



TERRA FIRMA™
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CITY OF YARRA

TREE GATE CASE STUDY

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Smith Street (north) tree project with water sensitive urban design.

City of Yarra project team: Karl Shanley, Sarah Haq, Clare Lee, Michael Rogers, Mary Sullivan, Darul Islam

Tree pit cover design & engineering: Terra Firma Industries

Tree guard fabrication: Furphy Foundary

Civil contractor: Patane Brothers

Tree planting and Water Sensitive Urban Design (wsud): Sevron Environmental Contractors

Civil Engineering design: Connell Wagner/Aurecon

Photographs: Hugo Cran

Funding: Melbourne Water Living Rivers Programme and the Department of Community Development and Planning Creating Better Places grant

Executive Summary

A recent community consultation process identified a public desire for more trees in the Smith Street Activity Centre – a busy shopping strip running from Victoria Parade to Alexander Parade, Collingwood. The City of Yarra recruited and coordinated a cross-disciplinary team consisting of landscape architecture and design, water sensitive urban design, arboriculture and innovative engineering. Together, they pioneered an innovative new system that has vastly improved the streetscape aesthetic, harnessed stormwater runoff for fully sustainable tree watering, improved the quality of water entering the stormwater system, and significantly decreased the volume of gross pollutants entering vulnerable waterways.

Background

The Smith Street Structure Plan for the Smith Street Activity Centre (adopted by the City of Yarra in November 2008) involved a community consultation process in which the public were asked what they would like to see in Smith Street. There was a consistent and popular request for more trees and more green in the street. The Smith Street Activity Centre is an inner city street shopping strip with lots of colour, clutter and variety. The local heritage and character is very much evident and alive. Smith Street is heavily used, with a constant flow of vehicles and pedestrians, day and night.

The new street tree planting project included both exciting design opportunities but also numerous constraints. While the character has a contemporary, eclectic feel, it also has a strong heritage character, with the majority of the street covered by a heritage overlay. The road way and footpaths are narrow with many used and de-commissioned underground services. The central section is dominated by small shops with awnings and verandahs making the planting of decent-sized street trees virtually impossible.

The north and south ends of Smith Street have the space for new street trees however, with fewer awnings and verandahs and slightly wider footpaths. The new street tree planting was therefore concentrated on the north and south ends. The north end of the street, from Johnston Street down to Alexandra Parade, has a significant slope which created an opportunity to integrate Water Sensitive Urban Design (WSUD) into the street tree planting project. The inclusion of WSUD into the project involved a range of additional constraints and also opportunities, which will be discussed in detail.

The Design: Tree Grates and Guards

The design concept for the new tree guards and grates was to be distinctive, original and functional. They have been inspired by the industrial heritage of many Collingwood and Fitzroy streets, including Smith Street. The design is an attempt to capture, in a stylised and simple form, the idea of the factory and machine mass production. This is reflected in the repeated, circular/curved sections of the tree guards and the use of galvanised steel - a raw industrial material. The guards are designed to have an un-identifiable, industrial appearance, while not directly replicating a particular industrial form or object. The tree guard and grate design also compliment the heritage red brick industrial buildings and general urban feel of the street, while softening the streetscape with their elegant curved (rather than angular) forms.

Smith Street has a strong heritage streetscape character with not only the continuous rows of Victorian shopfronts, but also the original (and re-layed in some sections) bluestone kerbs and gutter stone channels. The tree grate design included a lintel (for the WSUD), which is 300mm wide, to match and continue the existing heritage bluestone kerb line. The heritage bluestone pitcher channels were kept intact, with only slight changes to the angle of a minimal number of pitchers to direct water into the side entry of the tree pit for the WSUD.

Tree Selection

The eclectic character of Smith Street called for an unconventional approach to tree selection while ensuring a guaranteed effect. A choice of two tree species were selected, both native and exotic. Considering the multicultural heritage of the area it was decided to plant Mediterranean olives and native Australian eucalypts.

The olives were selected to provide a reliable and regular form, while the Eucalypts (which are a species which had not been used before in the City of Yarra) have bold and bright yellow flowers, and unusual large pale pink gum nuts which are highly perfumed and attract birds. The Olive trees and Eucalyptus Lorikeet 'Summer Sensation' inter-planted has an element of consistency when moving along or looking down the street as they are of a similar mature size and both species have distinctive blue-grey foliage.

Water Sensitive Urban Design

As part of its ongoing commitment to improving community and environmental outcomes, the City of Yarra has adopted stormwater quality runoff improvement targets. To achieve these objectives the Council is implementing a range of Water Sensitive Urban Design projects such as the bioretention tree pits in Smith St

The intent of the WSUD tree pits is to direct stormwater runoff that flows down Smith St into a "treatment train" of 18 bioretention tree pits. The objective is to treat the polluted stormwater through the tree pits which contain filter media designed to remove contaminants before the water is released back into the stormwater drain and continues through to the local waterways. An additional benefit is that the trees are "passively" irrigated by the stormwater. Due to the fact that a stormwater drain was only present on the west side of Smith St, WSUD principles could only be included on this side of the street.

The project was modelled with the stormwater quality software tool MUSIC (Model for Urban Stormwater Improvement Conceptualisation) to calculate the number and size of bioretention tree pits required to achieve strong water quality outcomes. Modelling conducted for this project found that the project will see an 83.5% reduction in Total Suspended Solids (kg/per year) and a 40% reduction in Total Nitrogen (kg/per year).

Council contractors open the tree pits every two weeks to clean out litter and accumulated sediment and check on the health of the trees. The entry of the tree pits was designed to allow gross pollutants to fit through the openings to purposely act as a litter trap. Since being implemented maintenance reports show that approximately 240 litres of litter (bottles, food packaging, cigarette butts, etc) is trapped by the tree pits every fortnight. A water quality monitoring program is being developed to study the effectiveness of the tree pits in improving stormwater runoff quality.

The WSUD component of this project was co-funded by the Melbourne Water Living Rivers program.

Technical Details

One of the major challenges in the project was to design covers for the tree pits. The requirements for the pit covers included:

- **STRENGTH:** Smith Street is an inner city retail and commercial precinct. Due to large numbers of commercial deliveries and heavy traffic, pit lids must withstand significant loading.
- **EASE OF ACCESS:** The tree pits are cleaned and serviced every two weeks. Access to the pit should be easy and safe to enable routine cleaning, inspection and servicing of the tree pit. Due to the frequency of this servicing, this must be conducted in a cost effective and efficient manner.

- **FULL PIT OPENING:** A further requirement was for the full pit opening with all pit covers and cross beams fully removable. This would allow for unencumbered access to the pit if the tree was damaged and needed to be removed and replaced.
- **DESIGN FLEXIBILITY:** The covers needed to be in keeping with the overall design concept and offer a degree of flexibility in terms of shape and colour

Regular maintenance needs meant lids designed for infill pavers were not a practical solution due to excessive weight. This problem was exacerbated by the close proximity to the ground of the tree guard making it impossible to place lifting gear above the lids.

The City of Yarra works department recommended the project team contact Terra Firma Industries, manufacturer of lightweight, fibreglass composite Terra Firma Pit lids which are used for stormwater and utility applications throughout Melbourne.

The Terra Firma pit lids provided an ideal solution for this application. The product easily met the load bearing requirements of the project being able to bear loads in excess of 110kN. The weight of the customised covers designed by Terra Firma came in at a mere 13kg, making them easily accessible for regular servicing and maintenance.

The frame design was crucial to ensuring flexibility in access. The final design incorporated 2 covers with a 2part removable cross beam and tree ring. This allows open access to the pit with the potential to remove the cross beam and tree ring in the event a tree is damaged and needs to be replaced. The cross beam also required sufficient strength to support the tree guard and the potential levered weight of a vandal or late night reveller.

Terra Firma overcame multiple hurdles in the manufacture and design phases. The crossbeam design required a unique solution. Designing a crossbeam which was not fixed, incorporated a tree ring and did not have any other support required some lateral thinking to ensure a strong, flexible outcome.

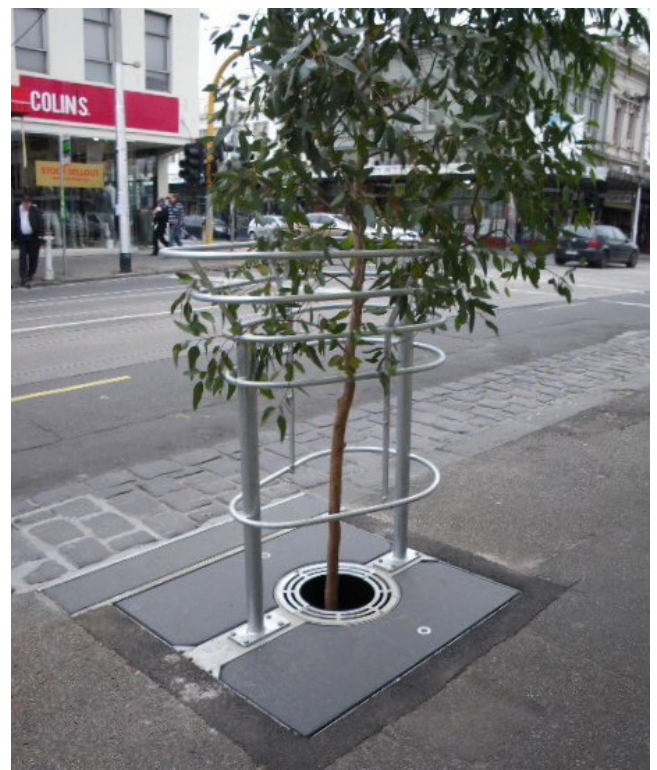
Another issue was the low kerb height and the need to create a strong, thin lintel for the side entry opening to the gutter. This was again solved by Terra Firma using covers incorporated into a reinforced galvanised lintel. This thin 50mm thick lintel can bear the weight of a bus, garbage or delivery truck mounting the kerb.

Conclusion

The final result of the project provided a stunning visual improvement to a previously dour, industrial, innercity streetscape. The outcomes included:

- An improved streetscape aesthetic;
- Greater community amenity;
- Use of stormwater for tree watering;
- Improved quality of water entering the stormwater system;
- A significant decrease in the volume of gross pollutants entering vulnerable waterways and Port Phillip Bay.

Bringing trees and greenery to Smith St was made all the more successful with the use of contemporary Water Sensitive Urban Design practices. The project utilised a cross-disciplinary team incorporating landscape architecture and design, WSUD, arboriculture and innovative engineering. The project also fulfilled the aims of meeting the community needs, environmental improvement and the urban beautification of a dynamic evolving inner city area.



**Terra Firma Tree Grate
Smith Street, Collingwood**



