

Ideas for Sydenham to Bankstown

Workshop Two: Precinct Case Studies
May 2019

About this document

This document is part of a series of workshop outputs that imagine a water sensitive future for the Sydenham to Bankstown Corridor in Sydney (NSW).

This document demonstrates how corridor level planning principles can be grounded in two case study precincts – Campsie and Marrickville. The purpose of this exercise was to translate planning principles into tangible outcomes; and the resulting ideas are early concepts requiring further detail and analysis.

The Sydenham to Bankstown project provides guidance, advice and resources to assist the two councils of Canterbury Bankstown and Inner West. The outputs help to:

- Identify objectives that can be used in Council's Local Strategic Planning Statements.
- Identify any barriers, challenges and opportunities for the precinct.

This planning and advice will also be of use to Sydney Water and the Dept. of Planning and Environment.

About the precinct workshops

This report documents the Campsie and Marrickville workshops on the 22 November and 23 November 2018 respectively.

These workshops created a forum for collaboration and research translation. They brought together the research of the CRC for Water Sensitive Cities (CRCWSC) with the experience of each council, Sydney Water, Dept. of Planning and Environment and other agencies to apply this knowledge to the context of urban redevelopment and with a specific grounding in each precinct.

The workshop approach included problem identification and solution generation using an interdisciplinary approach. This allowed planners, urban designers, engineers, ecologists and policy makers to work together to co-create ideas.



Background

Nine-point framework

An output of the first workshop on the Sydenham to Bankstown corridor was a nine-point framework to guide urban planning, water servicing and catchment management across the corridor.

Element	Description
Circular economy	A circular economy is regenerative and offers an alternative to the linear pattern of consuming and disposing of resources. This approach can be applied to water and energy to measure a city's performance and its impacts on waterway health, pollution and urban heat.
Water servicing	Managing the different parts of the urban water cycle – drainage, water and waste water – as an integrated service, and seeking opportunities to use local systems within the corridor.
Green lines	Developing a network of major and minor 'green lines' that deliver ecological as well as community outcomes.
Waterway health	The waterway is a critical element of the green corridor. It must perform well to deliver these functions and meet the needs of the community.
Flooding	Responding to flooding by retreating, adapting or defending land uses and infrastructure through the process of redevelopment.
Activating town centres and public realm	Harnessing the roles of water and greening to enhance the activation of streets and open spaces.
Building design	Water outcomes at the lot/building scale through better design.
Communities	Creating engaged and empowered water sensitive citizens.
Governance	This concerns the way we collectively plan, deliver and manage development and infrastructure.

Background

Proposed planning principles to implement the nine-point framework

Circular Economy

- Principle 1: Measure performance (i.e. targets) of the water cycle, rather than its individual elements.
- Principle 2: Regenerative design by reframing wastes as resources, co-location of land uses and building design.

Water servicing

- Principle 3: Defer future augmentations of centralised water services systems.
- Principle 4: Preference local scale options; use centralised infrastructure as a last resort.

Green lines

- Principle 5: Green grid delivers both ecosystem services (amenity, cooling, connectivity) and ecological functions (biodiversity, riparian corridor).
- Principle 6: Achieving greening outcomes will be pursued where strategically important, whether in private (e.g. setbacks, building design) or public (linear open space) domains.

Waterway health

- Principle 7: Prioritise strategic and collaborative waterway and catchment projects.
- Principle 8: Connect the community to their waterways

Flooding

- Principle 9: Plan for resilience.
- Principle 10: Balance infrastructure resilience and social resilience to avoid over reliance on either.

Activating town centres and public realm

- Principle 11: Streets are key infrastructure to achieve canopy, infiltration, and cooling targets.

Building Design

- Principle 12: All buildings are part of the catchment topography of the corridor – to harvest water and increase greening.

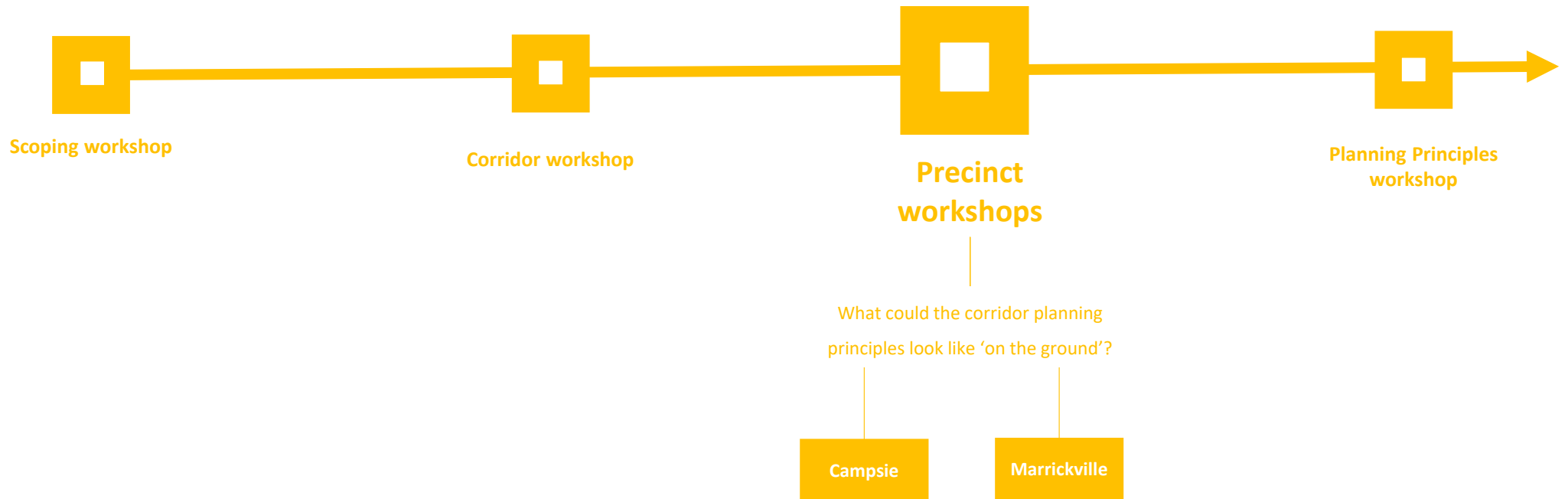
Communities

- Principle 13: Increase water literacy, and encourage water sensitive behaviours, by design.
- Principle 14: Enable community interaction with waterways.
- Principle 15: Make it easy for community to participate.

Governance

- Principle 16: Governance is integrated across agencies and disciplines to provide integrated solutions.
- Principle 17: Focus on best-for-community solutions rather than best-for-agency.
- Principle 18: Governance will be fit-for-purpose.

Where are we now?



About Campsie

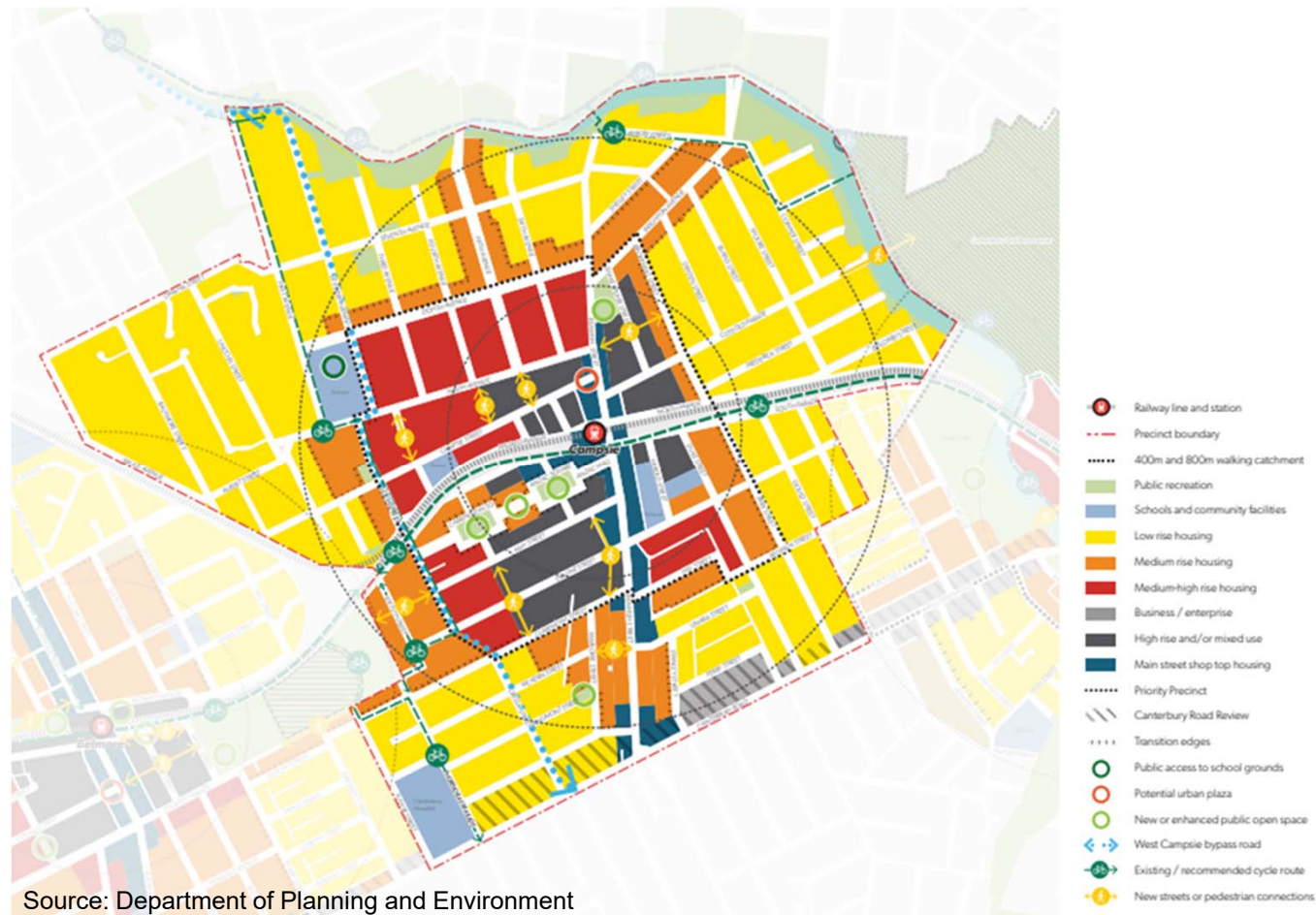
Overview

Canterbury Bankstown Council selected a precinct within the Campsie Central Business District as the workshop case study.

Context

Some of the key features and demographics of this precinct are:

- Large blocks with a lot of public domain and infrastructure.
- Campsie train station is a key site with substantial pedestrian traffic.
- Higher population density than rest of the Local Government Area.
- Higher percentage of families and a low percentage of couples with no children.
- Generally lower income, but starting to attract higher income groups.
- High transient population with families moving in and out of the area.
- Highly multicultural, with 72 cultural groups.
- A significant proportion of the population owns and drives cars.
- The health and education industry are major employers.



Campsie in a strategic context

The Greater Sydney Commission's [South District Plan](#) identifies Campsie as a strategic centre with opportunities for a significant night time economy and strengthened links between the CBD and the hospital and education facilities. It:

- Is strategically located with direct linkages to Sydney airport, Parramatta and Sydney CBD.
- Is one of the most important links in Sydney's green grid corridor identified by the Government Architect's Office.
- Is an area of high heat vulnerability.
- Has an existing vibrant night economy.
- Will grow from 5200 to 7000 jobs and experience a population increase of 50-100%.
- Has not experienced the same level of high-density growth as other areas in Canterbury Bankstown.

[The South District Plan](#) also highlights the need for quality open space within 400m of dwellings. The Open Space Strategy finds that existing open space is insufficient, even for the current population. Council intends to utilise riparian areas adjoining the river for this purpose although currently many parts of the Cooks River are inaccessible.

Opportunities

- Cooks River is not mentioned in any of the strategic plans. Council and the Cooks River Alliance want to put the Cooks River 'on the map'.
- Anzac Park an important public space.
- There are lots of schools in the area where open spaces can be opened to the public.
- Old council administration building and associated open space.
- Canterbury racecourse has a large area of open space with an undetermined future.
- Heritage assets including Sydney Water assets.
- Connecting Campsie to nearby urban centres using walking and cycling tracks.
- Key sites are in process of being redeveloped, including the RSL Club, Woolworths and the Campsie Centre.
- With the current development within the precinct, there is an opportunity to link with, and create, business hubs around the hospital and new schools.



Water servicing

The following issues were raised with regards to water and wastewater servicing:

- Development within the precinct needs to play a role in reducing sewer overflows to the Cooks River.
- Sydney Water's sewer infrastructure is reaching its capacity. Keeping stormwater out of the sewer will reduce wet weather flows to the Malabar Wastewater Treatment Plant.
- Sydney Water owns land close to the Cooks River which houses pumping stations. These pumping stations are at risk of flooding and sea level inundation. Sydney Water is hoping to avoid replacing this infrastructure.
- Sydney Water supports recycled water and stormwater harvesting solutions within and beyond the precinct.

Water quality and waterway health

A key development outcome is to improve water quality in, and provide connections to, the Cooks River. The nine point framework can deliver a range of local benefits (e.g. linkages with open space, increased urban biodiversity, urban heat reduction) while also improving local water quality. Sharing this narrative with the community will build broader support for waterway health improvements through development.

Flood management

Flooding is a significant issue along the Cooks River and this precinct. The topography within the precinct is complicated and there may be multiple solutions for localised flooding issues.



Green grid and public space activation

The concept of connecting the precinct to the green grid (the vision of the Greater Sydney Commission and the Government Architect's Office) is a key opportunity.

Ideally, any concepts developed should include a main spine coming from the Cooks River and smaller green links within the precinct. Buildings should be medium to high density to cater for population growth whilst still maintaining adequate open space for residents.

Council's Open Space Strategy states that open space is expected to deliver multiple benefits (e.g. urban cooling). This requires irrigation, which should also be a consideration of precinct planning.

Public and private domains

Redevelopment provides an opportunity to consider open space and greening across public and private domains. It is no longer feasible to assume that the responsibility for open space falls on Council alone. Instead (or, as well as), greening might be achieved by through mandating this outcome in Local Environmental Plans and Development Control Plans, as well as through S94 Development Contributions. This suggestion requires further policy analysis before a recommendation is made.



About Marrickville

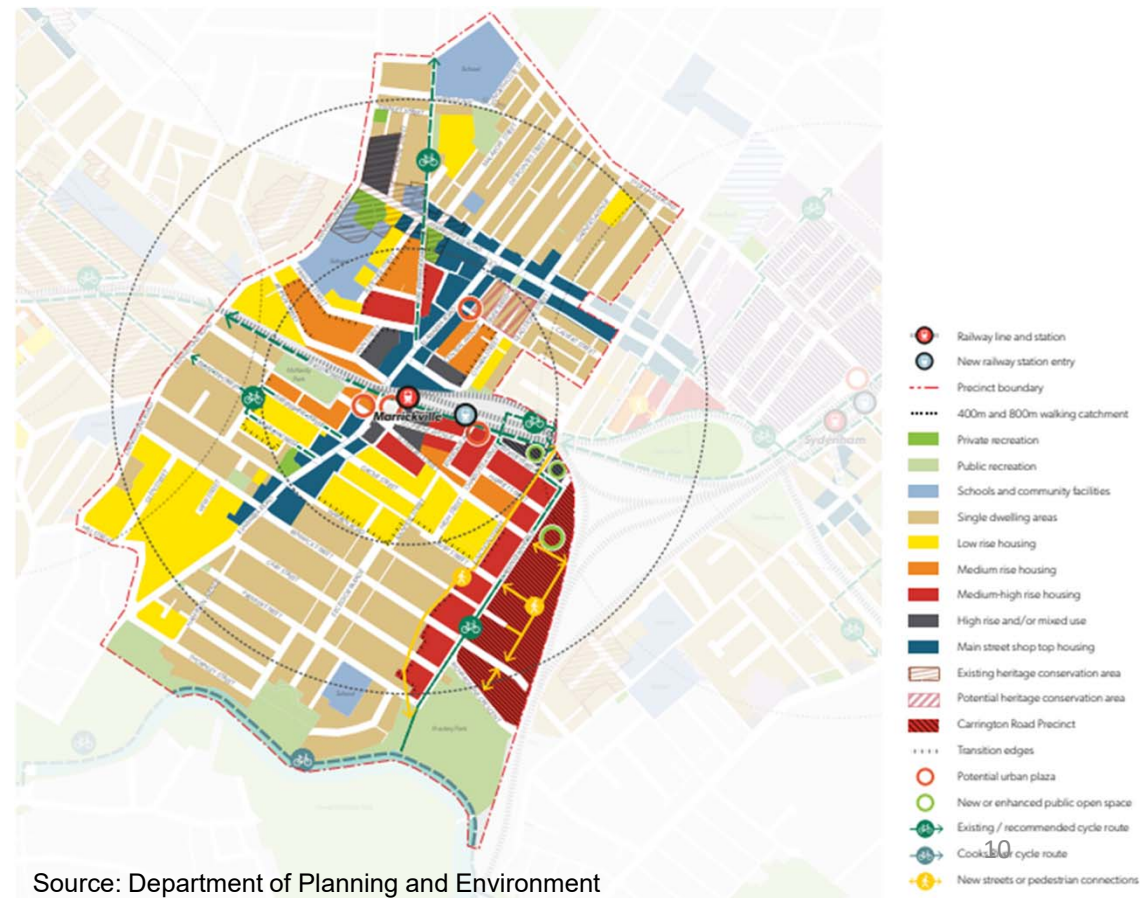
Overview

Inner West Council selected Marrickville as the case study for the project.

Context

Some of the key features and demographics of this precinct are:

- It is built on Gumbramorra Swamp.
- A large part of industrial land falls within Gumbramorra Swamp and this industrial land is becoming more densely populated.
- Very diverse and multicultural population, with 50% of residents born overseas.
- Unemployment rates are similar to average rates for Australia.
- High density of dwellings, with some disadvantaged housing.
- High vulnerability to heat with a small pocket in the affordable housing precinct being very vulnerable.
- Dwelling structure is 40% separate and 35% apartments.
- Large age cohort between 25 – 40, with more families coming into the area.
- The main method of travel to work is by car; 40% of people travel by train. A high proportion of the land use is for car parking.



Opportunities

A large part of the precinct is built on Gumbramorra Swamp and is subject to flooding. There is an opportunity to consider how this will be managed as part of any future development.

The composition of the precinct is very different to other parts of the LGA. Given its cultural diversity and high levels of education, there is a significant opportunity for place-based planning that is unique to this precinct.

Cooks River heat mapping shows that the Marrickville precinct has a high heat vulnerability with the small pocket of affordable housing showing very high heat vulnerability. Increasing the resilience of this community to heat through greening and water within the landscape will be a key opportunity within the precinct.

The edges of the Cooks River have been designated as riparian and biodiversity zones. While considerable resources are being put into the river's 'green line', far fewer resources are being put into increasing the urban ecology within the town centre.

Council has an active 'Sustainable Streets' program to work with the community to activate verges by converting grass into gardens. This program was initiated to reduce maintenance costs of lawn mowing however there are opportunities to utilise this program to increase urban biodiversity and to install rain gardens to improve water quality.

A water balance shows that there is a significant opportunity for stormwater harvesting and wastewater recycling within the precinct. Reducing flows to the Malabar Wastewater Treatment Plant would benefit Sydney Water by delaying the need to augment this infrastructure to cater of population growth. Opportunities to develop a local circular economy could also be investigated to maximise the value of water, waste and energy within the precinct.

Other considerations identified for the precinct included:

- Developing a 'Sustainable Irrigation Plan'.
- Connecting the community to green spaces and ensuring social equity in the access of these spaces.
- Brining water into the urban landscape through public art, at-surface WSUD treatments and waterways that are accessible for the community.
- Better connections between the public and private domain with regards to open space provision.
- Developing an urban form with lower imperviousness to reduce stormwater runoff.
- Green streets for reducing heat in Marrickville, particularly in areas used by the more vulnerable community members.
- The rail corridor is at risk of inundation from future sea level rises and should be protected.

Sydney Water considerations

Under predicted climate change scenarios, sea level is likely to increase. This will impact three of Sydney Water's pumping stations. One of Sydney Water's pumping stations is currently below sea level and water needs to be pumped out in times of high rainfall.

Wastewater is currently pumped to the Malabar Wastewater Treatment Plant.

Options which negate the need to relocate pumping stations (to avoid impacts from sea level rise) and to avoid augmentation of sewer pipelines (to service increased population) would be considered favourably by Sydney Water.

Planning Instruments

Council is advocating a holistic approach to city planning that looks at issues and opportunities across the whole LGA rather than the concentrating only on the corridor.

Issues such as density, gentrification and liveability are key discussion topics with the community, with opportunities to improve sustainability and long term resilience also being front of mind for planners.

Council is currently working with the Department of Planning and Environment on high level principles to inform the Local Strategic Planning Statement (LSPS). Marrickville Road Public Domain is currently being developed and presents an opportunity to implement planning corridor principles.

Key issues in any precinct plan include;

- Mitigation of urban heat island effect.
- Reducing the impact of future sea level rise on infrastructure and development.
- Reducing or avoiding wet weather sewer overflows into the Cooks River.
- Increasing urban ecology within the town centres.
- Balancing infrastructure resilience with social resilience as a mechanism to respond to river flooding.
- Considering alternative strategies within the precinct to respond to flooding. In some locations it might be appropriate to defend, sometimes retreat or adapt.
- Responding to the needs of a highly diverse community that is changing over time.



Ideas

Ideas for each precinct are presented here as propositions under a number of thematic headings. They can be further developed as exemplars of possible urban planning, water servicing and catchment management approaches for each precinct.

IDEAS FOR CAMPSIE

1. Water servicing
2. Green Lines
3. Activating the public realm
4. Flooding and waterway health

The ideas for Campsie generate several overlapping concepts for a green corridor within the precinct. These are presents separated to reflect the different drivers.

IDEAS FOR MARRICKVILLE

1. Green lines: Grow with the flow
2. Urban form
3. Water servicing:
 - Gumbramorra Islands
 - Circular water
4. Flooding: two further propositions

The ideas for Marrickville present several alternative strategies for flood resilience. These are all presented as options rather than selecting a preferred approach.





Ideas for Campsie

Water servicing

Why? What are the benefits?

Future urban development can address numerous issues within the Campsie precinct. These include:

- Significant population growth.
- Lack of capacity in Sydney Water's water and wastewater infrastructure to cater for growth.
- Ageing Sydney Water assets, with many over 100 years old.
- Stormwater infiltration into the sewer system and wet weather overflows into the Cooks River.
- Localised flooding in parts of the Cooks River catchment.
- High heat vulnerability.
- Climate change causing sea level rise more intense and frequent rainfall, hotter days and heatwaves.

Rather than addressing these issues separately, a multifunctional water servicing is preferred.

This approach can:

- **Reduce impact on Cooks River from sewer overflows.** Business as usual urban development generally increases impervious surfaces, leading to greater stormwater runoff and sewer inflow and infiltration.
- **Extend the operating life of existing infrastructure** including Sydney Water sewer networks and the Malabar Wastewater Treatment Plant.
- **Provide a cool urban oasis.** The urban heat island is a well-known phenomenon, and increased development within a precinct that is already vulnerable to urban heat can lead to serious health implications for the community.



What? What is the idea and how would it work?

This idea comprises several elements:

- **Pressure sewer** - An actively controlled, pressure sewer system that allows Sydney Water to control peak flows in the local sewer network before, during and after storms. Pressure sewers are less affected by stormwater infiltration and allow network managers to actively manage the timing and thus peak rate of inflows to wastewater treatment plants. Doing so can extend the operating life of an existing treatment plant asset by using current capacity more effectively.
- **Local sewer mining** – The increase in density and population will increase the volume of wastewater generated within the precinct. Treating and reusing this wastewater for air conditioning, toilet flushing or irrigation means that Sydney Water’s sewer network does not ‘see’ this population increase. This avoids the need to invest in network upgrades that create extra capacity. Locating a treatment plant and mandating connection to a recycled water distribution network will be key to the success of this idea.

A ‘**multifunctional stormwater infrastructure**’ approach. Green infrastructure includes swales, biofiltration and rainwater harvesting implemented widely across the precinct.

The precinct has several key opportunities for green infrastructure. The first is to create a **chain of ponds** within a multi-functional corridor. This chain of ponds would capture and hold stormwater back in the catchment, reducing downstream flooding and infiltration into the sewer system and wet weather overflows. The chain of ponds would also provide a localised cooling effect and add amenity to the precinct. The water held within the ponds could also be used to passively irrigate street trees within the precinct.

The second idea involves **smart tanks** on large development sites to store stormwater and control its release prior to high rainfall. This active control enables Council or Sydney Water to create storage space for rainfall when it is required, whilst ensuring rainwater is available for reuse at other times.



Who? What are the roles and responsibilities to implement this idea?

Council can utilise the Local Strategic Planning Statement, Local Environmental Plans and Development Control Plans to:

- Mandate a third (recycled water) pipe into all new developments ensuring that when Sydney Water builds the infrastructure, development is ready to connect.
- Require water sensitive urban design including 'landscape zones' to site green infrastructure.
- Identify the chain of ponds corridor in plans for the precinct.
- Require an Open Space Plan that must demonstrate how development will contribute to the corridor and

- street scale green infrastructure and/or to what their Special Infrastructure Contribution will go towards.
- Raising the minimum requirements for water reuse and stormwater and rainwater capture above BASIX.

Sydney Water, Council and the Department of Planning and Environment can collaborate to develop a Local Area Servicing Plan to ensure individual developers are provided with consistent and practical information about options available to them to achieve the outcomes identified.

For the ideas that have been generated to be given effect, exempt and complying development requirements could be reviewed. Unless this is addressed the same default approach to development will be allowed to proceed.



Green lines: Cooks 2 Campsie green link



Why? What are the benefits?

This demonstrates how the Greater Sydney green grid can be delivered in the precinct. The resulting green corridors and infrastructure will improve public amenity, cool the urban area, treatment stormwater runoff through water sensitive urban design, encourage active transportation and increase urban biodiversity.

What? What is the idea and how would it work?

Some of the key ideas generated include:

- Develop green nodes around key infrastructure.
- Anzac Park becomes a key green node in the precinct, featuring an urban wetland and a stormwater treatment system.
- Establish major 'green connections' between the river, mall and train station.
- Develop minor 'green lines' along key tree lined boulevards to connect the green nodes, the Cooks River and the hospital and education precincts.

- Widen these green lines over time using 5-10m setbacks for medium density development.
- Orient green infrastructure at building scale to maximise cooling benefits.
- Use signage and 'good' design' to raise community awareness of the function of green nodes and links.

Who?

The amalgamation of smaller blocks into larger blocks, as well as utilising the private domain for public assets, will be a significant shift for the community and they will need to support this transformation for it to succeed. Demonstrating the benefits to the community can be a first step by Council to gain community support.

It is also likely that there will need to be Council capability uplift to build awareness and understanding of these ideas, their funding and the maintenance.

Activating the Public Realm



Why? What are the benefits?

The public realm provides a canvas to

- manage flooding
- compliment the precinct green grid
- support urban ecology
- encourage active transport.

What? What is the idea and how would it work?

Urban renewal can transform both the public and private realm: as density increases, the public realm will need to adapt too.

The idea focusses on the public realm around Campsie Train Station. As an alternative to a flat frontage directly onto the street, the station could be redeveloped over the train tracks and repositioned to front the adjoining main square to provide a focal point in the CBD.

The train station can provide a key 'connector' linking the CBD to the Cooks River and to the hospital and education precincts.

The public realm will also be critical in managing localised flooding. Daylighting existing pipes and creating a vegetated, chain of ponds from the city centre down to the Cooks River serves multiple purposes, not the least being to withhold water back in the catchment in times of high rainfall.

Who?

The ideas proposed within the public realm span multiple agencies. For these ideas to work it must be a collaborative process with Sydney Water, Department of Planning and Environment, Transport NSW and Council. In addition, the community must be engaged to put pressure on government to ensure these ideas are implemented.

Making the Cooks a River again



Why? What are the benefits?

Urban renewal provides an opportunity to improve water quality within the Cooks River and reduce the urban heat island effect within the town centre.

These benefits represent an improvement in liveability for future residents, making Campsie a great place to live, work and visit.

What? What is the idea and how would it work?

This concept proposes that Rudd Parade form the basis of a strategic corridor for the precinct that incorporates water sensitive urban design to cleanse stormwater and increase infiltration.

Urban development adjacent to this corridor will be required to meet a set of planning controls that are consistent with a blue / green connection to multi functional public open space.

Who?

For this concept to be implemented, “out of the box thinking” is required. Campsie would be given priority as a strategic center and funded from a precinct levy, S94 contributions or Special Infrastructure Contributions.

To achieve the concept, a lead agency or waterway manager is needed to take responsibility for the vision, and to integration of the contributing components of urban form and the way they can developed in a coordinated way.

Ideas for Marrickville



Green lines: Go with the flow

Why? What are the benefits of this idea?

Green infrastructure can protect vulnerable community segments from the health impacts of heat waves. The green areas can also be designed to support urban biodiversity.

What is the idea and how would it work?

The idea strategically locates and designs green infrastructure, and maximises its adoption regardless of land tenure.

Priority areas for cooling can be identified from heat vulnerability maps and by looking for deficits in green open space. It is expected that this will focus on providing cool spaces in the more disadvantaged parts of Marrickville.

These cool spaces are not just about the tree canopy (shade) but also use the built form to establish green roofs and green walls that have been shown to provide cooling benefits in the urban landscape, especially in higher density areas where the installation and maintenance of street trees is more problematic.

These cool spaces can then be integrated into a precinct scale green grid.

The first move is to establish a major green spine. For this, the railway line provides a focal point.

The second step is to create local connections. This can be achieved by following drainage lines and overland flow paths from the railway line to the Cooks River.

Streets can be activated using smaller scale green infrastructure to invite the community into the public domain. An option is to convert some car parking spaces into nature based stormwater treatments to establish streets as linear parklands.

A further opportunity is to articulate what an “edge” development would look adjacent to major green links. This allows the urban form to blend into green open space to blur the lines between the two and to maximise the ecosystem services that are generated.

Who? What are the roles and responsibilities to implement this idea?

The existing streets present the greatest opportunity to implement these concepts. The Local Strategic Planning Statements Local Environmental Plans and Development Control Plans present an opportunity to influence the built form and provide additional open, green space.



Urban form

Why? What are the benefits of this idea?

Resilience to flooding and heat waves.

What is the idea and how would it work?

The idea provides a town planning response to changing climate and the associated uncertainties about flood risk. It proposes building typologies for three areas within the precinct.

Industrial area – The industrial precinct is particularly susceptible to flooding. A business as usual response could result in structural responses that diminish the character of the precinct. As an alternative, flood risk in the industrial precinct should be recognised and this zoning preserved until innovative flood resilient design will be more widely available. Retaining flexibility and adaptability is key.

Flood risk is not uniform throughout the industrial zone. Through urban renewal, a transitional gradient can be established with developments close to the river being modified to “live with” flooding and while those on the interface between industrial and residential zones can adopt more conventional typologies.

At the interface between urban development and the low-lying swamp areas there would be a series of vegetated sponges to “absorb” localised flooding.

Strategic planning can provide respite areas within the industrial precinct through vegetation and open space design. These areas could adopt vegetation that deters insects or mosquitos, provide gaps in buildings to allow in winter sunlight and maintain year-round pedestrian and recreational use.

Residential areas – If a new “wet landscape” is created in the industrial land then the urban form should take advantage of being in a close, but safe, proximity to this. There is likely to be higher amenity near these “wet areas” and any high -density zoning should reflect this.

Marrackville town centre - The character of the Marrickville town centre includes mixed-use zoning featuring shop-top housing. However these high urban landscapes features hard surfaces and materials that amplify the urban island effect. Urban renewal can maintain this town centre character with typologies that use “cool” building materials, green facades and street awning designs that allow for street trees. Green roofs are not a design priority as the cooling benefits would not be experienced at street level.



Who? What are the roles and responsibilities to implement this idea?

Council has control over the urban form through Local Environmental Plans and State Environmental Planning Policies.

Gumbramorra Island flood resilience

Why? What are the benefits of this idea?

This provides a long-term solution to the impacts of sea level rise on water and wastewater infrastructure in the precinct.

It recognises Gumbramorra Swamp as an ancient feature of the precinct landscape. It is likely that the community will continue to see water reappearing in the form of flooding and sea level rise and ensures the urban form is able to respond to this.

What is the idea and how would it work?

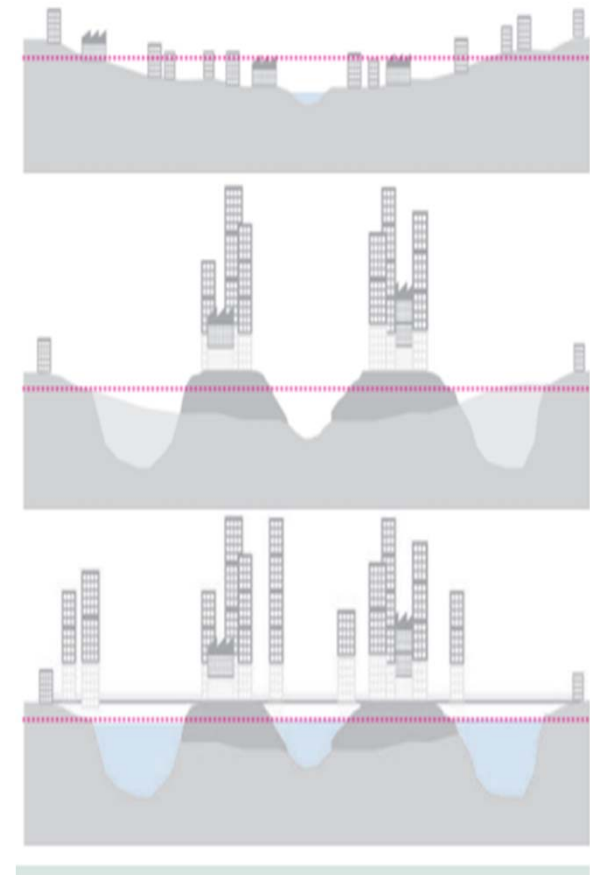
This adapts a CRCWSC proposal for Arden Macaulay (Vic). In this proposal, high density development in a swamp context is accommodated using constructed 'island developments' within a broader wetland landscape.

The concept includes:

- 1) defending an island zoned either industrial, residential or commercial
- 2) allowing the Cooks River to reclaim the area in between the island developments during floods. This fits within the context of the Cooks River wanting to reclaim the land of the Gumbramorra Swamp.
- 3) Using treated wastewater in the island developments and to water the green corridors within the precinct, to ensure these spaces are high quality for the community.

Who? What are the roles and responsibilities to implement this idea?

The State Government, Sydney Water, Council, the Greater Sydney Commission and developers would need to come together in a 'Collaboration Area'. There is potential to implement such a concept through the 'Local Area Service Plan' prepared by Sydney Water as part of the Eastern Sydney Regional Master Plan. A significant effort in collaboration would be needed between government and developers to negotiate building heights and areas of open space.



Circular water

Why? What are the benefits of this idea?

The future population of Marrickville will generate a large volume of wastewater. When reimagined as a resource instead of a waste, this creates an opportunity to support a precinct circular economy.

If this water can be retained within the precinct (or surrounds) this will restore a more natural water balance in a catchment that already has 72% imperviousness.

What is the idea and how would it work?

A major stormwater pipe and a regional sewer trunk transect the precinct. As such a large volume of stormwater and wastewater is potentially available for treatment and reuse.

The precinct also contains a significant amount of infrastructure (three pumping stations) that could be re-purposed to support a present reuse system.

Through the urban renewal process, a distribution network can be progressively installed to connect end users to the supply source, and to make water available outside the precinct when demand emerges.

The idea includes harvesting stormwater for the purpose of waterway protection. In this precinct the sewer infrastructure has enormous capacity to transport stormwater in controllable dry weather conditions. Stormwater low flows could be collected and introducing into the sewer system as an alternative to discharge to the waterway via the drainage network. The stormwater would provide further supply to improve reliability of recycled water supplies for the precinct. Sydney Water is already trailing this concept in the North West.

Who? What are the roles and responsibilities to implement this idea?

The State Government, Sydney Water, Council, the Greater Sydney Commission and developers would need to come together in a 'Collaboration Area'. There is potential to implement such a concept through the 'Local Area Service Plan' prepared by Sydney Water as part of the Eastern Sydney Regional Master Plan. A significant effort in collaboration would be needed between government and developers to negotiate building heights and areas of open space.



Flood resilience

Why? What are the benefits of this idea?

This concept reduces flood risk within the precinct.

What is the idea and how would it work?

There were three problematic flood areas in the precinct:

- The swamp, created through a combination of tidal influence and stormwater ingress. There is a central channel with a flood pump that reduces inputs from the catchment. There is a second flood pump that also tries to alleviate flooding although this is not very effective.
- Flooding in another area is symptomatic of poor local drainage.
- A third area, at the top of the catchment, which is low-lying with poor access to a discharge point to the western canal.

A 'retreat, adapt or defend' framework can be applied in each flood zone.

Retreat – A managed way of enabling land to progressively transform itself to become a swamp land. The key lies in facilitating this transition through ongoing changes to building stock as environmental conditions change.

Area 1: The retreat scenario includes a playing field on low-lying land. The simplest way to implement a retreat scenario is by changing the land use from active to passive.

Area 2: This necessitates an understanding that flooding is influenced by both local runoff and river flooding. Little can be done to stop sea level rise and river flooding because they are based on external drivers. A road can be built that is higher than the expected flood level to act as a flood levee as well as a road to allow safe evacuation. The existing flood pump could then be used to drain stormwater entering this site. If there was a way for this site to manage its own rainfall and runoff it could raise the value of this employment zone.

Area 3 – This concept utilises smart rainwater tanks to reduce the amount of runoff during a storm. There is also a central canal that could be rehabilitated to frame what might be a potential future development scenario around a wetland. This would create an uplift in land value.

Adapt – A managed way of looking at how the community can live with flooding. Rainwater tanks and smaller pumps can free up valuable land that might otherwise have been impacted by stormwater.

Council can require new development across a catchment to have smart rainwater tanks connected to real time weather data and enabled to empty prior to a storm. When

designed for the Aquarevo development in Victoria, this strategy was estimated to reduce peak flows by 25%.

Another option is flood resilient building design incorporating heavy flood proof doors in areas likely to flood.

Strategic planning could also reset expectations on how land is used within the corridor, i.e. where is the most appropriate place for buffers, green corridors, biodiversity, rehabilitation and community recreation.

Defend – scenario using pumps and levees to protect people and infrastructure.

Who? What are the roles and responsibilities to implement this idea?

Council has control over the urban form through Local Environmental Plans and State Environmental Planning Policies.

Collaboration between council and the insurance industry could deliver co-investment to reduce the number of properties exposure to social impact and flood damage claims.