



45 Shand Road, Reservoir Melbourne, Victoria

Location:
Melbourne,
VIC



Case Study — Prepared by Water Sensitive Cities
Australia, August 2022

Insight

This infill development uses rainwater harvesting and raingardens to meet council flood mitigation requirements, rather than dedicated on-site 'grey infrastructure' like concrete pits, tanks and pipes. The project also involved a new method of assessing flood water mitigation that proves these water sensitive solutions are a viable alternative to conventional infrastructure.

Project description

The 45 Shand Road affordable housing development (Shand) takes an innovative approach to water sensitive urban design (WSUD) as a part of a broader approach to long-term sustainability.

It's a 4-townhouse development on a 600 m² infill site in Reservoir, in Melbourne's north.

The 4 townhouses will be powered by rooftop solar and 100% GreenPower from the grid, and use electric-only appliances. The project also aims to demonstrate a high level of water management, including maximising the use of WSUD.

WSUD is ordinarily used to cleanse polluted stormwater runoff. At Shand, WSUD was also designed to achieve the



↑ Image 1: Architectural render for 45 Shand Road.

site's flood management requirements, specifically to reduce or avoid dedicated on-site detention storage. On-site detention is temporary water storage that slows the release of stormwater to street drains after heavy rain. It's used to control flooding. On-site detention infrastructure can store water above or below ground and often uses 'grey infrastructure' like concrete pits.

The design at Shand maximises water permeability across the site by employing: (1) rainwater reuse tanks for each townhouse, (2) a swale along the driveway, and (3) a raingarden along the front garden property boundary. All surface drainage is directed into the swales and raingarden for water detention. These WSUD assets remove the need for a large detention storage tank or pipe below the driveway. The water is then used on site, or drained slowly into the stormwater system during large storms.

The design is a collaboration between the developer, engineering consultant, WSUD consultant and the landscape architect. Darebin Council also came on board early by encouraging further investigation of flood assessment methodologies to assess how WSUD can contribute to flood management.

The project is currently in the design phase. Progress will be tracked throughout the development.

What does this case study demonstrate?

Each case study has been selected to demonstrate specific solutions, benefits or enabling structures that support the creation of water sensitive cities. This case study focuses on:

Flood mitigation

Rainwater and stormwater harvesting

Water sensitive homes and buildings

The drivers

The developer, Ys Housing, is a not-for-profit organisation that aims to deliver 1,000 new, affordable homes over 10 years to combat inequality and shape a fairer, more vibrant city. For Shand, Ys Housing set out to make sustainability more accessible and affordable. In particular, Ys Housing aimed to:

- demonstrate net-zero, water sensitive, affordable housing that is repeatable at a suburban scale
- reduce cost by replacing conventional underground concrete stormwater detention systems, with water sensitive alternatives
- meet stormwater flow volume reductions to protect waterways, as set out in EPA Victoria's Urban Stormwater Guidance and to comply with the obligations of the General Environmental Duty in the *Environment Protection Act 2017*
- meet the Australian Rainfall and Runoff 2019 guideline (AR&R) for the design and modelling of flood mitigation responses
- collaborate with the City of Darebin on WSUD innovation.

The innovations

This case study uses WSUD to meet council flood mitigation requirements, rather than dedicated on-site 'grey infrastructure' like concrete pits, tanks and pipes. In particular, the WSUD scheme at Shand introduced the following features:

- **Household collection and reuse of rainwater** – Each townhouse will be equipped with a 3000 L rainwater tank that has 2000 L for reuse and approximately

1000 L for stormwater detention. Harvested rainwater will be connected for flushing and external taps for gardens.

- **Integrated swale and raingarden** – The site will include a vegetated swale running the length of the driveway and a ~8 m² raingarden that runs along the front boundary, designed to support tree growth in the front set back.
- **High surface permeability** – The development will have ~200 m² (30%) of pervious surfaces made up of gardens, permeable paving and decking.
- **Plant selection** – The gardens will use native species that are local to the Victorian volcanic plains. The use of bird-attracting trees, wildflowers and scented shrubs will provide shade and encourage biodiversity, while also requiring little active irrigation because they are well-adapted to the Victorian climate.

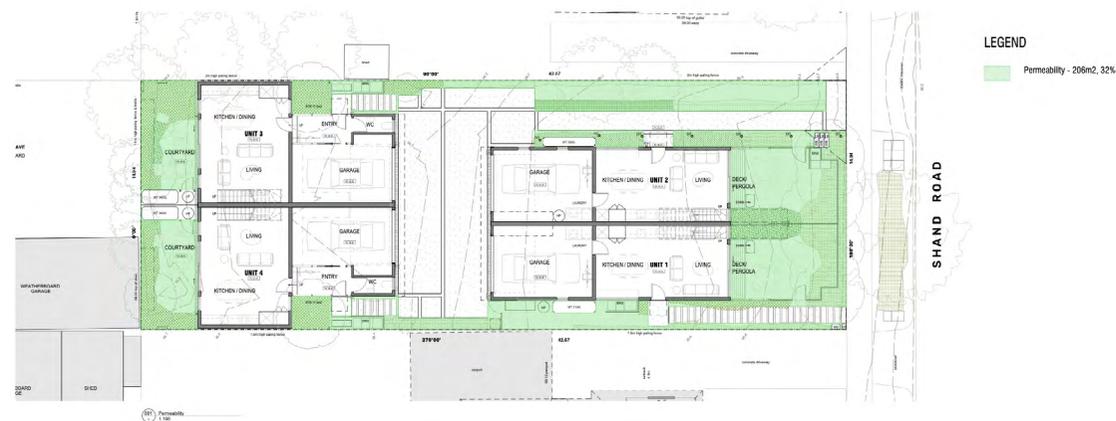
As well as using WSUD in this way, this case study also relied on a new method of assessing the flood mitigation of WSUD assets. This is a fundamental shift from the existing STORM design method. To achieve this, a new method was developed to assess on-site detention outcomes for WSUD assets that complies with AR&R.

In particular, the new assessment method properly accounts for the benefits of WSUD using continuous simulation with real rather than theoretical design storm events.

The project team also verified the effectiveness of the flood mitigation design using traditional methods.

The new assessment method was more conservative than traditional assessment methods, resulting in asset designs that work effectively across a broader range of storm events. With the new method, a flexible range of integrated WSUD and detention assets can be used to effectively mitigate flood risks that meet and exceed council's on-site detention requirements.

In addition to meeting flood management requirements, the design exceeds EPA Victoria's Urban Stormwater Guidance for stormwater quality and flow volumes for infill sites, and aligns with the stormwater management objectives in Melbourne Water's Healthy Waterways Strategy.



↑ Image 2: High levels of permeable surfaces at approximately 32% of the site.

The outcomes

 Cities providing ecosystem services	 Cities as water supply catchments	 Cities comprising water sensitive communities
<ul style="list-style-type: none"> • Stormwater quality improvements – Stormwater modelling predicts: <ul style="list-style-type: none"> - 47% of the stormwater flows will be retained for reuse and evapotranspiration within the landscape (compared with a target of 28%) - 17% of the stormwater will be infiltrated to recharge groundwater (compared with a target of 9%) - 82% of total nitrogen will be removed from the stormwater discharge to protect Port Phillip Bay (compared with a target of 45%). • Native vegetation – The use of native vegetation promotes increased biodiversity. 	<ul style="list-style-type: none"> • Water reuse – Rainwater harvested on the site will be used for non-drinking water use. This conserves Melbourne’s drinking water supplies. • Water conservation – By using a drought resilient native garden, and retaining rain that falls onto the site, the garden is largely self-sufficient in its water use. • Flood mitigation – WSUD is used to achieve flood management requirements, reducing the need for dedicated on-site detention. 	<ul style="list-style-type: none"> • Housing affordability – Shand delivers affordability via shared equity finance, meaning a well-located, environmentally sustainable home is available to lower income families, near jobs, schools and community. • Health benefits – The landscaping increases urban greening with thoughtful planting design while enhancing biodiversity by incorporating native vegetation.

Business case

Cost

- Total construction cost for the project is approximately \$1.8 million.
- The WSUD features are cost neutral. Construction costs are mostly offset by the avoided costs of ‘grey infrastructure’ including underground detention tanks and pipes.

Benefits

- The development provides sustainable solutions for affordable housing projects by reducing residents’ water bills, protecting local creeks and increasing biodiversity compared with a conventional affordable house design.
- The WSUD design exceeds EPA Victoria and Healthy Waterways Strategy requirements for stormwater management.
- The increased urban greening helps to improve health and wellbeing.

The lessons

- **Engage the council early.** Council is on board with the approach, but needs advice on how to quantify the detention and retention volume contribution of raingardens, and clarity on the margin-of-safety factors to account for deterioration of the vegetated systems over time.
- **Allow for additional coordination among the consulting team.** The project required strong collaboration and coordination between landscape design and drainage engineering for the overall design to be successful.
- **Allow for extra time, because the project is not business as usual.** Novel design approaches need extra consideration and time. Often there is insufficient consulting budget in projects to allow for this extra time, especially on small projects. It can be tempting to revert back to more standard 'grey infrastructure' solutions to keep the project on time and on budget.

Transferability

This project is highly replicable and can act as a template for developments across Australia whose goals are to create well-integrated landscapes for water management responses. Developments would need only minor adjustments to features such as tank size (depending on estimated rainfall for an area) and appropriate vegetation for varying climates.

Project collaborators

- Ys Housing
- E2DesignLab
- Ipsum Structures
- Watkin McLennan
- Bank Australia
- City of Darebin

Additional information

More information on the 45 Shand Road project can be found at:

[Open space contribution exemption for charitable affordable housing providers](#)



↑ Image 3: Rendered image of one of the front gardens.

Water Sensitive Cities Australia



PO BOX 8000
Monash University LPO,
Clayton, VIC 3800, Australia



info@wscaustralia.org.au



wscaustralia.org.au



MONASH
SUSTAINABLE
DEVELOPMENT
INSTITUTE



Water Sensitive Cities
Australia