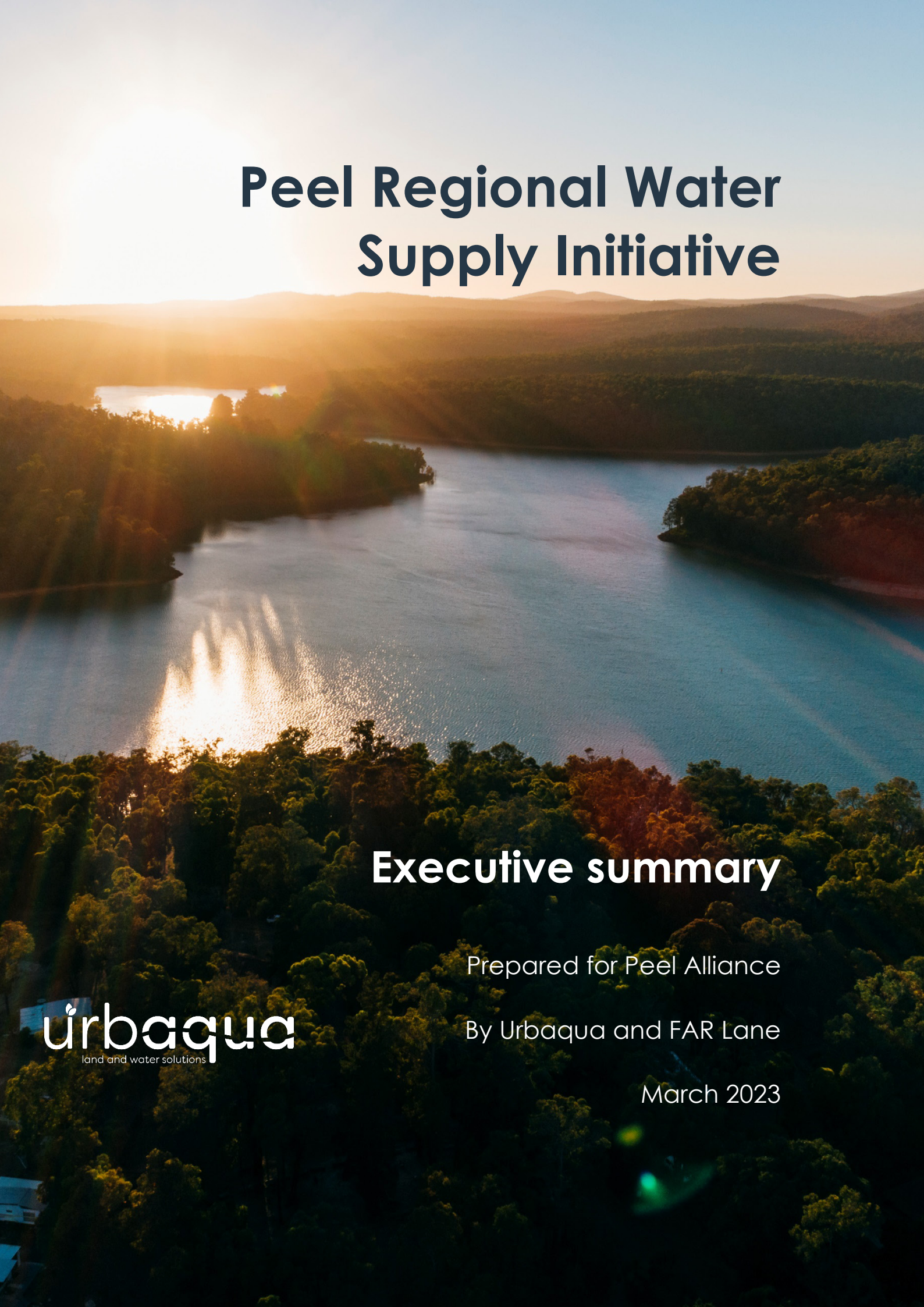


Peel Regional Water Supply Initiative

Executive summary

Prepared for Peel Alliance

By Urbaqua and FAR Lane

March 2023

urbaqua
land and water solutions

From Peel Alliance

This project has been made possible by funding from Peel Alliance, Peel Development Commission, Department of Primary Industries and Regional Development, and Harvey Water.

We acknowledge and thank the representatives from the following organisations that worked with us collaboratively, providing their knowledge and expertise to develop a shared position on the outlook of the Peel Region's water demand and supply to 2050:

- Peel Development Commission (PDC)
- Department of Water and Environmental Regulation (DWER)
- Department of Primary Industries and Regional Development (DPIRD)
- Water Corporation
- Harvey Water
- Department of Planning, Lands and Heritage (DPLH)
- Department of Biodiversity, Conservation and Attractions (DBCA)
- Department of Local Government, Sport and Cultural Industries (DLGSC)

together with our Peel Alliance members:

- City of Mandurah
- Shire of Boddington
- Shire of Murray
- Shire of Serpentine Jarrahdale
- Shire of Waroona
- Peel-Harvey Catchment Council
- Regional Development Australia Peel
- Peel Community Development Group

Thank you Shelley Shepherd and Helen Brookes from Urbaqua, along with Jason MacFarlane and Giles Tuffin from FAR Lane Consulting, for undertaking this initiative on behalf of the Alliance.

Cr Mike Walmsley
Peel Alliance Chair

Funded by:

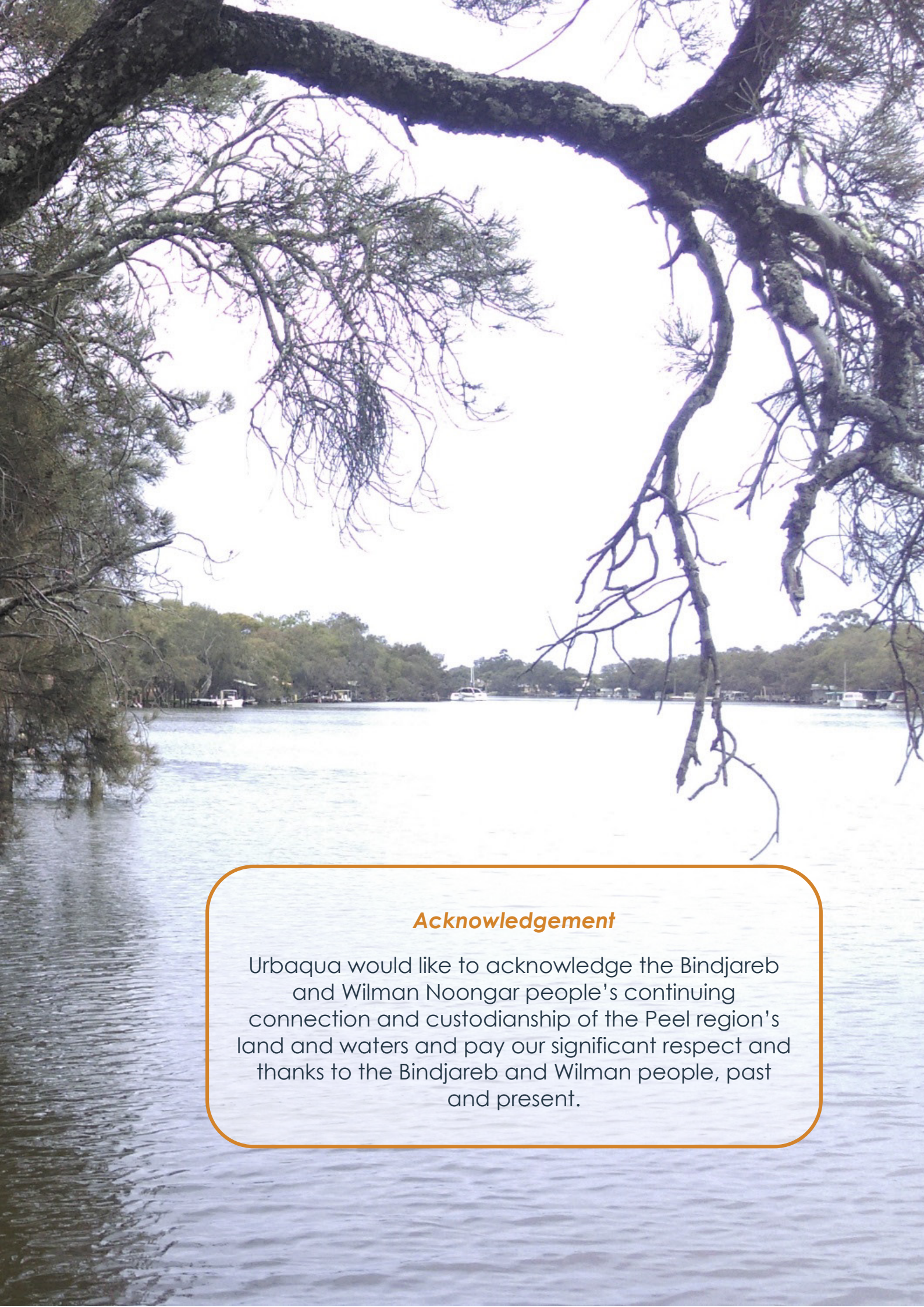
Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

PEEL Development Commission

PEEL ALLIANCE

HARVEY WATER

Images: courtesy of Peel Alliance, DAFWA & PHCC and Urbaqua



Acknowledgement

Urbaqua would like to acknowledge the Bindjareb and Wilman Noongar people's continuing connection and custodianship of the Peel region's land and waters and pay our significant respect and thanks to the Bindjareb and Wilman people, past and present.

Executive summary

In October 2021, Peel Alliance members and stakeholders met to better articulate the water supply challenges facing the Peel region and develop a collective understanding of the problem. This included consideration of current and future residential and industry water demands, economic benefits, environmental and cultural water requirements, climate change impacts and total water cycle management and supply options. Workshop participants agreed to the following problem statement:

> *Currently accessible water is a finite resource that is being increasingly impacted by climate change. The Peel region has aspirations for its community, economy and environment that exceed currently accessible water resources with current business as usual practices.*
>
> *We need to understand how currently accessible water resources can be more sustainably and efficiently used, including redistribution if necessary; what the remaining gap is; what the options are to fill the gap; and what the associated costs are.*
>
> *We also recognise that there is unlikely to be a single solution due to the significant knowledge gaps and uncertainties associated with timing, changing community and environmental values and market considerations including net zero and willingness to pay. The continued commitment to collaborative delivery is therefore critical to achieve the desired outcome for the Peel region.*

This study was undertaken to provide a technical basis to support the collective understanding of the magnitude of the problem and assist in the identification of future strategies and actions that may be proposed to address the problem.

It provides an indication of the water needs of the community, industry, agriculture and the environment in 2021 and to 2051, having consideration of climate change, on the basis of agreed growth scenarios. It is a broad analysis only, providing a regional picture and is not intended to support planning or decision making at a local level. It has also been prepared with a number of assumptions which should be noted and have been outlined in various sections of the report.

Study area

The Peel Region is home to over 150,000 people, supports over 40,000 jobs and has an annual economic output of $23.325 billion (Remplan, 2022). It contains the five local governments of Boddington, Mandurah, Murray, Serpentine-Jarrahdale and Waroona, covering an area of approximately 5,500 square kilometres. Its key regional community centres include Mandurah, Pinjarra, Byford, Dwellingup, Falcon, Serpentine, Jarrahdale, Keysbrook, Dawesville, North Dandalup, Waroona, Boddington, Preston Beach and Lake Clifton.

The natural environment is a strong element of the Peel Region, with the Peel Inlet and Harvey Estuary and associated wetlands having environmental values of international importance. The natural environment is also a critical component of the regional economy, with recent work suggesting the total value of economic activity, social and health impact of the Peel Harvey waterways to be around $20.8b with an annual economic benefit of $605.7m (Urbis, 2023).

A broadscale water balance of the region was developed to conceptually represent the flows of water into and out of the Peel Harvey system to assist in consideration of the effect of groundwater and surface water abstraction on flows to the estuary.

This water balance indicates that streamflows from the waterways in the Peel Harvey system are a critical component of the flows into the estuary, with the Murry system providing the bulk of freshwater during the winter months. In the lower catchments, the flat, poorly drained landform creates large areas of surface storage of winter rainfall which makes its way into the shallow groundwater and eventually into the major waterways and the estuary. This contribution of groundwater to surface water from the broader catchment is considered critical to the health of the Peel Harvey Estuary. It is noted, however, that the major watercourses are showing a significant declining trend in stream flows in the upper catchments and there is a small declining trend in both surface water and groundwater storage within the lower catchments. Thus, even with no further changes of land use, vegetation cover or the climate in the catchments, continuing declines in groundwater levels and streamflows are expected.

Current water sources and demands of the Peel region

The water sources and supplies within the Peel region currently comprise groundwater, surface water, the Water Corporation's Integrated Water Supply Scheme (IWSS), Harvey Water, dams, rainwater tanks and treated wastewater.

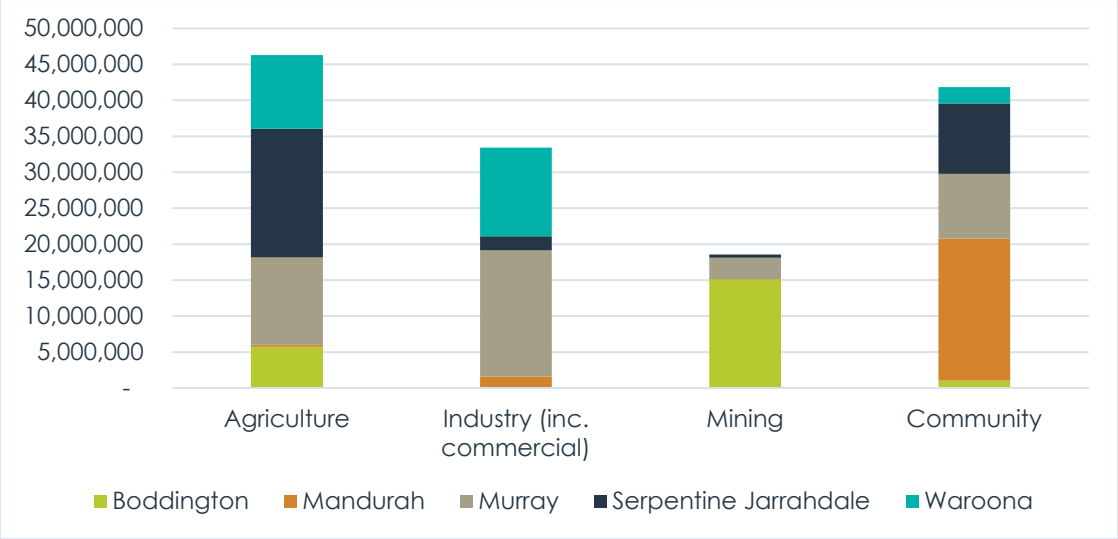
In 2021, the Peel Region had access to approximately 140 GL water from a range of sources to support the community, agriculture and industry. These are summarised in Summary Figure 1, Summary Figure 2, Summary Table 1 and Summary Table 2. This shows that currently, agriculture utilises 32%, the community 30%, industry including mineral processing and commercial uses comprises 24% and mining uses 14% of the total water demands, which are predominantly supplied by surface water (46%) and groundwater (42%) with scheme water comprising 11% and treated wastewater 1%.

Summary Table 1: Current water needs of the Peel Region

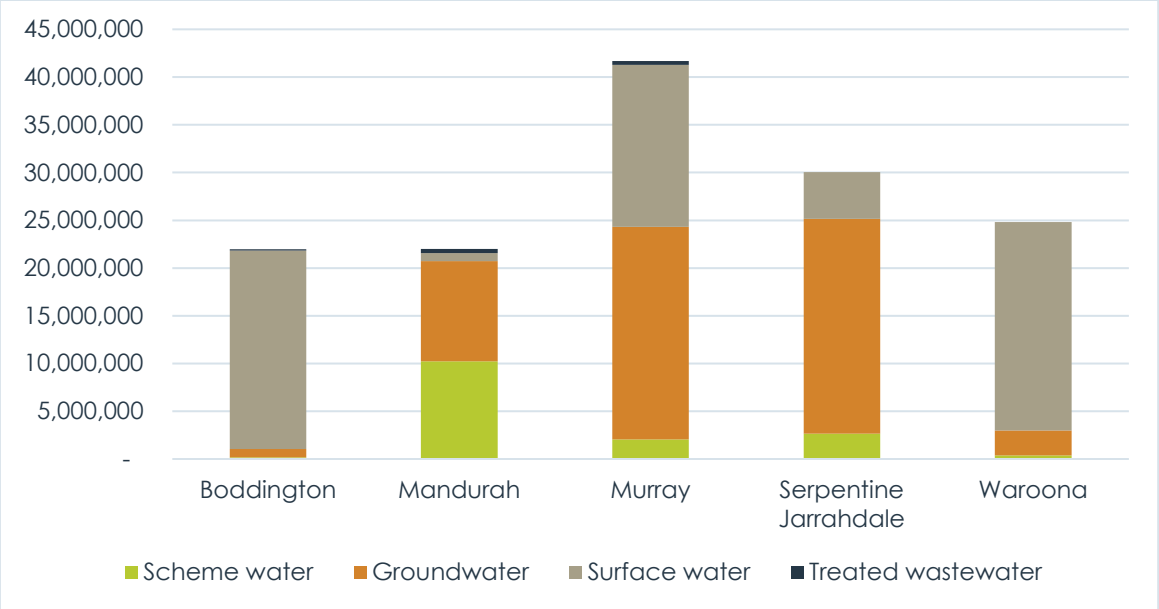
	Community	Agriculture	Industry (including commercial)	Mining	Totals
Boddington	1,031,537	5,757,804	43,164	15,132,900	**21,965,405**
Mandurah	19,755,215	242,585	1,567,673	12,500	**21,577,973**
Murray	8,995,888	12,176,144	17,541,403	2,962,597	**41,676,033**
Serpentine Jarrahdale	9,778,369	17,875,522	1,958,502	444,000	**30,056,393**
Waroona	2,284,365	10,242,571	12,301,416	0	**24,828,352**
Peel Region	**41,845,374**	**46,294,626**	**33,412,158**	**18,551,997**	**140,104,156**

Summary Table 2: Current water sources for the Peel Region

	IWSS	Groundwater	Surface water	Treated WW
Boddington	183,349	865,777	20,783,379	132,900
Mandurah	10,229,890	10,490,191	857,892	417,930
Murray	2,055,785	22,270,348	15,963,252	402,597
Serpentine Jarrahdale	2,638,630	22,516,467	4,163,076	0
Waroona	391,103	2,607,870	21,829,379	0
Peel Region	**15,498,757**	**58,750,653**	**63,596,978**	**953,427**



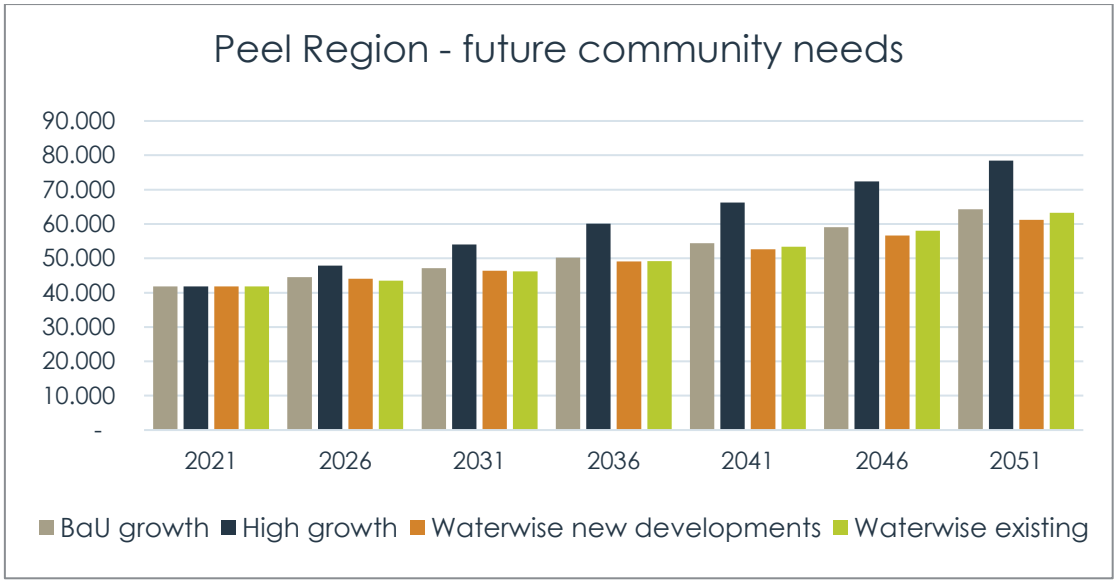
Summary Figure 1: Peel water needs summary by use and local government (kL)



Summary Figure 2: Current Peel water source summary (kL)

Future community, agricultural and industrial water needs

The key future water needs of the community include drinking water provided to new residential, commercial (including tourist) and industrial development through the IWSS, water for the irrigation of public open space and water for new peri-urban development. The estimation of demand was undertaken for agreed growth scenarios which represent business and usual (BAU) growth, high growth and future waterwise development. The results of the scenario analysis demonstrate that BAU growth will result in additional water demands of 22.5 GL by 2051 whereas the high growth scenario will need 36.6 GL. The water savings from 50% new residents having waterwise gardens is approximately 3.14 GL by 2051 and around 1.1GL from the waterwise retrofit of 30% existing gardens as shown in Summary Figure 3.

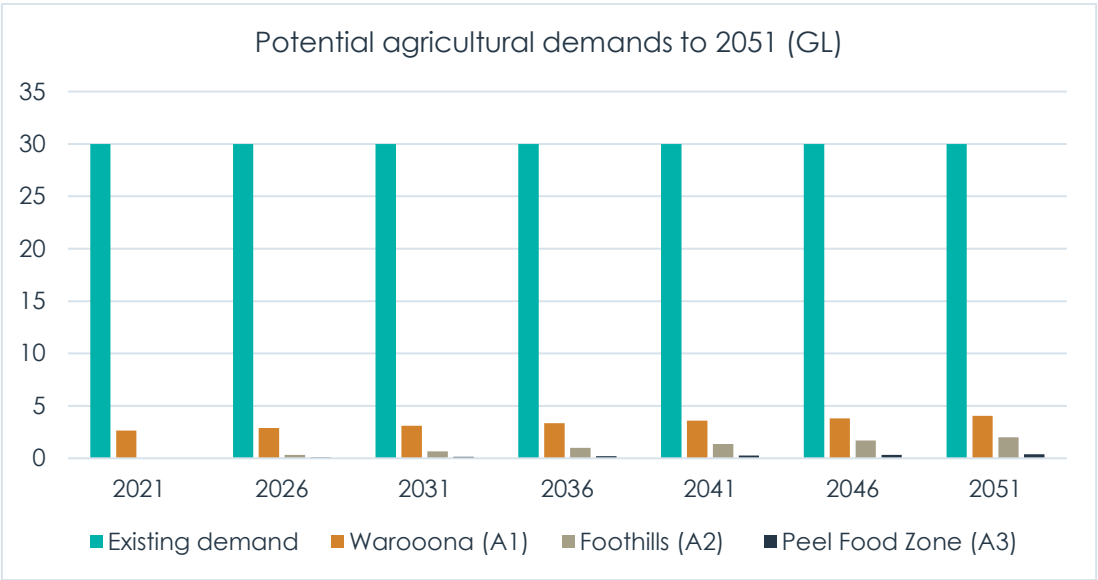


Summary Figure 3: Total community water demand for future scenarios (GL)

The future Peel agricultural water needs include the demands from existing irrigated agricultural areas and water captured by existing farm dams (currently approximately 30GL) plus the water required to support agricultural industry growth and the establishment of new areas of irrigated agriculture. The likely areas of growth were considered to be:

- Waroona Irrigation District - a change from irrigated pasture to perennial irrigated horticulture across 400 hectares by 2051 (scenario A1)
- North Dandalup to Serpentine foothills – development of 200 hectares of new intensive perennial irrigated agriculture by 2051 (Scenario A2)
- Peel Food Zone – 250 hectares of new closed-loop covered cropping by 2051 (Scenario A3)

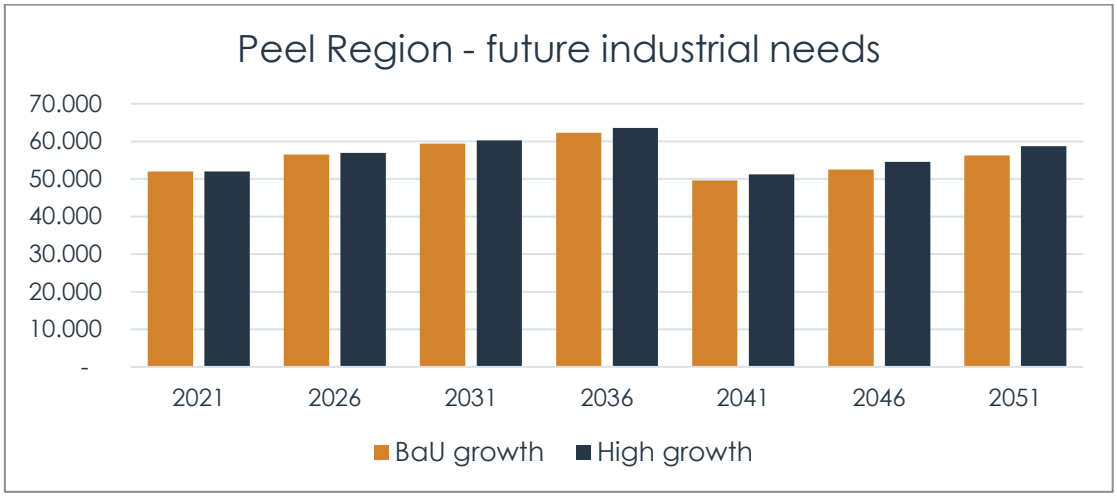
The demands for each scenario are shown in Summary Figure 4. The analysis indicates that, if all three scenarios were implemented, net water usage in the study area would increase by 6.46 GL in 2051.



Summary Figure 4: Potential agricultural demands to 2051 (GL)

Future industrial demands include growth in for population-driven industry in each local government area as well as growth in strategic industry and mining (as well as known mine closures), with the potential for emerging major water usage industries. The estimated growth in strategic industry considers the Industrial-zoned land available and the likely type of industry according to the location, however it is recognised that the water demands of industry are highly dependent on the nature of the future activity. Furthermore, there are some uncertainties associated with the future availability, particularly of surface water resources, so some broad assumptions were made to arrive at a future demand.

The scenario assessment suggested that future industrial needs of the Peel Region could increase by around to around 63 GL in 2036 then decline to between 57 and 59 GL in 2051. This is heavily influenced by the planned closure of the Newmont mine in Boddington in 2037.

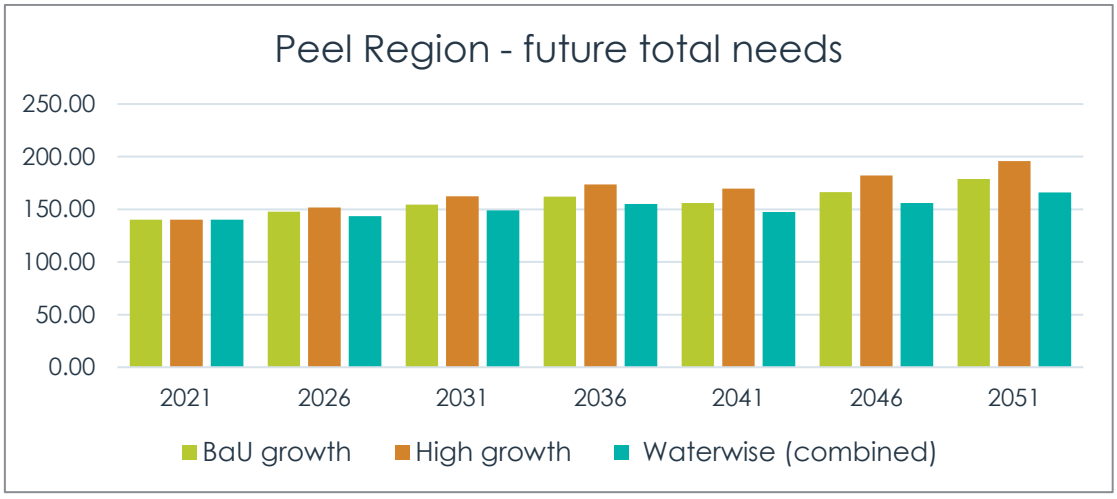


Summary Figure 5: Potential industrial demands to 2051 (GL)

The combined future water needs for the Peel Region are therefore estimated at:

- 179 GL for business-as-usual scenario
- 196 GL for the high growth scenario
- 166 GL for the waterwise scenario

noting the current baseline of 140GL.

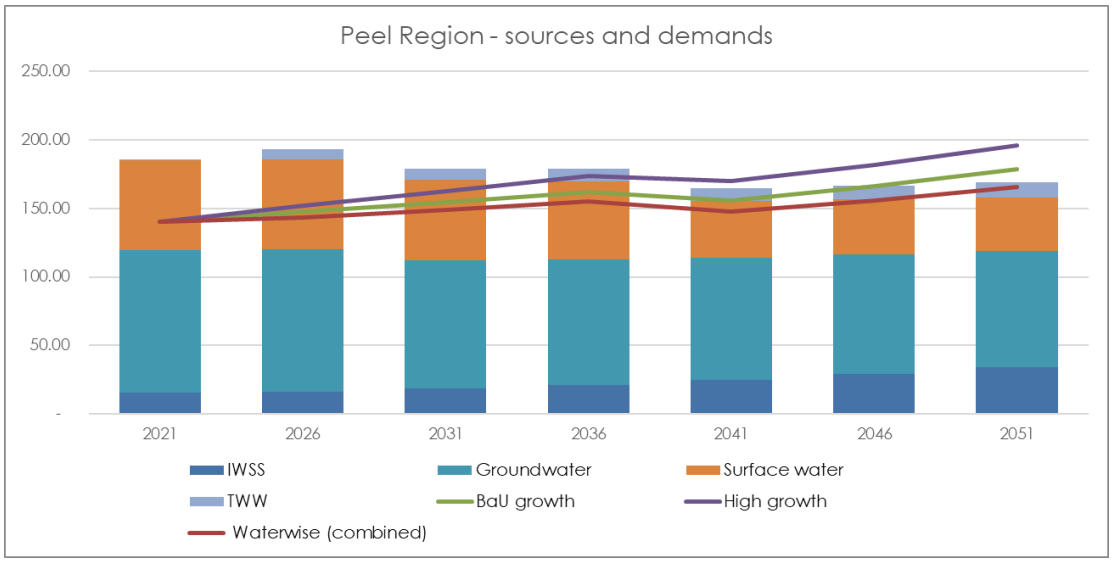


Summary Figure 6: Potential total demands to 2051 (GL)

Future environmental conditions and available water sources

This study reviewed the water source options currently available to meet the projected demand for the estimated growth in community, agricultural and industry needs. These include use of the IWSS to meet the future potable water needs of the community and population-driven industry; groundwater and surface water abstracted to available limits and the use of treated wastewater to the capacity of existing wastewater treatment plants.

Considering these sources at a regional level suggests that sufficient water is available (in 2021) to meet the future community, industrial and agricultural needs to 2051 under the waterwise scenario, to 2046 under BAU and to 2036 in the high growth scenario (Summary Figure 7).



Summary Figure 7: Future currently available water sources & demands of the Peel Region (GL)

This is not an accurate reflection of availability vs demand, however, as the location of the available sources **does not** align to the location of the demands, as indicated by the assessment at local government level which indicates that the Shire of Boddington will have insufficient readily available water supplies in 2026, followed by the Shire of Murray soon after 2031.

It is also recognised that there are significant existing constraints associated with obtaining access to some of these sources. The Department of Water and Environmental Regulation Water Register currently indicates that groundwater is available for allocation in some areas of Serpentine Jarrahdale, Murray and Waroona. However, the majority of this available water resource is in the Superficial Aquifer and significant yield limitations are likely for this resource in areas of clay soils. This means that it may not be possible to abstract groundwater up to the current allocation limit. Abstraction in the coastal superficial aquifer is also challenging as this area is prone to saline intrusion which is more likely as allocation limits are approached and sea level rise continues. In addition, 100% of wastewater generated/collected will not necessarily be available for reuse due to increasing competition for access to wastewater, infrastructure constraints and collection methodologies.

It is also noted that the water resources required to sustain the significant water-dependent environmental assets of the Peel Region will change in future, largely in response to changes to rainfall and evapotranspiration. This study has shown that the potential overall reduction in streamflows to the Peel Harvey Estuary by 2050 (~260 GL) due to climate change is significantly larger than the current level of surface water and groundwater abstraction combined

(~120 GL). This means that in a future climate, current freshwater flows into the Peel-Harvey system could not be maintained, even if all abstraction were to cease. This is likely to have significant implications for the health of the estuary over time.

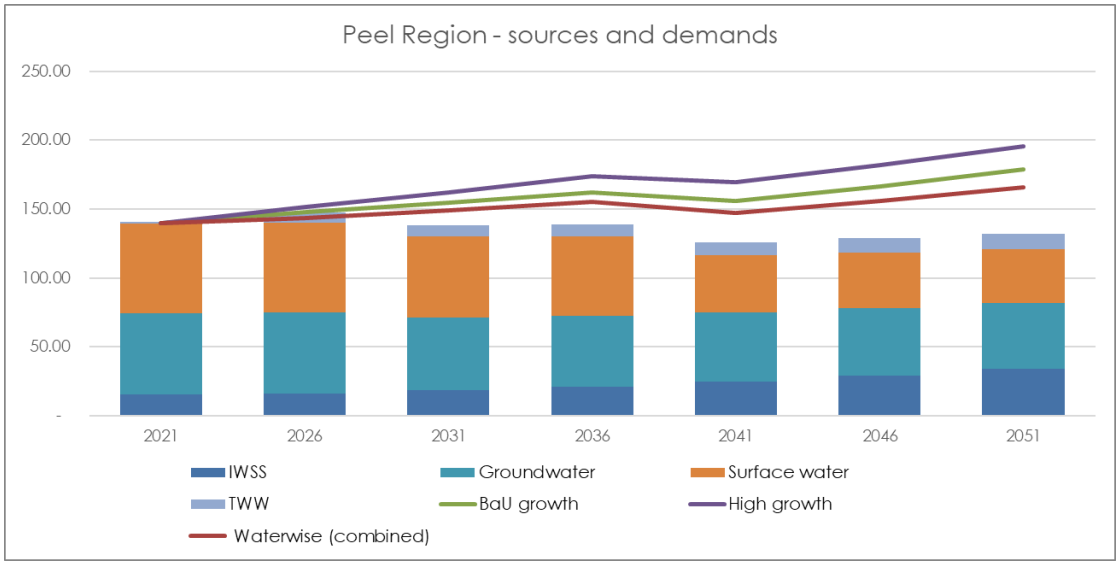
Therefore, impacts on estuary health may be exacerbated by any further abstraction from the superficial aquifer (even up to currently available limits) due to the nature of the connection between surface water and groundwater and the significant contribution of groundwater to streamflow in the Peel Harvey system.

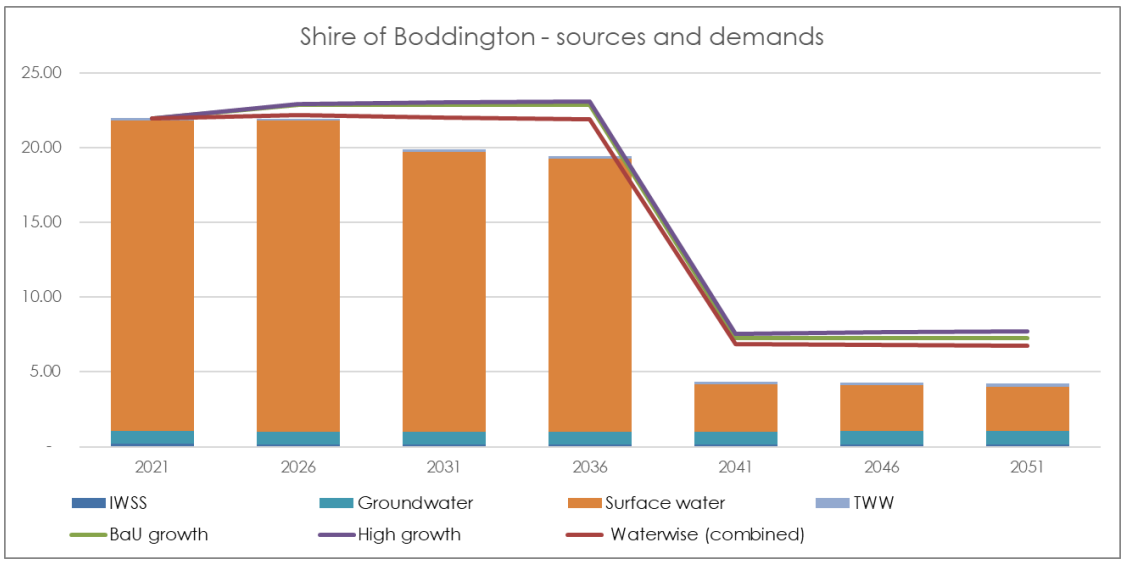
To account for the degree of impact of climate change on environmental flows, this study assessed a further scenario in which surface water abstraction is maintained at 2021 levels, groundwater allocation limits are maintained at 2021 levels to 2030, and then reduced by 10%, then reduced incrementally to reach a further 10% reduction by 2050. This scenario (labelled as Scenario E5 in the report) also addresses the recognised difficulty in accessing the currently available groundwater resources and acknowledges that it is unlikely that the currently remaining allocation can be accessed. It is also considered that this scenario most closely represents the current policy climate for management of groundwater and surface water resources, and while this scenario continues to see a declining trend in groundwater storage within the catchments and streamflow to the estuary (~290 GL by 2050), there is a small increase in surface water storage which reduces the potential for loss from waterways to the groundwater.

The analysis of this scenario suggests that the Peel Region will run out of currently available sources of water within the next few years and highlights the significant gaps in all local government areas except Mandurah (see Summary Table 3 and graphs below). A spatial representation of these supply gaps and currently utilised source options is provided in the report in Figure 54 and Figure 55.

Summary Table 3: Available water sources for each growth scenario at 2051 under scenario E5

Local government	BaU	High growth	Waterwise
Boddington	-3.03	-3.49	-2.56
Mandurah	6.11	3.89	8.01
Murray	-27.69	-40.85	-23.28
Serpentine Jarrahdale	-11.67	-12.18	-8.80
Waroona	-10.26	-11.00	-8.21
Total (GL)	**-46.55**	**-63.63**	**-34.85**


Peel Region - sources and demands
250.00
200.00
150.00
100.00
50.00
-
2021
2026
2031
2036
2041
2046
2051
IWSS
Groundwater
Surface water
TWW
BaU growth
High growth
Waterwise (combined)


Shire of Boddington - sources and demands
25.00
20.00
15.00
10.00
5.00
-
2021
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IWSS
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Surface water
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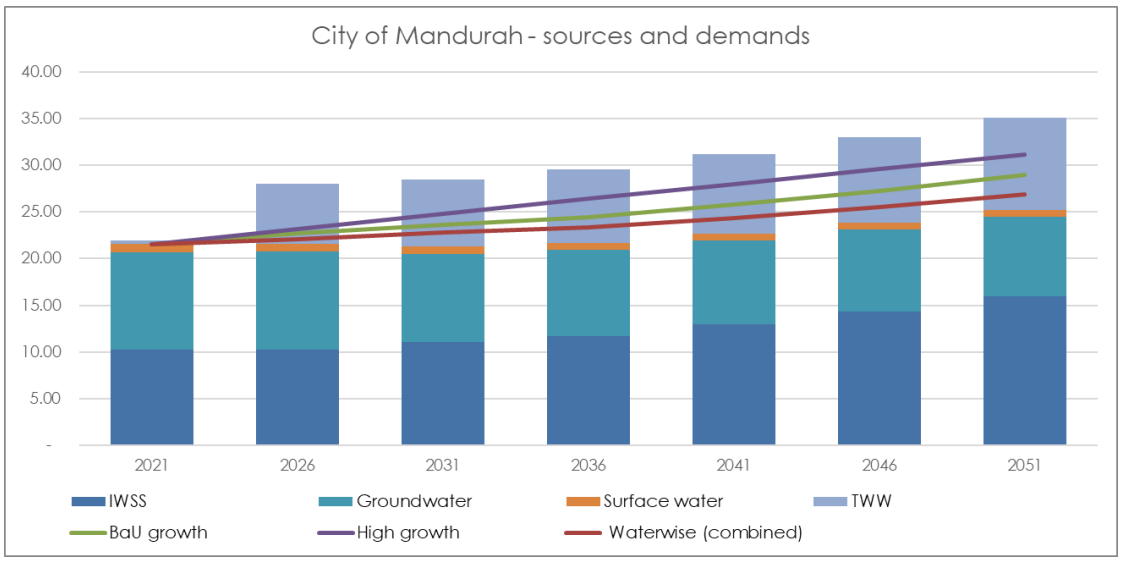
BaU growth
High growth
Waterwise (combined)


City of Mandurah - sources and demands
40.00
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25.00
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-
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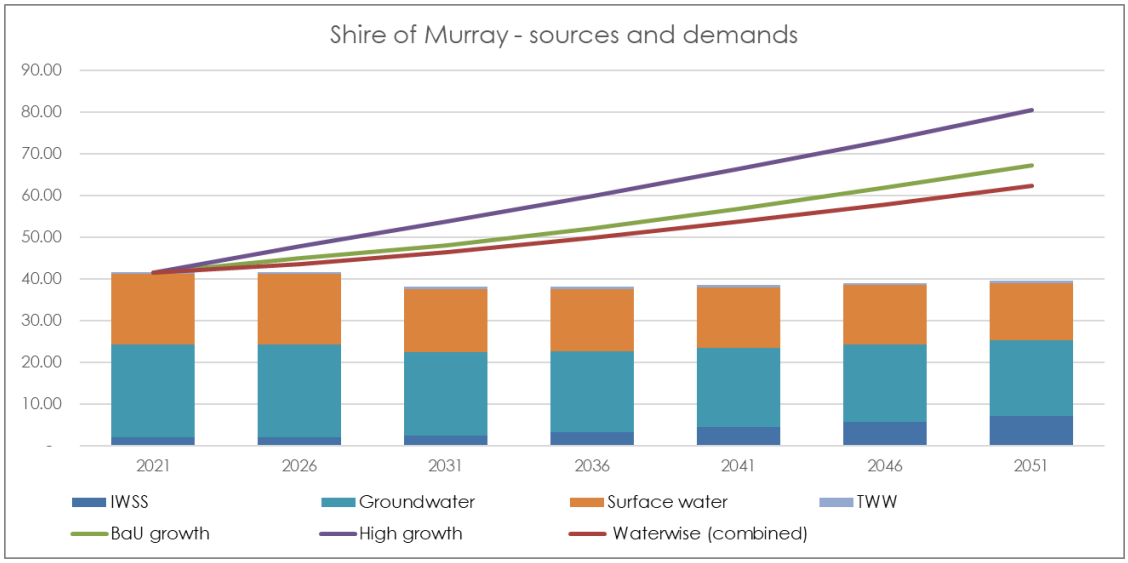
2051
IWSS
Groundwater
Surface water
TWW
BaU growth
High growth
Waterwise (combined)


Shire of Murray - sources and demands
90.00
80.00
70.00
60.00
50.00
40.00
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20.00
10.00
-
2021
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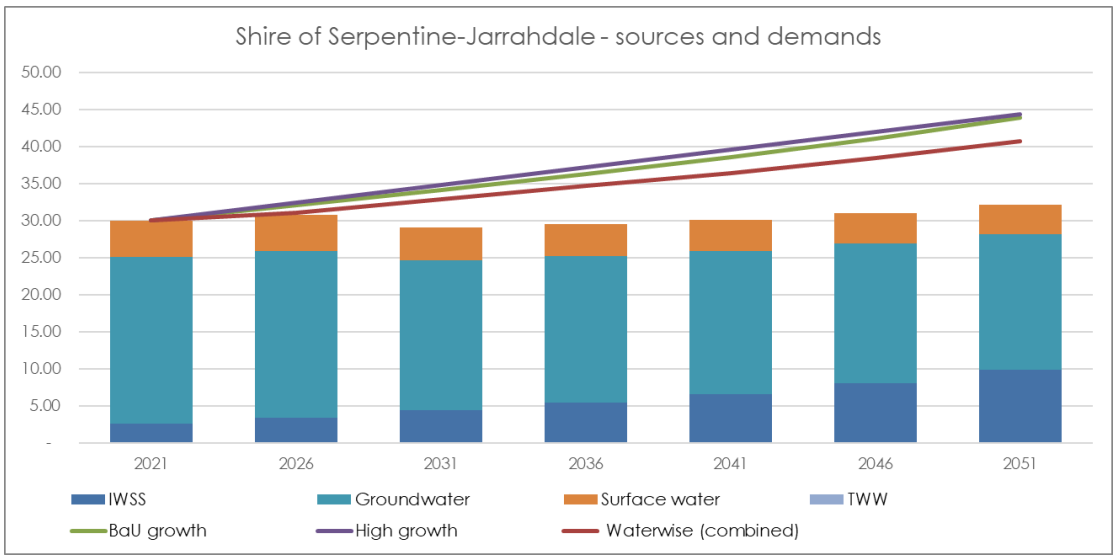
IWSS
Groundwater
Surface water
TWW
BaU growth
High growth
Waterwise (combined)


Shire of Serpentine-Jarrahdale - sources and demands
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45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
-
2021
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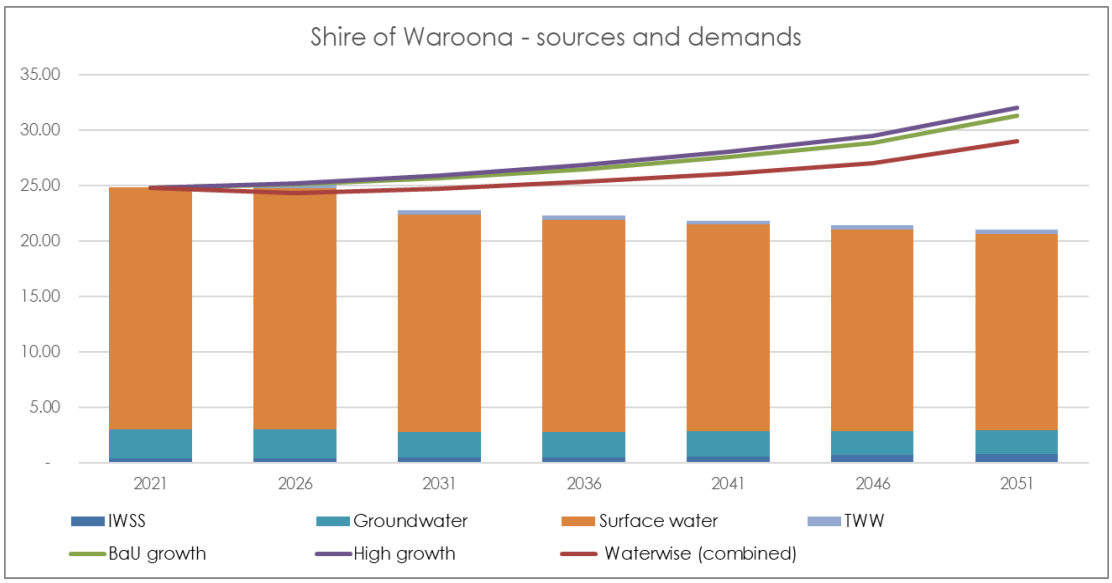
IWSS
Groundwater
Surface water
TWW
BaU growth
High growth
Waterwise (combined)


Shire of Waroona - sources and demands
35.00
30.00
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-
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2031
2036
2041
2046
2051
IWSS
Groundwater
Surface water
TWW
BaU growth
High growth
Waterwise (combined)

Towards a sustainable water future in the Peel Region

As stated previously, the availability of water sources into the future is heavily dependent on the likely impacts of climate change and water resource management regimes. Key considerations when planning for a sustainable water future include:

- The environmental values of the Peel region are significant, and the environment is already under stress. The level of environmental stress will only increase with the increasing impacts of climate change and is likely to become critical in response to any increased use of surface water or groundwater resources.
- There is some uncertainty associated with access to currently available groundwater resources within the superficial aquifer and further drawdown of this aquifer will reduce streamflows to the estuary.
- The viability of surface water resources will decline into the future and where possible, strategic releases of surface water to the environment may help to manage some of the impacts of climate change.
- Maximising use of recycled wastewater is an important opportunity that should be investigated as soon as possible.
- Alternative sources of water (including recycled water) are available, but these are generally complex and likely to cost more than current options. These solutions are more likely to succeed through collaborative partnerships that are flexible.

This report has identified the likelihood of significant water source shortfalls in the water requirements of the future community, agricultural and industrial growth and development within the Peel Region. It has considered the impact of climate change and the current water management regime on the environment, and particularly the internationally recognised Peel-Yalgorup Ramsar site. It is imperative that alternative sources of water are investigated by the Peel Alliance in partnership, so that any future solution considers the critical conditions together with the broad range of objectives and settings. This should include the consideration of any actions that can enhance environmental flows to and within the waterways of the Peel-Harvey Estuary (although our modelling has demonstrated the difficulty in achieving this objective).

It is therefore recommended that consideration is given to the following next steps:

- Consult with the Bindjareb and Wilman Noongar people to listen and share knowledge of the water resource needs, environmental conditions and likely impacts in order to improve management recommendations and outcomes.
- Each local government to continue optimising their current water source entitlements through identifying current sources, future needs, future water transfers (from developers), optimum supply network configuration and prioritisation of assets for irrigation.
- Continue to collaborate to develop collective and integrated solutions that can adapt to changing environmental conditions and development priorities.
- Seek further guidance on the viability of local and regional options including volumes, reliability, infrastructure and operational costs and arrangements, while meeting the principles to protect the Peel Harvey.
- Undertake detailed local, technical studies to prove sources.
- Develop a formal adaptive management framework to monitor environmental conditions, water supply sources and assess future demands which enables necessary responsive actions.

Please refer to the full report at www.peelalliance.org.au for more detailed information regarding the assumptions and findings of this study.

Disclaimer and Limitation