UDIA WA Position Paper

Alternative Water Sources: Irrigation of the Public Realm

Prepared by the UDIA WA Urban Water Committee

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1. Executive Summary

The identification and implementation of alternative water sources for irrigation of the public realm including but not limited to recycled waste water, water from surface and sub-soil drainage and stormwater harvesting can be driven by State-led Solutions, through the commercial interests of the private sector or in partnership of both. The absence of a holistic approach to the implementation of these water sources at scale has resulted in a number of Perth's major growth corridors being faced with limited volumes or an absence of water to irrigate these spaces.

Having access to quality public open space is critically important for the health and well-being of our communities. Such an issue creates significant disparity between our communities, with all West Australians deserving equitable access to the state's water resources at an equitable cost.

Historically, provision of water in Perth for the irrigation of public open space (POS) has been through the use of groundwater. However, managing water resources is increasingly challenging for urban development as population growth and a drying climate impair the availability of water. As allocations for groundwater are no longer available, the community faces the potential of dry parks and recreation spaces unless action is taken to provide alternative sources of water.

This paper examines the barriers to alternative water schemes (AWS) for the irrigation of the public realm and suggests a number of actions to ensure the amenity of POS is maintained to support the health and well-being of our communities in perpetuity.

As outlined within the paper, higher order barriers to the implementation of AWS across the Perth and Peel region include:

- The cost to implement AWS, which can directly impact on land pricing and affordability
- Cost comparability against the premise that groundwater is free
- The ability of a proponent to recover on-going operational expenses as alternative schemes have traditionally been more expensive than scheme water to operate
- The cost of resolution of water shortages is typically borne by new growth areas or new users, which is inequitable with existing users in WA
- The complexity associated with securing an operating agency to take ownership of the system and on-going maintenance; and
- The Proponents' risk considerations of navigating complex approval processes.

A comprehensive outline of barriers facing implementation is outlined in section 4.

Potential actions to foster the implementation of AWS across the Perth and Peel regions include:

1. Provide security of supply for developments where groundwater is fully allocated or constrained through use of alternative sources such as surface or sub-soil drainage, recycled wastewater, stormwater etc.

   The role of government could include:

   a. Direct funding of the delivery of an AWS demonstration project.

   b. Level the playing field between groundwater and alternative supplies by providing incentives (subsidies, grants, funds, programs etc.) for decentralized recycling schemes that promote economies of scale across multiple developers. This could be through partnership with a utility, through Local Government, a public private partnership, or another governance structure.

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c. Level the playing field between groundwater and alternative supplies by distributing the costs for decentralized recycling schemes across Perth's residential customer base.

d. Providing positive incentives for a Managed Aquifer Recharge storage scheme which can be used to store water for open space and the public realm in winter for use in summer.

2. Identify a suitable governance model that is able to achieve the following outcomes:

   a. coordination across groups, including the timely resolution of barriers and potential conflicting demand between the service utilities, local governments and developers.

   b. reduction of approval times for innovative developments proposing AWS

3. Identify the appropriate state agency, corporation or taskforce to develop a planning and implementation tool to help assess the costs and benefits of AWS. The tool will enable comparison of capital and operating costs for alternative AWS in a range of contexts across the Perth region, enabling selection of the most sustainable option, and where the AWS is financially viable it will help secure a licenced operator.

4. Establishment of a State -wide headworks strategy, which provides the cost of new water sources being shared by all West Australians.

5. Reduce demand for groundwater via a community awareness campaign for domestic groundwater users that explains the issues and proposes acceptance of low water use parks as well as possible changes to charging for water and water-rates.

6. Advocate for more effective integration of non-potable water supply planning into land use planning as part of the pending review of the Better Urban Water Management framework.

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2. Introduction

The purpose of UDIA's Urban Water Committee (UWC) is:

> "***To promote an efficient, innovative and coordinated approach to urban water management ensuring that competing social, economic and environmental demands for water are appropriately balanced"***

The UWC advocates for "***a whole-of-Government commitment to support the principle of fit-for-purpose water use, which includes the investigation and adoption of innovative and best practice water recycling methods, coupled with water sensitive urban design."*** Indeed, UDIA's State Council identified promoting "***Inter-Government/Agency collaboration to progress alternative water supplies"*** as a key focus area.

It is recognised that managing water resources is increasingly challenging for urban development as population growth and a drying climate impair the availability of water. As a result, a wide-ranging approach is needed to ensure that competing social, economic and environmental demands for water are appropriately managed with water secured for all needs. Significant scientific and technological developments in the design and construction of urban water management systems continue to offer opportunities for improvement and support the establishment of alternative water sources. Further, the identification of barriers that constrain the implementation of alternative water supplies, will enable the development of strategies and actions that provide solutions to address these barriers.

This position paper focuses primarily on overcoming the barriers of implementing alternative water schemes for irrigation purposes of the public realm in the Perth and Peel regions. Many of the issues and principles cited below, however, also apply to the South-West Region, and Bunbury and Busselton in particular. The barriers and recommended solutions for AWS at a household scale are dealt with in a separate position paper.

3. The need for Alternative Water Supply of the Public Realm in the Perth and Peel regions

Local government authorities, developers, schools, businesses and sporting clubs in Greater Perth (Perth and Peel Regions) currently take about 80 gigalitres a year of shallow groundwater to irrigate parks, school ovals, and other recreation spaces. A further 82 gigalitres per year of shallow groundwater is taken by an estimated 190,000 households that use bore water to irrigate gardens across the region. This low-cost and easily accessed non-potable water source has been a key element for urban growth and the liveability of Greater Perth.

The effects of climate change in reducing recharge to aquifers and the current intensity of water use has meant that sustainable groundwater sources are no longer available in most areas planned for future urban growth. Existing groundwater users will need to use less water in a hotter, drier climate while maintaining urban amenity and mitigating against urban heat. As an example of using less water, the City of Wanneroo has in the north-west urban growth corridor adopted a lower average irrigation rate of 6,750 kilolitres per hectare per year for public open space (i.e. the rate is 10% less than the previous recommended rate of 7,500 kL/ ha/year). Such an irrigation rate is expected to be implemented across the Greater Perth region.

The Department of Water and Environmental Regulation (DWER) estimates that non-potable water demand for green spaces in Greater Perth will exceed the available groundwater by 30 gigalitres per year by 2050. This is in addition to projected unmet demand for growth of the region's fresh food production, heavy industry and economic development needed to service a population of 3.5 million by around the middle of this century. While groundwater will continue to meet the largest portion of demand for non-potable water to irrigate greenspaces into the future, new urban areas, particularly in areas without access to groundwater resources will need alternative water sources to ensure high quality greenspaces and the resulting improvement in amenity and liveability.

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Stakeholders in the future urban development of the eastern outer metropolitan areas in particular (e.g. City of Swan, City of Armadale, and Shire of Serpentine-Jarrahdale), are currently planning for alternative, affordable water supply solutions to irrigate greenspaces.

Urban infill areas in the central sub-region and greenfield developments in each of the four Perth development corridors, together with the Peel Region and Greater Bunbury areas, will also need alternative water supplies to support urban and population growth.

Planning for new urban areas must consider the total water cycle and locally available, climate-resilient water resources. There are various matters to consider in identifying the most suitable alternative water supply including, for example: the water source (e.g. domestic wastewater, stormwater, surface drainage, and sub-soil drainage); treatment requirements (i.e. for end use, environment and public health); storage (e.g. surface storage, underground storage, managed aquifer recharge); and distribution.

A number of case studies have been considered by UDIA's UWC technical subcommittee on AWS as examples that explain how the identification of key barriers and opportunities were addressed for the implementation of AWS in each project that include:

- Alkimos: Recycled Water Plant at Alkimos WWTP;
- Hartfield Park: Managed Aquifer Recharge;
- Brabham and North East Corridor: Recycled Sub-surface Drainage

These case studies are presented in Annexure 1.

The AWS subcommittee has completed a detailed review of the barriers and opportunities available in regard to the implementation of the following AWS:

- Recycled Water Schemes; and
- Stormwater Harvesting.

This analysis is presented in Annexure 2.

Finally, considerations of stakeholder engagement are also important in considering the implementation of AWS. A Stakeholder Engagement Framework is presented in Annexure 3.

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4. Barriers to Alternative Water Systems in Public Realm Irrigation

There are numerous factors that limit the implementation and ongoing success of AWS, including:

1. Economic

1.1 High Establishment and Operational Costs: The initial high cost to construct and maintain an AWS, when limited project funding may be available.

1.2 Small bespoke AWS, with limited customer bases lack economies of scale to become price competitive with established alternatives; unless they can attract sufficient revenue other than from the supply of non-potable water, such as from tariffs for collecting and treating domestic wastewater. Use of non-standard technologies and limited availability of skilled operations may add to the expense of these systems.

1.3 Costs and risks associated with supply need to match demand throughout the entire lifecycle of the AWS to account for differences in availability of AWS and peak demand periods.

2. Planning

2.1 Whilst the existence of a shortage or absence of a sustainable source of water is often identified at the early stages of land use planning, consideration of alternative water sources is often deferred. Early identification of alternative water sources at the early stage of planning would support the State Government's position on creation of liveable neighbourhoods.

3. Regulatory and Policy

a. **Price Competition with Existing Water Sources**: The total cost considerations for establishment and operation of an AWS being greater than the costs associated with accessing groundwater (no volume charge) or mains water.

b. **Risk of Approvals**: Length of approval processes and uncertain outcomes as well as the lack of a key agency leading the approval process

c. **Onerous Levels of Service requirements**: Licensing of AWS usually attract the same level of service conditions as potable schemes. For example, a requirement to reinstate the supply within 6 hours, when a non-potable scheme could be down for days and not cause too much inconvenience. Having a 5-day reinstatement period would result in drastic savings for the operator who would not have to employ as many staff, carry inventory, pay overtime.

4. Governance

4.1. Establishment of Ongoing Operator: Uncertainty around the ongoing ownership and maintenance of an AWS, including associated costs, has been known to be a barrier in the uptake of AWS.

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5. Key Actions to Drive the Implementation of Alternative Water Supplies

Implementation of AWS for public realm irrigation across the Perth and Peel region of WA can be undertaken with some or all of the following actions:

1. Provide security of water supply to development areas where groundwater is fully allocated or constrained through the use of alternative sources such as surface or sub-soil drainage, recycled wastewater, stormwater etc. The role of government could include:
    a. Direct funding of (or obtaining federal grants for) the delivery of an AWS demonstration project.
    b. Adopting appropriate incentives (subsidies, grants, programs, etc) for decentralized recycling schemes that promote economies of scale across multiple developers. This could be through partnership with a utility, through a Local Government, a public private partnership, or another governance structure.
    c. Levelling the playing field between groundwater and alternative supplies by distributing the costs for decentralised recycling schemes across Perth's residential customer base.
    d. Providing positive incentives for a Managed Aquifer Recharge storage scheme which can be used to store water for open space and the public realm in winter for use in summer.
2. Identify a suitable governance model that is able to achieve the following outcomes:
    a. coordination across groups, including the timely resolution of barriers and potential conflicting demand between the service utilities, local governments and developers.
    b. reduction of approval times for innovative developments proposing AWS
3. Identify the appropriate state agency, corporation or taskforce to develop a planning and implementation tool to help assess the costs and benefits of AWS. The tool will enable comparison of capital and operating costs for alternative AWS in a range of contexts across the Perth region, enabling selection of the most sustainable option, and where the AWS is financially viable it will help secure a licenced operator.
4. Establishment of a State -wide headworks strategy, which provides the cost of new water sources being shared by all West Australians.
5. Reduce demand for groundwater via a community awareness campaign for domestic groundwater users that explains the issues and proposes acceptance of low water use parks as well as possible changes to charging for water and water-rates.
6. Advocate for more effective integration of non-potable water supply planning into land use planning as part of the pending review of the Better Urban Water Management framework.

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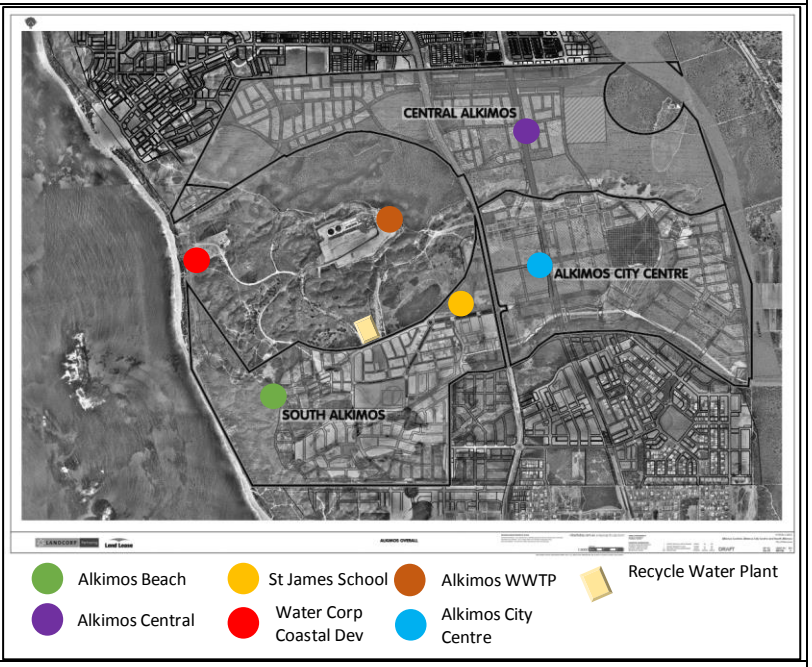
Annexure 1: Case Studies

Case Study: Alkimos

Purpose	Build a Recycled Water Plant at Alkimos WWTP to supplement existing water sources with recycled water for use on Public Open Spaces within the Alkimos Precinct Save groundwater resources or free up groundwater allocations in return for use of recycled source Maintain existing irrigation rates of 6,750kL/ha/yr to Public Open Space Introduce a fixed specified area rate through CoW to cover ongoing operational costs of the plant Financial contribution by the City in lieu of BAU current operating costs for bores Offset and supply agreement with WC for the use of recycled water Show environmental and social leadership
Proposal	Construct a new Recycled Water Plant (RWP) which would take effluent from WC's neighbouring Alkimos Wastewater Treatment Plant (AWWTP) and treat the effluent to the required standard of recycled water to irrigate the POS within the Alkimos area including the developments as shown on Figure below Effluent would be supplied by WC under a 30 year supply contract with LL or another entity WC would enter into offset agreement with LL or another entity for the supply of water to WC's operations and the Coastal Node development WC would facilitate the co-location of the RWP on their AWWTP site CoW would introduce a fixed specified area rate to ratepayers to cover ongoing operational costs of the plant City would pay small ongoing financial contribution in lieu of BAU current operating costs for bores 
Key Benefits	Recycled water from the RWP would: • Meet short, medium and long term irrigation water needs of all stakeholders including future development area of Alkimos Central

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	METRONET Station Precinct • Provide a sustainable and flexible irrigation water solution, ensuring long term security for irrigation of POS in a water constrained environment at the lowest whole of life cost • Be a valuable use of the waste water, saving groundwater resources or freeing up groundwater allocations in return • Ensure high quality green open spaces that will assist reducing urban heat island effect and improve health and wellbeing of residents as well as enhance biodiversity in the area
Barriers Encountered	Refer to key barriers 3.1 and 4.1; requires collaboration and commitment across multiple stakeholders and potential redistribution of costs and benefits, which there currently is a lack of.
Status	On hold due to current pending commitment from key stakeholders

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Case Study: Hartfield Park: Managed Aquifer Recharge

Purpose	Groundwater allocation were insufficient for the irrigation needs of the growing council. This led to an investigation into the opportunities for alternative water sources for irrigation of the Hartfield Park regional open space
Proposal	Investigations showed that MAR was feasible using an injection bore to recharge the Leederville Aquifer. The bore is approximately 50m deep and is used to inject the water into the Aquifer. This bore injects water in winter and extracts water in summer for irrigation. During the first year, the trial injected 4,400KL of filtered stormwater between June and October 2016. MAR technology requires bespoke design and research to accommodate site specific conditions.
Key Benefits	- When running at capacity, the full scheme is likely to produce a water surplus. City of Kalamunda considers using this excess for trading or for irrigation of other parklands. - Cost saving: The water source is very fresh and therefore the harvested stormwater only requires filtration treatment - MAR requires minimal on-going personnel involvement
Barriers Encountered	- Obtaining (DWER) licence to take surface water and a licence to extract the injected stormwater - During the first trial year, a record low winter rainfall and runoff affected the main drain and resulted in lower than expected available runoff. This highlighted the need to factor extreme climate conditions in the project's risk modelling - Stringent approval process, which included discussions with DWER, Department of Health and the Water Corporation. Together with an extensive hydrological feasibility and viability assessment, the need for appropriate time and resource allocation was imperative to the success of the project.
Status	The Hartfield Park MAR requires minimal ongoing personnel involvement When running at capacity, the full scheme is likely to produce a 100-150KL water surplus, after meeting the community's recreation and amenity needs. The city of Kalamunda is considering using the excess water for trading or to irrigate other parklands within the City.

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Case Study: Brabham and North east Corridor: Recycled subsurface drainage

Purpose	The Swan valley groundwater system is fully allocated leaving a shortfall for irrigation of public open space in Brabham and other future developments in the region.
Proposal	Harvest additional recharge from development in this already high groundwater region to be stored and collected through sub soil drainage. This will be used in summer for POS irrigation. The difference in timing between supply and demand could be managed through one or more of the following: - Managed aquifer recharge for storage, potentially at a regional scale. - Third pipe for use within homes which has a more consistent demand throughout the year. - Utilise other sources of water beyond subsoil drainage such as wastewater treatment, stormwater runoff etc.
Key Benefits	- Has the potential to produce a surplus that can be used for existing and future development sites in the region - Can be used to recharge the fully allocated Swan groundwater system - Department of Communities has a long-term involvement with the site and could be the owner of the system and carry the risk.
Barriers Encountered	- Obtaining (DWER) licence to harvest subsoil drainage that is considered “additional recharge” - Regional scale approach would be more cost effective but also subject to delays and increased risk. - Wastewater is already “recycled” at Beenyup and local wastewater recycling would reduce volumes available downstream
Status	- A design charrette titled “Ideas for Brabham” was held in June 2018 to explore water supply options - A local structure plan for Stage 1 of the Brabham development by Peet and Department of Communities will be delivered 2019 - Water Corporation is investigating wastewater reuse in the North East Corridor which includes Brabham

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Annexure 2: Key Barriers and Opportunities of AWS

A. Recycled water scheme

Key Barrier	Description	Possible Solutions	Opportunities
1. Perceived high CAPEX and OPEX	• CAPEX and OPEX are mostly compared with "free" groundwater and/ or "BAU" scheme water; therefore, the business case mostly doesn't stack up and developers don't budget for an AWS if they have an alternative option.	Market based / legislative • Increasing the price of scheme water and introducing a fee on groundwater to reflect the true costs (including social and environmental externalities) • Councils to introduce 'service charge' for the provision of well-maintained POS Incentives • Subsidies and financial government incentives or disincentives • Political or other ways to encourage water utilities and developers to take on innovative schemes	• Provide certainty by driving change for future charging of groundwater i.e. in regions reaching full allocation or limited groundwater ability • Provide incentives, subsidies for demonstration schemes i.e. in regions reaching full allocation or limited groundwater ability
2. Customer expectations	• Customers have an expectation that their Council provides well maintained POS and public realm at no extra costs to them • Concerns about perceived health issues in relation to water quality • Concerns about perceived visual issues in relation to aesthetics	Awareness raising: • Changed messaging around recycled / treated waste water and groundwater in general • Changed messaging around low irrigation parks • Understand trade-offs between the next desal plant and other alternative sources Market based instruments: • Increased pricing for water sources • Linking water pricing increases with the third Desal.	Encourage government to deliver shared messages around water availability Increased pricing for water. Water pricing to change balance between supply cost and usage charge
3. Timing of availability of supply and demand	• Not delivered in timeframe expected	Provide greater flexibility in access to water sources in the short term (e.g. bore water) while waiting for recycled water to come online. Awareness raising:	

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		• Share case studies from successful projects (WGV etc.)	
4. Approval process	• Poorly defined requirements • Lengthy approval processes	Removing barriers for innovative developments by considering one or more of the following: • Establishment of an interagency committee to support exemplar developments • Fee for fast track of innovative project pre-accreditation process • Single approval agency Awareness • Share case studies from successful projects (WGV etc.)	Learn from and scale up the CRCWSC project that will design, implement and evaluate a governance structure that supports innovation at Brabham.
5. Governance of the scheme	• Inability to agree on contractual terms or poorly defined arrangements • Conflict between stakeholders	Begin negotiations in the design & planning phase of the project Share case studies from successful projects (WGV etc.) Run a trial using new community titles. Provide an independent body to mediate discussions around ongoing governance	

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B. Drainage/Stormwater harvesting

Key Barrier	Description	Possible Solutions	Opportunities
1. Rainfall patterns and irrigation demand require large storage volumes to be effective	• Harvested water from surface catchment. • Needs large enough contributing catchment • Water must be treated before use • Usually requires large storage volume to maintain small irrigated area • Catchment may either be local (within development) or larger (regional, captures upstream inflows • Difficult to retrofit	• Subsurface storage could be achieved using MAR, where aquifers are suitable. • Surface storage via traditional tanks possible. • Subsurface storage solutions exist however are typically expensive to implement • Blend with modest groundwater allocation so that groundwater is only used during peak summer demand – to stretch the water out	• Investigate for areas where groundwater is over allocated or of poor-quality Greenfields development • Infill development with significant roof catchment areas. • Water Corporation drains Created surface drainage lines (e.g. Wungong Urban Water Area)
2. Governance of the AWS – local government the default owner and operator	• Harvesting system will rely on catchment areas which may or may not be under control of the operator. • May require controls on land uses within the catchment • Likely to require treatment pre-storage, and treatment pre-use • Operator may need specialist training to maintain the system • Owner of asset needs to be prepared for cost of managing and replacing the system.	• Private operator technically possible, but unlikely to be financially viable. • System maintained by corporate body or developer for an extended period • Differential rates to be applied to cover additional operating costs	

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Annexure 3: Stakeholder Engagement framework

The following stakeholders and their roles have been identified to either have key interfaces with approval processes for alternative water supply initiatives, be a user of the scheme or responsible for the implementation and/or maintenance of an AWS scheme.

Stakeholder	**Description**	**Potential Functions**		
		Proponent	Approval Body	End User
Land Developer	Designs, builds, finances and possibly owns and operates the AWS scheme. Can be either private developers (Lendlease, Peet) or state developers (Department of Communities, LandCorp/MRA)	Yes	No	Yes
LGA	Provides planning approval through the land planning process May be a water service provider Administers community health provisions of the Health Act 1911 Administers the Building Act 2011 and the Building Regulations 2012; Owns and maintains local drainage assets and public open space irrigation infrastructure and therefore is the ultimate end user of the AWS as responsible for the long-term irrigation, care and maintenance of POS once it has been handed over from a Developer unless other arrangements are put in place	No	Yes	Yes
Water Corporation (WC)	Service provider for water, wastewater and drainage services across the State	Yes	No	Yes
Water West Pty Ltd	Private sector water service provider for delivery of local water schemes Partners with developers to enable fit-for-purpose recycled water services	Yes	No	Yes
Department of Water and Environment Regulation (DWER)	Manages and regulates the state's environment and water resources Responsible for environment and water regulation, serving as a 'one stop shop' for industry and developers, with the aim of streamlining and simplifying regulation Issues licences for the extraction of water and the construction of bores and wells under the RiWI Act 1914 Regulates prescribed premises as determined under schedule 1 of the Environmental Protection Regulations 1987, including sewerage facilities and effluent discharged to land and waters from them	No	Yes	No

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Department of Health (DoH)	Regulates the design, construction, connection, operation and maintenance of sewage schemes and the management of required health standards of potable (drinking) and non-drinking water supplied by service providers in accordance with the Health Act 1911 Reviews and approves Recycled Water Quality Management Plan (RWQMP)	No	Yes	No
Economic Regulatory Authority (ERA)	Assesses technical and financial capability in the licensing of water service providers and issues water service licences under the Water Services Act 2012 Monitors compliance with licensing conditions	No	Yes	No
Office of the Environmental Protection Authority	Assesses proposals of potentially significant environmental impact under section 38 of the Environmental Protection Act 1986 referred by a proponent or by a decision-making authority Monitors compliance with Ministerial conditions related to approvals	No	Yes	No
Western Australian Planning Commission and Department of Planning	Coordinate, assess and approve regional land use planning and development in WA Approve water management reports required by Better urban water management (Western Australian Planning Commission 2008) on advice from the Department of Water, local government and other relevant agencies Consider non-drinking water proposals through the land planning process	No	Yes	No
Other private consumers	Potential user of the recycled water.	No	No	Yes
Dept of Biodiversity Conservation and attractions	Approvals for reduced flow into GDEs if water diverted to AWS	No	Yes	No
Dept of Planning Lands and Heritage	Planning framework	No	Yes	No
Dept of Local Govt, Sport and Cultural	POS and sporting oval policy	No	No	No
Federal Government	Funding for AWS eg Alkimos	No	No	No
WALGA/ regional councils	Policy for LGAs	Yes	No	No
Government Committees: Parkland WA, Infrastructure Coordinating Committee,		No	No	No

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Greywater Industry Reference Group, Drainage working group.				
NGOs: Parks and leisure, Greenspace Alliance, Irrigation Australia, Greywater and Wastewater Industry Group, Stormwater Industry Association and various industry Associations		No	No	No