

# Landscape Master Planning – A Strategic Framework for Adapting to Climate Change

Martyn Glover

Director Infrastructure Services

City of Joondalup

## Abstract

The City of Joondalup's Landscape Master Planning Project involved the conceptualisation and development of a Strategic Framework to enable the City to effectively adapt to climate change and manage public open spaces in accordance with community expectations.

The project involved research on community perceptions, an assessment of existing practices for dealing with public open spaces within the City, an evaluation of approaches from around Australia, plus the initiation of pilot projects to test the concepts.

The highlights of the project have been the introduction of two new concepts for landscaping namely ecozoning and hydrozoning. These concepts are being implemented through the Landscape Master Plan that outlines the aim, vision, principles, key strategies and actions that will be implemented over a 10 year timeframe. The Landscape Master Plan contains guidelines and criteria for developing individual public open space management plans which will reflect the ecozoning and hydrozoning concepts. The project has also included the development of a classification hierarchy that has enabled the City to determine a priority listing of works. A master species list and database have also been developed. The City has developed a unique concept design through its pilot projects which can be applied to verges and medians that will reinstate the natural biodiversity of City and minimise the use of water.

The aim of Landscape Master Planning is to provide strategic direction for the future management of public open space within the City's jurisdiction

The objectives being pursued include:

1. To provide an image for the City in its City Centre and entry points of high visibility that demonstrates the use of colour and indigenous species that exemplify the biodiversity of Joondalup;
2. To provide an effective response to climate change through reducing overall water consumption patterns across the City where appropriate;
3. To provide more opportunities for passive recreational pursuits in 'natural bushland' ecosystems;
4. To increase active recreational opportunities within attractive and functional created landscapes incorporating expanses of irrigated turf, maintained native garden beds and rehabilitating more natural bushland areas; and
5. To ensure community awareness and engagement occurs during planning and implementation program.

**Key Words:**

Landscape Master Planning

Landscape Master Plan

Individual Landscape Management Plans

Ecozoning

Hydrozoning

Climate change

Biodiversity

City of Joondalup

Water conservation

Variable irrigation systems

Water wise gardens

Adaptive management

Scenario planning

Climate change adaptation

Groundwater Dependent ecosystems

CPOSVM (Created Public Open Space Verges and Medians)

## Introduction

The City of Joondalup has over the last 20 years, experienced a period of unprecedented growth in urban residential areas and related infrastructure. This has seen the establishment of many styles of urban form and related open space. More recently the rate of urban expansion has slowed somewhat and the City is now undergoing a period of consolidation.

The City is richly endowed with extensive areas of public open space including bush forever sites, conservation category wetlands, nature reserves, areas of passive and active recreation, a wide range of purpose-built sporting grounds and generous verges and medians. For the purposes of this report we define areas of passive and active recreation, purpose-built sporting grounds, verges and medians collectively as CPOSVM (Created Public Open Space, Verges, Medians).

The City of Joondalup during 2007 embarked on an innovative project – now known as **Landscape Master Planning**, in order to address the issue of declining water resources through improved landscape planning and development. Climate change is now a global strategic issue, and for most parts of Australia it is a major concern given the continually drying climate that is being experienced.

The City of Joondalup is located in the north west of the Perth metropolitan area and has a population of 160,000 residents. It relies on water that is extracted from bores into the superficial and deeper groundwater aquifers lying deep under the sandy soils of the Swan Coastal plains. The region is fortunate that it has confined aquifers from which to draw bore water for commercial, residential, industrial, agricultural and public open space areas, however in recent years the ground water levels are lowering due to over consumption, lack of monitoring and control, over-allocations, and a decline in annual rainfall recharge.

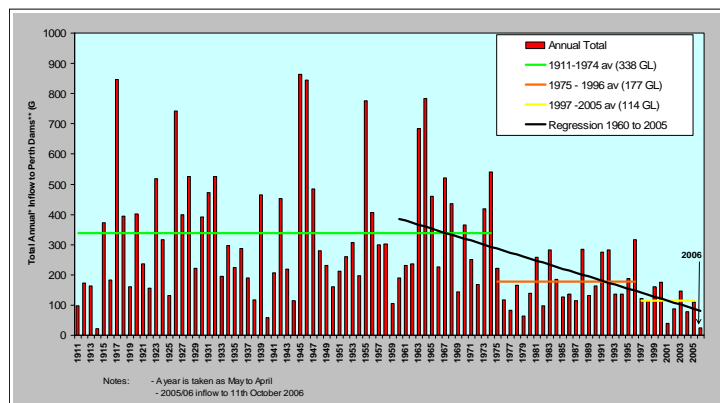


Figure 1 – Declining Water chart past 100 years

Source: Water Corporation Western Australia

In Western Australia declining rainfall has been recorded over the past 100 years and paints a disturbing picture for future water supplies and provision of active and passive public open space.

The Department of Water, in Western Australia has now moved to put in place new legislation that will place greater restrictions through licensing of groundwater supplies and this will be another factor for Local Government to take into account when managing public open space.

Since July 2008, the Department of Water has required all local authorities to report their groundwater usage against allocation targets of 7,500 kl/ha/yr of irrigated area through a Water Efficiency Plan.

The City of Joondalup currently has 161 production bores spread throughout the City to service 540 Ha of irrigated parks and road reserves. The bore licenses have been amalgamated into three allocation and reporting areas. Currently 117 parks are monitored by a central irrigation control system allowing detailed reporting of water use and fine control over irrigation scheduling. Additional parks are planned to be added to the central control system as budgets permit.

The City of Joondalup, in response to the many factors now placing undue pressure on the provision of public open space and in

consideration of community expectation with respect to the ongoing need for active, passive and natural areas, determined it would place a strategic focus through the development of a strategic **Landscape Master Plan**.

The Plan would aim to adapt the City's public open spaces, verges and medians in readiness for climate change whilst simultaneously enhancing local biodiversity and ensuring the continued provision of aesthetic leisure and recreational environments to the community.

The strategic framework within which the City can evolve individual landscape master plans over the next 20 years will enable the City to be well placed to adapt to the challenges and opportunities provided by climate change

## **Threats to the provision of open spaces**

Water availability and climate change have been recognised (DPC, 2007) as the greatest threats to the ongoing provision of quality public open space for Perth.

### **1. Climate change predictions**

Climate change impacts for 2030 have been predicted to include (IPCC 2007, IOCI 2005):

- WA will be hotter, particularly in inland regions
- WA will be dryer, particularly in the South West
- There will be more frequent droughts, heat waves and fires
- There will be more intense storms, floods, and tropical cyclones
- Sea-level will increase from 3 to 17 cm

### **2. Socio-cultural impacts**

The implications of the above climate change impacts for the provision of sport and recreation facilities have been determined to include:

- Disruption of the provision of outdoor sport and recreation facilities and programs;
- Create socio-cultural tensions between competing users of facilities;
- Adversely impact outdoor recreation in the natural environment and created landscapes;
- Create financial stress for facilities managers and providers; and
- Disadvantage remote communities, poorer outdoor sporting and leisure-based clubs.

### **3. Impacts of water shortages**

Reduced rainfall and falling groundwater levels currently being observed for much of Perth and the City of Joondalup lead to xerification (drying) of public open space (POS) and natural landscapes with increased oxidation of vadose zone leading to;

- Increased dissolved iron in groundwater requiring additional treatment prior to use for irrigation;
- Increased risk of acid sulphate in groundwater;
- Disconnection of groundwater dependent ecosystems (GDEs);
- Unpredictable changes in the floristics of bush forever (BF) sites and other areas of significant remnant vegetation; and,
- Water scarcity for existing and new CPOSVM.

### **4. Competing users**

Managing falling water levels and declining recharge for the superficial groundwater aquifers requires an integrated response by all groundwater users. In addition to the City of Joondalup, there are numerous other users of the superficial and deeper aquifers including: domestic bores, schools, private sporting clubs, groundwater dependent ecosystems and large users such as the Water Corporation.

It will become increasingly important for the City of Joondalup to participate in and to demonstrate leadership in the conservation of the groundwater aquifers.

## **Community expectations**

Recent research (Carter, 2007 pers comm) has found that the majority of the community have a preference for a diverse open space experience. This translates to a preference for diverse landscapes with a mix of irrigated turf, garden plantings of exotic plants together with areas of native plants. This means that the majority of the local community doesn't actually want wide spaces of bright green irrigated turf at the expense of other landscape types.

This research has also indicated that provided the community is presented with the reasons and reliable information for a particular landscape response (balancing water conservation, amenity, biodiversity) that they will accept hydrozoning, ecozoning and retention of local bush land as part of their local open space, verges and medians.

## **Approach to the Planning Process**

The process for landscape planning contained a number of stages:

### ***Stage 1 - Benchmarking and research***

The City has undertaken extensive benchmarking across Australia and has not been able to identify a landscape master planning process that resembles the City's approach and outcome. To date, there has been little creativity in managing POS. The opportunity to do things differently has eventuated because of the need to find adaptation strategies to new climatic conditions, namely reducing rainfall and resultant biodiversity loss.

Initiating the project required forming a cross functional team of officers from within the City with specific skills that could contribute to the development of the Strategic Framework. The initial research phase also involved the engagement of consultants to undertake research and a desktop review.

A series of workshops were held with staff to consider the issues and agree on concepts. This phase also involved developing a spatial

database of POS and developing maps using the City's GIS system to model concepts.

An audit was undertaken of the City's public open space which collected information on groundwater availability and quality, installed irrigation infrastructure and vegetation condition.

An audit of governance and management procedures as they relate to public open space was also undertaken. Factors assessed included planning procedures, management activities, monitoring and reporting frameworks, capital and maintenance works, City policies and strategies and research into community expectations.

### ***Stage 2 - Assessing Community Expectation***

Community research identified the community currently expects a wide range of experiences from City of Joondalup's provision of POS.

These include:

- the opportunity for passive recreational pursuits in 'natural' bush land ecosystems;
- active and passive recreational opportunities within attractive and functional created landscapes incorporating expanses of irrigated turf, manicured garden beds and more natural areas;
- attractive and functional streetscapes, *ie.* verges and medians; and the provision of a wide range of purpose-built sporting grounds based mostly on areas of irrigated turf.

In addition to balancing finite human, financial and natural resources against the community's expectations of POS experiences, local governments also have a range of statutory obligations being placed upon them by state and federal agencies relating to aspects of POS provision.

These include protection, rehabilitation and management of conservation areas, assessment and reporting provisions for

water usage and a range of other sustainability reporting initiatives

### Phase 3 – Gaining Political Direction, Setting the Vision

This phase occurred through a series of workshops with Elected Members, staff and community committees. The workshops presented a range of concepts and identified the need for a Strategic Framework for guiding direction and identifying the components required for effective landscape planning.

Council endorsed a set of guiding principles and agreed to develop a strategic Landscape Master Plan that would incorporate the development of benchmarks, processes and standards, indicators and targets and guide development of Individual Landscape Plans for future management of all POS including verges and medians. These components would form the toolbox for landscape planning across the City of Joondalup.

Council adopted principles included:

- 1 *Provide an image for the City in its City Centre and entry points of high visibility that demonstrate the use of colour and indigenous species that exemplify the biodiversity of Joondalup;*
- 2 *Provide more opportunities for passive recreational pursuits in 'natural' bushland ecosystems;*
- 3 *Increase active and passive recreational opportunities within attractive and functional created landscapes incorporating expanses of irrigated turf, maintained native garden beds and rehabilitating more natural bushland areas;*
- 4 *Provide attractive and functional streetscapes i.e. verges and medians;*
- 5 *Provide attractive created landscapes and maintained native garden beds around key community facilities;*
- 6 *Provide a wide range of purpose built sporting grounds based mostly on areas of irrigated turf where community utilisation can be maximised;*

7 *Provide an effective response to the issue of climate change through reducing overall water consumption patterns across the City where appropriate;*

8 *Ensure that the City's town planning scheme and development plans for commercial and residential development reflect the principles of landscape master planning;*

9 *Ensure community awareness and engagement occurs during planning and implementation processes.*

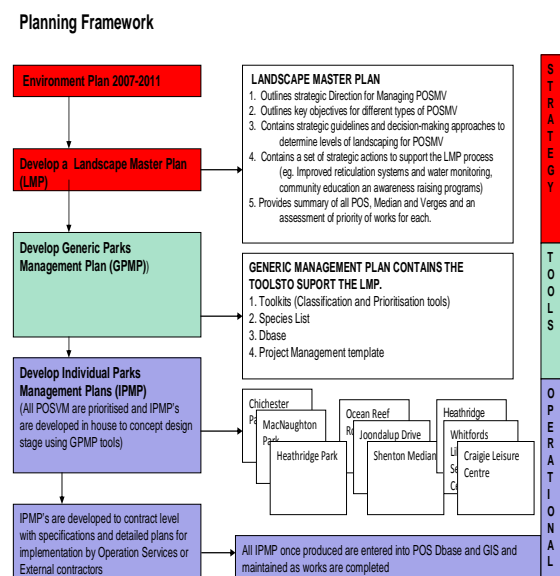
### Phase 4 – A Strategic Framework

The fourth phase was the development of the Strategic Framework to enable the implementation of the Landscape Master Plan.

Through the adoption of guiding principles and the development of a Strategic Framework and Action Plan the City would ensure the future sustainable management and ongoing amenity of POS to its community.

Figure 2

#### STRATEGIC MODEL FOR LANDSCAPE MANAGEMENT PLANNING



The strategic model shown above depicts the relationship between each level of implementation and the tools required to achieve the successful completion of actions. The model also highlights the strategic nature

of the Landscape Master Plan as an overarching instrument used to provide direction for all subsequent individual landscaping plans.

The City's Environment Plan 2007-2011 requires the development of a Landscape Master Plan. As the Landscape Master Plan is implemented, more detailed individual landscape management plans will be subsequently developed to reflect the principles contained within the Plan and to guide the implementation of on ground works within individually prioritised CPOSVM and building surrounds.

### Phase 5 – Implementation

With the development and endorsement of a strategic direction and the introduction of new concepts of ecozones and hydrozones being understood and embraced by the City and the Community, the City was well placed to commence implementation processes.

This stage required the development of a set of tools that could be used for assessment, evaluation and decision making by City Officers.

The new concepts that would underpin the design of future POS include:

**Ecozones** are areas of POS that are set aside for the planting of native species which over time will survive with little or no watering regimes in place. The development of ecozones will require the acquisition of new technical support, such as horticulturalists and botanists to assist with plant species propagation, soil profiles and setting up monitoring and testing systems.

**Hydrozones** relate to irrigation systems that have the ability to utilise different rates of water application.

Figure 3 Existing Park



Figure 4 – With ecozones and hydrozones



A number of planning tools have been developed and will be refined as pilot projects and iconic projects are implemented.

The key strategic tool includes the development of the City's **Landscape Master Plan**.

The Landscape Master Plan is now an endorsed public document that clearly provides a pathway for action.

The Plan contains a vision statement, aim and principles, themes and six key focus areas which contain actions for the implementation of a City wide landscaping program. The Key Focus Areas have been determined by classifying types of public open spaces subject to landscaping activities by the City and also considering overarching generic requirements for undertaking a City wide landscaping program that will apply to all the classified areas. Each Key Focus Area (KFA) will contain outcomes, objectives and actions.

The Six Key Focus Areas are:

- KFA 1 - A City-Wide Landscaping Image
- KFA 2 - Management and Development
- KFA 3 - Joondalup City Centre
- KFA 4 - Parks
- KFA 5 - Verges and Medians
- KFA 6 - Community Buildings Surrounds

Actions determined under each of the six key focus areas have been prioritised across a 10 year timeframe to completion and actions will be allocated annually through the City's business planning and budget process to ensure that adequate resourcing is provided and the Plan is being achieved.

Other tools supporting the Plan and forming the toolkit include:

- A system for monitoring the City's water usage patterns;
- A species list and database;
- Guidelines for achieving different objectives such as a generic template and a user guide for preparing individual landscaping management plans;
- A classification hierarchy for the different types of POS that will assist in the formulation of a long term works program;
- Criteria for assessing the feasibility and priority for developing individual management plans; and
- A standard concept design for the reinstatement of road reserves with native gardens.

### **Stage 6 – Pilot Projects**

The sixth stage included the identification of pilot projects and approval of funding for implementing the pilot projects. Pilot projects are those that have been, or are currently being implemented to 'pilot' the concepts.

These projects have resulted in the successful rehabilitation of areas seeded from local provenance seed stocks which are collected from other parts of the City and this

approach has resulted in a reduction in water usage in parks which have undergone ecozoning.

A significant number of Pilot projects have been undertaken and include:

- The Ocean Reef Road Direct Seeding Project
- The Mullaloo Beach Water Wise Garden
- The establishment of a local provenance Nursery
- Development of water wise garden projects with community groups
- Hydrozoning of Heathridge Park and Elcar Park
- Joondalup Drive Landscaping Project
- Whitfords Ave Landscaping Project

### **Stage 7 - Iconic Road projects**

A final strategy session was held with Elected Members to present the findings of the pilot projects and seek Council direction on the priority for implementing iconic projects that would utilise all the principles and tools that had been developed and piloted.

This led Council to formally adopt the new direction and endorse seven iconic landscaping projects to be undertaken

Iconic verge and median treatment designs were prepared for the City's seven major east-west road arteries of *Burns Beach Road*, *Hodges Drive*, *Shenton Avenue*, *Ocean Reef Road*, *Whitfords Avenue*, *Hepburn Avenue*, and *Warwick Road*. The designs feature water-wise plantings that replicate and showcase the local flora of the different east-west biodiversity zones of the City, and also facilitate the formation of habitat corridors for the support of native fauna.

Plant species will be chosen to maximise the effectiveness of these verges and medians acting as biodiversity linkages, facilitating the movement of pollen, seed and fauna species. To enhance this effect the community will be encouraged to plant complementary species on their own properties and verges.

Irrigation systems along verges and medians will be primarily used for the establishment of plants, after which the irrigation scheduling will be adjusted to provide supplementary water only in extreme conditions.

Concept designs for these iconic projects will provide a new look through the inclusion of structured plantings to allow commuters to recognise a progression of different local plant species from the coast in the west through to the wetlands in the east. The visual impact created in these designs will raise community awareness of local plant biodiversity and encourage residents to adopt similar water-wise, native designs in their own gardens and verges. Planting designs utilised in the iconic roads projects will be in harmony with the functional requirements of effective biodiversity linkages.

## Outcomes and Results

The City has to date achieved significant results in the development and implementation of its Landscape Master Plan and associated processes. The most significant result has been the cultural shift at Council, community and staff levels. The vision that was articulated through Landscape Master Planning has caught the imagination of all those involved. A clear vision can move the City forward in its endeavour to adapt to climate change whilst maintaining the amenity and recreational lifestyle that the community is accustomed to.

Specific results include:

1. The development and endorsement of a set of guiding principles;
2. The introduction of new concepts of ecozones and hydrozones;
3. A system for monitoring the City's water usage patterns;
4. A species list and database;
5. Guidelines for achieving different objectives such as a generic template and a user guide for preparing individual landscaping management plans; ( Refer Appendix 1)
6. A classification hierarchy for the different types of POS that will assist in the formulation of a long term works program;

7. Criteria for assessing the feasibility and priority for developing individual management plans; and
8. A concept design for the reinstatement of road reserves with native water wise gardens to create biodiversity corridors.
9. Pilot projects are those that have been or are currently being implemented to 'pilot' the concepts. These projects have resulted in the successful rehabilitation of areas seeded from local seed stocks which are collected from other parts of the City and a reduction in water usage in parks which have undergone hydrozoning.
10. Significant reduction in the use of water over a 12 month period from trial projects.

The highlights of the project have been the introduction of two new concepts for landscaping namely ecozoning and hydrozoning. Ecozones are areas of public open space that are set aside for the planting of native species which over time will survive with little or no watering regimes in place. The development of ecozones will require the acquisition of new technical support, such as horticulturalists and botanists to assist with plant species propagation, soil profiles and setting up monitoring and testing systems. Hydrozones relate to irrigation systems that have the ability to utilise different rates of water application.

These concepts are being implemented through the Landscape Master Plan which outlines the aim, vision, principles, key strategies and actions that will be implemented over a 10 year timeframe.

The Landscape Master Plan contains guidelines and criteria for developing individual public open space management plans which will reflect the ecozoning and hydrozoning concepts.

The project has also seen the development of a classification hierarchy, enabling the City to determine a priority listing of works. A master species list and database have also been developed to maintain corporate knowledge.

The City has developed a unique concept design through its pilot projects which can be applied to verges and medians to reinstate the natural biodiversity of the City and minimise the use of water.

The City has commenced the implementation of Iconic Projects and Council has endorsed a unique concept design that will enable the development of biodiversity corridors to link the eastern wetlands to the western foreshore reserves.

As of November 2008 working meters have been installed on all 192 of the City's bores. These meters are read at the end of every month and used to ascertain water consumption. Any irregularities are noted and maintenance required on the irrigation system is determined from this consumption data.

In conjunction with the installation of the meters, the City's irrigation systems are currently undergoing review. Testing of the irrigation uniformity at ten (10) of the City's parks had been undertaken. Further investigation into systems with low uniformity will occur with plans to upgrade the systems as required. The validity of creating ecozones and hydrozoning within the parks and updating of the irrigation systems are also being investigated.

Once the validity of these options has been assessed, design and implementation of the chosen option(s) will be undertaken.

An irrigation system upgrade and hydrozoning has been implemented at on a trial basis at one park and is planned for a second active park during the winter/spring of 2009.

Heathridge Oval, in Heathridge underwent upgrade in October 2008 with:

- New efficient irrigation system;
- New design incorporates eco zones;
- New design incorporates hydro zones; and
- Revised watering programs (approximate 30% saving).

Emerald Park, in Edgewater is set for upgrade with the following planned.

- New efficient irrigation system. (Installation in hand);
- New design incorporates eco zones; and
- New design incorporates hydro zones.

A review of all watering programs is currently being undertaken with three successful trials completed since the summer of 2006/2007.

**Table 1 - Elcar Park, Joondalup** – (Noting these results are based on 15 stations and 2 nights per week of watering.)

YR	Time (Mins)	Flow rate (litres/ mins)	Water consumption (litres/week)
2006 - 2007	87	700	1,827,000
2007 - 2008	60	700	1,260,000
2008 - 2009	60	700	1,260,000

Equating to a saving of 567,000 litres/week (31%) between the 2006/2007summer and 2007/2008 summer. This successful trial has resulted in the watering program being continued in the 2008/2009 summer.

**Table 2 - Edgewater Park, Edgewater** (Note these results are based on 4 stations with a flow rate of 720 litres per night)

Year	Time	Number of nights	Water consumption (litres/week)
2007/2008	30	5	432,000
2008/2009	90	1	259,200

Equating to a saving of 172,800 litres/week (40%).

**Table 3 - Trappers Park, Woodvale**

(Note these results are based on 4 stations with a flow rate of 600 litres per night)

Year	Time on each station (mins)	Number of nights	Water consumption (litres/week)
2007 - 2008	30	5	360,000
2008 - 2009	90	1	216,000

Equating to a saving of 144,000 litres/week (40%).

This reduction in consumption, whilst maintaining amenity, has proved successful and thus the City plans to continue rolling out reductions in water programs across other parks during the 2009/2010 summer.

Review of the time at which the summer watering programs commence was also undertaken; with the irrigation team reassessing the procedure of commencing summer watering in October. For the 2008/2009 financial year the irrigation team starting using greater volumes of water in September and October than in previous years to ensure that soil moisture was not lost. This resulted in an approximate halving in demand during November. Overall this resulted in a consumption reduction during the initial summer months of 56,450 kilolitres (kL).

**Table 4 – Total Consumption reduction from Pilot Projects**

	07/08 Consumption	08/09 Consumption
<b>September</b>	158,486 kL	263,678 kL
<b>October</b>	316,973 kL	421,421 kL
<b>November</b>	633,945 kL	367,855 kL
<b>Total consumption</b>	1,109,404 kL	1,052,954 kL

By promoting ongoing review and forward thinking by the City's irrigation team, actions are being implemented which result in reduced water consumption throughout the City. Due to the City's continuing commitment to ensuring its groundwater consumption is monitored and managed, the City has achieved annual savings in water total 102,366kL .

### **Community Engagement and Benefit**

The development and implementation of a strategic Landscape Master Plan is an example of how the City is demonstrating leadership and providing community education in environmental excellence and water management. The Landscape Master Plan is the first of its type in a local government which clearly indicates that the City of Joondalup will be a leader in this field.

In developing the Plan, staff across the City were heavily involved which has resulted in their commitment to the implementation of the process.

The City has a Conservation Advisory Committee including representatives of the City's Bushland Friends Groups. The Committee was instrumental in supporting the development of the native species list and providing local expertise.

The City has commenced pilot projects which have had direct community involvement. A natural landscaping project along two kilometres of verges in Ocean Reef was requested by the local community through a community consultation process. This led to the planting of natural vegetation being propagated from local seed stock. Another pilot project in Connolly involved the community selecting species and engaging in the landscaping design.

The implementation of the Iconic Road Projects and resultant biodiversity corridors will also provide a means of encouragement and community education. The City will introduce a program to supply residents living adjacent to biodiversity corridors with suitable native plants, free of charge, to augment the development of biodiversity corridors. The success of this program will be measured by

the degree of residents to subscribe to the free plants offer.

This project will also include community artwork opportunities that will be commissioned to communicate the intent of the biodiversity link to the broader community; and a community awareness and education campaign will also be introduced that can serve as a model for others to engage with their communities in such a process.

The Landscape Master Plan will provide education at three levels.

1. It will provide clear direction for operational staff within the City to clearly understand the City's directions and to implement the Plan.
2. It will enable the community to understand what the City intends to do to ensure the amenity of public open spaces is maintained and enhanced in the face of climate change and changing community expectations.
3. It will provide leadership to other local governments and assist them to implement their own plans. Ensuring that recreational amenity for the broader Western Australian community is preserved and enhanced.

The approach being taken by the City of Joondalup is highlighted by the transferability of the concepts to other local governments. Recently, the Department of Water, in rolling out new legislation requiring local government to develop Water Conservation Plans, used the City of Joondalup models in its presentations to other local governments.

1. The best model for strategic management will be a landscape master planning framework using adaptive management and scenario planning;
2. The City has an opportunity to provide leadership to directly influence the community and leverage outcomes through its partners and stakeholders;

3. Urban green spaces need to be better recognised as underpinning the very fabric of the Joondalup communities; and
4. The City needs to demonstrate water-use efficiencies across all sectors and develop, maintain and promote to the community a culture of excellence and continuous improvement.

The City's Landscape Master planning project has achieved these aspirations and will continue to do so in the future.

The City has achieved significant results in the development and implementation of its Landscape Master Plan and associated processes. The most significant result has been the cultural shift at Council, community and staff levels. The vision that was articulated through Landscape Master Planning has caught the imagination of all those involved and they can clearly see how the vision can move the City forward in its endeavour to adapt to climate change whilst maintaining the amenity and recreational lifestyle that the community wants.

## **Conclusion**

In summary the innovation of landscape master planning has come through bringing all aspects of City activities under a common theme and developing a logical approach for ongoing implementation and cultural change to occur. The innovation is also reflected in the tools and techniques that have been developed and employed.

The City of Joondalup's Landscape Master Planning Project involved the conceptualisation and development of a Strategic Framework to enable the City to effectively adapt to climate change and manage public open spaces in accordance with community expectations.

The highlights of the project have been the introduction of two new concepts for landscaping namely ecozoning and hydrozoning. These concepts are being implemented through the Landscape Master Plan that will be implemented over a 10 year timeframe.

The project has also included the development of a classification hierarchy that has enabled the City to determine a priority listing of works. A master species list and database will assist with species management and maintain corporate knowledge and experience in managing a local species regime.

The City has developed a unique concept design through its pilot projects which can be applied to verges and medians that will reinstate the natural biodiversity of City and minimise the use of water.

The City's Landscape Master Plan has provided a road map for others by implementing variable irrigation systems and ecozoning techniques to reduce water and re-instate biodiversity. It has looked holistically at all the processes that need to be considered when undertaking landscaping projects and linked these matters to the strategic and business planning processes of the City. By linking strategy at the highest level and providing long term plans that allow for ongoing implementation and improvement, the City has put in place a structure that will provide a sustainable future for the City's open space areas and natural areas.

A key highlight of the innovation being demonstrated by the City is the unique concept design that will be applied to seven iconic projects within high visible roads linking the coastline in the west to the wetlands in the east. The concept design has been developed using water sensitive urban design principles and replicating the natural geological soil conditions and species that originally thrived on this section of the Swan Coastal Plain.

The concept will lead to the reinstatement of key biodiversity corridors across the City and will also provide a statement to local residents on how they can develop water wise natural gardens that minimise the use of precious water resources and support the native species that depend on native flora for survival. Furthermore the reduction of water use across the City will have a profound impact on the superficial and deep aquifers

such as the Gngangara Mound from which the City draws its ground water resources.

The City has developed a number of water gardens projects, introduced hydrozoning techniques and infrastructure; and has worked closely with the community to establish projects. The impact of all the pilot projects and initiatives has been a significant reduction in water demand.

The landscape master planning concept has now become a reality for the City of Joondalup.

## References

Deeley, D (2007) City of Joondalup Landscape Master Planning - A strategic framework to adapt to climate change.

Carter, M. (2007) Personnel communication. PhD student Edith Cowan University, Joondalup Campus.

DPC (2007) State Water Plan 2007. Department of Premier and Cabinet, Government of Western Australia.

IAA (2006) Irrigation Association of Australia - Urban Irrigation Best Practice Guidelines v Irrigation Association of Australia, February, 2006.

ICLEI (1993) International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Change Strategy and Water Strategy.

IOCI, (2005) Living With Our Changing Climate: Report of Workshop, 17 August 2005. Indian Ocean Climate Initiative Report 3.[http://www.ioci.org.au/pdf/IOCIRReport\\_3.pdf](http://www.ioci.org.au/pdf/IOCIRReport_3.pdf)

IPCC (2007) Intergovernmental Panel on Climate Change Working Group I: Fourth Assessment Report Climate Change 2007: The Physical Science Basis, Summary for Policymakers

Natural England (2007) Natural England Health Campaign. Report on research exploring the attitudes of health professionals to supporting this initiative. Report No NE15 8NZ.

APPENDIX 1 – EXAMPLE OF INDIVIDUAL LANDSCAPE MANAGEMENT PLAN  
TEMPLATE

LANDSCAPE MASTER PLANNING PARK ASSESSMENT

<b>Reserve</b>	<b>Parkside Park</b>			<b>Date Conducted</b>	
<b>Property No.</b>	151138	<b>Reserve No.</b>	38835	<b>Active/Passive Classification</b>	Active
<b>Bush Forever Site</b>	NO	<b>Total area</b>	27599	<b>Irrigated Area</b>	19220
<b>Reserve Lighting</b>	Security	<b>Facilities Present</b>		<b>Sump/Drainage Site No</b>	RMS 08068
<b>project Stage</b>		Concept Design	Working Design	Final Design	
<b>Other B/U's consulted</b>	Irrigation	Parks	Infrastructure Management	Planning	Recreation and Culture
	Ops				
<b>Objectives</b>					

Description of Park, reserve, sports ground, verge or median (CPOSVM):


Threats / risks:


Opportunities:


Alternative water supplies available:


Landscape type – grass, natural bushland, planted bushland, adjoining areas


Opportunities for cultural enrichment / participation:


Community prominence – proximity to major roads, shopping centres, schools, club utilisation


Community education/promotion:


Suggested further research:

Cultural Development Plan		Water Harvesting Plan	
Detailed Planting Scheme		Irrigation Management Plan	
Concept Plan		Landscape Redevelopment Plan	
Facility Upgrade Plan			

Please indicate suggested areas for hydrozoning, ecozoning and beautification

Legend	
Hydro Zoning	
Eco Zoning	
Beautification	

Water Usage based on above suggestion

Yearly allocation @ 7500kL/ha (10000m2) : kL/year (approx)

Usage : kL

	HydroZone 1 Playing Surface	HydroZone 2 Passive High Use Turf (70%)	Hydrozone 3 Passive Low Use Turf (30%)	EcoZone Not Irrigated	Unwatered Assets	<b>Total</b>
Before Area m2						
After Area m2						
Before Water kL						
After Water kL						

Notes/Assumptions

- Area figures calculated using the above plan and GIS. Total reserve area is taken from GIS and does not include verges
- Irrigated area taken to be 115580m2 as the reticulation plan indicates that all of the school oval plus lot 127 is irrigated from the City's system. DET should be responsible for this area – could well be over watered from their bore also.
- Unwatered assets are taken to be the two conservation areas, the northern being 15567m2 and the southern being 16336m2. Other areas such as the carpark and clubhouse show extensive bore water staining, implying that they are receiving water and thus have been included in the irrigated area.
- Total water consumption taken from list XXXX
- HydroZones are based on a proportion of the water that the active playing surface receives.
- Allocated amount is 7500 kL/ha x total area of park in ha – lot size + school oval section + lot 127..
- Allocated amount is equiv to 6.9L/m2/water, based on watering 3 times per week for 36 weeks of the year. Current usage is equivalent to 9.22L/m2/water and consumption after the redevelopment is equivalent to 5.5L/m2/water, all based on the same watering regime.
- Areas indicated for beautification have been assumed to be irrigated at the underlying rate of HydroZone 2, 3 or EcoZone as indicated by their position. It is understood that they may require more water while establishing, however they should be landscaped with the final outcome in mind.

---

### **Budget summary** (To be completed for Stage 2)

Project management:

Landscape design:

Planting scheme:

Irrigation design:

Plant costs:

Site works, bulk earth works:

Irrigation installation:

Mulch, soil conditioners:

Landscape installation:

Complimentary infrastructure:

**Total budget:**

---

**Timeline** (To be completed for Stage 2)

<b>Item</b>	<b>Start</b>	<b>Duration (weeks)</b>	<b>Finish</b>
Project management:			
Landscape design:			
Planting scheme:			
Irrigation design:			
Plant costs:			
Site works, bulk earth works:			
Irrigation installation:			
Mulch, soil conditioners:			
Landscape installation:			
Complimentary infrastructure:			

---

**Project management details:** (To be completed for Stage 2)

---

**Attachments:**

---