

**WSUD INFRASTRUCTURE: AN ASSET TO BE MANAGED**

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**ABSTRACT**

Water sensitive urban design (WSUD) infrastructure is the product of a design philosophy that integrates land and water planning and management into urban design. The infrastructure takes the form of water conservation, wastewater minimisation and stormwater management systems. Like all infrastructure, WSUD assets require careful implementation and ongoing management to ensure that the service provided by the infrastructure is preserved.

The primary challenge associated with WSUD infrastructure is that it represents a new infrastructure type. Although the concept of WSUD has existed in the design fields for a number of years now, it remains a relatively new concept for the construction industry which builds and establishes the infrastructure, and the asset managers and owners who are responsible for ensuring the proper operation of the systems.

The policy position across many locations in Australia means that WSUD is now, or will be in the near future, an element of all new development and infrastructure delivery. Evidence from local authorities indicates there is a wave of WSUD infrastructure making its way through the development approval and construction process. This 'WSUD Asset Wave' will soon make its way into Council, or other, ownership for operation, management and maintenance. Extensive consultation in Queensland has identified a critical need for guidance to assist with the handover and ongoing management of WSUD assets.

With so many interconnected issues associated with asset handover and ongoing management, guidance needs to be based on the actual requirements of asset owners, which are mainly local authorities). Until now the scope and content of this guidance has not been well defined. However, a comprehensive 'needs and scope' assessment was undertaken in South East Queensland in 2008/2009 to identify the:

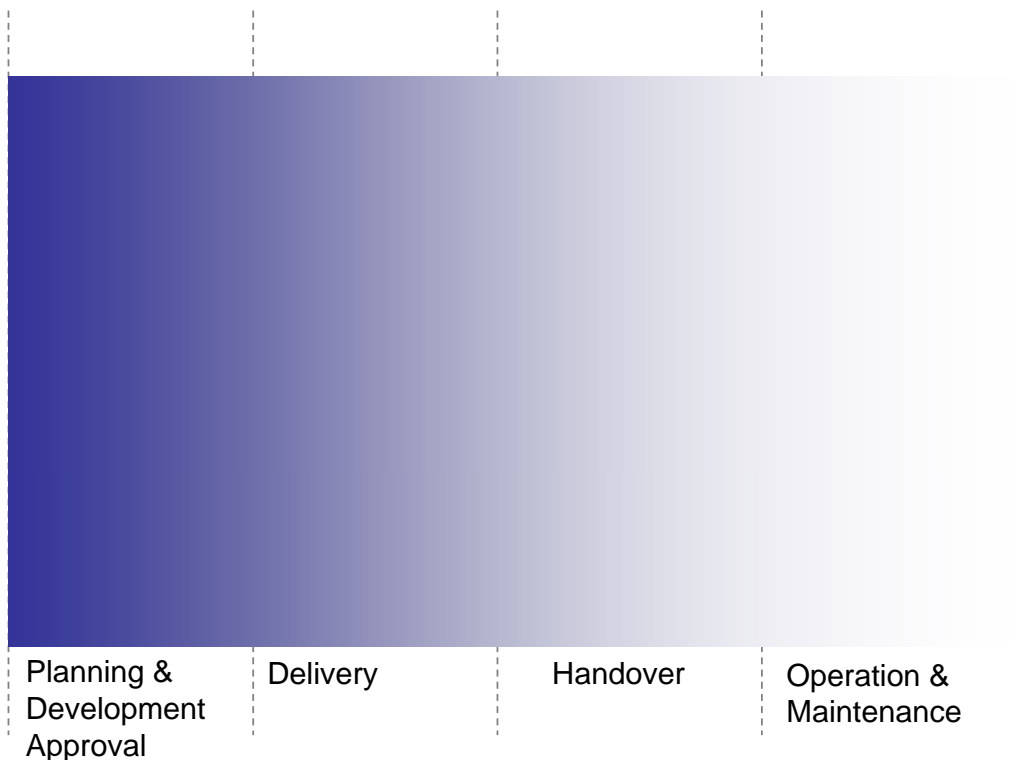
- current WSUD asset handover and management processes within local authorities
- issues and concerns with the current process
- guidelines and tools that are needed to improve handover and management processes.

The findings of the assessment have been used to establish a project plan to deliver a comprehensive range of guidelines and tools over 2 years that will assist and guide the management of WSUD assets from handover to ongoing maintenance. The paper will present the findings of the comprehensive needs and scope assessment, and the scope and application of the guidelines and tools. This project is unique across Australia for the comprehensiveness of the guidance that will be developed and the work undertaken with councils to scope it.

**BACKGROUND**

Water sensitive urban design (WSUD) infrastructure is the product of a design philosophy that integrates land and water planning and management into urban design. The infrastructure takes the form of water conservation, wastewater minimisation and stormwater management systems.

The policy position in across many locations in Australia means that WSUD is now, or will be in the near future, an element of all new development and infrastructure delivery. Evidence from local authorities in South East Queensland (SEQ) indicates there is a wave of WSUD infrastructure making its way through the development approval and construction process. As illustrated in Figure 1, this 'WSUD Asset Wave' will soon make its way into local authority, or other, ownership for operation, management and maintenance.



**Figure 1 The WSUD Asset Wave**

Like all infrastructure, WSUD assets require careful implementation and ongoing management to ensure the service provided by the infrastructure is preserved. Long-term function of WSUD assets requires:

- design that accommodates ease of maintenance
- ensuring that the asset is constructed, established and handed over in the correct form
- adequate data capture at handover stage
- ensuring that the digital asset data is managed properly
- understanding the ownership and maintenance responsibility
- understanding the level of service associated with the asset
- monitoring the condition of the asset
- undertaking appropriate maintenance with appropriately skilled people
- understanding life-cycle costs and ensuring that there is adequate funding for ongoing maintenance
- effective processes for asset management.

The primary challenge associated with WSUD infrastructure is that it represents a new infrastructure type. Although the concept of WSUD has existed in the design fields for a number of years now, it remains a relatively new concept for both the construction industry, which is building and establishing

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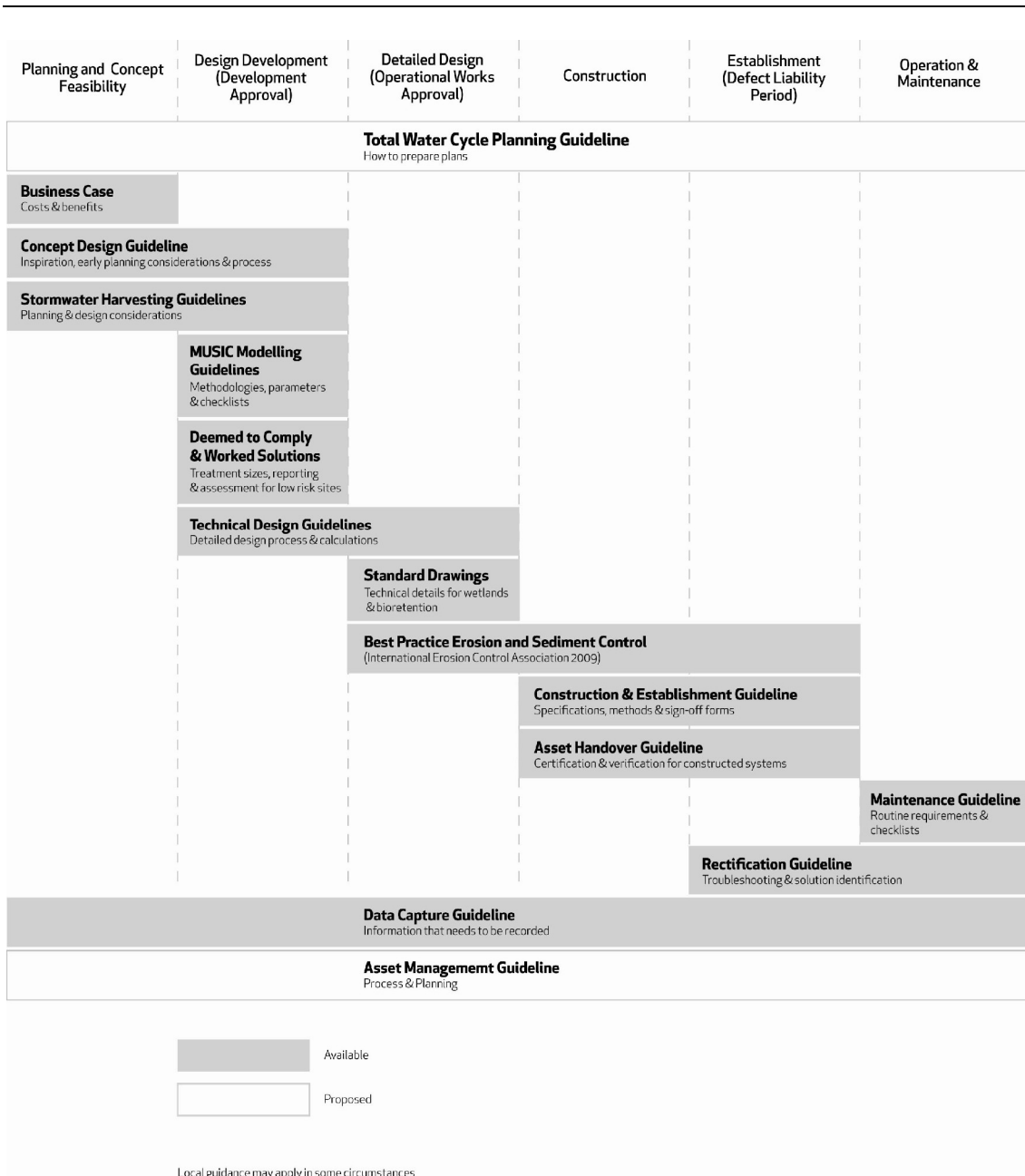
the infrastructure, and local governments, who generally will take ownership of the devices and be responsible for ensuring proper operation of the systems.

Within these sectors numerous stakeholders are involved, which adds to the challenge. Within private industry, there are developers, consultants, contractors, building managers and body corporates. Within local governments, there are development approval, compliance and enforcement, GIS and data management, stormwater policy, asset managers, engineering services, parks and gardens, ecologists, water experts, contractors and the financial planners/accounts.

Water by Design, a program of the SEQ Healthy Waterways Partnership, has initiated a number of tasks in response to the need for guidance on how to manage WSUD assets. The first task was the development of the *Construction and Establishment Guidelines for Swales, Bioretention Systems and Wetlands*. The guidelines provide sufficient resources to facilitate the successful delivery of vegetated stormwater management systems including specifications, construction considerations, construction and establishment procedures, and certification and compliance requirements.

The second task is development of resources to assist local government and the private industry with asset handover, management and maintenance of WSUD infrastructure. They are to include a menu of guidance, options and tools that asset managers can select, adopt and implement. The resources are intended to form the basis of the asset handover and management process in SEQ and will become part of the Water by Design suite of guidelines and tools (Figure 2).

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**Figure 2: Outline of the suite of Water by Design guidelines and resources**

**NEEDS AND SCOPE ASSESSMENT**

With many interconnected issues and disciplines associated with asset handover and ongoing management, it is important that the resources are not only comprehensive, relevant and useable, but that they are based on the specific requirements of stakeholders in SEQ. Until now the scope and content of this guidance has not been well defined. However, a comprehensive 'needs and scope' assessment was undertaken in South East Queensland in 2008/2009 to identify the:

- current WSUD asset handover and management processes within local authorities
- issues and concerns with the current process

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- guidelines and tools that are needed to improve handover and management processes.

The assessment involved a focused review of literature and policy and a series of workshops with five SEQ councils and other key stakeholders. The councils workshops were held with are:

- Redlands City Council
- Ipswich City Council
- Gold Coast City
- Sunshine Coast Regional Council
- Brisbane City Council

Meetings were also held with the Institute of Public Works Engineering Australia (Queensland Division), Queensland Water Directorate and the team developing As Designed & As Constructed (ADAC). The intention of these meetings was to ensure these stakeholder needs were identified as part of the project and to identify synergies with other asset management initiatives such as the National Asset Management Strategy, Australian Infrastructure Financial Management Guidelines and ADAC.

### **ISSUES AND NEEDS**

The range of issues and needs raised by stakeholders were categorised into the following areas: asset handover; data capture; asset management; funding and maintenance. A summary of the key issues and needs for each category follows.

#### **Asset handover**

An example of a typical handover process (from the Gold Coast City Council) is shown in Figure 2. Evidently, the handover process is complex. An effective asset handover process requires the cooperation of a range of both external stakeholders and internal departments within Councils. The handover process is influenced by a number of factors including:

- type of asset
- who constructed the asset
- who owns the asset (i.e. Council, State Government or privately owned)
- capacity of asset owner (resources, knowledge etc.).

A selection of key issues that were raised in the workshops include:

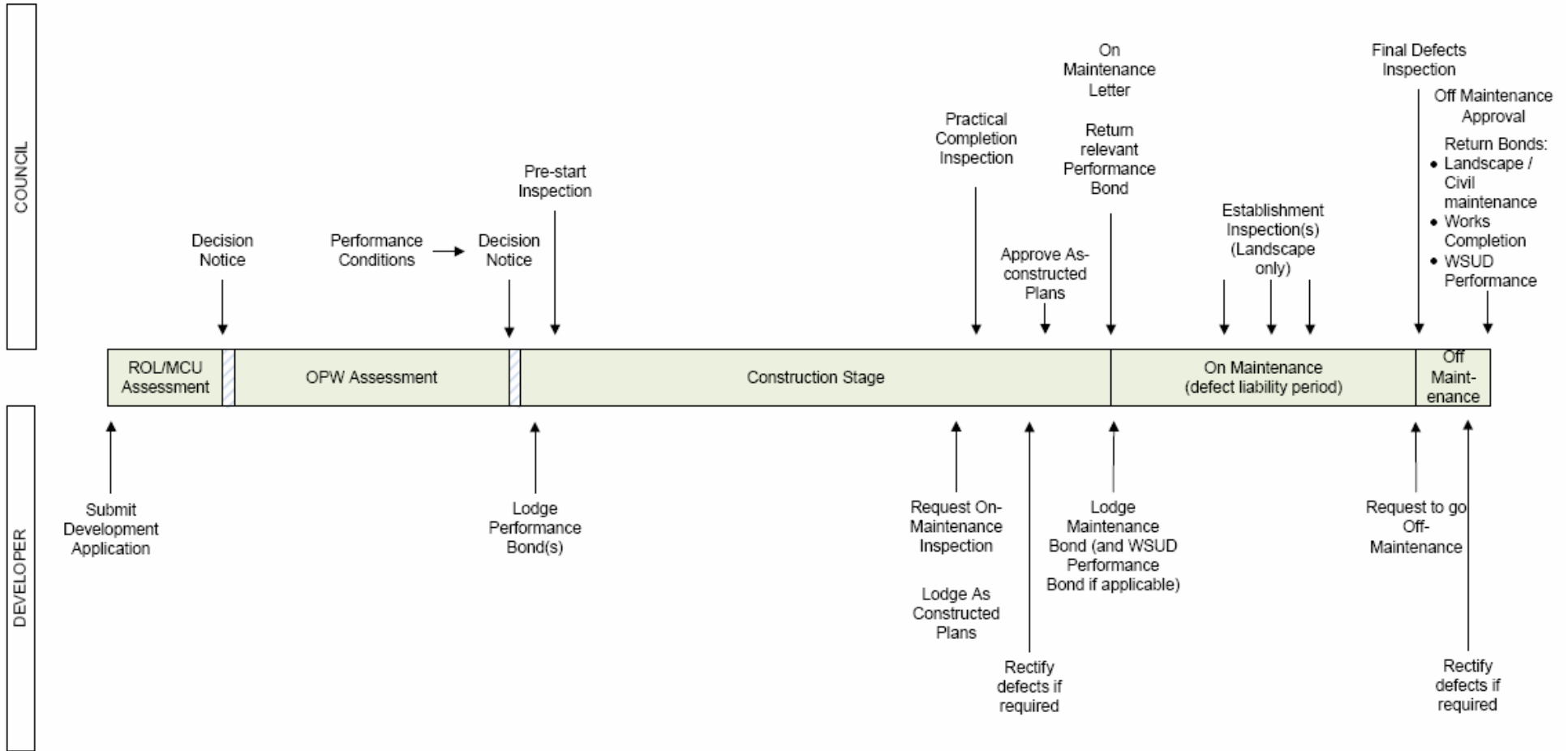
- Compliance: e.g. WSUD systems have been handed over to council that are either failing, require intensive maintenance or have fundamental design flaws such as inadequate or non-existent maintenance access.
- Civil versus landscape: e.g. the operational works approval process for new civil and landscape assets associated with developments occurs separately in many Councils, involves separate consultants, involves different approving officers within Council and is subject to different conditions of approval (i.e. segregated approval).
- Plan Sealing: e.g. Councils indicate guidance is required on the minimum construction, as-constructed and sign-off requirements required for Plan Sealing.
- Bonding: e.g. the lack of suitable costing information for WSUD infrastructure is leading to either under-estimating the bond value (and exposing Council to higher risk of having to pay the asset out of its own fund if the developer leaves) or over-estimating the bond value (to be conservative to manage Councils risk).

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- On and off maintenance: e.g. along with Plan Sealing, the on- and off-maintenance stages are the best time to ensure the quality of the WSUD asset is delivered. Councils consider on-maintenance as the last chance for requesting major change or rectification.
- WSUD in private property: the quality of current WSUD assets in private land is generally poor and in some cases it is not being constructed at all (even though it is required as part of the development application).

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**Figure 3 Typical Contributed Asset Handover Timeline (amended from Gold Coast City Council)**

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### **Data Capture**

Effective asset management relies on having an information system which contains the following data as a minimum:

- Physical characteristics of the asset (e.g. type, size, location)
- Construction and maintenance history
- Current condition and future maintenance/renewal requirements
- Financial information

A selection of issues identified in the consultation regarding data capture and management include:

- Quality and quantity of data: e.g. there is currently a poor understanding of what data needs to be captured and recorded during asset handover throughout all councils and departments. There is currently no standardised format for capturing WSUD assets.
- 'Green' data capture: e.g. these assets have generally not been included in GIS and asset management databases because they cannot be capitalised according to Australian accounting standards.
- Timing of data handover: e.g. all Council's agreed the earlier the WSUD data is captured the better. However, most Council do not start collecting data until just prior to Off Maintenance (if at all).

### **Asset management**

The goal of infrastructure asset management is to meet the required level of service, in the most cost effective manner, through the management of asset for present and future customers. Consultation identified that managing WSUD infrastructure must consider the existing asset management systems in place or under development. Creating a specialised asset management system for WSUD is not considered a realistic solution.

A selection of issues that were raised in the workshops include:

- Asset ownership: e.g. it is not clear which department owns the WSUD assets and therefore which department has the ultimate responsibility to manage them.
- Levels of service: e.g. there is a need to better understand WSUD levels of service and whether there should be differing levels of service that people would be willing to pay for.
- Monitoring: e.g. condition assessment and monitoring of WSUD assets has typically focussed on completing monthly water quality samples. Current thinking is that this type of monitoring does provide useful data and it is no longer recommended.
- Capacity: e.g. there is a lack of understanding of WSUD systems across all Council departments, particularly within park departments. It was suggested that active engagement with these groups is required to ensure bad policy is avoided (i.e. poor development approval conditions) and a better understanding of WSUD is achieved by asset owners

### **Funding**

Financial planning and funding is a fundamental part of asset management. In terms of WSUD infrastructure:

- the value of asset is required for bonding
- the landscape establishment costs are required for bonding/developer contributions and rectification works



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- the value of the asset is required at handover for incorporation into the Councils accounts (i.e. depreciation of assets etc.)
- the expected asset maintenance costs underpin funding applications and maintenance resource planning
- the value of the asset and its function assist owners make decisions around the priority of the asset in terms of management.

The consultation found that the main issue associated with funding was a serious shortage of funds to undertake on-going management activities such as maintenance. Currently no formal financial planning occurs for WSUD assets in any Council, other than Gold Coast City Council where a WSUD budget was recently established. Any management of WSUD is currently occurring through existing engineering or parks budgets. As a result, maintenance is usually not undertaken unless there is a critical issue that has gained public attention.

Generally funding is not becoming available for WSUD assets because:

- there is a poor understanding of lifecycle costs
- the number of assets owned is not known
- high level decision makers in Councils and politicians may not always appreciate the importance of WSUD
- current standard accounting systems do not provide for WSUD and green assets properly.

### **Maintenance**

The long term sustainability of WSUD infrastructure is directly related to its maintenance regime. A well maintained WSUD asset will operate more closely to design specification than a poorly maintained asset (DECC, 2008, draft). WSUD assets, if designed and constructed in accordance with best practice, require minimal maintenance (equivalent to conventional landscape or garden maintenance). Poorly designed and constructed systems are a usually a maintenance burden. However, well designed and constructed a WSUD assets can also become a maintenance burden if suitable ongoing maintenance is not provided from the start.

A selection of issues that were raised in the workshops relating to maintenance include:

- WSUD on private property: e.g. there is concern that within five or ten years many of these systems could be failing as they are not being adequately maintained
- Link to Policy and DA/Compliance: e.g. the need for improved communication between Council departments to ensure maintenance needs are considered in development approval and Council planning.
- Maintenance Plans: e.g. plans submitted are generally not useful as they are either cut and paste from inappropriate documents, are too long or lack practical information.
- Designing for maintenance: e.g. often systems are built with inadequate access, or access that requires specific equipment
- Resources and Equipment: e.g. the design and construction of systems has required special maintenance equipment in some cases resulting in maintenance needing to be contracted out.
- Training: e.g. currently there is a lack of staff and teams with the requisite skills to understand the full extent of the maintenance requirements of WSUD systems.
- Plant knowledge: e.g. there is a lack of specific horticultural knowledge on WSUD system plants
- Level of service: e.g. system performance and level of service need defining. No one had a good understanding as to what the indicators are that a system is failing

## **MOVING FORWARD**

The findings of the Needs and Scope assessment have been used to establish a project plan, issued in 2009, that sets out a comprehensive range of prioritised guidelines and tools that respond to the stakeholder needs and requests. These resources are intended to assist and guide the management of WSUD assets from handover to ongoing maintenance.

The range of projects and their purpose are listed below. Water by Design is in the process of delivering a range of these guidelines and tools at the time of writing this paper with funding being sought for the remainder of the projects.

1. Technical Design Guideline Update – Design for Maintenance (to be undertaken as part of the guideline update): Identify maintenance issues that must be considered when designing WSUD systems and incorporate into the WSUD Technical Design Guideline. The guideline is being updated at the moment for release in early 2011.

2. Policy Framework and Action Plan: Identify a head of power to improve management and maintenance of WSUD assets, and identify actions to implement.

3. Asset Handover Guideline: Provide a guideline that facilitates successful compliance and asset handover processes for WSUD infrastructure. This guideline is being finalised at the moment for release in late 2010.

4. Data Capture Guideline, including ADAC: Provide comprehensive WSUD Asset Data Capture Guideline to ensure a minimum level of data on WSUD assets is recorded within asset management systems. This guideline is being finalised at the moment for release in late 2010 or early 2011.

5. Maintenance Guideline: Provide a maintenance guideline that can:

- be easily used by asset maintenance teams to plan and undertake routine maintenance of public and private WSUD assets
- standardise maintenance requirements so Councils do not need to request maintenance plans as part of development applications and more standardised approaches to equipment and resources can be adopted.

This guideline is being finalised at the moment for release in late 2010.

6. Rectification Guideline: Create a WSUD rectification guideline that:

- describes processes to identify the cause of problems and define rectification options
- identifies typical problems and rectification options (i.e. case study examples)
- identifies 'basket case' WSUD infrastructure (i.e. WSUD elements which are so poorly designed and constructed that they can never be cost effectively rectified to a functional state) and provide option for what should occur with this infrastructure.

This guideline is being finalised at the moment for release in late 2010.

7. Support development of a lifecycle cost tool: Ensure the WSUD lifecycle cost tool or database that is developed by the WSUD in Sydney program meets SEQ stakeholder requirements, and in doing so, assists asset owners and maintenance teams define suitable maintenance budgets for WSUD systems.

8. Funding sources guidance: Provide guidance on potential funding sources.

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9. Business case for maintenance: Assist asset owners and maintenance departments lobby for WSUD maintenance funding by illustrating the risk of not completing maintenance and demonstrating that there is an overall net benefit of undertaking regular or scheduled maintenance of WSUD assets.

10. Linkages with community groups: Assist councils establish agreements with community groups to assist in the establishment and maintenance of WSUD Assets, and increase the capacity of community groups to undertake this.

11. Training: Develop a training course for asset handover, asset management and maintaining WSUD systems.

12. Support and Document Internal Council Process: Provide guidance on how to resolve internal council processes in order to facilitate successful WSUD implementation.

13. Asset Management Guideline: Provide a guideline to support Council and private entities manage WSUD infrastructure.

For further information the full report *Asset Management Resources for Water Sensitive Urban Design: Outcomes of a Needs and Scope Assessment* (Water by Design, 2009) is available from Water by Design on request.

## **CONCLUSION**

The policy position across many locations in Australia means that WSUD is now, or will be in the near future, an element of all new development and infrastructure delivery. Evidence from local authorities indicates there is a wave of WSUD infrastructure making its way through the development approval and construction process. This 'WSUD Asset Wave' will soon make its way into Council, or other, ownership for operation, management and maintenance.

The primary challenge associated with WSUD infrastructure is that it represents a new infrastructure type. The traditional approaches to asset management have not been terribly successful when applied WSUD assets. There are many stakeholders involved in the management of WSUD assets and therefore there are many opinions on how best to manage these assets. These stakeholders have been hungry of guidance and information to assist with managing WSUD assets. Until now the scope and content of this guidance has not been well defined. However, a comprehensive 'needs and scope' assessment was undertaken in South East Queensland in 2008/2009 to identify the:

- current WSUD asset handover and management processes within local authorities
- issues and concerns with the current process
- guidelines and tools that are needed to improve handover and management processes.

The findings of the assessment have been used to establish a project plan to deliver a comprehensive range of guidelines and tools over 2 years that will assist and guide the management of WSUD assets from handover to ongoing maintenance.

It is opinion of the authors of this paper that the findings of the 'needs and scope' assessment is transferrable across Australia. Our experience in other regions indicates the issues and needs are basically the same irrespective of location.

Additionally, the guidelines and tools being developed at the moment (Maintenance Guideline, Rectification Guideline and Asset Handover Guideline) have all been written to allow adoption

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anywhere in Australia. It is recommended these documents are considered and adopted by State Governments and Local Authorities throughout Australia to deliver and manage WSUD assets.