Sydney WATER

26 February 2018

Peter Poulet
Greener Places
Government Architect New South Wales
GPO Box 39
Sydney NSW 2001

Reference: Draft Green Infrastructure policy, Greener Places

Dear Mr Poulet

Thank you for the opportunity to provide feedback on the NSW draft Green Infrastructure policy, *Greener Places*, dated October 2017.

Sydney Water strongly supports the intent of the draft Green Infrastructure policy. We welcome reforms that assist Sydney Water in planning and delivering water services in a growing city in a way that is compatible with the community and NSW Government's objectives and strategic plans. We agree that Green infrastructure is an essential city shaping asset and should be included upfront in the planning system and decisions on infrastructure.

Sydney Water's specific comments on the draft Green Infrastructure policy, case studies and design examples are detailed in Attachments. These comments reflect our three equal objectives under the *Sydney Water Act 1994* to protect the environment, protect public health and be a successful business. Our key comments relate to:

- **Water in the landscape helps connect, cool and green** – Accessible and affordable water is a critical enabler of Green Infrastructure. Water in the landscape enhances urban cooling and provides health, liveability and ecosystem benefits. The policy needs to include actions that reflect this essential role of water.
- **Infrastructure planning is a catalyst for Green Infrastructure** – Green Infrastructure must be part of a well-planned and integrated approach in the design of cities, not merely an afterthought. Better integration of land use with grey/green infrastructure could be informed by our work with other agencies on the South Creek Corridor sector review and the Greater Parramatta and Olympic Peninsula Growth Infrastructure Compact.
- **Statutory and funding frameworks are essential** – Green Infrastructure must be given clear effect and priority in the planning system, supported by appropriate funding and economic evaluation frameworks. The policy should provide clear and tangible performance outcomes and be embedded in State Environmental Planning Policies.

As detailed in our submission, Sydney Water would welcome the opportunity to contribute to the refinement of actions and support the development of relevant manuals/toolkits, guidelines and case studies as relevant to our activities and expertise. Please contact Freya Hartley, Principal Advisor Environmental Policy at freya.hartley@sydneywater.com.au, or 8849 4632 if you need any further information.

Yours sincerely

Helen Liossis
Head of Corporate Strategy & Business Planning

Attachments:
Sydney Water's detailed comments on the draft Green Infrastructure Policy, Greener Places
Sydney Water case studies and design examples

Attachment: Sydney Water's comments on Draft Green Infrastructure Policy - Greener Places

Introduction (section 1)

Sydney Water agrees that Green Infrastructure is an essential city shaping asset, and should be included in plans and strategies. We strongly support the draft Policy's emphasis on including Green Infrastructure upfront in the planning system and in decisions on infrastructure investment. To achieve this, the policy must be more directive. The wording needs to be stronger to provide clear and tangible performance outcomes to achieve the ambitions of the Green Infrastructure policy.

Recommendation: Use more directive language and where possible, mandate Green Infrastructure requirements rather than 'advocate for' or 'guide' things to be 'considered'.

The policy aim focuses on improving community access and use, and does not clearly reflect the role of Green Infrastructure for habitat and ecological health.

Recommendation: The policy aim should include maintaining connection with the natural environment and providing healthy ecosystems.

Definitions of Green Infrastructure (section 1.1 and Glossary)

Sydney Water notes the broad definition of Green Infrastructure provided in the draft policy, including the 'blue' components of waterways. Sydney Water sees significant opportunities in defining waterways as essential infrastructure that supports the development of Sydney. Essential infrastructure gives a mandate to ensure infrastructure providers and developers can play their part.

We note the draft policy uses varying terminology eg. 'waterways', 'rivers' or 'water systems' (pages 11, 12 and the glossary). This could be confusing and lead to loopholes. The term 'water management systems' used on page 32 seems to refer to the 'grey infrastructure' associated with water supply, stormwater and waste water services.

Recommendation: Use consistent terminology in the definition of essential Green Infrastructure, such as 'waterways', and define these terms in the glossary (suggest also clarifying the term 'blue grid').

We note that the definition includes a large range of elements. These could be better grouped as a continuum. For example, of the elements identified on Page 12 of Green Infrastructure, number 8 (natural green space) appears to be in a different category than the others. In the range of benefits identified in dot points on page 11, we assume 'enhancing biodiversity and ecological resilience' should be a separate dot point as it is not directly connected to 'encouraging walking and cycling'.

Recommendation: Identify in the policy the continuum of Green Infrastructure elements, from existing remnant natural spaces up to the much more curated spaces (for an example see table 1 below from West & Jones 2009).

Table 1. Liveability and Melbourne's Public Land Network [5]

	Natural Environment			***Built Environment***		
	Parks and nature reserves, Foreshores	**Creeks and rivers Utility easements Railway reserves**	**Sports fields and complexes Playgrounds**	**Roads and footpaths Roadsides and road-related areas**	**Galleries and libraries School halls Health centres**	**Municipal offices Utility infrastructure Police Stations Hospitals**
Healthy, safe and inclusive communities	Open-air activities Physical and mental reinvigoration and preventative health measures	Active and passive recreation Physical and mental reinvigoration	Active and passive sport Adult- and child-focused recreation Preventative health measures	Communication Social interaction Active recreation e.g. jogging, skating, cycling	Cultural and educational activities Health and well-being	Civic governance Water, sewerage, etc Law and order Medical services
Dynamic, resilient local economies	Conservation-related employment	Communication and transport infrastructure	Recreation-related employment	Infrastructure Shopping strips Al-fresco dining Footpath trading	Community use venues and notice-boards	Local and regional services
Sustainable built and natural environments	Conservation of indigenous flora Habitat for fauna Landscape	Remnant vegetation and habitat Biodiversity corridors Landscape	Water conservation	Urban vegetation Community gardens	Heritage buildings	Recycling Transport
Culturally rich and vibrant communities	Egalitarian and cross-cultural interactions Spatial autonomy (eg for teenagers) Educational areas Sense of place	Revegetation	Sporting clubs	Street festivals Street art and sculpture	Events, exhibitions, social functions	Civic engagement
Democratic and engaged communities	'Friends' groups Conservation volunteers	'Friends' groups Conservation volunteers and advocacy groups	Committees of Management	Processions Rallies and protests	Cultural societies Parents' groups Ethnic-based social clubs	Local government activities

West & Jones (2009) The Contribution of Public land to Melbourne's Liveability. Report by McCaughey Centre, University of Melbourne.

Benefits and need for Green Infrastructure (sections 1.2 and 1.3)

Sydney Water proudly protects the health of our community through our water services. We are committed to contributing to healthy waterways that our communities can continue to enjoy and protecting and restoring natural environments in our care. We welcome the recognition in the draft policy of the health benefits of having access to quality green space, and suggest that the policy also includes the health benefits of recreational use of waterways. Sydney's iconic waterways are integral to our outdoors way of life. Beaches, lakes, harbours and rivers are important places for recreation activities such as swimming, boating and fishing.

Recommendation: Recognise the recreational uses of waterways and associated benefits for quality of life, health and wellbeing.

The draft policy could benefit from a more developed concept of the role of nature for the city and detail on why Green Infrastructure is important to the cities' success.

Recommendation: Include a more developed discussion of the role of nature for the city. City of Melbourne has a good example with a clear vision statement: https://www.melbourne.vic.gov.au/sitecollectiondocuments/nature-in-the-city-strategy-summary.pdf.

Policy objectives and setting (Section 1.4, 1.5 and 1.6)

Sydney Water supports the objectives of the draft policy. We strongly agree that Green Infrastructure must be considered in the strategic planning process – the regional, district and local plans. The principles and aspirations of the draft policy appear to align broadly with the vision and objectives established by the Greater Sydney Commission for Greater Sydney. We note the Sydney Green Grid priorities are incorporated in the draft District Plans. However, we are concerned that the draft Greener Places policy is not clearly positioned. Section 1.5 states it is positioned in a range of policies, however it is shown sitting outside the State Policy Framework.

Recommendation: Identify how the policy will be incorporated in the strategic planning framework, rather than just inform policies.

Sydney Water notes the Government Architect is producing three manuals/toolkits to support the implementation of the policy and is also gathering case studies and design guides. We have extensive experience, collaborative projects and design resources related to waterway management and would be pleased to discuss further with the Government Architect how we can support the development of relevant tools/guidelines. Please refer to some examples included in the Sydney Water Case Studies and Design Examples document attached to our submission.

Recommendation: Sydney Water be engaged to contribute to and support the development of relevant manuals/toolkits, guidelines and case studies, particularly related to those matters that are relevant to our area of activities.

Principles and outcomes of Green Infrastructure

We support the principles for green infrastructure and agree with the projected outcomes. The introduction to this section states that 'Greener Places makes a case for the importance of green space…'. The draft policy has done more than just make a case. It has explained very well the benefits of, and risks of not adopting this approach. At this point the document should state that Green Infrastructure is important and that is why the government is implementing this policy.

We note that different actions towards these principles are included in both section 2.1 and 3.4 of the draft policy. This is potentially confusing. While most of the action statements use outcome focused language to specify what is required, we suggest some actions need to be strengthened to achieve the Green Infrastructure outcomes.

Recommendation: Consolidate the actions in section 2.1 and 3.4 to avoid confusion and duplication and ensure actions statements use specific, use outcome focused language. ie less "encourage" and "ensure" and more "develop" and "deliver". We can provide detailed suggested edits on the draft policy document.

Principle of Integration (Principle 1)

- **Water as enabler of green infrastructure**

The policy should adequately explore 'keeping green infrastructure green'. Waterways are recognised as Green Infrastructure in the policy, and water management systems are recognised as one of the key aspects for which the policy wants to achieve integration. However, the key role of accessible and affordable water as a critical enabler of Green Infrastructure is not recognised or acknowledged. A significant amount of the ecosystem services attributed to by green infrastructure are likely to be hampered by drought conditions. The climate resilience of the policy would be fortified by more detailed sustainable irrigation concepts to allow an outcome that can be achieved even during periods of drought.

Some of the issues Sydney Water would likely consider to support sustainable irrigation include:

- For reuse water, the ability to appropriately manage excess supplies in winter periods
- For reuse water, the design of arrangements to top-up the irrigation supply from another water source if and when necessary i.e. dry periods
- For potable water, the impact on long-term water supply yield
- For any source, the impact on peak demands on network sizing and operation (which would vary depending on the blue / green grid solution design)
- For any source, the impact on drought restrictions on the maintenance of blue or green grids.

If the policy is serious about greener places it needs to look holistically at how to keep them green. The capacity for greening is dependent on both the soils and water. For example, the soils in the south west of Sydney ('Parkland' City) are typically high in clay and highly susceptible to drought conditions as clays dry out. There could be a role in some areas for Sydney Water's products, such as biosolids with high organic and nutrient content, to improve the water holding capacity of soils. Drought-resistant planting schemes offer an alternative to hard surfaces that require minimal water, and Sydney Water offers planting and water efficiency advice for gardeners.

Recommendation: Include an action to collaborate with water authorities and councils to provide well-planned and integrated fit-for-purpose water supplies to service open space areas and tree canopy plantings. Soil conditions and drought-resistant planting should also be considered.

- **Infrastructure projects as a catalyst**

Principle 1 acknowledges that major infrastructure projects can be a catalyst for enhanced landscapes through Green Infrastructure investment. We note the policy proposes an action related to understanding synergies with water supply and wastewater infrastructure. Another action proposes to collaborate with water authorities to maximise the opportunity to deliver Green Infrastructure benefits along waterways and stormwater channels. Sydney Water agrees that these actions are important. Our view is that in new growth areas, upfront planning of urban land use and water infrastructure is important to retain and create green places. Sydney Water is working actively with Infrastructure NSW as part of the South Creek Corridor sector review. This review seeks to establish the best way to deliver, and the economic value of, a green and cool parkland city in Western Sydney. The Greater Sydney Commission's current work in the Greater Parramatta and Olympic Peninsula (GPOP) for a Growth Infrastructure Compact seeks to better integrate decisions on land use with grey/green infrastructure. We suggest it is also important to consider actions for existing urban areas. Infrastructure and urban renewal not only provide opportunities to create open space, but Green Infrastructure can also provide alternatives to costly renewal and investment in built infrastructure.

Recommendation: Identify approaches to better integrate decisions on land use with grey/green infrastructure planning and projects, using current work underway. Include mechanisms to provide Green Infrastructure in established suburbs not experiencing significant growth, as well as infill and greenfield growth areas.

- **Role of green infrastructure in urban cooling**

Sydney Water notes that the policy identifies how 'integrated Green Infrastructure planning can contribute positively to energy use'. It also notes the importance of well-designed Green Infrastructure to 'help cool the urban environment'. These issues require an innovative and integrated approach that considers more than just tree canopy in an urban setting. A recent study by Sydney Water and the University of NSW titled 'Cooling Western Sydney' investigated the role of water and related infrastructure, greening as well as building materials in cooling Western Sydney. Incorporating a multi-faceted approach to reducing urban overheating will provide more comfortable thermal conditions for residents in western Sydney. Potential benefits of using green, blue and grey infrastructure include:

- reduced peak ambient temperatures
- energy savings
- lower peak electricity demand
- reduced heat related mortality

Recommendation: Include an action to enhance urban cooling by combining urban tree canopy with other strategies involving ground cover, water in the landscape and cool building materials.

Principle of Connectivity (Principle 2)

Sydney Water agrees that green spaces should be developed as a network rather than separate elements. Co-sharing creeks, rivers, canals and streams, infrastructure corridors and the adjoining land for active transport and amenity should be considered when prioritising infrastructure investments that enhance walkability and cycling. Appropriate funding models can be developed to support these options, especially if they are included in Infrastructure Contributions Plans.

- **Cultural heritage**

The principle of connectivity, should also include actions to link to the history of the land and waters, considering cultural heritage, Aboriginal stories and knowledge of Country. This should include meaningful engagement with recognized knowledge holders to inform planning and Green Infrastructure projects.

Recommendation: Identify actions to include cultural heritage and learnings from Aboriginal knowledge of Country, developed through appropriate engagement.

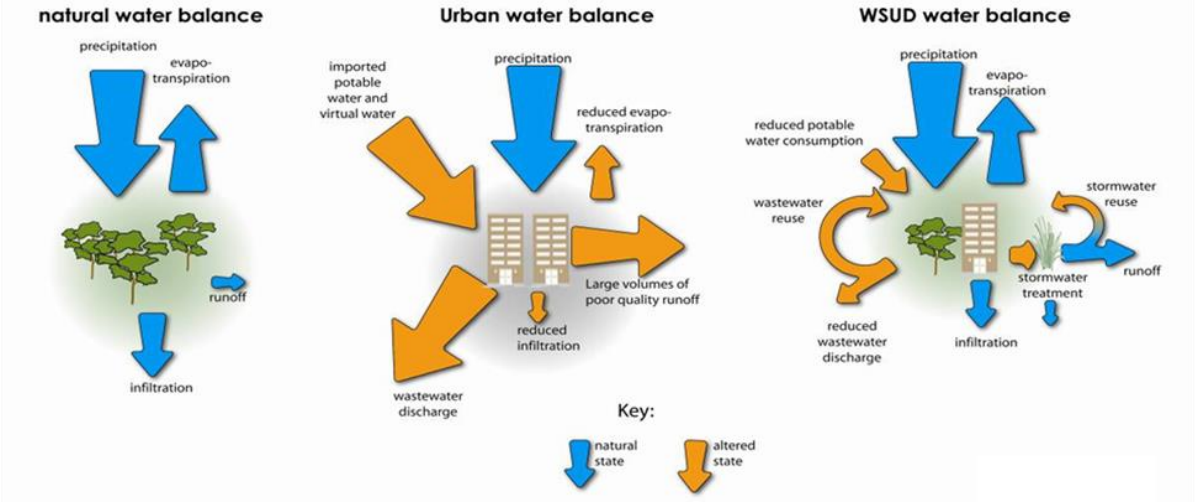
- **Catchment management and water sensitive urban design**

Sydney Water recommends that the principles should incorporate the Water Sensitive Planning Principles identified in the intergovernmental document 'Opportunities for a Water Sensitive Greater Sydney' available here: https://watersensitivecities.org.au/content/opportunities-water-sensitive-greater-sydney/. These principles were agreed across NSW government agencies and provide clear guidance to incorporate water management with urban design.

Actions to connect green spaces need to extend to the role of Catchment Management in protecting and enhancing natural waterways. That is, green infrastructure can have benefits in not only providing value to the immediate urban spaces but also for the downstream waterways (e.g. a well-built wetland can provide local aesthetics and cooling benefits as well as downstream water quality improvement). Water sensitive urban design (WSUD) is catchment management in urban areas. The figure below depicts this by comparing the natural water balance with a traditional urban water balance and a WSUD water balance.

Extensive vegetated corridors along drainage paths, raingardens and wetlands serve both to improve stormwater quality and to green urban areas. They also deliver broader biodiversity, waterway health and human health outcomes. Sydney Water already manages a number of diverse wetlands across Sydney.

Figure: Urban water cycle paradigms (Note that arrow sizes in the figure represent the relative volumes of water in the water cycles) Source: A Hoban and T Wong, 'WSUD resilience to Climate Change', 1st International Hydropolis Conference, Perth WA, October 2006



Recommendation: Incorporate the Water Sensitive Planning Principles and include actions that extend the principle of connectivity to Green Infrastructure that provides waterway catchment benefits.

Principle of Multifunctionality (Principle 3)

- **Importance of health and safety considerations, including providing multiple benefits from flood planning and mitigation**

Sydney Water supports the principle of multifunctionality by realising liveability benefits and ecosystem services from infrastructure provided for purposes such as flood mitigation. Urban development alters flood characteristics, particularly through increased impermeable surfaces. Urban growth and redevelopment can also provide the opportunity and drive for improvements in integrated water management and water sensitive urban design. Councils are the primary agency responsible for floodplain management in NSW, but Sydney Water's trunk stormwater assets form a vital part of the flood management system in some of Sydney's catchments. Communities expect the agencies that are responsible for planning and providing services will ensure that development is undertaken to incorporate flood management, waterway health and local amenity.

Challenges in greenfield development include providing sufficient stormwater retention, floodways and overland flow paths that safely provide for other compatible community uses. Infill development needs to deal with existing poor stormwater capacity and increased exposure to flooding. This issue particularly affects areas where old flood-affected industrial land is converted into a high density residential area. Once development has happened around grey-infrastructure stormwater assets, it is difficult to retrofit green infrastructure approaches.

In designing infrastructure for flood management or other uses that hold water, potential health and safety impacts should be carefully considered upfront. It is important to consider and manage the public health risks around providing water for green and blue infrastructure. For example, recycled stormwater used in fountains or other water features needs to be appropriately treated to be safe. Or ensuring that ecosystems are managed to minimise mosquito problems and that stormwater systems minimise occurrences of stagnant water that can accumulate pollutants. Access and safety are often barriers that must be considered.

Recommendation: Multifunctionality should be considered upfront in planning land development to ensure careful consideration of all potential impacts, including health and safety, to best manage flooding and water in the landscape.

- **Sharing and transfer of land**

The Green Infrastructure policy should include requirements to overcome barriers to sharing and transferring land. There would be value in developing a consistent approach for all NSW Government agencies to ensure the costs and benefits are transparent and recovered fairly and efficiently.

Adaptive management and co-sharing of land is a long-standing practice used by Sydney Water. Land used for operational purposes (ie trunk drainage land and buffer zones around facilities) may provide opportunities for multiple uses including cycleways, pocket parks, community gardens, etc. Sydney Water currently has numerous arrangements with councils to facilitate the use of operational land for open space. Sites with various restraints are made available for community use (eg. Scout Halls).

Sydney Water regularly reviews its land holdings to determine any that may be surplus to requirements, in accordance with our regulatory obligations. A significant part of the review seeks to determine the best outcome for a site; be it commercial or social. While we do have an obligation to act commercially in relation to the disposal of such assets, where there is limited commercial benefit to be gained, we seek to work with the local community to determine if it is feasible to transfer public land for social infrastructure.

Recommendation: Include an action to develop a consistent approach across NSW Government agencies and state-owned corporations to accelerate co-sharing opportunities and consider Green Infrastructure in surplus land disposal decisions. This approach will need to be supported by government through an appropriate commercial framework.

Principle of Participation (Principle 4)

- **Alignment with other planning processes**

Sydney Water supports this crucial principle. Sydney Water, has a number of projects to naturalise waterways, such as the examples included in the attachment to this submission. These projects have consistent principles and outcomes with this policy, and we acknowledge the importance of participation with Councils and the community when shaping open public places. Utilities and industry can't do this in isolation. Sydney Water works in collaboration with Councils and other agencies on floodplain risk management, water sensitive urban design, waterway health improvement and catchment plans of management.

Recommendation: Include a requirement to align actions with outcomes from existing participatory planning processes.

- **Capacity building and awareness**

A concerted effort is required to: educate and raise awareness of the benefits of green infrastructure; and build capacity among professionals and the community to support new approaches. Sydney Water is supporting the collaborative Splash network to build the capacity of urban and regional cities in NSW through their journey to become water sensitive cities. We have conducted a number of customer research initiatives with a broad section of the community that have shown that:

- without education, our customers know very little about stormwater infrastructure, but once informed they identify that stormwater assets produce outcomes they value
- customers want Sydney Water to enhance liveability in our cities by:
  - removing pollutants and litter from our waterways
  - waterway naturalisation
  - working with Councils to prevent flooding
  - greening our city with raingardens and wetlands
  - reusing treated stormwater.

Recommendation: Include an action to support capacity building, community research and awareness raising to better design and implement Green Infrastructure.

Implementation (Section 3.1) Statutory measures (Section 3.2)

Green Infrastructure must be part of a well-planned and integrated approach in the design of cities, not merely an afterthought. Fundamental to this success is the proposal in the draft policy that will see Green Infrastructure considered essential infrastructure and integrated into the NSW strategic and statutory planning framework. Including Green Infrastructure in all strategic plans, land use and infrastructure plans will enable priorities, planning and funding for green infrastructure to be considered in concert with other infrastructure. This should include additional, specific actions for the Sydney Green Grid beyond strategy.

The NSW Government's role in planned precincts provides a significant opportunity to demonstrate leadership in delivering green infrastructure through government projects. The Growth Infrastructure Compact approach proposed in the Greater Sydney Regional Plan should include green infrastructure endorsed by government policy to provide the statutory enabler to fund and operate these services.

Recommendation: Incorporate Green Infrastructure in all levels of infrastructure and strategic planning, supported by appropriate funding. This could include a specific action to develop a detailed design of the Sydney Green Grid which can be progressively updated and presented in the form of a masterplan that public authorities and developers must adopt when planning their developments.

The draft policy suggests 'the final greener spaces policies should operate within the strategic planning framework established in the EP&A Act'. It is not clear what that is yet. There must be clear legislative drivers to guide developers, utilities and government to enable green infrastructure to be appropriately considered and funded in the planning and delivery of projects. Under current regulation, the ability of local councils and utility providers (like Sydney Water) to deliver greater liveability outcomes is constrained by the obligations for necessary and efficient spending as assessed by IPART. Unless liveability outcomes are properly defined and expressed through government regulation or certified policies, service providers will be unable to deliver the level and types of services the community expects.

Sydney Water would support this policy being incorporated into a SEPP such as the Infrastructure SEPP and/or proposed Environment SEPP to better direct integration of Green Infrastructure into planning and development. If the draft policy is integrated into existing SEPPs, clear outcomes and specific targets including relating to the restoration and creation of new green spaces will need to feature more strongly.

Recommendation: Ensure that the Green Infrastructure policy, the Greater Sydney Green Grid and related concepts are given clearer effect and priority in the planning system. This could be through embedding the policy requirements in an appropriate SEPP to ensure due consideration in proposed activities and developments under Part 5 and Part 4 of the EP&A Act.

Open space outcomes are dependent on the definitions and spatial aspects of planning controls. The draft policy presents an opportunity to update definitions and planning controls to incorporate improved landscaping specifications and measurable targets.

Recommendation: Revisit open space planning controls to better advance Green Infrastructure outcomes.

While Sydney Water supports statutory reforms to implement the draft policy, it will be important for us to understand the implications for both management of our property portfolio as a whole and for planning and implementing individual infrastructure projects. This includes the delivery of asset renewals that result in significant Green Infrastructure benefits (such as stormwater channel naturalisation). Current provisions in the Infrastructure SEPP that facilitate the management of essential infrastructure by public authorities for community benefit in a timely manner (such as provisions for emergency and routine maintenance) should be retained.

Recommendation: Proposed statutory reforms related to Green Infrastructure should be developed in consultation with public authorities.

Sydney Water notes that there are a number of other related statutory obligations, guidelines and reforms. These include coastal, biodiversity and Marine Estate reforms as well as the proposed new Environment

SEPP. For example, we suggest the manual (waterways and bushland) should outline how it fits with guidelines such as the controlled activity guidelines (for works within 40 metres of the creek line) that support the Water Management Act.

Recommendation: Align the Green Infrastructure policy and supporting documents with other statutory requirements, guidelines and current reforms including the water management, environment policies, coastal, biodiversity and Marine Estate reforms.

Collaborative Government Action (Section 3.3)

Sydney Water notes that the indicative actions included in the policy are to be refined with more detailed actions through the consultation process, including through workshops with government agencies peak bodies and all relevant stakeholders.

Recommendation: Government agencies should also include State Owned Corporations. Sydney Water seeks the opportunity to support the Government Architect in the design standards and guidelines and review of the manuals and technical toolkits, particularly with regard to those matters that are relevant to Sydney Water's operations. We suggest metrics e.g. stormwater runoff must be assigned. Sydney Water can provide a case study on request and has undertaken analysis of irrigation strategy for Green infrastructure in GPOP.

Funding (Section 3.5)

Sydney Water agrees that the Green Infrastructure policy outcomes cannot be achieved without adequate funding and that it is essential to integrate and coordinate funding streams. A review of how green infrastructure is best funded needs to also consider the funding arrangements for the services metropolitan water agencies deliver.

Some mechanisms to finance and fund green infrastructure delivery are restricted. For example, these include IPART determinations on the application of development contributions and stormwater user charges, as well as the NSW Government's cap on council rates and stormwater management charges. To this end, we support the proposal to include Green Infrastructure as essential infrastructure. The policy mentions funding sources from council Section 94 contributions plans and Special Infrastructure Contributions (SIC) but not IPART-related developer charges. Developer charges methodologies for water, sewerage and stormwater by metropolitan water utilities are currently under review by IPART with a public hearing in March 2018. These charges are currently set to zero. It is important that any change to developer charge methodology does not inadvertently reduce the potential for integrated water cycle management (IWCM) approaches to enhance the liveability of our growing cities (refer Productivity Commission's Draft Report on National Water Reform (2017) recommendation 6.4d).

Another challenge in funding Green Infrastructure is the diverse benefits and range of beneficiaries. Future provision of greener places and liveability benefits (including waterway health) as part of Sydney Water's stormwater services is likely to involve engaging IPART and other stakeholders about new pricing structures to enable investment for the benefit of:

- all customers who use the services within Sydney Water's stormwater catchments
- broader, Sydney-wide outcomes for all customers in Sydney (regardless of declared catchments).

Recommendation: The proposed review of existing funding programs should consider all funding together, including regulatory pricing mechanisms for metropolitan water utilities, to support the most efficient way of delivering green infrastructure and harness the significant benefits metro water agencies could contribute

The policy talks about the broad range of benefits associated with greening (in qualitative terms) but there is minimal discussion about the costs of achieving these outcomes and how greening might be dealt with in a cost-benefit framework. By better understanding the benefits and costs and appropriate methods for valuing these, Green Infrastructure can be compared to conventional infrastructure and we can make more informed decisions about which to deliver.

For example, a recent study funded by Sydney Water (Morrison et al. 2016) has modelled the economic benefits of improvements to urban waterways and riparian areas in Southern Sydney. The results show that residents have a strong preference for vegetation and riparian areas. The study also revealed that residents highly value green infrastructure.

Sydney Water has engaged Frontier Economics to build an economic evaluation framework that identifies the social value from integrated water catchment management, including urban heat, using the GPOP corridor as its first application. This process will also be applied to the Western Masterplan that includes South Creek.

Recommendation: Supporting tools, practice guidelines and standards etc should include guidance on how actions that preserve/enhance the outcomes associated with a greener Sydney provide value to the community. Developing a better local evidence base would help reduce existing uncertainties and variation when valuing Green Infrastructure. Sydney Water would welcome the opportunity to discuss with the Government Architect NSW how our work in the GPOP corridor could support a broader economic framework that supports green infrastructure.

To provide Green Infrastructure requires a balance of prudent and efficient operating and capital investment, with decisions based on servicing requirements, community uses and expectations, emerging risks and achieving the lowest life cycle cost for assets. Operating investment is continually required such as to:

- remove pollutants such as litter and sediment from assets
- nurture natural assets through bush regeneration and weed management
- attend to repairs of assets.

Recommendation: Funding of Green Infrastructure should adequately address operating investment as well as capital costs.

Monitoring and reporting (Section 3.6)

Sydney Water recognises the value and need for open data as a fundamental enabler for collaboration. While there is a strong need for comprehensive monitoring and reporting of Green Infrastructure policy outcomes, we also suggest clear co-ordinated leadership is needed.

Recommendation: Monitoring and reporting of the policy outcomes should use digital solutions, be land-use based, and on a common platform with spatially relevant data. Information should be based on common planning assumptions for growth, employment, climate etc. Data could be displayed using existing platforms, such as ePlanning, towards solutions with spatially current data in a form that allows analysis.

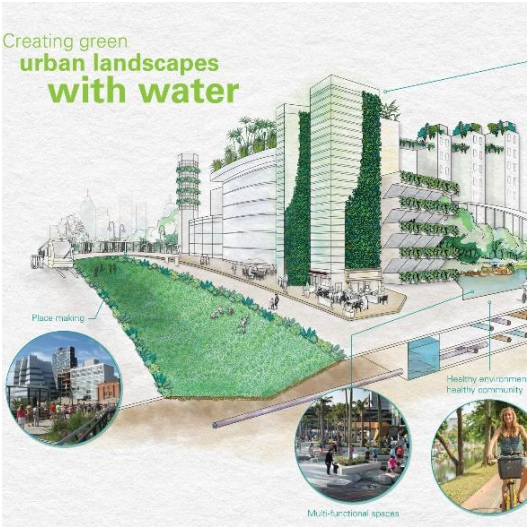
Next Steps (Section 3.7)

Climatic factors and the local conditions of the natural and altered landscape will likely affect Green Infrastructure. Examples of best practice initiatives from other areas will not necessarily work or be the best option to apply to cities in NSW. It will be important to support research, innovation and piloting of new approaches.

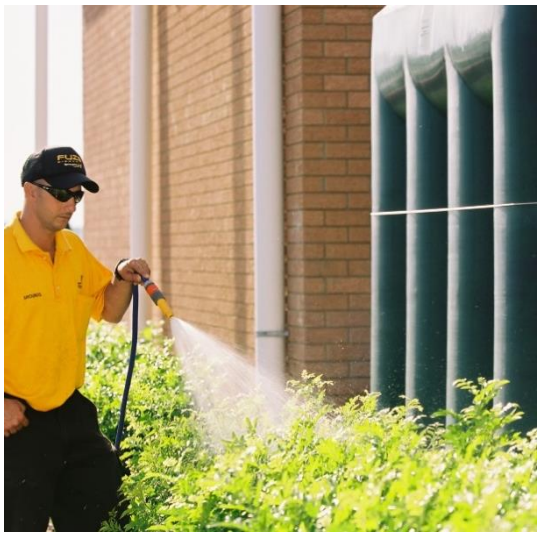
Recommendation: Support research and development of innovative ways to provide Green Infrastructure services at the lowest lifecycle cost, improve design and implementation and embrace emerging technologies and knowledge to meet future needs.

Attachment: Sydney Water's case studies and design examples

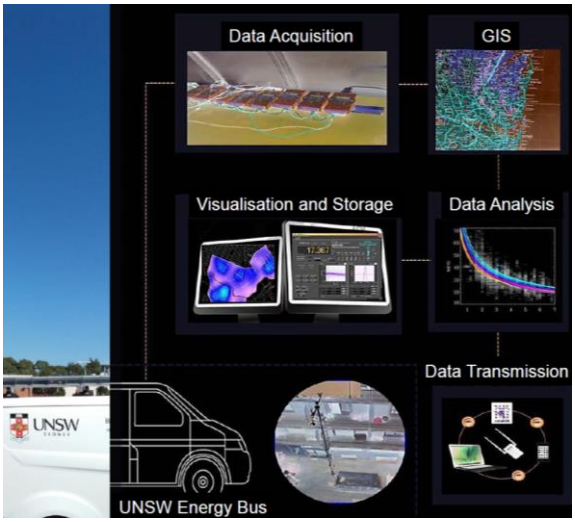
Integration



Integrated water cycle management
We work with our partners to plan for water sensitive cities of the future. We are using an integrated water cycle management approach to plan for priority precincts. This will support the creation of a green grid across Central and Western Sydney, provide alternative water sources for irrigation, public amenity and urban cooling, and contribute to improved liveability in new development areas. Sydney Water is working actively with Infrastructure NSW as part of the South Creek sector review that is seeking to establish how we best deliver, and the economic value of, a green and cool parkland city in Western Sydney.



Stormwater harvesting and use of recycled water
Irrigation water helps grow trees, keep grass green and healthy and keep sports fields in good condition. We work with local councils and other agencies to harvest stormwater for re-use. About 70 projects across the Sydney region are collecting and re-using stormwater to water local parks, gardens and sports fields and flush public toilets. We also supply recycled water as a reliable alternative water supply for irrigation. Using recycled water for irrigation provides valuable nutrients for plant growth, reducing the need to use chemical fertilisers. We have recently undertaken analysis of irrigation strategy for Green infrastructure in GPOP.



Cooling Western Sydney Research
We lead innovative research that looks at adapting essential water and wastewater infrastructure and services to meet future climate challenges to contribute to a climate-resilient future Sydney. Combining cool materials and water-based technologies into urban design can greatly reduce the impact of urban heat in western Sydney (http://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mty4/~edisp/dd_168965.pdf)

Irrigation and landscape efficiency
Our Irrigation and Landscape Efficiency Project was one of seven projects in the Hawkesbury-Nepean River Recovery Program funded by the Australian Government. Throughout the project, we worked with local councils, educational institutions and sporting grounds to improve efficiency of water use in open space irrigation, using improved technology and land and site management practices. We developed best practice guidelines for holistic open space turf management in Sydney (https://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045253.pdf).

Attachment: Sydney Water's case studies and design examples

Connectivity

Green square stormwater drain and shared path
Sydney Water, in partnership with the City of Sydney, is building a two kilometre underground stormwater drain from Epsom Road, Zetland to the existing stormwater system at Alexandra Canal in Alexandria. As part of the project, we'll install a 350 metre section of shared path on Sydney Water and City of Sydney land along the eastern side of the Shea's Creek stormwater channel. The path is improving connectivity as part of the Alexandra Canal Path. Source: Photomontage

Cooks River naturalisation and wetland
The Cooks River was originally a natural river, but by the mid-1900s, concrete panels were built along the 'unruly' natural river banks. Some sections of the concrete channel were in poor condition and needed to be replaced with more natural riverbanks. The work we did has helped improve the natural environment and character of the river. We created a wetland at Cup and Saucer Creek to treat stormwater run-off and improve the ecology and water quality.

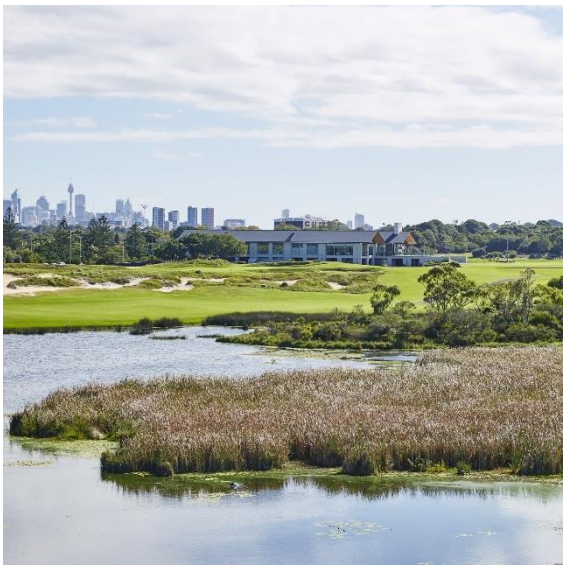
Alexandra Canal naturalisation
Alexandra Canal is a concrete lined channel in Sydney, with challenges including heritage values and legacy sediment contamination. We replaced a section of the concrete channel with sandstone blocks including niches for plantings.

Powells Creek naturalisation, Strathfield
Powells Creek was a meandering natural water channel until the mid-1930s when the current concrete channel was constructed. We're currently naturalising Powells Creek and expect to finish this work in mid-2018. This naturalisation project will improve the environment and ecological value of Powells Creek. We're also building new cycleways, boardwalks and seating for the community to enjoy.

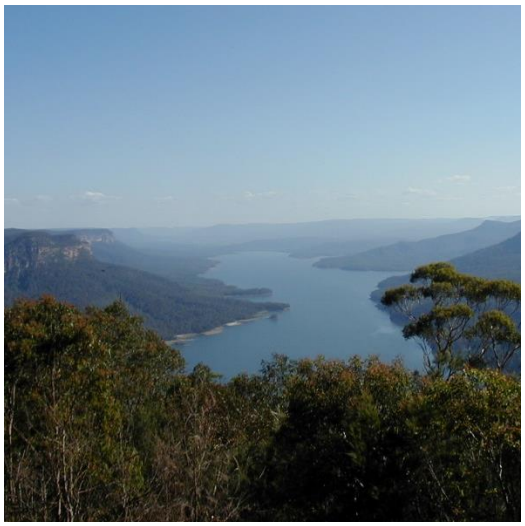
Attachment: Sydney Water's case studies and design examples

Multifunctionality

Multifunctional flood mitigation
We're reducing flood risk to properties and restoring local creeks and waterways in the Rouse Hill area of north west Sydney. We own stormwater or 'trunk drainage' land in Northwest Sydney in what is known as the 'Rouse Hill development area'. Trunk drainage land is low lying land that's prone to flash flooding. We regularly maintain and rehabilitate local creeks and bushland in this area by planting local native plants and removing weeds and invasive species. Photo: Rouse Hill wet basin in flood



Botany Wetlands management
We work with councils and golf clubs to manage the Botany Wetlands. We are renewing our management plans for our wetlands, outlining how the wetlands will be used and maintained. Botany Wetlands is an important natural heritage site under our care.



Catchment management
We work hand in hand with communities and local councils to manage and reduce the pollution of our waterways. We prepare Waterway Improvement Plans for local areas which include education programs, and social, scientific, and engineering solutions to help reduce and stop pollution from entering our waterways. Most of Sydney's drinking water comes from rainwater stored in lakes surrounded by some of the most unspoilt, native bushland in the region - including world heritage national parks. WaterNSW carefully manage and limit public access to protect water quality. Photo: Lake Burragorang at Warragamba.

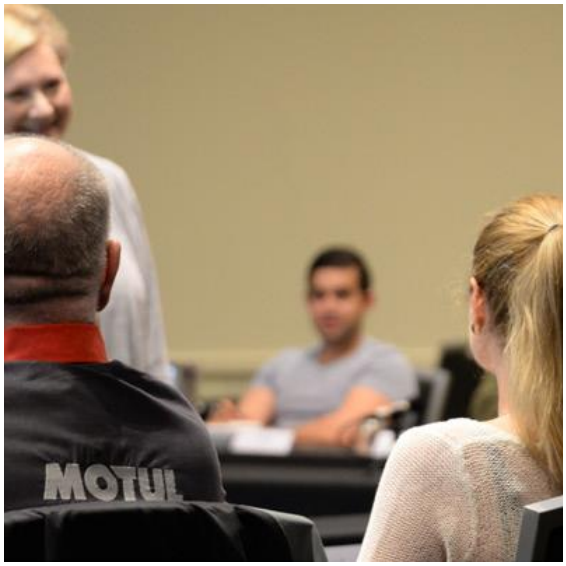
Choosing suitable plants for landscaping
We provide a plant selector tool to help our customers on choosing water efficient and drought-tolerant plants for gardens. We also provide guidance on what customers can do to help reduce tree roots blocking wastewater pipes by trees. We provide diagrams to locate wastewater pipes to avoid. We also provide a guide list of trees that are likely to cause problems in wastewater pipes based on botanical research. Our research including tree canopy mapping and work with the data analytics section of the CSIRO (Data-61) is helping us prioritise the inspection and preventative maintenance of our wastewater pipes. The Streets Opening Co-ordination Council (SOCC) and Sydney Water have guidelines for trees being planted close to utility and Sydney Water infrastructure.

Attachment: Sydney Water's case studies and design examples

Participation

Opportunities for a Water Sensitive Greater Sydney
We collaborated with water managers and key stakeholders to produce a vision and planning principles for a water sensitive Greater Sydney. Source: Cooperative Research Centre for Water Sensitive Cities, 2016 (https://watersensitivecities.org.au/wp-content/uploads/2016/06/47952-SW-GREATER-SYDNEY-DOCUMENT-JANUARY-2016-WEB-1.pdf)

Community drinking water stations
We have partnered with councils to install new permanent water stations in local parks to encourage better health and a better environment. We have portable hydration stations and bubblers for loan to eligible community-based organisations, local councils and events. Photo: Burwood council water station



Stormwater workshops
Sydney Water consults and engages on stormwater with communities, councils and other stakeholders. In early 2015 we conducted social research to better understand customer views on stormwater. This study by the Institute for Public Policy and Governance at the University of Technology Sydney (UTS) helped to understand willingness to pay for stormwater infrastructure and where to prioritise investment based on the range of values held by customers. Customers were engaged through focus groups, an online survey and a deliberative panel.

Splash network capacity building
We support the Splash collaborative network to build the capacity of urban and regional cities in NSW through their journey to become water sensitive cities (see https://www.sydneywatertalk.com.au/splash-network). This network facilitates knowledge sharing, education and training opportunities for individuals to strategically plan for the future of our communities. It identifies opportunities to overcome risks through adaptive planning, better asset management, green infrastructure, and effective water management through water sensitive urban design.