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

Gnangara

groundwater allocation plan

Statement of response

June 2022

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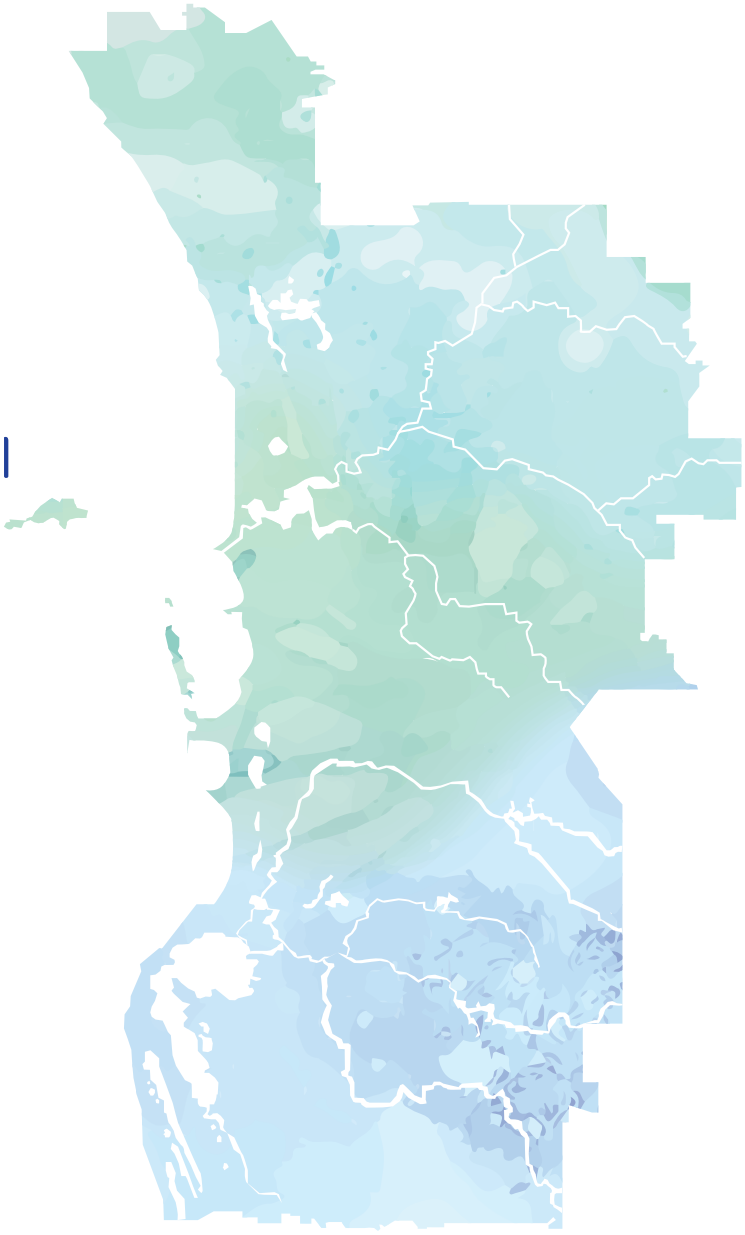
Cover photograph: Looking south above Lake Goollelal to the Perth city skyline, by Ashley Ramsay.

The Department of Water and Environmental Regulation acknowledges the Whadjuk and Yued Noongar peoples as the traditional owners and custodians of the lands and waters covered by this plan. We pay our respects to their elders past and present.

Waterwise Perth&Peel

The *Gnangara groundwater allocation plan* is part of the State 2019–2021 Waterwise Perth Action Plan which sets the direction for our transition to a waterwise city. Our ambition is for Perth to be a cool, liveable and sustainable place where people want to live, work and spend their time.

The *Gnangara groundwater allocation plan* helps deliver Action 14 of the Waterwise Perth Action Plan: Review groundwater allocation plans for Gnangara, Perth South and Jandakot, Cockburn and Serpentine to manage groundwater levels for wetlands, urban trees and irrigation of green spaces.



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Summary

The Department of Water and Environmental Regulation released the *Gnangara groundwater allocation plan: draft for public comment* (DWER 2021a) on 19 November 2021. The public comment period closed on 28 February 2022.

The new plan will replace the existing *Gnangara groundwater areas allocation plan*, published in 2009 (DoW 2009a). The plan includes measures to address declining groundwater levels and associated impacts to groundwater-dependent ecosystems that have resulted from a combination of groundwater use and reduced rainfall due to climate change. The plan includes reductions to groundwater use, both for public supply, and for private licensees and garden bore users. These and other measures aim to:

- maintain or increase groundwater levels to avoid further damage to water quality and environmental health at important locations
- reduce the rate of groundwater level decline in other locations
- maintain a reliable water supply.

During the public comment period the department received 315 formal submissions through a range of channels. Of these, about 60 per cent (197 submissions) related to the draft plan and about 40 per cent (118 submissions) focused only on the proposal to align the garden bore sprinkler roster with the scheme sprinkler roster.

This statement details the department's formal response to public feedback that has been received during the consultation process. This includes the 197 submissions on the draft plan that were received from a total of 193 respondents. Comments received from individuals who attended consultation events during the public comment period have also been considered in this statement.

Changes to the sprinkler roster went through a separate public comment process; hence we[1] have considered the 118 submissions on the roster change as part of that process (DWER 2022b).

Of the 193 respondents to the draft plan, a quarter (about 50 respondents) expressed their general support for the plan's intent and many agreed with the proposed action to reduce public water supply abstraction.

Around 90 per cent of the 216 respondents that completed our online survey as part of their submission (whether about the plan or roster) said they knew about Perth's rainfall decline since 1975 and that groundwater levels had been declining across the Gnangara groundwater system.

Respondents to the draft plan from all stakeholder groups, whether groundwater users or conservationists, generally recognised the need to reduce groundwater use

[1] In this statement, the term 'we' is used to refer to the Department of Water and Environmental Regulation, which assists the Minister for Water in the administration of the Rights in Water and Irrigation Act 1914 (WA), including in relation to licensing decisions.

from the Gnangara system in response to declining rainfall due to climate change. However, views differed on the volume of the reductions, which user groups should be targeted to reduce abstraction, and when to implement the reductions.

Almost all the groundwater licensees who made a submission objected to the proposed reduction to their own water entitlement or sector, citing negative impacts on their businesses. Generally, the licensees with smaller water entitlements (usually those with less than 10,000 kilolitres/year), those who had purchased water through trades, and those who maintained they had already maximised their water use efficiency, said they should be exempt from the proposed reductions.

Many environmental stakeholders said the proposed reductions to groundwater use did not go far enough to protect groundwater-dependent ecosystems. They called for a larger and quicker reduction to groundwater abstraction to meet existing environmental conditions in the current *Ministerial Statement no. 819* (Government of Western Australia 2009) and to create better outcomes for wetlands and bushland.

About 36 per cent of respondents (around 70 respondents) opposed further clearing of the Gnangara pine plantation due to impacts on the food source and habitat of Carnaby's cockatoo and asked for funding to be allocated for the revegetation of cleared areas.

Several submissions highlighted the importance of water and groundwater to Noongar culture and raised the need for greater consultation with and the involvement of Traditional Owners, Aboriginal people and communities in managing water resources. Involvement of First Nations people in resource management was noted as an important part of reconciliation.

Rebalancing our groundwater system – adjusting to less groundwater abstraction and addressing climate change impacts

There is strong support for continued education and waterwise-type programs to improve people's understanding of groundwater to embed water-efficient practices in the community.

Respondents also wanted to see more urban greening to reduce the urban heat island effect and to increase habitat and biodiversity.

Agricultural licensees outside the North Wanneroo area submitted that an efficiency grants program, like the one North Wanneroo licensees have access to, would be useful to assist them to adjust to the reductions in abstraction. Nursery businesses said the reductions to abstraction would impact on their ability to provide Perth with plants and trees – those being important for the greening of new and existing urban areas and to combat the increasing urban heat island effect in a drying climate.

Five local government authorities asked for help to implement the reductions to their water use, calling for support for efficiency initiatives or to enable research and development of alternative water sources. A number of respondents also called for funding to be committed to investigate, research and develop alternative water sources to limit the need for reductions to abstraction and to maintain Perth as a green and liveable city.

Changes included in the final Gnangara groundwater allocation plan

To address consultation feedback, we have amended the final plan to add the following implementation actions:

- The department and the Department of Primary Industries and Regional Development will develop a new water use efficiency grants scheme to support horticultural groundwater users in the Gnangara plan area that are subject to the 10 per cent reduction to abstraction.
- The department will develop a program to support local governments, targeting those in areas that are most impacted by the urban heat island effect, to prepare for the reductions in their water entitlements.
- The groundwater used by established nurseries and tree farms for irrigating plants and trees for commercial purposes will be exempt from the reductions in abstraction. These businesses will play an increasingly important role in providing plants for waterwise gardens, landscaping and the green spaces that help keep Perth cool as we adjust to a drier climate. The department will work closely with the nursery and tree farm sector to develop new waterwise standards.
- We will continue to engage with the Aboriginal Water and Environment Advisory Group to seek cultural advice and guidance on the best approach for consultation and engagement with the regional corporations or other representative groups. We will commit to working directly with the regional corporations or representatives to better incorporate Noongar knowledge into the management of Gnangara groundwater.

We have also amended the plan to provide more detail on the following:

- how larger reductions to abstraction would likely not significantly change compliance with current water level criteria in *Ministerial Statement no. 819* (Government of Western Australia 2009), compared with the reductions in the plan, according to our groundwater modelling
- how the former Gnangara pine plantation area will be managed, including information on revegetation initiatives, to protect the Carnaby's cockatoo
- our continued commitment to work with the Water Corporation through the *Waterwise Perth Action Plan* (Government of Western Australia 2019) and its linked programs to support urban greening initiatives and improving water literacy in the community
- our continued commitment to the research and investigation of alternative water sources for non-potable supply
- services and rebates offered by the Water Corporation to encourage the uptake of water efficiency products and practices and on Waterwise Garden activities to educate and inform customers on waterwise outdoor practices. Services and rebates will be available to assist households as they prepare for and transition into the drier months.

The *Gnangara groundwater allocation plan* is a deliverable of the *Waterwise Perth Action Plan*. As part of the State Government's Waterwise program of work, the department and Water Corporation will continue to educate the community on the importance of groundwater for Perth and work with local governments and other agencies to support residents to transition to more waterwise gardens and liveable communities in a drying climate. This includes continuing initiatives such as Think Climate Change Be Waterwise, Be Groundwater Wise, the Waterwise Greening Scheme through the Waterwise Councils Program, the Waterwise Garden Centre and Nursery Program and the Urban Canopy Grant Program.

1 Gnangara groundwater allocation plan: Statement of response

This statement shows how the Department of Water and Environmental Regulation has responded to the comments, issues and questions raised in submissions on the *Gnangara groundwater allocation plan: draft for public comment* (DWER 2021a) to inform the final plan (DWER 2022a).

1.1 The public comment process

The *Gnangara groundwater allocation plan: draft for public comment* (DWER 2021a) was open for submissions and feedback from 19 November 2021 to 28 February 2022. The plan was accompanied by the *Gnangara groundwater allocation plan: draft methods report* (DWER 2021b).

Invitations to comment

During the public comment period, the department sent about 2,000 letters to groundwater licensees and 120 letters and/or emails to other stakeholders to notify them that the draft plan was open for public comment. We also organised a Vietnamese translation of the letter to licensees for vegetablesWA to distribute.

An invitation to comment was advertised in the following newspapers:

- *The West Australian* – 20 November 2021 and 5 February 2022
- *Echo Newspaper* – 26 November 2021
- *Bayswater and Bassendean Reporter* – 25 November 2021
- *Joondalup Times* – 25 November 2021
- *Stirling Times* – 25 November 2021
- *Northern Valley News* – 2 December 2021.

We also posted about the draft plan and the public comment period multiple times on our LinkedIn and Twitter accounts, and stated that the plan was open for comment on the following websites:

- gnangara.dwer.wa.gov.au
- the department's consultation page and Gnangara plan page on WA.gov.au
- Rebalancing our groundwater page on WA.gov.au (as well as associated advertising and communications for it).

Stakeholder engagement

The department held 11 targeted consultation meetings and events with a range of stakeholders during the public comment period to help them understand and make submissions on the draft plan. We also responded to more than 40 phone and email queries to help inform submissions.

We consulted with stakeholders during the comment period as follows:

- Two information sessions for groundwater licensees:
  - 15 December 2021, at the Wanneroo Tavern and Function Centre. Invitations were sent to around 600 licensees across Wanneroo and around 100 people attended. Staff from the Department of Primary Industries and Regional Development were also present.
  - 8 February 2022, at the Swan Athletic Sporting and Community Club. Invitations were sent to around 800 licensees across and north of the Swan Valley and around 80 people attended. Staff from the Department of Primary Industries and Regional Development and City of Swan were also present.
- Meetings with or presentations to the following stakeholders:
  - garden industry representatives
  - Greenspace Alliance
  - City of Wanneroo
  - Western Australian Planning Commission
  - Conservation Council of Western Australia
  - Urban Bushland Council WA Inc.
  - City of Bayswater
  - Aboriginal Water and Environment Advisory Group (AWEAG)[2].
- A dedicated exhibition space staffed by members of the department's Gnangara planning team at the WA Wetlands Conference 2022 on 2–3 February 2022.

Most of the stakeholders who were briefed made a submission on the draft plan. While the Conservation Council and AWEAG did not make a written submission, we have included comments (as agreed) from AWEAG members taken at the time of the presentation. Both the Conservation Council and AWEAG indicated they supported the proposed reductions to abstraction to improve outcomes for wetlands and bushland areas and their associated community and cultural values.

[2] AWEAG was set up by the department to ensure that Aboriginal knowledge, values and needs are appropriately addressed in policies, planning, legislation, regulation and management that relate to the state's water and the environment. This collaboration will ensure that Aboriginal social, cultural and economic needs are central to the department and the Aboriginal people involved.

1.2 Submissions and comments received

During the comment period, the department received 315 formal submissions through a range of channels – online surveys, emails, phone and hard copies of the online survey provided at information sessions. Of these, 118 submissions (about 40 per cent) focused only on the proposal to align the garden bore sprinkler roster with the scheme sprinkler roster, and we have considered and responded to these in a separate consultation process (DWER 2022b).

In this statement we have responded to the comments we received in 197 submissions from 193 respondents (Table 1) on the *Gnangara groundwater allocation plan: draft for public comment* (DWER 2021a), as well as those of licensees who attended our two information sessions and other stakeholders we spoke to during the public comment period. See Section 2 for a summary and our response to the comments, questions and issues raised.

Table 1 List of respondents by stakeholder group

Stakeholder group	Respondents
Agriculture and irrigation industry	16 submissions and respondents: • Benara Nurseries • Cottesloe Tennis Club • Groundwater Consulting Services • Landsdale Plant Nursery • North Wanneroo Growers Group • Nowergup Poultry (2) • Parks and Leisure Australia WA • Swan Athletic Sporting and Community Club • Swan Valley Ratepayers and Residents Association • The Western Australian Chicken Meat Association • vegetablesWA and Nursery & Garden Industry WA • four individuals.
Conservation, environment and community	22 submissions and respondents: • Bassendean Preservation Group Inc. • Birdlife Australia • Friends of Allen Park Bushland Group • Friends of Bindaring Wetland Bassendean • Friends of Inglewood Triangle • Friends of Mosman Park Bushland • Friends of Trigg Beach • Friends of Wireless Hill • Friends of Woodbridge Bushlands • The Friends of Yellagonga Regional Park • Murdoch University • Murdoch Branch Wildflower Society of Western Australia • Perth NRM • Quinns Rocks Environmental Group

Stakeholder group	Respondents
	• Urban Bushland Council WA Inc. • WA branch of National Environmental Law Association • Wanneroo/Joondalup Orchid Society • Wetlands Conservation Society Inc. • Wildflower Society of WA • three individuals.
First Nations people	Note: This statement also includes comments from our meeting with the department's Aboriginal Water and Environment Advisory Group.
Water licensees	26 submissions from 25 water licensees Note: This statement also includes issues raised by licensees at the information sessions held during the comment period.
Garden bore users	59 submissions from 58 garden bore users.
Individuals	63 submissions from 61 other individuals.
Local government	6 submissions from local governments: • Shire of Gingin • City of Wanneroo • City of Joondalup • City of Stirling • City of Bayswater • City of Perth.
Mining and industry consultants	2 submissions and respondents: • AEMCO Pty Ltd • BD Water.
State agencies	3 submissions and respondents: • Department of Biodiversity, Conservation and Attractions • Metropolitan Cemeteries Board • Water Corporation.

1.3 Completing the final plan

We have considered the submissions and comments we received in finalising the *Gnangara groundwater allocation plan* (Gnangara plan, DWER 2022a). The changes we have made to the Gnangara plan as a result of the consultation process are outlined in the summary and throughout Section 2 of this report.

Thank you for taking the time to communicate your concerns and suggestions, for making submissions on the draft plan, and for your interest in managing the Gnangara groundwater system and Perth's groundwater.

We acknowledge that water is valued in many ways by different people, and this was portrayed strongly in the stakeholder events and submissions we received. Water affects people's livelihoods and wellbeing, and many people have a deep emotional connection with groundwater and the ecosystems that depend on it.

The Gnangara plan is a deliverable under Action 14 of the *Waterwise Perth Action Plan* (Government of Western Australia 2019). The department will continue to engage with stakeholders, licensees and the community as we implement the Gnangara plan and the Waterwise program of work.

Under section 46 of the *Environmental Protection Act 1986* we have requested changes to some environmental conditions set in *Ministerial Statement no. 819* (Government of Western Australia 2009) on the allocation of Gnangara groundwater. This is a result of our investigations, water level projections and management outlined in the draft plan.

We have provided the draft Gnangara groundwater allocation plan and supporting documentation, including the public submissions and this statement of response, to the Environmental Protection Authority to support its inquiry into whether the implementation conditions relating to the Gnangara Groundwater Resources proposal should be changed. Depending on the outcome of the inquiry and following consideration and endorsement by the Minister for Environment, we will incorporate any changes to the implementation conditions from that process into the final plan as an addendum. For more information on this, see Section 3 of this report or Section 8.1 of the Gnangara plan.

2 Comments received and the department's response

The following sections of the statement summarise the key comments we received during consultation and gives our corresponding responses. Comments and responses are grouped against the relevant plan chapters and sections, and the general issue raised. Some responses describe how we changed the final plan to address the comment.

2.1 General comments

Most stakeholders we spoke with, and most respondents, seemed to understand and support the need to respond to climate change and its impact on water availability. Many showed general support for the plan and what it proposed. Some respondents asked for additional support to adjust to the abstraction reductions.

Table 2 General comments and questions received on the draft plan

Comment	Department of Water and Environmental Regulation response
Support for the plan	
i. About a quarter of respondents noted their general support for the draft plan including local governments, individuals, 'friends of' bushland and wetland groups, Water Corporation and Department of Biodiversity, Conservation and Attractions.	Noted.
ii. Some respondents acknowledged management of Gnangara groundwater resources to date and the science used in the plan. Further comments on these are discussed in the following sections.	Noted.
Not supportive of the plan	
Some respondents said they did not support any part of the draft plan. Many respondents opposed parts of the plan. For example, licensees generally opposed the proposed reductions to their licences due to impacts to their businesses.	Noted.
Government coordination to support the Gnangara plan	
Several respondents sought a whole-of-government approach or were concerned about a lack of cross-departmental coordination on rebalancing the Gnangara groundwater system and managing water sources.	We agree that a cross-departmental, whole-of-government approach is needed to address climate change and water management issues and implement waterwise strategies. The government released the *Waterwise Perth Action Plan* in 2019 (Government of Western Australia 2019) and continues to develop the Waterwise program of work to

Comment	Department of Water and Environmental Regulation response
	implement actions to support the ambition for world-leading, waterwise communities for Perth and Peel by 2030.
Support to adapt to less groundwater abstraction	
i. Many submissions suggested that additional support be considered and provided. Licensees identified the need for continued assistance to use water more efficiently.	**Plan changes:** The final plan includes actions to support local governments and agricultural water users across the plan area.
ii. Some licensees suggested that licence holders need to be compensated for their losses (as per the National Water Initiative).	Under the National Water Initiative compensation is not payable for reductions to allocations as a result of: • seasonal or long-term changes in climate • periodic natural events such as bushfires and drought.
iii. Respondents submitted that irrigation technology should be supported and promoted for commercial and domestic applications.	Each year the Water Corporation makes tailored rebates and offers available to help people save water in their homes and gardens. The Water Corporation is aiming to reinstate the weather smart irrigation offer in 2022–23, which is a program that supports water efficient technology.
Local government submissions called for:	
i. positive incentives for implementing water efficiency through technical innovations	As an implementation action of the Gnangara plan, support will be targeted to local governments that are in areas most impacted by the urban heat island effect to prepare for the reductions in their water entitlements from 2028. **Plan changes:** The final plan includes actions to support local governments, targeting those in areas most impacted by the urban heat island effect.
ii. the new Waterwise irrigation training program for Gold Waterwise Councils to also be made available to other non-Gold status Waterwise Councils	Noted.
iii. State Government to: • reinforce the plan's commitment to providing support to local governments in finding alternative water sources • request federal funding to support development of sustainable water supply projects for the state, as Infrastructure Australia has identified 'Perth water security' as a national priority	Local governments with significant plans for greenfield urban development are well progressed in planning non-potable water for public open space irrigation. Many of these areas have sufficient access to groundwater to irrigate public open space now and for some future development if they apply best practice irrigation rates and ensure licences are transferred from existing land uses. Water is also available for most future district and regional public open spaces planned under the State Government's *Perth and Peel@3.5million* (DPLH & WAPC 2018).

Comment	Department of Water and Environmental Regulation response
• continue researching and investing in innovative measures to secure and recharge Perth's groundwater supply • provide significant funding to assist local governments to invest in alternative water supply infrastructure for irrigation of sporting grounds, and to help include or retrofit water sensitive urban design principles in infrastructure projects, such as via redeveloping storm and groundwater drainage systems.	Depending on location, alternative non-potable water sources to irrigate open space for sport may be technically and economically feasible. The department and the Water Corporation can assist local governments to examine their options. Where government funding is sought to develop non-potable water supply infrastructure, well-evidenced business cases are needed that identify the costs, benefits and water service provision arrangements. See also our response to 'Alternative water sources for non-potable supply' in Section 2.2 of this report, and guidelines for managed aquifer recharge on WA.gov.au and non-drinking water systems.
Other comments	
i. A number of respondents conveyed the following: • Action to protect our water resources should have occurred sooner.	• The department and Water Corporation have implemented strategies to manage the Gnangara groundwater system for decades. This is outlined in Section 1.4 of the 2022 plan, in the 2009 plan and at gnangara.dwer.wa.gov.au.
• Calling the plan a draft and having a public comment period was misleading, considering the extensive consultation and decisions that had already been made, and stakeholders' comments were unlikely to be listened to or actioned.	• We consulted extensively with stakeholders and used their experiences and advice to guide drafting of the plan and have listened and responded to public comments to finalise it. Look for **Plan changes** throughout this statement for the changes we made to the final plan in response to public comments.
iv. Some submissions called for: • increases in the cost of scheme and bore water use or costs to be tiered with increased use • all garden bore use to be metered and charged, with grants and incentives to pay for meters on all garden bores.	The Water Corporation uses a tiered pricing system to encourage the careful use of water. The more water you use, the higher the price you pay per kilolitre. The cost of installing, maintaining and using garden bores makes them a cost-effective alternative to using scheme water for larger gardens (less than 0.2 ha). Metering and charging for garden bore use would make bore water less cost-effective for these users. The government has introduced changes to garden bore use regulations that will reduce the amount of water taken by these water users. There is no intent to introduce metering or charging for garden bore use. See also our responses to submissions on the garden bore sprinkler roster change (DWER 2022b).

Comment	Department of Water and Environmental Regulation response
Question asked:	
Why aren't water bores or even all ground water abstractions licensed? Can this be implemented going forward?	Effective regulation of water use needs to be targeted to where it is needed most rather than adopting a common approach regardless of risk. All water resources in the Gnangara plan area are covered by groundwater areas proclaimed under Section 26B of the *Rights in Water and Irrigation Act 1914* (the Act). This means you need a water licence to take groundwater in these areas. A licence is also required to construct or alter wells unless an exemption under Section 26C of the Act applies. Exemptions for a water licence may also apply (see also Chapter 4 of the Gnangara plan). Garden bores generally do not require licensing because they are small bores, using a small amount of water compared with other licensed groundwater users, There are about 70,000 unlicensed garden bores in the Gnangara plan area, compared with about 2,600 water licences, and they are regulated under the Water Agencies (Water Use) By-laws 2010. The by-laws specify permanent water efficiency measures, temporary water restrictions and exemption provisions.

2.2 Plan context and scope

This section of the statement outlines comments received on matters raised in relation to Chapter 1 of the final plan. The subheadings in Table 3 below relate to specific sections in Chapter 1 in the plan.

Almost half of all respondents commented on the context for or scope of the plan. Many respondents commented on related plans and strategies, such as urban development and pines management for Carnaby's cockatoo in the Gnangara area.

Respondents generally appreciated that reduced rainfall due to climate change, as well as abstraction, had impacted on the Gnangara groundwater system, and that this had led to falls in aquifer levels that saw the drying of wetlands. About 90 per cent of online respondents said before they read the plan, they knew about the rainfall decline in Perth since 1975 and that groundwater levels had been declining across the Gnangara groundwater system[3].

Table 3 Comments and questions received on the context and scope of the plan

Comment	Department of Water and Environmental Regulation response
1.1 Purpose of the plan	
Several respondents had varied comments on the purpose of the plan.	
i. The plan does not fully address or answer what we want the future Perth to look like, with concern for lack of water for gardens – meaning Perth will be drier and hotter.	We recognise that this plan alone cannot solve the complex issues associated with climate change and the Gnangara groundwater system. But it is one action of the *Waterwise Perth Action Plan* (Government of Western Australia 2019) under which we will continue to act to ensure attractive urban spaces and water security beyond 2030.
ii. While one respondent agreed with the aims of the plan, they thought it was not ambitious or transparent enough to protect groundwater-dependent ecosystems and address climate change.	The reductions in abstraction under the plan will decrease total water use from Gnangara aquifers by almost one-fifth, which is the most significant adjustment of groundwater use in response to climate change ever implemented in Western Australia. This, along with other management actions in the plan and initiatives of the *Waterwise Perth Action Plan*, will significantly improve protection of groundwater-dependent ecosystems.
1.2 Plan area	
i. Several respondents pointed out that some neighbouring farmers – including in the Gingin area either side of the northern plan boundary – would be	As part of this plan, we are signalling our intent to consider reductions to groundwater abstraction in the Gingin area. However, the approach is yet to be determined. The new Gingin water allocation

[3] This relates to the 216 online submissions we received through the consultation page for the draft Gnangara plan, including those that only commented on the proposal to change the garden bore sprinkler roster.

Comment	Department of Water and Environmental Regulation response
subject to reductions and some would not.	plan is currently under development. See Section 5.2 of the Gnangara plan for more information.
Questions asked:	
1. How big is the Gnangara plan area?	The Gnangara plan covers about 2,200 km^2. See Section 1.2 of the plan for more information and a map.
2. Why is there no mention of the situation south of the Swan River; that is, the Jandakot Mound? Surely the concerns relevant to the Gnangara area also apply there. And when will the department produce action plans for Perth's other two groundwater mounds (Jandakot and Cloverdale mounds)?	We are currently reviewing allocation limits for the Perth South, Jandakot and Serpentine groundwater areas to the south of the Swan River as part of the *Waterwise Perth Action Plan* (Government of Western Australia 2019). The *Cockburn groundwater allocation plan* (DWER 2021c) was published in 2021. The Perth South groundwater area covers the Cloverdale area. Find more information and a map of this area in *Hydrogeology and groundwater resources of the Perth Region Western Australia* (Davidson 1995).
1.3 The importance of groundwater for Perth	
Respondents generally understand the importance of groundwater as a major water source for Perth and that our lakes, wetlands, cave systems and bushlands also depend on the Gnangara groundwater system. Respondents suggested the department hold regular workshops with stakeholders so both are better informed to achieve better outcomes.	We will continue to engage with the community on the importance of groundwater for Perth. Since 2019, the department and Water Corporation have run the *Water for Life*, *Think climate change Be waterwise* and *Be Groundwater Wise* campaigns by way of television, radio and digital media, with messages about the reliance of Perth and the environment on groundwater. For more information visit www.watercorporation.com.au and begroundwaterwise.wa.gov.au. We have also carried out many stakeholder engagement activities during the past several years as part of developing the Gnangara plan and publish annual environmental compliance reports that summarise our major management activities and environmental outcomes. We will continue to engage with the public and key stakeholders as we implement the Gnangara plan and will publish progress reports online every two years.
1.4 The groundwater system and changes over time	
i. Groundwater level data should be more accessible and transparent to show impacts in urban areas and the effects of abstraction interventions.	To summarise the status of the Superficial aquifer (the aquifer used most by private water users) and its response to rainfall and management, we update an average groundwater level graph monthly and storage change graph annually on the 'Status' page of our Gnangara website: gnangara.dwer.wa.gov.au/status Raw data from each of our monitoring bores and staff gauges is available on our map-based

Comment	Department of Water and Environmental Regulation response
	Water Information Reporting portal at wir.water.wa.gov.au. Environmental compliance reports are published annually. These reports summarise groundwater level data against water level criteria. Visit WA.gov.au and search Gnangara compliance.
ii. Some respondent said that declines in the Leederville aquifer in the Swan Valley are greater than stated and that monitoring bores have been decommissioned.	AM35 was a Leederville aquifer bore located in the Swan Valley. We decommissioned and replaced AM35 with a new bore: AM35C. Monitoring at that bore began in 2017. Measurements from bore AM35 and then AM35C show that pressure heads in the Leederville aquifer in the Swan Valley have declined by around 14 m since the 1980s. We have updated the plan and the associated methods report (DWER 2022b) with this information. In 2022, we plan to install nine groundwater monitoring bores in the Leederville aquifer in the Swan Valley as part of our State Groundwater Investigation Program.
iii. There has been an increase in Superficial aquifer levels as a result of new urban areas in the North East corridor (visible as creeks running longer and stronger) but it won't recharge the Leederville aquifer because there is no natural or man-made connection between them in the area.	New urban areas can result in a localised increase in the amount of rainfall that enters the Superficial aquifer as recharge. This can support creeks and rivers that receive groundwater input from the Superficial aquifer. It is true that an extensive clay layer, the Kardinya shale, separates the Superficial aquifer from the Leederville aquifer across most of the Swan Valley (western portion) and the North East corridor. To inform future management of the Superficial and Leederville aquifers in the North East corridor we have funded a hydrogeological investigation under the State Groundwater Investigation Program that aims to help identify potential areas for managed aquifer recharge.
iv. The Swan Valley should be considered in isolation to the rest of the system because the Superficial and Leederville aquifers are somewhat disconnected. The respondent indicated the hydrogeology was heterogeneous to the broader system and the Superficial aquifer was perched and of limited lateral extent.	The groundwater chemistry and contour data from our groundwater investigation project in the Swan Valley and North East corridor shows the Superficial and Leederville aquifers in the Swan Valley are not disconnected from the greater Gnangara groundwater system, but rather are part of it.
v. One respondent noted that watertable levels can recover quickly, providing anecdotal evidence that in the 10 years before 2021 the local watertable at Muchea had fallen up to 2 m but then recovered in 2021 by 1 m after a single normal rainfall year.	While it is true that Perth had relatively good rainfall in 2021 that led to improvements in groundwater levels in some areas, the reductions to abstraction in the Gnangara plan are needed in response to the multi-decadal, long-term declines in rainfall we have seen across Perth. These declines have resulted in significantly reduced recharge to groundwater resources.

Comment	Department of Water and Environmental Regulation response
	Climate change modelling for the plan is consistent with what we have experienced in Perth, and the latest climate change models show high confidence that the south-west of Western Australia will continue to get drier and warmer, resulting in even fewer years of high rainfall to boost water levels. This further justifies reducing groundwater use. See Section 3.1 of the Gnangara plan for more information on this.
vi. Most of Perth's original wetlands have already been filled and drained as Perth has been developed, with less than 20 per cent of wetlands remaining. It is of concern that the remaining wetlands are drying or declining in health.	In Section 6.1 of the plan we describe that more than 80 per cent of Perth's original wetlands have been lost. A major objective of this plan and one of the key reasons for the reduction in groundwater abstraction is to maintain or improve remaining wetland water levels and ecosystem health.
vii. The government knew about the problem of declining rainfall and has not done enough to avoid or mitigate impacts.	With less water filling Perth's dams, groundwater helped bridge the gap in public water supply in the early 2000s, giving us time to develop new climate-independent water sources. The previous *Gnangara groundwater areas allocation plan* (DoW 2009a) drove reductions in the use of groundwater for public water supplies. The previous plan also capped growth in licensed, self-supply groundwater entitlements but avoided direct reductions to the entitlements of licensees other than those of the Water Corporation. With the 2022 plan, the government aims to rebalance groundwater abstraction in line with reduced rainfall, maintain or improve water levels in many areas, and reduce the rate of decline due to climate change in the areas remaining.
viii. There is a disconnect between Perth's need for green parks and gardens when we have hot summers and low rainfall. In the 1980s we used to accept brown gardens in summer.	As we face a drier, hotter future we need to change how we use water to maintain gardens, lawns and shade trees. Creating waterwise gardens is one of the most efficient ways to save water and still have enjoyable green spaces for our homes and communities. Find out more about waterwise gardens, irrigation and bores at www.watercorporation.com.au and begroundwaterwise.wa.gov.au.
ix. Groundwater and lake levels at Lake Joondalup have increased in recent years and the lake is not drying out in summer, which helps to reduce nutrient loads in the system and is an important process in lake ecology.	Previous drying at Lake Joondalup has contributed to increasing acidity and proliferation of nuisance midges. In recent years, localised increases in recharge caused by development to the east have influenced water level trends at Lake Joondalup. We are continuing to monitor changes in water quality resulting from changes in lake levels, as part of our ecological monitoring program. Monitoring data shows that nutrient concentrations in the lake have been high for

Comment	Department of Water and Environmental Regulation response
	many years but this is not an increasing trend. We are continuing to engage with the cities of Joondalup and Wanneroo, and Department of Biodiversity, Conservation and Attractions, to manage lake levels.
x. Evapotranspiration is rising due to climate change, but this is not mentioned in the plan, and should be included in modelling and budgeted for in increased water demand for crops.	The vertical flow model used in the Perth Regional Aquifer Modelling System (the model used for the plan) uses an energy budget to calculate evapotranspiration based on future climate projections. This means evapotranspiration is generally higher in model predictions compared with historical measurements. Climate change will compel all water users, including the agricultural sector, to adapt their water use practices to adjust to hotter and drier periods. The agricultural sector will need to adjust to increased evapotranspiration and higher crop water demands by making a range of business, water use and crop adjustments to improve the way it uses water.
Questions asked:	
1. Given the timeframe involved in the numerous studies and identification of the issues, at least one generation should have grown up with a knowledge of the problem. Why aren't we seeing the effect of this on Perth's water usage? Is the education process failing?	The water sector, water users and the Perth community have been contending with and adapting to climate change for more than two decades. Perth's water use has adjusted over time with per capita water use slowly reducing. Since the 2000s there has been an increase in Perth' population from 1.5 to 2 million (approximately one-third) while the volume of water supplied has increased by around 8 per cent, from 275 gigalitres to 298 gigalitres. (see the interactive chart on the homepage of the Water Corporation's website).
2. Are there any studies being undertaken of the increased 'water catchment' being created from the large number of subdivisions within Wanneroo and Yanchep?	Land clearing and urban development have, and will continue to have, a significant influence on groundwater recharge. We made decisions in the plan based on groundwater modelling that accounted for planned and expected land use changes to 2030. For example, licensees in the area identified as urban expansion in East Wanneroo are exceptions to abstraction reductions. Groundwater levels are expected to rise in the area during the plan's life because of land use changes and associated water use changes. Along the North West urban growth corridor we accounted for increased recharge due to planned urbanisation in setting aside water for future public water supply and for establishing and irrigating new public open space areas.

Comment	Department of Water and Environmental Regulation response
1.6 Stakeholder interests	
i. Local governments noted the department's consultation with them through developing the draft plan. One noted that reductions to abstraction were discussed as early as 2013. It was suggested that a list of all local governments that were consulted should be published in the plan.	We appreciate the collaboration with local governments as they have important practical and stewardship roles for water in our communities, by irrigating and maintaining waterwise public spaces and by helping residents to understand and adopt waterwise practices. They also play a key role in protecting the health of local groundwater-dependent ecosystems such as wetlands and areas of native bushland. **Plan changes:** The final plan includes a list of all the local governments we consulted during the plan's development (Section 1.6 and Appendix A).
ii. Some respondents called for the greater involvement of and consultation with Traditional Owners during plan development and for ongoing management of Gnangara groundwater resources.	During development of the draft Gnangara plan the department, through the South West Aboriginal Land and Sea Council (SWALSC), offered engagement with the Whadjuk and Yued working parties on the Aboriginal cultural aspects of the plan. We briefed the Aboriginal Water and Environment Advisory Group (AWEAG) on 2 March 2022. The group includes three Noongar representatives. The department set up the AWEAG to ensure that Aboriginal knowledge, values and needs are appropriately addressed in managing the state's water and environment. We sought feedback from members on how to better account for Aboriginal values, knowledge and traditional management of country in the final plan. At the briefing, members suggested we continue to engage with the group to improve Noongar consultation and engagement initiatives, and to better incorporate Noongar knowledge into the management of Gnangara groundwater. See also our response for 'Community and cultural values' in Section 2.7 of this report. **Plan changes:** The final plan includes a new Section 1.6.1 on Aboriginal engagement, and actions in Table 8, to continue to engage with the AWEAG and to work directly with regional corporations or representatives as we implement the plan.
1.7 Related plans and strategies	
A respondent raised that 'Perth water security' including water supply and resilience was identified as a new high-priority initiative to be implemented within the next five years by Infrastructure Australia on its 'Infrastructure Priority List'.	In February 2021 we successfully nominated 'Non-potable water security in the Perth Groundwater Basin' for inclusion in Infrastructure Australia's 'Infrastructure Priority List'. Inclusion in this list provides a pathway for Western Australia to propose capital and non-capital solutions to address projected water deficits

Comment	Department of Water and Environmental Regulation response
	across the Perth Groundwater Basin as nationally significant investments. We are progressing through Infrastructure Australia's assessment framework to evaluate options for improving self-supply water use efficiency and water entitlement transactions and delivering infrastructure solutions where needed.
1.7.1 Waterwise approaches and water sensitive urban design	
i. About 20 respondents called for continued or increased public education campaigns to improve water literacy and to help the community reduce their water use.	The *Waterwise Perth Action Plan* (Government of Western Australia 2019) includes actions to help Perth households save water, while encouraging the community to value water by improving water knowledge. The action plan includes a target to increase community engagement and knowledge about water by 15 per cent. As part of the state government's Waterwise program of work, the department and Water Corporation are continuing the 'Think Climate Change – Be Waterwise' program, including the Be Groundwater Wise initiative (see begroundwaterwise.wa.gov.au).
ii. About 20 respondents wanted to see more urban greening to reduce the urban heat island effect and to increase habitat and biodiversity.	Under the *Waterwise Perth Action Plan* (Government of Western Australia 2019) the state government has planted 84,000 waterwise plants across Perth and Peel suburbs, along with 3,500 trees across 18 Perth and Peel local governments. This was completed through the Waterwise Greening Scheme under the Waterwise Councils program, and the Urban Canopy Grant Program funded by the Water Corporation and administered by the Western Australian Local Government Association. The Waterwise Greening Scheme, through the Waterwise Councils program, will continue to provide eligible local governments with up to $10,000 in dollar-for-dollar co-funding for waterwise verges, street trees and plant sales programs, waterwise gardening workshops, demonstration gardens and waterwise garden competitions. As an implementation action of the Gnangara plan, support will be targeted to local governments that are in areas most impacted by the urban heat island effect to prepare for the reductions in their water entitlements from 2028. **Plan changes:** The final plan includes actions to support local governments, targeting those in areas most impacted by the urban heat island effect.
iii. Respondents called for new urban developments to be more waterwise by	We assess water management strategies and plans prepared under Better Urban Water Management processes for urban developments,

Comment	Department of Water and Environmental Regulation response
properly implementing water sensitive urban design.	provide water management and design advice on development proposals, and advocate for and engage with various stakeholders so that developers implement a water sensitive urban design approach. The Western Australian Planning Commission is updating the state's water planning policy framework including *Planning for water policy 2.9*, aiming to protect, conserve and enhance valued water resources, help ensure water is available for people and the environment, and support sustainable use of water resources.
iv. Some suggested that we need to define a waterwise Perth being 'green', with native trees and shrubs and hydro-zoning key to this, as opposed to an English landscape.	As we face a drier, hotter future we need to adjust how we use water to maintain gardens, lawns and shade trees. Creating waterwise gardens is one of the most efficient ways to save water and still have enjoyable green spaces in our homes and communities. Find out more about waterwise gardens, irrigation and bores at www.watercorporation.com.au and begroundwaterwise.wa.gov.au
1.7.2 Perth and Peel@3.5million	
Ten respondents noted the need for a whole-of-government approach to better align water planning and land use planning.	As Perth's population grows, our city's increasing demand for water will largely need to be met through further development of climate-independent sources such as desalination or groundwater replenishment. Western Australia's native vegetation is unique, biodiverse and internationally renowned. On 26 May 2022, the State Government released WA's first Native Vegetation Policy (DWER 2022c) to protect and manage native vegetation throughout this State. To achieve a 'connected city' pattern of growth, the Western Australian Planning Commission's Directions 2031 framework set a target to improve on current infill residential development trends of 30 and 35 per cent. The new 47 per cent target will help ensure growth of the city can be sustained beyond 2031 (WAPC 2010). The Department of Planning, Lands and Heritage is the lead agency for Directions 2031.
1.7.3 Alternative water sources for non-potable supply	
About 80 respondents suggested that more alternative water resources should be researched, invested in and developed to help meet the water demands of Perth's growing population or to limit the need to reduce the water use for agriculture, public open space or from garden bores. The water sources suggested included	During the past two decades, the State Government has responded to the impacts of climate change on Perth's water resources by investing in climate-independent water sources. More than 45 per cent of Perth's public water supply comes from desalinated seawater and groundwater replenishment.

Comment	Department of Water and Environmental Regulation response
desalination, wastewater recycling and managed aquifer recharge, stormwater and drainage water, grey water reuse and water from the north of the state. Most respondents agree that desalination capacity should be increased to help meet Perth's growing water demand. Some want this fast tracked. Many called for continued increases in wastewater reuse with managed aquifer recharge.	The government announced $1.4 billion of funding in the 2021–22 state budget for a third desalination plant, providing another climate-independent drinking water source. The third desalination plant will be operational by 2028. We collaborated with the Western Suburbs Regional Organisation of Councils in groundwater investigations and evaluating water management strategies, including treated wastewater and managed aquifer recharge, to meet future irrigation demand for green spaces in Perth's western suburbs. For irrigating new green spaces in the North East corridor area of the City of Swan we are supporting the investigation of sub-soil drainage harvesting at Brabham and options for managed aquifer recharge. For agriculture: • The East Wanneroo district structure plan identified a future option for transferring drainage water from East Wanneroo to North Wanneroo to support irrigated agriculture. This concept is being considered through land use planning processes. • As part of the State Groundwater Investigation Program, we are undertaking a detailed study of groundwater in the North East corridor and Swan Valley. The study results will inform sustainable water management and the potential for managed aquifer recharge in the area. We have initiated an Infrastructure Australia Stage 2 assessment of 'Options for non-potable water security in Perth and Peel regions to 2050'. This project follows the successful nomination of 'Non-potable water security in the Perth Groundwater Basin' to Infrastructure Australia's 'Infrastructure Priority List' in February 2021. Inclusion on this list provides a pathway for Western Australia to propose capital and non-capital solutions to meet water demands across the Perth Groundwater Basin as nationally significant investments. **Plan changes:** We have included a section in the plan, 1.7.3 Alternative water sources for non-potable supply.
1.7.4 Drinking water quality and source protection	
Several respondents said the plan should refer to protection of bores and water sources for drinking water, such as the department's *Water quality protection note 36: Protecting public drinking water source*	We have a drinking water source protection program over the Gnangara Underground Water Pollution Control Area. *Water quality protection note 25: Land use compatibility tables for public drinking water source areas* (DWER 2021d) is in

Comment	Department of Water and Environmental Regulation response
areas (DoW 2009b) that guides land use near public water supply bores to ensure drinking water is not polluted.	place to protect drinking water quality and public health. The recharge areas of groundwater sources are called 'public drinking water source areas' (PDWSAs). We protect these areas to ensure the ongoing availability of safe, reliable and affordable drinking water supplies to current consumers and future generations. We assign priority areas within PDWSAs to guide land use decisions. These are based on the land planning factors and water factors that exist in a PDWSA at the time. Priority areas are assigned and regularly reviewed via drinking water source protection reports (written or endorsed by the department) or land use and water management strategies (prepared by the Western Australian Planning Commission with advice from the department). **Plan changes:** We have included a new section (Section 1.7.4) on drinking water protection management in the plan and have referred to *Water quality protection note 25: Land use compatibility tables for public drinking water source areas* (DWER 2021d).
1.7.5 The Gnangara, Pinjar and Yanchep pine plantations	
i. About 70 respondents from various sectors called for pine clearing to be ceased to protect Carnaby's cockatoo, and some proposed the reductions to abstraction should be greater so that the plan objectives could be met with the pines retained. Many respondents also called for the former pine plantation area to be revegetated with native species.	The Department of Biodiversity, Conservation and Attractions (DBCA) has pursued several opportunities to revegetate parts of the ex-plantation areas, including an existing planting program that has planted approximately 15,000 to 20,000 native seedlings each year for the past five years. In August 2020, the State Government released the Carbon for Conservation initiative, a market-led proposal process that called on the private sector to identify carbon farming opportunities within Western Australia's national parks and reserves. One of the candidate sites identified for Carbon for Conservation was the northern Swan coastal plain area, which includes the Gnangara–Moore River State Forest. The government is currently evaluating proposals received under this initiative through the market-led proposal process. Successful proposals will identify carbon farming partnerships that provide co-benefits for biodiversity conservation and Aboriginal people.
1.7.6 Western Australian climate policy	
One respondent suggested we make more references to the goal of adapting to climate change consistent with the Western Australian climate change policy.	The plan refers extensively to how we will manage the system to continue adapting to climate change. The Western Australian climate policy is described in Section 1.7 of the plan.

2.3 What the plan will achieve

This section of the statement outlines comments received on matters raised in relation to Chapter 2 of the final plan. The subheadings in Table 4 below relate to specific sections in Chapter 2 in the plan.

More than half of respondents commented on the outcomes, water resource objectives or strategies in the plan. Most respondents generally supported what the plan aims to achieve, and most supported and wished to see water levels and the health of wetlands and bushland being maintained or improved.

Table 4 Comments and questions received on what the plan will achieve

Comment	Department of Water and Environmental Regulation response
2.1.1 Outcomes	
i. Respondents generally supported the draft plan's outcomes and water resource objectives, acknowledging the benefits to the environment and community of maintaining and improving water levels and the health of groundwater-dependent ecosystems in a drying climate.	Noted.
ii. Respondents raised concerns including that the plan would not achieve its outcomes, whether wetlands would actually be saved, that Perth would get hotter and drier, and that the reduction in abstraction wouldn't match reductions in rainfall recharge.	The department developed the outcomes and objectives and reductions to abstraction in the plan following extensive groundwater modelling that used climate projections consistent with accepted global climate models. We will publish progress reports every two years and, in 2030, will formally assess actual rainfall against future climate projections and assess the plan's objectives
iii. A respondent recommended the impacts of rising levels on Yellagonga wetlands be considered and the potential impacts of this on ecological health and function should be further assessed.	Groundwater modelling projects that the effect of land use change from semi-rural to urban in the East Wanneroo development zone will be a rise in groundwater levels in the local area, extending downgradient to the Lake Joondalup area. The detailed drainage design for the East Wanneroo development is still being devised and this will ultimately affect the degree of groundwater rise associated with the development. We have statutory environmental conditions that we must adhere to at 30 groundwater-dependent sites including two for the Yellagonga wetlands (lakes Joondalup and Goollelal). We conduct annual vegetation, macroinvertebrate and water quality monitoring at many of these sites, as well as monthly water level monitoring, to measure whether the minimum water level criteria are being met. We will continue to liaise with the cities of Wanneroo and Joondalup, the Department of Planning,

Comment	Department of Water and Environmental Regulation response
	Lands and Heritage (DPLH) and the DBCA on drainage design of the East Wanneroo development to help ensure the ecological integrity of the Yellagonga wetlands.
2.1.2 Water resource objectives	
i. Some respondents were disappointed and thought it was unacceptable that not all Ministerial sites would return to minimum water levels, and some levels would decline, even with the large reduction to abstraction.	Our groundwater modelling projected that, under a dry climate, even if all groundwater abstraction from the Gnangara groundwater resources ceased, groundwater levels would not improve enough to meet current water level criteria at all 30 sites. The Gnangara plan gives the community clarity and certainty about how we will rebalance the Gnangara groundwater system and address the impact climate change is having on our precious groundwater and the ecosystems that depend on it. Important wetlands and native bushland will be protected and become more resilient to climate change through the plan's actions.
ii. A local government considered 'Maintain a reliable water supply' to be unlikely if we rely so heavily on groundwater when rainfall and temperature cannot be controlled.	A key outcome of the plan is to reduce abstraction to secure the Gnangara groundwater system as a long-term sustainable water resource that supports a healthy environment for Perth. We recognise that we need to keep responding to climate change through investing in climate-independent water sources. See our response to 'Alternative water sources for non-potable supply' in Section 2.2 of this report.
iii. One local government suggested objective 1 should have further sub-objectives to ensure maintenance of key environmental values (i.e. wetlands, subterranean ecosystems, natural vegetation systems) and to maintain direct groundwater-dependent land use activities, especially intensive rural activities and food production.	We set ecological objectives for wetlands and other groundwater-dependent ecosystems in the plan that are consistent with Environmental Protection Authority (EPA) guidelines. The EPA is undertaking a formal review of our proposed changes to the environmental conditions set on the Gnangara groundwater resources in *Ministerial Statement no. 819* (Government of Western Australia 2009). The plan aims to maintain groundwater-dependent land use activities by helping secure their long-term access to good quality groundwater.
iv. A respondent questioned how reducing the rate of groundwater level decline reduces the risk of critical decline for certain key environments, as it seems to only extend the time over which the critical decline will take place, but not reduce the risk of it happening.	Reducing the rate of decline enables groundwater-dependent environments to transition to drier ecohydrological states, under which many of the original values are maintained. For example, a fast rate of groundwater decline will have a quicker and more critical effect on vegetation as plants do not have time to adapt to the drying conditions.

Comment	Department of Water and Environmental Regulation response
	As part of its review of our proposed changes to the environmental conditions set in *Ministerial Statement no. 819,* the EPA is considering whether our proposed objectives result in unacceptable changes to or loss of ecological values.
2.2 Strategies (to meet the plan's water resource objectives)	
i. Some respondents suggested both domestic and commercial supply should be entirely sourced from desalination as soon as possible.	During the past two decades, the State Government has responded to the impacts of climate change on Perth's water resources by investing in climate-independent water sources. See our response to 'Alternative water sources for non-potable supply' in Section 2.2 of this report.
ii. One respondent suggested there were opportunities to introduce and implement water use efficiency measures. They suggested this would also encourage best practice throughout the agricultural sector. They said these measures would also improve ecosystem health, particularly pest and weed control.	In 2019, the Department of Primary Industries and Regional Development (DPIRD) set up two demonstration sites showing water efficient techniques and best-practice irrigation, and commissioned Irrigation Australia to assess the irrigation efficiency of 22 on-farm systems. The results found opportunities for growers to become more efficient by modernising their irrigation systems. To support growers to adapt to less groundwater availability, the State Government established a $600,000 water efficiency grants program in 2021 to help growers improve the design of water systems, implement soil and crop sensor technology, and apply soil amendments to increase soil-moisture holding capacity. These programs are administered by DPIRD.

2.4 Water allocation changes across the system

This section of the statement outlines comments received on matters raised in relation to Chapter 3 of the final plan. The subheadings in Table 5 below relate to specific sections in Chapter 3 in the plan.

More than half of respondents commented on the water allocation changes across the system. This included comments on the science underpinning the reduced abstraction, how reductions to abstraction should be shared and when reductions should be implemented. When we add the number of respondents that made specific comments on reductions to different water uses (see our response in Section 2.6), about 85 per cent of respondents commented on the decision or alternatives to the abstraction reductions in the Gnangara plan.

Table 5 Comments and questions received on water allocation changes across the system

Comment	Department of Water and Environmental Regulation response
3.1 Science to determine reduced abstraction	
i. Several submissions questioned the validity of Ministerial criteria and their use as the 'sole reference' for assessment of reduced abstraction options.	The water level criteria in *Ministerial Statement no. 819* (Government of Western Australia 2009) were set by the Minister for the Environment on advice from the EPA and expert ecologists. The criteria were set to protect the ecological values of important, representative sites where modelling showed that public and private licensed abstraction was likely to impact on groundwater levels. The sites are scattered across a large part of the Gnangara system and the criteria have been validated as a relevant method to protect the groundwater-dependent values at these sites by 30 years of water level data and ecological monitoring. The amount known about the criteria sites and their relationship with groundwater – coming from such a long-term dataset – means they are the best reference sites for assessment of the ecological impacts of groundwater decline across the Gnangara groundwater resources. However, evaluation of these sites was just one part of the options assessment. The analysis also included an assessment of the potential changes in area of healthy groundwater-dependent ecosystems under different reduction scenarios, and of water quality (movement of the saltwater interface and risks of acidification of groundwater).
ii. Some respondents submitted that the assessment of options in the draft Gnangara plan did not adequately	Noted. The implementation of the plan will include support programs for specific water users, to limit the social and economic

Comment	Department of Water and Environmental Regulation response
consider social or economic impacts, including the impacts of reducing abstraction for agriculture.	impacts of reducing groundwater abstraction. See the Summary and Table 8 in the Gnangara plan.
Climate change	
i. Some note that recent science indicates our climate is drying faster than expected.	Noted. The recently released Intergovernmental Panel on Climate Change Sixth Assessment Report emphasises that climate impacts are appearing faster and are more severe than expected. The World Climate Research Programme's Coupled Model Intercomparison Project (CMIP) makes global climate change projections publicly available in a standardised format. The two most recent phases – CMIP5 (2013) and CMIP6 (2021) –projected with high confidence that the future climate for south-west Western Australia will be warmer and drier. Modelling for the Gnangara plan falls within the range in average rainfall at 2030 under the CMIP5 and CMIP6 projections.
ii. Some respondents submitted that deforestation in the south-west of Western Australia is contributing to our reduced rainfall.	Noted.
iii. Some respondents were concerned the modelling for the plan did not consider longer-term drying due to climate change.	Modelling for the Gnangara plan is based on a climate projection to 2030 to align with the plan's timeframe and related strategies.
Groundwater modelling	
i. Several submissions commended the science that supported the draft plan.	Noted.
ii. Some respondents noted that: • the sensitivity of key modelling assumptions should have been tested • the uncertainty in the modelling input and outputs should have been clearer • more modelling outputs should have been included, such as hydrographs for predictive scenarios.	We completed a sensitivity analysis and a post-calibration verification of the Perth Regional Aquifer Modelling System (PRAMS) 3.5, which further demonstrated that the model is reliable and effective as a groundwater management tool. This is outlined in the methods report. Future climate is the factor with the largest modelling uncertainty in the PRAMS 3.5 model inputs and subsequent outputs. However, the projected climate scenario used in the modelling for the plan closely aligns with observed trends, as demonstrated by the model validation to 2019. We used spatial maps as the key visual aid as they clearly communicate changes and trends over the entire model domain for a given time horizon, while hydrographs are point specific.
iii. Several agricultural sector respondents from the North Wanneroo area submitted that the proposed reduction in abstraction	The 10 per cent reduction to abstraction in North Wanneroo is needed to contribute to meeting objectives to improve levels at nearby

Comment	Department of Water and Environmental Regulation response
in Carabooda is not supported by the modelling presented in the draft plan (Figure 7a), which shows stable to slightly rising levels predicted in the Superficial aquifer for the Carabooda subarea under the 'No intervention' scenario, due to land use changes.	wetlands, including sites with water level criteria set in *Ministerial Statement no. 819* (Government of Western Australia 2009) – Lake Yonderup, Lake Wilgarup, Pipidinny Swamp and Lake Nowergup (with continued supplementation). These wetlands have been impacted by local abstraction from the Superficial aquifer, which has contributed to levels being non-compliant with water level criteria set by the Minister for the Environment.
Land use changes	
Some respondents suggested that more information should have been included in the draft plan or methods report on actual estimates of recharge and how they were applied in the modelling.	PRAMS uses a vertical flux model to calculate recharge based on land use, soil type, climate (rainfall and evaporation) and depth to watertable. The development of the vertical flux model was informed by various studies that estimated recharge. For more information see *Construction and calibration of PRAMS 3.5.2* (CyMod Systems Pty Ltd 2014) and *Vertical flux model for the Perth groundwater region* (Silberstein et al. 2003).
3.2 Sharing reductions	
i. Some licensees proposed that the reductions should be made on a case-by-case basis rather than using a blanket approach. One licensee suggested that local government authorities and the Water Corporation should be assigned the reductions proposed in the plan, rather than self-supply users.	Extensive groundwater modelling and analysis show that to achieve the plan's water resource objectives, we need to reduce annual groundwater abstraction by 54 gigalitres during the next decade. Though the Water Corporation is taking a significantly larger reduction than other licensed users, the objectives cannot be met by only reducing its abstraction and that of local government authorities.
ii. A number of respondents called for the reductions to self-supply licensed use (including agricultural use) to be increased to 30 per cent and to be made immediately.	While larger or more immediate reductions to self-supply abstraction would result in improved environmental outcomes, it would also be significantly more disruptive for licensed water users and mean fewer licensees would be able to adapt to the changes.
iii. Timing is unfair – some garden bore users submit that the timing of the proposed changes to the garden sprinkler roster is inequitable with the timing of the proposed reductions to licensed use.	Climate change means we all have a role to play to protect and adapt the way we use water. The department and Water Corporation have supported the need for Perth gardens to be waterwise for many years. The waterwise programs have resulted in the increased use of waterwise plants which are suited to our climate, need less water, are low maintenance and look great. Scheme water users in Perth have maintained their gardens on a two day per week sprinkler roster since 2001.

Comment	Department of Water and Environmental Regulation response
3.2.1 Exceptions to reduced abstraction	
i. A range of respondents from different sectors submitted that more licensed water uses should be exceptions to reductions, including licences: • with entitlements under 10,000 kilolitres/year • for horticultural and agricultural purposes (including nurseries) • for the irrigation of parks, gardens and recreation spaces • for the irrigation of sporting grounds • where more than 50 per cent of the licence volume was acquired through a water licence transaction • of businesses that have already invested heavily in water use efficiency • that have been reduced recently (such as through a recouping process)	We considered the exceptions proposed in submissions. The groundwater used by established nurseries and tree farms for irrigating plants and trees for commercial purposes will be exempt from the reductions in abstraction. These businesses will play an increasingly important role in providing plants for waterwise gardens, landscaping and the green spaces that help keep Perth cool as we adjust to a drier climate. **Plan changes:** The final plan exempts water used by established nurseries and tree farms for the irrigation of plants and trees for commercial purposes from reductions to abstraction. The department will work closely with the nursery and tree farm sector to develop new waterwise standards. The plan also includes actions to support the following sectors to adjust to less groundwater abstraction: • horticulture (similar to the North Wanneroo water use efficiency grants scheme) • local governments, targeting those in areas most impacted by the urban heat island effect.
ii. Some respondents submit there should be no exceptions to the proposed reductions, and many disagree with schools and hospitals being exempt.	We encourage primary and secondary schools and hospitals to reduce their groundwater use. As an action of the *Waterwise Perth Action Plan*, we are working with the Department of Education and Water Corporation to develop a Waterwise School Grounds program to help public schools demonstrate best practice outdoor water use, find water (and financial) savings, and adapt to climate change. The program aims to give schools and staff the information, skills and tools to improve outdoor water efficiency and reduce groundwater use.
3.3 Allocation limits	
Some were concerned that even with the total proposed reductions of 54 gigalitres/year, many resources would remain over-allocated.	We have clarified the statement in the plan that resources would still be over-allocated after 2028. This is because over-allocation will remain until all licence entitlements have been reduced in accordance with and within the allocation limits in the plan, which will happen from 2028–2032. **Plan changes:** The plan now clarifies that water resources will remain over-allocated until all licence

Comment	Department of Water and Environmental Regulation response
	entitlements have been reduced in accordance with and within the allocation limits in the plan.

2.5 Water licensing

This section of the statement outlines comments received on matters raised in relation to Chapter 4 of the final plan. The subheadings in Table 6 below relate to specific sections in Chapter 4 in the plan.

About 30 per cent of respondents commented on water licensing requirements, processes or policies in the draft plan. These respondents represented most stakeholder groups, including agriculture and irrigation; conservation and environment; garden bore users, individuals; licence holders and local government.

Table 6 Comments and questions received on water licensing

Comment	Department of Water and Environmental Regulation response
4.1 Water Corporation	
A number of respondents submitted that the Water Corporation should always comply with the extraction allocation set by the EPA and never again be granted emergency allocations from the Gnangara Mound, as it was done in the past and never 'repaid'.	The Water Corporation complies with its licensed entitlements, which are currently in line with the public water supply allocation set in the *Gnangara groundwater areas allocation plan* (DoW 2009a). It has not been allocated continency groundwater since 2016–17.
4.2 Self-supply users – reductions to entitlements	
Some licensees said their licensed water entitlement had already been reduced in the past and would like to be exempt from a further 10 per cent reduction.	We recognise that some licence entitlements have already been recouped through normal licence assessment processes, land use change or transaction processes. However, this plan aims to reduce how much groundwater is actually abstracted to rebalance the groundwater system and stabilise water levels in a drying climate. Our current application assessment process will continue to review licensed water use on a case-by-case basis and implement reductions in accordance with the *Gnangara groundwater allocation plan*.
4.2.1 Self-supply users – metering	
Eleven respondents commented on metering:	
i. Respondents requested that all bores and groundwater users be metered, including unlicensed garden bores and bores for licences with annual entitlements less than 10,000 kilolitres/year.	Under the Rights in Water and Irrigation Regulations 2000 (Metering Regulations), all licences in the Gnangara groundwater system with an annual entitlement of 10,000 kilolitres and above required an approved water meter by 31 December 2019, a year earlier than others due to the priority of this system.

Comment	Department of Water and Environmental Regulation response
	Metering may also be required for other licences as a licence condition, such as near environmentally sensitive areas.
ii. Some licensees were concerned that unmetered licensees may be taking above their licensed entitlement, especially in the Swan Valley, and that more bores would become unmetered with entitlements falling below 10,000 kilolitres/year after the 10 per cent reduction.	See our response to '4.4 Compliance and enforcement approach' below.
iii. Some licensees were confused about metering requirements and responsibilities, particularly regarding the regulations and state-owned meter handover.	Advice about new regulations for metering the take of water was sent to licensees in 2019. You can find out more about how the changes affect you by accessing our website at www.dwer.wa.gov.au or reading our metering fact sheet and frequently asked questions.
Questions asked:	
1. What was discovered regarding the water usage of land owners in the Swan Valley from the bore metering project which was conducted several years ago? I was told that it determined that our impact on the Gnangara Mound was negligible in comparison to other users and hence the project was discontinued.	As part our effort to improve water resource management across Western Australia, state-owned water meters were installed on licensed groundwater drawpoints to measure the take of water for about 1,000 properties across the Gnangara Mound. While measuring the take of water was commonplace for water licences with high volumes of water, the Gnangara Mound Metering program monitored abstraction from a broader range of licensees and measured their impacts on other water users and near groundwater-dependent ecosystems. See our website for information on the outcomes of the *Gnangara Metering Project*.
2. Measure it to manage it – What controls are there on industry and horticulture, garden bores, parks and other green spaces north of the Swan River?	All licensees with an annual water entitlement equal to or greater than 10,000 kilolitres/year must meter their water use and submit metering data to us through Water Online, in accordance with Regulation 41C of the Metering Regulations and in line with our *Statewide policy – Measuring the taking of water* (DoW 2016). This includes licensees who use water for industry, horticulture and for the irrigation of parks and green spaces. Garden bores are not metered.
4.2.2 Self-supply users – recouping	
i. Some respondents believe recouping will encourage the wasting of water and that there should be no penalties for under use.	In line with the community's expectations, we will not tolerate the wasting of water. Licence holders seen to be abstracting groundwater for the purpose of protecting the annual water entitlement will be subject to property surveys and water use investigations by our regional licensing officers, and compliance and

Comment	Department of Water and Environmental Regulation response
	enforcement officers. See responses under 'Water entitlement transactions' and 'Compliance and enforcement approach' below.
ii. Some respondents suggested multi-year averaged water entitlements would be beneficial for managing their water use to account for variations in crop/s and annual temperature and rainfall.	We may consider multi-year averaged water entitlements in the Gnangara groundwater system once the system is no longer over-allocated.
iii. Some respondents have already made water use savings in anticipation of proposed reductions and believe that reducing their licences further through recoup of unused water entitlements would be penalising efficient use.	See response to comment i. above. Licence holders who have saved water through water efficiency measures may not be subject to recouping of unused water if they can establish, to our satisfaction: • demonstrated efficiency gains and a continuing requirement for all the entitlement • the extenuating circumstances outlined in the policy *Management of unused licensed water entitlements* (DWER 2019).
Question asked:	
What will happen to water that has been recouped? Will it become available for other users?	Given the over-allocated status of the Gnangara system, recouped water entitlements will be retired and not made available for re-allocation, consistent with local licensing policy 2.2.5 in the plan. This means the water will be returned to or left in the groundwater system going forward.
4.3 Water entitlement transactions	
Respondents submitted the following on water entitlement transactions:	
i. Volumes of licensed water obtained through transactions should be an exception from reductions to abstraction. Licensees should be compensated for any reductions to their purchased entitlements.	Water acquired through water entitlement transactions are subject to the same tenure policy and then renewal processes as all other licences, including recouping processes where appropriate. Water acquired through water entitlement transactions and 'free issued' entitlements are also subject to the same reduction to abstraction under the Gnangara plan. The Gnangara plan recognises that all water entitlements have value and applies a fair 10 per cent reduction to the used entitlements of all licences (other than those covered by the exceptions stated in the plan).
ii. Improve trading rules to manage the resource, especially to protect groundwater-dependent ecosystems, with additional assessment and conditions	Whether assessing applications to trade or transfer, or through agreements allowing another person to take water, we ensure that these transactions will not compromise the sustainability of the local environment and

Comment	Department of Water and Environmental Regulation response
required near these ecosystems if this isn't already the case.	ecosystems of the water resources being managed. We assess issues relating to applications for trades, transfers or agreements, according to matters given in Section 7(2) of the *Rights in Water and Irrigation Act 1914*, including whether the proposed taking and use of water is ecologically sustainable and environmentally acceptable.
iii. The department should develop an adequate water trading platform to better facilitate future trading.	The Water Register is our platform for users to search and view information about water availability and licences. It allows licensees or potential licensees to identify all the current water licences in a water resource. It provides them with the contact details and the licensed allocations of those licensees. Users may wish to contact these licensees for trades or agreements. Licensees can apply for a trade or agreement through the Water Online Portal. We will assess the application following the same process we use to assess all licence applications.
iv. The department should facilitate trade applications submitted late in the water year to reduce the incidence of overuse, unless there are clear negative impacts associated with the trade being approved.	We must fully assess each licence application and all applications are still subject to our final assessment. Applicants must allow sufficient time to allow this to occur before the end of the water year, noting the approval of a trade is not guaranteed. The Water Online Portal enables licensees to see how much of their water entitlement has been used within their water year. If meter reads are entered monthly, the portal displays the volume taken to date against the annual water entitlement. This enables licensees to see if they are getting close to their annual water entitlement or if they have a high portion remaining. This would give both parties insight into how much or how little water they have for potential trading for the remainder of the water year.
v. One respondent suggested that trading rules be changed to allow water trading across subarea boundaries. This could be assessed on a case-by-case basis and permitted on a temporary/ time-limited basis.	Allocation limits are set for a resource within a groundwater subarea. Hence water entitlements and transactions must remain within the same groundwater resource (an aquifer within a subarea).
vi. One respondent was concerned 'water hoarding' could impact on the water trading environment, potentially creating a skewed idea of market demand and market value. They were concerned if	As stated in *Policy: Water entitlement transactions for Western Australia* (DWER 2020), we discourage the use of water entitlement transactions as speculative investment alone, as this may lead to water

Comment	Department of Water and Environmental Regulation response
water entitlements were held and not used, it would make the resource appear scarcer than it actually is and distort natural supply and demand curves.	not being used productively. We will act to prevent market manipulation that disrupts the use of water entitlement transactions as a business tool to provide increased flexibility to legitimate water users. The redistribution of any 'saved' or recouped water will be at our discretion consistent with approved policy. See also our responses under 'Compliance and enforcement approach' below.
4.4 Compliance and enforcement approach	
i. Some respondents suggested that regulating and measuring unlicensed use should be more targeted and thorough.	In line with our *Compliance and enforcement policy* (DWER 2021e), we survey and monitor all licence holders' groundwater use to detect unauthorised use. Unauthorised use includes taking more groundwater than the licensed annual water entitlement. These investigations are done on a case-by-case basis and may result in our officers conducting an inspection of the property. If a breach is proven we have a range of enforcement options available. If a water meter is not used, we will review the water uses stated on the groundwater licence and the area it is used for. We may also investigate how the groundwater is being used to ensure it is being used responsibly. This includes groundwater use exempt from licensing, such as domestic use in the home and for gardens up to 0.2 ha. **Members of the public are encouraged to report misuse of water resources to the department.** We will receive, record and acknowledge all reports, and assess the risk posed to water resources. Based on this assessment, we will determine an appropriate level of response. If you have concerns about potential misuse of water, please contact our Swan Avon regional office on 08 6250 8000 or email ellam.reception@dwer.wa.gov.au. To report potential non-compliance with watering restrictions specifically, please email our Water Efficiency Measures program on wem@dwer.wa.gov.au.
ii. Some respondents note that fines under the new legislation need to increase to deter overuse and that fines would be more effective if they were proportionate to annual income, rather than a one-size-fits-all amount as it currently stands.	Noted.

Comment	Department of Water and Environmental Regulation response
iii. One respondent suggested that alternative measurement techniques such as assessment of aerial imagery would not accurately measure water use, for example poorly managed horse properties where landholders were effectively watering sand.	Noted.
iv. Some respondents suggested that water use should be audited to assess water wastage and water hoarding. They were concerned about licensees holding onto licences or pumping water just to hold onto their licence, particularly for economic value.	Licensees found to be wasting water to ensure they have used their full water entitlement will not be protecting their entitlement and will be subject to *Statewide policy – Management of unused licenced water entitlements* (DWER 2019). We conduct field and desktop assessments – including inspections, analysis of aerial and satellite imagery and use of intelligence – to gather and assess information on potential risks as part of our ongoing compliance program.
v. One respondent wanted to ensure the department's compliance function was run by internal employees and not outsourced to a third party.	Compliance functions are not outsourced, though we may collaborate with other departments and local government.
vi. One respondent asked for definitions of 'water wastage' and 'wasteful behaviour' to be included in the plan and compliance and enforcement policy, as the terms are referred to without any clear definition.	Noted. **Plan changes:** We have added a definition of 'water wastage' in the plan's glossary.
vii. One respondent suggests it is currently unclear how to report water wastage. They would like to see a platform to report water wastage, perhaps as an extension of the Pollution Watch online form.	To report water wastage please contact the Swan Avon regional office on 08 6250 8000 or at ellam.reception@dwer.wa.gov.au
4.5 Local licensing policies	
i. Some respondents requested a daytime watering ban be implemented.	For groundwater licences granted for the irrigation of non-commercial crops, we already include licence conditions that prohibit the operation of above-ground sprinkler irrigation systems during the day (between the hours of 9am and 6pm), unless extenuating circumstances apply. Winter watering restrictions may also apply.
ii. Some licensees would like to see annual usage fees introduced for licensees.	Noted.
iii. Some respondents wanted to see licensing and metering introduced for garden bore users to limit water use in this sector.	To be effective, regulation of water use needs to be targeted to where it is needed most rather than adopting a common approach regardless of risk. Garden bores generally do not require licensing because they use a small amount of water compared with other licensed groundwater users. There are about 70,000

Comment	Department of Water and Environmental Regulation response
	unlicensed garden bores in the Gnangara plan area, compared to about 2600 water licences, and they are regulated under the Water Agencies (Water Use) By-laws 2010. The by-laws specify permanent water efficiency measures, temporary water restrictions and exemption provisions.
iv. Some respondents wanted no new bores to be allowed in any sector to reduce pressure on the groundwater system.	Our modelling to develop the plan factored in expected growth in garden bore use associated with new urban developments and reductions in groundwater use associated with the proposed change in garden bore sprinkler roster.
v. One respondent suggested that treated wastewater should be managed by the State Government in a similar way to ground and surface water currently. Treated wastewater could be made available for licensing on a temporary basis, until such time as the Water Corporation is ready to use wastewater for reinjection purposes.	Access to treated wastewater as a water source is subject to arrangements with the relevant water service provider. In addition to commercial considerations, integrating private wastewater or treated wastewater schemes safely and reliably into existing and planned wastewater systems is a key consideration for Water Corporation, the main provider in the Gnangara area.
vi. One respondent was concerned about the potential for new licences to be issued to the Water Corporation for groundwater replenishment or managed aquifer recharge. They would like to see no further allocation from the Yarragadee aquifer, regardless of the circumstances.	We have rigorously assessed licence applications associated with the Water Corporation's groundwater replenishment scheme to ensure the distribution of injection and abstraction results in a neutral or positive impact to the Yarragadee aquifer in the northern part of the Gnangara system (where there is connectivity between the Yarragadee, Leederville and Superficial aquifers).
vii. Some respondents highlighted the value of water as a natural resource and wanted trading to be abolished to avoid irreversible environmental damage.	Trades, transfers and agreements allow existing licensees to expand their operations as well as adapt to changing circumstances. For water entitlement transactions near groundwater-dependent ecosystems, we may ask for additional information to complete our assessment of the licence application and apply licence conditions to minimise the risk to these environments. Applications for water entitlement transactions that increase the risk of abstraction impacts on groundwater-dependent ecosystems may be refused.

2.6 Changes to groundwater abstraction for different water uses

This section of the statement outlines comments received on matters raised in relation to Chapter 5 of the final plan. The subheadings in Table 7 below relate to specific sections in Chapter 5 in the plan.

About 70 per cent of respondents commented on changes to groundwater abstraction for certain water uses. Most respondents supported the proposed 30 gigalitres/year reduction to abstraction for public water supply and some suggested the Water Corporation's abstraction reduction should be greater than 30 gigalitres/year.

Respondents provided alternative options and suggested what support could or should be provided to water users to help them adapt to less groundwater abstraction.

We have responded to comments on the garden bore sprinkler roster change in a separate statement of response report (DWER 2022b).

Table 7 Comments and questions received on changes to groundwater abstraction

Comment	Department of Water and Environmental Regulation response
5.1 Public water supply	
i. Respondents generally supported the proposed 30 gigalitres/year reduction to abstraction for public water supply.	Noted.
ii. Many submissions suggested the reductions to public water supply abstraction should be greater so that it would: • offset the need for reductions to agricultural water licences • improve outcomes for wetlands and bushland.	The Water Corporation's previous abstraction reductions (around 25 gigalitres/year in 2013), which were part of implementing the *Gnangara groundwater areas allocation plan* (DoW 2009a), were targeted at non-urban areas of the Superficial aquifer and the deep aquifers in areas where they are connected to the Superficial. The 2009 plan did not reduce licensed self-supply or garden bore use. The 30 gigalitres/year reduction to the Water Corporation's abstraction in the 2022 Gnangara plan is again targeted at non-urban areas of the Superficial aquifer and areas in the northern half of the deep aquifers where they are connected to the Superficial. The Water Corporation's remaining allocation in the Superficial aquifer will mostly be in urban areas, where the reductions to public open space irrigation and garden bore use will help improve groundwater levels, and in deep aquifers where they are less or not connected to the Superficial aquifer in the southern part of the Gnangara plan area.

Comment	Department of Water and Environmental Regulation response
iii. Some submissions proposed we should increase public water supply abstraction in East Wanneroo and urban areas and reduce abstraction in other agricultural areas.	As per the response above, we have worked with the Water Corporation to reduce its abstraction from the Superficial aquifer in non-urban areas. The potential to increase public water supply from the East Wanneroo area was considered as part of developing the *East Wanneroo district water management strategy* (Urbaqua 2021). Some of the issues considered were as follows: • Groundwater levels could not be adequately controlled in the area to limit risks to wetlands and urban development using abstraction. Instead, a concept to control groundwater via subsoil drains and a pumping scheme to remove water from the area was proposed. • Considerable uncertainty around timing and quantities of water potentially available for abstraction given the timing of the development was uncertain. • Water quality risks.
iv. One respondent queried whether changes to deep aquifer abstraction management could be used to achieve the same outcomes while limiting the need for the proposed reductions to the agricultural sector.	Reducing groundwater abstraction as set out in the plan will help save wetlands and bushland that depend on Superficial aquifer levels. We have researched and recommended changes to deep aquifer abstraction and groundwater replenishment for public water supply to increase benefits to the Superficial aquifer. The optimisation modelling for the Perth Regional Confined Aquifer Capacity (PRCAC) study (DWER 2021f) informed the modelling done for the Gnangara plan. Based on this work, the reduction to public water supply abstraction in the plan is targeted at deep aquifers in connected areas in the northern half of the Gnangara system. The split of the 30 gigalitres/year reduction across aquifers reflects the PRCAC findings.
v. Reduce scheme demand easily through simple home and garden changes.	The *Waterwise Perth Action Plan* (Government of Western Australia 2019) includes actions to help Perth households save water through practical water savings solutions. The Water Corporation is continuing to work with Perth households to reduce scheme demand through changes to water use in homes and gardens. For information on saving water in and around your home see: www.watercorporation.com.au/waterwise
vi. Water losses and wastage from leaking pipes needs to be addressed.	In 2020–21, the State Government, through the Water Corporation, invested around $76 million in water mains renewals across the

Comment	Department of Water and Environmental Regulation response
	state to reduce the amount of water lost through leaks. Of Australian capital cities, Perth has the lowest rate of leaks and bursts.
vii. Water Corporation dividends must return to the Water Corporation or the department to fund low carbon power, desalination and managed aquifer recharge (MAR).	The State Government has committed to funding for Water Corporation to build a third desalination plant that will be powered by renewable energy. Providing cost-effective water supplies and complying with environmental regulation and obligations are part of the Water Corporation's business costs. These costs are already paid before profits and dividends are calculated.
Question asked:	
How much Gnangara groundwater goes to Kalgoorlie?	The Goldfields and Agricultural Water Supply Scheme, including Kalgoorlie, is supplied by a portion of the water from Mundaring Weir. Mundaring Weir receives transfers from the Integrated Water Supply Scheme – a mix of surface water, desalinated water and groundwater.
5.2 Agricultural water supply	
i. Many licensees oppose the reductions due to the impact on their business security and viability.	Climate change means we all have a role to play to protect and adapt the way we use water. We recognise that reducing groundwater use may impact on people's livelihoods and businesses. The State Government has established a $600,000 water efficiency infrastructure and technology grants program for North Wanneroo, which is being administered by the DPIRD. To further support licensees a grants program will be developed to support horticultural users in other parts of the Gnangara groundwater area (see plan changes below). We are also implementing larger reductions for public water supply abstraction compared with other water users so we can minimise impacts on individual licensees. However, we need to reduce abstraction across all water users to help stabilise local groundwater levels and protect water quality, water security and groundwater-dependent ecosystems in a drying climate. **Plan changes:** The plan includes an action for the department to develop a new water use efficiency grants program to support horticultural groundwater users in the Gnangara plan area who will be subject to the 10 per cent reduction to abstraction.

Comment	Department of Water and Environmental Regulation response
ii. Some growers expressed willingness to use scheme water or wastewater and pay to access these resources (with the additional cost passed onto consumers); however, this option is not currently available to them.	Alternative water sources including treated wastewater and drainage water continue to be examined for their potential to supplement self-supplied groundwater for irrigated agriculture in North Wanneroo and Swan Valley. We will continue to work with growers, vegetablesWA, City of Wanneroo, City of Swan and DPIRD to support investigations of alternative water sources.
5.2.1 Agricultural water use in North Wanneroo	
Licensees, residents, and one local government:	
i. opposed the reductions to North Wanneroo growers	The reductions are needed to contribute to meeting objectives to improve levels at nearby wetlands, including sites with water level criteria set in *Ministerial Statement no. 819* – Lake Yonderup, Lake Wilgarup, Pipidinny Swamp and Lake Nowergup (with continued supplementation) (Government of Western Australia 2009).
ii. supported using excess water from East Wanneroo	The *East Wanneroo district water management strategy* (Urbaqua 2021) identifies potential yields of 3.4 gigalitres/year from subsoil drainage. This estimation arises from the groundwater level predicted at full build-out of the entire *East Wanneroo district structure plan area*, and therefore the volume is not expected to become available until after that has occurred, and a distribution scheme is developed.
iii. suggested reductions should be targeted to licensees closest to wetlands	We need to reduce abstraction across all water users to help stabilise local groundwater levels and protect water quality, water security and groundwater-dependent ecosystems in a drying climate.
iv. suggested progressing an agricultural precinct.	Noted.
v. A local government suggested that the best incentive for growers to be more water efficient is to ensure that any water saved through efficiency gains is made available to increase production.	We support water use efficiency and the productive use of water entitlements. Extra water gained through efficiency can be an opportunity for further production or trade. However, to respond to climate change and protect the Gnangara groundwater resources, we need to reduce groundwater abstraction, including for agricultural use.
5.2.3 Agricultural water use in the Swan Valley	
Licensees and landholders in the Swan Valley:	
i. did not support the reductions, requested agricultural water be an exception to the	To respond to climate change and to stabilise fresh groundwater flows to the river and

Comment	Department of Water and Environmental Regulation response
reductions and stated that more water is needed in the Swan Valley.	reduce salinity risks along it, we need to reduce groundwater abstraction in the Swan Valley.
ii. proposed water trading should not be allowed at all or should include agricultural use in the rural zone, not just the agricultural zone.	Trades, transfers and agreements allow existing licensees to expand their operations as well as adapt to changing circumstances. The trading rules associated with the new Swan Valley subarea are to help ensure water is retained in the priority agricultural zone.
5.2.4 Agricultural water use in the Gingin area	
One respondent suggested there will not be enough water available in Gingin to support an increased demand in food production.	As reduced rainfall due to climate change continues to reduce groundwater availability, demand for water will need to come from water trading, transfers, greater water use efficiency and water savings, or from alternative sources (other than groundwater).
5.3 Irrigating parks, gardens and recreational areas	
i. Respondents wanted lawn areas to be reduced and replaced with native vegetation to provide habitat for biodiversity.	We support measures that find water savings to adapt to using less groundwater in the future that also consider urban cooling and biodiversity outcomes.
ii. One respondent was concerned about the requirements of private and public golf courses. They wanted to see a fair and consistent approach to groundwater management at an industry level, to ensure differences do not become evident. One respondent wanted clarity about the impact of reductions on a golf course and similar licensed operations.	Golf courses will need to reduce their groundwater use by 10 per cent from 2028. We encourage golf courses to join the Waterwise Golf Program which 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.
iii. Respondents suggested improved water efficiency measures would also be needed to meet targets.	Many actions in the *Waterwise Perth Action Plan* (Government of Western Australia 2019) focus on improving water use efficiency to create waterwise and climate-resilient public open space and recreational areas. These include an irrigation training program to equip local government staff with the skills and knowledge to ensure best practice in efficient water use, through improved irrigation design, installation and maintenance.
iv. Reductions in abstraction from the Superficial aquifer could magnify the urban heat island effect.	In many cases, the water for irrigating public open space can be reduced using measures that do not significantly affect liveability, urban heat or physical and mental health. These measures include: • ongoing programs to maintain irrigation systems and improve practices

Comment	Department of Water and Environmental Regulation response
	• waterwise designs such as hydro-zoning and eco-zoning (for example, replacing turf with waterwise trees and plants) • efficiency upgrades to irrigation infrastructure and use of soil wetting agents.
v. One respondent suggested they are already operating as efficiently as possible and continuously researching other water saving options. They would like to be exempt from the reductions, which they believe will affect the operation and customer enjoyment of their facility.	We need to reduce abstraction across all water users to help stabilise local groundwater levels and protect water quality, water security and groundwater-dependent ecosystems in a drying climate. The reductions to groundwater use are a necessary response to rebalance groundwater abstraction with reduced rainfall and recharge, to date and projected under climate change; and to protect the Gnangara groundwater system and the values it supports from further impacts.
vi. One respondent suggested the draft plan could lead to further inequality between older suburbs with more trees and green areas and newer, outer suburbs with less, due to differences in groundwater availability at the time of development.	Our work as part of the *Waterwise Perth Action Plan* (Government of Western Australia 2019) has found that, in most cases, current groundwater availability will be adequate to meet the demand for water to irrigate green spaces in future development areas. This is because as land use changes, existing groundwater licences within the development zone would be transferred across for the purpose of public open space irrigation. In addition, by implementing waterwise practices on older, established green spaces, councils will be able to 'free up' water from their current entitlement to use on new areas. As an implementation action of the Gnangara plan, support will be targeted to local governments that are in areas most impacted by the urban heat island effect to prepare for the reductions in their water entitlements from 2028. **Plan changes:** The final plan includes actions to support local governments, targeting those in areas most impacted by the urban heat island effect.
vii. One respondent suggested the proposed reductions to groundwater abstraction could contribute to increased salinity in the soil profile, leading to poor plant growth and an increase in plant deaths.	We consider the risk of increases in surface soil salinity enough to affect plant growth is relatively low across most of the Gnangara plan area. Winter rainfall often provides sufficient leaching to prevent salts in sandy soils building up and carrying over to the following year. The risk would be greatest where brackish groundwater is used on fine-textured soils such as loams and clays. Irrigators in these areas should already be

Comment	Department of Water and Environmental Regulation response
	managing their practices to account for these risks.
5.3.1 Groundwater use by local government	
i. One local government submitted the approach to reduce water allocations would impact green spaces and sporting grounds which are key to liveability and amenity.	In many cases, local government authorities should be able find water savings and adapt to using less groundwater in the future through: • ongoing programs to maintain irrigation systems and improve practices • waterwise designs such as hydro-zoning and eco-zoning • efficiency upgrades to irrigation infrastructure and use of soil wetting agents • adjusting the distribution of water to prioritise actively used and higher value spaces over passive spaces. As an implementation action of the Gnangara plan, support will be targeted to local governments that are in areas most impacted by the urban heat island effect to prepare for the reductions in their water entitlements from 2028. **Plan changes:** The final plan includes actions to support local governments, targeting those in areas most impacted by the urban heat island effect.
ii. One local government said it would support an allocation of 6,700 kilolitres per hectare based on current irrigated public open space, which is the nominal amount of water to sustain turf.	Noted. Comment as i above.
iii One local government suggested a model is used where any part of the annual water entitlement that is not used due to efficiency gains, can be banked and used in future years if required, or similarly a multi-year averaged water allocation be allowed for local governments.	We may consider banking or multi-year averaged water entitlements in the Gnangara groundwater system once the system is no longer over-allocated.
iv. The State Government should continue researching and investing in innovative measures to secure and recharge Perth's groundwater supply.	See our responses for 'Alternative water sources for non-potable supply' in Section 2.2 of this report.
5.4 Water for public open spaces in developing areas	
i. One respondent wanted more information about increased trading opportunities for developers, particularly about water reserved for strategic purposes. They wanted to know how the department will advise developers about new	Water reserved for public open space can be licensed to developers. The *North West corridor supply strategy* uses a schedule to set a volume of water that individual developers can apply for in the Quinns, Eglinton and Yanchep groundwater subareas

Comment	Department of Water and Environmental Regulation response
opportunities to trade water entitlements, particularly who will be notified, how these parties will be notified and how this water can be applied for.	to meet all essential public open space requirements. Elsewhere, developers can look for opportunities to trade or transfer water entitlements from existing or transitioning properties. For enquiries and more information on water trading, please contact the Swan Avon regional office on 08 6250 8000 or at ellam.reception@dwer.wa.gov.au.
ii. One respondent questioned the effectiveness of the Waterwise Councils program, particularly as it is not mandatory and there are eligibility requirements for councils to participate.	Of the 16 metropolitan councils in the Gnangara plan area, all but one are part of the Waterwise Councils program. The program provides many benefits to councils and their residents, such as access to the urban greening scheme and waterwise irrigation training.
iii. One respondent suggested that Chapter 5 of the plan should cover future water demands in more detail, particularly for growing urban areas and in response to Western Australia's drying climate.	As part of the *Waterwise Perth Action Plan* (Government of Western Australia 2019) we are working with the Water Corporation, the Department of Planning, Lands and Heritage, the Department of Local Government, Sport and Cultural Industries and local governments to provide guidance on future development areas where local groundwater is likely to be insufficient to meet the demand for irrigation of public open space to 2050, and where strategies such as improvements in water use efficiency, redesign of existing public open space areas or investigations into an alternative water supply may be needed.
Question asked:	
Has the future urban growth of the North West corridor, and the water needs for that, been considered in the draft Gnangara plan allocations? Is additional groundwater going to be allocated for this urban growth?	As per Section 5.4 of the plan, we accounted for the changes in water demand and groundwater recharge from land use changes when assessing water availability for these growth areas. Along the North West urban growth corridor we have set aside water for future public water supply and for developing and irrigating new public open space areas where it was available and appropriate to do so.
5.5 Other licensed use	
i. One respondent suggested the reductions to the industry and mining sectors be increased to 20 per cent and the sectors should use scheme water or other sources as, in many cases, they have access to it and a higher ability to afford it.	The extraction of sand and other raw building materials is needed to support Perth's growth and development. In developing the plan, we considered larger reductions to licensed self-supply use. Larger reductions to self-supply abstraction, while resulting in improved environmental outcomes, would be significantly more disruptive for licensed self supply groundwater users and might result in

Comment	Department of Water and Environmental Regulation response
	fewer licensees being able to adapt to the changes. Where there is not enough groundwater available to meet demand for industry or mining, water will need to come from water trading, transfers, greater water use efficiency and water savings, or from alternative sources (other than groundwater).
ii. One respondent suggested that developers should pay a higher price for water than agricultural users and should be heavily regulated.	Water licence holders in Western Australia are not charged for the water they use.
Questions asked:	
1. Are there opportunities for construction and mining to use treated water for dust reduction programs and other aspects of extraction soon?	Temporary licences, such as for dust suppression and dewatering during construction, are exempt from the reductions in the plan. Where there is not enough groundwater available to meet demand for industry or mining, water will need to come from water trading, transfers, greater water use efficiency and water savings, or from alternative sources (other than groundwater).
2. If horticulture and residents can make changes, what are the capabilities of large companies to also achieve savings?	The 10 per cent reduction to groundwater abstraction for commercial and industrial operations, construction and mining will mean these users will need to make a range of business and water use adjustments similar to other sectors to reduce water demand and improve efficiency.

2.7 The benefits of taking less from the Gnangara groundwater system

This section of the statement outlines comments received on matters raised in relation to Chapter 6 of the final plan. The subheadings in Table 8 below relate to specific sections in Chapter 6 in the plan.

About a quarter of respondents commented on groundwater-dependent ecosystems, water quality or community and cultural values.

Table 8 Comments and questions received on the benefits of taking less from the Gnangara groundwater system

Comment	Department of Water and Environmental Regulation response
6.1 Groundwater-dependent ecosystems	
i. Local governments expressed concerns about the effect that the projected rise in water levels would have on wetland values and surrounding infrastructure within the vicinity of the East Wanneroo development area.	Ministerial water level criteria are established at four of the wetlands likely to be affected by groundwater level rises caused by the change in land use associated with the East Wanneroo development – lakes Goollelal, Joondalup, Mariginiup and Jandabup. The ecological water requirements of affected wetlands are a significant consideration in the design of the drainage infrastructure for the East Wanneroo development. We will work with the City of Wanneroo to advise on future levels at lakes – including Lake Badgerup – to inform the management of the lakes and construction of any assets such as boardwalks. See also our responses to related comments in Section 2.2 and under Section 2.3 of this report.
ii. Some respondents stated that more should be done to improve groundwater levels to meet existing water level criteria, rather than the draft plan's proposal to lower criteria levels at some sites. Many requested that current criteria levels be met at all 30 sites (rather than at around 15 sites as projected in the draft plan).	Our groundwater modelling shows that meeting the current Ministerial water level criteria at all 30 sites is unlikely to be achievable under a dry climate scenario, even if all groundwater abstraction is ceased. The EPA is formally reviewing our proposed changes to the environmental conditions set on the Gnangara groundwater resources in *Ministerial Statement no. 819* (Government of Western Australia 2009), including the water level criteria, under Section 46 of the *Environmental Protection Act 1986*. See Section 3.1 of this report or 6.1 of the Gnangara plan for more information.
6.2 Water quality	
Some submissions suggested prohibiting bores near the coast and the river to prevent saltwater intrusion. Some suggested this	Before a groundwater licence is issued to an applicant, we assess the application and situation, including evaluating the potential

Comment	Department of Water and Environmental Regulation response
apply not only to new bores but that existing bores be capped, and garden bores prohibited.	impacts of taking the groundwater. For licence applications near the coast, we consider saltwater intrusion risks. Where we identify some risks of saltwater intrusion, licensees may be required to monitor movement of the saltwater interface as part of their licence operating strategy. Our garden bore suitability map identifies areas close to the coast that may be unsuitable for installing new garden bores.
6.3 Community and cultural values	
Some submissions highlighted the importance of water and groundwater to Noongar culture and raised the need for greater consultation with and the involvement of Noongar Traditional Owners, Aboriginal people and communities in managing water resources. Involvement of First Nations people in resource management was noted as an important part of reconciliation. The department's Aboriginal Water and Environment Advisory Group encouraged the department to open discussions on actions proposed in the draft Gnangara plan with the new Noongar regional corporations in the coming months. These are yet to be established following the South West Native Title Settlement in 2021. One respondent called for the Gnangara plan to identify specifically how impacts to community and cultural values will be mitigated, avoided or restored in the event of any harm.	To contribute to Aboriginal empowerment and ensure that cultural values, economic, social and spiritual wellbeing are respected, we have four principles to inform and guide decisions to effectively collaborate and genuinely engage with Traditional Owners, Aboriginal people and communities. These guiding principles align with Western Australia's Aboriginal Empowerment Strategy and Closing the Gap Jurisdictional Implementation Plan that sets the State Government's high-level strategic approach for engaging and working with Aboriginal people towards empowerment and better outcomes. We are committed to engaging and consulting with Noongar Traditional Owners in managing Gnangara groundwater resources, with the goal of forming genuine partnerships that contribute to improved outcomes for the groundwater resource and for First Nations people. See also our response in Section 2.2 of this report under 'Stakeholder interests'.

2.8 Monitoring program for the Gnangara groundwater system

This section of the statement outlines comments received on matters raised in relation to Chapter 7 of the final plan. The subheadings in Table 9 below relate to specific sections in Chapter 7 in the plan.

Ten respondents commented on monitoring water levels, groundwater-dependent ecosystems and water quality or evaluating against the objectives. We operate an extensive network of more than 700 monitoring bores and 30 staff gauges to monitor the Gnangara groundwater system and the ecosystems that depend on it. This network ensures there is a comprehensive understanding of water levels across all aquifers of the Gnangara system.

Table 9 Comments and questions received on the monitoring program for the Gnangara groundwater system

Comment	Department of Water and Environmental Regulation response
7.1 Current monitoring	
i. One respondent commented that previous monitoring and analysis would be an important factor in assessing whether the proposed measures included in the draft plan would effectively protect groundwater-dependent ecosystems in the Gnangara plan area.	We agree that continued monitoring of water levels, water quality and ecological health, together with targeted scientific research, are essential to determining whether the plan's measures are meeting its objectives.
ii. One respondent suggested the plan did not contain enough clarity about the relationship between performance indicators and intervention strategies from the implementation date (2022) up to 2030. They suggest frequent reviews of monitoring data would assist in the assessment and determination of management responses due to unforeseen changes in groundwater elevation and/or quality outside of predictions and thresholds.	We will continue to comply with reporting requirements related to *Ministerial Statement no. 819* (Government of Western Australia 2009) or a revised statement following the assessment under Section 46 of the *Environmental Protection Act 1986*. These annual reports are published on WA.gov.au and detail our level of compliance with Ministerial conditions and commitments under *Ministerial statement no. 819*. The reports present total licensed groundwater entitlements from the Gnangara groundwater system and outline the results of our environmental monitoring, management, research and consultation in managing abstraction from the Gnangara groundwater system.
iii. One respondent wanted the department to monitor the health of all wetlands affected by the Gnangara system on an annual basis.	As part of our commitments under *Ministerial Statement no. 819* (Government of Western Australia 2009), we conduct and engage ecological condition monitoring at representative wetland and bushland sites. This monitoring provides critical information about the system's overall health and the effects of short- and long-term changes in

Comment	Department of Water and Environmental Regulation response
	water levels on ecosystem values. The current monitoring program is given in Section 7.1 of the plan. We will continue to conduct a comprehensive ecological monitoring program into the future.
iv. One respondent wanted findings from wetland health monitoring to be reported on an annual basis and reviewed externally every three years.	We will continue to comply with reporting requirements related *to Ministerial Statement no. 819* (Government of Western Australia 2009) or a revised statement following the assessment under Section 46 of the *Environmental Protection Act 1986*. See our response to comment ii above. These reports are submitted to and audited by the EPA.
v. One respondent was concerned about the removal of departmental monitoring bores that had gone dry.	We have a groundwater assets team responsible for managing our monitoring bores. They oversee a bore replacement program to replace bores, as required, and install new bores.
vi. One respondent was concerned about a lack of Leederville monitoring bores (current and proposed) in the Swan Valley. They wanted to see monitoring bores installed in the east and west of the valley to ensure adequate monitoring data was being obtained.	In 2022, as part of the State Groundwater Investigation Program, we plan to install nine shallow groundwater monitoring bores in the Superficial aquifer, and nine deep groundwater monitoring bores in the Leederville aquifer. We will use information from these new bores to develop a new hydrogeological conceptual model of the area and provide a regional scale guide to facilitate potential managed aquifer recharge proposals for water supply.
vii. One respondent believed the focus of water quality considerations in the draft plan appear to be on water supply and salinity and suggested full groundwater analytical programs would assist in ensuring the future health of groundwater-dependent ecosystems.	Our ecological monitoring program incorporates annual measurement of water quality parameters, in conjunction with macroinvertebrate sampling at representative wetlands, with the aim to identify trends and changes to wetland health. For example, wetland water quality monitoring detected acidification events at Lake Jandabup, which prompted changes to the artificial maintenance regime and succeeded in restoring wetland health. See Section 7.1 of the plan for more detail.
viii. One respondent said the proposed monitoring programs appeared to focus on vulnerable environmental values and suggested these monitoring programs be accompanied by specific intervention strategies, clearly defining what actions are required when water quality thresholds are exceeded.	As part of requesting amendments to some of the minimum water level criteria under Section 46 of the *Environmental Protection Act 1986*, we are preparing a groundwater monitoring and management plan that will consolidate our commitments related to the Gnangara plan. The plan will include monitoring of water quality parameters at representative wetlands and describe how we will respond to adverse trends or anomalous data detected by the monitoring program.

Comment	Department of Water and Environmental Regulation response
ix. One respondent was concerned about dewatering of acid sulfate soils (ASS) and potential acid sulfate soils (PASS) classified areas. They recommended that dewatering and drawdown not be allowed in these areas, whether from garden bores or construction, due to the risk of irreversible acidification. They said more specific information about the location of these areas was necessary.	Broadscale risk maps for several coastal regions of WA, including the Gnangara area, may be accessed via data.wa.gov.au which delivers land-based spatial information to the public. See our website for more information on acid sulfate soils including a fact sheet on: *Managing urban development in acid sulfate soil areas*.
7.2 Evaluating against water resource objectives	
One respondent suggested planning and implementation actions should be designed so that tipping points are not reached, however that cannot be guaranteed.	Table 8 in the Gnangara plan outlines the actions we will take to implement the plan. So that we remain transparent and accountable to our stakeholders, we will publish progress reports every two years. These progress reports will be published on our Gnangara website and WA.gov.au. We will continue to comply with any reporting the EPA requires after its assessment of this plan under Section 46 of the *Environmental Protection Act 1986*. These reports will also be available on our website.

2.9 Implementing and reviewing the plan

This section of the statement outlines comments received on matters raised in relation to Chapter 8 of the final plan. The subheadings in Table 10 below relate to specific sections in Chapter 8 in the plan.

Eleven respondents commented on aspects of implementing and reviewing the plan, including the plan timeframe and stakeholder engagement and collaboration.

Table 10 Comments and questions received on implementing and reviewing the plan

Comment	Department of Water and Environmental Regulation response
8.1 Plan timeframe	
i. One respondent asked how the plan links to the Water Sensitive Cities Program which establishes 2030 as the target year. However, the plan refers to 2032 – this needs to be consistent as a government policy.	The Gnangara plan is not directly linked to the Water Sensitive Cities Program but is a part of the *Waterwise Perth Action Plan* (Government of Western Australia 2019) that sets a target of using 10 per cent less groundwater across the region by 2030. The reductions in the Gnangara plan, which will be fully implemented by 2032, are contributing to this target.
ii. One respondent thought a 10-year timeframe for the plan was too short and suggested that it should be at least 25 years. Another thought the 10-year timeframe was unrealistic, especially considering the outcomes and objectives will only be reviewed in 2030, two years before the plan expires.	The Gnangara plan will remain in effect until it is replaced by a new water allocation plan, amended or revoked by the Minister for Water. A formal review of whether the plan's outcomes and objectives are being met will take place in 2030.
8.2 Implementing the plan	
i. One respondent would like us to ground truth the modelling that is supporting the assessment under Section 46 of the *Environmental Protection Act 1986* by annually checking against real data and said we should revise the management approach accordingly.	We assess water levels at groundwater-dependent ecosystems as part of our annual and triennial reporting requirements related to *Ministerial Statement no. 819* (or a revised statement following the assessment under Section 46 of the *Environmental Protection Act 1986*). We will use these assessments and other monitoring across our network to track how actual levels are performing against modelled levels.
ii. One respondent believes the management of Gnangara groundwater resources needs to be overseen by an independent community-based group. Members would represent Traditional Owners, community members of bushland groups, environment experts, scientists and local government.	We consult with a range of community groups and in the past few years, have held dozens of meetings, presentations and information sessions for community stakeholders to develop the Gnangara plan. We will continue with a targeted approach to community consultation, such as through annual updates to key environmental and Noongar stakeholders.

Comment	Department of Water and Environmental Regulation response
iii. The Aboriginal Water and Environmental Advisory Group (AWEAG) commented that we should wait to finalise the plan until after the Noongar ILUA prescribed body corporates are established, and directors appointed, and they have had an opportunity to review the plan.	We have progressed the final plan to begin rebalancing the groundwater system as soon as possible. However, we will contact the relevant Noongar regional corporations to begin the conversation about how to improve incorporation of Noongar knowledge into the management of Gnangara groundwater resources. See also related responses to comments in Section 2.2 of this report under 'Stakeholder interests' and Section 2.7 of this report under 'Community and cultural values'. **Plan changes:** The final plan includes a new Section 1.6.1 on Aboriginal engagement and actions in Table 8 to continue to engage with the AWEAG and to work directly with regional corporations or representatives as we implement the plan.
iv. Respondents commented that they supported collaborating with the department or others to achieve the plan or better outcomes for water users.	We value collaborating with stakeholders to achieve better outcomes for water users, water resources and groundwater-dependent ecosystems. We look forward to continuing to do so as we implement and evaluate the Gnangara plan.

3 Where to next?

Where indicated in the tables above, plan changes have been included in the final *Gnangara groundwater allocation plan* (DWER 2022a). The plan is available on our Gnangara website and WA.gov.au.

The final *Gnangara groundwater allocation plan* outlines how we will allocate and manage groundwater resources in the Gnangara area through licensing, assessment, policy and reporting.

The final plan includes the following implementation actions to support water users to adjust to the abstraction reductions:

- The department will develop a new water use efficiency grants scheme with DPIRD to support horticultural groundwater users in the Gnangara plan area who are subject to the 10 per cent reduction to abstraction.
- The department will develop a program to support local governments, targeted to those in areas most impacted by the urban heat island effect, to prepare for the reductions in their water entitlements.
- The groundwater that existing nurseries and tree farms (i.e. that hold a licence at the time the Gnangara plan is released) use to irrigate plants for commercial purposes will be exempt from the reductions in abstraction. These businesses will play an increasingly important role in providing plants and trees for waterwise gardens and landscaping, which will help keep Perth cool and green as we adjust to a drier climate. The department will work closely with the nursery and tree farm sector to develop new waterwise standards.
- To support water wise gardens and the introduction of the changes to the garden bore sprinkler roster, the Water Corporation will be offering services and rebates to encourage the uptake of water efficiency products and practices ahead of the drier months.

3.1 Addendum to the Gnangara plan and groundwater monitoring and management plan

The Gnangara plan includes proposed new minimum water level thresholds at some of the representative wetland and bushland sites that have criteria set in *Ministerial Statement no. 819* (Government of Western Australia 2009). These changes consider what is likely to be achievable given the effects of climate change and reductions to abstraction and are currently being assessed by the Environmental Protection Authority (EPA).

The EPA is undertaking a formal review of our proposed changes to the environmental conditions set on the Gnangara groundwater resources in *Ministerial Statement no. 819*, including the water level criteria, under Section 46 of the *Environmental Protection Act 1986*.

As part of requesting amendments to some of the minimum water level criteria, we are preparing a groundwater monitoring and management plan (GMMP) for the Gnangara groundwater resources. The GMMP will be consistent with the EPA's recent guidance on preparing environmental management plans (EPA 2021).

The groundwater monitoring and management plan (GMMP) will:

- consolidate our environmental monitoring program for the Gnangara plan, including monitoring of vegetation condition, water level and water quality parameters at representative wetlands
- describe how we will report on and respond to adverse trends or anomalous data detected by the monitoring program
- be relevant to both the current water level criteria set in *Ministerial Statement no. 819* and to the proposed new threshold levels intended to come into effect from 2028
- describe how new climate science regarding rainfall projections will be incorporated into the evaluation and review process for the new thresholds.

Once the EPA has completed its Section 46 assessment, including consideration of the submissions we received on the draft Gnangara plan and our response to them, it will provide its report and recommendations to the Minister for Environment. Following approval by the Minister, any revisions to existing environmental conditions and water level criteria in *Ministerial Statement no. 819* will form part of a new statement, which will be published as an addendum to the final *Gnangara groundwater allocation plan,* along with the GMMP.

The *Gnangara groundwater allocation plan methods report* (DWER 2021b) has more detail on how we developed the new threshold levels.

3.2 Further information

Information is available at the following websites:

- Gnangara groundwater system and *Gnangara groundwater allocation plan*, visit: gnangara.dwer.wa.gov.au
- Waterwise Perth Action Plan, see: https://www.wa.gov.au/service/natural-resources/water-resources/program-waterwise-perth-action-plan
- Be Groundwater Wise initiative, including waterwise gardens and bores, visit: https://begroundwaterwise.wa.gov.au

For queries about this statement of response, contact: gnangara.planning@dwer.wa.gov.au

Shortened forms

ASS	Acid sulphate soils
AWEAG	Aboriginal Water and Environmental Advisory Group, set up by DWER
BoM	Bureau of Meteorology
CMIP	Coupled Model Intercomparison Project
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Department of Biodiversity, Conservation and Attractions
DER	Department of Environmental Regulation (now DWER)
DLGSCI	Department of Local Government, Sport and Cultural Industries
DoW	Department of Water (now DWER)
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
GMMP	Groundwater monitoring and management plan
ILUA	Indigenous Land Use Agreement
IPCC	International Panel on Climate Change
MAR	Managed aquifer recharge
NWI	National Water Initiative
PASS	Potential acid sulfate soils
PDWSA	Public drinking water source area
PRAMS	Perth regional aquifer modelling system
PRCAC	Perth regional confined aquifer capacity study
SGIP	State Groundwater Investigation Program
SWALSC	South West Aboriginal Land and Sea Council
WAPC	Western Australian Planning Commission
WEM	Water Efficiency Measures
WPAP	Waterwise Perth Action Plan

Glossary

Commonly used terms in relation to water resource management in the plan area are listed below.

Abstraction	Withdrawal of water from any groundwater source of supply.
Acid sulfate soils	Sediments that contain sulfuric acid stored below the watertable (and in wetlands) as the mineral pyrite that is released and starts to leach when exposed to air.
Allocation limit	Annual volume of water set aside for use from a water resource.
Ecological values	The natural ecological processes occurring within water-dependent ecosystems and the biodiversity of these systems.
Groundwater area	The boundaries proclaimed under the *Rights in Water and Irrigation Act 1914* (WA) and used for water allocation planning and management.
Groundwater-dependent ecosystem	An ecosystem that is at least partially dependent on groundwater for its existence and health.
Licence (or licensed entitlement)	A formal instrument granted under the *Rights in Water and Irrigation Act 1914* that entitles a licensee to take water (the licensed entitlement) from a water resource in accordance with the specified terms, conditions and restrictions.
Metering	Refers to the measurement of water that is taken from a water resource using a water meter. Licensees must ensure the meter and installation complies with the Rights in Water and Irrigation (Approved meters) Order 2009.
Over-allocation	A situation where licensed water entitlements, together with exempt uses and public water supply reserves, exceed the allocation limit set for a water resource.
Over-abstraction	A situation where the total volume of water actually abstracted by licensed and exempt water users exceeds the allocation limit set for a water resource.
Public water supply	Water taken by public water suppliers (licensed through the Economic Regulation Authority) to supply water to homes and businesses, generally at drinking water quality and through a metropolitan or town water supply scheme.
Public water supply reserve	The volume of water reserved for planned public water supply needs.
Recharge	Water that infiltrates through the soil to replenish an aquifer.
Saline water intrusion	An increase in the area where dense salty water from the ocean, along our coastlines and saline parts of rivers, has reached into the bottom of the aquifer.

Self-supply water use (private use)	Water taken or diverted from a source by a private individual, company, or public body for their own individual requirements.
State Agreement	A State Agreement is a legal contract between the Western Australian Government and an applicant of a major project within the boundaries of Western Australia. State Agreements detail the rights, obligations, terms and conditions for the development of the specific project. In some circumstances the agreement contains clauses regarding water supply and this can affect what is required under the *Rights in Water and Irrigation Act 1914*.
Subarea	A subdivision, within a surface or groundwater area, defined to better manage water allocation. Subarea boundaries are not proclaimed and can therefore be amended without being gazetted.
Temporary licence	A licence issued under section 5C of the *Rights in Water and Irrigation Act 1914* for a duration shorter than the maximum 10 years for a temporary use. Justification for a temporary licence may include type of works and risk to resource.
Unused water entitlement	That part, or all of a licensed annual water entitlement that has not been taken for more than three consecutive years. For the Gnangara plan area, the department will calculate the amount of unused water as the annual water entitlement less the recorded peak water use (productive, authorised use), where peak water use is the largest recorded volume used during the previous three years, and may be audited with alternative methods including onsite surveys.
Vegetation hydrotype	A grouping of plants based on their 'water tolerance' and determined by where they are found in the landscape in relation to topography and groundwater depth (Sommer & Froend 2010).
Water level criteria	Water levels and thresholds committed to as conditions set under the *Environmental Protection Act 1986* in *Ministerial Statement no. 819* (Environmental Protection Authority 2009).
Water resource	Water resources includes — • watercourses and wetlands together with their beds and banks; • other surface waters; and • aquifers and underground water.

Water wastage

Water from a well that —

- is being wasted, whether by reason of neglect, failure to make repairs that are reasonably necessary for proper maintenance of the well or any other cause; or
- is being improperly used; or
- is being taken or used without all reasonable steps being taken to minimise degradation of the water resource; or is having harmful effect; or
- is not being used to the best advantage.

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