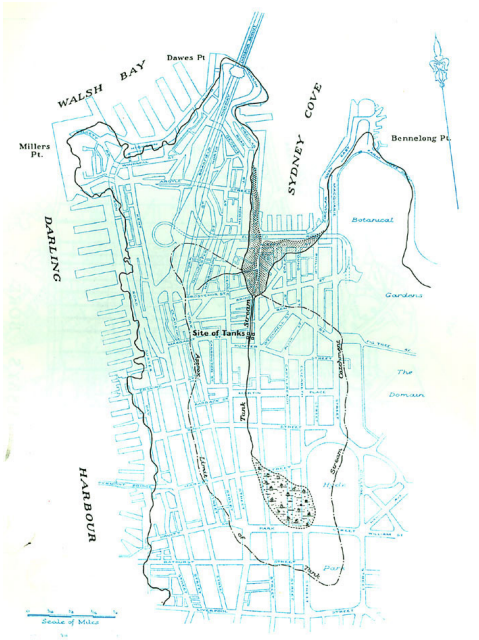
West Circular Quay Public Domain Revitalisation

Water Sensitive Urban Design
Concept design information
(final)

13 May 2010



Connection to Sydney's water history

Significant stormwater catchments upstream

A lush green space in the city

Water cycle management objectives for West Circular Quay

SHFA has a commitment to reduce their operational and precinct footprint by 80 percent by the year 2020.

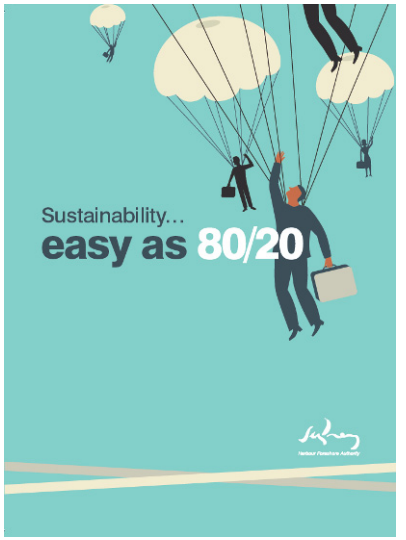
In terms of water cycle management, SHFA's sustainability strategy ("easy as 80/20") emphasises:

- collecting rainwater
- by 2010, using harvested rainwater on all parks
- by 2020, reducing potable water consumption by 80% across SHFA precincts

West Circular Quay can play an important role in helping to meet these goals.

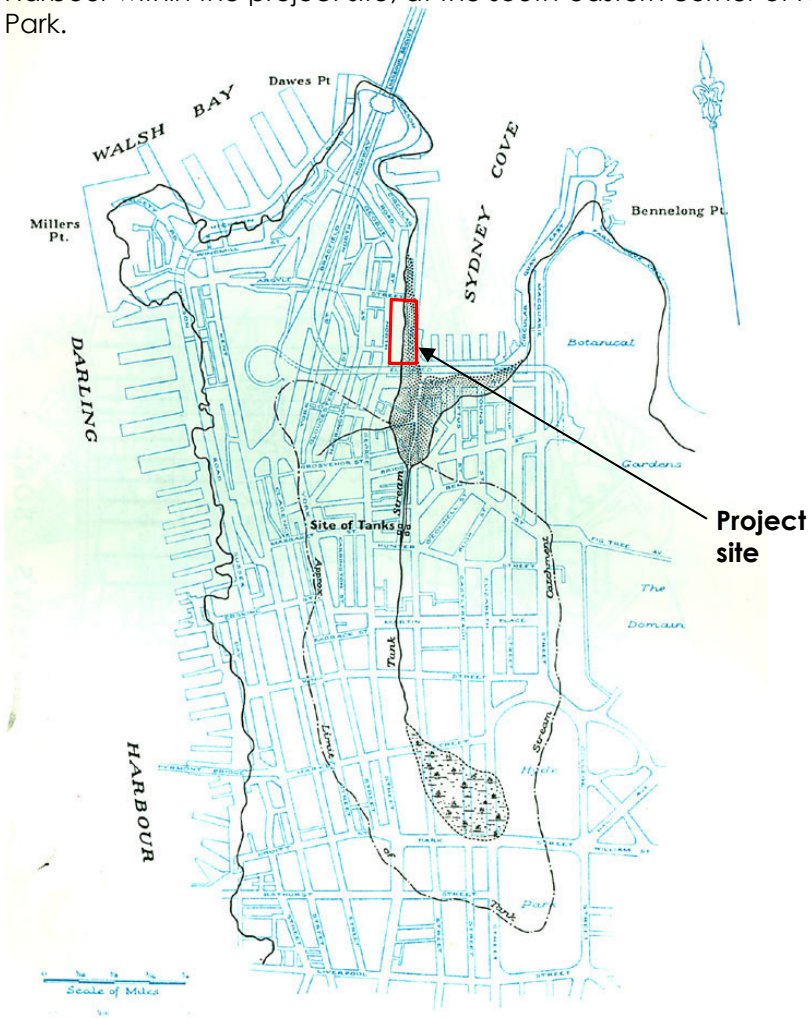
West Circular Quay can also play a role in reducing pollutant loads from stormwater discharging into Sydney Harbour. Best practice targets (widely used in NSW) are:

- 85% reduction in the mean annual load of total suspended solids
- 60% reduction in the mean annual load of total phosphorus
- 45% reduction in the mean annual load of total nitrogen

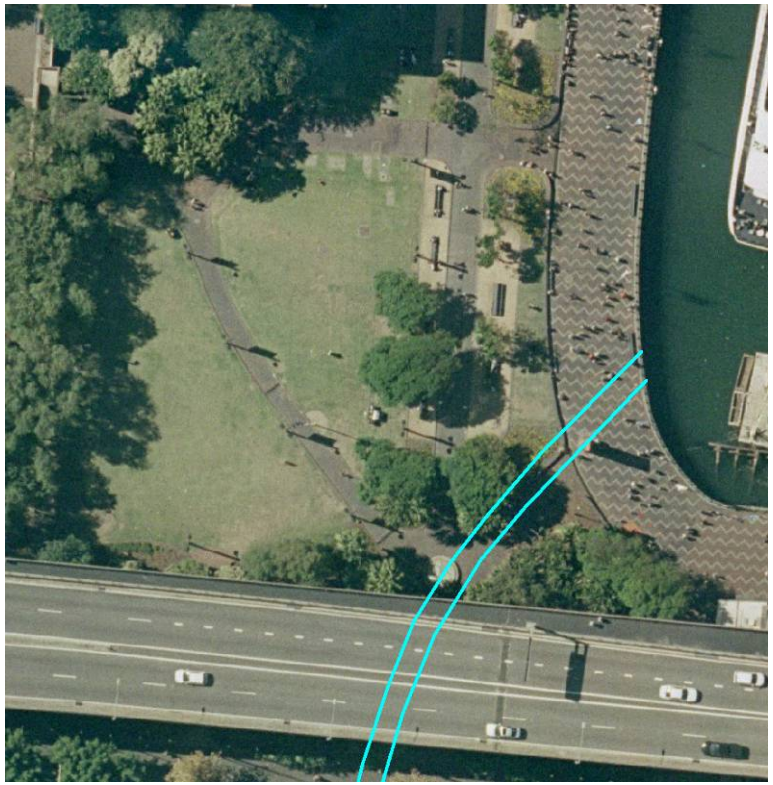


Water history at West Circular Quay

The West Circular Quay Public Domain Revitalisation offers an opportunity for interpretation of Sydney's water history. The Tank Stream, which was Sydney's first water supply, discharges into the Harbour within the project site, at the south-eastern corner of First Fleet Park.



Catchment and course of the original tank stream



Approximate alignment of the Tank Stream today

The Tank Stream is now buried in a channel deep below the city. At First Fleet Park, it's not possible to see its location or connection to the Harbour. Additional infrastructure has been added in layers, including stormwater drainage at ground level and from the Cahill Expressway overhead.

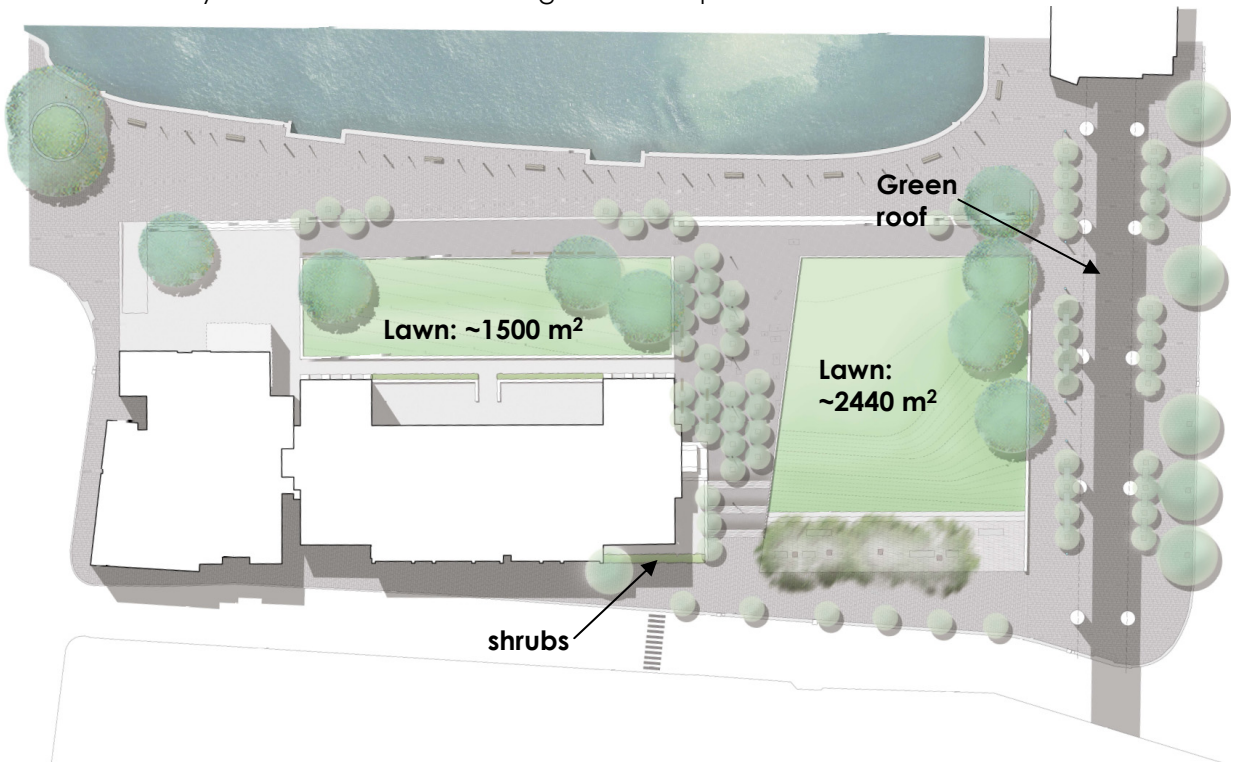
Future water demands

Irrigation demands at West Circular Quay should be met with non-potable water, in keeping with SHFA's sustainability strategy.

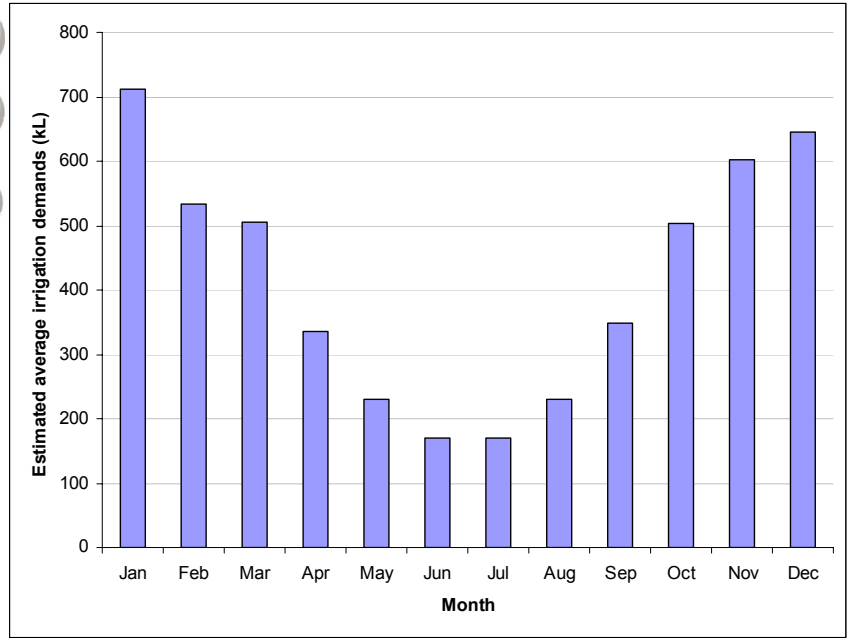
Future irrigation demands at West Circular Quay were estimated using Sydney Water's "WaterRight" gardens tool. Irrigation demands were estimated at **4,980 kL/year**.

Water demands have been estimated based on:

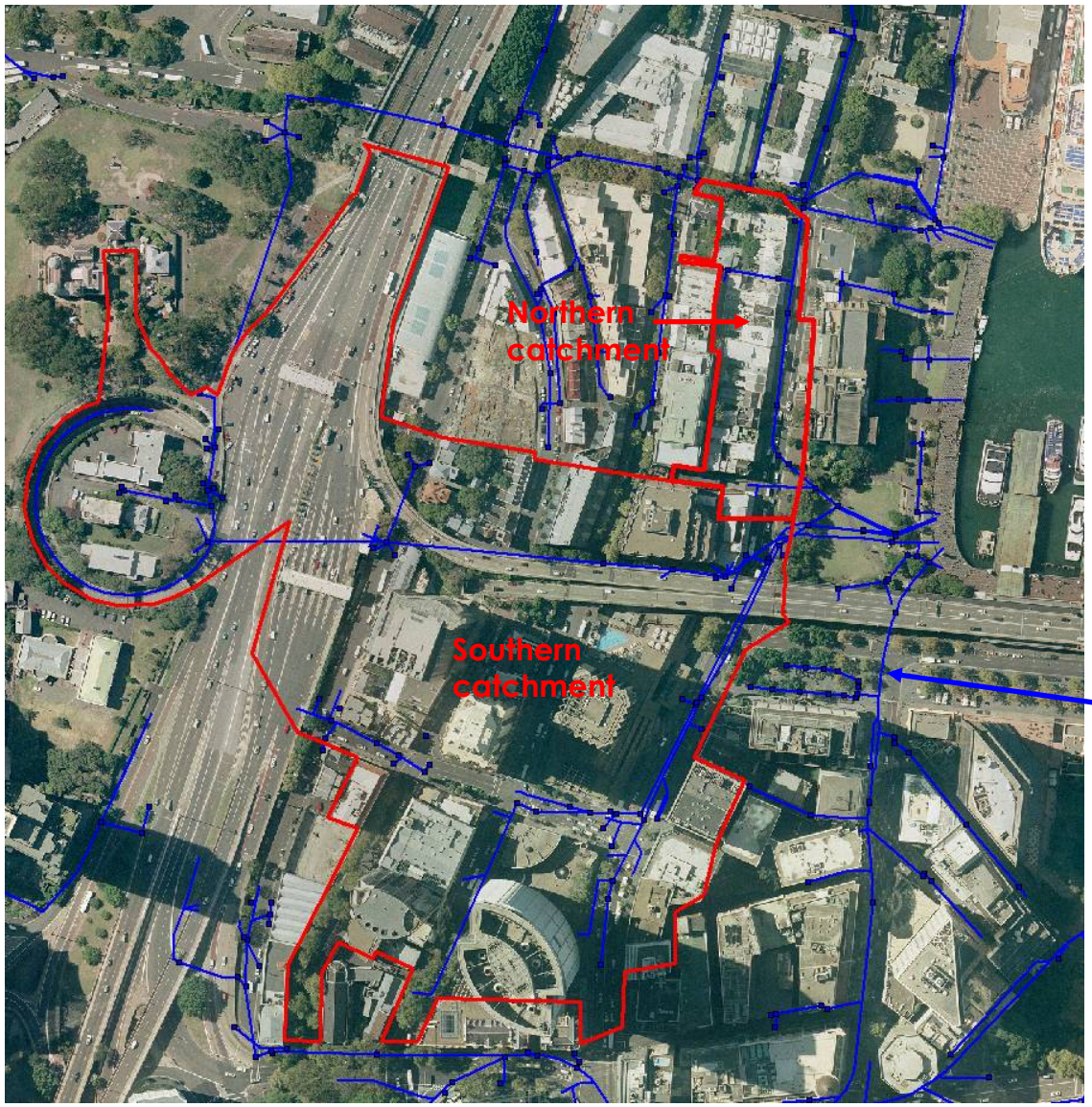
- A 3,940 m^2 area of grass (as shown below), subject to high traffic and maintained to a high standard
- Approximately 75 trees, with moderate water requirements
- One area of shrub planting, approximately 35 m^2, with low water requirements
- A green roof installation under the Cahill expressway, with mist irrigation system and moderate to high water requirements



Irrigation water demands will follow a seasonal pattern, estimated to reflect monthly evapo-transpiration at the site:



West Circular Quay catchments



Stormwater drainage lines shown from the City of Sydney's GIS system

Two significant catchments drain through West Circular Quay from George Street to the Harbour.

As George Street is significantly higher than the park, these stormwater systems may not be too deep within the park (note that levels are currently unknown). It may even be possible to divert flows from George Street to surface level within the park. Therefore these two catchments are considered the best potential options for stormwater treatment, harvesting and reuse.

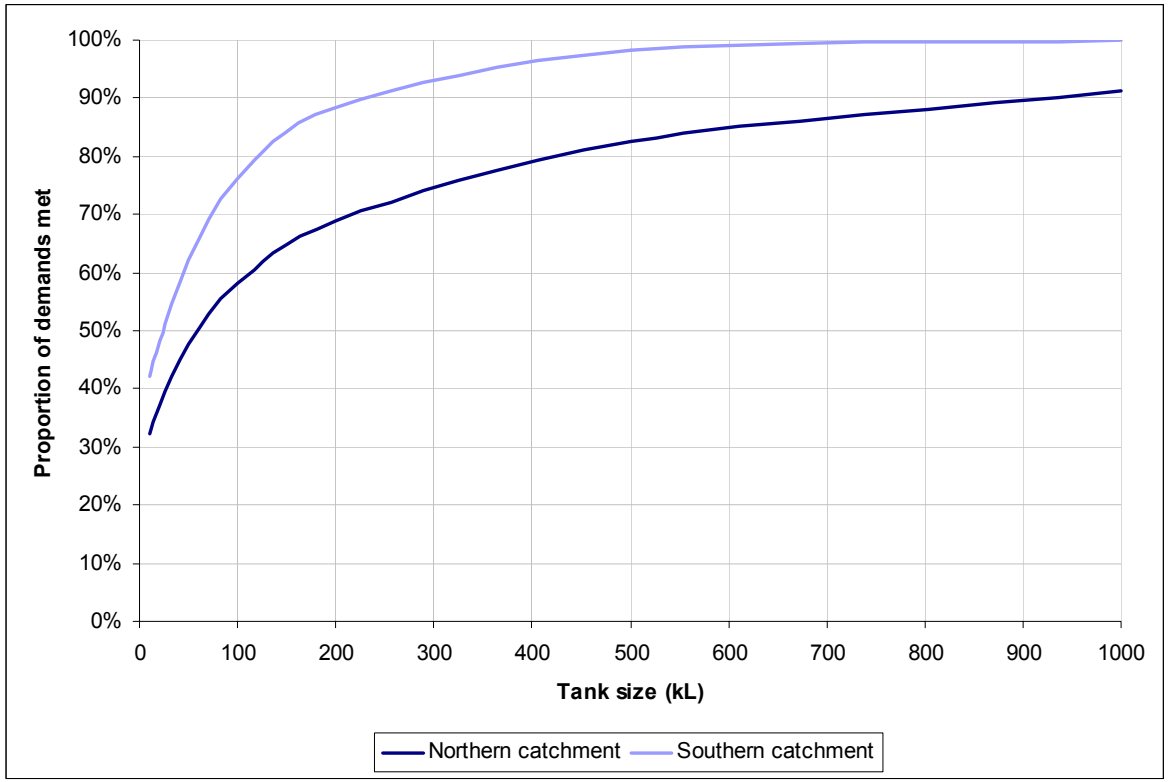
There are also a series of small stormwater catchments draining the MCA building and its surrounds directly into the Harbour.

The Tank Stream passes through the south-eastern corner of First Fleet Park. The Tank Stream has a large catchment, but is likely to be quite deep below the surface of the park and tidally affected within the park.

Catchment name	Area (ha)	Estimated impervious fraction	Annual runoff (ML/year)
Northern	0.9	95%	9
Southern	9.0	90%	90

Potential for stormwater harvesting and reuse at West Circular Quay

Water balance modelling has been undertaken to assess the potential for stormwater harvesting to supply future irrigation demands at West Circular Quay. Results are shown below, indicating that it should be possible to meet approximately 85-90% of the park's irrigation demands from treated stormwater. This is equivalent to 4,230-4,480 kL/year.



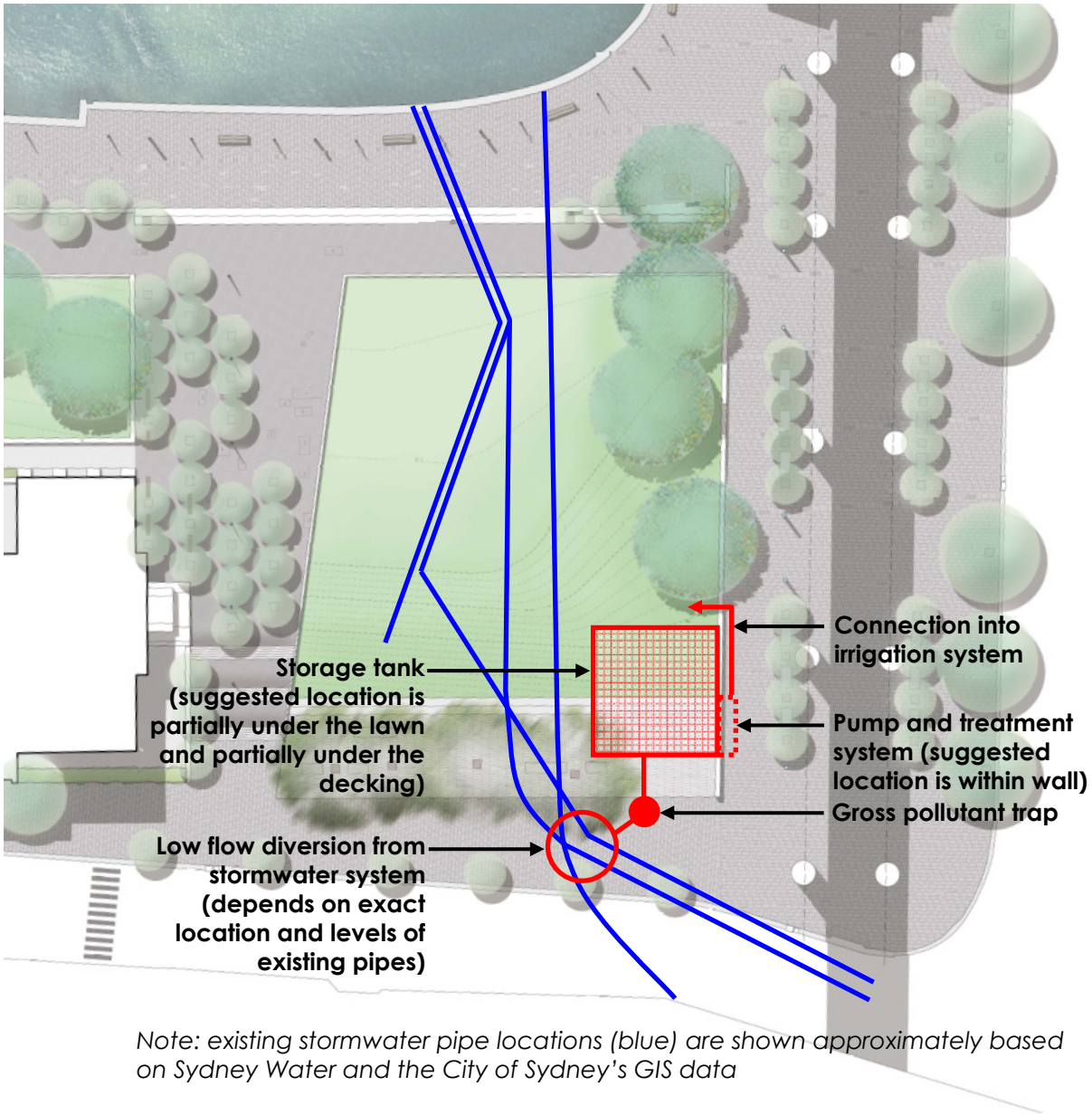
The southern catchment can meet a greater proportion of demands than the northern catchment. A tank size of 150-200 kL would be required to meet approximately 85-90% of the estimated irrigation demands.

A storage tank could be constructed underground within the park. An underground tank could be constructed of concrete or modular plastic cells.

200 kL concrete stormwater tank under construction at Prince Alfred Park in Sydney

Modular plastic stormwater tank under construction at the South Australian Museum

Components of a stormwater harvesting and reuse scheme



Note: existing stormwater pipe locations (blue) are shown approximately based on Sydney Water and the City of Sydney's GIS data

This conceptual layout shows the key elements of a stormwater harvesting scheme. Note that this is not to scale and the design would be dependent on the levels of the stormwater system, which are not currently known. This is a key issue for resolution at the functional design stage.

The locations of most components are flexible. The GPT and storage tank would be located underground. The pump and treatment system could also be located underground, however the location suggested is within the wall on the southern side of the site.

Example of a stormwater pump and treatment system for a harvesting scheme at Ryde Park

Potential for stormwater treatment at West Circular Quay

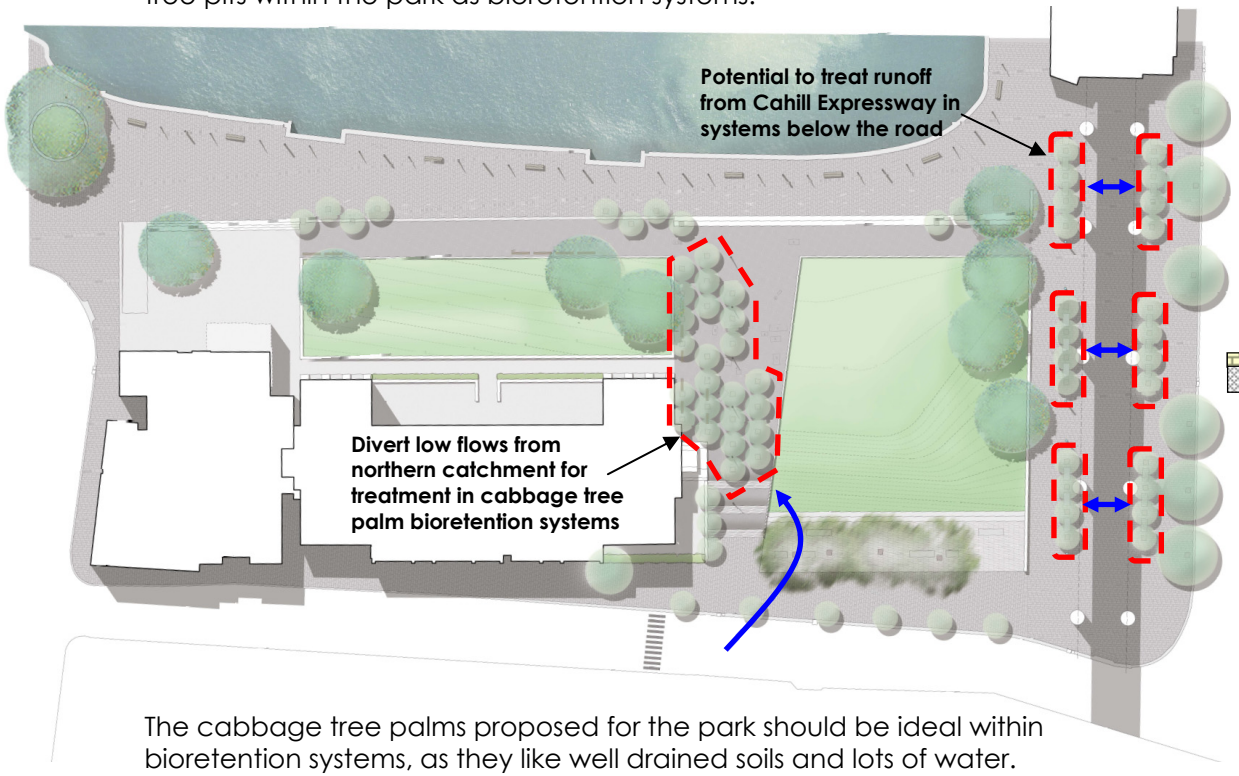
Stormwater is a significant source of pollutants flowing in to Sydney Harbour. Stormwater treatment at West Circular Quay can help to reduce these pollutant loads.

Stormwater quality modelling was undertaken in MUSIC to estimate the size of a bioretention system required to treat the northern and southern catchments to meet best practice targets (85/60/45% reduction in TSS/TP/TN):

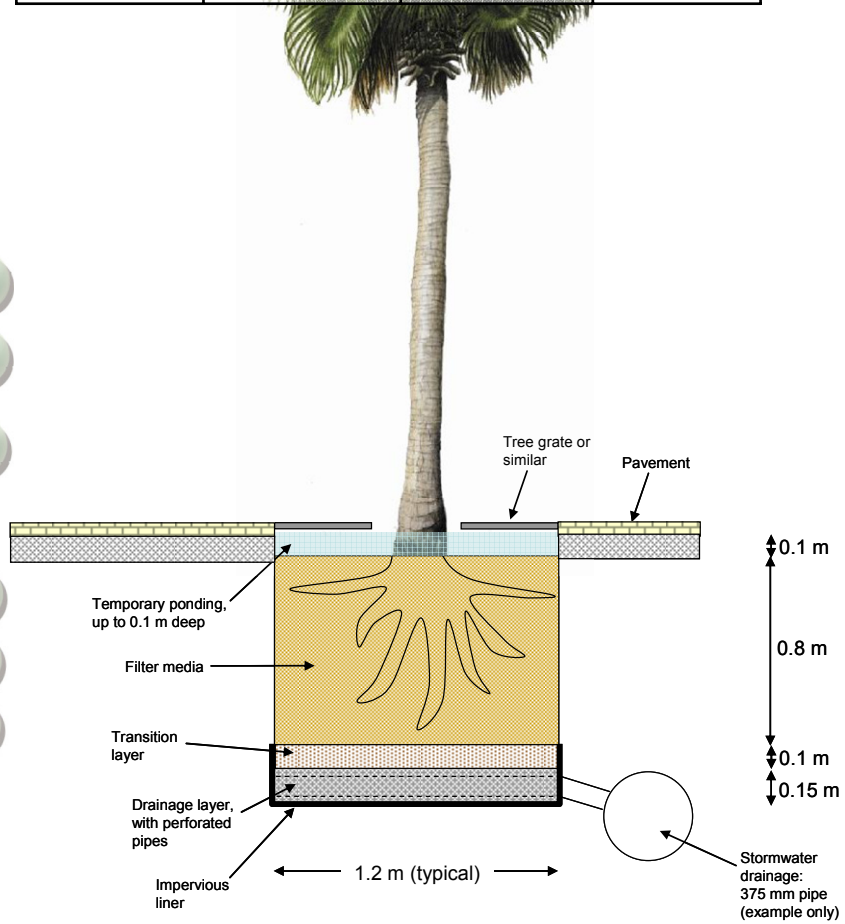
- Northern catchment: 190 m^2
- Southern catchment: 1,800 m^2

There is space within the park (assuming levels can be resolved) to treat the northern catchment to best practice. The preferred option is to construct new tree pits within the park as bioretention systems.

Catchment name	Mean annual pollutant loads (kg/year)		
	Total Suspended Solids	Total Phosphorus	Total Nitrogen
Northern	2,100	4.2	28
Southern	20,000	41	280



The cabbage tree palms proposed for the park should be ideal within bioretention systems, as they like well drained soils and lots of water.



Typical section of a street tree bioretention system