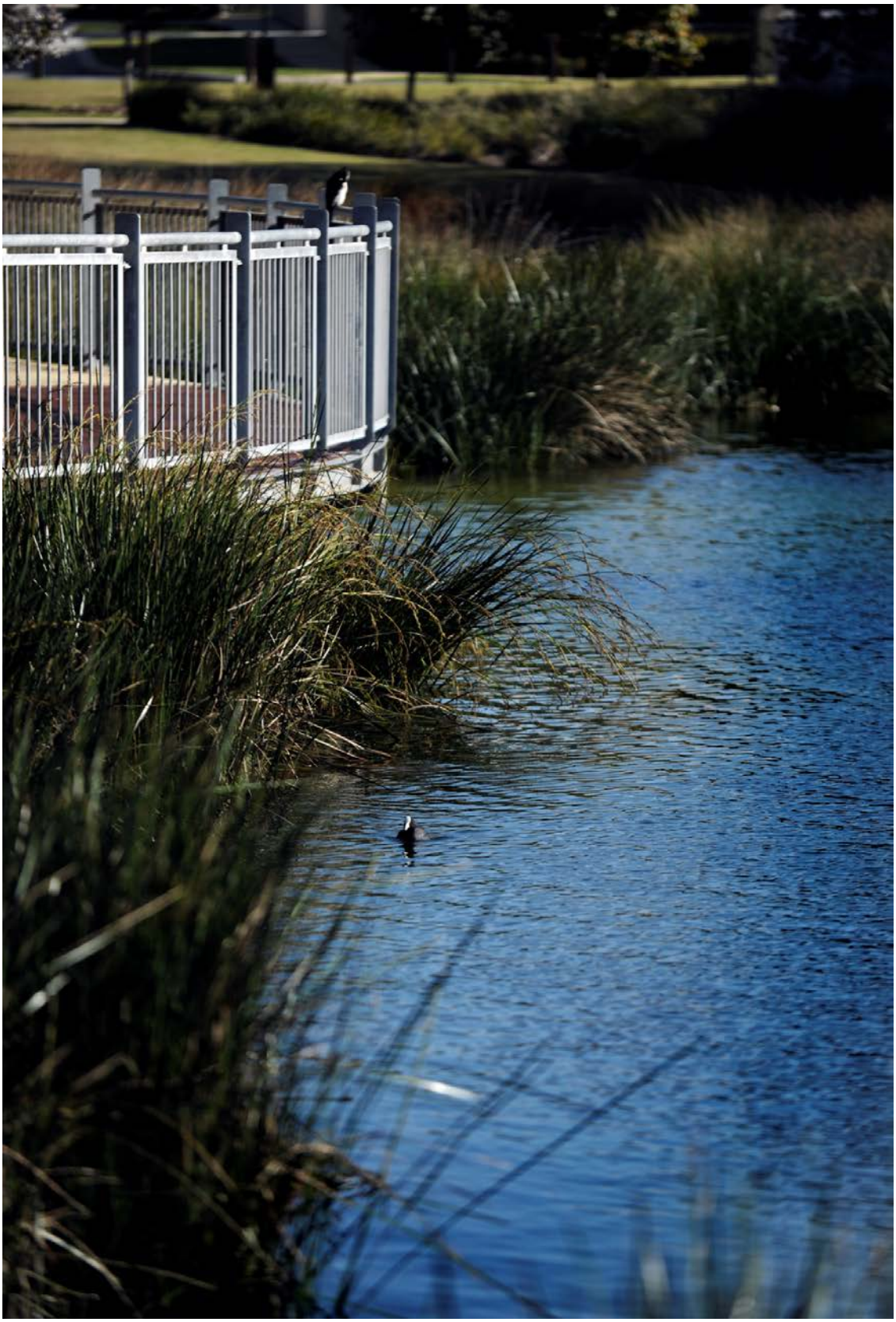
APPENDIX 8
ATTACHMENT 1

City of Joondalup

City Water Plan

2016 – 2021



City of Joondalup Oahu Park (Hillarys)

Contents

Executive Summary

The City of Joondalup recognises the importance of the sustainable use of water within its operations and facilities, and the need to promote water conservation and water efficiency within the community. Sustainable water management is an important issue for the City of Joondalup and the need to balance provision of water services for the community with the protection of water resources is becoming even more vital in a drying climate.

As a local government, the City relies heavily on both scheme and groundwater resources. Scheme water is used within the City's buildings and facilities whilst groundwater is utilised for the irrigation of parks and reserves managed by the City.

As water availability decreases due to competing uses, population growth and climate change, it is essential that the City takes steps to use water resources in a sustainable manner while delivering adequate services and facilities for the community.

The City of Joondalup has demonstrated a commitment to sustainable water management by developing and implementing a City Water Plan 2012-2015 and by joining the Waterwise Council Program to further increase the capacity of the City to use and manage water resources in a more efficient way.

Following a review of the City Water Plan 2012-2015, a new Water Plan has been developed to guide the sustainable management of the City's water practises into the future. The *City Water Plan 2016-2021* provides strategic direction for the delivery of water conservation and water quality improvement initiatives within the City of Joondalup over the next five years. The Plan builds on the achievements of the City's previous City Water Plan 2012-2015 and reflects the water management objectives outlined in the City of Joondalup Environment Plan 2014-2019.

The *City Water Plan 2016-2021* covers eight key focus areas: water monitoring and reporting, management of wetlands and public open spaces, water sensitive urban design, contracts and purchasing, staff education and participation, community education and participation and partnership and policy.

Many of the successful projects which were developed and implemented from the previous City Water Plan 2012-2015, are carried forward and form the basis of the updated Plan.

The City's key achievements in regard to water conservation and water quality improvement from the past three years include:

- Monthly groundwater bore meter monitoring.
- Installation of soil moisture sensors within public open spaces across the City.
- Park upgrades to include hydrozoning, ecozoning, redesign of irrigation systems and landscaping as per the Parks Redevelopment Program.
- Implementation of Environmental Building Audits.
- The delivery of a wide range of community and staff water education initiatives.
- Continued participation in the Waterwise Councils Program.
- Implementation of the Yellagonga Integrated Catchment Management Plan.

The *City Water Plan 2016-2021* includes a number of targets which will enable the City to monitor progress towards achieving the objectives of the Plan. Annual reporting against the targets will ensure both transparency and accountability to the community in the delivery of the outcomes.

The City's ongoing commitment and proactive approach to sustainable water management is demonstrated by the initiatives that are included within this Plan which are beyond regulatory requirements for local government in the area of water management.

Water on a Proteaceae Yellagonga Wetlands (Joondalup)

Acronyms

BoM	Bureau of Meteorology
CoJ	City of Joondalup
CRC	Cooperative Research Centre
CWSC	Cities as Water Supply Catchments
DoH	Department of Health
DoW	Department of Water
DPaW	Department of Parks and Wildlife
EEP	Environmental Education Program
GPT's	Gross Pollutant Traps
GWL	Groundwater Licence
Ha	Hectare
kL	Kilolitre
KPI	Key Performance Indicator
ICLEI	International Council for Local Environmental Initiatives
IWSS	Integrated Water Supply System
mm	millimetre
NWI	National Water Initiative
WA	Western Australia
WEAP	Water Efficiency Action Plan
WEMP	Water Efficiency Management Plan
WOC	Works Operation Centre
WSUD	Water Sensitive Urban Design
YICM	Yellagonga Integrated Management Plan 2014-2019
YR	Year

Part 1: Introduction

1.1 Purpose

The *City Water Plan 2016 – 2021* (the Plan) builds on the foundations of the City Water Plan 2012-2015 and continues to provide a coordinated approach for the City to sustainably manage water resources within the City's operations and the community. The Plan identifies the main water related issues impacting the City and sets objectives for scheme and groundwater water conservation, water quality and quantity improvements.

The *City Water Plan 2016-2021* will guide the City's water management practises over the next five years, which will facilitate the City's ongoing leadership in meeting its water conservation and water quality management targets whilst creating community awareness regarding the need to manage water resources for the future.

1.1.1 Aims

The City *Water Plan 2016 – 2021* aims to build upon the outcomes of the previous City Water Plan by providing a holistic and long term strategic plan to improve water conservation and water quality management within the City.

1.1.2 Objectives

The overarching objective of the *City Water Plan 2016-2021* is: *to manage the City's water resources in a sustainable manner in order to decrease water consumption, increase efficiency and improve water quality.*

1.1.3 Structure of the Plan

The City Water Plan utilises a project based implementation framework and includes the development of specific water related projects that will be implemented over the life of the Plan to achieve its stated objectives. The project based framework addresses both water conservation and water quality within City operations and the community sector.

Part 1 of the City Water Plan provides context to the water management issues facing the City, including future threats and impacts.

Part 2 is an overview of water consumption by the City and the community and details operational barriers to water management and the City's strategic water management targets.

Part 3 of the Plan includes key projects that will be implemented over the life of the Water Plan to achieve the City's water conservation and water quality improvement targets within the following areas:

- Water Monitoring and Reporting.
- Management of Wetlands and Public Open Space.
- Water Sensitive Urban Design.
- Contracts and Purchasing.
- Staff Education and Participation.
- Community Education and Participation.
- Partnerships and Policy.

The City Water Plan will be continually monitored and reviewed on an annual basis, against a set of indicators for water conservation and water quality improvement. This will assist the City to track progress towards the water management targets.

1.2 City Water Plan 2012 – 2015

The City of Joondalup adopted the City Water Plan 2012-2015 in June 2012. Substantial progress was made in implementing initiatives within the Plan with all projects that were scheduled for implementation during the life of the Plan having been either completed or commenced. The key achievements from the City Water Plan 2012-2015 are outlined below.

1.2.1 Key Achievements

A number of projects have been implemented since the adoption of the City Water Plan in June 2012, which have contributed to the overall reduction in water consumption and improved water quality. Details of the progress of the projects are provided in Appendix 1.

Key achievements include:

- Monthly groundwater bore meter monitoring.
- Installation of soil moisture sensors within public open spaces across the City.
- Park upgrades to include hydrozoning, ecozoning, redesign of irrigation systems and landscaping as per the Parks Redevelopment Program.
- Implementation of Environmental Building Audits.
- The delivery of a wide range of community and staff water education initiatives.
- Continued participation in the Waterwise Councils Program.
- Implementation of the YICM Plan.

Yellagonga Wetlands (Joondalup)

1.3 Strategic Context

A decline in water availability has prompted action at the national, state and local level. Water management has shifted from purely an operational issue for water service providers and water managers, to one that is now embedded in strategic policy for all spheres of government.

The decline in the availability of water sources has lead to the introduction of strong national and state legislation, regulation and restrictions. The key strategic documents and initiatives undertaken to improve water management across government are outlined below.

1.3.1 Local

The aims and objectives within the City Water Plan align with the City's broad range strategic documents, namely the Joondalup 2022: Strategic Community Plan 2012-2022 and the Environment Plan 2014-2019.

Joondalup 2022: Strategic Community Plan 2012-2022 is the overarching document for all of the City's strategic planning documents and outlines the City's commitment to achieving the vision and aspirations of its community and regional stakeholders.

Environment Plan 2014-2019 provides strategic direction for environmental management across the City's natural resources and assets. The aim of this plan is to ensure that the City's operations are delivered in an environmentally sustainable manner and that the City takes measures to effectively influence positive environmental behaviours within the community. The plan also outlines a framework for the development of environmental plans and strategies to address key environmental issues including water, as outlined in Figure 1. Water is one of the key themes of the Plan with the objective to *manage the City's water resources in a sustainable manner in order to decrease water consumption, increase water efficiency and improve water quality.*

Figure 1 City of Joondalup Strategic Environmental Framework.

1.3.2 State Legislation and Regulation

1.3.2.1 Groundwater Licensing and Allocations

The Department of Water (DoW) is responsible for managing and allocating the State's water resources. The DoW grants the right to take water from these resources by issuing licences with water entitlements, under the Rights and Water Irrigation Act 1914.

Water allocation plans have been developed to help protect Western Australia's key water sources and outline how much water can be taken from groundwater and surface water resources, while safeguarding the sustainability of the resource and protecting the water-dependent environment. The allocation limits are set based on a combination of factors such

as on recharge estimates, modelling, environmental objectives and benefits of groundwater use and provide a guide for determining water availability for individual licence assessments. Due to declining rainfall and groundwater recharge over the past forty years, the Gnangara aquifer has become over allocated and the Gnangara Groundwater Areas Allocation Plan provides steps for returning the system back into balance[1]. Overall abstraction limits have been reduced by 15% between 2010/11 and 2013/14 in response to the declining rainfall.

The Gnangara Groundwater Areas Allocation Plan is currently being reviewed and a draft report for public comment is expected to be released by 2017. This could see further reductions to current allocation limits. The *City Water Plan 2016-2021* groundwater targets will be amended incorporating any changes resulting from the revised Gnangara Groundwater Areas Allocation Plan.

1.3.2.2 Legislative Reform

Reduced stream inflow has affected water availability for the Perth Metropolitan region and has led to increased pressure on groundwater resources. The region's reliance on groundwater has resulted in more stringent management and monitoring of groundwater use by the State Government. It has meant large users such as the local government sector have had to adapt and significantly reduce groundwater use.

The Department of Water is facilitating reform of water resources legislation to ensure a more equitable, transparent and sustainable approach to groundwater allocations and management. Local governments will need to prepare for the possibility of changes to the amount of groundwater that is available for irrigation purposes as well as possible changes to management and monitoring processes which will need to be incorporated into future revisions of the Plan.

1.3.3 WaterWise Council Program

The Waterwise Council program was launched by the Water Corporation and Department of Water in 2009 in order to build a cooperative working relationship with local governments to improve water use efficiency in their industry and their communities. The program encourages local government to lead by example in promoting efficient and effective water management within their communities.

The City joined the program in 2010 to further increase capacity in managing its water resources. The City of Joondalup was named WA's Waterwise Council at the 2011 WA Water Awards for its innovative and sustainable management of water resources. The City has demonstrated ongoing commitment to achieving sustainable water management by retaining Waterwise Council accreditation since 2010.

The Water Corporation and the Department of Water reviewed the Waterwise Council Program criteria in 2015, including the requirement to develop of a Water Efficiency Action Plan (WEAP). The *City Water Plan 2016-2021* will achieve the requirement for a WEAP.

[1] DoW (2009)

1.4 Physical Environment

1.4.1 Climate

The City of Joondalup experiences a Mediterranean climate of hot dry summers with an average temperature of 32°C during the day and mild wet winters with an average day time temperature of 20°C.[2]

The average annual rainfall in the City of Joondalup from 2004 to 2015 was 660mm. The average annual rainfall from 1993 to 2003 was 716mm, indicating an annual decrease of approximately 56mm in the past two decades. Approximately 77% of the annual rain falls between the months of May and September, as shown in Figure 2.[3]

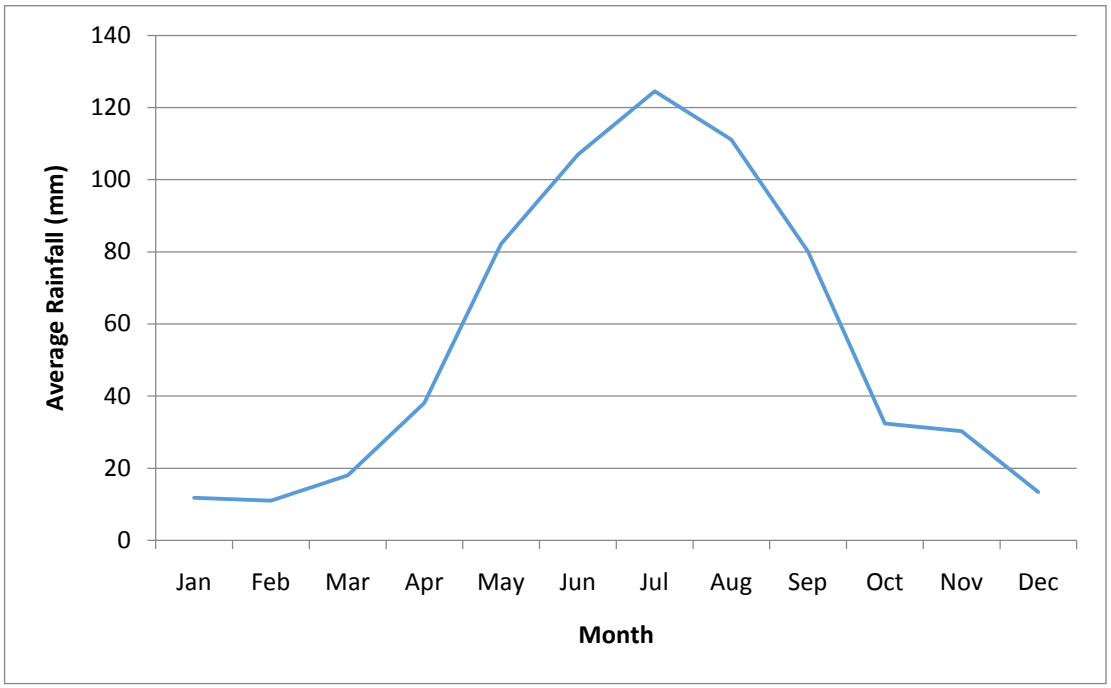


Figure 2 Mean Monthly Rainfall Recorded at Perth Airport Weather Station 2004-2015 (sourced from BoM).

1.4.2 Gnangara Groundwater System

The City of Joondalup is located within the Gnangara Groundwater System which is the largest source of good quality, fresh water in the Perth region and supports nationally significant groundwater dependant ecosystems[4].

[2] Perth Tourist Centre (2016)
[3] BoM (2016a)
[4] DoW (2011)

The Gnangara Groundwater System stretches approximately 2200 square kilometres along the coastal plain north of the Swan River to Gingin and to the Darling Scarp in the east. The Gnangara Groundwater System comprises of four main aquifers: superficial Gnangara Mound (shallow, unconfined), Mirrabooka (deeper, semi-confined), Leederville (deep, mostly confined) and the Yarragadee (deep, mostly confined).See Figure 3.

Forty per cent of the Integrated Water Supply System (IWSS) for public water supply is sourced from the Gnangara system[5]. Water is sourced from all of the aquifers within this system. However, less water is sourced from the superficial aquifer to reduce the impacts on groundwater dependant ecosystems.[6]

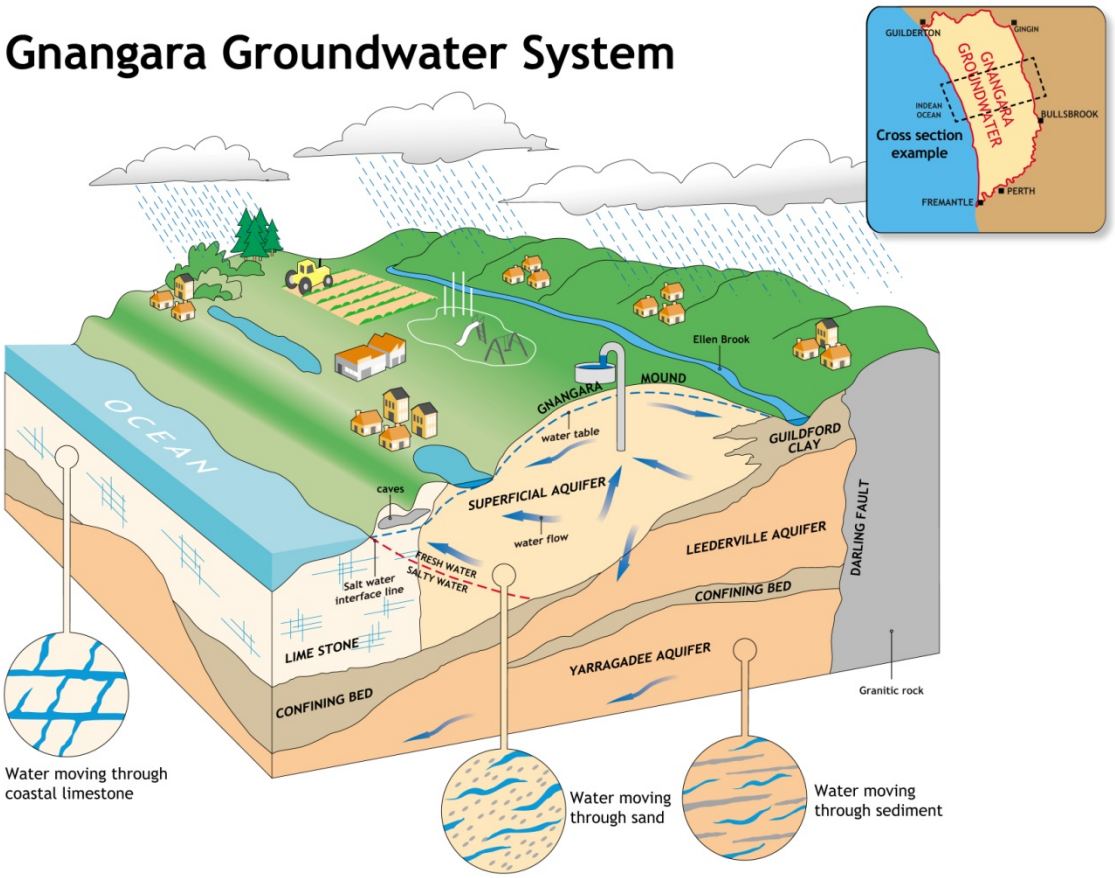


Figure 3 The Gnangara groundwater system (sourced from DoW).

Groundwater levels in the superficial aquifer have been declining over the past 40 years due to a combination of abstraction and declining rainfall. However since the introduction of the Department of Water's Gnangara Groundwater Areas Allocation Plans in 2011 there has been a demonstrated decrease in the rate of decline for groundwater levels as shown in Figure 4.

[5] DoW (2009)
[6] DoW (2016a)

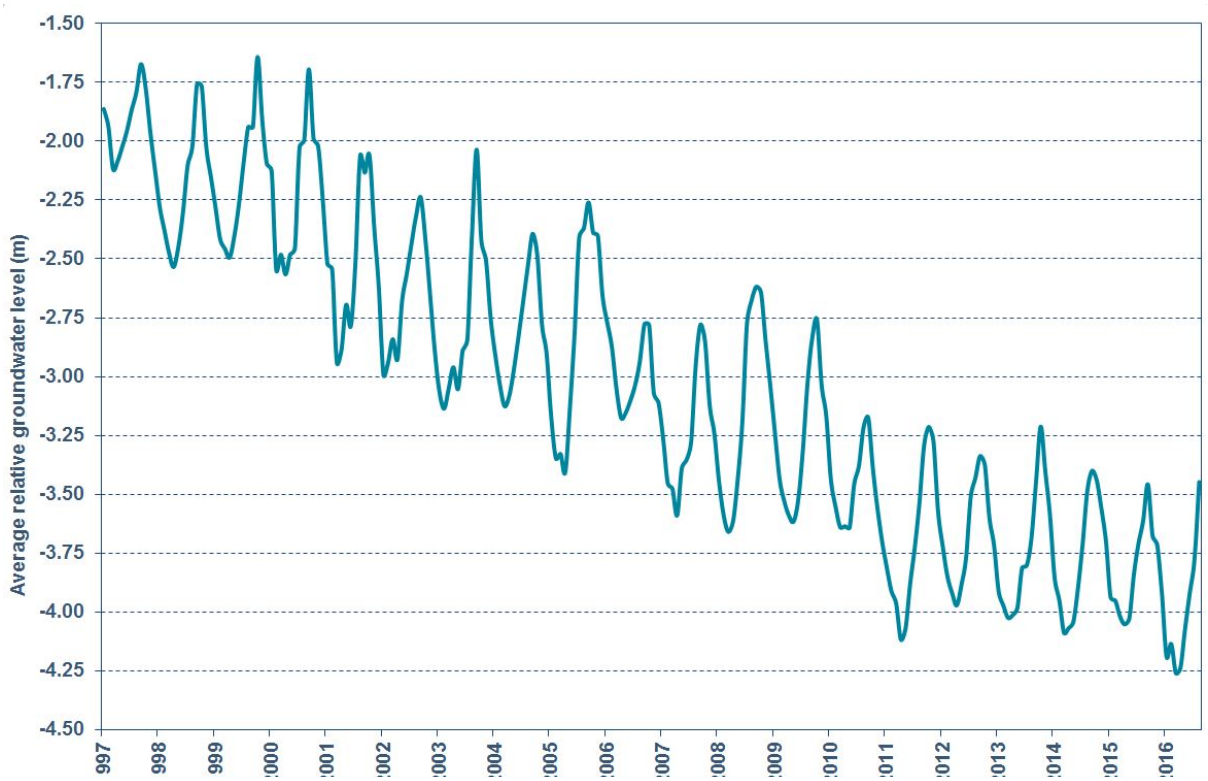


Figure 4 Average groundwater level in the Gnangara Mound (sourced from DoW).

The Water Corporation conducted a successful three year groundwater replenishment trial at the Beenyup Wastewater Treatment Plant which ended in December 2012. The construction of the treatment plant, which will boost Perth's drinking water supplies with the ability to recharge 14 billion litres of water into groundwater supplies, is expected to be completed by the end of 2016[7].

1.4.3 Yellagonga Regional Park and Wetlands

Yellagonga Regional Park (the Park) is one of eleven regional parks within the Perth Metropolitan area and lies on the Swan Coastal Plain located approximately 20km north of Perth. The City of Joondalup contains part of this distinct linear wetland system which consists of a wetland chain including, from north to south, Lake Joondalup, Beenyup Swamp, Walluburnup Swamp and Lake Goollelal.[8] See Figure 5.

[7] Water Corporation (2016)
[8] CALM et al (2003)

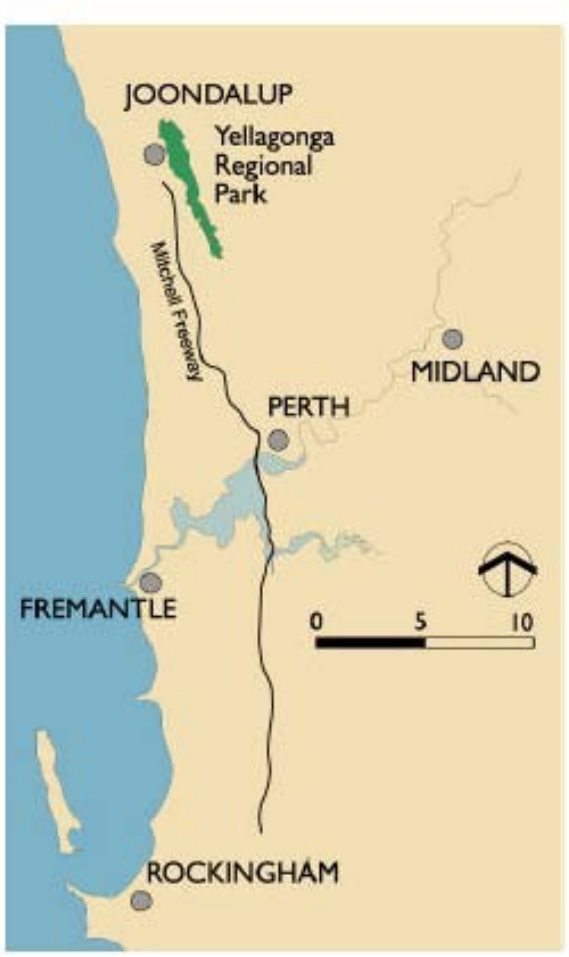


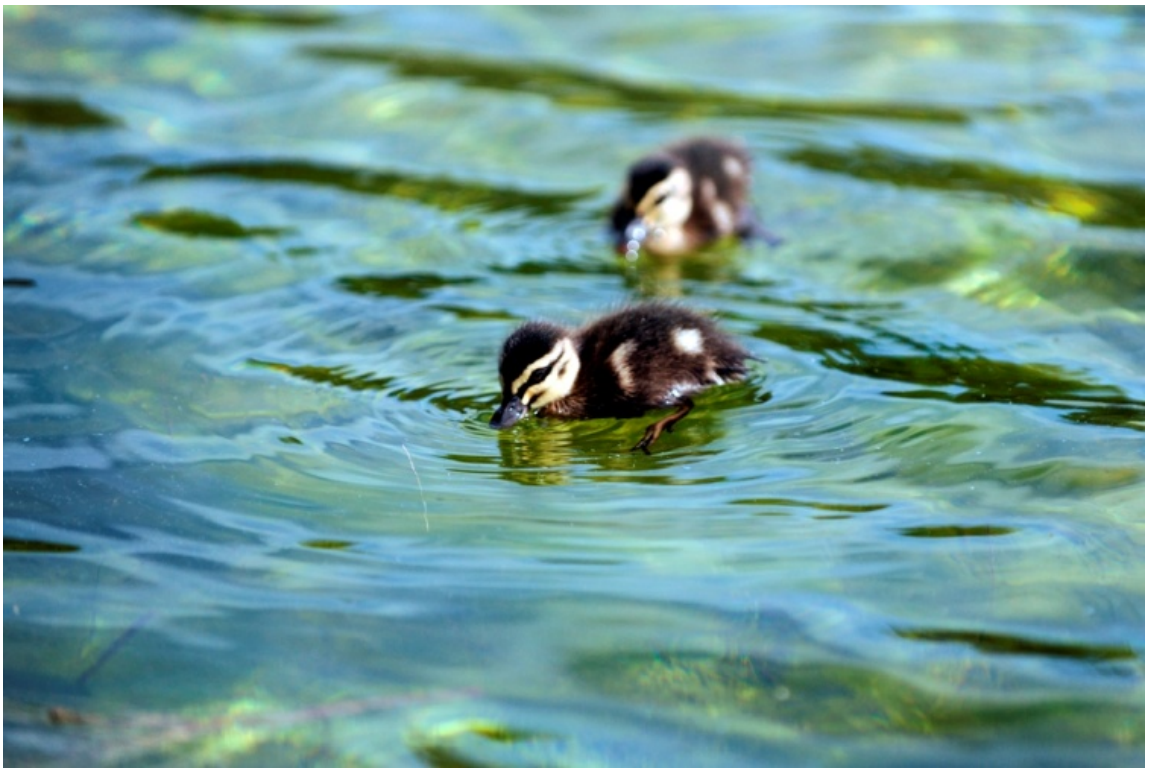
Figure 5 Location of the Yellagonga Regional Park[9].

The surface water catchment area impacting on the Park is estimated to cover an area of approximately 4000 hectares.[10] The catchment area is linked to the Park by surface flows via drainage infrastructure and groundwater flows. The catchment encompasses land on either side of the Park located in the Cities of Joondalup and Wanneroo and includes medium to high-density residential, commercial and light industrial development interspersed with green areas. Lakes Joondalup and Goollelal, and the swamps Beenyup and Walluburnup, are the receiving aquatic environments for water from this catchment via surface, groundwater and stormwater flows. Any land use within this catchment will have some impact on the quality and quantity of the water entering the wetlands which can also have an impact on the floristic and faunal communities within the Park.

In order to maintain and enhance amenity, recreational, scientific, educational and conservation values of the Park for present and future generations, an integrated catchment approach has been undertaken by the Cities of Joondalup and Wanneroo and the Department of Parks and Wildlife (DPaW) providing a comprehensive and integrated approach to managing the Park.

[9] CALM et al (2003)
[10] Ove Arup and Partners (1994)

City of Joondalup Picnic Cove (Edgewater)



Baby Pacific Black Ducks Yellagonga Wetlands (Edgewater)

1.5 Key Challenges

The City undertakes its water management activities in the context of a number of pressures including requirements to reduce water consumption, a drying climate, increased provision of services and facilities and the impact of pollutants on receiving water bodies from the urban environment.

Four key challenges have been identified for water management within the City and are shown in the diagram below.

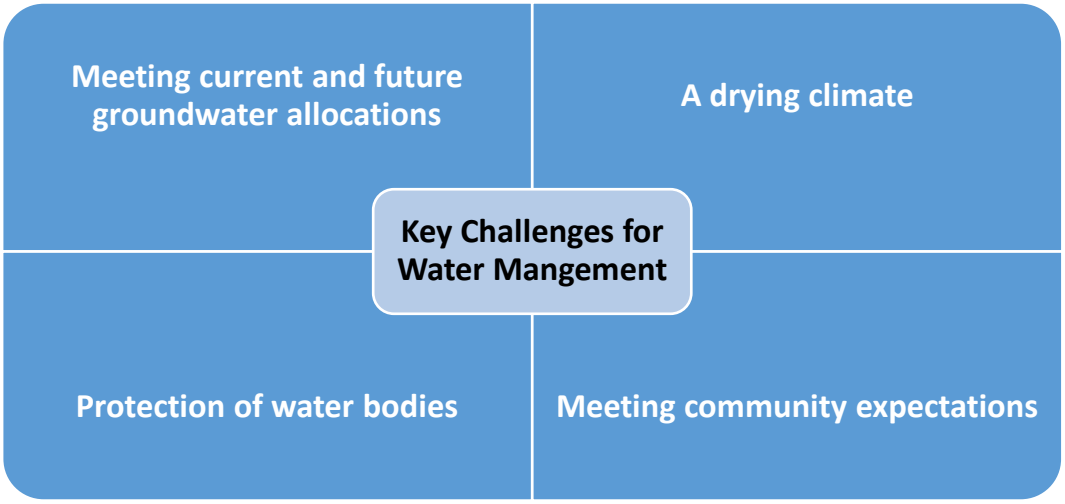


Figure 6 Key Water Management Challanges within the City of Joondalup.

1.5.1 Meeting current and future groundwater allocations

Groundwater levels in the superficial aquifer have been declining over the last 40 years due to a combination of continued groundwater abstraction, declining rainfall and groundwater recharge. Future projections of further decline in rainfall for the south-west region will result in less available water for groundwater recharge[11]. With an expected increase in population across the Perth-Peel Region from 1.65 million to 3.6 million by 2050[12], demand on water resources is set to increase considerably. This could result in further water allocation reductions within the Gnangara Groundwater Areas Allocation Plan which is currently under review by the Department of Water (DoW) and expected to be released for public comment in 2017.

A reduction in water allocations within the Gnangara Groundwater Areas Allocation Plan could result in a reduction of the City's current Groundwater Licence's annual allocation limits, which will impact on the available water to irrigate the City's parks and open spaces. The City's future management of its parks and open spaces will need to be considered in the context of changing groundwater allocations.

[11] DoW (2013)
[12] Department of Planning & Western Australian Planning Commission (2014)

1.5.2 A drying climate

One of the key issues for the south west of WA is the amount of available water due to deceased rainfall which has affected stream flow into Perth dams. See Figure 7. Rainfall in the south west of WA has already deceased by 15% since the 1970's [13],which has resulted in reduced stream flow to surface water bodies and dams by 70%[14]. The reduction in available water within local dams has placed extra pressures on the groundwater resources at the same time that demand for water is increasing. Reduced stream flow has also dramatically reduced recharge to groundwater aquifers.

Modelling suggests that mean annual rainfall will continue to decrease and the south west of WA could potentially experience 80% more drought-months by 2070.[15]

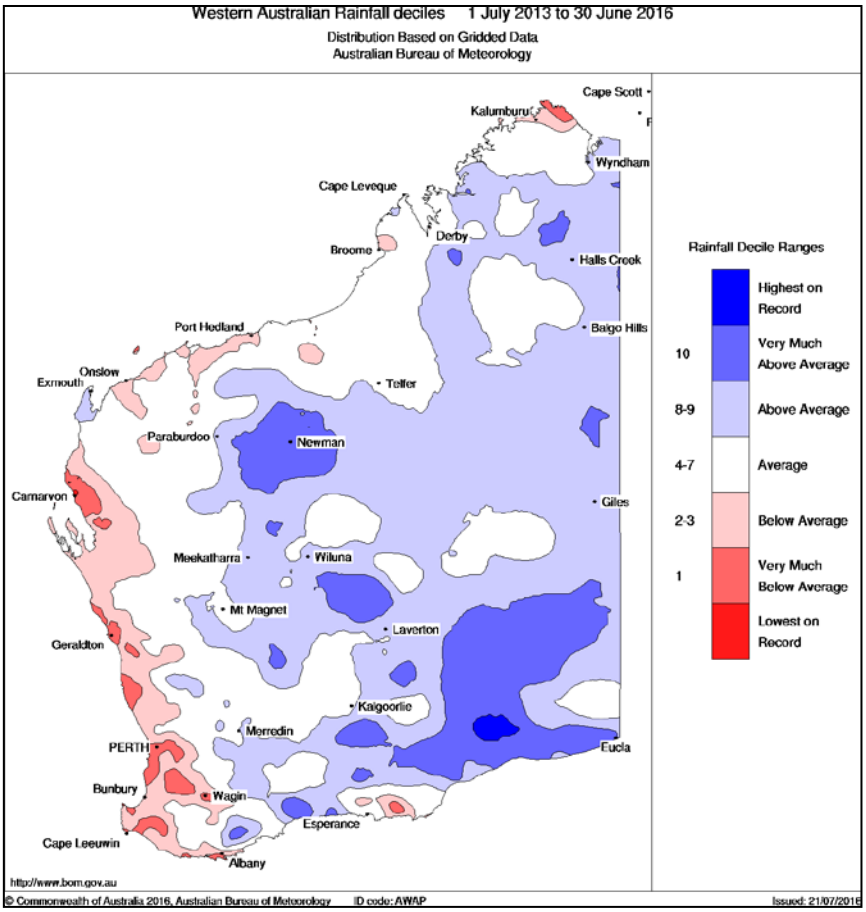


Figure 7 Western Australian Rainfall Deciles 1 July 2013 to 30 June 2016 (sourced from BoM).

Adaptation to the drying climate is critical, particularly as the impacts of climate change are already being experienced. Climate change is likely to increase temperatures and the number of days over 30 degrees in the Southwest, which will subsequently increase evaporation rates from surface water bodies and soil. By 2030, the annual average number

[13] DoW (2013)
[14] Water Corporation (2008)
[15] Department of Environment (2016)

of days over 35°C in Perth could rise from the current 27 to 29-38 days per year[16]. More extreme weather events are also predicted, including increased frequency and severity of droughts. The City's future management of water resources will need to be considered in the context of a changing climate.

Mudflats at Yellagonga Wetlands (Edgewater)

1.5.3 Protection of water bodies

The interface between surface water, wetlands, coastal waters and groundwater means that water quality and quantity management is an important issue as an adequate quantity and quality of water is required to support water dependant ecosystems and to provide adequate drinking water sources.

Water quality can be negatively impacted through drainage operations, maintenance works and management of waterways and public open spaces. Within the community, the application of fertilisers, waste management, vehicle use and interaction with waterways can also lead to a reduction in water quality within the receiving environments. Additionally, water quality can be impacted by factors such as land use, groundwater abstraction and climate change.

Pollutants such as heavy metals, hydrocarbons, nutrients, suspended solids and litter can enter the water bodies via the stormwater runoff, groundwater flow and rainfall. Poor water quality can affect the health of wetlands and aquatic systems with increased levels of metals

[16] South Western Australia (Climate Change) (n.d)

and nutrients within water bodies which can lead to algal blooms, reduced reproduction rates and death of flora and fauna.

1.5.4 Meeting community expectations

The City's population has increased by almost 5% in the past ten years. This has increased demand for services and facilities within the City. With an expected increase in population across the Perth-Peel Region from 1.65 million to 2.2 million by 2031[17], demand for water resources is set to increase considerably. As water availability decreases and demand increases, it is essential the City takes steps to use water resources in a responsible manner while maintaining the delivery of high quality services and facilities for the community. To achieve this, the City aims to improve both water conservation and efficiency.

City of Joondalup Oahu Park (Hillarys)

[17] Department of Planning (2010)

Part 2: City Water Profiles

2.1 Water Sources

The City utilises both groundwater and scheme water within its operations and buildings. The City utilises scheme water within its community buildings, facilities and administrative buildings whilst groundwater is used in the irrigation of the City's parks and open spaces.

Opportunities for alternative water sources, such as in Currambine Community Centre which utilises a 20 kL rainwater tank for toilet flushing and irrigation, will continue to be investigated. Wherever practicable, the City will also improve the eco-efficiency of City owned buildings and assets by implementing environmentally sustainable design principles into the construction, renovation and retro-fitting of all future building assets as the City adapts to a drying climate.

City of Joondalup Currambine Community Centre

2.2 Corporate Water Consumption

2.2.1 Groundwater

The City uses groundwater from superficial (shallow) aquifers in the Gnangara Groundwater System to irrigate parks and public open space. Groundwater usage accounts for 98% of the City's corporate water use.

The City has three groundwater licenses (GWL 155515, GWL 155582 and GWL 155510) for irrigating parks and public open space. The GWLs cover two groundwater subareas: Whitfords and Quinns. GWL 155510 is in the Quinns subarea, which is located north of Burns Beach Road and consists of newer parks and sporting fields. The remaining two GWLs cover the Whitfords subarea, from Beach Road to Burns Beach Road. This area consists predominantly of established parks and sporting ovals with older infrastructure and design elements.

The GWL have set allocation limits and the usage within the two Whitfords licenses has been amalgamated. While the licence areas are still separate, the allocations are effectively combined which gives the City greater flexibility to reduce or increase water use in particular areas when needed, providing for holistic, sustainable management of the City's groundwater resources. The licence areas for the City's GWLs are displayed in Figure 8.

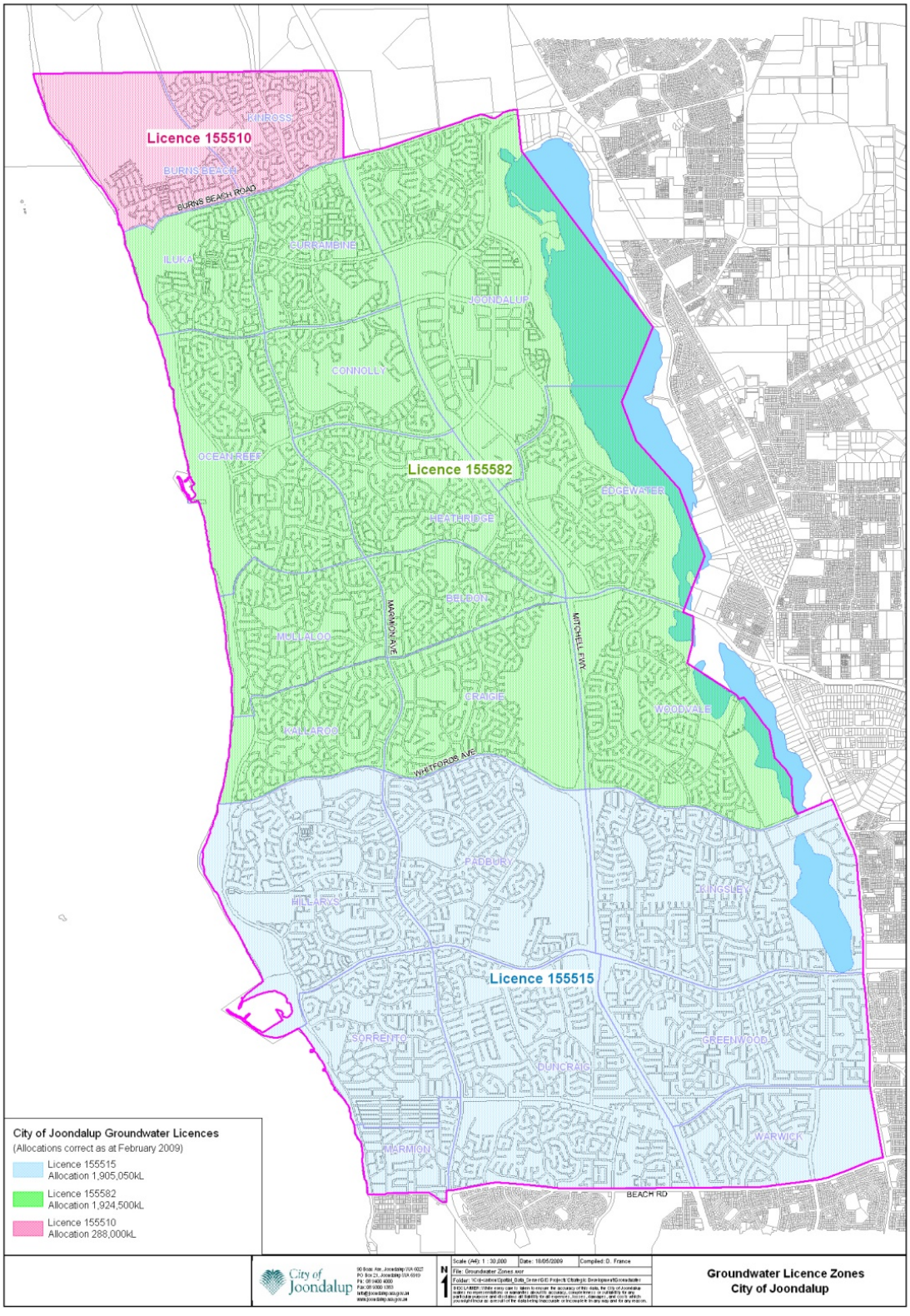


Figure 8 Groundwater Licence Zones - City of Joondalup.

The City undertakes monthly groundwater consumption monitoring as part of its commitment to increasing water efficiency and proactive resource management. Regular monitoring assists the City to manage and monitor actual usage against the Department of Water GWL allocations. Groundwater consumption data has been collected since 2007/08; however, meters were not installed on all bores until 2008/09. Figure 9 below compares the groundwater consumption over the past five years.

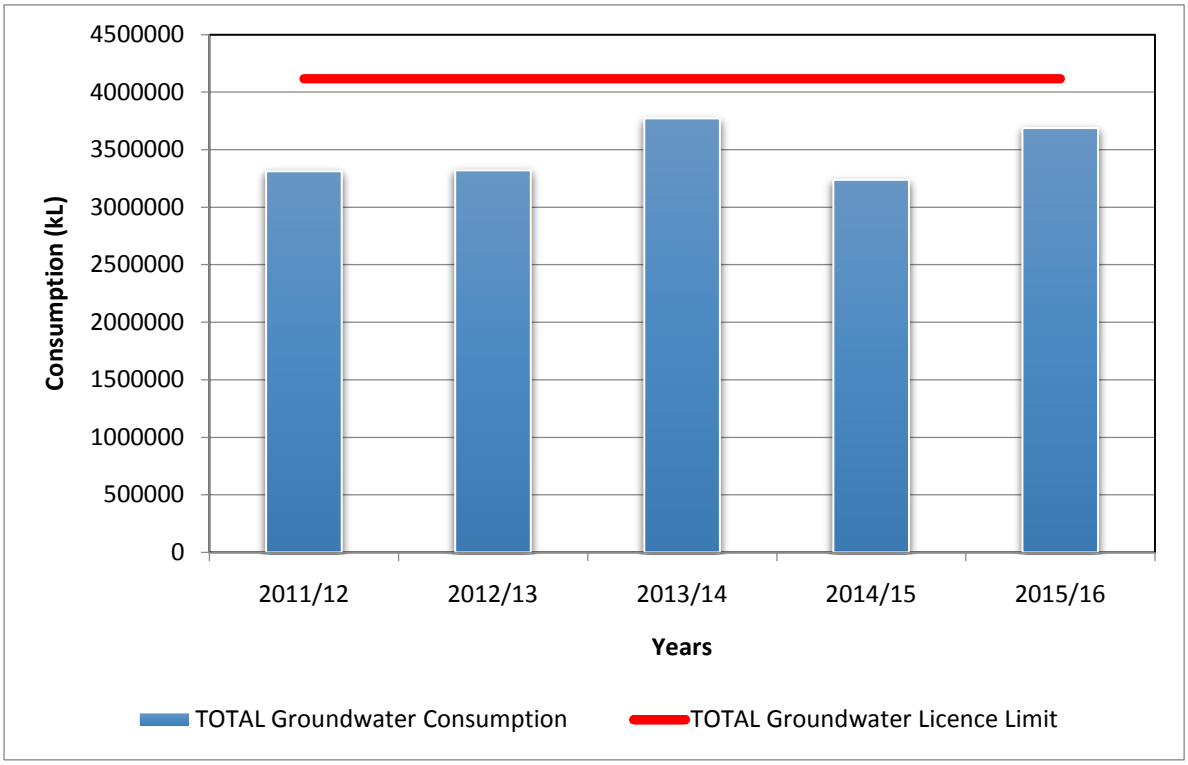


Figure 9 Groundwater consumption 2011/12 – 2015/16.

Over the past 5 years, the City's overall groundwater consumption has been below the DoW's annual allocation. The increase in groundwater consumption in 2013/14 can be attributed to Perth experiencing well below average summer rainfall with above average maximum temperatures resulting in Perth experiencing its fifth driest summer since 1876[18].The 2015 winter was Perth's 9th driest winter on record which was followed by Perth's 5th driest spring[19].These climatic factors influenced the City's groundwater consumption during 2015/16.

[18] BoM (2014)
[19] BoM (2016b)

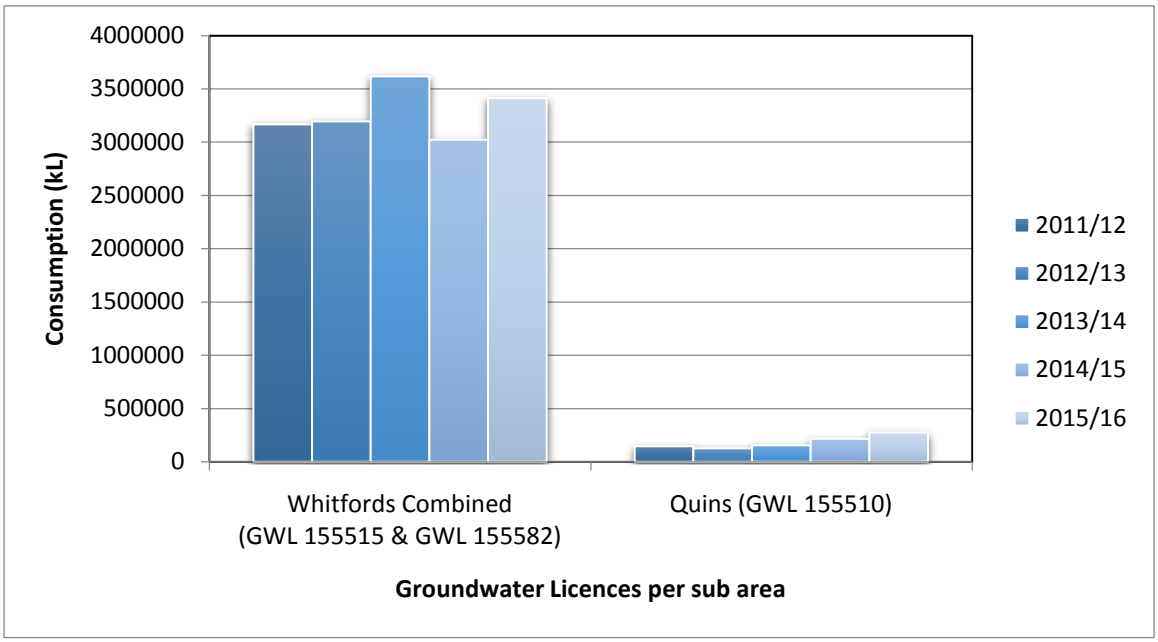


Figure 10 Groundwater use for each groundwater subarea since 2011/12.

The City has moved towards a reporting regime based on groundwater subareas, rather than groundwater licenses as displayed in Figure 10. The Whitfords subarea is an amalgamation of GWL 155515 and GWL 155582. The Quinns subarea is GWL 155510. The trends in groundwater consumption are relatively consistent across the groundwater subareas and reflect similar usage trends based on rainfall and seasonal variations across the years.

Irrigation controller at Santa Ana Park City of Joondalup (Currambine)

Irrigation testing at Iluka District Open Space City of Joondalup (Currambine)

2.2.2 Scheme Water

All scheme water is supplied to the City of Joondalup via the Integrated Water Supply System (IWSS) which is sourced from a combination of groundwater, surface water and desalination resources[20]. This is treated at local groundwater treatment plants to drinking water quality. The City uses scheme water in its community facilities, offices, recreation centres, libraries and civic centres.

Figure 11 displays the total scheme water consumption for all City buildings from 2011/12 to 2015/16.

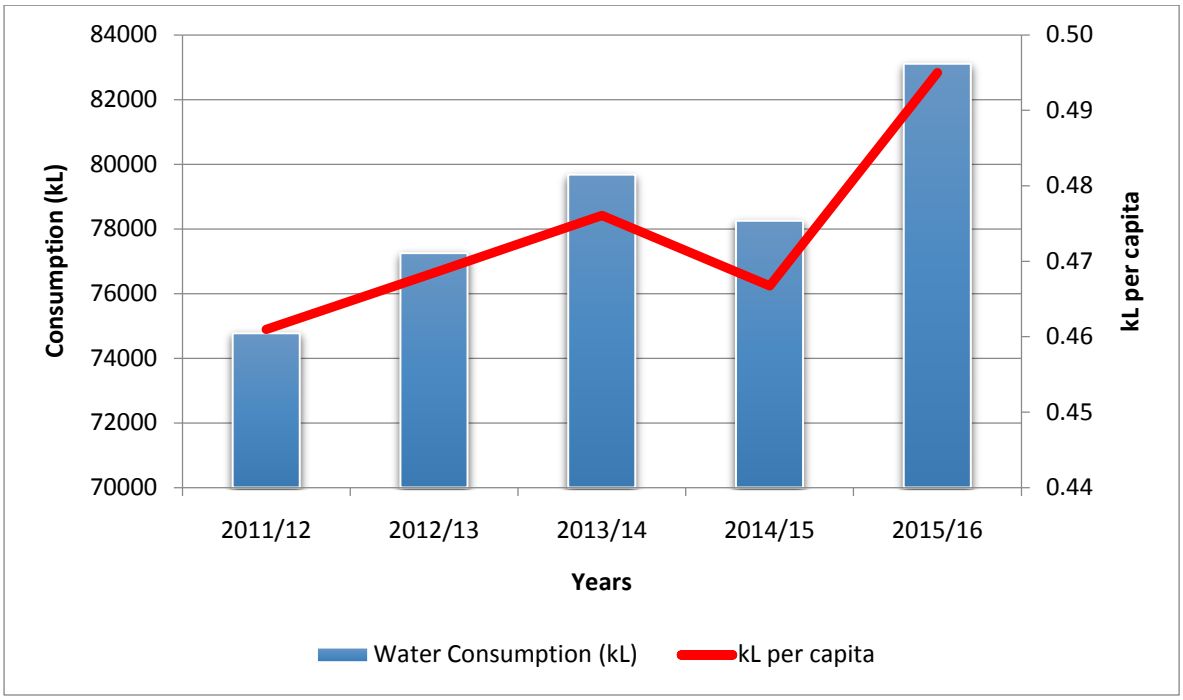


Figure 11 Total Corporate Scheme Water Consumption 2011/12 to 2015/16.

The City has made concerted effort to reduce scheme water use. However, population growth and new or upgraded facilities such as the Craigie Aquatic Facility upgrade in 2010/11, has influenced the City's overall scheme water use.

The increase in scheme water consumption during 2013/14 can be attributed to Perth experiencing well below average summer rainfall with above average maximum temperature resulting in Perth experiencing its fifth driest summer since 1876[21]. The 2015 winter was Perth's ninth driest winter on record, followed by Perth's fifth driest spring[22], which could have influenced the City's scheme water consumption during 2015/16.

The City provides a broad range of services and owns a number of facilities across numerous different building groups. This includes buildings which are owned and operated

[20] DoW (2012)
[21] BoM (2014b)
[22] BoM (2016b)

by the City as well as City owned buildings which are leased to community groups. In some leased buildings the City is responsible for the water usage accounts and in others, the lessee is responsible for water usage accounts. City leased buildings where the lessee is responsible for their own water usage accounts, have not been included as part of the Plan. Over the past 5 year period, City leased buildings (excluding City leased buildings responsible for their own water accounts), have accounted for 30% of the total Corporate Scheme water usage as displayed in Figure 12 . The water consumption figures provided throughout this Plan are based on the most up to date data available at the time. This includes actual data collected through billing information plus minor estimated components. Any water consumption data provided in subsequent reporting will incorporate any minor amendments made to the consumption figures.

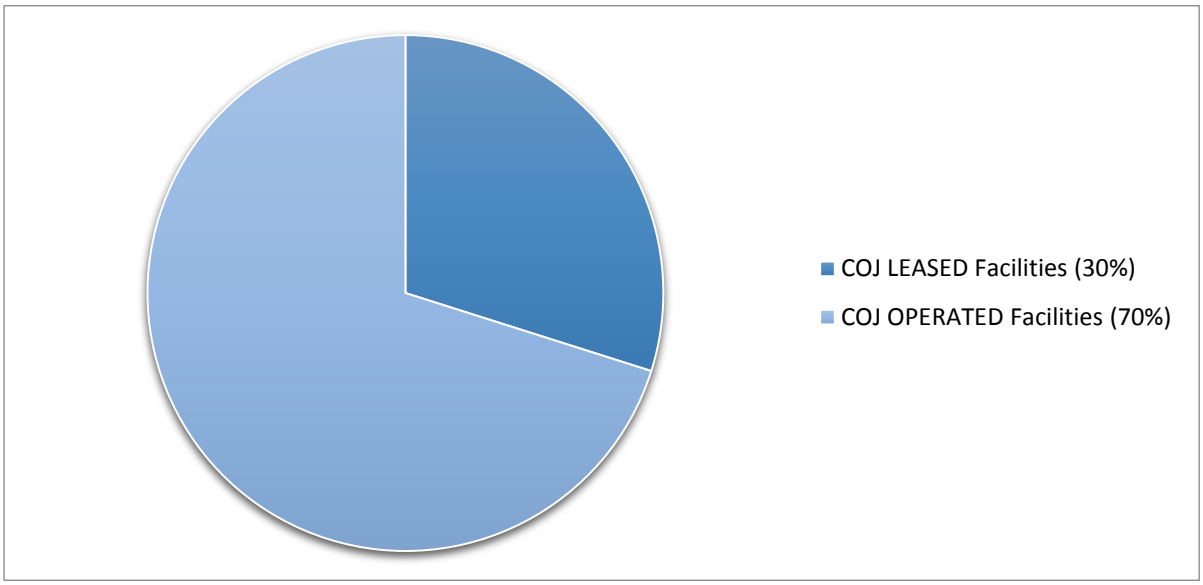


Figure 12 Total scheme water consumed for City leased and City operated facility groups from 2011/12 to 2015/16.

Figure 13 below indicates that the City's highest scheme water consumers for City owned and operated facilities are the Aquatic centre (Craigie Leisure Centre), followed by change rooms and toilets facilities and office buildings.

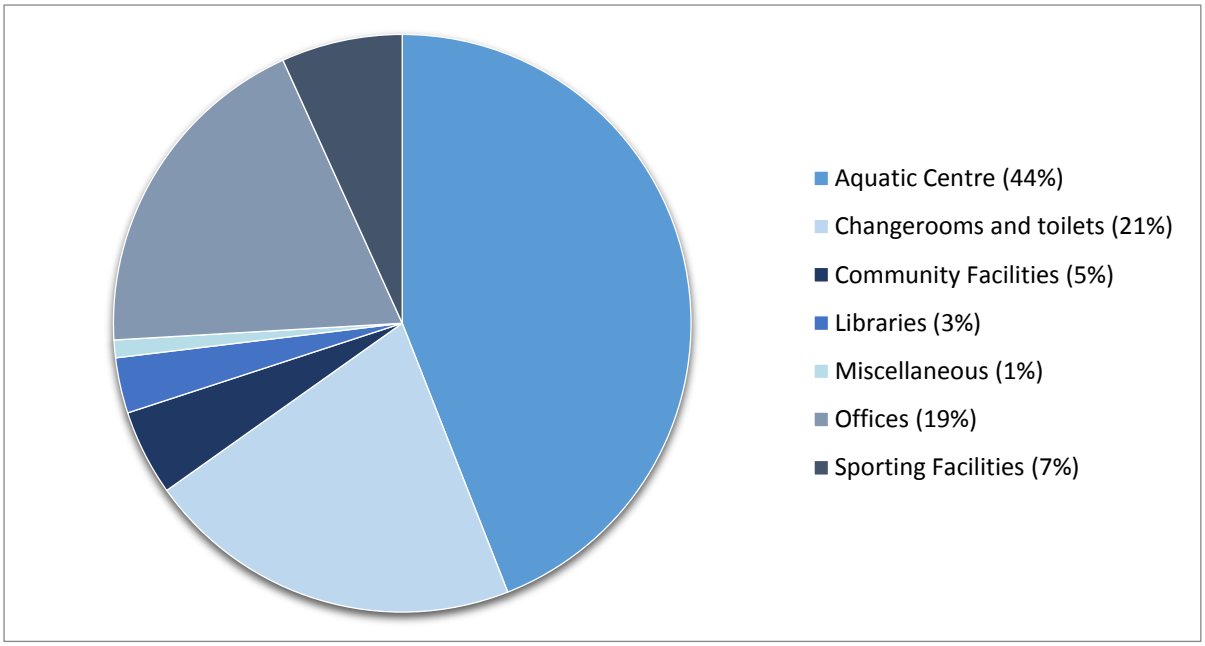


Figure 13 Total scheme water consumption for City of Joondalup operated facility group types from 2011/12 to 2015/16.

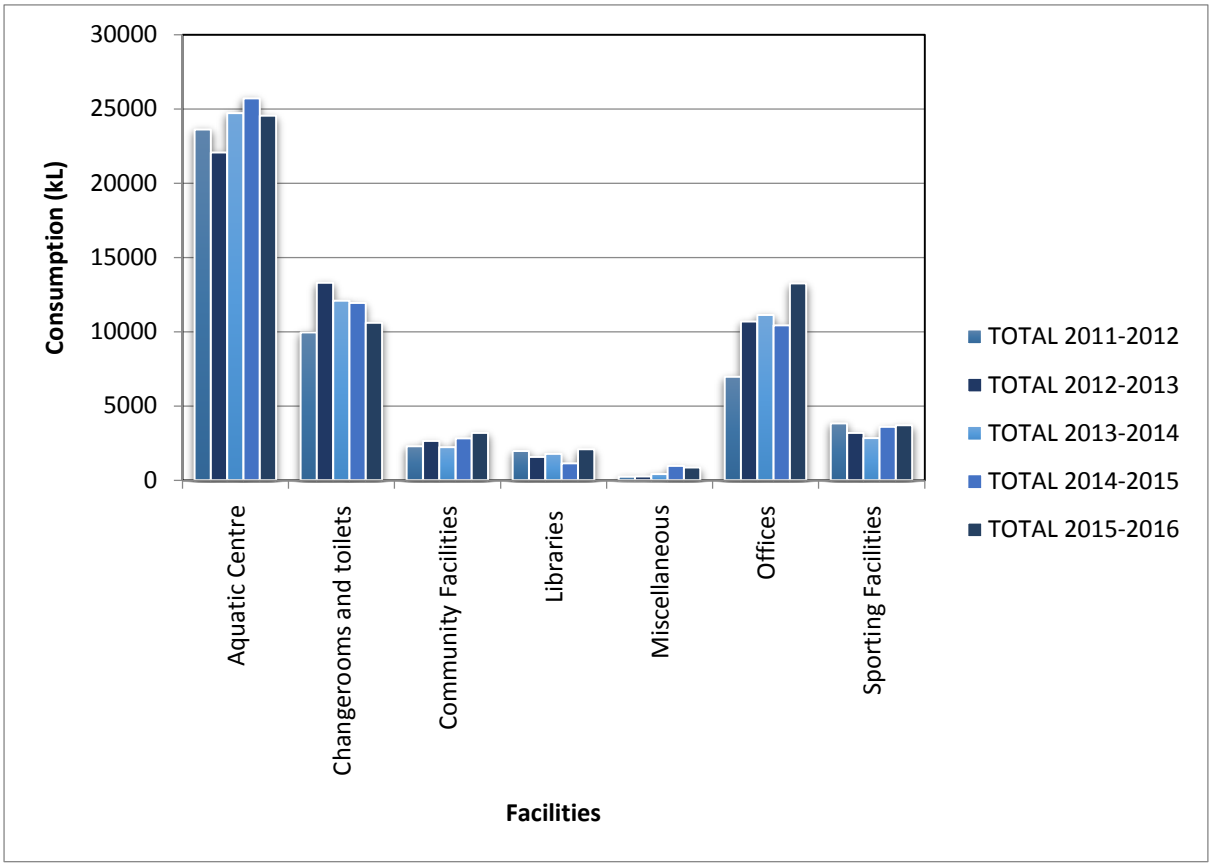


Figure 14 Total scheme water consumption per facility type for City of Joondalup operated facilities from 2011/12 to 2015/16.

Scheme water usage over the last five year period has varied amongst the building and facility groups owned and operated by the City as demonstrated in Figure 14. Variation in water usage within these facilities can be attributed to an increase or decrease in facility usage by the local community as well as additional infrastructure being built or retrofitting of existing facilities within the City.

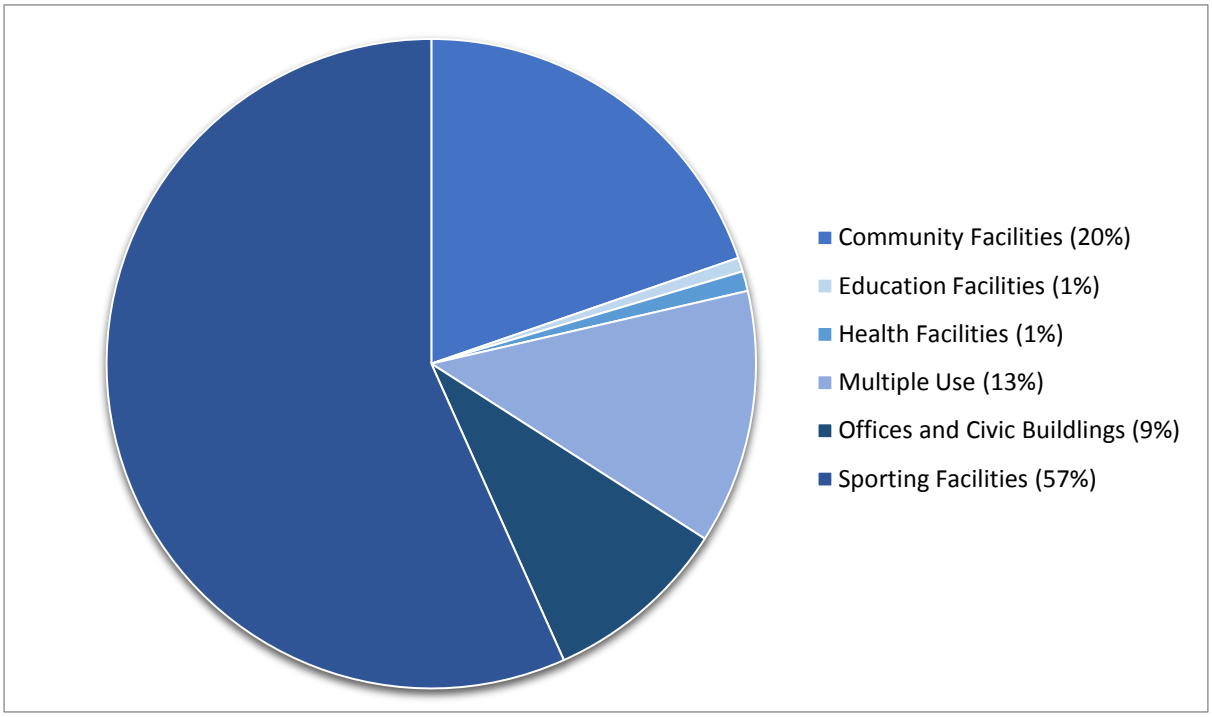


Figure 15 Total scheme water consumption per facility group type for City of Joondalup leased facilities from 2011/12 to 2015/16.

Figure 15 above indicates that the City's highest scheme water consumers for City leased facilities are the sporting facilities, community facilities and multiple use buildings.

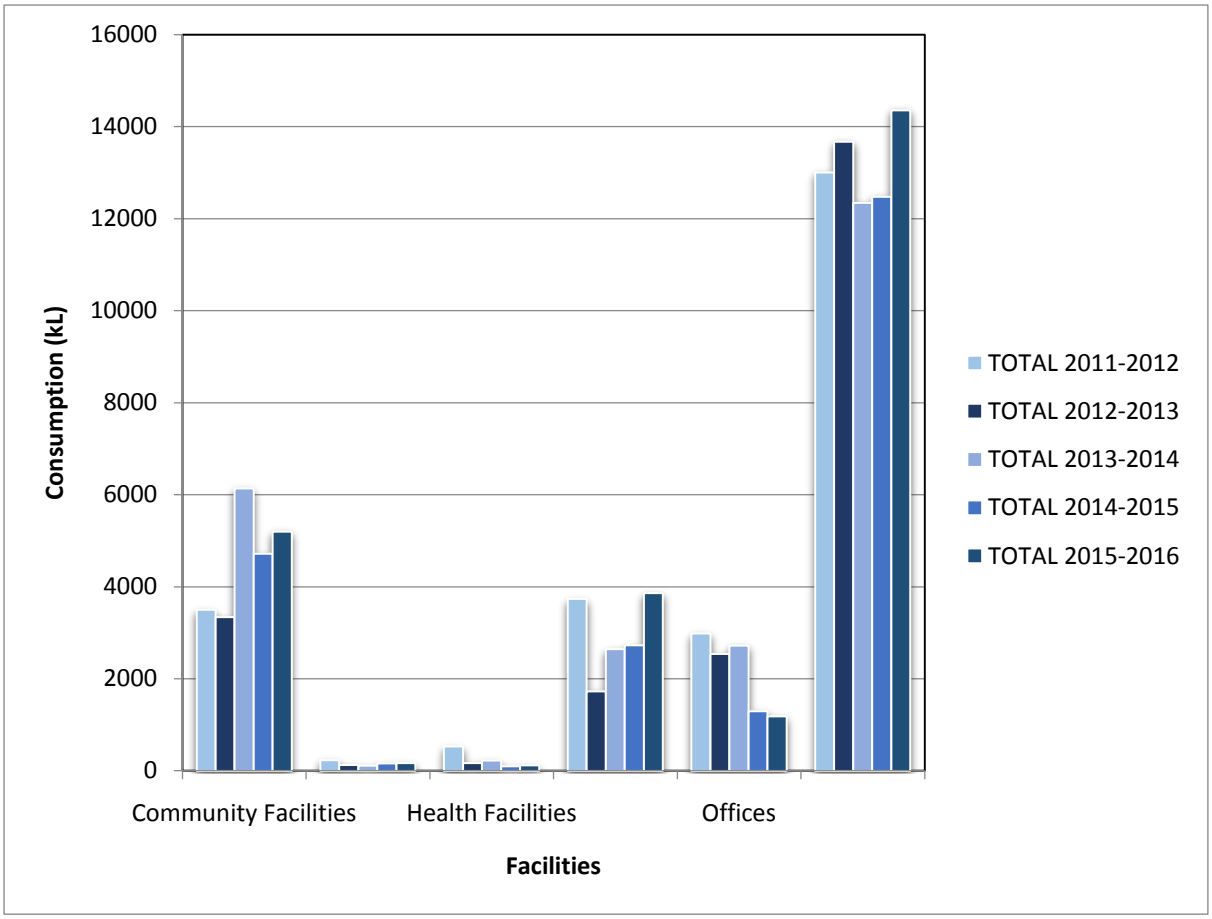


Figure 16 Scheme water consumption per facility group type for City of Joondalup leased facilities from 2011/12 to 2015/16.

Scheme water usage over the five year period has varied amongst the City's leased building and facility groups as demonstrated in Figure 16. Variation in water usage within these facilities can be attributed to the number of facilities leased as well as consumption by users. Water usage can be affected by additional infrastructure being built or retrofitting of facilities within the City.

However, population growth and climatic conditions could also increase the City's overall scheme water use within both City owned and operated buildings and City leased buildings.

City of Joondalup Craigie Leisure Centre

Top 12 Water Using Facilities

Figure 17 below displays the City's top 12 Corporate Scheme water using facilities from 2011/12 to 2015/16.

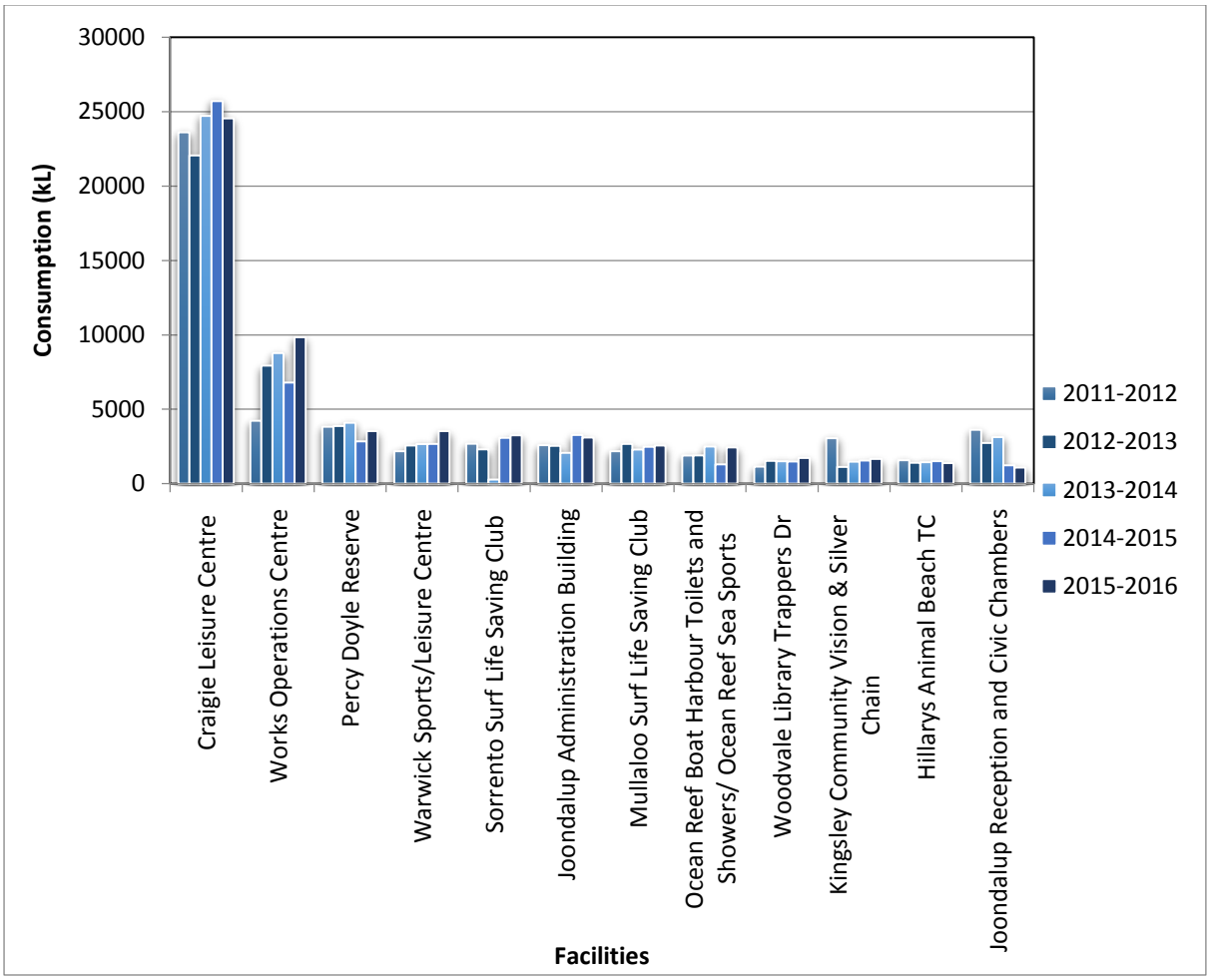


Figure 17 Top 12 City of Joondalup corporate scheme water consuming facilities for 2011/12 to 2015/16.

The top 12 facilities have remained constant over the past five years even though actual usage may have varied. The facilities are a combination of City owned and operated buildings and City leased facilities across various facility types. By far, the highest user was the Craigie Leisure Centre which includes multiple swimming pools, spa, sauna, gymnasium, change room facilities and sports courts. In 2015/16, the top 12 facilities formed 71% of the total corporate scheme water usage.

City of Joondalup Currambine Community Centre

2.3 Community Water Consumption

2.3.1 Groundwater

Groundwater supplying community garden bores is drawn from the superficial aquifer and currently, there is no requirement for home bores within the superficial aquifer to be registered or licensed[23]. There is also no measured data available on community groundwater consumption.

It is estimated that there are 169,200 garden bores within the Perth Metropolitan Area[24]. The DoW has developed the Groundwater Atlas to map areas that are suitable for garden bores. An area can be deemed unsuitable due to water quality concerns or potential impacts to waterways, groundwater dependent ecosystems or acid sulphate soils. Garden bores are encouraged by the State Government because they can reduce demand on scheme water resources by proving a fit for purpose water source.

Availability of the groundwater for residential garden bores is dependent on rainfall to recharge the shallow superficial aquifer and due to the drying climate, sprinkler restrictions have applied to residential garden bores during winter months since 2010.

City of Joondalup Oahu Park (Hillarys)

[23] Department of Environment (2004)

[24] Water Corporation (2013)

2.3.2 Scheme Water

All scheme water is supplied to the City of Joondalup via the Integrated Water Supply System (IWSS) which is sourced from a combination of groundwater, surface water and desalination resources[25]. This is treated at local groundwater treatment plants to drinking water quality. The residential sector accounts for 71% of the water consumption, 39% of which is used for irrigation[26].

The average annual water usage per person in the Perth region has decreased from 191 kL in 2001 to 126 kL per person in 2015. This is a reduction of 34% and is well on track to achieving the Water Corporation's Water Forever 2030 target of 125 kL per person[27].

The Water Corporation has implemented a number of strategies to reduce community water consumption across Perth, including enforcing water restrictions and watering days, the H_2O Assist™ Program, Fresh Water Thinking Campaign and providing information about saving water around the home and garden on the Water Corporation website.

City of Joondalup Sustainable Gardens Workshop at Currambine Community Centre

[25] DoW (2012)
[26] Water Corporation (2010)
[27] Water Corporation (2015a)

The City's total community scheme water consumption includes residential, commercial and trade scheme water.

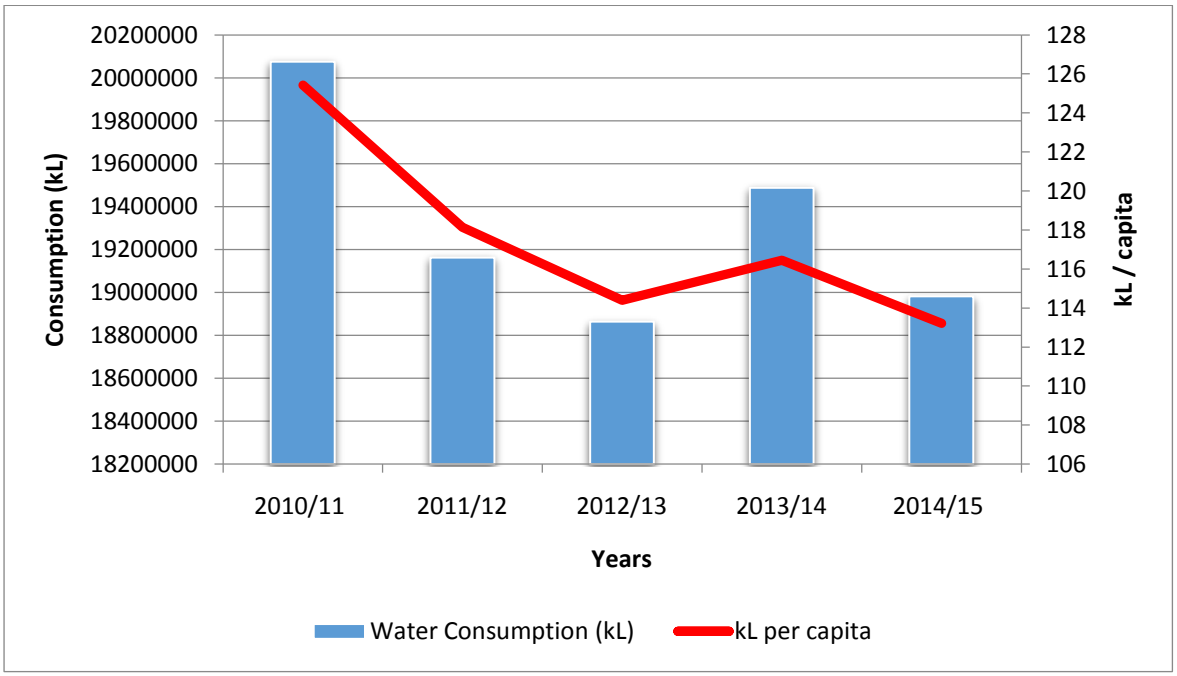


Figure 18 City of Joondalup Community scheme water consumption from 2010/11 to 2014/15[28].

Total community scheme water usage for the City of Joondalup has decreased over the past five years, with the exception of 2013/14. See Figure 18. Climatic conditions may have contributed to this increase as the summer of 2013/14 had well below average rainfall and above average maximum temperatures across the Perth region. The City's Community scheme water usage was 20,075,112 kL with an estimated resident population of 160,053[29] for 2010/11 (125 kL per capita) and 18,981,393 kL with an estimated resident population of 167,653[30] for 2014/15 (113 kL per capita). The water consumption figures provided throughout this Plan are based on the most up to date data available at the time.

[28] Water Corporation (2015b)
[29] Profile ID (2016)
[30] Profile ID (2016)

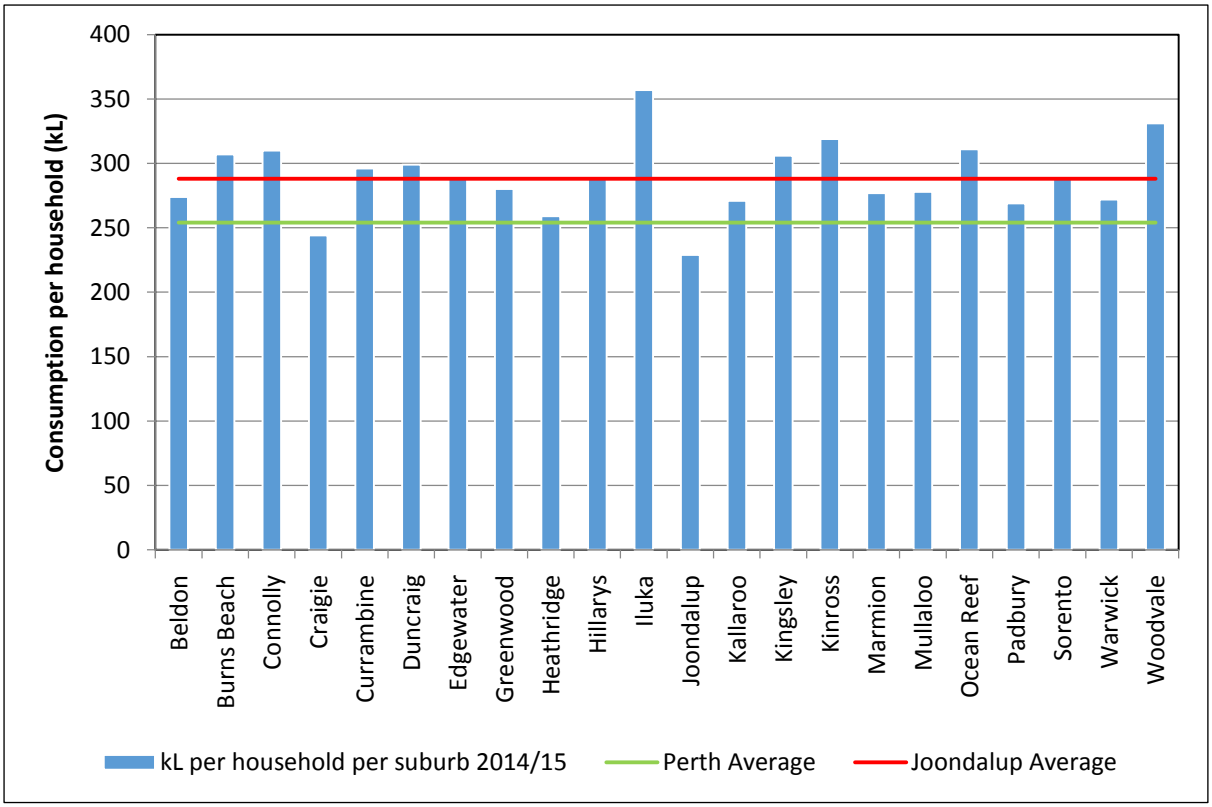


Figure 19 Household scheme water consumption by suburb for 2014 – 2015[31].

In 2014/15, the City of Joondalup average water consumption per household was 288 kL which is an overall decrease of 26.6 kL per household since 2010/11. However, the City's average household scheme water consumption remains higher than the Perth average for household scheme water consumption, which has decreased from 276 kL[32] in 2010/11 to 254 kL in 2014/15[33]. See Figure 19.

The top five residential suburbs for household scheme water consumption are Iluka, Woodvale, Ocean Reef, Connolly and Currambine. Iluka continues to have the highest annual consumption per unit of 357 kL, which is a decrease of 40 kL from 2011. Suburbs with a greater number of high density residential dwellings recorded less water use per unit.

The City will continue to run targeted campaigns for water conservation based on the analysis of suburb by suburb residential water consumption. The City will continue to encourage water efficiency through its Think Green Environmental Education Program and Eco Home Audits Program. The City will continue to support community water efficiency programs implemented by State government agencies.

[31] Water Corporation (2015b)
[32] National Water Commision(2013)
[33] BoM (2015)

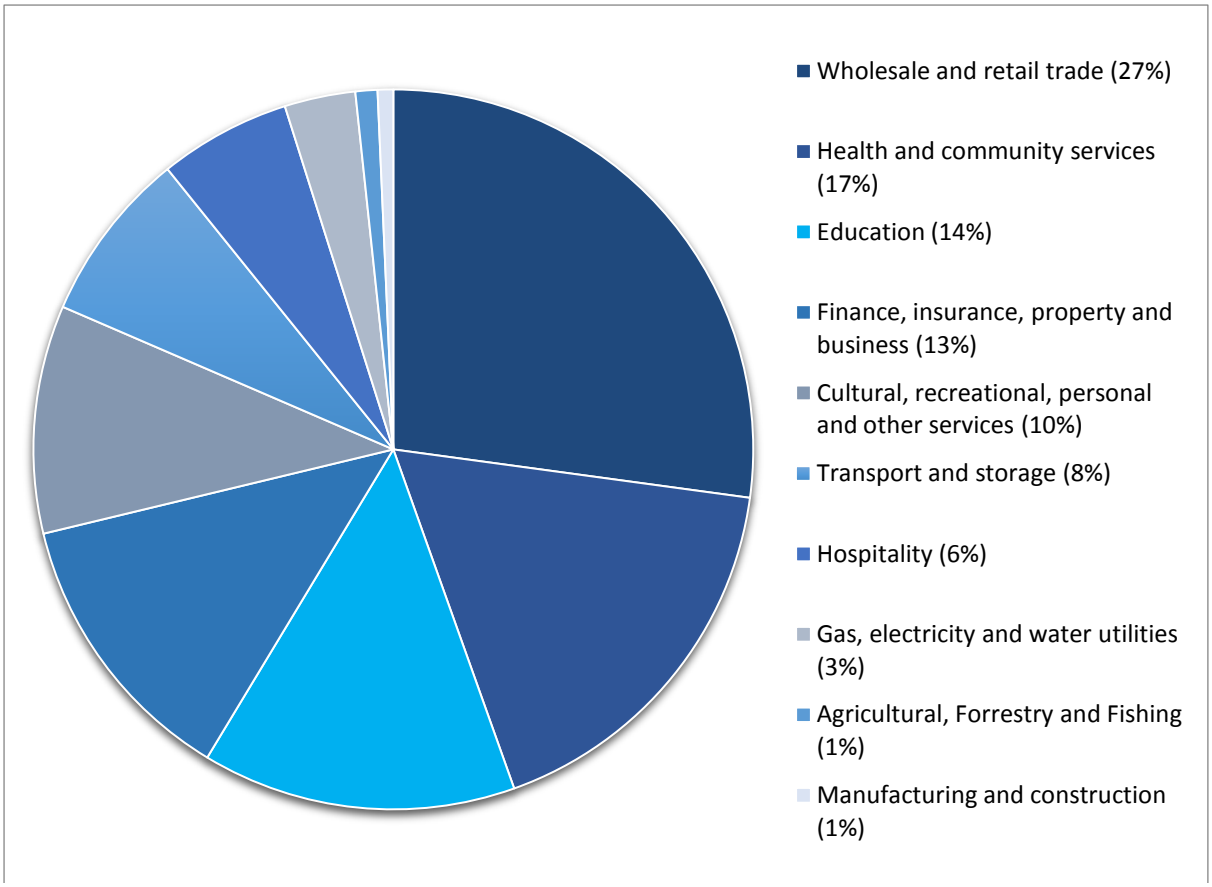


Figure 20 Non-residential community water use breakdown for 2014 - 2015[34].

Non-residential community use equates to 10% of the overall community scheme water usage. The top five non residential community water user sectors over the past five years are wholesale and retail trade, health and community services, education, finance, insurance, property and business and cultural, recreational, personal and other services. The wholesale and retail trade category remains the highest non-residential category water user sector. See Figure 20.

The City will continue to use this information to target water conservations programs to specific community users through the City's Environmental Education Program.

[34] Water Corporation (2015b)

2.4 Corporate Water Quality

Water quality also forms an integral part of water management as water of an adequate quality is also required to support water dependant ecosystems and adequate drinking water sources. Water quality can also be impacted by factors such as land use, groundwater abstraction and climate change.

A significant area of the City is located within the Perth Coastal Underground Water Pollution Control Area which is classified as a Priority 3 public drinking water source area and groundwater is extracted from this area as part of the IWSS[35].

The City is also located within the Yellagonga catchment and the health of the Yellagonga Regional Park and its associated wetlands is of high importance to both the local and wider communities, stakeholders and organisations responsible for managing the park. Pollutants such as heavy metals, hydrocarbons, nutrients, suspended solids and litter can enter the Park's wetlands via stormwater runoff, groundwater flow and rainfall.

Water quality monitoring is undertaken at various locations within the Yellagonga Wetlands as part of the Yellagonga Water Quality Monitoring and Improvement Project within the Yellagonga Integrated Catchment Management Plan (YICM) 2015 - 2019. This monitoring increases the understanding of contaminants entering the system and provides the required data for improved management of the area.

Water quality monitoring at coastal sites, undertaken with the primary purpose of protecting public health, indicates that contaminates and nutrients are present in marine waters. Contaminants reach the coast through existing stormwater systems that discharge into coastal areas, and through sub-marine discharges from groundwater, and can have a significant impact on coastal water quality.

2.4.1 Stormwater Management

The City manages stormwater through its drainage network which consists of pipelines, side entry gullies, outfalls, sumps, leach drains, soak wells, gross pollutant traps (GPTs) and bubble-up pits. Stormwater in the City is discharged via ocean, wetland and sump outfalls, and recharged to groundwater resources via infiltration through soakwells and drainage sumps.

Stormwater systems traditionally collected and conveyed stormwater to water bodies, including groundwater, without any treatment. However, the City has developed a Stormwater Management Policy which incorporates the principles of water sensitive urban design into stormwater management to protect local waterways from contaminants and other pollutants.

The City of Joondalup has completed an upgrade of all its outfalls in the Yellagonga Catchment as part of the implementation of the YICM Plan 2009-2014. The City has developed a Stormwater Drainage Program which provides the City with an opportunity to

[35] Water Corporation (2007)

improve the environmental performance of stormwater management systems, and to reduce potential water quality and water quantity impacts to the local environment. The project aims to increase the amenity of the sumps and improve the quality of water infiltrating into the groundwater systems by improving the biofiltration of the City's sumps. New and renewal projects also provide an opportunity for the City to upgrade stormwater assets to manage increased, and more intense, storm events, as expected under climate change scenarios.

City of Joondalup Burns Beach Park (Burns Beach)

2.5 Community Water Quality

Water quality can also be negatively impacted by the community through the application of fertilisers to residential gardens, waste management, vehicle use and the community's interaction with the local waterways.

The City will continue to provide water awareness programs to the local community through the City's Environmental Education Program and Yellagonga Ecotourism and Community Awareness Program.

Part 3: Water Plan

3.1 Water Plan Key Focus Areas

Eight Key Focus Areas have been identified to address key water issues and opportunities within the City.

Implementation of projects within these key focus areas will ensure that a holistic approach to water management is adopted. Objectives to improve water management within the City have been developed for each key focus area and are provided in Table 1 below.

Table 1 Key Focus Areas

KEY FOCUS AREA	KEY ISSUES	OBJECTIVES
Water Monitoring and Reporting	Gaps in data for City Scheme water consumption. Gaps in the City's scheme water and groundwater efficiency tracking. Monitoring and reporting systems for water consumption that are time consuming and prone to human error. Lack of accountability for variances in water use in City facilities. Gaps in some areas of water quality management.	Collate and maintain accurate water consumption and water quality data that allows for consistent monitoring, efficiency tracking, review and reporting.
Built Environment	Lack of accountability for variances in water use in City facilities. Financial constraints for infrastructure upgrades and building retrofits.	Create and maintain City assets that minimise the use of water and protect local water resources through appropriate design, construction and operation.

KEY FOCUS AREA	KEY ISSUES	OBJECTIVES
	Gaps in research for new water technologies.	
Management of Wetlands and Public Open Space	Financial constraints for infrastructure upgrades and retrofits. City operations may negatively impact on local water quality. Continued decline of water quality in wetlands of Yellagonga Regional Park. Gaps in research for new water technologies.	Manage and protect local water resources through best practice management of the natural environment and public open space.
Water Sensitive Urban Design	Financial constraints for infrastructure upgrades and building retrofits. City operations may negatively impact on local water quality. Traditional stormwater conveyance systems which do not provide environmental and social benefits.	Promote and implement stormwater management practices that improve local water quality and reduce water consumption.
Contracts and Purchasing	External contractors and suppliers that operate under different policies and procedures.	Minimise the consumption of, and impact to, water resources through the consideration of environmental criteria in City purchasing and tender decisions.
Staff Education and Participation	City operations may negatively impact on local water quality.	Improve the environmental performance of the organisation through the provision of information to

KEY FOCUS AREA	KEY ISSUES	OBJECTIVES
	Level of staff awareness regarding water quality of Yellagonga Regional Park and local waterways. Staff water consumption and behaviours.	staff regarding sustainable water management and water quality improvement.
Community Education and Participation	Level of community awareness regarding water quality of Yellagonga Regional Park and local waterways. Residential activities may negatively impact on local water quality. Community water consumption and behaviours.	Provide opportunities for community education and participation in water efficiency and water quality improvement initiatives.
Partnerships and Policy	Continued decline of water quality in parks of Yellagonga Regional Park and local waterways. Gaps in research for new water technologies. Coordination and collaboration with stakeholders.	Develop partnerships with the State Government and external stakeholders to enhance water conservation and water quality improvement opportunities within the City.

4. Overarching Targets and KPI's

By establishing targets, the City can monitor and measure the progress made towards achieving the objectives of the City Water Plan. New water usage targets have been established and are outlined in the following section. A summary of the targets are provided in Table 2. Progress made in achieving these targets will be reported on annual basis.

Table 2 City Water Plan 2016-2021 Targets

INDICATOR	TARGET 2020/21	BASELINE
Corporate Groundwater Consumption	To reduce the amount of groundwater used per hectare by 10% (average kL/irrigated hectare)	average of 7,500 kL/irrigated hectares (2007/08 DoW allocations per hectare)
Corporate Scheme Water Consumption: Aquatic Leisure Centre	5% reduction kL/patron	2015/16 kL/patron
Corporate Scheme Water Consumption: CoJ owned, operated and leased buildings	5% reduction on average kL/m^2	5 year average kL/m^2 (2011/12-2015/16)
Corporate Water Quality	Undertake water quality improvement projects within City operations, procedures and policies in at least three Key Water Focus Areas by 2020-2021.	
Community Scheme Water Consumption	5% reduction kL/capita	2014/15 kL/capita
Community Water Quality	Undertake water quality improvement projects that encourage community awareness and promote partnerships for water quality improvement in at least two Key Water Focus Areas by 2020-2021.	

4.1. Baseline water use and Key performance indicators.

The City's water consumption targets and baseline values have been developed through the review of the City's water consumption profile over the past 5 years. Individual baseline values have been developed for each indicator which allows for more accurate representation of water consumption in that particular area. The KPI units have been

selected to provide measurements of water use that are representative for the type of facility or user group. The target year for all indicators is the final implementation year of the Plan of 2020/21.

The City Water Plan targets have been developed in consideration of the achievements that the City has already made in reducing water consumption. Through implementation of the City's Water Plan 2012-2015, the most economic and easily achieved improvements have already been undertaken. Whilst there is still scope for improvement, these initiatives are more challenging and often have larger budgets associated with their implementation.

Corporate Groundwater Consumption

In 2007/08, the DoW allocated the City an annual groundwater abstraction allocation based on an average irrigation rate of 7,500 kilolitres per hectare per year. The DoW is currently reviewing the volumes for water abstraction which could see a reduction in the City's existing GWL allocation. However, the City has established a groundwater consumption reduction target of 10% kL per irrigated hectare with the DOW annual allocation of 7,500 kL per irrigated hectare being the baseline value. A KPI of kL per irrigated hectare has been proposed based on the benchmark indicator by industry for Public Open Spaces.

The City's groundwater consumption baseline value is an average usage of 7,500 kL/irrigated hectares. The City will need to reduce its groundwater use to an average usage of 6,750 kL/irrigated hectares by 2020/21 in order to meet this target.

Corporate Scheme Water Consumption

Separate reduction targets have been established for corporate scheme water use within the Craigie Leisure Centre's Aquatic Centre and the remaining City owned, operated and leased buildings.

Aquatic Centre (Craigie Leisure Centre)

Craigie Leisure Centre's Aquatic Centre is recognised as a Waterwise Aquatic Centre due to the best practice approach that is taken to managing water use within the facility.

To build on past achievements of Craigie Leisure Centre, a reduction target of 5% kL per patron has been established. A KPI of kL per patron has been proposed to account for the number of people using the facility. However, other factors have the potential to impact upon the amount of water consumed including planned maintenance work during the life of the Plan as well as a major refurbishment scheduled to occur by 2020/21, which will require major drainage of the pool and will impact on total scheme water used at the facility.

A baseline year of 2015/16 has been selected. The Leisure Centre's water usage in 2015/16 was 0.0209 kL/ patron. The City will need to reduce its water use to 0.0199 kL/patron by 2020/21 in order to meet this target.

City owned, operated and leased buildings and facilities

In order to recognise that the City's water usage can increase with the number of building and facilities that it manages, a reduction target of 5% kL per meter squared has been established. The average scheme water consumption per meter squared over a 5 year period from 2011/12-2015/16 will be used as the baseline value. City operated and managed buildings and facilities including leased premises are included in this category. However, City owned buildings that are leased by operators that are responsible for their own water accounts are excluded from this group.

The baseline consumption for the City's corporate scheme water consumption for City owned, operated and leased buildings and facilities is an average usage of 9.68 kL/$m^{2.}$ The City will need to reduce its water consumption within these facilities to an average usage of 9.20 kL/m^2 by 2020/21 in order to meet this target.

Corporate Water Quality

The following Corporate water quality target has been set based on the City implementing a minimum number of projects per year.

Undertake water quality improvement projects within City operations, procedures and policies in at least three Key Water Focus Areas by 2020-2021.

Community Scheme Water Consumption

The City does not have any direct influence over how the community utilises scheme water or groundwater. The City can raise awareness of water conservation and water efficiencies within the community. A target for scheme water reduction within the community has been set. However, no target has been established for community groundwater consumption as there is no available data on community bore consumption.

A reduction target of 5% per capita has been established for community scheme water consumption. The average community water consumption per capita in 2014/15 will be used as the baseline value. A KPI of per capita has been used to capture population growth within the City.

The City's community scheme water consumption baseline value is 113 kL/capita. The community will need to reduce its scheme water use to 107 kL/capita by 2020/21 in order to meet this target.

Community Water Quality

The City does not have any direct influence over behaviours by the community that can impact on water quality. However, the City can raise awareness of water quality issues through undertaking community awareness projects. Community water quality targets have been set based on a minimum number of projects implemented per year.

Undertake water quality improvement projects that encourage community awareness and promote partnerships for water quality improvement in at least two Water Focus Areas by 2020-2021.

4.2 Water Plan Projects

In order to achieve the objectives of the *City Water Plan 2016-2021* a number of projects have been identified under the eight key focus areas. Some projects may contribute to achieving objectives across multiple key focus areas. Projects will be implemented over the life of the Plan and will be subject to regular monitoring and review.

4.2.1 Project Descriptions

A summary of each project is provided in Appendix 2, which includes project descriptions, project objectives and deliverables.

5. IMPLEMENTATION

Effective and coordinated implementation is critical to achieving the objectives of the Plan. Implementation of the Plan will be coordinated by the establishment of processes for monitoring and reviewing projects and key performance indicators. See Table 3.

Table 3 City Water Plan 2016-2021 Implementation

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
Water Monitoring and Reporting	Environmental Building Audits	1	In order to reduce water and energy use within City buildings undertake environmental audits of key sites including the development of a new audit schedule.	Asset Management	Existing	■	■	■	■	■
	Soil Moisture Monitoring	2	Continued installation of soil moisture and rain sensors as required to assist in maintaining effective irrigation schedules.	Operation Services	Existing	■	■	■	■	■

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Groundwater Classification Project	3	Investigate opportunities to further breakdown groundwater usage and development of more detailed water usage reports.	Strategic and Organisational Development/ Operation Services	New	■	■			
	Water Database Project	4	Continue collection of water usage data and the development of improved water anomaly and quarterly usage reports.	Strategic and Organisational Development	Existing	■	■	■	■	■
	Yellagonga Water Quality Monitoring and Improvement Project	5	Improve understanding of contaminants entering the Yellagonga Regional Park by undertaking water quality monitoring and mapping within Yellagonga Regional Park.	Strategic and Organisational Development	Existing	■	■	■		
	Water Efficiency Database	6	In order to track water efficiency projects implemented by the City,	Infrastructure Management Services /	New	■	■			

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Project		develop a centralised data storage location for easier tracking of projects and outcomes.	Strategic and Organisational Development/ Operation Services/ Asset Management						
	Weather Station Project	7	Investigate and install web based irrigation central control software incorporating three weather stations located in the northern, central and southern suburbs to gain accurate weather information to influence irrigation run times.	Operation Services	New	■	■	■	■	■
	Leak Detection Project	8	Improve understanding of water usage and leak detection, investigate leak detection options and implement recommended option.	Strategic and Organisational Development/ Asset Management	New	■	■			

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Water Utilities Review Project	9	Investigate and develop a system for tracking water consumption across the City's buildings for reporting purposes.	Asset Management	New	■	■			
Built Environment	Building Sub-metering Project	10	Development of a priority listing for buildings which are appropriate for submeters with the installation of a least one submeter per annum over the life of the project.	Asset Management	Existing		■	■	■	
	Waterless Urinal Upgrade Project	11	In order to increase water efficiency within the City Facilities, undertake waterless urinal retrofits in alignment with the building refurbishment schedule.	Asset Management	New	■	■	■	■	■
	Flow Restrictor Tap Retrofits	12	In order to increase water efficiencies within City facilities, trial water flow	Asset Management	New	■				

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
			restrictor devices on appropriate taps at the WOC.							
	Craigie Leisure Centre Water Demonstration Project	13	Continued promotion of water efficiency technologies and community education at Craigie Leisure Centre.	Leisure and Cultural Services	Existing	■	■	■	■	■
	Green Stamp	14	Maintaining sound environmental management practises through continuous improvement of environmental practises through the reviewing of best practises.	Operation Services	Existing	■	■	■	■	■
	WOC Iron Filtration Project	15	Implementation of iron filtration system at the WOC which will reduce dependence on scheme water for the nursery.	Operation Services	New	■				

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Review of Contaminant Disposal at the WOC	16	Continue review of contaminant disposal at the WOC and determine opportunities for performance improvements.	Operation Services	Existing	■	■	■	■	■
Management of Wetlands and Public Open Spaces	Low Rainfall Irrigation Management Plan	17	Development and implementation of Irrigation Plan which addresses irrigation priorities within a drying climate.	Operation Services	New	■	■			
	Irrigation Infrastructure Management	18	Continued management of the City's irrigation network by undertaking ongoing irrigation infrastructure audits, groundwater consumption data collection and bore maintenance program.	Operation Services	Existing	■	■	■	■	■
	Review of Nutrient	19	Review of operational practises to determine	Strategic and Organisational	Existing	■	■	■	■	■

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Management Practises		where environmental performance can be improved.	Development						
	Wetlands Management Plan	20	Continued development of the Wetlands Management Plan and associated Action Plans to ensure best management practises within the City's constructed wetlands.	Operation Services	Existing	■	■	■	■	■
	Parks Redevelopment Program	21	Continue implementing hydrozoning and ecozoning, and redesigning of irrigation systems to reduce groundwater use within City parks and public open space.	Operation Services/ Infrastructure Management Services	Existing	■	■	■	■	■
	Stormwater Management Policy	22	Continued implementation of the policy to provide direction and guidance on the design and	Infrastructure Management Services	Existing	■	■	■	■	■

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
			maintenance of drainage systems within the City will be undertaken as per Stormwater Drainage Program.							
	Stormwater Drainage Program	23	Continued retrofitting of sumps annually to increase their amenity and ecological values.	Infrastructure Management Services	Existing	■	■	■	■	■
Contracts and Purchasing	Sustainable Procurement Practices	24	Continue to implement the sustainable procurement practises within the City's Purchasing Policy that integrates water criteria, as well as other environmental impacts, into purchasing decisions to ensure that the City purchases services and products that are environmentally sustainable, wherever possible.	Financial Services	Existing	■	■	■	■	■

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
Staff Education and Participation	Think Green– Green Office Program	25	Continue to deliver the Green Office Program in order to raise staff awareness of water efficiency and conservation practices.	Strategic and Organisational Development	Existing	■	■	■	■	■
Community Education and Participation	Environmental Education Program	26	Continued implementation of community education programs within the community as well as provision of water usage data and educational materials to Lessees within City buildings.	Strategic and Organisational Development	Existing	■	■	■	■	■
	Yellagonga Ecotourism and Community Awareness	27	Implementation of community awareness and ecotourism initiatives to reduce the community impacts on the Yellagonga wetlands.	Strategic and Organisational Development	New	■	■	■		

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Think Green Buildings	28	Continue to implement environmental technologies within City buildings using the Think Green Building rating framework and continue promotion of the initiative to the community.	Strategic and Organisational Development	Existing	■	■	■	■	■
	Greywater Rebate	29	Develop a program to provide financial incentives such as a rebate, to City residents that install approved greywater reuse systems to encourage greater uptake of the use of greywater within the City's community.	Compliance and Regulatory Services	New	■	■			
Partnership and Policy	Craigie Backwash Water Recycling Feasibility Study	30	Undertake Feasibility Study for backwash water reuse options at Craigie Leisure Centre as part of continued water efficiencies.	Leisure and Cultural Services	New	■				

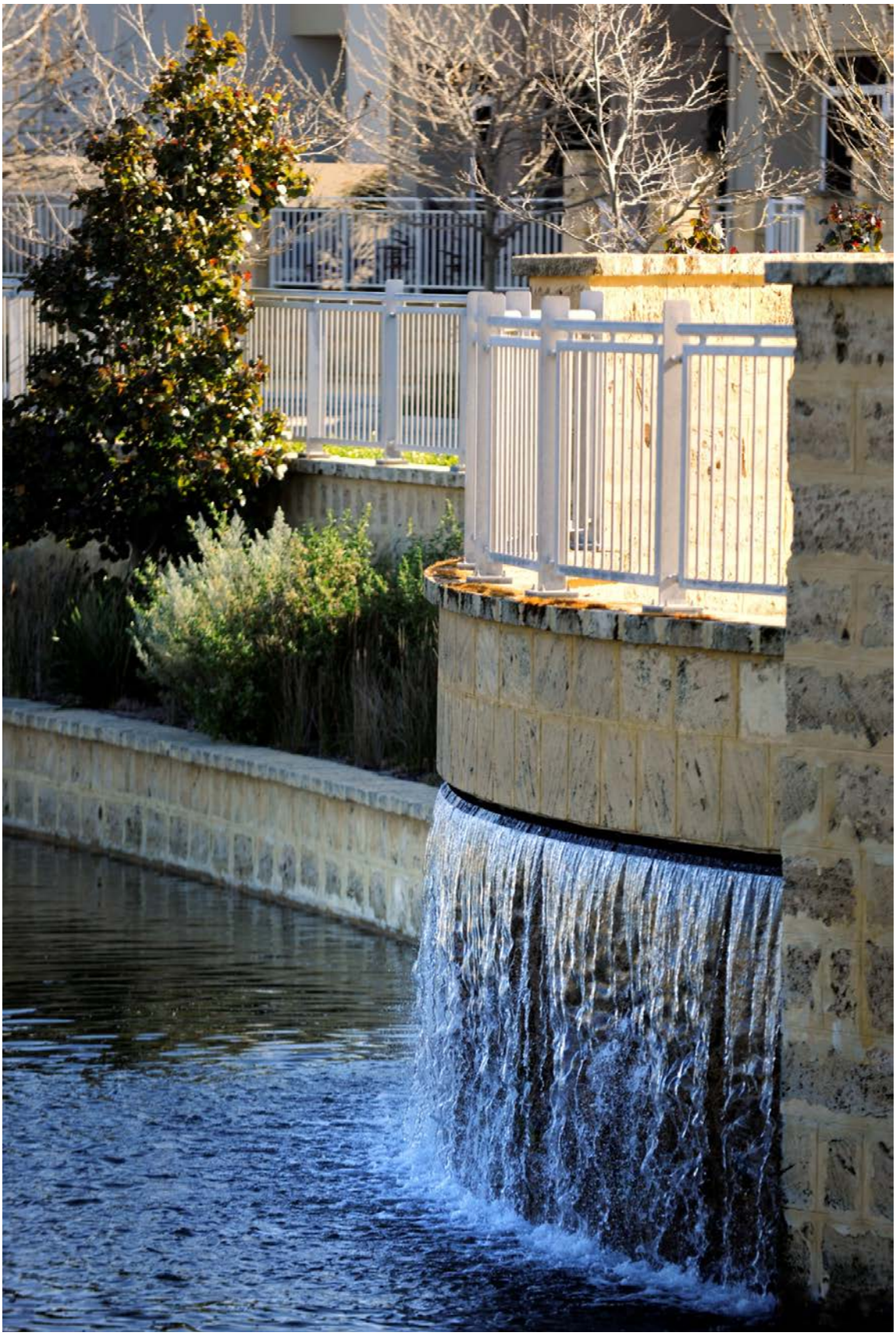
						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	CRC for Water Sensitive Cities Program	31	Continued participation in and financial support to the research program which will provide the City with access to best available science on stormwater harvesting and peripheral research into institutional barriers, land use planning, capacity building and adaptive governance.	Infrastructure Management Services / Operation Services	Existing	■	■	■	■	■
	Waterwise Council Program	32	Ongoing participation in the program and provision of annual reports to Waterwise Council to maintain accreditation.	Strategic and Organisational Development	Existing	■	■	■	■	■
	Midge Management Strategy Partnership	33	Continued participation in the Partnership and implementation of projects when required for ongoing control and management of nuisance midge within the Yellagonga Regional Park.	Compliance and Regulatory Services	Existing	■	■	■	■	■

						Timeframe for Implementation				
Key Focus Area	**Project Title**	**Project Number**	**Description**	**Responsible Business Unit**	**Project Type**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
	Beach Microbial Sampling	34	In order to address the risk of stormwater contamination impacting coastal systems, undertake regular monitoring of beach water quality on behalf of the Department of Health.	Compliance and Regulatory Services	New	■	■	■	■	■

5.1 Monitoring and Review

Annual review of the *City Water Plan 2016-2021* will identify the progress and effectiveness of projects enabling the City to adapt to emergent issues, readjust priorities and project scopes to ensure effective management of the City's water is achieved within the timeframe of the Plan.

A major five year review will be undertaken at the end of the Plan which will identify further actions which may be required to address any additional issues that have arisen.



City of Joondalup Oahu Park (Hillarys)

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Appendix 1-Key Achievements of City Water Plan 2012-2015

CORPORATE

Groundwater Use

A number of corporate groundwater projects have been implemented since the adoption of the City Water Plan 2012-2015 that have contributed to a reduction in water use, these include:

- Monitoring of all bore meters on a monthly basis to track groundwater use.
- Assessing weekly evaporation rates and daily rainfall to determine watering regimes.
- Installation of Signal Data Systems at sixteen parks to allow for real time communication with irrigation control systems.
- Installation of twenty-five soil moisture sensors within public open spaces across the City.
- Installation of nine rain sensors within public open spaces across the City.
- Installation of nine new bores to replace older bores and replacement of sixteen pumps as part of the Bore Maintenance Program.
- Eleven parks upgraded as part of the Parks Redevelopment Program including hydrozoning, ecozoning, redesigning irrigation systems and landscaping.

Scheme Water Use

The following key projects were implemented for scheme water conservation from 2012-2015:

- Installation of sub-meters at thirteen City buildings to monitor water usage and easily identify issues.
- Continued monitoring of water use in City buildings through the Planet Footprint program and the Water Corporation My Water website. Buildings showing significant water increases were identified and remedial action undertaken.
- Implementation of Environmental Building Audits of the Administration Building, Works Operations Centre, Civic Centre, Joondalup Library and Craigie Leisure Centre.
- Continuation of the ‘Think Green’ Green Office program aimed at raising awareness and encouraging sustainable behaviour among City of Joondalup employees.

- Continued participation in the Waterwise Councils Program.
- Installation of sixteen Think Green Buildings signs at the entrance to City buildings that have received environmental upgrades to promote technologies that can be implemented by community members.

Corporate Water Quality Management

The following corporate water quality projects are key achievements for 2012-2015:

- Implementation of the Yellagonga Water Quality Monitoring and Mapping Project to monitor the state of surface and groundwater quality within the Yellagonga Catchment Area.
- Implementation of the Yellagonga Acid Sulphate Soils Project to further assess the extent of acid sulphate soils in the Yellagonga region.
- Continued participation in the Midge Steering Group including water quality monitoring and midge treatment strategies.
- Implementation of the City's Sump Retrofit Program with six sumps being upgraded.
- Adoption of the new Yellagonga Integrated Catchment Management Plan 2014-2019.

COMMUNITY

Community Scheme Water Use

The City of Joondalup undertakes a number of environmental education initiatives that promote water conservation to the community, including:

- Gardening Seminars – two gardening seminars are held every year promoting water conservation messages and tips for water wise gardening. Over the past three years 680 residents have attended one of the City's gardening workshops.
- Home Eco-Audit Program – through the Home Eco-Audit Program residents can sign up for a free eco-audit of their home. As part of the program residents can have an auditor visit their home to assess their energy and water consumption and make recommendations for reducing their consumption. Residents can also receive up to $50 worth of energy or water saving hardware for their home including water efficient showerheads, tap flow restrictors and shower timers. Over the past three years 240 audits have been provided to residents.
- Information and Awareness Raising – The City in partnership with the Department of Water, produced two brochures Saving Water in the Home and Saving Water in the Garden which it distributes through the City's libraries and customer service centres. Information on how to save water in the home and garden is also provided on the City's website.

The City has limited direct control over community scheme water use. However, it will continue to encourage water efficiency through its Environmental Education Program and

Eco Home Audits Program and will continue to support community water efficiency programs implemented by State government agencies.

Community Water Quality Management

The following community water quality projects were implemented and are highlights for 2012-2015:

- Yellagonga Community Awareness Project including the Green Frog Stencilling Program, Yellagonga school ecology program, environmental events such as flora, fauna and bird watching tours, sustainable gardens workshops, water quality displays and presentations at the Wetland Management Conference.
- Distribution of the *Nuisance Midges* brochure to community members and promotions on the City's website.

Appendix 2 - Project Summaries

WATER MANAGEMENT AREA: WATER MONITORING AND REPORTING

Objective: Collate and maintain accurate water consumption and water quality data that allows for consistent monitoring, review and reporting.

Project 1 Environmental Building Audits

Project Status	**Project Commencement**
Existing Project	2016-17

Project Description

Environmental auditing involves the identification of assets and processes that contribute to inefficiencies in water use within facilities and operations. Audits also enable the identification of opportunities for improvements which can reduce water consumption.

The City will continue to carry out Environmental Building Audits of key facilities that utilise scheme water in order to identify opportunities for upgrades or improvements in water efficiency. Physical audits of nominated facilities will be conducted.

Property scheme water usage data, provided by database, will be used to inform the Audits. A report will be developed that will include recommendations to improve water use within the facilities. Recommended works will be incorporated into future Capital Works Programs and Maintenance Schedules.

Project Objectives

- Identify where water efficiencies can be made through the auditing of scheme water infrastructure in City facilities.
- Prioritise upgrades, retrofits and replacements for the City's Capital Works Program and Maintenance Schedules.

Deliverables

- Continue to develop an audit schedule for City buildings identifying those that can be audited by City staff and those that require the skills of an external consultant.
- Develop a new building audit schedule to include high water using facilities that aligns with the City's maintenance schedule and building upgrades projects.
- Environmental Building Audit and Report outlining findings for City facilities including:
    - Craigie Leisure Centre
    - Joondalup Administration Building
    - Works Operations Centre.
    - Joondalup Library, Woodvale Library, Duncraig Library and Whitfords Library.
- Develop a structured implementation program schedule to including budget allocations for the feasible recommendations from the audits undertaken.

Approach

The focus of the Project will be to continue to conduct audits at the City's highest water consumption buildings. Consultants will be engaged to undertake Water Audits for larger City facilities. Audits requiring less investigation may be conducted by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Building Capital Works (Environmental Initiatives)	Asset Management

Project 2	**Soil Moisture Monitoring**
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

Soil moisture monitoring allows the identification of moisture levels in the soil profile and the scheduling of irrigation regimes according to turf requirements. It also allows the City to promote deep root growth without causing stress to turf roots.

Following a trial of ten soil moisture sensors in active sporting ovals in 2011, the City developed a Case Study to investigate the benefits of the technology. Currently, the City has installed twenty-five soil moisture sensors within public open spaces across the City and will continue to install moisture sensors and monitor each year as required. Soil moisture meters monitor moisture at four depths in the soil profile. This data is then automatically sent to a website where it can be viewed and analysed by City staff to inform irrigation regimes.

The City will continue to use soil moisture data to develop irrigation schedules based on turf needs. The sensors indicate moisture levels after rainfall events, preventing over-watering, and allow the City to manage turf on minimal irrigation without causing stress. Soil moisture sensors are used in combination with weather forecasts, evaporation rates and soil types to ensure the City adopts a science based approach to irrigation scheduling.

Project Objectives

- Ensure the City adopts a science-based approach to irrigation scheduling to increase water use efficiency.

Deliverables

- The continuation of the program with the installation of soil moisture meters as required.
- Ongoing development of irrigation schedules with consideration of soil moisture levels and turf requirements.

Approach

Ongoing research and implementation will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Capital Operational	Operation Services

Project 3	**Groundwater Classification Project**	
Project Status New Project	**Project Commencement** 2016-17	
Project Description The City undertakes monthly groundwater consumption monitoring as part of a commitment to increasing water efficiency and proactive resource management. Regular monitoring assists the City to manage and monitor actual usage against the Department of Water Ground Water Licence conditions. The City's groundwater consumption is currently reported against the Department of Water groundwater allocation. The City proposes to investigate opportunities to further track groundwater usage against the park classification to gain a better understanding regarding the specifics of the City's groundwater usage.		
Project Objectives • Increase understanding of the City's groundwater consumption.		
Deliverables • Investigate opportunities within current systems to link bore usage to park classifications. • Investigate opportunities for including hectare details within internal monthly reporting. • Develop detailed groundwater usage reports.		
Approach This project will be carried out by the City of Joondalup.		
Timeframe for Implementation 2016/17 – 2017/18	**Proposed Budget Source** Operational	**Responsible Business Unit** Operation Services

Project 4 Water Database Project	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The availability of consistent and accurate water consumption data assists in identifying anomalies and the outcomes of City water efficiency projects. Frequent monitoring and reporting of water consumption data is also important in tracking progress towards water management targets.

The City will continue to measure its environmental performance, providing energy, water, waste, fleet and greenhouse performance including consumption, costs and greenhouse gas emissions data on a quarterly basis.

The City will continue to monitor its energy and water consumption within its buildings, as well as its overall water use, and has water consumption data for each property for the past five years. The City will also report on anomalies and review any significant increases in water consumption. The performance of City buildings is benchmarked against National and International properties in a similar category. The data will be used to inform the priorities for *Environmental Building Audits* as well as measure the consumption and cost benefits of changes the City makes as a result of the Building audits.

Project Objectives

- Enable consistent and ongoing monitoring of water consumption data to measure targets and to identify trends and anomalies.
- Provision of qualitative data to inform City decisions, reports and strategic direction relating to water management.
- Provision of data to inform the development of community and staff environmental education programs relating to water conservation.

Deliverables

- Development of a priority list of high water using buildings.
- Development of water consumption and anomaly reports.
- Establishment of a working group to investigate anomalies.
- Undertake quarterly reviews and reporting of the data.

Approach

The City will continue to collect and collate water use data for interpretation and reporting of data internally and externally.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Strategic and Organisational Development

Project 5	**Yellagonga Water Quality Monitoring and Improvement Project**
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

There are a number of water quality issues arising from groundwater and surface water inputs. These include nutrient enrichment resulting in eutrophication, algal blooms and midge outbreaks; and toxicants such as heavy metals, petroleum products, pesticides, herbicides and industrial / household chemicals.

Monitoring and mapping of water quality entering into Yellagonga wetlands is vital to continued understanding of the movements and concentrations of contaminants.

Edith Cowan University Centre of Ecosystem Management has undertaken surface and groundwater quality monitoring and reporting for the City of Joondalup since 2010. The monitoring provides details on water quality and recommendations to improve water quality are provided.

The Water Quality Monitoring and Improvement Program is undertaken in liaison with the Midge Management Strategy Partnership which shares the same goal of improving water quality.

Project Objectives

- Increase the understanding of contaminant inputs into Yellagonga wetlands.
- Provide data upon which sound management decisions can be made.
- Reduce negative impacts within the Yellagonga Catchment associated with poor water quality.

Deliverables

The project will:

- Continue scientific monitoring and investigations of groundwater and surface water in the Yellagonga Catchment and Park.
- Support scientific and education programs aimed at identifying and mitigating sources of contaminants.
- Collate, analyse and share data between managing authorities.
- Provide recommendations for on ground actions to improve water quality.
- Investigate septic tank decommissioning opportunities in Kingsley, in conjunction with the Water Corporation.
- Investigate the opportunity of physical algal bloom removal.
- Identify the extent of the non-native species Typha orientalis at South Lake Joondalup for potential revegetation of native species to improve water quality.

Approach

This project will be coordinated by the City of Joondalup, in partnership with the City of Wanneroo and the Department of Parks and Wildlife.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2018/19	Operational	Strategic and Organisational Development

Project 6	**Water Efficiency Database Project**
Project Status New Project	**Project Commencement** 2016-17

Project Description

The City undertakes numerous projects to improve water efficiencies across its groundwater and scheme water usage areas. A centralised data storage location, which tracks the projects undertaken, cost and water savings achieved through these projects, will enable more efficient tracking of overall water savings and enable greater access to information by decision makers. This information can assist in providing qualitative data to enable the City to make informed decisions in implementing the most effective water efficiency measures.

Project Objectives

- Consistent monitoring and reporting of water efficiency projects.
- Improved tracking of water efficiency projects outcomes.
- Provision of qualitative data to inform City decisions, reports and strategic direction relating to water efficiency management.

Deliverables

- Evaluate current record keeping processes.
- Development of a standardised template for reporting water efficiency measures.
- Development of improved centralised record keeping process which quantifies costs and savings.

Approach

This project will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2017/18	Operational	Strategic and Organisational Development Operation Services Infrastructure Management Services Asset Management

Project 7 Weather Station Project	
Project Status New Project	**Project Commencement** 2016-17

Project Description

Various environmental factors including climate and weather affect water consumption. The City currently utilises the Department of Agriculture and Food weather station to obtain temperature, wind speed, solar radiation and relative humidity data which assists in determine the amount of water required for productive plant growth.

The City proposes to investigate installation of web based irrigation central control software incorporating 3 weather stations located in the northern, central and southern suburbs to gain accurate weather information to influence irrigation run times. The system will automatically download weather data daily and calculate the evapo-transpiration to determine irrigation times for the entire system or specific areas or stations.

Project Objectives

- Provision of more accurate daily weather data linked to a web based central control irrigation system.
- Reduced groundwater and power consumption through more accurate data and control of the City's irrigation practises.

Deliverables

- Investigate installation of web based irrigation control software.
- Installation of 3 weather stations located northern, central and southern suburbs.
- Adjust irrigation times accordingly to data received including the shutting down of nominated irrigated systems due to wet weather events.

The research and implementation will be carried out by the City of Joondalup. The installation of the weather station and software will be co-ordinated by the City of Joondalup and contactors will be used as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Capital Operational	Operation Services

Project 8 Leak Detection Project	
Project Status New Project	**Project Commencement** 2016-17

Project Description

The City utilises an extensive water pipeline infrastructure network for the provision of scheme water. While leaks can be unavoidable, the early detection and maintenance of leaks are within the City's control. Currently, the City relies on visual inspections and monitoring of water consumption to identify possible leaks. However, visual inspections and reliance on invoicing data have limitations and undetected leaks have the potential to waste large volumes of water.

The City proposes to investigate various leak detection options which can assist in earlier leak detection, including identifying minor leaks which could remain undetected for long periods of time.

Project Objectives

- Improved leak detection processes to reduce incidences of water wastage.
- Effective and targeted water education programs.

Deliverables

- Investigate various options for leak detection and determine most effective option.
- Determine top ten water using buildings which are high risk for water leaks.
- Investigate the option of rotating the water loggers amongst high water using buildings and develop a rotation schedule.
- Implement recommended options.
- Review data logging information to monitor for leaks.
- Develop targeted education and behavioural change programs based on logging information.

Approach

The research and implementation will be carried out by the City of Joondalup. The installation of the data loggers will be co-ordinated by the City of Joondalup and contactors will be used as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2017/18	Operational Building Capital Works (Environmental Initiatives)	Strategic and Organisational Development Asset Management

Project 9	**Water Utilities Review Project**
Project Status New Project	**Project Commencement** 2016-17

Project Description

The City processes over 150 building water usage bills annually with payments managed by the Asset Management Business Unit. This includes the financial allocation of utilities to other business units within the organisation and on-costing to external lessees on a bi-monthly basis.

To calculate costs the City either utilises sub-meters or, on most occasions, applies an arbitrary percentage allocation of water use, which may not reflect the true level of water consumption by the building user.Sub-meters are generally read on a bi-monthly basis to align on-costing to lessees with the current billing period.

The storing of water consumption data against specific buildings is undertaken by an external provider. The data is used for annual reporting purposes, but is often subject to time delays and some inaccuracies.

To encourage reduced water consumption by building users, it is important that accurate consumption data is tracked and frequently reported by the City, as billing alone is not always an effective tool for discouraging high water use due to the affordability of water compared to other utilities.

Project Objectives

- Improved water consumption data at a building level to encourage reduce water usage.
- Improved reporting capability to inform future water efficiency projects.
- Review billing allocation methodology to reduce complexity and improve water efficiency outcomes.

Deliverables

- Investigate and implement a Utility Management System to record water and other utility data.
- Develop reports for relevant users to provide accurate information on water consumption for the purposes of encouraging behavior change or informing capital works programming.
- Identifying responsibilities for monitoring consumption data and actioning responses to trends and anomalies.

Approach

The investigation of a system will be carried out by a project team at the City of Joondalup. A supplier may be engaged to purchase a system if required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2017/18	Operational	Asset Management Strategic and Organisational Development Information Technology

WATER MANAGEMENT AREA: BUILT ENVIRONMENT

Objective: Create and maintain City assets that minimise the use of water and protect local water resources through appropriate design, construction and operation.

Project 10 Building sub-metering Project	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

Submeters have been installed within 13 City of Joondalup facilities during the previous City Water Plan which has assisted the City to identify water consumption trends and provide greater accountability to water users. Many of the City's water accounts are for buildings with a number of different occupants or for combined indoor and outdoor uses. Sub-metering allows for separating water consumption and identifying anomalies. Separate account information also assists the City to target its water education and awareness campaigns.

The City will continue to investigate opportunities to identify where sub-metering is required. Meters will be installed according to a priority listing based on water consumption data and trends.

Project Objectives

- Identification of high water consuming users within City facilities and buildings.
- Measurable reductions in water consumption at City owned and managed buildings.

Deliverables

- Development of a priority listing for buildings which are appropriate for submeters.
- Installation of at least one sub-meter per annum in City facilities over the life of the project.

Approach

Initial investigations and installation of sub-meters will be conducted by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2017/18 – 2019/ 20	Capital	Asset Management

Project 11 Waterless Urinal Upgrade Project	
Project Status New Project	**Project Commencement** 2016-17

Project Description

The City has identified through undertaking Building Audits that there are a number of City facilities containing dated water related infrastructure, such as urinals. The current type of urinals use a significant amount of water and the City has identified an opportunity to replace these units with waterless urinals. The new urinal model will use no water, which will result in a cost benefit to the City and provide 100% water saving in relation to use of the urinals. This project will have a positive impact on the City's overall use of scheme water.

This project will also be promoted through the City's Think Green Buildings Program, via the City's website and local media. It is an opportunity for the City to lead by example and highlight to the community examples of environmental upgrades that can be implemented in homes of residents and businesses within the City.

Project Objectives

- Reduce scheme water usage.
- Promote environmental upgrades and water efficiency to the community and businesses within the City.

Deliverables

- Remove existing urinals stalls and reconfigure pipe work to suite waterless urinals.
- Install waterless urinals in alignment with the building refurbishment schedule.
- Promote water efficient urinal upgrades to the community through Think Green Buildings Program.

Approach

Installation of the waterless urinals will be undertaken by contractors managed by City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/ 21	Capital (part Grant funded)	Asset Management

Project 12	**Flow Restrictor Tap Retrofits**
Project Status New Project	**Project Commencement** 2016-17

Project Description

The City has identified through undertaking Building Audits that there are opportunities for the installation of more water efficient products and fittings within City Buildings. The City has identified an opportunity to pilot water flow restricting units within hand basin taps. The installation of flow restrictors in taps will reduce the scheme water consumption as they reduce the excess flow of water from the taps. This project will have a positive impact on the City's overall use of scheme water.

The City proposes to trial the installation of flow restrictors within toilet facilities at the Works Operation Centre prior to rolling out the initiative to other City's buildings.

This project will also be promoted through the City's Think Green Buildings Program, via the City's website and local media. It is an opportunity for the City to lead by example and highlight to the community examples of environmental upgrades that can be implemented in homes of residents and businesses within the City.

Project Objectives

- Increase water efficiency by reducing excess water flow from hand basin taps thus reducing scheme water usage.
- Promote environmental upgrade and water efficiency to the community and businesses within the City.

Deliverables

- Determine appropriate hand basin taps for installation of flow restrictors at the WOC.
- Install flow restrictors and monitor effectiveness.
- Identify suitable facilities to have flow restrictors fitted to basins subject to outcome of the trial.
- Promote water efficient tap retrofits to the community through Think Green Buildings Program.
- Develop and implement flow restrictor tap retrofit program.

Approach

Installation of flow restrictors will be undertaken by contractors managed by City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17	Operational	Asset Management

Project 13 Craigie Leisure Centre Water Demonstration Project	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

Craigie Leisure Centre is the City's flagship building for implementing environmental initiatives, it therefore presents an opportunity to demonstrate new technologies and water use efficiency to the community.

This project will continue to promote existing water conservation technologies at Craigie Leisure Centre and new initiatives implemented over the life of the City Water Plan. Future projects may include greywater reuse, pool backwash recycling, rainwater harvesting and upgrading existing plumbing and taps to water efficient products. These innovations will be promoted to encourage waterwise behaviour in the community.

Project Objectives

- Promote water efficiency and water efficient technologies to the wider community.
- Increase water efficiency at Craigie Leisure Centre through community education and installation of new technologies.
- Demonstrate City leadership in environmental sustainability.

Deliverables

- Continued promotion of existing technologies and new projects resulting from Craigie Leisure Centre environmental audit.
- Continuation of communications campaign at Craigie Leisure Centre to promote sustainable technologies and encourage sustainable behaviour in patrons.

Approach

This project will be managed by the City of Joondalup. External service providers will be engaged for the installation of water efficient technologies as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17– 2020/21	Operational	Leisure and Cultural Services

Project 14 Green Stamp	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The Green Stamp Program is an environmental initiative that assists small to medium scale automotive businesses to improve their environmental performance. The Program was developed by the Motor Trade Association of WA in conjunction with the Waste Authority, with funding assistance from the Waste Avoidance and Resource Recovery Account.

Practices such as inappropriate storage and use of chemicals, wash down procedures, water wastage and waste disposal can affect local water quality. By incorporating environmental performance into processes and practices, the City can achieve Green Stamp accreditation. Following accreditation the City will be required to demonstrate ongoing commitment to operating in a manner that incorporates sound environmental management practises.

The accreditation process involves a baseline audit, audit report and secondary audit to determine the level of Green Stamp accreditation achieved.

Project Objectives

- Ensure the City's mechanical processes and practices do not have a detrimental impact on local water quality.
- Ensure water conservation and water quality improvement opportunities are harnessed at the City's mechanical workshop.

Deliverables

- Continued implementation of recommendations from the Green Stamp Baseline Audit and Secondary Audit Report.
- Gaining Green Stamp accreditation.
- Continue to investigate opportunities to improve environmental performance.
- Continued use of the Robowash Facility.

Approach

This project will be organised and implemented by the City of Joondalup in conjunction with Green Stamp.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Operation Services

Project 15 WOC Iron Filtration Project	
Project Status New Project	**Project Commencement** 2016-17

Project Description

Water for irrigation of the City's WOC Nursery was originally sourced from groundwater bores. However, due to the high iron content within the local groundwater source which was found to negatively affect plant growth as well as causing blockages within the nursery irrigation system, the City changed to scheme water to supply the nursery irrigation.

The City will investigate options for implementing an iron filtration system at the WOC Nursery with the intent of using bore water for nursery irrigation which will reduce dependence on scheme water. A preferred option will be identified and action taken to implement the preferred option.

Project Objectives

- Increase the water efficiency of the City's by identifying where improvements in technology can be made.

Deliverables

- Research and analysis into iron filtration systems for irrigation infrastructure.
- Installation of iron filtration system at WOC nursery.
- Installation of new sprinkler heads.
- Transfer of water source within the nursery irrigation system from scheme water to ground water.

Approach

Research and implementation will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17	Capital	Operation Services

Project 16 Review of Contaminant Disposal at Works Operations Centre	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The City will continue to review its existing chemical and solvent disposal methods as required which will identify where improvements can be made to protect local water quality. Contaminants including solvents used for cleaning, oils, other chemicals and hydrocarbons from vehicle use are used within the Works Operations Centre. If disposed in an inappropriate manner, these contaminates can leach into groundwater and impact on local water quality.

This project will allow for continuous improvement to existing processes and practices which can reduce the impact of chemical use on water quality.

Project Objectives

- Improve local water quality through the identification of contaminant disposal practices that lead to its decline.
- Implement best practice safety and environmental practices for contaminant disposal.

Deliverables

- Implementation of an audit of current contaminant use and disposal methods at the Works Operation Centre as required.
- Research into current best practice for contaminant disposal and opportunities for safe disposal that has a low environmental impact.
- Implementation of processes and practices that lead to improved water quality outcomes.
- Education to staff on new processes and practices.

Approach

The ongoing review of contaminant disposal will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17– 2020/21	Operational	Operation Services

WATER MANAGEMENT AREA: MANAGEMENT OF WETLAND AREAS AND PUBLIC OPEN SPACE

Objective: Manage and protect local water resources through best practice management of the natural environment and public open space.

Project 17 Low Rainfall Irrigation Management Plan	
Project Status New Project	**Project Commencement** 2016-17

Project Description

The City uses groundwater to irrigate its public open spaces, parks and streetscapes. The City abstracts the groundwater under three groundwater licences which are issued by the Department of Water, namely Groundwater Licence (GWL) 155515 and 155582 located within the Whitfords Groundwater Sub area (GSA) and GWL155510 located within the Quinns GSA. Each groundwater licence has an annual groundwater abstraction limit which needs to be taken into consideration when irrigating parks, public open spaces and streetscapes.

While the City has programs in place to develop efficient irrigation schedules, such as soil moisture monitoring, groundwater use is also influenced by unpredictable environmental factors such as climate and weather. During hotter and drier conditions, greater groundwater is required to irrigate the parks, public open spaces and streetscapes. The City proposes to develop a Low Rainfall Irrigation Management Plan to manage its groundwater usage during low rainfall conditions and ensure it remains within groundwater allocation.

Project Objectives

- Ensure the City effectively manages the parks, public open spaces and street scapes during low rainfall conditions.

Deliverables

- Development of low rainfall categories and trigger values based on Park Classifications.
- Development of priority listing for parks, public open spaces and street scapes based on the rainfall categories and triggers values.
- Develop an irrigation schedule based on priority listing.
- Development of consultation strategies and provision of information to the local community regarding the Low Rainfall Irrigation Management Plan.
- Implementation of Low Rainfall Irrigation Management Plan.

Approach

Development and implementation of the Low Rainfall Irrigation Management Plan will be carried out by the City of Joondalup, although external experts will be engaged as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2017/18	Operational	Operation Services

Project 18 Irrigation Infrastructure Management	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

An irrigation infrastructure management program is required to ensure the efficient operation of the City's irrigation bore network. The management program consists of three programs, namely irrigation infrastructure auditing, ongoing groundwater consumption data collection and a maintenance program designed to prevent iron build up within the bores.

The City will continue to carry out audits of irrigation infrastructure to identify where upgrades and maintenance is required. The audits will assess the condition of irrigation assets and will indentify where faulty or end-of-life infrastructure exists, as well as the efficiency of irrigation systems.

The automated monitoring system will allow for more in-depth analysis of the City's groundwater use and significantly reduce time spent on collecting, analysing and reporting groundwater use data and reduces potential human error in recording meter readings.

Ongoing regular maintenance using a bore cleaning agent and air compressor will reduce and prevent iron build up and reduce the need to remove pumps for repair. Bores will continue to be fitted with recirculation valves to allow for filtration of bore water and injection of a bore cleaning product.

Project Objectives

- Increase the water efficiency of the City's irrigation infrastructure by identifying where improvements in technology can be made.
- Implement routine maintenance of City bores to reduce the impact of iron build-up in order to improve water efficiency.

Deliverables

- Continue maintenance inspections of the City's irrigation infrastructure including: lakes, liners, filters, bores, pumps and irrigation systems.
- Continue the Landscape Master Plan Capital Works Program detailing priority projects to improve water efficiency and ongoing maintenance schedules.
- Ongoing research and analysis into the latest water efficient technologies for irrigation infrastructure.
- Ongoing development and implementation of a Bore Maintenance Program.
- Ongoing implementation of the Pump and Bore Replacement Program through the Capital Works Budget.

Approach

The ongoing maintenance inspections of irrigation infrastructure and development of priorities for the City's works and maintenance schedules will be continued by the City of Joondalup.

Fitting of bore filters and implementation of the maintenance program will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Operation Services

Project 19 Review of Nutrient Management Practices	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

A number of operational activities undertaken by the City have the potential to impact on the water quality of wetlands, groundwater and drinking water resources. Water quality can be impacted through direct contamination and discharge to water bodies, and through groundwater leaching. The City will review its nutrient management practices to see where improvements can be made to ensure that City operations have minimal impact on local water quality.

The Review will include an overview of:

- fertiliser use;
- lawn mowing;
- street sweeping;
- litter management;
- vehicle wash down procedures; and
- drainage system maintenance.

Following the review of City activities it is proposed that amendments be made to procedures, where applicable, in order to improve the City's nutrient management practices.

Project Objectives

- Ensure the implementation of best practice by determining where improvements can be made in the City's nutrient management practices.
- Protect local water quality by improving City operations and practices.

Deliverables

- A Review of all City practices that potentially impact on water quality.
- A Report with recommendations to improve nutrient management practices in City operations.

Approach

The Review and actions arising from this project will be implemented by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Strategic and Organisational Development

Project 20 Wetlands Management Plan	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The City is developing a Wetlands Management Plan to ensure the implementation of best management practices for the City's constructed wetlands. An overarching Wetlands Management Plan will be developed, as well as 17 site specific Action Plans. The Wetlands Management Plan and associated Action Plans will ensure that hydrology, water quality, erosion and habitat protection are considered within the management of the City's artificial lakes and wetlands.

Water monitoring is conducted at wetland sites and this data will be used to inform the development of the Wetlands Management Plan.

Project Objectives

- Ensure City management of constructed wetlands considers hydrology, water quality, erosion and habitat protection to improve the ecological values of these wetlands.

Deliverables

- Completion of water quality monitoring and fauna/flora surveys at artificial wetlands.
- Wetlands Management Plan that covers an overview of all constructed and rehabilitated water bodies in the City.
- Individual Action Plans for each of the 17 constructed wetlands within the City.
- Implementation of the Wetlands Management Plan.

Approach

The Wetlands Management Plan will be developed and implemented by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Operation Services

Project 21 Parks Redevelopment Program	
Project Status Existing Project	**Project Commencement** 2016-2017

Project Description

The City will continue the implementation of the Landscape Master Plan through the ongoing Parks Redevelopment Program including hydrozoning ,ecozoning and redesigning irrigation systems, to reduce groundwater use within its parks and open space areas.

A hydrozone relates to water delivery and is the practice of establishing separate areas or zones to receive different amounts of irrigation water. An ecozone relates to the vegetation that can best accommodate a given watering regime and is usually a grouping of plants with similar water requirements.

As part of the project, amenity is also being improved to ensure community expectations are balanced with sustainable water management. The project has been successful in reducing groundwater use by up to 50% in some parks.

Project Objectives

- Ongoing implementation of hydrozoning and ecozoning principles to reduce groundwater use in City parks.
- Continue to increase the amenity and diversity of parks in the City.

Deliverables

- Ongoing development of detailed landscaping and irrigation design for identified parks to reduce irrigated areas.
- Ongoing implementation of redevelopment projects including: hydrozoning and ecozoning, at a rate of at least one park per year.
- Continue development of consultation strategies and provision of information to the local community on projects in their area.

Approach

The Parks Redevelopment Program will be implemented by the City of Joondalup and external contractors as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Capital	Operation Services

WATER MANAGEMENT AREA: WATER SENSITIVE URBAN DESIGN

Objective: Promote and implement stormwater management practices that improve local water quality and reduce water consumption.

Project 22 Stormwater Management Policy	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The City can improve water management through the implementation of water sensitive urban design in stormwater infrastructure maintenance. Water Sensitive Urban Design (WSUD) is considered best practice because it considers the total water cycle, improves water quality and increases amenity.

The ongoing implementation of the Stormwater Management Policy will provide continued direction and guidance on the design and maintenance of drainage systems and the installation of infrastructure that facilitates infiltration and/or treatment. Flush kerbing, vegetated swales and soakwells will be used to protect property from flooding, with the added benefit of water quality and amenity improvement. Maintenance of the City's stormwater drainage systems will be undertaken as part of the Stormwater Drainage Program.

The adoption of best practice in new and redeveloped sites will also be ensured through the implementation of the Stormwater Management Policy and provision of advice on water sensitive urban design principles.

Project Objectives

- Ensure that City management of stormwater protects water quality of receiving environments and utilises opportunities for treatment, infiltration and reuse where possible.
- Improve amenity of stormwater infrastructure while retaining or improving flood management and treatment properties.
- Ensure best practice stormwater management is provided through planning and development.

Deliverables

- Ongoing implementation of the Stormwater Management Policy.
- WSUD is considered in land use planning process by the City's Planning Officers.
- WSUD is integrated into the City's management of stormwater and projects promoted to the community.

Approach

The continued implementation of the Stormwater Management Policy will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Infrastructure Management Services

Project 23 Stormwater Drainage Program	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

Drainage sumps are infiltration points for untreated stormwater and contribute to groundwater quality decline. Stormwater that is directed to sumps carries pollution such as fertilisers, pesticides and petrochemicals.

The City will continue to implement its Stormwater Drainage Program to increase the ecological and amenity values of its sumps. This 10-year Program initially focused on sumps near Yellagonga Regional Park. However, a detailed review of all sumps across the City has since been completed with six sumps have being retrofitted.

The Stormwater Drainage Program focuses on the functionality of sumps to manage local flooding events. Biofiltration within sumps will also be maximised to ensure stormwater is treated before it infiltrates groundwater. Projects are limited by the depth, location and surrounding land uses, however, where possible, fencing will be removed to provide additional amenity benefit. Sump redevelopment is also an opportunity for underground storage of stormwater and allows for the improved utilisation of land for public open space.

Project Objectives

- Increase the amenity and functionality of drainage sumps in the City.
- Improve the water quality of local waterways, including groundwater, through the implementation of treatment measures in City sumps.

Deliverables

- Development of detailed engineering and landscape design for identified priority sumps to improve drainage function, treatment and amenity.
- Implementation of retrofit projects at a minimum rate of two sumps per year.

Approach

The City's Stormwater Drainage Program will be implemented by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Capital	Infrastructure Management Services

WATER MANAGEMENT AREA: CONTRACTS & PURCHASING

Objective: Minimise the consumption of, and impact to, water resources through the consideration of environmental criteria in City purchasing and tender decisions.

<table>
<tr><th colspan="3">Project 24 Sustainable Procurement Practises</th></tr>
<tr><td colspan="2">Project Status
Existing Project</td><td>Project Commencement
2016-17</td></tr>
<tr><td colspan="3">Project Description

The City can contribute to water conservation and water quality management through various purchasing mechanisms, which consider suppliers and products that are environmentally sustainable.

The City has developed sustainable procurement objectives within the City's Purchasing Policy that has integrated water criteria, as well as other environmental impacts, into purchasing decisions. This will ensure that the City purchases services and products that are environmentally sustainable.</td></tr>
<tr><td colspan="3">Project Objectives
• Ensure that water use and water quality is considered in City purchasing decisions and formalised through the City's Purchasing Policy.</td></tr>
<tr><td colspan="3">Deliverables
• Continued integration of water criteria into the City's purchasing mechanisms.
• Continued use and promotion of sustainable purchasing through the City's internal staff education Program, Think Green- Green Office Program.</td></tr>
<tr><td colspan="3">Approach

This project will be implemented by the City of Joondalup.</td></tr>
<tr><td>Timeframe for Implementation

2016/17 – 2020/21</td><td>Proposed Budget Source

Operational</td><td>Responsible Business Unit

Financial Services</td></tr>
</table>

WATER MANAGEMENT AREA: STAFF EDUCATION AND PARTICIPATION

Objective: Provide staff with information regarding water consumption and water quality management that enables them to operate sustainably within the organisation.

Project 25 Green Office 'Think Green' Program	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

Staff education and awareness-raising is important in encouraging sustainable behaviour across the organisation. The Green Office 'Think Green' Program currently delivers water conservation education and awareness raising projects to City staff. The Program is focused on increasing participation by City staff in environmental projects and fostering behaviour change. There is opportunity to expand the Program to include more water related resources and activities and to review existing staff practices to improve sustainable water management.

The Program will continue to include:

- Regular reporting of scheme and groundwater use.
- Water related resources and tips for staff.
- Water quality improvement projects.

Project Objectives

- Raise the awareness of the importance of water resources amongst City employees.
- Ensure that staff utilise water resources in a sustainable manner during work activities.
- Ensure that City facilities and civic buildings have appropriate procedures, processes and infrastructure in place to achieve sustainable water management outcomes.

Deliverables

- Ongoing inclusion of water consumption data on the City's Intranet.
- Ongoing development of waterwise and water quality management tips on the Intranet.
- Delivery of water related activities and events that provide opportunities for staff participation.

Approach

The Green Office 'Think Green' Program will be implemented by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Strategic and Organisational Development

WATER MANAGEMENT AREA: COMMUNITY EDUCATION AND PARTICIPATION

Objective: Provide opportunities for community education and participation in water efficiency and water quality improvement initiatives.

Project 26 Environmental Education Program

Project Status	**Project Commencement**
Existing Project	2016-17

Project Description

Community education is vital in influencing behaviour change and this fosters improved environmental management in the community. The City has developed a coordinated program of environmental education activities through its Environmental Education Program (EEP). Water management activities and resources will be incorporated into the existing Program, under the banner of *Think Green – Water,* to promote water conservation and water quality improvement practices. Some of the activities that will be implemented as part of this project include those targeting households, schools and businesses.

A number of the City's buildings are leased to external organisations and groups. The City will also continue to raise awareness of water conservation to lessees through the delivery of education initiatives.

The Environmental Education Program includes the development of:

- Water related education resources, including information regarding the water table and climate.
- Water conservation and efficiency information in community newspapers, other publications and the City's website.
- Waterwise workshops and other water education events.
- Provision of water usage information to City's lessees.

Project Objectives

- Promote behaviour change in the community through the provision of water conservation information and resources.
- Awareness-raising in the community about water quality management.
- Interaction with the City of Joondalup community to achieve sustainable water management across the City.

Deliverables

- Development of water related resources for the community and City's lessees.
- Development and delivery of water related workshops and events.

Approach

This Program will be developed by the City of Joondalup, although external experts will be engaged as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Strategic and Organisational Development

Project 27 Yellagonga Ecotourism and Community Awareness	
Project Status New Project	**Project Commencement** 2016-17

Project Description

Yellagonga community awareness and ecotourism initiatives will target local residents and the broader community with an aim to enhance appreciation of the conservation significance of Yellagonga Regional Park. Most ecotourism initiatives are delivered through the City of Joondalup's Think Green Environmental Education Program (EEP).

The Project's objectives and scope, outlined below, are specific to activities delivered in the Yellagonga Catchment.

Project Objectives

- Develop and implement initiatives and projects that aim to increase the community's understanding of environmental issues affecting the Yellagonga Catchment.
- Increase the community's access to ecotourism experiences by delivering biodiversity and cultural heritage related initiatives within the Yellagonga Catchment Area.
- Reduce adverse community impacts on the Yellagonga Wetlands through the provision of information and resources addressing the key threats to the area.

Deliverables

- Sustainable gardening community workshops to encourage reduced water and fertiliser use and native plantings adjacent the Yellagonga Wetlands.
- Yellagonga school and community educational resources available on the City's website.
- Ongoing distribution and displays of existing and new brochures and posters to raise awareness of key Yellagonga conservation issues including water quality.
- Tours and presentations to raise community awareness of the Park e.g. catchment model activities, bird watching and flora tours.

Approach

This Program will be developed by the City of Joondalup, although external experts will be engaged as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2018/19	Operational	Strategic and Organisational Development

Project 28 Think Green Buildings	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The City's ECOSTAR program was renamed as the Think Green Buildings Program to align with the branding used as part of the City's Think Green Environmental Education Program.

The Program showcases sustainable technologies in City buildings which reduce energy, water and resource use and highlights examples of environmental upgrades that can be implemented by community members. This communication also helps to build greater trust in the community of sustainable technologies.

Project Objectives

- Improve the City's environmental performance through systematically upgrading the City's community facilities with water saving technologies.
- Raise the community's awareness of environmental technologies through the demonstration and promotion of technologies within City facilities.
- Communicate the progress of the City's environmental improvement initiatives through the placement of Think Green Building plaques and completed upgrades.

Deliverables

- Installation of water efficient technologies in City facilities.
- Evaluation and rating of City facilities using the Think Green Buildings rating framework.
- Promotion of Think Green Buildings rated facilities to the community through Think Green Buildings plaques and on the City's website and community newspaper.

Approach

This project will be implemented by the City of Joondalup, although external experts will be engaged as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Strategic and Organisational Development

Project 29 Greywater Rebate	
Project Status New Project	**Project Commencement** 2016-17

Project Description

Greywater is the wastewater generated from household bathrooms, laundries and kitchens, excluding toilet wastewater. Greywater can be reused for irrigation of domestic gardens and even though most households won't produce enough greywater to supply the entire garden needs, re-using greywater is a valuable contribution to water conservation, particularly in the context of the drying climate.

The Code of Practice for the Reuse of Greywater in Western Australia outlines acceptable greywater re-use practices to ensure the conservation of ground and surface water supplies and the protection of health standards. The installation and operation of all greywater systems must comply with the code. The installation of a single residential greywater system requires local government approval.

In order to encourage greater uptake of the use of greywater within the community the City of Joondalup will develop a program to provide financial incentives such as a rebate, to City residents that install approved greywater reuse systems.

Project Objectives

- To increase the number of greywater reuse systems being installed within the City of Joondalup.

Deliverables

- Examination of available options for providing financial incentives to applicants seeking approval for the installation of a greywater system.
- Development of relevant processes and procedures to guide the implementation of a rebate program.
- Implementation of a rebate for greywater systems, including promotion to the community.
- Review of the rebate program after one year of operation.

Approach

The research and implementation will be carried out by the City of Joondalup.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2017/18	Operational	Compliance and Regulatory Services

WATER MANAGEMENT AREA: PARTNERSHIPS AND POLICY

Objective: Develop partnerships with the State Government and external stakeholders to enhance water conservation and water quality improvement opportunities within the City.

<table>
<tr><th colspan="3">Project 30 Craigie Backwash Water Recycling Feasibility Study</th></tr>
<tr><td colspan="2">Project Status
New Project</td><td>Project Commencement
2016-17</td></tr>
<tr><td colspan="3">Project Description

Wastewater has traditionally been viewed as a waste product. However, due to declining water availability is now recognised as a valuable resource. The City will investigate the feasibility of reusing pool backwash at Craigie Leisure.

A feasibility study investigating backwash water recycling opportunities will be produced detailing the feasibility in terms of economic, social and environmental considerations.</td></tr>
<tr><td colspan="3">Project Objectives
• Determine the feasibility, in consideration of economic, social and environmental implications and benefits, of backwash water recycling opportunities at Craigie Leisure Centre.</td></tr>
<tr><td colspan="3">Deliverables
• Development of a Feasibility Study into backwash water recycling opportunities at Craigie Leisure Centre.</td></tr>
<tr><td colspan="3">Approach

Initial investigations will be carried out by the City of Joondalup. Stakeholders may be engaged if the project progresses.</td></tr>
<tr><td>Timeframe for Implementation

2016/17</td><td>Proposed Budget Source

Operational</td><td>Responsible Business Unit

Leisure and Cultural Services</td></tr>
</table>

Project 31 CRC For Water Sensitive Cities Program	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The Cities as Water Supply Catchments (CWSC) which ended in 2013/2014 and became the Water Sensitive Cities Cooperative Research Centre. The CRC for Water Sensitive Cities was established in July 2012 under the Commonwealth Government Cooperative Research Centre (CRC) Program and will continue until 30 June 2021. The program is also supported by higher education institutions, government and non-government organisations, water utilities and the private sector. The vision of the CRC for Water Sensitive Cities is for sustainable, resilient and liveable water sensitive cities.

In collaboration with over 70 research, industry and government partners, the CRC for Water Sensitive Cities will deliver the socio-technical urban water management solutions, education and training programs, and industry engagement required to make towns and cities water sensitive.

Project Objectives

- Collaborate with leading research organisations and other Local Governments to ensure that research into stormwater harvesting is WA specific.
- Ensure the City has access to the best available science on stormwater harvesting and peripheral research into institutional barriers, land use planning, capacity building and adaptive governance.

Deliverables

- Recognition of the City as a financial partner of the consortium as identified in promotional material.
- Continued attendance and participation in workshops and training opportunities.
- Continued participation in research, workshop and resource development opportunities.

Approach

The City of Joondalup will be involved in the Program as part of the WA Consortium

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Infrastructure Management Services Operations Services

Project 32 Waterwise Council Program	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

The Waterwise Council Program is a joint initiative between the Water Corporation and Department of Water. The aim of the Program is to build a co-operative working relationship with Local Governments to improve water use efficiency. The Water Corporation and the Department of Water have reviewed the Waterwise Council Program criteria in 2015.

The City joined the Waterwise Council Program in 2009 and was officially endorsed as a Waterwise Council in the same year. Criteria for Waterwise endorsement included implementation of water projects identified in the Water Efficiency Action Plan (*City Water Plan 2016-2021*) and Waterwise training for staff in the areas of: Water auditing for non residential facilities; Cooling Tower water efficiency; and Water efficient landscape and irrigation. The City is required to demonstrate an ongoing commitment to water conservation and is assessed against criteria, set annually by the Water Corporation, to retain Waterwise endorsement.

Project Objectives

- Demonstrate leadership in water conservation through the gaining of knowledge and new skills regarding best practice water conservation.
- Foster partnerships with the State's Water Utility, Water Corporation and the State's Water Management Agency, Department of Water.
- Leverage opportunities for staff training, access to resources and promotion.
- Promote the City's water performance through the use of Waterwise branding.

Deliverables

- Implementation of projects that achieve Waterwise criteria on an annual basis to retain Waterwise status.
- Development and submission of the City's annual review detailing water use data and status of water conservation projects to the Water Corporation.

Approach

The Waterwise Council Program is implemented by the City of Joondalup in liaison with the Water Corporation and Department of Water.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Strategic and Organisational Development

Project 33 Midge Management Strategy Partnership	
Project Status Existing Project	**Project Commencement** 2016-17

Project Description

Midge populations in and around the City's wetlands are closely linked to water quality. Improvements to water quality are therefore likely to reduce midge populations and the overall health of receiving water bodies.

The City of Joondalup has had a formal agreement with the City of Wanneroo and Department of Parks and Wildlife (DPaW) for managing midge within the wetlands of the Yellagonga Regional Park since 1999. This partnership was established as it was considered that the midge issue emanates from the surrounding catchment areas and that midge management requires the expertise and resources of the three agencies to be integrated.

The main objective of the Midge Management Strategy Partnership Agreement 2015-2020 is to encourage an effective and sustainable partnership for the purposes of managing nuisance midge within wetlands of the Yellagonga Regional Park. This is achieved through improving cooperation, communication and collaboration between the two spheres of government.

Project Objectives

- For control and management of nuisance midge within the wetland system of the Yellagonga Regional Park, through funding midge larval and water monitoring, nuisance reduction using pesticide application when required, other intervention strategies, research projects in an effort to better understand the factors contributing to the seasonal midge plagues and public information and education.
- To arrange for the allocation, management and administration of funds for the strategy.

Deliverables

- Continued implementation of a larval and water quality monitoring program.
- Application of chemical treatment as required in line with current DPaW requirements.
- Undertaking of research into midge populations and their environment.
- Continued implementation of a Midge Education Program to inform local residents about water quality and midge management as required.

Approach

The Midge Management Strategy Partnership is a partnership project with the City of Wanneroo and DPaW. The City of Joondalup participates in the Partnership and implement projects as required.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Operational	Compliance and Regulatory Services

Project 34 Beach Microbial Sampling	
Project Status New Project	**Project Commencement** 2016-17

Project Description

Stormwater runoff can impact the water quality of coastal systems as they can carry pollutants such as fertilisers, pesticides, sediments and petrochemicals. High levels of some bacteria can indicate a decrease in water quality for swimmers, diving, surfing and skiing. A bacterial monitoring program has been implemented by the Department of Health (DOH) to assess the health of a number of popular recreational waterways.

The City undertakes bacterial monitoring of the City's beaches on the behalf of the Department of Health.

Project Objectives

- Ensure adequate beach water quality for swimmers and other recreational activities.
- Provide water quality sampling information which can be used by the DOH to identify pollution sources and pollution events.

Deliverables

- Undertake the required beach water quality sampling.

Approach

The City of Joondalup undertakes the beach water quality sampling on the behalf of the Department of Health.

Timeframe for Implementation	**Proposed Budget Source**	**Responsible Business Unit**
2016/17 – 2020/21	Department of Health (testing of samples) Sampling costs are Operational	Compliance and Regulatory Services