Working with Councils to Achieve Best Practice Stormwater Management in the Sydney Catchment Area

Shireen Baguley

Molino Stewart, SBaguley@molinostewart.com.au
Kristy Good

WaterNSW

Abstract

Best practice management for stormwater management is the adoption of Integrated Water Cycle Management and for the treatment of urban stormwater, Water Sensitive Urban Design. Councils are land managers and regulators across the Sydney catchment area and, in this capacity, have the ability to significantly impact the rate, quantity and quality of stormwater run-off into local waterways.

WaterNSW (formerly the Sydney Catchment Authority) can influence better stormwater management through legislation and through partnership programs. Through these tools WaterNSW works in partnership with councils to reduce the risks to water quality, public health and the environment from stormwater.

To help inform the development of these programs, WaterNSW worked with Molino Stewart and catchment councils on an Evaluation of Stormwater Management Practices in the Sydney Drinking Water Catchment. This study looked at council practices in the key management areas (KMA) of community education, council commitment, awareness and training, catchment planning, stormwater treatment, new development and operations and maintenance. The evaluation identified a number of recommendations that would help councils move towards the implementation of better management practices.

After consulting with councils on the findings and recommendations, tailored action plans were developed for each council. These Action Plans outline how WaterNSW and council would work together to adopt a more holistic approach to water management and integrate water sensitive urban design into council processes and policies. Implementing the initiatives in the plans in turn will help to improve water quality at its source within the catchment.

Introduction

WaterNSW was formed on 1 January 2015 following a merger between State Water and the Sydney Catchment Authority (SCA). This new organisation makes WaterNSW Australia's biggest water supplier and the major supplier of raw water in NSW. Sydney Water is WaterNSW's biggest customer providing clean drinking water to over 4.5 million customers. WaterNSW also provides raw water to a number of smaller rural and regional councils including Shoalhaven, Wingecarribee and Goulburn Mulwaree to meet their potable water demand. In total, WaterNSW supplies drinking water to approximately 60% of NSW's population.

WaterNSW operates under the *Water NSW Act 2014* (the Act) and the area of operations includes all of New South Wales. The Act also defines a 'declared catchment area' and the Governor may declare an area of land to be, or part of, a declared catchment area. The only declared catchment area currently gazetted under the *Water NSW Act* is the Sydney catchment area. This area is the same as what was previously known as the Sydney Drinking Water Catchment under the *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* "the SEPP".

One of the principal objectives of the Act is to ensure that declared catchment areas and water management works in such areas are managed and protected to promote water quality, public health

and safety and the environment. To help protect drinking water quality, WaterNSW has adopted the Australian Drinking Water Guidelines (ADWG) (National Health and Medical Research Council, 2011). These guidelines promote risk management and the use of the multi-barrier approach as the most effective means of protecting drinking water. The guidelines advocate that no single barrier is effective for removing all sources of contamination and preventative measures should be applied as close as possible to a source of contamination rather than relying solely on downstream treatments. This multi barrier approach or, catchment to tap risk assessment, adopted by WaterNSW and its customers is documented in WaterNSW's Water Quality Management Framework 2012-2017 (SCA [1], 2012).

The Healthy Catchment Strategy 2012-16 (HCS) outlines the preventative measures WaterNSW takes in the catchment to protect water quality. The HCS actions are grouped into seven initiatives and are outlined below.

Supporting Initiatives

- Through **Maintaining a catchment science and evidence base** science underpins WaterNSW decisions about prioritising, designing and evaluating catchment management actions.
- Through **Active communities** WaterNSW aims to improve the community's understanding and active participation in activities to reduce the risks to water quality and quantity in the catchment.

Operationalising Initiatives

- Through **Setting the example** WaterNSW aims to set the example by managing Special Areas and WaterNSW lands to reduce the risks to water quality, ecological integrity and cultural heritage. The focus of these activities is on land that WaterNSW owns and has control of.
- Through **Ensuring legislation protects our catchment** WaterNSW utilises legislation and enforcement to reduce the incidence of behaviours in the catchment that pose a risk to water quality or threaten the special areas. The focus of these activities is on a targeted inspection program and Special Area Enforcement.
- Through **Maintaining sustainable catchments** WaterNSW utilises legislation to ensure future development and activities in the catchment has a neutral or beneficial effect on water quality.
- Through **Targeting high risk pollution** WaterNSW aims to reduce the risks to water quality from activities related to rural lands and sewage and stormwater. These programs focus on working in partnership with local government and communities to influence activities on lands whereby WaterNSW has no direct influence.
- Through **Managing merging catchment issues** Water NSW aims to have a comprehensive understanding of and have the capacity to respond to major emerging environmental, social and economic issues in the catchment that could present a risk to water quality. Currently mining is at the forefront of this initiative.

In the declared catchment, 54% of land is privately owned with close to 250,000sq/m of impervious surfaces (Naylor, 2015). All development and urban land use within the catchment can impact on the rate, quantity, quality and timing of flows of stormwater runoff into local waterways and ultimately into WaterNSW's reservoirs. As the majority of the catchment is in private ownership, it is important to work with local government and communities to influence better land and stormwater management practices. There are eight councils that have large areas of their LGA within the declared catchment.

The two initiatives whereby WaterNSW has an opportunity to work with these catchment councils to minimise the risks to water quality from urban areas and stormwater are through 'Ensuring legislation protects our catchment' and 'Targeting high risk pollution sources'.

Development and activities in the catchment are not sustainable

In the declared catchment, under the SEPP, consent authorities (i.e. local government) are not to grant consent to the carrying out of Part 4 development of the *Environmental Planning and Assessment Act, 1979* unless they are satisfied that the carrying out of the proposed development would have a neutral or beneficial effect (NorBE) on water quality. The consideration of NorBE also extends to applications for development under Part 5 of the Act (SCA [3], 2015).

Targeting high risk pollution sources

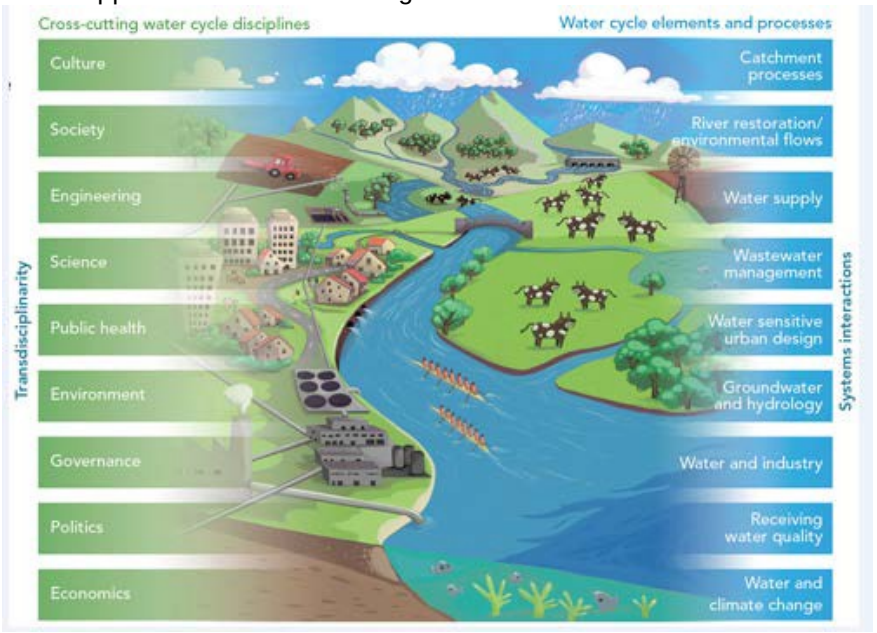
To help identify risks to water quality in the catchment and to inform catchment protection works, WaterNSW has developed the Pollution Source Assessment Tool (PSAT). The PSAT is a spatial decision support system that incorporates the best available science, spatial data, modelling, expert knowledge and best management practices to assess the potential risk of pollution sources across the catchment (SCA [4], 2015). In 2012 the PSAT identified that stormwater posed the fifth most significant risk to water quality and in 2015 after revising the model, urban land uses including stormwater posed the fourth most significant risk to water quality in the declared catchment. WaterNSW develops and implements targeted programs to address the risks to water quality as identified from PSAT.

To help minimise the risk to water quality from urban land uses including stormwater it is important that WaterNSW work with catchment councils to implement best practice stormwater management.

Best practice stormwater management

Throughout history, best practice urban stormwater management has changed considerably and has been largely influenced by changing socio-political climates (Brown et al, 2009). Traditionally stormwater systems were designed to remove stormwater as quickly as possible from urban areas to protect people and property from flooding. This thinking in urban stormwater management resulted in the removal of natural waterways and the construction of highly connected, concrete drainage channels across our cities. By the mid 1980's urban waterways had become severely degraded resulting in significant pressure from community groups calling for action to remedy the situation. The 1990s saw the first significant response by government to implement programs to improve the condition of local waterways and the early 2000s saw the partial implementation of water sensitive urban design (WSUD) as a means of minimising urban impacts on local waterways (Sargent, 2015).

Contemporary best practice stormwater management is the adoption of an integrated approach to water cycle management. The development of a holistic approach to water management is essential to achieving what many practitioners refer to as a 'water sensitive city' (Brown et al, 2009). The main focus of integrated water cycle management (IWCM) and total catchment planning is to utilise all components of the water cycle, including stormwater, and regard them as a resource rather than a waste or an externality. This approach involves bringing together all disciplines that can influence the water cycle and plan urban centres in such a way that the impact on the environment and communities is minimised. The mechanism to reduce the impact of urban stormwater runoff on local waterways is through the adoption and implementation of WSUD. The concept of WSUD within an IWCM approach is illustrated in Figure 1.



Sources: International Water Centre (2015)

Figure 1 Integrated Water Cycle Management

Water by Design is a capacity building program that supports the uptake of WSUD in South East Queensland. WaterNSW has adopted a number of the guidelines published by Water by Design as Current Recommended Practices for use by developers in the declared catchment (SCA [5], 2015). This organisation defines WSUD as an approach to the planning and design of urban environments that support healthy ecosystems, lifestyles and livelihoods through smart management of all our waters. Some of the specific WSUD objectives promoted by Water by Design include (Water by Design, 2015);

- Minimise impacts on existing natural features and ecological processes,
- Minimise impacts on natural hydrologic behaviour of catchments,
- Protect water quality of surface and ground waters,
- Minimise demand on the reticulated water supply system,
- Improve the quality of and minimise polluted water discharges to the natural environment,
- Incorporate collection treatment and/or reuse of runoff, including roof water and other stormwater,
- Reduce run-off and peak flows from urban development,
- Re-use treated effluent and minimise wastewater generation,
- Increase social amenity in urban areas through multi-purpose greenspace, landscaping and integrating water into the landscape to enhance visual, social, cultural and ecological values,
- Add value while minimising development costs (e.g. drainage infrastructure costs),
- Account for the nexus between water use and wider social and resource issues, and
- Harmonise water cycle practices across and within the institutions responsible for waterway health, flood management, pollution prevention and protection of social amenity.

The push for the adoption and implementation of WSUD has been evolving over the last fifteen years and has been embraced by both government and industry. There is often the perception however that the implementation of IWCM and WSUD, as a means of achieving holistic and effective water resource management, is reserved for large urban centres. This is not the case. There are many examples of rural and regional councils that have adopted an integrated approach to water management and have successfully implemented WSUD into their urban centres including Orange City Council, Bathurst Regional Council and Mildura Rural City Council.

In many ways, local government in rural and regional areas has a greater opportunity to adopt an integrated approach compared to their city counterparts. In most regional areas, local governments are responsible for the provision of water and sewerage services to the community as well as stormwater. While institutional barriers are often regarded as an impediment to the adoption of IWCM, the responsibilities of these three services in many rural areas often fall within the one organisation. In larger urban centres however, water and sewerage services are often provided by large utilities and stormwater is managed by local government. The divide between different organisations is often harder to overcome than trying to address institutional barriers within the one organisation.

In addition, local governments in regional areas often have greater ability to ensure new growth areas are planned to allow for adequate space for stormwater detention and treatment. These new growth areas provide a ‘clean slate’ with significant opportunities to integrate urban planning with water systems planning to enhance project outcomes. More often than not regional areas also have a greater land area to retrofit integrated and water sensitive solutions into developments in a more cost effective manner than larger urban centres.

It is recognised however that while there are many opportunities for rural and regional areas, the lower populations and lower rate base effectively means that these councils have less financial resources for the implementation of IWCM and WSUD initiatives. To overcome this impediment local governments in regional areas rely on grant funding provided by state and government programs. In many cases however regional councils simply do not have the funds to be able to meet grant criteria. Local governments are under increasing pressure to manage population growth within their cities in a manner that is sustainable. Adopting an integrated approach to water management, including stormwater, has been cited as one of the most influential factors shaping urban centres and the standard of living now and into the future. In order to create sustainable, liveable and resilient cities, government, industry and the community must partner and work together to manage and protect

water resources and natural assets. IWCM and WSUD is a tool to achieve these water sensitive cities of the future that our communities desire.

While local governments are in the best position to influence, shape and create water sensitive cities there are a number of conditions at play within council that will determine their ability to do so. One of the key elements at the core of IWCM is the importance that councils put on stormwater management and its integration into council planning, policies and processes.

How do councils influence better stormwater management practices and move towards the adoption of IWCM and WSUD

Under the *Local Government Act 1993*, councils are given the ability to provide goods, services and facilities to carry out activities to meet the current and future needs of local communities and the wider public. They also have a role to play in the management, improvement and development of resources within their LGAs. The Act also requires councils to have regard to the principles of ecologically sustainable development in carrying out their responsibilities.

Councils are significant land managers within the declared catchment and the management of stormwater is an important part of a council's function. As either the manager or the regulator, catchment councils have significant capacity to influence the water quality discharged into local waterways. There are four broad areas where local government can influence better stormwater management practices. These are in the broad areas of planning, operation and maintenance, community education and meeting community expectations.

Planning

Local governments have the ability to minimise the impacts of urbanisation from stormwater by suitable land use planning. Planners can help to protect urban waterways by ensuring that land is capable of sustaining urban development (CSIRO, 2006). To assist councils in the declared catchment, the former SCA developed strategic land and water capability assessments (SLWCA) to help guide planning and zoning throughout the catchment. Through this planning role councils also have the capacity to ensure that there is sufficient area for stormwater detention and treatment for new development.

Through local planning instruments, councils have the ability to ensure that the effect of urban development and drainage infrastructure is designed to minimise impacts on local waterways. This function is reinforced through the Drinking Water Catchment SEPP. Under the SEPP, consent authorities (local government) are not to grant consent to Part 4 development of the *Environmental Planning and Assessment Act, 1979* unless they are satisfied that the carrying out of the proposed development would have a neutral or beneficial effect (NorBE) on water quality. The consideration of NorBE also extends to applications for development under Part 5 of the EPAA.

A neutral or beneficial effect on water quality is satisfied if the development:

(a) has no identifiable potential impact on water quality, or
(b) will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or
(c) will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority (SCA, 2015).

The most widely recognised way for a development to achieve NorBE for the water cycle management component of a development is through the implementation of WSUD.

Operation and Maintenance

Notwithstanding the need for new development and activities to meet NorBE, the ongoing operation and maintenance of these WSUD assets is critical for the long term ability to meet the actual objectives of NorBE and WSUD. Anecdotal evidence indicates that councils currently have limited capacity in terms of resources, budget and knowledge to acquire these WSUD assets from developers and ensure their effective ongoing operation and maintenance.

Local governments are also responsible for management of various parts of the urban environment that discharge into the stormwater system. These include roads, reserves and car parks. Adopting best practice management in regard to the operation and maintenance of these assets is an essential element for improved stormwater quality across the catchment (CSIRO, 2006).

Community Education

Urban development affects stormwater quality both during the construction and operation period. During the construction period, ground cover is often removed and soil exposed resulting in the potential for significant sediment and pollutant runoff to local waterways. During the operational period of a development the land use practices of landowners can significantly influence the quality and quantity of stormwater runoff. Councils are in the best position to put in place behaviour change and capacity building programs for local communities and council staff to be aware of and improve the practices on lands in their ownership.

Community Expectations

There are also many community expectations that need to be managed by council. There have been a number of studies conducted to identify what people want from their cities. Regardless of people's background or where they live there are some common elements of what is considered desirable in a city. People want their urban environments to support their preferred lifestyle, their well-being and their quality of life. Fundamental to this concept of liveability is the security of a clean and abundant water supply. Communities also seek the social cohesion that is brought about by a city that is green, healthy and clean and the recreational opportunities that these cities provide (Wong, 2015).

Communities expect that local governments contribute to sustainable cities. A sustainable city is one that has the capacity to provide clean water, food and also has the ability to assimilate pollutants that are discharged within its confines. There is also an expectation from communities that their councils provide resilient cities. Resilient cities are those that have the capacity to absorb extremities of climate change such as drought and flood and also have the capacity to recover when impacted (Wong, 2015). Water management is fundamental to the concepts of liveability, sustainability and resilience and is integral to our urban and regional prosperity, for job generation and for the basic necessities of life. Local governments that adopt an integrated approach to water management are likely to see fewer negative impacts on water resources and an increased ability to meet the needs of its communities (Khouri, 2006),

In NSW, local governments are required to administer over 120 pieces of legislation (IPART, 2014). This places enormous pressure on local government particularly those in rural and regional areas that have a small ratepayer base to achieve all of its functions and objectives. Contemporary best practice stormwater management is the adoption of IWCM and, with respect to stormwater, the implementation of WSUD principles. WaterNSW has a vested interest in local government adopting this management regime because of the improved water quality outcomes that can be achieved at source within the drinking water catchment. In turn, local government have a vested interest to adopt this management approach as a means of achieving liveable, resilient and sustainable cities. It makes sense that local government and WaterNSW work together to help achieve and facilitate the uptake of IWCM and WSUD to achieve common goals of each organisation.

What are Council's stormwater management practices and what needs to be addressed to reach best practice?

There are a number of factors, internal and external, that influence a council's ability to adopt and successfully implement an integrated approach to water cycle management and WSUD. An evaluation and benchmarking exercise was initiated by WaterNSW as a mechanism to examine council's stormwater management practices as well as strengths and weaknesses. The findings and recommendations of this evaluation are documented in the "Evaluation of Councils Sewage and Stormwater Management Practices" (Molino Stewart, 2014) and have been used to inform the development of partnership programs.

The assessment offered WaterNSW and the eight participating councils numerous beneficial outcomes including:

- Evaluating each council's current practices,
- Identifying priority areas for improvement,
- Formulating recommendations for use as the basis of tailored, practical action plans to improve performance and to inform future program initiatives,
- Enabling a council to understand its current stormwater management status and to measure its performance, both over time and against other councils within the catchment group,
- Providing data to enhance WaterNSW's understanding of the status of stormwater management in the catchment and
- Helping to achieve the objective of WaterNSW's HCS initiative to reduce risks to water quality from stormwater.

Key Management Areas

The basis of the benchmarking assessment was set by identifying the key management areas (KMAs) relevant for holistic stormwater management and the foundations for the adoption of WSUD within council operations. These KMAs were grouped into the four areas of council's influence and set a framework against which each council was assessed including;

Planning

a) ***Pollution and Prevention: council commitment***: evaluated the extent to which council and its senior management demonstrated that water quality management matters and how effectively this attitude is communicated and results are achieved. It considered the strategic framework within which the council operated and provided support through plans, policies and resourcing, both short and long term.

b) ***Catchment planning:*** considered the understanding and analysis that had been undertaken by a council with regards to hydrological processes and pollution transportation.

c) **New Development:** considered how a council managed stormwater management measures at the planning and approvals phase. The development control framework was assessed to determine if it included specific requirements and targets for new development in accordance with the current recommended practices (CRPs) and NorBE.

d) **Stormwater treatment:** assessed how proactive a council was in implementing a program of stormwater treatment measures across the urbanised catchment areas.

Operations and Maintenance

e) **Operations and Maintenance (O&M):** ranged from considering how site specific treatment measures were implemented, if an asset register was maintained, if current O&M plans were being implemented, resource allocation and the sustainability of a councils stormwater treatment measures.

Community Education

f) **Awareness and training:** awareness and training focused on the expertise of the council staff operating and managing stormwater assets within council. It considered the skills and expertise of staff and if they felt they had sound, up-to-date knowledge within the field.

g) **Pollution and Prevention: community education:** explored the resources allocated to community education and awareness, the nature and extent of education programs.

At the time of the assessment, planning for and meeting community expectations was undervalued and therefore was not included as a KMA for achieving effective stormwater management. Future assessments will include community expectations as a KMA.

Each key management area was divided into five performance categories based on a star rating:

- 5-star – Best practice performer
- 4-star – Extensive program of activities
- 3-star – Basic program of activities
- 2-star – Limited resources allocated
- 1-star – Awareness of water / wastewater management.

The framework by which council was assessed in each KMA is shown in Attachment 1.

Key Findings

Each council was given a score within each KMA and the minimum, maximum and average of these are presented in the table below.

Key Management Area	Minimum	Maximum	Average
Pollution and Prevention: community education	1	4	2.5
Pollution and Prevention: council commitment	2	3	2.3
Awareness and training	2	3	2.6
Stormwater Treatment	1	4	2.5
Catchment planning	1	3	1.9
Operations and Maintenance	2	2	2.0
New Development	1	4	2.4

The results showed that there is no one KMA that all councils were achieving consistently high performance. The three KMA identified for improvement included Pollution and Prevention: council commitment, New Development and Operations and Maintenance.

KMA: Pollution & Prevention: council commitment
The evaluation found there was often not the strategic plans and policies needed to drive IWCM and WSUD from the executive. Without this commitment, it is difficult for the staff involved in managing stormwater to make significant advances.

Stormwater management was also found to be fragmented and at times accompanied by a lack of clear and transparent allocation of responsibility. Within councils, responsibility for stormwater management was found to be spread across various sections including environment, development control, engineering/construction, asset management and on-ground maintenance. Maintaining good communication between these sections often proved to be a challenge.

The management of stormwater is also impacted by resourcing constraints, both human and financial. Resources that were allocated were predominantly directed towards the management of water quantity and flooding. This traditional approach to stormwater management was consistent across most councils.

Further, it was confirmed that councils are subject to the drivers and pressures from their communities. If there is not a strong expectation from stakeholders with regards to water quality management, there is unlikely to be the support for council to drive and achieve this.

KMA: New Development
Across the catchment new infrastructure is generally being driven by new development rather than within and from council. The NorBE requirement sets a clear standard for all development within the declared catchment. To meet this, WSUD principles and technologies are often only being applied to new private developments.

Councils have indicated that while they are appreciative of the NorBE Tool and other guidelines provided by WaterNSW they still have concerns about their capacity to handle water quality assessments particularly for larger and more complex developments. Many councils are also concerned that the NorBE approach does not give due consideration to the long term sustainability, or other factors such as:

- Local conditions;
- Aesthetic / open space use;
- Council capacity; and
- The operations and maintenance legacy.

At the completion of a development, councils often become responsible for WSUD assets and usually there is not the knowledge, skills or resources to properly operate and maintain them. At one end of the scale, this has led to barriers around the implementation of WSUD still being firmly entrenched within some sections of some councils. At the other end, councils are either inadvertently or actively removing treatment systems because of these issues. To this end, some councils felt aggrieved by the NorBE burden placed upon them to meet such development requirements. This is both from the point of having a potential legacy of assets that they cannot afford to operate and maintain, and for those around the outskirts of the catchment, from 'losing' development opportunities when developers go into a neighbouring LGA which does not require the same high level of water quality control.

The management of WSUD assets on private lands was also raised as an issue. While having such assets in private ownership is preferred by some councils as it means the operations and maintenance responsibility does not sit with council, these assets ultimately connect to and can affect the operation of council assets.

KMA: Operations & Maintenance

Stormwater asset O&M practices were greatly impacted by budgetary constraints, the lack of capacity for councils to handle WSUD infrastructure and the lack of O&M plans or manuals. Maintenance is generally reactive and not sufficient for long-term sustainability. This is particularly applicable for WSUD assets.

While most councils had an asset management plan, supported by an asset register and condition reports, this framework generally did not incorporate any 'soft' assets, that is, the WSUD assets. Additionally, such documentation is high level and doesn't guide day to day O&M activities. Councils often lacked understanding of WSUD infrastructure requirements. This was compounded by the issue of which section of council is actually responsible for the WSUD infrastructure. Traditionally, this function sits with works crews. These crews are proficient with the requirements of a 'pit and pipe' network, but do not recognise their responsibility extending to WSUD assets.

Key Recommendations

Based on the evaluation and benchmarking outcomes and in consultation with council staff, a suite of recommendations were developed. These recommendations were developed for individual councils and sought to add value to council's management practices and/or move councils to best management practice.

To develop a practical action plan that could be implemented by councils either individually, in association with other councils and/or with support from WaterNSW there was also a process of ranking the recommendations. The ranking process took into consideration the following factors:

- If an action was critical for benchmark progression;
- The potential cost of implementation;
- The ease of implementation;
- The potential effectiveness in achieving water quality improvement; and
- An action's application to multiple councils

In all, there were 299 recommendations identified where WaterNSW could play a role in partnership with the councils, with 89 ranked as high priority (Priority 1 or Priority 2) recommendations. The key recommendations for WaterNSW focussed on the actions it could undertake or influence to work in partnership with councils to improve stormwater management practices. These were primarily related to:

- Support councils by assisting with capacity building: developing tools, training and education;

- Develop case studies to identify good practices to other councils; and
- Influence outcomes through raising awareness within the community and at the council executive level; the councillors and senior staff.

A summary of these recommendations are outlined by KMA below.

Awareness & training
Institutional capacity or process improvement recommendations included:
- Developing policy and designs for standard stormwater treatment devices based on demonstrated performance and life cycle sustainability; and
- Developing standard procedures for the O&M of WSUD assets.

Three training and capacity building recommendations were formulated, which were to
- Run council management and staff workshops that identify barriers and provide solutions for managing WSUD and
- Run WSUD training courses, workshops or tours covering case studies, examining the challenges and solutions and long-term sustainability.

New Development
Institutional capacity or process improvement recommendations included:
- Developing specific criteria to meet needs in relation to stormwater management and NorBE in consultation with councils and considering the whole life-cycle of WSUD assets and
- Reworking of the model stormwater controls relating to new development to link with stormwater treatment measures that are based on proven technologies.

A training and capacity building recommendation was made for WaterNSW to run education programs for the design, construction and maintenance of WSUD assets. These programs would target council staff and industry participants with a focus on current recommended practices (best management practices) and linked to proven technologies with standards developed.

Operations and Maintenance
The O&M recommendations were to run on-ground training programs to assist the development of good maintenance practices and to develop strategies to manage the maintenance burden that WSUD brings for councils.

How has WaterNSW responded to work with councils to influence better stormwater management across the declared catchment

Over the past fifteen years WaterNSW has worked with councils in various capacities to help reduce the risks to water quality in the catchment from urban development and in particular stormwater.

One of the most recognised achievements has been the development of the on-line NorBE Tool. The tool was developed to simplify and streamline the assessment of development applications for development proposals in the catchment and to coincide with the gazettal of the Drinking Water Catchment SEPP in 2011. This tool provides a transparent, consistent and less onerous process for applying the NorBE test consistent with the requirements of the SEPP. Local government was given the powers to complete their own NorBE assessments for development proposals having a low to medium risk to water quality.

With the recent upgrade of the NorBE Tool (February 2015), the types of development able to be assessed by councils has expanded. In addition consultants operating in the catchment can now also complete their assessments to submit to councils with a development application. This results in better quality and more consistent NorBE assessments being submitted, reducing costs and workloads for council staff. Councils now only need to ‘certify’ that a consultant’s assessment has been completed correctly.
WaterNSW has provided a high level of support for councils through a comprehensive training and familiarisation program for the NorBE Tool, NorBE guidelines, user guides and other documentation, as well as ongoing support and mentoring for council staff, all provided at no cost to councils.

The NSW Department of Planning considers that the NorBE concept and its associated tool, guidelines and user guides represent best practice of how a state government organisation can support the streamlining of the development assessment process. The NorBE requirement is supported by 'current recommended practices' either developed and/or endorsed by WaterNSW for incorporation into developments in the catchment. There are a number of current recommended practices or best management stormwater practices adopted by WaterNSW. These can be found on WaterNSW's website (SCA, 2015).

While the NorBE requirements under the SEPP and the associated tools and guidelines developed to help facilitate the implementation of NorBE are important, they need to be supported by programs to work with councils and build capacity in other areas beyond the planning, development and assessment stage. Programs need to be developed to address some of the recommendations made in the assessment prepared by Molino Stewart.

Initiative 6 of the Healthy Catchment Strategy outlines the Priority Pollutants Program (PPP) which WaterNSW will implement in partnership with councils to reduce the risks to water quality from stormwater. The evaluation and recommendations of council's stormwater management practices has helped to identify council's needs and inform the development of the PPP.

The PPP developed by WaterNSW focuses on building capacity in three main areas;

- **Management Practices** – Implementing a series of one day conferences to identify the benefits of IWCM and WSUD, how council can implement this best practice into policies and procedures and how NorBE can be implemented with better consideration of council's current and future capacity. Implementing training and networking opportunities to increase skills and understanding in the maintenance of WSUD assets.
- **Stormwater infrastructure** – Installing stormwater treatment systems in high priority areas and using the project as a case study and demonstration site for council.
- **Knowledge and data gaps** – Implementing research, investigation and data sharing programs to increase the knowledge of risks from stormwater across the catchment.

Each of these programs utilises a number of integrated tools including training, education, incentives, catchment investigations, networking opportunities, workshops and compliance to assist councils to implement better stormwater management practices.

WaterNSW has consulted with each catchment council to identify programs and initiatives they would like to work in partnership with WaterNSW to implement. These agreements have been detailed in individual WaterNSW and Council Action Plans. To date three Councils have agreed to work in partnership to implement these actions while other catchment councils are participating in activities on a case by case basis.

Anecdotes from councils indicate that the development of these tailored action plans to work more closely with councils and address their individual needs is very beneficial. This provides the support many staff need to help drive and implement change across their organisation as they move to the adoption of IWCM. As a result of this program WaterNSW is also being approached by councils to help work through their policy to ensure that the benefits of NorBE are maintained during the life of the development.

WaterNSW will continue to work with catchment councils, state government and industry to help our rural and regional councils move towards the adoption of IWCM and the integration of WSUD into urban planning. We will keep abreast of how best we can work together to remove the barriers and identify opportunities for partnership projects.

References

Brown, R., Keath, N., Wong, T. 2009. Urban Water Management in Cities: Historical, Current and Future Regimes. Water Science and Technology, Vol 59 (5), 2009, pp847-855.

CSIRO. 2006. Urban Stormwater: Best Practice Environmental Management Guidelines. International Water Centre (2015

IPART. 2014. Sydney Catchment Authority Operational Audit 2013/14 – Report to the Minister.

Khouri, G. 2006. Integrated Water Cycle Management" "An Australian Perspective". European Water., Vol 15/16 PP 23-32.

Molino Stewart. 2014. Evaluation of Sewage and Stormwater Management Practices in Sydney's Drinking Water Catchment. Consolidated Report.

National Health and Medical Research Council. 2011. Australian Drinking Water Guidelines

Naylor, S. 2015, Stormwater Risk Assessment. Unpublished.

Sargent, B. 2015. A Systematic Stormwater Literature Review of the Sydney Region. Unpublished.

Sydney Catchment Authority [1]. 2012. Sydney Catchment Authority Water Quality Management Framework

Sydney Catchment Authority [2], 2012. Healthy Catchment Strategy..

Sydney Catchment Authority [3]. 2015. Neutral or Beneficial Effect on Water Quality Assessment Guideline.

Sydney Catchment Authority [4]. 2011. Spatial Decision Support Systems for Assessing Water Quality Risks in Sydney's Drinking Water Catchment. Noonan & Greene.

Sydney Catchment Authority [5], 2015

Water by Design, 2015. What is WSUD

Wong, T. 2015. Water for Liveable and Resilient Cities Course

Attachment 1 – Stormwater Benchmarking Spectrum – Molino Stewart (2014)

Key Management Area	*	**	***	****	*****
	Awareness of Stormwater	Limited resources allocated	Basic program of activities	Extensive program of activities	Best practice performer
Pollution and Prevention: community education	Awareness of the benefits of pollution prevention	Undertake an occasional community education program supported by external funding	Basic education / outreach program	General education programs, targeting varying audiences within the community	Ongoing education / outreach program that targets all audiences
Pollution and Prevention: council commitment	Council awareness of the benefits of good stormwater management	Minimal staffing and resources allocated	Maintaining water quality of concern within the council; relevant stormwater management plans and policies in place.	Plans and policies in place, regularly updated and commitment reflected in council's Integrated Planning & Reporting (IP&R) documentation	Targets set and regular reporting in council's IP&R documentation supported by plans, policies and resourcing.
Awareness and training	Staff awareness of the benefits of good stormwater management	Level of expertise needs to be substantially improved in some aspects	Staff expertise available but some skill areas need attention	Expertise adequate, with sound up-to-date knowledge across stormwater management measures	Exceeds needs for effective operation of systems
Stormwater Treatment	Aware of the benefits of stormwater quality improvements	Installed several gross pollutant traps (GPTs) supported by external funding	Infrequently installs GPTs/Water Sensitive Urban Design (WSUD) elements based on high risk pollutants to water quality	Installs appropriate WSUD elements based on high risk pollutants to water quality	Comprehensive program of stormwater treatment measures
Catchment planning	Awareness of catchment processes	Understanding of hydrological processes and pollution transportation. Identifies catchment specific features, risks and opportunities	Identify strategic and cost-effective sites to improve catchment mgt	Develop multi-purpose/ synergic stormwater mgt plan/ program. Implementation as funding becomes available.	Apply (external and internal) funding to deliver the master catchment plan/ water cycle mgt plan
Operations and Maintenance (O&M)	Recognises the importance of O&M	Adhoc maintenance of stormwater drainage systems	Prepares and implements appropriate O&M plans	Develops and maintains a register of stormwater management measures, and implementation and review of appropriate O&M plans	1. Develops treatment measures that are site specific and hydraulically designed. 2. Maintains a register of stormwater management measures. 3. Implements and reviews appropriate O&M plans. 4. Reuses waste materials from stormwater treatment measures.
New Development	Recognises the need for planning controls and basic understanding of Neutral or Beneficial Effect (NorBE)	Includes some requirements for appropriate controls for new development with reference to NorBE	Includes broad requirements for appropriate controls for new development and are aligned with NorBE	Includes general requirements for appropriate controls for new development in accordance with the Sydney Catchment Authority's (SCA) Current Recommended Practices (CRPs) and are assessed in accordance with NorBE	Includes specific requirements and targets for appropriate controls for new development in accordance with the SCA's CRPs and applies NorBE.