

We are all Cooks River People

MARRICKVILLE
council

WATEREVOLUTION

Funded by the Marrickville community through the Stormwater Charge

Marrickville Council – Waterevolution
Planning the Western Channel Subcatchment



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1.1 Subcatchment Planning

Marrickville Council has been working in partnership with its community for over ten years on sustainable urban water management (SUWM) projects. It is moving current urban water management to a more sustainable and flexible approach that promotes liveable, productive, resilient and sustainable communities.



To enable this, Marrickville Council adopted the *Strategy for a Water Sensitive Community* in February 2013. It is supported by these four strategies:

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

Over the next ten years, the work under these strategies, including subcatchment planning, will be done through the initiative, support and actions of Council and its growing **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)

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



Sustainable urban water management means:

- Reducing the amount of wastewater leaving a catchment that may cause pollution in other locations (e.g. the Cooks River)
- Reducing the reliance on drinking quality (potable) water brought in from outside the catchments
- Using water that is fit-for-purpose i.e. using potable water for consumption only – not for watering the garden or flushing the toilet
- Reducing the impact of stormwater on waterways

This planning booklet is designed to support people to participate in the planning process to create the Western Channel Subcatchment Management Plan.

1.2 What is Subcatchment Planning?

Subcatchment Planning

Between 2002 and 2006, Marrickville Council developed the collaborative and locally focused subcatchment planning process with researchers at Monash University.

The new approach addresses three identified problems in conventional urban water management:

1. Technical experts, particularly engineers, have traditionally been responsible for developing solutions to complex urban water problems. It is now recognised that we need to take a more holistic approach and include other thinkers, such as social scientists and ecologists.

Solution: Integrate the many disciplines, e.g. sociology, ecology, urban planning and engineering.

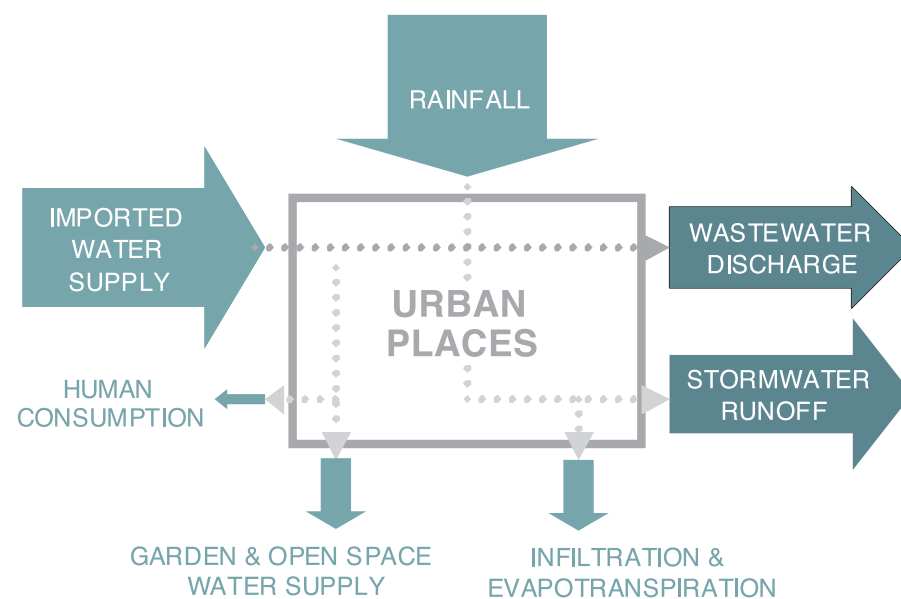
2. The people affected by urban water problems, including residents, businesses, community groups and government departments have usually not been involved enough in planning discussions.

Solution: Involve the community of interest in the decision making and implementation.

3. In the past, plans have been designed for whole river catchments rather than one appropriate and practical 'locally grown' solution to urban water problems.

Solution: Reduce the planning unit to the local level, e.g. subcatchments

Conventional Urban Water Management



The Waterevolution Subcatchment Planning Program

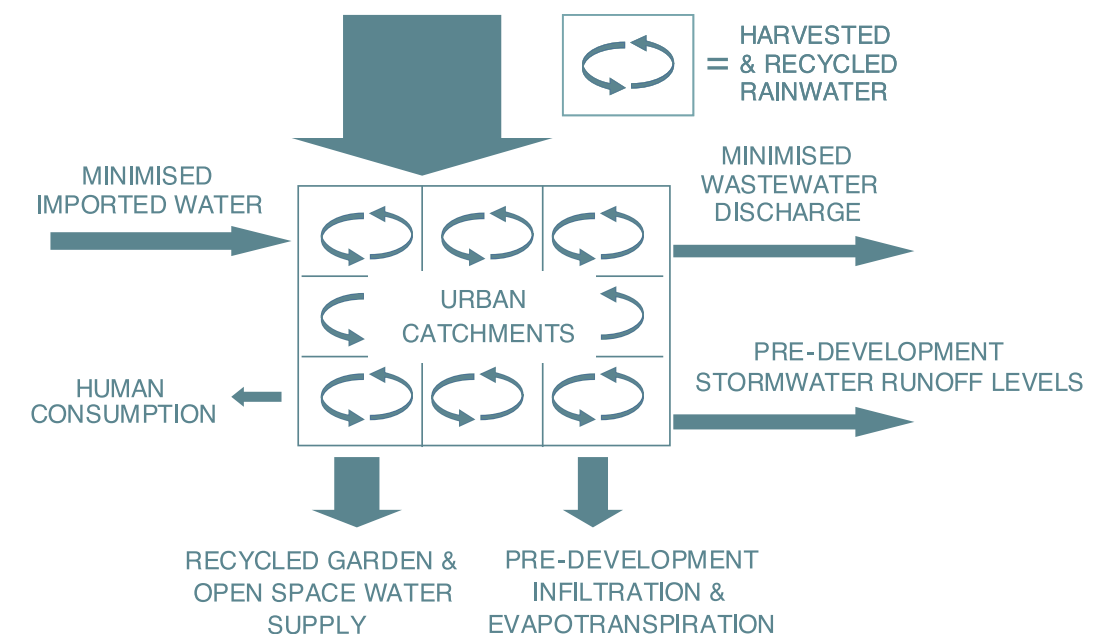
In 2006, Council adopted subcatchment planning as part of its approach to implementing sustainable urban water management (SUWM) in the Marrickville local government area. Through Marrickville's *Waterevolution Subcatchment Planning Program*, people from the community and in Council with various backgrounds and experience (e.g. engineers, social and urban planners, artists, environmental scientists, educators, parks and recreation managers) now join together to identify problems and solutions for their neighbourhoods.

The *Waterevolution Subcatchment Planning Program* has so far led to five management plans being created and adopted by Council with community water working groups being established for each:

- The Illawarra Road Subcatchment - 2006
- The Tennyson Street Subcatchment - 2009
- The Riverside Crescent Subcatchment - 2010
- The Eastern Channel East Subcatchment (part of the Marrickville Valley) - 2011
- The Eastern Channel North Subcatchment (part of the Marrickville Valley) - 2013

Other SUWM solutions resulting from this program include community water working groups being established for each subcatchment, seven rain gardens, the Rainwater Tank Incentive Scheme and the Urban Water Education Program with its popular water sensitive urban design workshops.

Sustainable Urban Water Management



1.3 Planning the Marrickville Valley

What have we done so far?

Since 2005, Council in partnership with the community has prepared five subcatchment management plans. Since 2008, Council has been working on the Marrickville Valley subcatchments carrying out flood studies, surveying the community and businesses and analysing ABS data. Two of these have been completed for Eastern Channel East Subcatchment (2011) and Eastern Channel North Subcatchment (2013).

For Western Channel Subcatchment, Council has researched and compiled all the information presented in this planning booklet including:

- Surveying residents and businesses about their knowledge, attitudes and behaviour to water conservation and use
- Calculating the water cycle, i.e. water coming in and going out of the area
- Working out how much is covered in hard (impervious) surfaces and the amount of pollution carried in stormwater going to the Cooks River
- Developing a good understanding of the demographic characteristics of the subcatchment so programs can be delivered to meet the needs of the Western Channel communities

What is happening now in Western Channel?

In Western Channel in 2014:

- 81% of mains water ends up in the Tasman Sea as wastewater
- 77% of rainwater runs into the Cooks River
- 78% of Western Channel Subcatchment is covered with hard, impervious surfaces

For the Cooks River in 2014:

- The level of pollution is so high that it cannot be used for swimming or fishing 75%-100% of the time
- The level of suspended solids (e.g. sediment from erosion) is six times higher than acceptable limits
- Roof runoff is a major cause of stormwater pollution

(Georges River Combined Councils' Committee, 2013)

Why a community subcatchment vision?

Too often in the past, the people living and working in the areas affected by water plans have not been included in the planning process. This has meant that plans have often been inappropriate and/or not supported nor fully understood by the main water users and decision makers. As well, opportunities for getting local knowledge of the subcatchment have been missed, and local ideas for better pollution control and increased water saving are not captured.

By including the subcatchment vision from each of the subcatchment communities, this project maximises local knowledge and develops locally generated ideas. This will ultimately produce a community subcatchment plan for each of the Marrickville Valley subcatchments that is tailor-made to local conditions, so more widely accepted and adopted.



What are we doing now?

At this stage of the project, residents of Western Channel are imagining what water management will look like in 2060. Through vision sessions and other engagement activities, people who live and work in the subcatchment will contribute to a subcatchment vision. These visions will be the basis for goal setting and planning at the community planning forums that will be held in May 2014. These forums will involve local residents and a broad range of stakeholders from business, government and community organisations.

How to use this information booklet

This booklet presents information about Western Channel Subcatchment gathered to date. The first section is an overview of the whole of the Marrickville Valley, followed by separate information on Western Channel Subcatchment. It details the water cycle and physical features, history, land use, 'hot spots' (areas with problems of flooding and/or dumping), social characteristics, government and non-government organisations relevant in the area, Council's planned capital works and future development.

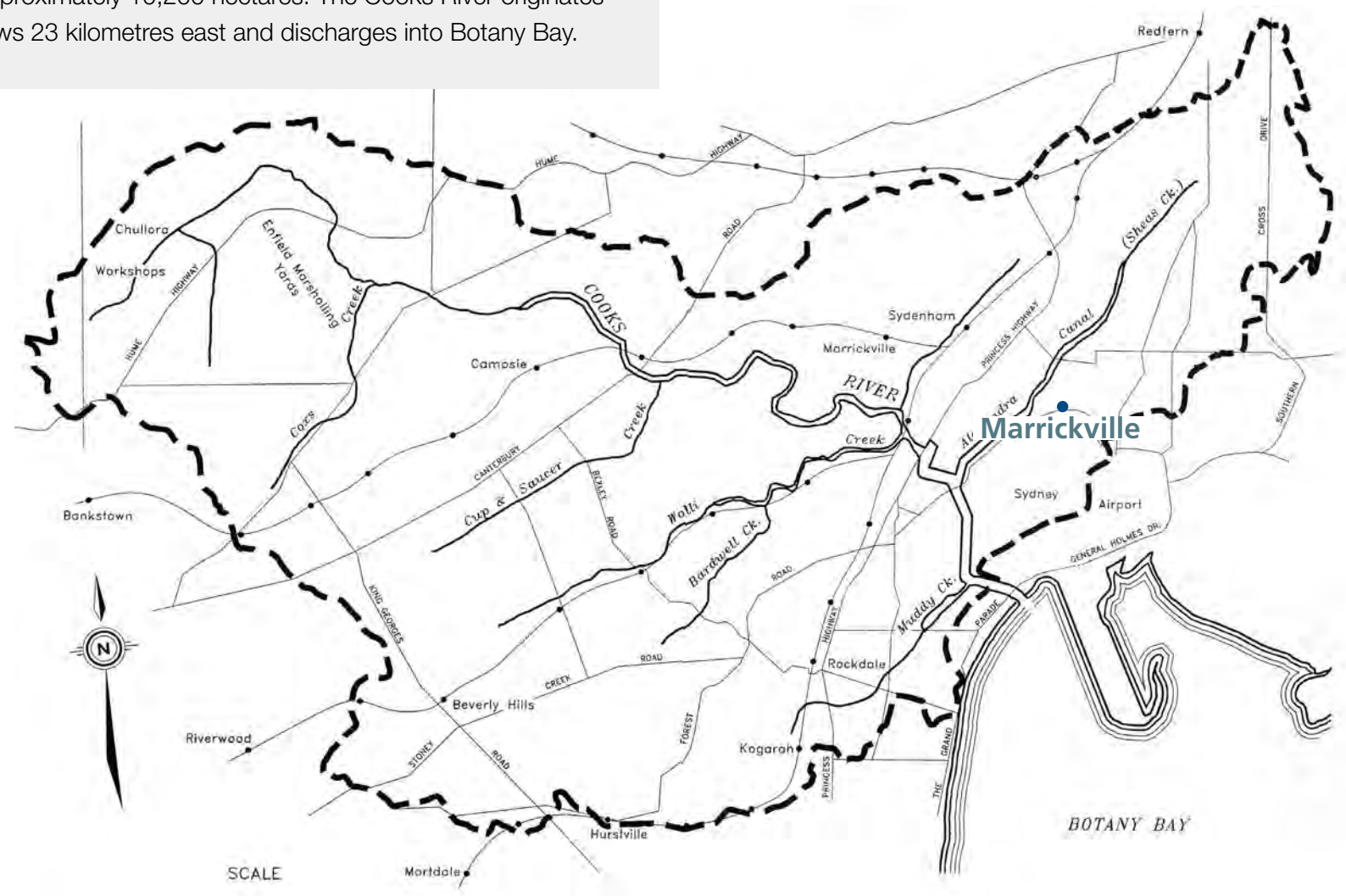
Get ready for the visions sessions and planning forums

To help you take part in the vision and planning session, think ahead to the year 2060 and as you read this booklet imagine how things have changed. We encourage you to make notes of your ideas and contexts, using the information in this booklet. When you finish, you might come up with possible answers to the list of questions on the following page.

The Supporting Information section includes other topics to consider when planning for sustainable water management.

1.5 The Cooks River Catchment

About two-thirds of the Marrickville local government area falls within the Cooks River Catchment, located in the southern suburbs of Sydney. The Cooks River Catchment covers approximately 10,200 hectares. The Cooks River originates in Bankstown and flows 23 kilometres east and discharges into Botany Bay.



Impacts on Estuarine Environments

Stormwater runoff and sewer overflows have a negative impact on estuarine environments, resulting in a reduction of ecological diversity. Increased loads of toxicants tend to accumulate in sediments and reflect on ecosystem health.

There are over 150 sewer overflow points in the Cooks River Catchment with typical overflow frequencies of over 20 times a year.



There are eight tributaries to the Cooks River:

- Wolli Creek
- Bardwell Creek
- Muddy Creek
- Alexandra Canal
- Sheas Creek
- Cup and Saucer Creek
- Cocks Creek
- Fresh Water Creek

Current groups working on the long-term health of the river in the Marrickville LGA include:

- The Cooks River Alliance
- Cooks River Valley Association

Water Quality

The Cooks River is regarded as one of the most polluted urban rivers in Australia. Discharges of sediments and gross pollutants combined with sewage overflows are significant contributors to the degradation of the river.

Various studies since 1997 have identified that the river contains high levels of faecal contaminants, elevated concentrations of heavy metals (lead, zinc, mercury, chromium, silver and copper), high levels of nutrients resulting in potential for eutrophication or algal growth and highly contaminated sediments. Water quality with respect to primary and secondary contact recreation is considered poor.



Council	Percentage of Catchment
Ashfield	0.2%
Auburn	0.9%
Bankstown	9.1%
Botany Bay	5.9%
Burwood	2%
Canterbury	25.1%
Hurstville	8.2%
Kogarah	0.5%
Marrickville	11.3%
Randwick	1.2%
Rockdale	18.2%
Strathfield	6.8%
Sydney City	10.5%

2.1 Marrickville Valley – Location

The Marrickville Valley is in the central and southern part of the Marrickville local government area (LGA). It falls within the regional Cooks River Catchment, draining an area of 590ha to the Cooks River. Seven subcatchments make up the Marrickville Valley, as shown on the right:

- EN - Eastern Channel North (136 ha) (subcatchment management plan completed 2013)
- EE - Eastern Channel East (131 ha) (subcatchment management plan completed 2011)
- EW - Eastern Channel West (75 ha)
- ES - Eastern Channel South (43 ha)
- WC - Western Channel (81 ha)
- EC - Eastern Channel 2 (52 ha)
- CC - Central Channel (71 ha)

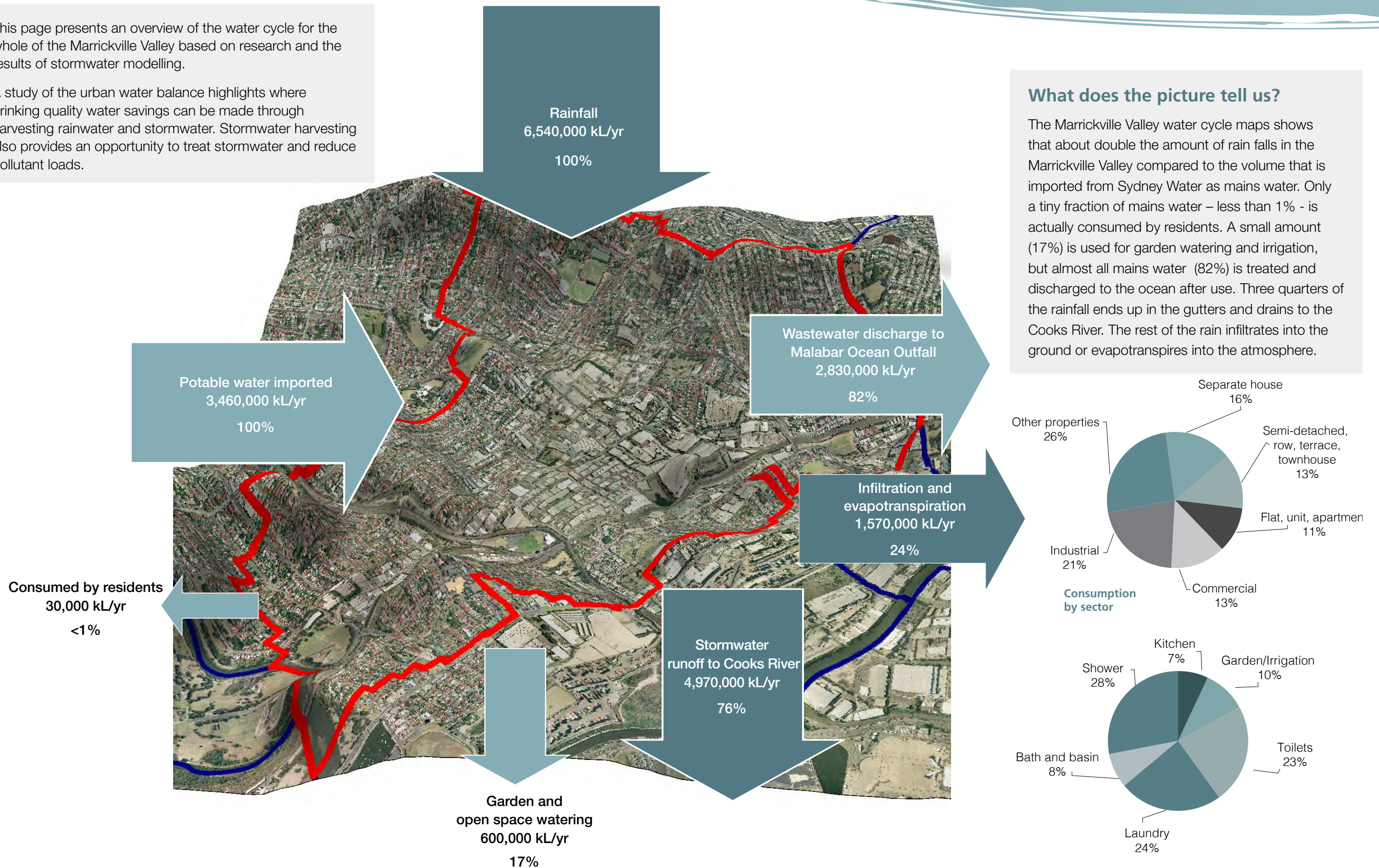


Above: The seven subcatchments of the Marrickville Valley within the Marrickville LGA.

2.2 Marrickville Valley Subcatchment Water Cycle

This page presents an overview of the water cycle for the whole of the Marrickville Valley based on research and the results of stormwater modelling.

A study of the urban water balance highlights where drinking quality water savings can be made through harvesting rainwater and stormwater. Stormwater harvesting also provides an opportunity to treat stormwater and reduce pollutant loads.



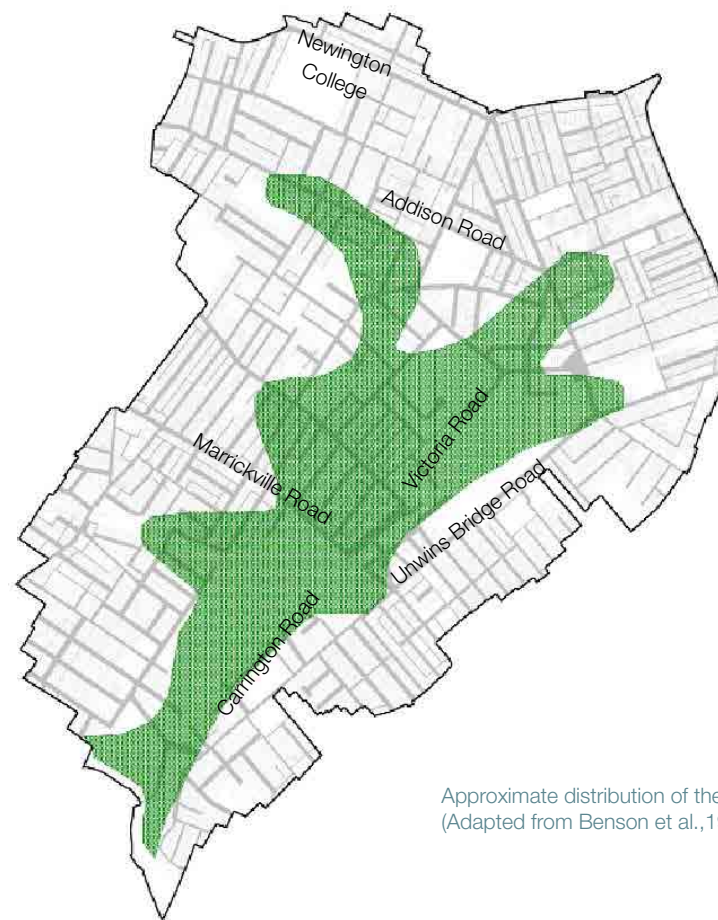
Before European Colonisation

The Cadigal and Wangal people had lived successfully along the Cooks River for thousands of years prior to the arrival of the First Fleet in 1788. Over this time, an enormous body of knowledge and special skills were developed to use the life sustaining resources that the Cooks River and its surrounding lands provided. This included trapping birds and animals, exploiting fish and shellfish, gathering plants, making canoes and carrying dishes from bark, and using sandstone shelters for occupation and art. The Gumbramorra Swamp and its associated mudflats, mangroves and salt marshes supported a rich variety of wildlife providing an abundant source of food for the local Aborigines.



Spear fishing on the Cooks River
(Source: www.cadigalwangal.org.au)

Cadigal history, like the history of many Aboriginal clans, is based on oral traditions handed down by many generations over millennia. However, through the invasion, the Cadigal and Wangal nations were dispersed, dispossessed and alienated from their traditional lands (Meader, 2008).



Approximate distribution of the swamp
(Adapted from Benson et al., 1999)

The Gumbramorra Swamp

The low-lying land in the centre of the Marrickville Valley was known as the Gumbramorra Swamp. The size of the brackish and freshwater swamp varied depending on the season and rainfall and could double in size during wet periods.

In 1799, a grant of 30 acres made to emancipated convict John Fincham was virtually useless as it was entirely contained within the swamp (Meader, 2008).



Cooks River Tempe House (1838) by Conrad Martens
(1801-1878) (Source: www.nla.gov.au)



By Tranquil Waters (1894) by Sydney Long (1871-1955) – a group of youths bathing in the Cooks River at the close of a summer's afternoon. (Source: www.nga.gov.au)



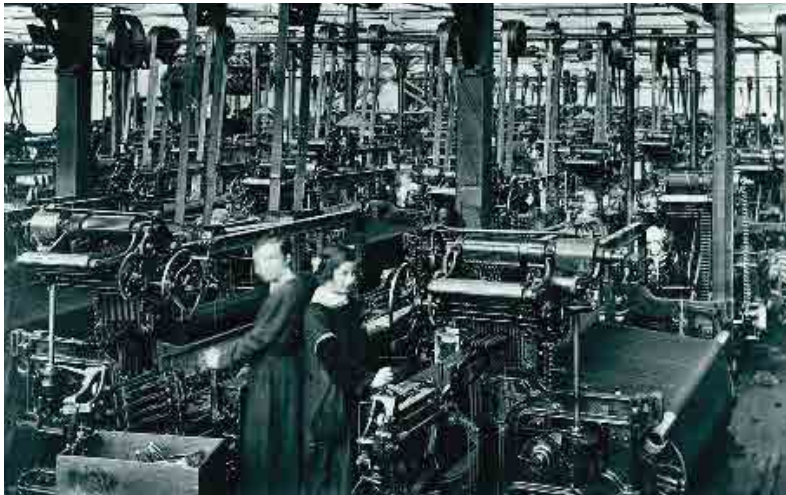
1836, Unwins Bridge built across Cooks River. (Photo: Canterbury Council Library)



1878, Marrickville Town Hall, Illawarra Road (opened 1879)



1889, The Great Marrickville flood. Water extends from to Unwins Bridge Road and floods the Gumbramorra Swamp. (Photo: 'The Inundations at Marrickville: Rescuing the Homeless' May 1899, Illustrated Sydney News, 6 June 1899, p14)



1893, Vicars Woollen Mills opens in Victoria Road.



1926, General Motors Holden assembly plant opens on Carrington Road. Produced 70 vehicles per day; employed 400.



1966, Greek Orthodox Church opens in Marrickville Road.
(St Nicholas Greek Orthodox Church)

Year Event

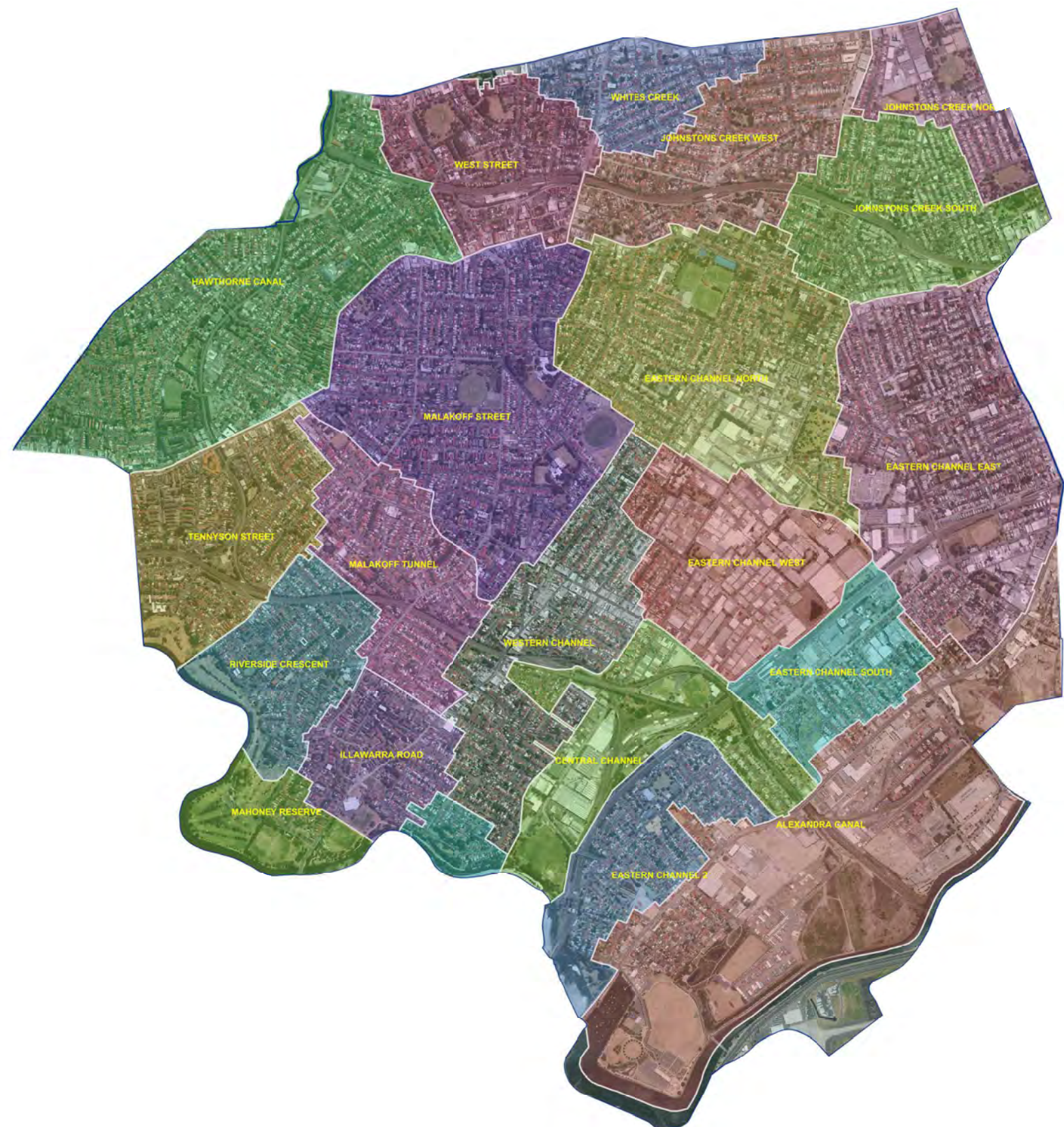
1789	First land grant of 1000 acres (405 hectares) for church, school and Crown reserves.
1833	Punt on Cooks River established.
1835	'Enmore' named after Enmore House built in 1835 by Captain Sylvester Browne.
1836	Unwins Bridge built across Cooks River.
1838	St Peters Anglican Church consecrated: first Anglican Church built using non-convict labour.
1855	'Marrickville' named by Thomas Chalder after his native village of Marrick, North Yorkshire, England. William Dean (of the Marrick Hotel) added the 'ville' in 1861.
1861	6 November: Marrickville became a municipality after merging with and Petersham. Marrickville Municipal Council formed.
1863	Koll's tannery established on 'Mill House' site, Illawarra Road (now Marrickville Metro); Schwebel's quarry opened between Schwebel Street & Grove Street providing stone for kerbing and guttering in Marrickville.
1864	Marrickville's first school opened.
1865	Marrickville's first post office opened.
1867	Alcock and Davenport's boot factory opened on Koll's Tannery site. Property forfeited to the London Chartered Bank in 1893 and purchased by John Vicars and Co. Wool Manufacturers.
1878	Marrickville Town Hall, Illawarra Road, built (opened 1879).
1884	Tempe Railway Station opened. Tourist crowds visited Cooks River for swimming and boating.
1886	Thomas Daley's Standsure Brick Company opened on Sydenham Road. Closes in 1914. Now Henson Park.
1889	The Great Marrickville flood. Water extended to Unwins Bridge Road and flooded the Gumbramorra Swamp.
1890's	Sydenham became the industrial hub of the area. Factories included Sydney Steel Company, Australian Woollen Mills, Malleable Castings, Marrickville Margarine and Fowler's Potteries.
1893	Vicars Woollen Mills opened in Victoria Road. By 1935, Vicars employed 1200 people – 75% of whom were women. The mill closed in 1976 replaced by the Metro Shopping complex.
1898	Construction of Marrickville Pumping Station in Carrington Road commences. One of only two steam powered pumping stations and only one to pump both sewage and stormwater. Completed 1900. Still in operation today.
1910	Sydney Steel Company founded by Alexander Stuart on Edinburgh Road Marrickville, providing steel for the AWA Tower, Sydney Morning Herald building, Qantas building and Sydney Harbour Bridge. During World War 2, was the largest employer in Marrickville with 76 300 workers in 1936. Production ceased in the late 1960s.
1912	Fowler's Pottery opened in Fitzroy Street Marrickville employing over 400 people for the next 40 years. Produced chimney pots, bricks, stoneware containers and 'Fowlerware' crockery. Clay originally extracted from the site, but later imported from Wilpinjong clay mine, 220kms northwest of Sydney. Site demolished in 1982.
1913	Addison Road Army Barracks replaces farm and used by the military until 1976.
1926	General Motors Holden assembly plant opened on Carrington Road. Produced 70 vehicles per day; employed 400.
1927	St Peters Town Hall built in Unwins Bridge Road.
1929	Onset of Great Depression. Unemployment reached record levels: 29% in Marrickville; 43% in Newtown.
1934	Shelley and Sons Cordial Factory established in Edinburgh Road, Marrickville.
1935	Construction of Sydenham Detention Basic commences. First Sydney Water stormwater drainage infrastructure. Providee work for unemployed during Great Depression. Completed 1941.
1936	Davis Co-op Cotton took over General Motors site in Carrington Road.
1942	John Vicars and Company – wool manufacture – scouring in Victoria Road, Marrickville until 1984.
1948	Marrickville, St Peters and Petersham combined as Marrickville under the Local Government Areas Act.
1953	Beginning of decline in small manufacturing firms in Marrickville.
1957	Tram services ceased.
1966	Greek orthodox church opened in Marrickville Road.
1975	Fowler's ceased pottery manufacture in Marrickville.
1976	Vicars Woollen Mills closed. Addison Road Community Centre opened.

3.1 Location

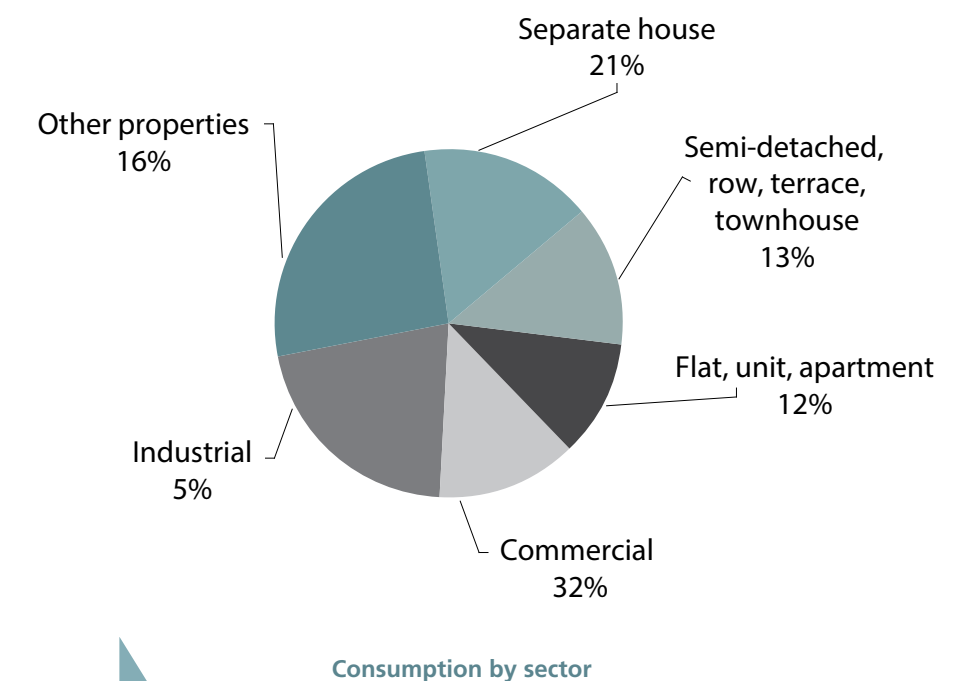
Located in the southern part of the Marrickville LGA, the Western Channel Subcatchment slopes gently to the south, draining to the Cooks River via the Western Channel. The subcatchment covers 81 hectares, representing 14% of the Marrickville Valley.

The subcatchment is predominantly residential with a population of 4,930 making up 6.4% of the LGA's population of 76,500 (ABS 2011 Census).

Public open space is limited to the eastern side of McNeilly Park and the O'Hara Street Playground as well as several small pocket parks. Stormwater drainage is the responsibility of Council and Sydney Water.



3.2 Western Channel Subcatchment Water Cycle



What does the picture tell us?

The Western Channel Subcatchment water cycle maps shows that almost double the amount of rain falls in the subcatchment compared to the volume that is imported from Sydney Water as mains water. Only a tiny fraction of mains water – less than 1% - is actually consumed by residents. A small amount (17%) is used for garden watering and irrigation, but almost all mains water (82%) is treated and discharged to the ocean after use. More than three quarters of the rainfall ends up in the gutters and drains to the Cooks River. The rest of the rain infiltrates into the ground or evapotranspires into the atmosphere.

3.3 Western Channel Subcatchment Water Cycle - 2060?



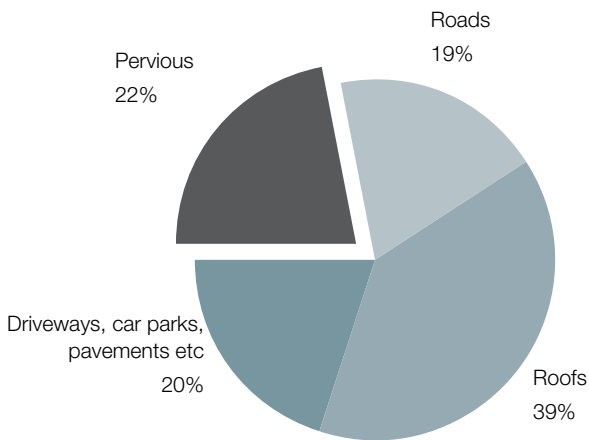
In 2060?

3.4 Pollutants and Hard Surfaces

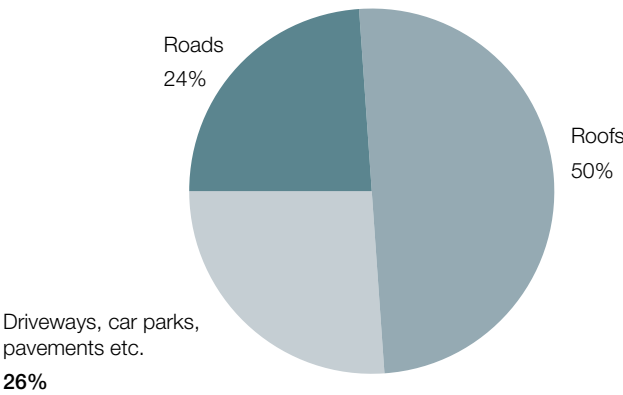
Pollutant	Estimated Mean Annual Pollutant Load (kg/yr) *	Best Practice Stormwater Targets (% reduction)	Target Pollutant Load (kg/yr)
Gross Pollutants	16,000	90%	1,600
Total Suspended Solids^	150,000	85%	22,500
Total Phosphorus	300	65%	105
Total Nitrogen	2,300	45%	1,265

* Estimated with MUSIC modelling software.
^ Note: removal of suspended solids will result in a reduction of heavy metals and hydrocarbon loads.
These figures do not take into account the performance of existing gross pollutant traps within the subcatchment.

Proportion of pervious and impervious surfaces



Proportion of impervious surfaces by type



Pollutants and Impervious Surfaces

Approximately 78% of the Western Channel Subcatchment is impervious, reflecting the high density residential character of the area. Of the impervious surfaces, roads make up 24%, driveways, pavements and car parks make up 26%, whilst 50% is roofs.

Water quality modelling determines the relative pollutant contributions from the subcatchment based on a breakdown of the impervious area.

With residential development making up 47% of the subcatchment, private property contributes significantly to gross pollutant and nitrogen loads due to the large volume of stormwater runoff. Reducing the flow volume would reduce the amount of gross pollutants and nitrogen mobilised into waterways.

Public roads collect a disproportionate amount of phosphorous and suspended solids. The stormwater drainage network combines runoff from public roads and runoff from private property. It is therefore important to target both public roads and private areas in order to reduce the movement of stormwater pollutants into waterways.

Pollutants	What are they?	What are their impacts?
Gross Pollutants	<ul style="list-style-type: none">LitterCoarse sedimentsOrganic matter	<ul style="list-style-type: none">Reduce stormwater drainage capacityImpact on visual amenityImpact on aquatic habitatsImpact on water quality indicators such as oxygen demand, hydrocarbons and metals
Suspended Solids	<ul style="list-style-type: none">Soil particlesAirborne particlesSediment from erosion and land degradationLeaf litter	<ul style="list-style-type: none">Reduce the penetration of light through water impacting on the respiration of aquatic plantsPhosphorus, heavy metals and organic chemicals utilise sediment as the medium for transportation in urban runoff
Total Nitrogen Total Phosphorus	Nutrients from natural and non-natural sources including: <ul style="list-style-type: none">Atmospheric depositionSoil particlesHuman and animal faecesPlant matterFertilisersVehicle exhaust	<ul style="list-style-type: none">Nutrients promote growth of aquatic plant life. In large concentrations they can produce algal blooms on the water surfaceAlgae 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
Lead	Trace metals derived from petrol additives, hydrocarbons, old paint (prior to 1970), lead acid batteries	<ul style="list-style-type: none">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
Zinc	Trace amounts derived from vehicle wear (tyres), herbicides, galvanised roofs	<ul style="list-style-type: none">Lead can be harmful or deadly to aquatic and human lifeLow levels of zinc can be deadly to aquatic life
Hydrocarbons	<ul style="list-style-type: none">Mineral oilsAutomotive oilDiesel fuel	<ul style="list-style-type: none">Impact on visual amenityLowers water qualityIncreases chemical oxygen demandCan be highly toxic to aquatic life in low to moderate concentrations
Organic Matter	<ul style="list-style-type: none">LeavesGrass clippingsHuman and animal faeces	Organic matter can impact on: <ul style="list-style-type: none">Biogeochemical processes (cycling of substances)Nutrient cyclingAbility of organisms to use or degradeChemical transport and interactions

Water Quality Indicators	What are they?	What are their impacts?
Chemical Oxygen Demand	The amount of oxygen required for the chemical oxidation of organic and inorganic material	<ul style="list-style-type: none">Used as an indicator of "general health" of a water body. Organic material uses oxygen in biodegradation and chemical oxidation
Biological Oxygen Demand	The amount of oxygen required for the biodegradation and oxidation of organic material	<ul style="list-style-type: none">High oxygen demand will limit capacity to support vibrant ecosystems reducing available
Total Organic Carbon	Total amount of organic material measured using amount of carbon	

3.5 Hot Spots



Flooding on the corner of Illawarra Road and Sydenham Road (2013)



Flooding on the corner of Victoria Road and Marrickville Road (2012)



Flooding in Renwick Street (2011)

Stormwater Ponding and Overland Flows

Stormwater ponding typically occurs in low points or 'sags' where water cannot drain quickly. Overland flows occur when the capacity of the underground drainage system is exceeded and stormwater flows down the street or other overland flow paths. In these circumstances, stormwater can spread across the road and into adjacent properties. Ponding and overland flows in Western Channel subcatchment occurs in:

- Despointes St
- South of Sydenham Rd along and adjacent to the Western Channel
- Illawarra Rd south of Marrickville Rd
- Calvert St, Central Ave and Byrnes St area
- Corner Marrickville Rd and Victoria Rd
- Along the railway line near Marrickville Station
- Warburton St and Wooley Ln
- Renwick St

This map shows the stormwater issues and hot spots as identified by the community and in interviews with Council staff.



Dumping in Touhy Lane (2013)

Dumping

Dumping is regularly a problem at:

- Despointes St
- Convent Ln
- Garners Ave
- Frampton Ave
- Seymours Ln
- Petersham Rd
- Marrickville Ln
- Touhy Ln
- Silver Ln
- Wooley Ln
- Frede Ln
- Johnston Ln



Dumping in Marrickville Lane (2013)

3.6 Capital Works Program and Connecting Marrickville



Capital Works Program

The planning process for capital works is carried out as part of the Council's planning and reporting requirements. This includes:

- asset management plans
- the Long-term Financial Plan
- 4-year delivery plan, and
- annual operational plan

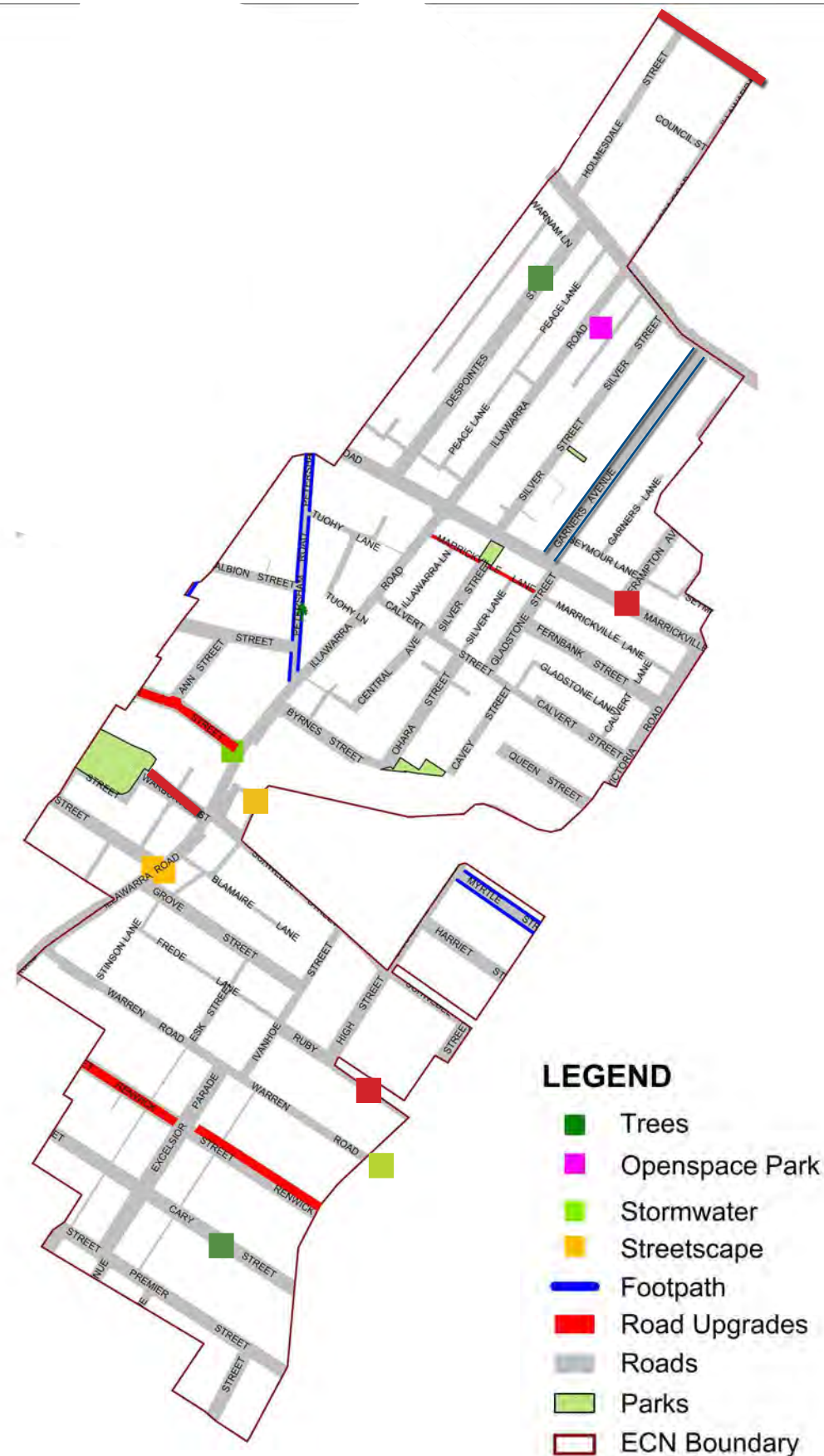
Council has a rolling program for capital works for new infrastructure, upgrades and renewal. Stormwater drainage and water sensitive urban design (WSUD) works are currently prioritised by:

- condition – are they in good condition or should they be replaced?
- function – are they doing what they are designed / expected to do?
- level of service – do they meet community needs and expectations?
- long-term strategies and plans – are they meeting the goals of a strategy or plan?

Connecting Marrickville

Connecting Marrickville is a new program that will deliver more drainage and water sensitive urban design (WSUD), better footpaths, street trees, cycle ways, and local area traffic management, while building on Council's social justice, access, and Sustainable Streets programs.

The program is transforming Council's approach to urban streetscape design, delivery and maintenance by integrating capital works where possible, moving Council from single-issue to place-based planning and delivery of capital works. The WSUD works proposed for Western Channel Subcatchment will be delivered through Connecting



Capital Works in Western Channel

The four-year capital works program currently includes the following capital works to be completed by 2017:

- Woodland Street - road upgrade
- Murdoch Playground upgrade
- Garners Avenue - footpath upgrade
- Frampton Avenue car park - road upgrade
- Marrickville Road - pedestrian crossing near Frampton Avenue
- Petersham Road - footpath upgrade
- Arthur Street - drainage works
- Station Street - streetscape works
- Warburton Street - streetscape works
- Illawarra Road near Grove St - streetscape works
- Myrtle Street - footpath upgrade
- Ruby Street - speed hump
- Renwick Street - road upgrade
- Warren Road - drainage works

(Note: the capital works program may change if other priority or emergency works are identified)

3.7 Land Use

Residential Dwelling Types

Catchment Size – 81 hectares (14% of the Marrickville Valley)
Number of residential dwellings – 1,807*
Unoccupied dwellings - 132 (7%)



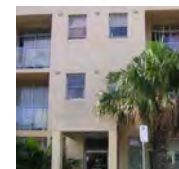
40%

Separate Houses



17%

1 storey semi, row, terrace or townhouse



14%

3 storey residential flat building



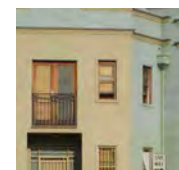
10%

1 or 2 storey residential flat building



5%

4 storey residential flat building



3%

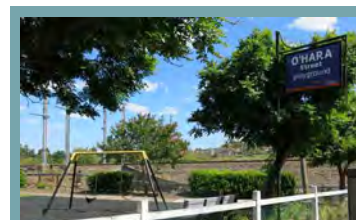
2 or more storey semi, row, terrace or townhouse



3%

House or flat attached to a shop

* ABS 2011 Census Data



O'hara Street Playground



St Clements Anglican Church



Murdoch Playground



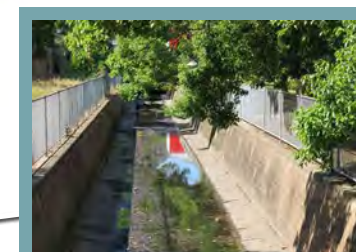
Silver Street pocket park



McNeilly Park



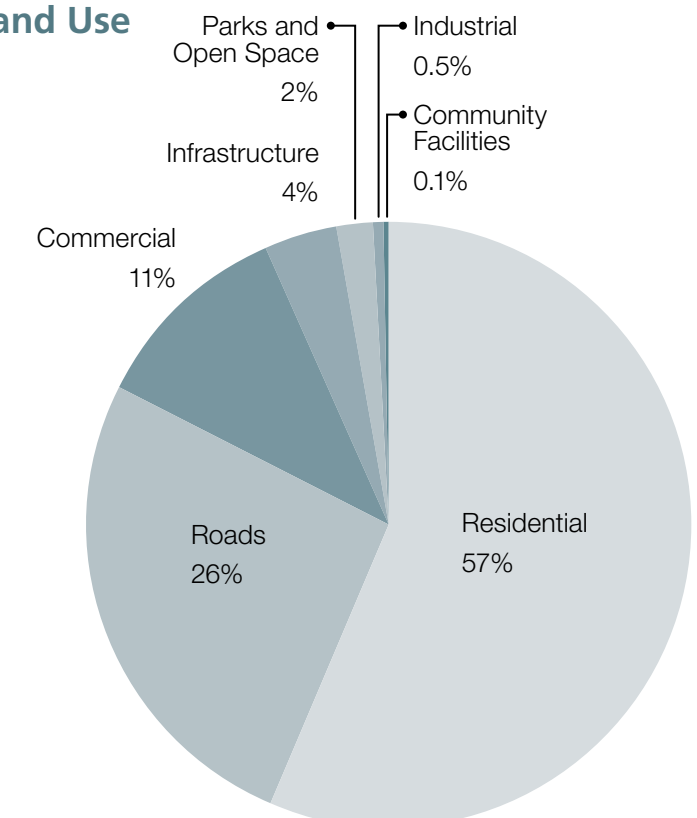
Ferncourt Public School



Western Channel



Land Use



3.8 Organisations and Community

Authorities

Sydney Water Corporation

State owned corporation responsible for the control of trunk stormwater drainage, wastewater and potable water infrastructure and delivery within the Subcatchment.

Departments

Housing NSW

Provides affordable housing for low-income families in 4% of dwellings in the Subcatchment.

Local Land Services

Provides agricultural production advice, biosecurity, natural resource management and emergency management.

NSW Office of Environment and Heritage

Works to protect and conserve the NSW environment, including the natural environment, Aboriginal country, culture and heritage and built heritage, and manages NSW national parks and reserves.

NSW Office of Water

The NSW Office of Water in the Department of Primary Industries is responsible for the management of the State's surface water and groundwater resources.

Roads and Maritime Services

State Government agency responsible for building and maintaining some roads, overseeing harbours and waterways to deliver essential services to users.

Transport for NSW

Provides a strategic focal point for transport coordination, policy, integrated transport service and infrastructure planning and delivery. Responsible for the management and maintenance of Marrickville Station and associated rail infrastructure.

Parks, Playgrounds & Reserves

All parks and reserves managed by Council's Infrastructure Works and Services Section.

McNeily Park (east)	Playground, BBQ, picnic area, rest area
O'Hara St Playground	Playground
Silver St pocket park	Playground
Murdoch Park	Grassed area



Land Users

Schools

The northern side of Ferncourt Public School is in Western Channel Subcatchment.

Churches

- St Clements Anglican Church - Corner Petersham Road and Marrickville Road, Marrickville
- Silver Street Baptist Mission - Corner Silver St and Calvert St Marrickville
- Marrickville Church of Christ - 389 Illawarra Road, Marrickville

Community Services

Organisation/Operation	Activities/Management	Location
Australian Federation of Chinese Organisation	Weekly meeting of Chinese opera singers	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Centrelink	Delivers a range of Commonwealth services to the community	373 Illawarra Rd Marrickville
Community and Cultural Connections	Seniors support group meets weekly	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Community and Cultural Connections - Arabic Group	Monthly meeting of Home and Community Care day care group	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Council Art Group	Fortnightly meeting of art group	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Employment Plus	Salvation Army employment services	264 Illawarra Rd Marrickville
Falun Dafa Association of Australia	Weekly band practice and meeting	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Gurkha Nepalese Community	Twice weekly community meetings	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Inner West Filipino Migrant Group	Informal meeting of Filipino migrants	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Marrickville Chamber of Commerce Inc.	Providing a voice for local business	274A Marrickville Rd, Marrickville
Marrickville Festival	Held annually in October to promote Marrickville	Marrickville Rd and Illawarra Rd, Marrickville
Marrickville Heritage Society Inc	Monthly meeting and outings, newsletter. Monitor heritage buildings at risk.	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Marrickville Police - Local Area Command	Law enforcement assists members of the community with various policing issues and enquiries	89-101 Despointes St Marrickville
Marrickville Residents for Reconciliation	Advocacy group work for reconciliation in Marrickville. Meets every second Wednesday	389 Illawarra Rd Marrickville
Marrickville Legal Centre	Free legal advice, assistance and education to local community	338 Illawarra Rd Marrickville
Veitnamese Family Support	Offers Vietnamese women opportunity to meet other mothers and provide informtion on education immigration, housing, health and employment. Meets fortnightly	Herb Greedy Hall, 79 Petersham Rd, Marrickville
MTC Australia - Skills for Education and Employment	Not-for-profit organisation helps people to gain employment, skills training, work experience and self confidence	334-336 Illawarra Rd Marrickville
Newtown Neighbourhood Centre/ Multicultural Health Service	Twice weekly meeting of Greek Seniors day care	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Newtown Women's Domestic Violence Court Assistance Scheme	Provice address to a safe room and support worker to provide assistance through the Court process	338 Illawarra Rd Marrickville
Redeemed Christian Church of God	Occasional meetings	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Rotary Club of Marrickville	Community Service Club	203 Marrickville Rd Marrickville
Sierra Leone Performance Group	Weekly meeting of support goup for capacity building, resettlement and community development	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Stretch-A-Family	Non-profit organisation breaking the cycle of youth homelessness	198 Marrickville Rd Marrickville
Unidos	United Portuguese Speaking Citizen Group	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Vietnamese Seniors Association of Marrickville	Monthly meetings	Herb Greedy Hall, 79 Petersham Rd, Marrickville
Zumba	Fortnightly group of Zumba dancing	Herb Greedy Hall, 79 Petersham Rd, Marrickville

3.9 Urban Development

Marrickville Urban Strategy

In April 2007, Marrickville Council adopted the *Marrickville Urban Strategy* that provides the planning context for future development across the Marrickville local government area. The strategy is available online.

The Place Project

To help implement the Marrickville Urban Strategy, Council is currently undertaking The Place Project (formerly known as the Public Domain Study). The Place Project will assist Council in improving the look and feel of Council-run public spaces such as streets, lanes, footpaths and urban squares such as Newtown Square, throughout the Marrickville Council area. The Place Project commenced in March 2012 and is intended to be completed by November 2014.

This page focuses specifically on the character and opportunities of the Western Channel Subcatchment's areas designated for redevelopment.



Marrickville Road

Changes introduced under the Marrickville Local Environmental Plan allows for 4-5 storey shop-top housing, which will see significant changes along the Marrickville Road retail strip as opportunities are taken up by developers.



Calvert Street Carpark

As part of the Illawarra Road Precinct upgrade, the Calvert Street Carpark was identified in The Place Project (formerly the Public Domain Study) as an opportunity for rejuvenation. The space may be redesigned to provide attractive public open space adjacent to the bus and pedestrian area providing flexibility for the area to be used for markets or events.



Marrickville Railway Station and Station Street

Potential to integrate the station upgrades with the redevelopment of 2-18 Station Street, with enhanced public open space and transport interchange. Potential for 'pop up' retail activities within the existing retail spaces to generate new development over the long term. Opportunities to incorporate water sensitive urban design and increase tree canopy to reduce the urban heat island effect, and improve stormwater management.



Marrickville/Illawarra Road Precinct

Potential for shared bicycle/pedestrian zones and for events especially in the rear lanes; opportunity for updated streetscapes, increased pavement widths and commercial and retail opportunities through increased residential populations. Opportunity to increase tree canopy, incorporate water sensitive urban design and increase links to surrounding open spaces. The masterplan for the Marrickville/Illawarra Road precinct will be completed by mid-2014.



3.10 Biodiversity

Council is committed to improving local biodiversity for the future through the Biodiversity Strategy (2011-21). Its associated Biodiversity Action Plan (2011-15) provides actions to meet the challenges of urban biodiversity management over the next four years.

The Western Channel Subcatchment is part of the Urban Habitat Mosaic Priority Biodiversity Area as identified in the Biodiversity Strategy. The area is important because it:

- provides structural habitat through a mixture of native and exotic vegetation and food resources for a range of fauna, including frogs, rock/crevice dependent reptiles, moisture dependent reptiles, nocturnal birds, small grain-eating birds, small nectar-eating and insect-eating birds, microbats and mega bats
- provides local and regional connectivity. In particular, the Cooks River is linked to the eastern side of the subcatchment via the low-lying land and vegetation on the western side of Mackey Park



New Holland Honeyeater (Larry Drunis 2009)



Grey Headed Flying Fox (www.australiananimallearningzone.com)



McNeilly Park
Significant tree plantings



Murdoch Playground
Grassed area linking Illawarra Road and Le Clos Lane



Greenbank Street
Resident's verge planting illustrating what can be done by locals



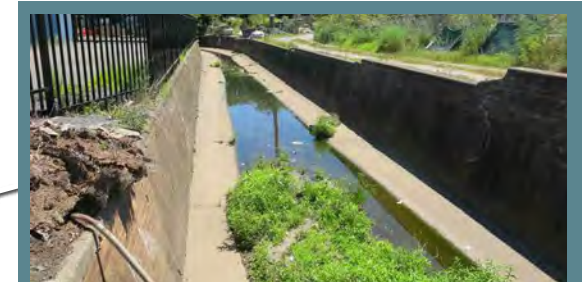
Ivanhoe Street
Birthplace of Sustainable Streets program with a trial of native grasses and groundcovers



Fernbank Street
Community-driven native verge initiative



Railway Corridor
Pockets of native vegetation with biodiversity value



Sydney Water land
Located just off Myrtle Street. Significant mixed vegetation coverage providing very good small bird habitat



Ruby Street
Sandstone outcrop combined with moist gully conditions provide a rare variety of habitats, many directly related to stormwater

3.11 Social Characteristics



Key Statistics

Population – 4,930 residents

Origin – 51% born overseas: 10% Vietnam, 5% Greece. 3% UK

Languages spoken at home – 37% non-English: 12% speak Greek, 8% speak Chinese, 4% speak Arabic

Religion – 27% no religion, 20% Catholic, 12% Buddhist, 11% Eastern Orthodox, 5% Islamic, 4% Hindi

Travel to work – 51% by car, 30% by train, 8% by bus, 7% walked and 3% by bicycle

Education

Education attendance – 31% (1,522 people):

- Preschool 4%
- Infant/primary 18%
- Secondary 13%
- Technical or further educational institution* 11%
- University or other tertiary institution 24%
- Other education institution 3%
- Institution not stated 27%

Non-school qualifications (over 15 years) – University 40%, Other 38%; not stated or not described 22%

(*includes TAFE)

Employment

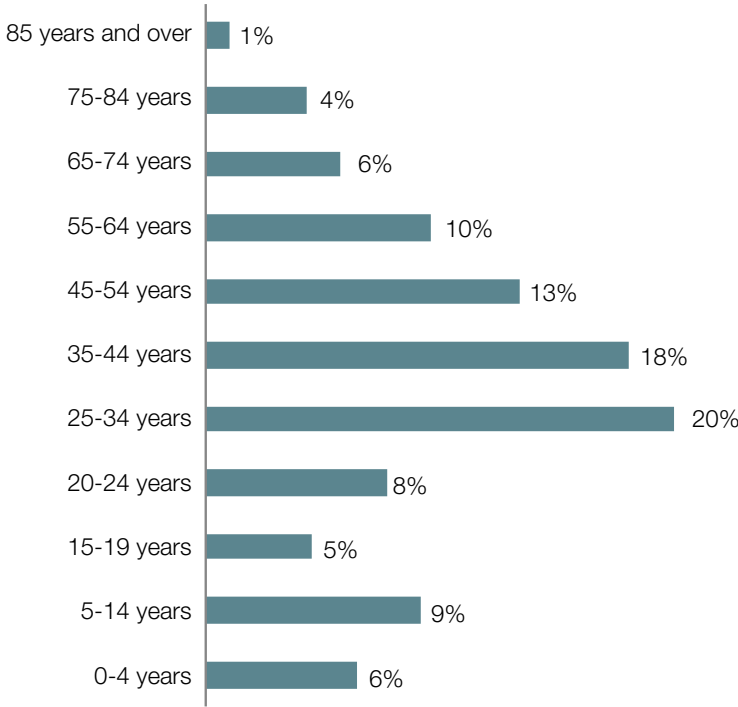
Of the total labour force (4,027 people):

- Full time - 68%
- Part time - 25%
- Unemployed - 7%

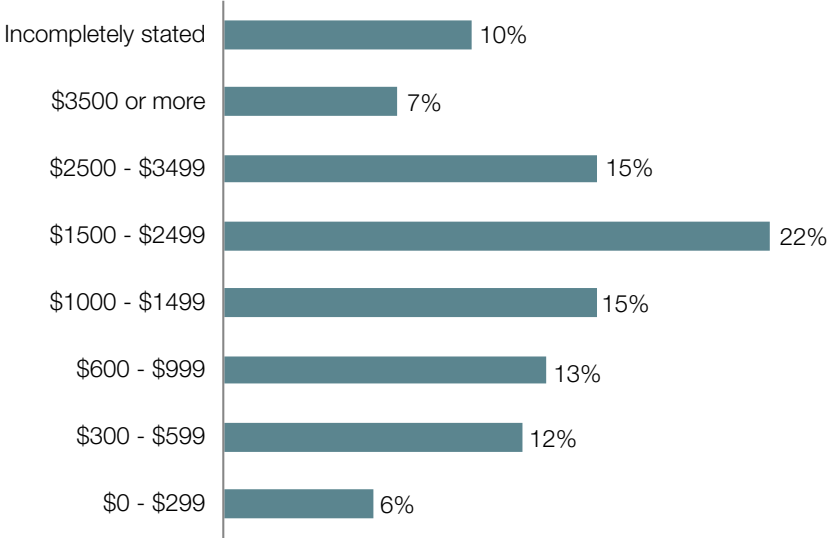
Household income

- More than 32% of households have income above the Marrickville median of \$1,605
- 13% of households have an income above \$3,000 per week

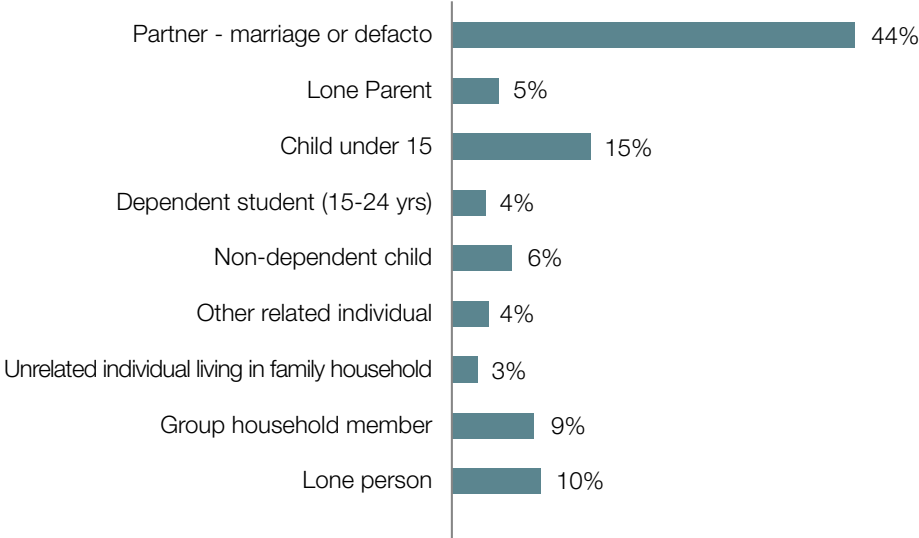
Age Distribution



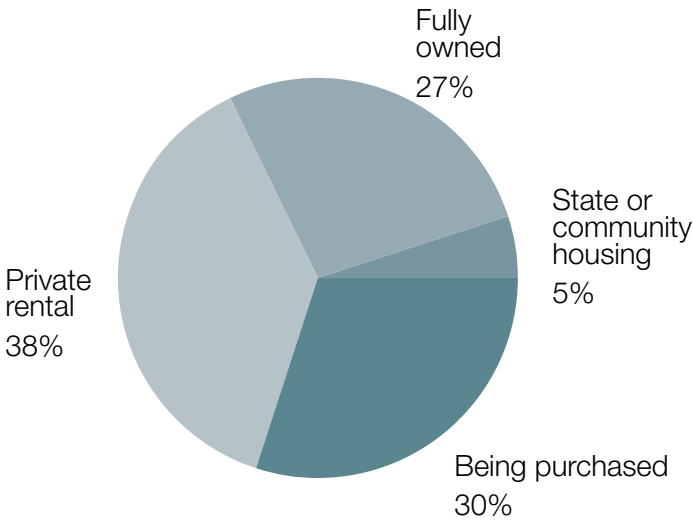
Income Distribution



Household Types



Household Tenure



Information on this page is from the Australian Bureau of Statistics Census, 2011.

3.12 Western Channel Community Water Survey

Who answered the survey?

(Total: 306 responses, 17% of Western Channel households)

Gender	60% Female 40% Male
Origin	63% Australia 17% Europe 12% Asia 2% New Zealand 2% Americas 2% Africa & Middle East
Age	29% 40-49 years 23% 30-39 years 20% 60 years + 19% 50-59 years 9% 18-29 years
Household Type	30% Couple no children 28% Couple with children 18% Single person living alone 6% One parent with children 9% Share with family or non - family
Tenure Type	54% Fully own home 24% Buying home 18% Private rental 2% Public rental
Dwelling	42% Separate house 31% Semi, Terrace, Townhouse 27% Flat, Unit, Apartment
Time in Current Residence	38% 0-5 years 31% >15 years 18% 6-10 years 12% 11-15 years

Future environmental improvements

Respondents were asked what long-term improvement environmental improvements they would like to see:

- 45% wanted improved water management, cleaner waterways and more rainwater tanks
- 24% wanted improved green space
- 22% wanted reduced pollution
- 6% renewable energy
- 5% wanted more environmental education

What were their answers?

Knowledge of urban water systems

1. In Marrickville, the rainwater in the street drains normally goes:

- 75% to the nearest waterway (correct answer)
- 20% to the sewerage system
- 3% to the sea

2. Water from which of the following would normally end up in the street drains?

Responses	
The kitchen sink	11% (incorrect)
The shower	10% (incorrect)
The toilets	6% (incorrect)
The washing machine	11% (incorrect)
The garden	70% (correct)
Driveways, footpaths	86% (correct)
Other paved areas	77% (correct)
Rainwater from the roof	76% (correct)

3. On average, how many litres of water does a typical Marrickville household use per day?

- 56% underestimated daily water use
- 25% chose the correct range (300-400L per day)
- 19% overestimated daily water use

Behaviour

Of 306 households:

1. Rainwater Tanks

- 31 respondents (10%) indicated that they have a rainwater tank installed.
- 90% used rainwater for the garden and 25% used rainwater for flushing toilets and in the washing machine.

2. Greywater Systems

13 respondents (4%) indicated that they had a greywater system.

3. Water Saving Devices

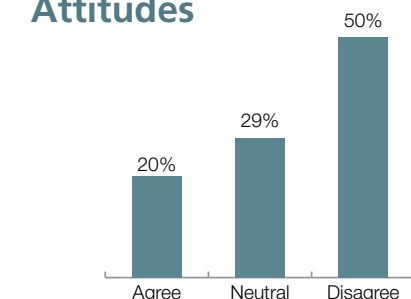
240 respondents (82%) have water saving devices such as water saving showerheads, tap aerators and toilet flush water savers.

Receptivity to using rain and greywater

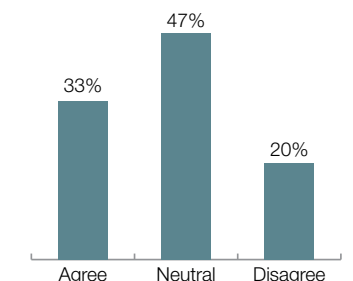
The percentage of people that would consider using rainwater and greywater and how they would use them is shown below:

	Filtered rainwater	Treated recycled water
Cooking	33%	10%
Drinking	26%	9%
Showering	55%	28%
Washing Clothes	69%	51%
Flushing the toilet	83%	86%
Washing the car	82%	80%
Watering the garden	89%	90%

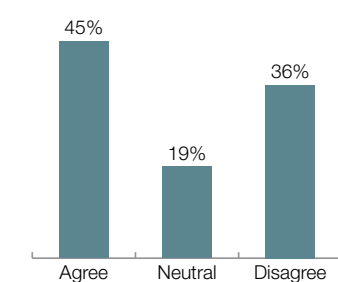
Attitudes



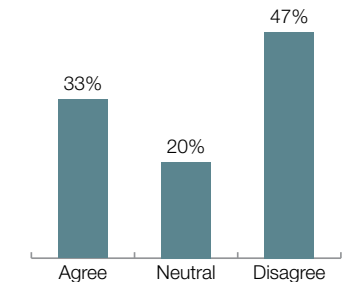
a) 'Jobs are more important than the environment'



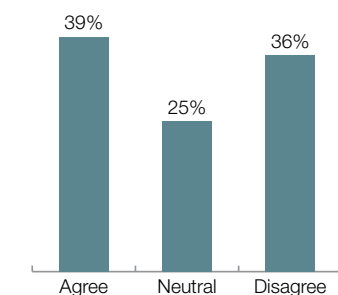
b) 'Access to a healthy natural environment is more important than access to community facilities'



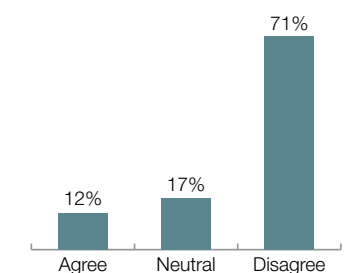
c) 'My daily activities have little negative impact on the waterway environment'



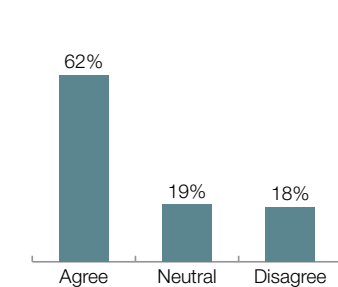
d) 'Government agencies should be mainly responsible for the waterway environment, rather than the individual'



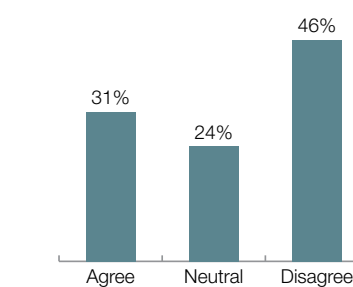
e) 'We should aim for the same waterway conditions as before Europeans arrived about 230 years ago'



f) 'I would reduce my shower time by half to save limited water resources'



g) 'Most people want to improve the health of the waterway environment'



h) 'Laws are more effective than education for protecting the waterway environment'

3.13 Marrickville Valley Business Community Water Survey

MARRICKVILLE
council

WATER3EVOLUTION
Funded by the Marrickville community through the Stormwater Charge

What sort of businesses responded to the survey?

Business Type	29% Manufacturing 22% Retail trade 13% Wholesale trade 9% Construction 9% Other services 7% Professional, scientific and technical services 4% Health care and social assistance 4% Food services 2% Accommodation
Property Type	53% Warehouse 35% Shopfront/retail 4% Shopping Centre 9% Other
Tenure	52% Fully owned 33% Leased privately 13% Being purchased 2% Other

Knowledge of urban water systems

1. In Marrickville, the rainwater in the street drains normally goes:
- 80% to the nearest waterway (correct answer)
11% to the sewerage system
2. Water from which of the following would normally end up in the street drains?

Responses	
Driveways, footpaths	83% (Correct)
Other paved areas	54% (Correct)
The roof	67% (Correct)
The garden	32% (Correct)
The kitchen sink	4% (Incorrect)
The toilet	4% (Incorrect)

Behaviour

Of 52 people:

1. Rainwater Tanks

Two (2) of the businesses have rainwater tanks with 20,000L and 24,000L capacity respectively.

2. Greywater Systems

Two (2) of the businesses have greywater reuse systems

3. Water Saving Devices

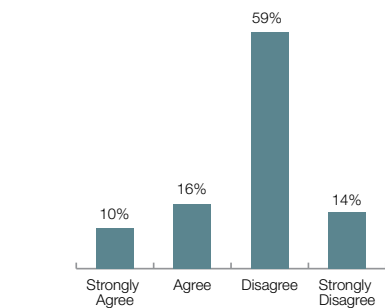
39% of businesses have water saving devices such as tap aerators and toilet flush water savers.

Receptivity to using rain and greywater

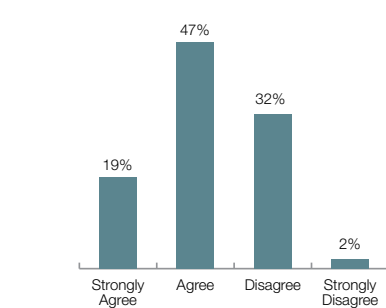
The percentage of respondents that would consider using rainwater and greywater and how they would use them in their businesses is shown below:

	Filtered Rainwater	Treated Recycled Water
Flushing toilet	63%	70%
Washing car	50%	48%
Washing clothes	35%	33%
Showering	24%	22%
Cooking	22%	17%
Drinking	24%	8%
In manufacturing for:		
Food production	9%	6%
Washing	24%	24%
Cooling	22%	26%
Other	11%	11%

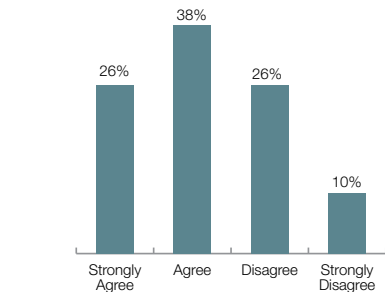
Attitudes



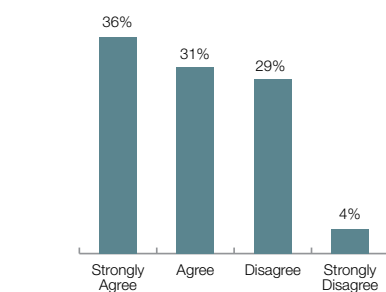
a) 'Jobs are more important than the environment'



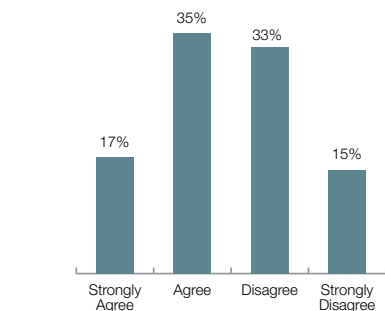
b) 'Access to a healthy natural environment is more important than access to community facilities'



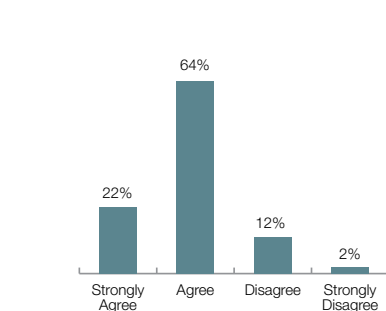
c) 'My daily activities have little negative impact on the waterway environment'



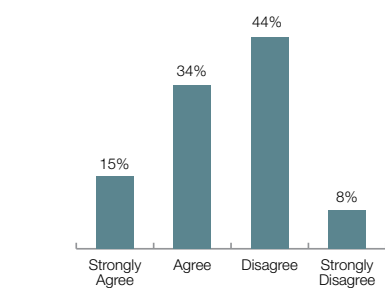
d) 'Government agencies rather than business should be mainly responsible for the waterway environment'



e) 'We should aim for the same waterway conditions as before Europeans arrived about 220 years ago'

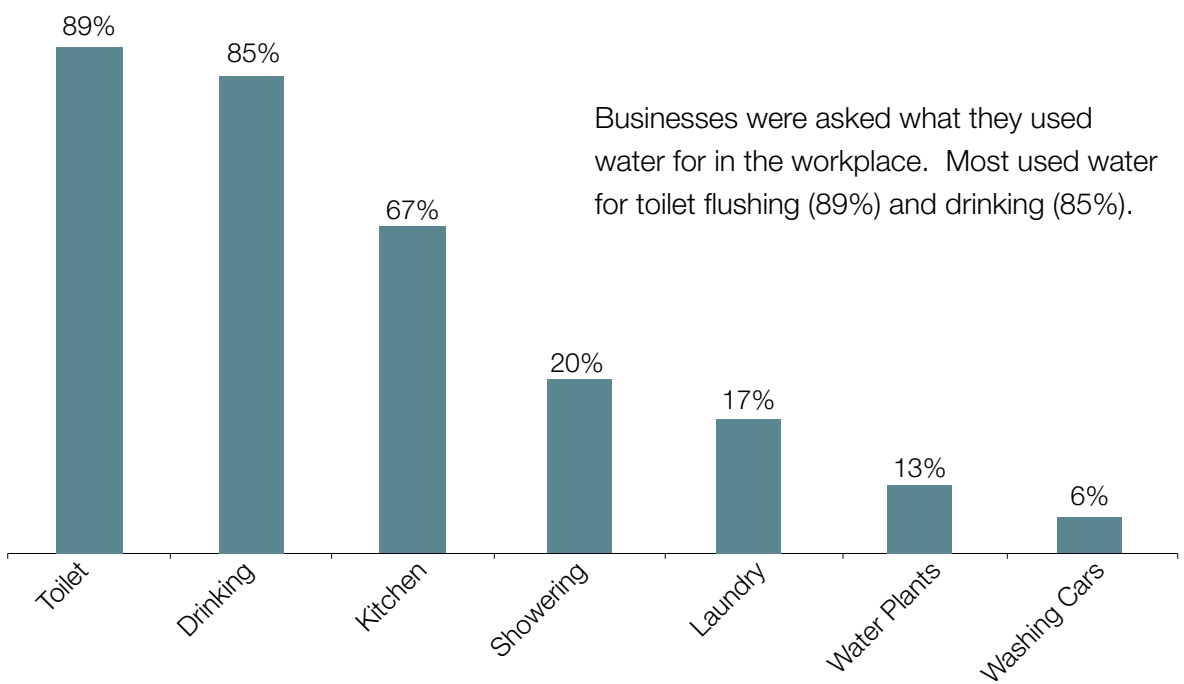


f) 'Most people want to help improve the health of the waterway environment'



g) 'Laws are more effective than education for protecting the waterway environment'

Businesses water use



Businesses were asked what they used water for in the workplace. Most used water for toilet flushing (89%) and drinking (85%).

3.14 The Business Community in Western Channel

Council has established close relationships with many businesses within the LGA. Council works with local businesses to help them reduce water and energy consumption through the Target Sustainability program.

Businesses in the Marrickville local government area that have worked with Council through the Target Sustainability program are saving 25 million litres of water per year.

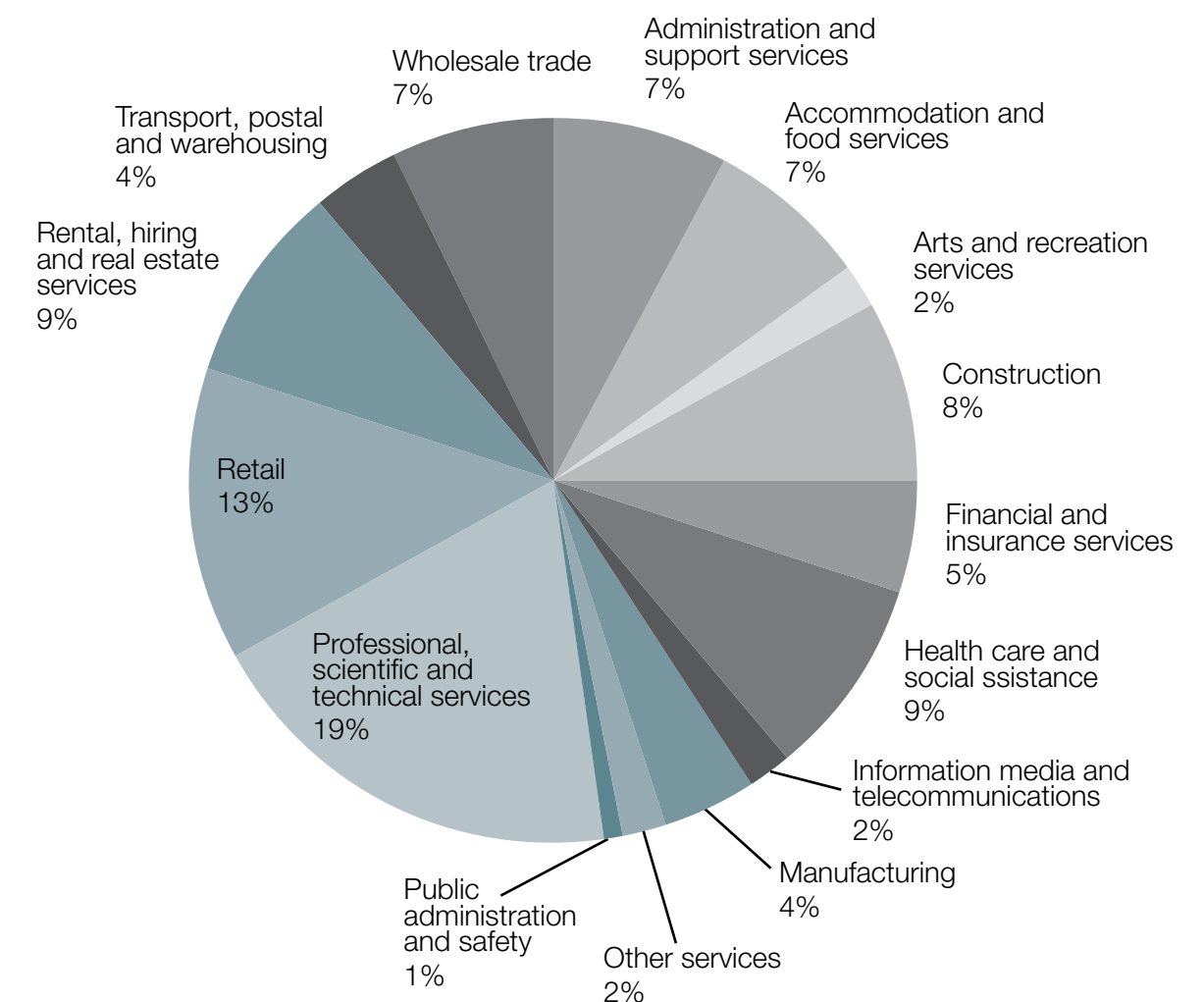
Yen for Viet
Winner 'Best New Sustainable Business' Award - 2011

Van Long Groceries
Trialling timers on refrigerators

The chart below reveals the diversity of businesses operating within Western Channel Subcatchment with a large professional, scientific and technical services sector as well as a strong retail sector. Water consumption and discharge will vary according to specific use in the industry. Food services, manufacturing, retail and health care services will all have differing water needs.

Cornersmith Cafe
Winner 'Waste Not' Award - 2013
Sustainable Innovation Award - 2012
Community Partnership Award - 2012

Cornersmith Picklery



4. Supporting Information

MARRICKVILLE
council

WATER3VOLUTION
Funded by the Marrickville community through the Stormwater Charge



4.1 Marrickville Council Key Areas of Influence

General Manager

Corporate Strategy and Communications

Legal Services

Executive Manager Major Projects

People and Workforce

Manager Integrated Strategy

Infrastructure Services

Planning & Environmental Services

Corporate Services

Community Services

Infrastructure Planning

Development Assessment

Customer Service

Community Development

Infrastructure Works and Services

Environmental Services

Finance

Children and Family Services

Investigation and Design

Monitoring Services

Governance and Risk

Library and History Services

Planning Services

Culture and Recreation Services

Economic Development

Development Assessment

Primarily responsible for determining development applications involving assessing applications from residents and other developers to construct new buildings, alter or make additions to buildings, subdivide land or change the use of a building.

Current Water Relationship: Placing of standard consent conditions for on-site stormwater detention, water sensitive urban design, BASIX and sediment control at the development application stages.

Monitoring Services

Ensure a safe, clean, equitable and accessible environment for the community. Achieved by effectively monitoring the community for compliance and building codes, consent conditions, fire safety, health and environmental standards. Providing a ranger service that proactively patrols parking restrictions and Council's parks and reserves and investigating public concerns regarding nuisance and dangerous dogs, abandoned vehicles and water issues.

Current Water Relationship: Rangers and building inspectors monitoring implementation of sediment control and on-site stormwater detention for new developments. Responding to community pollution complaints (mainly sewage overflows, flooding and dumped rubbish).

Environmental Services

Primarily responsible for the implementation of Ecologically Sustainable Development programs and processes across Council and all other sections of the Marrickville community. Responsible for developing the long-term strategic direction of Council in terms of ecological sustainable development. Contributes to development of community strategic plans, asset plans and preparing and implementing strategies for biodiversity, water, carbon and greenhouse gas emissions management, community sustainability and resource management.

Current Water Relationship: Responsible for the Strategy for a Water Sensitive Community and coordinating its implementation across Council and the community. The Waterevolution sustainable urban water management program includes collaborative subcatchment planning, sustainable irrigation, community partnership projects, incentive schemes and urban water education, all promoting water sensitive practices on public and private property. Internal capacity building to improve Council's water management practices through research partnership with CRC for Water Sensitive Cities and partnerships with CMA, neighbouring councils (Cooks River Alliance).

Infrastructure Planning and Property

Primarily responsible for the forward planning of civil infrastructure works improvements and local emergency management and management of Council's property portfolio. Services include strategic management of traffic and parking, floodplain management and open space works in accordance with adopted parks plans of management and emerging community needs.

Current Water Relationship: Management of potable water use and wastewater discharges in Council buildings; floodplain management planning; support establishment of park irrigation using recycled water; contribute to promotion of Cooks River wildlife corridor; prepare stormwater asset management plans; investigate and address stormwater management deficiencies and integrate capital works programs to include water sensitive urban design.

Infrastructure Works and Services

Primarily responsible for the maintenance of Council's parks, reserves and landscaping of council roadway areas. Maintaining recreational and sporting areas, planting of the tree management program.

Current Water Relationship: Irrigation (potable water) of parks, street trees and sports fields. Keeping sports fields and parks dry and preventing soil loss during and after wet periods (i.e. managing stormwater runoff). Currently examining the use of artificial turf surfaces to reduce the need for irrigation and fertilisation of playing fields.

Investigation and Design

Primarily responsible for the investigation, technical design and specification for civil and parks infrastructure capital works, project management of the delivery of parks and landscape capital works, provision of tree management services, investigation and management of operational traffic and parking related matters.

Current Water Relationship: Responsible for the survey and design of drainage and water sensitive urban design projects; contributing technical advice for subcatchment planning; investigation of stormwater and flooding issues and responding to community enquiries on flooding and stormwater.

Planning Services

Primarily responsible for developing new planning instruments and planning policies. These plans and policies include objectives, guidelines and development controls for a range of land uses, including residential, industrial, commercial and mixed uses. Responsible for amending planning instruments and policies through site-specific rezonings and changes to development controls. Responsible for co-ordinating and providing advice on major developments. Responsible for policy development, co-ordination and advice on specialist planning areas, including transport, heritage and public domain design.

Current Water Relationship: Planning development controls for flooding, stormwater management and water sensitive urban design including water efficiency. Develop land use strategies that promote sustainable water management.

Community Development

Primarily responsible for the provision of community services and programs that develop social capital and meet the needs of the diverse population of Marrickville. Advocate for and support people experiencing economic challenge and social isolation, and provide Meals on Wheels Service delivery for senior and less mobile residents.

Current Water Relationship: Aboriginal community consultation on the cultural heritage of the Cooks River through the Aboriginal Interpretive Signage project. Development of a whole of area initiative for South Marrickville which will incorporate ecological values of the Cooks River. Implementing water sensitive urban design at childcare facilities and the Tom Foster Community Centre which has become a demonstration site for water sensitive urban design.

Finance

Primarily responsible for developing Council's long-term financial plan and annual budget, reporting of Council's financial performance and all associated revenue accounting and collection.

Current Water Relationship: Strategic financial planning to reflect the changing demography and associated increasing environmental amenity, restoration and protection expectations of the community. Consideration to resource need and opportunities for supporting more integrated and improved sustainable water management services and practice in the future.

Culture and Recreation Services

Primarily responsible for arts and cultural development, major events, recreation planning and community facilities. This includes open space planning and the management of a range of indoor and outdoor community facilities, sportsgrounds, aquatic and recreation centres.

Current Water Relationship: Minimising environmental impact and promoting sustainability through the effective planning and management of cultural and recreational facilities.

Economic Development

Primarily responsible for facilitating and maintaining economic growth in the LGA through place making strategies in our urban centres, promotion of local manufacturing, business skills and development training, business attraction and providing administrative and web support for the Marrickville Business Association.

Current Water Relationship: Working with Target Sustainability team to identify businesses who need help with the control of water usage and waste water. General pre-start up advice in relation to Council requirements regarding water usage, recycling and waste disposal.

4.2 Strategy for a Water Sensitive Community

The *Strategy for a Water Sensitive Community* aims to move current urban water management in Marrickville to a more sustainable and flexible approach that promotes liveable, productive, resilient and sustainable communities. The Strategy will be enabled through the initiative, support and actions of Council and a Water Sensitive Community.

Council is committed to implementing its four strategies outlined in the Strategy for a Water Sensitive Community to:




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


Work is being undertaken to:

- Install water-saving devices and rainwater tanks on Council properties
- Build rain gardens and wetlands to filter stormwater before it drains into the Cooks River, Parramatta River, Botany Bay or Sydney Harbour
- Install porous paving to reduce runoff and filter stormwater
- Sustainably irrigate playing fields to reduce water consumption

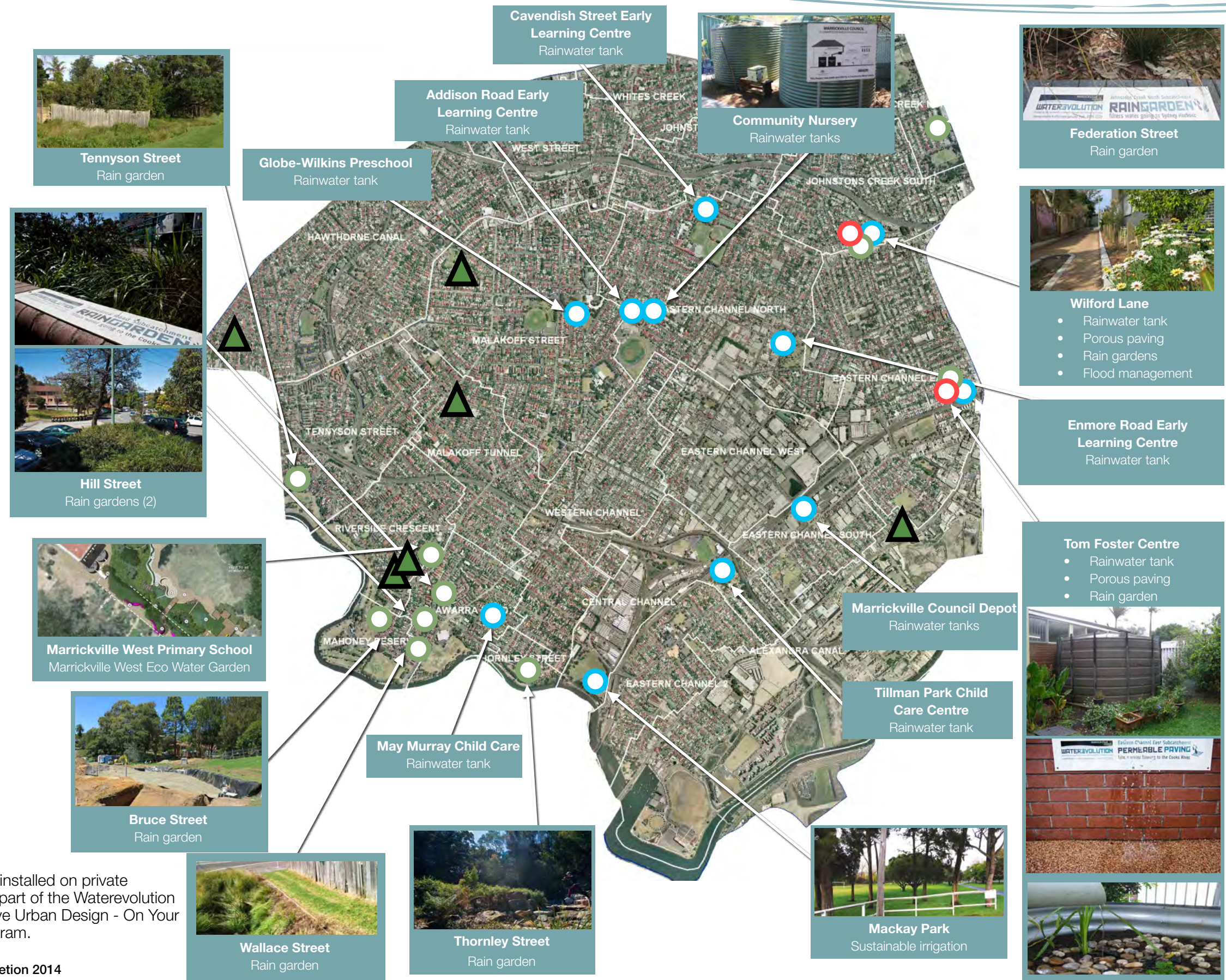
Projects undertaken so far are shown on the map.

In addition to these works, 114 rainwater tanks have been installed on private property under Council's Rainwater Tank Incentive Scheme (that includes a rebate) saving over 4 million litres of imported mains water per year.

-  Rain garden (Council)
-  Rainwater tank (Council)
-  Porous paving (Council)

 Rain gardens installed on private properties as part of the Waterevolution Water Sensitive Urban Design - On Your Property Program.

* Due for completion 2014



4.3 Managing Flooding in the Marrickville Valley

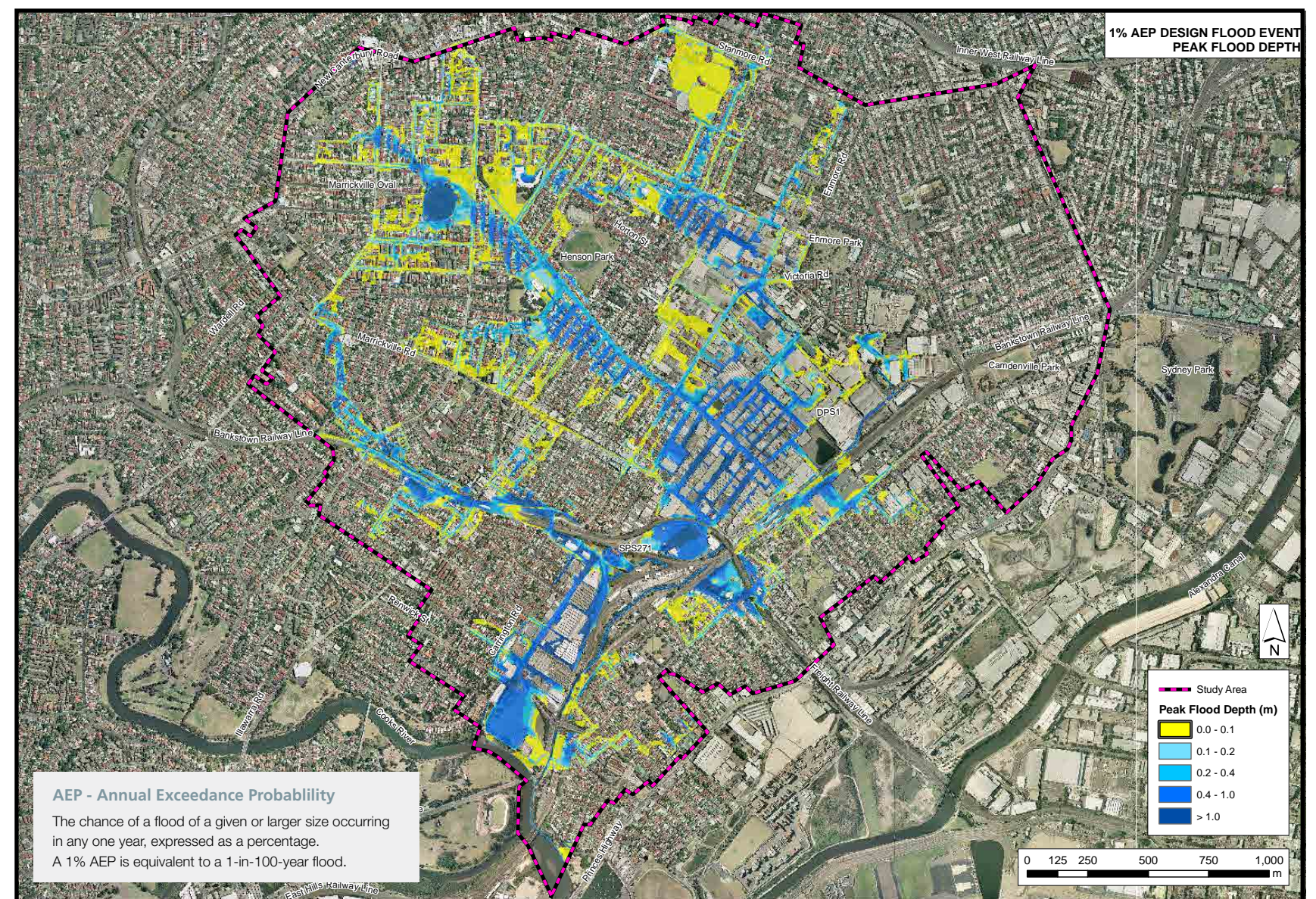
The low lying parts of the Marrickville Valley have recorded flooding during major storm events since records began. The potential for flooding is related to topography, level of service provided by the stormwater drains and historical patterns of development. Increases in hard surfaces together with changes in climate have produced perfect conditions for accumulations of flood waters, especially in flatter and more densely urbanised areas in the valley.

Modelling for the Marrickville Valley Flood Study identified a number of areas that experience flooding during significant rainfall or storm events. These areas coincide with known flooding hotspots and include:

- Carrington Road and surrounds
- Marrickville Industrial Area
- Malakoff St, downstream of Marrickville Oval and southern side of Sydenham Road (Livingstone Rd)
- Marrickville Railway Station and surrounds
- Sydenham Railway Station
- Jabez St and Shephard St and surrounds

The map on the right shows areas most at risk from flooding. In Western Channel, flooding is likely to occur along Illawarra Road, near Marrickville Station and around the industrial eastern part of the subcatchment where there are predominantly impermeable surfaces and topography is flatter so water is slower to move away from the area.

The Marrickville Valley Flood Study was adopted by Council in March 2013. The NSW Office of Environment and Heritage is providing funding for the development of a Floodplain Risk Management Plan for the Marrickville Valley during 2013-2015. The plan will recommend the work and activities to help reduce future flood risks.



Above: Extent of a 1-in-100-year flood. A 1-in-100-year flood is a flood event that has a 1% chance of occurring in any given year.

Note: Flood depths are not shown in buildings even though they may be subject to flooding.



Camden Street Newtown, March 2013



Riverside Crescent Marrickville, February 2011



Riverside Crescent Marrickville, February 2011

SUPPORTING INFORMATION

4.4 Biodiversity

MARRICKVILLE
council

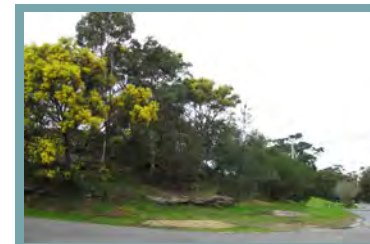
WATER3VOLUTION
Funded by the Marrickville community through the Stormwater Charge



Abergeldie Street
Powerful Owl sighted
2011 & 2012
(Photo: The Habitat Advocate)



Dibble Avenue Waterhole
Priority Biodiversity Area
Peron's Tree Frog
Eastern Dwarf Green Tree Frog



Cooks River
Remnant vegetation



Cooks River
Microbats
(Gould's Wattled Bat)



Greenway
Priority Biodiversity Area
(www.thegreenway.org.au)

Lincoln Street
Verge garden



West St, Petersham
Bandicoots
(Photo: P. Meek (OEH))



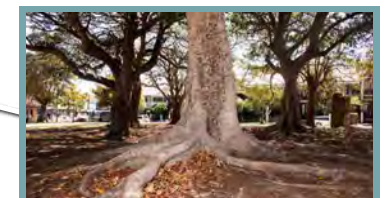
Community Nursery
Frog Pond
Native bee hive



Camperdown Cemetery
Remnant vegetation
Sydney Turpentine Ironbark
Forest



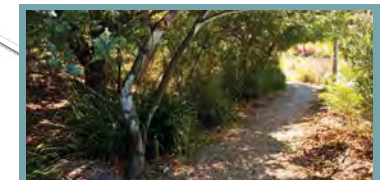
Juliett Street, Enmore
Population of Blue Wrens
(Photo: Voren O'Brien)



Enmore Park
Grey-headed flying foxes
forage in fig trees



Fraser and Tillman Parks
Priority Biodiversity Area



Meeks Road
Bush Pocket

Dulwich Hill Station near Kays Ave
Remnant Vegetation
Sydney Turpentine Ironbark Forest

Riverside Cres & Balfour St
Verge garden

Greenbank Street
Verge garden

Marrickville Golf Club
Landcare Site



Ruby Street
Remnant Vegetation



Tempe Reserve and Tempe Lands
Priority Biodiversity Area
50+ native birds



Alexandra Canal
Priority Biodiversity Area
(Photo: Friends of the Greenway)



Cooks River
Priority Biodiversity Area
Baby Eastern Longneck turtle
(Photo: Voren O'Brien)

Council is committed to looking after local biodiversity for the future through the first *Biodiversity Strategy* which provides actions to meet the challenges of urban biodiversity management over the next ten years.

4.5 Groundwork – grassroots sustainability

Marrickville Council has taken a new approach to community environmental initiatives that encourage community members to learn from each other. The primary focus of the Groundwork grassroots sustainability program is skills sharing and peer-supported learning. Community members are still able to call upon Council for advice and support, however this approach is more responsive to the needs of each community group, and will reward those already making a positive contribution.

Groundwork supports groups by:

- providing information and training on structures and processes to help the groups establish and continue independently of Council
- advertising and promoting projects to encourage residents to become actively involved
- facilitating skills training workshops as needed and identified by the groups, and Sustainability Ambassadors
- teaming like-minded community members with groups in the same geographical area
- hosting network and celebration events to acknowledge and promote the successes of the groups
- providing \$12,000 each year in grant funding to local groups through the Groundwork Sustainability Grants program
- evaluating projects and determining the effectiveness of Groundwork intervention



Different types of water in the drainage system

Rainwater can be collected from roofs. It is generally regarded as safe to drink if it is clear, has little odour and taste, and the tank and roof are well maintained. Rainwater can safely be used for showering, washing clothes and watering the garden. However, the quality can be affected by:

- debris (e.g. leaves and animal droppings) from the roof or guttering
- dead insects, trapped animals and leaf litter in the tank
- heavy metals (e.g. lead) from roofing materials
- air pollution from traffic emissions and industrial exhaust

Nevertheless, where a treated mains water supply is unavailable, it can be a major source of drinking water.

Potable water is drinking quality water. In Sydney, Sydney Water pipes in the water from the catchment area to the west of Sydney. Sydney Water's operating licence comes under strict guidelines and reporting requirements to make sure the quality is always safe for human consumption.

Stormwater is rain that drains into the stormwater system as 'runoff' from roofs, roads, footpaths and other surfaces. It usually flows untreated directly into local waterways. The water carries rubbish, animal droppings, engine oil, petrol, tyre rubber, soil and debris.

Stormwater from public and private properties is increasingly being used to water local sports fields and parks and provide water for wetlands.

Greywater is used water from the kitchen, laundry and bathroom drains but does not include toilet water and water containing food wastes (sometimes called *blackwater*). Treated greywater can be used for flushing toilets, washing clothes and subsurface garden watering. However, its use is currently limited because greywater:

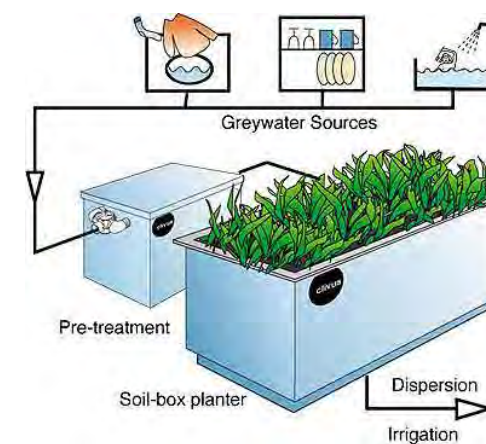
- can kill phosphorus sensitive plants
- can change soil composition
- can contain urine and faeces from nappy washing and showering, kitchen scraps, soil, hair, detergents, cleaning products with boron and phosphates, and fats and oils
- is often alkaline and saline (salty)

Wastewater is the used water and sewage that goes down sinks, toilets and inside drains. This enters the sewerage system, which is owned and operated by Sydney Water.

Sewage is the water entering the sewerage system that combines greywater with high concentrations of toilet material. This water can be thoroughly treated and recycled at a sewage treatment plant. It can then be piped to individual households, as part of a dual-pipe water-supply system (in addition to and separate from the normal tap water supply). It can be used for toilet flushing, garden watering, washing cars and outdoor surfaces, irrigating sports fields and public parks, fire control, sewerage flushing, dust control, or irrigating agricultural crops. A number of such systems are currently in place across Australia.

Recycling Systems

The technology for recycling greywater and sewage continues to improve. There is now a range of systems to suit the different types of housing and building structures. Recycling systems can also be adapted for the intended use of the recycled water i.e. making the water 'fit-for-purpose' (Mitakakis et al., 2004).



© <http://www.greywater.com>
Figure 1: Example of a simple greywater treatment system suitable for domestic housing.

4.7 Water Storage and Treatment

As well as storing and treating stormwater, water sensitive urban design can provide ecosystem services including creating microclimates, providing thermal benefits, providing habitat, acting as carbon sinks, producing oxygen and improving aesthetics.



Rainwater tanks collect rainwater from roofs and hard surfaces. In urban areas, rainwater from tanks is not generally used for drinking, but for watering gardens and flushing toilets.



Grassed swales or vegetated swales are open gutters covered in grasses and plants to remove sediment and suspended solids. Their efficiency depends on type and height of vegetation.

(www.wsud.org - Carindale Pines, Brisbane, QLD)



Rain gardens or bioretention systems are devices that slow water down and remove sediments, phosphates, and nitrates by passing water through gravel or sand.



Buffer strips are strips of vegetation, such as grasses and shrubs, used to absorb road runoff. They remove coarse sediments, such as soil and gravel, from stormwater.

(www.wsud.org - Victoria Park, Sydney, NSW)



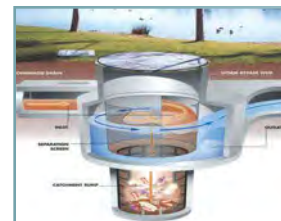
Wetlands are natural water filtering systems made up of plants such as grasses and reeds. They remove soil, sediments, nutrients, some chemicals and litter from stormwater. Wetlands use a combination of physical, chemical and biological processes to remove pollutants.



Ponds are open bodies of water that settle sediments out of the water. Phytoplankton or other living organisms break down the nutrients and sunlight disinfects the water.



Permeable paving reduces or eliminates stormwater runoff because water is able to go through the surface and into the ground or storage system. It can help reduce pollution and control erosion while assisting property owners to reduce the impervious surface area while still maintaining use of their property for purposes requiring hard surfaces.



Gross pollutant traps remove pollutants such as litter and leaves from stormwater. They are commonly used in urban areas but require high maintenance.



Sedimentation basins are large bodies of open water that remove sediment, soil and litter. Water is held for periods of time while pollution settles out of it.



(The Westbury, Darlinghurst.
Photo: Mark Harper)

Green roofs and walls can be made to suit a variety of building types and are particularly suitable for multi storey flats, units and apartments. They can:

- increase access to private outdoor green space
- support urban food production
- promote individual, community, and cultural diversity
- improve air quality and reduce CO₂ emissions
- increase habitat
- insulate buildings
- increase the value of buildings for owners and tenants alike
- create jobs in research, design, construction, landscaping, gardening, health, and food production
- delay stormwater runoff

4.8 Urban Planning

Marrickville Urban Strategy

In April 2007, Marrickville Council adopted *The Marrickville Urban Strategy* that provides the planning context for future development across the Marrickville local government area. The strategy is available online (Marrickville Council, 2007).



Population

The NSW Department of Planning and Infrastructure predicts that Marrickville will grow by an additional 11,500 residents by 2031. (From 76,500 in the 2011 Census, to 88,000). Expected changes include:

- Over the 2011-2031 period, the population of Marrickville is expected to age with a 29% increase in the 65+ age group
- The average number of persons per dwelling expected to decrease from 2.3 to 2.13
- Household types such as couple families without children and lone person households expected to grow
- An additional 6,700 private dwellings will be required to provide for the additional 11,500 residents in Marrickville

Of particular note, even with zero population growth, Marrickville will still need an additional 2,440 dwellings to accommodate social and demographic change (i.e. ageing, divorce, people living alone).

Urban Development

The Strategy suggests that Marrickville Council should plan for 3,830 dwellings over 25 years, through a mix of the renewal approach to provide:

- Rezoning and development controls to allow for 2,530 dwellings in the first 10 years
- An additional 1,300 dwellings in 10 to 25 years, and
- 80% of new dwellings located in or near centres, in walking distance to shops and services close to public transport

The position against these targets will be assessed and reviewed at five-yearly intervals, with the first review in 2012/2013. There is a lack of information on the future retail, commercial and industrial land needs in the LGA.

Modelling undertaken for the strategy predicts that employment growth over the next 25 years will result in the creation of 2,360 jobs, which includes 240 industrial jobs, with the remainder (2,120) in the retail and commercial sectors.

Natural Environment

Consultation for the Urban Strategy with the Marrickville community revealed the high values placed on Marrickville's existing natural areas and the variety of wildlife in the area. The large amount of impervious surfaces including roads, footpaths and backyard paving were raised as major issues. Stormwater and pollution were identified as a key threat to the health and amenity of the Cooks River. Increased tree planting to improve shade, habitat and street amenity, was also raised.

Through the Urban Strategy, Marrickville Council aims to continue improving water quality, particularly in the Cooks River, by:

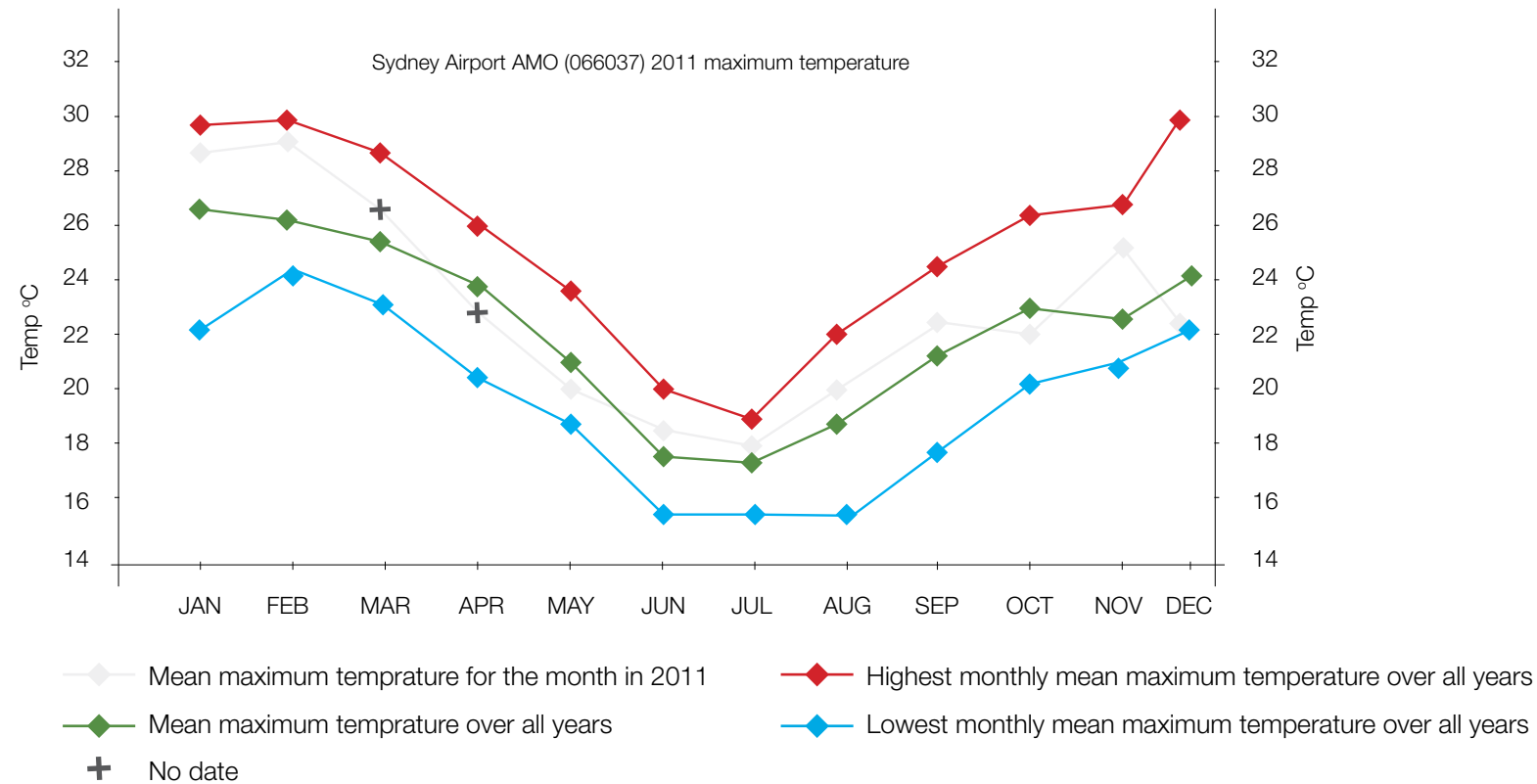
1. Planning and implementing the subcatchment management plans across the whole LGA using the current collaborative approach
2. Ongoing partnerships with catchment councils through the Cooks River Alliance
3. Ongoing monitoring of the ecological health of the river through Riverscience and the Georges River Combined Councils Committee
4. Translating relevant actions, (e.g. stormwater harvesting for irrigation of public spaces, public and private rainwater harvesting) from previous subcatchment action plans into the comprehensive LEP and DCP controls
5. Ensuring new developments and redevelopments comply with Sydney Water Corporation objectives for safe water supply, re-use and collection
6. Incorporating Water Strategy objectives including water sensitive urban design into public works projects



4.9 Marrickville Valley – Current Climate

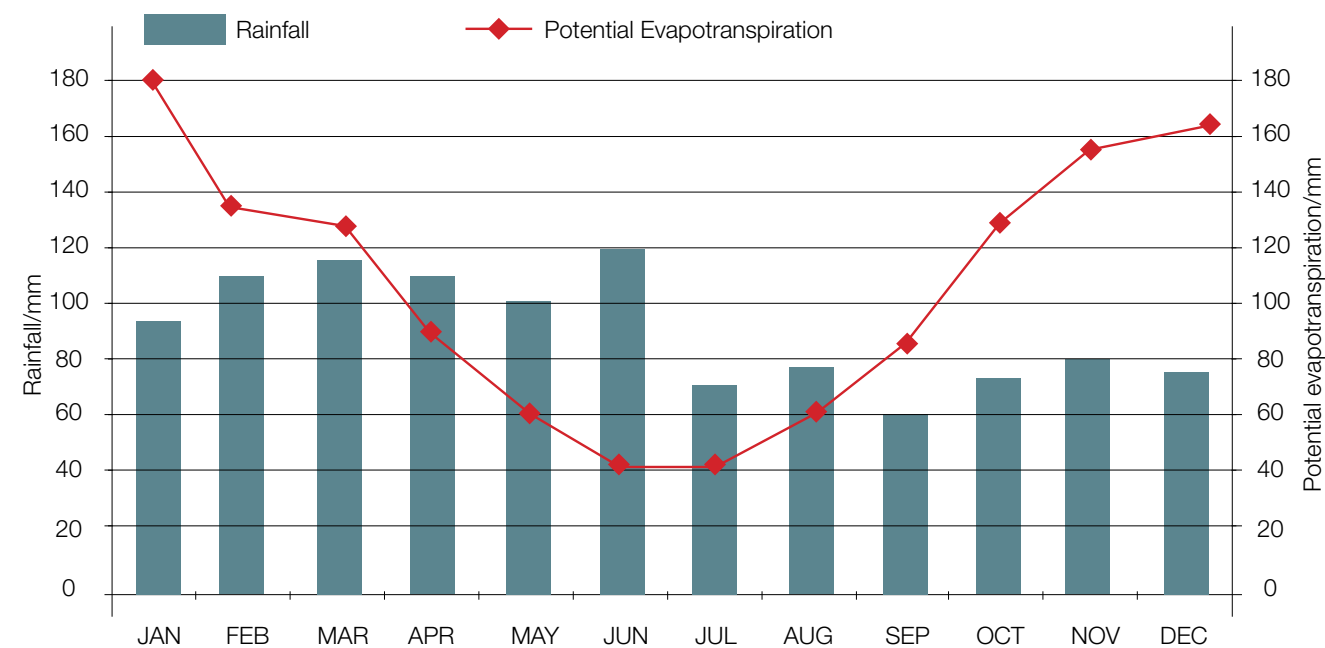
Temperature

The Marrickville Valley has a temperate humid climate with summer maximum temperatures typically of 26°C and winter minimum temperatures typically of 8°C.



Rainfall

Average annual rainfall is approximately 1,100mm per year falling slightly in the west of LGA. Evapotranspiration is distinctly higher from January to June than in July to December.



Information in this section is from the Bureau of Meteorology. Available at www.bom.gov.au

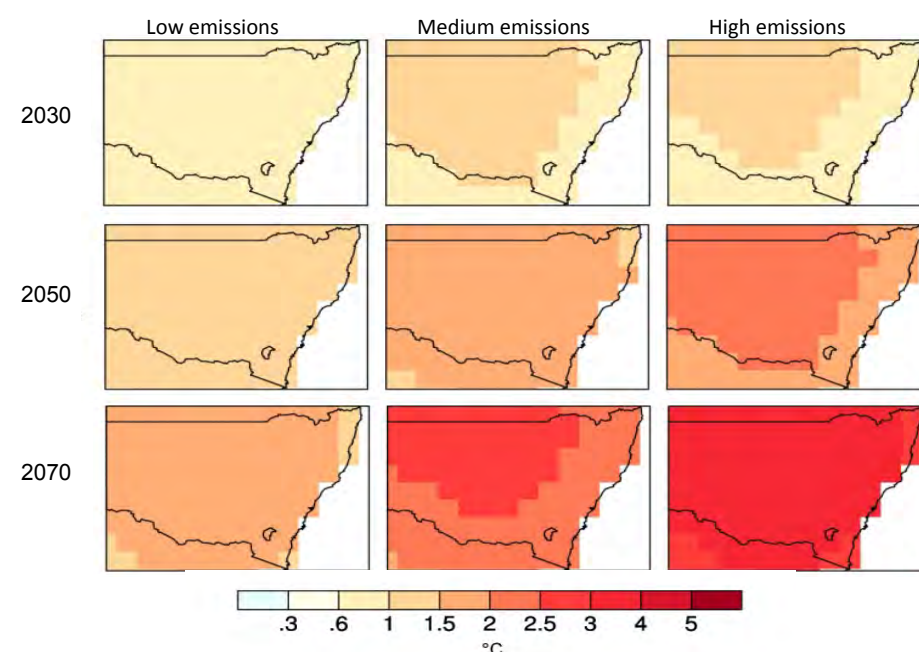


Recent climate of south-eastern Australia

In recent times, south-eastern Australia has experienced a wide range of climate extremes. The most severe drought since instrumental records began in 1865, the Millennium drought (1997-2009), was broken by the wettest two-year period (2010-2011) on record (CSIRO, 2012a).

Temperature

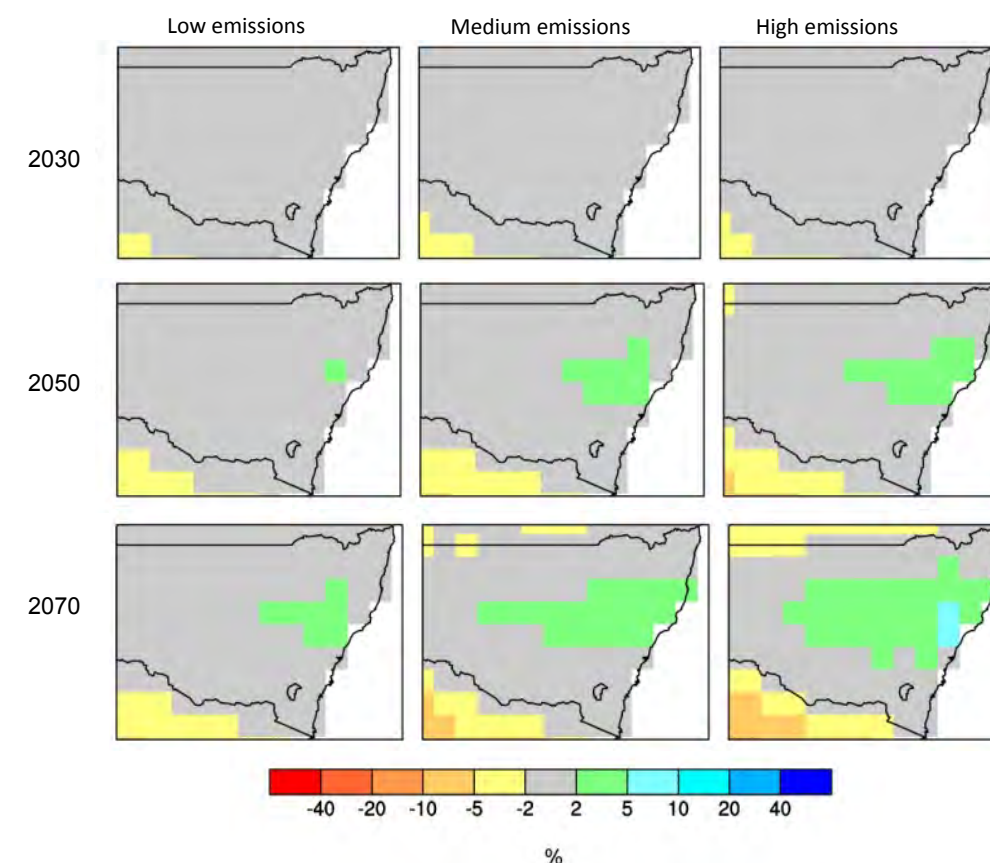
CSIRO modelling shows southern and coastal areas of NSW are likely to experience the least warming. Most warming is expected to occur in spring and summer, and least in winter (CSIRO, 2012a).



Above: Best estimate annual average temperature in NSW in 2030, 2050 and 2070 (CSIRO, 2012)

Rainfall

Projections show a general trend for decreasing annual-average rainfall, mainly in winter and spring. In autumn, the direction of rainfall change is uncertain. Summer rainfall is expected to increase on the coast and inland. Heavy rainstorms are likely to become more frequent but decrease along the coast in autumn and winter (CSIRO, 2012b).



Left: Best estimate annual average rainfall in NSW in 2030, 2050 and 2070 (Department of Environment Climate Change and Water, 2010).

Sydney Region

By 2050, in the Sydney region:

- The climate will be hotter
- Summer rainfall will increase and winter rainfall will decrease
- Floods volumes will increase
- Storm frequencies and intensities will increase

These changes will result in an increase in flood frequencies. That is, drainage designed to a 100 year standard in 1990 will likely flood every 40 years in 2100.

The projections above will be exacerbated by the expected increase in population density of Sydney (six million people by 2036). This will increase impervious areas if new housing is built to current designs. The impervious area increase in Marrickville LGA is estimated at 5% and will result in increased flood volumes and greater sensitivity of some buildings to flooding if planning codes remain unchanged (Department of Environment Climate Change and Water, 2010).

Sea Level

Mean sea level rise

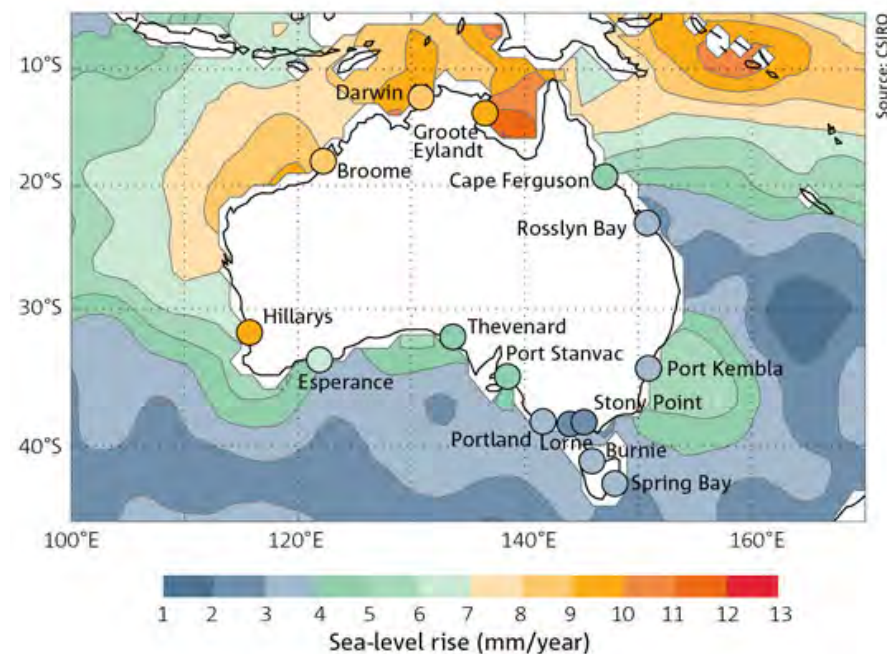
Global average mean sea level rose faster between 1993 and 2011 than during the 20th Century as a whole. Global sea level rise is projected to be 88cm by 2100 compared to the 1990 levels. There is uncertainty regarding the melting of ice sheets but this is one-sided; it is unlikely that this projection will be significantly lower but it could be significantly higher.

Sea level rise has been measured at 3.2mm per year at Port Kembla over a 20-year period from 1991; 2.6mm per year is attributable to global warming. Note that the measured sea level rise off the south east Australian coast is higher than the projected global average (CSIRO, 2012b).

Sea level extremes

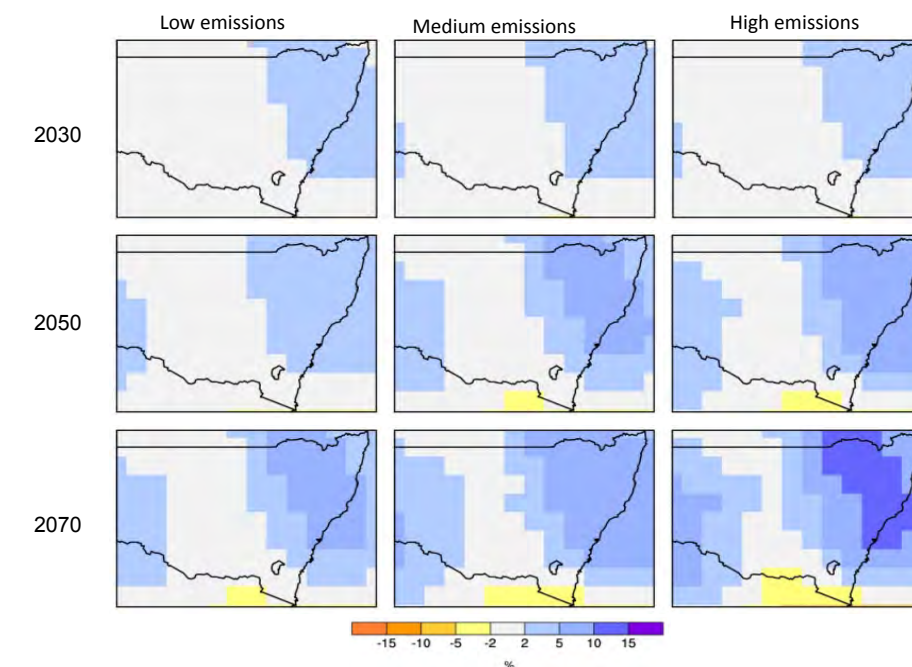
The most serious impact of sea level rise will be from changes to extreme sea levels (storm surges). Climate change is likely to increase the strength of storm surges through increased wind force as well as barometric pressure changes. Storm surges will cause inundation and damaging waves to penetrate further inland, increasing flooding, erosion and the impacts on built infrastructure and natural ecosystems.

The flood hazard in Marrickville LGA results from a combination of storm surge and flooding of the Cooks River. This hazard will increase due to increased intensity and frequency of storms as well as increased storm surge (CSIRO, 2012b).



Wind

There is a tendency for average wind speed and extreme winds to increase in spring and summer, with the greatest increases across northern NSW. These areas may have stronger extreme winds in spring and summer by 2070 (J Wyndham Price, 2012).



General impacts from climate change

According to the CSIRO, some impacts are:

- Risks to unique and threatened systems:** Natural systems are vulnerable to climate change, and more systems will be damaged irreversibly as global warming increases.
- Risks from extreme climate events:** Changes in extreme events are likely to be a major cause of impacts on ecosystems, crops and society. In recent decades, exposure to these risks has increased partly due to demographic (population characteristics) change and partly due to climate change.
- Distribution of impacts:** Negative impacts are likely to be greater in the poorer developing countries but as warming increases with time, even the more developed countries will experience negative effects.
- Risks from future large-scale abrupt changes:** There is an unquantified potential for large-scale and possibly irreversible changes in the Earth's systems resulting in impacts at regional and global scales.

One of the biggest issues is water. Annual average stream flow is expected to decrease in Australia. Water quality is likely to be degraded by higher water temperatures (e.g. toxic algal blooms), and the frequency and size of floods are likely to increase. However, non-climatic changes such as population growth may have a greater impact on water resources than climate change (CSIRO, 2012b).

Aboriginal Weather Knowledge

This information here is presented in the language of the D'harawal people. Marrickville Council wishes to acknowledge the Cadigal Wangal people of the Eora Nation. Council is working with the Marrickville Aboriginal Consultative Committee on cultural and heritage issues of the Marrickville LGA to continue updating local knowledge and understanding.

Aboriginal Australians have long held their own seasonal calendars based on the local sequence of natural events. From the Aboriginal perspective, all things past and present are interrelated, including the weather, landscape and previous generations, together with the plant and animal kingdoms. All these are connected as a continuum in which everything is placed in a proper order and has distinct meaning and relevance. Therefore, Aboriginal people can interpret the weather by recognising the different cycles in weather patterns and local ecology (Bureau of Meteorology, 2010).

Sydney's Climate

Frances Bodkin, a botanical author, teacher and traditional storyteller at Mount Annan Botanic Gardens is a traditional D'harawal Aboriginal descendant and one of the last people in Sydney to inherit tens of thousands of years of weather wisdom. Bodkin's clan is aware of two more cycles that run considerably longer than the yearly cycle, the Mudong, or life cycle which lasts about 11 or 12 years, and the Garuwanga, or Dreaming which is a cycle that lasts about 12,000 to 20,000 years (Australian Broadcasting Corporation, 2003).

Climatic cycles

GARUWANGA - Dreaming

- Approx 12,000 to 20,000 years
- Talara (Time of Ice) - When the sea is three days walk to the east from the Cave of Secrets
- Gani (Time fo Fire) - When the Sea Spirits reside in the Cave of Secrets

MUDONG - Life

- Approx 11-12 years
- Gadalung Burara - Hot and Dry
- Murayung Murrai - Getting cooler and wetter
- Tugara Murrai - Cold and Wet
- Goray Murrai - Getting warmer and wet
- Gadalung Murrai - Hot and wet
- Murayung Burara - Getting Cooler and Drier
- Tugara Burara - Cold and dry
- Goray Burara - Getting warmer and drier
- Ends with the appearance of the Aurora Australis in the sky

Seasons of the year

Goray'murrai Nov-Dec (approx)

- Time of the blooming of the Kai'arrewan (Acacia binervia)
- Warm and wet, do not camp near rivers
- Parra'dowee the Great Eel calls his children to him

Gadalung Marool Jan-Feb (approx)

- Time of the blooming of the Weetjellan (Acacia implexa)
- Hot and dry, eat only fruit and seeds
- Burra (kangaroos) start having their babies

Bana'murrai'yung Mar-May (approx)

- Time of the ripening of the fruit of the Lillipilli (Syzygium spp)
- Wet, getting cooler, time to make cloaks and start the journey to the coast
- Marrai'gang, the tiger quoll seeks her mate

Tugarah tuli Jun-Jul (approx)

- Time of the flowering of the Burringoa (Eucalyptus tereticornis)
- Cold, time to gather the nectar for ceremony,
- Barrugin, the echidna begin their gatherings.

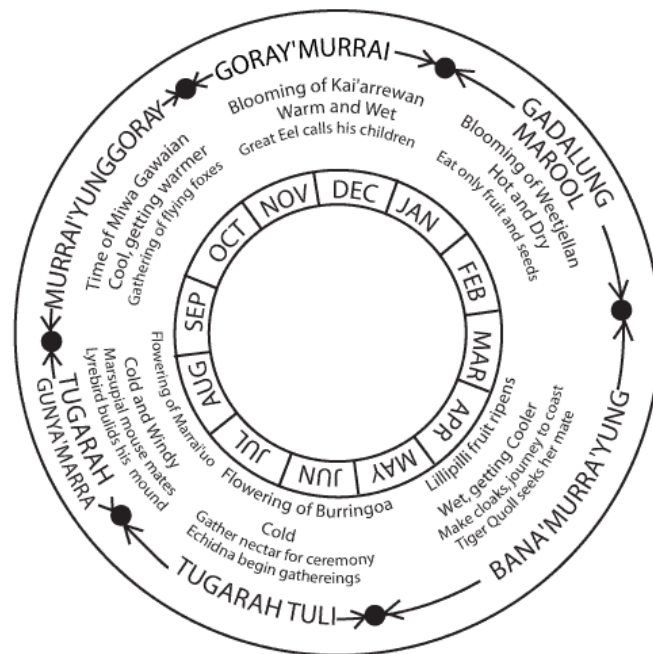
Tugarah gunya'marra Aug (approx)

- Time of the flowering of the Marrai'uo (Acacia floribunda)
- Cold and windy, build shelters facing the rising sun, time to begin the journey to the highlands along the rivers, plenty of fish
- Boo'gul the marsupial mouse mates and dies
- Wiritjiribin, the Lyrebird builds his mounds when season ends

Murrai'yunggoray Sep-Oct (approx)

- Time of the Miwa Gawaian Telopea peciosissima)
- Cool, getting warmer, time for major ceremony
- Gathering of the Ngoonuni, flying foxes.

Aboriginal Weather Knowledge



Weather cycles for around Sydney

© Bodkin/Andrews clan of the D'harawal People
 Weather cycles for around Sydney from the Bodkin/Andrews clan
 of the D'harawal People
 (pic: © Bodkin/Andrews clan of the D'harawal people)

Interconnections

All the different lengths and levels of these cycles are interwoven. Every major cycle is slightly different to any other because it will arrive at a different time in relation to the smaller cycle.

Bodkin observed that in the last few years of the twentieth century there were several signs of a long-term weather pattern. Over three consecutive years, she noted three very worrying signs. Firstly, there was the Aurora Australis in the skies over Sydney. The next sign was the “three sisters dancing in a line” referring to the alignment of three planets. The final occurrence was “the massive numbers of cicadas”. According to Bodkin, these three things occurring together within a year or two of each other indicates a severe drought.

When all the messages are added together, every part of the environment can indicate what the weather for the day, week or the months ahead will be. Knowing how to recognise these signs is the key to understanding this information, which is inherent in the surrounding environment.

5. Glossary

Term	Meaning in this booklet.
Catchment	An area of land where rainfall runs off to a creek, river, lake or ocean.
Ecology	The scientific study of the interaction between living things and their environment.
Ecosystem	The relationship between environment, living organisms and non-living structures within a connected system. An example would be a desert, coral reef or ice cap.
Ecosystem services	The multitude of complex interactions among living and non-living components of the environment that provide resources and processes that support and enrich life.
Eastern Channel	The stormwater drain managed by Sydney Water that collects stormwater from Eastern Channel North Subcatchment and other subcatchments in the Marrickville Valley.
Fit-for-purpose	The water is suitable for the purpose for which it is used. An example is using rainwater to irrigate the garden and flush the toilet, rather than using potable water.
Gross solids	Pieces of debris larger than 5mm such as cigarette butts, leaf litter, grass cuttings and pebbles.
Hydrocarbons	Type of chemicals found in crude oil. Petrol, diesel and lubricating oils contain hydrocarbons. In waterways, they cause visual and chemical pollution, endangering plant and animal life. Hydrocarbons do not mix with water and form oil slicks on the water surface.
Impervious	A surface that cannot be penetrated. Pavements, concrete, roofs and roads are usually impervious to water.
Inorganic matter	Things that do not break down to form carbon are inorganic. Examples are metals, phosphates and chlorine bleach.
Lead	Lead is a heavy metal used in car batteries, some paints, roof materials and some fuels. It is a toxic metal that can cause blood and brain disorders.
Microclimate	The climate of a small, distinct place within an area as contrasted with the climate of the whole area. For example, the microclimate under a shady tree may be cooler than the surrounding area.
Organic matter	Things that break down and release carbon are organic. Leaves, grass cuttings, twigs and plants are all organic matter.
pH	The strength of acids and alkalines/bases. pH is measured on a scale of 1 - 14 with 1 - 6 being classed as acid and 8 - 14 alkaline. Pure water has a pH value of 7, the level a normal waterway should be. If pH varies too much, it can affect plant and animal life.
Potable water	Drinking-quality water.
Phosphorus	A chemical element essential for life, phosphorus is a plant nutrient. Pesticides and detergents usually contain phosphorus. When too much phosphorus enters waterways, plant growth increases, putting pressure on oxygen and contributing to algal blooms.
Runoff	Water that does not soak into the ground due to the surface being hard (impervious) or waterlogged.

Term	Meaning in this booklet.
Sediments	Small particles that get carried in water. The particles eventually settle to the bottom of a body of water.
Stormwater	Water from rain that “runs off” across the land instead of seeping into the ground.
Subcatchment	A small catchment where rainfall runs off to a waterway or stormwater drain. The Marrickville local government area has 22 subcatchments.
Topsoil	The surface soil that is rich in organic matter and contributes to plant nutrition. Topsoil forms very slowly so it is important to protect it for plant growth.
Trunk drain	Large open channels or underground pipes and culverts that convey major stormwater flows during heavy rain.
Water quality testing	A set of analytical tests carried out on water samples to find out if the water is safe to support plant and animal life.

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