

**PHILOSOPHY, DESIGN CRITERIA AND GUIDELINES FOR
FUTURE ENVIRONMENTAL MANAGEMENT PLANS
CHAMPION LAKES PROJECT**

Prepared for:

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1.0 INTRODUCTION

The City of Armadale and the Western Australian Planning Commission (WAPC) propose to create a local and regional sporting facility that will provide a comprehensive variety of sporting uses for the region.

The proposed Regional Park is to be named 'Champion Lakes' and a number of water and land based activities are included in the proposal, together with other associated uses and concepts.

The subject land consists of approximately 136 ha of land situated on Lake Road within the City of Armadale.

The current Champion Lakes Concept Plan includes the following facilities:

- International standard rowing course;
- Whitewater, cable ski and water park;
- Urban land uses;
- Indoor sport and aquatic centre;
- Conference Centre;
- Aboriginal Interpretative Centre; and
- Conservation area and constructed watercourse.

The Champion Lakes Regional Recreational Park Development is currently in the process of a formal assessment under the *Environmental Protection Act, 1986* at the level of Public Environmental Review (PER).

The brief issued for the preparation of the PER by the proponents, which specified that:

“Conduct an environmental impact assessment of the proposal and provide design criteria for the future preparation of management plans including Wetland Management Plan; Drainage, Nutrient and Irrigation Management Plans; Water Quality management Plan, and a Revegetation Plan that includes a focus on revegetating areas with Forrestfield Complex vegetation”

The preparation of the various management plans is scheduled to be undertaken following a separate consultancy to the PER which will review and prepare a more detailed Structure Plan for the site. Logically, detailed management plans cannot be prepared for a Structure Plan where the final end uses, and configuration, are unknown.

However in the interim, this document provides an important overarching philosophy, with design criteria and guidelines for the preparation of individual drainage, nutrient, irrigation, water quality, revegetation and wetland management plan.

The site falls outside the study area for the Southern River/Forrestdale/Brookdale/Wungong Structure Plan Urban Water Management Strategy (WRC 2002), but is located within the catchment of the Southern River.

Therefore the objectives, design criteria and guidelines for drainage, nutrients, irrigation and water quality within the site are intended to be consistent with this strategy, and the Water and Rivers Commission guidelines for preparation of a Nutrient and Irrigation Management Plan (WRC 1998).

Notwithstanding the above, it is important to note that the waterbodies proposed within the Champion Lakes site are lined with relatively impermeable material, and that it is proposed to harvest surface water from hard stand areas for course water level maintenance. Consequently, the interaction with local groundwater and surface water drainage patterns will be limited.

2.0 DRAINAGE, NUTRIENTS, IRRIGATION AND WATER QUALITY

2.1 Drainage

2.1.1 Objectives

- Minimise pollutant input to surface water and groundwater through the use of source control techniques and WSUD (water sensitive urban design) BMP's (best management practices).
- Harvest stormwater from the development area to minimise rowing course top up requirements from other sources.

Appropriate drainage controls are essential in any development, and are intended to provide the following benefits (ARMCANZ/ANZECC 2000):

- Minimise the effects of urbanisation on the hydrological characteristics of the catchment including wet weather and low flows;
- Minimise the amount of pollution entering the stormwater system and removing an appropriate amount of any residual pollution;
- Maximise the value of indigenous riparian, floodplain and foreshore vegetation; and
- Maximise the value of physical habitats to aquatic fauna within the stormwater system.

2.1.2 Design Criteria and Guidelines

- Source controls for construction activities and maintenance of landscaped areas including development of site management plans and BMP's for construction sites;
- Implement WSUD BMP's where appropriate and design drainage to harvest water from development areas as a mechanism to conserve and manage water;

- Develop and implement a public education campaign to decrease stormwater pollution by household and business activities;
- Drain marking;
- Encourage planting of native gardens (see Landscape Strategy) and minimise water use for landscaped areas by adopting landscape water conservation techniques;
- Undertake regular street sweeping; and
- Implement enforcement measures to complement education programs and other management programs

2.1.3 Outcomes

Each component of the development as nominated within the Concept Plan will require the preparation of a Drainage and Construction Management Plan, as part of the overall DNIMP, which addresses the objectives and design criteria and above guidelines.

2.2 Nutrients

2.2.1 Objectives

- To minimise nutrient application to the development area; and
- To minimise nutrient export from the development area via runoff and leaching.

Fertiliser use in gardens within the Perth Metropolitan Area is more than double the application rate in agricultural areas. Over 5,000 tonnes of fertiliser is used in Perth every year (SRT, 1999). Fertiliser application is also increasing as housing density increases leading to heavy leaching losses of nutrients to groundwater and surface runoff to drains, which subsequently result in deterioration of the receiving waterways. Consequently it is necessary to minimise nutrient export from the site through encouraging reduced fertiliser use in gardens, using slow-release fertilisers and promoting native gardens. A second alternative is to minimise lot sizes and consequently the area of garden established within each lot.

2.2.2 Design Criteria and Guidelines

- Minimise fertiliser use for landscaped areas by reducing extent of exotic vegetation cover and irrigated landscaped areas;
- Determine fertiliser requirements to minimise nutrient applications - identify areas of site to be fertilised including quantity, duration, frequency and method of application;
- Eliminate or minimise fertiliser applications adjacent to the rowing course and return lane;
- Amend soils with phosphorus binding substances where practicable;
- Use slow release fertilisers; and
- Use low fertiliser requirement plants

2.2.3 Outcomes

Each component of the development will require the preparation of a Nutrient Management Plan, as part of the overall DNIMP, which addresses the objectives and design criteria and guidelines above.

The DNIMP will nominate a monitoring schedule and contingency in the event that unacceptable nutrient levels are detected in the surface and groundwater.

2.3 Irrigation

2.3.1 Objectives

- To conserve and minimise water consumption throughout the development;
- To lower water, power and maintenance requirements and costs;
- To minimise fertiliser leaching;
- To minimise evaporative and leaching water losses.

Management of irrigation within the project area is essential to achieve the objectives listed above. Perth is currently experiencing very low rainfall levels with dam levels at 20% and therefore water conservation within this development is of paramount importance. In addition, irrigation management will prevent further leaching of nutrients into the waterways.

2.3.2 Design Criteria and Guidelines

- Adopt a target to reduce overall consumption for irrigation by 30% within a 5 year period. This approach will allow establishment of landscape areas then acclimatisation to progressively lower volumes of irrigation waters;
- Reduce extent of irrigated landscaped areas, including irrigated turf;
- Minimise water use for landscaped areas by adopting landscape water conservation techniques;
- Design irrigation systems to suit climatic, soils and vegetation needs;
- Regularly determine quantity, quality and availability of the water source;
- Aim for a minimum of irrigation water to pass beyond the plant root zone;
- Consider potential to recapture runoff from irrigated areas and recycle the water;
- Design frequency, rates and timing of applications to match evapo-transpiration rates;
- Define how irrigation will be scheduled to avoid runoff, excessive groundwater mounding and leaching.
- Consider a fully computerised irrigation system linked to an on-site weather station, together with soil moisture sensors.

2.3.3 Outcomes

The above irrigation objectives, design criteria and guidelines will be incorporated in the proposed irrigation management plan for the site as part of the overall DNIMP. Each component of the development will require its own DNIMP to meet the targets set within the overall DNIMP.

2.4 Water Quality

2.4.1 Objectives

- To maintain groundwater quality and surface water quality of the Southern River;
- To contribute towards achieving the Swan Canning Cleanup Program targets for phosphorus and nitrogen export concentrations in the Southern River; and
- To maintain water quality at primary contact levels within the rowing course as practicable;
- To avoid water quality conditions conducive to episodes of algal blooms and associated problems.

The Southern River/Forrestdale/Brookdale/Wungong Structure Plan Urban Water Management Strategy (UWMS) (WRC 2002) states that there is little data regarding water quality for the area, and no clear water quality guidelines exist at the State Government level. The national guidelines do not readily apply to stormwater management.

The only available targets are those provided in the Swan Canning Cleanup Program Action Plan (SCCP) (SRT 1999). The UWMS recommends that existing water quality is determined first, through a monitoring program. This data should then be used in conjunction with the SCCP and ANZECC data to establish water quality targets. Targets should not be established without determining existing water quality as this may lead to a failure to meet unrealistic targets and implement unnecessary pollution control measures at cost to local community (see PER).

The Southern-Wungong River catchment is one of the four most significant nutrient contributors to the Swan-Canning system. Management of water quality within the site is necessary to contribute to improving the quality of the Southern River and subsequently the Swan-Canning system.

2.4.2 Design Criteria and Guidelines

- Source controls for construction activities and maintenance targets of landscaped areas including development of site management plans;
- Develop and implement education campaigns to decrease stormwater pollution by household and business activities;
- Implement WSUD Best Management Practices where applicable;
- Refinement of local authority management and maintenance activities;
- Planting of indigenous gardens;
- Street sweeping;
- Land use planning to exclude developments with significant risk of stormwater pollution.

Targets for phosphorus and nitrogen in the Southern River from the SCCP (SRT 1999) are provided in Table 1.

Table 1
Recommended Total Phosphorus and Nitrogen Concentration
Targets for the Southern River (SRT 1999)

Parameter	2005	2020
Total Phosphorus	0.2 mg/L	0.1 mg/L
Total Nitrogen	2.0 mg/L	1.0 mg/L

Consequently, any waters which flow to the Southern River from the site should remain at current nutrient concentrations as a minimum standard, and below these guideline levels as a preference. Other groundwater quality parameters should be maintained below the guideline values for drinking water (DEP 2001).

The target for surface waters within the site should be to remain within primary contact (health) water quality criteria (see Table 2).

2.4.3 Outcomes

Procedures to implement the designated objectives, design criteria and guidelines for water quality within the site will be detailed within the overall DNIMP.

Measures to protect water quality will be further detailed in the DNIMP for each component of the development.

Table 2
Guideline Values for Maintaining Water Quality for Primary Contact
(EPA 1993)

Parameters	Standards
Microbiological Characteristics for Secondary Contact	<p>The median bacterial content in fresh and marine waters should not exceed:</p> <ul style="list-style-type: none"> • 150 faecal coliform organisms/100mL (minimum five samples taken at regular intervals not exceeding one month, with four out of five samples containing less than 600 organisms/100mL) • 35 enterococci organisms/100mL (maximum number in any one sample 60-100 organisms/100mL) <p>Pathogenic free-living protozoans should be absent from bodies of fresh water (it is not necessary to analyse water for these pathogens unless the temperature is greater than 24°C)</p>
Nuisance Organisms	<p>Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, sewage fungus and leeches should not be present in excessive amounts</p> <p>Direct contact activities should be discouraged if algal levels of 15000-20000 cells/mL are present, depending on the algal species.</p> <p>Large numbers of midges and aquatic worms should also be avoided.</p>
Visual Clarity and Colour	<p>To protect the aesthetic quality of the water body:</p> <ul style="list-style-type: none"> • The natural visual clarity should not be reduced by more than 20% • The natural hue of the water should not be changed by more than 10 points on the Munsell Scale • The natural reflectance of the water should not be changed by more than 50% <p>To protect the visual clarity of waters used for swimming, the horizontal sighting of a 200mm diameter secchi disc should exceed 1.6m</p>
pH	The pH of the water should be within the range of 5.0-9.0, assuming that the buffering capacity of the water is low near the extremes of the pH limits.
Toxic chemicals	Waters containing chemicals that are either toxic or irritating to the skin or mucous membranes are unsuitable for recreation. In general, toxic substances should not exceed the concentrations given for untreated drinking waters
Temperature	For prolonged exposure, temperatures should be in the range of 15-35°C.
Surface films	Oil and petrochemicals should not be noticeable as a visible film on the water nor should they be detectable by odour.
Nutrients	<p>The indicative concentration values or ranges are:</p> <p>Total P – 10-100 µg/L</p> <p>Total N – 100-750 µg/L</p>

3.0 REVEGETATION AND WETLANDS

3.1 Revegetation

3.1.1 Objectives

- To rehabilitate Bush Forever Site 260 and Wetland and Conservation Areas to resemble their original form as closely as possible;
- To provide further revegetation through landscaping;
- Minimise vegetation loss, especially mature existing trees and wetland vegetation; and
- To increase the overall quantity of vegetation present on the site.

Nine percent of the original 11,328 ha of the Forrestfield Complex in the Swan Coastal Plain portion of the Perth Metropolitan Area remains, and 17% of the original 31,148 ha of Southern River Complex there remains. Both percentages are well under the 30% “threshold level” specified by the EPA to remain uncleared. Only 2% (219 ha) of the original Forrestfield Complex vegetation has some existing protection, and only 6% (1775 ha) of the original Southern River Complex vegetation has some. Both are under the 10% threshold level specified by the EPA as needing effective protection, and the 10% target criteria adopted by Bush Forever (Government of Western Australia, 2000). Re-establishment of vegetation of these complexes within the project area, as far as is practicable, will contribute to preservation of the complexes on the Swan Coastal Plain, and contribute to available fauna habitat.

3.1.2 Design Criteria and Guidelines

- Retain and protect any existing natural vegetation in revegetation/conservation areas;
- Monitor and manage to minimise the spread of dieback;
- Control and minimise the spread of weeds;

- Control feral and domestic animals;
- Prevent and control vandalism;
- Maintain controlled public access;
- Regenerate remnant bush areas damaged by past grazing and weed infestations in accordance with the Concept Plan;
- Use plants that are indigenous to the area and belong to the Forrestfield or Southern River vegetation complex where possible, particularly in nominated conservation areas and Bush Forever Site 260;
- Manage access to conservation areas by providing designated trails and fencing sensitive areas (particularly Bush Forever Site 260);
- Use plants that have low water and nutrient requirements;
- Create diverse habitats;
- Create links to wider network of natural wetland and bush environments;
- Enhance views to Darling Range and screen views of the powerlines and Tonkin Highway;
- Mitigate prevailing winds to increase potential use of the rowing course.

3.1.3 Outcomes

The revegetation of the site will be addressed in detail within the Foreshore Management and Revegetation Plan prepared by the proponent.

3.2 Wetland

This section relates to the rowing course and return leg as a wetland function, and should be read in conjunction with the Landscape Strategy for the project.

3.2.1 Objectives

- To restore the ecology of the Southern River, its riparian zone and an adjacent buffer;
- Create a functional aquatic ecosystem to improve water quality in the waterways and maintain biodiversity;
- Form a wetland network by providing a series of connected conservation areas;
- To create wetland conservation zones surrounding the course; and
- To create a conservation island.

Over one quarter of the Swan Coastal Plain land between Wedge Island and Dunsborough consists of wetlands. Only 17% of these wetlands remain fully vegetated with a substantial area of the resource partly vegetated (Government of Western Australia 2000). Re-creating wetland zones within the site will contribute to increasing conservation wetland areas in the Perth Metropolitan Area, and providing important habitat to a range of flora and fauna.

3.2.2 Design Criteria and Guidelines

- Link the wetland areas with the regional wetlands including the Southern River;
- Use appropriate wetland species belonging to the Forrestfield or Southern River Complex;
- Maintain appropriate wetland water levels;
- Monitor and minimise the spread of dieback;
- Control and minimise the spread of weeds;

- Control feral and domestic animals;
- Prevent and control vandalism;
- Maintain controlled public access;
- Provide a refuge for water birds by restricting public access;
- Create a variety of bird habitats using vegetation to encourage birds to nest;
- Create a variety of wetland zones including ephemeral swamp, shallow marsh, deep marsh and open water as practicable;
- Provide a variety of aquatic habitats by varying the living streams to include pools, riffles, runs, floodplains and sedge stands;
- Ensure adequate surface area to facilitate sedimentation process and depth for vegetation; and
- Stabilise embankments to prevent erosion.

3.2.3 Outcomes

The wetland objectives will be achieved through implementation of the above design criteria and guidelines which will be detailed in the Construction Environmental Management Plan, the Foreshore Management and Revegetation Plan, and the overall DNIWQMP.

4.0 REFERENCES

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