more positive attitudes to risk taking and about being well informed about trading. Irrigators who engaged in entitlement trade were, on average, significantly more likely to agree than non-traders with the statements that they were ‘generally a risk taker when it comes to trade’, and to a lesser extent, that they were ‘generally well informed about district trading rules’.

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1376 ‘Significantly’ should be interpreted to refer to statistical significance to a 0.01 significance level, unless stated otherwise.  
1377 ‘Significantly’ should be interpreted to refer to statistical significance to a 0.01 significance level, unless stated otherwise.
Figure A.16: Irrigators’ attitudes in 2011 towards water trading and behaviours, Southern Basin, 2009–10


Note: ** and *** represents significant differences between trader and non-traders at the 0.05 and 0.01 significance level, respectively.

The exact question is ‘Using the scale strongly disagree (1) to strongly agree (5), could you respond to the following? The statements related to this figure are ‘I am generally a risk taker when it comes to allocation trades’, ‘I usually follow the same strategic approach to allocation trading each year’, ‘I am well informed about the trading rules in my district’, ‘I closely track water market prices to obtain maximised trade outcomes’, ‘Trading water allows me to cope with seasonal uncertainty’, ‘I believe water trading has been a good thing for farming’.

Tables A.3 and A.4 compare various attitudes expressed in 2016 by irrigators who traded and did not trade allocations and entitlements in the Southern Basin in 2014–15. Grey rows signify a statistically significant difference in the attitude score between traders and non-traders.

Table A.4 shows that in 2016 irrigators who traded allocations in the Southern Basin, relative to irrigators who did not trade, had a significantly:
- more positive attitude to water trading (that is, they agreed more than non-traders with the statement ‘I believe water trading has been a good thing for farming’)
- more positive attitude to investors (that is, they agreed more than non-traders with statements ‘Retired irrigators no longer farming should be allowed to retain and trade water’ and ‘Corporate non-farm entities should be allowed to invest in water’)
- more positive attitude to environmental water recovery and the Basin Plan (that is, they agreed less than non-traders with the statements that ‘The Commonwealth Environmental Water Holder belongs in the agriculture not the environment department’ and ‘I believe the Basin Plan should be suspended’)
- less traditional attitude to farming (that is, they agreed less than non-traders with the statements ‘Farming is the only occupation I want to do’ and ‘I could never imagine living anywhere other than this area’).

Table A.5 shows that in 2016 irrigators who traded entitlements in the Southern Basin, relative to irrigators who did not trade, had a significantly:
- more positive attitude to water trading (they agreed more than non-traders with the statement ‘I believe water trading has been a good thing for farming’)
- more positive attitude to water investors (they agreed more than non-traders with the statement ‘Corporate non-farm entities should be allowed to invest in water’)
- more positive attitude to environmental water recovery and the Basin Plan (they agreed more than non-traders with the statements ‘Most irrigators think increasing environmental water flows is a good thing’, ‘It is essential to make allocations to the environment otherwise irrigation will not be long-term
sustainable’, ‘The Murray–Darling Basin Authority is serious about helping our community to solve our own environmental flow problems’ and ‘More money should be spent on water buybacks by the Commonwealth’, they agreed less than non-traders with the statements ‘The Commonwealth Environmental Water Holder belongs in the agriculture not the environment department’ and ‘I believe the Basin Plan should be suspended’.

A.6.4 Findings

In 2016, irrigators who engaged in water entitlement and allocation trade in the Southern Basin, relative to irrigators who did not trade, had a significantly more positive attitude to water trading, to investors owning water, to environmental water recovery, and the Basin Plan, and less traditional attitudes to farming.

Table A.3: Attitudes of water allocation traders vs non-traders in 2016, NSW, VIC, SA Southern Basin survey (based on 2014–15 trading history)

<table>
<thead>
<tr>
<th>Farm and farmer characteristics</th>
<th>Non-water allocation trader (n=404)</th>
<th>Allocation trader (n=595)</th>
<th>2 sample t-test (p-value) a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming is the only occupation I can imagine doing</td>
<td>3.84</td>
<td>3.65</td>
<td>0.03</td>
</tr>
<tr>
<td>Financial gain is the only reason for my involvement in farming</td>
<td>2.56</td>
<td>2.44</td>
<td>0.11</td>
</tr>
<tr>
<td>I am generally a risk taker when it comes to operating my farm business</td>
<td>3.10</td>
<td>3.04</td>
<td>0.48</td>
</tr>
<tr>
<td>I believe water trading has been a good thing for farming</td>
<td>2.22</td>
<td>2.70</td>
<td>0.00</td>
</tr>
<tr>
<td>I could never imagine living anywhere other than this area</td>
<td>3.49</td>
<td>3.24</td>
<td>0.00</td>
</tr>
<tr>
<td>Knowing about new technology that becomes available is important to me</td>
<td>4.12</td>
<td>4.22</td>
<td>0.10</td>
</tr>
<tr>
<td>We would be willing to have our seasonal allocations reduced to ensure sufficient water for the environment</td>
<td>1.59</td>
<td>1.58</td>
<td>0.95</td>
</tr>
<tr>
<td>Most irrigators think increasing environmental water flows is a good thing</td>
<td>1.93</td>
<td>2.03</td>
<td>0.19</td>
</tr>
<tr>
<td>Generally I feel optimistic about my future in this region</td>
<td>3.30</td>
<td>3.26</td>
<td>0.59</td>
</tr>
<tr>
<td>It is essential to make allocations to the environment otherwise irrigation will not be long-term sustainable</td>
<td>2.52</td>
<td>2.63</td>
<td>0.23</td>
</tr>
<tr>
<td>I want to continue farming for as long as I am able</td>
<td>4.25</td>
<td>4.18</td>
<td>0.21</td>
</tr>
<tr>
<td>I like to make my own decisions and not be too influenced by others</td>
<td>4.41</td>
<td>4.30</td>
<td>0.04</td>
</tr>
<tr>
<td>The CEWH belongs in the agriculture not the environment department</td>
<td>4.17</td>
<td>4.05</td>
<td>0.08</td>
</tr>
<tr>
<td>The water portfolio belongs in the agriculture not environment department</td>
<td>4.39</td>
<td>4.29</td>
<td>0.11</td>
</tr>
<tr>
<td>Corporate non-farm entities should be allowed to invest in water</td>
<td>1.52</td>
<td>1.69</td>
<td>0.01</td>
</tr>
<tr>
<td>Retired irrigators no longer farming should be allowed to retain and trade water</td>
<td>2.58</td>
<td>2.92</td>
<td>0.00</td>
</tr>
<tr>
<td>Water buybacks for the Basin Plan should be suspended</td>
<td>3.91</td>
<td>3.93</td>
<td>0.80</td>
</tr>
<tr>
<td>More money should be spent on on-farm irrigation infrastructure by the Commonwealth</td>
<td>3.88</td>
<td>3.75</td>
<td>0.08</td>
</tr>
<tr>
<td>More money should be spent on water buybacks by the Commonwealth</td>
<td>2.05</td>
<td>1.96</td>
<td>0.28</td>
</tr>
<tr>
<td>The Murray–Darling Basin Authority is serious about helping our community to solve our own environmental flow problems</td>
<td>2.44</td>
<td>2.44</td>
<td>0.92</td>
</tr>
<tr>
<td>I believe the Basin Plan should be suspended</td>
<td>3.60</td>
<td>3.43</td>
<td>0.06</td>
</tr>
<tr>
<td>Irrigation infrastructure money has been wasteful and inefficient</td>
<td>3.54</td>
<td>3.37</td>
<td>0.04</td>
</tr>
<tr>
<td>I would rather irrigation infrastructure money was spent instead on rural health and education services</td>
<td>2.72</td>
<td>2.66</td>
<td>0.39</td>
</tr>
</tbody>
</table>


Notes: Attitudinal statements are measured by Likert scales from 1=strongly disagree to 5=strongly agree. a Two sample equal mean test (t-stat) for continuous and Likert scale variables were used. b 2 sample equal proportion test (z-score) for binary variables were used. c Pearson Chi-squared test was used for categorical variables.
### Table A.4: Attitudes of water entitlement traders vs non-traders in 2016, NSW, VIC, SA Southern Basin survey (based on 2014–15 trading history)

<table>
<thead>
<tr>
<th>Farmer attitude</th>
<th>Entitlement trade in 2014-15 (1=yes; 0=no)</th>
<th>2 sample t-test (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-entitlement trader (n=864)</td>
<td>Entitlement trader (n=135)</td>
</tr>
<tr>
<td>Farming is the only occupation I can imagine doing</td>
<td>3.73</td>
<td>3.70</td>
</tr>
<tr>
<td>Financial gain is the only reason for my involvement in farming</td>
<td>2.48</td>
<td>2.54</td>
</tr>
<tr>
<td>I am generally a risk taker when it comes to operating my farm business</td>
<td>3.06</td>
<td>3.08</td>
</tr>
<tr>
<td>I believe water trading has been a good thing for farming</td>
<td>2.42</td>
<td>3.04</td>
</tr>
<tr>
<td>I could never imagine living anywhere other than this area</td>
<td>3.36</td>
<td>3.21</td>
</tr>
<tr>
<td>Knowing about new technology that becomes available is important to me</td>
<td>4.16</td>
<td>4.33</td>
</tr>
<tr>
<td>We would be willing to have our seasonal allocations reduced to ensure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sufficient water for the environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most irrigators think increasing environmental water flows is a good thing</td>
<td>1.93</td>
<td>2.34</td>
</tr>
<tr>
<td>Attitude: Generally I feel optimistic about my future in this region</td>
<td>3.27</td>
<td>3.36</td>
</tr>
<tr>
<td>It is essential to make allocations to the environment otherwise irrigation will not be long-term sustainable</td>
<td>2.54</td>
<td>2.86</td>
</tr>
<tr>
<td>I want to continue farming for as long as I am able</td>
<td>4.21</td>
<td>4.22</td>
</tr>
<tr>
<td>I like to make my own decisions and not be too influenced by others</td>
<td>4.34</td>
<td>4.33</td>
</tr>
<tr>
<td>The CEWH belongs in the agriculture not the environment department</td>
<td>4.14</td>
<td>3.84</td>
</tr>
<tr>
<td>The water portfolio belongs in the agriculture not environment department</td>
<td>4.36</td>
<td>4.14</td>
</tr>
<tr>
<td>Corporate non-farm entities should be allowed to invest in water</td>
<td>1.59</td>
<td>1.80</td>
</tr>
<tr>
<td>Retired irrigators no longer farming should be allowed to retain and trade water</td>
<td>2.75</td>
<td>2.96</td>
</tr>
<tr>
<td>Water buybacks for the Basin Plan should be suspended</td>
<td>3.96</td>
<td>3.70</td>
</tr>
<tr>
<td>More money should be spent on on-farm irrigation infrastructure by the Commonwealth</td>
<td>3.79</td>
<td>3.86</td>
</tr>
<tr>
<td>More money should be spent on water buybacks by the Commonwealth</td>
<td>1.97</td>
<td>2.20</td>
</tr>
<tr>
<td>The Murray–Darling Basin Authority is serious about helping our community to solve our own environmental flow problems</td>
<td>2.38</td>
<td>2.79</td>
</tr>
<tr>
<td>I believe the Basin Plan should be suspended</td>
<td>3.55</td>
<td>3.15</td>
</tr>
<tr>
<td>Irrigation infrastructure money has been wasteful and inefficient</td>
<td>3.51</td>
<td>3.02</td>
</tr>
<tr>
<td>I would rather irrigation infrastructure money was spent instead on rural health and education services</td>
<td>2.70</td>
<td>2.53</td>
</tr>
</tbody>
</table>


Notes: Attitudinal statements are measured by Likert scales from 1=strongly disagree to 5=strongly agree. A Two sample equal mean test (t-stat) for continuous and Likert scale variables were used. b 2 sample equal proportion test (z-score) for binary variables were used. c Pearson Chi-squared test was used for categorical variables.
Appendix B – Overview of exchange platforms

In this report, the term ‘trade’ is generally used rather than ‘transfer’, and ‘trade’ is defined to include ‘transfer’.

B.1 H2OX

H2OX launched in 2015, with an aim to make water trading more transparent and financially secure. In particular, its objective was to bring all the intermediaries operating in the basin together so that trading was in one spot to provide price discovery and transparency. The intention was to take the financial and settlement administration side out of the brokers business to develop a central clearing house. H2OX operates an online real-time exchange for entitlements and allocations, including trading between a client’s own licences. Users of the exchange include water users, brokers and their clients, and non-irrigator market participants.

Users choose which offers they match with on the exchange platform (a ‘buy-it-now’ style matching service), providing flexibility for sellers and buyers to choose the trading zones they match with and to offer partial or full volume trades.

H2OX’s broker member agreements and trading rules do not allow brokers to be principal to a trade, and the exchange platform was designed to eliminate mark-up by brokers.

H2OX also provides advisory services and can facilitate trading arrangements for other water products such as options, forwards, parking and leasing.

H2OX also provides services for managing client internal trades between zones affected by inter-valley and Barmah Choke trade restrictions.

The H2OX exchange platform facilitates trade across New South Wales, Victoria and South Australia.

H2OX maintains an escrow account to facilitate trades and holds the buyer’s funds until trades are approved by relevant authorities, at which point the funds are released to the seller.

B.2 Waterexchange

Waterexchange offers automatic matching and listings with buy-it-now pricing. Waterexchange operates a live market and clearing house for trading in the Southern Connected Murray-Darling Basin, but has also extended trading to Queensland in recent years. Waterexchange has automatic matching, and where the platform finds a match it will automatically create a transaction and notify parties to the trade, and the rules do not allow a broker to act as a principal in a trade.

Waterexchange was originally established in 1994, and prior to 2017, Waterexchange was limited to Ruralco brokers.


1379 ibid.

1380 ibid.


Waterexchange lists its customers as individuals, brokers and also approval authorities such as Sunwater, Murrumbidgee Irrigation and others. Both the buyer and seller are charged fees for completed trades.

Waterexchange facilitates spot allocation trades, entitlement sales, forward allocation agreements, entitlement leases and carryover capacity.

They provide services such as preparing contracts and lodging trade forms with the relevant authorities. Waterexchange also offers connection to local water brokers for brokerage services.

Waterexchange also provides services to a number of approval authorities, who are able to use Waterexchange to approve trades online.

B.3 Waterfind

Waterfind operates an online real-time trading exchange platform for temporary and permanent water on spot and forward markets. Orders are matched on the exchange based on price, volume and tradability. The matching process is "based on trading rules built into [the] exchange and amended from time to time when temporary restrictions are in place."

Users of Waterfind's exchange platform include brokers, irrigators, investors, corporations, government and authorities. Waterfind offer water brokerage services to water market participants regardless of scale and whether government or corporate.

Waterfind can also facilitate arrangements for carryover parking and long-term leasing and provide brokerage, valuation, advisory and prospecting services. Waterfind also offers historical data on trade volumes and prices, allocations, storage levels, climate and commodity prices.

Waterfind facilitates trade in the Murray-Darling Basin across New South Wales, Victoria and South Australia.

Waterfind facilitates trading of temporary and permanent water in spot and forward markets on their exchange, and can arrange carryover parking and leases off-platform.

Waterfind operates a trust account that receives monies from buyers. Waterfind distributes payments to sellers after approval.

Waterfind also precludes brokers from acting as principals in trades.

B.4 Waterpool

Waterpool Trading operates a not-for-profit online trading exchange platform offering both a real-time regular trade room and a weekly pool for water trading. Participation in the weekly pool does not require any additional registration from sellers and is managed by an opt-out process. Traders include water users, agribusinesses and investors.

While matching on the weekly pool is automated, the real-time trade room requires buyers and sellers to accept offers for sale or purchase that have been posted onto the exchange platform. Unmatched offers are subsequently included in the weekly pool. Trade can occur anonymously while information on historical trades and current offers is publicly available. Trades processed through the pooled exchange

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are limited to Victoria. Waterpool Trading’s exchange platform is limited to temporary and permanent water trading.

Waterpool operates a holding account that receives water purchase monies from buyers. Waterpool distributes payments to sellers following approval of the trade.¹³⁹⁰

**B.5 Water Exchange (Murray Irrigation Limited)**

Murray Irrigation Limited’s (MIL) Water Exchange is an online real-time exchange platform that facilitates the trading of temporary water and water delivery rights on a spot market only. The trade of delivery rights is limited to members of MIL.

Users can submit sell offers and buy bids, which are matched by the exchange platform (lowest sell offer to highest buy bid). Buyers can also accept offers for sale that have been posted onto the exchange platform. Current offers and a daily aggregate of historical trades for the current water year are publicly available.

MIL’s Water Exchange is limited to temporary water and water delivery rights.

MIL operates a separate non-interest bearing account for Water Exchange that receives commission fees, any applicable trade fees and water purchase monies from buyers. MIL subsequently distributes payments to sellers, less commission fees, any applicable external trade fees and any other debt owed to MIL.

The individual irrigation right account holder is responsible for paying the WaterNSW trade fee to WaterNSW, and MIL will credit/debit the irrigation right account after approval for the trade has been received from WaterNSW.

**B.6 WaterMart (Coleambally Irrigation Co-operative Limited)**

WaterMart Exchange is an online real-time exchange platform that facilitates the trading of temporary water within the Coleambally Irrigation network and provides CICL members with access to the Southern Connected Basin market. All market participants can register to trade on the exchange.¹³⁹¹

WaterMart does not offer brokerage services and does not offer any water market advice.

CICL describe the volumes of their trades as ‘not significant’ compared to the total transactions in the Murrumbidgee.¹³⁹²

WaterMart is limited to the trade of temporary water only.

In addition to the matching service, WaterMart also provides electronic invoicing, settlement and approvals. Buyers and sellers are charged the same flat fees when both parties are within CICL, and WaterNSW lodgement fees are paid to WaterNSW when CICL members use WaterMart to access the external market.

WaterMart provides electronic documents to approval authorities to facilitate real-time approvals.

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¹³⁹² Coleambally Irrigation Co-operative Limited, op. cit., p. 3.
B.7 Irrigation infrastructure operator intermediary services

A number of irrigation infrastructure operators (IIOs) have also indicated that they offer various brokerage or other intermediary services to their members. For example, such services involve maintaining a list of members wanting to sell water and a list of members wanting to buy water. In some cases, these services may be freely offered to customers, and they may not be specifically identified by the IIO as an intermediary service.
Appendix C – Monetary transaction costs

This appendix provides a summary of the fees charged by Basin State authorities, how these support Basin States’ cost-recovery activities and the operating costs of Basin States’ water registers and trade processing services.

The fees charged by irrigation infrastructure operators (IIOs) to process trades\textsuperscript{1393} and the commissions charged by intermediaries (brokers and exchange platforms) are also included.

C.1 Basin State trade approval application fees

C.1.1 Allocation trades

Victoria and New South Wales have comparable fees in 2020–21 for allocation trades ($47.50 for Victoria when submitted via their online system, $49.37 for New South Wales) while South Australia’s fee for allocation trades was almost six times greater ($277). New South Wales also applies bulk rural water usage charges for interstate allocation trades, and also certain intrastate trades.\textsuperscript{1394} In 2020–21, the charges are $2.06/ML for allocation water purchased from the Murray Valley and $3.57/ML from the Murrumbidgee Valley.\textsuperscript{1395}

While Victoria has a paper-based allocation trade submission option available, the $89.50 charge is significantly greater than for online processing. This cost differential reflects the reduced labour costs associated with Victoria’s automated online processing system.

South Australia’s high fees reflect the relatively high labour costs for the trade approval authority to process trades. South Australia currently relies on labour to manage its paper-based system, but it is modernising its water registry\textsuperscript{1396}, which is expected to improve trade processing capability in the future.\textsuperscript{1397}

Figure C.1 shows trade approval fees have not changed significantly since 2015–16, except in New South Wales. Up to 2016–17, allocation trade fees in New South Wales comprised of a fixed cost (the minimum fee) and a variable cost for the volume of water traded, with a maximum fee in place. Since 2017–18, the trade fee has been a fixed cost regardless of the quantity of water traded.

\textsuperscript{1393} Includes transfers (that is, a trade that does not involve the payment of consideration).

\textsuperscript{1394} This charge is applied to all allocation trades where the destination water access licence does not hold a New South Wales works approval, and so also applies to non-water users such as investors and certain categories of water users such as environmental water holders.

\textsuperscript{1395} These charges are determined by the New South Wales Independent Pricing and Regulatory Tribunal (IPART) as part of its economic regulation of monopoly providers of water services, such as WaterNSW.

\textsuperscript{1396} Department of Agriculture, Submission to the Murray-Darling Basin water inquiry issues paper, 30 January 2020, p. 10.

\textsuperscript{1397} Department for Environment and Water (South Australia), 2018–19 Annual Report, 2019, p. 20.
Entitlement trades

Entitlement trade fees in each state are greater than allocation trade fees, although the difference is most significant in New South Wales where its $518.25 fee ($483.76 when submitted online) is about ten times that of its allocation trade fee. Entitlement fees for the other states ranged from $201 in Victoria to $471 in South Australia. Figure C.2 shows entitlement trade approval fees have increased only marginally in real terms since 2015–16.
C.1.3 Trade approval authorities recover their costs through trade approval application fees

Under the National Water Initiative (NWI), the Australian, state and territory governments agreed to cost recover the administration and water resources management of the Basin, including the water accounting systems that facilitate water trading. Each Basin State is responsible for its spending and cost recovery, where fees charged to water users and traders should be closely linked to the costs of the activities. Water registry, accounting and management costs should be recovered from entitlement holders via entitlement fees while trading costs and specific trade-related registry functions should be recovered from traders via trade approval fees. Consequently, trade approval application fees vary by state, depending on the costs incurred to facilitate water trading and the number of trades that costs can be recovered from.

Table C.1 shows trade approval fees are a relatively small proportion of trade value in the Southern Connected Murray–Darling Basin (Southern Connected Basin). While some water market participants have called for a consistent approach to trade allocation fees, such changes will affect states’ cost-recovery mechanisms.

Table C.1: Estimated revenue from trade approval authority allocation trade fees in the Southern Connected Basin, 2018–19 ($million)

<table>
<thead>
<tr>
<th>Origin state fees</th>
<th>Destination state fees</th>
<th>Total fees</th>
<th>Total reported allocation trade value</th>
<th>Origin state fees as % of total</th>
<th>Total fees as % of trade value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>0.154</td>
<td>0.035</td>
<td>0.188</td>
<td>141</td>
<td>81.9</td>
</tr>
<tr>
<td>Victoria</td>
<td>1.015</td>
<td>0.031</td>
<td>1.046</td>
<td>415</td>
<td>97.0</td>
</tr>
<tr>
<td>SA</td>
<td>0.316</td>
<td>0.144</td>
<td>0.459</td>
<td>72</td>
<td>68.8</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on NSW, Victoria and SA governments’ responses to voluntary information requests, trading fees as published on WaterNSW, Department for Environment and Water (SA) and Victorian Water Register websites.

Notes: Values in 2019–20 dollars. Estimates based on the relevant trading fees and approved allocation trades only, including zero dollar trades. Destination state fees apply for interstate trades only. Excludes New South Wales’s variable usage charges and zero Water Access Licence (WAL) set up costs. Data has been updated since the interim report.

Table C.2 shows Basin States’ operating costs for their water registry and trade processing functions, although the scope of each state’s services varies. For example, New South Wales’s trade processing costs not only include trade approvals for surface water and groundwater in the Southern and Northern Basins, but also the costs of other water licencing and works approval functions.

1398 Council of Australian Governments, Intergovernmental Agreement on a National Water Initiative, 2004, paragraphs 64 and 67(i).
1399 Water Act 2007 (Cth), Schedule 1 – Murray–Darling Basin Agreement, Schedule 2, s. 4(3).
Table C.2: Estimate of New South Wales, Victoria and South Australia’s operating costs for maintaining water registers and processing allocation and entitlement trade, 2018–19 ($million)

<table>
<thead>
<tr>
<th></th>
<th>Registry resourcing costs</th>
<th>Trade processing costs</th>
<th>Total Southern Connected Basin trade value</th>
<th>Trade processing costs as % of Southern Connected Basin trade value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>0.356&lt;sup&gt;a&lt;/sup&gt;</td>
<td>8.911&lt;sup&gt;b&lt;/sup&gt;</td>
<td>300</td>
<td>2.97</td>
</tr>
<tr>
<td>Victoria</td>
<td>2.897</td>
<td>1.478</td>
<td>716</td>
<td>0.21</td>
</tr>
<tr>
<td>SA</td>
<td>0.741</td>
<td>1.511</td>
<td>105</td>
<td>1.44</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on NSW, Victoria and SA governments’ responses to voluntary information request, NSW and Victoria governments responses to ACCC annual Water Monitoring Report Requests for Information, IPART and Bureau of Meteorology data.

Notes: Values in 2019–20 dollars. Registry resourcing costs include operating, capital and labour costs for each state’s water registers. Trade approval costs are those incurred by agencies when performing their trade approval and registration functions.

(a) NSW registry costs reported by the Department of Planning, Industry and the Environment (DPIE).
(b) NSW trade processing costs, reported by the DPIE and WaterNSW, also include the issuing of licences and the administration of works approvals.

Trade value includes allocation and entitlement trades, including zero dollar trades (and as such, is likely an underestimate of the true trade value, see section 11.3.4). Data has been updated since the interim report.

While Victoria’s operating costs for trade approval services are a much smaller proportion of trade value compared to other states (table C.2), this does not consider previous investments that have improved trading processes in the Victorian Water Register. Victoria’s registry resourcing costs include licensing, water usage, compliance, and resource management functions. While some of the fixed costs of maintaining the Victorian Water Register are cost recovered from holders of Victorian water entitlements through an annual levy collected by Victorian water corporations<sup>1400</sup>, there have also been investments of $5.1 million from 2009–10 to 2011–12 from the Australian Government<sup>1401</sup> and $4.6 million from 2012–13 to 2015–16 from the Victorian Environmental Contribution levy<sup>1402, 1403</sup>. These investments allowed for upgrades that benefitted water traders: allocation trades could be lodged online for a reduced fee<sup>1404</sup> and approval times were reduced<sup>1405</sup>, without any changes to the paper-based application fees for trade approval that had been in place since 2009.<sup>1406</sup>

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<sup>1402</sup> The Environmental Contribution Levy is collected from Victoria’s urban and rural water businesses to fund water reforms and water-related environmental initiatives.


<sup>1404</sup> Water (Resource Management) Regulations Amendment Regulations 2013, S.R. No. 163/2013.


<sup>1406</sup> Trade approval fees in Victoria are set by legislation. The current Water (Resource Management) Regulations 2017 (Victoria) prescribe fees for entitlement trade applications as 13.57 fee units, and for allocation trade as 3.20 fee units through the automated lodgement process or 6.04 fee units though any other lodgement process. The revoked Water (Resource Management) Regulations 2007 prescribed the same fees for entitlement and allocation trade applications from 2009. The automated lodgement process prescribed fee came into effect following the 2013 amendments and was set at 3.20 fee units. In Victoria, fee units are automatically indexed.
C.2 Irrigation infrastructure operator trade approval application fees

C.2.1 Temporary trades

Water users located within irrigation networks are generally able to undertake temporary trades within the network of their irrigation infrastructure operator (IIO) or buy water from outside of the IIO and only incur a small trade approval fee of up to $75 per trade from the IIO. However, trading water into and out of the IIO’s network can incur more significant costs as these trades also attract Basin State trade approval authority fees. Further, certain IIOs also charge ‘exit fees’ for temporary trade, being a charge per ML of water traded outside the irrigation network. Combined IIO and trade approval authority fees (including exit fees) for a 100 ML trade can range from $79.37 to $1,309.37 (table C.3).

Table C.3: Irrigation infrastructure operator (IIO) fees for temporary trades within and external to IIO network, exclusive of Basin State trade approval authority fees for 2020-21

<table>
<thead>
<tr>
<th>Irrigation infrastructure operator</th>
<th>Internal trade fee ($)</th>
<th>External trade fee ($)</th>
<th>Fee for 100 ML external trade ($)</th>
<th>Fee for 100 ML external trade, including trade approval authority fees ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coleambally⁷</td>
<td>75.00</td>
<td>130.00</td>
<td>130.00</td>
<td>179.37</td>
</tr>
<tr>
<td>Hay</td>
<td>30.00</td>
<td>30.00</td>
<td>30.00</td>
<td>79.37</td>
</tr>
<tr>
<td>Jemalong⁶</td>
<td>-</td>
<td>6.86 per ML⁶</td>
<td>686.00</td>
<td>735.37</td>
</tr>
<tr>
<td>Moira</td>
<td>-</td>
<td>90.00 + 8.0 per ML⁶</td>
<td>890.00</td>
<td>939.37</td>
</tr>
<tr>
<td>Murray Irrigation Limited⁶</td>
<td>No charge</td>
<td>86.00</td>
<td>86.00</td>
<td>135.37</td>
</tr>
<tr>
<td>Murrumbidgee Irrigation Limited</td>
<td>No charge</td>
<td>92.00</td>
<td>92.00</td>
<td>141.37</td>
</tr>
<tr>
<td>West Corurgan⁷</td>
<td>30.00</td>
<td>110.00 + 11.5 per ML⁶</td>
<td>1,260.00</td>
<td>1,309.37</td>
</tr>
<tr>
<td>Western Murray Irrigation</td>
<td>28.00</td>
<td>69.00</td>
<td>69.00</td>
<td>118.37</td>
</tr>
<tr>
<td>South Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Irrigation Trust</td>
<td>No charge</td>
<td>62.00</td>
<td>62.00</td>
<td>339.00</td>
</tr>
<tr>
<td>Renmark⁸</td>
<td>25.00⁸</td>
<td>35.00⁸</td>
<td>35.00</td>
<td>312.00</td>
</tr>
</tbody>
</table>

Source: ACCC analysis of data provided and published by irrigator infrastructure operators analysed for this report.

Notes: (a) Fees advertised inclusive of GST.
(b) Per ML exit fees levied by Jemalong, West Corurgan and Moira only apply to water transferred out of the irrigation network; water transferred in does not attract this charge. For Jemalong, water transferred in may also attract charges in relation to conveyance.
(c) Murrumbidgee Irrigation Limited does not charge for the first five internal trades each season, but charges $50 thereafter.
(d) Renmark also offer a service where irrigation right holders can list buy and sell offers. Each offer is charged $36 and includes approval once the offer is matched by another irrigation right holder (such that Renmark receives $72 per pair of buy/sell offers).
(e) Renmark offer a reduced charge of $26 for external trades when a broker lodges the trade application form to the trade approval authority.

C.2.2 Entitlement trades and leases

Water users within IIOs are also able to permanently trade their irrigation rights. Fees range from $70 to $400 for each trade within their IIO’s network (table C.2).

Permanent trading or leasing of irrigation rights outside of the IIO district is more complex as the irrigation right must be transformed into a water access entitlement. ‘Transformation’ is a process
that allows irrigators with an irrigation right against IIOs in New South Wales and South Australia to permanently transform their irrigation right into a water access entitlement in their own name.1407

Fees charged by IIOs for permanent trade or leasing of irrigation rights outside of the IIO’s network range from $70 to $550 (table C.4).

Trading the transformed irrigation right as an entitlement or lease outside of the IIO network also attracts Basin State trade approval authority fees. Irrigators in New South Wales without a water access licence are required to establish one prior to the transformation of their irrigation rights into entitlements, incurring an additional $344.64 charge ($308.56 online) to the $518.25 entitlement trade fee ($483.76 online). This water access licence establishment charge can be avoided if the irrigator sells their water right to a buyer who already has a water access licence and the transformation is processed directly into that licence. However, it is unavoidable for irrigators who do not yet have a licence and choose to hold the subsequent entitlement for leasing or trading allocations.

Table C.4: Irrigation infrastructure operator (IIO) fees for permanent trade within and external to IIO network for 2020–21

<table>
<thead>
<tr>
<th>Irrigation infrastructure operator</th>
<th>Internal trade fee ($)</th>
<th>External trade fee ($)</th>
<th>External trade fee including maximum trade approval authority fees ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NSW</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coleambally*</td>
<td>250.00</td>
<td>250.00</td>
<td>1,112.89</td>
</tr>
<tr>
<td>Hay</td>
<td>-</td>
<td>350.00</td>
<td>1,212.89</td>
</tr>
<tr>
<td>Jemalong</td>
<td>400.00</td>
<td>400.00</td>
<td>1,262.89</td>
</tr>
<tr>
<td>Moira</td>
<td>-</td>
<td>300.00</td>
<td>1,162.89</td>
</tr>
<tr>
<td>Murray Irrigation Limited*</td>
<td>316.00</td>
<td>393.00</td>
<td>1,255.89</td>
</tr>
<tr>
<td>Murrumbidgee Irrigation Limited</td>
<td>230.00</td>
<td>230.00</td>
<td>1,092.89</td>
</tr>
<tr>
<td>Narromine</td>
<td>70.00</td>
<td>70.00</td>
<td>932.89</td>
</tr>
<tr>
<td>West Corurgan*</td>
<td>385.00</td>
<td>550.00</td>
<td>1,412.89</td>
</tr>
<tr>
<td>Western Murray Irrigation</td>
<td>209.00</td>
<td>319.00</td>
<td>1,181.89</td>
</tr>
<tr>
<td><strong>South Australia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Irrigation Trust</td>
<td>375.00</td>
<td>375.00</td>
<td>846.00</td>
</tr>
<tr>
<td>Renmark*</td>
<td>36.00</td>
<td>335.00</td>
<td>806.00</td>
</tr>
</tbody>
</table>

Source: ACCC analysis of data provided and published by IIOs analysed for this report.
Notes: (a) Fees advertised inclusive of GST.
(b) This includes WaterNSW fees for establishing a zero share WAL and applying for share component trade approval, and registration of the approved dealing with NSW LRS. Fees can be reduced by $70.57 if both applications with WaterNSW are lodged online. Fees quoted apply to regulated systems only.

C.3 Broker and exchange platform commission costs

Water brokers and exchange platforms provide a variety of advisory, matching and information services. While there are many intermediaries that can match buyers and sellers for allocation and entitlement trades, water market participants seeking to trade other products may need to incur some research transaction costs to choose a service provider that meets their needs.

Table C.5 provides an overview of broker and exchange fees as at April 2020. Simple bulletin board style services tend to have the lowest fees and clear guidance on the parties responsible for payment of trade approval authority fees. However, more complex trades are less-suited to bulletin boards and water market participants may prefer to use a broker rather than spend time and resources understanding trading rules, finding trading partners and negotiating the contract.

1407 Transformation processes are governed by the Water Market Rules 2009 (Cth) and enforced by the ACCC, where Rule 22 provides for recovery of the amount of loss or damage suffered as a result of conduct, or an omission, of another person that contravenes the rules.
<table>
<thead>
<tr>
<th>Fee model</th>
<th>Buyer’s fees</th>
<th>Seller’s fees</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allocation trades</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable (volume-based) fee, parties charged equally but buyer pays all trade approval authority fees</td>
<td>$2/ML, with a $75 minimum plus all trade approval authority fees.</td>
<td>$2/ML, with a $75 minimum.</td>
</tr>
<tr>
<td>Variable (volume and value-based) fees, where buyer pays more but both parties pay trade approval authority fees</td>
<td>1.9% of trade value, with a $100 minimum, additional fees of $1.90/ML plus trade approval authority fees.</td>
<td>$2/ML, with a $100 minimum, plus trade approval authority fees.</td>
</tr>
<tr>
<td>Combination of fixed and variable fees.</td>
<td>Fixed fee range: $0–$300.</td>
<td></td>
</tr>
<tr>
<td><strong>Forward allocation agreements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable (annual volume-based) fee, parties charged equally but buyer pays all trade approval authority fees</td>
<td>1% per ML per annum plus all trade approval authority fees.</td>
<td>1% per ML per annum.</td>
</tr>
<tr>
<td>Combination of fixed and variable fees.</td>
<td>Fixed fee range: $0–$500</td>
<td></td>
</tr>
<tr>
<td><strong>Options</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed and variable (value-based) fees.</td>
<td>$275 establishment fee plus 1.1% of option premium (minimum of $0.55 per option) and strike price.</td>
<td>Not specified – provided by a private supplier.</td>
</tr>
<tr>
<td><strong>Entitlement trades</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable (value-based) fee, parties charged equally but buyer pays all trade approval authority fees</td>
<td>0.75% of value, with a $750 minimum, plus all trade approval authority fees.</td>
<td>0.75% of value, with a $750 minimum.</td>
</tr>
<tr>
<td>Fixed and variable (value-based) fees, where both parties are charged equally and both pay trade approval authority fees</td>
<td>$750 plus 3.5% of trade value plus trade approval authority fees.</td>
<td>$750 plus 3.5% of trade value plus trade approval authority fees.</td>
</tr>
<tr>
<td>Combination of fixed and variable fees.</td>
<td>Fixed fee range: $0–$750</td>
<td></td>
</tr>
</tbody>
</table>

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1409 ibid.
1411 ibid.
1413 ibid.
1415 ibid.
1417 ibid.
1419 ibid.
### Entitlement leases

<table>
<thead>
<tr>
<th>Type</th>
<th>Fee Structure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable (volume or value-based) fee, parties charged equally but buyer pays all trade approval authority fees</td>
<td>1% per ML per annum (or $1/ML for low reliability water) plus all trade approval authority fees</td>
<td>$1 per ML plus all trade approval authority fees</td>
</tr>
<tr>
<td>Combination of fixed and variable fees.</td>
<td>Fixed fee range: $0–$100</td>
<td>Fixed fee range: $0–$300, alternate variable volume fee: $0.00–$2.0 per ML.</td>
</tr>
<tr>
<td><strong>Lessee may become responsible for any fees associated with the entitlement being leased.</strong></td>
<td>Variable trade value fee range: 0.5–4.0% of trade value, although some individual brokers are moving to a variable volume charge.</td>
<td></td>
</tr>
</tbody>
</table>

### Carryover

<table>
<thead>
<tr>
<th>Type</th>
<th>Fee Structure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable (volume) fee, parties charged equally but buyer pays all trade approval authority fees</td>
<td>$1/ML plus all trade approval authority fees</td>
<td>$1/ML.</td>
</tr>
<tr>
<td>Combination of fixed and variable fees.</td>
<td>Fixed fee range: $0–$300</td>
<td>Fixed fee range: $0–4.0%.</td>
</tr>
<tr>
<td><strong>Payment of trade approval authority fees to be negotiated between parties.</strong></td>
<td>Variable trade value fee range: 0.0–4.0%.</td>
<td>Alternate variable volume fee: $0.00–$2.0 per ML.</td>
</tr>
</tbody>
</table>

Source: Information from intermediaries’ websites and s. 95ZK responses.

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1421 ibid.
1423 ibid.
Appendix D - Transaction costs in the Southern Connected Basin

This appendix provides an overview of the transaction costs associated with water trading.\(^{1424}\) It considers how Basin State and irrigation infrastructure operator (IIO) approval processes, and intermediaries’ lodgement processes, affect individual trade approval applications and the availability of information to the market.

D.1 Impact of trading fees on trade

D.1.1 Allocation trades processed by Basin State trade approval authorities

Analyses in this section only consider water allocation trades from 1 July 2017 to 30 November 2019 as Basin State trade approval authority fees did not materially change during this period (see appendix C).

Trading volumes across the Southern Connected Murray-Darling Basin (the Southern Connected Basin) varied significantly by state and trade type during 1 July 2017 to 30 November 2019.\(^{1425}\) Briefly:

- Victorian water trade buyers undertook almost 40,000 allocation trades, where 96% were for water sourced intrastate.
- New South Wales buyers executed almost 9,000 trades, less than a quarter of Victoria’s total number of trades, but only 83% of trades were for water sourced intrastate.
- South Australian buyers had the smallest number of trades and the smallest proportion of trades where water was sourced intrastate (65%).

Water volumes were another aspect of trading that varied for each of the states (figure D.1). Almost half of the Victorian trades were less than 25 ML and over 75% were less than 100 ML. While this could be attributed in part to Victoria’s low trade approval fees, the distribution of volumes is markedly different in New South Wales (which is also has relatively low approval fees) where less than one quarter of trades were up to 25 ML and only about 50% of trades were less than 100 ML. South Australia, with trade approval fees that are six times the size of the other two states\(^{1426}\), had a distribution that was closer to Victoria than New South Wales where over one-third of trades were for volumes up to 25 ML and almost two-thirds were for volumes up to 100 ML. This may be due to South Australia’s high proportion of interstate trades, which it predominantly sources from Victoria.\(^{1427}\) However, when interstate trades are excluded, buyers in Victoria and South Australia have similar buying patterns despite marked differences in trade approval charges (figure D.2).

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1424 Includes transfers (that is, a trade that does not involve the payment of consideration).
1425 See section 10.4.1.
1426 See appendix C.
While Victoria and South Australia have marked differences in trade approval charges, buyers in these states have similar buying patterns (figure D.2).

From a monetary transaction cost perspective, buyers are generally best off when they only purchase intrastate. Interstate trades are a small proportion of all trades for each of the Basin States in the Southern Connected Basin, particularly in Victoria and New South Wales. Victoria and South Australia had similar volume distributions for intrastate trades and both had more trades of at least 200 ML from interstate than from intrastate, indicating a tendency for interstate trades to be of higher volume than intrastate trades (figure D.3 and figure D.5). New South Wales buyers tended to purchase similar volumes from Victoria as intrastate, but tended to purchase more moderate volumes (50–100 ML) from South Australia (figure D.4). These trends towards higher volume interstate trades may suggest the
higher trade approval fees and increased complexity associated with interstate trade may be limiting interstate trade of low volumes.

**Figure D.3:** Relative proportions of trades by volume traded purchased in Victoria, for water sourced from New South Wales, Victoria and SA from 1 July 2017 to 30 November 2019

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.

Notes: Includes zero dollar trades. Data has been updated since the interim report.

**Figure D.4:** Relative proportions of trades by volume traded purchased in New South Wales, for water sourced from New South Wales, Victoria and SA from 1 July 2017 to 30 November 2019

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.

Notes: Includes zero dollar trades. Data has been updated since the interim report.
While inconsistent trade approval fees across the Basin States were an issue for a number of stakeholders\textsuperscript{1428}, they do not seem to be significantly influencing the water volumes being traded within each Basin State. Victoria and South Australia both had a high proportion of small (up to 50 ML) intrastate trades from 1 July 2017 to 30 November 2019 despite the significantly higher trade approval fees in South Australia compared to Victoria. However, intrastate trades in New South Wales and interstate trades across all the Basin States in the Southern Connected Basin have a greater proportion of larger volume interstate trades. It is unclear whether this is due to the complexity of interstate trades (due to intervalley transfer restrictions and/or the need to interact with two trade approval authorities) or difficulties in finding interstate trading partners for low volume trades.

**D.1.2 Temporary trades processed by NSW and SA IIOs**

Analyses in this section are limited to IIOs that were able to provide data to the ACCC in a structured electronic form. As some of the datasets were very small, this section considers trades from a longer period than in the previous section (1 July 2016 to 30 November 2019).

Figure D.6 shows that while IIOs have significantly different numbers of temporary trades, ranging from under 250 (West Corurgan) to over 14,000 (Murray Irrigation Limited), most trades were within each IIO’s network (except for Western Murray Irrigation (WMI), where just under 50% of trades were internal). The ACCC considers that WMI’s relatively low proportion of internal trades may be due to its small size and that its customers have access to the Murray Irrigation exchange platform.

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\textsuperscript{1428} H2OX, Submission to the Murray-Darling Basin water inquiry interim report, 13 November 2020, p. 5; Murray Valley Food and Fibre Association, Submission to the Murray-Darling Basin water inquiry interim report, 13 November 2020, p. 6; National Irrigators Council, Submission to the Murray-Darling Basin water inquiry interim report, 13 November 2020, p. 17.
The water volumes traded by irrigation right holders also vary across the IIO networks (figure D.7). WMI, Central Irrigation Trust (CIT), and Renmark Irrigation Trust (RIT) are all dominated by small volume trades (those less than 25 ML) while over half of the trades processed by CICL and West Corurgan were of at least 100 ML. The volumes traded by customers of Murray Irrigation and Murrumbidgee Irrigation, which are the two largest IIOs and do not charge fees for trades within their networks (see table C.3 in appendix C), were more evenly distributed where trades up to 25 ML, those between 25 ML and up to 100 ML and those of at least 100 ML each accounted for about a third of trade in each network. While CIT also does not charge for trades within their network, the high proportion of trades less than 25 ML may be better explained by the dominance of horticulture in South Australia where irrigators are likely managing relatively smaller farms.

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1429 Murrumbidgee Irrigation do not charge for the first 5 internal trades each season (see section C.2 in appendix C).
Trades within the IIO networks generally had a higher proportion of smaller volume trades than those traded into and out of the network (figure D.8). This is likely due to the higher transaction costs of trading into and out of IIO networks, where trades must be approved by at least two trade approval authorities (the IIO and the Basin State in which the IIO holds its water access entitlement(s)), incurring trade approval application fees from each authority and requiring more time for these trades to be processed (see section D.3.2). Additionally, most IIOs charge more for trades into and out of the network than for internal trades (see table C.3 in appendix C) and this can further suppress the trade of smaller volumes into and out of IIO networks.
Figure D.8: Relative proportions of trades within, into and out of IIO networks by volume traded for buyers in IIOs from 1 July 2016 to 30 November 2019

Source: ACCC analysis based on NSW and SA governments’ and IIOs’ responses to voluntary information requests and s. 95ZK responses.

Notes: CICL: Coleambally Irrigation Cooperative Limited; MI: Murrumbidgee Irrigation Limited; MIL: Murray Irrigation Limited; WC: West Corurgan; WMI: Western Murray Irrigation Limited; CIT: Central Irrigation Trust; RIT: Renmark Irrigation Trust. Includes zero dollar trades. Excludes trades into and out of networks that could not be matched with Basin State registers.

D.2 Trade processing times

One of the key issues experienced by participants of water markets is a lack of timely information, and many water market participants rely on water registries to provide them with the data they require to make more informed trading decisions (see section 11.3.1).

D.2.1 Basin State TAA’s allocation trade processing times

Service standards for allocation trades were first adopted by COAG\textsuperscript{1430} in November 2008\textsuperscript{1431} for commencement on 1 January 2009\textsuperscript{1432}, with the current service standards in place since 1 July 2009.\textsuperscript{1433} Since 1 July 2009, Basin States are required to meet the following timelines for allocation and entitlement trades:

- at least 90\% of intrastate allocation trades processed within 5 business days (10 days for South Australia)
- at least 90\% of interstate allocation trades processed within 10 business days (20 days for South Australia)
- at least 90\% of entitlement trades processed to the registration stage within 10 business days
- at least 90\% of entitlement trades processed to the approval stage within 20 business days.

However, the New South Wales and Victorian trade approval authorities now measure the performance of their interstate allocation trades to South Australia using the 20 business day benchmark rather than 10 business days.\textsuperscript{1434}

\textsuperscript{1430} On 29 May 2020, National Cabinet agreed to the formation of the National Federation Reform Council (NFRC) and the cessation of the Council of Australian Governments (COAG).

\textsuperscript{1431} COAG Communiqué, 29 November 2008.


\textsuperscript{1434} However, the WaterNSW FAQ page refers to the 10 business day benchmark for interstate approvals (see \url{https://www.waternsw.com.au/customer-service/ordering-trading-and-pricing/trading/faqs-water-trading}, viewed 16 April 2020).
Unlike the other Basin States, Victoria’s allocation trade approval applications are assessed by an automated online processing system, which has been able to provide same-day approvals for 90% of intrastate trades since 2016–17 (figure D.9). While New South Wales trade processing is undertaken manually, it has achieved next business day approval times for 90% of its approved intrastate allocation trades in the Southern Connected Basin since 2017–18. South Australia has a paper-based manual process, and has approved 90% of its allocation trades within 4–6 business days since 2013–14.

Sunwater is not required to record trade approval application submission dates but has typically processed its allocation trades within five business days, which meet the COAG service standards.

Figure D.9: Number of business days taken by Basin State trade approval authorities to approve at least 90% of intrastate allocation trades, by state and year

Interstate trading requires coordination between both Basin States’ trade approval authorities. The processes are independent but rely on a batched ‘interoperability’ system to verify whether a trade can be progressed. Figure D.10 shows all states have improved their interstate processing times since 2012–13. New South Wales has reduced its approval time, for at least 90% of interstate trades, from 6 business days in 2012–13 to 2 business days for the 2019–20 water year (to 30 November 2019).

While the Victorian automated system can deliver same-day approvals for intrastate trade, if submitted online the system approves the Victorian side of an interstate trade automatically but relies on other Basin States’ trading rules to process their side of the trade. Consequently, Victoria’s approval times for at least 90% of interstate trades only decreased from 7 business days in 2012–13 to 4 business days in 2018–19. South Australia has also improved its processing time for interstate trades, with approval times decreasing from eight business days in 2012–13 to 4 in 2018–19. While Victoria’s and South Australia’s approval times for at least 90% of trades at the start of the 2019–20 water year have increased to six business days, this is still well below the 2009 COAG service standard of 10 business days for Victoria and 20 for South Australia.

1435 This is a term used by the Southern Connected Basin States to describe their file sharing arrangement for supporting interstate trade (see section 10.3.3 in chapter 10).
1436 Note: New South Wales/Queensland interstate trades still operate on a manual bilateral approval process.
One of the objectives under the National Water Initiative was to develop open and efficient water markets that facilitate trading within and between states to broaden and deepen markets, with a specific reference to ensuring competitive neutrality in the Southern Murray–Darling Basin. However, the variable trade processing times shown above could influence trading and investment decisions, and subsequently affect the value of water in certain trading zones. Extended processing times also contribute to delays to information flows, providing a false picture of the ‘current’ market and increasing transaction costs for traders.

However, on average, the New South Wales and South Australian trade approval authorities struggle to meet the COAG service standards at the start of each water year (figure D.11).

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1437 Council of Australian Governments, *Intergovernmental Agreement on a National Water Initiative*, 2004, paragraphs 23(v) and 58(i).
1438 ibid, paragraph 63(ii).
Figure D.11: Average number of business days taken by Basin State trade approval authorities to approve at least 90% of intrastate and interstate allocation trades by month, 1 July 2012 to 30 November 2019

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.
Notes: This figure shows the 90th percentile for allocation trade approvals in the Southern Connected Basin, for each state, for each month, averaged over the 2012–13 to 2019–20 (to 30 November 2019) water years. Excludes weekends and public holidays. Includes zero dollar trades. Data has been updated since the interim report.

Further, the extended average approval times are limited to particular trading zones (table D.1). 90% of trades that moved water into trading zone 10 (New South Wales Murray Above Choke) experienced a trade approval time of up to 48.2 days (that is, 10% of trades experience a trade approval time greater than 48.2 days).
Table D.1: Number of business days taken by Basin State trade approval authorities to approve at least 90% of allocation trades, by destination trading zone, from 1 July 2012 to 30 November 2019 by month

<table>
<thead>
<tr>
<th>Trading Zone</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NSW</strong></td>
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<tr>
<td>10 NSW Murray Above Choke</td>
<td>48.2</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2.7</td>
<td>2</td>
<td>2</td>
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<td>11 NSW Murray Below Choke</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>13 Murrumbidgee</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>14 Lower Darling</td>
<td>2</td>
<td>1.2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>12.6</td>
<td>6</td>
<td>3</td>
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<td><strong>VIC</strong></td>
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<td>2</td>
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<td>1</td>
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<tr>
<td>1B Boort</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2.8</td>
<td>1</td>
<td>1</td>
<td>1.5</td>
<td>1</td>
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<td>1</td>
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<tr>
<td>2 Broken</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>31.3</td>
<td>0.5</td>
<td>1.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>3 Lower Goulburn</td>
<td>1.6</td>
<td>12</td>
<td>0</td>
<td>3.4</td>
<td>3.6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4A Campaspe – Eppalock to WWC</td>
<td>0.9</td>
<td>1.9</td>
<td>5.2</td>
<td>1</td>
<td>0.4</td>
<td>3.8</td>
<td>1</td>
<td>1</td>
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<tr>
<td>4C Lower Campaspe</td>
<td>0</td>
<td>0</td>
<td>1.8</td>
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<td>0.8</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>5A Loddon – CC/Tull to LWP</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1.9</td>
<td>1</td>
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<tr>
<td>6 VIC Murray – Dart to Barmah</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<td>2</td>
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<td>2</td>
</tr>
<tr>
<td>6B Lower Broken Creek</td>
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<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7 VIC Murray – Barmah to SA</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<td><strong>SA</strong></td>
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<tr>
<td>12 SA Murray</td>
<td>12</td>
<td>7</td>
<td>6</td>
<td>6.8</td>
<td>7</td>
<td>6.3</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

**Legend**
- 0 to ≤ 5 business days
- 5 to ≤ 10 business days
- 10 to ≤ 20 business days
- Over 20 business days

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.

Notes:
- This table shows the 90th percentile for allocation trade approvals in the Southern Connected Basin from 1 July 2012 to 30 November 2019, for each destination trading zone, for each month. Excludes weekends and public holidays. Includes zero dollar trades. Data has been updated since the interim report.

### D.2.2 IIOs’ temporary trade processing times

IIOs are not required to meet any service standards for temporary trade, but some were able to provide both the date the trade approval application was submitted and the date the trade was approved. Only 3 IIOs were able to provide records of both dates. A fourth IIO only provided this information regarding water offered for sale on an associated exchange platform (where approval is only required for listing a sell offer).

Figure D.12 shows IIO C completed same-day approvals. IIO B approved at least 90% of trades within 2 business days, and that these processes outperformed WaterNSW’s allocation trade approval processing for intrastate trades. However IIO A approved most of its trades within 4–7 business days, which was slower than WaterNSW. Not shown are the times recorded by the fourth IIO (IIO D) for at least 90% of its approved trades, which are approved at board meetings. IIO D’s times subsequently ranged from 14.5 business days in 2018-19 to 36 days in 2017-18.

1439 While table G.4 (in appendix G) shows some IIOs’ trading datasets were missing fields, for some IIOs information is also stored in separate systems that could not be integrated with the supplied trading data in time for more complete data to be provided to the inquiry.

1440 This almost occurs instantaneously due to this IIO’s interoperable finance, water management and water trading systems (see section 10.3.3).

1441 ACCC analysis based on IIO’s response to voluntary information request.
This is another example of how water markets participants experience varied transactions costs. Irrigators within IIO networks generally have lower trade approval fees than for water allocation account holders outside of IIOs (except CICL, see table C.3 in appendix C) but the time taken for temporary trades to be approved is highly variable.

**Figure D.12**: Number of business days taken by IIOs to approve at least 90% of irrigation right trades within IIO networks, by IIO and year

Trading water into and out of IIOs requires approval from at least two trade approval authorities – the IIO and the Basin State in which the IIO is located. Unlike for interstate trading, the processes cannot be undertaken in parallel and one must precede the other. For example, when trading water into an IIO – the Basin State trade approval authority must first approve the allocation trade onto the IIO’s water account, then the IIO must approve the temporary irrigation right trade onto the irrigator’s water account. Whereas for interstate trade, a Basin State trade approval authority can ‘pre-approve’ a trade and then finalise the trade when the outcome of the other Basin State’s approval process is known.

Section D.2.6 also notes exchange platforms take longer to submit trades to the NSW and SA trade approval authorities than electronically to the Victorian one.
Figure D.13: Number of business days taken by IIOs to approve at least 90% of irrigation right trades into IIO networks, by IIO and year

Source: ACCC analysis based on NSW Government’s and IIOs’ responses to voluntary information requests and s. 95ZK responses.

Notes: This figure shows the 90th percentile for irrigation right trade approvals into IIO networks in the Southern Connected Basin, for each IIO, for each water year. Excludes weekends and public holidays. Irrigation right trades into IIO networks are processed as allocation trades by the Basin State trade approval authorities. Includes zero dollar trades. 2019–20YTD = 2019–20 year to 30 November 2019. Data has been updated since the interim report.

Figure D.14: Number of business days taken by IIOs to approve at least 90% of irrigation right trades out of IIO networks, by IIO and year

Source: ACCC analysis based on NSW Government’s and IIOs’ responses to voluntary information requests and s. 95ZK responses.

Notes: This figure shows the 90th percentile for irrigation right trade approvals out of IIO networks in the Southern Connected Basin, for each IIO, for each water year. Excludes weekends and public holidays. Irrigation right trades out of IIO networks are processed as allocation trades by the Basin State trade approval authorities. Includes zero dollar trades. 2019–20YTD = 2019–20 year to 30 November 2019. Data has been updated since the interim report.

D.2.3 Basin State trade approval authorities’ entitlement trade processing times

Entitlement trades take longer to process than allocation trades as they are more complex, requiring identity checks and at times involving third party interests such as mortgages and long-term leases.
They also require 2 steps, first to gain approval and then to register the trade, with approval and registration in some Basin States being provided by two separate entities, even for intrastate transfers.

In New South Wales, two entities can be involved in the entitlement trading process - the trade approval authority (WaterNSW) and the registry (New South Wales Land Registry Services). Where entitlement trade only requires a change in ownership of the water access licence (WAL), this can be directly registered with New South Wales Land Registry Services (NSW LRS). However, for entitlement trades where share components are transferred between NSW WALs the trade is first approved by WaterNSW before it is registered with NSW LRS, the entitlement holder (the seller) is responsible for registering the change in ownership with NSW LRS. The impact of this two-step process on IIO transformations in 2018–19 is shown in the next section where transformations from within NSW IIOs take significantly more time to approved than those from SA (see figure D.15).

Water entitlement transfers are also a two-step process in Victoria. The transfer is lodged with the rural water corporation for approval and then a separate form must be submitted to the Water Registrar to complete and register the trade.

In South Australia entitlement trades can be wholly managed by one entity, the Department for Environment and Water. The single entity approach to processing entitlement transfers result in a shorter approval time, as discussed in the next section (D.2.4).

**D.2.4 IIOs’ transformation application processing times**

Transformation allows irrigators with an irrigation right held within an irrigation network in New South Wales and South Australia to permanently transform their irrigation right into a water access entitlement in their own name. Irrigators may wish to do this so they can trade water without any restrictions that may be imposed by their IIO.

An IIO’s revenue is derived from infrastructure charges for the delivery of water to their irrigators, and so has an incentive to restrict water trade out from their network. The *Water Market Rules 2009* prevent IIOs from imposing excessive fees or unreasonably delaying the transformation of irrigation rights. However, the rules give IIOs up to 60 business days to reach agreement with an irrigator on the contractual details of the irrigation right they are considering to transform, and associated water delivery rights. Once agreement has been reached and the irrigator has applied to their IIO for transformation and paid any fees and outstanding charges, the IIO has 20 business days to process the application and an additional 5 business days to notify the irrigator of the outcome.

Following the processing of the transformation application by the IIO, the relevant state authority needs to create the water entitlement. In 2018–19, the median number of days for an IIO in South Australia to complete the initial transformation processing was 2 days, while the median state authority processing time was 14 days. Meanwhile, the median IIO processing time in New South Wales was 12 days, while the second component of processing had a median time of 32 days (figure D.15).

The extended state authority processing time in New South Wales is due to the involvement of two separate government entities and the separate processes for approval and registration. After the initial processing by the IIO, the application is forwarded to WaterNSW. The application is then returned to the IIO who either submits the approved application to the NSW Land Registry Services directly or returns it to the irrigator for lodgement. In South Australia, the Department for Environment and Water is responsible for both trade approval and registration of the transformed water right. Additionally, until recently, entitlement transfers in South Australia were given effect as soon as they were approved by the Minister and there was not a separate step to register the trade (see appendix E).

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Figure D.15: Median days to process transformation applications, by processing stage and state, 2018–19

<table>
<thead>
<tr>
<th>Approval Time (Business Days)</th>
<th>NSW</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIO initial processing</td>
<td>zero.tab</td>
<td>one.tab/five.tab</td>
</tr>
<tr>
<td>State Authority, Secondary IIO processing and Title Registration</td>
<td>zero.tab/two.tab/five.tab</td>
<td>zero.tab/two/tab/five.tab</td>
</tr>
<tr>
<td>IIO initial processing</td>
<td>zero.tab</td>
<td>one.tab/five.tab</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on IIOs’ responses to ACCC annual Water Monitoring Report Requests for information.
Notes: Includes zero dollar trades.

D.2.5 Impact of processing times on transparency

The variable trade processing times experienced by water market participants throughout the water year and in different areas of the Southern Connected Basin suggest there are significant inconsistencies in the water markets. For water users seeking an immediate source of water, this variability can influence trading and investment decisions and decrease the value of difficult to access water sources.

More broadly, extended processing times delay the timely publication of any trading data and increase the transaction costs for market participants as they must undertake additional research to better understand the ‘current’ state of the water market.

One way to consider the impact of delayed processing on market information is to compare the price of water for trades submitted to a trade approval authority with the price of water for trades approved by the trade approval authority on the same day. This will only be a minimum lag given trade application forms are lodged after the deal has been struck, and data on approved trades are published after the trade has been approved by the trade approval authority.

In the case of trade approval authority lags, the price dispersion ratio will equal one for days when the price of water is the same for trades that are lodged and trades that have been approved that day. When trades lodged have a lower price than those approved on the same day, the price dispersion ratio is less than one. When the trades lodged have a higher price than those approved on the same day, the price dispersion ratio is greater than one. The price dispersion ratio is calculated for each trading zone, and will be influenced by intrastate and interstate trading processes.

Figure D.16 shows price dispersion ratios are closest to one for trading zones in Victoria, which is likely a result of the consistent short approval times for intrastate trade. It also means water market participants have better information on Victorian trading zones than for other states, reducing the research costs for those trading Victorian water allocation. Trading zones in New South Wales and South Australia have more variable price dispersion ratios, although this does stabilise for zones in New South Wales from mid-2017. This coincides with New South Wales achieving next business day approval times for at least 90% of its approved allocation trades (figure D.9).
Figure D.16: Monthly averages of the daily price dispersion ratios due to trade approval authority trade processing lags for Southern Connected Basin trading zones from 1 July 2015 to November 2019

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.
Notes: Daily zone price series derived using ABARES GAM methodology. Discontinuities in the NSW data series are due to trade approval closures at the end of the 2015–16 and 2016–17 water years. Excludes zero dollar trades. Data has been updated since the interim report.

D.2.6 Impact of intermediaries on processing times

Private transaction costs incurred by water market participants will vary depending on whether they trade directly with others or use an intermediary, who can help some water market participants find trading partners and navigate complex trade rules associated with intervalley trades and delivery limits. The private transaction costs incurred by a water market participant who uses an intermediary includes the monetary fees charged (see appendix C) and any time lags between when an intermediary strikes a trade and lodges the trade approval application form with the relevant trade approval authority. These lags can be due to a combination of factors, including the intermediary’s payment system and policies (such as that a trade approval application form is not lodged until the buyer of the tradeable water right has paid the intermediary for the trade) and the ease of the lodgement process.

As described in section 6.2, the ACCC used its information gathering powers to obtain data from the exchange platforms operated by WEX Water (trading as Waterexchange), H2OX, Water Partners (trading as Waterpool) and Waterfind. The ACCC also obtained data from the platforms operated by Murray Irrigation Limited (trading as Water Exchange) and WaterMart under voluntary requests and compulsory notices.

1446 ABARES recommend the use of a filter when smoothing methods (including GAM) are used, as the methods can produce unreliable results during brief periods of market inactivity in otherwise high frequency markets, such as when trading is temporally suspended by regulators. Source: ABARES, Measuring water market prices, 2019. Available at https://www.agriculture.gov.au/abares/research-topics/water/measuring-water-market-prices#key-findings, viewed 5 February 2021.
Figure D.17 shows that while most exchange platforms took about 6 to 8 business days (8 to 11 days if weekends and public holidays were included\(^{1447}\)) to lodge 90% of their trades since they were matched\(^{1448}\), Exchange Platform C took less than 5 days (5 days including weekends and public holidays\(^{1449}\)). Exchange Platform C predominantly matches intrastate trades in Victoria only and is connected to the Victorian Water Register through the Broker Application Programming Interface (API) facility.

**Figure D.17:** Number of business days taken for exchange platforms to lodge Southern Connected Basin trades with Basin State trade approval authorities from 1 July 2017 to 30 November 2019

![Figure D.17: Number of business days taken for exchange platforms to lodge Southern Connected Basin trades with Basin State trade approval authorities from 1 July 2017 to 30 November 2019](image)

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests and s. 95ZK responses.

Notes: Includes zero dollar trades. Time lags exclude weekends and public holidays (based on the jurisdiction of the Basin State trade approval authority).

However, Exchange Platform C also outperforms the other exchange platforms when only lodgement times to the Victorian Water Register are considered (figure D.18), although the other exchange platforms only connect to the Victorian Water Register through the Broker Portal lodgement facility rather than the automated Broker API.

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1447 ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests and s. 95ZK responses.

1448 The ACCC acknowledges that some trades were for water products such as forwards, carryover or contractual leases. In the case of forwards and contractual leases, the trade applications may not be lodged until closer to the time of delivery as agreed between the buyer and seller, while carryover trades may not be lodged until the end of the water season.

1449 ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests and s. 95ZK responses.
Figure D.18: Number of days taken for exchange platforms to lodge Southern Connected Basin trades with the Victorian Water Register via the Broker API or Broker Portal from 1 July 2017 to 30 November 2019

Cumulative proportion of trades

Business days taken to lodge following matching of trades

<table>
<thead>
<tr>
<th>Exchange Platform A</th>
<th>Exchange Platform B</th>
<th>Exchange Platform C</th>
<th>Exchange Platform D</th>
</tr>
</thead>
</table>

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests and s. 95ZK responses.

Notes: Includes zero dollar trades. Time lags exclude weekends and public holidays (based on the jurisdiction of the Basin State trade approval authority).

Figure D.19 shows that exchange platforms took the least time to lodge their trade approval applications through Victoria’s electronic lodgement facilities, while the most time was taken lodging applications to the SA trade approval authority.

As discussed in section 10.2.4, this could be due to a range of factors, such as:

- ease of using the electronic lodgement facilities
- incentive to use electronic lodgement facilities due to limits on trading opportunities
- absence of IIOs from which approval must also be sought to trade into and out of IIO networks
- requirement to first lodge interstate trades to Victoria when using their electronic lodgement facilities.\(^{1450}\)

The ACCC also acknowledges there may be cases where a buyer fails to pay for a trade or provide sufficient information in a timely manner, and that an intermediary will not lodge the trade application form to the relevant trade approval authority until payment or additional information is received, which will increase lag times.

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests and s. 95ZK responses.

Notes: Includes zero dollar trades. Time lags exclude weekends and public holidays (based on the jurisdiction of the Basin State trade approval authority).

D.2.7 Impact of lodgement lags on transparency

The time taken for intermediaries to lodge trades to approval authorities not only affects the water market participants who are directly involved in the trade, but also contributes to delays associated with the timely publication of trading data.

Figure D.20 compares the price dispersion ratio due to the combined effects of lodgement and processing lags\textsuperscript{1451} to ratio the effect of processing lags alone\textsuperscript{1452}, and shows that lodgement lags have a significant impact on price dispersion ratios. Victorian trades have the least variable price dispersion ratios due to shorter lodgement times (figure D.19) and shorter processing times (figures D.9) than the other states, while South Australian trades have the most variable due to the longer lodgement times and longer processing times.

In order to fill this information gap, some intermediaries publish information on trades that have not yet been approved by trade approval authorities.\textsuperscript{1453} While this in an imperfect approach to proving more timely data to the market, the majority of trades lodged to trade approval authorities are approved.\textsuperscript{1454}

The price dispersion ratios suggest water markets participants who plan to trade South Australian water rights would have a greater dependence on these information sources to form price expectations.

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\textsuperscript{1451} In this case, the price dispersion ratio equals one for days when the price of water is the same for trades that are matched and trades that have been approved that day. When matched trades have a lower price than those approved on the same day, the price dispersion ratio is less than one. When matched trades have a higher price than those approved on the same day, the price dispersion ratio is greater than one.

\textsuperscript{1452} Price dispersion ratios due to trade approval authorities’ trade processing lags are discussed in section D.2.5.

\textsuperscript{1453} For example, Waterexchange publishes trades that have been matched but are not yet approved, clearly labelling them as “pending”.

\textsuperscript{1454} ACCC analysis based on Victorian government response to voluntary information request.
Figure D.20: Monthly averages of daily price dispersion ratios due to lodgement and processing lags for Southern Connected Basin trading zones from 1 July 2017 to November 2019

Source: ACCC analysis based on NSW, Victorian and SA governments' responses to voluntary information requests and s. 95ZK responses.

Notes: Price dispersion ratios that consider lodgement and processing lags compare the prices of trades matched each day to the prices of trades approved by Basin State trade approval authorities in the same trading zone on the same day. Price dispersion ratios that only consider processing lags compare the prices of trades lodged each day to the prices of trade approved in the same trading zone and on the same day. Daily zone price series derived using ABARES GAM methodology.\textsuperscript{1455} Excludes zero dollar trades. Data has been updated since the interim report.

D.3 Basin States’ technological differences give some water rights holders a competitive advantage

D.3.1 Barmah Choke trade limit

The Barmah Choke trade limit\textsuperscript{1456} applies to trade downstream regardless of whether trade occurs through NSW trading zones, Victorian trading zones or an interstate trade. In all cases, the Basin State trade approval authority must seek advice from the MDBA, which is responsible for keeping track of the balance of trade.\textsuperscript{1457}

The NSW trade approval authority seeks this advice through an online portal, where trade details must be manually input. The process of manually providing trade details to the online portal introduces a lag to the NSW trade approval process. While the trade details were already manually input to the NSW trade approvals systems from the trade form, there is no interoperability between the NSW trade approvals system and the MDBA’s online portal.

However, the Victorian trade approval authority co-developed an API with the MDBA that was implemented in mid-2018 to automate the MDBA advisory process.\textsuperscript{1458} Once the trade application has been lodged, the Victorian Water Register’s automated trade approvals process can assess the trade, seek and receive the advice from the MDBA, and approve (or refuse) a trade almost instantaneously. This allows water rights holders who use Victoria’s electronic lodgement facilities (Broker Portal, Broker


\textsuperscript{1456} See section 3.2 in chapter 3 for an overview of the major trade restrictions in the Southern Connected Basin.

\textsuperscript{1457} Murray-Darling Basin Agreement (Schedule D — Permissible Transfers between Trading Zones) Protocol 2010 (Cth), ss. 8, 10.

API and My Water portal) to access trading opportunities through the Barmah Choke without being hampered by manual interactions.\footnote{1459}

While trades lodged through WaterNSW represented about one-third of approvals per water year from 2012–13 to 2017–18, since 2018–19 Victorian water rights holders had a significantly greater number of approved trades through the Barmah Choke than NSW water rights holders (figure D.21). This was predominantly achieved through the Broker Portal in 2018–19 and the My Water portal in 2019–20 (to 30 November 2019).

**Figure D.21:** Number of approved allocation trades from above to below the Barmah Choke, by lodgement pathway and year

![Graph showing number of approved trades](image)

Source: ACCC analysis based on NSW and Victorian governments’ responses to voluntary information requests.

Notes: In NSW, paper forms can be submitted by email, fax, mail or in person. In Victoria, paper forms can be submitted by fax, email, upload or in person. The Broker Portal, Broker API and My Water portal are Victorian lodgement options. The Barmah Choke trade limit has been operating in its current form since 28 October 2014. Prior to this date, there were fewer restrictions on trade across the Barmah Choke. Includes zero dollar trades. Excludes 3 trades completed in 2013–14 through Victoria’s preliminary broker portal. 2019–20YTD = 2019–20 year to 30 November 2019.

From 2012–13 to 2017–18 the volume traded downstream through the Barmah Choke was mostly sourced from NSW water rights holders, but this changed in 2018–19 and 2019–20\footnote{1460}, where Victorian water rights holders were the predominant supplier of the water traded by volume (figure D.22). Figures D.21 and D.22 also indicate the implementation of the Victoria–MDBA API has changed the nature of trade through the Barmah Choke from a small number of large-volume trades to a large number of small-volume trades.

\footnotetext{1459}{Trades lodged through Victorian Water Corporations (GMW, LMW) need to be manually entered into the Victorian Water Register system by GMW and LMW staff.}

\footnotetext{1460}{2019–20YTD = 2019–20 year to 30 November 2019.}
Figure D.22: Allocation volumes of approved trades from above to below the Barmah Choke, by lodgement pathway and year

Source: ACCC analysis based on NSW and Victorian governments’ responses to voluntary information requests. Notes: In NSW, paper forms can be submitted by email, fax, mail or in person. In Victoria, paper forms can be submitted by fax, email, upload or in person. The Broker Portal, Broker API and My Water portal are Victorian lodgement options. Trade through the Barmah Choke was not restricted during 2013–14 and until 28 October 2014. Includes zero dollar trades. Excludes 3 trades completed in 2013–14 through Victoria’s preliminary broker portal. 2019–20YTD = 2019–20 year to 30 November 2019.

D.3.2 Interzone and interstate trading for Victorian water rights holders

Victorian water rights holders are able to lodge trades through three lodgement pathways:

- through an intermediary that uses the Broker Portal or Broker API to connect to the Victorian Water Register
- the My Water portal (which can also be used by a water rights holder’s nominated broker)
- by completing a trade form and sending this to a Victorian water corporation by fax, email, upload facility or in-person.

Figure D.23 shows that since the Victorian Water Register upgrade in December 2013 and the introduction of lower approval fees for trades submitted online, the use of the paper forms has declined significantly. The majority of trades are now lodged through the Broker Portal, and there has been a slow take up of the My Water portal which only submitted a greater proportion of approved trades than the paper form pathway in the 2019–20 water year (to 30 November 2019).

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1461 Prior to the upgrade of the Victorian Water Register (VWR) in December 2013, there was a preliminary broker portal. This preliminary portal was replaced with the modern Broker Portal.
Figure D.23: Approved allocation trade in Victoria, by lodgement pathway and year

![Graph showing proportion of trade by lodgement pathway and year]

Source: ACCC analysis based on Victorian Government response to voluntary information request.


The increase in the use of the My Water portal during 2019–20 (to 30 November 2019) is due to its use in interzone trade within Victoria (figure D.24). The use of the My Water portal for this interzone trade was driven by only a few water market participants: 3 individuals accounted for over 50% of interzone trades lodged through My Water during 2019–20YTD compared to over 30 during 2018–19.\footnote{1462}

For Victorian water rights holders who do not wish to use a broker, the My Water portal allows for near-real time allocation trade approvals, a feature that is not available when lodging a paper form. When trade approval authorities process trades through IVTs using a ‘first come, first served’ queuing system\footnote{1463}, water market participants are incentivised to use electronic lodgement facilities such as the Broker Portal and My Water portal that enable market participants to quickly lodge trades and compete to be ‘at the head of the queue’ for trade opportunities (see sections D.3.1 and 5.6 in chapter 5).

\footnote{1462} ACCC analysis based on Victorian Government’s response to voluntary information request.
\footnote{1463} See section 14.1.6 in chapter 14.
In the case of interstate allocation trade however, Victorian water rights holders are limited to lodging the trade in paper form or engaging a broker who can submit interstate trades through the Broker Portal or API. Interstate trade is not possible through the My Water portal. Since 2014–15, over 85% of interstate trade has been lodged through the Broker Portal (figure D.25).

1464 Brokers can only use the Broker Portal/API through an agreement with the Victorian Department of Environment, Land, Water and Planning.
The Victorian Water Register lodgement facilities require Victorian water rights holders who wish to engage in interstate allocation trade to either pay a higher fee to lodge the paper form with their local water corporation\textsuperscript{1465} or pay for a broker to lodge the form electronically. Victorian water rights holders who wish to trade through IVTs that have limited opening windows may find they must engage a broker, and pay additional transaction costs to electronically lodge the trade when there is a trading opportunity.

\textsuperscript{1465} For the 2020–21 water year, the fee for lodging a ‘paper’ trade application form by fax, email, upload or in person is $89.50 while the fee is only $47.50 if it is lodged online.
Appendix E – Basin State entitlement, allocation, trade approval and registration frameworks

Water rights have been partially ‘unbundled’ into the right to hold or take water (separate to land), the right to use water on land, the right to construct or operate water-related infrastructure and the right to have water delivered by an infrastructure operator. These unbundled rights are what is traded in water markets, with the majority of trade being trade in water access entitlements and water allocations.

The details below highlight that there continue to be fundamental differences in the terminology and structure of water rights across the Basin. The consequence of these differences is that slightly different rights are afforded to individuals and the resulting trading processes also differ (see chapter 12 for recommendations to address this).

The differences in the trade processes and state registers discussed in chapter 10 have also given rise to different information being made available to the public from these registers. In order to fulfil the National Water Initiative (NWI) ‘publicly accessible’ register objective, each Basin State’s Act includes a provision on how the register should be made available. Chapter 11 explores how the current legislative provisions in relation to making registers publicly available are not meeting users’ information needs.

E.1 Overarching governance framework

E.1.1 The National Water Initiative envisaged a national water market, and the Water Act was the next stage of reform

The states agreed under the NWI to establish compatible institutional and regulatory arrangements to facilitate intrastate and interstate trade. Under the NWI, the Australian, state and territory governments also agreed to cost recover the administration and water resources management of the Basin, including the water accounting systems that facilitate water trading.

Schedule 3 of the Water Act 2007 (Cth) sets out the Basin water market and trading objectives and principles, which include that ‘[r]egisters be compatible, publicly accessible and reliable’ and that there are ‘good information flows in the market’. The Basin Plan water trading rules are required to contribute towards the achievement of these objectives and principles set out in the Act.

The Water Act 2007 (Cth) specifies the following objectives and principles for water market and trading arrangements for the Murray-Darling Basin, which are drawn from NWI commitments. The objectives are:

(a) to facilitate the operation of efficient water markets and the opportunities for trading, within and between Basin States, where water resources are physically shared or hydrologic connections and water supply considerations will permit water trading

(b) to minimise transaction cost on water trades, including through good information flows in the market and compatible entitlement, registry, regulatory and other arrangements across jurisdictions

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1466 Some aspects of rights remain bundled, for example, in most catchments, rights to storage and to on-river delivery remain bundled with water access entitlements and/or water allocations.
1468 Water Act 2007 (Cth), s. 22.
1469 Water Act 2007 (Cth), Schedule 3, s. 3.
to enable the appropriate mix of water products to develop based on water access entitlements which can be traded either in whole or in part, and either temporarily or permanently, or through lease arrangements or other trading options that may evolve over time

to recognise and protect the needs of the environment, and

to provide appropriate protection of third-party interest.

Relevant principles include:

(3) All trades should be recorded on a water register. Registers will be compatible, publicly accessible and reliable, recording information on a whole of catchment basis, consistent with the National Water Initiative.

(15) Institutional, legislative and administrative arrangements will be introduced to improve the efficiency and scope of water trade and to remove barriers that may affect potential trade.

As these excerpts show, compatibility between registers is a fundamental goal of the NWI and the Act, and is linked to the quality of information flows.

The ACCC has observed that significant efforts have been made by governments in cooperation with other stakeholders to pursue these objectives and develop an effective and efficient market system. 1470

While there are some clear differences in both the structural set up of trade approval authorities and registers, as well as information collection and publication across jurisdictions, the Basin States have agreed to certain levels of transparency and processing standards in relation to water trading in the course of water reform processes over the last 15 years. 1471

### E.1.2 Schedule D protocols – Murray–Darling Basin Agreement


Interstate entitlement trading and allocation trading in the Southern Connected Basin is also governed by Schedule D of the Murray–Darling Basin Agreement and the Permissible Transfers protocol made under it.

Schedule D of the Murray–Darling Basin Agreement requires the states to notify the Murray–Darling Basin Authority (MDBA) of any intervalley trade. The MDBA is also required to provide Ministerial Council a report each year on the operation of Schedule D.

The Murray–Darling Basin Agreement (Schedule D – Permissible Transfers between Trading Zones) Protocol 2010 1472 outlines the restrictions and rules applying to interstate trade in the Southern Connected Basin, including for trade through the Barmah Choke. 1473 The MDBA has the role of monitoring these trades under the protocol, and approval authorities must promptly advise the MDBA if they approve any trades from below to above the Choke. 1474 The MDBA also has the role of advising

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1470 In performing its roles of providing advice on the development of the Basin Plan water trading rules and preparing annual water monitoring reports, the ACCC has observed significant effort of Basin State and Australian government agencies over time which go part way to deliver on these commitments. For example, states have both amended legislation and upgraded systems to facilitate with water trading. Victoria, New South Wales and South Australia have implemented file sharing arrangements for interstate trades, which allow them to share the status of applications. The Commonwealth government has introduced the Water Regulations 2010 (Cth) which have helped to improve the capture and dissemination of water market information. Other agencies, such as MDBA and environmental water holders have also worked to increase and improve the level of information provided to market participants. The ACCC’s water monitoring reports are available at https://www.accc.gov.au/publications/accc-water-monitoring-report.

1471 For example, the NWI committed the states to developing registers which would produce good information flows in the market.

1472 As required by Schedule D of Basin Agreement under paragraph 6(1)(e).


1474 Murray–Darling Basin Agreement (Schedule D – Permissible Transfers between Trading Zones) Protocol 2010, Paragraph 10(1) which states ‘If an approval authority approves the transfer of a water entitlement, or the transfer of an allocation, from below to above the Choke, the approval authority must promptly advise the Authority.’ Note that in this report, the term ‘trade’ is generally used rather than ‘transfer’, and ‘trade’ is defined to include ‘transfer’.
an approval authority whether a proposed trade from above to below the Choke may be approved. If the MDBA advises the authority that the trade from above to below the Choke cannot be approved, the authority must then refuse the trade.


Interstate allocation trades in the Southern Connected Basin are also governed by another Schedule D protocol, the Murray–Darling Basin Agreement (Schedule D – Processing Interstate Transfers of Water Allocations) Protocol 2010. This protocol outlines a five step process which the states have agreed the approval authorities will follow in processing interstate allocation trades in the Southern Connected Basin.

At the first step, the protocol requires that forms be submitted to the destination state and to the origin state. The protocol requires that an application not be processed unless:

a. the transferor provides the original of the transferor’s authority’s application form (that is, the origin state authority’s form) and a copy of the transferee’s authority form (the destination state authority’s form) to the origin state authority, and

b. the transferee has provided an original of the transferee’s form and a copy of the transferor’s form to the destination state authority.

The protocol then requires consideration of the application by the destination state authority, and requires the authority to assign a transaction identification number to the trade. The authority is also required to consider if any protocol under subclause 6(1) of Schedule D of the Murray–Darling Basin Agreement or any other matters required to be considered would prohibit the trade.

As the third step, the protocol requires consideration by the origin state authority. If the origin state authority decides the application should be approved, they must notify the destination state authority and provide the application identification number, debit the allocation account, set the date upon which the trade will take effect, and advise the transferor that the application has been granted.

At the fourth step, the destination state authority must finalise the application. This occurs when the destination state authority receives the notice of approval from the origin state, and the destination state authority must promptly approve the trade, amend records to reflect the trade, calculate the volume of the allocation to be received, and advise the transferee and any broker or agent engaged in process that the trade has been finalised.

Finally, the MDBA conducts a monthly reconciliation of interstate trades and updates its register of interstate trades.

**E.1.4 Basin Plan Water Trading Rules**

The Basin Plan Water Trading Rules (BPWTR) provide for the free trade of surface water within or between regulated systems, except for restrictions which are permissible, for example where there are hydrological constraints or environmental protection needs.

The BPWTR provide the right to trade free of certain restrictions and define the types of trade restrictions that are and are not permissible in the Basin. For example:
A person may trade a water access right free of any restriction on the trade that relates to the person being a member of a particular ‘class of persons’ (such as environmental water holders or irrigators) or to the ‘purpose’ for which the water will be used.\(^{1480}\)

Free trade of surface water is required within and between regulated systems, and within unregulated systems, except where a restriction meets certain criteria (for example, where there is a physical constraint, lack of connectivity, or a need to protect the environment).\(^{1481}\)

The Basin States are however able to set their own trading rules, and specify these rules in a variety of instruments, for example, in regulations (Queensland), Water Sharing Plans (New South Wales), Water Allocation Plans (South Australia), Protocols (Queensland), or separate rules (Victoria). These rules may place restrictions on trades that are generally allowable in the state legislation, but not allowed in certain water courses.

The BPWTR include rules intended to improve market information and in particular require the price of each trade of a water access right to be reported to the relevant approval authority.\(^{1482}\) This obligation however does not extend to specifying how this information should be collected and recorded by approval authorities, and the obligation does not extend to price reporting for trades of irrigation rights and water delivery rights within irrigation infrastructure operator (IIO) networks.

### E.1.5 Water Regulations 2008 (Cth)

The Water Regulations 2008 (Cth) includes a part (Part 7) on water information, which gives effect to the requirement placed on the Bureau of Meteorology (BOM) under Part 7 of the Water Act 2007 (Cth) to collect, hold, manage, interpret and disseminate Australia’s water information. The BOM also has a role in maintaining and developing Part 7 of the Regulations, which sets out the requirements of the water information framework established in the Water Act 2007 (Cth). Part 7 specifies what information is required to be provided by certain organisations (over 200 organisations are named in the Regulations), and they also specify the time and the format in which the information must be provided to the BOM. This includes information such as allocation trade data from the state registers.

BOM uses this information to publish its Water Information and Water Markets Dashboards.

### E.1.6 Water Market Rules 2009, Water Charge (Termination Fees) Rules 2009 and Water Charge Rules 2010

The Water Market Rules 2009 seek to ensure irrigators can permanently transform their irrigation right into or onto a statutory water access entitlement which they can trade or hold in their own name, free of any trade restrictions imposed by the IIO.

The Water Market Rules 2009 are a legislative instrument enabled under the Water Act 2007, and are not as broad as they may sound, and the ACCC has a very limited role in enforcing these rules which are specifically in relation to the transformation of irrigation rights held within IIOs in New South Wales and South Australia.

### E.1.7 COAG service standards

Service standards for allocation trades were first adopted by COAG\(^{1485}\) in November 2008\(^{1484}\) for commencement on 1 January 2009\(^{1485}\), with the current service standards in place since 1 July 2009.\(^{1486}\)

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1480 Basin Plan 2012 (Cth), ss. 12.07-12.08.
1481 Basin Plan 2012 (Cth), ss. 12.16-12.18.
1482 Basin Plan 2012 (Cth), s. 12.48.
1483 On 29 May 2020, National Cabinet agreed to the formation of the National Federation Reform Council (NFRC) and the cessation of the Council of Australian Governments (COAG).
1484 COAG Communiqué, 29 November 2008.
The COAG service standards for allocation trades were agreed upon following a review of trade processing times in the Basin States. Prior to the introduction of these service standards, there was an inconsistent approach where not all public authorities had service standards, and those that did varied by scope.

In its review of the National Water Initiative, the Productivity Commission noted trade approval times had decreased and recommended service standards be tightened.\(^{1487}\) The ACCC also recommended that service standards be reviewed every two years.\(^{1488}\) However, there has been no change to service standards since 1 July 2009. Despite processing improvements, trade approval times continue to fail to meet the expectations of market participants\(^{1489}\) and there are inconsistencies in these times between states.\(^{1490}\) While outdated and in need of tightening, the standards are also only aspirational with no consequences for trade approval authorities that fail to meet them. Further, the New South Wales and Victorian trade approval authorities now measure the performance of their interstate allocation trades to South Australia using the 20 business day benchmark rather than 10 business days.\(^{1491, 1492}\)

Victoria, New South Wales and South Australia legislation all refer to the Murray–Darling Basin Agreement\(^{1493}\) allowing for interstate trade. The states in the Southern Connected Basin have introduced file sharing arrangements to assist interstate trading and meet obligations under the protocol. There are also separate provisions allowing the states to form inter-governmental agreements (IGAs) for interstate trade. In the Border Rivers, a separate intergovernmental agreement\(^{1494}\) was made to enable interstate trade, as this trade is not covered by the Murray–Darling Basin Agreement.

### E.2 Queensland

#### E.2.1 Entitlement and water allocation framework

In Queensland, what is considered a Water Access Entitlement in the Commonwealth Water Act is referred to as a ‘Water Allocation’. Queensland’s Water Act 2000 enables a Water Allocation to be granted in accordance with the processes set up (if those processes are set up) in a water plan, water management protocol or regulation.\(^{1495}\) Unlike other states, where a water access entitlement may be held independently of location-related rights, if the allocation is to be managed under a Resource Operations Licence\(^{1496}\) (ROL), a water allocation may only be granted to a person if they also hold a water supply contract with the ROL holder.\(^{1497}\)

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1492 However, the WaterNSW FAQ page refers to the 10 business day benchmark for interstate approvals (see https://www.waternsw.com.au/customer-service/ordering-trading-and-pricing/trading/faqs-water-trading, viewed 16 April 2020).
1495 Water Act 2000 (Qld), s. 27(2)(i), s. 39(d) and s. 147.
1497 Water Act 2000 (Qld), s. 147(d).
E.2.2 Entitlement trading

In Queensland, there are two broad categories of water dealings: dealings which require approval and registration\textsuperscript{1498}, and dealings which only require registration.\textsuperscript{1499} This is set out in the Act as ‘permitted’ dealings in the water allocation dealing rules, which are dealings which do not require consent, and other dealings that are not prohibited or permitted (and therefore require consent).\textsuperscript{1500} Dealings which require approval as well as registration include ‘changes’ (such as location, purpose and priority), subdivisions and amalgamations. Dealings which only require registration (not approval) include leases or transfers of water allocations that do not affect the water allocation’s resource-related attributes.\textsuperscript{1501} Regardless of whether approval is required prior to registration, the dealing does not have effect until the dealing is recorded on the register by the Registrar.\textsuperscript{1502}

Water allocation dealing rules apply to the whole state.\textsuperscript{1503} However, these rules do not apply to the extent that a relevant water management protocol provides an alternative for either making an application, or the process for deciding the application.\textsuperscript{1504} All dealings must be applied for using the approved form and accompanied by the relevant fee.\textsuperscript{1505} Other dealings (those not outlined in Subdivision 3 of regulations, or in a protocol) are subject to subregulation 73(1), which outlines what must be assessed and established for a dealing to be approved by Department of Regional Development, Manufacturing and Water (DRDMW)\textsuperscript{1506}, including a public interest test.\textsuperscript{1507}

E.2.3 Allocation trading

Allocation trading in Queensland is known as ‘seasonal water assignment’.\textsuperscript{1508} Seasonal water assignments for water allocations are dealt with in the regulations not the Act.\textsuperscript{1509} Both supplemented (regulated) and unsupplemented (unregulated) water can be seasonally assigned but different processes apply, due to the different entities responsible for managing different types of water supply.

For seasonal water assignments under water allocations not managed under a ROL, the chief executive must approve the application if the application is consistent with the seasonal water assignment rules stated in the water management protocol applying to the relevant water plan area.\textsuperscript{1510} The application must be in the approved form and accompanied by the relevant application fee.\textsuperscript{1511} Seasonal water assignments not within a ROL take effect on the day a notice is given to the applicant.\textsuperscript{1512}

\textsuperscript{1498} These include dealings that require two steps, an application/approval followed by lodgement/registration:
\begin{itemize}
\item Dealings which firstly involve an assessment and approval by the resource manager (that is, the relevant water area of the administering department – the Queensland Department of Regional Development, Manufacturing and Water (DRDMW), formerly DNRME) and then lodgement of relevant instruments at the Titles Office for registration on the Water Allocations Register (WAR) – to take effect.
\item Dealings that include ‘changes’ (e.g. location, purpose, priority, etc.), ‘subdivisions’ and ‘amalgamations’.
\end{itemize}

\textsuperscript{1499} These are dealings that involve only lodgement at the Titles Office for registration on the WAR, and do not involve resource manager approval. Such dealings include: water ‘transfers’; ‘leases’; and other/associated ‘conveyance’ dealings e.g. recording encumbrances and caveats.

\textsuperscript{1500} Assessed water allocation dealings are dealt with under Subdivision 4 of the Water Regulation 2016 (Qld).


\textsuperscript{1502} Water Act 2000 (Qld), s. 161(2).

\textsuperscript{1503} Water Act 2000 (Qld), s. 158, and Water Regulation 2016 (Qld), s. 62.

\textsuperscript{1504} Water Regulation 2016 (Qld), s. 62(2).

\textsuperscript{1505} Water Regulation 2016 (Qld), s. 63, and Schedule 12.

\textsuperscript{1506} Formerly the Department of Natural Resources, Mines and Energy (DNRME).

\textsuperscript{1507} Water Regulation 2016 (Qld), s. 73(1)(b).

\textsuperscript{1508} ‘Seasonal water assignment’ is defined under Schedule 4 of the Water Act 2000 (Qld), and refers to the assignment to another person of all or part of the water that may be taken under certain instruments, including ‘water allocations’ and ‘water licences’.

\textsuperscript{1509} Part 5, Division 2 of the Water Regulation 2016 (Qld) governs seasonal assignments.

\textsuperscript{1510} Water Regulation 2016 (Qld) s. 59.

\textsuperscript{1511} Water Regulation 2016 (Qld) s. 58(3), and Schedule 12 sets out the relevant application fees.

\textsuperscript{1512} Water Regulation 2016 (Qld) s. 59(6).
A holder of a Resource Operations Licence, such as Sunwater, is responsible for approving seasonal water assignments of supplemented water. The application process for seasonal water assignments can occur via paper form or online via Sunwater’s website. Sunwater assesses an application for a seasonal assignment of supplemented water in accordance with the Local Conditions (for example, any loss adjustments that may be applicable) for the water supply scheme in place on the day that Sunwater receives an application. Other considerations include whether the buyer has a Supply Contract with Sunwater for delivery of the water prior to the application being made (and ensuring that all accounts are current). If the seller has an arrangement with Sunwater for payment of outstanding charges, Sunwater may approve the assignment subject to these proceeds being paid to reduce the outstanding amount.

### E.2.4 Queensland water registers

The water register in Queensland is maintained by the Titles Registry. Section 168 of the *Water Act 2000* (Qld) sets up the Water Allocations Register and sets out what is required to be recorded by the Registrar on the water allocations register. Subsection 168(2) states that regulations may prescribe additional requirements of the register.

The *Water Act 2000* (Qld) specifies more detail about what must be recorded on the register about water allocations compared to other states. Section 152(1) sets out what information must be recorded on the water register, such as name, volume, location of water and other details. Certain dealings relating to water allocations must also be registered. There are also other relevant provisions in the *Water Act 2000*, for example, sections 173–174 refer to the collection of water transfer information including under the Duties Act, which is a link to sale price.

Seasonal water assignments do not require registration and are maintained in the water management system of the ROL holder (for supplemented water) and the department (for unsupplemented water).

The *Water Act 2000* (Qld) does not specifically set out requirements for the publication of the permanent register information.

DRDMW publishes a monthly Permanent Water Trade Report (PWTR) which includes a weighted average sale price per ML (for all commercial water trades after filtering out valid, zero dollar trades), for supplemented / unsupplemented water and provided at the level of water supply scheme (supplemented water) and water management area (unsupplemented water) and priority/water allocation group respectively. Section 175 of the Act states that a person may on payment of fee prescribed in regulation, search and obtain a copy of a water allocation or information kept on the register about the allocation.

Queensland’s legislative framework does not require information on allocation trade prices to be captured or published. This is consistent with their legislative framework which does not require allocation trades to be registered.

The Water Act was amended in December 2018 to provide for a ROL to include conditions, such as a requirement ‘that the licence holder collect and publish the sale price for each seasonal water assignment of a water allocation managed under the licence’. No ROLs in Queensland have been amended yet in accordance with this provision, which was introduced in December 2018.

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1513 For trades for water allocations managed by Sunwater, subregulation 61 (2)(a) enables Sunwater or DRDMW to consent to the arrangement.
1514 *Water Act 2000* (Qld), s. 161.
1515 There are two avenues available for water market participants to access permanent sale data. For example, the public can access water sale price data either via the department’s business centres or online from private value-added resellers. The department’s products include: an Abbreviated sale data listing ($9.00) or a Full sale search ($18.05), both of which provide volume, price and other details of the dealing.
1516 *Water Act 2000* (Qld), s. 179(e)(vi) for new ROLs, and s. 1288 (2) (b) for existing ROLs to be amended to include this condition.
E.3 New South Wales

E.3.1 Entitlement and water allocation framework

The New South Wales Water Management Act 2000 allows for the granting of a ‘water access licence’ (WAL) which permits the holder to access water from a specified water source. The total volume of water available to be extracted from a specified source is shared among WAL holders based on the ‘Share Component’ of each licence which sits underneath the WAL.

Unlike in other states, a person wishing to hold a water allocation must hold a WAL. Thus, in New South Wales the WAL takes the place of a water account (South Australia) or allocation bank account (Victoria). This is important because it acts as an additional step and fee for someone wanting to participate in temporary trade.

E.3.2 Entitlement trading

Section 71Y sets out that dealings (including entitlement trades) in New South Wales are to be dealt with in accordance with the water management principles, orders established under section 71Z of the Act (currently the Access Licence Dealing Principles Order 2004), and access licence dealing rules established by any relevant management plan.

Dealing principles are able to be published on the New South Wales legislation website to establish access licence dealing principles that regulate or prohibit the kinds of rules which may be made in management plans, and to regulate or prohibit the kinds of dealings under the Act and to establish conversion factors applicable to the share components of access licences.

The Act has set up two broad types of dealings: those that require an assessment and consent followed by registration (called General Dealings), and those that just require registration. There are numerous dealing types specified in the Act, including:

- **Transfer** of access licence (some require consent, others do not)
- **Term transfer** of entitlements under access licences – must be for more than six months (requires consent)
- **Conversions** of access licences to new category (can apply to cancel current licence and grant of new one)
- **Subdivision and consolidation** of access licences (can apply to split or consolidate if licences are in same water management area and are of same category)
- **Assignment of rights under access licence** (known as ‘share component trading’) – enables the holders of two or more licences to apply decrease the share component of one licence to have the corresponding increase in the other licence. This can also be used for the extraction component of the licence.

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1517 Water Management Act 2000 (NSW), s. 61.
1518 Water Management Act 2000 (NSW), s. 56.
1520 Water Management Act 2000 (NSW), s. 5 sets out the water management principles.
1521 For example, the Murrumbidgee Regulated Water Sharing Plan (WSP) for the Murrumbidgee Regulated River Water Source 2016 (available at: [www.legislation.nsw.gov.au/8/view/regulation/2016/367](http://www.legislation.nsw.gov.au/8/view/regulation/2016/367)) outlines additional access licence dealing rules at Part 10; such as prohibiting certain dealings under the Act (with that dealing in the Act stating it was subject to the WSP). Section 71Z of the Act also requires any access licence dealing rules established by management plans are consistent with the principles in the Order.
1522 Water Management Act 2000 (NSW), s. 71Z.
1523 Water Management Act 2000 (NSW), s. 71M and s. 71N. A term transfer under s. 71N does not just entitle the transferee access to allocations made to the licence, but to any entitlement conferred by the licence, payment of fees and charges under the licence, and other conditions (see ss. 71N (5), 71O, 71P and 71Q).
All entitlement dealings take effect once registered with the New South Wales Land Registry Services, with only dealings on default, certain co-held share dealings (subject to sections 71M and 71N) and security interests not first requiring consent.

Given the way WALs are set up, an entitlement trade in New South Wales can be a trade of the WAL (known as ‘transfer trading’), or a trade of the share component which sits underneath it (known as ‘share assignment trading’).\(^{1524}\)

New South Wales trades vary in what requires consent, consent and registration, and registration only. Similar to South Australia, while WaterNSW processes trades for private diverters, trades that occur wholly within privately owned irrigation infrastructure operators (IIOs) – the largest being Murray Irrigation Limited – are processed and approved by the IIO and information is not shared with WaterNSW.\(^{1525}\)

### E.3.3 Allocation trading

Trade of water allocations in New South Wales is referred to as ‘water allocation assignment’. A water allocation can only be transferred between access licence holders and requires the consent of the Minister. An intrastate assignment dealing\(^{1526}\) or interstate assignment\(^{1527}\) must be dealt with in accordance with (a) water management principles, (b) the access licence dealing principles established by the Order\(^{1528}\), and (c) the access licence dealing rules established by any relevant management plan.\(^{1529}\)

Unlike the other states, both the seller and the buyer are considered applicants for a temporary trade in New South Wales.\(^{1530}\) This means that, in concert with the regulations,\(^{1531}\) consent is required from both parties.

Water allocation assignments take effect as soon as the details are entered into the water allocation account.\(^{1532}\) Therefore, while dealings with WALs that require consent need to then separately be registered, water allocation assignments only require consent although they are recorded in the Assignment Division of the register.

Water allocation accounts are required to be kept under the Act, and are required to record debits and credits.\(^{1533}\)

### E.3.4 NSW water registers

Division 3A of the *Water Management Act 2000* (New South Wales) sets out the Water Access Licence Register. Subsections 71(3) and (4) allow the Minister to determine the form and manner in which the register is kept, with the only limitation being that it needs to be a computer record.

There are two divisions of water registers in New South Wales – the Water Access Licence Register (General Division), which is maintained by the New South Wales Land Registry Services, and the Water Register (Assignment Division) which details assignment dealings (allocation trade) and is maintained by WaterNSW. This means that allocation trades are recorded in a register in New South Wales.

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1525 Some IIOs (irrigation corporations) are listed in the *Water Management Act 2000* (NSW) at Schedule 1. There are also a number of smaller IIOs who, though they have authority to approve, and to restrict, trade into, out of, and within their networks, have no trade approval or trade reporting obligations at all.
1526 *Water Management Act 2000* (NSW), s. 71T.
1527 *Water Management Act 2000* (NSW), s. 71V.
1529 *Water Management Act 2000* (NSW), s. 71Y.
1530 *Water Management Act 2000* (NSW), s. 71T(2).
1531 *Water Management (General) Regulation 2018* (NSW), s. 9(b).
1532 *Water Management Act 2000* (NSW), s. 71L(4).
1533 *Water Management Act 2000* (NSW), s. 85.
Both the General and Assignment Division provisions in the Act specify that the registers must record any further information as specified in regulations. The regulations require additional information be recorded on security interests in the General Division, and all assignment dealing applications which have been submitted in approved form and signed must be recorded in the Assignment Division.

In New South Wales, section 71J sets out the ability to access the register, including that the Minister ‘is to make the information available to any member of the public at the times and in the manner and on payment of the fee (if any) approved by the Minister’. The New South Wales water register is the only register that allows for searches by entitlement number to bring up complete allocation trade history. This information is however not available in bulk download and only by one entitlement at a time. Trades conducted within IIOs are not required to be published by the IIOs, however some IIOs have obligations to report to the BOM.

E.4 Australian Capital Territory

E.4.1 Entitlement and water allocation framework

The Australian Capital Territory Water Resources Act 2007 establishes ‘Water Access Entitlements’, which entitle the holder to a specified share of surface or ground water within a particular water management area.

E.4.2 Entitlement trading

Australian Capital Territory water access entitlements are tradeable, either permanently or for a limited period. In approving the transfer, the authority must not approve the transfer unless it is satisfied it is consistent with the conditions of the entitlement, and either consistent with the Territory plan or approved by the authority responsible for water management in the State or Territory in which the water is to be used.

E.4.3 Allocation trading

While Australian Capital Territory legislation does make provision for the announcement of annual allocations which are able to be traded separately to water access entitlements, in practice water allocation trades have not yet occurred in the Australian Capital Territory.

E.4.4 ACT water registers

Under the Water Resources Act 2007 (section 66), the Australian Capital Territory Environment Protection Authority is required to maintain a register that includes details of (among other things) water access entitlements. The Act does not specify what information on water access entitlements is required to be recorded, just that ‘details’ need to be recorded.

In the Australian Capital Territory, there is a provision which states that the register should be available for public inspection at reasonable times.

1534 Water Management (General) Regulation 2018 (NSW), subr. 11(1)(a) and (b).
1535 Water Management (General) Regulation 2018 (NSW), subr. 11(2).
1537 Under the Water Regulations, BOM is able to determine Category E persons.
1538 Water Resources Act 2007 (ACT), s. 19.
1539 Water Resources Act 2007 (ACT) s. 26 (3).
1540 Water Resources Act 2007 (ACT) s. 26 (2).
1542 Water Resources Act 2007 (ACT), s. 67(1).
E.5  Victoria

E.5.1  Entitlement and water allocation framework

The Victorian Water Act 1989 sets up ‘Water Shares’, which are ongoing entitlements to a share of the water available in a declared water system.\textsuperscript{1543}

The majority of water users who participate in Victorian Basin water markets hold ‘Water Shares’, although environmental entitlements and bulk entitlements can be amended and traded under certain circumstances.\textsuperscript{1544} A ‘Water Share’ is a water access entitlement in and of itself, and does not sit underneath a licence (as in New South Wales or South Australia).\textsuperscript{1545} In Victoria, the term ‘licence’ refers to either a take and use licence or a registration licence.

E.5.2  Entitlement trading

In Victoria, a Water Share can be traded wholly\textsuperscript{1546}, or it may be divided or amalgamated.\textsuperscript{1547} Therefore a whole transfer is a different dealing to a partial transfer. The Victorian Act gives rise to the following separate dealing types (not all of which are necessarily trades):

- **Transfer of ownership** of water share (water shares can be co-owned and if owned as tenants in common, a person may transfer that person’s portion of the share without consent of other tenants – but in other cases requires consent from other owners).\textsuperscript{1548}

- **Limited term transfers of rights to future water allocations under water shares** (leases – transfer involves ‘whole of the right to future water allocations’). The Act specifies it cannot be for more than 20 years, but does not have a minimum, and that the lease gives right to future allocations.\textsuperscript{1549}

- **Standing directions as to future water allocations under water shares**.\textsuperscript{1550}

- **Division of water shares**.\textsuperscript{1551}

- **Consolidation of water shares**.\textsuperscript{1552}

The Minister must not give approval to a transfer of ownership if any fees owed for the water share are outstanding, any other prescribed reason.\textsuperscript{1553} The Minister, in approving the transfer, must have regard to any relevant trading rules made under Division 13 of the Act.\textsuperscript{1554} Once the transfer is approved, the buyer and seller must then submit a form to the Registrar. A water share transfer takes effect once recorded in the Victorian Water Register by the Registrar.\textsuperscript{1555} This requires individuals to submit a separate notification to the Registrar, other than their trade form and made available by the water corporation on approval of the transfer or limited term transfer.\textsuperscript{1556}

‘Trade’ of water shares can mean a transfer of ownership, a change of location, or both. A change of location may occur when a water share transfer or an application to vary or associate a water share (without a transfer of ownership) is approved and recorded in the Victorian Water Register. Also, unlike

\textsuperscript{1543} Water Act 1989 (Vic), s. 33F.
\textsuperscript{1544} Bulk entitlements may be traded permanently (transferred under section 46D of the Victorian Water Act) and water held under a bulk entitlement can be temporarily traded (assignment of allocation under section 46 of the Victorian Water Act).
\textsuperscript{1545} Water shares are described in Water Act 1989 (Vic), s. 33E.
\textsuperscript{1546} Water Act 1989 (Vic), s. 33S.
\textsuperscript{1547} Water Act 1989 (Vic), s. 33Y and s. 33Z, respectively.
\textsuperscript{1548} Water Act 1989 (Vic), s. 33T.
\textsuperscript{1549} Water Act 1989 (Vic), s. 33U.
\textsuperscript{1550} Water Act 1989 (Vic), s. 33Y.
\textsuperscript{1551} Water Act 1989 (Vic), s. 33Z.
\textsuperscript{1552} Water Act 1989 (Vic), s. 33Y.
\textsuperscript{1553} Water Act 1989 (Vic), s. 33X(2)(a).
\textsuperscript{1554} Water Act 1989 (Vic), s. 33X(4).
\textsuperscript{1555} Water Act 1989 (Vic), s. 84J(1) and s84JA(1).
in New South Wales, only a whole water share can be transferred and there is no equivalent to share component trading where one share is increased and another is decreased.

E.5.3 Allocation trading

Allocation trading in Victoria is referred to as ‘assignment of water allocation’ in the Victorian Act. A person may assign the whole or part of the water allocation available under their water share to any person, which may then be further traded.\(^{1557}\) In Victoria, an allocation trade is described as assigning whole or part of a water allocation to someone else.\(^{1558}\) The allocation trade takes effect from the date specified in the assignment.\(^{1559}\) The Minister must not give approval under section 33X(1)(c) for any prescribed reason, and must have regard to any relevant trading rules made under Division 13 of the Act.\(^ {1560}\)

E.5.4 Victorian water registers

The Victorian Water Register commenced on 1 July 2007. The water register is established under Part 5A of the Victorian Water Act 1989 which sets out the obligations in relation to the collection, storage and disclosure of register information. Section 84C states that the Minister is responsible for establishing and maintaining a system for the water register in which the Registrar has responsibility to maintain records and information on water shares, and an Authority has responsibilities to record water allocations, services delivered, water consumption and other details. Unlike other states, the Victorian Act sets out a purpose for the water register:

>The purpose of the water register is to facilitate the responsible, transparent and sustainable use of the State’s water resources and includes - (a) facilitating monitoring of, and reporting in relation to, records and information about water-related entitlements and allocation and use of water resources; and (b) facilitating a market for water related entitlements and water resources by providing publicly available records and information and other records and information about ownership and use of water-related entitlements.\(^{1561}\)

Importantly, section 84C(1) requires the establishment and maintenance of the register by the Minister in which records and information referred to in subsections (2), (2A) and (3) is kept. These subsections include more than just ownership (title) information.\(^{1562}\)

The Minister is responsible for maintaining records and information on water-use licences, water-use registrations, bulk entitlements, environmental entitlements, amounts allocated to water shares under section 33AC and works licences, and take and use licences.\(^{1563}\) The Registrar is then responsible for records and information on water shares.\(^{1564}\)

An Authority\(^{1565}\) is responsible for establishing and maintaining records and information in the water register relating to water allocation assignments (allocation trades), standing directions, consumption of water, and other take and use licence information.\(^{1566}\) The recording of water consumption in the register is unlike the other states, whereby water use is recorded only in water accounts and not in a register.

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1557 Water Act 1989 (Vic), s. 33U and s33V.
1558 Water Act 1989 (Vic), s. 33U.
1559 Water Act 1989 (Vic), s. 33U(3) and s. 33V(3).
1560 Water Act 1989 (Vic), s. 33X(3)(b) and s. 33X(4).
1561 Water Act 1989 (Vic), s. 84B.
1562 Section 84C (2) states that records and information on (a) water-use licences; and (b) water-use registrations, and (c) bulk entitlements; and (d) environmental entitlements; and (e) the recording of amounts of water that are to be allocated to each water share under section 33AC; (f) works licences under section 67(1); and (g) licences to take and use water issued under section 51(1) or registration licences. Section 84C(2A) states that the Registrar is responsible for establishing and maintain records relating to water shares, and (3) states what an authority is responsible for.
1563 Water Act 1989 (Vic), s. 84C(2).
1564 Water Act 1989 (Vic), s. 84C(2A).
1565 Defined in Act as a water corporation or a Catchment Management Authority. The Act includes a list of water corporations in Schedule 1.
1566 Water Act 1989 (Vic), s. 84C(3).
Section 84W(b) states that any water allocation assignment in a water system for which that Authority is responsible must be recorded in the water register by the Authority. A number of authorities have responsibilities for recording in the water register. Victoria's water register ensures that ownership of water entitlements is recorded with integrity, with consistency in recording across the State, due process in recording, and providing a state-wide view of entitlements recorded, water availability and use.

Victoria has implemented various improvements to the data they publish, including the way it is published – with the home screen of the Victorian Water Register website providing dashboard type information including some trade price information. In Victoria, section 84EA(2) states '(t)he Minister may make a report created under subsection (1)(c) available to the public, if the report does not include the names and addresses of individuals'.

E.6 South Australia

E.6.1 Entitlement and water allocation framework

The Landscape South Australia Act 2019 provides that the Minister may grant a 'water licence', which provides the holder access to a share of water available in the consumptive pool(s) to which the right relates. A 'water access entitlement' is a specific share or volume of a particular consumptive pool that the licence holder is entitled to access. Therefore, in South Australia, a licence may hold several different classes of water access entitlement.

This framework is somewhat similar to the New South Wales framework. However, in South Australia, a licence may have several different classes of water access entitlement specified on it (for example, one licence held by a South Australian IIO has Class 1, Class 3 and Class 5 water access entitlements), whereas in New South Wales different classes of entitlements are held on different licences (for example, an IIO in New South Wales may hold three separate WALs – one each for Conveyance, High Security and General Security entitlements).

E.6.2 Entitlement trading

Entitlement trades can either be for the licence or for the all or part of the WAE that sits underneath. A transfer of a WAE without the licence must be to someone who already holds a licence. Trade application for an entitlement trade must be submitted in a form specified by the Minister. The South Australian Act enables the following dealing types:

- **Transfer of water licence** – whole licence (may be absolute or for a limited period)
- **Transfer of water access entitlement** – all or a portion of shares (may be absolute or for a limited period)
- **Surrender of water licence** (not a trade)
- **Variation of water licence** (not a trade).

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1568 Landscape South Australia Act 2019 (SA), s. 121(1).
1569 Landscape South Australia Act 2019 (SA), s. 121(2).
1571 Landscape South Australia Act 2019 (SA), s. 125(1)(a).
1572 Landscape South Australia Act 2019 (SA), s. 125(1)(b).
1573 Landscape South Australia Act 2019 (SA), s. 125(2)(a).
1574 Landscape South Australia Act 2019 (SA), s. 125(5)(a).
1575 Landscape South Australia Act 2019 (SA), s. 125(1)(a).
1576 Landscape South Australia Act 2019 (SA), s. 126.
1577 Landscape South Australia Act 2019 (SA), s. 124(1).
Entitlement trades take effect upon registration, however, registration can occur either at the time of approval or a separate application for registration can be made. This is a change from the previous Act and Regulations, whereby entitlement trades took effect on approval. Under the new Regulations, the holder of the entitlement can request at the time of applying for the transfer request that the Minister give effect to the transfer either at the time of approval, or by registering the transfer on a separate application made for the purposes of registration.

In making a decision to approve or refuse the transfer or variation, the transfer must be consistent with the relevant water allocation plan, be in the public interest (taken to be met if the application satisfies the water allocation plan principles) and, if within the Basin, must take into account the requirements of the Murray–Darling Basin Agreement and any Ministerial Council resolution under that agreement that is relevant.

In South Australia, the Department for Environment and Water (DEW) serves as the trade approval authority. However, irrigation trusts which operate in South Australia also act as approval authorities for trades within their networks. DEW processes and approves all entitlement and allocation water trades in South Australia (except for those within irrigation trusts).

### E.6.3 Allocation trading

Allocation trades in South Australia are called ‘allocation transfers’, and the holder of a water allocation may apply to transfer the water allocation to another person subject to the Minister’s approval. The transfer must also be submitted in a form approved by the Minister and with the relevant fee paid. Allocation trades must be consistent with the relevant water allocation plan and be in the public interest (taken to be met if the application satisfies the water allocation plan principles). No other state Act requires individual allocation trades to be in the public interest. No separate sections deal with registration of the allocation transfers.

At the time of the MDBA’s Price Audit, South Australia did not require price to be recorded on either allocation or entitlement trades. However, the MDBA reported that since South Australia was advised of the audit outcomes, South Australia has since made price reporting mandatory. There is a provision in the Act which provides the Minister to require the monetary consideration of any transfer to be stated in connection with an application to register a transfer.

### E.6.4 South Australian water registers

In South Australia, the water register is set up under the Landscape South Australia Act 2019. The water register is part of the Landscape Scheme Register established under section 241 the Act. Section 241(2) allows the Minister to divide the Landscape Scheme Register as the Minister sees fit, subject to the establishment of one part specifically for the water register.

While section 241 of the Act sets out the Water Register must be established as part of the Landscape Scheme Register, further detail on what must be recorded is set out in Schedule 4, and includes ownership, temporary and permanent trades all in one register. The Minister can record information under Schedule 4 in the manner and to the extent that the Minister sees fit, and may, in addition to information that is required to be recorded, record such other information in the register as the Minister

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1578 Landscape South Australia (Water Register) Regulations 2020 (SA), subregulation 7(1)(a) and 7(1)(b).
1579 Natural Resource Management Act 2004 (SA), s. 7(2), and Natural Resources Management (General) Regulations 2005, r. 43A. Permanent trades took effect when the Minister gave effect to the transfer in accordance with procedure in regulations; and the regulations stated that the trade was given effect by approval.
1580 Landscape South Australia (Water Register) Regulations 2020 (SA), subregulation 7(1)(b).
1581 Landscape South Australia Act 2019 (SA), s. 125(8)(a)–(c).
1582 Landscape South Australia Act 2019 (SA), s. 132.
1583 Landscape South Australia Act 2019 (SA), s. 132(3)(a) and (b).
1584 Landscape South Australia Act 2019 (SA), s. 132 (4) and (5).
1586 Landscape South Australia Act 2019 (SA), Schedule 4, s. 16.
1587 Landscape South Australia Act 2019 (SA), Schedule 4.
The information that is required to be recorded includes details of the entitlement holder, resource to which the entitlement relates and any matter set out in regulations. There are also new regulations, the Landscape South Australia (Water Register) Regulations 2019 which specify further requirements on the information which must be recorded on the water register. The regulations also require price (if any) paid for transfers to be recorded on the register.

In South Australia, the register is to be made available for public inspection, except for information that the Minister considers should be kept confidential for safety and security reasons. South Australian irrigation trusts also do not publish information on internal trades (although they may choose to report annual aggregate trade volumes in their annual reports).

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1588 Landscape South Australia Act 2019 (SA), Schedule 4, Part 1, s. 4.
1589 Landscape South Australia Act 2019 (SA), Schedule 4, Part 2 s. 6.
1590 For example, there subregulation 4(f) specifies the information which must be kept on water allocations.
1592 Landscape South Australia Act 2019 (SA), s. 241.
Appendix F - Sectoral case studies

In order to better understand what would be involved to implement the longer term recommendations set out in chapter 12, the ACCC conducted five sectoral case studies. The full case study reports are set out below.

For each case study, the ACCC gathered factual information on the key digital infrastructure used, and identified the role of government and industry, as well as the legislation and data standards. The ACCC then considered the results of this analysis and for each case study drew several ‘lessons learned’ for the water sector.

F.1 Standard Business Reporting and Single Touch Payroll - making PAYG easier for businesses

F.1.1 Moving to online business reporting – what SBR and STP entail

Australian businesses are required to keep a range of records and to report information to government agencies, such as the Australian Taxation Office (ATO) for tax purposes.

In the past, there was little standardisation of record-keeping and businesses spent considerable time and resources to collate the information required to be reported to government – particularly when the information was required by multiple agencies and sometimes in differing formats. Over the last decade, government has worked with industry to introduce standardisation and digital tools to streamline and automate record-keeping and reporting where possible, to reduce costs for businesses and improve the accuracy and timeliness of reporting.

According to the Standard Business Reporting (SBR) website, the SBR software ‘uses the business transactions captured in business software to prepare reports that are required by employers to provide to the Australian Taxation Office. This is the concept of ‘capturing once’ and means businesses no longer have to re-enter information (possibly in slightly different ways) for multiple reporting obligations.’

The SBR program was introduced in 2010 to simplify businesses’ reporting obligations. SBR is built into business and accounting software, and the Australian Business Register (ABR) maintains a register of SBR-enabled software. Single Touch Payroll (STP), which uses SBR and was announced by government in late 2014, is a government initiative to streamline employer payroll reporting obligations.

Under this initiative, the use of STP is mandated by the Government and administered by the ATO, and software providers – termed Digital Service Providers – developed compliant software to roll out to employers across Australia. STP includes mandatory reporting obligations, but also includes some voluntary reporting that some software allows employers to also report if they choose.

STP commenced on 1 July 2018 and provides a way for employers to automatically report to the ATO through STP-enabled software. The software sends payroll information such as salaries and wages, PAYG withholding and superannuation to the ATO each time an employee is paid. This reduces administrative burden as the software does this in the background as part of normal payroll functions.

Mandatory reporting rollout was staggered and STP was introduced for larger employers (those with more than 20 employees) on 1 July 2018, and then on 1 July 2019 applied to all employers. The rollout also included a 12 month transitional phase for employers to start using STP software. There are also low cost options for micro-employers, and applications for deferral were also available to those who did not think they would be able to meet the deadlines.

The Government announced in the 2019–20 federal Budget that it would expand the data reported through Single Touch Payroll (STP) by the ATO – called ‘STP Phase 2’. SBR was set up in a way to ensure that it could be built on and expanded, and part of phase 2 is expanding STP to allow employers to report child support information, if they choose, to reduce the burden on employers by providing a single avenue for businesses to report to multiple Government agencies.1601

Building on STP’s first phase of streamlining the way employers report payroll and superannuation information to the ATO, STP phase 2 will assist in the administration of social security for Australian citizens in a more efficient, accurate and timely manner.

The cost of compliance with the old PAYG framework was estimated to be $2.5 billion in 2011, and represented a large regulatory burden for employers.1601 In comparison the Regulatory Impact Statement estimated that STP could deliver a potential net compliance cost saving of about $2 billion over 10 years, with the saving being attributed to STP delivering ‘streamlined TFN declaration and Superannuation standard choice form for new employees, as well as automated reporting of PAYG Withholding’.1602 Sharing STP data with Services Australia (formerly the Department of Human Services) was estimated in later Budget Papers to also deliver $2.1 billion savings by improving the accuracy of income reporting and reducing overpayments of income support payments.1603 The expansion of STP was announced in 2019 (phase 2), and the 2019–20 budget committed $65.278 million to the ATO (including capital expenses) for the rollout over four years.1604

F.1.2 What is the role of government?

Government performs several functions for the SBR program in general, and STP more specifically, including:

- developing underpinning legislation
- providing funding
- administering the product register of SBR-enabled software, and, together with Digital Service Providers, developing the Digital Service Provider operational framework
- receiving data/information
- engaging with industry to develop operational frameworks.

Government agencies participating in the broader SBR program include:

- the Australian Taxation Office (ATO)
- the Australian Prudential Regulation Authority (APRA)
- the Australian Securities and Investments Commission (ASIC)
- State Revenue offices (SROs).

STP data is also shared with Services Australia and the Department of Veterans’ Affairs, and will receive further STP information once phase 2 has been rolled out.1605

The ATO also made STP data available to other agencies as a response to COVID and the need for economic modelling. For example, the ATO shared data with the ABS in order for the ABS to publish ‘Weekly Payroll Jobs and Wages in Australia’.\textsuperscript{1606}

STP-enabled software products must meet the Digital Service Provider Operational Framework security requirements, and the Digital Service Provider must be authorised to use the ATO digital whole services and send data directly to the ATO or via a Sending Service Provider (SSP).\textsuperscript{1607} The framework was developed in 2017 and involved input from a work group and focus groups.\textsuperscript{1608} The scope of the Framework includes any software product provided by a Digital Service Provider which ‘reads, modifies or routes any tax or superannuation related information and the product performs a role in the supply chain’.\textsuperscript{1609}

Digital Service Providers must also demonstrate their software’s ability to comply with the framework by completing a security questionnaire to the ATO via the DPO. The ATO states that ‘[a]ll Digital Service Providers wanting to use our digital services will need to complete the questionnaire and meet the relevant requirements which can include, but is not limited to:

- authentication
- encryption
- supply chain visibility
- certification
- data hosting
- personnel security
- encryption key management
- security monitoring practices.’\textsuperscript{1610}

The ATO will assess the evidence provided and, if satisfied, will grant approval (product will be whitelisted).\textsuperscript{1611}

In circumstances where an approved Digital Service Provider later fails to meet Digital Service Provider framework requirements, the ATO will in the first instance try to work through the issues with the Digital Service Provider. Where that process fails, the Digital Service Provider will face restriction of access to services or de-whitelisting. The ATO is enabled by the SBR Conditions of Use to suspect or terminate any software product, report or information from accessing the SBR channel.\textsuperscript{1612}

The ATO also maintains the product register for SBR and STP products. Products on the STP register are ‘products and services are whitelisted for the Payroll Event service and meet the security requirements under the Digital Service Provider Operational Framework.’\textsuperscript{1613}

\begin{footnotes}
\end{footnotes}
F.1.3 What is the role of legislation?

STP was legislated on 16 September 2016 as part of the Budget Savings (Omnibus) Act 2016 (Cth). This Act included amendments to be made to the Tax Administration Act 1953 (TAA), and specified that information must be reported under STP in the approved form.

Single Touch Payroll reporting is established under the TAA 1953. The Legislative Instrument Single Touch Payroll – Determination of Amounts to be Notified specifies further information which must be provided in addition to that required under the TAA.

The specifications published in the Standard Business Reporting Australian Taxation Office Payroll Event package (the Package) describe the information which is required to be notified in the approved form.

Employers must report the information specified in the legislation and must supply this information in an approved form.

In terms of data sharing, no additional changes were required to enable the ATO to on-disclose STP information. This is because the same confidentiality provisions that apply to other information collected by the ATO also apply to STP.

F.1.4 What is the role of standards and guidelines?

For STP reporting, the Digital Service Providers do not have obligations under the TAA to supply information to the ATO because these obligations fall on employers. The standards which Digital Service Providers must use in developing STP software are called ‘the technical service design artefacts’.

Compliance with the standards is mandated by reference in the TAA, whereby STP data must be provided in the ‘approved form’. The form approved for mandatory ‘Single Touch Payroll’ reporting is outlined in the Payroll Event (called PAYEVNT) specifications on the SBR website. A protocol called ‘ATO ebMS3’ is used to exchange the web service messages using the XML format.

The Digital Service Providers make it easy for employers to comply with the approved form and reporting requirements because they are built into the STP-enabled software. Employers are however the ones that have the obligations under the Act; Digital Service Providers do not. Digital Service Providers do however have contractual obligations with businesses to provide a specific service (STP services).

F.1.5 What is the role of industry and how is engagement facilitated?

Digital Service Providers play several crucial roles in delivering the STP and SBR initiatives:

- they develop the digital tools (software) for employers to use, thereby delivering the STP in practice
- they engage with ATO on the Digital Service Provider operational framework, which helps ensure that framework is fit-for-purpose

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1616 Taxation Administration Act 1953 (Cth), Division 389 of Schedule 1.
1617 Determination under subsection 389-5(3) of Schedule 1 to the Taxation Administration Act 1953 (Cth).
1618 Information additional to that required under 389-5(1) of the Taxation Administration Act 1953 (Cth).
1619 Under sections 389-5 and 389-15 of Schedule 1 to the Taxation Administration Act 1953 (Cth).
1620 That is information under 389-5(1) of Taxation Administration Act 1953.
1621 Taxation Administration Act 1953, s. 389-5(2).
1623 Taxation Administration Act 1953 (Cth), s. 389-5.
they engage with businesses to develop software that meets business reporting needs as well as
STP needs. The ATO developed a Digital Service Provider Engagement Model to establish a consistent approach to
Digital Service Provider engagement, and includes strategic, operational, tactical and informative levels
of consultation. Digital Service Providers Architecture Reference Group (DARG) forms part of the
strategic engagement in the ATO’s Digital Service Provider engagement model, and there are other
groups which consult on the Digital Service Provider Operational Framework in an ongoing manner:

The ATO then conducted specific STP consultation with Digital Service Providers, which enabled the
collaboration and coordination to develop and deliver STP. While employers must report through STP,
the Digital Service Providers must make compatible and enabled software available to employers
to use. Therefore, the ATO conducted extensive consultation with Digital Service Providers to
develop the Digital Service Provider Operational Framework (general SBR) and then the STP
software requirements. As Digital Service Providers were required to develop, seek authorisation and
accreditation, and then rollout STP enabled software, extensive consultation was required to develop
the technical service design artefacts. The consultation process included working groups, advisory
groups and forums, including (but not limited to):

- Single Touch Payroll document navigation focus group
- Single Touch Payroll advisory group (STPAG)
- Single Touch Payment Industry Engagement Forum.

In the initial consultation round, Digital Service Providers noted that they considered varied product
types would be necessary to cater to small through to large businesses.

There are also procedures in place to deal with matters that cannot be resolved, for example, when a
technical matter cannot be resolved under direction from ATO technical lead, the role of the STPAG is
to provide advice and recommendations to the STP project collaboration forums. Where the technical
matter is broader than STP, the matter can be referred to DARG for advice.

F.1.6 Lessons learned

STP and SBR more broadly demonstrate the potential to reduce regulatory burden and compliance
costs for industry through the use of Regulatory Technology (‘RegTech’), and using digital solutions that
are built into business software and essentially store information for regulatory purposes in the course
of standard business operations (i.e. automated information collection). This means that data collection
remains the same, but reporting is standardised. The SBR approach also aligns itself with the relevant
international (ISO) standards where possible.

This is particularly relevant in the water space where the ACCC has identified that significant information
is generated but the data capture, storage and sharing is not harnessing the full potential of the
data. Currently there is also considerable double entry of information, whereby information manually
recorded on a form is then also resubmitted on another form.

There are also considerable concerns about who will bear the cost of increased regulation, and there
is a need to identify ways in which current information can be better harnessed rather than creating more
reporting obligations and increasing compliance costs.

sites/default/files/resource-attachments/ATO_Digital Service Provider_engagement_model_v1.0.pdf, 2018, viewed 15
December 2020.
sites/default/files/resource-attachments/ATO_Digital Service Provider_engagement_model_v1.0.pdf, 2018, viewed
15 December 2020.
15 December 2020.
The use of mandating standards by reference to an ‘approved form’ in the legislation is also of particular relevance to the ACCC’s recommendation regarding the implementation of a Digital Messaging Protocol for water trading (recommendation 10). This could work effectively for water trade also by allowing for the technical requirements to be outside of the legislation, but the mandate to be within.

The STP program undertook significant consultation with industry in order to develop the framework for the Digital Service Providers, and has taken a staged implementation approach. These learnings can be applied in the water space, where any major RegTech change, such as the proposed Digital Messaging Protocol, will require not only the mandate but also industry and Basin State buy-in and consultation.

The multiple opportunities to leverage the data collected and shared through STP also demonstrates the benefits that the proposed Digital Messaging Protocol and near real-time data could provide in water markets.

F.2 E-conveyancing – developing interoperability

F.2.1 Background – what was the challenge?

In Australia, conveyancing is managed by the states and territories. In recent years, there has been a shift to electronic conveyancing (e-conveyancing), although some states have not yet implemented this.\textsuperscript{1632} Five states have mandated the use of electronic conveyancing, such as NSW in July 2019, SA in August 2020.\textsuperscript{1633}

In order to operate, an Electronic Lodgment Network Operator (ELNO) must apply to the Registrar in the jurisdiction they wish to operate and meet the Australian Registrars’ National Electronic Conveyancing Council’s (ARNECC) Model Operating Requirements (MOR) – which also requires an ELNO to satisfy requirements for licencing and approvals with other agencies such as ASIC.\textsuperscript{1634} To date, the only two ELNOs who have gained approval are PEXA, and more recently, Sympli.

Now that there are two players in the e-conveyancing market, the next issue which has been debated at length is how to design a market in which competition can be encouraged. The issue requires establishing the regulatory framework, risk framework and the actual market model to support competition. This also means making a decision on the technical nature of the connections between ELNOs, Electronic Lodgement Networks (ELNs) and the state registries (and other relevant entities) – and whether this should be done in a nationally standardised way, or on a state-by-state basis. This decision has not yet been made.

The mandating of electronic conveyancing has conferred significant scale and network advantages on PEXA as a first mover, and has significant implications for the ability of new entrants to compete. As the dominant incumbent, PEXA has benefited from network effects and economics of scale of its first mover advantage.\textsuperscript{1635}

As alternative ELNOs emerge (such as Sympli), without introducing some form of interoperability property transactions require both the buyer and seller (and their respective banks) to use the same ELNO, with the exception of some single sided transactions which do not require interoperability to be completed. Given e-Conveyancing was mandated before competition emerged, conveyancers, lawyers and banks have already signed up to PEXA, and as such it would be difficult for someone to only sign up for a competitor ELNO. Without interoperability, all parties to a transaction need to subscribe to the same ELNO so parties subscribing to a competitor ELNO would mostly likely also need to sign up to PEXA to complete transactions. Interoperability could also develop as different models in each state.\textsuperscript{1636}

\textsuperscript{1632} Tasmania and Northern Territory have not yet rolled out e-conveyancing.
\textsuperscript{1633} See: \url{https://www.nswlrs.com.au/eConveyancing}, while the ACT has enacted e-conveyancing, it will not mandate the use of it and still allows for paper forms.
\textsuperscript{1635} ACCC, \textit{ACCC report on e-conveyancing}, 2019, p. 4.
\textsuperscript{1636} ibid.
Interoperability in respect to e-Conveyancing means a user (conveyancer, lawyer, or financial institution) is able to be a subscriber to one ELNO and transact with a user of another ELNO, without having to subscribe to both (for example, buyer’s conveyancer using PEXA, seller’s conveyancer using Sympli).

In December 2019, the ACCC Chair Rod Sims wrote to the Chair of the Australian Registrars’ National Electronic Conveyancing Council (ARNECC) and the heads of the state based policy agency outlining the ACCC’s concerns regarding the structure of the developing e-Conveyance markets.

The work of ARNECC is now to consider the complete reform process, which includes the technical approach to interoperability.

**F.2.2 What is the role of government and industry?**

**E-conveyancing generally**

The e-Conveyancing market has been brought about by:

- the Intergovernmental Agreement (IGA) for an Electronic Conveyancing National Law (ECNL)
- technological advancements, and
- the technical roll out by state Land Registries and adoption in state legislation (either mandating or allowing for electronic conveyancing).

The IGA established ARNECC to facilitate the implementation and facilitate a national approach to the regulatory framework for e-Conveyancing. The IGA covers, for example, that ARNECC was required to develop one nationally agreed set of Operating Requirements for ELNOs.

**Interoperability**

Interoperability is an industry led, government supported reform process. On 7 September 2020, a Ministerial Direction was released, supporting the principle of requiring interoperability between ELNOs in the ECNL.

Leading up to this, the key roles and outcomes in developing a solution for market structure have been:

- The ACCC played a role in advocating for a market in which robust competition can be encouraged. The ACCC did not specify the model of interoperability to achieve this, but stated this was a matter for the technical experts. While the ACCC advocated for a national approach it recognised that, given the urgency, if this cannot be achieved then individual states and territory government should progress their preferred approach so that some markets will benefit from competition.
- In January 2020, ARNECC agreed to undertake a project to compare the costs and benefits of various different interoperability models (this project is currently on hold).
- ARNECC organised a review by Dench McClean Carlson to review e-conveyancing.
- In June 2020, the NSW ORG commissioned the Centre for International Economic’s report which looked at the costs and benefits of interoperability.
- South Australia conducted a tender process for blockchain based solutions to interoperability.
- The NSW and SA Registrars chair an Interoperability Industry Panel which reports to ARNECC.

After the Ministerial Direction, the Industry Interoperability Panel’s Technical Working Group prepared a report which recommended a ‘phased Enterprise Service Bus (ESB) approach’ which would involve Direct Connection through a set of open Application Programming Interfaces (API) to support

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connection between PEXA and Sympli. The approach would then move towards an Enterprise Service Bus (ESB) model which would allow connections between multiple ELNOs and the key market participants (such as land registries and revenue offices).\textsuperscript{1642}

The Ministerial Direction states that the interoperability platform will be based on APIs, and will be consistent with the National API Design Standards. It also noted that the ECNL will be amended to require interoperability.\textsuperscript{1643}

Ministers agreed in principle to working towards the following dates:

- **September to November 2020**: consult on draft regulatory approach and draft Bill for updating eConveyancing National Law to require interoperability between ELNOs.
- **November 2020**: Governments to consider updated draft Bills and provide final agreement.
- **February 2021**: introduce the Bill to NSW and once passed, amended legislation is automatically adopted in ACT, Qld and Vic.
- **From February 2021**: remaining jurisdictions submit corresponding legislation to their parliaments.
- **Mid-2021**: legislation in place.
- **Ongoing**: developing of technology and testing for interoperability with an aim of being live as soon as practicable and by no later than the end of 2021.

### F.2.3 What is the role of legislation?

The ECNL specifies that ELNOs must comply with the Model Operating Requirements (MOR) made by the Registrar in each state and territory. MORs generally mirror the national template, although some states have some minor differences.

The ECNL will now also be updated with requirements for interoperability. This forms part of the first phase agreed in September, with consultation planned on the draft regulatory approach the draft Bill for updating the ECNL.

New South Wales, Queensland, South Australia and Western Australia agreed to develop the technical and regulatory regime for legislation to be in place by mid-2021, with the aim to have the solution live as soon as practicable, and by no later than the end of 2021.

A decision will be required to determine what is included in the MORs, ECNL and the interoperability agreement. This is being considered through the Industry Interoperability Panel and its working group (the Interoperability Technical Working Group, convened in early 2020), with a decision to be made by ARNECC.

### F.2.4 Lessons Learned

While a Ministerial Direction has been issued, there is yet to be a decision on the model provided under this mandate by ARNECC.\textsuperscript{1644} Some stakeholders, including the ACCC, have stressed it will be important to view the direct connection model as an interim measure. To avoid entrenching a duopoly it will be important to provide clear guidance on when and how industry will move to the ESB model. At the same time, most stakeholders (including the ACCC) recognise it is important to facilitate meaningful competition as soon as possible, especially given the lengthy delays involved with the reform process to date.

The key learning from e-conveyancing, particularly the ACCC’s involvement in advocating for competition, is the importance of setting up ex-ante regulatory arrangements to enable the development of competition. Mandating services in advance of such arrangements may entrench an


inadequately regulated monopoly and not facilitate new entrants. This lesson can be applied to the calls for a ‘single exchange’ or a ‘single clearinghouse’ for water trade, in which a monopoly would be created. If a monopoly exchange is created and digital links between the exchange and Trade Approval Authorities and Registries are established, it could then be difficult to later bring online other exchanges or establish links between competitors (such as requiring the single exchange to facilitate connections with brokers).

While the ACCC considers that the development of standards used by the Digital Messaging Protocol (at recommendation 10) should involve processes of co-design, collaboration and industry consultation, the process also needs to be mindful of differing levels of resourcing available to stakeholders and their ability to engage in such processes.

Additionally, e-conveyancing demonstrates some learnings from a multi-jurisdictional approach to develop a national standard, and the magnitude of the task in coordinating. The regulator involved in this coordination and development of a national approach must be appropriately resourced, and the ACCC has acknowledged the good work that ARNECC has achieved but that they remain somewhat hampered by funding constraints.\textsuperscript{1645}

Duplication of costs has also been an issue for parties involved in e-conveyancing, with each new entrant establishing links to registries, banks and revenue offices, while the ESB approach (similar to the Backbone Platform proposed at recommendation 11) is designed to avoid this.

F.3 Data standards and digital information systems in the Australian wool industry

F.3.1 Digital tools in the Australian wool industry

Australia’s wool industry consists of a number of participants, from growers, shearsers, classers, through to brokers and private treaty wool merchants, wool handlers (such as AWH), testing services, wool dumps, exporters, processors and retailers. These participants all contribute to the successful movement of wool along the path from the producer to the end consumer, and add value and provide services as wool travels through the wool ‘pipeline’.\textsuperscript{1646}

The wool industry relies on a range of digital tools to ensure wool markets and related services operate efficiently and effectively, both within Australia and internationally. The key components of this digital infrastructure are described below.

Electronic Data Interchange (EDI): industry-specific data standards and digital protocol

Electronic Data Interchange (EDI) is the electronic communication of business documents in a standard digital format. In simple terms, EDI is a standard electronic format that replaces paper-based documents and forms. EDI standards define the location and order of information in a document format.\textsuperscript{1647}

The wool industry was an early adopter of EDI standards and services. Standards development began in the 1980s, with periodic updates and development over the last four decades.\textsuperscript{1648} The standards were managed collectively by the Wool Industry EDP User Group (WIEDPUG). The Australian Wool Exchange (AWEX) assumed responsibility for EDI Network Services in 1995\textsuperscript{1649}, but has since ceased

\textsuperscript{1645} ACCC, ACCC report on e-conveyancing, 2019, p. 20.
service provision although retaining a role in the EDI standards development. In July 2020 AWEX issued version 35.0E of the Wool Industry Data Communications Handbook. The EDI network and custom-built software. For a period of time, it was operated by a private entity, Talman, the ‘largest supplier of in-house wool IT systems in the world’. Following a security incident in 2020 (described in box F.1 below), the EDI network is now mostly run by the Australian Wool Testing Authority (AWTA), although Talman still provides API systems which most buyers and some brokers use.

The wool industry EDI covers a wide variety of wool industry data, including invoices and payment advices, delivery orders and shipping summaries, wool auction and private catalogues, price and buyer information, and technical specifications of wool bales. The wool industry EDI chiefly comprises three delivery vehicles:

1. **Wool Industry EDI networks**: EDI networks are used to exchange public sale catalogues, auction sales results, post-sale invoices, wool delivery orders and test results between many different market participants. Data transmission encompasses private data flows (e.g., invoices and delivery orders) and private transmissions, whilst auction catalogues are available to all users. Nearly all wool industry participants are subscribers to this network infrastructure.

2. **Australian Wool Testing Authority test data**: receives and transmits information relating to pre- and post-sale testing requirements of wool selling brokers and buyers.

3. **Proprietary point to point transmissions using internal or Internet mediums**. This is dependent on the type of information transferred.

All three systems require users to apply or subscribe before use and are largely mailbox type systems. The EDI network is charged on a user-pays system in terms of volume of data moved. It is not mandatory to belong to the EDI network, as manual documents are supported for non-EDI users (although very few use this option).

AWEX maintains an EDI code list on behalf of the wool industry in Australia to ensure that a single unique set of codes are utilised in all wool industry EDI transmissions. For example, the EDI includes a **Wool Industry Organisation Code**: this provides a unique identifier assigned to each EDI user, enabling clear identification of each participant and their activity. The master file of Organisation Codes is maintained by AWEX as a publicly available database. To register for a wool industry code an organisation must have a registered ABN and the organisation name registered is required to be either the registered entity name or a trading name for the ABN.

Changes to the EDI standard are administered via the WIEDPUG. WIEDPUG began as a technical forum for the development and implementation of data and document standards for electronic communication of wool industry data through the Industry EDI Networks, and has since expanded to have a policy role. It progresses its recommendations by consensus, relying upon the merit of proposals and the perceptible benefits flowing from essential standardisation. Changes to data exchange standards are considered on referral from recognised industry organisations.

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1652 AWEX, 2020, https://www.awex.com.au/media/1977/widch-version-350e.pdf, viewed 17 November 2020. At present formats exist for the following kinds of data: a) Invoices, Weight-Notes & Test Certificates for Auction and Private Treaty sales; b) Delivery Orders and Shipping Instructions, and Delivery Summaries; c) Auction Catalogues, Auction Catalogue Updates and Private Catalogues; d) Requests for the post-sale printing of pre-sale test certificates; e) Account statements; f) Requests for the production of test certificates; g) Names, addresses, telephone numbers, etc. of wool industry organisations; h) The selling price and buyer of each lot offered at auction; i) Test Certificates; j) Verification of requests for pre-sale tests; k) Wool tax register details and WIN number replies; l) Payment Advices; m) General text document; n) Dark & Medullated Fibre Risk Verification; o) Test Status.


Box F.1: The Talman cybersecurity incident

The final report of Australian Wool Innovation’s Wool Selling Systems Review in 2016 had noted the potential issues with the concentration of wool industry IT systems, concluding that ‘reliance on a single provider for such an important piece of infrastructure leaves the industry vulnerable and it should take steps to manage this risk. One of the objectives which should be made explicit in the development of the WEP [Wool Exchange Portal]…should be to ensure effective interfacing with existing systems such as Talman and other IT platforms.’

In February 2020, this concern became a reality, when a malicious cyberattack caused all Talman systems, including the EDI network, to be offline for around 1 week, resulting in wool auctions also being suspended.

Industry commentators described the incident as a ‘wake-up call’, and called for an ‘autopsy’ of the incident to find out what happened and to make plans for a network which was much less susceptible to hacking.

A significant outcome of this incident is that AWTA now largely administer the EDI network, since it had an EDI system which it was able to get up and running relatively quickly as a replacement for the Talman software.

WoolQ digital information portal

In October 2014, the wool industry peak body Australian Wool Innovation (AWI) commissioned an independent review of the wool selling system (WSSR). The purpose of the review was ‘to determine whether greater efficiencies, increased competitive tension and improved transparency could be delivered in the journey of wool from the shearing shed to the ship’s rail for export...The major recommendation of the Review was the concept of a Wool Exchange Portal (WEP), an online tool that could address the major issues identified in the WSSR as well as respond to the original key objectives of the review.’ WoolQ is the online platform that delivers this recommendation. According to AWI, ‘WoolQ is an online platform that aims to allow woolgrowers and industry participants to easily harness digital efficiencies across the wool-growing and selling cycle. Its goal is to facilitate digital communication and exchange to leverage new opportunities.’ Table F.1 provides an overview of the WoolQ Market platform components.

In 2019–20, AWI spent $0.7 million on developing and operating WoolQ, just under 1% of its annual budget.

Brokers and buyers registering to use the WoolQ market must provide a valid EDI code (i.e. unique identifier). WoolQ data is transmitted between participants using the EDI network and standard messaging formats.

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### Table F.1: WoolQ Market platform components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Dashboard</td>
<td>Displays upcoming Auction Catalogues and an interactive graph of WoolQ Market wool sale prices (for 19 and 21 microns) across a time horizon</td>
<td>Registered WoolQ Market Users</td>
</tr>
<tr>
<td>Market Auction</td>
<td>Platform where users go to view or transact within the WoolQ Market live auction; also provides historical auction results (including bales sold and passed in)</td>
<td>Registered WoolQ Users</td>
</tr>
<tr>
<td>Market Bulletin Board</td>
<td>An offer board of buying and selling interest which is accessible 24/7 (not yet fully operational)</td>
<td>Registered WoolQ Users</td>
</tr>
<tr>
<td>Market Order Book</td>
<td>Enables buyers to review the status of all lots sold on WoolQ Market, and provides buyers with useful averages across wool parameters</td>
<td>Registered WoolQ Market Users</td>
</tr>
<tr>
<td>Market Admin</td>
<td>A console is where the WoolQ Market administrator manages disputes; schedules and manages upcoming WoolQ Market Auctions; manages WoolQ Market registrations; and performs necessary reporting functions</td>
<td>WoolQ Market Administrator(s)</td>
</tr>
</tbody>
</table>

Source: WoolQ

### E-speci

The wool industry relies on wool data being captured accurately when wool is shorn, and transmitted alongside the wool bales all the way through the wool distribution ‘pipeline’. Historically, key wool data has been captured on paper forms called the wool classer specifications (known in the industry as ‘specis’) together with the National Wool Declaration (NWD). The classer’s speci and the NWD are on the same form.

As with any paper-based system, paper-based specis and NWDs introduce opportunities for error and also need to be physically transferred (or a copy transmitted electronically). E-specis are a recent innovation to replace paper-based forms with digital forms that are automatically saved and transmitted or made accessible to the different parties who need the data. According to developers, e-specis assist the wool industry by providing ‘intuitive workflow[s] designed to reduce workload and errors’, and allowing for more seamless digital transmission of information. Several different e-species have been developed, although overall take-up has been low to date as a proportion of the total wool clip:

- **WoolClip™** is a free, online internet and smartphone app leveraging Microsoft Azure technology, released in 2017–18. It allows the user to create wool Specifications and National Wool Declarations. WoolClip™ has been developed by AWEX, and according to AWEX’s CEO, more than 67,000 bales have been created on WoolClip™ in the 2019-20 season, and had increased further in the first part of the 2020–21 season. Modules within WoolClip™ include Farm Accounts, Job Details, Sheep Mob information, National Wool Declarations, Wool Book bales, Wool Specifications and Consignments. Data entered and developed by the user is subsequently released to user nominated marketing organisation and warehouse. The cost to date to develop the WoolClip app is estimated at around $0.6–0.8 million, of which, the bulk was spent in 2018.

- **WoolQ™ eSpeci** is another online app which provides similar functionality. Launched in 2015, it has been developed by AWI as part of the WoolQ information platform. According to AWI, the WoolQ™ eSpeci also digitises the ‘Wool Book’ and allows for ‘virtual’ collaboration between growers, classers, farm managers and brokers.

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F.3.2  What is the role of government?

Digital tools developed for the wool industry are predominantly industry-led and managed, with relatively smaller and indirect roles for government:

- **Oversight role**: AWI is responsible to the Australian Government; for example, the Senate Estimates process has been used to probe expenditure and progress on the WoolQ platform’s development.
- **Funding role**: AWI grower levies are matched by finance from the Australian Government.\(^{1667}\)

F.3.3  What is the role of industry?

Wool industry participants – particularly key industry bodies such as AWEX, AWI, AWTA, Australian Wool Handlers (AWH), the National Council of Wool Selling Brokers of Australia (NCWSBA) and the Australian Council of Wool Exporters and Processors (ACWEP) – play the central role in developing digital tools and fostering adoption by individual wool industry participants.

F.3.4  What is the role of standards and guidelines?

The EDI standards form a central digital backbone which underpins both wool trading directly, wool testing certificates issued by AWTA, and other digital tools. It also facilitates traceability of wool in the event of an EAD outbreak, such as Foot & Mouth Disease.

Digital tools, particularly the e-Specis, also make use of other standards and guidelines developed by and for the industry, such as:

- **National Wool Declarations**: a standardised declaration method for recording details about animal welfare practices (i.e., Mulesing Status), the Dark and Medullated Fibre Risk (DMFR) and chemical residues information\(^{1668}\)
- **Code of Practice for the Classing of Wool (AWEX)**
- **1PP certificates**: certificates issued to a select group of superfine wools annually that exhibit superlative quality, style and soundness and are prepared in the best possible manner.
- **AWEX-ID**: a standardised system for the appraisal and description of non-measured characteristics of greasy wool.\(^{1669}\)

Together, these standards provide a consistent framework for recording and transmitting wool industry data and identifying industry participants. This increases transparency for market participants, reduces transactions costs and underpins confidence in wool trading and related services.

Standards development, review and versioning is an iterative process led by industry peak bodies, with expert guidance from advisory committees such as the Industry Services Advisory Committee, which provides advice to AWEX on a range of technical matters, and the WIEDPUG technical forum (see above).

F.3.5  Lessons learned

**Data standards can work in a voluntary context given the right conditions**

Use of the EDI data standards and software is ubiquitous within the wool industry, even without their use being mandated via legislation or regulation. This has been developed for and driven by commercial imperatives. This shows that industry participants see value in the standardisation and ease-of-transacting that the EDI system brings.


One aspect driving industry to participate is that almost all Australian wool is sold from Australian wool growers to international mills, generally via an intermediary such as wool brokers (who act as an agent for growers) and Australian-based wool buyers and exporters. This means that the wool supply chain is geographically diverse, but also more linear than in water markets, where irrigators (as well as other market participants) could enter on the supply side, demand side, or both. In the wool industry, there is a higher cost in using non-digital approaches (i.e. paper documentation) to facilitate transactions, both in terms of transmitting and verifying information, than would be the case for a market that is less geographically dispersed.

There is also little incentive for certain participants to not participate out of an intent to maintain a small, localised market. In contrast, in water markets, some market participants who are opposed to the geographical movement of water (e.g. out of an irrigation district or trading zone) may have incentive to opt out of reforms which encourage standardisation and lowering of transactions costs of trade. This means that, while there may be significant support for introducing data standards for water markets, a mandatory approach may be warranted to ensure that reforms have the appropriate coverage. However, not every aspect necessarily needs to be mandated – for example, there could be a high level mandatory requirement of participation, but the exact requirements for data provision (e.g. format, periodicity) could be specified in industry standards and/or guidelines.

Digital tools can build on each other, underpinned by high quality, industry-accepted standards

This case study shows that it is not necessary to have a single digital technology to deliver all aspects of the digitalisation of trade services. It is possible to have an integrated ecosystem of technologies; however, in this approach, underlying data standards are crucial to ensure seamless interoperability between different technologies in the ecosystem.

The key learnings for the water context are that these underlying data standards should be developed first, and that interoperability and seamless interfacing between different digital tools should be a key design criterion for those tools. Ad hoc initiatives currently being developed in the water sector are being developed in isolation from each other, and are unlikely to deliver this integrated outcome.

Reliance on single industry-wide digital tools can create additional risks that need to be well-managed

Core digital technologies in the wool industry were subject to a serious cyberattack in 2020. The incident showed that the technology provider was unprepared and had insufficiently robust security protections and risk management strategies, and as a consequence was slower than expected to respond to the incident.

The lesson learned for the water sector is that if water trade is going to move towards adopting industry-wide custom-built software (in line with ACCC recommendations), there will need to be a focus on building in security protections and risk management strategies from the outset. Examples of strategies that could be taken to help ensure secure and resilient technologies is to use distributed approaches or cloud-based services to make systems more robust; and to plan in advance for potential security incidents or other robustness threats.

F.4 National Livestock Identification Scheme

F.4.1 Australia’s National Livestock Identification System

The National Livestock Identification System (NLIS) is Australia’s system for the identification and traceability of cattle, sheep and goats. Formed out of early systems for recording livestock movements as far back as the 1960s, the NLIS now combines a range of digital and non-digital tools to deliver a national system for ‘whole of life’ tracking and tracing Australian livestock. The key components of this system are:

- Livestock identifiers: All livestock are identified by a visual or electronic eartag/device.
Location identifiers: All physical locations are identified by means of a Property Identification Code (PIC).

Transaction records: All livestock location data and movements are recorded in a central database.\textsuperscript{1670}

Enforcement to ensure compliance.\textsuperscript{1671}

The NLIS was introduced in 1999 to enhance Australia’s ability to trace cattle during disease and food safety incidents, and was expanded to also include sheep and goats in 2009.\textsuperscript{1672} The key motivation of the NLIS is food safety and biosecurity. According to a 2019 impact assessment for the period of 2015 to 2020, livestock traceability and food safety systems generated an economic benefit of $316.7 million, by avoiding disease costs and attracting export market premiums.\textsuperscript{1673} A significant ancillary benefit of the system is that the data generated can be combined with data from other sources to provide a range of analysis for industry participants, and to support marketing initiatives. The industry is currently engaged in several initiatives to make better use of this data (see below).

F.4.2 What is the role of government?

The key roles of government in the NLIS system are:

- to set the policy agenda and strategic direction for red meat integrity systems
- to participate in standards development
- to ensure standards are mandatory by embedding them in legislation
- to provide funding (in addition to industry levies and fee revenues).

Policymaking for the NLIS occurs through Safemeat – an industry-government partnership responsible for meat safety. The Safemeat Secretariat is located within the Department of Agriculture, Water and the Environment. State and territory legislation forms the regulatory framework for the system. The NLIS also has standards and advisory committees.\textsuperscript{1674}

F.4.3 What is the role of industry?

The NLIS is endorsed by major producer, feedlot, agent, saleyard and processor bodies.

The NLIS is currently operated by the Integrity Systems Company (ISC) a wholly-owned subsidiary of Meat & Livestock Australia (MLA). ISC delivers a suite of integrity programs for Australia’s red meat sector (including NLIS), and also provides promotional and educational services. The ISC is also responsible for developing and delivering the Digital Value Chain Strategy and Livestock Data Link, two ongoing initiatives to make better use of existing and new data, including data from the NLIS central database, and to conduct research and development to ensure the best digital tools and database management systems are used to strengthen red meat integrity systems over time.\textsuperscript{1675}


ISC was created following a review of Australian red meat supply chains, in 2016. ISC has significant industry involvement, for example receiving advice and input on operational aspects from the Integrity Systems Taskforce, which has representation from all peak industry councils across the red meat supply chain.

ISC and MLA have invested approximately $65 million into the NLIS over the 12-year period between 2006 and 2017. Over that period, the annual operating cost of the NLIS was $5.4 million. ISC’s activities are funded predominantly through red meat industry levies, with matching government research and development levy investment. Income is also received from the sale of National Vendor Declaration books and Livestock Production Assurance accreditation fees.

F.4.4 What is the role of standards and guidelines?

The NLIS is underpinned by state/territory legislation, which forms the regulatory framework for the system. This state/territory legislation mandates the adherence to relevant standards:

- **Cattle traceability standards** provide a set of minimum standards for identifying livestock and recording livestock movements that, if adhered to, will ensure the traceability of cattle for disease control and food safety purposes.

- The legal obligation to record the arrival of cattle, sheep and goats, rests with the person receiving the livestock (e.g. saleyard or buyer/receiver of stock). The receiver may engage someone else to notify the database on their behalf.

- **RFID standards and tag accreditation** provide a set of criteria against which new livestock tagging devices can be accredited, and designates NLIS Ltd. as the accreditor.

The NLIS system also conforms to international standards for quality management systems, being ISO9001 certified.

F.4.5 Lessons learned

Centralisation of record-keeping has been a critical step for the NLIS, and was feasible in part because of limited state-level roles

The NLIS provides an example of a multi-party system where many actors report transactions (livestock movements) to a central record (the NLIS database), in order to provide a comprehensive, ‘single point of truth’ for livestock traceability. The central database is administered by a purpose-built, independent entity, the ISC.

When NLIS was being introduced, there was considerable discussion among industry participants about the merits of a central database versus more decentralised approaches. Prior to centralisation of record-keeping into the central database, states and territories maintained their own databases. Centralisation was feasible in part because – unlike for water trade – states and territories do not have a role in improving transactions (in this case, livestock movements), and there is no centralisation of livestock management at the state/territory level. This meant that there was no strong driver to keep record-keeping at the state level; in fact, there were considerable benefits from adopting the more


centralised approach, particularly given that livestock regularly crosses state borders, and the need to ensure a nationally-consistent approach to biosecurity risk management.

In contrast, water resources need to be managed at the trading zone, water source and Basin levels, and all trades need to be approved by the relevant approval authorities. This entails a much more active role for Basin State governments, and also for irrigation infrastructure operators. Also, given interstate trade currently forms only a very small proportion of water allocation trade, and a minute proportion of water access entitlement trade, the expected benefits from centralising records management and trade administration in the water context are likely to be lower than for the NLIS context. This suggests that while there may be benefits from centralising water market information and data, there is less of a strong driver to centralise the actual records management functions in the water context.

**Staged implementation and differing requirements have caused complexities and confusion**

The NLIS has differing requirements for different animal types, and across jurisdictions. Further, introduction of NLIS requirements has used a staged approach, across animal types, jurisdictions, and participants. As detailed in box F.2 below, this makes it harder for participants to understand their reporting obligations and to achieve compliance. The lesson learned from this experience is that a consistent approach should be pursued as the ‘first-best’ approach, with deviations from this being carefully considered. Applying this lesson to water markets suggests that requirements for collecting, storing, and transmitting water market information should be as consistent as possible across jurisdictions, types of trades, and water market participants.

**Mandating requirements in legislation is a necessary but not sufficient component of the NLIS**

The Integrity Systems Company, which operates the NLIS, identified that mandating requirements via legislation is ‘not enough of a reason for participants to comply’; participants ‘need a compelling reason to comply’, and ‘value propositions need to be established across all participant segments to encourage end-to-end compliance’ (see box F.2).

This experience highlights the need to ensure obligations provide clear benefits to data providers (in the water context, trade service providers), as well as the sector more generally.
Box F.2: Administering the NLIS: challenges and learnings

In a recent submission to a Senate Inquiry considering the feasibility of a National Horse Traceability Register for all horses, ISC provided an overview of its experience in the development and implementation of national livestock traceability systems. Several of the points raised are highly relevant to consideration of introducing data standards and digital tools for water trade:

- **Staged implementation** of NLIS requirement led to ‘complexity in communicating requirements, to both participants and customers’. ISC recommended that ‘where possible, agree on a national timetable for implementation [and] minimise the lag for implementation across [different areas]’.

- **Different requirements** (in the case of NLIS, across animal species), created confusion and inconsistent rules. ISC recommended a ‘consistent national approach’ to requirements to avoid such outcomes.

- **Defining the role of industry vs government in compliance and enforcement**: ISC identified this as a challenge, noting also that there has been a ‘reduction in resources to support compliance and enforcement over time’, and that ‘penalties for breaches [are] seen as not significant enough to discourage non-compliance’. ISC recommended that ‘compliance and enforcement activities need to be well resourced to be impactful’, and that ‘both industry and government should play a role in supporting compliance.’

- **Technology adoption**: ISC noted that ‘while the NLIS is based on technology, it also caters for those unwilling/unable to engage with or adopt technology, creating complexity in system design and implementation’. Further difficulties in ‘smoothly integrat[ing] technology with other software or hardware systems negatively impacts adoption’. ISC recommended ‘agree[ing] on the minimum technology requirements and deliver that technology in the most simple and cost-effective way’, and that ‘technology needs to present a value proposition beyond compliance in order to drive broad-based adoption’.

- **Resources allocated for communication and education** were primarily for initial implementation, and were eroded over time as the system shifted from implementation to ‘business as usual’. ISC recommended that ‘on-going and sustained investment in communication/education must be factored into the system design’, and that ‘compliance cannot be achieved without on-going communication and education’. ISC flagged the need to ‘ensure there are regular “touch-points” with participants to remind them of the “what” and the “why”’.

- **Value proposition**: ISC highlighted that mandating requirements via legislation is ‘not enough of a reason for participants to comply’; participants ‘need a compelling reason to comply’, and ‘value propositions need to be established across all participant segments to encourage end-to-end compliance’.

- **Funding**: ISC noted that ‘funding has eroded over time as industry and government priorities have shifted’, and that there has been an ‘inability to establish a secure, longer-term funding stream for the system. ISC recommended that funding commitments be established upfront, and ‘sustained at a level that supports compliance objectives and continuous improvement’.


F.5 Data sharing protocols to manage Australia’s biosecurity

F.5.1 Background

Biosecurity is ‘the management of risks to the economy, the environment and the community, of pests and diseases entering, emerging, establishing or spreading’ and the ‘goal of the national biosecurity..."1681 Council of Australian Governments, Intergovernmental Agreement on Biosecurity, 2019.
system is to minimise adverse impacts of pests and diseases on Australia’s economy, environment and the community while facilitating trade and the movement of plants, animals, people and products.\(^{1682}\)

While there exists both federal (namely the Biosecurity Act 2015 (Cth)) and state legislation to manage biosecurity in Australia, a key mechanism to ensure a consistent and holistic approach to managing biosecurity is the Intergovernmental Agreement on Biosecurity (IGAB).\(^{1683}\) This case study examines how the IGAB has facilitated the creation and use of data sharing protocols and digital platforms to underpin a shared approach to managing biosecurity risks facing Australia.

Point 6 of IGAB preliminaries sets out the nature of shared responsibility:

Parties recognise that biosecurity is a responsibility shared by all Australians and that cooperation, investment and action with industry and the community are essential for a strong national biosecurity system. Governments’ agreements and arrangements with industry and the community are separate but related to this Agreement.\(^{1684}\)

The IGAB (now on its second iteration called IGAB2, see box F.3) is an important part of Australia’s biosecurity architecture and has a crucial role in strengthening the biosecurity by enhancing national collaboration among Australian governments, and supporting the biosecurity system to meet current and future challenges.\(^{1685}\)

The IGAB2 sets out the components of the national biosecurity system, which includes ‘a national information and intelligence system’.\(^{1686}\) The National Biosecurity Committee (NBC) was formally established under the Intergovernmental Agreement on Biosecurity (IGAB). In 2017, NBC endorsed National Minimum Dataset Specifications for surveillance and emergency activity across each sector.

IGAB2 commits each party to ‘sharing biosecurity information, data, intelligence and other knowledge necessary for the efficient functioning of the national biosecurity system with other Parties and, where appropriate, with industry and the community’.\(^{1687}\)

The revised IGAB (IGAB2) came into effect in January 2019, and the Commonwealth and all states and territories are signatories. The IGAB2 was developed in response to the recommendations of the 2017 review of the initial IGAB (see box F.3). In response to the review’s findings, a ‘stronger commitment to data and knowledge sharing has therefore been included in the revised IGAB’.\(^{1688}\) Implementation of the review’s recommendations have either been the responsibility of the Commonwealth Department of Agriculture, Water and the Environment (DAWE), or state governments. The recommendations are being implemented through mechanisms such as the NBC, or are the responsibility of state and territory governments (see below for details on implementation of data-related recommendations).\(^{1689}\)

The NBC is now focusing on priority areas that will guide implementation of the new agreement. These priority areas were agreed to by agriculture ministers on 25 October 2018, in response to the final report of the initial IGAB review.

\(^{1688}\) Agriculture Ministers’ Forum, *Priorities for Australia’s biosecurity system: Response from Australian agriculture ministers to the report by the Intergovernmental Agreement on Biosecurity review*, 2018.
Box F.3: Review of initial IGAB identified the need to strengthen data arrangements

The first IGAB was signed in 2012 by all states except Tasmania. In 2015, the IGAB was reviewed by Wendy Craik, culminating in a final report *Priorities for Australia’s biosecurity system* (the report) published in 2017. Agriculture ministers commissioned this review to fulfil the commitment within the initial IGAB for a review of the implementation and effectiveness of the IGAB and its schedules. The review also considered and provided recommendations on the capacity of key components of the national system to manage increasing biosecurity risk.

The review made several recommendations to be incorporated into a new IGAB, some of which include strengthening data arrangements.

The review found that data arrangements under the original IGA were not as coordinated or aligned as they could be, leading to some gaps in comprehensive data, and the report found that ‘there also appears to be a tendency for the NBC to be overly risk averse in sharing biosecurity information, data and intelligence.’

The original IGAB was criticised by some stakeholders for not involving industry and the community in its development. The original IGAB also contained detailed schedules which proposed extensive bodies of work which could not be completed by the jurisdictions. Under the original IGAB, the National Biosecurity Committee (NBC) played a role in reviewing and reprioritising these schedules, and the 2017 review indicated that the NBC should continue to have flexibility in this respect.

F.5.2 Governance

The IGAB and its successor IGAB2 provide an over-arching governance mechanism to help co-ordinate federal, state and territory biosecurity efforts. These IGAs are in turn supported by several institutions with governance roles:

- The *Agriculture Senior Officials Committee* (AGSOC), provides for cross-jurisdictional coordination to matters of national interest, and has a number of sub-committees which include specific ones for biosecurity. The AGSOC comprises all department heads and CEOs of agencies responsible for primary industries policy issues, and is chaired by the Secretary of DAWE.

- The *National Biosecurity Committee* (NBC), established by the IGAB itself, provides advice to the Agriculture Senior Officials Committee on national biosecurity, and on progress in implementing the Intergovernmental Agreement on Biosecurity. It is also responsible for managing a national, strategic approach to biosecurity threats relating to plant and animal pests and diseases, marine pests and aquatics, and the impact of these on agricultural production, the environment, community well-being and social amenity. The NBC is supported by four sectoral committees and a communications and engagement network. These provide policy, technical and scientific advice on matters affecting their sector, covering all pests and disease risks to the terrestrial and aquatic (inland water and marine) animals and plants, and the environment.

- The *National Biosecurity Information Governance Expert Group* (NBIGEG) was established by the NBC to guide improved cooperation between the Commonwealth, state and territory governments,

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1694 These are: the Animal Health Committee; the Plant Health Committee; the Marine Pest Sectoral Committee; and the Environment and Invasives Committee.

with industry, in the collection, collation, analysis, storage and sharing of biosecurity information, in order to improve decision making and enhance operational efficiency.

- The Inspector-General for Biosecurity, who is independent from DAWE and makes recommendations for overall system improvements.\(^{1696}\)

### F.5.3 Data sharing protocols, platforms and standards to support management of biosecurity risks: recent progress

All governments, through the NBC, endorsed the National Minimum Dataset Specifications for surveillance and emergency activities and these are now being implemented. The National Minimum Dataset Specifications provide specific instructions about how each field is to be filled in for different scenarios and surveillance types, which will ensure consistency for surveillance protocols.\(^{1697}\)

To facilitate the use of these standards the Department of Agriculture and Water Resources is developing a metadata registry that will support access.

The 2017 review recommended that data sharing be a core commitment of jurisdictions under the new IGA, and that this commitment include agreed minimum standards and specifications for datasets. The Agriculture Senior Officials Committee (AGSOC) signed the data sharing protocol arrangement in 2018.

The 2017 review made four data-related recommendations (recommendations 39 to 42, see box F.4), which were agreed to be implemented by the state and national ministers in their joint response to the review.\(^{1698}\)

#### Box F.4: Data sharing recommendations in the Intergovernmental Agreement on Biosecurity Review

The review of the IGAB set out 42 recommendations for strengthening Australia’s national biosecurity system. Of these, four recommendations related specifically to strengthening data sharing arrangements:

- Recommendation 39: Data and knowledge sharing should be a core commitment of jurisdictions under IGAB2. Minimum standards and specifications should be agreed for datasets.
- Recommendation 40: Within the period covered by IGAB2, the Australian Government agriculture department should lead the development of a common information architecture for the national biosecurity system (including data-sharing protocols, standards and authority protocols) for all jurisdictions to share and access biosecurity data and information in the national interest.
- Recommendation 41: The Australian Government should establish, within the agriculture department, a dedicated National Biosecurity Analytics and Intelligence Centre, to centralise, coordinate and provide advice to the NBC, AGSOC and AGMIN on biosecurity intelligence covering emerging risks and pathways and international and domestic pest and disease detections.
- Recommendation 42: Jurisdictions should adopt the proposed new priority reform areas and associated work program for IGAB2 and amend the IGAB in line with proposed revisions.

Source: Craik, Palmer and Sheldrake, 2017.\(^{1699}\)

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\(^{1698}\) Agriculture Ministers’ Forum, Priorities for Australia’s biosecurity system: Response from Australian agriculture ministers to the report by the Intergovernmental Agreement on Biosecurity review, 2018.

In the joint response to the review, ministers noted that the NBC had already endorsed National minimum Dataset Specifications for surveillance and emergency activities.\textsuperscript{1700}

The NBC also earlier (in 2016) noted the progress made with the National Minimum Dataset Specifications, a biosecurity data and information governance framework and progress of international standards for biosecurity data.\textsuperscript{1701}

Significant progress has been achieved on implementing the review’s recommendations, although certain actions are not yet complete.

The data sharing protocols, recommendation 40, have been implemented.\textsuperscript{1702} This recommendation was the responsibility of DAWE, and in earlier documentation and again in August 2020, DAWE reported that in AGSOC signed a national data sharing protocol in 2018 to facilitate data sharing between the Australian Government and state and territory biosecurity agencies.\textsuperscript{1703}

Implementation of the National Biosecurity Analytics and Intelligence Centre (recommendation 41) is still in progress. Through the Agricultural Competitiveness White Paper, the Australian Government invested in developing an advanced analytics capability in biosecurity. In the joint response to the IGAB review, the ministers stated that:

\begin{quote}
We will build a secure national platform for sharing biosecurity data between government agencies and significantly advance our ability to identify passengers, imports and pathways most likely to expose Australia to exotic pests or disease.\textsuperscript{1704}
\end{quote}

The Australian Government committed $15.9 million to develop an advanced analytics capability for biosecurity in 2016, and then later announced funding of $36.5 million over five years to support the development of a secure national biosecurity data platform ("Biosecurity Portal" (BSP)). The platform is being built within the DAWE, and will work to support existing data sharing with states and territories.\textsuperscript{1705}

The result of this recommendation is the online portal called the BSP, which is jointly funded by DAWE and Plant Health Australia (PHA). The BSP ‘aims to strengthen Australia’s biosecurity research, surveillance, diagnostic and response capability, by enabling researchers, industry and governments, to collaborate, use expertise, share data, information, and generate intelligence using leading edge tools and technologies made available through the BSP’s online workspaces.’\textsuperscript{1706} When complete, the BSP will comprise:

\begin{itemize}
\item a centralised repository and gateway to online biosecurity information, which includes the ability to provide differential access (e.g. restricted access sub-sites for each member industry)
\item a ‘self-supporting operational system’, comprising hardware, software and maintenance, which can be used by researchers, industry and government.\textsuperscript{1707}
\end{itemize}

In providing a ‘gateway’, the BSP provides links to other relevant online resources and databases, such as the Australian Plant Pest Database.\textsuperscript{1708} As such, the BSP does not itself aim to house all relevant information or duplicate information already provided elsewhere, but rather will provide a single access point for relevant parties, including industry, researchers and governments.

\begin{thebibliography}
\addcontentsline{toc}{section}{References}
\bibitem{1700} Agriculture Ministers’ Forum, \textit{Priorities for Australia’s biosecurity system: Response from Australian agriculture ministers to the report by the Intergovernmental Agreement on Biosecurity review}, 2018.
\bibitem{1704} Agriculture Ministers’ Forum, \textit{Priorities for Australia’s biosecurity system: Response from Australian agriculture ministers to the report by the Intergovernmental Agreement on Biosecurity review}, 2018, p. 4.
\bibitem{1705} ibid, p. 24.
\end{thebibliography}
In August 2020, DAWE reported that recommendation 41 was being implemented progressively and that a ‘skilled team is progressively sourcing data, improving its quality and integrating it to support biosecurity decision making. These improvements will enhance the existing data shared with state and territory agencies’.1709

The review also proposed three priority reform areas and associated programs of work to be delivered. Recommendation 42 outlines how these should be actioned.

One of these priority reform areas was ‘knowledge management and system performance’, and included relevant deliverables of:

- national collaboration on data and intelligence sharing
- agreement to common information architecture for the national system, including data sharing protocols, and data standards
- an independent comparative Report of Government Biosecurity Services (ROGBS)
- an independent IGAB Evaluation Program of jurisdictional commitments
- nationally consistent system for property identification codes (PICs).

The reform priority areas were agreed by Agriculture Ministers (AGSOC) in 2018, and have evolved from the reform areas proposed in the review’s final report (for instance, there are now four reform priority areas).

There is still a reform deliverable of a ‘national information sharing, intelligence and analytics system, to support scenario planning, risk identification and resource allocation’.1711

F.5.4 Information platform and enhanced traceability

The Biosecurity Act 2015 (Cth) contains information gathering powers, and such powers also come with restrictions to balance with privacy and security concerns.

The National Surveillance and Diagnostics Framework (the framework) has been developed by the IGAB Schedule 4 working group to provide an integrated approach to the funding and management of the activities that fall under this framework.

One other outcome in the key reform priorities was to develop ‘a single national traceability framework for animal and plant products’, which requires as a key deliverable, a ‘nationally consistent property identification code system with agreed business rules, supported by appropriate legislation and administrative arrangements’.1712

Recommendation 6 of the IGAB review is also relevant to traceability:

Jurisdictions should develop a nationally consistent system for the allocation and use of property identification codes (PICs) across the animal and major plant production sector.1713

With regard to traceability, the IGAB review found the use of PICs would support identification and traceability, and that a system would have substantial value if a ‘unified, national system tied to GPS data was adopted across the animal and major plant production sectors.’

F.5.5 Lessons for water

The IGAB review process highlighted the need for an improved and nationally consistent approach to biosecurity, and that key to this was developing data and intelligence sharing supported by common information architecture, data sharing protocols and data standards. Some key learnings to be drawn from this process which are relevant to water markets are:

- The use of an IGA as a tool for this kind of reform has been quite valuable. The IGA has facilitated coordination between different government agencies, and has provided a framework upon which other tools such as standards and protocols can be built. The review process also highlights the importance of building in mechanisms to review the IGA and its priority areas. The value in centralising information and publishing committee outcomes has also been demonstrated in this case.

- There are benefits in bringing various agencies together to commit to data sharing, and formalising these commitments in agreements and protocols.

- In the biosecurity sphere, there is value in creating compatible hardware and software for use by government and industry. This case study provides a useful example for the water sector in considering what kind of hardware and software would be required to implement a holistic Digital Messaging Protocol and Backbone Platform for water trading and water market data.

- This case study shows that the role of the Inspector General in the biosecurity data and information management system is to provide independent recommendations for overall system improvements. This is relevant for water because the Commonwealth Government has already signalled its intention to have an Inspector General for water compliance (IGWC), but the precise functions of the Inspector General are under development. The example of biosecurity suggests that it will be useful to consider data-related functions of the IGWC.

- In the biosecurity context, there is value in supporting ‘traceability’, and there is a need for this to be nationally consistent. In water markets, and water management more generally, there is currently only very limited traceability for specific parcels of water allocation. This case study shows that keys to establishing traceability are the use of individual identifiers, and having a holistic approach covering all relevant areas, rather than a piecemeal or jurisdiction-based approach.

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Appendix G – Basin Water Market Data Quality Assessment

Key Points

- High quality data is fundamental to evidence based decision making.
- The ACCC has assessed key Basin water market data sources using an eight-dimension Data Quality Framework.
- The ACCC has identified various data quality issues across data types (trade, accounting, management and other data) and data suppliers (Basin States, private businesses such as irrigation infrastructure operators (IIOs) and exchange platforms, and other government bodies). The most serious issues identified are:
  - an inability to consistently identify individual market participants, which affects all datasets analysed (lack of referential integrity)
  - an inability to produce complete historical transaction records of certain types of trades (‘share component trade’) in New South Wales (incompleteness, lack of referential integrity)
  - a near-complete absence of price information for some IIOs (incompleteness)
  - a complete lack of the use of transaction identifiers for some IIOs (incompleteness, leading to a lack of referential integrity)
  - usage data not being available at sufficient granularity in relation to time or location (due to incompleteness and timeliness)
  - problems in matching trade data between different approval authorities (lack of completeness and referential integrity, leading to issues with accuracy)
  - inconsistencies between what data is held by IIOs and made available via public sources.
- These data quality issues make it difficult to fully analyse water markets, and can impede implementation of policy tools which rely on having complete, accurate, and granular data about water trade and/or usage.
- Water markets data is primarily an administrative by-product which is collected for non-statistical purposes, and therefore not managed or maintained as an information asset for analytical purposes.
- In addition data is often poorly described, managed and maintained. This leads to transparency issues for market participants and a poor basis for conducting analysis which requires time series data for market analysts and policy evaluation.
- Improvements to data quality would lead to improved transparency and confidence in water markets and better informed decision making.

G.1 Assessing data quality

Data quality is a measure of the condition or state of data in relation to its use. Poor quality data means that data may not be fit for purpose, and contributes to misconceptions and misinformation about the conduct of market participants and harms market confidence. In contrast, high quality data enables effective and evidence based decision making and increases transparency and confidence. The purpose of this appendix is to assess the quality of public and private water market data and related data in the Basin, using a standardised framework to evaluate different datasets. It is important to note that while a number of data quality issues are identified in this appendix, in most cases this does not render the affected data useless, rather these issues limit the robustness of the conclusions that can be drawn from the data. That is they make the data more unreliable and less trustworthy. Further, the assessment is limited in scope to the data provided to the ACCC through voluntary information processes, and through s. 95ZK responses, and that this may not represent the full extent of data holdings by providers.
The ACCC/AER uses a Data Quality Framework (DQF) in order to achieve an agreed Data Quality standard across the ACCC/AER. The Inquiry has adopted this framework in order to assess the quality of certain key data sets relevant to water markets. The datasets assessed broadly fall into four categories:

1. **Water trading information**: data relating to the trading of entitlements and allocation.
2. **Water accounting information**: non-trade data relating to inflows and outflows to individual water accounts (e.g. usage, forfeits, carryover).
3. **Water management information**: data relating to the management and movement of water through the system (e.g. IVT balance information, storage levels).
4. **Other information**: data relating to water markets which do not fit into any of the above categories.

This appendix largely focusses on trading and accounting information, however does comment on data quality issues in the other categories where relevant. One of the complexities of water market information is that there are a number of suppliers and holders of information (for example the Bureau of Meteorology (BOM), Basin State governments, irrigation infrastructure operators (IIOs), water market intermediaries and other private corporations). Where relevant, the data quality of each of these data sources will be considered separately.

One key aspect of the DQF for the purposes of the Inquiry is the eight dimensions for assessing data quality. These dimensions are based on the Data Management Body of Knowledge (DMBOK) framework, and provide a framework to assess the quality of a particular set of data.

Table G.1 provides a summary of the eight dimensions of data quality in the DMBOK Data Quality framework.
### Table G.1: Data Quality Dimensions

<table>
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<tr>
<th>Dimension of Quality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>Accuracy refers to the degree that data collected for a given attribute accurately reflects the real world object that is being recorded i.e. is the data correct.</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
<td>Completeness refers to whether all required data is present. Completeness can be measured at the data set, record or column level. For example, completeness asks: are all trades recorded? Do all trades have data for all relevant fields (e.g. price, volume, buyer and seller details)?</td>
</tr>
<tr>
<td><strong>Consistency</strong></td>
<td>Consistency refers to ensuring that data values are consistent and reflect the same information across data sets. Consistency also refers to data values being consistent within a record in a dataset, across time and between systems. Consistency can also be used to refer to consistency of format of data. For example, consistency considers questions such as: are different types of trade dealings (leases, forward contracts, ‘spot’ allocation trades, entitlement transfers, etc.) referred to consistently within and across datasets? Are trades always recorded in the same units (e.g. ML), or are difference units clearly identifiable? Are trading zones defined consistently over time and across datasets?</td>
</tr>
<tr>
<td><strong>Integrity</strong></td>
<td>Data Integrity (or ‘Coherence’) includes ideas associated with completeness, accuracy and consistency. In data, integrity usually refers to either referential integrity (consistency between data objects via a reference key contained in both objects) or internal consistency within a data set such that there are no ‘holes’ or missing parts. Data sets without integrity are seen as corrupted, or have data loss. Data sets without referential integrity have ‘orphans’ (invalid reference keys), or ‘duplicates’ (identical rows) which may negatively affect aggregation functions.</td>
</tr>
<tr>
<td><strong>Reasonability</strong></td>
<td>Reasonability asks whether a data pattern meets expectations. For example, in the water markets context, reasonability could assess whether the distribution of allocation trading activity across a geographic area makes sense based on what is known about demand factors and market participant behaviour (e.g. irrigation activity) in that catchment or region, and supply factors such as water allocation and storage levels, etc. Measurement of reasonability can take different forms. For example, reasonability may be based on comparison to benchmark data, or past instances of a similar data set (e.g. trade volumes and values from the previous quarter). Reasonability is sensitive to the specific context of the dataset.</td>
</tr>
<tr>
<td><strong>Timeliness</strong></td>
<td>Timeliness is a measure of the delay between the real world event occurring and the data capture of that event. For example, time lags between when a trade is agreed between parties and when it appears in public registry data or time lags between when water usage occurs at the individual level and when aggregate water usage data for a trading zone or catchment becomes publicly available.</td>
</tr>
<tr>
<td><strong>Uniqueness/Deduplication</strong></td>
<td>Uniqueness requires that no entity exists more than once within the data set. Asserting uniqueness of the entities within a data set implies that a key value relates to each unique entity, and only that specific entity, within the dataset. Uniqueness is measured by testing against key structure. For example, is each and every trader identifiable in the dataset using a unique identifier? Is each and every transaction (trade) identifiable using a unique identifier?</td>
</tr>
<tr>
<td><strong>Validity</strong></td>
<td>Validity refers to whether data values are consistent with a defined domain of values. A domain of values may be a defined set of valid values (such as in a reference table), a range of values, or value that can be determined via rules. The data type, format, and precision of expected values must be accounted for in defining the domain. For example, if a trade is reported to have a ‘zero price’, is there a valid reason for this? Is the reason captured in the dataset?</td>
</tr>
</tbody>
</table>

Source: Adapted from DAMA, DAMA-DMBOK: Data Management Body of Knowledge (2nd Edition).
G.2  Accuracy

Accuracy refers to the degree that data correctly represents ‘real-life’ entities. Accuracy can be affected by, amongst other things, measurement errors, instrument precision, misreporting and misclassification.

Accuracy is also relative to what variable the data is trying to measure. For example, a smart watch may record a person’s heart rate and use this to accurately measure whether the person is ‘active’ or ‘at rest’. However the same heart rate readings may be inaccurate when compared to another, more precise source. In this case the heart rate measured by the smart watch accurately measures activity levels but not the numbers of beats per minute of the heart.

Box G.1: Accuracy of matched data

Interstate trade matching

In order to produce a holistic view of allocation trade in the Southern Connected Basin, it was necessary to combine data from the Basin State trade approval authorities. In doing so the ACCC also had to match data across approval authorities for trades that occurred interstate. This matching process was necessary to avoid double counting and get a complete picture of the buyers and sellers (as for an interstate trade each state only holds information on either the buyer or the seller).

For trades between New South Wales and Victoria, it was possible to attempt to perform direct matching of trades as New South Wales records the trade identifier for the incoming or outgoing trade with Victoria (that is, the trade identified acted as a unique common key). For all other trade directions (e.g. between New South Wales and South Australia and South Australia and Victoria) only the account number buyer or seller was recorded (and an account may be associated with multiple trades) so other matching variables were required (date, price and volume).

At the aggregate level, there was very little difference between the volume of water that states reported as either outflows or inflows into their state due to interstate allocation trade. The maximum (over 6 years) difference was 1.4% (representing approximately 14.5 GL of water) between what New South Wales reported as volume going into South Australia versus what South Australia reported as having received from New South Wales in allocation trade.

Table G.2: Aggregate difference in reported volume of interstate trade, 2012–13 to 2019–20 YTD

<table>
<thead>
<tr>
<th></th>
<th>NSW to SA</th>
<th>NSW to VIC</th>
<th>SA to NSW</th>
<th>SA to VIC</th>
<th>VIC to NSW</th>
<th>VIC to SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>% difference in volume (Average)</td>
<td>1.4%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.

Notes: YTD = year to date (2019–20 year to 30 November 2019)

For each matched trade, an assessment of the accuracy of the matching process undertaken relied primarily on creating ‘quality flags’, which took on a value from zero to three based on the number of variables (date, price and volume) matched across the two records, where a higher number indicates higher match quality. For example, if the trade of a water allocation from New South Wales to South Australia was recorded in both states as sharing the same date, price and quantity, the matched trade would have a quality flag of three.

Analysis of the quality flag variable showed that only 26% of matched trades (by volume) perfectly matched on all three indicators. For the remaining matches, 73% of the volume trades share two indicators while 2% exactly matched only one or no indicator at all (in which case the match is the closest trade).
While the number of matched indicators differs by trade direction, the distribution is broadly similar across all directions. The most common mismatched indicator was date. The next most common mismatch was price, with volume between each trade approval authority agreeing the most. The ACCC’s assessment is that date mismatches most likely occur because of how the dates of the application lodgement and approval differ, rather than because of data errors within each states dataset. Mismatches arise because interstate trades essentially entail two separate approval processes – one in the origin state, and another in the destination state – which are joined via interstate interoperability protocols. Price mismatches could occur for the same reason, especially if the buyer and seller do not consistently report price inclusive or exclusive of transactions costs such as brokerage fees. While the quality of matches obtained through the ACCC’s matching process is reasonable given existing processes for approving interstate trade, ideally there should be 100% matching across all directions and all indicators.

**External IIO trade matching**

Similar to interstate trades, external IIO trades (that is, trades which move water from inside to outside the IIO’s network or vice versa) involve two or more trade approval authorities (that is, at a minimum, the IIO itself and the relevant Basin State). As such, information on the trade, particularly the identities of the buyer and seller, may be fragmented across these data sources. The ACCC accordingly attempted to match IIO data to the Basin State registry data to create a holistic view of IIO trades.

Unlike interstate trades, at the aggregate level there were significant differences between what the Basin States reported as the volume of water going into or out of the IIO compared to what the IIOs themselves reported to the ACCC in their trade data. In most cases, the number of trades were within ±10% of the number of trades reported by the Basin States. Volume differences are larger, but these differences in volumes are largely influenced by unmatched outlier trades.
### Figure G.2: Difference in trade numbers reported by IIOs compared to Basin States, 2016-17 to 2019-20YTD

<table>
<thead>
<tr>
<th></th>
<th>Trades into IIO</th>
<th>Trades Out of IIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>CICL</td>
<td>-80%</td>
<td></td>
</tr>
<tr>
<td>CIT</td>
<td>-70%</td>
<td></td>
</tr>
<tr>
<td>MIL</td>
<td>-60%</td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>-50%</td>
<td></td>
</tr>
<tr>
<td>WC</td>
<td>-40%</td>
<td></td>
</tr>
<tr>
<td>WMI</td>
<td>-30%</td>
<td></td>
</tr>
<tr>
<td>RIT</td>
<td>-20%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10%</td>
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<tr>
<td></td>
<td>60%</td>
<td></td>
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<tr>
<td></td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80%</td>
<td></td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on NSW, Victorian and SA governments’ and IIOs’ responses to voluntary information requests and s. 95ZK responses.

Notes: CICL: Coleambally Irrigation Cooperative Limited; CIT: Central Irrigation Trust; MIL: Murray Irrigation Limited; MI: Murrumbidgee Irrigation Limited; WC: West Corurgan; WMI: Western Murray Irrigation Limited; RIT: Renmark Irrigation Trust. YTD = year to date (2019-20 year to 30 November 2019).

In terms of matching individual trades, some IIOs provided the relevant Basin State trade ID which assisted with matching. However, given many IIOs do not record price, in the absence of a trade ID to match on, matching often resorted to matching only on volumes and dates of trade. This was made more difficult by the practice of some IIOs combining multiple parcels of water from within the IIO but submit only a single trade with the Basin State trade approval authority, or to split a trade of water into the IIO into multiple different parcels. This practice is likely the cause of the difference in the number of trades reported by CIT compared to the Basin States as seen in figure G.2 above.

The result of this is that the quality of matches between the IIOs and the Basin States can be poor at the unit record level. Given the lack of price reporting from many IIOs (see table G.4) in most cases it was not possible to produce quality flags in the same manner as for interstate trades. In the case of IIO external trades, dates are also not a reliable indicator of data quality given the different basis for reporting of date (for example, date of approval could be approval by the IIO or the Basin State).

#### Exchange platform trades matching

As exchange platforms contain information on the trade which may be useful for analytical purposes (such as struck date), being able to match records from the exchange platforms to the Basin State trade records should in theory provide a more complete picture of individual trades and therefore enhance data quality.

As part of the analysis of lodgement lags in appendix D, a matched dataset between some of the exchange platforms and the Basin State allocation trade dataset was created.
Trades were initially matched based on the exchange platforms’ records of the application ID for each Basin State trade approval authority. In the case of one exchange platform where the application IDs were not consistent with Basin State trade approval records for a specific period, trades were matched based on:

- volume
- origin trading zone
- destination trading zone
- date of trade approval
- value of trade.

Based on this dataset, somewhere between 65% and 78% of exchange platform trades could be successfully matched to a Basin State trade.

**Figure G.3: Matching rates between selected exchange platform and Basin State trade records**

Some exchange platform trades could not be matched as they may have been within-IIO trades conducted on-platform which may explain the lower matching rate. In addition, some exchange platforms do not consistently record trade identifiers from the Basin State (meaning there is not a universal and unique matching key). For example, identifiers may not be recorded, or may be recorded inconsistently, particularly where the trade involves multiple parcels of water or multiple trade approval authorities.

### G.2.1 Accuracy of water trading information

One data quality issue noted by a number of stakeholders is the issue of zero dollar trades. This issue refers to the fact that considerable proportions of trades recorded in Basin State registry data have a reported price of zero dollars. As noted in section 8.8, some stakeholders allege that some trades may be deliberately misreported as zero dollars in order to influence the average price of water products (e.g. allocations). Other stakeholders are concerned that, even where zero dollars is the real price associated with a trade, it is difficult to determine the purpose or meaning of zero dollar trades (for example, are they simply movements of water allocation between trading zones, or users’ own accounts). The MDBA has also acknowledged problems with zero dollar trades, and has acknowledged the difficulty of determining whether the reported price of zero dollars (or null) is not only an issue of completeness, but also an issue of accuracy. If consideration was paid for the trade and zero dollars or nothing is reported then the data does not correctly reflect ‘real-life’ (that is, the recorded data is
inaccurate). However, in some cases the zero dollars may be accurate (for example if no consideration was paid because the trade was to execute a transfer of water from the same entity’s accounts in different zones). In other cases the zero dollars may reflect the fact that the consideration paid represented a non-standard trade (for example carryover parking), in which case a zero dollar reported, whilst inaccurate, may be more accurate than reporting an actual price. Given accuracy is relative to the purpose, if the purpose of the price field is to capture the price of a ‘commercial trade’ of water, then only prices for market trades should be captured. Omitting data may increase the accuracy of the price for the purposes of determining the market price of water, though it may decrease the accuracy of the total value of all water traded. This is further considered in box G.2.

Analysis in this appendix shows that a significant proportion of trades at zero dollars are either for environmental purposes or trades between the same or related parties. As noted in chapter 4, movements in water allocation between trading zones (whether or not an ownership change has occurred) are sometimes referred to as ‘transfers’ (as opposed to ‘commercial trades’) by some water market participants. This distinction may have overall implications for the accuracy of trade data, depending on the purposes for which it is to be used. If the intention is to measure what is occurring in the system as a whole, there are likely to be less implications for quality than if the intention is to measure water traded in between legitimate buyers and sellers at market prices.

In addition to accuracy of price, accuracy of volume traded is also a potential data quality issue in some circumstances. While trades which occur entirely within the same zone are assumed to be accurate (as there is no other information source on which to calculate accuracy), in the case of interstate trades different approval authorities may record different volumes in some cases (see box G.1), which raises the question of which record is correct.

Accuracy can also be affected by failures in other data quality dimensions. As discussed in box G.4, a lack of referential integrity or common identifiers can have implications for whether activities are recorded against the correct entity. In some cases during the Inquiry records capturing the movement of water have been found to be recorded against multiple unassociated names and this may not accurately reflect the real transfer of water within named accounts. Name inaccuracy can also be a particular concern for corporations, with multiple variations on the legal name of the entity. In one case, one large business was recorded against at least 9 different variations of the name.

For allocation trade, the Basin State trade approval authorities record at least the submitted date (the date an application was lodged) and the approval date (the date the application was approved). However none captured the struck date (or the date that the agreement for the sale was reached). While the submitted and approval dates are accurate for their own purposes, calculation of an average price may be inaccurate when based on approval or submitted date. Take for example, a case where two parties agreed to a trade of water of $X per ML on some date t, however the trade is not submitted until t+1 and not approved until t+2, in the time between period t and t+2 there has been significant rainfall causing the price of water to fall to $Y per ML. Any average calculated on the approval date (t+2) will include a price $X which is higher than $Y. While in some cases this can be somewhat overcome by incorporating data from brokers and exchange platforms (who do record the struck date), water trades that are conducted outside of an exchange platform cannot be assessed against the prevailing market price. It is difficult to assess the accuracy of transacted prices when the prevailing market conditions and context are not recorded.

G.2.2 Accuracy of water accounting information

As discussed in the section on consistency below, the ACCC encountered issues in attempting to apply accounting identities to track credits and debits within individual users’ allocation accounts. One possible explanation for this inconsistency is due to inaccurate data. Accurately assessing account movements may be impeded when water credits and debits do not accurately balance.

1715 Note, however, that both may need to be considered as different types of trade, for example, for the purpose of assessing the aggregate volume of trade (including ‘transfers’ and ‘commercial trades’) between two trading zones against relevant trading rules such as Inter-Valley Trade restrictions.
One key input into water accounting data is usage information. In addition to concerns around whether meters correctly measure the amount of water take, the issue of timeliness (covered later in this appendix) can also impact accuracy. Even if meters were perfect, in the absence of more frequent recordings of meter readings, the information from meters will only be useful for measuring aggregate usage or take and will not be suitable to measuring patterns or trends of usage over time.

G.2.3 Accuracy of water management and other information

Conveyance losses is also an area where the ACCC has concerns about the accuracy of data. The current data and collection methodology are unable to accurately specify the magnitude of conveyance losses from the movement of individual parcels of water or as a result of changing patterns of water trade. However it is noted that given the nature of water deliveries being managed at a ‘bulk’ level, it is unlikely to be able to accurately measure losses for individual movements.

G.3 Completeness

Completeness refers to whether all required data is present. Completeness can be measured at the data set, record or column level. For example, for trade data, data set level completeness would be affected by whether there were any missing trades, record level completeness would be affected by any missing information about a particular trade, and column level completeness would be affected by any missing variables for all trades.

Completeness can also impact on other dimensions of data quality. Incomplete information will affect accuracy (for example in the case of price for trades), and if certain variables used as identifiers are missing (for example ABNs/ACNs of traders) this could impact on integrity of the data.
Box G.2: Completeness of water market information held by the states and IIOs

**Basin State registry analysis**

The capturing of Australian Business Numbers (ABN) and Australian Company Numbers (ACN) for tradeable water right holders is an area in which Basin State registries can improve the completeness of their data. This information is typically captured as an optional field by the Basin State authorities and as a result is often left blank. However, there are sometimes requirements to provide an ACN or an ASIC company extract when a company is involved in trading. No equivalent requirement applies for unincorporated businesses to provide ABNs. Table G.3 below highlights the level of completeness for the ABN/ACN fields for the various state registries in the basin.

<table>
<thead>
<tr>
<th>Basin State</th>
<th>Percentage of water entitlements with either ABN or ACN listed for owner</th>
<th>Percentage of water allocation (by volume) trades with either ABN or ACN listed for either party (Southern Connected Basin only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>n/a</td>
<td>1%</td>
</tr>
<tr>
<td>VIC</td>
<td>4%</td>
<td>9%</td>
</tr>
<tr>
<td>SA</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>QLD</td>
<td>22%</td>
<td>n/a</td>
</tr>
<tr>
<td>ACT</td>
<td>67%</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.

While it is not a requirement to have an ABN or ACN in order to own a tradeable water right (and therefore without such a requirement it will never be possible to reach 100% reporting of ABN or ACN), the ACCC considers it is highly likely that this information has been materially under-reported in a number of state registries. Additionally, the NSW Land Registry Service was not able to provide the ACCC with information relating to their customers ABN or ACN as they do not collect this information. Improving the completeness of the ABN and ACN reporting would enable Basin State registries to more accurately identify trading parties across state boundaries.

Trade pricing information has also been identified as an area where completeness in data reporting can be improved. Over 30% of all trades (by number of trades) in the Southern Connected Basin were reported as zero dollar trades between water years 2012–13 and 2018–19. Similar trade price reporting practices have been observed by all the Basin State registries in the Southern Connected Basin, as shown in figure G.4 below. Legitimate reasons for zero dollar trades exist, such as environmental trades and owners transferring water between their own accounts, and when these are accounted for it reduces the percentage of trades for which a reason for the zero dollar trade cannot be ascertained. It is likely that at least some of these trades reported at zero dollars are commercial trades which have been incorrectly reported, though less than the headline figure suggests, as the analysis in this box shows.

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1716 Includes NSW LRS for entitlement information and WaterNSW for allocation information.
1717 Includes the Qld DNRME only.
1718 This figure is n/a due to absence of allocation trade in ACT.
Figure G.4: Distribution of allocation trade prices reported across the Southern Connected Basin state registries during water year 2018–19

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.
Notes: A density plot shows the distribution of trade prices. Higher densities mean more trades at that price. Upper bound outliers have been removed using the Inter Quartile Range method.

Figure G.5: Proportion of trades with missing or zero price by state, 2012–13 to 2019–20 YTD

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.
Notes: YTD = year to date (2019–20 year to 30 November 2019).

Analysis was conducted on zero dollar allocation trades to determine whether it was possible to account for the reason that zero dollars was reported. Figure G.6 shows that once same and related party trades, trades for the environment and carryover parking are accounted for, the proportion of unaccounted for zero dollar trades by volume is at most a quarter, and in most years only a fifth of all zero dollar trades.
When placed in the context of all allocation trades, the proportion of potentially missing or inaccurate trades falls to less than 20% by volume and less than 30% by number. The proportion of inaccurately reported or missing prices is likely to be even lower once other reasons (such as trades mediated through a third party, which it was not possible to identify with the data available), have been accounted for.

Of the remaining unaccounted for zero dollar trades, almost half involve trades between irrigators or IIOs and other market participants (see figure G.8) as opposed to larger agribusinesses or institutional investors. Where zero dollar trades involve trade to or from IIO licences, the issue of inaccurate price reporting in Basin State registry data becomes linked to the question of trade data recorded by IIOs. For example, if an IIO routinely does not require internal customers to report price, the IIO itself may be unable to report the correct price when making its application to the Basin State on behalf of the internal customer.
IIO analysis

The ACCC acquired data from several IIOs across the Basin on their temporary (water allocation) trades. Although recording practices varied significantly across IIOs, some similarities emerged in the ACCC’s analysis of this data.

Much of the analysis conducted in this Inquiry used an aggregated dataset which joined various smaller datasets source from Basin States’ and IIOs’ registers. This process of aggregating datasets uncovered inconsistencies within the data. These inconsistencies were most obvious for allocation trades into, or out of, an IIO network. In some cases inconsistencies also occurred internally within an IIO’s own records, for example duplicate records or inconsistent formats for transaction identifiers.

Table G.4 illustrates the differences between the data collected from IIOs on allocation trading from 2016–17 to 2018–19. Most IIOs specified the volume of each trade occurring within their network. Over 90% of transactions specified some sort of internal identifier for buyers or sellers, although this information was often not recorded for external parties for trades in to or out of the IIO’s network. Half of the IIOs included in the analysis recorded the date on which a transaction was submitted. In contrast all but one recorded the date on which it was approved by the IIO or Basin State trade approval authority.

A price was recorded for less than 30% of IIO trades overall. It is likely that this number is skewed by some IIOs not recording a price when they intend to record a zero dollar trade, since four of the IIOs did not collect price data at all.
Table G.4: Completeness of IIO field specification from temporary allocation trade data during water years 2016–17 to 2019–20 YTD

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Price</th>
<th>Volume</th>
<th>Party ID</th>
<th>Account ID</th>
<th>Date Submitted</th>
<th>Date Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>CICL</td>
<td>53%</td>
<td>100%</td>
<td>0%</td>
<td>57%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CIT</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>68%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>MI</td>
<td>22%</td>
<td>98%</td>
<td>80%</td>
<td>80%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>MIL</td>
<td>46%</td>
<td>100%</td>
<td>100%</td>
<td>77%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Narromine</td>
<td>78%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>98%</td>
<td>75%</td>
</tr>
<tr>
<td>RIT</td>
<td>0%</td>
<td>77%</td>
<td>6%</td>
<td>6%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>WC</td>
<td>93%</td>
<td>97%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>WMI</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
<td>99%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on IIOs’ responses to voluntary information requests and s. 95ZK responses.

While not formally defined as incomplete information, there are also values which are not being collected by trade approval authorities but which could or should be in order to improve data quality, particularly data integrity and consistency. These include trade and party identifiers (see box G.2), intermediary identifiers and identifiers from exchange platforms. Further, as noted above in section G.1, failure to include sufficient information on the timing of trades can distort the accuracy of derived statistics such as average prices or prevailing prices in a given time period (for example, minimum and maximum daily prices).

In addition to the above examples, and the issues regarding timeliness and accuracy of water metering data, is the difficulty in allocating aggregate usage at the account level to a specific location. Whilst locational information is often attached to the specific meter used to record usage, it is not a straightforward process to link this low level data to the aggregate account usage. The lack of defined spatial boundaries for trading zones also mean that latitude and longitude data (which is often associated with meters) can not be readily mapped to trading zones. Improving the geospatial element of accounting and usage data, where possible, would further enhance the analytical potential of water accounting data.

G.4 Consistency

Consistency refers to ensuring that data values are consistent:
- across different records in different datasets (cross-record consistency)
- within the same record in a single dataset (record-level consistency)
- within the same record across time (temporal consistency)
- across data values or data elements in different systems.

If data is consistent then the same event will be recorded in the same way not only within a single dataset but also across different datasets where that event is recorded multiple times.

For example, for water trade data, if an interstate trade was rejected, the data would be consistent if both approving authorities recorded the trade as being rejected. Data would not be consistent within a dataset if, for example, the status was ‘rejected’ but there was also a valid ‘date of trade approval’.

Consistency between sources is particularly important where there are multiple providers of information, as is the case with water markets. Inconsistent results or irreconcilable differences, can

1719 Date Submitted refers to the date the trade was submitted to the IIO.
1720 Date Approved refers to the date the trade was approved by the IIO or the Basin State Trade Approval Authority (for external trades).
raise data quality concerns about all providers, even where the data quality issues only stem from one of the sources. Box G.3 looks at differences between data sources in relation to trade data.

**Box G.3: Consistency of information sources for trade data**

**Comparing BOM and IIO information**

The BOM publishes information relating to water trading within the basin. This information is provided by Basin State trade approval authorities and IIOs, and published on BOM’s Water Markets Dashboard, and aims to provide greater transparency of trade information within the Basin. Basin States are required to report trade of leases of entitlement and trades of allocation to BOM; IIOs are required to report trade or leases of irrigation right to BOM, although the regulations do not currently clearly distinguish between temporary and permanent trade of irrigation right.

The ACCC has compared the public information published by the BOM with the information provided by the IIOs through the process of the Inquiry to determine the cross-record consistency of the two datasets. The Water Regulations (2008) specify both the type of water information and the type of organisations that need to provide information to the BOM. This includes rural water utilities such as Coleambally Irrigation Co-operative Limited (CICL), Murrumbidgee Irrigation Limited (MI), Murray Irrigation Limited (MIL), Central Irrigation Trust (CIT), and SunWater. Other IIOs outlined in this report including Narromine, Renmark Irrigation Trust (RIT), West Corurgan Private Irrigation (WC), and Western Murray Irrigation (WMI) are not required to provide information to the BOM.

The BOM consolidates trade data from these sources and publishes it on its Water Markets Dashboard, using a consistent set of trading zones to identify the relevant locations of traded rights. In relation to trades involving IIOs, BOM currently only identifies an IIO-specific zone for trades wholly internal to the IIO. For example, MIL is one IIO required to report trade data to BOM. In the BOM trade data, a trade wholly within MIL’s network is identified as a trade where both the origin and destination trading zone is ‘Murray Irrigation’. However, the trading zone for trades to and from MIL is designated as ‘New South Wales Murray Regulated River Water Source / that part of the water source upstream of the River Murray at Picnic Point’ (zone 10); it is currently not possible to distinguish trades into, or out of MIL’s network from trades within zone 10 that occur wholly outside MIL’s network. As such, it is difficult to compare the external trade volumes in the BOM data with the volumes provided by the IIOs themselves. External trades make up a large proportion of the total trade volumes involving IIO networks. Figure G.9 below highlights the relative volumes of the two trade types for CICL, CIT, MI, and MIL.

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1723 This designation is equivalent to ‘Zone 10’ in the MDBA’s inter-state trading zone schema, although BOM does not use this terminology.
Another issue with the cross-record consistency between BOM and the IIOs data is the total reported volume of water traded. Internal trade volumes are not always consistent between BOM data and IIO data provided to the ACCC, as shown in table G.5 below.

**Table G.5: Volumes (ML) of water traded internally in IIOs, as reported by IIOs to ACCC, and BOM Water Markets Dashboard**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IIO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CICL</td>
<td>53,840</td>
<td>54,378</td>
<td>55,135</td>
</tr>
<tr>
<td>CIT</td>
<td>17,927</td>
<td>2,599</td>
<td>25,253</td>
</tr>
<tr>
<td>MIL 1724</td>
<td>430,286</td>
<td>662,048</td>
<td>404,280</td>
</tr>
<tr>
<td>MI</td>
<td>325,321</td>
<td>326,596</td>
<td>435,645</td>
</tr>
</tbody>
</table>

*Source: ACCC analysis based on IIOs’ responses to voluntary information requests and BOM data.*

Some of these differences may be due to definitional issues, for example, the definition of trade versus transfer. In terms of the discrepancy with CIT, the ACCC’s view is that reporting of trades from CIT may be complicated by several factors, particularly that CIT actually operates multiple irrigation districts on behalf of member trusts (meaning that definitions of ‘external’ trade may differ in this case). Note that these discrepancies should not be taken to imply that IIOs are failing to provide information to BOM as required under the regulations; rather, discrepancies emphasise the difficulties of consolidating datasets provided across multiple entities in the absence of clear and shared definitions of different types of trades, and trading zones.

The ACCC also found inconsistencies between water accounting data provided to the Inquiry and publically available sources. This was most prevalent in New South Wales where data on account inflow and outflows could not be reconciled with New South Wales General Purpose Water Accounting Reports (GPWAR) data in some zones.

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1724 MIL provided revised data in February 2021 (2016-17: 504,766; 2017-18: 420,529; 2018-19: 197,902). This revised data was unable to be incorporated fully into the report in time for publication. MIL has stated that it believes that the differences between its figures and those reported by the BOM may be principally due to definitional issues.
The accounting data in New South Wales also had some apparent internal inconsistencies, with basic account identities (for example closing balance = opening balance + inflows – outflows) not balancing for all account holders. This issue was most pronounced with carryover data, with figures reported for carryover into the new water year in many cases not matching what carryover was assumed to be based on the closing balance of the previous year. Accounting rules can change from year to year, even within a year, which can be the cause of these apparent inconsistencies. The ACCC is not suggesting that balances or data are incorrect (and WaterNSW has advised that balances are routinely checked by internal and external parties) but rather that data quality can be affected by apparent inconsistencies (even when the data, in fact, is not inconsistent). Surface level inconsistencies in the data, with no apparent reason to a reasonably well-informed user, can result in lack of confidence around the underlying data.

In terms of water management information, there are issues of consistency of IVT data. Details of the current status of IVT can differ between the relevant Basin State agency and the MDBA. These differences are often related to timing (for example whether the balance is being stored in a continuous series or only for specific points in time), but can make it difficult to reconcile the data between the two sources. This is further complicated by differences in how the IVT balance is stored (for example as the actual balance or the amount available for forward or back trade).

Inconsistent data can have a number of causes, however a common cause is changes to definitions, or definitional differences between data producers. For example, Queensland processes for interstate ‘tagged trade’ operate differently than in other states, which affects reporting of tagged trade volumes and means these volumes are not directly comparable with data on tagged trades in other jurisdictions.

In addition, correctly structuring data, including the provision of relevant identifiers, can make it easier to reconcile two or more different datasets. Often an apparent inconsistency may simply be due to different inclusions or exclusions in the data. However, if it is not possible to join data together then not only is there no opportunity to resolve inconsistencies, but they may also not even be identified in the first place.

G.5 Integrity

Data Integrity includes ideas associated with completeness, accuracy and consistency. Generally there are two types of integrity: referential integrity, which refers to integrity and consistency of data between sources: and structural integrity (or internal consistency), which relates to the consistency or integrity of data within a data source.

Referential integrity has been a key data quality issue faced by the Inquiry in relation to all information sources.
Box G.4: Referential integrity and related data in water markets

At its most basic interpretation referential integrity refers to the ability for a database to keep related data from becoming corrupted. In the water markets context, much of the data is related. For example, that an entitlement belongs to an account and that an account is owned by an entity are examples of related data. Referential integrity is therefore essential to being able to relate piece of data to each other.

In order to have referential integrity, not only is there an ongoing data management requirement to ensure references remain up to date, but there is also a foundational requirement to set up Primary and Foreign Keys on the relevant tables, and this is commonly done through the use of some kind of identifier. These keys must also be unique and mutually exclusive (this is known as entity integrity).

In the context of water markets data, all states maintained identifiers for entitlements/licences and, where they existed, their allocation accounts. All the states also had identifiers for their trades, and one state also had identifiers for all their incoming and outgoing transactions into the water account.

Victoria and New South Wales also maintained identifiers for market participants (for example owners or holders of allocation accounts), however there were issues with these (see below). South Australia, Queensland and the ACT all use account identifiers but do not have separate identifiers for individual entities. This can present a potential data quality issue if the accounts are able to change ownership (see the example at the end of this case study).

For IIOs, the use of identifiers is even more variable. Of the IIOs included in this analysis, one does not use account identifiers, and only two use party identifiers, again presenting potential data quality issues.

Quality of participant identifiers

In Victoria, market participants (or entities) are issued ‘Party Codes’, which are intended to uniquely identify the same participant across all data. Whilst intended to be unique, the same entity may have multiple Party Codes, however DELWP and the Water Corporations have invested in data cleansing to minimise effect of this. Analysis of Victorian data shows that some commercial and government entities have in excess of half a dozen different Party Codes, and at least 5 entities have 20 or more unique Party Codes. For all unique entity names in Victoria, almost 13% had more than one Party Code. However, analysis also shows that in many cases Party Codes remain with entities even when their names change (for instance, due to marriage) this indicates there are processes in place for Party Codes to track an entity through time, and provided that appropriate governance is in place to retain historical names (which the inquiry was unable to asses with the information available), this will lead to improved data quality.

In New South Wales, WaterNSW uses ‘Customer Numbers’ to identify different entities. At least one entity had 13 different Customer Numbers, and of all unique entity names in New South Wales almost 4% had more than one Customer Number.

As noted in section G.1, it is also the case that the same entity might be recorded under several different names. For example, company names may, in one data source, be recorded with Pty Ltd and in another data source, without; or first names may be included in full in some cases but be initialised in other. Machinery of Government changes result in departments having frequent name changes, which particularly impacts on water held by various environmental water holders, where the owner is often listed as the responsible Minister or Department. These issues not only affect comparisons of entities across data sources (such as in different states), but also even amongst the same data source (for example, different names being used for the entitlement versus the allocation).
Lack of trade and other transaction identifiers

Some IIOs lack any trade identifiers. While this alone is not a data quality issue, it becomes problematic when combined with unusual data structures. For example, some IIOs report internal transfers across two rows in a dataset, one row for the buyer side and one for the seller side. In the absence of a trade identifier, joining the buyer and seller side data (for example, to identify who the trade was from or to) relies on making assumptions about the data which may not hold true. This is further exacerbated when the volume of water debited from one account may not match the water credited to another (for example to account for conveyance losses, or where there are multiple buyers and/or sellers participating in a single transaction). This issue was not unique to the IIOs, issue was also present with one Basin State trade approval authority.

For identifiers to be useful, they must also have entity integrity, that is the identifiers must be unique and mutually exclusive. This requires additional considerations when transactions involve multiple parcels of water. In this case, while it is essential for each trade (that is, each unique parcel going from Party A to Party B) to have an identifier (a trade identifier), as noted above, each part of the transaction as a whole needs to have its own identifier (a transaction identifier) as a transaction may consist of multiple trades. In some cases, such as for external trades into or out of the network, IIOs had a transaction identifier but not a trade identifier. When multiple parcels of water were aggregate or disaggregated the lack of a consistent trade identifier made it difficult to match trades from the Basin State register to the equivalent trade in the IIO data.

While the majority of water trading occurs within the same state or IIO and therefore requires only the involvement of a single trade approval authority, a not insignificant amount (approximately 16%) involve more than one approval authority, for example interstate trades and trades out of or into an IIO. Some trades can even involve 3 or more approval authorities. As noted above, while most approval authorities maintain their own trade identifiers, in general there is no collaboration across approval authorities to use the same, (globally-consistent) set of trade identifiers, and the recording of trade identifiers used by another approval authority is less consistent. For example, South Australia, Victoria and New South Wales each use their own sets of trade identifiers. NSW data provided to the ACCC recorded both the NSW and interstate trade identifiers in the case of interstate trade involving NSW; but data provided by other Basin States did not. Only some of the IIOs record the relevant Basin State trade identifier for internal and external trades. As noted in box G.2 this can have implications for the accuracy of matched data.

In addition to trade data, other transactions (such as forfeits, allocations and other debits and credits to water accounts) should also be associated with identifiers (both an individual transaction identifier and the identifier of the account to which the transaction relates). This would enable information from multiple sources to be seamlessly combined for more detailed analysis.

Implications for lack of identifiers

Apart from the risks of orphans and duplicate data if identifiers are not correctly managed, the lack of robust identifiers and can result in lack of integrity (particularly when combining multiple data sources).

For example water entitlements (which can and do legally change hands, potentially multiple times). While all states have identifiers for the entitlements themselves, if these are not associated with party identifiers, as well as a historical record of the relationship between the entitlement and the party, it may not be possible to recreate historical information about what has occurred in the past. This issue was realised not only with entitlement ownership data but also entitlement and allocation trade data in New South Wales. Neither NSW Land Registry Services (LRS) (as holders and managers of the data) or WaterNSW (as key users of the data) were able to provide a dataset listing the owner of a water access licence (WAL) at a historical point in time. This led to numerous issues with NSW entitlement trade and ownership data:
WaterNSW provided water allocation trade data, with the ‘buyer’ and ‘seller’ fields listing the current owner of the relevant WAL. This means that this dataset may inaccurately represent allocation trading activity for a particular market participant where a WAL has changed hands over time.

LRS provided a list of WAL ‘dealings’, which includes ownership changes of WALs, subdivisions, amalgamations and cancellations, but not trade of share component. Where an ownership change occurs, LRS provided two fields: ‘Holders on title’, listing the names of WAL holders prior to the dealing, and ‘Incoming holders’, listing the names of WAL holders post-dealing. This means that ownership changes can be deduced by comparing these two fields, but this requires manual comparison, and errors could be introduced, if, for example, there was a misspelling of the name of a holder who was a continuing holder (that is, their name was listed in the ‘Holders on title’ and ‘Incoming holders’ fields).

LRS also separately provided a dataset of ‘share component trades’: this is a trade in which the volume or share component is reduced for one WAL, and commensurately increased for another WAL, without the WALs themselves changing ownership. LRS advised that they were unable to extract or provide information required by the inquiry, namely, the historical ownership of the WAL at the time of the trades (although they could provide information to enable the ACCC to create historical ownership information). This means that there is no readily accessible record of who was involved in share component trades. For a standard WAL transfer the share component being traded is not required to be collected as part of operating the WAL Register and was therefore unable to be supplied, NSW LRS was only able to report on the volume share of the WAL as it currently stood, not at the time that the trade was made. It is possible that if the data had referential integrity back to a centralised point in time historical dataset that this information could be produced.

This inability to provide reliable records of ownership and WAL volumes before and after trade is a serious shortcoming and indicates that LRS systems, whilst being reliable for the purposes of water management and the legislated functions of NSW LRS, are currently not fit-for-purpose for providing readily accessible and complete information for analytical purposes.

These issues had significant implications for the ACCC’s analysis of historical market activity, and also have broader implications for the quality of any analysis requiring an accurate and complete time series or historical trade records.

For the purposes of the Inquiry, the ACCC has ‘backward engineered’ WAL ownership for this dataset by meshing together this dataset with the WAL dealings dataset described above. While this ‘backward engineering’ was technically possible, it was difficult to assess the quality of the resulting outputs as any corruption of the underlying data will result in errors in this process. Further, such processes also require a level of sophistication which may not be available in all agencies (as was the case with NSW LRS).

Lack of appropriate integrity also has implications for trade analysis. Take another example: if Account 1 was owned by Party A, Jane Doe and was subsequently sold to Party B, John Smith, if the only identifier in a dataset is that some action was performed by the owner of Account 1, we may not know if this action was undertaken by Jane Doe or John Smith unless these information is also recorded in the dataset. However even when the name of the entity is recorded, further issues can potential arise. If after selling Account 1, Jane Doe married and changed her name to Jane Nguyen and then established Account 2, with only the names available we cannot analyse the actions that Party A (Jane Nguyen nee Doe) performed across both accounts.

Lack of referential analysis can also make aggregate analysis difficult. For example, it may be desirable (or even essential), to analyse the total activity of an individual market participant (as opposed to their activity against only a single account or entitlement). If it is not possible to relate each account back to an entity this makes this type of analysis much more difficult. While using the same names can be one potential solution, as noted in section G.1 Accuracy, a single entity may not have its name accurately or consistently recorded.
Issues relating to structural integrity have largely already been considered above in relation to the Consistency dimension of data quality.

Another aspect of integrity is domain integrity, which relates to ensuring that data in a field contains valid values. This is considered in more detail in section G.9. Validity.

G.6 Reasonability

Reasonability asks whether a data pattern meets expectations (in its given context). Data may be seen to be unreasonable where it does not meet expectations and there is no credible explanation as to why. For example, if average water prices (the data) were to fall significantly during a period of drought and less water allocation (the context) this would not fit into expectations around the effect of supply and demand on prices. In the absence of an alternative explanation as to why the data does not meet expectations, then it is possible that the data has quality issues.

Where multiple data sources measure the same entity or event, it may be possible to assess reasonableness by assessing whether data sources are broadly in agreement, for example by showing the same trends or yielding the same conclusions.

Reasonability tends to be more relevant for sample or survey data, where sampling and non-sampling errors can cause measurement errors which can result in data failing to meet expectations. Where data is administrative in nature, or a census, as is the case with most water market information, data is unlikely to be unreasonable in the absence of any other data quality issues, because it represents a complete picture of the state of affairs.

Notwithstanding the above, derived data (for example the calculations of averages or other summary statistics), can have issues with reasonableness if the summary statistics do not well represent the distribution of the data as a whole. Here the summary data does not meet the expectations in the context of the source data. The case study below examines this notion in more detail in relation to the calculation of average water prices.
Market participants often want to understand what the ‘current’ or ‘prevailing’ price of water products is, and how this changes over time. This gives rise to the question of how best to aggregate price information from individual trades into some kind of average or aggregate indicator. Many different methodologies are currently in use, including simple measures such as medians or simple averages, and more complex methods such as Volume-Weighted Average Price (VWAP) or methods which rely on computer modelling of price movements. Further, due to the known issues in Basin water markets data, many methodologies also apply some kind of ‘cleaning’ to raw trade data prior to calculating the average or aggregate indicator, such as removing of outliers.

In 2019, ABARES reviewed a number of different methodologies and recommended the use of General Additive Models (GAM) for the calculation of average price series for allocations and entitlements. The rationale was that GAM methods produce lower error and best overall performance. Despite this recommendation, most public reports either use a simple median or a VWAP with some removal of outliers. While simple median methods were included in the ABARES analysis, VWAP methods were not. Generally, VWAP methods are easier to implement, understand and interpret than the smoothing methods recommended by ABARES and thus results may seem more reasonable. The ACCC has not sought to replicate the analysis undertaken by ABARES, but has tested the following propositions:

- that GAM results can produce unexpected results
- that VWAP methods are broadly reasonable enough to be considered a substitute for the more complex GAM method, even if GAM produces the most accurate results in theory.

VWAPs can be ‘rolling’, where calculations include data for a certain number of days (e.g. 14 days) from the reference date (the date the price is being calculated for) being included, either after the reference date (‘left aligned’), before the reference date (‘right aligned’) or on either side of the reference date (‘centre aligned’). They can also be ‘tumbling’, where each reference period (for example a week) is mutually exclusive and only prices from that period are used to calculate a VWAP for the whole period. VWAPs can also be calculated using means or medians (where means are more common because they are easier to weight).

Where the GAM method seems to excel is in two areas:

- being able to provide a ‘smooth’ daily estimate of price
- remaining stable even with few (but not zero) prices.

This is particularly evident when looking at the period leading up to and after the new water year (where there are fewer transactions, as well as some days of zero transactions due to seasonal closures of trade processing). As shown in figure G.10, the two VWAP methods both show temporary price drops before returning to roughly the same level, whereas the GAM smooths over the drop. It is an open question as to which method is more reasonable; on the one hand the GAM prices remain consistent and smooth and potentially better estimate what the price of water would have been during that period had there been more transactions, given prices returned to that level. In effect GAM smooths out any short term changes in price and attempts to capture the overall trend. On the other hand, the end and beginning of the water year have less transactions because there is less demand for water and therefore water potentially does trade at a temporarily reduced price. So whether such short term changes are reasonable likely depend on the purpose of the data: providing an up-to-the-minute estimate of prices or showing the longer term trends in water prices.
The tendency of GAM to find the trend in the data, while useful for longer term analysis, can have some interesting side effects. Consider the Water for Fodder (WFF) program where participants could purchase 50 ML of water from South Australia for $100 per ML, well below the prevailing market price at the time. The program was announced in November 2019, however trades were not approved until at the earliest 2 January 2020. As would be expected, these trades had a downward effect on prices.

As figure G.11 shows based on the VWAP there was some downward pressure on prices in December 2019 (due to some outlier trades at very low values), the average returned to close to $800 per ML toward the end of 2019, and then dropped and remained low in the first quarter of 2020 due in large part to the WFF trades. However this nuance is potentially lost in the GAM series which peaks on 30 November 2019 and slowly declines and remains low in the first quarter of 2020; this trajectory occurs because the GAM method employs local smoothing, incorporating information from forwards and backwards and so the WFF trades in January 2020 are influencing the price series in December. Again in terms of reasonableness, which series is more reasonable depends on the purpose of the analysis. The GAM series robustly ignores the outliers in late 2019 but also displays a downward trend over a longer period of time, the VWAP series is more influenced by short term movements but correctly identifies the timing of the WFF program’s influence on prices.
In summary, it may not be possible to determine one single method that is optimal for expressing average or aggregate water price trends in all situations. The GAM method recommended by ABARES, as their analysis shows, demonstrates good overall performance, lower error and as the above analysis shows a strong indication of the trend in water prices. For longer term analysis this may be the most reasonable, but it may not satisfy the requirements for short term pricing of water, especially given its complexity to implement and the potential for later events to affect price derivations in earlier periods. In particular, where it is important to capture significant short-term price movements or series breaks, the GAM method may be less appropriate than other methodologies which do not ‘smooth out’ such fluctuations.

G.7 Timeliness

Timeliness can refer to the difference between when an event happens and when data about the event becomes available. It can also refer to the difference between when data is expected or advertised to become available and the date in which it is actually available. Length delays between the actual event and data becoming available are likely to have implications for how up to date or reliable the data is.

G.7.1 Timeliness of water trading information

In general, for all water trade information, timeliness for at least one source of data is generally good (relative to the date of approval). For example, in NSW and Victoria information about trades is generally available on the water registry website a short period after trade approval. However, for aggregated or consolidated data (such as that from BoM), information is less timely. Where close-to-real time information on water prices is required, these timeliness issues can be significant for market participants.

In order to assess the timeliness of publicly available finalised trade data, historical data on finalised allocation trades in the Southern Basin was periodically collected from the Waterflow website over a number of weeks to assess the length of time it took for most trades for a given period to be reported. On average, over half (56%) of finalised trades were published on Waterflow within 2 weeks of the trade being finalised. Almost all (91%) of finalised trades were available within 3 weeks of the trade being finalised. However, only 2% of trades were available within the first week.

1726 Data on approved trades is updated daily on the Victorian Water Register website. Data in allocation trade opportunities on the website is managed in real-time.

1727 That is, not including broker trade data also available from Waterflow, based on BoM data only.
The result of the lag between the trade being finalised and being published is that any derived data based on finalised trade data, particularly averages, are likely to be subject to significant revisions as more data is published. Figure G.13 below shows the VWAP which would have been calculated in the first, second, third and sixth weeks after the trade was finalised. It shows that the average calculated in the first week bears little resemblance to the final average price, at best correctly showing that prices went down at some point over the period. While the average stabilised in weeks 2 and 3, there is still some further revision.

Given the issues that historical finalised trade data has with timeliness, more timely data (for example data on trades available prior to finalisation) would be required to calculate robust average prices in a timely manner.

Waterflow also includes some data from brokers on current bids and offers, as well as historical trade data from broker or exchange platform websites (rather than from Basin State registry data). This goes some way to addressing timeliness issues with registry data, as it supplements finalised data; however,
it is limited to that set of trades which are facilitated on participating broker or exchange platforms. Currently this broker data does not feed into average price calculations. There is some indication that market participants evaluate the current price of water with reference to comparable trades, rather than an average or spot price, in which case calculation of a timely average price is less important than having access to information about recent trades consolidated in a single location.

Prices for trades are generally calculated based on the approval date of the trade, however this may be some days after the price of the water was agreed (the struck date), particularly if the price was agreed through the use of an exchange platform or other third party. The more time that passes between the agreed price being set and the trade being approved (that is, the less timeliness there is in the data), the more this difference could distort average prices and other statistics, particularly if the price of water is rapidly rising or falling.

G.7.2 Timeliness of water accounting information

In terms of water market accounting data, granular information about inflows and outflows to individual account holders is not made publicly available and therefore there are no timeliness issues to consider from the perspective of public data. For internal users of the water accounting data (for example, the Basin State trade approval authorities themselves, and individual account holders), there are no indications that timeliness is an issue given that the states themselves operate the systems from which data is extracted. With the data available to the Inquiry it was not possible to investigate the timeliness of individuals being able to access their own information from relevant authorities. However, aggregated water market accounting data does exhibit significant delays. For example, as at 25 November 2020, 2018–19 is the most recent year for which New South Wales General Purpose Water Accounting Reports \(^{1728}\) and (finalised) National Water Accounts \(^{1729}\) are available.

G.7.3 Timeliness of water management and other information

For water management and other information, IVT account balance data can have issues with timeliness. In theory, the balance of an IVT account should be continuously recorded as each separate transaction affects the balance individually. While information on the Goulburn IVT account is recorded near continuously, the Murrumbidgee IVT account balance is only stored as an end-of-day balance. While this is sufficient for many purposes, when trying to conduct intra-day analysis or analysis of very specific openings then the difference between the event occurring (a credit or debit to the balance), and the balance being recorded at the end of the day, can be insufficient despite it being less than 24 hours.

Water usage information in the Basin is generally collected by water meters or estimated via computer models. Information from water meters is (usually) periodically read by or sent to the relevant Basin State authority who then debits the water from the holder’s account. While meters continuously read consumption at the point of usage, in some cases this is only reported periodically so there can, at times, be a large gap between when the usage occurred and when the information about that usage is reported (in aggregate). For example, if an irrigator had their meter read quarterly, and in the first quarter of a year used 10 ML a day for the first month, 200 ML a day in the second month, and 0 ML a day in the third their usage would only be recorded once on the 31 March as 5910 ML. This single data point does not give any information as to the pattern of usage beyond it being used in the first quarter of the year. Even calculating an average per day usage would be inaccurate for any given day in the period. The timeliness of usage information can be approximately inferred from the frequency of debits from water accounts. This analysis shows that there is a clear difference between the frequency of account debits (and therefore meter reads) recorded for South Australia accounts, compared to New South Wales and Victoria. The median difference in New South Wales and Victoria is one day, which suggests that at least 50% of usage debits in the Southern Connected Basin are occurring at daily intervals in New South Wales and Victoria.

Table G.6: Mean and median time (in days) between account debits by state, Southern Connected Basin

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Victoria</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>SA</td>
<td>67</td>
<td>74</td>
</tr>
</tbody>
</table>

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.

Further analysis of the average number of days between usage debits for each account in South Australia, New South Wales and Victoria shows that in New South Wales the density peaks at 14 days (and then falls off), whereas for South Australia it peaks at 90 days (with some variation) and Victoria shows an even distribution across days. This suggests for South Australia the typical lag between actual usage and recorded usage is 90 days, whereas for New South Wales it is 14 days. The data for Victoria is harder to interpret, but based on the average and median the typical lag is somewhere between New South Wales and South Australia (but closer to New South Wales).

Figure G.14: Density of Average days between usage debits by state, Southern Connected Basin

Source: ACCC analysis based on NSW, Victorian and SA governments’ responses to voluntary information requests.
Notes: This density plot shows the distribution of water allocation accounts. Higher densities mean more accounts had an average days at that point.

G.8 Uniqueness and deduplication

Uniqueness requires that no entity exists more than once within the data set.

Few issues with unexplained duplicate data were encountered during the course of the inquiry, suggesting there are processes in place to ensure duplication does not generally occur.

One issue of note however was that for a number of data providers, information relating to trades was recorded across multiple rows of a dataset, with one row containing information about the seller and another containing information about the buyer. One state also provided multiple rows of data for each every time the trade record was updated during the approval process (for example, one row representing the transaction at the time the application was submitted, another at the time it was approved; and sometimes with additional rows showing intervening steps). While technically this results in duplicate data, neither of these on their own present data quality issues (provided there are no referential integrity issues, see the case study in box G.4). However this type of duplication can increase the complexity of the data which can create data quality issues when the data is transformed into a ‘1 row per trade’ format (which is optimal for analysis). This is further discussed in section G.10 Other data quality issues.
G.9 Validity

Validity refers to whether data values are consistent with a defined domain of values. Value domains may specify a specific format, data type or range or the value domain may be enumerated (that is, restricted to a specific list of codes or values).

As with duplicate data, few issues with validity have been encountered by the Inquiry team across all types and sources of data. However one significant issue relates not to validity within data sources, but rather validity across sources, and that is reporting of trading zones. The BOM reports water trade data against either a Trading Zone or Water Resource Plan Area. While concordances exist to translate data into a Trading Zone, failure to have universal and publicly available concordance tables could result in data quality issues across a number of dimensions, including validity, completeness and coherence. Similarly, definitions of the Southern Connected Basin also exist. Where possible, these concordances and definitions should be standardised and data should be published using the standardised classification, even if this means publishing multiple versions of the data.

Another quality issue relating to validity which was observed primarily in IIO trade data was the use of free text fields for the reporting of data items which should instead be reported against an enumerated and defined domain of values (such as a code list or classification). In some cases IIOs use free text fields as quasi trade IDs, but these IDs were inconsistently reported and defined. Additional information which had potential analytical value was also stored in ‘notes’ fields, which made consistent extracting relevant information problematic.

G.10 Other Data Quality Issues

While high quality data is important, if the data itself is not appropriately managed, understood and maintained, this can result in:

- data not being shared, because data owners are unable to extract it from their systems or compile data into an appropriate form for sharing
- data not being understood, either by the data owners or recipients of shared data
- data errors, through incorrect compilation or interpretation of the data.

G.10.1 Data Governance and Management

Most water market data is sourced from water registers or water management systems, and as such may be classed as an administrative by-product, as opposed to survey data or primary or secondary data. According to the Australian Bureau of Statistics (ABS), ‘Administrative by-product data are produced by an agency in the course of providing services and/or undertaking their core business.’

Administrative by-product data is often a rich data source and increasingly being used in the compilation of official statistics. However, one side-effect of administrative data is that more often than not it is not collected for statistical or analytical purposes. This has particularly been the case for water markets data, which is primarily collected for the purposes of service delivery and physical water management. Many of the data quality issues identified in this appendix are due to decisions agencies made about data that allow them to best operate the system (for example to manage the movement of water between accounts), rather than to produce analytical outputs or to facilitate market monitoring. For example, the practice of recording trades in two parts (against the buyer and seller separately) makes sense when the purpose is to correctly debit and credit water accounts, but this comes at the expense of a single row per trade dataset, suitable for aggregate reporting and statistical analysis.

There were also a number of instances over the course of the Inquiry where data providers (Basin State agencies and IIOs included) were unable to supply the data requested of them either because it was simply not available, or the provider lacked the technical expertise to be able to extract it from the relevant IT systems. One key example was water accounting data in NSW which, due to system design, had to be compiled from the various inputs to the accounts as WaterNSW does not store historical data.
outputs to their accounts data, and transactional lists are limited to a single water year at a time. WaterNSW creates transactional account statements dynamically from the water accounting system when required, (for example, creating statements at the end of the water year). Further, some IIOs could not provide ownership details for accounts which no longer existed. There were also the issues identified in box G.4 in relation to NSW LRS.

While the primary function of many of these agencies and IIOs will be service delivery, greater focus on other uses of the data, beyond service delivery, would likely go some way to identifying and improving data quality issues at the source. In particular, reviewing data sources through the lens of their suitability for market monitoring and analysis would be a valuable exercise.

Improvements to systems and processes to support the dual purposes of service delivery and end to end management of market information will likely require some level of technical expertise to implement, which may be beyond the current capabilities of some IIOs given the issues identified in section 10.3.3 of the main report. Introduction of data governance and data management policies and practices will also be required in order to reduce quality issues at the source of the data, and this may require new skills and capabilities to be introduced to the agencies and IIOs. Again, this may be more feasible for government departments than it is for IIOs.

G.10.2 Accessibility, Interpretability and Transparency

Data governance and data management are important internal foundations on which evidence-based outcomes rest; if the evidence lacks quality, the conclusions that can be derived from that evidence will be limited. However, in addition to having high data quality, accessibility and interpretability are important externally facing foundations, and are needed to ensure that data users can make the best use of data resources, whatever their quality.

According to the ABS:

Accessibility refers to the ease of access to data by users, including the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which information can be accessed. The cost of the information may also represent an aspect of accessibility for some users. Accessibility is a key component of quality as it relates directly to the capacity of users to identify the availability of relevant information, and then to access it in a convenient and suitable manner.\(^{1731}\)

Poor data quality can lead to a reluctance to make data more accessible, or may lead to a lack of confidence in using the data. In addition there may be privacy implications for the level of data shared.

Interpretability is about ensuring that sufficient information is available in order to help provide insights into the data. This can include things like information on the structure of the datasets and other associated metadata, such as concepts and classifications. This is important as it enables information and data to be used appropriately and with due care. As part of information requests to Basin States and other data holders, the ACCC requested information that would help to interpret the data provided. While almost all data holders were able to provide some information, much of it was informally documented. Only one data holder (Victorian Department of Environment, Land, Water and Planning) provided formal documentation on the data models used in their underlying data warehouse.

In the vast majority of cases, officials from the relevant data holders had extensive understanding as to the meaning and interpretation of variables within the data, or as to why certain data was the way that it was. However, an over-reliance on people, rather than documentation, as a storage mechanism for this contextual information introduces a potentially unacceptable level of ‘key-person risk’ (that is, the risk that data sources are compromised or core information is lost if, for example, a key person with core institutional knowledge moves on from the organisation).

\(^{1731}\) https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/1520.0Main%20Features9May%202009?opensource&tabname=Summary&prodno=1520.0&issue=May%202009&num=&view=, viewed 9 December 2020
As noted in chapter 11, good quality and timely water information is key to providing confidence and enabling informed trading decisions across the Basin water markets. Pro-active disclosure and increased accessibility of both metadata and data will not only enhance data quality, particularly for derivative data, but increase transparency and therefore confidence in the market. Furthermore it will enhance evidence-based decision making by ensuring data that is used to inform decisions is fit for purpose.
Appendix H – Smart markets as a potential long-term solution for water trading in the Murray–Darling Basin

H.1 Overview

The ACCC has identified various problems relating to interzone trade and the impacts on third parties, including the environment. One potential solution to these may be a smart market or water market operator. The following is one type of model that could be used, and there may be other models that are more appropriate. It still remains to be proven that there are large enough problems with the market operation to justify a reform of this kind.

A smart market is a centralised computer-assisted market which takes information from buyers and sellers (in the form of bids and offer curves) and which computes the trading outcomes that maximise the gains from trade subject to the physical limits of the underlying infrastructure. In the case of the Southern Connected Murray-Darling Basin the physical limits of the underlying infrastructure take two forms: (a) the delays in water transportation as water flows through the system of weirs and sluice gates; and (b) the maximum and minimum flows in the system consistent with preventing damage to infrastructure or the environment.

Smart markets are used extensively in energy markets, and the ACCC acknowledges that there are key differences between these markets and the water market. However there are enough similarities that the ACCC believes that this option is worth exploring.

H.2 Problems with the status quo

As discussed in chapters 13 to 16, many of the issues in the market stem from a mismatch between the implicit property rights and the underlying hydrological reality. These problems have become more material over time as water use patterns have changed, water has become more valuable, and climate change is increasing the scarcity and variability of inflows.

There are two main categories of problems with the property rights. The first category relates to rights to water allocation and storage; the second category relates to rights to deliver water (the use of the river network infrastructure). This proposal only addresses questions relating to the use of the river infrastructure. The property rights relating to storage and carryover can be addressed separately and are not covered in this model.

This appendix focuses on resolving the issues related to managing delivery capacity. At present constraints on the river infrastructure are largely or imperfectly defined ignored in the definition of property rights to water. As a consequence, there is a risk that the changing patterns of water use (brought about as a result of water trade) will lead to flows which exceed the capability of the network to handle, leading to either curtailment of flows or extractions (with consequential economic harm to water users), or damage to the network itself.

The effect of this imperfection in existing property rights is that:

- water users do not have an incentive to put water to its highest-value use
- there are third-party effects associated with water use, delivery, and storage decisions

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1732 Note that the ACCC refers to property rights throughout this report with reference to their definition in economic theory, which is that a property right implies ‘the powers to consume, obtain income from, and alienate ... assets’. Economic theory commonly notes characteristics of property rights as excludable, enforceable and transferrable and can include ‘incomplete’ property rights. The extent to which statutory water rights have proprietary characteristics appears to vary between different types of statutory right – see ICM Agriculture Pty Ltd v The Commonwealth, Barzel Y, 1997, Economic analysis of property rights (2nd edition), Cambridge University Press, p. 64.
water trade occurs even when it is not socially beneficial and some water trades that are socially beneficial do not occur

there is an overlay of administrative restraints on trade (e.g., IVT limits) which are a source of friction and which give rise to windfall gains for those who manage to overcome the limits.

Viewed through the lens of property rights, the problems with the current market arrangements derive from the lack of effective mechanisms for signalling (and efficiently rationing) the scarcity of network capacity. One solution may be to define tradeable delivery-capacity rights for the choke or pinch-points on the network, and to require that all users of those choke points at times of congestion hold delivery rights.

The accurate definition of delivery-capacity right shares may be impractical. Although in principle it might be possible to define delivery-capacity rights for all segments of the river, defining, pricing, and enforcing these rights as flow changes over the system is almost certainly infeasible in practice.

H.3 Operation

This market requires two types of market participants (who may be the same person): water users or extractors who desire to extract water from the system at a specific location, and water owners or water injectors, who have the ability to inject water into the system (typically through providing instructions for a release from storage).

A key difference between a smart market for water and a smart market for electricity is in the time period covered by the market. Water takes time to move through a water network. In a largely gravity-fed water network, such as the Murray–Darling Basin, it takes several weeks for water to move from the major upstream storages to the mouth of the Murray. These delays are a key characteristic of the physical infrastructure that must be taken into account. For this reason, a smart market for water must determine not only water injection and extraction in the short term (over the next 24 hours, say), but must also determine forward promises to inject or extract over several days (perhaps 30–60 days) into the future.

Each day, the water market would operate as follows: market participants who desire to inject or extract water would submit a supply or demand curve (respectively) to the water market operator, both for the immediate future (next 24 hours) and potentially for each day out over the time horizon of the market (say 30 days). The water market operator would assess the current state of the network, including the physical characteristics and limits of the network, and would carry out a mathematical optimization process to determine the combination of injections and withdrawals which maximise the gains from trade subject to the physical limits of the infrastructure. A by-product of this process is the set of corresponding prices (spot and forward prices) for water – both water delivered immediately, and water to be delivered in the future. The water market operator would then issue instructions to the water market participants who would be required to inject or extract the corresponding amount over the next 24 hours, and would be paid the corresponding prices. The water market operator would also communicate any future obligations or promises to inject or extract in the future (such obligations do not need to be fulfilled until real-time, and can be offset by making offsetting trades up until real-time).

There are several key benefits of a smart market approach to water trading:

- Provided certain conditions are satisfied (specifically, provided there is effective competition, and provided the water market operator is able to accurately model the hydrological constraints in the water network) the outcome of the smart market maximises overall economic welfare. In other words, the total gains from trade are exhausted, subject to the physical constraints of the river infrastructure.

- The resulting prices provide efficient signals to all market participants – including efficient signals for the injection and extraction of water and efficient incentives for investment in water-related production and consumption assets, such as investment in crops (including permanent plantings) and on-farm water storage. The prices also provide efficient signals for investment in the infrastructure itself, such as widening or deepening of river channels or construction of new canals.
In principle, the smart market can also provide the water market operator with guidance on how to use its control over the water network (e.g., heights of weirs, diversion into storage ponds) in ways which maximises overall welfare.

In principle, environmental objectives can be incorporated and addressed in two ways: either (a) through an environmental market participant submitting supply and demand curves; or (b) in the specification of the physical limits of the infrastructure.

The approach is potentially robust to long-term developments in the sector, including further changes in inflows and water use patterns. There should be no need for any further overhaul of the water trading arrangements provided the conditions set out above continue to hold.

The approach eliminates the need for administrative discretion in the operating of trading arrangements.

The establishment of a smart market for water trading arrangements in the Murray–Darling Basin offers the potential for long-term sensible and sustainable reform which promotes the long-term interests of water users and investors in the Murray–Darling Basin.

At the same time, there remain several issues that would need to be resolved:

- It would be necessary to establish a sufficiently accurate hydrological model of the river network. Factors that will need to be taken into account are conveyance losses, interaction with groundwater, and return flows. The MDBA and Basin States already have models of water flows in the Murray–Darling Basin. These would have to be developed further.

- The precise specification of the water market operator’s mathematical optimisation would need to be determined. For example, there are questions as to whether the optimisation can be formulated as a “linear program” which can be solved quickly and easily, or whether more complex algorithms would be required.

- There are important questions about how any transition to the new market design would occur. A key question is whether it is possible to roll out such a market in a progressive manner, or whether a once-off “big bang” approach is required.

There would likely be a material one-off start-up or establishment cost associated with a move to a smart market. Amongst other things, there are the establishment costs of the water market operator itself, and the costs of training water users to make effective use of the market for their own ends.

### H.4 The design of the proposed smart market for surface water

In order to establish the proposed smart market, certain preliminary actions would need to be taken, as explained below:

1. First, an appropriate time interval for the market should be determined, and an appropriate time horizon. At this stage the proposed market could operate at an interval of one day, and a time horizon of 30–60 days (according to the length of time it takes water to flow through the system).

2. Second, market participants – at all locations up and down the river – must register as either water injectors, or water extractors (or both). All water injections and extractions must be accurately measured at the location of injection or extraction (in other words, effective, high-quality metering is essential). Water injectors would be holders of rights to inflows (that is, those who hold a tradeable water right and receive a “water allocation” under the existing arrangements). These would typically be held in a storage, in which case the point of injection is at the point of outflow from the dam. In principle, holders of rights to inflows in unregulated tributaries could also be allowed to participate as injectors. In principle, owners of on-farm storage may also be able to register as injectors provided the injected water can be accurately measured and provided the injected water meets quality requirements (particularly salinity).

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1733 That is, provided there is effective competition in the market, and provided it is possible to model water flows in the system.

1734 Raffensperger et al (2009), in their proposal for a groundwater market, propose a time interval of one week, and a time horizon of one year.
Third, it would be necessary to develop a hydrological model of water flows in the Murray–Darling Basin. Specifically, the operator would need to know: how does water flow between the segments of the network? How does the water flow rate over each weir, flume, or sluice gate depend on factors such as the height of the water? How much water is lost due to evapotranspiration and conveyance losses, and how does this relate to factors such as weather conditions and the height of the water in each segment? What are the interactions with groundwater?

The proposed water market would operate as follows:

- Each water day, water users (that is, extractors) who desire to extract water from the network, either immediately or in the near future up to the time horizon, would submit a demand/offer curve for water to the water market operator (WMO) for extraction at a specific location. To illustrate, here are some example demand curves:
  - “I would like to extract 20 ML from location X, over the next 24 hours, as long as the price of water at X does not exceed $500/ML.”
  - “I would like to extract 10 ML per day from location Y, starting in 7 days and extending to 14 days in the future.”
  - “I would like to extract 100 ML per day from location Z, on any day when the price is below $100/ML, reducing to 50 ML on any day when the price is below $200/ML, otherwise nothing.”

- Similarly, water owners (that is, injectors) who have (or expect to have) water in their account for a specific location would submit a supply curve for injecting water at that location (typically the location of the dam/storage). Here are some example supply curves:
  - “I am prepared to inject up to 20 MW at location Z, over the next 24 hours, provided the price does not drop below $200/ML.”
  - “I am willing to inject 200 ML per day on any day when the price is above $500/ML.”

- The water market operator takes all of the supply and demand curves and finds the combination of injections and extractions which maximises the gains from trade subject to the physical constraints of the water network. This process results (as a by-product) in the price for water at each location on the network on each day out to the time horizon. Each water market participant receives back from the water market operator:
  - the spot price for water at each location on the network, for the next 24 hours, and instructions on how much the participant must inject or extract at his/her location over the next 24 hours
  - the future price for water at each location on the network, for each day in the future out to the end of the time horizon, together with instructions on the obligation to inject/extract water that the participant has incurred.

- The water market operator would then monitor compliance with the instructions or obligations provided by the market, and would ensure that market participants settle at the corresponding prices.

Provided there is effective competition at each location for injection and withdrawal, each market participant has an incentive to submit a bid/offer curve which reflects their true demand/supply curve. Provided the water market operator correctly models the hydrology of the network (injections, withdrawals, flows, levels, losses), the resulting prices and injections/withdrawals maximise the total gains from trade in the system, guaranteeing that the market is extracting the maximum benefit from the network subject to the physical and environmental constraints.

A few points are worth emphasising:

- There is only a single price for water at each location at each point in time – in other words, the price that must be paid to extract water is the same as the price paid to a user for injecting water at the same location at a given point in time.

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1735 For this proposal to work effectively the constraints under which the water market operator operates would have to be made explicit and transparent (and ideally non-discretionary).

1736 There is a strong analogy here to the operation of the wholesale electricity market, although there are also clear differences: primarily that the electricity market operates on a single time period at a time.
At any given point in time, the water difference in the price for water across two locations is the “cost of delivery”, reflecting physical flow constraints, conveyance losses, and the time delay in water flowing through the system.

At any given point in time, the market operator receives a flow of funds corresponding to the difference in revenue from payments from water extractors and payments to water injectors. This flow of funds or surplus corresponds to the “merchandising surplus” received by the system operator in the context of the electricity sector. This payment stream may be positive, but this would have to be proven. It could be negative in some circumstances (for example, when there is an unexpected drop in demand at a location, and water has already been injected upstream).

One remaining issue to be addressed is the implications of the proposal for risks to which water market participants are exposed. Under the status quo, water users (extractors) who hold water in their water account are insulated from variations in the spot price of water (in the dam) and are partly insulated from variations in the cost of delivery (only partly because under the status quo there is a risk of undeliverability). Following the establishment of the smart market, water market participants would need to have the same ability to insulate themselves from risk. Therefore, the final element of this proposal is a discussion of the associated risk management instruments. It is proposed that:

- Up until the time horizon, water market participants can enter into arrangements to inject or withdraw a given volume of water at a fixed price and therefore are insulated from risk.
- In addition, on a time scale longer than the time horizon, the ACCC expects that forward contracts would develop for the price of water at specific locations. For example, there could be a forward price for water in Hume dam, and so on. It is expected that these instruments could be provided by financial markets and no further specific action by the market designers would need to be taken. In other words, they would arise spontaneously.
- It may also be necessary for the water market operator to make available financial contracts which insulate market participants from the risk of price differences across locations. The precise form of these hedging instruments would be the subject for further research and development.

### H.5 A simple worked example

To give some idea of how this might work, let’s consider a simple example. In this example the river network comprises three segments, separated by weirs, labelled A, B and C. The last segment drains to the sea. This is illustrated in figure 1 below. The rate at which water flows from segment A to segment B, segment B to segment C, and out of segment C, depends on the height of the water above the weir in each case. With the parameters chosen, half of the water in segment A can drain out in 2.3 days, and in segment B in 6.9 days, and segment C in 13.9 days.

To get some indication of how water flows through this hypothetical network, let’s assume that there is 10 metres of water in segment A and then, at time zero, this water is released (there are no other injections or withdrawals). The resulting water flow is illustrated in figure 2. As can be seen, the water level in segment A drops off over ten days, while the water level in B increases rapidly before peaking and dropping off. The water level in segment C peaks around day 15 and then drops off.
Finally, imagine that there is a water injector in segment A and a water extractor in segment C. Let’s start in a steady-state in which the water injector and the water extractor are injecting/extracting at a constant rate. Then imagine that the water extractor forecasts an increase in demand in 30 days time (this could be due to a need for crop irrigation, or a forecast decline in rainfall). What happens to prices and flows in this case?

The answer can be seen in figure 3. As can be seen, in the efficient (welfare maximising) water dispatch pattern, the injector in segment A starts increasing the injection of water well before the increase in demand. This builds up water in segment B and segment C in advance of the increase in demand, at first depressing the price at C. But the price at C increases rapidly before the increase in demand, before peaking and then declining to the new, higher, steady state.

Observe that this pattern of flows is surprisingly complex for a relatively simple network. Further analysis is needed to make sure this is not an artefact of the modelling. At this stage, this is considered to be representing a real effect of efficient pricing in a water network with flow constraints, such as set out here.
H.6  Conclusion

This proposal offers clear price signals, to which market participants can respond. The proposal also allows for market participants to focus attention on their own activity, such as water use (i.e. farming), without needing to pay attention to the specifics of how water flows through the network. The proposal would require market participants to do a bit more than at present (specifically to submit bids and offers to a centralised market operator), but some degree of change is inevitable in any effective reform of the water trading arrangements.

Many specific issues remain to be addressed and several design issues must still be worked out. For example, there are questions about how the environmental requirements (including periodic flooding) would be taken into account. There are also questions about precisely how the optimisation would be formulated, and about the design of the hedging instruments. At this stage, there is no indication that these issues are insurmountable.

Questions also still need to be answered as to whether the problems present in the market and their impacts on the river system are of sufficient importance to justify this large scale reform.