

CASE STUDY

Cooks River naturalisation

Author: Daniel Cunningham, Sydney Water

Sydney Water remediated 1.1 km of deteriorated concrete stormwater canal along the Cooks River to incorporate more natural bank features with sandstone blocks and native plants (Figure 1). The \$8.6 million project included over 100,000 local native plants, creating new areas of endangered saltmarsh, a freshwater wetland, as well as social amenities such as pathways, seating, interpretive signs, an outdoor classroom and a picnic shelter.



Figure 1. Riparian revegetation (foreground) and saltmarsh bench (background) at Cup and Saucer Creek.

Project need

Concrete lining or channelisation of waterways around Sydney started in the late 19th Century and continued through most of the 20th Century. Creeks and rivers were usually lined to alleviate flooding, flush out pollutants and to facilitate urban development. Unfortunately this practice devastated the ecological values of Sydney's waterways. When deteriorating and collapsing sections of concrete stormwater channels in the Cooks River precinct dating back to the 1940s needed replacing it presented an opportunity to reintroduce natural waterway features and social values back into the area and provide a methodology for similar assets elsewhere (Figure 2).



Figure 2. a) Burwood RH concrete bank with bottlebrush growing in cracks; b) Deteriorating section of concrete channel identified for renewal.

Project steps

Asset inspections

In the early 2000's a regular stormwater asset inspection by Sydney Water identified several sections of concrete riverbank along the Cooks River that were significantly deteriorated and presented a high risk to adjacent assets and/or to people's safety (Figure 3a). Structural assessments recommended completely replacing these sections through asset renewal. Rather than proceeding with a like for like renewal using concrete, Sydney Water decided to explore alternative methods to replace the deteriorated banks. Naturalisation, laying the steep banks back to a gentler slope stabilised with sandstone and native plants, was determined as an alternative approach.

Naturalisation masterplanning

Naturalisation is only possible where there is available adjacent open space, and where works would not affect underground and overhead services and flooding potential. To assess the opportunities for naturalisation Sydney Water developed a masterplan in consultation with local councils and community groups along Cooks River. The masterplan identified several locations where naturalisation was possible and to what extent works could be developed. The opportunities in the masterplan were then overlaid with the sections of riverbank that needed to be replaced to identify sites where concept designs for naturalisation could be developed.

Flood study

At the same time as the masterplanning, Sydney Water conducted a flood study of the Cooks River main channel and key tributaries to provide a baseline of flooding information. The flood study was undertaken in partnership with local councils and other agencies and was made available more broadly to assist local floodplain management. TUFLOW flood simulation modelling software, developed by BMT WBM, was used to help design and assess the potential flood impact of naturalisation concepts (Figure 3b).

Preliminary concept designs

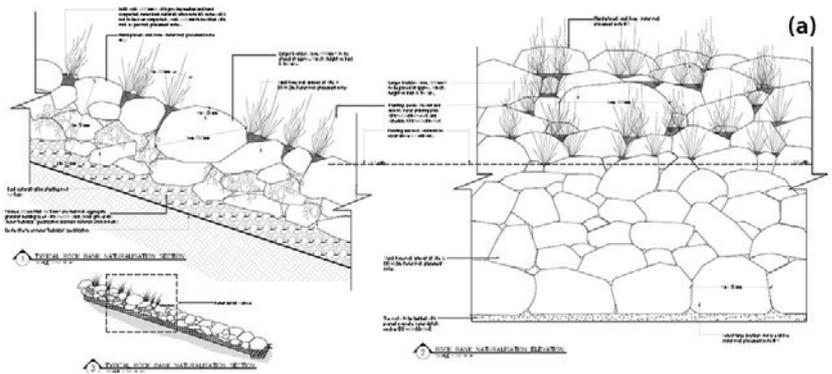
Preliminary concept designs were developed for three sites where the concrete channel needed to be replaced and where naturalisation was determined to be a viable option (Figure 3c and d). Designs aimed to maximise natural features and aesthetics such as layback of the riverbank, fully structured native vegetation as well as off channel wetlands. Natural features were integrated along with social features such as pathways, viewing areas, interpretive signage and seating. Key stakeholders including council staff, state agencies and local residents were involved in the development of the designs.

Figure 3. Concrete channels earmarked for remediation (a, b, below). Naturalisation plans and concept designs (c, d, next page).



Detailed concept designs

A detailed concept design was developed by landscape architects and specialist designers experienced in ecological restoration to ensure the intended benefits of the design were translated through to construction (Figure 4a). The detailed concept fully specified the rock and vegetation designs, with some civil aspects of the design left to be finalised by the construction contractor. The detailed concepts, specification and Review of Environmental Factors formed the construction tender package.



Construction

Construction contractors with a high level of experience with ecological restoration and working within a live waterway were contracted to do the works.

Due to timing constraints associated with a Federal Government grant the works were conducted in a staged approach. The off-channel wetland in the Cup and Saucer Creek catchment, a tributary of the Cooks River, was constructed under a separate design and construction contract prior to the main remediation work on the riverbanks. The wetland was constructed offline to protect it from storm events and was designed to incorporate two wetland "cells". An offtake structure built into the invert of Cup and Saucer Creek redirects water via an underground pipe into the upper wetland cell.

Both cells were excavated and lined with geosynthetic clay liner before being covered with topsoil and planted. Water levels in the wetland cells are able to be manipulated to optimise its function. This allowed water levels to be raised slowly as aquatic plants established.

At all sites the river banks needed to be isolated from the waterway using coffer dams running parallel to the bank before works could proceed (Figure 4b). This enabled a suitable foundation for the toe of the bank to be constructed in dry conditions. Cofferdam technology and application needed to be customised to each section of bank depending on water depths, flow velocities and tidal influence. Concrete sections and the earth riverbanks behind them were removed using an excavator to lay the new bank back to a gentler slope. Typically bank slopes were reduced from 1V:1H to 1V:4H but this varied from section to section (Figure 4c).

A range of specifically sized sandstone boulders and smaller cobbles were then placed over bedding layers and interplanted with local species to achieve the naturalised banks. The specific stone size and plant type combination was important to achieve the designed roughness and structural stability for the banks (Figure 4d).



Figure 4. Drain naturalisation process from concept design (a) to action on the ground (b, c) and the newly remediated site (d).

Establishment

A two year establishment period was built into the construction contract to help ensure the success of the vegetation in the riverbanks and terrestrial planting areas. Newly vegetated areas were fenced to protect them from being trampled (Figure 4d). Post establishment period maintenance of the newly naturalised banks has been handed over to Sydney Water bush regeneration contractors. Community connection with the project has been enhanced where local bushcare volunteers have adopted some sites and assist with ongoing weed management and litter removal.



Figure 5. Overview of the saltmarsh bench and riparian plantings from landward side.

Successes and lessons learnt

A total of 1.1km of steep concrete banks across three sites were returned to a more natural slope and stabilised with sandstone and native plants. The degree of naturalisation for each site was customised depending on hydraulics, available space, adjacent services and other constraints. Contingencies in the budget and project time frame were required due to the identification of contaminated soil and poor geotechnical conditions, two of the many pitfalls of working around waterways.

Coffer dam design and implementation was also crucial so as to provide a suitably dry working area. Various technologies and approaches were tried during construction. The best and lowest risk approaches identified involved working on small sections of bank at one time. New saltmarsh and wetlands were created adjacent to the riverbanks where these important habitats had been lost

(Figure 5 and 6). The project has delivered increased diversity of native riparian habitat types and improved connectivity for flora and fauna between reaches of the river that had been disconnected.

The local community has a greatly improved sense of pride and positivity in the local area. Their involvement in the design process allowed them to feel comfortable with the designs and to take ownership of the project. Vastly improved aesthetics of the reach and the provision of a new social amenity via pathways, seating and interpretive signage has provided an opportunity for local communities to reinstate a sense of place and reconnect with each other in the context of a natural river.

The project represents value for money considering the longer asset life expected by the natural system and the flow-on economic benefits the restoration will realise in the local community.

Project design specifics

- 1.1 kilometres of deteriorated concrete bank was replaced with environmentally friendly river banks.
- Bank slopes reduced from 1V:1H down to between 1V:3H to 1V:5H.
- Over 1,000 square metres (2.5 hectares) of new saltmarsh was created.
- A 2,500 square metre freshwater wetland with a fauna underpass underneath the adjacent cycleway, linking the wetland to the river.
- Over 100,000 local native plants were used to stabilise the banks, within the wetland, and to create habitat in adjacent terrestrial areas. Plants were chosen to emulate local ecological communities. This created over 28,000 square metres of new native vegetation.
- Over 800 metres of new public pathways.
- Five new interpretive signs explaining the benefits and history of the river naturalisation.
- New seating and picnic shelter as well as relocated dog off-leash area.



Figure 6. Riparian reed plantings in foreground, saltmarsh bench in background, looking downstream.

Quick facts

Project overview	Masterplanning, design and construction of environmentally friendly riverbank to replace deteriorated concrete channel at three sites along the Cooks River.
Location	Croydon Park, Belfield and Campsie on the Cooks River, inner south western Sydney.
Cost and time	\$8.6 million total budget. Planning 2007-2011. Design 2011-2014. Cup and Saucer Wetland Construction 2010. Riverbank Construction 2014-2015.
Funding and technical support	For the \$900,000 Cup and Saucer Wetland at the Campsie site: <ul style="list-style-type: none"> • \$265,000 from Canterbury City Council (now City of Canterbury Bankstown). • \$335,000 from the Australian Government. • \$300,000 Sydney Water contribution.
Key project facts and outcomes	1.1km of deteriorated concrete channel replaced with natural banks stabilised with sandstone and native plants. Over 100,000 local native plants. A 0.25 hectare constructed wetland to treat stormwater and provide habitat.
Project partners	Parsons Brinckerhoff - Flood study, flood impact assessments and hydraulic design. Thompson Berrill Landscape Design - Naturalisation masterplanning, concept design, detailed concept design and construction supervision. Total Earth Care - Cup and Saucer Wetland construction. Josa Constructions - Riverbank construction. Toolijooa - Vegetation planting and establishment.

Planning and approvals

- No consent is required for development for the purpose of a stormwater drainage system under the *State Environmental Planning Policy (Infrastructure) 2007* by public authorities (such as Sydney Water). Therefore works were self-determined under Part 5 of the *Environmental Planning and Assessment Act 1979* through a Review of Environmental Factors (REF).
- Despite the *State Environmental Planning Policy (Infrastructure)* prevailing over *State Environmental Planning Policy 19 (Bushland in Urban Areas)*, the REF gave considerations to remnant bushland as required under SEPP 19.
- As per the *State Environmental Planning Policy (Infrastructure)* consent was not required from local council under their planning scheme ordinances. However both Canterbury and Burwood Councils were involved in the design and REF process and were formally notified of the works.
- As a public authority, Sydney Water was exempt from obtaining a controlled activity approval under the *Water Management Act 2000*. However the design considered NSW Office of Water guidelines for in-stream works.
- The project was consistent with the targets outlined under the Sydney Metropolitan Catchment Management Authority's Catchment Action Plan prepared under the *Catchment Management Authorities Act 2003*.
- Under the *Fisheries Management Act 1994* Sydney Water notified the Minister regarding the need for "dredging", specifically excavation of intertidal water land.
- Assessments were made to ensure there were no impacts on threatened species or ecological communities under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999*.
- Due diligence investigations were made to ensure no impact on Aboriginal cultural heritage under the *National Park and Wildlife Act 1974*.
- License deeds of agreement were entered into with both Canterbury and Burwood Councils with regard to use of council land during the works and around ongoing ownership and management of the works post construction.

NOTE: Always consult with your local Council prior to undertaking any foreshore works or adjustments. They will be able to provide information on what approvals may be required and which government agencies provide these.

Find out more

Fish Friendly Marine Infrastructure is a NSW Department of Primary Industries (Fisheries) developed program. This project has been assisted by the NSW government through its Environmental Trust. More information on Fish Friendly Marine Infrastructure can be found at: www.fishhabitatnetwork.com.au, or by calling the NSW Department of Primary Industries (Fisheries) Aquatic Habitat Rehabilitation team on 02 6626 1396.

To find out more about the Cooks River naturalisation project contact Daniel Cunningham, Sydney Water, on 0439 606 488.

© State of New South Wales through the Department of Industry 2017. You may copy, distribute and otherwise freely deal with this publication for any purpose, provided that you attribute the NSW Department of Primary Industries as the owner.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (August 2017). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the Department of Primary Industries or the user's independent advisor.

ISBN 978-1-76058-121-3

