DRAFT Upper Wolli Creek Subcatchment Management Plan - Rockdale City Council

OurRiver
cooks river sustainability initiative

ROCKDALE CITY COUNCIL
On Historic Botany Bay

NSW Environmental TRUST

COOKS RIVER FORESHORES

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Executive Summary

This document has been developed for Rockdale City Council as part of their involvement in the OurRiver - Cooks River Sustainability Initiative. The OurRiver project is an initiative of the Cooks River Foreshore Working Group and is funded by the NSW Environmental Trust's Urban Sustainability Program from 2007 to 2010. It is a partnership between Ashfield, Bankstown, Canterbury, City of Sydney, Hurstville, Marrickville, Rockdale and Strathfield councils, and Monash University. The project is focusing on six local areas (known as subcatchments) and is working with councils and communities to develop subcatchment management plans that reflect local conditions, ideas and needs. The aim of the subcatchment management plan is to improve the health of the Cooks River and to involve local communities in planning and implementing more sustainable water management solutions.

A community water vision and goals and ideas (page 18-21) to help achieve that vision were developed by members of the Upper Wolli Creek Subcatchment community at workshops held in March, April and May 2009. The Upper Wolli Creek Subcatchment Management Plan will link into Rockdale City Council's strategic direction of creating 'A Liveable City with Lifestyle Quality' and will help Council to achieve the desired outcome of enhancing the City's natural environment and demonstrating leadership in environmental management. The ideas provided by the community and other stakeholders as part of this planning process have formed the basis of the actions presented in this plan (pages 13-17). These actions have been assessed by Council's staff and where possible will be integrated into current and future education programs, policy and programmed works.

The Upper Wolli Creek Subcatchment community's future water vision is shown below:

"In 2050 our community understands and is aware of the importance of water and energy conservation. Our public spaces and streets are clean and cared for by all. Waste and rubbish are no longer a problem. Our catchment is planted with native vegetation and there are roadside gardens which clean the stormwater before it flows into Wolli Creek. The amount of stormwater that runs off the catchment is reduced through smarter urban design. Wolli Creek is safe to swim in again. All our homes and buildings, including those used by industry, are sustainable and designed to capture, treat, store and reuse all water sources. Energy is generated locally from renewable resources to meet our communities demand."

Upper Wolli Creek 2050 Community Water Vision

This document was prepared in December 2009 by Sarah Kamarudin and Kate Christianson, OurRiver - Cooks River Sustainability Initiative and Alexandra Vandine, Environmental Strategist, Rockdale City Council. The authors would like to acknowledge the input and assistance provided by Rockdale Council staff, Upper Wolli Creek Subcatchment residents and other stakeholders who participated in interviews, attended meetings and workshops, and provided valuable information and support along the way.

Contents

Front Cover: Clockwise from top left corner: 1) Wolli Creek Reflections by Barry Porter, 2008; 2) Rainwater harvesting and reuse scheme, Strathfield Municipal Council NSW; 3) Permeable paving; 4) Streetscape raingarden at Victoria Park, Zetland; 5) Wolli Creek Channel, Kingsgrove NSW.

NB: The ABS 2006 Census Data used in this booklet was collated prior to the finalisation of the Upper Wolli Creek Subcatchment boundary, therefore the figures for the current Subcatchment may vary slightly from those shown in the pages of this booklet.

Glossary

Catchment: An area bounded by high points such as hills that funnel rain and run-off water to a creek, river, lake or ocean. Creeks and streams carry much of the water in natural catchments, but in urban catchments creeks and streams have often been replaced by stormwater drains.

Greywater: Water that has been used (for domestic purposes) in the laundry, shower, bath, hand basins and is re-used for purposes such as watering the garden.

Rainwater: Water that falls as rain.

Stormwater: Water (usually rainwater) that flows over surfaces, such as pavements, and makes its way into stormwater drains often via the gutter.

Subcatchment: An area that collects and funnels rainwater to a smaller waterway before it flows into a larger waterway (e.g., Upper Wolli Creek flows into the Cooks River). The water flowing from many subcatchments comes together in a creek, river, lake or ocean. OurRiver is focusing on six subcatchments within the Cooks River catchment.

Sustainable Urban Water Management (SUWM)*: The holistic management of water (including water supply, rainwater, stormwater and waste water) which minimises the import of large quantities of potable (drinking quality) water into cities and the discharge of wastewater and stormwater to urban waterways and oceans. SUWM includes WSUD (see definition below) but is a broader term used to include non-structural elements related to water management such as policy, funding, education and community engagement.

Wastewater: Any water that has been adversely affected in quality by human influence. It includes liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations.

Water Cycle: Describes the continuous movement and transformation of water (vapour, liquid, solid) on, above and below the Earth's surface. The urban water cycle typically includes how water enters, is used and leaves an urban setting (USGS 2009).

Water Sensitive Urban Design (WSUD)*: Integrates urban planning with the management, protection and conservation of the urban water cycle. WSUD ensures that urban water management is sensitive to natural hydrological and ecological processes (Wong 2007). WSUD aims to protect natural systems (e.g., creeks and rivers), protect water quality (reduce pollution), reduce demand on drinking water supplies and reduce the intensity of stormwater flows to waterways. Some examples of WSUD are:

- Harvesting rainwater or stormwater – lessens the demand on imported drinking water supplies (e.g., water from Warragamba Dam) and also reduces the amount of run-off and pollution that reaches our local waterways (creeks, rivers and oceans).
- Raingardens and swales – mimic processes that take place in more natural non-urban areas, they can slow or reduce the flow of stormwater reaching waterways, increase the amount of water that soaks into the soil and filter pollutants from stormwater.

**Various definitions exist for Sustainable Urban Water Management and Water Sensitive Urban Design. In this document the two terms are used according to the definitions on this page.*

WSUD streetscape on Rawson Street, Croydon Park. Photo courtesy of Ashfield Council.

Water feature that uses filtered rainwater, Kogarah Town Square. Photo courtesy www.wsud.org.

Introduction

PURPOSE OF THIS PLAN

This Plan provides information on the social and physical characteristics of the Upper Wolli Creek Subcatchment and also describes how water is currently managed in the Subcatchment. The results of the planning process undertaken as part of the OurRiver project, and options for improving water management in the area are also detailed within this Plan. This document is designed to be used by all stakeholders (including Council, community and state agencies) to ensure more sustainable water management in the Upper Wolli Creek Subcatchment.

WHY IS THIS PLAN NEEDED?

Most water used in the Upper Wolli Creek Subcatchment comes from Warragamba Dam and is treated to a drinking quality standard. As of 2010 up to 15% of Sydney's water is supplied from the Kurnell desalination plant; this water is also treated to drinking quality standard. However only 1% of this drinking quality water is used in the Subcatchment for drinking and cooking - the rest is used for purposes that do not require such high quality water, like watering gardens and toilet flushing. Rainwater is an under utilised source of water in Sydney. In the Upper Wolli Creek Subcatchment most rainwater washes directly into Wolli Creek carrying with it pollutants such as litter, and petrol and oil derivatives. This Plan identifies potential solutions to problems such as the growing demand for water and the poor health of the Cooks River. Information on the way this plan links into Council's existing water management framework as well as how it will be used and implemented within Council can be found on page 4.

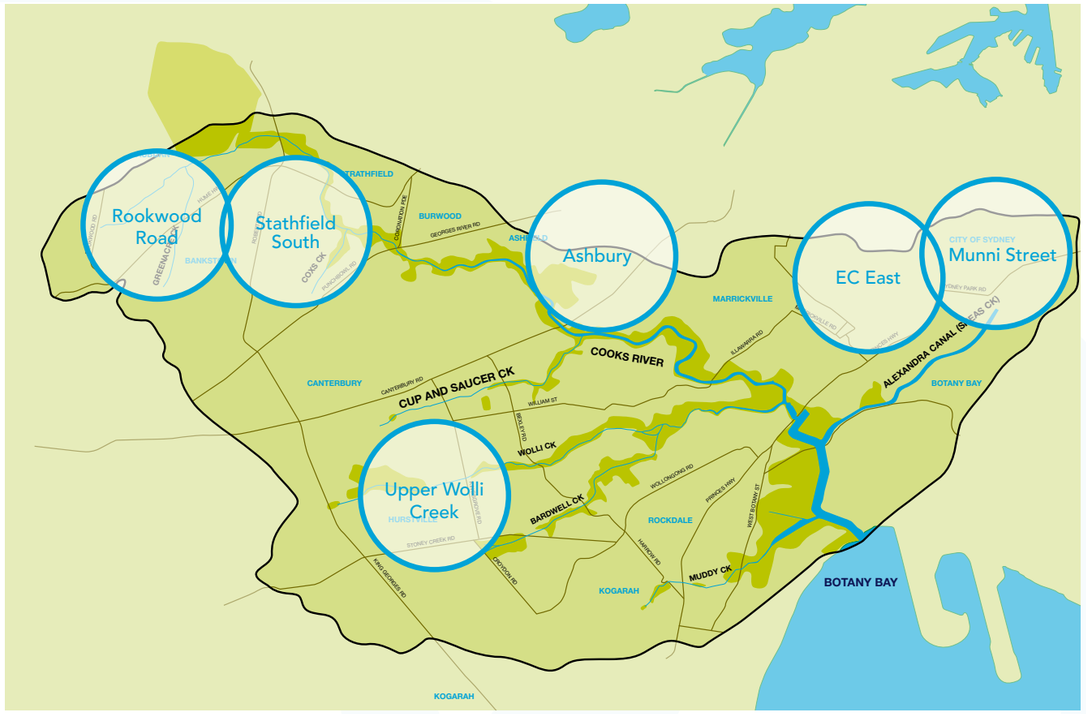
OURRIVER - COOKS RIVER SUSTAINABILITY INITIATIVE

OurRiver is a research project that is addressing urban water problems in innovative ways to improve the health of the Cooks River, and to increase the use of local water sources such as rainwater. OurRiver is an initiative of the Cooks River Foreshore Working Group and is funded through the NSW Environmental Trust's Urban Sustainability Program from 2007 to 2010. The project is a partnership between eight Councils (Ashfield, Bankstown, City of Canterbury, City of Sydney, Hurstville, Marrickville, Rockdale City, Strathfield) and Monash University.

OurRiver aims to facilitate a catchment-wide shift to sustainable urban water management, and to establish a catchment-wide alliance to support the ongoing rehabilitation of the Cooks River. The project is focusing on six local areas (known as subcatchments) and is working with Councils and communities to develop subcatchment management plans that reflect local conditions, ideas and needs. A map of the six OurRiver subcatchments is shown on this page. The OurRiver planning process is different from traditional processes due to its collaborative approach involving council, residents and other stakeholders, in its analysis of social and physical characteristics at the subcatchment scale, and its review of councils' current approach to water management.

COOKS RIVER CATCHMENT

Wolli Creek is the largest of four major tributaries to the Cooks River. The Cooks River starts in Bankstown and flows 23km east to discharge into Botany Bay. The River is regarded as one of the most polluted urban rivers in Australia - a result of its historical use as a drain by industries along the River and the more current problems of polluted stormwater run-off from urban areas, and sewage overflows. The Cooks River Catchment covers approximately 11,000 hectares and is home to more than 500,000 people (CRVA 2009). There are 13 local councils within the Catchment.



The Cooks River Catchment showing the location of the six OurRiver Subcatchments.

Sustainable Water Management Options - structural

Options for Water Sensitive Urban Design in the Upper Wolli Creek Subcatchment

In order to help achieve the Upper Wolli Creek Subcatchment community water vision, the OurRiver team has identified several sites within the Upper Wolli Creek Subcatchment that are potentially feasible for building WSUD features. The OurRiver team, under the supervision of a specialist environmental engineering consultant, is developing structural concept designs for these sites where they are:

- deemed feasible
- cost effective
- determined to provide the maximum environmental benefit
- going to enhance the natural beauty and amenity of the local environment

The concept designs will utilise the WSUD technology that is determined to be most appropriate for that site. Raingardens, swales, permeable paving and rainwater harvesting are some of the WSUD measures that will be investigated. The sites that have been identified are in a variety of locations across the Subcatchment and represent both water quality and water conservation projects.

The potential sites/structural actions identified here do not represent a definitive list of potential actions for the Subcatchment. Further investigation will reveal other opportunities for WSUD technologies that will help reduce the amount of pollutants that leave the Subcatchment as well as reduce the growing demand on the drinking water supply.

The OurRiver project has investigated opportunities for WSUD on council land only. Opportunities may also exist on private and other government owned land within the Subcatchment.

Structural action for the Upper Wolli Creek Subcatchment

As part of the OurRiver project, each council will receive funding for improving stormwater quality. Rockdale City Council and OurRiver staff have selected the raingarden in Gilchrist Park and the rainwater harvesting and reuse scheme at the Kingsgrove-Bexley North Community Centre to receive this funding. These works will be completed in 2010. See pages 16-17 for more information on these structural actions.

Rockdale LGA's section of the Upper Wolli Creek Subcatchment showing sites that are potentially feasible for WSUD. These sites have been identified through the OurRiver project.

Planning Process

The planning process undertaken as a part of the OurRiver project builds on rigorous research into urban water management in New South Wales (Brown, 2003). The research detailed three key elements that were necessary for ensuring successful implementation of sustainable urban water management:

1. Due to the complexity of urban water problems, the development of effective solutions requires the involvement of a range of professionals from engineers to planners to ecologists and social scientists.
2. The people affected by urban water problems, including residents, businesses, community groups and government departments need to work more closely to identify solutions.
3. Plans must be developed on a scale smaller than a whole river catchment in order to account for the variation in communities and physical features along the river and to enable the use of practical 'locally grown' solutions to urban water problems.

To address the elements outlined above, the planning process for the Upper Wolli Creek Subcatchment entailed:

- Collaboration within Council - staff from different departments including Community Services, Engineering, Urban and Environmental Strategy and Parks were involved in the planning process;
- Collaboration with local residents, businesses, community groups and government departments to develop a future vision for the Subcatchment and interim goals and actions in order to achieve the vision;
- Planning on the Subcatchment (i.e., neighbourhood) scale, which allowed for detailed social, physical and organisational profiling to ensure solutions and strategies developed are right for the Subcatchment and its community.

Upper Wolli Creek 2050 Community Water Vision

"In 2050 our community understands and is aware of the importance of water and energy conservation. Our public spaces and streets are clean and cared for by all. Waste and rubbish are no longer a problem. Our catchment is planted with native vegetation and there are roadside gardens that clean the stormwater before it flows into Wolli Creek. The amount of stormwater that runs off the catchment is reduced through smarter urban design. Wolli Creek is safe to swim in again. All our homes and buildings, including those used by industry, are sustainable and designed to capture, treat, store and reuse all water sources. Energy is generated locally from renewable resources to meet our communities demand."

Photos from left to right: 1) Upper Wolli Creek planning forum, 2) residential rainwater harvesting, 3) Upper Wolli Creek planning forum, 4) typical house in the Subcatchment. All photos courtesy OurRiver.

Subcatchment Planning Implementation

How Does Subcatchment Planning Fit With Existing Policy?

Federal

The National Water Initiative (NWI) is an agreement between the Federal Government and all state and territory governments. The NWI includes actions related to improving the capacity of all relevant stakeholders (including governments and communities) to achieve Sustainable Urban Water Management. Subcatchment planning is about councils, residents and other stakeholders working together to achieve this aim. Subcatchment planning also aims to deliver the following NWI objectives:

- provide healthy, safe and reliable water supplies;
- increase water use efficiency in domestic and commercial settings;
- encourage re-use and recycling of wastewater where cost effective;
- encourage innovation in water supply sourcing, treatment, storage and discharge.

State

There are a number of state level policies and plans concerned specifically with water, catchment management and local planning. This includes:

- NSW Government Integrated Planning and Reporting
- NSW Government Water for Life Metropolitan Water Plan
- Sydney Metropolitan Catchment Management Authority Catchment Action Plan

Subcatchment planning shares the following aims with these plans:

NSW Government Integrated Planning and Reporting

- Integrated planning with physical, social and organisational characteristics taken into account
- Increased stakeholder engagement with councils, state agencies, residents and other stakeholders working together on long term plans
- Improved connection between councils' and communities' visions

Water for Life Metropolitan Water plan

- Securing a sustainable and secure water supply through recycling and water efficiency
- Protecting rivers and their catchments

SMCMA Catchment Action Plan

- Improvement in condition of riverine systems and important wetlands
- No decline in the condition of marine waters and ecosystems
- More people, communities and organisations have increased capacity to contribute to natural resource management
- Increase in native vegetation

Local

The development of the Upper Wolli Creek Subcatchment Management Plan links into Rockdale City Council's strategic direction of creating 'A Liveable City with Lifestyle Quality'. The Plan will help Council to achieve the desired outcome of enhancing the City's natural environment and demonstrating leadership in environmental management.

How Will the Upper Wolli Creek Subcatchment Management Plan Be Implemented?

The comments and ideas received from the community and other stakeholders as part of the planning process have formed the basis of the options presented in this Plan. These options have been assessed by Council's staff and where possible will be integrated into current and future programmed works.

Underground water storage tanks during installation at Pratten Park, Ashfield. Photo courtesy of Ashfield Council.

Upper Wolli Creek Subcatchment

The complexity of urban water problems requires localised solutions. It is therefore necessary to understand local characteristics as part of any urban water planning process. As part of the OurRiver project detailed research was undertaken to understand the physical characteristics of the Upper Wolli Creek Subcatchment, its community and the organisations relevant to water management in the area. This research assists the development of solutions that reflect local conditions, views and needs.

The Upper Wolli Creek Subcatchment is positioned across three local government areas: Canterbury, Hurstville and Rockdale. The Subcatchment area was collectively chosen by staff from the three councils to:

1. Encourage further collaborative planning between the three councils,
2. Encourage council-stakeholder engagement and
3. Improve the water quality and overall health of Wolli Creek.

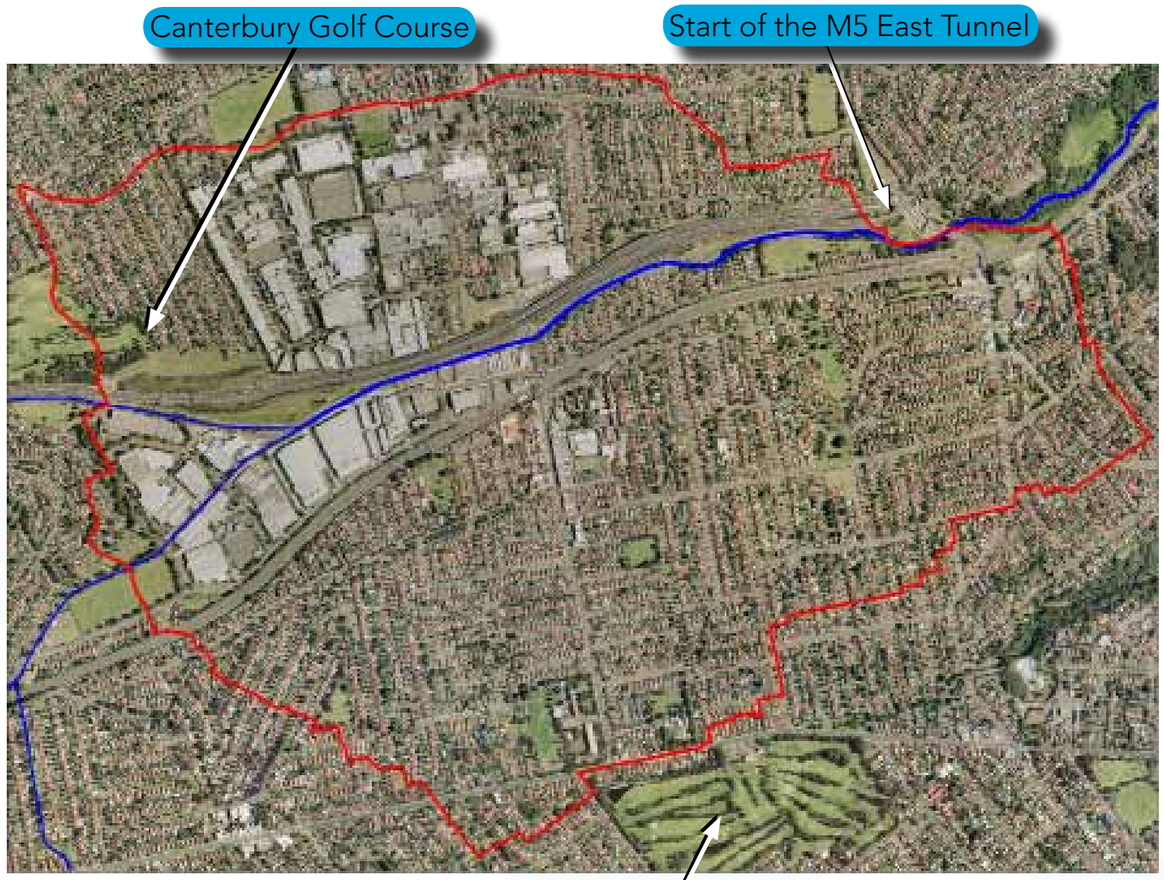
The Upper Wolli Creek Subcatchment occupies 385 hectares and includes parts of the following suburbs: Kingsgrove, Bexley North and Beverly Hills. The area is roughly bordered by Stoney Creek Road to the south, Homer Street and St Albans Road to the north, Bexley and Illawarra Roads to the east, and Tallawalla Street to the west. Stormwater from this area flows directly into Wolli Creek, which is the largest of four major tributaries of the Cooks River.

Land use within the Subcatchment is predominately residential with a notable amount of industrial development concentrated in the north and western areas of the Subcatchment, and local businesses located primarily along Kingsgrove and Bexley Roads. There are numerous parks, reserves and sporting fields throughout the Subcatchment. The Subcatchment also includes distinct landmarks such as the M5 freeway, the East Hills railway line, Kingsgrove and Bexley North train stations.

According to the Australian Bureau of Statistics 2006 Census:

- 30% of households have a weekly income of $1,400 or more
- 40% of residents over 15 years old hold a tertiary qualification
- 40% of the population is aged between 25 and 54 years
- 57% of residents speak a language other than English at home
- 51% of residents own their own home, 24% are purchasing their home
- 72% of residents lived at the same address five years before the 2006 Census

For more information on demographics and social research results see pages 9-10.



Upper Wolli Creek Subcatchment

The Wolli Creek Valley, located immediately down stream from the Upper Wolli Creek Subcatchment, contains one of the largest and most significant areas of bushland in inner southwest Sydney. The Wolli Creek Valley not only provides important habitat for many plant and animal species but it is also an area of cultural and historical significance. This unique remnant of bushland features walking tracks, sandstone escarpments, rich and diverse bird life, wetlands, park areas, heath and woodland forests. Currently eight hectares of the bushland along the Wolli Creek has been declared Wolli Creek Regional Park and is managed by National Parks and Wildlife Service (NPWS). Additional land is in the process of being acquired by NPWS that will see the Regional Park increase in size to 50 hectares (WCPS 2009).

Subcatchment Water Budget

The Subcatchment water budget shows the water entering the area from rainfall and from Sydney's primary drinking water supply at Warragamba Dam (potable water). This diagram also shows how the water is used and where it goes after use.

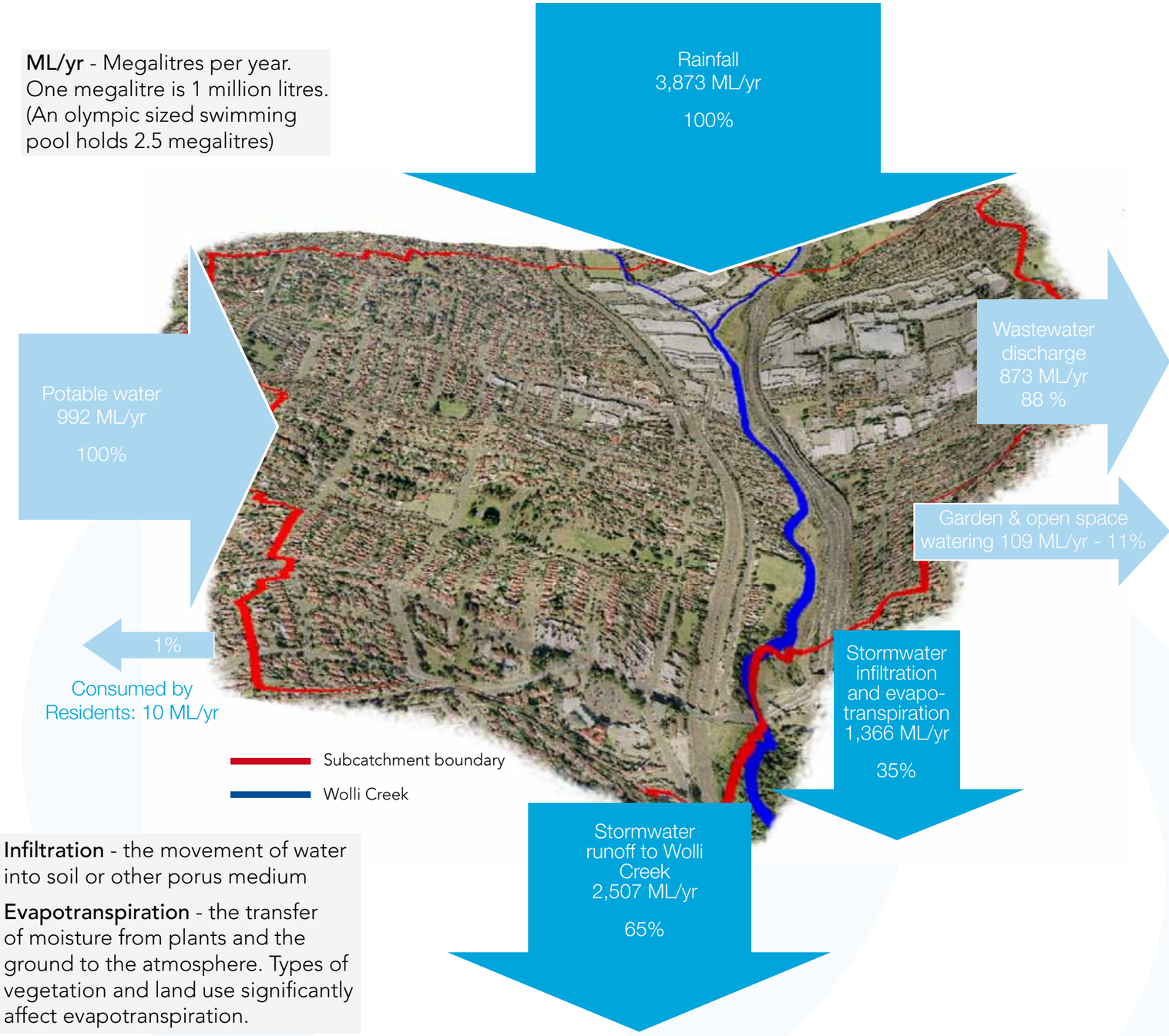
This water budget is based on data from the Bureau of Meteorology and Sydney Water, and stormwater modelling undertaken by the OurRiver team.

The water budget shows the following:

- Only 1% of potable (drinking quality) water is used for drinking and cooking.
- Rainfall is almost four times the amount of potable water imported from Warragamba Dam.
- 65% of rainfall flows directly to Wolli Creek as runoff.

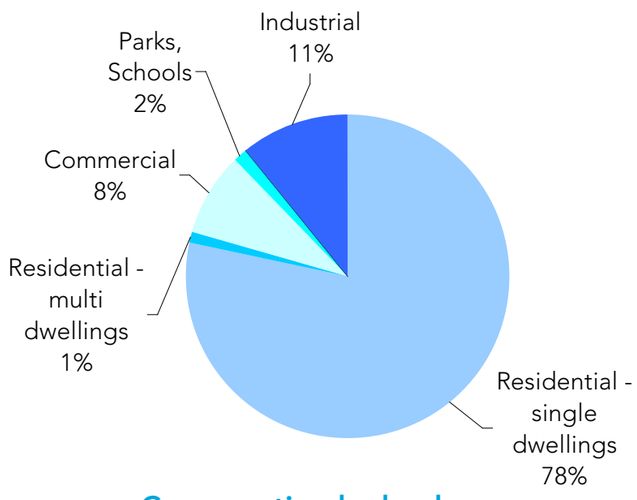
Local rainfall could be utilised for purposes that do not require potable water such as toilet flushing and garden and open space watering.

ML/yr - Megalitres per year. One megalitre is 1 million litres. (An olympic sized swimming pool holds 2.5 megalitres)



Infiltration - the movement of water into soil or other porus medium

Evapotranspiration - the transfer of moisture from plants and the ground to the atmosphere. Types of vegetation and land use significantly affect evapotranspiration.



Consumption by land use

NB: The above image has been distorted in such a way that it reflects the actual topography of the Subcatchment.

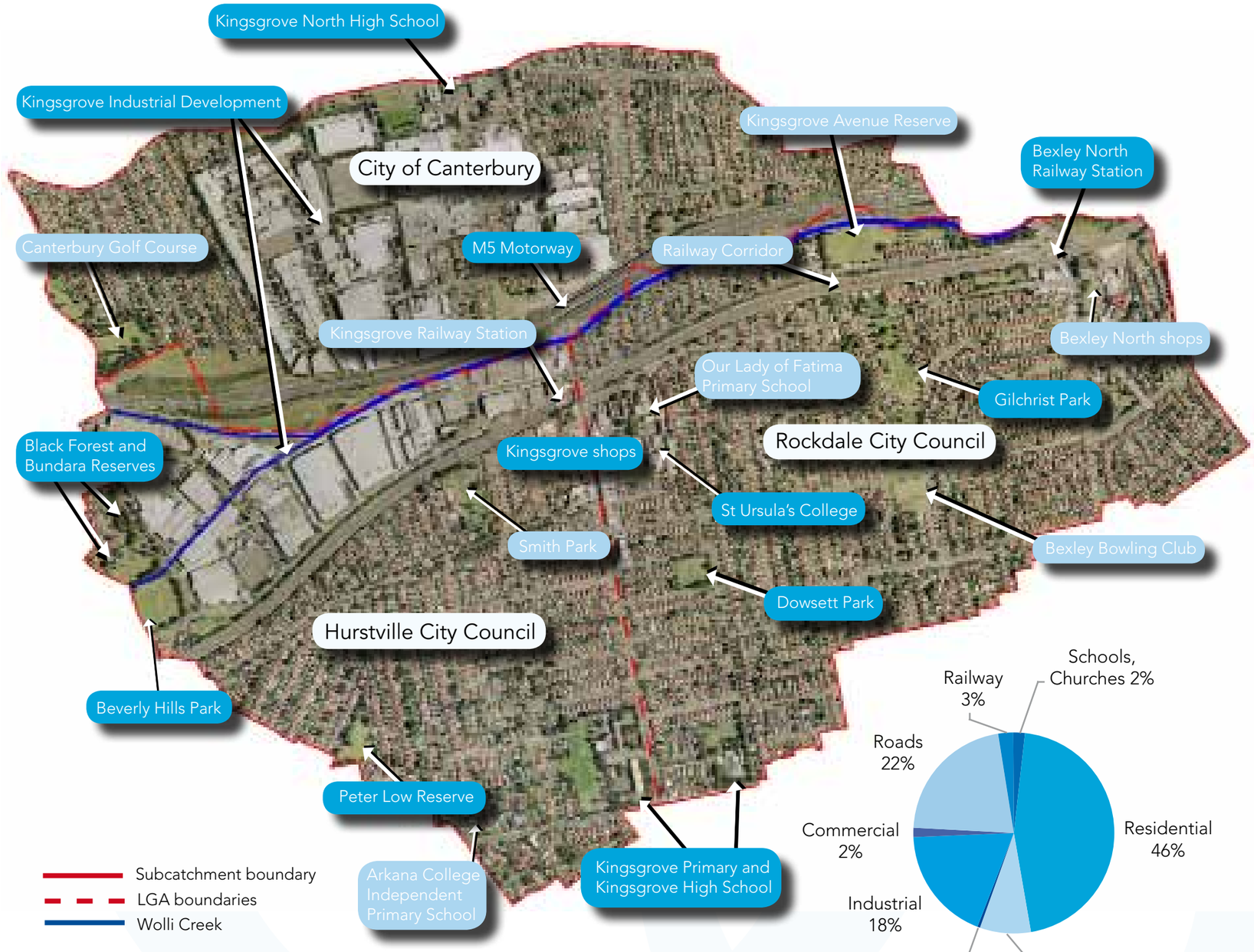
Physical Characteristics

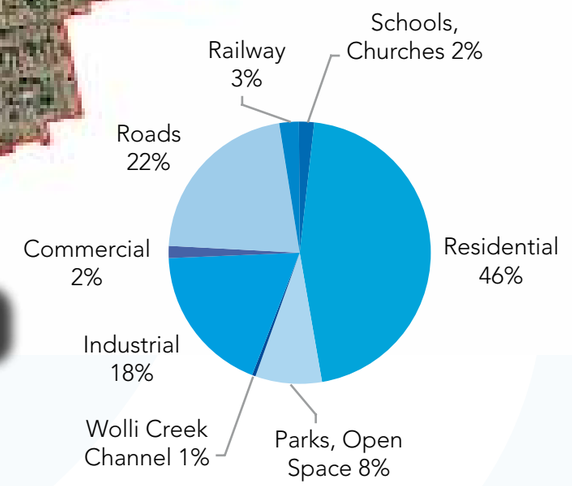
Detailed information about the Subcatchment's physical characteristics has been gathered to help identify opportunities and constraints for the application of Sustainable Urban Water Management practices.

Land use

Subcatchment area: 385 hectares (ha)

- The Subcatchment is positioned across three local government areas: Canterbury 118ha, Hurstville 120ha and Rockdale 146ha.
- Subcatchment land use includes a mix of residential, industrial, commercial, roads, railway and open space.
- The largest land user in the Subcatchment is residential development; the average residential lot in this Subcatchment is 600m^2.
- Open space occupies 8% of the Subcatchment, this includes at least 15 parks, reserves and sporting fields, Canterbury Golf Course, the M5 East linear park and land bordering the railway corridor.
- The RTA is a significant landholder, with roads occupying 22% of the Subcatchment area.
- Roads, railway corridors and large developments (e.g., industrial estates) can be barriers to the physical movements of the local population. The M5 freeway, the East Hills railway corridor and Wolli Creek all bisect the Subcatchment in an east-west direction, creating physical barriers within this area.
- The Wolli Creek flows west to east through the middle of this subcatchment. The Creek is a concrete-lined channel for the entire length of the Subcatchment. Stormwater is delivered to the Creek through the Subcatchment's existing pits and pipes network.





Land use within the Subcatchment

Physical Characteristics

Residential Dwellings

There are approximately 3,532 residential dwellings in the Subcatchment (ABS 2006). The type of dwelling affects the type of water solutions that are possible (e.g., 90% of dwellings in this Subcatchment are separate houses on medium sized lots, which allows space for gardens and rainwater tanks).

90%
Separate houses

1%
House or flat attached to shop

3%
1 storey semi, row, terrace or townhouse

2%
1 or 2 storey block – Flat, unit, apartment

3%
2 storey or more semi-detached, row or terrace

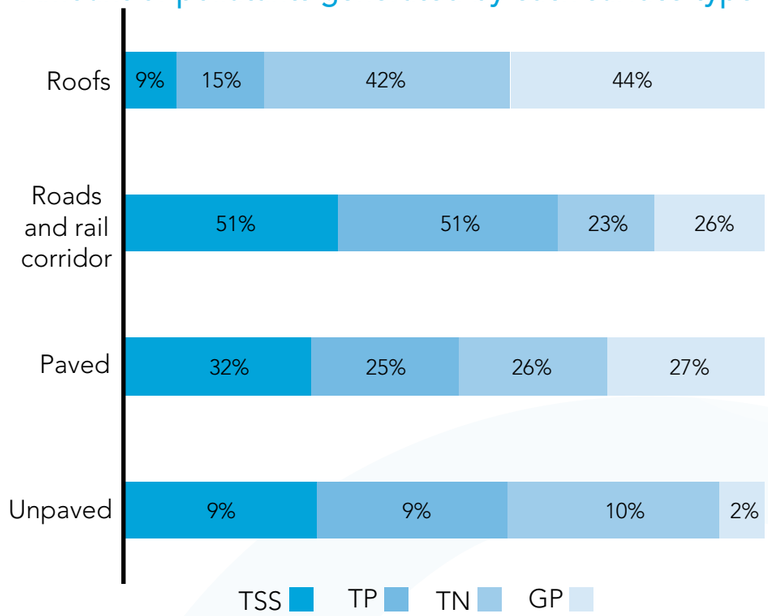
1%
3 or more storey block – Flat, unit, apartment

Pollution and Sealed Surfaces

A major source of pollution for Wolli Creek is the large area of sealed surfaces. As rainwater runs over these surfaces it collects a variety of pollutants, which it then transports to the Creek and onto the Cooks River.

Approximately 71% of the Upper Wolli Creek Subcatchment is made up of sealed surfaces, which includes roofs, pavement, roads and railway tracks. The large proportion of these surfaces reflects the highly urbanised character of the Subcatchment.

Amount of pollutants generated by each surface type

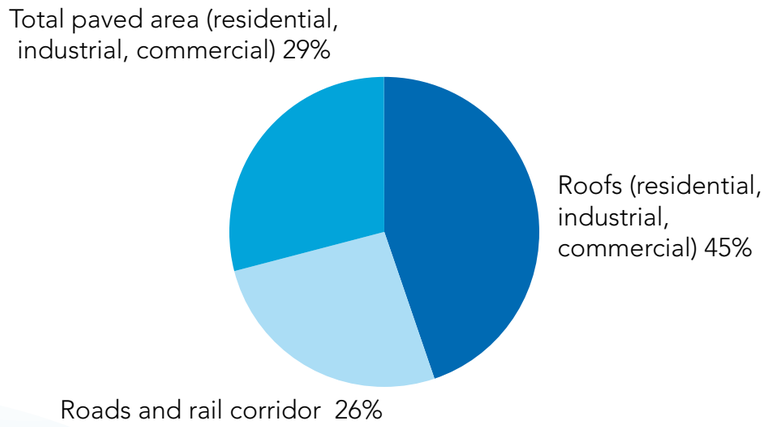


TSS - Total Suspended Solids - small soil particles, dust, sediment from erosion, etc.

TP & TN - Total Phosphorous/Nitrogen - nutrients from natural and non-natural sources including atmospheric dust, soil particles, faeces, decaying plant matter, fertilisers and detergents, vehicle exhaust.

GP - Gross Pollutants - litter, plastic bottles, coarse sediments, leaves, etc.

Karingal St, Kingsgrove, 2008. Photo courtesy OurRiver.



Surface types within the Subcatchment

The table below shows the estimated amount of pollutants currently found in stormwater in the Subcatchment. The Best Practice Stormwater Targets shown below are targets set by the NSW Government for new development in order to help improve water quality. Based on these targets gross pollutants for example, should be reduced by 90% from the current level of 61,500 kilograms per year to 6,150 kilograms per year (Landcom 2009).

Pollutant	CURRENT average pollution loads (kg/yr) *	BEST PRACTICE Stormwater Targets (% reduction)	TARGET pollution loads (kg/yr)
Gross pollutants	61,500	90%	6,150
Suspended Solids#	747,000	85%	112,050
Total Phosphorus	1,380	65%	483
Total Nitrogen	8,710	45%	4,791

* Estimated with MUSIC (Model for Stormwater Improvement Conceptualisation) modelling software
#Note: removal of suspended solids will result in a reduction of heavy metal and hydrocarbon loads.

Social Characteristics

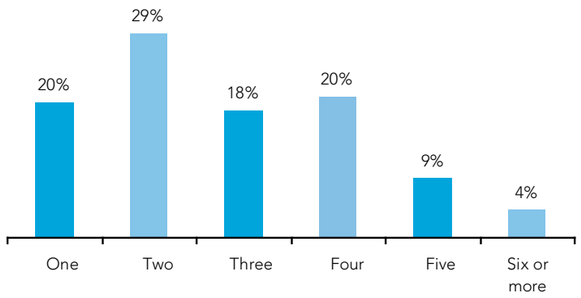
Data from the 2006 Australian Bureau of Statistics Census was used to determine the social make-up of residents in the Subcatchment. In addition, residents and businesses were surveyed (see page 10) to determine current knowledge, attitudes and behavior related to water, including receptivity to water recycling and re-use. The Census data and survey results provide important information that can be used to tailor community engagement and education programs.

Key Statistics

- Population - 10,175 residents
- Origin - 42% born overseas; China (8%) followed by Greece (5%), Hong Kong (3%) and Italy (3%)
- Languages spoken at home include - 57% non-English; 16% speak Greek, 11% Cantonese, 6% Arabic
- Travel to work - car (72%), train (20%), bus (2%), walk (3%)

Household Types

How many people per dwelling?:

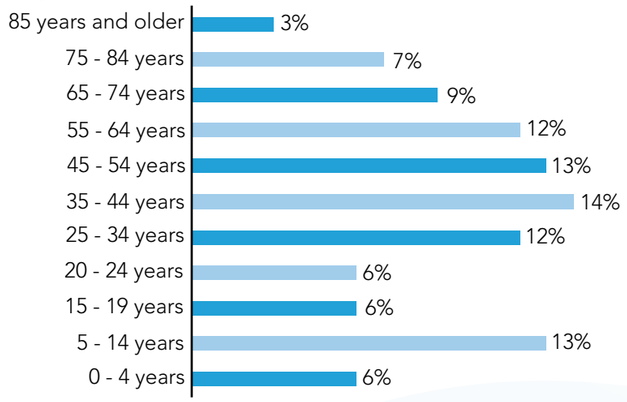


- 31% of families are couples with no children
- 30% of families are couples with children under 15

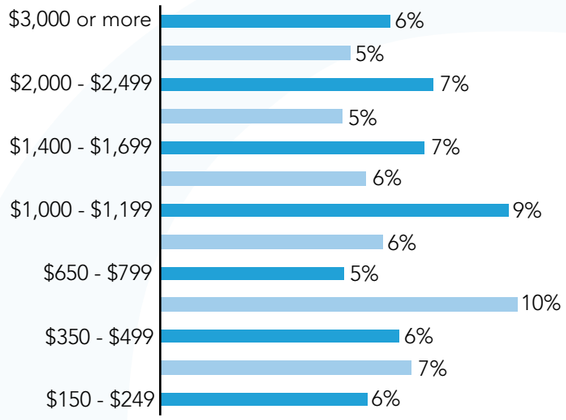
Time Spent at the Same Address

- 92% of residents lived at the same address one year ago
- 72% of residents lived at the same address five years ago

Age Distribution



Weekly Household Income



Employment

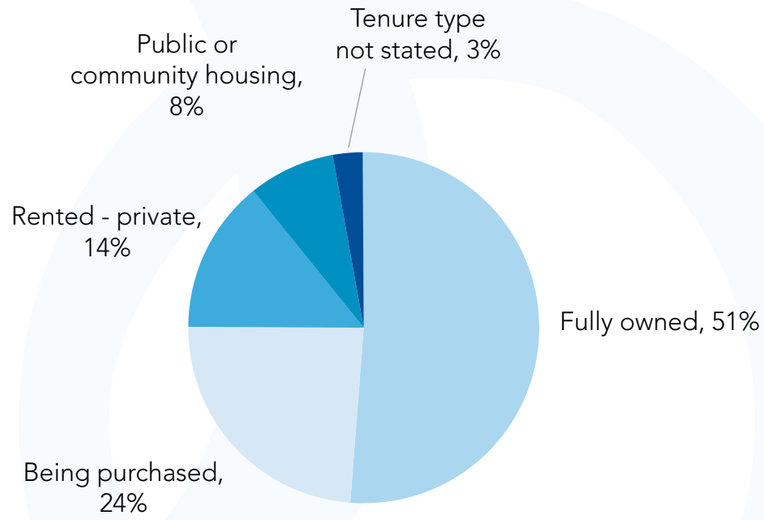
Of the total active labour force (4,607 residents):

- 68% are employed full-time
- 22% are employed part-time
- 4% are unemployed

Education

- 28% currently attend an educational institution
- 40% (over 15 years) have a non-school qualification
- 13% have a Bachelor degree or higher
- 17% have an Advanced Diploma, Diploma or Certificate

Upper Wolli Creek Subcatchment Water Wise Tour, 2009. Photo courtesy OurRiver.



Household tenure within the Subcatchment

Social Characteristics

Residential Water Survey

The Residential Water Survey was undertaken in July 2008. 512 completed surveys were returned (14% response rate) providing an indication of the community's current knowledge, attitudes and behavior related to water including their willingness to reuse rainwater and greywater. A summary of the results is shown here.

Knowledge of Urban Water Systems

- 58% of residents answered correctly when asked where water in street drains normally goes (to the nearest waterway)
- 76% of residents underestimated the amount of water used by an average local household

Rainwater Harvesting

64 people indicated that they currently use rainwater, of these:

- 99% use it for the garden
- 67% use it for washing the car
- 34% use it for toilet flushing

Greywater Reuse

- 220 people indicated that they currently reuse greywater, 91% of those use it in the garden
- 15 people indicated they had a greywater diversion and/or treatment system installed

Receptivity to Using Rainwater and Greywater

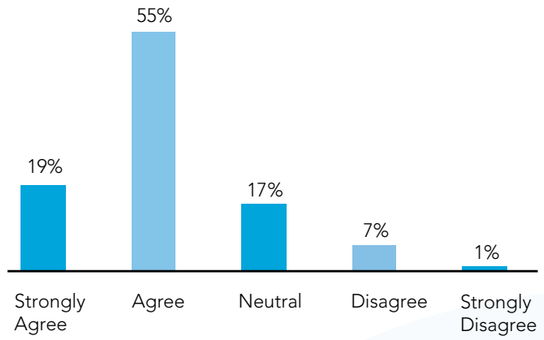
Over 70% of residents would consider using rainwater and greywater for watering the garden and/or flushing the toilet.

Water Saving Devices

81% of respondents have water saving devices such as showerheads and tap aerators.

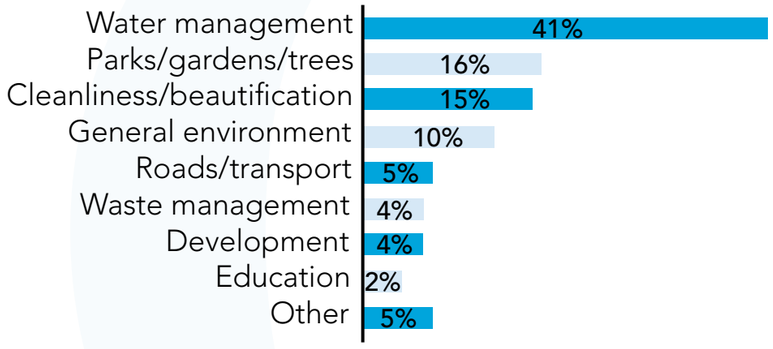
Attitudes

"Most people want to help improve the health of the waterway environment."



What major improvement to the environment in your council area do you want to see in the next 20 years?

There were a total of 479 responses to this question, which have been categorised as follows:



As shown above, 41% of responses to this question relate to the management of water.

NB: The survey results shown are from the entire Subcatchment and therefore include responses from residents in Canterbury, Hurstville and Rockdale LGAs. To view the full results from the Upper Wolli Creek 2008 Residential Water Survey, please visit the environment section of Rockdale City Council's website.

Business Water Survey

The Business Water Survey was undertaken in June 2009. From an estimated 240 businesses, 211 were successfully contacted and 57 responses obtained (a 27% response rate). A summary of results is shown here.

Business type

- 18% of businesses are manufacturing related
- 68% of businesses lease their premises

Water use

- 82% said that the cost of water to their business was not significant
- 63% use water for domestic purposes only
- 2 businesses had rainwater tanks
- 98% would use reticulated recycled waste water if it were available

Attitudes

"Do you think that government agencies should be mainly responsible for the waterway environment rather than businesses?"

61% disagreed which may indicate that they felt businesses also had some responsibility towards the waterway environment.

Subcatchment Water Wise Tour, 2009. Photo courtesy OurRiver.

Subcatchment Stakeholders

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Introduction

There are a range of organisations operating within the Upper Wolli Creek Subcatchment including government agencies, utility companies, schools and community groups. These organisations have responsibilities related to water, development and infrastructure (e.g., government agencies or utility companies), or have the power to make some decisions regarding water on their land (e.g., land users and public and private land owners). In order to improve the health of the local waterways, urban water management solutions are required on both public and private land.

Many of the stakeholders listed here have been engaged and/or consulted as part of the OurRiver project.

City of Canterbury

The northern section of the Subcatchment above and including the M5 Motorway falls within City of Canterbury local government area (LGA).

Hurstville City Council

The south western section of the Subcatchment falls within Hurstville City Council LGA. This includes the area south of the M5 and the area west of Kingsgrove Road.

Rockdale City Council

The south eastern section of the Subcatchment falls within Rockdale City Council LGA. This includes the area south of the M5 and the area east of Kingsgrove Road.

All three Councils manage their respective roads, parks, playgrounds and stormwater infrastructure. Councils are also responsible for implementing planning controls and providing services such as waste collection.

Private landowners

There are a range of private landowners in the Subcatchment. This includes land in residential, commercial and industrial areas. These landowners have the power to make decisions (subject to Council approval) related to water quality, water consumption and flooding controls on their land.

Sydney Water Corporation

Sydney Water Corporation (SWC) is responsible for supplying drinking quality water and for the management of infrastructure associated with the delivery of drinking water and disposal of wastewater. SWC is also one of the authorities responsible for the management of Wolli Creek.

Housing NSW/Community Housing

These organisations provide affordable housing options. Approximately 8% of the dwellings in the Subcatchment are either rented or owned by the Housing NSW or community housing organisations.

RailCorp

RailCorp is responsible for the management and maintenance of Kingsgrove and Bexley North train stations, the East Hills railway line and all other associated rail infrastructure including the railway corridor.

Roads and Traffic Authority (RTA)

RTA is responsible for the management and maintenance of the M5 Motorway and the M5 Linear Park (road reserve adjacent to the M5). RTA also manages and maintains the arterial roads within the Subcatchment, such as Kingsgrove, Bexley and Stoney Creek Roads.

Schools

There are a number of public and private educational institutions operating within the Subcatchment: Arkana College Primary School, Kingsgrove North High School, Kingsgrove Public School, Kingsgrove High School, St Ursulas College and Our Lady of Fatima School.

Pedestrian footpath along the northern side of the M5 motorway. Photo courtesy OurRiver.

Community Centres

The Kingsgrove-Bexley North Community Centre and Kingsgrove Community Aid Centre operate within the Rockdale and Hurstville LGAs respectively.

Religious Organisations

The following religious organisations have buildings located within the Subcatchment:

- Our Lady of Fatima Catholic Church
- St Thomas Anglican Church
- St Davids Presbyterian Church
- Kingsgrove Christian Brethren Church
- Kingsgrove Chinese Christian & Missionary Alliance Church

Collaborative Planning

What is Collaborative Planning?

Collaborative planning is key to the subcatchment planning process. Collaborative planning means partnering with all stakeholders in each aspect of decision making including the development of alternatives and the identification of the preferred solution (IAP2 2004).

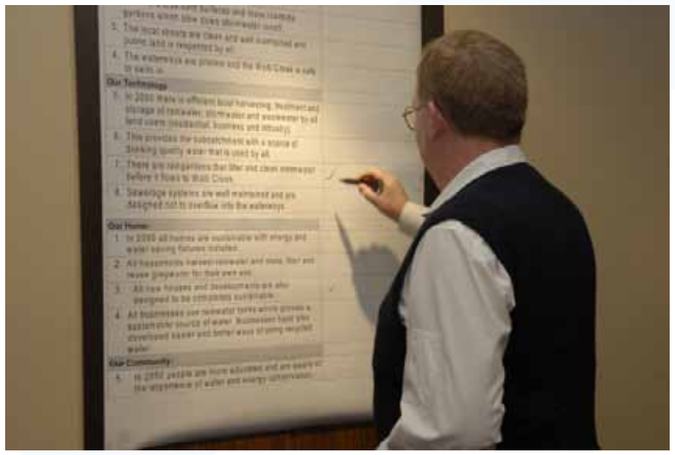
Collaborative planning in the Upper Wolli Creek Subcatchment

The Upper Wolli Creek Subcatchment stakeholders include:

- residents
- businesses
- schools
- community groups
- government organisations

Collaboration with stakeholders so far has consisted of the following:

1. Survey: Residents and businesses completed a survey which included questions about knowledge, behaviour and attitudes related to water (see page 10).
2. Vision sessions: In March and April 2009 residents and other stakeholders took part in workshops to develop the Upper Wolli Creek Subcatchment 2050 community water vision (see page 3).
3. Planning forums: In April and May 2009 residents and other stakeholders including representatives from the Cooks River Urban Water Initiative (managed by the Sydney Metropolitan Catchment Management Authority), National Parks and Wildlife Service (part of Department of Environment, Climate Change & Water), Cooks River Foreshores Working Group and the Wolli Creek Preservation Society worked with the OurRiver team and Canterbury, Hurstville and Rockdale council staff to develop goals and ideas to achieve the community water vision (see pages 18-21).



Benefits

The vision sessions and planning forum provided the community with an opportunity to share their local knowledge, increase their awareness of water management issues specific to the local area and gain knowledge on more general concepts such as WSUD. The sessions also assisted the OurRiver team and Council staff in determining the community's receptivity to water reuse and treatment techniques. Gaining this understanding is essential for creating a management plan that is appropriate for the local area and is supported by local stakeholders.

Ongoing Collaboration

Stakeholder collaboration is important throughout the life of the Upper Wolli Creek Subcatchment Management Plan in order to understand and incorporate the changing needs of stakeholders (council staff, residents, business owners, community groups, etc.) and the environment. Ongoing engagement also helps to create a greater sense of awareness and ownership of things such as management plans and on-ground works projects.

Stakeholders may continue to be involved in a number of ways including on-ground activities (such as a community planting day for a newly built raingarden), and reviewing and reprioritising goals and actions. This involvement may take the form of a subcatchment working group or may be less formal.

The photos here are from the Upper Wolli Creek Subcatchment community planning forums held in April and May, 2009.

Sustainable Water Management Options - non-structural

The Upper Wolli Creek Subcatchment Community Goals and Ideas (pages 18-21) has been developed by the Subcatchment community and includes solutions that are related to both non-structural (e.g. policy and education) and structural (on-ground works). The actions listed below (non-structural) have been developed by Rockdale City Council and OurRiver staff, and draw on the goals and options that have been identified by the Subcatchment community in pages 18-21. The options listed below describe activities that can be most effectively implemented or carried forward at the local council level in order to help achieve the broader aspirations of the Upper Wolli Creek community.

Non-structural Council options for Upper Wolli Creek Subcatchment:

Action Type	Council Actions	How It Will Be Implemented
Education and Awareness	Conduct an education campaign and actively engage community and council staff to increase their awareness of water issues, conservation, sustainability.	Will be undertaken as part of Council's Water Sensitive Urban Design Action Plan - Lower Georges River Sustainability Initiative.
	Actively promote WSUD through media, schools, tours, local groups, signs, festivals, street parties.	Will be undertaken as part of Council's Water Sensitive Urban Design Action Plan - Lower Georges River Sustainability Initiative.
Reporting and Accountability	Provide details of Council's consumption of potable water, including any activities designed to reduce that consumption.	Currently undertaken through the State of the Environment Report. This information will be promoted more widely.
Staff Training	Key staff to participate in relevant industry groups, associations and other forums in order to keep abreast of emerging SUWM/WSUD technologies. Findings to be reported back to Council's internal water management team.	Will be undertaken as part of Council's Water Sensitive Urban Design Action Plan - Lower Georges River Sustainability Initiative.
Facilitation of Sustainability Measures	Implement planning controls that help reduce or stabilise the extent of the urban impermeable surface footprint.	Draft Development Control Plan (DCP) includes increased setbacks, landscaped area and deep soil zones for most types of development, including flat buildings and multi unit dwelling developments. This reduction in site coverage will have the benefit of reducing hard surfaces in developments within the City.
	Identify and promote opportunities to apply sustainability focused building techniques (e.g., green roofs) within Council's planning instruments and guidelines.	Draft DCP currently has a section on sustainable building design, which includes energy efficiency, solar access and natural light and ventilation. These controls relate to both design and to a lesser degree building construction.
	Convert some community centres to double as environmental resource centres and where possible, convert under-utilised public space into community gardens and/or nurseries.	To be investigated further by Council.

Sustainable Water Management Options - non-structural

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Non-structural Council options for Upper Wolli Creek Subcatchment continued:

Action Type	Council Action	How It Will Be Implemented
Facilitation of Sustainability Measures	Identify a model business/industry that has implemented water and energy saving devices or assist a business/industry in becoming a demonstration model.	To be investigated further by Council.
	Be an active partner with residents, businesses and industry in water conservation activities.	Will be undertaken as part of Council's Water Sensitive Urban Design Action Plan - Lower Georges River Sustainability Initiative.
Incentives for reducing mains water demand	Key staff to identify and promote appropriate funding opportunities/mechanism to increase the uptake of SUWM practices and behaviours within the community.	Currently underway through Council's environmental workshops.
	Sponsor competitions for local areas based on recycling, water conservation, etc.	To be investigated further by Council.
Innovation and Research	Liaise with Sydney Water to identify opportunities for regional water reuse schemes, e.g., 3-pipe system (potable, non-potable, wastewater).	Will be investigated through the Sydney Water Corporation proposed Liverpool-Ashfield recycled pipeline.
	Community water collection and storage devices are investigated (e.g., under roads and in parks).	To be investigated further by Council.
	Identify the potential for rainwater harvesting within the Subcatchment, for commercial, industrial and residential.	To be investigated further by Council.
Allotment Scale Controls	Incentives (e.g., subsidies, rebates and grant funding) are established to encourage the uptake of sustainable urban water management practices on private land.	To be investigated further by Council.

Sustainable Water Management Options - structural

The Upper Wolli Creek Subcatchment Community Goals and Ideas (pages 18-21) includes actions that are related to both non-structural (e.g., policy and education) and structural (on-ground works) solutions. The actions listed below (structural) have been developed by Rockdale City Council and OurRiver staff, and draw on the structural goals and options that have been identified by the Subcatchment community in pages 18-21. The options listed below describe those activities that can be most effectively implemented or carried forward at the local council level in order to help achieve the broader aspirations of the Upper Wolli Creek community.

Structural Council actions for Upper Wolli Creek Subcatchment:

Structural Options for the Upper Wolli Creek Subcatchment	Identified Linkage into Existing Projects
Where appropriate in future works permeable paving will be used instead of bitumen and concrete, i.e., for shopping centres and parks.	Long term initiative that in the short term will need to be assessed against other priority catchment areas and link into Council's capital works and maintenance program.
Undertaken the construction of the WSUD structures identified on page 2 of the Upper Wolli Creek Subcatchment Management Plan.	Two projects underway, see pages 16-17. Additional projects will be further assessed.
Continue to identify future WSUD structures suitable for installation in the Upper Wolli Creek area.	Long term initiative that in the short term will need to be assessed against other priority catchment areas and link into Council's capital works and maintenance program.
Gross pollutant traps are used, where appropriate, as an extra measure to protect waterways.	Ongoing.
Use the best practice technology of the time.	Implemented where feasible.
Greywater is being reused on-site, for gardens or other suitable purposes.	To be investigated further.




Photos from left to right: 1) WSUD, Victoria Park, Zetland NSW 2) WSUD retrofit, Buckland St, Chippendale NSW 3) WSUD retrofit, Chelsea VIC 4) WSUD retrofit, Kogarah NSW. Photos courtesy www.wsud.org

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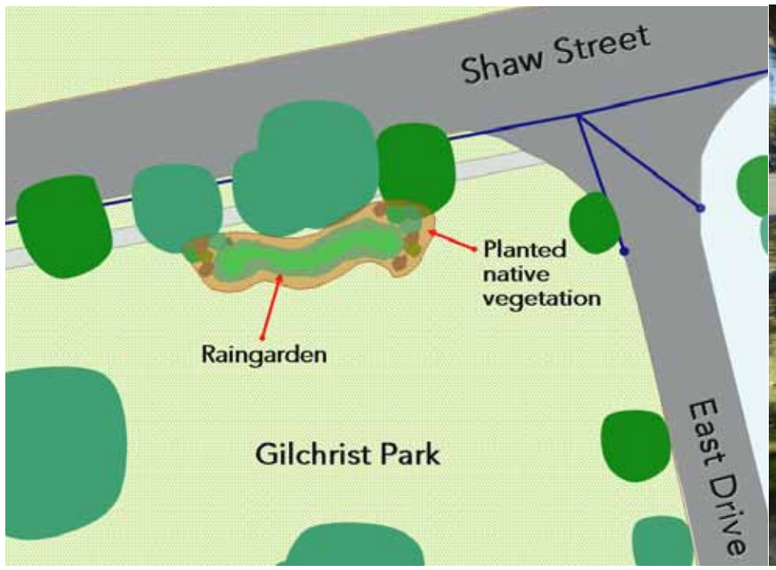
Gilchrist Park Raingarden

As part of the OurRiver project, each council will receive funding for improving stormwater quality. One of the projects selected to receive this funding in Rockdale's section of the Upper Wolli Creek Subcatchment is a raingarden in Gilchrist Park, located between East and West Drives and fronting Shaw Street in Kingsgrove. This project will provide an opportunity to collect and treat stormwater from East Drive to best practice standards before it enters Wolli Creek.



Plan view of Gilchrist Park raingarden, Kingsgrove.

Gilchrist Park looking towards East Drive, Kingsgrove.

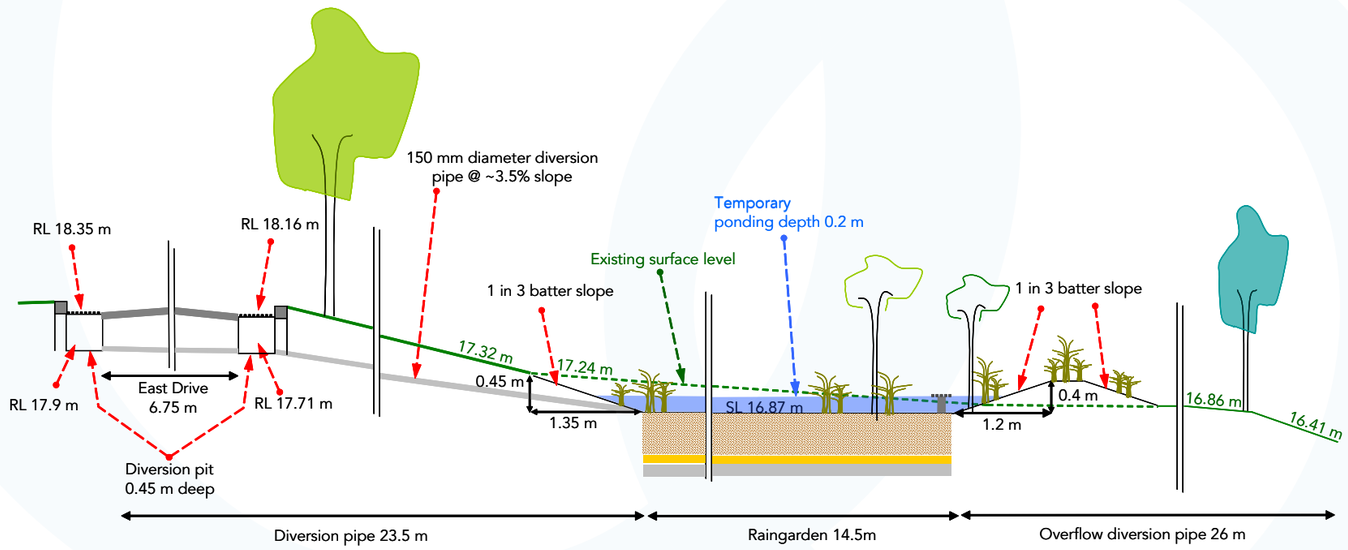
Raingarden, Kingston VIC. Photo courtesy www.wsud.org.

What is a Raingarden? A rain garden is a planted depression that absorbs rainwater runoff from hard surfaces in urban areas like roofs, driveways, footpaths and roads. Rain gardens reduce runoff by allowing stormwater to soak into the ground (as opposed to flowing into storm drains and surface waters which causes erosion, water pollution, flooding, and diminished groundwater). Rain gardens can dramatically reduce the amount of pollution reaching creeks and rivers.

Treatment Performance

Modelling of pollutant loads in this Subcatchment has determined that a 22m^2 raingarden will come close to meeting NSW Government's Best Practice Stormwater Targets for new development. This table shows the nutrient removal performance for all key pollutants

Best Practice	% Reduction with a 22m^2 Raingarden	Pollutant
85%	**80%**	Total Suspended Solids
65%	**68%**	Total Phosphorous
45%	**41%**	Total Nitrogen
100%	**100%**	Gross Pollutants



Cross section plan of the raingarden

OurRiver Funded On-ground Actions

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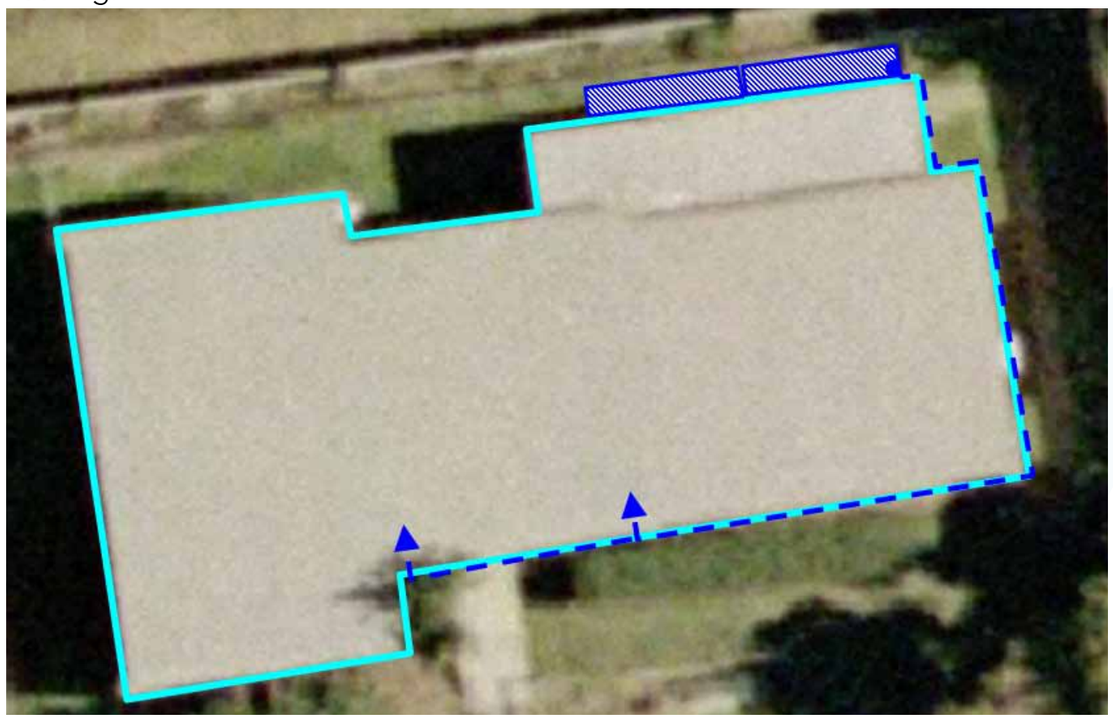
Rainwater Harvesting and Reuse

A rainwater harvesting and reuse scheme at the Kingsgrove-Bexley North Community Centre in Kingsgrove is the second project that has been selected to receive funding as part of the OurRiver project. This project will harvest rainwater from the roof of the Centre and use it for non-potable purposes such as toilet flushing.



Kingsgrove-Bexley North Community Centre roof catchment & propsed rainwater tank location.

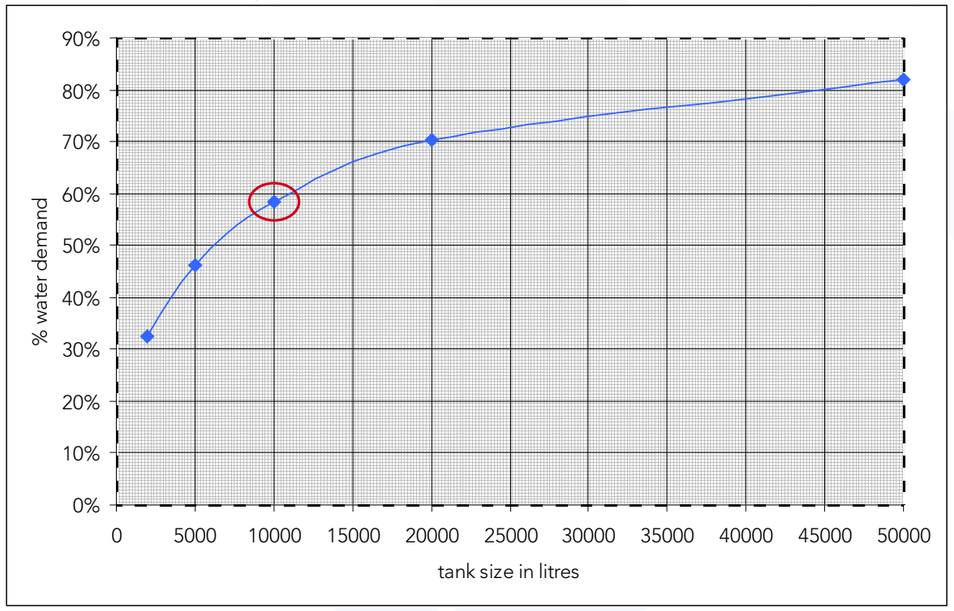
Treatment Performance

The treatment performance of this rainwater harvesting scheme indicates that the Best Practice Stormwater Targets are being met for most key pollutants:

Best Practice	% Reduction	Pollutant
85%	**72%**	Total Suspended Solids
65%	**67%**	Total Phosphorous
45%	**59%**	Total Nitrogen
100%	**100%**	Gross Pollutants

Rainwater harvesting and reuse scheme, Strathfield Council NSW. Photos courtesy OurRiver.

How does Rainwater Harvesting Help Improve Our Waterways? Rainwater harvesting provides an alternative water source to potable water, reduces stormwater volumes and runoff frequencies to more natural levels which in turn, reduces stream erosion, improves in-stream aquatic ecosystem health, and reduces the potential for minor flooding events. Rainwater harvesting provides a reliable source of water for non-potable purposes.



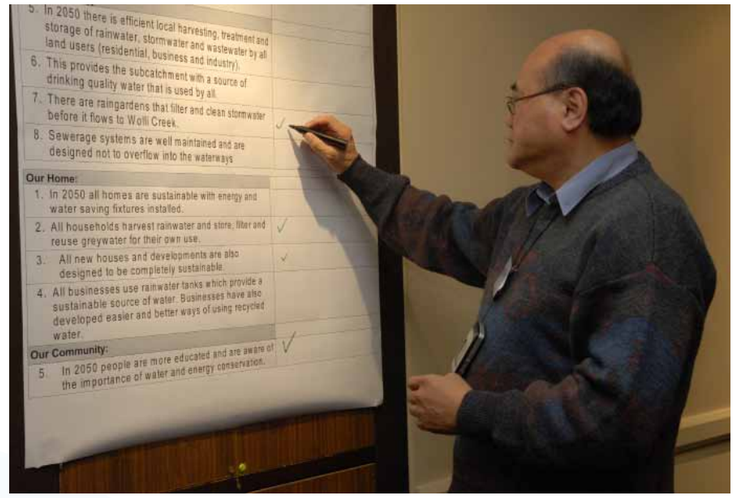
Water use demand for the Kingsgrove-Bexley North Community Centre.

Rainwater Harvesting for Non-potable Water Use. Calculating the non-potable water demand for the Centre has determined that the optimum size for the rainwater tank is 10,000 litres (see chart above).

Subcatchment Community - Goals & Ideas

Upper Wolli Creek Subcatchment Community Water Vision, Goals and Ideas

The Upper Wolli Creek Subcatchment 2050 Community Water Vision was developed by Subcatchment residents, council staff and other stakeholders at the vision sessions, held on Wednesday 25 March and Wednesday 1 April 2009. Following the vision sessions, the 2050 Community Water Vision was divided up into statements and categorised into common themes (Our Catchment, Our Technology, Our Homes and Our Community). At two planning forums, held on Wednesday 29 April and Tuesday 5 May 2009, the **community** chose which statements were most important to them and then developed goals and ideas for each prioritised statement. The outcomes shown here were distributed to the wider Subcatchment community for comment. The statements, goals and ideas presented over the following pages (18-21) reflect the desires and wishes of the Upper Wolli Creek Subcatchment community.



Upper Wolli Creek planning forum, 2009.
Photo courtesy OurRiver

Theme 1 - Our Catchment:

In 2050 there are less hard surfaces and more roadside gardens (raingardens) which collect stormwater and filter out the pollutants before it flows into Wolli Creek.

Goals:

- Reduce or halt the Subcatchment's urban impermeable (hard surfaces) footprint.
- Build 10 Water Sensitive Urban Design (WSUD) structures within the Subcatchment.
- Retrofit existing development with WSUD where it's feasible.
- Install raingardens and other WSUD structures in wide streets.
- Maintain environmental flows for Wolli Creek.

Ideas:

Conduct an education campaign and actively engage community and council staff to increase their awareness of water issues, conservation, sustainability and specifically the negative impact that increasing impervious surfaces has on the waterway.

Implement planning controls that help reduce or stabilise the urban impermeable surface footprint.

When implementing WSUD structures, target the areas in the Subcatchment that are likely to benefit the most (e.g., where flooding occurs after intense rainfall).

Council investigates and considers incentives related to hard surface area and stormwater discharge (e.g., incentive for rainwater tanks or other WSUD features that effectively reduce impermeable area by slowing, cleaning/filtering stormwater discharge).

Grassed swale, Warriewood NSW.
Photo courtesy of www.wsud.org

Theme 2 - Our Technology:

In 2050 there is efficient local harvesting, treatment and storage of rainwater, stormwater and wastewater by all land users (residential, business and industry).

Goals:

- All residential properties and industrial sites are collecting and storing rain/stormwater and utilising solar panels.
- All commercial big water users are now using rainwater, stormwater or recycled wastewater.
- Stormwater is treated/cleaned before it enters the natural water cycle.

Ideas:

Be an active partner with residents, businesses and industry in water and energy conservation activities

Opportunities for sustainability measures (e.g., rain/stormwater harvesting, raingardens, green roofs, energy conservation) are continually identified and pursued by Council and all stakeholders.

Identify the potential for rainwater harvesting within the Subcatchment, for commercial, industrial and residential

Gross pollutant traps are used, where appropriate, as an extra measure to protect waterway health.

Install rainwater tanks and create stormwater treatment and storage in roads and parks where appropriate.

Identify appropriate funding for water and energy saving devices (e.g., tax increase, levy, etc.).

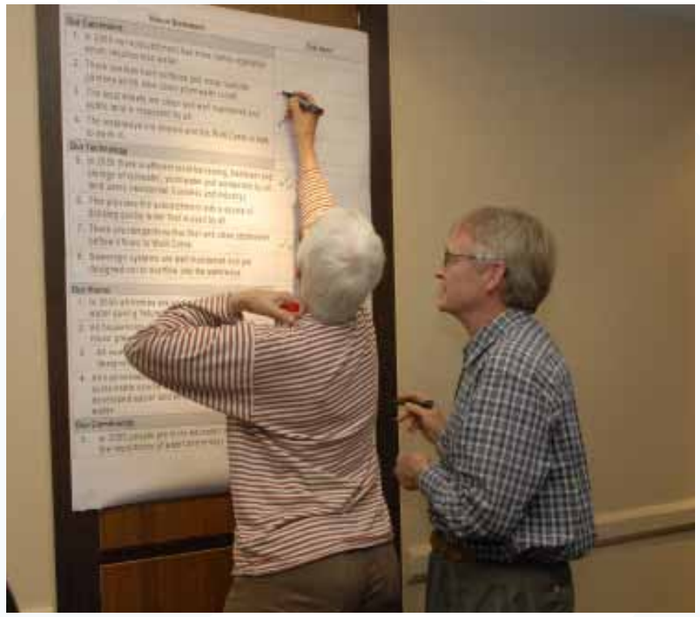
Identify, promote and create opportunities to apply sustainability focused building techniques (e.g., green roofs) within Council's planning instruments and guidelines

Identify a model business/industry that has already implemented water and energy saving devices or assist a business/industry in becoming a demonstration model.

It is a requirement that solar panels are installed when a building/property is built/sold/leased/ redeveloped.

Use the best practice technology of the time, e.g., investigate the use of micro-turbines in Bexley North parks.

Bioretention system, Sydney University NSW. Photo courtesy of www.wsud.org



Upper Wolli Creek planning forum, 2009. Photo courtesy OurRiver

Subcatchment Community - Goals & Ideas

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Theme 3 - Our Homes:

In 2050 all homes are sustainable and use energy and water saving fixtures.

Goals:

- All appliances and fixtures use the best practice technology of the time.
- All homes have an on-site water-collecting device that collects or provides access to 100% of the water required for that home/property.
- All buildings have a renewable energy source.
- Greywater is being reused on-site, for gardens or other suitable purposes.
- Local and regional water collection and reuse schemes for irrigating parks and for people who can't collect sufficient water on their property. Excess water is fed back into the mains supply (similar to solar energy feeding into the electricity grid).

Ideas:

Permeable paving is used instead of bitumen and concrete where appropriate.

Investigate regional water reuse schemes e.g., 3-pipe system (potable, non-potable, wastewater).

Community water collection and storage devices are investigated (e.g., under roads and in parks).

Conduct education campaigns in schools, community groups and the wider community to showcase the Subcatchment.

Greywater diversion systems are encouraged and widely used.

Make rainwater tanks, or similar storage device, a requirement for all buildings.

Water meters are on display to publicly identify the water usage of each dwelling.

Federal, State and Local Governments promote ongoing subsidies to support water and energy efficiency efforts (e.g., Every Drop Counts).

Incentives (e.g., subsidies, rebates and grant funding) are established to encourage the uptake of sustainable urban water management practices on private properties.

Permeable paving, Sydney Olympic Park, NSW. Photo courtesy of www.wsud.org

Residential rainwater storage tank, Bexley North NSW. Photo courtesy OurRiver.

Theme 4 - Our Community:

In 2050 people are better informed and aware of the importance of, and actively engaged in, water and energy conservation.

Goals:

- All people actively involved in maintaining their community raingarden or local WSUD features.
- All energy consumed comes from renewable, non-polluting resources.
- All roofs (residential, business and industrial) have solar panels and collect rainwater for reuse.
- People are participating in a variety of water conservation measures.
- Wolli Creek Subcatchment is seen as a model of 'sustainability' with regards to its water management practices.
- People take responsibility for their streets and there is a real sense of civic pride.
- There is an embedded cultural change towards sustainability – by residents, businesses and industry alike.

Ideas:

Actively promote WSUD through media, schools, tours, local groups, signs, festivals, street parties.

Identify ways to fund on-going maintenance of open-space associated with business and industrial development.

All community centres double as environmental resource centres and where possible, convert under-utilised public space into community gardens and/or nurseries.

Actively engage the community to increase their awareness of water issues, conservation and sustainability.

Deliver sustainability focused education campaigns designed to ignite community interest, support and participation (including within culturally and linguistically diverse communities).

Sponsor competitions for local areas based on recycling, water conservation, etc.

Four demonstration sites are established within the industrial areas that generate and provide energy for themselves, surrounding industry and/or residential.

Organise to "bulk-buy" green energy in order to receive discount. There is a regional consortium/local energy production.

Bioretention system, Fitzroy VIC. Photo courtesy of www.wsud.org

Upper Wolli Creek Subcatchment community planning forum, April 2009. Photo courtesy OurRiver.

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Street-side biofiltration retrofit, Kingston VIC.
Photo courtesy www.wsud.org.

Raingarden at St Vincent's Hospital, Darlinghurst NSW.
Photo courtesy OurRiver.

Raingarden median strip, Victoria Park, Zetland NSW.
Photo courtesy OurRiver.