Government of **Western Australia**
Department of **Water and Environmental Regulation**

Environmental management of groundwater from the Gnangara Mound groundwater resources

Annual compliance assessment report
July 2024 – June 2025

March 2026

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Acknowledgements

The Department of Water and Environmental Regulation (DWER) acknowledges the Whadjuk and Yued peoples of the Noongar Nation as the Traditional Owners of the Gnangara Mound groundwater resources. DWER acknowledges the Traditional Owners of the lands on which we live and work throughout Western Australia and we pay our respects to Elders past and present. DWER recognises the practice of intergenerational care for Country and its relevance to our work and working with the community. DWER continues to move forward with a shared commitment to protect and conserve Country for our future generations.

This document was prepared by the Water Allocation Planning Branch with assistance from the Water Science Division and Statewide Delivery Directorate, including officers of the Swan Avon region.

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Summary

This report describes the Department of Water and Environmental Regulation's (the Department) compliance with Ministerial conditions and commitments under *Ministerial Statement no. 819 – Gnangara Mound groundwater resources [including East Gnangara Shire of Swan]* (Government of Western Australia 2009) for the period 1 July 2024 to 30 June 2025, under Part IV of the *Environmental Protection Act 1986* (EP Act).

The report presents total licensed groundwater entitlements across all aquifers within the Gnangara groundwater system, as defined in the *Gnangara groundwater allocation plan* (DWER 2022a), and summarises the Department's environmental monitoring, management actions, research initiatives and stakeholder engagement undertaken to manage groundwater abstraction.

Under *Ministerial Statement no. 819*, the Department must comply with water level criteria set at 30 groundwater-dependent wetland and terrestrial vegetation sites. In 2024–25, 14 sites were non-compliant with absolute minimum or minimum peak water level criteria – two fewer than in 2023–24.

Rainfall at Perth Airport (Bureau of Meteorology station no. 009021) during the reporting period was 647.2 mm, closely aligned with the 10-year average of 650.2 mm, but below the long-term (80 year) average of 751.8 mm.

In 2024–25, public water supply abstraction volumes licensed to Water Corporation for the Integrated Water Supply Scheme (IWSS), remained similar to the previous year (see Table 1). The Department continued to work with Water Corporation to adjust abstraction patterns in response to groundwater level trends, prioritising reductions near environmentally sensitive areas and near sites that were non-compliant with water level criteria under *Ministerial Statement no. 819*.

The volume of water licensed to Water Corporation's groundwater replenishment scheme remained at 28 gigalitres (GL) in 2024–25. Just over 21 GL was injected into the Leederville and Yarragadee aquifers in 2024–25, compared with 16.30 GL in 2023–24. Abstraction volumes in both years were very similar – 23.38 GL in 2024–25 and 23.47 GL in 2023–24 (see Tables 1 and 2 and Section 3.1).

Private licensed entitlements increased by 1.19 GL across all aquifers compared with the previous year (see Tables 1 and 2 and Section 3.2).

Estimated groundwater use from activities exempt from licensing (exempt use) – primarily domestic garden bores – was adjusted to 29.4 GL/year to reflect the change in the garden bore roster (effective 1 September 2022) from three to two days per week. This estimate aligns with projections of exempt use to 2030 as published in the 2022 *Gnangara groundwater allocation plan* (see Section 3.3).

To address climate-related pressures on the Gnangara groundwater system, and rebalance groundwater use, the Department released the Gnangara groundwater allocation plan in June 2022 (DWER 2022a). Developed through extensive stakeholder consultation, the plan aims to ensure long-term environmental

sustainability and supply certainty by reducing annual groundwater use from the Gnangara resources by 54 GL (approximately 19 per cent). These reductions are intended to stabilise or increase groundwater levels in key locations and slow declines elsewhere to avoid further impacts to the health of groundwater-dependent ecosystems.

The 2022 *Gnangara groundwater allocation plan* also proposes changes to water level criteria at some sites. The Environmental Protection Authority (EPA) is currently reviewing these proposed changes under section 46 of the EP Act. Pending the outcome of the EPA's inquiry and the Minister for the Environment's decision, a new Ministerial Approval Statement will be issued. Until then, the Department will continue to meet its monitoring and reporting requirements under *Ministerial Statement no. 819*.

Table 1 Rainfall, licensed entitlement totals and exempt use from all aquifers, and compliance summary

	2023–24	2024–25
Rainfall[1]	458.4 mm	647.2 mm
Public water supply entitlements[2] (IWSS baseline licences, Town of Woodridge [ToW] and Moore River South development [MRSD])	111.62 GL	111.47 GL
Public water supply entitlements[3] (IWSS groundwater replenishment)	28.00 GL	28.00 GL
Injected (actual)	*16.30 GL*	*21.14 GL*
Abstracted (actual)	*23.47 GL*	*23.38 GL*
Private licensed entitlements	127.77 GL	128.96 GL
Estimated exempt use[4] (garden bores, stock and domestic)	29.4 GL	29.4 GL
Sites non-compliant with absolute minimum or peak water level criteria[5]	16 of 30	14 of 30

1 Rainfall measured at Perth Airport (Bureau of Meteorology station no. 009021), based on July-June water year.
2 In 2024–25, IWSS baseline licence was 110.65 GL (including 1.08 GL from bore MR17, outside the Gnangara plan boundary but within the Perth South groundwater area); ToW: 0.13 GL; MRSD: 0.69 GL.
3 In 2023–24, IWSS baseline licence was 110.80 GL (including 0.88 GL from bore MR17); ToW: 0.13 GL; MRSD: 0.69 GL.
4 See Section 3.1 and Table 2 for full details of IWSS groundwater replenishment entitlements, injection and abstraction volumes.
5 Exempt use volumes are from the Superficial aquifer, estimated using survey data, information from the Australian Bureau of Statistics and Water Corporation records of household use. See Section 3.3 for more information.

Refer to Table 4 and Appendix A for full compliance details.

1 GL = 1,000,000 kilolitres. Figures have been rounded to two decimal places.

1 Background

1.1 Ministerial Statement no. 819

Ministerial Statement no. 819: Gnangara Mound groundwater resources [including East Gnangara Shire of Swan] (*Ministerial Statement no. 819*) (Government of Western Australia 2009) sets out the environmental conditions and commitments governing the allocation of groundwater from the Gnangara groundwater resources. The Department of Water and Environmental Regulation (the Department) is the designated proponent for this proposal and is required to report annually to the Environmental Protection Authority (EPA) on its compliance with the implementation conditions under Part IV of the *Environmental Protection Act 1986* (the EP Act).

The Department was formed in July 2017 following the amalgamation of the Office of the Environmental Protection Authority, the Department of Water and the Department of Environment Regulation. To avoid any perceived conflict of interest, the Director General of the Department does not participate in assessing compliance with *Ministerial Statement no. 819*. Instead, this responsibility has been formally delegated to the Executive Director, Assurance.

Some of the key conditions in *Ministerial Statement no. 819* are environmental water provisions, set as minimum water level criteria at 30 representative sites across the Gnangara groundwater system. These include 14 wetland sites and 16 terrestrial phreatophytic[1] vegetation sites (Figure 1).

Implementation conditions associated with the Gnangara groundwater proposal were established in 1988 and have since been revised several times. Revisions have included the addition of new criteria sites and the removal of sites where environmental values had been lost due to factors other than abstraction – such as reduced rainfall, land clearing and urban development (Appendix C). The water level criteria at the current 30 sites have been designed to protect each site's important environmental values from significant impact due to groundwater declines caused by abstraction of groundwater.

In June 2022 the Department released the *Gnangara groundwater allocation plan* (DWER 2022a), which proposes changes to some of the water level criteria in *Ministerial Statement no. 819*. The EPA is currently reviewing the proposed changes under section 46 of the EP Act. Following the EPA's inquiry, the Minister for the Environment will consider its recommendations. If the Minister determines that the implementation conditions in *Ministerial Statement no. 819* should be amended, a new Ministerial Approval Statement will be issued. Until that time, the Department will continue to meet its monitoring and reporting obligations under *Ministerial Statement no. 819*.

[1] Phreatophytic vegetation is vegetation that uses groundwater to meet at least part of its water needs. On the Swan Coastal Plain, native vegetation that occurs within 10.5 m depth to groundwater is considered likely to be phreatophytic.

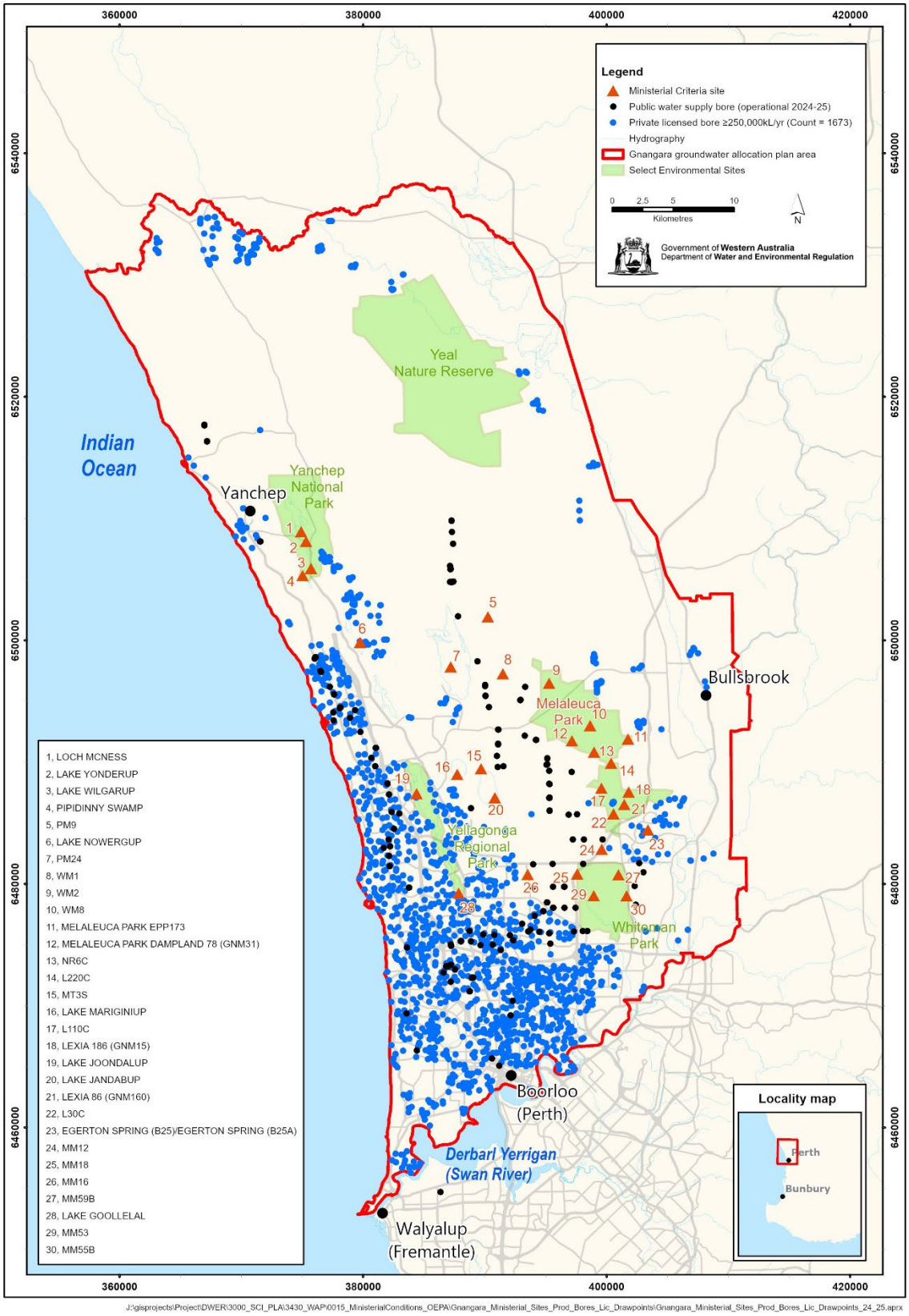

Figure 1 *Location of Gnangara water level criteria sites, public water supply production bores and drawpoints of private licences with larger entitlements*

1.2 The Gnangara groundwater system

The Gnangara groundwater system is located on the Swan Coastal Plain. It extends from the Swan River in the south to Moore River and Gingin Brook in the north, and from the coast to close to the Darling Scarp in the east. It covers an area of about 2,200 km^2 (Figure 1). The system comprises four main aquifers:

- **Superficial aquifer** – a shallow, unconfined (watertable) aquifer also known as the Gnangara Mound
- **Mirrabooka aquifer** – a shallow, semi-confined aquifer
- **Leederville aquifer** – a deep, partially confined aquifer
- **Yarragadee aquifer** – a deep, mostly confined aquifer.

The Gnangara groundwater system is currently overallocated and overused. Over the past 40 years, reductions in rainfall and increasing groundwater use have contributed to significant declines in water levels across parts of the system, adversely affecting important wetlands and other groundwater-dependent ecosystems. Key drivers of these declines include:

- groundwater abstraction for public water supply and private use
- reduced rainfall and recharge due to climate change
- pine plantations limiting recharge to groundwater.

The Superficial aquifer is the primary regional watertable aquifer of the Gnangara groundwater system and plays a critical role in supporting groundwater-dependent ecosystems. These ecosystems can be negatively affected not only by direct pumping from the Superficial aquifer but also by abstraction from deeper aquifers where they are hydraulically connected to the Superficial. Such inter-aquifer connections are particularly significant in the northern part of the Gnangara groundwater system (Figure 2).

Private groundwater users predominantly draw from the Superficial aquifer, while Water Corporation is the principal user of the deeper Leederville and the Yarragadee aquifers for public water supply purposes.

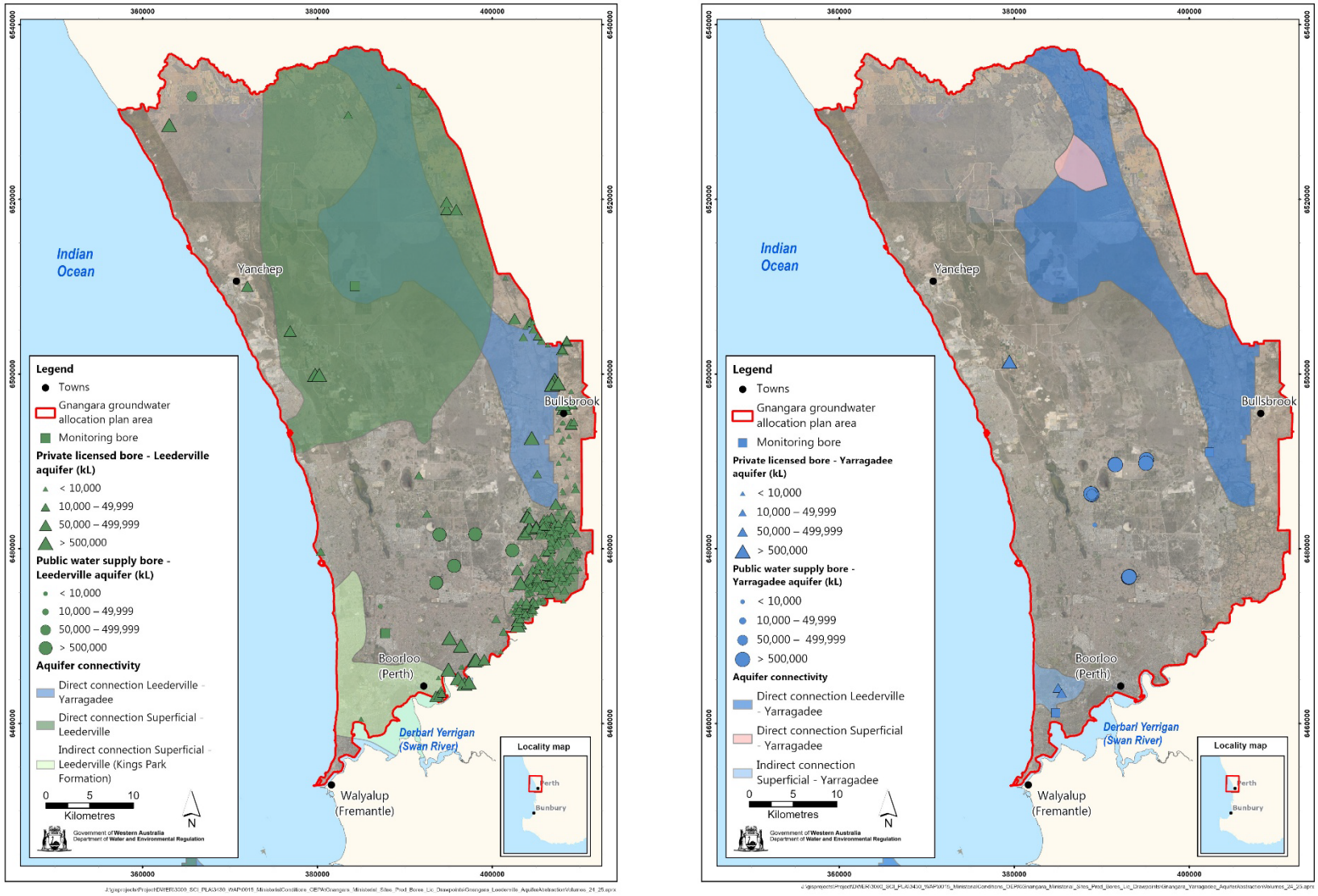

Figure 2 Groundwater connectivity of the Leederville (left) and Yarragadee (right) aquifers, with abstraction locations and volumes

1.3 Allocation limits and licensing

The Department manages the use of groundwater resources through three key mechanisms:

- setting **allocation limits**
- **licensing** groundwater abstraction
- **monitoring** of water use, water levels, water quality and dependent ecological values.

An allocation limit is the annual volume of water set aside for consumptive use from a water resource. This typically includes:

- water available for licensing
- water use we account for that is exempt from licensing, such as domestic garden bore use.

Groundwater abstracted under managed aquifer recharge schemes (including Water Corporation's groundwater replenishment scheme – see Section 3.1) is licensed but accounted for outside the allocation limit, as there is no net deficit to the groundwater resource.

Water allocated to the environment is not included as part of the allocation limit. Rather, it is the water that is left in the groundwater system to support environmental, cultural and community values.

To protect groundwater-dependent ecosystems, water level criteria have been set at high-value wetland and bushland sites across the Gnangara groundwater system under *Ministerial Statement no. 819*. These criteria ensure that ecological water requirements of groundwater-dependent ecosystems are considered when water is allocated from the system. This helps ensure there is sufficient water left in the system to meet environmental needs. If criteria are not met, there is a risk of impact to ecological values. Breaches, or impending breaches, trigger management actions, which may include further investigations, changes to groundwater management, or reductions to groundwater use.

Persistent breaches of water level criteria set in *Ministerial Statement no. 819* led to the development of the 2022 *Gnangara groundwater allocation plan* (DWER 2022a). This plan reduces groundwater use by 54 GL/year[2] and establishes new allocation limits for the Gnangara groundwater resources.

The revised limits were informed by comprehensive assessments of the state of Gnangara groundwater resources, including:

[2] Reductions to groundwater use under the 2022 *Gnangara groundwater allocation plan* include a 30.1 GL/year reduction to baseline public water supply abstraction, a 10 GL/year reduction to private licensed use (10 per cent of licensed entitlements), and a 13.6 GL/year reduction to unlicensed (exempt) stock and domestic garden bore use. Reductions to licensed use will be implemented from 2028. Reductions to exempt use were implemented through a change to the garden bore roster (from three watering days to two days per week) on 1 September 2022.

- climate science
- hydrogeological modelling
- environmental risk assessments.

For a summary of the new allocation limits, refer to the *Gnangara groundwater allocation plan* (DWER 2022a). Detailed methodologies used to determine these limits are provided in the *Gnangara groundwater allocation plan: Methods* (DWER 2022b).

2 Rainfall

Groundwater recharge in the Gnangara system is primarily driven by rainfall. How much groundwater levels rise and fall each year is affected by the volume of rain that falls in the catchment, but also by how it falls (timing, pattern and intensity). Recharge is also affected by temperature – warmer conditions increase evaporation, reducing the proportion of rainfall that infiltrates and replenishes the aquifer.

During the 2024–25 reporting period, rainfall recorded at Perth Airport (Bureau of Meteorology station no. 009021) was 647.2 mm. This was higher than rainfall in 2023–24 (458.4 mm) but below the long-term (80-year) average of 751.8 mm and close to the short-term (10-year) average of 650.2 mm (Figure 3).

The first five months of 2025 (January to May) were particularly hot and dry, with only 89 mm of rainfall recorded and an average maximum daily temperature of 30.6°C.

The climate across Western Australia (WA) is changing. Average temperatures statewide have risen 1.3°C since 1910. To date, the rainfall decline affecting south-west WA has been greater than anywhere else in Australia.

According to the Intergovernmental Panel on Climate Change (IPCC 2021), south-west WA is very likely to continue drying in the future and is projected to experience:

- less rainfall in winter and spring, and lower annual rainfall
- increased drought duration
- increased evaporation rates, leading to reduced soil moisture and surface runoff.

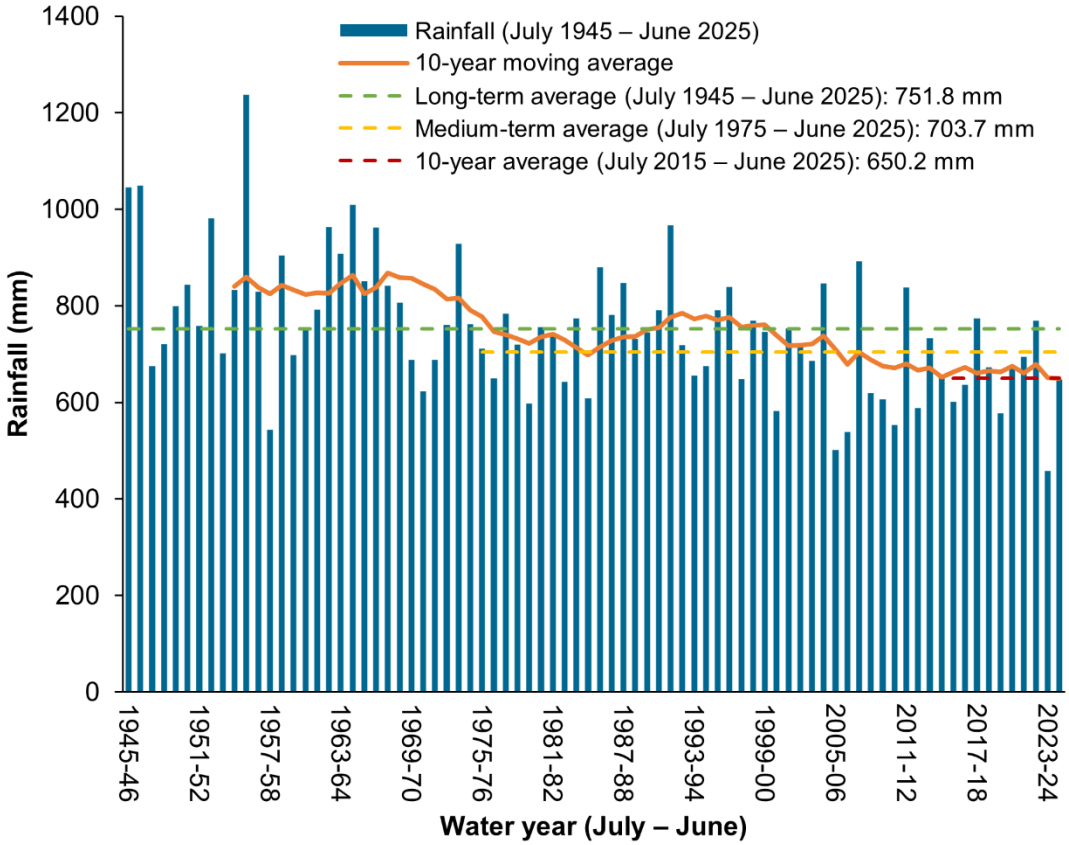

Figure 3 Annual and average water year (July–June) rainfall at Perth Airport (Bureau of Meteorology station no. 009021)

3 Groundwater use

The Gnangara groundwater system is the Boorloo (Perth) region's largest source of easily accessible, low-cost, good-quality water. It provides almost half of Boorloo's public water supply and supports irrigation for public open spaces, local horticulture and viticulture, and domestic garden bores.

This chapter summarises the licensed groundwater entitlements within the Gnangara groundwater allocation plan area for the 2024–25 reporting period, including volumes exempt from licensing.

3.1 Public water supply entitlements

The Department licenses Water Corporation to take groundwater from the Gnangara and Jandakot systems for Boorloo's Integrated Water Supply Scheme (IWSS). Additionally, small volumes of groundwater are licensed from the Leederville aquifer to supply the Town of Woodridge (ToW) and for the Moore River South development (MRSD), which are licensed separately from the IWSS.

In 2024–25, the total volume of groundwater licensed for public and town water supply from all aquifers of the Gnangara groundwater resources was 111.47 GL, a slight decrease from 111.62 GL in 2023–24. Refer to Table 2 for the distribution of licences by aquifer and Table 3 for the distribution of licences across Superficial aquifer subareas.

The Department continues to work with Water Corporation to adjust abstraction patterns in response to groundwater level trends, prioritising abstraction reductions near environmentally sensitive areas and near sites non-compliant with water level criteria under *Ministerial Statement no. 819*.

Groundwater replenishment scheme

Water Corporation's groundwater replenishment (GWR) scheme is a managed aquifer recharge initiative, licensed separately from standard public water supply entitlements. Groundwater abstracted under this scheme is offset by equivalent volumes of injected water, resulting in no net deficit to the groundwater resource. Therefore, it is not included in the allocation limits.

At the Beenyup Wastewater Treatment Plant in Craigie, water is treated to drinking water quality standard and recharged (or injected) into the Leederville and Yarragadee aquifers. In 2024–25:

- 21.14 GL was injected (up from 16.30 GL in 2023–24)
- 23.38 GL was abstracted (similar to 23.47 GL in 2023–24)

Licensing for the GWR scheme considers IWSS operational constraints while aiming to minimise impacts on groundwater-dependent ecosystems.

See Table 2 for the GWR scheme's injection and abstraction volumes by aquifer.

3.2 Private licensed entitlements

Groundwater licensed for private use from the Gnangara groundwater system is primarily drawn from the Superficial aquifer and supports irrigation for agriculture, commercial operations and public open spaces.

In 2024–25, private licensed entitlements increased by 1.19 GL across all aquifers compared to 2023–24 (Tables 2 and 3).

While most groundwater subareas recorded a decrease in entitlements, this was offset by a temporary licence of 4.75 GL issued for the Superficial aquifer in the Eglinton subarea (Table 3). The licence, granted for two years, facilitates dewatering for construction of the Alkimos Seawater Desalination Plant. The licence underwent a detailed assessment (DWER 2020), requiring hydrogeological analysis and numerical modelling. The risk of drawdown or seawater intrusion impacts to groundwater-dependent ecosystems associated with the temporary dewatering is low. An environmental management framework is in place, incorporating trigger water levels, ongoing monitoring and review, and recharge of extracted water near the coastline to mitigate seawater intrusion.

3.3 Use that is exempt from licensing

In addition to licensed groundwater abstraction, the Department accounts for groundwater use that is exempt from licensing under the *Rights in Water and Irrigation Act 1914*. The primary exempt uses within the Gnangara groundwater system include:

- domestic garden bores in urban areas
- stock and domestic bores in rural areas where scheme water is unavailable.

To improve water efficiency and reduce pressure on groundwater resources, the sprinkler roster for garden bores in the Perth and Mandurah areas was amended on 1 September 2022, reducing watering days from three to two days per week. This change aligns garden bore use with the roster for scheme water users.

Based on projections in the *Gnangara groundwater allocation plan* (DWER 2022a), the estimated annual volume of groundwater use from domestic garden bores is 29.4 GL. This figure accounts for a small amount of growth in bore numbers between the plan’s release and 2030 and will be used in compliance reporting until updated data becomes available.

As exempt uses are not subject to metering regulations, the Department relies on alternative methods to estimate volumes, including:

- household surveys
- data from the Australian Bureau of Statistics
- Water Corporation records of household water use.

Average water use per bore was initially assessed through the domestic bore metering project, which ran from 2009 to 2012. Following the introduction of the three-day-per-week sprinkler roster and the winter sprinkler ban in 2010, average water use per bore decreased from about 800 kL/year to 430 kL/year in urban areas.

Further information on the management of garden bores is provided in Section 5.2.

Table 2 Licensed entitlements and estimates of garden bore use from all aquifers in the Gnangara groundwater system

Aquifer	Public water supply entitlements[1] (GL)								Private licensed entitlements (GL)[3]		Garden and stock/ domestic bore use exempt from licensing (GL)[4]	
	IWSS + ToW + MRSD entitlements[2]		IWSS GWR scheme									
			GWR Entitlements		GWR Injected		GWR Abstracted					
	2023–24	2024–25	2023–24	2024–25	2023–24	2024–25	2023–24	2024–25	2023–24	2024–25	2023–24	2024–25
Superficial	34.89	34.98	2.20	1.50	-	-	0.86	1.19	112.52	114.50	29.4	29.4
Mirrabooka	3.48	3.48	0.80	0.80	-	-	0.58	0.75	2.22	2.04	-	-
Leederville	32.25	30.72	13.51	16.11	9.34	13.39	11.64	11.65	11.76	11.61	-	-
Yarragadee[5]	41.01	42.30	11.50	9.60	6.96	7.75	10.38	9.79	0.68	0.68	-	-
Fractured rock[6]	-	-	-	-	-	-	-	-	0.59	0.13	-	-
Total	**111.62**	**111.47**	**28.00**	**28.00**	**16.30**	**21.14**	**23.47**	**23.38**	**127.77**	**128.96**	**29.4**	**29.4**

1 Public water supply volumes include groundwater licensed to Water Corporation for the IWSS, Town of Woodbridge (ToW) and the Moore River South Development (MRSD). Data sourced from COMPASS, and Water Corporation annual reports.
2 In 2024–25, IWSS baseline licence was 110.65 GL (including 1.08 GL from bore MR17, outside the Gnangara plan boundary but within the Perth South groundwater area); ToW: 0.13 GL; MRSD: 0.69 GL.
In 2023–24, IWSS baseline licence was 110.80 GL (including 0.88 GL from bore MR17); ToW: 0.13 GL; MRSD: 0.69 GL.
3 Private licensed entitlements are based on COMPASS reports run on 1 July of each respective year.
4 Exempt use volumes are estimated based on survey data, ABS statistics, and Water Corporation household use records. The figure of 29.4 GL reflects the two-day-per-week sprinkler roster introduced on 1 September 2022 and aligns with projections to 2030 published in the 2022 *Gnangara groundwater allocation plan*.
5 Yarragadee volumes include bore MR17: 1.08 GL (2024–25) and 0.88 GL (2023–24).
6 Includes licensed entitlements from the Coastal Saline aquifer: 0.0 GL (2024–25); 0.47 GL (2023–24).

1 GL = 1,000,000 kL. Figures have been rounded to two decimal places (except for exempt use volumes, which are estimates).

Table 3 Licensed entitlements from the Superficial aquifer in subareas of the Gnangara groundwater system over the 2024–25 annual reporting period

Groundwater area	Subarea	Ministerial criteria site present?	Public water supply entitlements[1] (GL)				Private licensed entitlements[2] (GL)	
			IWSS + Town of Woodridge entitlements		Groundwater replenishment			
			2023–24	2024–25	2023–24	2024–25	2023–24	2024–25
Gingin	Beermullah Plain South	No	-	-	-	-	2.92	2.92
	Deepwater Lagoon South	No	-	-	-	-	2.79	3.18
	Guilderton South	No	-	-	-	-	9.75	9.75
	Lake Mungala	No	-	-	-	-	2.66	2.62
Total for Gingin Groundwater Area			**0.00**	**0.00**	**0.00**	**0.00**	**18.13**	**18.47**
Gnangara	Reserve	Yes	0.65	0.65	-	-	1.62	1.67
	Wanneroo Wellfield	Yes	6.51	7.76	-	-	2.17	2.22
Total for Gnangara Groundwater Area			**7.16**	**8.41**	**0.00**	**0.00**	**3.78**	**3.88**
Gwelup	Gwelup	No	3.39	3.39	0.10	0.10	1.40	1.35
Total for Gwelup Groundwater Area			**3.39**	**3.39**	**0.10**	**0.10**	**1.40**	**1.35**
Mirrabooka[3]	Ballajura	No	2.27	2.25	0.05	0.05	0.97	0.87
	Beechboro	No	-	-	-	-	0.82	0.57
	Henley Brook	No	0.45	0.45	-	-	0.45	0.27
	Improvement Plan 8	No	1.73	1.73	-	-	0.19	0.19
	Landsdale	Yes	-	-	-	-	0.27	0.25
	Plantation	No	-	-	-	-	0.28	0.27
	State Forest	No	-	-	-	-	1.09	1.01
	Whiteman Park	Yes	0.05	0.05	-	-	0.52	0.65
Total for Mirrabooka Groundwater Area			**4.50**	**4.48**	**0.05**	**0.05**	**4.60**	**4.09**
Perth[3]	City of Bayswater	No	-	-	-	-	2.12	1.83
	City of Fremantle North	No	-	-	-	-	0.05	0.12
	City of Nedlands	No	-	-	-	-	2.36	2.36
	City of Perth	No	-	-	-	-	1.50	1.58
	City of Stirling	No	3.35	3.35	0.30	0.30	8.77	7.70
	City of Subiaco	No	-	-	-	-	0.95	0.98
	Eglinton	No	-	-	-	-	3.70	8.07
	Quinns	No	10.85	10.85	0.25	0.25	2.86	2.84
	Shire of Peppermint Grove	No	-	-	-	-	0.08	0.08
	Shire of Swan North	No	-	-	-	-	0.72	0.59
	Town of Bassendean	No	-	-	-	-	0.41	0.37
	Town of Cambridge	No	-	-	-	-	2.29	2.30
	Town of Claremont	No	-	-	-	-	0.62	0.62
	Town of Cottesloe	No	-	-	-	-	0.28	0.28
	Town of Mosman Park	No	-	-	-	-	0.48	0.48
	Town of Vincent	No	-	-	-	-	0.72	0.71
	Whitfords	Yes	4.55	3.50	1.50	0.80	9.43	9.13
Total for Perth Groundwater Area			**18.75**	**17.70**	**2.05**	**1.35**	**37.34**	**40.05**
Swan[3]	Bandy Spring	No	-	-	-	-	0.32	0.45
	Cockman Bluff	No	-	-	-	-	0.77	0.82
	East Swan	No	-	-	-	-	0.19	0.17
	Neaves	No	-	-	-	-	3.36	3.01
	North Swan	Yes	-	-	-	-	2.44	2.41
	Radar	No	-	-	-	-	1.90	1.88
	South Swan	No	-	-	-	-	0.46	0.48
	Swan Valley[4]	No	-	-	-	-	4.69	4.54
Total for Swan Groundwater Area			**0.00**	**0.00**	**0.00**	**0.00**	**14.14**	**13.76**
Wanneroo	Adams	Yes	-	-	-	-	0.99	1.05
	Carabooda	No	-	-	-	-	8.00	7.59
	Carramar	No	-	-	-	-	1.56	1.41
	Jandabup	No	-	-	-	-	0.18	0.16
	Joondalup	No	-	-	-	-	0.73	0.71
	Lake Gnangara	No	-	-	-	-	6.03	6.14
	Mariginiup	Yes	-	-	-	-	3.95	3.94
	Neerabup	No	-	-	-	-	2.39	2.44
	Nowergup	Yes	-	-	-	-	2.70	2.66
	Pinjar	Yes	-	-	-	-	0.57	0.57
Total for Wanneroo Groundwater Area			**0.00**	**0.00**	**0.00**	**0.00**	**27.10**	**26.67**
Yanchep	Yanchep	Yes	1.10	1.01	-	-	6.03	6.24
Total for Yanchep Groundwater Area			**1.10**	**1.01**	**0.00**	**0.00**	**6.03**	**6.24**
Total for Gnangara groundwater allocation plan area			**34.89**	**34.98**	**2.20**	**1.50**	**112.52**	**114.50**

1 Data sourced from COMPASS, and Water Corporation annual reports.
2 Based on COMPASS reports run on 1 July of each respective year.
3 As part of finalising the Swan Valley subarea within the Swan groundwater area, minor boundary changes were made to the Perth and Mirrabooka groundwater areas as well as to subareas within Swan groundwater area.
4 Most of the former Central Swan subarea has been absorbed into the new Swan Valley subarea. The remaining portion of Central Swan was absorbed into East Swan subarea and East Swan boundaries were adjusted accordingly. The former Central Swan subarea has been abolished.

Current water availability volumes are available via the Department's website or by contacting the Swan–Avon regional office.
1 GL = 1,000,000 kL. Figures have been rounded to two decimal places.

4 Compliance

The conditions and commitments in *Ministerial Statement no. 819 – Gnangara Mound groundwater resources [including East Gnangara Shire of Swan]* (Government of Western Australia 2009), which the Department must comply with under Part IV of the *Environmental Protection Act 1986*, are detailed in Appendices A and B (the 'audit tables').

4.1 Compliance with water level criteria

Ministerial Statement no. 819 sets water level criteria at 30 sites across the Gnangara Mound. There are 14 wetland sites and 16 terrestrial (phreatophytic) vegetation monitoring sites. Some criteria sites have multiple criteria and may therefore be non-compliant with more than one.

The water level criteria include:

- **Absolute minimum water levels** – the primary indicator used to assess compliance
- **Preferred minimum water levels** – water levels may fall between the preferred and absolute minimum in up to two out of six years to replicate natural drying cycles. These are referred to as '*other*' criteria in this report and provide insight into water level trends
- **Additional** criteria – including maximum rate of decline, timing and frequency of drying, and minimum lake depth – these are also classified as '*other*' criteria in this report.

During the 2024–25 reporting period, 14 of the 30 sites were non-compliant with absolute minimum water level criteria, a reduction from 16 sites in 2023–24 (Table 4). Lexia 86 (GNM16) and MM55B, which were non-compliant in the previous year, met the criteria in 2024–25.

The same five sites were non-compliant with 'other' water level criteria in 2024–25 and 2023–24 (Table 4).

One site, PM9, a terrestrial (phreatophytic) vegetation monitoring site, is not currently being monitored due to safety concerns related to site access. Monitoring ceased in 2016 following significant groundwater level declines, and it is now considered unlikely that vegetation in the area remains groundwater-dependent as levels have dropped below typical rooting depths for Banksia woodland communities. Given this, the Department is proposing to remove the water level criteria for PM9. The Environmental Protection Authority (EPA) is currently inquiring into this and other proposed changes to the implementation conditions.

Details of the Department's management and mitigation actions in response to non-compliance are described in Section 5. Details for individual sites can be found in the audit tables in Appendix A.

Table 4 Summary of non-compliance with water level criteria for Gnangara groundwater resources for the 2024–25 annual reporting period

Non-compliant sites[1]				
Absolute minimum or peak water level criteria			**Other water level criteria**	
Wetlands	**Terrestrial vegetation**	**Total non-compliant**	**Wetlands**	**Total non-compliant**
2023–24				
Loch McNess Lake Yonderup Lake Jandabup Lake Nowergup Lake Wilgarup Pipidinny Swamp Lexia 86 (GNM16) Lexia 186 (GNM15) Melaleuca Park EPP173	MM53 MM55B MM59B PM9 WM1 WM2 WM8	16 of 30	Lake Mariginiup Lake Nowergup Lexia 86 (GNM16) Lexia 186 (GNM15) Melaleuca Park Dampland 78 (GNM31)	5 of 8
2024–25				
Loch McNess Lake Yonderup Lake Jandabup Lake Nowergup Lake Wilgarup Pipidinny Swamp Lexia 186 (GNM15) Melaleuca Park EPP173	MM53 MM59B PM9 WM1 WM2 WM8	14 of 30	Lake Nowergup Lake Mariginiup Lexia 86 (GNM16) Lexia 186 (GNM15) Melaleuca Park Dampland 78 (GNM31)	5 of 8

1 If a site is non-compliant with both absolute summer minimum and peak water level criteria within the same reporting year, it is recorded as a single incidence of non-compliance to avoid double counting. Refer to Appendix A for detailed site-specific compliance information.

5 Environmental monitoring, management, research and consultation

5.1 Environmental monitoring

Expert environmental consultants undertake environmental monitoring for the Department in accordance with the commitments in *Ministerial Statement no. 819* (Government of Western Australia 2009). This long-term monitoring program provides a representative assessment of the overall health of the Gnangara groundwater system and includes:

- wetland vegetation
- terrestrial vegetation
- wetland macroinvertebrates and water quality
- mound spring macroinvertebrates and water quality
- frogs.

The ecological condition of groundwater-dependent ecosystems is influenced by multiple factors, of which the water regime is just one. Other contributing factors include fire, insect attack, disease, weed invasion, pollution and disturbance from land use changes. Similarly, groundwater abstraction is one of several influences on ecosystem water regimes, alongside rainfall and temperature variability, fire, and land use changes such as urbanisation.

The Department uses the results of environmental monitoring, carried out each spring in the reporting period, to continually improve its understanding of the relationship between water levels and ecological condition. The results also inform groundwater management decisions, including adjustments to public water supply abstraction at priority locations – particularly where monitoring indicates ecological decline and water stress is a likely contributing factor.

In line with commitment 6.3 in *Ministerial Statement no. 819*, the Department is required to review and revise the monitoring program every six years, aligned with the triennial reporting cycle, and submit the updated program to the EPA. A formal update was submitted to the EPA in 2022 as part of the proposed changes to implementation conditions outlined in the *Gnangara groundwater allocation plan* (DWER 2022a).

Wetland vegetation monitoring

Vegetation monitoring was conducted in spring 2024 at the following wetland transects:

- Lake Jandabup
- Lake Mariginiup
- Lake Nowergup North
- Lake Yonderup
- Lexia 86 (GNM16)
- Lexia 186 (GNM15)
- Loch McNess
- EPP173 (Melaleuca Park)
- Lake Gwelup
- Quin Brook
- Lake Joondalup North
- Lake Joondalup South.

Canopy condition has declined at most sites compared to baseline monitoring[3], with the exception of Lake Nowergup and Lake Yonderup, where improvements were observed. At Lake Yonderup, this improvement is likely linked to regeneration following the December 2019 fire (Natural Area Consulting Management Services 2025).

A shift toward poorer canopy health (trees classified as poor, dead, or not found) was observed at lakes Jandabup, Mariginiup, Joondalup North, Loch McNess and Quin Brook in 2024. Lake Mariginiup was severely affected by a bushfire in 2023, resulting in the loss of all trees from the transect.

Changes in species composition were evident across all sites and years, with larger changes often associated with fire events. Native species richness increased at Lexia 86 (GNM16), Lexia 186 (GNM15), and Lake Mariginiup, but declined at Lake Jandabup, Lake Nowergup, Lake Yonderup, Loch McNess, EPP173 (Melaleuca Park), Quin Brook, Lake Gwelup and both Joondalup transects.

Five transects recorded no regeneration, but sites affected by recent fires – Quin Brook, Lake Jandabup and Lake Mariginiup – showed increased regeneration.

Four wetlands – Lake Yonderup, Loch McNess, Quin Brook, and Lake Mariginiup – remain wetlands of concern due to declining groundwater levels, deteriorating canopy condition, increasing weed loads, declines in native species richness, and shrinking or shifting of species' hydro-ecological ranges.

Wetland macroinvertebrates and water quality

In spring 2024, coinciding with peak water levels, macroinvertebrates and water quality were monitored at ten wetlands:

- EPP173 (Melaleuca Park)
- Lake Gnangara
- Lake Gwelup
- Lake Jandabup

[3] Baseline monitoring occurred in 1996 at Lake Nowergup North, Lake Jandabup and Lake Joondalup; in 1997 at Lake Yonderup, EPP173 (Melaleuca Park), Lexia 86 (GNM16) and Lexia186 (GNM15); in 2004 for Loch McNess; in 2009 for Quin Brook; in 2013 at Lake Gwelup; in 2023 for Lake Mariginiup (re-established transect).

- Lake Joondalup (North and South)
- Lake Mariginiup
- Lake Nowergup North
- Lake Yonderup
- Loch McNess South
- Quin Brook.

Lexia 86 (GNM16), Loch McNess North and Pipidinny Swamp were not included in the 2024 round of sampling and Lexia 186 is no longer monitored due to the lack of surface water (Lette, Buder & Burnham 2025).

Following another year of low rainfall and high temperatures in 2024, surface water levels decreased at most sampled wetlands compared to 2023, except for Lake Gwelup and EPP173 (Melaleuca Park), which experienced marginal increases, and lakes Jandabup and Mariginiup, which may have experienced reduced evapotranspiration after bushfires in 2023 and increased recharge linked to catchment urbanisation.

Water quality trends were generally consistent with 2023, with key findings including:

- the urban Spearwood dune lakes (Goollelal, Joondalup and Gwelup), continue to show signs of nutrient enrichment, evidenced by some or all of: elevated turbidity and/or chlorophyll-a, very high pH due to super-saturated dissolved oxygen levels, high nitrogen and phosphorus levels, and floating algal mats
- the East Wanneroo interdunal wetlands (lakes Jandabup, Mariginiup and Gnangara) continue to show evidence of acidification, particularly at Lake Gnangara, which recorded very low pH, high acidity and eroded buffering capacity
- of the Spearwood Dune wetlands, Lake Nowergup continued to record low nutrient levels. However, Lake Yonderup showed increased chlorophyll-a, ammonium, phosphorus and nitrogen, raising concerns given declining water levels and changes in macrophytes. Loch McNess also recorded elevated nutrient levels in the main water body, but not in the spring that flows into the lake, suggesting that nutrients may be originating in part from decomposing vegetation and terrestrialisation of sediments.

A total of 60 macroinvertebrate families were recorded across the ten wetlands, a slight decrease from 2023 (63 families). In other findings:

- Lake Jandabup recorded the highest increase (3 families) and had the highest richness overall (33), despite fire impacts to much of the lake's riparian vegetation in 2023.
- Seven wetlands recorded a decline in spring family richness of between 3 and 12 families. Loch McNess, which often has the highest richness, recorded the largest decline (12), possibly due to extremely low water levels and changes to vegetation. Assemblages at Loch McNess have undergone the largest change of all the monitored wetlands.
- Lake Gnangara has a different and more variable macroinvertebrate assemblage compared to the other two East Wanneroo wetlands (lakes Jandabup and Mariginiup), likely as a result of water quality factors and the lake's low macroinvertebrate species richness.

- Lakes Goollelal, Gwelup and Joondalup recorded similar results to recent years. Assemblages at lakes Gwelup and Goollelal have been the most consistent over time, while those at Lake Joondalup have been highly variable but have stabilised more recently. North and south ends of the lake remain distinct, most likely due to differences in water quality and habitat availability.
- Macroinvertebrate assemblages at EPP173 (Melaleuca Park) changed following a loss of permanent surface water at the wetland in approximately 2010, and in 2024 family richness continues to be low.

Mound spring macroinvertebrates and water quality

Five mound springs (Sue's Spring, Gaston Road Spring, Barnard Spring, Egerton Spring and Edgecombe Spring) along the eastern edge of the Gnangara groundwater allocation plan area were monitored for aquatic macroinvertebrates and water quality during the reporting period (SLR 2025).

Groundwater levels in monitoring bores B10 (near Edgecombe Spring) and B25/B25A (near Egerton Spring) have been rising in recent years, likely due to the progressive urbanisation of the Ellenbrook area. Levels at L160C (near Barnard Spring) have been relatively stable over the past two decades but prior to that had experienced a declining trend. Surface water flow at all three springs in 2024 was very similar to recent years, suggesting that groundwater levels are currently adequate to maintain these ecosystems.

Surface flow also remained stable at Gaston Road and Sue's Spring. However, groundwater levels at nearby monitoring bore GN24 have been slowly declining since the 1990s, and since 2016 have been noticeably affected by local abstraction.

In July 2024 the Department installed loggers and telemetry in GN24 (near Gaston Road and Sue's springs) and B25A (near Egerton Spring) to help assess the response of groundwater levels to stressors including low rainfall, local abstraction and land use change. The higher-frequency groundwater level monitoring will also support improving our understanding of the relationship between groundwater levels and flow at these springs.

Water quality at each of the mound springs remained similar over the reporting period. Electrical conductivity, dissolved oxygen, pH and water temperature remained stable, and no signs of drying or exposure of acid sulphate soils were detected. Nitrogen oxide exceeded ANZG (2018) eutrophication trigger values at Egerton, Edgecombe and Sue's Spring, but not at Barnard or Gaston Road springs. Nitrate concentrations exceeded ANZG (2018) toxicant guideline values for the protection of 95 per cent of species at Edgecombe, and for 90 per cent protection at Sue's Spring and Egerton Spring. Although exceedances have been consistent since 2013, high nitrate levels are common in Australian groundwater, and toxicity guidelines are conservative. Resident fauna may have adapted to historically elevated nitrate concentrations.

Species richness in 2024 ranged from 16 taxa at Egerton Spring to 24 at Gaston Road Spring. Insects continue to dominate the assemblages, making up almost half of all taxa recorded. The high degree of surface-water invertebrates suggests that aerial colonisation is a major driver. However, the continued presence of groundwater-dependent taxa – ranging from 3 taxa at Gaston Road Spring to 6 at Sue's Spring – emphasises the importance of the springs as Threatened Ecological Communities, providing habitat for species with limited capacity to disperse or relocate. The presence of crustacean fauna at the springs is particularly significant, as some of these species may be endemic to the Gnangara Mound.

Wetland frogs

In 2024, frog populations were monitored at 14 wetland sites during autumn and spring using head-torching, hand-capture, measurement and aural surveys of calling males (Emerge Associates 2025).

Seven species of frog were recorded in 2024 – the quacking frog, rattling froglet, squelching froglet, moaning frog, western banjo frog, slender tree frog and the motorbike frog. No new species were recorded, and for the first time since 2013 the crawling toadlet (also known as Guenther's toadlet), was not recorded. The rattling froglet and slender tree frog were the most frequently recorded species.

The largest decline in species richness in 2024 occurred at Quin Brook, where no frog calls were recorded – the first time since 2015 that this has occurred. Frog assemblages remained intact at some of the urban wetlands, such as lakes Goollelal and Joondalup, where groundwater levels have been stable or increasing.

Since monitoring began in 2002, numbers of calling frogs have varied greatly over time and between sites. In 2024, the total abundance of frogs was the lowest recorded across all sites in the past decade, with the crawling toadlet, moaning frog and slender tree frog showing the most substantial declines.

Although it was concluded in 2021 that the moaning frog was effectively lost from Lexia 86 (GNM16) and Lexia 186 (GNM15), results from the 2022 survey indicated that it was still present, though it had failed to breed recently (Bamford & Bleby 2023). In 2024, adult moaning frogs were only heard and hand-captured at one site north of EPP 173 (Melaleuca Park) but again failed to breed.

Emerge Associates (2025) examined the relationship between frog richness and abundance and factors such as surface and groundwater level, rainfall and temperature. Temperature appeared to have the strongest negative correlation, though correlations were also found with water levels and rainfall at some sites, suggesting that heat stress, desiccation, and reduced rainfall are threats to frogs on the Gnangara Mound.

5.2 Management actions

2022 Gnangara groundwater allocation plan

In response to the changes described in Section 5.1 and the persistent non-compliance identified in this and previous reports, the Department is implementing strategies to reduce impacts on environmentally important sites. These strategies are outlined in the Gnangara groundwater allocation plan (DWER 2022a).

The plan sets out a reduction to groundwater abstraction by 54 GL/year from the Gnangara groundwater system. It aims to:

- stabilise or improve groundwater levels in key areas of environmental significance
- slow the rate of decline in other areas affected by climate-driven changes.

The *Gnangara groundwater allocation plan* includes adjustments to most licensed water users' entitlements that will better align groundwater abstraction with rainfall recharge under a drying climate. These measures aim to ensure Boorloo's groundwater-dependent environments are more resilient to climate change, and that the city's most important water source remains secure and sustainable in the long term.

Gnangara groundwater allocation plan – 2024 progress report

The Gnangara groundwater allocation plan – 2024 progress report (DWER 2024a) provides an update on the implementation of the Gnangara groundwater allocation plan, covering the period since the release of the plan in June 2022 to June 2024. The progress report includes information on:

- recent climate, rainfall and groundwater level trends
- licensing statistics
- the status of plan actions
- engagement with key stakeholders and industry partners.

Of the 16 actions outlined in the 2022 *Gnangara groundwater allocation plan*, the implementation of the garden bore roster change, and the development of an integrated water strategy for the North East urban growth corridor have been completed, with substantial progress made on other actions.

The next progress report will be published in 2026, followed by a third in 2028 and a formal review of the *Gnangara groundwater allocation plan* in 2030 to determine whether the plan requires replacement after 2032.

Managing public water supply use

Each year the Department works with Water Corporation to distribute abstraction across its borefields to minimise environmental impacts. Annual decisions on bore quotas consider:

- groundwater level trends
- environmental monitoring results and compliance with water level criteria under *Ministerial Statement no. 819*
- Integrated Water Supply Scheme (IWSS) operational constraints.

An environmental sensitivity criteria (ESC) system is used to rank IWSS production bores from 1 (most sensitive) to 3 (least sensitive), and direct abstraction away from ESC1 bores and towards ESC3 bores as much as possible. The ESC ratings were reviewed and updated in 2025.

In 2024–25, Water Corporation reduced abstraction from the Yanchep Superficial aquifer bores (YB3, YB4 and YB90) west of Yanchep National Park to a total of 0.21 GL per year. This compares to a peak of 1.0 GL per year in 2015–16 and 0.49 GL per year when the 2022 *Gnangara groundwater allocation plan* was released. The reduction will help to reduce the negative effects of low water levels on groundwater-dependent ecosystems within the national park.

From mid-2028, Water Corporation will reduce abstraction from the Gnangara groundwater system by 30 GL per year. To offset the reduction, it is progressing new sources, including the Alkimos Seawater Desalination Plant, which will be the state's next major water source.

In 2025, consistent with the provision of public water supply reserves made in the *Gnangara groundwater allocation plan*, the Department finalised its assessment of the Water Corporation's licence application for its new Eglinton groundwater scheme and has issued the groundwater licence to the Water Corporation. The Eglinton scheme is being co-developed with the Alkimos Seawater Desalination Plant and will supply an additional 4.86 GL of groundwater per year to the IWSS. Abstraction from the scheme is scheduled to begin in 2028 at the time of commissioning of the Alkimos plant. The public water supply reserve volumes in the North West Coastal Corridor were set following modelling and assessments for the *Gnangara groundwater allocation plan*, which found that urbanisation in the area would increase recharge to the Superficial aquifer compared with pre-development conditions.

Groundwater replenishment scheme

Recycling of wastewater is an increasingly important component of Boorloo's water supply, providing a climate-independent source to help meet increasing water demands. Stages 1 and 2 of the groundwater replenishment (GWR) scheme at the Beenyup Wastewater Treatment Plant (WWTP) in Craigie are now in operation.

Injection bore locations for Stage 2 were informed by the *Perth Region Confined Aquifer Capacity study* (DWER 2021c), completed by the Department to help achieve sustainable use of Boorloo's deep aquifers. Due to the greater interconnectivity of the Superficial and deeper aquifers north of the Stage 2 injection points, water injected from Stage 2 bores is projected to have broader benefits to the northern part of the Gnangara groundwater system, including at wetlands such as Lake Nowergup.

At the time of construction, the GWR scheme had a planned injection capacity of 28 GL per year – 14 GL via the Stage 1 injection sites at the Beenyup WWTP, and 14 GL via Stage 2. However, operational challenges, such as clogging of Stage 2 bores, have prevented achieving the full 14 GL capacity for Stage 2. In 2024–25, a total of 21.14 GL was injected, and 23.38 GL was abstracted through the GWR scheme (refer to Table 2).

Managing local government and other private licensed use

Under the *Gnangara groundwater allocation plan* (DWER 2022a), most self-supply licence holders, including local governments, will have a 10 per cent reduction applied to their annual water entitlement, effective from 1 July 2028, implemented during licence renewal.

Managing groundwater use exempt from licensing

The use of domestic garden bores is managed under the provisions of the *Water Agencies (Water Use) By-Laws 2010*. Permanent water efficiency measures apply across the Gnangara Mound. They include:

- a winter sprinkler ban from 1 June to 31 August each year (unless amended by the Minister for Water due to low rainfall)
- a daytime sprinkler ban between 9am and 6pm
- watering day rosters for both scheme and domestic garden bore users.

Since 1 September 2022, garden bore users have followed a two-day-per-week watering roster – aligned with scheme water users – replacing the previous three-day schedule. The State Government is supporting garden bore users to adopt waterwise practices through initiatives such as Be Groundwater Wise, which promotes efficient garden bore use and waterwise gardening.

Water Corporation supports this initiative by offering rebates for waterwise products (e.g. smart irrigation controllers), providing waterwise plant selection advice, and endorsing waterwise specialists such as garden designers, landscapers, irrigators and nurseries.

Compliance and enforcement of garden bore watering restrictions are jointly managed by the Department and Water Corporation.

Waterwise action plan program

The Waterwise Perth action plan, released in October 2019, was the first of successive across-government strategies to transition Boorloo (Perth) and Bindjareb (Peel) to be leading waterwise communities by 2030 (Government of Western Australia 2019). The initial plan involved eight government agencies coordinating on 38 actions with the aim of creating waterwise communities and helping Boorloo to stay cool and liveable in the face of climate change. The plan focused on sustainable use of water, and urban greening.

Subsequent plans expanded the scope:

- Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2 (October 2022) included 11 agencies and 41 actions
- Kep Katitjin – Gabi Kaadadjan – Waterwise action plan 3 (October 2024) strengthened collaboration and action to address climate change, population growth and urban intensification. It promotes water conservation, biodiversity, tree canopy protection and urban greening to build climate-resilient communities.

The Department continues to work with local government, industry and the broader community to support key commitments under the program, including:

- reducing groundwater use in Boorloo and Bindjareb by 10 per cent by 2030
- achieving Waterwise Gold status for all local councils
- supporting local governments in the Gnangara plan area to develop a pathway to achieve reductions in their groundwater use through the $4 million Gnangara Waterwise Councils Grants Program
- assisting horticultural water users in the Gnangara plan area to adjust to the effects of climate change and reductions in water licence entitlements through the $1.6 million Gnangara Horticulture Water Use Efficiency Grants Program
- working with the commercial nursery and tree-farming representative bodies to assist businesses in the sector to adopt industry waterwise standards – this $75,000 program was completed in June 2025
- continuing to support the golf course industry to achieve waterwise outcomes through the Waterwise Golf Program
- embedding improvements in water management and practices for school grounds
- auditing and improving waterwise management of 100 per cent of irrigated open space

Allocation limit reviews

As part of the commitment under the Waterwise action plan program to reduce groundwater use across Boorloo and Bindjareb by 10 per cent by 2030, the Department is reviewing allocation limits in the region to ensure sustainable use as our climate changes. To date, these reviews have led to the release of the:

- Cockburn groundwater allocation plan in January 2021 (DWER 2021a)
- Gnangara groundwater allocation plan in June 2022 (DWER 2022a)
- Murray groundwater area allocation statement in December 2022 (DWER 2022d)
- Waangaamaap – Serpentine groundwater allocation statement in March 2024 (DWER 2024c).

The review of allocation limits currently being undertaken for the Jandakot and Perth South groundwater areas will complete the allocation limit review action under the current Waterwise action plan program.

Beyond the Waterwise action plan program area, a review of groundwater and surface water allocation limits in the Gingin area is underway. Due for release in 2028, the Gingin water plan area includes the northern part of the Gnangara plan area south of Gingin Brook. The Department published an evaluation statement for Gingin water allocation planning in June 2024 (DWER 2024d).

Management of Gnangara-Moore River State Forest

In December 2023, the Minister for the Environment announced the cessation of pine harvesting in the Gnangara-Moore River State Forest (State Forest 65) to preserve 1,800 hectares of mature pines, which provide critical black cockatoo habitat.

However, high-density young pine plantations and pine wildings continue to affect groundwater levels in the Superficial aquifer. The plantations and wildings are restricting recharge to the Gnangara groundwater system, and are also above the optimal density for maximising of pine cone production – an important food source for endangered Carnaby's cockatoos.

Reducing pine densities in State Forest 65 through a thinning program is crucial to achieving objectives for groundwater-dependent ecosystems under the *Gnangara groundwater allocation plan*, and to provide important feeding habitat for cockatoos. The Department is working closely with the Department of Biodiversity, Conservation and Attractions (DBCA) to determine the best approach for managing pine densities in State Forest 65.

5.3 Research initiatives

The Department, together with research partners, has completed several major projects that assist with planning for a drier future and focus management effort on the areas that will deliver the most benefit from changes to abstraction. Recent research initiatives have been outlined in previous compliance reports and are also documented in the *Gnangara groundwater allocation plan* (DWER 2022a) and the *Gnangara groundwater allocation plan: Methods* (DWER 2022b).

Projects that are contributing to improving the understanding and management of the Gnangara groundwater resources include:

- Perth Regional Aquifer Modelling System (PRAMS)

  PRAMS has been updated to version 3.6 (Siade et al. 2024), extending the history-matching period to 2019 and incorporating industry-leading, automated parameter estimation techniques. This update significantly enhanced model parameterisation and delivered the most accurate fit to observed data to date. PRAMS version 3.6 is being used to assess the impacts of groundwater abstraction, climate and land use changes as part of the review of allocation limits in the Jandakot and Perth South groundwater areas.

- Guide to future climate projections for water management in Western Australia

  Published in September 2024 (DWER 2024b), this guide provides a framework for water planners and decision-makers to use climate change projections in climate impact assessments. It forms part of a broader State Government initiative to deliver up-to-date climate science resources for WA's water sector. The guide is being applied in the current review of allocation limits in the Jandakot and Perth South groundwater areas and in the review of allocation limits in the Gingin groundwater and surface water plan area.

- Groundwater Telemetry

  Following a successful trial in 2019 under the State Groundwater Investigation Program, telemetry systems are being progressively installed in priority monitoring sites across the state. Between 2023–24 and 2026–27 approximately 40 per cent of the Department's monitoring bore network will be equipped with telemetry, including many of the monitoring bores relevant to the management of the Gnangara groundwater resources. This initiative will significantly enhance data availability for groundwater modelling, licence assessments, for monitoring the effects of abstraction, rainfall and land use changes, and for improving the understanding of aquifer connectivity. Telemetry installation is now in progress for groundwater monitoring bores with water level criteria under *Ministerial Statement no. 819.*

- Recharge Estimation Collaboration (REC) Project.

  The Department has partnered with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the University of Western Australia (UWA) and groundwater experts under the Recharge Estimation Collaboration (REC) project to improve understanding and forecasting of groundwater recharge.

  As part of this initiative, seven research sites were established across the 12,000 km^2 Swan Coastal Plain – including near Dandaragan, Gingin, Gnangara, Whiteman Park and Myalup – to monitor recharge under different land covers and land uses.

  Key findings of this project include:

  - groundwater recharge has declined substantially over the past 50 years, primarily due to fewer winter storms
  - this decline in recharge is disproportionately larger than reductions in rainfall – measurements since the 1960s show near-linear reductions in potential recharge of 50 per cent, compared to a 20 per cent reduction in rainfall.
  - for Banksia woodland, the best-represented land cover in the dataset, reduction in potential recharge was closer to 70 per cent.

  Research will continue to 2026 under the Recharge in a Changing Climate (RiCC) project, led by UWA.

The findings will inform future updates to the Perth Regional Aquifer Modelling System and other coastal plain groundwater models, delivering more accurate recharge estimates. These improvements will strengthen predictive capability and support better-informed decisions for sustainable groundwater management.

- North-East Corridor and Swan Valley groundwater investigation.

  The Department has undertaken a detailed study of groundwater in the North-East Corridor and Swan Valley, which will:

  - deliver a regional hydrogeological conceptual model
  - help to quantify recharge and the degree of aquifer connectivity
  - improve our understanding of groundwater salinity in the Swan Valley
  - map areas according to their suitability for managed aquifer recharge to assist future water supply planning

  A draft hydrogeological assessment report has been produced that is due to be finalised in the coming months.

- As part of the recently released Kep Katitjin – Gabi Kaadadjan – Waterwise action plan 3 (Government of Western Australia 2024), we will undertake a study in collaboration with Water Corporation to evaluate the effectiveness of the change to the domestic garden bore sprinkler roster.

5.4 Consultation

There was extensive stakeholder consultation ahead of the finalisation of the *Gnangara groundwater allocation plan* (DWER 2022a). The Department worked closely with water users, industry reference groups and government agencies to identify practical pathways to bring the system back into balance, prepare for a future with less groundwater availability and build climate-resilient organisations and businesses. A total of 197 submissions on the draft plan (DWER 2021b) informed its finalisation, with Department responses to the issues raised documented in the *Gnangara groundwater allocation plan: Statement of response* (DWER 2022c).

Following the release of the *Gnangara groundwater allocation plan*, the Department has continued to collaborate and consult with State Government agencies, Water Corporation, local governments and peak industry bodies to deliver the plan implementation actions, such as those described in Section 5.2. Further details are provided in the Gnangara groundwater allocation plan – 2024 progress report (DWER 2024a).

Consultation with Traditional Owners

The Gnangara groundwater allocation plan area spans the traditional lands of two language groups – the Whadjuk and Yued peoples. Indigenous Land Use Agreements are in place for both language groups, represented by the Whadjuk and

Yued Aboriginal Corporations. In 2024, the Department-initiated engagement with both Corporations to progress commitments made under the *Gnangara groundwater allocation plan*.

Both Corporations have expressed a strong desire to work with the Department to increase the involvement and benefits for Whadjuk and Yued Traditional Owners in water and environmental monitoring and management across the Gnangara plan area. The Department looks forward to building these relationships and developing ways of working together on Whadjuk and Yued Country.

Appendices

Appendix A Water level monitoring results for Ministerial sites for the Gnangara Mound groundwater resources for 2015–25

Bold text refers to compliance with water level and other criteria. **Black bold text** indicates sites compliant with water level and other criteria. **Red bold text** indicates sites non-compliant with water level criteria. **Blue bold text** indicates sites non-compliant with other criteria.

Table A1 Wetland sites

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End of summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25
Lake Goollelal	6162517 (Staff)			26.2*	26.0	Max	27.1	27.3	27.3	27.2	27.5	27.3	27.6	27.6	27.5	27.4
						Min	26.4	26.8	26.9	26.9	26.7	26.7	26.8	26.9	26.6	26.7

Compliance

Compliant with absolute summer minimum criterion.

Compliant with other criterion.

Since monitoring began, water levels at Lake Goollelal have consistently met the absolute summer minimum water level criterion.

Ecological condition

Vegetation was not surveyed at this site during the reporting year. In 2024, macroinvertebrate spring monitoring recorded a family richness of 25, an increase of one family compared to 2023. Water quality monitoring in 2024 recorded high nutrient levels; however, there was less algae on the lake surface than in 2023. Frog species richness was assessed at two sites in 2024; compared to 2023, one site showed a slight increase, while the other showed a slight decrease. Notably, the abundance of slender tree frogs declined significantly at one site between 2023 and 2024.

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End-of-summer minimum			2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
		Pref	Abs	Pref	Abs												
Loch McNess	6162564 (Staff)				6.95	Max	6.25	6.25	6.25	6.25	6.02	6.03	6.01	5.90	5.91	5.76	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Loch McNess has remained non-compliant since 2002–03. Lake levels fell sharply from 2006 with some easing of the rate of decline evident in recent years. The original staff gauge is no longer inundated and a new gauge was installed in a deeper part of the wetland in 2019. The new staff gauge reads dry at 5.50 mAHD. Peak water levels in 2024–25 were the lowest recorded since monitoring began. Ecological condition Long-term monitoring has shown significant changes, including: • declines in the health of *Melaleuca rhaphiophylla* • changes in species' composition towards terrestrial species • increase in abundance of exotic species. A major fire in December 2019 severely burnt the southern, western and northern parts of Loch McNess, causing considerable loss of organic soils. Groundwater level declines have contributed to the loss of the key wetland macrophyte *Baumea articulata* at the monitoring transect and the degradation and loss of aquatic habitat for macroinvertebrates. Sampling for macroinvertebrates has occurred on foot since 2020 because of the ongoing terrestrialisation of the lake. Macroinvertebrate family richness is still relatively high but was below the mean in 2024, likely due to habitat loss at the spring site following the removal of *Typha* sp. Notably, Carter's freshwater mussel (*Westralunio carterii*) was recorded again in 2024 after being absent in 2023. Management and mitigation Studies under the *Perth shallow groundwater systems investigation* (DoW 2011a) found that a groundwater level of 5.27 mAHD at bore BH-LM2 (AWRC ref. 61640108) would meet the minimum groundwater requirements of wetland vegetation. The Department is using levels at BH-LM2 to better relate groundwater levels to the ecological condition of vegetation. The minimum groundwater level at the bore has not met the minimum groundwater requirement of wetland vegetation since 2006. Monitored peak and minimum levels in BH-LM2 still appear to be in a downward trend, although the rate of decline has been slower post-2015 than it was in the preceding decade. In 2016, the Department completed an additional study into the cause of rapidly declining levels in Loch McNess (Kretschmer & Kelsey 2016). This study improved our understanding of the hydrogeology of the lake and surrounding areas, including the Yanchep Caves. Based on the findings of the study, the Department has: • reduced Superficial aquifer abstraction in the Yanchep National Park • ceased the Yanchep Caves supplementation trial • reduced public supply abstraction from the Leederville aquifer in the Pinjar borefield. Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels in the vicinity of Yanchep National Park. These actions aim to help to stabilise and slightly improve water levels at Loch McNess in coming years.
						Min	**6.07**	**6.25**	**6.25**	**6.25**	**5.89**	**5.94**	**5.85**	**5.81**	**5.50 dry**	**5.50 dry**	

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End of summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
Lake Yonderup	6162565 (Staff)				5.9	Max	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.7	5.6	5.6	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Lake Yonderup has been non-compliant since 2007–08. Peak and minimum levels declined from about 2006, although peak levels were relatively stable from 2014 to 2021. The 2024–25 peak levels were again low, marking the second consecutive year of reduced levels. Minimum levels have continued to decline, particularly since 2011, and this trend persisted over the reporting period. The staff gauge is dry at 5.4 mAHD. Ecological condition In December 2019, Lake Yonderup was severely burnt in a large fire, resulting in near complete removal of vegetation to the lake edge. Typha sp. first observed in 2017, expanded further in 2024. Nutrient levels increased in the lake in 2024, and this is of concern. Management and mitigation Work completed as part of the Perth shallow groundwater systems investigation (DoW 2011b) found that a groundwater level of 5.48 mAHD at bore YDP_SC (AWRC ref. 61611840) would meet the minimum groundwater requirements of wetland vegetation. The minimum groundwater level at this bore has remained more than one metre below this level for over a decade, including over the reporting period. While water levels in YDP_SC were stable from 2016 to 2021, minimum levels have declined since 2022 and reached their lowest point in 2024. Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels in the vicinity of Yanchep National Park. These actions aim to stabilise and gradually improve water levels at Lake Yonderup in coming years.
						Min	**5.5**	**5.6**	**5.5**	**5.5**	**5.6**	**5.5**	**5.4**	**5.4**	**5.4**	**5.4**	
Lake Joondalup	6162572 (Staff 8281)			16.2*	15.8	Max	16.9	17.1	17.3	17.6	17.5	17.4	17.8	17.8	17.8	17.7	Compliance and trends **Compliant with absolute summer minimum criterion.** **Compliant with other criterion.** Lake Joondalup is the largest of the monitored wetlands and has consistently remained above the preferred minimum criteria since 2016–17, with levels continuing to rise in recent years. In 2024–25, minimum surface and groundwater levels were slightly higher than the previous reporting year. The site is now telemetered, enabling for continuous data capture for future reporting periods. Ecological condition Urbanisation pressures near the lake are contributing to the rising water level trends that are negatively affecting the health of fringing *Melaleuca rhaphiophylla* adjacent to the lake. Macroinvertebrate richness in 2024 was similar to that recorded in 2023, although sites in the northern part of the lake continue to show low family richness. The persistently low number of insect larvae remains a concern. Frog species richness at the lake remained fairly stable over the annual reporting period. Groundwater modelling projects that water levels at Lake Joondalup are likely to rise more as result of the ongoing urbanisation of East Wanneroo.
						Min	16.1 **4/6 yr**	16.5 **4/6 yr**	16.6 **4/6 yr**	16.8 **4/6 yr**	16.7	16.7	17.0	17.0	16.8	16.9	
	61610661 (Bore 8281)					Max	18.7	19.0	19.2	19.4	19.4	19.2	19.5	19.6	19.5	19.6	
						Min	18.1	18.5	18.6	18.7	18.6	18.6	18.8	18.9	18.7	18.8	

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End of summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
Lake Mariginiup	6162577 (Staff 1943)	42.1*	41.5			Max	**41.1** 4/6 yr	**41.4** 4/6 yr	41.5 4/6 yr	41.6 4/6 yr	**41.4** 4/6 yr	**41.3** 4/6 yr	41.6 4/6 yr	41.7 4/6 yr	41.5 4/6 yr	41.5 4/6 yr	Compliance and trends **Compliant with absolute minimum spring peak criterion.** Peak water levels at Lake Mariginiup have shown an increasing trend over the past decade and this improvement continued over the reporting period. Groundwater modelling projects that lake water levels are likely to rise in the future due to increasing urbanisation of the East Wanneroo area and a corresponding decrease in groundwater abstraction from agricultural land uses. The staff gauge reads dry at 41.0 mAHD. The site is now telemetered, enabling continuous data capture in future reporting periods. **Non-compliant with other criterion.** Water levels have not reached the preferred spring peak since 1994. Therefore, the allowance for water levels to fall between the preferred minimum and absolute minimum in two out of six years has not been met. Ecological condition Water quality continues to deteriorate due to acidification, with extremely low alkalinity levels indicating the lake's buffering capacity is exhausted. Iron concentrations were higher in 2024 than in 2023, which was previously the highest level recorded across all wetlands. Macroinvertebrate family richness decreased slightly from 2023 to 2024 but remains higher than in any year from 2018 to 2022. Lake Mariginiup's typically high nutrient levels were still among the highest of all wetlands sampled in 2024. The original vegetation monitoring transect was relocated in 2023 due to the absence of native species. Following the 2023 fire, *Eucalyptus rudis* is no longer present at the site and there has been a steep decline in the canopy condition of all trees within the relocated transect. The exotic species *Melaleuca quinquenervia* is continuing to spread across the lakebed. Management and mitigation Work completed as part of the Perth shallow groundwater systems investigation (Searle et al. 2010a) found that: • bore MS10 (AWRC ref. 61610685) should be used to measure water level criteria when the lake is dry, applying a revised level of 41.1 mAHD • bore MGP_C (AWRC ref. 61611440) should be used to relate changes in the watertable to wetland vegetation condition. The Department is using MGP_C to better relate groundwater levels to the condition of wetland vegetation. Minimum levels at bores MS10 and MGP_C decreased over the reporting period compared to 2023–24.
						Min	41.0 dry	41.0 dry	41.0 dry	41.0 dry	41.0 dry	41.0 dry	41.0 dry	41.0 dry	41.0 dry	41.0 dry	
	61610685 (Bore MS10 – telemetered site^)					Max	40.8	41.1	41.1	41.2	41.1	40.9	41.2	41.3	41.1	41.2	
						Min	40.0	40.4	40.4	40.3	40.2	40.2	40.4	40.6	40.3	40.3	

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End of summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25
Lake Jandabup	6162578 (Staff 1944)	44.7*	44.2		44.3	Max	44.6	44.7	44.8	45.0	44.8	44.6	44.9	44.9	44.7	45.0
						Min	**44.1**	44.3	**44.2**	44.3	44.3	**44.3**	**44.2**	**44.3**	**44.0**	**44.2**

Compliance and trends

Compliant with absolute spring peak criterion.

Non-compliant with absolute summer minimum criterion.

In 2024–25, Lake Jandabup water levels were non-compliant with the absolute summer minimum criterion. Water Corporation supplements lake levels to meet the absolute spring peak water level criterion and to prevent the lakebed from drying and oxidation, which could lead to acidification upon rewetting.

Overall, lake levels have remained relatively stable, and artificial supplementation has successfully prevented acidification. Peak water levels in 2024–25 were the highest recorded since 2018–19.

Groundwater modelling for the Gnangara plan projects that urbanisation in East Wanneroo and reduced agricultural abstraction will likely raise water levels at Lake Jandabup, reducing reliance on artificial supplementation.

Ecological condition

Long-term vegetation monitoring indicates:

- declines in canopy condition
- shifts in species composition toward terrestrial species
- increased abundance of exotic species.

The 2023 fire does not appear to have significantly impacted the macroinvertebrate community. In 2024, 33 families were recorded – the highest since 2010 – three more than 2023 (30 families) and above the mean spring family richness (29.3 families). If water levels decline and the lakebed is exposed, the risk of acidification remains high.

Management and mitigation

Work completed as part of the Perth shallow groundwater systems investigation identified that bore JB12B (AWRC ref. 61610764) should be used to relate groundwater levels to the ecological condition of vegetation on the transect. This bore has shown a rising trend since 2011.

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End of summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
Lake Nowergup	6162567 (Staff) 616145 (Lake Nowergup North – telemetered site^)	17.0*	16.8			Max	**16.0** **4/6 yr**	**16.0** **4/6 yr**	**16.0** **4/6 yr**	**15.7** **4/6 yr**	**15.6** **4/6 yr**	**15.6** **4/6 yr**	**15.7** **4/6 yr**	**15.9** **4/6 yr**	**15.7** **4/6 yr**	**15.6** **4/6 yr**	Compliance and trends **Non-compliant with absolute spring peak criterion.** Lake Nowergup has been non-compliant with the absolute spring peak criterion in most years since 1996, despite artificial supplementation. Since 2018, levels have been monitored using a telemetered site at the lake (AWRC ref. 616145), which shows relative stability over this period. **Non-compliant with other criterion.** As the absolute spring peak water level has not been met since 1996, the criterion that water levels are allowed between the preferred minimum and absolute minimum at a rate of two in six years, has also not been met. Ecological condition The lake has experienced an increase in canopy cover since the baseline survey, along with a slight decrease in exotic species in 2024 compared to 2023. It now consists of open water and is dominated by fringing *Typha* sp., with small patches of *Baumea* sp. Despite artificial supplementation, the lake has contracted in size, and vegetation changes mean that the original macroinvertebrate habitats where annual sampling occurred no longer exist and new sites are now used. Macroinvertebrate family richness has declined due to loss of fringing macrophyte habitats. The lake retains sufficient buffering capacity at current levels, and the risk of acidification has subsided. Management and mitigation From work completed as part of the Perth shallow groundwater systems investigation, Searle et al. (2010b) made the following recommendations: • continue the supplementation regime • use groundwater levels at bore LN2-89 (AWRC ref. 61611247) to relate changes in the watertable to wetland vegetation condition. Minimum levels at LN2-89 declined from 2007 to 2016 but rose about 1.5 m in 2017–18. Water levels were stable until 2022–23. Since 2022–23 minimum levels have been declining and in 2024–25 were the lowest recorded since 2016–17. Investigations indicate that local Superficial aquifer use for horticulture has the greatest impact on lake levels, followed by reduced rainfall, then Leederville aquifer pumping from Quinns and Pinjar borefields (Global Groundwater 2015). Under the *Gnangara groundwater allocation plan* (DWER 2022a), reductions in both public and private licensed entitlements, combined with continued supplementation, are expected to help to stabilise water levels and buffer the lake against the effects of climate change.
						Min	16.0	16.0	16.0	15.1	15.0	15.0	15.1	15.1	15.1	15.1	

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End-of-summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
Lake Wilgarup	6162623 (Staff)	6.10	5.65	4.8	4.5	Max	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	**6.00 dry**	Compliance and trends **Non-compliant with absolute spring peak criterion.** The lake has been dry since 1998. **Non-compliant with absolute summer minimum criterion.** Groundwater levels have declined since 1998 and have remained non-compliant with the absolute minimum criteria since 2006–07. In 2024–25, minimum groundwater levels were slightly higher than in the previous year but remain significantly lower than when monitoring first commenced. The site is now telemetered, enabling continuous data capture for future reporting periods. Ecological condition Due to the absence of surface water, wetland vegetation, macroinvertebrates and water quality are no longer monitored at this site. Management and mitigation Lake Wilgarup lies just east of Loch McNess, and management actions aimed at improving water levels at Loch McNess are expected to provide some benefit to groundwater levels at Lake Wilgarup. However, groundwater modelling results indicate that these improvements will not be sufficient to restore surface water at Lake Wilgarup. Vegetation at the lake is therefore likely to remain dominated by terrestrial species.
						Min											
	61618500 (Bore – telemetered site^)					Max	4.21	4.34	4.29	3.64	3.43	3.32	3.58	3.58	3.34	3.34	
						Min	**3.66**	**3.88**	**3.75**	**2.99**	**2.86**	**2.83**	**2.90**	**2.94**	**2.73**	**2.79**	

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End-of-summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
Pipidinny Swamp	6162624 (Staff)	2.70	2.40		1.6	Max	**1.64**	**2.04**	**2.04**	**2.21**	**1.54**	**0.95**	**1.97**	**2.10**	**1.54**	**1.58**	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Levels at Pipidinny Swamp have been non-compliant since 2009–10. **Non-compliant with absolute spring peak criterion.** Spring peak levels have been non-compliant since 2005–06. Management and mitigation A new bore – PIP_C (AWRC ref. 61611872) – was installed as part of the Perth shallow groundwater system investigation (Searle 2009). Levels at this bore are well correlated with the staff gauge and can be used to measure compliance with absolute summer minimum criteria when the gauge is dry. Levels have been relatively stable at the bore since it was installed in 2009. Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels in the vicinity of Yanchep National Park. This action should help to stabilise and slightly improve water levels at Pipidinny Swamp in coming years.
						Min	**1.0**	**1.0**	**1.0**	**1.0**	**<0.7**	**<0.7**	**<0.7**	**<0.7**	**<0.7**	**<0.7**	
Lexia 86 (GNM16)	61613215 (Bore – telemetered site^)			47.3*	47.0	Max	47.3	47.7	47.9	48.2	48.2	47.8	47.9	48.1	47.8	47.9	Compliance and trends **Compliant with absolute summer minimum criterion.** The minimum water level in 2024–25 was above the end-of-summer absolute minimum, though reported as 47.0 mAHD due to rounding. The minimum water level in 2024–25 increased slightly compared to 2023–24. The site is now telemetered, enabling continuous data capture in future reporting periods. **Non-compliant with other criterion.** Water levels have not met the preferred summer minimum of 47.3 mAHD since 2009, meaning the allowance for two-in-six-year variation has not been achieved. Ecological condition Long-term monitoring shows reduced frog numbers, declines in canopy condition, changes in species composition to more terrestrial species and increased exotic species. In 2024, the ratio of weed cover to native species increased compared to the 1999 baseline. Management and mitigation Under the *Gnangara groundwater allocation plan* (DWER 2022a), reductions in groundwater abstraction are planned for areas affecting Superficial aquifer levels near Lexia wetlands to maintain water levels at Lexia 86.
						Min	**46.9** **4/6 yr**	47.1 **4/6 yr**	47.1 **4/6 yr**	47.3 **4/6 yr**	47.2 **4/6 yr**	47.1 **4/6 yr**	47.1 **4/6 yr**	47.2 **4/6 yr**	**47.0** **4/6 yr**	47.0 **4/6 yr**	
Lexia 186 (GNM15)	61613214 (Bore – telemetered site^)			47.5*	47.2	Max	46.7	47.0	47.3	47.5	47.6	47.3	47.6	47.7	47.5	47.4	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Water levels at Lexia 186 have been non-compliant with the absolute summer minimum criterion since 1997. Minimum groundwater levels recorded in 2024–25 improved slightly compared to 2023–24. The site is now telemetered, enabling continuous data capture for future reporting periods. **Non-compliant with other criterion.** Minimum water levels have not been above the preferred summer minimum criteria of 47.5 mAHD since monitoring began, meaning the two-in-six-year allowance has not been achieved. Ecological condition

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End-of-summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
						Min	**46.3** **4/6 yr**	**46.5** **4/6 yr**	**46.6** **4/6 yr**	**46.8** **4/6 yr**	**46.8** **4/6 yr**	**46.7** **4/6 yr**	**46.8** **4/6 yr**	**46.9** **4/6 yr**	**46.6** **4/6 yr**	**46.7** **4/6 yr**	Long-term monitoring shows: • declines in canopy condition • shifts in species composition toward terrestrial species • increased in abundance of exotic species. Compared to the 2023 vegetation survey, 2024 canopy condition has shown slight improvement. Wetland macroinvertebrates and water quality are no longer monitored due to the absence of surface water. No frog species were detected in 2024, consistent with 2023 results. Management and mitigation Under the *Gnangara groundwater allocation plan* (DWER 2022a), reductions in groundwater abstraction are planned for areas affecting Superficial aquifer levels near the Lexia wetlands. These actions aim to help maintain levels at Lexia 186.
Melaleuca Park EPP173	6162628 (Staff)				50.2	Max	50.4	50.8	51.0	51.1	50.8	50.6	50.8	51.0	50.6	50.6	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Water levels have remained below the absolute summer minimum criterion since monitoring began in 1995. Minimum groundwater levels at monitoring bore GNM14 (AWRC ref. 61613213) are currently about 0.5 m lower than in the first decade of monitoring but have been relatively stable since 2017. The site is now telemetered, enabling continuous data capture in future reporting periods. The staff gauge reads dry at 50.4 mAHD. Ecological condition Groundwater declines since the mid-2000s have led to the near disappearance of key wetland species *Baumea articulata* and *Pericalymma ellipticum* from the transect, although *B.articulata* persists in very low abundance. Other tree species remain in good health. Groundwater declines have also contributed to the degradation and loss of aquatic habitat for macroinvertebrates and a decline in macroinvertebrate richness. In 2024, 19 families were recorded – up from 18 families in 2023, but still below pre-2009 levels (23-26 families). The native fish *Galaxiella nigrostriata* is presumed locally extinct as the wetland dries annually. The wetland is highly coloured and is the only wetland of all those in the sampling program to show organic acidity. Frog species' richness at the lake increased slightly over the reporting period. Management and mitigation Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas affecting Superficial aquifer levels near Melaleuca Park. Modelling indicates that these actions should help limit declines in groundwater levels at bore GNM14.
						Min	50.4 dry	50.4 dry	50.4 dry	50.4 dry	50.7	50.4 dry	50.4 dry	50.4 dry	50.4 dry	50.4 dry	
	61613213 (Bore GNM14 – telemetered site^)					Max	49.3	50.2	50.3	50.8	50.1	49.8	50.3	50.4	49.8	50.0	
						Min	**48.5**	**49.0**	**48.8**	**48.7**	**48.7**	**48.6**	**48.8**	**48.8**	**48.5**	**48.6** #	

Wetland	AWRC reference number	Water level criteria (mAHD)				Water level (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
		Spring peak		End-of-summer minimum												
		Pref	Abs	Pref	Abs		2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
Melaleuca Park Dampland 78 (GNM31)	61613231 (Bore – telemetered site^)			65.4*	65.1	Max	64.9	65.1	65.2	65.4	65.5	65.4	65.6	65.9	65.7	65.5	Compliance and trends **Compliant with absolute summer minimum criterion.** **Non-compliant with other criterion.** Minimum water levels at Melaleuca Park Dampland 78 have not exceeded the preferred summer minimum criterion of 65.4 mAHD since 2009, meaning the two-in-six-year allowance has not been met. While groundwater levels showing a rising trend since 2016, as at June 2025 in the 2024–25 reporting period, water levels were still declining and had not reached their seasonal minimum. The site is now telemetered, enabling continuous data capture in future reporting periods. Ecological condition Long-term monitoring indicates reduced frog numbers, declines in tree health, changes in species composition to more terrestrial species and increases in abundance of exotic species. Management and mitigation A cluster of bores was installed adjacent to GNM31 as part of the *Perth shallow groundwater systems investigation* (Searle 2009). Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels of Melaleuca Park. Modelling indicates that these actions should help limit further declines at bore GNM31.
						Min	**64.7** 4/6 yr	**64.7** 4/6 yr	**65.0** 4/6 yr	65.2 4/6 yr	65.2 4/6 yr	65.1 4/6 yr	65.2 4/6 yr	65.3 4/6 yr	65.3 4/6 yr	65.3 # 4/6 yr	
Egerton Spring (B25)/ Egerton Spring (B25A)	61618607/ 61672233 (Bore – telemetered site^)				39.29	Max	39.97	40.10	40.20	40.26	40.15	40.07	40.86	40.95	40.75	40.69	Compliance and trends **Compliant with absolute summer minimum criterion.** Water levels have remained compliant since 2003, supported by increased localised recharge from surrounding urban development. However, minimum groundwater levels in 2024–25 were the lowest recorded since 2020–21. The site is now telemetered, enabling continuous data capture in future reporting periods. Ecological condition Water quality remained generally stable over the reporting period. Nutrient levels have increased the risk of eutrophication at the spring and sulfate levels remain elevated. Additional information Monitoring at bore B25 ceased due to access and safety issues; bore B25A (AWRC ref. 61672233) is now used to measure water level criteria. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at bore B25A.
						Min	39.58	39.84	39.84	39.76	39.71	39.77	40.28	40.33	39.97	40.08	

* *Water levels are allowed to fall between the preferred minimum and absolute minimum for two out of six years to replicate natural drying cycles.*

^ *Currently, eight sites have been telemetered, but only one site (Lake Nowergup) had data available for the full reporting year. Therefore, the minimum and maximum of daily mean water level readings from telemetry data were used at Lake Nowergup, while monthly manual water level monitoring data was used to assess compliance at other sites where full-year telemetry data was unavailable.*

As at June 2025, water levels were still declining.

Table A2 Terrestrial phreatophytic vegetation sites

Groundwater monitoring bore	AWRC reference number	End-of-summer absolute minimum (mAHD)	Water levels (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
				2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
MM16	61610835 (telemetered site^)	38.8	Max	40.1	40.3	40.7	41.1	41.0	40.7	41.0	41.1	40.9	41.1	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum water levels have been stable in recent years. Minimum groundwater levels in 2024–25 were slightly higher compared to the previous reporting year. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at MM16.
			Min	39.3	39.5	39.8	40.0	40.0	40.0	40.1	40.2	39.9	40.0	
MM18	61610918 (telemetered site^)	38.6	Max	39.6	40.0	40.2	40.6	40.6	40.2	40.5	40.5	40.1	40.4	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum water levels have been stable in recent years. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates that with the planned reductions to abstraction groundwater levels can be maintained at MM18.
			Min	39.1	39.2	39.4	39.6	39.6	39.5	39.6	39.5	39.4	39.4 #	
MM53	61610493	33.3	Max	33.5	33.7	34.0	34.3	34.1	33.7	34.1	34.1	33.9	34.2	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Minimum water levels have been stable in recent years. Management and mitigation Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates that planned reductions to abstraction should help improve groundwater levels at MM53 over time.
			Min	**32.9**	**33.1**	**33.1**	**33.3**	**33.2**	**33.1**	**33.2**	**33.2**	**33.1**	**33.2**	
MM55B	61610559	29.5	Max	30.3	30.4	30.6	30.8	30.7	30.2	30.7	30.7	30.5	30.7	Compliance and trends **Compliant with absolute summer minimum criterion.** Water levels increased in the reporting period and were compliant in 2024–25 after being non-compliant in 2023–24. The minimum water level in 2024–25 was above the end-of-summer absolute minimum, though is reported as 29.5 mAHD due to rounding. Management and mitigation Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates that planned reductions to abstraction should help improve groundwater levels at MM55B over time.
			Min	**29.2**	**29.4**	**29.5**	**29.5**	**29.3**	**29.3**	29.5	29.6	**29.3**	29.5	
MM59B	61611025	36.3	Max	36.0	36.1	36.4	36.7	36.5	36.0	36.5	36.6	36.3	36.5	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Minimum water levels remain below the absolute summer minimum, though they have been relatively stable in recent year. The lowest groundwater level during the reporting period was recorded in July 2024. Management and mitigation Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates that planned reductions to abstraction should help improve levels at MM59B over time.
			Min	**35.4**	**35.5**	**35.6**	**35.8**	**35.6**	**35.5**	**35.6**	**35.7**	**35.5**	**35.6** #	

Groundwater monitoring bore	AWRC reference number	End-of-summer absolute minimum (mAHD)		Water levels (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
				2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
MT3S	61610745 (telemetered site^)	43.0	Max	44.3	44.6	44.9	45.0	44.8	44.5	44.9	45.1	44.6	44.9	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum water levels have been stable in recent years. The site is now telemetered, enabling continuous data capture in future reporting periods. Groundwater modelling projections indicate that the ongoing urbanisation of East Wanneroo is likely to increase groundwater levels at MT3S in the coming years.
			Min	43.6	44.0	44.1	44.0	44.0	43.9	44.0	44.0	43.9	44.0	
NR6C	61610982 (telemetered site^)	58.5	Max	59.1	59.5	60.0	59.9	59.7	59.5	59.6	59.9	59.3	59.4	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum water levels have been stable in recent years. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling under the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at NR6C.
			Min	58.7	58.8	59.0	59.0	59.0	58.8	58.9	59.0	58.7	58.7 #	
PM9	61610804	56.3	Max											Compliance and trends **Non-compliant with absolute summer minimum criterion.** The bore is not currently being monitored because of safety issues associated with its location in a rifle range. When it was last monitored in 2016, water levels at the site were greater than 10.5 m depth to groundwater, and it is unlikely that vegetation in the vicinity is currently accessing groundwater. As the minimum water level in 2016 was more than 5 m below the absolute summer minimum, this site is presumed to be non-compliant. Management and mitigation Because of the likelihood that the surrounding vegetation is no longer groundwater dependent, the Department is proposing to remove the water level criteria at PM9. The EPA is currently inquiring into this and other proposed changes in the proposal.
			Min	**51.8**										
PM24	61610697 (telemetered site^)	40.5	Max	42.1	42.2	41.6	42.5	42.2	42.0	42.0	42.5	41.9	42.2	Compliance and trends **Compliant with absolute summer minimum criterion.** Groundwater levels declined by about 2 m at this site between the early 1980s until about 2011 and have been more stable since then. Minimum groundwater levels in 2024–25 remained the lowest recorded since monitoring commenced. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at PM24.
			Min	41.0	41.4	41.0	41.1	41.0	40.9	41.0	41.1	40.8	40.8 #	

Groundwater monitoring bore	AWRC reference number	End-of-summer absolute minimum (mAHD)	Water levels (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
				2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
WM1	61610833 (telemetered site^)	55.7	Max	54.5	55.1	55.6	55.9	55.6	55.2	55.4	55.8	55.2	55.0	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Groundwater levels have declined by approximately 4 m since monitoring began in 1975 but recovered slightly in 2017 and have been stable since then. Water levels had not reached their seasonal low and were still declining in June 2025. The site is now telemetered, enabling continuous data capture in future reporting periods. Management and mitigation Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels in the vicinity of WM1. Modelling indicates that this action should limit declines in groundwater levels at the site.
			Min	**54.1**	**54.3**	**54.7**	**54.9**	**54.9**	**54.6**	**54.6**	**54.7**	**54.6 #**	**54.5 #**	
WM2	61610908 (telemetered site^)	66.5	Max	66.6	67.2	67.3	67.5	67.0	66.6	66.7	66.9	66.5	66.4	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Groundwater levels have fallen about 3 m at this site since monitoring began in 1975 but have been more stable since 2012. Minimum groundwater levels in 2024–25 were the lowest ever recorded. As at June 2025, water levels were still declining. The site is now telemetered, enabling continuous data capture in future reporting periods. Management and mitigation Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels in the vicinity of WM2. Modelling indicates that this action should limit declines in groundwater levels at the site.
			Min	**66.3**	**66.4**	66.7	66.7	66.5	**66.2**	**66.2**	**66.2**	**66.1 #**	**66.0 #**	
WM8	61610983 (telemetered site^)	64.8	Max	64.3	64.7	65.2	65.6	65.5	64.7	65.0	65.3	65.2	65.2	Compliance and trends **Non-compliant with absolute summer minimum criterion.** Groundwater levels have fallen about 4 m at this site since monitoring began in 1975 but have been relatively stable since 2012. However, in the 2024–25 reporting period, in June 2025, water levels were still declining. The site is now telemetered, enabling continuous data capture in future reporting periods. Management and mitigation Under the *Gnangara groundwater allocation plan* (DWER 2022a), groundwater abstraction will be reduced in areas that are affecting Superficial aquifer levels in the vicinity of WM8. Modelling indicates that this action should limit declines in groundwater levels at the site.
			Min	**64.1**	**64.1**	64.9	65.0	**64.7**	**64.4**	**64.4**	**64.6**	**64.6 #**	**64.4 #**	

Groundwater monitoring bore	AWRC reference number	End-of-summer absolute minimum (mAHD)	Water levels (mAHD)										Status and comments on compliance during the 2024–25 annual reporting period
				2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24	2024–25	
MM12	61610989 (telemetered site^)	42	Max	43	43	43	44	44	43	44	44	43	43	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum water levels have been stable in recent years. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at MM12.
			Min	43	43	43	43	43	43	43	43	43	43 #	
L30C	61611010 (telemetered site^)	47.2	Max	47.7	47.9	48.1	48.6	48.6	48.2	48.4	48.6	48.2	48.3	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum groundwater levels in 2024–25 were consistent with previous years. The minimum groundwater level was recorded in July 2024. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at L30C.
			Min	47.3	47.3	47.6	48.0	48.0	47.8	47.8	47.9	47.7	47.7 #	
L110C	61611011 (telemetered site^)	55.7	Max	57.4	57.6	57.8	57.9	57.7	57.3	57.5	57.7	57.3	57.4	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum groundwater levels in 2024–25 were the lowest recorded since monitoring commenced. The minimum groundwater level was recorded in July 2024. As at June 2025, water levels were still declining. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at L110C.
			Min	57.1	57.1	57.3	57.3	57.2	57.0	57.0	57.1	56.9	56.8 #	
L220C	61611018 (telemetered site^)	52.2	Max	53.4	53.8	54.1	54.4	54.3	54.1	54.5	54.7	54.0	54.1	Compliance and trends **Compliant with absolute summer minimum criterion.** Minimum groundwater levels in 2024–25 were the lowest recorded since 2015–16. The site is now telemetered, enabling continuous data capture in future reporting periods. Modelling completed as part of the *Gnangara groundwater allocation plan* (DWER 2022a) indicates groundwater levels can be maintained at L220C.
			Min	52.8	53.1	53.2	53.3	53.3	53.2	53.4	53.6	53.1	53.1 #	

Note: Observed water levels have been rounded to the same number of decimal places as shown in Table 1 and 2 on *Ministerial Statement no. 819*.

As at June 2025, water levels were still declining.

^ *Currently, twelve sites have telemetry, but data was unavailable for the full reporting year. Therefore, monthly manual water level monitoring data was used to assess compliance at these sites.*

Appendix B Audit tables: Environmental conditions, procedures and commitments for the Gnangara groundwater resources

Proponent: Department of Water and Environmental Regulation (formerly Department of Water)

Period: 1 July 2024 to 30 June 2025

Table B1 Ministerial conditions and procedures

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 1-1	Implementation	The proponent shall implement the proposals as documented in "Section 46 Review of Environmental Conditions on Management of the Gnangara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions" (August 2004), as modified and documented in Environmental Protection Authority Bulletin 1155.	Implement proposals given in EPA Bulletin 1155 and *Ministerial Statement no. 819*.	Compliance report	Minister for the Environment		Overall		**Non-compliant.** Strategies have been implemented to reduce impacts on environmentally important sites. These include: • significantly reducing abstraction for public water supply • increasing licence compliance and enforcement activities • capping abstraction for private licensed water supply • reducing the garden bore sprinkler roster for the Perth and Mandurah area from three to two days per week. Further reductions to both public supply, and private licensed groundwater abstraction will be implemented from 2028 as per the strategies outlined in the Gnangara groundwater allocation plan (DWER 2022a). The 2022 Gnangara plan supports the targets of the State Government's Waterwise action plan program to review groundwater allocation limits across Perth and Peel to ensure groundwater is used sustainably, in line with climate change.
819: M 2-1	Proponent commitments	The proponent shall implement the environmental management commitments, as revised in May 2009, and documented in schedule 1 of *Ministerial Statement no. 819*, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority (EPA).	Implement commitments given in Schedule 1 of EPA Bulletin 1324 and *Ministerial Statement no. 819*.	Compliance report	Minister for the Environment	EPA	Overall		**Non-compliant.** Refer to the results given in Table 4 and Appendix A Water level monitoring results for Ministerial sites for the Gnangara Mound groundwater resources for 2015–25. Several sites were non-compliant with the absolute minimum and/or peak water level criteria identified in Schedule 1 of *Ministerial Statement no. 819*. There were 14 sites non-compliant with absolute minimum and/or peak water level criteria in 2024–25 compared to 16 sites in 2023–24. The sites that were non-compliant throughout the annual reporting period were Loch McNess, Lake Yonderup, Lake Jandabup, Lake Nowergup, Lake Wilgarup, Pipidinny Swamp, Lexia 186 (GNM15), Melaleuca Park EPP173, MM53, MM59B, PM9, WM1, WM2 and WM8. Five sites were non-compliant with the other criteria identified in Schedule 1 of *Ministerial Statement no. 819*, Lake Mariginiup, Lake Nowergup, Lexia 86 (GNM16), Lexia 186 (GNM15) and Melaleuca Park Dampland 78 (GNM31).
819: M 3-1	Proponent nomination and contact details	The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.	Adhere to conditions, procedures and commitments given in EPA Bulletin 1324 and *Ministerial Statement no. 819*. Maintain responsibility for implementation of proposal.	Letter notifying the Chief Executive Officer of the Office of the Environmental Protection Authority (OEPA) of any change in proponent details. Compliance report.	Minister for the Environment	EPA	Overall		**Compliant** No change to proponent was made over the reporting period.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 3-2	Proponent nomination and contact details	If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.	Follow procedure given in 'action'.	Letter notifying the Chief Executive Officer of any change in proponent details.	Minister for the Environment		Overall		**Not required at this stage.** No change to proponent was made over the reporting period.
819: M 3-3	Proponent nomination and contact details	The nominated proponent shall notify the Chief Executive Officer of the EPA of any change of contact name and address within 60 days of such change.	Follow procedure given in 'action'.	Letter notifying the Chief Executive Officer of any change in proponent details.	CEO		Overall	60 days of change	**Not required at this stage.** No change to proponent was made over the reporting period.
819: M 4-1 1	Compliance audit and performance review	The proponent shall prepare an audit program and submit compliance reports to the EPA which address: • evidence of compliance with the conditions and commitments.	Detail in annual/triennial reports. Compliance report will include: • evidence of compliance with the conditions and commitments.	Audit program	CEO		Overall	Annually	**Compliant.** Performance and compliance with water level criteria, management activities and research initiatives are summarised in Sections 4 and 5 of this report and the 'status' column of this table.
819: M 4-1 2	Compliance audit and performance review	The proponent shall prepare an audit program and submit compliance reports to the EPA which address: • the performance of the environmental management plans and programs.	Detail in annual/triennial reports. Compliance report will include: • the performance of the environmental management plans and programs.	Compliance report	CEO			Annually	**Compliant.** The *Gnangara groundwater allocation plan* (DWER 2022a) includes strategies to work towards meeting the following objectives: • reducing the total volume of water abstracted from the Gnangara groundwater system towards a level that better reflects the recharge from rainfall because of climate change • protecting groundwater-dependent ecosystems from impacts associated with abstraction. It also proposes some changes to conditions in *Ministerial Statement no. 819*, which are being assessed by the EPA under section 46 of the EP Act. The Department has prepared and submitted a Groundwater Monitoring and Management Plan as part of its proposed changes to implementation conditions. Until such time as a new Ministerial Approval Statement is issued, the Department continues to comply with the reporting requirements in *Ministerial Statement no. 819*.
819: M 4-2 1	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: • compliance with the conditions.	The performance review will address: • compliance with the conditions.	Compliance report	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** Refer to **819: M 4-1 2**. Compliance with conditions can be found in the 'status' column of this table.
819: M 4-2 2	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: • the achievement of environmental objectives set for the proposal.	The performance review will address: • the achievement of environmental objectives set for the proposal.	Compliance report	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** Evidence of achievement of the objectives is given by the 'evidence' and 'status' columns of this table.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 4-2 3	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: • stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any ongoing concerns being expressed.	The performance review will address: • stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any ongoing concerns being expressed.	Compliance report	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** The *Gnangara groundwater allocation plan* (DWER 2022a) was finalised and released in June 2022. The accompanying *Gnangara groundwater allocation plan: Statement of response* (DWER 2022c) sets out how we responded to issues raised by the public to finalise the plan, and how we are working towards managing these issues in implementing the 2022 plan. Prior to the release of the 2022 plan, evaluation statements were completed in 2013 and 2015 for the 2009 Gnangara plan (DoW 2013, 2015). The 2009 and 2022 allocation plans, evaluation statements, and statement of response (DWER 2022c) are published on the Department's website. The Department submits annual and triennial compliance reports that are performance review reports on compliance with water level criteria, management activities and research initiatives.
819: M 4-2 4	Compliance audit and performance review	The proponent shall submit a performance review report by 1 December each year and more detailed reports by 1 February every three years, to the requirements of the EPA, which address: • proposed environmental management over the next three years to comply with conditions and environmental objectives set for the proposal.	The performance review will address: • proposed environmental management over the next three years to comply with conditions and environmental objectives set for the proposal.	Compliance report	CEO		Overall	By 1 December each year and more detailed reports by 1 February every three years.	**Compliant.** The Department submits annual and triennial compliance reports that are performance review reports on compliance with water level criteria, management activities and research initiatives. In addition to the contents of this report, the 2022 *Gnangara groundwater allocation plan* and the Gnangara Groundwater Monitoring and Management Plan (submitted to the EPA early in 2023) set out the Department's proposed environmental management program and commitments related to the Gnangara groundwater resources for the coming years.
819: M 4-3	Compliance audit and performance review	The proponent shall make the reports required by condition 4-2 publicly available, to the requirements of the Chief Executive Officer of the EPA.	Available on website.	Reports made available on the Department of Water (now Department of Water and Environmental Regulation) website.	CEO		Overall	After EPA Acknowledge-ment letter being received. Department website.	**Compliant.** Refer to Gnangara annual and triennial compliance reports.
819: M 4-4	Compliance audit and performance review	The proponent shall report any breach or anticipated breach of the environmental criteria set out in tables 1 and 2 or environmental objectives to the Chief Executive Officer immediately it becomes evident to the proponent.	Report in regular summaries sent to the Chief Executive Officer.	Letter to the Chief Executive Officer reporting non compliances with water level and other criteria as required. Compliance report.	CEO		Overall	Immediately as it becomes evident.	**Non-compliant.** The Department informs the EPA of non-compliance with criteria water levels and other criteria in annual and triennial compliance reports.
819: M 5-1	Management of the water resource	The proponent shall base decisions affecting the management of groundwater resources of the Gnangara Mound on the concept of sustainable yield of resources and maintenance of ecological systems in accordance with the objectives of *A State Conservation Strategy for Western Australia* (1987).	Base decision on the concept of sustainable yield of resources and maintenance of ecological systems in accordance with the *A State Conservation Strategy for Western Australia* (1987). Present relevant material in annual/triennial compliance reports.	Compliance report	Minister for the Environment		Overall		**Compliant.** The Department recognises that the sustainable yield of Gnangara groundwater has diminished because rainfall recharge has decreased. The Department has reassessed future allocation of Gnangara resources based on reduced rainfall recharge in line with climate change as part of the development of the 2022 *Gnangara groundwater allocation plan* (DWER 2022a). The *Gnangara groundwater allocation plan: Methods* (DWER 2022b) report contains additional information on the science and other information that informed the management decisions in the 2022 Gnangara plan.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 5-2	Management of the water resource	The proponent shall subject to review, every three years, the basis for groundwater management decisions, including groundwater allocations and licences, and the criteria specified for conservation of the environment and the groundwater resource of the Gnangara Mound, to the requirements of the EPA on advice of Department of Biodiversity, Conservation and Attractions (DBCA, formerly Department of Parks and Wildlife [DPaW]).	Present relevant material in annual/triennial reports. Refer draft groundwater management planning reports to the EPA and the DBCA for comment. Make compliance reports publicly available (on the Department of Water and Environmental Regulation's website).	Compliance report. Draft groundwater management documents sent to DBCA/EPA for comment. Reports made available on Department of Water (now Department of Water and Environmental Regulation) website.	EPA	DBCA	Overall	Subject to regular review every three years.	**Compliant.** The *Gnangara groundwater allocation plan: Statement of response* (DWER 2022c) sets out our response to issues raised by stakeholders, including DBCA, in finalising the 2022 Gnangara plan. The Department consults with DBCA routinely on groundwater-related management issues that either concern lands under its management, such as Gnangara – Moore River State Forest, Yanchep National Park and Yellagonga Regional Park, or concern protected flora and fauna or Threatened Ecological Communities. Gnangara annual and triennial compliance reports are publicly available on the Department's website.
819: M 6-1	Groundwater allocation	The proponent shall ensure that the allocation of water to public and private users and the operation of the Pinjar Stages 1, 2 and 3, Wanneroo, Mirrabooka, and Lexia Groundwater Schemes comply with environmental water provisions.	Licensed allocations not to exceed allocation limits for Groundwater Area sub-areas.	Compliance report	Minister for the Environment		Overall		**Non-compliant.** The addition of the Perth and Southern desalination plants, and the groundwater replenishment scheme to the Integrated Water Supply Scheme has reduced the pressure on the Gnangara groundwater system for public water supply. From 2012–13 Water Corporation's baseline groundwater allocation from Gnangara and Jandakot for the Integrated Water Supply Scheme has been reduced from 145 GL to 126 GL/year (from existing infrastructure). The Department recognises that it remains non-compliant with about half of the environmental water provision criteria for the Gnangara groundwater resources proposal. Licensed entitlements exceed the allocation limits in many groundwater subareas. The *Gnangara groundwater allocation plan* (DWER 2022a) outlines additional reductions to licensed groundwater entitlements from 2028 and to domestic garden bore use from 1 September 2022, along with other strategies to help bring Gnangara groundwater resources back into balance. However, groundwater modelling conducted for the plan showed that even with significant reductions in groundwater abstraction, many existing environmental water provisions criteria could not be met under projected drying climate conditions. Changes to water level criteria were proposed in the Gnangara plan and the EPA is currently inquiring into the proposed changes under section 46 of the EP Act.
819: M 7-1	Groundwater-dependent ecosystems	The proponent shall ensure that the integrity of all groundwater-dependent ecosystems (GDE) located on the Gnangara Mound that may be impacted as a result of groundwater abstraction are protected, to the requirements of the Minister for the Environment on advice of the EPA and the DBCA (formerly DPaW).	Comply with EPA Bulletin no. 1324 and *Ministerial Statement no. 819*. Undertake a monitoring program to measure integrity of GDEs.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Non-compliant.** Refer to the results given in Appendix A Water level monitoring results for Ministerial sites for the Gnangara Mound groundwater resources for 2015–25. Several sites were non-compliant with the absolute minimum and/or peak water level criteria identified in Schedule 1 of *Ministerial Statement no. 819*. 14 sites were non-compliant in 2024–25 compared to 16 in 2023–24. Section 5.1 and Appendix C describe the Department's environmental monitoring program (in line with the commitments in *Ministerial Statement no. 819*). The Department undertakes management and research initiatives to limit impacts of abstraction on groundwater-dependent ecosystems.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 8-1	Groundwater availability	The proponent shall widely publish by the end of October each year the limits on groundwater availability for the Gnangara Mound.	Detail limits on availability on the Department of Water (now Department of Water and Environmental Regulation) website.	Allocation limits made available on the Department of Water (now Department of Water and Environmental Regulation) website. Current water availability figures can be obtained from the Department's Swan Avon regional office or through the Department's water register.	Minister for the Environment		Overall	End of October each year	**Compliant.** Water availability figures are constantly changing. Up-to-date figures are available by contacting the Department's Swan–Avon regional office or through the water register.
819: M 8-2	Groundwater availability	The proponent shall update annually the figures published according to the requirements of condition 8-1, with the emphasis on those areas of high allocation relative to sustainable yield of the groundwater resource so that limits to use and development can be clearly seen by all interested parties. The updated figures shall also be widely published.	Detail limits on availability relative to sustainable yield (allocation limits) published on the Department of Water and Environmental Regulation's website.	Allocation limits made available on the now Department of Water and Environmental Regulation website. Current water availability figures can be obtained from Swan Avon regional office or through the Department's water register.	Minister for the Environment		Overall	End of October each year	**Compliant.** Water availability figures are constantly changing. Up-to-date figures are available by contacting the Department's Swan Avon regional office or through the water register.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 9-1	Water conservation	The proponent shall actively encourage further reduction in public and private water demand in accordance with the *Securing our water future: A State Water Strategy for Western Australia* (2003) and other water conservation initiatives.	Engage in activity that supports water conservation.	Compliance report	Minister for the Environment		Overall		**Compliant.** The Department has worked with local governments to investigate conceptual water supply and demand management options for North East Corridor urban expansion and Swan Valley agriculture, North Wanneroo agriculture and Western Suburbs Regional Organisation of Councils greenspaces. In 2019, the cross-agency *Waterwise Perth Action Plan* (Government of Western Australia 2019) was initiated to help transition Boorloo to become a leading waterwise city by 2030. In 2022, the second two-year plan *Kep Katitjin – Gabi Kaadadjan Waterwise Perth action plan 2* (Government of Western Australia 2022) was released and it contained an expanded program of 41 actions to be delivered by 11 agencies. The third plan *Kep Katitjin – Gabi Kaadadjan Waterwise action plan 3* (Government of Western Australia 2024) was released in 2024 and it contains 43 actions to help conserve water resources, support urban greening, biodiversity, the tree canopy and urban cooling to create climate-resilient communities. Action 8 of the *Kep Katitjin – Gabi Kaadadjan Waterwise action plan 3* is the implementation of the Be Groundwater Wise initiatives, which include social media campaigns to raise awareness of the importance of using water-saving principles in the garden. September 2022 saw the implementation of the two-day-per-week sprinkler roster for garden bore owners, bringing them into line with scheme water users. Actions 11 to 15 focus on the implementation of Waterwise Councils, Waterwise Schools, Waterwise School Grounds, Waterwise Golf and Waterwise Business programs. Actions 27 and 28 specifically target water use efficiency improvements and reducing the reliance on groundwater in the agricultural and local government sectors in the Gnangara allocation plan area. Action 29 aims to improve the uptake of waterwise accreditation and certification programs in the nursery and tree farm sectors in the Gnangara allocation plan area.
819: M 10-1 1	Research and monitoring	The proponent shall participate in and undertake research and monitoring on the Gnangara Mound which includes: • clarification of the relationship between groundwater level and rainfall under conditions of declining long-term rainfall • to the requirements of the Minister for the Environment on advice of the EPA and the DBCA (formerly DPaW).	Engage in research projects to address this issue, which includes: • clarification of the relationship between groundwater level and rainfall under conditions of declining long-term rainfall.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Compliant.** The *Gnangara groundwater allocation plan* (DWER 2022a) and the *Gnangara groundwater allocation plan: Methods* (DWER 2022b) contain information on a range of research and investigation programs that have been carried out in recent years by the Department to improve the understanding of the Gnangara groundwater system.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 10-1 2	Research and monitoring	The proponent shall participate in and undertake research and monitoring on the Gnangara Mound which includes: • improvement in the understanding of the relationship between groundwater levels and vegetation, including plantations • to the requirements of the Minister for the Environment on advice of the EPA and the DBCA (formerly DPaW).	Engage in research projects to address this issue, which includes: • improvement in the understanding of the relationship between groundwater levels and vegetation, including plantations.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Compliant.** As part of the development of the *Gnangara groundwater allocation plan* (DWER 2022a), the Department used PRAMS modelling to simulate groundwater levels under various pines, land use and climate scenarios. Through the Perth shallow groundwater systems investigations, we have improved our understanding of the interrelationships between wetlands and the Superficial aquifer and the complex, superimposed impacts of climate change, land use and abstraction on groundwater levels. We are using the investigation's outcomes to better relate water levels to ecological condition at groundwater-dependent ecosystems. The Department commissioned Dr Bea Sommer and Professor Ray Froend of Edith Cowan University to develop a conceptual model for determining ecological risk to groundwater-dependent vegetation across the Gnangara groundwater system as the climate changes (Sommer & Froend 2010). The model is based on 30 years of ecological and hydrological monitoring data. It has been an important management tool for assessing the impact of future land, water-use and climate scenarios and for reviewing allocation limits for the Gnangara plan. Refer to Section 5.3 for details on other research initiatives, such as the Recharge Estimation Collaboration (REC) project.
819: M 10-1 3	Research and monitoring	The proponent shall participate in and undertake research and monitoring on the Gnangara Mound which includes: • improvement in the understanding of the relationship between groundwater level and abstraction from unconfined and confined aquifers of the Gnangara Mound • to the requirements of the Minister for the Environment on advice of the EPA and the DBCA (formerly DPaW).	Engage in research projects to address this issue, which includes: • improvement in the understanding of the relationship between groundwater level and abstraction from unconfined and confined aquifers of the Gnangara Mound.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Compliant.** The Department is using PRAMS modelling to improve understanding of the relationship between groundwater levels and abstraction from unconfined and confined aquifers of the Gnangara system. Refer to Section 5.3 for details on the recent update of PRAMS to version 3.6. The Perth Region Confined Aquifer Capacity study used robust and established science coupled with innovative research to improve our understanding of the deep Leederville and Yarragadee aquifers in the Boorloo region. Perth shallow groundwater systems investigations have improved the Department's understanding of the interrelationships between wetlands and the Superficial aquifer and the complex, superimposed impacts of climate change, land use and abstraction. The Department is using the investigation's outcomes to limit abstraction impacts on groundwater-dependent ecosystems.
819: M 10-1 4	Research and monitoring	The proponent shall participate in and undertake research and monitoring on the Gnangara Mound which includes: • clarification of the relationship between groundwater level and wetland water levels and wetland water quality • to the requirements of the Minister for the Environment on advice of the EPA and the DBCA (formerly DPaW).	Engage in research projects to address this issue, which includes: • clarification of the relationship between groundwater level and wetland water levels and wetland water quality.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Compliant.** The Department has studied hydrogeology at several sites across the Gnangara groundwater system as part of the Perth shallow groundwater systems investigation with 10 reports available on the Department's website. These reports examine relationships between wetland hydrogeology, chemistry and ecosystem function to provide a basis for improved management strategies that limit abstraction impacts. In 2023 the Department engaged Edith Cowan University to examine the possibility of developing water quality trigger criteria at nine monitored wetlands on the Gnangara Mound. Horwitz (2024) proposed trigger and threshold criteria for six water quality parameters and presented a suite of management response options to be used in combination once trigger and threshold criteria are reached. The Department will incorporate the proposed triggers and thresholds into its annual wetland water quality monitoring program to test their practicality and effectiveness.

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M 10-1 5	Research and monitoring	The proponent shall participate in and undertake research and monitoring on the Gnangara Mound which includes: • improvement in the understanding of the relationship between groundwater level and water levels in the Yanchep caves • to the requirements of the Minister for the Environment on advice of the EPA and the DBCA (formerly DPaW).	Engage in research projects to address this issue, which includes: • improvement in the understanding of the relationship between groundwater level and water levels in the Yanchep caves.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Compliant.** Water quality and macroinvertebrate monitoring in the Yanchep Caves ceased in 2013–14 because of low water levels and cave safety issues. Water loggers have been installed in some caves to monitor water levels. As water levels in caves reflect the surrounding Superficial aquifer groundwater levels, the Department uses nearby monitoring bores to monitor cave water levels. The Department has a good understanding of the relationship between groundwater levels and cave water levels. Building on the work of the shallow groundwater systems investigation, the Department completed a study on the cause of rapidly declining levels at Loch McNess in Yanchep National Park (Kretschmer & Kelsey 2016). This study improved our understanding of the hydrogeology of Loch McNess and surrounding areas, including the nearby caves. We continue to monitor groundwater levels in relation to cave levels and have made management changes that aim to improve levels in the caves. We have worked with Water Corporation to reduce public water supply abstraction near the Yanchep National Park and further reductions will be implemented from 2028 under the Gnangara plan. Reductions in abstraction, both public and private, and removal of pine plantations to the east will assist in improving groundwater levels in the vicinity of the Yanchep Caves.
819: M 10-1 6	Research and monitoring	The proponent shall participate in and undertake research and monitoring on the Gnangara Mound which includes: • improvement in understanding of the conservation value of wetland and other groundwater-dependent ecosystems on the Gnangara Mound • to the requirements of the Minister for the Environment on advice of the EPA the DBCA (formerly DPaW).	Engage in research projects to address this issue, which includes: • improvement in understanding of the conservation value of wetland and other groundwater-dependent ecosystems on the Gnangara Mound.	Compliance report	Minister for the Environment	EPA/ DBCA	Overall		**Compliant.** The conservation value of wetlands is a prime responsibility of DBCA. The Department does research and monitoring to determine how conservation values are supported by groundwater and how abstraction can be managed to limit impacts on these values.
819: M Proced-ure 1		Where a condition states, “to the requirements of the Minister for the Environment on advice of the EPA”, the EPA will prepare the written notice to the proponent.	The EPA to provide written notice to the proponent (Department of Water, now Department of Water and Environmental Regulation).		Minister for the Environment		Overall		**Not required at this stage.** Not the responsibility of the Proponent (the Department).
819: M Proced-ure 2		The EPA may seek advice from other agencies or organisations, as required, to provide its advice.	The EPA to seek advice as required.		EPA	Other agencies as required.	Overall		**Not required at this stage.** Not the responsibility of the Proponent (the Department).

Audit code	Subject	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: M Proced-ure 3		Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Chief Executive Officer of the EPA.	Department of Water and Environmental Regulation liaises with advisory body as required.	Liaison with advisory body in compliance report.	EPA	Agencies listed as part of compliance reporting.	Overall		**Compliant.** Refer to commitments: • **819: M 2, M 4, M 6, M 8** and **M 21** = DBCA • **819: M 21** = Forest Products Commission (FPC). Both the FPC and the then DEC made public submissions to the *Gnangara groundwater areas water management plan: draft for public comment* (DoW 2008a), which dealt with similar issues as the conditions. The Department is working directly with these two advisory bodies on future management of the Gnangara, Pinjar and Yanchep pine plantations given the multiple objectives of the area – pine harvesting, Carnaby's cockatoo conservation and groundwater recharge. The Department routinely works with DBCA on any groundwater management-related issues within its managed lands (such as Yanchep National Park and Yellagonga Regional Park), or in connection with threatened ecological communities or flora and fauna of conservation significance.

Table B2 The proponent's (Department of Water, now Department of Water and Environmental Regulation) environmental management conditions

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: P 1	Gnangara Mound allocations	Sustainable use of groundwater from the Gnangara Mound (Superficial aquifer).	Manage public and private groundwater abstraction to meet objectives and Environmental Water Provisions (EWP) criteria presented in tables 1 and 2 (*Ministerial Statement no. 819*).	Meet objectives and EWP criteria presented in tables 1 and 2 (*Ministerial Statement no. 819*).	Compliance report	Minister for the Environment		Overall		**Non-compliant.** Refer to the results given in Appendix A Water level monitoring results for Ministerial sites for the Gnangara Mound groundwater resources for 2015–25. Several sites were non-compliant with the absolute minimum and/or peak water level criteria identified in Schedule 1 of *Ministerial Statement no. 819*. There were 14 sites non-compliant with absolute minimum and/or peak water level criteria in 2024–25 compared to 16 sites in 2023–24. The sites that were non-compliant during the annual reporting period were Loch McNess, Lake Yonderup, Lake Jandabup, Lake Nowergup, Lake Wilgarup, Pipidinny Swamp, Lexia 186 (GNM15), Melaleuca Park EPP173, MM53, MM59B, PM9, WM1, WM2 and WM8. Five sites were non-compliant with the other criteria identified in Schedule 1 of *Ministerial Statement no. 819*, Lake Mariginiup, Lake Nowergup, Lexia 86 (GNM16), Lexia 186 (GNM15) and Melaleuca Park Dampland 78 (GNM31).
819: P 2	Management objectives and criteria	To provide for ongoing adaptive management.	Management objectives, criteria and water allocation limits will be regularly reviewed and amended as information becomes available to provide for ongoing adaptive management.	Regularly review management objectives, criteria and water allocation limits. Best examined in triennial reports, which also review long-term trends.	Compliance report	Minister for the Environment	DBCA	Overall		**Compliant.** The Department reviewed the management objectives and allocation limits of Gnangara resources as part of the development of the 2022 *Gnangara groundwater allocation plan* (DWER 2022a). The plan proposes some changes to environmental conditions and water level criteria, which the EPA is inquiring into under section 46 of the EP Act. Gnangara plan evaluation statements were completed in 2013 and 2015 (DoW 2013, 2015). These statements evaluated the Department's management of Gnangara groundwater resources against the objectives in the previous (2009) *Gnangara groundwater areas allocation plan* (DoW 2009). The evaluation statements are available on the Department's website. The most recent completed review of Ministerial conditions and commitments for the Gnangara mound is the 2007 *Review of Ministerial Conditions on the groundwater resources of the Gnangara Mound* (DoW 2008b) and confirmed in *Ministerial Statement no. 819*.
819: P 3	Yanchep Caves	To minimise environmental and/or significant impact.	Continue to develop catchment strategies to minimise change in hydrological regime within the caves of Yanchep National Park. Monitor water levels and cave fauna.	Interact with State and local agencies to coordinate land and water development activity to promote objective. Incorporate water level and fauna monitoring of caves in the Department of Water and Environmental Regulation's Gnangara Mound monitoring program.	Compliance report	Minister for the Environment	DBCA	Overall		**Non-compliant.** Water levels in Yanchep Caves have been declining for many years and accessible caves are now dry. We can no longer gain access to several caves because of safety concerns. This informed the decision to discontinue macroinvertebrate and water quality monitoring at the Yanchep Caves. Monitoring of surrounding Superficial aquifer groundwater bores is ongoing. We have also installed loggers in some of the bores in the caves to monitor cave water levels (Boomerang Gorge, Water Cave, Carpark Cave). Building on the work of the shallow groundwater systems investigation, the Department completed a study on the cause of rapidly declining levels in Loch McNess in Yanchep National Park (Kretschmer & Kelsey 2016). Working with DBCA, the Department has reduced local abstraction in Yanchep National Park. It has also made changes to public water supply abstraction to limit impacts on the caves and adjoining Loch McNess. There have been reductions to some northern Superficial and Leederville aquifer public water supply abstraction in line with the recommendations in Kretschmer & Kelsey (2016). More reductions in licensed groundwater entitlements are outlined in the *Gnangara groundwater allocation plan* (DWER 2022a), which also aim to improve groundwater levels in the vicinity of Yanchep National Park and the Yanchep Caves.

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: P 4	Strategic drainage plans	To minimise environmental and/or significant impact.	Prepare strategic drainage plans for the study area including options for management of higher water levels in lakes Joondalup, Goollelal, Mariginiup, and Jandabup.	Prepare strategic drainage plans for the study area.	Compliance report	Minister for the Environment		Overall		**Compliant.** The Department assesses water management strategies and plans against our legislation, policies and guidelines to ensure that: • water management opportunities and issues are addressed at the appropriate planning and design stages of urban development • proposed urban development does not result in adverse impacts to water resources and the environment. The Department worked with the Department of Planning, Lands and Heritage (DPLH), City of Wanneroo and Urbaqua to complete the District Water Management Strategy for East Wanneroo in 2021. The existing environmental conditions set on lakes Mariginiup and Jandabup are important considerations for the establishment of controlled groundwater levels and overall drainage designs for future urban development in the East Wanneroo area.
819: P 5 1	Research and investigation program	Improving understanding of: • groundwater-environmental relationships on the Swan Coastal Plain • the associated management requirements, and • potential management techniques.	Prepare a research and investigation program for submission to the EPA for review and subsequent finalisation of the program to the satisfaction of the EPA. The research and investigation program will be prepared with the objective of improving understanding of: • groundwater – environmental relationships on the Swan coastal plain • the associated management requirements, and • potential management techniques • and will incorporate all relevant aspects of research and investigation work currently committed to under *Ministerial Statement nos. 438* and *496*.	Prepare a research and investigation program.	Submit research and investigation program to the EPA for approval. Compliance report.	EPA	DBCA	Overall	Within four months of a revised statement being issued following the 2004 Stage 1 section 46 review	**Compliant.** A previous research and investigation program was produced and submitted to the EPA on 21 December 2005. It was detailed in Appendix 7 of Gnangara Triennial report 2003–06 (DoW 2007). The audit of 2003–06 and 2006–07 compliance reports agreed that the commitment could be 'cleared' upon confirmation from the DEC (now DBCA). The Department, together with research partners, is focusing management effort on the areas that will show the most benefit from changes to abstraction. This work has informed the *Gnangara groundwater allocation plan* (DWER 2022a) and includes: • updates to PRAMS (see Section 5.3) • completion of the Perth Region Confined Aquifer Capacity (DWER 2021c) study that investigated the best locations and depth for sustainable abstraction from the Leederville and Yarragadee aquifers and for groundwater replenishment (or managed aquifer recharge) • completion of the Perth shallow groundwater systems investigations (reports available on the Department's website) – these studies improved our understanding of the interrelationships between wetlands and the Superficial aquifer and the complex, superimposed impacts of climate change, land use and abstraction • a conceptual model of vegetation water requirements developed by Edith Cowan University, which was used in the draft plan, to assess the risk of impacts to groundwater-dependent vegetation under different water, land use and climate scenarios.
819: P 5 2	Research and investigation program	Administrative	Implement the research and investigation program to the satisfaction of the EPA.	Make part of annual Departmental work program.	Compliance report	EPA	DBCA	Overall		**Compliant.** The Department uses outcomes from the research and investigation program to develop management strategies based on scientific data, to promote the sustainable use of the groundwater resources of the Gnangara system.
819: P 5 3	Research and investigation program	To provide for ongoing up-to-date adaptive management.	Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA.	Incorporate review in Triennial reporting in six-year intervals.	Triennial compliance report	EPA	DBCA	Overall	Every six years (coincide with triennial reports)	**Compliant.** The Department's research and investigation program is constantly evolving. Projects that are contributing to improving the understanding and management of the Gnangara groundwater resources are described in Section 5.3.

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: P 6 1	Environmental monitoring program	To enable evaluation of the environmental impact of groundwater abstraction from the Gnangara Mound (Superficial aquifer).	Prepare an environmental monitoring program for submission to the EPA for review and subsequent finalisation of the program to the satisfaction of the EPA. The monitoring program will include: • monitoring of groundwater levels in all relevant aquifer systems • relevant wetland water levels and water quality • condition of vegetation and fauna associated with groundwater-dependent ecosystems • cave water levels.	Prepare an environmental monitoring program.	Submit monitoring program to the EPA for approval. Compliance report.	EPA	DBCA	Overall	Within four months of a revised statement being issued following the 2004 Stage 1 section 46 review	**Compliant.** An environmental monitoring and research and investigation program was prepared by the Department in mid-2009 following the release of *Ministerial Statement 819*. The program was reviewed by the Department of Environment and Conservation and endorsed by the EPA. The monitoring program continues to be implemented and is periodically updated. A Groundwater Monitoring and Management Program was submitted to the EPA in early 2023 to support its inquiry into the proposed changes to implementation conditions of the Gnangara groundwater resources proposal. The EPA is yet to complete its inquiry.
819: P 6 2	Environmental monitoring program	Administrative	Implement the approved environmental monitoring plan to the satisfaction of the EPA.	Make part of annual Departmental work program.	Compliance report	EPA	DBCA	Overall		**Compliant.** (See **819: P 6 1**)
819: P 6 3	Environmental monitoring program	To provide for ongoing up-to-date adaptive management.	Review and revise the program every six years (coinciding with triennial reports), to the satisfaction of the EPA.	Incorporate review in Triennial reporting in six-year intervals.	Triennial compliance report	EPA	DBCA	Overall	Every six years (coincide with triennial report)	**Compliant.** Although the action states that a review must be compiled in triennial reports every six years, the environmental monitoring program undergoes regular revisions as required. Revisions were made in 2010 and 2013 and have been previously reported. We assess the monitoring program each year to ensure that the most appropriate sites are being monitored based on trends in water level and ecological condition. The Department has also reviewed environmental objectives and monitoring as part of developing the *Gnangara groundwater allocation plan* (DWER 2022a) and has submitted a Groundwater Monitoring and Management Plan to the EPA for review as part of its request to change some of the implementation conditions in *Ministerial Statement no. 819* under the EP Act. The EPA is yet to complete its inquiry into the proposed changes.
819: P 7	Development advice	Integrated land and water resource planning for enhanced water resource management.	Continue to provide advice to the City of Wanneroo, DPLH (formerly Department of Planning and Infrastructure), DBCA (formerly DEC) and other relevant agencies on the impact of land use on groundwater resources.	Liaise with the City of Wanneroo, the DPLH, DBCA and other relevant agencies.	Compliance report	Minister for the Environment	City of Wanneroo, DBCA and other relevant agencies	Overall		**Compliant.** The Department assesses land-use proposals with potential water resource issues that are referred to it from local and State Government agencies.
819: P 8	Gnangara inter-agency technical advisory group	Integrated land and water resource planning for enhanced water resource management.	Convene and provide ongoing executive support for an inter-agency technical advisory group for water resources planning and management issues on the Gnangara Mound. The group will consider planning and management issues in the context of recommendations of the Select Committee on Metropolitan Development and Groundwater Supplies.	Provide executive duties for the Gnangara Coordinating Committee. Provide executive duties for the Gnangara Consultative Committee (see P 9).	Compliance report. See P 9.	Minister for the Environment		Overall		**Not required at this stage.** (See **819: P 9**)

Audit code	Subject	Objective	Action	How	Evidence	Require-ment of	On advice from	Phase	When/ where	Status and further information for the 2024–25 annual reporting period
819: P 9	Community consultation	Useful forum for information exchange and advice.	Continue to chair and provide support for the Gnangara Consultative Committee as an ongoing forum for information exchange and advice.	Chair and provide support for the Gnangara Consultative Committee.	Compliance report	Minister for the Environment		Overall		**Not required at this stage.** The Gnangara Consultative Committee was discontinued at the time of the Gnangara Sustainability Study (GSS); a major multi-agency initiative that employed a cross-government approach to the sustainable management of Gnangara groundwater resources. Upon completion of the GSS, the Gnangara Consultative Committee was not reinstated. However, the Department continues to consult regularly with a range of stakeholders on sustainable use of Gnangara groundwater. Development of the *Gnangara groundwater allocation plan* (DWER 2022a), involved extensive consultation with stakeholders and community. Refer to Section 5.4 for further details.
819: P 10	Vegetation protection	Limit environmental impact – tree deaths.	Limit potential for tree deaths around production wells to 100 metres radius for normal (average) climate conditions and within 200 metres to extreme conditions.	Considered in the Water Corporation operating strategy.	Compliance report	Minister for the Environment		Overall		**Compliant.** The Department has classified the sensitivity of each public water supply bore based on its proximity to environmentally sensitive areas and uses these classifications to distribute public supply abstraction to limit impacts at groundwater-dependent ecosystems.
819: P 11	Lake Nowergup supplementation	Protect environmental values.	Should EWPs in Lake Nowergup not be met by November, artificial supplementation will be used until the EWP is reached.	Operate Lake Nowergup artificial maintenance facility if EWPs not met by end of November until EWP is reached.	Compliance report	Minister for the Environment		Overall		**Non-compliant.** Supplementation of water levels continues to occur at Lake Nowergup all year round, but water levels continue to be non-compliant.
819: P 12	Reporting	Assessment of environmental impact(s) from groundwater abstraction for public water supply.	Require Water Corporation to submit yearly production plans as part of the operating strategy and to report on compliance with environmental commitments made in the operating strategy.	Water Corporation to submit annual production summary and report on compliance with environmental commitments defined in operating strategy.	Compliance report	Minister for the Environment		Overall		**Compliant.** The Department requires and reviews annual bore abstraction plans from Water Corporation to ensure that abstraction is distributed to limit impacts on groundwater-dependent ecosystems. Water Corporation also submits annual water monitoring summaries that report on compliance with environmental commitments made in its operating strategy.
819: P 13	Vegetation protection	To minimise environmental and/or significant impact.	Establish additional monitoring wells in those areas where suitable wells do not exist to monitor groundwater levels under phreatophytic vegetation.	Review monitoring program and recommend construction of additional monitoring wells as required.	Compliance report	Minister for the Environment		Overall		**Compliant.** A similar commitment from previous *Ministerial Statement no. 438*: P 2 was stated as 'cleared' by the then Department of Environmental Protection's Environmental Audit Branch on 28/10/1997 (refer to Appendix 7 of the Gnangara 2000–03 triennial compliance report). However, the Department is continuing work in this area. The Department completed a management area review (McHugh & Bourke 2007) that summarised the monitoring and management issues facing wetlands on the Gnangara and Jandakot groundwater mounds and identified the information and data required to address these issues. The review recommended sites to be included in the Perth shallow groundwater systems investigation, prioritised based on ecological significance, management issues and geomorphic setting. As part of the investigation, we redesigned and upgraded existing monitoring infrastructure and installed new monitoring networks at ecologically important sites. Under the Department's telemetry program, many of the monitoring bores in the Gnangara groundwater allocation plan area have been connected to telemetry systems.
819: P 14	East Gnangara wetlands	Offset environmental impact with environmental benefit.	Require Water Corporation to implement its 2001 wetland mitigation strategy and subsequent approved revision and report to the then Department of Water (now Department of Water and Environmental Regulation) on implementation.	Require information in the Water Corporation annual production summary and report on compliance with environmental commitments defined in operating strategy.	Compliance report	Minister for the Environment		Overall	Prior to the commissioning of the Lexia scheme	**Partially compliant.** Water Corporation has developed a wetland offset strategy, but it has not been fully finalised or implemented. Production from the Lexia borefield did not reach full capacity because of environmental concerns and under the *Gnangara groundwater allocation plan* (DWER 2022a), abstraction from the borefield is likely to be reduced further or ceased altogether. The Department has proposed a change to this implementation condition as part of its request for changes to implementation conditions under section 46 of the EP Act. The EPA is inquiring into the proposed changes.

Appendix C History of Ministerial statements for the Gnangara Mound

The importance of managing abstraction from the Gnangara Mound to protect groundwater-dependent ecosystems was formally recognised in the late 1980s. The Environmental Protection Authority (EPA) proposed conditions on Gnangara groundwater abstraction in 1986 when the Gnangara Mound water resources environmental review and management program was released (WAWA 1986). The conditions, released in March 1988 under *Ministerial Statement no. 021*, included Ministerial water level criteria based on environmental knowledge at the time. These were considered reasonable by the then Water Authority of Western Australia (WAWA) to maintain key elements of the environment. These Ministerial criteria accounted for expected groundwater abstraction for the region, expected land-use changes and historical rainfall variations.

After more research on wetland water requirements, WAWA reviewed the Ministerial water-level criteria in 1995 (WAWA 1995). The review highlighted that climate was an important factor affecting groundwater levels, and it was difficult to predict future groundwater levels given the uncertainty of future climatic conditions. Following the release of this report in 1996, the water service provision and water management arms of WAWA were separated to form Water Corporation and the Water and Rivers Commission. A new statement with revised conditions (*Ministerial statement no. 438)* was issued to the Water and Rivers Commission in 1997. With the addition of Water Corporation's new Lexia Borefield in the late 1990s, another set of Ministerial conditions was established on the Water and Rivers Commission for the East Gnangara area in 1999 (*Ministerial Statement no. 496*).

In 2001, in response to land-use changes and lower rainfall, the EPA endorsed a two-stage approach to review the Ministerial conditions and commitments for the Gnangara, East Gnangara and Jandakot mounds under section 46 of the *Environmental Protection Act 1986* (EP Act). The first stage of the review led to *Ministerial Statement no. 687* for Gnangara/East Gnangara (Government of Western Australia 2005a) and *Ministerial Statement no. 688* for Jandakot (Government of Western Australia 2005b).

In 2007, the then Department of Water conducted another review of Ministerial conditions and commitments on Gnangara (DoW 2008b). Its purpose was to remove Ministerial criteria from sites where ecological values had been lost because of reasons other than groundwater level change, and from sites where analysis showed that abstraction was not the main factor influencing groundwater levels. This review eventually led to a revised *Ministerial Statement no. 819* being released in 2009, which is the current set of environmental conditions under which the Gnangara groundwater resources are managed (Government of Western Australia 2009).

The second stage of the section 46 review proposed in 2001 was meant to be a more comprehensive review to improve management of public and private abstraction and to incorporate ecological information from work underway at the time. This work was

overtaken by more recent investigations into the shallow groundwater systems and ecological responses to climate. The results of these and other investigations have been used to develop the new *Gnangara groundwater allocation plan* (DWER 2022a). The plan was finalised in June 2022 after a three-month public comment period. The plan also proposes changes to water-level criteria at some sites that will require assessment by the EPA under the EP Act and so a section 46 review process has been initiated. If the Minister for the Environment, after reviewing the EPA's recommendations, determines that the implementation conditions should be changed, a new Ministerial Approval Statement will be issued, and an addendum will be added to the plan.

Shortened forms

AHD	Australian Height Datum
AWRC	Australian Water Resources Council
the Bureau	Bureau of Meteorology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation (former)
DoW	Department of Water (former)
DPaW	Department of Parks and Wildlife (former)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
ESC	Environmental sensitivity criteria
EWP	Environmental Water Provisions
FPC	Forest Products Commission
GDE	Groundwater-dependent ecosystems
GWR	Groundwater replenishment
IWSS	Integrated Water Supply Scheme
MRSD	Moore River South development
PER	Public Environmental Review
PRAMS	Perth Regional Aquifer Modelling System
REC project	Recharge Estimation Collaboration project
ToW	Town of Woodridge
UWA	The University of Western Australia
WAWA	Water Authority of Western Australia

Volumes of water

One litre	1 litre	1 litre (L)
One thousand litres	1,000 litres	1 kilolitre (kL)
One million litres	1,000,000 litres	1 megalitre (ML)
One thousand million litres	1,000,000,000 litres	1 gigalitre (GL)

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