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Northern Basin Supplementary Commentary

Supporting the Independent Assessment of Economic and Social Conditions in the Murray-Darling Basin

A Marsden Jacob Report

Prepared for Social and Economic Assessment Panel
Marsden Jacob Associates

This investigation has been commissioned by the Panel for the Independent Assessment of Social and Economic Conditions in the Murray-Darling Basin. The Panel has made this document available for public scrutiny as part of its commitment to transparency. The views in this report do not necessarily represent the views of the Panel. This is part of a series of literature reviews and research investigations that will help inform the Panel's eventual findings and recommendations.

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Context

This document addresses comments provided by the Panel about the ABARES *Murray-Darling Basin water markets: trends and drivers 2002-03 to 2018-19* report. This document should be read as a supplement to the ABARES report, and is not a standalone document.

The Panel's comments on the ABARES water market paper identified a gap in overall Northern Basin commentary and analysis. This supplementary document aims to close the northern Basin information gaps identified by the Panel, by responding directly to comments made on the ABARES water trade paper. We have done this using existing data sources and information available to address comments where possible, including groundwater and environmental recovery.

This supplementary paper addresses some of the Panel's review comments. Budget and time constraints have not permitted a full review and separate report on the trends and drivers in the northern Murray-Darling Basin as suggested in the review comments. In addition, ABARES did not meet Marsden Jacob's requests for access to ABARES water supply data to perform additional analyses. This has limited our ability to respond to some issues raised.

Contents

Acronyms and abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
BOM	Bureau of Meteorology
GL	gigalitres
GS	General Security
MDB	Murray-Darling Basin
MDBA	Murray-Darling Basin Authority
ML	Megalitre
NRM	Natural Resource Management
NSW	New South Wales
QLD	Queensland
SA	South Australia
Vic	Victoria
VWAP	Volume Weighted Average Price

Glossary

Aquifer	An underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand, or silt).
Environmental flows	The streamflow required to maintain appropriate environmental conditions in a waterway or water body.
Environmental water(ing)	Water that is available or preserved, to achieve environmental outcomes, including ecosystem function, biodiversity, water quality and water resource health.
Forward markets	Markets in which contracts for future delivery are entered into. A forward market for water trades in contracts to deliver water in the future, at a price agreed in the present.
Volume-weighted average price	VWAP is the ratio of the value traded to total volume traded over a particular time horizon.

1. Summary

The northern Basin is generally seen as beginning at the Lachlan catchment and extending north to the Barwon-Darling and its tributaries. The northern Basin rivers support a broad range of irrigated crops, Indigenous communities and culturally significant sites, and a large number of wetlands including internationally significant Ramsar and native ecology breeding sites.

The catchments that make up this area include the Lachlan, Macquarie-Castlereagh, Barwon-Darling Watercourse, Intersecting Streams, Namoi, Gwydir, NSW and QLD Border Rivers, Moonie, Condamine Balonne and Warrego-Paroo-Nebine. Each of these catchments have varying geomorphology, climate and water availability that results in distinct regulatory frameworks and water markets. Water resource plan areas for northern Basin surface water and groundwater areas are available on the MDBA spatial data site.

The landscape across much of the northern Basin is flat. This results in few large public storages to regulate and store water. The storable volume of water in the northern basin is 6,450 gigalitres. This equates to just 28 per cent of the total Basin storage of 22,746 gigalitres. The MDBA water in storages site shows capacity, current volume and active storage for northern Basin surface water areas.

Water licences in the north are predominantly from unregulated water sources (e.g. no dams to regulate flow). The proportion of regulated licences reduces moving further north into the Condamine Balonne. Regulated and unregulated water products in the northern Basin are available on the NSW water register and the Queensland water entitlement viewer.

This segment of the basin also experiences sporadic rainfall conditions with very little water reaching in-stream during large rainfall events as floodplains dominate much of the northern Basin. Overland flow or water harvesting licences allow licence holders to harvest water moving laterally across the landscape to supplement in-stream flow.

There is little interconnectivity across the northern Basin. Areas such as the Paroo system only connect to the Barwon-Darling during extreme flooding[1]. Combined with the unregulated nature of the river systems, this leads to each catchment having isolated and inactive water markets compared to the southern Basin.

[1] CSIRO - Water Availability in the Barwon-Darling

2. Northern Basin commodity types

The flow regime across the northern Basin is highly variable. Many factors influence flow changes in the northern Basin, including climate change and variability, soil type, river regulation, land use and irrigation development. Commodity types across the northern Basin generally reflect differences in these factors.

As noted in the ABARES *Murray-Darling Basin water markets: trends and drivers 2002-03 to 2018-19*, much of the northern Basin's irrigated crop is dominated by cotton when water allocations are sufficient.

Figure 1 shows the varying composition of commodity types between 2016 to 2018 for two natural resource regions, north west NSW and Queensland basin. Cotton is most dominant in north west NSW, which encompasses the northern valleys of the Basin including the Border Rivers and Gwydir regions.

In comparison, the NRM region - Queensland Murray Darling Basin - aligns with the greater Condamine Balonne water resource area. This region is also predominantly cotton-oriented, however approximately a third of the irrigated commodities grown include vegetables and permanent plantings. Figure 2 highlights this with cotton excluded from the commodity mix.

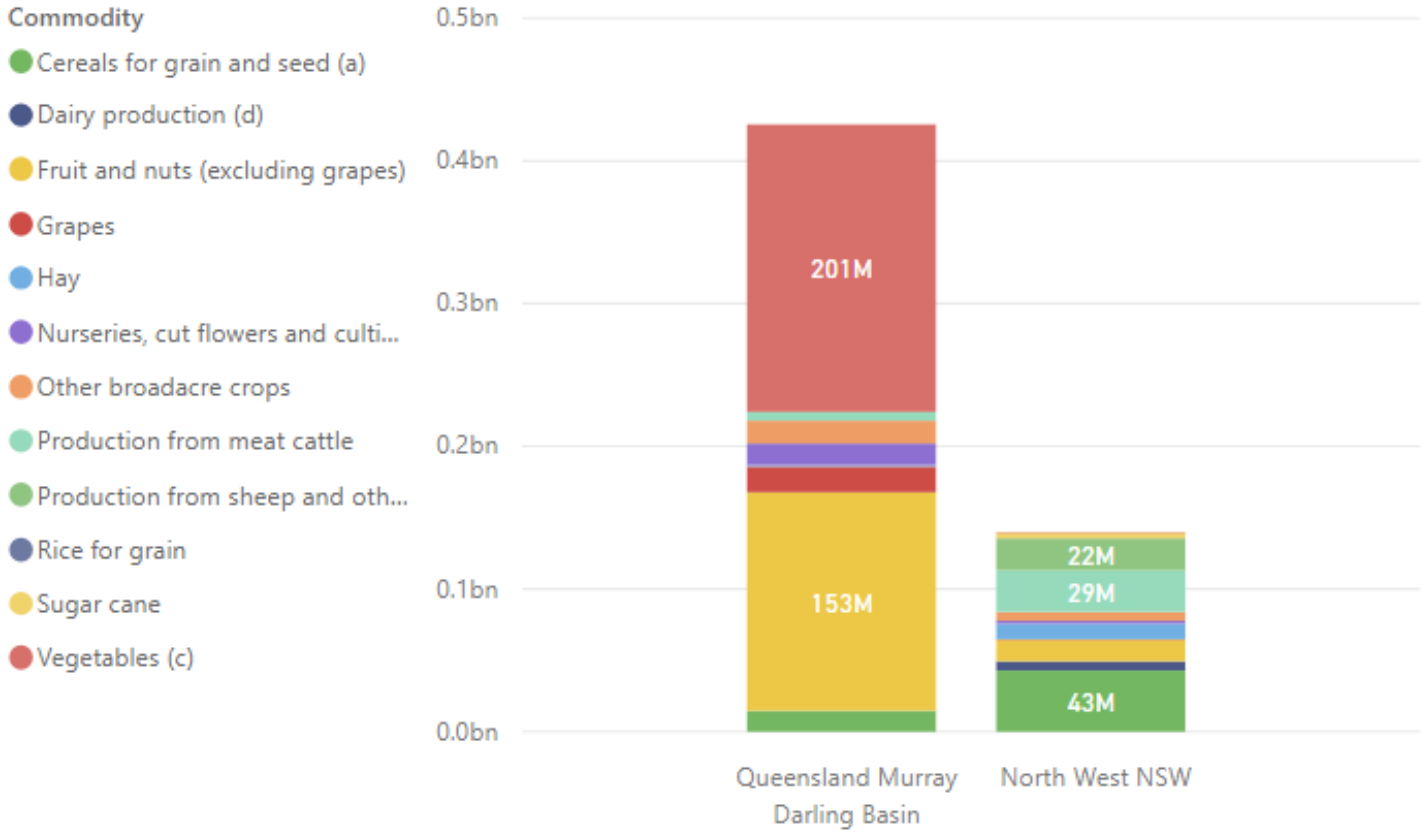
The Condamine Balonne region has significant groundwater resources which are highly reliable and allow for other commodity types such as vegetables, fruit and nuts. The composition of irrigated commodities varies significantly between the northern and southern Basin for this same reason.

Figure 3 highlights this by comparing the Riverina and Murray NRM regions. Figure 3 shows that these regions have a range of water entitlements with varying reliabilities, along with interconnected trading systems that allow for a greater diversity of irrigated commodities.

Figure 1: Gross value of irrigation production $ by NRM regions and commodity

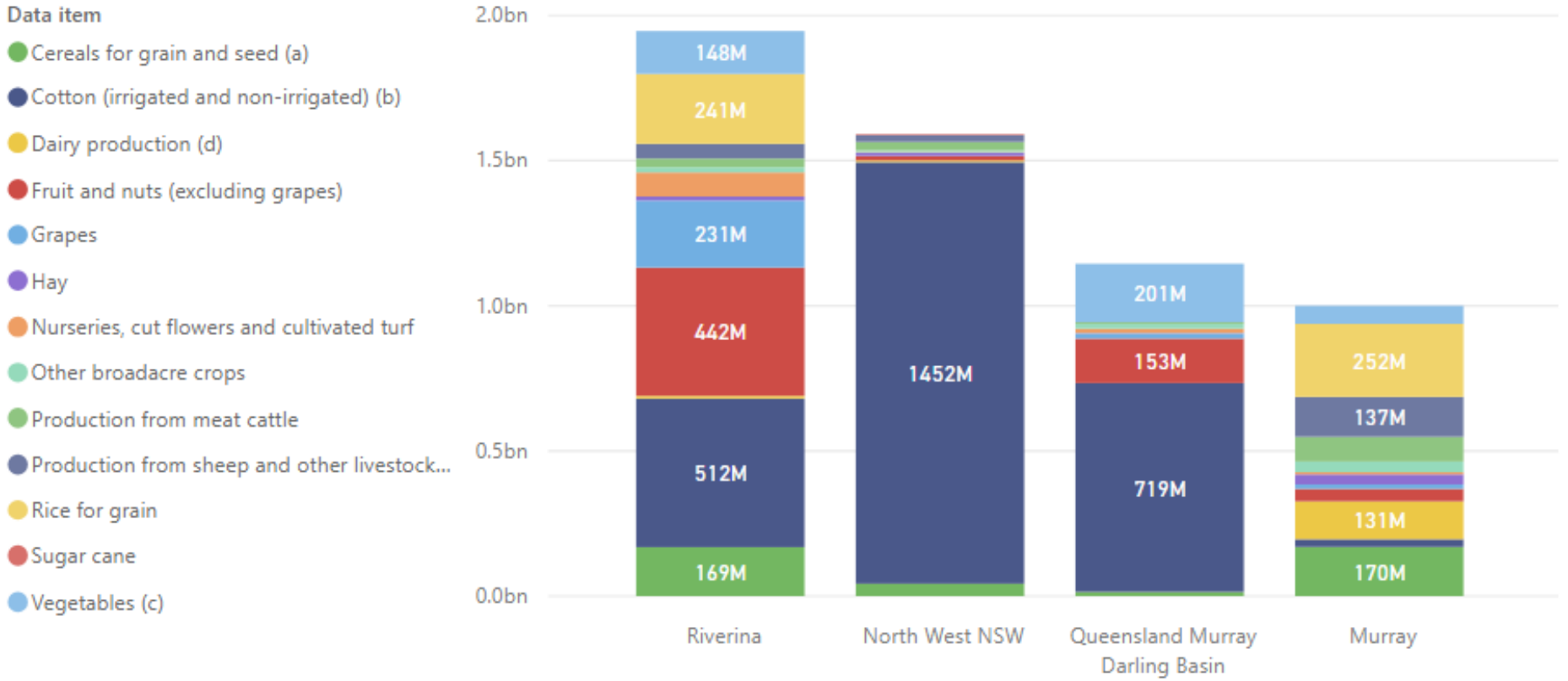
Source 1: ABS Data

Figure 2: Gross value of irrigation production $ by NRM regions and commodity, excluding cotton



Source 2: ABS Data

Figure 3: Gross value of irrigated production $ by NRM region and commodity



Source 3: ABS Data

3. Northern Basin water markets

Trading activity across the northern Basin is less substantial than across the southern Basin. This is due in part to the isolated nature of the catchments, fewer water users in each system, and less commodity diversity. These factors mean that markets in the northern Basin are generally less responsive to market shocks, such as fluctuating water allocations, commodity prices, and weather.

NSW general security allocation yields are shown in Table 1 for 2009-19. Table 1 shows that northern catchments are generally less reliable and more volatile than southern catchments. The exception is the Upper Namoi due to several major water storages.

As noted previously, irrigated cotton dominates the northern Basin, especially in the northern NSW valleys. A consistent commodity cropped across the regions means that demand for water, and its marginal value product, is relatively stable and predictable.

Water market price spikes usually occur between the December – February cotton watering season. During this period, water users will enter the market to top up their water accounts if not limited by State-based use limits.

Alternative water market products such as forwards are gaining significant interest across the Basin due to their ability to reduce farm operation risks by securing water into future years. This is especially important with crops that require yearly watering such as permanent plantings, and for cotton crops that have been forward sold prior to allocation announcements. However, due to the unreliable nature of northern Basin water sources, mainly in northern NSW and

Queensland, forward water market products are not well suited to this environment and therefore less favourable than in the south.

Table 1: Comparison of NSW general security entitlement allocation yields

Water Year	Murrumbidgee GS	NSW Murray GS	Gwydir GS	Lachlan GS	Macquarie GS	Lower Namoi GS	Upper Namoi GS
2009-10	27.0%	27.0%	0.0%	0.0%	0.0%	0.6%	50.0%
2010-11	100.0%	100.0%	82.9%	117.0%	100.0%	109.7%	100.0%
2011-12	100.0%	100.0%	306.9%	136.0%	100.0%	116.6%	100.0%
2012-13	100.0%	100.0%	162.4%	0.0%	64.0%	48.8%	100.0%
2013-14	63.0%	100.0%	0.0%	0.0%	6.0%	6.4%	100.0%
2014-15	53.0%	61.0%	0.0%	0.0%	2.0%	0.0%	100.0%
2015-16	37.0%	23.0%	5.3%	25.0%	7.0%	0.0%	60.0%
2016-17	100.0%	100.0%	78.6%	131.0%	100.0%	124.7%	100.0%
2017-18	45.0%	51.0%	17.6%	2.0%	38.0%	7.1%	100.0%
2018-19	7.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
10-year average	63.2%	66.2%	65.4%	41.1%	41.7%	41.4%	91.0%

Source 4. Marsden Jacob analysis

The disconnected nature and unreliable water availability in most northern systems have meant that water users have become savvy and many have developed considerable knowledge assets. Knowledge asset refers to knowledge and know-how about water market rules, water allocation and licensing frameworks, and market characteristics. It also entails knowledge and know-how about where to source water market information.

Once water users are aware of the underpinning characteristics, rules and regulations, they can understand the market drivers better and incorporate this into their annual planning process. They can also make informed decisions regarding water market products that are the best fit for their farming operations and water requirements.

Northern NSW allocation market: further commentary

Due to water market data issues in Queensland, this analysis only looks at nothern NSW catchments.

Commodity prices and water availability are the key drivers that influence the allocation market across the northern Basin. Figure 4 summarises the northern NSW allocation market prices and trading activity since 2012. Figure 4 shows that after a period of relatively high water availability, the northern NSW catchments are starting to face lower water availability, resulting in restricted allocation trading activity.

During the last two years, the price curves in the Lachlan and Macquarie have closely tracked each other, albeit at different price levels. Lachlan and Macquarie have slightly more diversity in their crop mix compared to the more cotton-dominated catchments of Namoi, Gwydir, and Border Rivers. This partly explains why price movements in Lachlan and Macquarie are less prone to mid-summer peaks when cotton watering occurs.

Northern NSW entitlement market: further commentary

There has recently been increasing interest in general security entitlements across the northern Basin catchments given current climatic conditions, however, the ongoing challenge is finding sellers to match buyer demand. For these reasons, the entitlement market activity is often thin when purely looking at trade volumes.

Whilst entitlement prices across the southern Basin can change significantly over time, these trends are more supressed in the northern Basin because water is tightly held, catchments are isolated, the number of potential sellers is constrained, and commodity diversity is lower.

Because cotton is the predominant crop in these catchments, growers who own the permanent entitlements are not incentivised to sell since they can gain from buoyant prices. Arguably, there is currently not much room for further increases in entitlement prices over the near term. Our view is that the market already reflects the returns from dominant commodities, particularly cotton margins.

In recent years, the Northern catchments have been seeing increasing prices as hot and dry conditions continue to result in strong demand for water entitlements. Examining the entitlement prices over a longer time horizon, it can be seen that prices (Figure 5) in the Lachlan, Gwydir, and Upper and Lower Namoi are at, or near, all-time highs. Apart from climatic

drivers, these result are mostly attributed to increased confidence and optimism around agriculture over the last 5 -7 years, which is underpinned by strong prices for cotton, growth of higher value permanent crops (e.g. citrus and almonds in the Lower Lachlan), and stronger than average commodity prices in the broadacre sector (e.g. wool, sheep meat). While prices have fallen from historic highs in 2017-18, they remain above the 10-year average.

Figure 4: Northern NSW allocation market summary

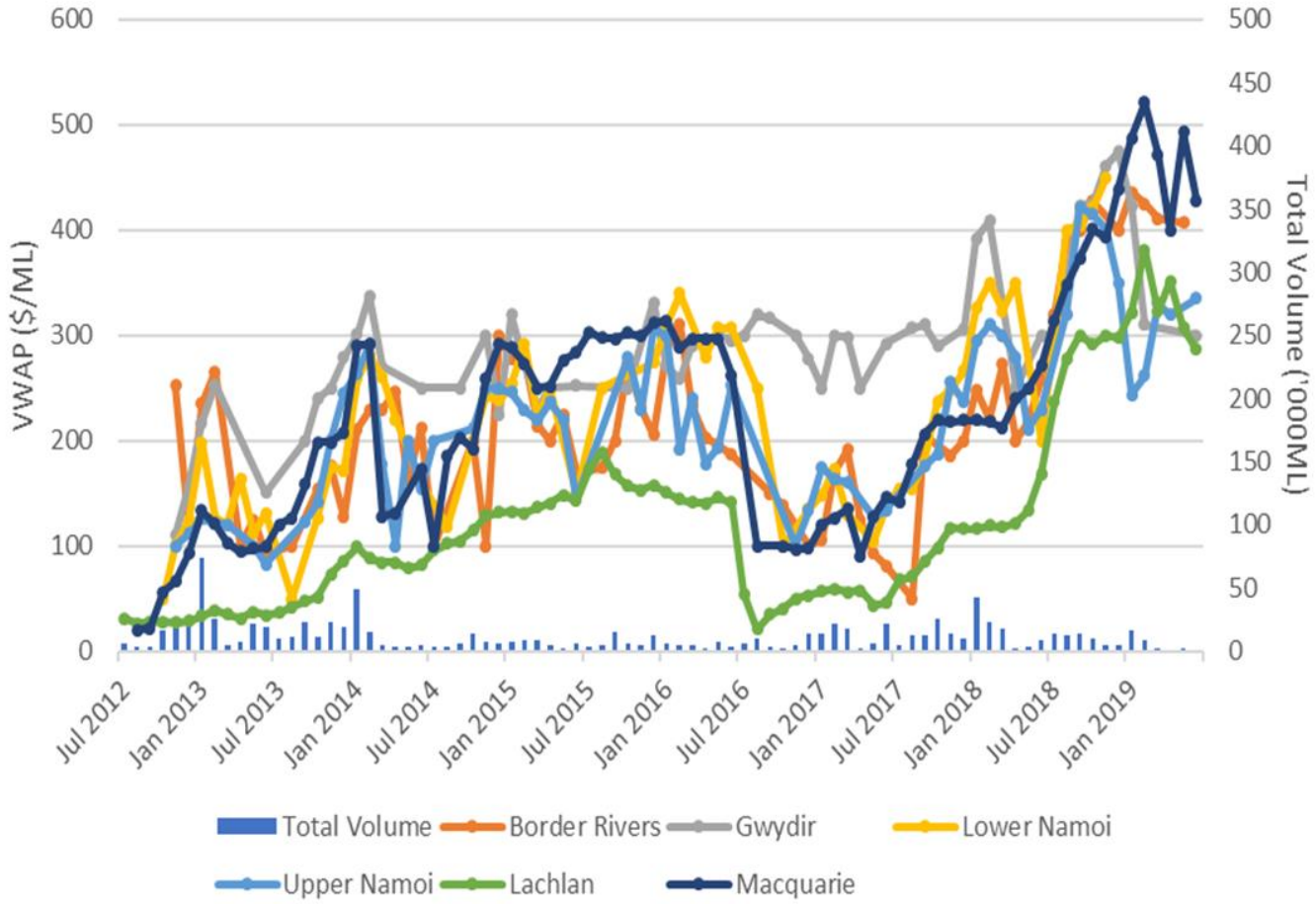
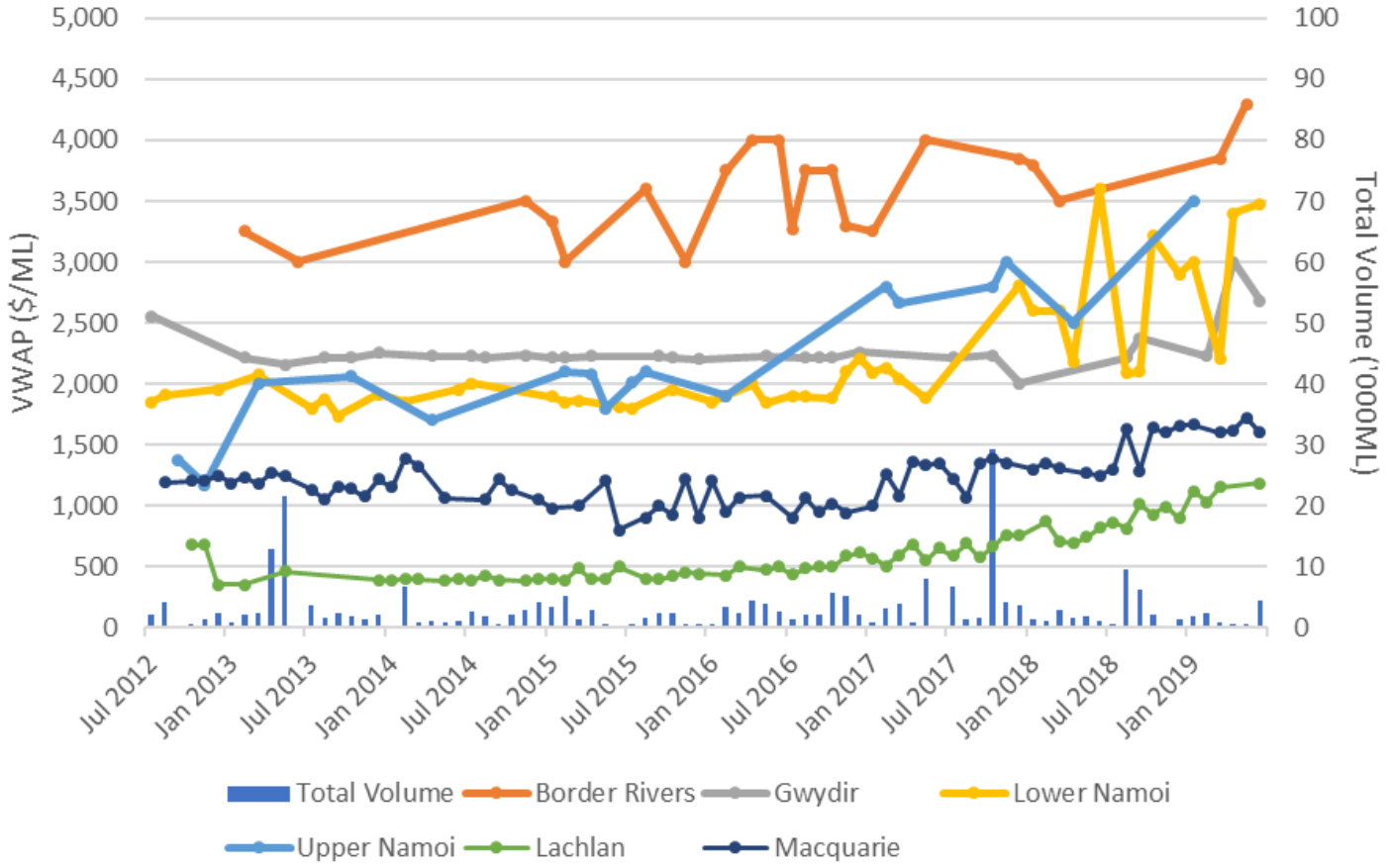


Figure 5: Northern NSW general security entitlement market summary



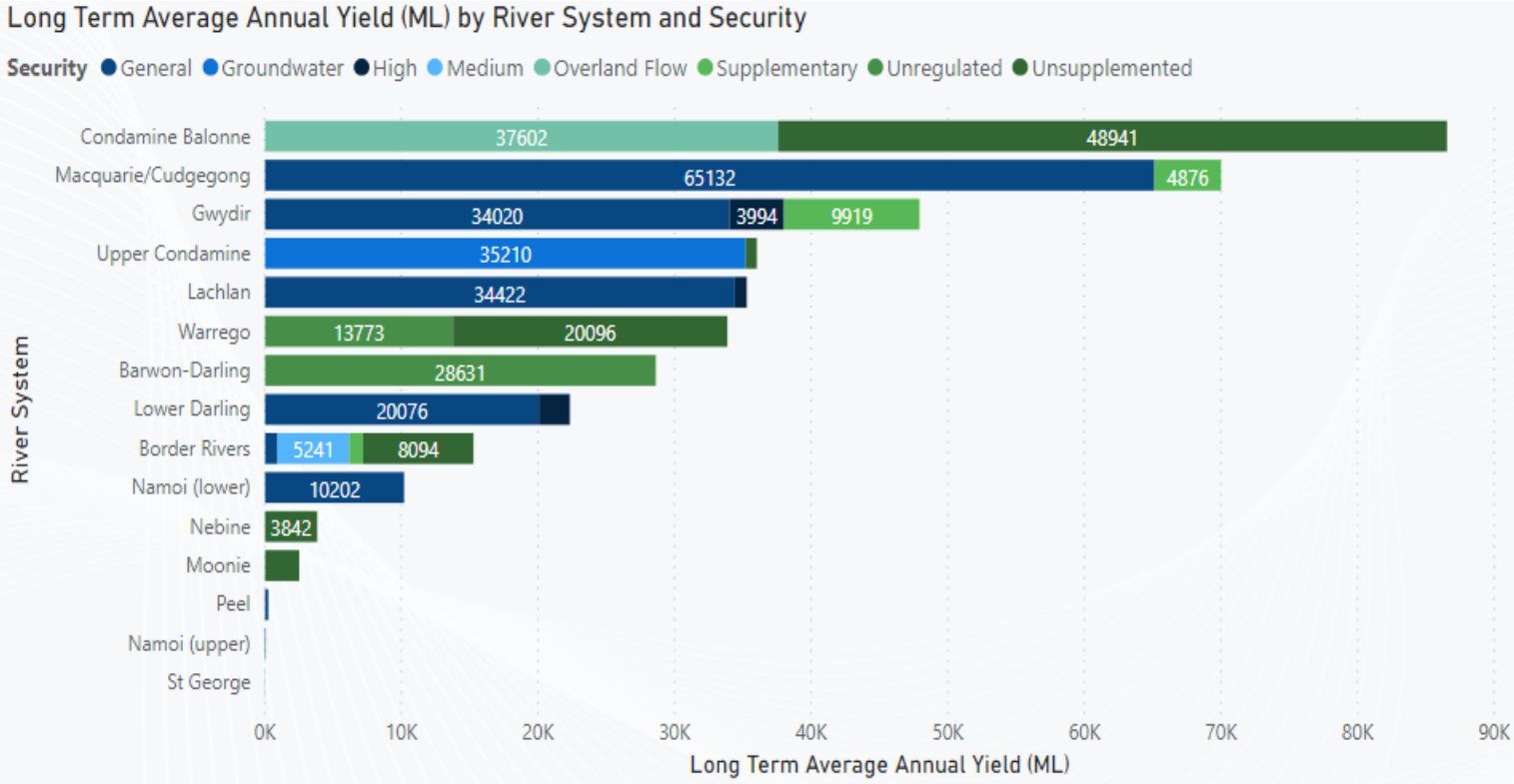
Source 5: Marsden Jacob analysis using Waterflow™ data

4. Environmental Water

Environmental recovery in the northern Basin aims to improve flows and outcomes in the Barwon-Darling, with the exception of the Lachlan. Flows into the Barwon-Darling rely on contributions from upstream tributaries. Each catchment contributes varying flow profiles.

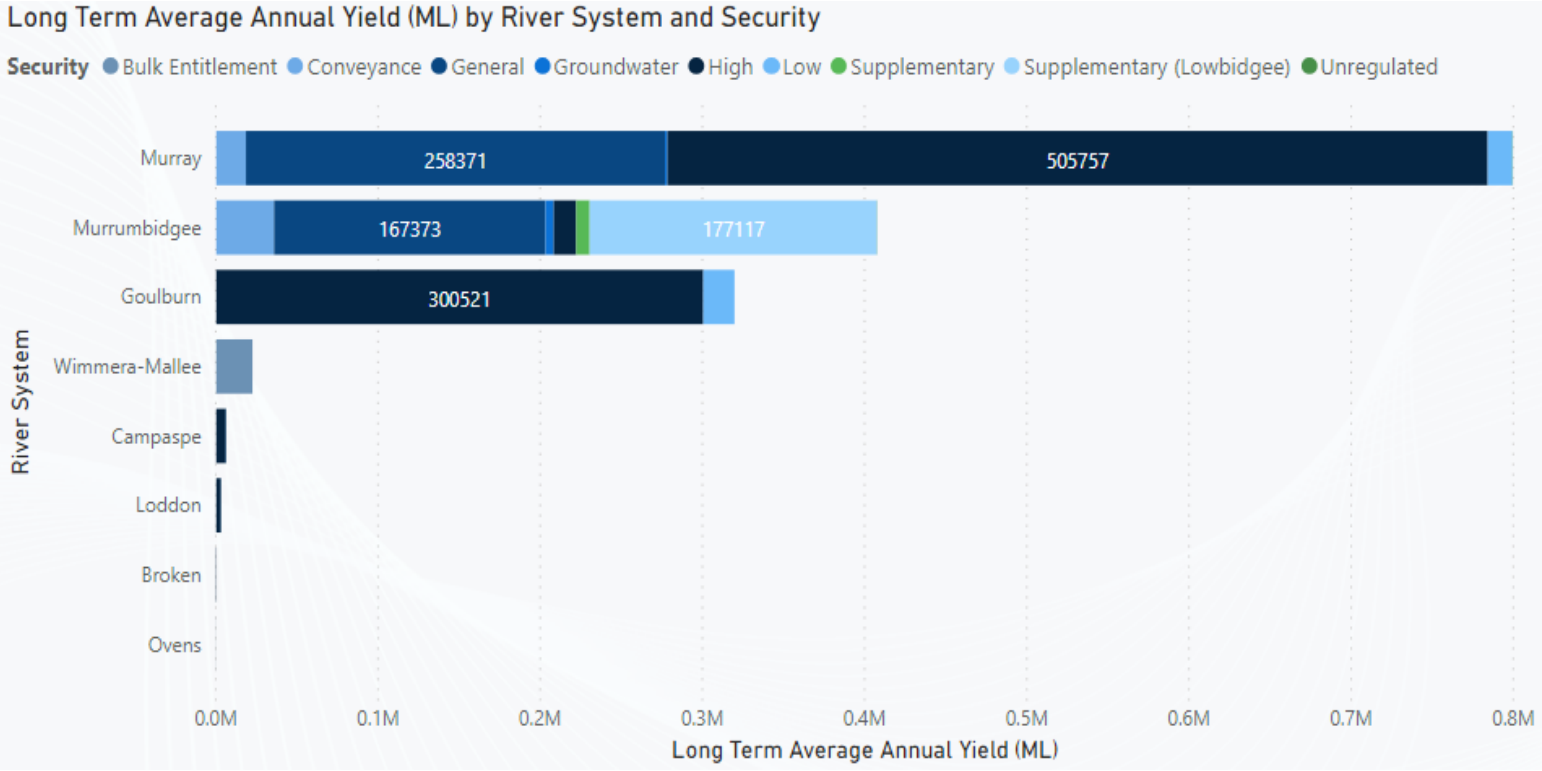
Figure 6 segments the current recovery volume for northern Basin river systems by entitlement type. Figure 7 does the same for the southern Basin. Figure 6 shows the that largest contributor of environmental water in the northern basin is the Condamine Balonne. This is due to its proximity to key northern Basin environmental assets.

Figure 6: Northern Basin environmental recovery by entitlement type



Source 6: Marsden Jacob analysis of CEWH Water Holdings

Figure 7: Southern Basin environmental recovery by entitlement type



Source 7: Marsden Jacob analysis of CEWH Holdings

5. Groundwater

Groundwater is an important water source and is becoming a crucial part of surviving long periods of drought for both town supply and irrigation purposes.

This section covers groundwater use in the southern and northern Basin.

In 2017-18, data from the BOM National Water Account suggested that there are around 2,505GL of groundwater rights in the MDB. In 2017-18 around 1,630GL of rights were used across the Basin (Table 2). This includes around 730GL in the northern Basin. Most groundwater is used for irrigation supply (Table 2). Groundwater extractions for consumptive use increased from 2017 to 2018, which was largely influenced by the drop in surface water availability.

The management and planning for groundwater is similar to surface water, with water resource plans developed by Basin States to manage usage and quality. Most groundwater use in the northern Basin is centred on a small number of large alluvial aquifers in New South Wales and Queensland, Victoria, and South Australia.

There are areas in the Basin where groundwater is the only reliable source of water and this is particularly the case in the Condamine Balonne regions of the northern Basin (Table 2). Groundwater resources within this region are significant and provide water for both urban and rural uses. Groundwater in both the alluvial and basaltic aquifers are used extensively for urban, domestic, stock, irrigation, intensive livestock, commercial and industrial purposes.

The Upper Condamine Alluvium is also the only groundwater resource under the Basin Plan that requires water recovery. The Basin Plan requires groundwater extractions in the Queensland Upper Condamine Alluvium to be reduced by 40.4 GL. Several Commonwealth-run open and limited tenders have been held to purchase groundwater licences in this area, enabling progress towards the long-term protection of the productive base of the aquifer.

Table 2: Groundwater users in the MDB for the 2017–18 (ML)

Individual users							
Groundwater resource plan area	State	Allocated diversions	Other statutory right diversions	Total individual users	Urban users	Total environmental user	Total
Total		1,348,065	237,321	1,584,438	45,599	-	1,630,037
GW22 Warrego-Paroo-Nebine	Qld	449	1,136	1,585	-	-	1,585
GW21 Condamine-Balonne	Qld	140,556	29,427	169,983	5,570	-	175,553
GW20 Moonie	Qld	243	90	333	-	-	333
GW19 Queensland Border Rivers	Qld	20,405	2,989	23,394	-	-	23,394
Sub-total Queensland		161,653	33,642	195,295	5,570	-	200,865
GW18 New South Wales Border Rivers Alluvium	NSW	6,114		6,114	42	-	6,156
GW17 New England Fractured Rock and Northern Basalts	NSW	1,470		1,470	37	-	1,507
GW16 Eastern Porous Rock	NSW	8,766		8,766	174	-	8,940
GW15 Gwydir Alluvium	NSW	32,836		32,836	1,972	-	34,808
GW14 Namoi Alluvium	NSW	192,879		192,879	8,394	-	201,273
GW13 New South Wales Great Artesian Basin Shallow	NSW	1,411		1,411	-	-	1,411
GW12 Macquarie–Castlereagh Alluvium	NSW	64,102		64,102	4,992	-	69,094
GW11 Lachlan and South Western Fractured Rock	NSW	8,938		8,938	289	-	9,227
GW7 Darling Alluvium	NSW	1,392		1,392	-	-	1,392

Individual users							
GW10 Lachlan Alluvium	NSW	190,019		190,019	3,942	-	193,961
GW9 Murrumbidgee Alluvium	NSW	350,126		350,126	19,538	-	369,664
GW8 Murray Alluvium	NSW	100,279		100,279	649	-	100,928
GW6 Western Porous Rock	NSW	8,080		8,080	-	-	8,080
Sub-total New South Wales	NSW	966,412	176,292	1,142,704	40,029	-	1,182,733
GW2 Goulburn-Murray	VIC	168,799	20,235	189,034	-	-	189,034
GW3 Wimmera-Mallee (groundwater)	VIC	5,449	-	5,449	-	-	5,449
Sub-total Victoria	VIC	174,248	20,235	194,483	-		194,483
GW5 Eastern Mount Lofty Ranges	SA	44,804	2,474	47,278	-	-	47,278
GW4 SA Murray Region	SA	0	4,678	4,678	-	-	4,678
Sub-total South Australia	SA	44,804	7,152	51,956	-	-	51,956
ACT (groundwater)	ACT	948	-	948	-	-	948

Source 8 data provided to Marsden Jacob from the BOM National Water Account

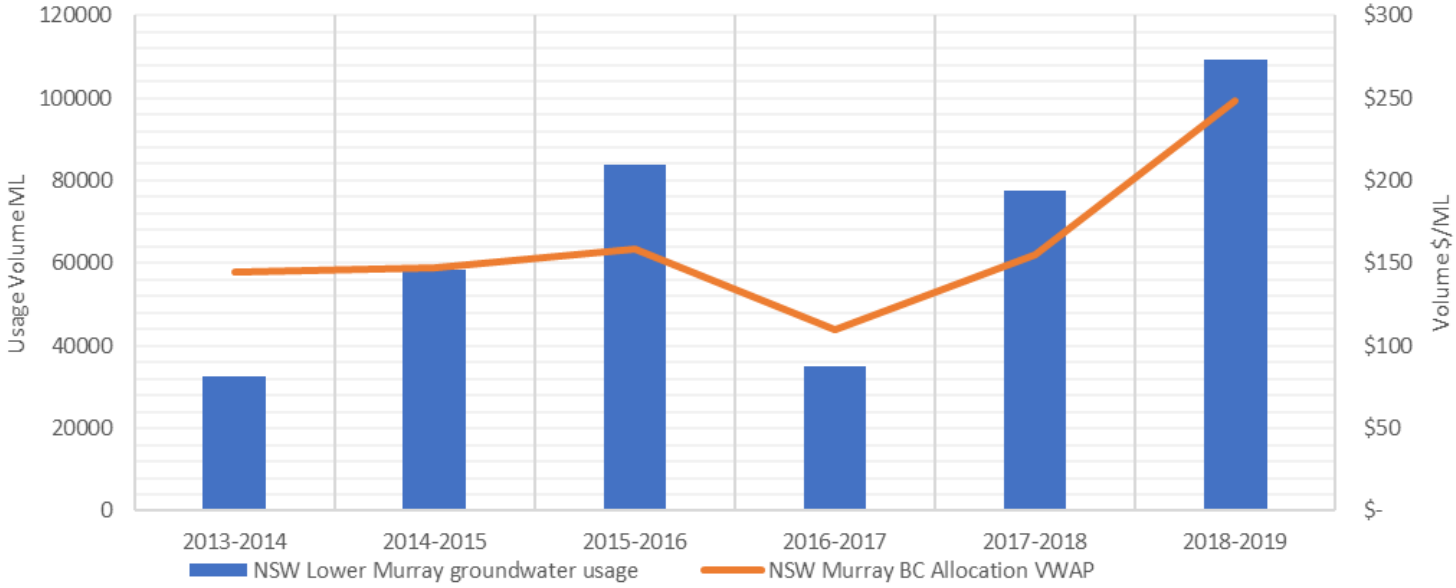
Figure 8 and Figure 9 examine the NSW Lower Murray groundwater and NSW Lower Namoi groundwater sources. Typically, a drop in surface water availability will mean that a proportion of total water use from groundwater will increase.

Figure 8 and Figure 9 show the yearly accumulated usage of groundwater against the volume weighted average price of the surface water equivalent, which is used as a proxy for surface water demand in the region.

From the NSW Murray in the south and NSW Namoi in the north, there is a related response between demand in surface water and groundwater usage. This is to be expected. However it highlights an important factor when considering the demand for surface water in regions with sustainable groundwater supplies.

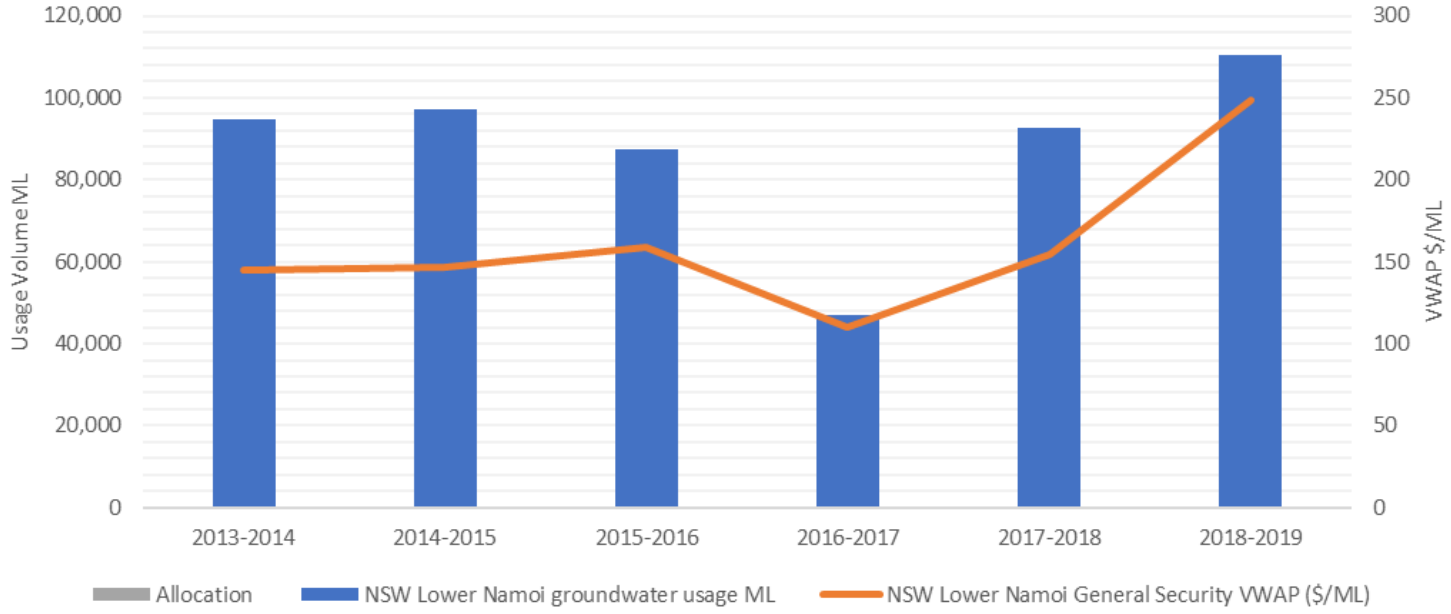
As the water market continues to mature, groundwater will become more relied upon as dry periods become more extensive. There are already reports of market participants reporting high demand for temporary groundwater with prices increasing across the Basin during the 2019-20 water year.

Figure 8: NSW Lower Murray groundwater usage plus NSW Murray B/C General Security allocation VWAP ($/ML)



Source 9: BOM Dashboard

Figure 9: NSW Lower Namoi groundwater usage plus Lower Namoi General Security allocation VWAP ($/ML)



Source 10: BOM Dashboard