WATER3VOLUTION

Funded by the Marrickville community through the Stormwater Charge

MARRICKVILLE COUNCIL

DRAFT STRATEGY FOR A WATER SENSITIVE COMMUNITY 2012 – 2021

MARRICKVILLE council

Acknowledgments

Marrickville Council's Environmental Services section has worked across Council, particularly with Infrastructure Services, in the development of this Draft Strategy.

Council acknowledges the contribution many people in the Marrickville community have made to sustainable urban water management, particularly through subcatchment planning. Council has also benefited greatly from its research partnership with Monash University and now the CRC for Water Sensitive Cites. The knowledge and ideas from the community and research partners have been included in this strategy and will continue to guide its implementation.

Cover photo – Joshua Merchant at Thornley Street rain garden in Warren Park, Marrickville South, September 2012. (Photo by Lisa Hogben.)

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VISION OF A WATER SENSITIVE COMMUNITY

Water sensitive communities create places that are "resilient, liveable, productive and sustainable. They efficiently use the diversity of water resources available within towns and cities; enhance and protect the health of urban waterways and wetlands; and mitigate against flood risk and damage. They also create public spaces that harvest, clean and recycle water, increase biodiversity and reduce urban heat island effects."

(CRC for Water Sensitive Cities, 2012)

Transformation of urban systems from a focus on water supply and wastewater disposal to more complex, flexible systems.

A water sensitive community:

- supplies water from within its catchment;
- provides green infrastructure to support ecosystem services; and
- participates in making plans, designs, and decisions that are water sensitive.

1. The Marrickville Strategy for a Water Sensitive Community

1.1. Four Strategies

Four strategies in the Our Place, Our Vision Community Strategic Plan 2021 will direct Marrickville towards becoming a Water Sensitive Community. Each strategy has an action plan as detailed in the Marrickville Action Plan for a Water Sensitive Community. Over the next ten years, the work under these strategies will address the many complex issues relating to sustainable urban water management (SUWM) in Marrickville.

To become a water sensitive community, Council has developed the following strategies:

- Reduce the use of potable mains water in homes, businesses, Council facilities and public spaces.
- Manage the stormwater system and its impacts on the urban environment.
- Support regional projects to improve the health of the Cooks River, Botany Bay, Lower Parramatta River, Sydney Harbour and their catchments.
- Implement sustainable urban water management.

1.2. Strategies, Objectives and Targets for 2021

Strategy one:
Reduce the use of potable mains water in homes, businesses, Council facilities and public spaces

Objectives

- Encourage private land managers to reduce water consumption.
- Reduce Council's use of potable mains water.

2021 Targets

- Marrickville LGA water consumption per household has decreased on 2010 levels.
- Community knowledge of local water systems has increased on 2010 levels.
- Council's use of potable mains water has decreased by 30% on 2010 levels.
- 2 in 5 sports fields are irrigated using non-potable water.
- 15 of Council's 30 highest water use facilities use harvested rainwater.

Strategy two:
Manage the stormwater system and its impacts on the urban environment

Objectives

- Improve stormwater runoff quality working towards NSW best practice targets.
- Reduce the impacts of stormwater flows including flooding.
- Increase flood preparedness.
- Plan for integrated asset renewal and maintenance.

2021 Targets

- 30ha of the LGA is treated by vegetated stormwater treatment systems constructed by Council.
- The effective impervious area has decreased on 2010 levels.
- Flood study and floodplain risk management plans are completed for all subcatchments.
- All flood prone properties in the Marrickville LGA have been tagged.
- Five major flood mitigation projects with construction costs over $250,000 have been completed.
- Stormwater asset information is integrated into capital works programs and subcatchment plans.
- A proactive stormwater maintenance regime has been successfully implemented.
- Volunteer hours on Waterevolution programs are maintained at 2010 levels.
- 20 vegetated stormwater treatment systems have been built on private properties through the Waterevolution program.
- 150 tanks have been installed on private properties through the Rainwater Tank Incentive Scheme.

Strategy three:
Support regional projects to improve the health of the Cooks River, Lower Parramatta River, Sydney Harbour and their catchments

Objectives

- Increase the area of riparian and aquatic habitat.

2021 Targets

- The area of estuarine vegetation around the Cooks River has increased on 2010 levels.
- The diversity of macro-invertebrates in the Cooks River has increased on 2010 levels.

Strategy four:
Implement sustainable urban water management (SUWM)

Objectives

- Increase Marrickville Council's ability for SUWM.
- Establish organisational direction and common understanding of SUWM.
- Improve awareness and knowledge of SUWM.
- Enable staff to work across different sections of Council on water-related projects.
- Implement SUWM planning.

2021 Targets

- Marrickville Council has a very high capacity for SUWM.
- 90% of staff knows about the Strategy for a Water Sensitive Community 2012-2021.
- One Council-wide SUWM awareness campaign/event is held every two years.
- All capital works projects use SUWM objectives (see 2.1).
- All subcatchments have collaboratively developed management plans.

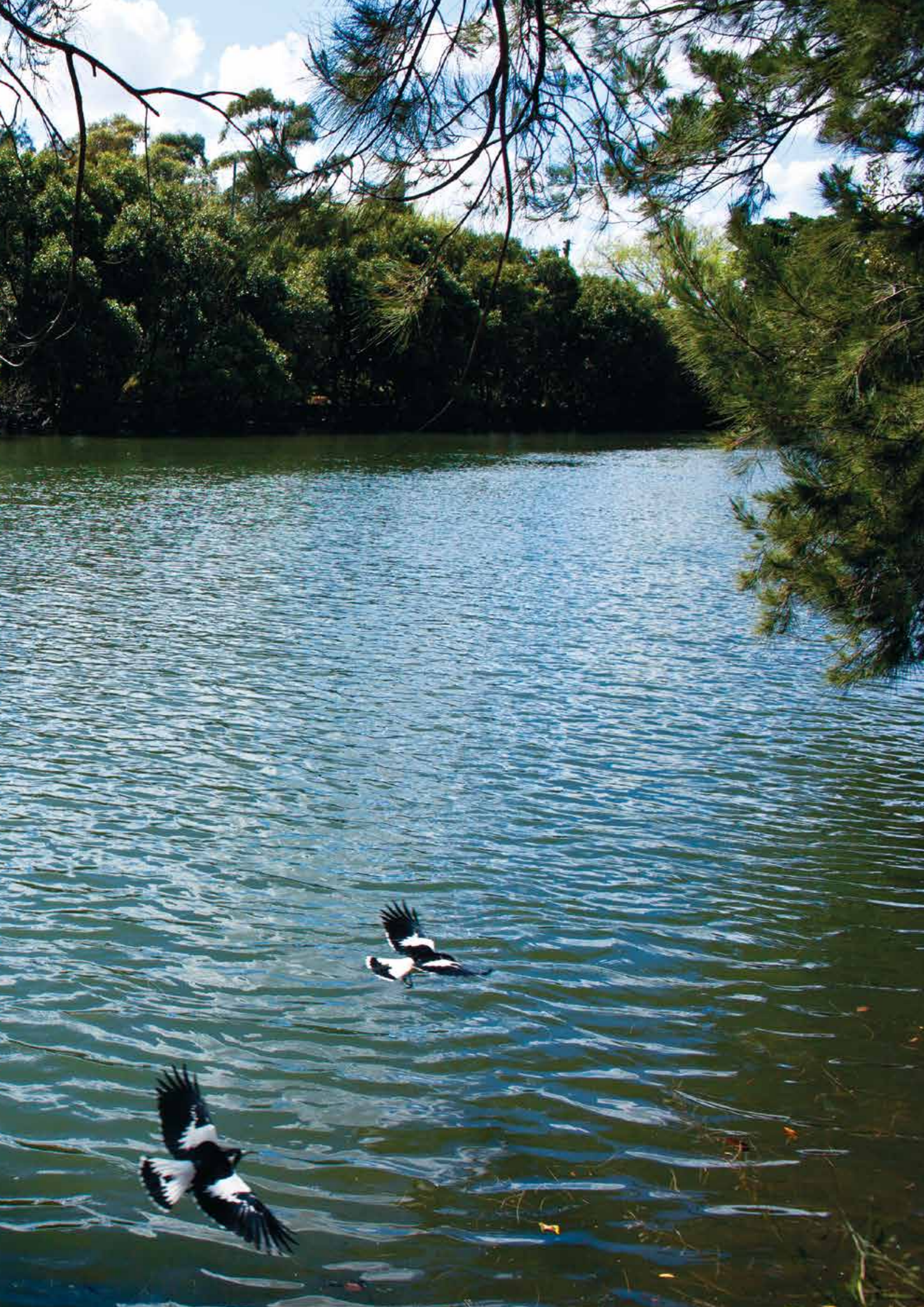
1.3. Strategies, Objectives and Targets for 2021

This Strategy will be implemented through the Marrickville Action Plan for a Water Sensitive Community 2012 - 2016, with actions under each of the four strategic areas. Council will continue to fund its water programs from the Stormwater Charge and relevant capital works programs, and seek grant and other sources of funding where possible.

Marrickville Council will monitor and evaluate the implementation of this Strategy and report on achievement of actions through the delivery and operational plans. The Strategy will be reviewed and updated in 2016 and 2020.

Data management will include systematic and consistent collection and regular reporting. The targets are therefore quantifiable and measurable. Indicators will be used where numerical targets are not possible as they show trends and other useful information on progress.

Progress with implementation of the Marrickville Action Plan for a Water Sensitive Community will be reported annually and a complete revision will occur with the Strategy review in 2016.



2. Strategy for a Water Sensitive Community

2.1 Why Marrickville has developed this strategy

Marrickville has been implementing projects for sustainable urban water management (SUWM) for over 10 years. The projects have been influenced by a combination of many years of research and conversations with the Marrickville community that show that traditional water management is unsustainable and the community expects governments to adopt sustainable practices. However, up until 2010, the various programs undertaken in Marrickville were not well integrated. This strategy joins the wide range of programs under one common vision.

Currently, Council's general approach to water management is for a Drained City or Waterways City as defined by Brown et al. (2008) (see Section 4, p18). The aim of implementing the Strategy for a Water Sensitive Community 2012-2021 is to move Marrickville LGA to a Water Cycle City, and eventually to a Water Sensitive City.

This Strategy pulls together Council's current water related plans and programs, and includes new programs that fill in the gaps. The Strategy aligns them directly with the Marrickville Community Vision, and the Council and community key result areas (see Figure 1, p11), and key outcomes that together provide the long-term direction for Marrickville.

Sustainable urban water management (SUWM) in Marrickville.

Marrickville's SUWM objectives are to:

- Reduce reliance on potable (drinking quality) water brought in from outside the Marrickville local government area.
- Use water that is treated to a level suitable for its use; e.g., use stormwater for irrigation.
- Reduce the impact of stormwater on the Cooks River, Botany Bay, Lower Parramatta River and Sydney Harbour to:
  - improve the quality of stormwater runoff
  - reduce the quantity of stormwater entering the waterways
- Reduce the amount of wastewater leaving Marrickville LGA that may cause pollution in the Tasman Sea via Malabar Ocean Outfall.

(Adapted from Brown, 2007)

To achieve this, Council will:

- Develop and maintain Council's ability for SUWM through skill development, data collection and sharing, evaluation and learning.
- Integrate planning and projects.
- Identify and cost capital works needed to implement SUWM and include these in asset management plans and Council's Long-Term Financial Plan.
- Work in multidisciplinary teams.
- Work with the people who live and work in the affected areas.
- Communicate progress and results to all stakeholders.

2.2. Marrickville Community Strategic Plan 2021

The Our Place, Our Vision - Marrickville Community Strategic Plan 2021 sets out the Marrickville Community Vision and defines the long-term aims and how to achieve them for the community.

Marrickville's Vision 2021

In 2021, Marrickville still feels like home. It is a place of culturally diverse, forward thinking, inner city communities and neighbourhoods. It is the land of the Cadigal-Wangal people of the Eora Nation and continues to be enriched by generations of migrants from all parts of the world.

In 2021, Marrickville remains a just and welcoming society with an eclectic mix of cultures and communities. There is a common belief that the community should support, care for and empower its members who are disadvantaged or marginalised. There is a common agreement that all citizens are able to participate in the social, cultural and economic life of the community.

In 2021, Marrickville's businesses are confident, thriving and responsive to the needs of the local community. Its industrial areas are revitalised and remain an important part of the local economy, while high-tech, creative and eco enterprises prevail.

In 2021, Marrickville is a creative community. It values the people who celebrate, challenge and inspire local identity and sense of place. It has innovative and responsible urban planning that protects the character and heritage of the area. Public spaces are enticing, lively and accessible, with a street life that connects the community and welcomes visitors. As well as being clean and well maintained, these areas are sustainable and are alive with trees and birds, grandparents and children, pedestrians and cyclists.

In 2021, Marrickville's environment is healthy. Children can swim in the river and play in the dirt, and native plants and animals, including frogs, bees and ants, are thriving. The community is resilient to climate change and works together to minimise its ecological footprint and live sustainably. There are fewer cars, less congestion and a reduction in noise. Community members have their choice of well connected, accessible and efficient public transport options, including light rail.

In 2021, local communities work closely with Council, which is ethical, effective and accountable. Council provides supportive and cooperative leadership and is a strong advocate for community interests. It is a responsible partner and works together with community organisations, businesses and other levels of government to improve the quality of life for all residents of Marrickville.

(Marrickville Council, 2010a)

"In 2021, children can swim in the river and play in the dirt"

2.3. How this strategy fits with the Community Strategic Plan

Council has a number of targeted strategies and plans that will help deliver the many outcomes in the Community Strategic Plan. Figures 1 and 2 show how the Marrickville Strategy for a Water Sensitive Community 2012-2021 fits with Council's current planning framework.

This Strategy will contribute to Council's overall direction for plans, projects, operations and services as they relate to water. It will be reviewed in 2016 before the Delivery Program review in 2017.

Figure 1. How the Marrickville Strategy for a Water Sensitive Community works with Council's planning framework.

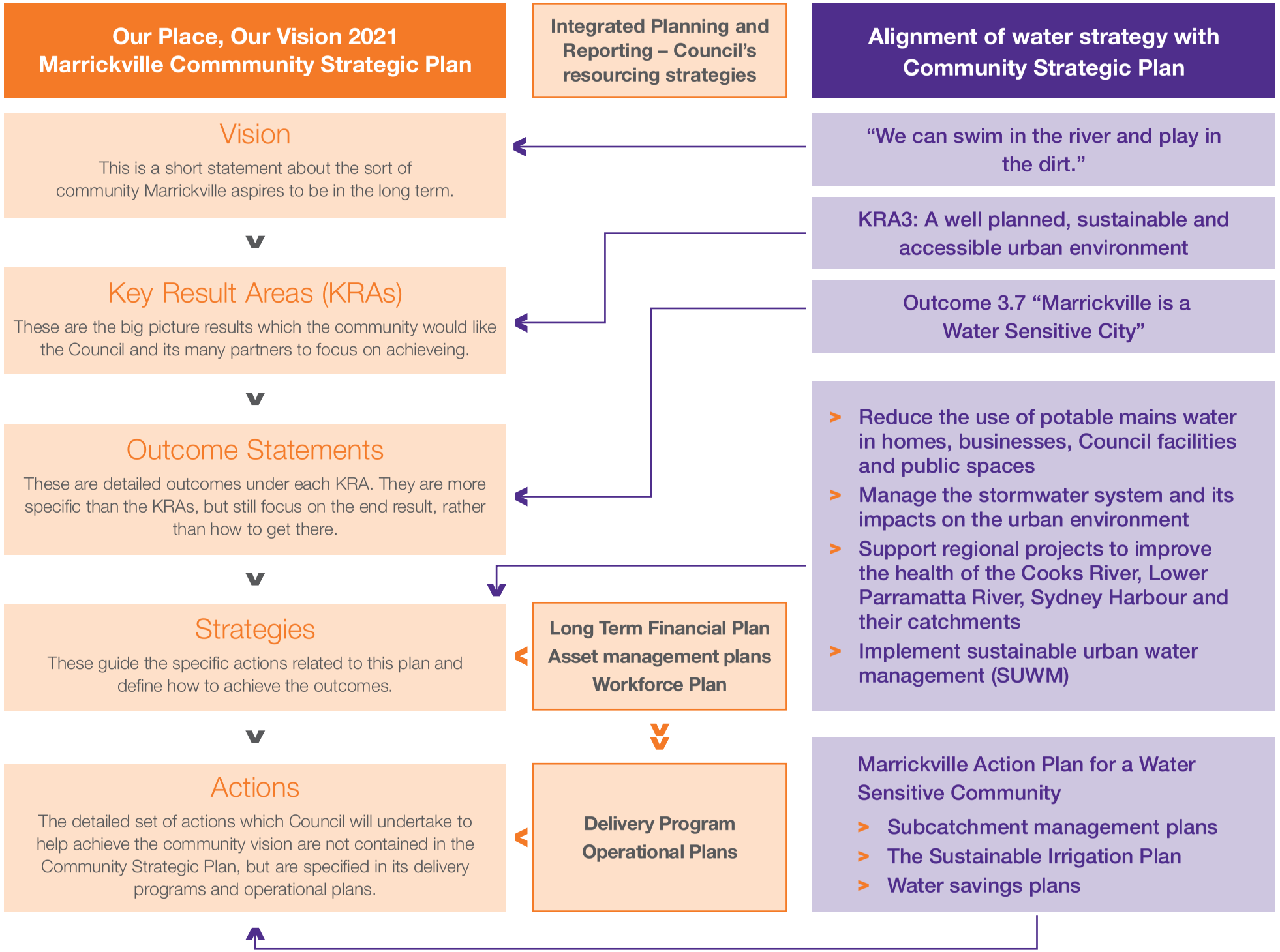


Figure 2. How the Marrickville Strategy for a Water Sensitive Community aligns with the Community Strategic Plan.


NTEU
The Mudcrabs

3. What will a Water Sensitive Community look like?

A water sensitive community has a range of water sources to rely on. Its built environment benefits and supports the functions of the natural environment and helps tackle the effects of climate change. People, business, and governments work well together and support an ecologically sustainable lifestyle (adapted from Wong and Brown, 2009).

A water sensitive community:

- can supply water from within its catchment;
- provides ecosystem services through green infrastructure; and
- makes plans, decisions and designs that are water sensitive.

3.1. A water sensitive community can supply water from within its catchment.

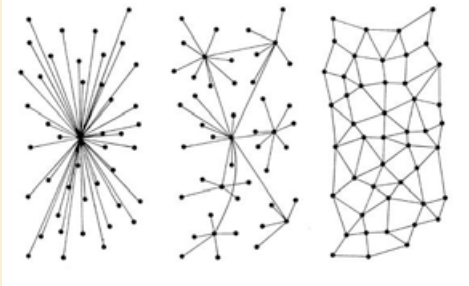
- Infrastructure is a mix of centralised systems (potable mains water from outside the catchment), and decentralised and distributed systems. Water quality matches the intended water use; e.g., rainwater is used for flushing toilets, and stormwater for irrigating ovals.
- Water sources include rainwater, stormwater, wastewater, desalinated water, and groundwater.

Understanding the Terminology

Centralised, decentralised and distributed infrastructure systems

Centralised systems provide a single service of one product (e.g. potable mains water supply, sewage), and have one or more external systems accessing the service, for example, a water supply system providing drinking quality water only to specific areas.

Decentralised systems are made up of many independent systems and products that can link with each other if necessary as a network.



Centralised, decentralised and distributed systems (Baran, 1964).

Distributed systems have no centre and do not have to depend on a centre for their functioning. All nodes in a distributed system are networked.

Centralised systems have a greater risk of one event breaking the entire system. However, if one of the systems in a decentralised or distributed system breaks, it is more likely that only one element is lost, not the whole system.

3.2. A water sensitive community provides green infrastructure to support ecosystem services.

- Stormwater is harvested, treated for use, and cleaned before entering waterways, e.g. by rain gardens and wetlands.
- Infrastructure is designed for more infiltration and evaporation, improving microclimates, helping reduce effects of local flooding, e.g. vegetated roofs and permeable paving.
- The movement, distribution, and quality of water are managed so that it is more like the natural water cycle.
- Urban waterways are rehabilitated to support local biodiversity and influence microclimate.

Understanding the Terminology

Ecosystem Services are the things that plants, animals, water, soil, and air provide. Examples include:

- trees acting as carbon sinks and providing oxygen;
- trees and water cooling the nearby area;
- fungi and insects breaking down waste; and
- bees pollinating plants.

Microclimate is the climate of a small specific place in contrast with the local larger area. Differences in rainfall, wind, temperature and humidity can be affected by trees, buildings, water bodies, aspect and even the colour of the ground which can create a local microclimate.

3.3. A water sensitive community makes plans, decisions, and designs that are water sensitive.

- Citizens, businesses, community and government organisations promote and maintain an ecologically sustainable lifestyle.
- Water planners and managers of public and private land are skilled at managing urban water sustainably.
- Local, state and national government policies strengthen inter-government collaboration and public/ private engagement.

Understanding the Terminology

Ecological Sustainability (Council of Australian Governments, 1992)

Goal:

Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

Core Objectives:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations
- to provide for equity within and between generations
- to protect biological diversity and maintain essential ecological processes and life-support systems

Guiding Principles:

- decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations
- where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- the global dimension of environmental impacts of actions and policies should be recognised and considered
- the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised
- the need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
- cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- decisions and actions should provide for broad community involvement on issues which affect them

These guiding principles and core objectives need to be considered as a package. No objective or principle should predominate over the others. A balanced approach is required that takes into account all these objectives and principles to pursue the goal of ESD.

4. Water Planning and Management

4.1. Planning Approaches

4.1.1. The Past

Since colonisation, water management in Australia has developed through a number of phases, each generated by different urban development priorities for that period (Figure 3).

The service focus of earlier periods (i.e. the supply of clean water, removal of sewage, and large-scale drainage schemes) have served Marrickville well for 150 years by significantly reducing the incidence of disease, personal injury and property damage. However, Marrickville now needs to manage water sustainably as traditional approaches have resulted in over extraction of water and high levels of pollution in waterways with little or no accounting for the ecological services provided by the environment (Brown, 2008).

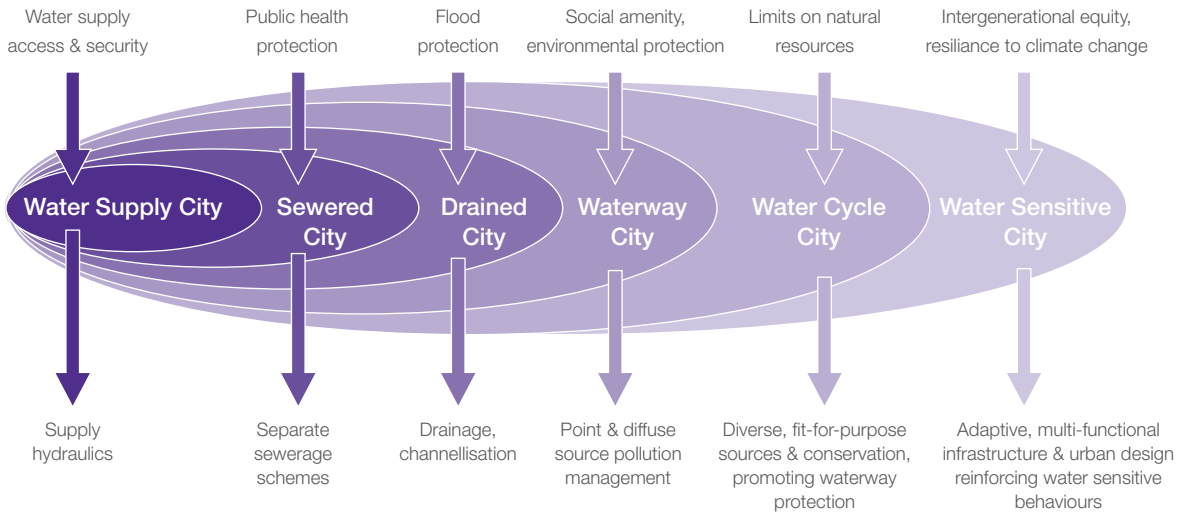


Figure 3. The Urban Water Management Transitions Framework (Brown et al, 2008).

The six historical periods with different drivers of service and water management are:

1. The Water Supply City – from early colonisation in late 1700s

- access to clean water for the survival of the colony
- building water supply infrastructure

2. The Sewered City – from mid- late 1800s

- construction of sewerage systems in response to public health problems

3. The Drained City – throughout the 1900s to the present

- efficient stormwater drainage for protection of property from flooding

4. The Waterways City thinking and some practice - from 1970s

- increased focus on environment and increasing concern about the state of local waterways as visible pollution, degradation and algal blooms became headline news
- environmental regulation and enforcement through a central body e.g. EPA

5. The Water Cycle City thinking and some practice – from 1990s

- a variety of water sources that are appropriate to the intended use
- water saving initiatives
- measures to protect waterway health

6. The Water Sensitive City thinking - from 2000s:

- a mix of centralised and decentralised water supply and reuse systems
- urban design and infrastructure that supports human and ecosystem wellbeing
- a community active in sustainable water planning and management

4.1.2. The Present

The current approach to water management in Marrickville spans three of these recognised phases:

- Road and stormwater asset management still holds with the drivers of the Drained City;
- The introduction of water sensitive urban design (WSUD) works through subcatchment planning since 2005/06 and programs such as verge gardens has adopted the Waterways City and Water Cycle City;
- This Strategy together with integrated SUWM planning (being achieved through asset plans incorporating subcatchment planning, which focuses on the community as a key player in planning and decision making) are pushing Marrickville towards a Water Sensitive City (Figure 4).

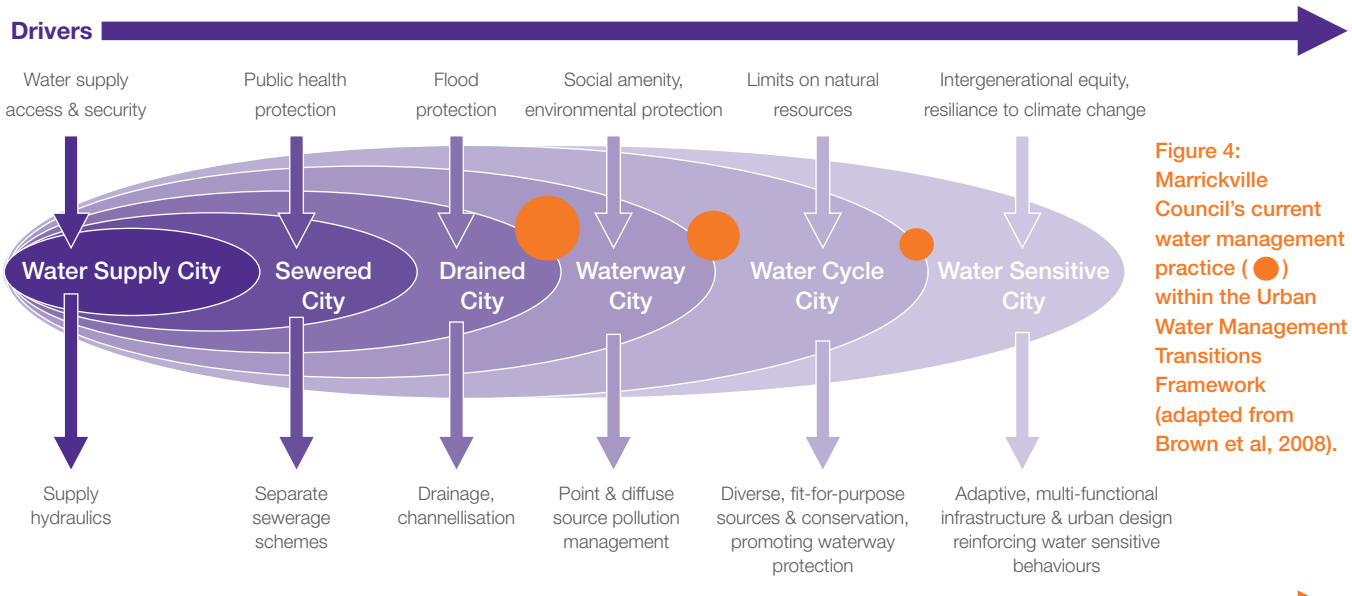


Figure 4: Marrickville Council's current water management practice (●) within the Urban Water Management Transitions Framework (adapted from Brown et al, 2008).

4.2. Council's capacity for Sustainable Urban Water Management

4.2.1. Council Organisational Survey

For Marrickville Council to be able to work towards becoming a water sensitive community, Council needs to determine where its strengths and weaknesses are for implementing SUWM and how to overcome problem areas.

In 2009/10, Monash University assessed Marrickville Council's capacity to carry out SUWM and found that it had moderate ability for SUWM (Figure 5 below). Council was in the growth phase in 2010, having a moderate level of SUWM ability, with some areas close to the insider phase (high SUWM ability). Therefore, Council has some good capacity for SUWM.

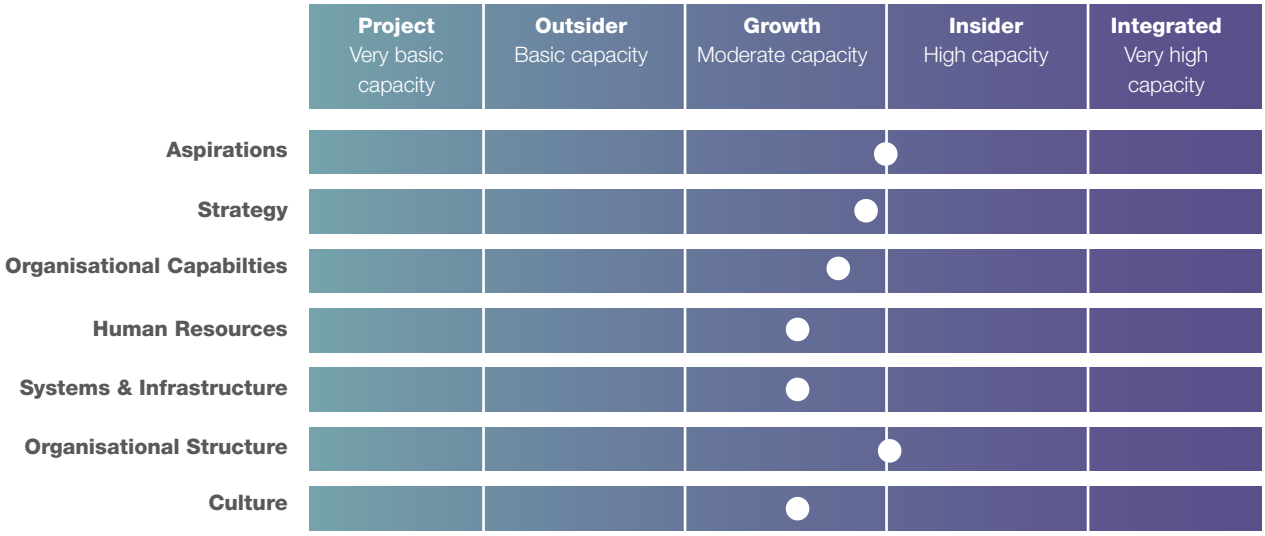


Figure 5. Areas of Council's ability shown according to organisational development phases (A. Bos, 2010).

Understanding the Terminology

- Organisational systems are the formal and informal processes that make SUWM work within Council.
- Infrastructure refers to the actual SUWM physical and non-physical infrastructure and assets that contribute to SUWM within Council.
- Organisational culture is the connective tissue that binds Council together to work towards SUWM.

Growth phase

This means that Council has a moderate level of capacity for SUWM

- Growing commitment for SUWM at political, managerial and community level;
- SUWM driven by consistent formal/informal network;
- Dedicated staff hours solely to SUWM activities;
- Still highly dependent on external skills;
- Some internal conflict regarding roles and responsibilities persists;
- Proficient in obtaining external grants for projects;
- Increasing internal funding for SUWM;
- Champions with moderate influence are becoming apparent;
- Extended stakeholder network established, but tensions between the organisations; and
- Increasingly extended community engagement.

Council's strengths are in its organisational structure, human resources, aspirations and strategy (Figure 5). However, considerable improvement is needed for Council to reach its full SUWM potential. In addition, its systems and infrastructure, and culture for SUWM inhibited Council's SUWM practice in 2010. The study also shows that outside influences (government legislation and policies) provide very limited direct incentives for developing and implementing SUWM within Council.

To achieve SUWM, the assessment (Bos, 2010) recommends that Council firstly needs to:

- develop organisational direction and a common understanding of SUWM
- gain a Council-wide commitment to SUWM
- define explicit cross-Council goals and targets for SUWM, including performance targets with attached measurable criteria
- improve organisational awareness and internal education for SUWM
- develop supporting organisational systems including measures that lead to SUWM from planning to operation and maintenance

This Strategy goes towards addressing these recommendations.

4.3. Current Planning

4.3.1. Subcatchment Planning

Between 2002 and 2006, Marrickville Council trialled and developed the subcatchment planning process in partnership with leading researchers at Monash University through the Urban Stormwater Integrated Management (USWIM) project. In 2005/2006, Council adopted the collaborative and locally focused subcatchment planning as its strategic approach to carry out the objectives of sustainable urban water management.

Subcatchment planning addresses the identified flaws in previous approaches to urban water management by:

- reducing the planning unit to the local level;
- integrating all elements of water management (water quality, water use and reuse, stormwater and flooding);
- integrating the many disciplines (e.g. sociology, ecology and engineering); and
- involving the community of interest in the decision making and implementation.

A key part of understanding the subcatchment planning context is through researching the physical, social and organisational characteristics of the subcatchment (Figure 6).

Figure 6. Subcatchment planning maps the local context and uses this information to inform participation and final subcatchment management plans.

Understanding the social and organisational influences in the subcatchment facilitates collective decision making on the best management approaches to consider water quality and use together. This has resulted in numerous locally appropriate stormwater treatment works and plans for harvesting, and community partnership activities. However, integrating flood management into the SUWM program is in its infancy.

The flood studies and management plans analyse flood risks and recommend actions. Council is now focused on how best to integrate the recommendations into subcatchment planning so that analysis is of the subcatchment's full water cycle, as well as wastewater reuse, stormwater quality, flooding, including tagging of flood prone properties, and development controls.

What is subcatchment planning about?

- Planning at a manageable neighbourhood scale (e.g. subcatchment)
- Involving people who live and work in the subcatchment in planning and implementation
- Including people with different professions, knowledge and skills in the planning and decision making
- Tailoring plans to the area's social, cultural, biophysical and planning contexts
- Designing neighbourhoods to reduce pollution of local waterways - the Cooks River, Botany Bay, Lower Parramatta River and Sydney Harbour
- Reducing dependence on potable mains water brought in from outside the catchment by using water that is fit for its purpose i.e. the quality of water is safe for its intended use (e.g. stormwater harvesting and wastewater recycling);
- Providing green infrastructure for healthier communities and liveable neighbourhoods
- Partnering with leading SUWM research - currently the CRC for Water Sensitive Cities

Major achievements

Since Council adopted the USWIM project's subcatchment planning approach as its major water planning process in 2006, there have been numerous advances in SUWM in Marrickville LGA:

- The creation of specific staff roles within Council to support the Waterevolution SUWM program;
- A commitment from the organisation to have no more 'single issue' planning for water management;
- The introduction of the Stormwater Management Service Charge from July 2007, which raises around $830,000 per year and funds the 10-year Waterevolution SUWM program.
- Four community neighbourhood (subcatchment) visions to the year 2050 with subcatchment management plans representing the ideas, knowledge and values of those living and working in the subcatchments (Marrickville Council, 2005, 2009a, 2009b, 2010b, 2012);
- The Water Sensitive Urban Design Development Control Plan 2011;

- Flood management now being integrated with subcatchment plans – Eastern Channel East Subcatchment being first to include flood management in its 2011 subcatchment plan;
- The Stormwater Asset Management Plan adopted in 2010;
- A wide range of subcatchment specific actions and works that help build community capital, and are appropriate for the subcatchment community, landscape, land use and infrastructure;
- A selection of on-ground projects that can be funded from the Stormwater Management Service Charge or government grants;
- Construction of seven rain gardens across the LGA and permeable paving at Tom Foster car park (Figure 8);

Figure 7. The *Eastern Channel East Subcatchment Plan* in 2011 was the first subcatchment plan to include flood management.

Figure 8. L-R- Hill Street and Thornley Street rain gardens, Marrickville South, 2010; Permeable paving at Tom Foster Community Care car park, 2010.

- The subcatchment planning approach being used by 7 other Cooks River councils through the Cooks River Sustainability Initiative;
- The Sustainable Water Ambassadors volunteer peer education program;
- The Rainwater Tank Incentive Scheme, including over 100 rebates for rainwater tanks based on their capacity (at December 2011), and 460 participants at over 35 rainwater harvesting technical workshops to support implementation and maintenance;
- The Marrickville Sustainable Irrigation Plan to introduce alternative water supplies; and
- A cross-Council SUWM water team.

4.3.2. Floodplain Management Planning

Marrickville Council has been planning and managing flooding in line with the approach set out in the NSW Government's Floodplain Development Manual (Figure 9) (Department of Infrastructure, Planning and Natural Resources, 2005). The main aim of this approach is to reduce the impact of flooding and flood liability on owners and occupiers of flood prone property and to reduce private and public losses resulting from floods. By applying this process, the NSW Government and Council are providing a risk management approach to flooding, reflecting the drivers of a Drained City (Figure 3).

The primary tools used by Council to manage flooding are the Local Environment Plan 2011 and flood risk management plans. The Marrickville Floodplain Management Advisory Committee oversees the floodplain management process and makes recommendations.

Figure 9. NSW Floodplain Management Process.

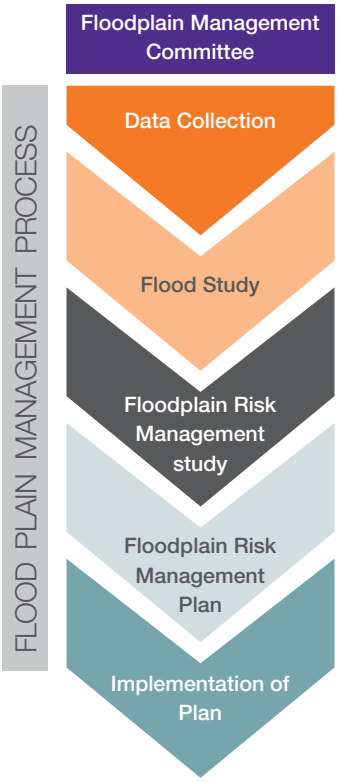


Figure 10. Flooding in Illawarra Road – circa late 1960s (Reproduced with the kind permission of Leslie Isted. Copy held in Marrickville Council's History Collection).

4.3.3. Stormwater Asset Management Planning

Integrated Planning and Reporting Framework

Marrickville Council recently implemented an asset management policy, strategy and plan completed in 2010 as part of the new Integrated Planning and Reporting Framework (IPR). The IPR resulted from the Department of Local Government recognising the need for improved asset management for councils' infrastructure assets, and includes statutory planning and reporting processes required by the Local Government Act 1993 and the Environmental Planning and Assessment Act 1979.

Integrated planning and reporting enables a more defined strategic force behind asset management. The asset management plan ensures the financially sustainable delivery of services from councils' infrastructure. The plan defines the services provided, how the services are provided and what funds are required, including actions for agreed levels of service in the most economical manner.

As part of Marrickville Council's resourcing strategy, the new Infrastructure Planning section was created in 2010/11 to improve Council's long-term strategic planning and management of community assets.

The profile of stormwater has steadily increased in recent years. Industry and government are now more than ever looking for opportunities to effectively manage stormwater as a resource and create more liveable environments. The asset management plans strategically introduce changes to existing service levels, construction techniques, and the design and maintenance of councils' assets. Council's first Stormwater Asset Management Plan 2010 is currently under review with a focus on improving its integration with the Community Strategic Plan.

The asset management planning process provides an opportunity to consider biotic and non-structural assets together with the built assets. It is a key step in the implementation of this Strategy for a Water Sensitive Community and in moving Marrickville LGA from a Drained City to a Water Sensitive City. The sustainable urban water management objectives form part of the level of service that Council provides the Community. The asset management plans need to translate the objectives into costs and actions relating to managing stormwater assets.

5. Marrickville's current planning context for water management

5.1 The Social Context

Marrickville Community Snapshot (ABS 2011)

- Population - 77,700
- Area – 17 sq km
- Private dwellings – 32,920
- Own/purchasing homes - 50%
- Average household water use 2010/11 - 185kL/year

Council has been engaging local communities on SUWM since 2005. It has documented the vision and goals of communities through four subcatchment management plans. These aspirations are reflected in this Strategy along with the following social factors that impact water management:

The community is changing its relationship with the environment (Marrickville Council, 2010)

- 87 species of native wildlife live in the Marrickville area.
- 94% of residents believe it is important to provide natural areas and green spaces.
- 73% of Marrickville residents believe it is important to restore the Cooks River and its foreshores.
- 45% of responses to the recent water survey of residents property owners and businesses in the Marrickville Valley (figures 11, 12 and 13) prioritised water saving and managing water pollution. (Ruby Cha Cha, 2011)

Figure 11. The Marrickville Valley subcatchment.

"Maintain lovely green space"

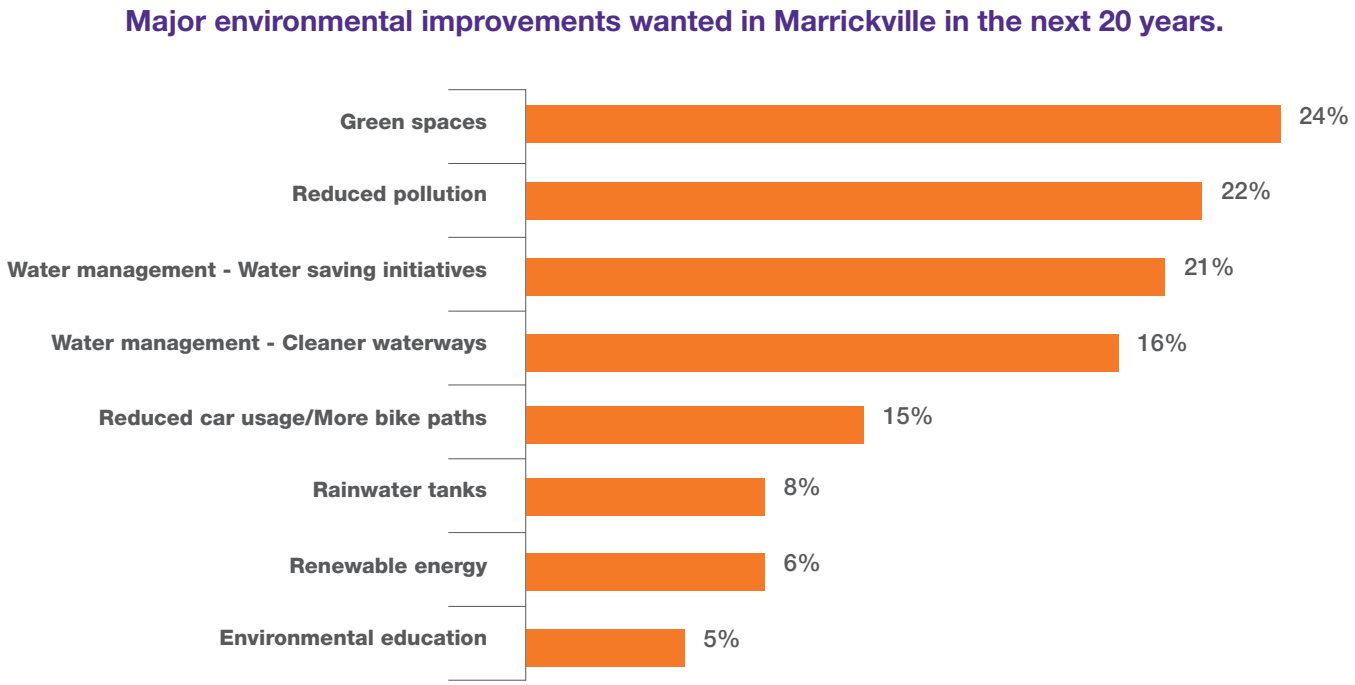


Figure 12. The 8 most mentioned environmental improvements wanted in Marrickville LGA in the next 20 years according to the survey of Marrickville Valley citizens (Ruby Cha Cha, 2011).

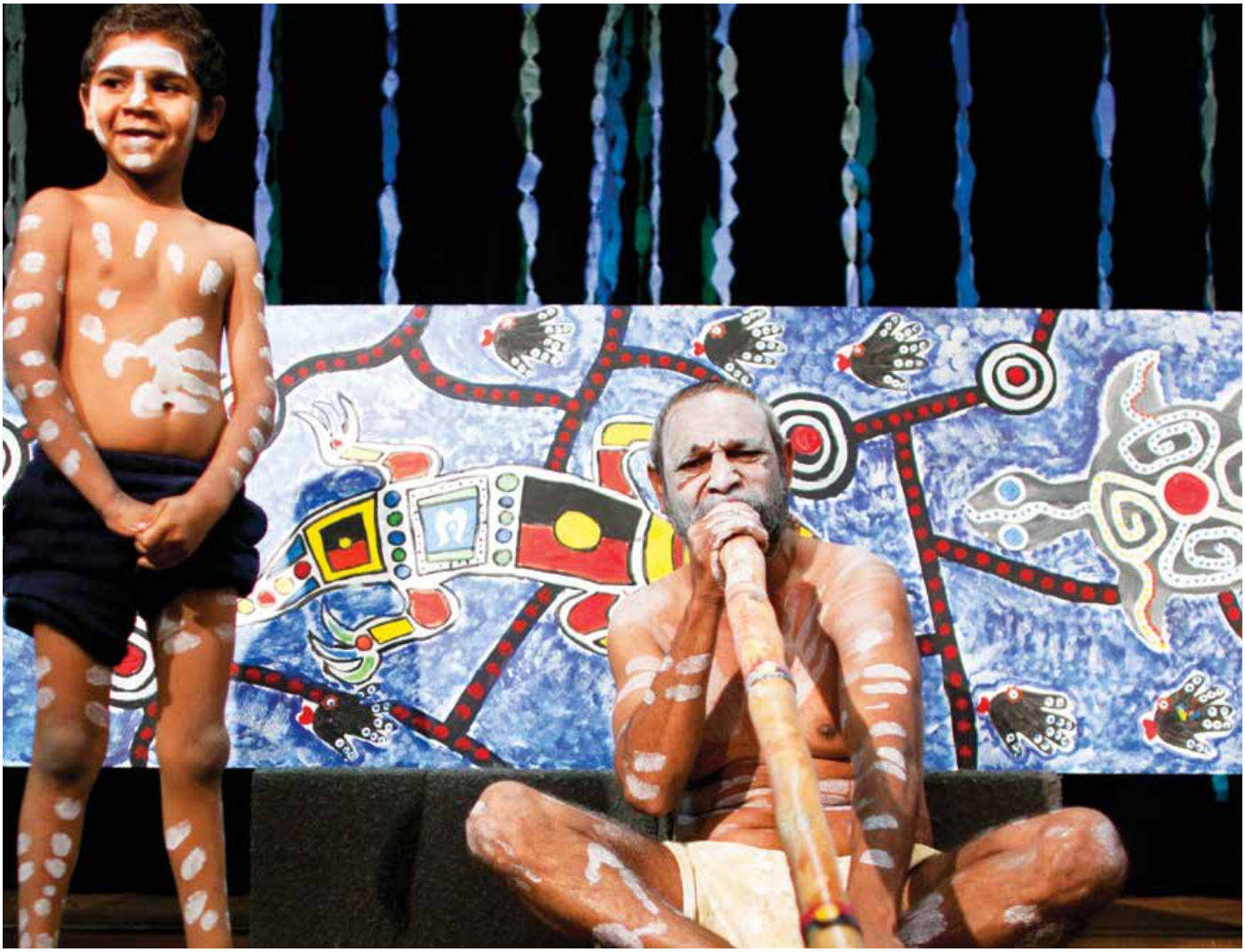
Figure 13. Clustering of the most commonly used phrases when describing improvements to Marrickville's environment wanted in the next 20 years (Ruby Cha Cha, 2011).

The community expects Marrickville Council to take the lead in partnership building and engagement (Marrickville Council, 2010):

- Marrickville Council has 13 Advisory and Consultative Committees, 3 specific to water management - the Marrickville Environment Committee, Marrickville Cooks River Committee, and the Marrickville Floodplain Management Advisory Committee.
- In 2011, four subcatchment community working groups work on programs related to their local areas, including the Illawarra Road, Tennyson Street, Riverside Crescent and Eastern Channel East subcatchment working groups.
- 56% of residents are satisfied that Marrickville Council informs them about its activities and services.
- 38% of residents are satisfied that Marrickville Council carries out good community consultation.

Land use planning is becoming more challenging (Marrickville Council, 2010):

- 45% of residents were satisfied that new developments protect and preserve heritage
- Over 4,150 new dwellings will need to be built in Marrickville to 2031
- By 2036, the impervious area of the Inner West is estimated to increase by 2% (SMCMA, 2012)



5.2. The Physical Context

5.2.1. The Water Cycle

Marrickville's water cycle (Figure 14) clearly shows the current way water is used in Marrickville LGA is unsustainable.

- Much more rain falls in Marrickville LGA than is brought in via Sydney Water's mains to supply the LGA.
- Most mains water leaves the catchment as sewage via the sewerage system. The treated wastewater is discharged into the Tasman Sea via the Malabar Ocean Outfall.
- A significant amount of Marrickville's rainfall runs off hard surfaces and into drains, picking up pollution that ends up in the Cooks River, Botany Bay, the lower Parramatta River and Sydney Harbour.

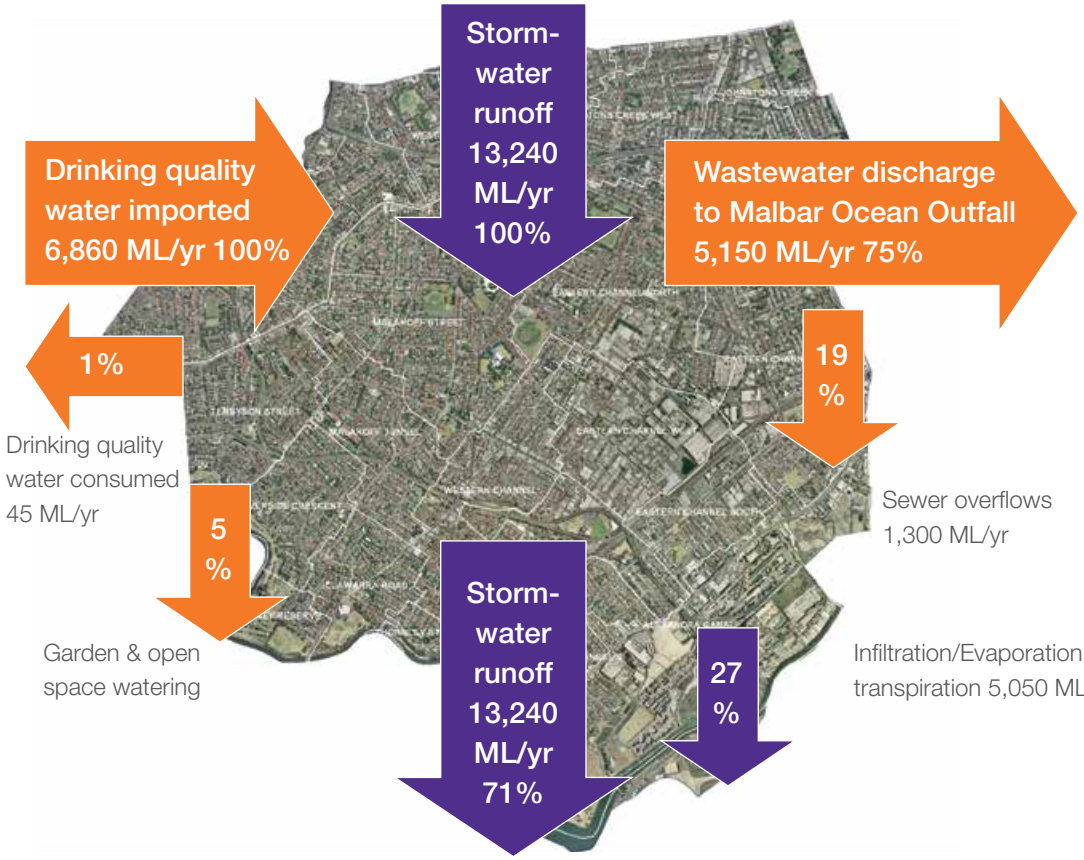


Figure 14. The water cycle in Marrickville (Equatica, 2010).

5.2.2. Marrickville's Catchments

Marrickville LGA has 21 subcatchments (see Figure 15). The six subcatchments north of Stanmore Road and New Canterbury Road flow to the Lower Parramatta River before entering Sydney Harbour. The 15 subcatchments to the south flow via stormwater channels to the Cooks River or Alexandra Canal and then to Botany Bay.

Subcatchments flow north to Lower Parramatta River and Sydney Harbour.

Subcatchments flow south to Cooks River, Alexandra Canal and then to Botany Bay.

Figure 15. The 21 subcatchment in the Marrickville local government area (Marrickville Council).

5.2.3. Impervious Area

Hard impervious surfaces (mainly public roads, roofs, driveways and car parks) cover around 76% of Marrickville LGA (see Figure 16).

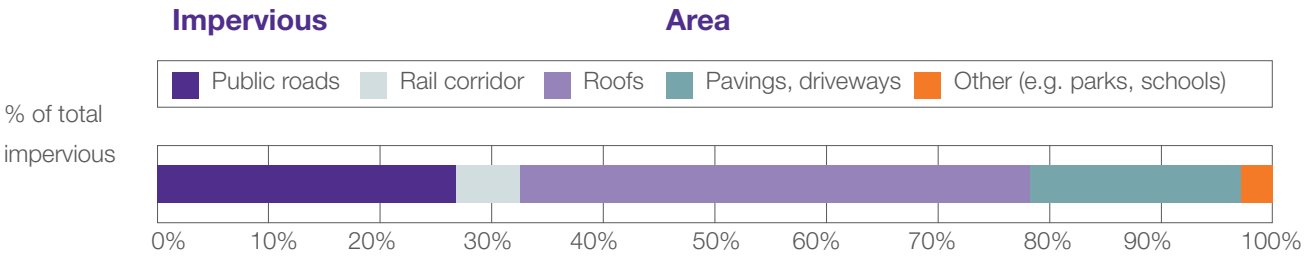


Figure 16. Relative proportion of different impervious surface areas (Equatica, 2010).

Impervious surfaces stop water from soaking into the ground. Examples include roofs, driveways, carparks, swimming pools, patios, paved areas, tanks, and other features that are waterproof to rainfall.

Understanding the Terminology

5.2.4. Water Quality - Stormwater Pollution

The stormwater drainage network combines runoff from roads with runoff from properties, including roofs. The combined runoff from roads and roofs is the largest source of stormwater pollution in Marrickville LGA (see Figure 17).

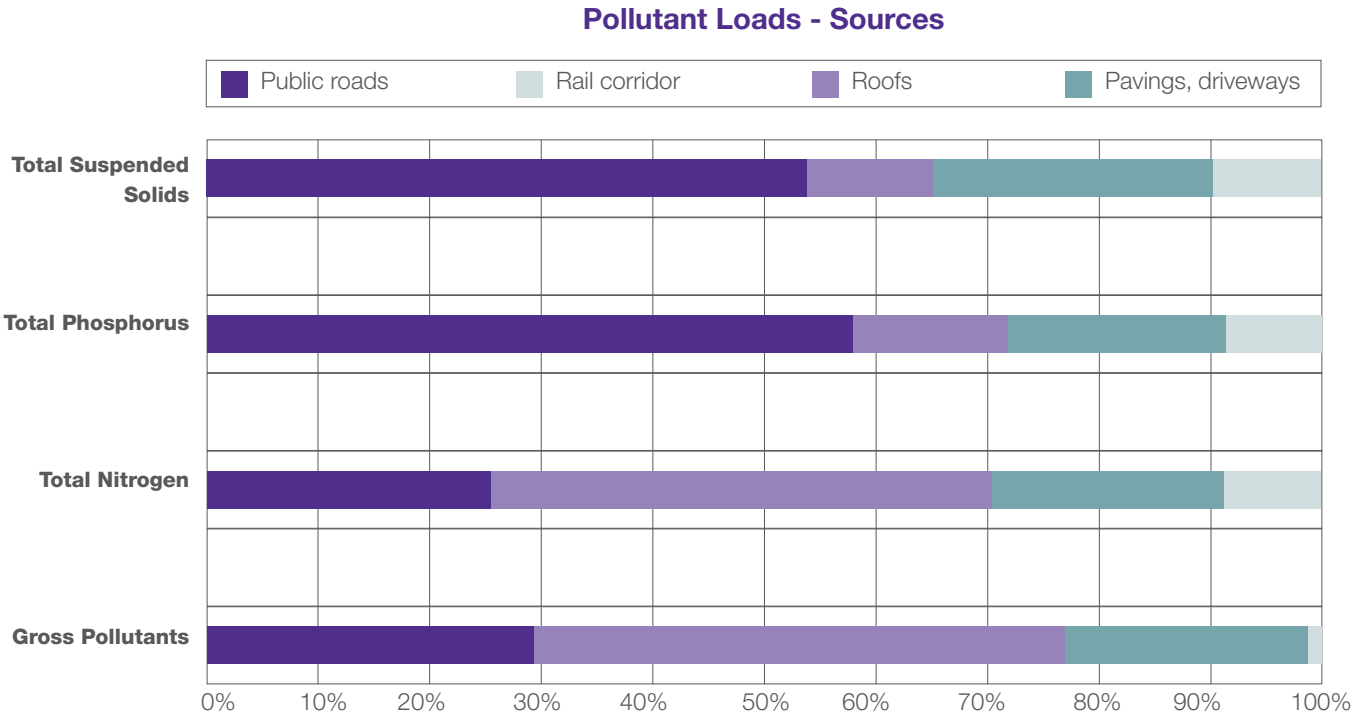


Figure 17. Proportion of common pollution types in runoff (Equatica, 2010).

- Suspended solids are small solid particles that stay in suspension in water.
- Gross pollutants include litter, coarse sediments and organic matter.

Water quality modelling identifies the degree of pollution coming from each source by looking at the different types of impervious areas. As seen in Figure 17, public roads contribute the largest amount of suspended solids and phosphorous, while roofs collect nitrogen and gross pollutants, including leaf litter, other organic matter and sediment.

Stormwater also collects sewer overflows containing pathogens and heavy metals from vehicles and roads.

Pollutants	What are they?	What are their impacts?
Organic Matter	> Leaves > Grass clippings > Human and animal faeces	Organic matter can impact on: > Biogeochemical processes (cycling of substances) > Nutrient cycling > Ability of organisms to use or degrade materials > Chemical transport and interactions
Gross Pollutants	> Litter > Coarse sediments > Organic matter	> Reduce stormwater drainage capacity > Impact on visual amenity > Impact on aquatic habitats > Impact on water quality indicators such as oxygen demand, hydrocarbons and heavy metal levels
Total Nitrogen Total Phosphorus	Nutrients from natural and non-natural sources including: > Atmospheric deposition > Soil particles > Human and animal faeces > Plant matter > Fertilisers > Vehicle exhaust	> Nutrients promote growth of aquatic plant life. In large concentrations they can produce algal blooms on the water surface > Algae are microscopic plants which occur naturally in water bodies. Increased nutrients promote algal growth resulting in a build up of toxins. Toxic algal blooms cause the closure of fisheries, water farming industries and public beaches
Suspended Solids	> Soil particles > Airborne particles > Sediment from erosion and land degradation	> Reduce the penetration of light through water impacting on the respiration of aquatic plants > Phosphorus, heavy metals and organic chemicals utilise sediment as the medium for transportation in urban runoff
Lead	Trace amounts derived from: > Petrol additives > Hydrocarbons > Old paint (prior to 1970) > Lead acid batteries	> Impact of metals on water bodies can vary widely. Impacts are affected by complex interactions with biophysical parameters such as pH, dissolved oxygen and temperature > Lead can be harmful or deadly to aquatic and human life. > Low levels of zinc can be deadly to aquatic life
ZInc	Trace amounts derived from: > Vehicle wear (tyres) > Herbicides > Galvanised roofs	
Hydrocarbons	> Mineral oils > Automotive oils > Diesel fuel	> Impact on visual amenity > Lowers water quality > Increases chemical oxygen demand > Can be highly toxic to aquatic life in low to moderate concentrations

Pathogens are the viruses and microorganisms that can cause illness. Major sources in stormwater are sewage overflows and animal droppings. Pathogens are a major concern when they are in streams, rivers, lakes, seas and oceans.

Understanding the Terminology

5.2.5 Water Quantity

Flooding

In Marrickville LGA, the source of flooding is either mainstream flooding from the Cooks River or flooding resulting from overland flow from stormwater runoff. Serious flooding in Marrickville usually occurs when there is a combination of heavy rainfall and high tides in the Cooks River.

Major floods in Marrickville

Records of past floods across the Marrickville LGA are limited; however, the following are some of the widely reported events since the second half of the Nineteenth Century:

- 25-27 May 1889 – the highest flood on record. Seventeen inches of rain in Sydney; flooding from Victoria Road to Unwins Bridge Road. Tuesday 28 May 1889, 3m deep floodwaters along Victoria Road after four days of rain (SMH, 28 May, 1889).
- 1 June 1897 – Heavy downpours and high tide led to closing of the Cook's River floodgates. 'Tramvale' area of Marrickville converted into a lake (SMH, 2 June 1897). Cottage on corner of Meeks Road (now Carrington Road) and Renwick Street reported to be "4ft deep" (1.2m).
- 17 January 1911 – Width of Cook's River near Tempe reportedly increased from 20 yards (18m) to quarter of a mile (400m); residents from this part of Tempe complained the floods "create swarms of mosquitoes, and outbreaks of fever." The SMH reporter noted, "the overflow from the stormwater sewer must bring unpleasant consequences." (SMH, 19 January, 1911).
- 25 January 1937 - thunderstorm tore through Marrickville, Mascot, Botany and Matraville. Five people died and many injured as buildings collapsed and heavy rain generated flash floods.
- November 1961- second highest known flood.
- 8 March 2012 - Residents from 20 homes in three Marrickville streets evacuated due to severe flash flooding; the Cooks River flooded, reaching over 1.5 metres at Tempe Bridge.

Cooks River

The last large flood on the Cooks River was the event in November 1961. However, small events occur every few years with the last being on 8 March 2012.

Years the Cooks River is recorded as flooding (Webb McKeown and Associates, 1994, and Marrickville Library History Services):

1887	1925	1938	1950	1963	1978
1889	1926	1942	1952	1964	1983
1897	1927	1946	1953	1969	1993
1911	1931	1947	1956	1971	2008
1913	1933	1948	1957	1974	2011
1920	1937	1949	1961	1975	2012

Whenever the drainage system is overloaded from heavy or lengthy rainfall or because parts of the engineered system fail, such as pumps, flooding occurs at various scales. The drainage system also transports stormwater runoff that picks up pollutants into local waterways, including the Cooks River and Lower Parramatta River.

The flood engineering practice in Marrickville LGA is now moving towards the Waterways City as designs include a combination of constructed pipelines, channels and designed floodways, typically incorporating green space. Although it is still a centralised drainage system, this type of stormwater system allows for flooding of the constructed stormwater system without endangering property. While this approach has become mainstream since the 1970s, it is more challenging to implement in the Marrickville LGA as the area was already developed prior to this practice becoming established, and property acquisition is very expensive.

5.2.6 Stormwater Infrastructure

The stormwater infrastructure in the Marrickville LGA is one of the oldest in Sydney, dating back over 100 years. Stormwater assets can be difficult to manage with the limited information on location and condition of the pipe network. Over the past 20 years, engineers have mapped the extent of the underground pipe network. Council commenced a closed circuit television investigation in 2011 to verify the underground network.

Council's stormwater assets include:

- 70km of stormwater pipes (75mm to 1.8m).
- 5,628 stormwater structures (pits).
- 22 gross pollutant traps.
- 1 pump station at Camdenville Basin.
- 5 detention Basins (Marrickville Oval - 4,200m^2 channel, Camdenville Basin - 7700m^3, Tempe reserve – 3 basins 1,200m^2, 2,000m^2, and 5,200m^2.
- 16 Stormwater treatment systems (rain gardens, porous paving)

The stormwater network includes pipes and other infrastructure owned and managed by Sydney Water Corporation (18km of pipes and the 16,300m^2 Sydenham detention basin), Roads and Maritime Services (ex RTA) (11km pipes), and RailCorp NSW (3.5km pipes).

The gradual development and urbanisation of the Marrickville LGA has meant that stormwater infrastructure has been built and modified over time, responding to the community's need for flood mitigation. The works were generally not sufficient for future development and did not plan for water quality improvements. Consequently, the stormwater system in Marrickville LGA performs to a number of different design standards.

A recent assessment of the condition of a small number of Council's stormwater pipelines showed that the pipe network requires significant renewal and upgrade. Stormwater infrastructure renewal and upgrade programs will use sustainable water management objectives and include water sensitive design technologies where possible. The costs associated with this transition will be clearly defined and included in Council's Resourcing Strategy.

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