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

Gnangara

groundwater allocation plan
2024 progress report

December 2024

Department of Water and Environmental Regulation

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Disclaimer

Acknowledgement of Country

The Department of Water and Environmental Regulation acknowledges the Whadjuk and Yued Noongar people as the Traditional Owners and custodians of the lands and waters covered by the *Gnangara groundwater allocation plan*, and their deep and continuing connection to the land and waters of the region.

We pay our respects to their Elders past, present and emerging, and to all members of the Aboriginal communities in the Gnangara plan's area and their cultures. We acknowledge that Traditional Owners have been custodians of Country for countless generations and that water is integral to life.

We recognise that Aboriginal people and their cultures across the Gnangara plan's area are diverse and that continued custodianship of the land and water is fundamental to their health, spirit, culture and community.

We embrace the spirit of reconciliation, and we seek to listen, learn, and build strong partnerships with genuine opportunities for Aboriginal people throughout our business.

Kep Katitjin – Gabi Kaadadjan

Waterwise Perth Action Plan 3

Kep Katitjin – Gabi Kaadadjan Waterwise action plan 3 is the next step in the Government of Western Australia's long-term commitment to transform Boorloo and Bindjareb into leading waterwise communities.

The 2022 Gnangara groundwater allocation plan was released as part of the first *Waterwise Perth action plan 2019*. Several actions from the Gnangara plan were progressed as part of the *Kep Katitjin – Gabi Kaadadjan Waterwise Perth action plan 2* and will continue to be implemented under the third plan.

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Background

The *Gnangara groundwater allocation plan* (DWER 2022a) was published by the Department of Water and Environmental Regulation (the department) in June 2022. The plan was a response to ongoing groundwater-level declines across aquifers of the Gnangara groundwater system, which are affecting environmental health and groundwater quality. The groundwater declines have been caused by a combination of groundwater abstraction, dense pine plantations (which affect rainfall recharge), and a long-term reduction in rainfall (because of climate change).

The Gnangara plan sets forth a series of strategies and actions to reduce groundwater use by 2032. These were designed to achieve the plan's water resource objectives and secure the groundwater system as a long-term sustainable water resource that supports a healthy environment for Perth.

In the Gnangara plan we outlined 16 actions the department will take to help meet the plan's outcomes and objectives. Some of these actions are being implemented as part of the *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* (Government of Western Australia 2022) and the *Kep Katitjin – Gabi Kaadadjan – Waterwise action plan 3* (Government of Western Australia 2024). We also committed to publishing three short progress reports on the plan's implementation every two years (2024, 2026 and 2028) that will provide an update on:

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

This 2024 report is the first progress report. It covers the period from June 2022 to the end of June 2024.

The third and final progress report in 2028 will be followed by a formal review of the Gnangara plan in 2030. This will help us to determine whether the plan needs replacing after 2032.

1 Climate – recent rainfall, temperature and future projections

Recent rainfall and temperature at Perth Airport weather station

For the past decade (2014–2023) annual average rainfall measured at Perth Airport weather station (9021) has been 654 mm.

In 2022 – the year the Gnangara plan was released – 669 mm of rain was recorded. In 2023 only 554 mm of rain fell, making it the fifth driest year for the period of record at Perth Airport (1945–2023); it was also the hottest year on record with an annual average maximum daily temperature of 26.2°C.

The first five months of 2024 (January to May) were very dry and very hot, with only 74 mm of rainfall recorded and an average maximum daily temperature of 31.2°C. These extreme conditions led to widespread vegetation die-off across south-west Western Australia (Fowler & Ruthrof 2024) (Figure 1). In some parts of the Gnangara plan area, groundwater levels in the Superficial aquifer were the lowest on record.

Figure 1 **Vegetation die-off in Woodridge (northern Gnangara plan area) following hot and dry conditions in early 2024 (Photo credit: Joe Fontaine, Murdoch University)**

Future projections

The department has published updated guidelines (DWER 2024a) on how to use future climate projections for water management. This was part of a State Government initiative to deliver up-to-date climate science resources for Western Australia's water community – see *Guide to future climate projections for water management in Western Australia* (www.wa.gov.au).

The aquifers of the Gnangara groundwater system are recharged by rainfall, primarily in winter and spring. Declines in annual and wet season (winter and spring) rainfall are projected to continue because of climate change (DWER 2021).

Figure 2 below is a re-creation of a similar figure published in the 2022 Gnangara plan, but we have updated it to include the annual rainfall data of the past three years (2021 to 2023)[1]. We also extended the 30-year moving average to include the additional three years. The projected range of future climates at 2030 is consistent with those recommended in the *Guide from the Australian Water Outlook – the Bureau of Meteorology's National Hydrological Projections* (BoM 2022).

The decision to reduce Gnangara groundwater use by 54 gigalitres per year, announced in the 2022 plan, was a risk-based decision. It was informed by groundwater modelling scenarios that assumed a continuation of Perth's declining rainfall trend of the previous two decades. The decision remains sound considering the recent climate, updated guidelines and latest application-ready climate projections (DWER 2024a).

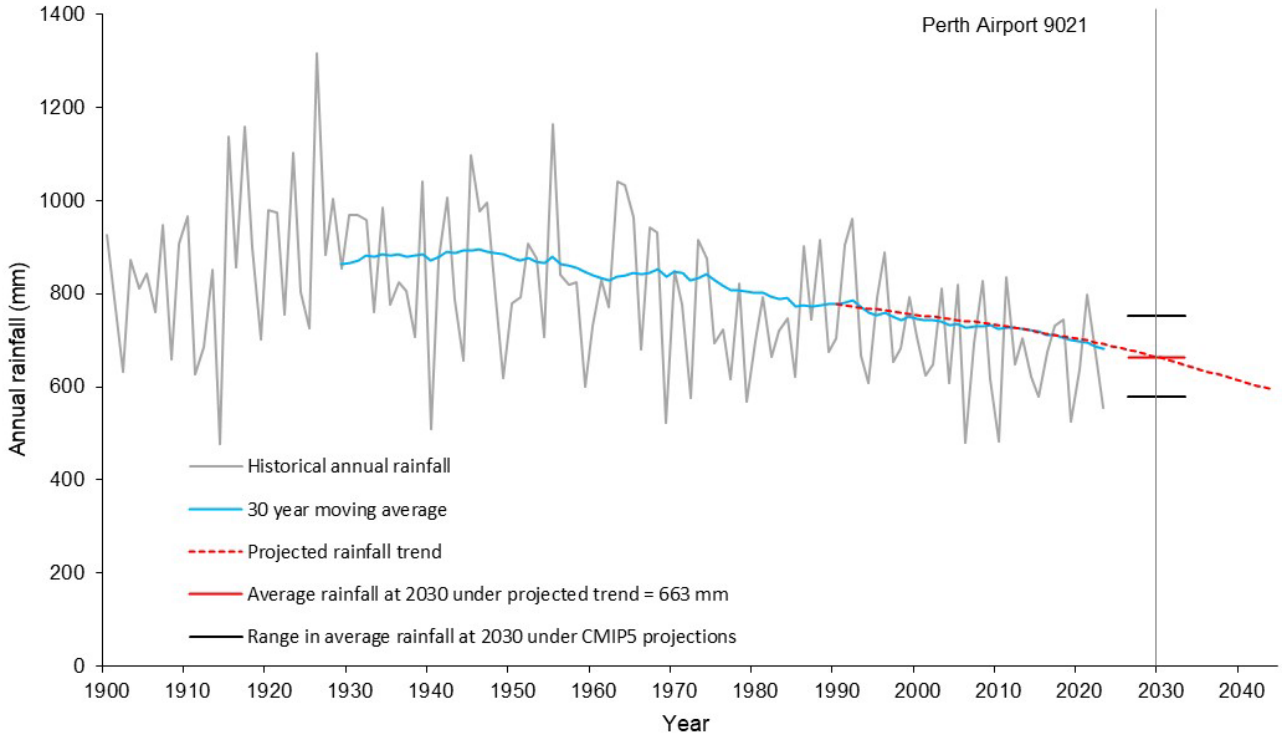


Figure 2 Historical and projected rainfall at the Perth Airport weather station (9021)

1 The Gnangara plan included annual rainfall data up to 2020.

2 Groundwater resource trends

Groundwater levels in the Superficial aquifer have generally been in decline across large parts of the Gnangara plan area for the past 40 years because of decreasing rainfall, the continued use of groundwater, and pine plantations (which limit recharge). The central and northern parts of the plan area have seen the largest declines in groundwater levels in the Superficial aquifer of up to 10 metres. Of most environmental concern are areas where declining groundwater levels coincide with shallow watertables (where groundwater is within around 10 metres of the ground surface), as these are areas where native bushland and wetlands are most likely to depend on that water for survival.

As described in the *Gnangara groundwater allocation plan* (DWER 2022a), across the plan area there is evidence that falling groundwater levels are negatively affecting important groundwater-dependent ecosystems, such as to bushland and wetlands around Yanchep, in Wanneroo and across to east Gnangara and Lexia.

Declining groundwater levels are also compromising groundwater quality: salt water is intruding near the coast and close to the Swan River (e.g. in the Swan Valley) and some wetlands are acidifying (e.g. Jandabup and Mariginiup lakes in east Wanneroo).

Most of the reductions to groundwater use under the Gnangara plan, to help address these declining water levels and environmental impacts, will not be implemented until 2028. This allows time both for self-supply licensees to adapt to the changes and for Water Corporation to bring new replacement water sources online, such as the Alkimos desalination plant. Nevertheless, some changes to groundwater use have already been implemented: the domestic garden bore roster was changed from three days to a two days per week (from 1 September 2022, see Action 5) and abstraction was reduced from Water Corporation's Superficial aquifer bores to the west of Yanchep National Park (see Action 8). Groundwater abstraction from these bores peaked at just over 1 gigalitre per year in 2015–16 and was 0.49 gigalitres per year when the Gnangara plan was released in 2022. Water Corporation has been able to reduce pumping from its Yanchep Superficial aquifer bores to 0.21 gigalitres per year from 2024–25, one year ahead of schedule.

The *Gnangara groundwater allocation plan: methods* report (DWER 2022b) presented a snapshot of hydrographs in a series of figures (see figures 8, 9 and 10 in the methods report) that showed how groundwater-level trends varied between bores in different areas up to 2020. These figures have been replicated and updated below to include groundwater-level data to June 2024 (figures 3, 5 and 6). Figure 3 shows that groundwater-level trends in the Superficial aquifer since 2020 have remained similar across the selection of bores.

The hot and dry conditions that Perth experienced in the summer/autumn of 2023–24 contributed to groundwater levels in the Superficial aquifer dropping notably from September 2023 to their lowest level in eight years – in some areas – by April 2024. The groundwater-level declines in the Superficial aquifer led to some Perth wetlands becoming dry for the first time in many years. For example, Lake Gwelup was dry for the first time since 2013 (Figure 4).

At the end of June 2024, a total of about 1,240 gigalitres of groundwater storage had been lost from the Superficial aquifer across the Gnangara plan area since 1980 (Figure 5). This emphasises the importance of the Gnangara plan to rebalance this important groundwater system in the Perth region.

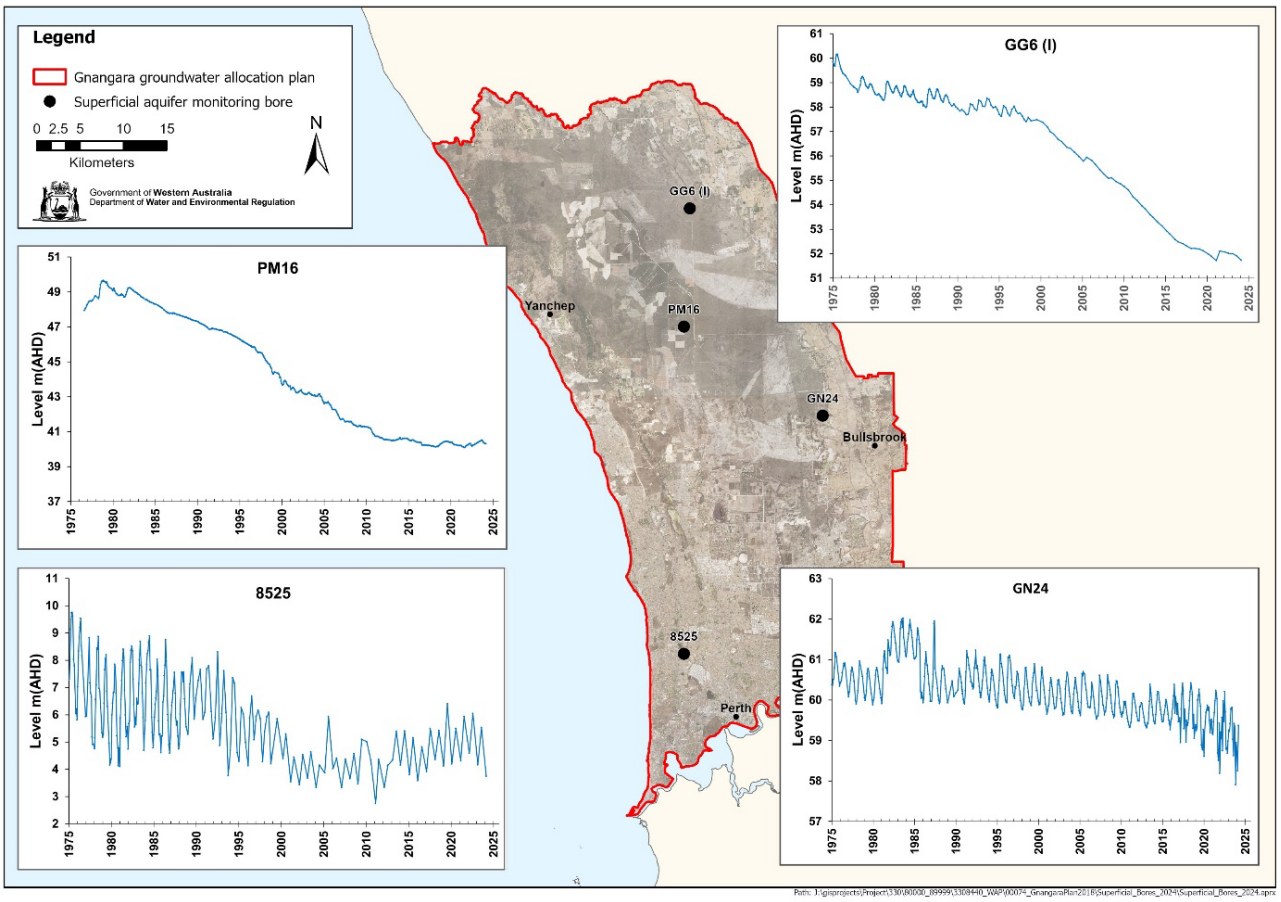


Figure 3 **Trends in the Superficial aquifer groundwater-levels plot (update of Figure 8 from the Gnangara plan methods report)**

Figure 4 **Lake Gwelup was dry in the summer/autumn of 2024 for the first time since 2013 (Photo credit: Joshua Tjioe, Department of Water and Environmental Regulation)**

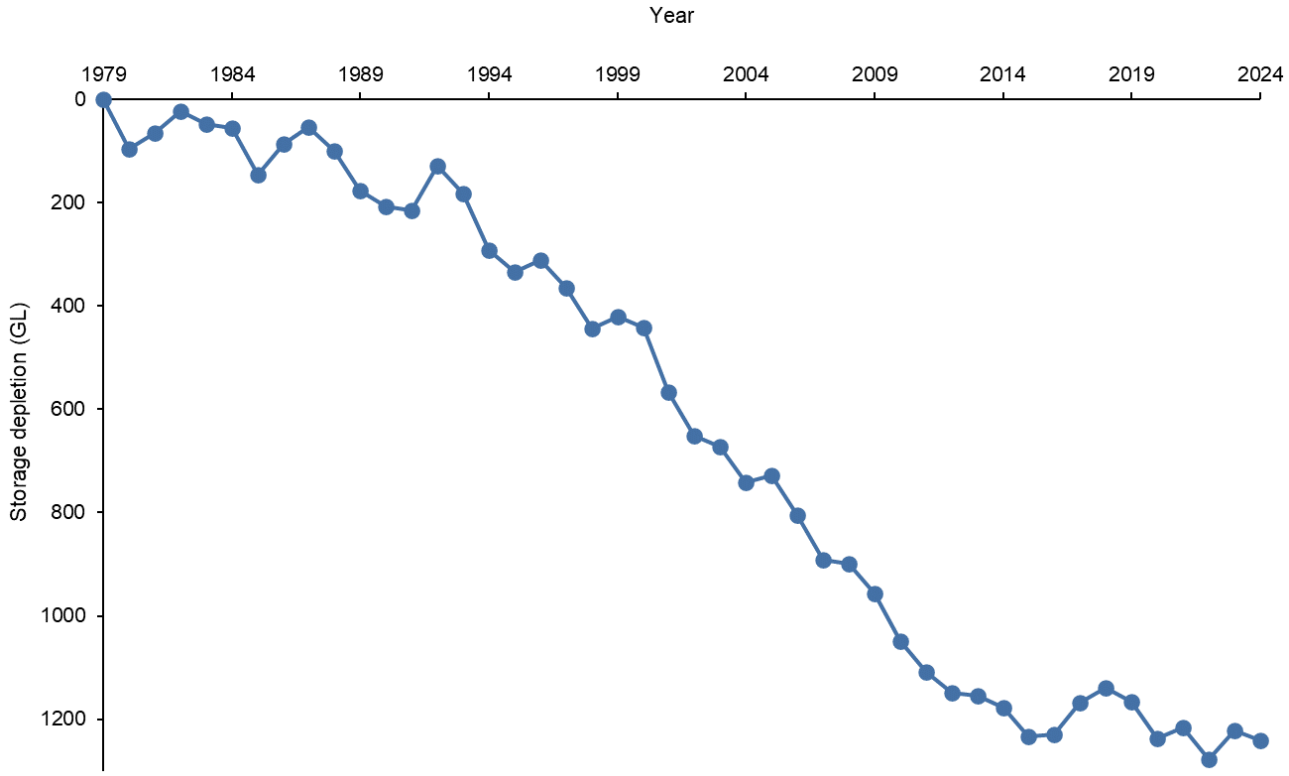


Figure 5 **Groundwater storage depletion in the Superficial aquifer to June 2024 (update of Figure 9 from the Gnangara plan methods report)**

Wagardu (Loch McNess) water levels

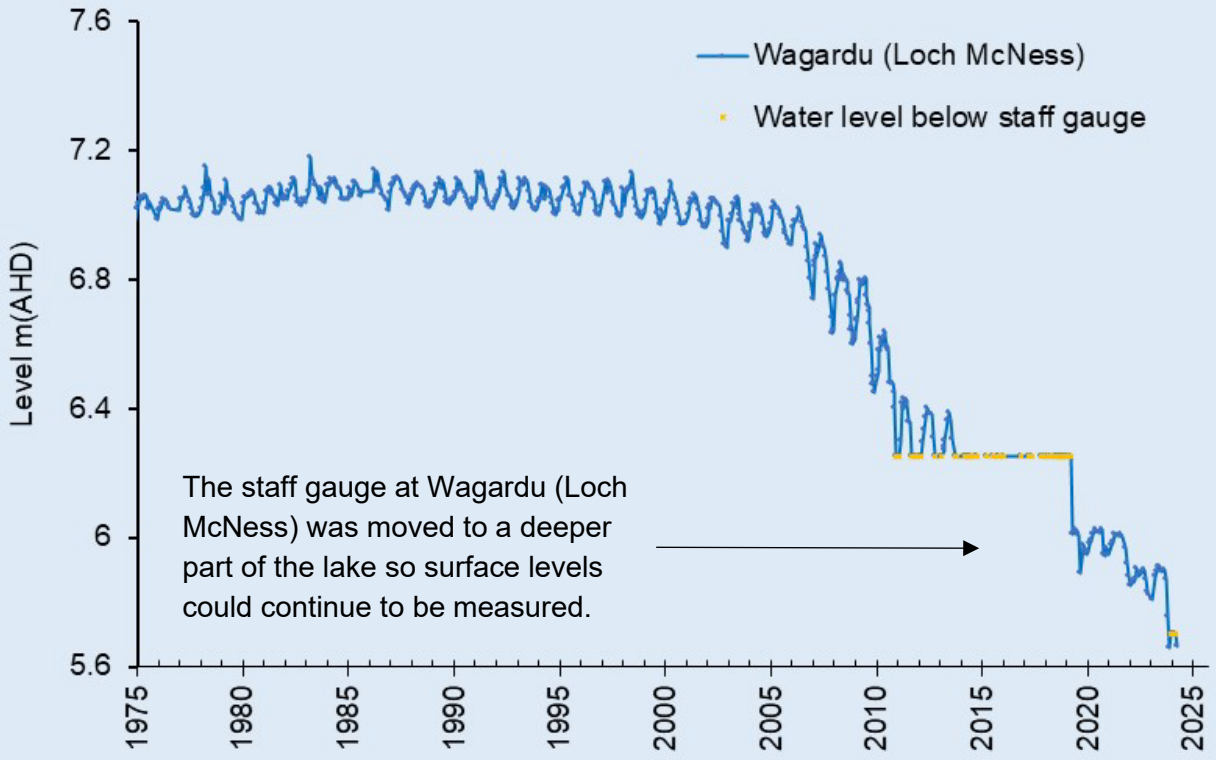
Water levels at Wagardu (Loch McNess) fell to their lowest on record in April/May 2024.

Despite the steady decline in surrounding groundwater levels, up until the early 2000s water levels at Wagardu (Loch McNess) – an important groundwater-dependent wetland in Yanchep National Park – remained very stable.

With a seasonal fluctuation in water levels of only 10 to 15 centimetres, to a casual observer Wagardu and its neighbour Lake Yonderup looked to be untouched by the drying trends that were affecting other wetlands supported by the Gnangara groundwater system. Unfortunately, appearances belied what was happening under the surface.

In the mid-2000s the decreasing volume of groundwater flow into the lake from the east and beneath the lake bed finally became insufficient to keep pace with the water spilling out into the karst system to the west, and lake levels began a dramatic decline.

This decline has continued virtually unabated to the present day, and water levels at Wagardu are now almost 1.5 metres lower than they were two decades ago. The loss of surface water has made a huge difference to the lake's visual amenity. Boating on the lake, which was once a popular activity for visitors, is now not possible, vegetation has established on the lake bed, and permanent water only remains in narrow channels that were dredged long ago at the lake's eastern edge. Wagardu's muddy shores also have had impacts on local wildlife, making access to water during summer months increasingly difficult.



End-of-summer water levels in April/May 2024 were the lowest on record at Wagardu.

The 54 gigalitres per year reduction to groundwater use under the Gnangara plan, in combination with urbanisation and pine plantation management within the Gnangara-Moore River State Forest, is projected to stabilise and make a small improvement to water levels at Wagardu. Although some of the planned changes to abstraction have already occurred since the plan's release (including a decrease in the volume of public water supply abstracted from Superficial aquifers to the west of the national park), there has been no noticeable improvement in water levels within the national park itself.

In the Gnangara-Moore River State Forest to the east of Yanchep National Park, high-density young pine plantations and pine wildings are affecting groundwater levels in the Superficial aquifer. The plantations and wildings are not only restricting recharge to the Gnangara groundwater system, but they are also above the optimal density for maximising the production of pine cones – an important food resource for endangered Carnaby's cockatoos. Reducing pine densities within the state forest is not only crucial to achieve positive outcomes for the water resource and groundwater-dependent ecosystems in areas such as Wagardu, but also to provide important feeding habitat for Carnaby's cockatoos.

In conjunction with other government agencies, we are carefully considering a range of management options to best advance the Gnangara plan's objectives.

Declines in hydraulic pressure in the Leederville and Yarragadee aquifers (measured as pressure head in metres Australian height datum) have accelerated since the 1980s as groundwater abstraction from these aquifers, mostly for public water supply, increased. Public water supply abstraction from the Leederville and Yarragadee aquifers peaked in 2011–12 and has been reduced since then, particularly from northern areas where the connection between the confined aquifers and the watertable is greatest. We will continue to target abstraction from the Leederville and Yarragadee aquifers in northern areas as a priority for reductions as the 30 gigalitre per year cut to Water Corporation's abstraction for public water supply from mid-2028 approaches.

Recent trends in aquifer pressure heads (Figure 6) have remained consistent with the trends to 2020 published in the Gnangara plan methods report (DWER 2022b). Leederville aquifer pressure heads continue to show some improvement since abstraction from the aquifer was reduced a decade ago but further improvements are needed to support Superficial aquifer levels and groundwater-dependent ecosystems in the northern part of the Gnangara system. Yarragadee aquifer pressure heads remain steady in east Gnangara but are still declining steadily in the south.

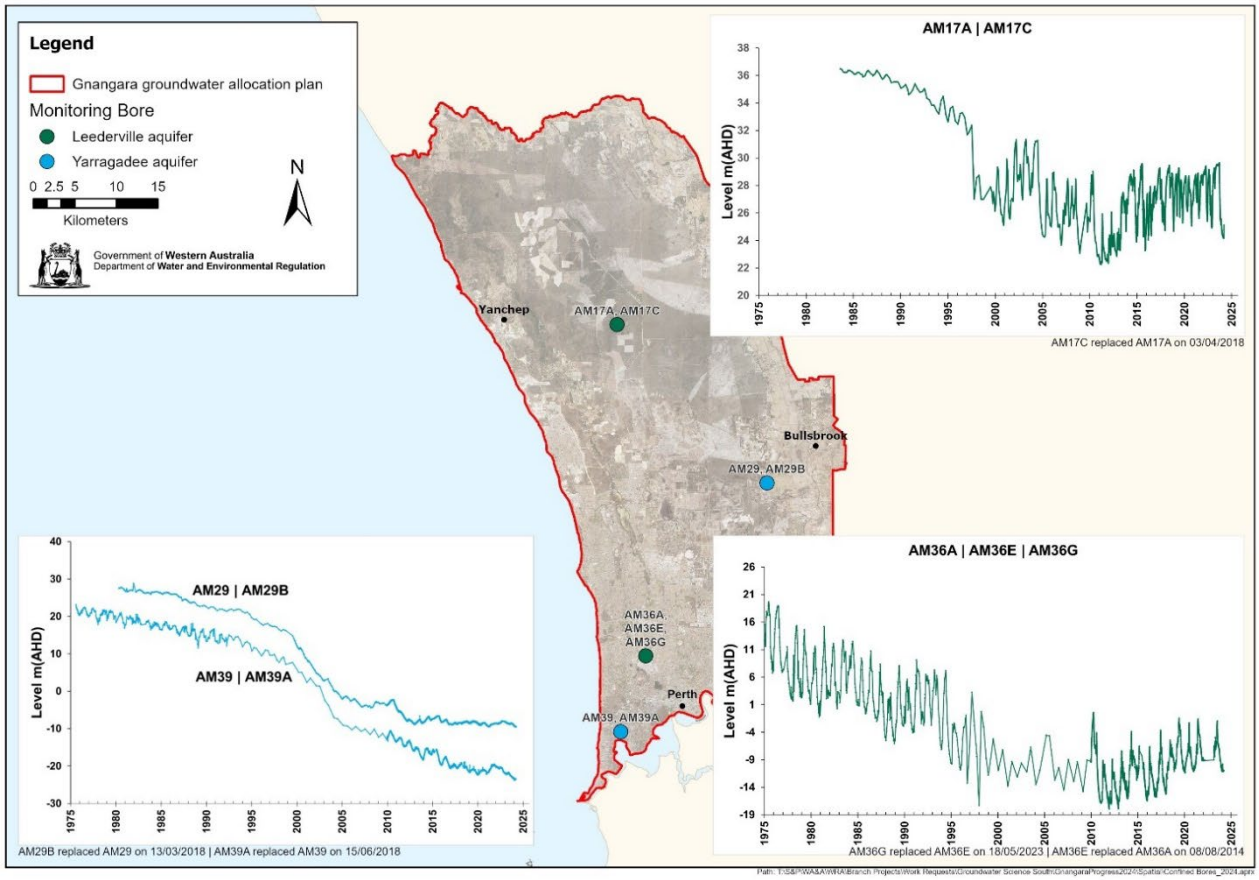


Figure 6 **Trends in pressure heads in the Leederville and Yarragadee aquifers (update of Figure 12 from the Gnangara plan methods report)**

3 Licensing statistics

Public water supply licensing

See Action 8 for work we have been doing with Water Corporation to manage groundwater licensing for public water supply.

Self-supply licensing

Under the Gnangara plan, most self-supply licence holders will have a 10 per cent reduction applied to their annual water entitlement, effective from 1 July 2028. This is being implemented through a review process when licensees apply to have their licences renewed, generally at the end of the standard 10-year licence term. The review process involves:

1. Assessing metering and water use information.
2. Assessing if the annual water use is regularly below the entitlement volume and, where appropriate, recouping unused water and adjusting the licence entitlement.
3. Adding a condition to adjust the water entitlement:

   (a) for a licence application determined before 1 July 2028, including a licence condition to reduce the (adjusted) entitlement volume by 10 per cent from the beginning of the first water year after 1 July 2028, or

   (b) for a licence application determined on or after 1 July 2028, reducing the (adjusted) entitlement volume by 10 per cent upon re-issue.

Since the release of the Gnangara plan (during the reporting period June 2022 to June 2024):

- A total of 354 licence renewal applications have been submitted to the department.
- About 500,000 kilolitres of unused groundwater has been recouped and licence entitlements adjusted where appropriate.
- More than 150 licences have had licence conditions added that will reduce the adjusted entitlement by 10 per cent at the start of the first water year after 1 July 2028. This will result in a future reduction of 750,000 kilolitres per year.

The department investigated 50 compliance incidents during the two-year reporting period, which variously resulted in letters of education, letters of warning and infringement notices being issued. Some of the compliance issues we dealt with included water users abstracting more than their annual water entitlement, failing to record and submit monthly water meter readings, and taking water without a valid groundwater licence.

4 Gnangara groundwater allocation plan actions

Section 8.2 of the *Gnangara groundwater allocation plan* (DWER 2022a) has a table detailing 16 actions to help achieve the plan's objectives. Progress on these actions is reported below.

Action 1

> Alter this plan to reflect any changes to the implementation conditions of the Gnangara groundwater resources proposal that arise from the Environmental Protection Authority's inquiry into the department's proposed amendments to the current conditions.

The department submitted information to the EPA to support our proposal to change some of the implementation conditions in *Ministerial Statement no. 819* (Gnangara groundwater resources) after the *Gnangara groundwater allocation plan* was published in 2022. The EPA has been conducting its inquiry since that time.

Once the EPA has delivered its report and recommendations to the Minister for Environment, and if the minister decides on changes to any of the implementation conditions, a new ministerial statement will be issued for the Gnangara groundwater resources proposal. Until such time, we will continue to comply with, and report against, the implementation conditions in *Ministerial Statement no. 819*. Since the release of the Gnangara plan we have submitted the following compliance reports to the EPA in line with the conditions in *Ministerial Statement no. 819*:

- *Environmental management of groundwater from the Gnangara Mound – Annual compliance report July 2021–June 2022* (DWER 2024b)
- *Environmental management of groundwater from the Gnangara Mound – Annual compliance report July 2022–June 2023* (DWER 2023)

The department's triennial compliance report, covering the period July 2021 to June 2024, will be submitted to the EPA in February 2025 and published online soon after.

If/when a new ministerial statement is issued, we will begin the process of reviewing and amending the Gnangara plan to ensure it is consistent with the new statement.

Actions 2 and 3

> 2. With the Department of Primary Industries and Regional Development (DPIRD), develop a new water efficiency grants scheme to support horticultural water users in the Gnangara plan area who are subject to the 10 per cent reduction to abstraction.
> 3. Continue to work with DPIRD and other stakeholders on the commitments made by government in response to the North Wanneroo Agriculture and Water Taskforce, including putting in place a water efficiency infrastructure and technology grants program.

In June 2022, the State Government committed $1 million to a grants program to support agricultural licensees within the Gnangara plan area to achieve water use efficiency gains ahead of

the upcoming 10 per cent reduction to licensed groundwater use. This funding was in addition to $600,000 previously committed in November 2021 to support agricultural licensees in the North Wanneroo area specifically.

Under the Gnangara Horticulture Water Use Efficiency Grants and Voucher Program launched in October 2022, eligible growers (those in the Gnangara plan area subject to the 10 per cent reduction in licensed water use) could access up to $50,000 in water use efficiency grant monies, up to $30,000 in soil amelioration grants and up to $5,000 from the voucher program. The two grant streams required a 50:50 co-contribution, while the voucher program had no co-contribution requirement.

In May 2024, the State Government announced that the available grant amount under the program had increased to $100,000 for each of the water use efficiency and soil amelioration grant streams (to a maximum of $100,000 in total per licensee), with a sliding scale introduced for co-contributions that reduced the grower investment requirement for smaller grants.

DPIRD is administering the program with support from the department. For more information on the program, see DPIRD's website. Figures 7 and 8 show examples of how grants under the program have been used to improve water use efficiency.

Figure 7 **Guttering installed using the Gnangara Water Use Efficiency Grants and Voucher Program to collect and reuse excess irrigation water (Photo credit: DPIRD)**

Figure 8 **A net house installed using a grant under the Gnangara Water Use Efficiency Grants and Voucher Program to protect against crop loss, reduce evaporation and increase water use efficiency (Photo credit: DPIRD)**

Action 4

Support local governments, targeting those in areas most impacted by the urban heat island effect, to develop a pathway to achieve the reductions in their groundwater use.

The Gnangara plan requires local governments in the plan area to reduce their groundwater use by 10 per cent from 2028.

The Gnangara Waterwise Councils Grants Program is supporting local governments to develop a pathway to achieve the necessary reductions in their groundwater use. The program is a joint initiative between the department and Water Corporation and targets local governments with large groundwater entitlements that also face the most risk from the urban heat island effect. The program will provide a total of $4 million over four years to assist local governments to reduce their groundwater use.

Funding support will help to redevelop parks using waterwise principles and create resilient open spaces, increase tree cover, upgrade irrigation systems, install weather stations and smart irrigation control systems, as well as implement stormwater harvesting. Some projects will also look at the potential for alternative water sources, including wastewater reuse.

See below for the nine local governments included in this program, and a summary of their projects which are underway.

1. Town of Bassendean – install sports turf injection systems at three sporting facilities to improve turf management and reduce water use; and apply eco-zoning to reduce areas of irrigated turf at Success Hill Reserve and Mary Crescent Reserve, along with mulch application and tree planting.
2. City of Bayswater – prepare an action plan to identify sites with opportunities to significantly reduce groundwater use and convert 4 hectares of an underutilised, irrigated area of turf to a waterwise urban forest (Figure 9).

Figure 9 Part of the City of Bayswater's concept masterplan for the Riverside Gardens Urban Forest (Source: City of Bayswater)

3. Town of Cambridge – audit groundwater use to identify priority sites for reducing irrigation demand; prepare a groundwater management strategy, including a schedule of park retrofits to achieve groundwater use reduction goals; and establish two demonstration sites.
4. City of Joondalup – redevelop Barridale Park using waterwise design principles and hydro-zoning, and install new irrigation smart meter systems across multiple sites.
5. City of Perth – expand the stormwater harvesting capacity of the existing Claisebrook main drain harvesting system via installation of an automated pipeline between Claisebrook Lake, Queens Gardens and Lake Vasto to reduce groundwater/irrigation demands.
6. City of Swan – apply hydrozoning to reduce irrigation demands at Lilac Hill Northern Oval, Ron Jose Oval and Ballajura Oval.
7. City of Stirling – implement waterwise park upgrades (hydro-zoning, eco-zoning and irrigation improvements) at nine locations; investigate and conduct a cost-benefit analysis of potential alternative water sources for irrigating public open space (e.g. stormwater harvesting, managed aquifer recharge, sewer mining); and create a WaterSmart Park demonstration site, showcasing water-sensitive urban design principles.

8. City of Vincent – conduct a feasibility study of wastewater reuse at Beatty Park Leisure Centre (Figure 10); improve in-ground irrigation at Litis Stadium; install weather stations and soil moisture probes to improve water efficiency; map trees at parks to preserve canopy cover and guide future planting locations; and engage an education officer to increase awareness of the importance of waterwise activities and change public perceptions of green spaces in a drying climate.
9. City of Wanneroo – install a centrally-controlled smart irrigation system (including weather stations at strategic locations across the city) which will allow irrigation schedules to be adjusted automatically in real time based on site climatic conditions.

Figure 10 **Launch of the Gnangara Waterwise Councils Grants Program in the City of Vincent**

Action 5

Amend the sprinkler restrictions for garden bores in Area 3 Perth/Mandurah to align with the scheme water roster in the Water Agencies (Water Use) By-laws 2010.

The use of urban garden bores and domestic bores is managed under the provisions of the Water Agencies (Water Use) By-laws. On 1 September 2022, the domestic garden bore sprinkler roster was changed to align with the two-days-per-week sprinkler roster for scheme water users in Perth and Mandurah – a reduction of one day of watering per week (Figure 11).

Figure 11 **Sprinkler restrictions for garden bores align with the two-days-per-week scheme water roster**

Water Corporation undertakes sprinkler roster compliance monitoring under a joint memorandum of understanding with the department. Inspectors monitor compliance with sprinkler restrictions in the metropolitan area and in Water Corporation-serviced regional areas.

For the first 12 months after the roster change, we focused on education rather than enforcement. During this time, we issued more than 100 educational letters to garden bore users who were observed watering on a non-rostered day.

As of 1 September 2023, we began issuing infringements to garden bore owners found watering on a non-rostered day. Under the Water Agencies (Infringements) Regulations 1994, a penalty of $100 may be issued. If the evidence was insufficient to satisfactorily prove an offence was committed, we issued a warning letter instead. There were 99 infringements and 79 warning notices issued from 1 September 2023 to 30 June 2024.

Our ‘Be Groundwater Wise’ seasonal campaigns raise awareness of the importance of Perth’s groundwater and encourage the responsible and efficient use of garden bores. The campaigns have featured practical advice on how garden bore users can adjust to the two-days-per-week roster and help conserve our precious groundwater resources. For further information on these campaigns, see Action 7.

As part of the recently released *Kep Katitjin – Gabi Kaadadjan Waterwise action plan 3* (Government of Western Australia 2024), we will undertake a new study in collaboration with Water

Corporation to evaluate the effectiveness of the change to the domestic garden bore sprinkler roster. We will use the study's results to update estimates of the number of households with garden bores and per-household bore water usage volumes.

Action 6

Water Corporation to offer services and rebates to encourage the uptake of water efficiency products and practices for helping gardeners to become more waterwise. This will include waterwise garden activities to educate and inform customers on waterwise outdoor practices. Services and rebates will be available in 2022 to assist households as they prepare for and transition into the drier months.

Services and rebates provided by Water Corporation have included the spring sprinkler service, weather-based irrigation controller rebate, and garden advice sessions to support groundwater-bore owners adjust to the two-day-per-week sprinkler roster.

The spring sprinkler service was a free 60-minute irrigation audit from an endorsed waterwise garden irrigation expert, which included a basic leak test, sprinkler run test (check of uniformity and pressure), a check for broken sprinklers and inefficient misting/micro sprayers, and a controller check and re-set (if necessary). From 2022 to 2024, more than 3,000 of these audits were conducted across suburbs in the Gnangara plan area.

The weather-based irrigation controller rebate was another successful program, which provided a rebate towards the purchase and professional installation of weather-based irrigation controllers or components. Water Corporation granted just under 3,000 of these rebates after the Gnangara plan was released.

At present Water Corporation is offering customers a rebate on eligible waterwise products and services provided by a waterwise garden design shop/waterwise garden irrigator. Customers must purchase their eligible product or service from the nominated waterwise specialists and can claim the rebate on either:

- buying and setting-up an eligible weather-based irrigation controller
- hiring a waterwise specialist to assist with the operation of their automatic irrigation controller, including checking their watering settings are optimal for their garden conditions
- hiring a waterwise specialist to improve their irrigation system for better water efficiency, such as fixing leaks, improving coverage, helping with pressure issues, replacing existing sprinklers with waterwise alternatives and replacing/fixing faulty irrigation valves.

Another program supplied by Water Corporation provided garden advice to support garden bore owners to adjust to the changed garden bore sprinkler roster. Customers received a free 45-minute garden advice session from specialists with waterwise horticulture knowledge on plant varieties and positioning, soil amendments and mulch, irrigation and controller settings, and overall garden design.

Water Corporation has hosted more than 100 waterwise garden workshops since the release of the Gnangara plan. The workshops attracted more than 2,000 attendees keen to learn about how they could make their gardens thrive using a waterwise approach. In addition, about 5,000 people visited

Water Corporation's pop-up installations at the Perth Garden and Outdoor Living Festival and the Perth Four Wheel Drive and Adventure Show.

Action 7

Consistent with the *Waterwise Perth action plan*, continue to support the 'Be Groundwater Wise' community education campaign to encourage garden bore users to implement waterwise behaviours and reduce their abstraction.

The 'Be Groundwater Wise' campaign aims to increase the community's understanding of the importance of groundwater and the vital role it plays in our built and natural environments.

Since the release of the Gnangara plan, the department has run four seasonal campaigns, which have focused on using digital media to communicate key messages including:

- groundwater is a precious resource
- our groundwater levels have declined due to climate change
- groundwater supports our lakes, wetlands, bushland and street trees
- we use groundwater for horticulture; industry; and irrigating our parks, sporting grounds, public open spaces and gardens
- groundwater is a shared resource and it's up to all of us to manage it wisely.

The two-part spring/summer campaign in 2022 featured local waterwise gardening expert Sabrina Hahn (see the Be Groundwater Wise website) who shared her knowledge on keeping our gardens looking attractive while being groundwater wise, and achieving a groundwater wise garden in a drying climate. Recent campaigns have included information on how to garden to the Noongar seasonal calendar (Figure 12).

Table 1 below shows each campaign and the duration of the content. The overall impressions indicate a measure of the success and public audience reach.

Table 1 Seasonal 'Be Groundwater Wise' campaigns run since the release of the Gnangara plan

Campaign	Duration	Overall impressions
Spring/summer 2022	Part 1: 16 days from 26 October to 10 November 2022 Part 2: 14 days from 16 December to 29 December 2022	Part 1: 9,946,884 Part 2: 2,760,804
Autumn 2023	14 days from 18 to 31 May 2023	1,056,425
Spring 2023	14 days from 17 to 30 November 2023	1,711,772
Autumn 2024	18 days from 6 to 23 May 2024	3,061,271

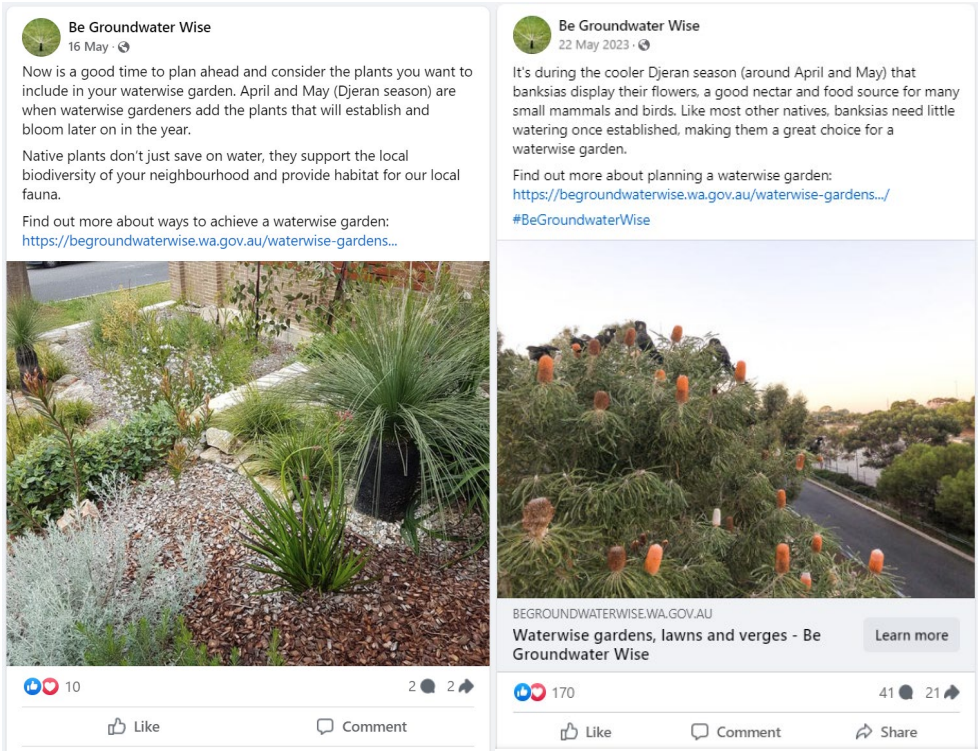


Figure 12 **Social media content from the 2023 and 2024 Djeran (autumn) season campaign**

Action 8

Continue to work with Water Corporation to optimise abstraction from its existing borefields and support its source development investigations.

Every year the department works with Water Corporation to distribute abstraction from its existing borefields to minimise the impacts of pumping on important groundwater-dependent ecosystems and the environment. Our environmental water and licensing teams consider the recent climate, groundwater levels and trends, environmental monitoring information, and the operational constraints on the distribution of public water supply abstraction across Water Corporation's borefield network.

We use an environmental sensitivity criteria (ESC) system, whereby Water Corporation's integrated water supply scheme (IWSS) production bores are given a rating from 1 (most sensitive) to 3 (least sensitive), enabling bore abstraction quotas to be directed away from ESC1 bores and towards ESC3 bores as much as possible. The ESC ratings for each bore are periodically reviewed and updated (this process occurred again in 2024).

A year ahead of schedule, Water Corporation reduced its groundwater abstraction from the Yanchep Superficial aquifer bores (YB3, YB4 and YB90) west of Yanchep National Park to a total of 0.21 gigalitres per year in 2024–25. This action will help to reduce the negative effects of low water levels on groundwater-dependent ecosystems within the national park. Groundwater abstraction from these bores peaked at just over 1.0 gigalitres per year in 2015–16 and was 0.49 gigalitres per year when the Gnangara plan was released.

Water Corporation is preparing to reduce public water supply abstraction from the Gnangara groundwater system by 30 gigalitres per year from mid-2028. To offset the reduction, it is progressing new sources, including the Alkimos seawater desalination plant. The plant will be the state's next major water source (Figure 13). On completion of stage 1 in mid-2028, the plant will supply up to 50 gigalitres per year of drinking water, with a future second stage doubling capacity to 100 gigalitres per year.

Water Corporation has also submitted a licence application for a proposed groundwater scheme to be co-developed with the desalination plant. The proposed groundwater scheme would access water reserved for public water supply under the 2022 *Gnangara groundwater allocation plan* in the Eglinton groundwater subarea. The subarea's reserve volume was set using modelling and assessments for development of the allocation plan. These found that urbanisation would increase the amount of rainfall recharging the Superficial aquifer compared with the pre-development, uncleared conditions in most of the subarea.

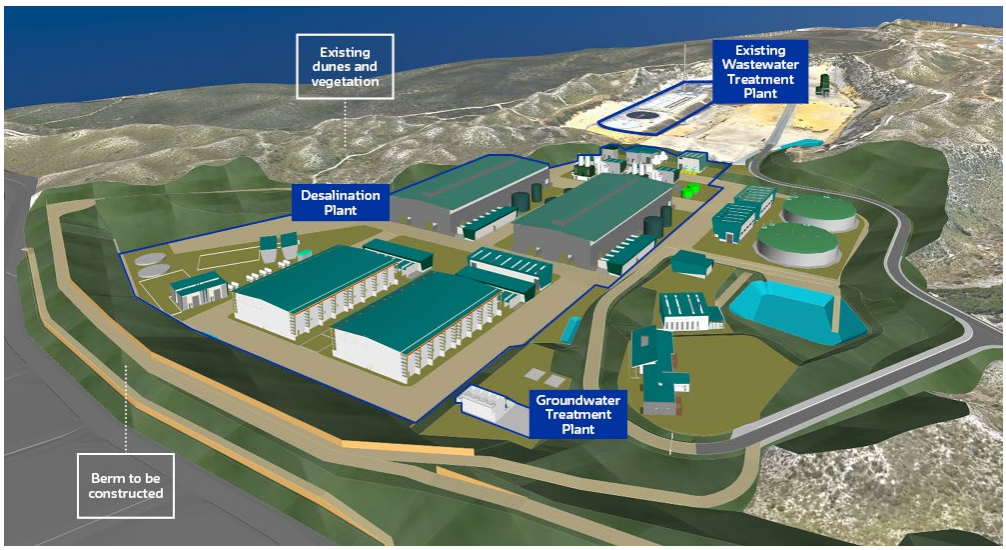


Figure 13 Alkimos seawater desalination plant concept illustration (Source: Water Corporation)

Action 9

Consistent with the *Waterwise Perth action plan*, partner with industry, other agencies and researchers to promote innovative water projects, build capacity in water efficiency and explore new water supply options with water users.

The *Kep Katitjin – Gabi Kaadadjan Waterwise action plan 3* (Government of Western Australia 2024) was released in October 2024. Under actions in the plan, we will continue to collaborate to build capacity in water efficiency and to guide proponents on feasible water supply options. See more information on the *Waterwise action plan 3* under 'Other work with key stakeholders and industry partners' below.

Waterwise nurseries and tree farms

Established commercial nurseries and tree farms in the Gnangara plan area are currently exempt from the Gnangara plan's requirement for groundwater licence holders to reduce their groundwater

abstraction by 10 per cent from 2028. The exemption recognises that this sector has an important role in supplying waterwise plants and trees to the community – helping to combat urban heat, improve biodiversity, and enabling households to use less water in their gardens.

While we acknowledge the sector is integral to achieving some of the Gnangara plan's outcomes, commercial nurseries and tree farms are still expected to be proficient in waterwise practices and actively participate in the collective effort to reduce overall groundwater use from the Gnangara groundwater resources. To reinforce this, we are working closely with the Nursery & Garden Industry Western Australia (NGIWA), in partnership with Greenlife Industry Australia (GIA), to promote training in waterwise irrigation practices and increase the number of businesses with accreditation in the following programs of the Australian Plant Production Standard (APPS) framework:

1. Nursery Industry Accreditation Scheme Australia (NIASA) Best Management Practice accreditation
2. EcoHort Environmental Management System certification.

To promote the increased uptake of accreditations under NIASA and Ecohort, NGIWA held two waterwise irrigation workshops targeted at commercial nurseries and tree farms, providing industry-specific information on managing groundwater use as efficiently as possible. These workshops were held in October 2023 and February 2024 and attended by 20 Gnangara nursery and tree farm operators.

The GIA has also conducted one-on-one technical training sessions for individual nursery and tree farms. Thirty-one training sessions have been conducted with operators in the plan area since the program began.

Figure 14 City of Stirling has been implementing water efficiency measures at its nursery after attending a Waterwork irrigation training workshop (Photo credit: NGIWA)

Irrigation Australia Ltd – Western Australia region partnership activities

The department has a long-standing partnership with the Western Australian branch of Irrigation Australia Ltd (IALWA). As the state's peak body for the irrigation industry, IALWA has members operating throughout Western Australia, in all irrigation sectors including urban residential, commercial, and rural food production. The partnership helps both parties to promote important messages around water use efficiency and continuous improvement to the broader irrigation community.

The partnership aims to improve irrigation performance and water efficiency in the Gnangara groundwater area and across the state. Irrigation Australia also hosts regional member events throughout the year to help strengthen industry connections. In May 2024, Irrigation Australia hosted a Western Australia region members breakfast at the Vines Golf Course, showcasing the recent irrigation upgrades (Figure 15).

Figure 15 **Irrigation Australia Ltd hosted an event for Western Australia region members at the Vines Golf Course (Photo credit: IALWA)**

The department regularly contributes articles to IALWA's quarterly digital publication, *The Overflow* magazine. Since the Gnangara plan's release, *The Overflow* has included 18 articles supporting the plan's implementation. Recent editions of *The Overflow* have included articles on how summer in 2023–24 affected Perth's groundwater resources and on the release of the Gingin evaluation statement.

Action 10

Consistent with the *Waterwise Perth action plan*, work with Water Corporation to continue to extend the Waterwise Councils, Golf and Schools programs.

Waterwise Councils Program

Beginning in 2009, the Waterwise Councils Program is one of several industry-leading initiatives helping to ensure all water users in the community do their bit to conserve precious water supplies. The Waterwise Councils Program aims to build a cooperative working relationship with local governments (councils) in the Gnangara plan area and Western Australia, by acknowledging them for demonstrating leadership in sustainable water management. The program, run by Water Corporation jointly with the department, supports councils to improve water efficiency and adopt waterwise practices in their operations and communities. All 16 metropolitan councils in the Gnangara plan area are part of the program: 14 have gold status and six have also achieved platinum status as past winners of the Platinum Waterwise Council of the Year.

In 2023, two councils in the Gnangara plan area shared the coveted Platinum Waterwise Council of the Year award in recognition of their innovative efforts to reduce water consumption and improve efficiency.

The City of Stirling was recognised for encouraging ratepayers to choose native waterwise plants during a series of pop-up garden workshops, and for launching its Sustainable Verge Awards program. Special mention was also made of the city's efforts to reduce groundwater consumption at Grindleford Reserve in Balcatta through hydro-zoning technology.

The Town of Cambridge was acknowledged for making waterwise upgrades at several local parks and reserves, including Perry Lakes where a stormwater diversion project has helped replenish water levels and created a breeding habitat for swans.

Waterwise Golf Program

The Waterwise Golf Program has been running for 11 years. The program is a joint initiative of the Golf Course Superintendents Association of Western Australia and the department. The program supports golf courses to improve water efficiency and resilience to climate change by focusing on training, design, efficient irrigation, water budgeting, soil management and alternative water supplies to maintain high-amenity golf courses that use less water. Out of the 22 golf courses located in the Gnangara plan area, 11 courses are participating in the program.

In August 2024, a recognition event with the Hon. Sabine Winton MLA was held at the Wanneroo Golf Course where certificates for bronze level accreditation were presented to the Carramar Golf Course, WA Golf Club and the Wanneroo Golf Club (Figure 16). The Wembley Golf Course was also awarded silver accreditation for its advanced water efficiency efforts to reduce water demand and is well on its way to gold accreditation.

Figure 16 **The Waterwise Golf Program recipients with the Hon. Sabine Winton MLA Wanneroo (far right of photo) and department staff**

Waterwise School Grounds

The Department of Education collaborated with the department and Water Corporation to update the 'Waterwise Irrigation and Water Management' training for school gardeners and maintenance personnel. Launched in early 2024, the program included monthly metropolitan and regional training, and covered topics such as key responsibilities of groundskeepers, improving irrigation efficiency, reducing water demand, soil management, irrigation maintenance and groundwater use reporting.

Action 11

Consistent with the *Waterwise Perth action plan*, continue to undertake integrated water planning, including:

- guide the Department of Planning, Lands and Heritage (DPLH) and Western Australian Planning Commission (WAPC) on water supply-demand gaps and supply options for the irrigation of green space in development zones
- support Water Corporation to identify where a strategic approach to alternative (non-drinking water) supply options may be needed to meet supply-demand gaps for the irrigation of green spaces.

In 2024, the department undertook an assessment of groundwater available for urban and industry development in Perth and Peel. The assessment estimated the volume of water needed to irrigate future public open space and for industrial areas planned in the *Perth and Peel @ 3.5 land use planning and infrastructure frameworks*. We identified areas with insufficient groundwater to guide assessments of additional water supplies through the land use planning process. This information will inform our input to land planning processes and help support more timely decisions to deliver cost-effective and fit-for-purpose water supplies for urban and industrial development.

We continue to collaborate with Water Corporation on integrated water planning, including through our joint action in the *Kep Katitjin – Gabi Kaadadjan – Waterwise Perth action plan 2* and *Kep Katitjin – Gabi Kaadadjan – Waterwise action plan 3*. This collaboration will support local governments to identify sustainable water demand management and supply options for green space irrigation. Our work is also contributing to State Government strategic initiatives, including DPLH's work on the *Perth and Peel Urban Greening Strategy*, as well as sector adaptation planning for climate change.

Action 12

Continue to work with the City of Swan to complete an integrated water management strategy for the North East urban growth corridor that considers alternative water source options.

The department completed an integrated water strategy for public open space in the Swan urban growth corridor in collaboration with the City of Swan. The strategy examines water demand and the need for additional water sources under a range of scenarios. The strategy is supporting the department, City of Swan, land and water planners, developers and consultants to resolve water issues through the development process.

Directions in the strategy include the setting of local government priorities and preferences for irrigated green spaces in local planning schemes and policies. This is foundational for determining cost-effective water supplies. Baseline standards for irrigated green spaces can be met in the urban growth corridor by optimising the use of groundwater through water efficiency initiatives and the timely transfer and trade of groundwater licensed entitlements. The strategy also identifies scenarios where alternative water supplies are needed in addition to groundwater, alternative water supply options, and principles to support stakeholder decisions about the options.

Action 13

Continue to work with the DPLH to implement the *Swan Valley action plan: protecting the Swan Valley's unique character* (Government of WA 2019).

In June 2024, the department presented at a meeting of the Swan Valley Statutory Planning Committee (the decision-making body that determines subdivision and development proposals for the Swan Valley) on the *Gnangara groundwater allocation plan*, the 10 per cent reduction to entitlements, and water trading and unused entitlement policies.

In response to the *Swan Valley action plan*, the *Gnangara groundwater allocation plan* includes a new Swan Valley subarea that is aligned with DPLH's *Swan Valley Planning Scheme No. 1* to ensure that water is managed to support the valley's unique agricultural character.

The new trading rules in the Gnangara plan align with the priority agriculture zone identified in the planning scheme to help ensure water is retained in, and prioritised for, the priority agriculture zone.

Eligible horticulture and viticulture groundwater licensees in the Swan Valley can apply for grants or vouchers under the Gnangara Horticulture Water Use Efficiency Grants and Voucher Program to achieve water use efficiency gains ahead of the upcoming 10 per cent reduction to licensed groundwater use.

Groundwater modelling presented in the Gnangara plan showed declines in groundwater levels in the Swan Valley area, including along the Swan River. Continued declines in groundwater levels and increasing salinity will negatively affect the future of Swan Valley horticulture, viticulture and agritourism, which all rely on groundwater. Since the release of the Gnangara plan, groundwater-level declines in the Superficial aquifer in the Swan Valley area have continued, particularly in areas where the Superficial aquifer is connected to the Leederville aquifer (Figure 17).

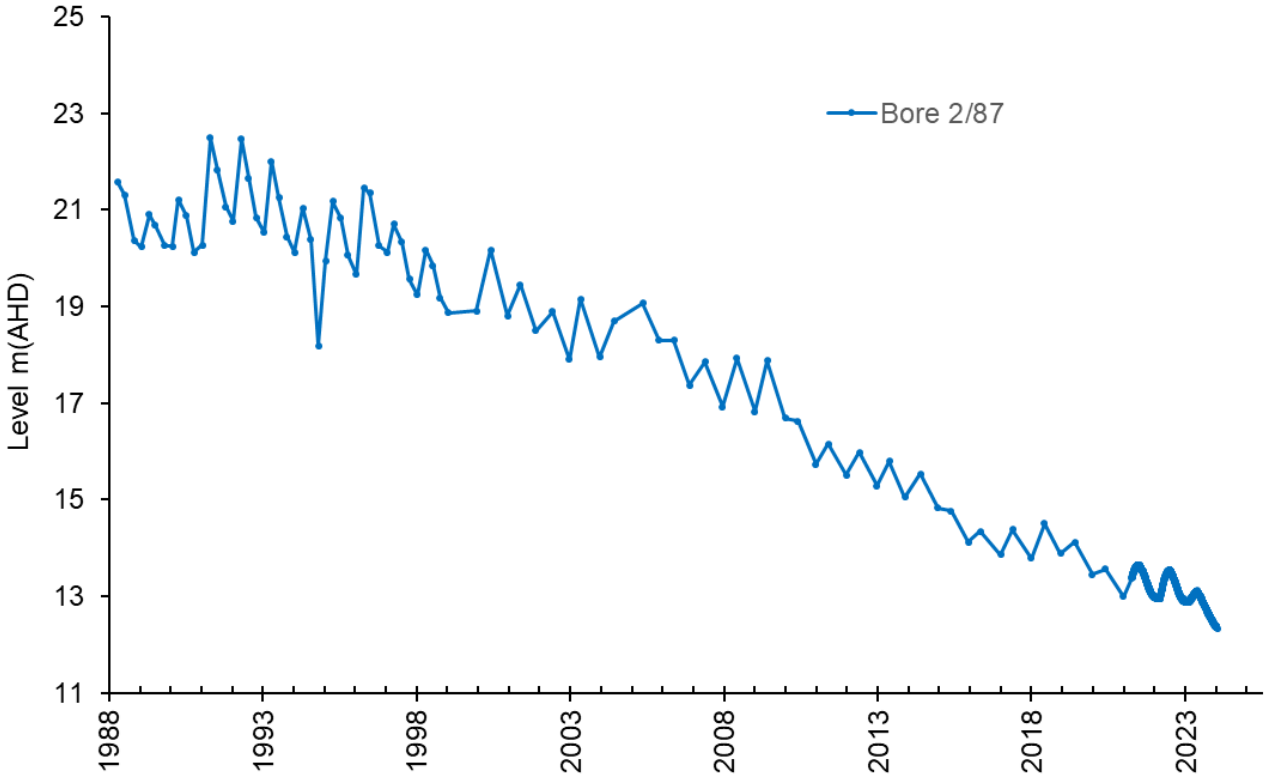


Figure 17 Groundwater levels at Superficial aquifer monitoring bore 2/87 in the Swan Valley

The reductions to abstraction in the Gnangara plan will help limit further groundwater-level declines in the Swan Valley area, and along the river. In turn this will reduce risks to groundwater-dependent ecosystems and help prevent saline water from the river being drawn into groundwater.

The North-East Corridor and Swan Valley groundwater investigation, funded through the State Groundwater Investigation Program, began in 2019 and aims to refine our understanding of the groundwater system in this area. The investigation has involved construction of 20 monitoring bores in the Superficial and Leederville aquifers, water sampling from nearly 200 locations and an airborne electromagnetic survey (AEM). We are using the collected data to determine the connectivity between aquifers and the location and characteristics of aquifer faults. A more detailed understanding of the groundwater system will show where alternative water supplies (e.g. managed aquifer recharge) could potentially be located in the future.

Action 14

Consult with, and provide updates to, the Aboriginal Water and Environmental Advisory Group (AWEAG) on implementation of this plan, and seek AWEAG's cultural advice and guidance on the best approach for broader engagement with the regional corporations and/or other representative groups.

The Aboriginal Water and Environment Advisory Group (AWEAG) is a strategic initiative of the department to incorporate First Nations peoples' traditional knowledge and values into environmental and water resource management. AWEAG meets quarterly and is co-chaired by the department's Director General and an Aboriginal member. The group provides strategic counsel to the department, recognising the profound cultural knowledge and connection to Country and living waters of First Nations peoples.

AWEAG is supported by the Aboriginal Empowerment Program (AEP) team within the department. The Gnangara planning team communicates regularly with the AEP team to ensure AWEAG is kept informed, and where necessary consulted on Aboriginal engagement activities with Whadjuk and Yued regional corporations or other Traditional Owner groups (such as Danjoo Koorliny) in relation to the management of Gnangara groundwater resources.

Action 15

Work directly with the regional corporations or representatives to better incorporate Noongar knowledge into the management of Gnangara groundwater.

The six Noongar regional corporations were established in late 2022 under the South West Native Title Settlement. The settlement formally commenced on 25 February 2021 and is made up of six individual Indigenous Land Use Agreements (ILUAs) that relate to the six Noongar native title agreement groups. Each agreement group is represented by a regional corporation. One of the roles of the regional corporations is to directly assist the agreement group to manage and use the land and waters within their region to which they have a traditional connection.

The Gnangara plan area crosses two ILUA areas: the Yued and the Whadjuk. The department initiated engagement in 2024 with both the Yued and the Whadjuk Aboriginal corporations in regard to the Gnangara plan implementation commitments.

Both regional corporations have indicated a strong desire to engage with us to increase the involvement of and benefit for Traditional Owners in water and environmental monitoring and management.

Yued Aboriginal Corporation highlighted the importance of *cultural protection* for groundwater, as well as surface water, stating:

> Protection and management [of water] is an intrinsic part of the cultural responsibility of Traditional Ownership and Custodianship of the Noongar People. In western society, [although] environmental regulation has been handed to state and local agencies, it has been the responsibility of the Noongar People to care for, or 'regulate' boodja for tens of

> thousands of years. We would like to see some of those responsibilities returned through joint decision-making [in water] allocation planning, connecting science with culture.

As a next step, we will meet with both the Yued and Whadjuk Aboriginal corporations' cultural advisory committees to further scope out the engagement terms and work towards the setting of objectives and targets to meet the intent of this Gnangara plan action. We look forward to a long and productive association with the regional corporations to further the goal of walking together to heal Gnangara waterways.

Action 16

Review and replace the *Gingin groundwater allocation plan* and *Gingin surface water allocation plan* with a new Gingin water allocation plan.

In June 2024, an evaluation of the 2015 *Gingin groundwater allocation plan* and 2011 *Gingin surface water allocation plan* was published (Figure 18). The evaluation statement includes updated management arrangements to manage the impacts of climate change and abstraction in the southern part of the Gingin region. The changes strengthen the protection of Gingin's water resources and support local water users and the environment by restricting new water licensing, and the trade of water in areas most impacted by climate change and water use.

The 2022 *Gnangara groundwater allocation plan* indicated the department's intent to reduce groundwater abstraction in the Gingin area, and to replace both the groundwater and surface water plans with a new, combined Gingin water allocation plan.

A new draft Gingin water allocation plan is expected to be released in 2028 for public consultation. This is a change from the estimated 2025 timeframe given in the 2022 Gnangara plan. The change will allow for development of a new numerical groundwater model using the latest climate projections. The new combined surface and groundwater plan is intended to capture the complex groundwater/surface water interactions throughout the Gingin area and to outline a consistent approach to managing groundwater resources to the north and south of Gingin Brook and Moore River estuary.

Following the release of the evaluation statement in June 2024, we met with the Yued Aboriginal Corporation and separately with members of the Chittering Landcare Group and Gingin Brook Catchment Group (formerly Gingin Water Group) to discuss the evaluation statement, the new Gingin allocation plan and opportunities for collaboration and engagement during plan development.

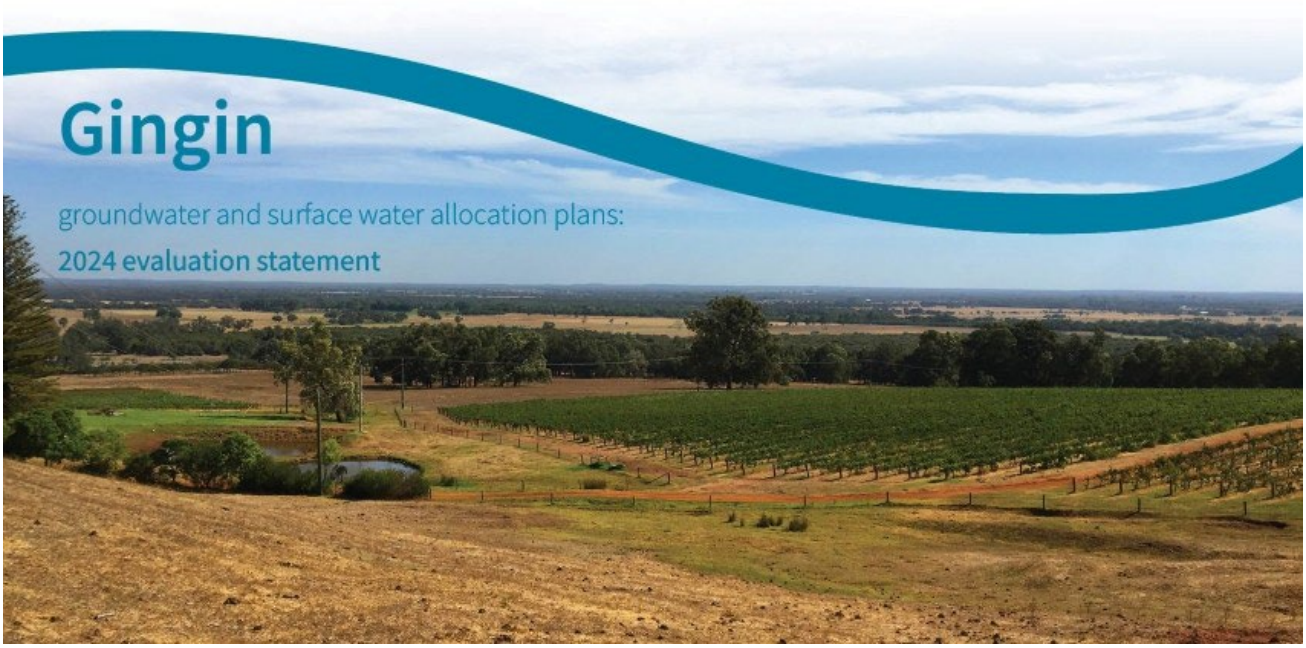


Figure 18 **The *Gingin groundwater and surface water allocation plans: 2024 evaluation statement* was released in June 2024**

Other work with key stakeholders and industry partners

Kep Katitjin – Gabi Kaadadjan – Waterwise action plan 3

Delivered through the collaborative efforts of 11 agencies, *Kep Katitjin – Gabi Kaadadjan Waterwise action plan 3* (Government of Western Australia 2024) is the third plan in the State Government's Waterwise Program to deliver 'leading waterwise communities for Boorloo (Perth) and Bindjareb (Peel) by 2030'.

The *Waterwise action plan 3* includes 43 actions which aim to:

- enable better liveability outcomes such as quality public open space, and an increased urban tree canopy and understorey to support healthier communities and biodiversity
- identify waterwise policy settings and innovations to meet our population growth requirements
- prolong access to groundwater for local governments and seek alternative solutions for new public open space where groundwater is not available
- incorporate Aboriginal knowledge systems and values into waterwise planning and action
- increase community awareness of the importance of waterwise practices in response to climate change
- build deeper collaboration and synergies across government
- research and scope the future application of waterwise initiatives to selected regional urban centres.

The *Waterwise action plan 3* will continue to include programs related to implementation of the Gnangara plan, including Waterwise Councils, Waterwise Golf and the Be Groundwater Wise campaigns.

Management of Gnangara-Moore River State Forest 65

In December 2023, the Minister for the Environment announced that the harvesting of pine plantations in the Gnangara State Forest would stop to preserve 1,800 hectares of mature pines that are critical black cockatoo habitat.

The remaining pine plantations and pine wildings in Gnangara-Moore River State Forest 65 (State Forest 65) need to be managed to achieve the dual benefits of maximising groundwater recharge and optimising cone production to support feeding habitat for Carnaby's cockatoos. Consistent with the Gnangara plan, we have been liaising closely with the Department of Biodiversity, Conservation and Attractions (DBCA) and Forest Products Commission regarding the management of pines in State Forest 65. We are also continuing to work closely with DBCA on revegetation and carbon farming opportunities.

The Black Cockatoo Conservation Management Project is managed by Murdoch University and is helping to address knowledge gaps for Carnaby's black cockatoos and inform conservation initiatives identified as part of the post-harvest management of State Forest 65. Murdoch University undertook releases of satellite-tracked Carnaby's black cockatoos in the forest in 2018 and 2021. The tracked movements of the cockatoos demonstrated that the remaining pine plantations continued to provide critical foraging habitat and, once the pine food source was exhausted each year, the pine plantations provided roosting habitat while the cockatoos foraged on banksias.

The Recharge Estimation Collaboration project, funded by the State Groundwater Investigation Program, is a joint project between department, the University of Western Australia and CSIRO. It will refine our understanding of groundwater recharge under different land uses including pine wildings and banksia woodland. The research findings could guide future revegetation initiatives in State Forest 65 to help minimise potential impacts to the Gnangara groundwater system.

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