

# CHAPTER 2: PLANNING FOR BIOFILTRATION

## 2.1 INTRODUCTION

These guidelines address the practical issues of implementing water biofiltration schemes. Given that biofiltration systems are a relatively new addition to the set of technologies associated with integrated urban water management, there are a number of common challenges faced by implementers of the technology. These issues can be classified into the following three types:

- Limits to planning and regulation;
- Construction faults; and
- Maintenance problems.

While construction and maintenance issues are considered in Chapter 4 (*Practical Implementation*), this chapter outlines the planning aspects associated with implementing biofiltration systems and reviews the planning instruments and initiatives to facilitate biofiltration in each state and territory of Australia. After identifying the gaps in the policy frameworks across the nation and highlighting the successful initiatives to endorse the implementation of biofiltration (Section 2.2), we offer interim performance measures for the technology that may be used in the absence of state or territory policy (Section 2.3).

Policy Officers and Strategic Planners will most benefit from the guidance in this chapter. However, engineers, scientists, and environmental managers who are developing policy in the area of WSUD will also find this chapter helpful. Whilst this document does not provide definitive guidance on which planning instruments to use, it does provide a very useful link to initiatives currently in place and default measures that can be used in the absence of existing local regulatory requirements.

## 2.2 PLANNING FOR STORMWATER BIOFILTRATION

In planning for stormwater biofiltration, it is useful to consider two separate modes of implementation:

- The private domain (residential, commercial and industrial development); and
- The public domain (eg. parks, town squares, and road reserves).

Each mode follows a separate planning process. Planning for the private domain is particularly important, given that the great majority of development in Australia occurs on private land. While biofiltration has largely been implemented within the public domain as part of demonstration projects throughout Australia, recently, with the amendment to planning regulations in Victoria, an emerging suite of biofiltration technologies can be seen in greenfield residential developments around Melbourne. It is anticipated that, as planning regulations across the Australian states and territories acquire more indicative and prescriptive elements for WSUD, biofiltration will become standard practice and thus will eventually dominate the urban landscape in the private domain. Accordingly, the private domain is the area which requires greater planning emphasis and thus we deal with this matter first.

### 2.2.1 The Private Domain

Each of the states and territories in Australia operate different planning legislation which affects the uniform implementation of stormwater biofiltration. In some states, the planning regulations may facilitate the inclusion of biofiltration within the developed landscape, while others may inhibit it. We have selected all the states and territories of Australia to review the relevant aspects of the planning legislations and provide guidance on what may enhance the implementation of biofiltration through planning schemes.

 **IMPORTANT!**

- These guidelines are not designed to provide a detailed analysis of the legislative frameworks but to practically advise on what policy opportunities exist to implement biofiltration systems.

The planning legislation in all of the six states and the Northern Territory do not currently privilege biofiltration systems, or more generally, the practice of WSUD. This is recognised by the industry as potentially inhibiting the advancement of the technology (Hatt *et al.*, 2006; Mitchell, 2006; Wong, 2006a). It is argued that part of the problem is the lack of clear direction and mandatory prescription of WSUD in the planning regulations (Potter & RossRakesh, 2007). At the time of publication, Victoria was the only state to require WSUD in its totality but this is restricted to residential subdivisions. In the Australian Capital Territory (ACT), requirements for WSUD were mandated in 2008 for a large proportion of new urban development. This is the most advanced of the states and territories for implementing WSUD. Further details of the requirements for WSUD across the states and territories are provided below.

While the Queensland Integrated Planning Act provides general support and direction for WSUD, which is followed by local councils in preparing their local planning schemes across the state, the South East Queensland Regional Plan acknowledges WSUD as best-practice for urban development and specifically requires its adoption (HWP, 2006). A number of local councils have prepared local planning schemes that include provisions for WSUD; noteworthy are the councils of the Sunshine Coast region (formerly Maroochy Shire), Gold Coast City and Ipswich City (A. Hoban, pers. comm.). While municipal officers in the south-east region do not believe the current provisions are satisfactory to achieving WSUD on new developments (HWP, 2007), the state government plans to release revisions of the Environmental Protection Policy (Water) and State Planning Policy (Water). It is expected that these reforms will consistently apply load-based pollutant reduction targets for stormwater runoff to urban development across the state and hence, remove the need for councils to individually produce local policies of this nature (A. Hoban, pers. comm.).

The introduction of the *Building Sustainability Index* (BASIX) in New South Wales by the state government has stimulated the inclusion of rainwater tanks and water conservation measures in new housing (DoP, 2007), but does not currently prescribe exclusive stormwater treatment facilities. The state government's land development corporation, Landcom, has led a number of WSUD ventures, including Victoria Park in southern Sydney and Second Ponds Creek in the outer north-west of the metropolitan area. These projects, combined with a number of local government and private development initiatives, have provided a variety of showcases to build upon. However, current planning legislation at the state level is vague on WSUD requirements and therefore the onus is on local councils to provide the mandate. The government has included in its direction to local government under Section 117 of the Environmental Planning and Assessment Act the requirement to consider the impact of stormwater discharges on waterways when preparing *Local*

*Environmental Plans* (LEPs), although it was uncertain at the time of writing whether this consideration would translate into WSUD.

In Victoria, Clause 56.07 (Integrated Water Management) of the *Victoria Planning Provisions* (DPCD, 2008) prescribes Water Sensitive Urban Design for residential subdivisions. Loopholes do exist for so-called ‘procedural subdivisions’ under Clause 56, i.e., subdivisions of land containing an existing dwelling. These types of development are common in the suburban areas of Melbourne and regional townships in Victoria where, for example, a classic quarter-acre block with home is subdivided for multiple, freestanding dwellings. In these cases, the applicant can seek approval under Clause 55 of the Victoria Planning Provisions to construct multiple dwellings on the lot prior to obtaining a subdivision planning permit, which in practical terms means that WSUD is not pursued (Potter & RossRakesh, 2007). In developments other than residential subdivisions, the planning provisions do not mandate WSUD and as a consequence, biofilters are not generally features of these developments. Melbourne Water is working with the Department of Sustainability and Environment to amend the 5-star building regulations with requirements for WSUD (Potter & RossRakesh, 2007). These will enhance the current requirements for either a rainwater tank or solar hot water system associated with a dwelling. However, it is expected the regulatory amendments will take some years to materialise.

With the injection of federal funds through the Natural Heritage Trust, the Derwent Estuary Program in Tasmania has prepared WSUD engineering procedures (DPE, 2005) and worked with the Royal Botanic Gardens in Hobart to showcase a biofilter with visitor interpretive signage and information in the gardens. While there are a number of protagonists within state and local governments, the implementation of WSUD is in its infancy in Tasmania.

Planning SA (the Government of South Australia’s planning agency) is currently pursuing a consistent WSUD planning framework and associated guidelines and industry capacity building to ‘institutionalise’ WSUD across the Adelaide metropolitan area. The work was scheduled to be completed by the end of 2008 (Planning SA, 2008).

Western Australia is the birthplace of WSUD, going back fifteen years with the publication of a discussion paper entitled *Planning and Management Guidelines for Water Sensitive Urban (Residential) Design* (Whelans, 1993). While developments such as Ascot Waters, Beachridge, and Brookdale/Wungong situated around Perth demonstrate WSUD, the initiative has not translated into wholesale application throughout the state. The WA Planning Commission has developed the *Statement of Planning Policy 2.9 ‘Water Resources’* which requires that developers take into account WSUD principles and ensure that development is consistent with current best management and planning practices for the sustainable use of water resources, particularly stormwater. However, WSUD will only be practically achieved once the principles are translated into “local planning strategies, structure plans and town planning schemes and the day-to-day consideration of zoning, subdivision, strata subdivision and development proposals and applications, together with the actions and advice of agencies in carrying out their responsibilities” (Planning Commission WA, 2006). To date, there is little evidence to suggest WSUD has been extensively incorporated into these systems.

In the Australian Capital Territory, WSUD is promoted in the government’s draft policy – *Water ACT* (ACT, 2003) and the strategy *Think water, act water* (ACT, 2004). One of the six objectives of the strategy is to “facilitate the incorporation of water sensitive urban design principles into the urban, commercial, and industrial development”. The Planning and Land Authority of ACT has since included in its principal planning document, – the *Territory Plan* – a “general code” for WSUD, known as *Waterways* (PLA, 2008). The code sets out the stormwater management requirements for new

urban development, which are mandatory for all new residential estates, all residential development including three or more residential units and any non-residential development where the total site is greater than 5,000 m<sup>2</sup>. Biofiltration is one of the suggested best-practice techniques for achieving the mandatory requirements.

WSUD is new to the Northern Territory, with relatively little implementation to date. However, the Australian Government's Coastal Catchments Initiative is funding a project in NT that considers WSUD policy and implementation with a trial underway in a new greenfield subdivision (R. McManus, pers. comm.). The Bellamack residential subdivision in Palmerston (21 km south of Darwin) is a new suburb under development that is intended to combine the principles of affordable housing and WSUD. The project is being managed by the NT Lands Group, an arm of the NT government.

Taken together, the situation across Australia indicates that the current planning frameworks for WSUD are somewhat fragmented and need to be consistently applied and mandated at the state and territory level, particularly for those developments outside of the large residential estates (Kay *et al.*, 2004).

#### 2.2.1.1 Local Policy Leadership

At this point in time, biofiltration systems as an element of WSUD are being pursued mainly at the municipal level through the planning system. There are many examples of good practice stimulated by local councils seeking more sustainable urban development and protecting the ecological health of local waterways. Municipal Development Control Plans (DCPs) in select NSW local councils include WSUD terminology and promote WSUD solutions for new developments and redevelopments (Dahlenburg, 2005). In a number of cases, these have been guided by model planning provisions created by coalitions of local councils, such as the Lower Hunter and Central Coast Regional Environmental Management Strategy (REMS), the Southern Councils Group, the Clarence Valley Councils, and the WSUD in Sydney Region project. Following these initiatives, councils such as Newcastle City, Richmond Valley, Sutherland Shire, Ku-ring-gai, and Hunters Hill have developed DCPs that promote the implementation of WSUD<sup>2</sup>.

#### PLANNING TIP

- There is currently no consistent national planning approach for achieving WSUD. In the interim, practitioners may resort to local municipal planning instruments to implement biofiltration systems and draw from the various examples provided here.

Two Sydney councils, Kogarah Council and Parramatta City Council, have implemented “deemed-to-comply” requirements that establish WSUD objectives for development proposals. Both schemes are complementary to the NSW Government's BASIX scheme and balance WSUD and On-site Detention requirements for flood control at the lot scale.

Kogarah Council has prepared a *Water Management Policy* that stipulates generally that development proposals on land less than 3000 m<sup>2</sup> in area include stormwater treatment measures in accordance with the on-line calculator (see Kogarah Council, 2006a for specific requirements). Development proposals on sites of 3000 m<sup>2</sup> or greater shall be comprehensively assessed by the council. In either case, the council prescribes biofiltration as a solution for water quality

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<sup>2</sup> The website of the WSUD in the Sydney Region project provides the policies of these councils for download: [www.wsud.org/Exchange.htm](http://www.wsud.org/Exchange.htm)

management and provides media specifications and performance data in a practice note for development applicants (Kogarah Council, 2006b).

Modelled on the Stormwater Management Manual of the City of Portland, Oregon in the United States, the *Deemed to Comply Stormwater Management Requirements* of Parramatta City Council are separated into two parts: a simple calculator method that utilises standard drawings for construction; and submissions requirements for developments of a more complex nature that are assessed using recognised water quality modelling software, such as MUSIC (Collins *et al.*, 2008). The requirements are established under both the City's Local Environmental Plan and comprehensive Development Control Plan. The council is currently evaluating incentives for development applicants who exceed the minimum WSUD requirements.

Within Queensland, the Healthy Waterways Partnership in the south-east region has fostered the implementation of WSUD through capacity-building initiatives under the banner of "Water by Design". The majority of the eighteen local councils in the region possess local planning schemes that include provisions for WSUD (Gaskell, 2008). A subset of these councils have well-developed, in-house technical expertise to approve and advise on the inclusion of WSUD in development proposals. Within the region, proposed design objectives for urban stormwater management have been prepared and placed within the *Regional Implementation Guideline 7 for Water Sensitive Urban Design*. The objectives include criteria to address both the hydrologic and ecological impacts of stormwater runoff from urban developments.

In Victoria, the Association of Bayside Municipalities (ABM), a group of councils that fringes Port Phillip Bay, released a planning framework – *Clean Stormwater* – to incorporate WSUD in municipal planning schemes (Kay *et al.*, 2004). The framework includes a model planning policy and provisions for state and local planning schemes. An amendment to the local planning scheme by Bayside City Council incorporates the framework. However, after three years, the amendment was recently approved in a modified form by the Minister for Planning and the councils are now in the process of applying the amendments to their local planning schemes. Kingston City Council, a member of the ABM, has successfully adopted principles for treating industrial developments, which involve the structural isolation of developments that are assessed through the local planning scheme (Pfitzner, 2006; Potter & RossRakesh, 2007; Walsh & Wong, 2006). Moreover, the council has pursued WSUD for infill developments and has been successful in getting a commitment from applicants to WSUD treatments despite the lack of mandatory controls under the Victoria Planning Provisions. This has been achieved by the combined use of standard conditions and negotiations with developers (P. Jumeau, pers. comm.). The City of Port Phillip and Moreland City Council are leading a group of councils committed to the sustainability assessment of development proposals, of which WSUD is a consideration. The tools, known as STEPS and SDS for residential and non-residential developments respectively, incorporate a simplified stormwater quality assessment tool (known as STORM) that is supported by Melbourne Water<sup>3</sup>. At this stage, the sustainability assessment tools are only voluntary for developers to use. Knox City Council is in the process of developing a WSUD policy document; in the meantime, the council has issued an interim policy requiring that all new council projects and substantial rehabilitation, renewal and upgrade projects maintain pre-development stormwater runoff levels.

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<sup>3</sup> See [www.morelandsteps.com.au](http://www.morelandsteps.com.au) and <http://www.portphillip.vic.gov.au/sds.html> for details on the STEPS and SDS tools, respectively.

### 2.2.1.2 Summary of the National Policy Landscape

It is clear that the current planning frameworks do not provide consistent nor mandatory prescriptions for WSUD. Table 1 summarises the existing frameworks for each state and territory and identifies the current gaps in the planning instruments for WSUD.

### 2.2.2 The Public Domain

While biofiltration has been showcased in a number of public areas throughout Australian cities, the examples can generally be attributed to innovative public-private partnerships for design and construction. In the industry focus group convened by FAWB in February 2008, a common concern raised by the participants was that there is little guidance in the form of standard drawings, specifications, and quality assurance documentation (such as inspection and testing plans) for stormwater biofiltration.

The design documentation for biofiltration systems is evolving and, perhaps in time, suitably qualified professionals will be accredited to certify the designs and constructed elements. However, in the interim, within Chapter 4 (*Practical Implementation*) of these guidelines, relevant recommendations are provided for organisations calling tenders for design and/or construction of biofiltration schemes.

## 2.3 PERFORMANCE TARGETS FOR BIOFILTRATION

Prescribing stormwater biofiltration in both the private and public domains requires the inclusion of suitable performance targets to ensure the reliability of the design and installation of the technology and relate to the ecology of the receiving waters.

A number of states, territories, regions and municipalities stipulate performance targets for WSUD, which often include biofiltration systems. These targets should in all cases take precedence when planning for stormwater biofiltration. However, in the absence of mandated targets, the primary performance objective should be to ***maintain or restore runoff volumes and frequency to pre-development levels***, provided the standard of design for a biofiltration system is in accordance with Chapter 3 (*Technical Considerations*) of these guidelines. For example, in Melbourne, the objective approximately translates to maintaining discharges from the stormwater pollutant treatment train for the 1.5-year ARI at pre-development levels (MWC, 2008). In South-East Queensland, the 1-year ARI for pre-development and post-development peak discharges are matched in order to satisfy this requirement for maintaining the geomorphic integrity of the receiving streams.

Should the pre-development runoff objective not be achieved, then load reduction targets, such as those in Chapter 7 of *Australian Runoff Quality* (Wong, 2006b), are recommended alternatives, particularly for the protection of lentic waterways such as lakes, estuaries and bays. In South-East Queensland, guidelines have been provided to meet such targets as well as to minimise the impact of small, frequent rainfall events on aquatic ecosystems: the first 10mm of runoff from impervious surfaces up to 40% of the site and 15mm of runoff for higher levels of imperviousness shall be treated within 24 hours of the runoff event (see Appendix 2 in Gaskell, 2008). Note, however, that these are not alternatives, but are in addition to the predevelopment runoff objective. In western Sydney, the first 15 mm of runoff is required to be treated for a 24-hour to 48-hour period on development sites less than five hectares in area (UPRCT, 2004). For the ACT, 14 mm of runoff shall be retained for at least 24 hours (up to 72 hours) in order to treat the 3-month ARI event (PLA, 2008).



**Table 1. Current planning instruments addressing WSUD at the State and local scales.**

Planning Instruments	Queensland	New South Wales	Victoria	Tasmania	South Australia	Western Australia	Australian Capital Territory	Northern Territory
State planning legislation	WSUD encouraged in SEQ Regional Plan. Policy reform underway.	WSUD not prescribed in legislation. Section 117 direction requires stormwater discharge considerations in LEPs.	WSUD specified only for residential subdivisions. Initiative in motion to include WSUD in 5-star building regulations.	WSUD not prescribed in legislation. WSUD guidelines prepared under the state government's Derwent Estuary Program.	WSUD not identified in planning legislation; project currently underway to create planning framework.	Statement of Planning Policy 2.9 'Water Resources' promotes WSUD in new development but not mandatory.	General Code within the Territory Plan requires WSUD within new residential development including three units or more, commercial and industrial above 5000 m <sup>2</sup>	Policy under development with the provision of a new WSUD suburb.
Local	Various local council policies with ranging requirements (see Gaskell, 2008 for comprehensive review in SEQ).	Various Development Control Plans (see <a href="http://www.wsud.org">www.wsud.org</a> for complete list); deemed-to-comply requirements at Kogarah and Parramatta Councils.	'Clean Stormwater' local planning scheme framework (ABM); Kingston City Council planning for industrial precincts and standard conditions for medium density residential developments; STEPS and SDS sustainability planning assessment tools.	Limited policy development	Limited policy development	Limited policy development	N/A	Limited policy development

Pollutant load reduction objectives are provided in the majority of Australian states and territories, the most rigorous for private development sites being in South-East Queensland, where 80% of total suspended solids, 60% of total phosphorus, and 45% of total nitrogen on the site shall be retained by the stormwater treatment train (see Appendix 2 in Gaskell, 2008).

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