IMPLEMENTATION NOTES
WATER SENSITIVE URBAN DESIGN STRATEGIES IN LOCAL PLANNING POLICY

1 INTRODUCTION

These Implementation Notes are provided to support the implementation of the strategies in the Water Sensitive Urban Design Local Planning Policy (the Policy).

The objectives of the Policy are:

1.1 To improve the achievement of total water cycle management outcomes via the planning and development approvals process, consistent with *State Planning Policy 2.9: Water Resources* (2006) and *Better Urban Water Management* (WAPC, 2008);

1.2 To achieve better integration of land and water planning and thereby improved water management outcomes for the catchments within the local government area; and

1.3 To ensure that land use planning decisions are consistent with the requirements of environmental protection policy and compatible with the achievement of relevant objectives and environmental quality criteria.

2 ACHIEVING BETTER URBAN WATER MANAGEMENT OUTCOMES

The achievement of better urban water management outcomes requires consideration of the total water cycle in an urban context. This is best explained by the principles of water sensitive urban design which are outlined in section 5 of the Policy.

In order to achieve improved outcomes, strategies should be incorporated into planning and development proposals which address the elements of each principle.

A matrix demonstrating how the water sensitive urban design strategies in section 7 of the Policy can achieve the principles outlined in Section 5 of the Policy is provided in Table 1.

Table 1: Linking WSUD strategies to the achievement of better urban water management (principles of WSUD).

Water Sensitive Strategies (refer to sections 7.1 – 7.14)	Water Sensitive Urban Design Principals (Refer section 5.1 – 5.6)					
	Flood protection	Maximise water use efficiency and reuse	Minimise runoff/ increase infiltration	Retain natural systems and water balance	Minimise pollution inputs to ground and surface waters	Enhance social amenity
Compliance with environmental criteria	XX	XX	X	X	XX	
Compliance with stormwater management policies	XX		XX	XX	X	
Water conservation and reuse		XX	X	XX	X	X
Water efficiency		XX		X		XX
Stormwater infiltration	X	X	XX	XX		
Vegetated swales	X	X	XX	X	X	X
Rain gardens and bio-filtration systems	X		X	X	XX	XX
Soil Amendment			X		XX	
Connection to sewer					XX	X
Retention of bushland			X	X	X	XX
Landscaping techniques	X	X		XX	XX	XX
Construction and site management					XX	X
ASS assessment and management plan					X	
Compliance measures	X	X	X	X	X	X

Key
XX significant contributor to achievement of principle
X contributes to achievement of principle

3 WATER SENSITVE URBAN DESIGN STRATEGIES

The following strategies, as identified in the Policy, should be applied as part of an integrated approach to urban water management. The approach should be consistent with SPP 2.9: Water Resources (2006), *Better Urban Water Management* (WAPC, 2008) and the *Decision Process for Stormwater Management in Western Australia* (DoE and SRT, 2005) to achieve improved water management via planning and development.

3.1 Compliance with environmental criteria

The achievement of better urban water management outcomes is best demonstrated through the meeting of environmental criteria which have been developed to ensure the protection and maintenance of environmental values. These criteria may be in the form of principles, objectives, parameters, targets or standards.

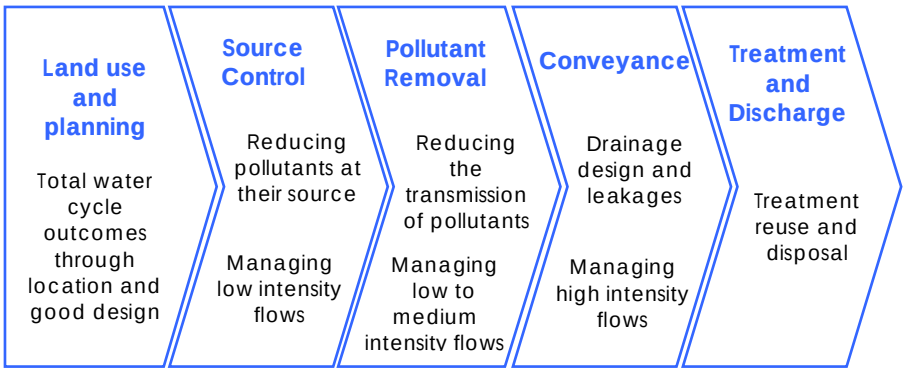
Criteria are likely to be developed for certain areas, as they are specific to and representative of the existing and desired values of each area. These criteria are likely to be contained in reports, strategies or plans released by the State or Local Government. Where no specific criteria have been developed, the generic criteria in Appendix 2 of the Policy should be applied.

As stated in the Policy, demonstration of compliance may be achieved through appropriate computer models, assessments and calculations appropriate to the stage of planning and scope of the proposal, as supported by the Department of Water. Further information is contained within *Better Urban Water Management* (WAPC, 2008).

3.2 Compliance with stormwater management policies

Stormwater management systems must address the principles of water sensitive urban design and propose strategies or actions which address all parts of the treatment train. Stormwater management systems should include structural (fixed or engineering) solutions as well as non-structural controls ("soft" solutions such as education programs, management and maintenance practices and programs, catchment management plans and activities, and town planning controls).

The elements of the treatment train which should be considered are:



Source: Peel-Harvey WSUD Technical Guidelines (PDC, 2007).

State Government stormwater management policy is outlined in the *Stormwater Management Manual for Western Australia* (DoW, 2004 - 2007) and the *Decision Process for Stormwater Management in WA* (DoW, 2004).

3.3 Water conservation and reuse

Climate change and pressure on our sources of drinking and non-drinking water require that actions are taken to conserve water and reuse or recycle it wherever possible.

Consideration of water conservation or the provision of a non-drinking water source (water reuse or recycling) should occur as early in the planning system as possible so that appropriate infrastructure and approvals can be obtained. Strategies to consider include location and landscape visions for public open spaces; capture and reuse of stormwater from roads or drains; use of superficial groundwater via a shared bore system; domestic rainwater tanks plumbed into toilets, laundrys and hot water system; domestic greywater systems; sewer mining; and treated wastewater from a wastewater treatment plant.

Consideration should be given to both supply (source) and demand (use) and a strategy developed which optimises fit-for-purpose use. Fit-for-purpose use is the provision of a certain quality (or grade) of water which is appropriate for its use. For example, drinking water should not be used to water gardens or wash the car but should be used in kitchens. It may also not be necessary in some industrial processing or industries, where a "lower" quality of water would be appropriate.

Proposals for alternative sources of water supply and use should be supported by a water balance of the pre- and post-development scenario. Approvals are also likely to be required from appropriate service providers and the Health Department of WA (see www.health.wa.gov.au/envirohealth/water/index.cfm).

The Water Corporation has developed a seven step guide for developers to facilitate the implementation of alternative water supplies in the Perth region. The guide identifies a process which includes necessary approvals and costing tools to aid the establishment of alternative water, wastewater and drainage services. For further guidance see *Developing Alternative Water Supplies in the Perth Metropolitan Area Series* (http://www.watercorporation.com.au/P/publications_alternative_water_supply.cfm).

3.4 Water efficiency

Water efficiency should also occur at the building/lot level. Maximising water efficiency through the use of water efficient fittings and appliances as well as in landscape areas is a core component of water sensitive urban design.

The State Government of Western Australia has established the 5 Star Plus Water Use in Houses Codes to supplement the Building Code of Australia. These codes help reduce the consumption of water in residential homes by requiring water efficient fittings, minimising water wastage and facilitating the use of alternative sources of water such as grey water and rain water. Under the 5 Star Plus Water Use in Houses Code all new homes must ensure:

a) 3 or 4 star rated water efficient fittings and fixtures are fitted; and
b) all hot water outlets are located close to the hot water system or a recirculating hot water supply.

For further information about the 5 Star Plus Codes visit www.5starplus.wa.gov.au.

Through the Waterwise Land Development Program, the Water Corporation have established criteria to reduce the consumption of scheme water and improve surface and groundwater management in new developments. These criteria include

(a) All taps over basins having a 4 star or AAAA rating;

(b) All showers having a 3 star or AAA rating;
(c) All appliances having a 4 star or AAAAA rating; and
(d) The inclusion of tap aerators, single lever mixer taps and volume control devices where possible.

Information on waterwise developments is located on the Water Corporation website (http://www.watercorporation.com.au/_files/Waterwise_Land_Development_Criteria.pdf).

3.5 Stormwater infiltration

Infiltration of frequent stormwater events has many environmental and economic benefits. Onsite stormwater infiltration should be used to reduce peak stormwater flows; reduce downstream flooding, erosion and sedimentation while improving groundwater recharge and stormwater quality.

Flat areas with high soil permeability, low groundwater tables, low soil salinity and low risk of acid sulfate soils present the best conditions for use of stormwater infiltration devices. Infiltration devices should be used as part of an overall strategy for managing stormwater in the development, including use with complementary devices such as rainwater tanks, bioretention systems (raingardens), conveyance structures and landscaping techniques. Common infiltration devices include soak wells, leaky side entry pits, retention trenches, infiltration basins, infiltration cells, pervious paving and seepage pipes.

Paved surfaces can have a significant impact on the water cycle. Paved areas reduce infiltration, increase stormwater peak flows and increase the risk of downstream flooding and stream bank erosion. Large paved areas also increase the need for expensive drainage infrastructure to manage stormwater flows and prevent pollution of natural waterways.

For further information on infiltration systems refer to Chapter 9 of the *Stormwater Management Manual for Western Australia* (Department of Water, 2007).

3.6 Vegetated swales

Vegetated swales can be used for both stormwater treatment and stormwater conveyance. They should be considered at the design stage of any development (local structure plan) and integrated into public open spaces, road networks and at the lot level.

A swale is a vegetated channel used to convey stormwater where the stormwater is filtered through the vegetation. They can replace conventional piped drainage or be used in combination with it.

For further information on vegetated swales and buffers refer to Chapter 9 of the *Stormwater Management Manual for Western Australia* (Department of Water, 2007).

3.7 Rain Gardens and Biofiltration Systems

Biofiltration systems, also known as rain gardens, remove nutrients, sediment and heavy metals from stormwater. Biofiltration systems should be considered as part of an overall strategy for managing stormwater in a development and should be considered at both the estate (in road medians, verges and public open spaces) and lot scale (road verges and gardens).

Biofiltration systems can help restore catchment hydrology to its pre-development state and therefore protect the health of natural waterways.

Biofiltration systems filter stormwater through vegetation and a filter media prior to infiltration or collection in a below ground storage tank. Once filtered, the water can be reused or directed into the stormwater system. A rain garden is a bio-filtration system incorporated into a landscaped area as a design feature.

Biofiltration systems are extremely versatile in their design and can be adapted to almost any size or site condition. Biofiltration systems can also be designed as biofiltration swales to incorporate stormwater conveyance at the surface during storms.

If designed properly, the following pollutant removal performance can be expected:

a) >95% removal of suspended solids
b) >90% removal of heavy metals
c) >85% removal of phosphorus
d) >50% removal of nitrogen

When designing an appropriate biofiltration system, the following criteria should be addressed.

a) Biolfiltration systems should be sized at approximately 2% of the directly connected, constructed impervious area to ensure satisfactory performance;
b) The soil used must meet Australian Standard AS4419-2003 for Landscaping and Gardening;
c) The filter media must have a hydraulic conductivity of 100-300mm/hr and meet the criteria set out in the Facility for Advancing Water Biofiltration's Guidelines for Soil Filter Media in Bioretention Systems (FAWB, 2008);
d) At least 50% of the plants used should be made up of *Carex* species, *Juncus* species, *Melaleuca* species and *Goodenia ovate*. The remainder of plants can be selected for biodiversity and aesthetic purposes, though thick rooted species are preferred;
e) Plants should be planted at high densities, preferably angled at 45° to the direction of flow of water, to reduce weed invasion and decrease maintenance requirements.

For further information on the design and construction of rain gardens and biofiltration systems refer to the Guidelines for Soil Filter Media in Bioretention Systems; Version 2.01 (FAWB, 2008) which is available on the New WAter Ways website (www.newwaterways.org.au) or Chapter 9 of the *Stormwater Management Manual for Western Australia* (Department of Water, 2007).

3.8 Soil Amendment

Soil amendment is a simple method to minimise the transport of nutrients to the groundwater and stormwater system.

Recent research (Kitsios and Kelsey, 2008) has suggested that the general public is applying fertiliser at 1.5 times the rate previously estimated – at levels comparable to dairy farming. Much of the Swan Coastal plain contains sandy soils which have limited ability to absorb nutrients. In these areas, soil amendment in garden areas to maximise

the phosphorus retention capability of the soil is critical to reduce the transport of fertilisers to the groundwater and stormwater systems.

Furthermore, many areas of future development will require fill to achieve adequate separation from groundwater. Any imported fill should also have the capacity to reduce phosphorus export via soil leaching, whilst also meeting the Local Government's soil permeability and soil compaction criteria. Where the phosphorous retention index is insufficient, the fill should be amended.

3.9 Connection to sewer and effluent disposal

A connection to reticulated sewerage is required as part of any proposal to develop land for residential, special residential, commercial, industrial or tourist uses where the land has a maximum groundwater level of less than 1.2m below the natural ground surface or where subsoil drainage is proposed or will be required as a part of subdivision or development.

Where access to a reticulated sewerage system is not available and the conditions are not consistent with those outlined above, on-site effluent disposal facilities are to be provided to treat and dispose of any domestic effluent. Soil permeability, nutrient retention characteristics and slope must be demonstrated to be appropriate for the proposed system.

No effluent disposal facility (including any leach drain or soak well) is to be located:

(e) within 6m of any open drainage channel or subsoil drain; or
(f) within 30 metres of the outer edge of an intermittent water course; or
(g) within 50 metres of the outer edge of a permanent water course in the case of a nutrient removal system or within 100 metres for a conventional septic system; or
(h) within 100 metres of any protected wetland, or within such greater distance as may be required to achieve a minimum one metre vertical separation between the natural ground level at that distance and the natural ground level of the adjacent wetland vegetation; or
(i) within 100 metres of a bore or underground water source used for human consumption, unless otherwise approved by the City/Town/Shire.

The Local Government may require additional setbacks for effluent disposal facilities and/or require the installation of specific types of facilities (including those involving the removal of nutrients) where it considers such requirements appropriate or necessary for the protection of water resources or other environmental values.

3.10 Retention of Bushland

The retention and re-establishment of deep-rooted vegetation in open space areas and corridors aids the maintenance of pre-development groundwater levels and reduces the amount of runoff from new development areas. Retention of bushland also provides an opportunity to infiltrate frequent stormwater events. Bushland may also be used for detention storage for flood events provided that the frequency, extent and duration of inundation is within the natural variability of the ecosystem.

Retention and revegetation of bushland should be considered as part of the design of estates (structure planning) to ensure that appropriate areas for protection are identified.

All regionally significant vegetation should be protected, as well as any vegetation or individual tress which have heritage significance.

Further information on significant vegetation is contained in *EPA Guidance Statement No 33: Environmental guidance for planning and development* (EPA, 2008).

3.11 Landscaping Techniques

There are a variety of landscaping techniques that can be used to manage stormwater flows, minimise irrigation requirements of public open spaces, use stormwater onsite and minimise reliance on scheme water supply for garden watering.

The Policy recommends landscaping techniques including soil improvement to retain moisture; xeriscaping; hydrozoning; smart irrigation systems including monitors and controllers; mulching; buffer and filter strips and use of appropriate areas and specied of turf.

Waterwise turf species endorsed by the UWA Turf Industries Research Steering Committee are as follows.

Scientific name	Common name	Cultivar or selection
Cynodon dactylon	Couch or Bermudagrass	Wintergreen Windsor Green CT-2
C. dactylon x C. transvaalensis	Couch hybrid or Bermudagrass hybrid	Santa Ana
Paspalum vaginatum	Saltene or Seashore Paspalum	
Stenotaphrum secundatum	Buffalo or St. Augustine grass	
Pennisetum clandestinum	Kikuyugrass	

Source: Adapted from the Water Corporation's Waterwise Land Development Program.

For further information on water sensitive landscaping techniques, refer to the Water Corporation's Waterwise Program at http://www.watercorporation.com.au.

3.12 Construction and Building Site Management

Actions must be proposed to address management of construction activities, particularly litter and sediment management as well as vegetation and tree protection.

A Construction and Building Site Management Plan should be developed to support subdivision and/or development. The management plan should consider the following:

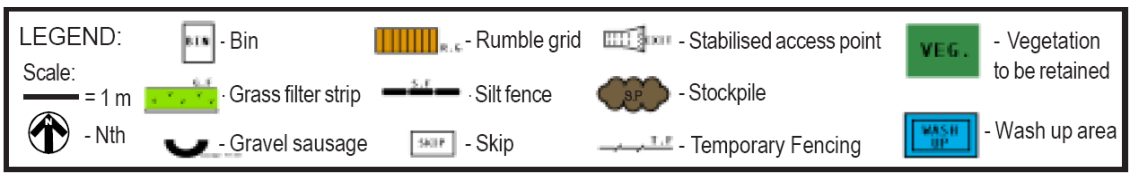
- Any Council-specific requirements for site management;
- Protection of vegetation or wetlands on site – how will this be achieved? Has a survey been conducted?
- Water management – where is the lowest point? This is where surface water will pond. It is often useful to retain vegetation in these areas. Are there other surface water pathways? Is groundwater close to the surface? Will areas be waterlogged?
- Location of site entry (crossover) – this should be away from vegetated areas and waterlogged areas.

- Location of stockpiles – should be away from vegetated areas and waterlogged areas.
- Control of sediment – fences should be erected around vegetated areas and any WSUD structural controls to ensure they are not "clogged" by sediment during construction as this will affect their performance. Grvel "sausages" should also be placed in front of drainage pits. Sediment feces should also be erected around the site to keep sediment on site.
- Erection of safety/construction fence – Some sites may need to be fenced to keep building activities to the site, helps stop movement of litter, and helps to keep a site safe by stopping members of the public wandering on site.

The following Checklist may be helpful.

TASK	GUIDELINES
Check Council requirements and plan before you start work on site	□ Crossover away from lowest point □ Sediment control fence on lowest side □ Stockpiles away from lowest point □ Marked trees and vegetation to keep on site
Stop erosion on site and contain sediments	□ Sediment control fence in place □ Catch drains on high side of site □ Vegetation areas kept at boundary □ Downpipes set up as early as possible
Protect stockpiles.	□ Base and cover for stockpiles □ Gravel sausage at stormwater pit
Keep mud off road and on site.	□ Crushed rock access point □ Vehicles keep to crushed rock areas □ Mud removed from tyres before leaving site □ Clean road if muddy
Keep litter contained on site	□ Site fencing in place □ Litter bins in place with lid closed
Clean and wash up on site.	□ Cutting and clean up area on site □ Clean equipment off before washing □ Sediment filters down slope □ Contain all washings on site

The site management plan may incorporate the following symbols:



Source: Keeping Our Stormwater Clean – A Builders Guide (Melbourne Water)

3.13 Management of Acid Sulfate Soils

Acid sulfate soils should not be disturbed or allowed to oxidise as a result of dewatering or drainage throughout development.

The assessment for acid sulfate soils should be undertaken consistent with the Department of Environment and Conservation's acid sulphate soils guideline series (http://www.dec.wa.gov.au/management-and-protection/acid-sulfate-soils/index.html).

4 FURTHER INFORMATION

4.1 Key resources

4.1.1 Guiding state policy

State Water Plan. Government of Western Australia, 2007

A Blueprint for Water Reform in Western Australia: Final advice to the Western Australian Government, Water Reform Implementation Committee. Government of Western Australia, 2006

Governments Response to the Report of the Irrigation Review Steering Committee. Government of Western Australia, 2005.

State Water Strategy. Government of Western Australia, 2003.

State Planning Policy No. 2 Environment and Natural Resources. Western Australian Planning Commission, 2003.

State Planning Policy No. 2.7 Public Drinking Water Source Policy. Western Australian Planning Commission*, 2003.*

State Planning Policy No. 2.9 Water Resources. Government of Western Australia, 2006.

4.1.2 Operational and design manuals

Australian Rainfall and Runoff, 3rd Edition, Institution of Engineers, 2001.

Australian Runoff Quality: A guide to water sensitive urban design, Institution of Engineers Australia, 2006.

Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative, Western Australian Planning Commission & Department for Planning and Infrastructure, 2007.

Peel Harvey Coastal Catchment Water Sensitive Urban Design Technical Guidelines, prepared for the Peel Development Commission, 2006.

Stormwater Management Manual for Western Australia. Department of Water, 2004 – 2007.

4.2 Further Information

New Water Ways - www.newwaterways.org.au

Department of Water - www.water.wa.gov.au

Western Australian Planning Commission - www.wapc.wa.gov.au

Water Corporation – www.watercorporation.com.au

Peel Harvey Catchment Council – www.peel-harvey.org.au

Phosphorus Awareness Project - www.sercul.org.au

Greening Australia - www.greeningaustralia.org.au/GA/WA/

Ribbons of Blue - www.ribbonsofblue.wa.gov.au