

# Design Works for the Greening Port Pirie Landscaping

## Concept Design



Prepared for Port Pirie Regional Council

+ Jensen PLUS

+ FMG

# Project Overview

The Port Pirie Regional Council is collaboratively working with SA Water, Department for Energy and Water (DEW), and with the Targeted Lead Abatement Program (TLAP) regarding various Greening Port Pirie Projects.

The scope of Greening Port Pirie has been developed by SA Water and specialist consultants to integrate water sensitive urban design initiatives (WSUD) as part of reducing lead contaminants in airborne dust. This includes increasing tree canopy cover, ground-level landscaping and increasing biodiversity to various areas.

## Project 1

- \_ Phoenix Park Wetland
- \_ Concept design + Detailed design
- \_ Ground / detail survey only

## Project 2.1

- \_ The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark (300 m)
- \_ Concept design + Detailed design
- \_ Ground / detail survey and underground services

## Project 2.2

- \_ The Terrace/Memorial Dr intersection
- \_ Concept design + Detailed design
- \_ Ground / detail survey and underground services

## Project 2.3

- \_ Memorial Drive Concept design. Incorporate intersection of Memorial Drive & Gertrude Street
- \_ Concept design + cost estimate only
- \_ Ground / detail survey and underground services

## Project 2.5

- \_ The Terrace: Alexander Street to Memorial Drive + Mary Elie Street to Grey Terrace
- \_ Concept design + cost estimate only
- \_ Ground / detail survey and underground services



# Relevant public realm strategies + plans

## Summary



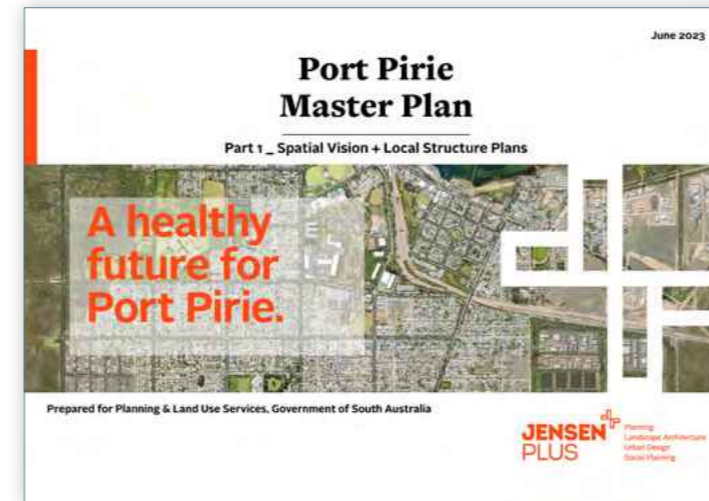
### Greening Port Pirie Master Plan (2022)

- \_ Discussion on dominant landscape, lack of street trees & ground cover to suppress dust.
- \_ Identifies key considerations for Phoenix Park wetlands including treatment of water, regeneration of native species, habitat value and adopting a management system.
- \_ Identifies key considerations for the Primary School and The Terrace, including biodiversity, streetscape arrangements, and succession planning.
- \_ The Greening Design Toolkit provides WSUD solutions utilised in this project, including build-outs, passive irrigation, treenet inlets, ground coverings to suppress dust, permeable paving and plant selection.



### Memorial Park (2019) and Port Pirie Master Plan (2023)

- \_ The Master Plans were used as a base for further research and analysis and development of the designs for each area based on local conditions.
- \_ Key considerations for Memorial Drive and The Terrace were explored further and implemented including maximising street potential for a pedestrianised street, formalised parking, road treatments, WSUD, tree planting and improved cycling.
- \_ Lagunaria trees are recommended for removal.
- \_ Implementing the objectives of the Master Plan for improvement of the community's health, liveability and sustainability.



- \_ Meeting these objectives through species suitability, canopy cover, wetlands enhancement, development of micro-forests, dust suppression strategies and streetscape realignments.

### Other strategies and plans:

- \_ Tree Strategy (2016) - tree management including street tree planting lists.
- \_ Bicycle Strategy outlining the cycling network with improvements including treatments and shared paths.



### Phoenix Park plans & reports:

- \_ Phoenix Park Wetlands Design Handbook (2015) encompassing design guidelines including planting recommendations for improved recreation and education.
- \_ EcoLogical soil testing and reports including Port Pirie Greening Land Management Services report.
- \_ Wandearah Road Detention Basin Embankment Upgrade Design (2016) showing a redesign of the levee and fill adjacent to private land.
- \_ Tonkin investigation, feasibility and design reports on drainage (2015-2017).
- \_ Phoenix Park Wetlands Improvements Information Sheet.
- \_ Oval civil design by SMEC.

# Vision + objectives

Create a greener Port Pirie using perennial and appropriate plant species to reduce airborne lead dust, improve human health and ensure long-term climate resilience - **Greening Port Pirie Master Plan Vision**

**Council's previous plans and strategies have identified a key vision and objectives for the greening of Port Pirie.**

**There is one primary objective that responds directly to the vision and is the key driver for this project of greening Port Pirie.**

**A number of additional objectives identified expand on and support the previous plans/strategies that have been completed to improve the visual appeal, environmental benefit and health of the community.**

## Primary objective

**Reduce lead dust through greening, improving human health and ensuring long term climate resilience**

This key objective focuses on increased ground level planting, and improved species diversity & resilience to reduce airborne lead dust.



Greening Port Pirie Master Plan, SA Water 2022

## Secondary objectives

### Green and dust-free

Increased canopy cover (30-40% for each new project), dust suppression and land rehabilitation.

### Green impact for community and the city

Prioritising projects based on outcomes that align with the vision and objectives, i.e. projects with the biggest greening outcome.

### Accessible

Projects supporting improved pedestrian accessibility including appropriate infrastructure. Appealing open spaces that achieve improved passive surveillance.

### Resilient

Appropriate plant species and material selection, and water-conserving improvements for future resilience.

### Enhance biodiversity

Rehabilitation of conservation areas, establishing and strengthening partnerships, and increased biodiversity in local flora and fauna.

### Innovation in design

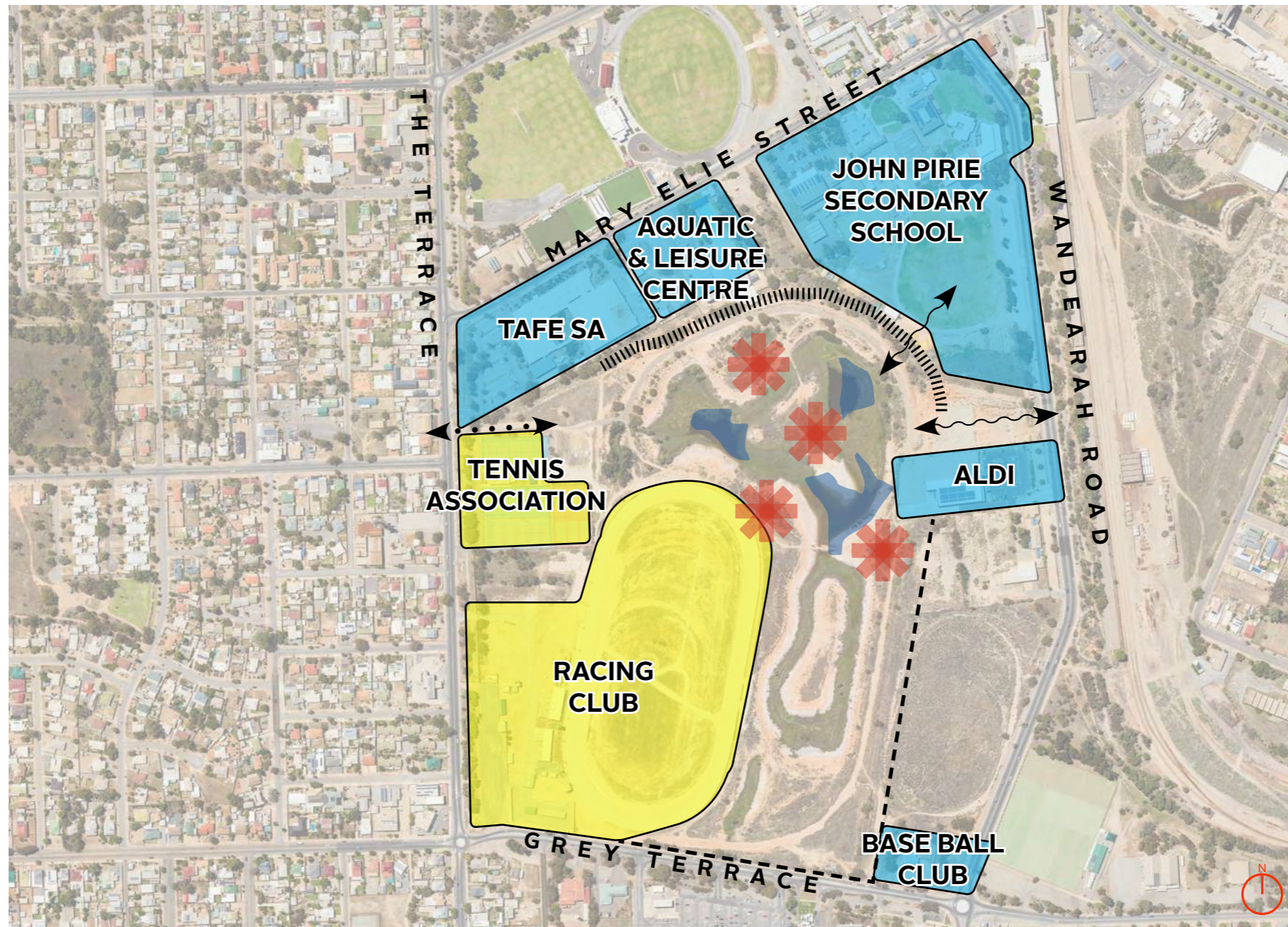
Water sensitive urban design (WSUD), biodiversity sustainable urban design (BSUD), and utilising micro-urban forests.

# Project 1 Phoenix Park Wetland

## Site Analysis

Phoenix Park Wetland is surrounded by many quality facilities including educational institutions (school and tafe), sporting and leisure facilities (tennis, racing, baseball clubs and aquatic centre), and a shopping centre. However, the wetland's interior is mostly barren with exposed soils and lack of large trees.

It is identified as a good community project aimed at education and training for the youth, and has the potential to be further enhanced as a functional, attractive and serene public open space.



### Legend:

- Regional facilities
- Community facilities
- Pedestrian connection
- Pedestrian connection (private)
- Fence
- Lookout point
- Open water area
- Levee

Map of Phoenix Park (Not to scale)

# Project 1 Phoenix Park Wetland

## Existing Conditions



The western entrance of the park has a disorderly roadway, lacks pedestrian sidewalks, has poor visibility, and suffers from severe road surface damage.



The unsealed roadway and the lack of vegetation cover on the levee have led to mud and soil erosion.



There is potential for views of the Flinders Ranges from within the park.



There are some abandoned facilities within the park that could be considered for renovation and repurposing.



The southern basin of the park lacks trees, which results in a lack of shade for pedestrians. Access is disjointed and should be shared with the racing club maintenance road.



The park is disconnected from the surrounding land and facilities, resulting in weak accessibility.



The water at the city drainage outlet is severely eutrophic.

Within the park, various bird species have been observed, including Black Swans, and Australian White Ibis.



There is conflict between the park's ring road and the land where Aldi is located.



DESIGN APPROACHES



1 The new two-way entrance with adjacent footpath provides easier vehicular and pedestrian access to the wetland



2 Adjustments to the car park traffic movement direction (optional) and upgraded bitumen + adding landscaped build-outs



3 The new food garden offers possibilities for collaboration with John Pirie Sencondary School

DESIGN APPROACHES



4 New lawn with shade trees and car parks for the community and visitors



5 Looped gravel maintenance road + compacted sand pedestrian paths



6 Possible future pedestrian access and connections



7 Possible location for a future birdwatching shelter.





## The new two-way entrance with adjacent footpath



- \_ New pockets of landscaping and mulch to verges for dust suppression,
- \_ New native tree plantings,
- \_ New bitumen two-way entry into Phoenix Park
- \_ New pedestrian footpath adjacent to road into Phoenix Park.
- \_ Upgraded shared path
- \_ New wayfinding





## New lawn with shade trees and car parks



- \_ New pockets of landscaping and mulch to verges for dust suppression,
- \_ New bitumen carriage-way
- \_ New car park adjacent to lawn with new trees
- \_ New lawn with shade trees
- \_ Log fence between car park and lawn
- \_ New table sets provide picnic opportunities for families





## Levee with ground covers and coir logs



- \_ New ground cover to verges for dust suppression,
- \_ New native shrubs plantings,
- \_ Looped gravel maintenance road
- \_ Coir logs to protect levee from heavy water flows and sediment movement



# Phoenix Park Planting Palette

Selection is based on the recommendations listed in the EcoLogical Report

## Planting Zones

- VA1 – Bare mudflats
- VA2 – Chenopod shrubland
- VA3 – Wetland aquatic vegetation
- VA4 – Mixed exotic and native (non-local) amenity plantings

Stratum	Scientific Name	Common Name	Phoenix Park Wetland			
			VA1	VA2	VA3	VA4
Tree	Acacia oswaldii	Umbrella Wattle		■		
Tree	Acacia salicina	Broughton Willow				■
Tree	Acacia tetragonophylla	Dead Finish		■		
Tree	Acanthocladium dockeri	Spiny Daisybush		■		
Tree	Allocasuarina verticillata	Drooping Sheoak				■
Shrub	Atriplex spongiosa	Pop Saltbush		■		
Grass	Austrostipa elegantissima	Elegant Spear-grass		■		
Grass	Austrostipa scabra	Rough Spear-grass		■		
Tree	Callitris gracillis	Southern Cypress Pine		■		
Sedge	Carex tereticaulis	Tall Sedge	■			
Mat	Carprobrotus rossii	Rounded Noonflower		■		
Grass	Chloris guyana	Windmill Grass		■		
Groundcover	Chrysocephalum semipapposum	Clustered Everlasting		■		
Groundcover	Convolvulus remotus	Bindweed		■		
Sedge	Cyperus victoriensis	Channel Flat-sedge	■			
Mat	Disphyma crassifolium	Rounded Noonflower	■	■		
Shrub	Dodonaea subglandulifera	Peep Hill Hop-bush		■		
Shrub	Enchylaena tormentosa	Ruby Salt-bush	■	■		
Tussock grass	Enneapogon nigricans	Bottle Washers		■		
Shrub	Eremophila glabra	Tar Bush		■		
Tree	Eucalyptus camaldulensis	River Red Gum			■	■
Sedge	Ficinia nodosa	Knobby Club-rush	■	■		■
Sedge	Juncus krausii	Sea Rush	■			
Shrub	Maireana sedifolia	Pearl Bluebush		■		
Shrub	Maireana ericlada	Rosy Bluebush		■		
Shrub	Maireana rohrlachii	Rohrlach's Bluebush		■		
Tree	Malelueca lanceolatum	Dryland Tea-tree		■		
Tree	Melaleuca halmatuorum	Swamp Paperbark				■
Shrub	Myoporum insulare	Boobialla		■		■
Tree	Myoporum platycarpum	False Sandalwood		■		■
Shrub	Pittosporum angustifolium	Native Apricot		■		

Groundcover	Pycnosorus globosus	Billy Buttons		■		
Shrub	Rhagodia spinescens	Spiny Salt-bush		■		
Groundcover	Roepera aurantiaca	Shrubby Twinleaf		■		
Shrub	Roepera confluens	Forked Twinleaf		■		
Grass	Rytidosperma caespitosum	Common Wallaby-grass		■		
Tree	Santalum acuminatum	Quandong		■		
Shrub	Senna artemesioides	Silver Cassia		■		
Sedge	Schoenoplectus caldwellii	Sea Club-rush	■			
Groundcover	Sclerolaena diacantha	Grey Copperburr		■		
Grass	Sporobolus virginicus	Saltwater Couch	■	■		
Shrub	Tecticornia halocnemoides	Shrubby Samphire	■			
Shrub	Tecticornia pergranulata	Black-headed Samphire	■			
Groundcover	Tetragona implexicoma	Bower Spinach		■		



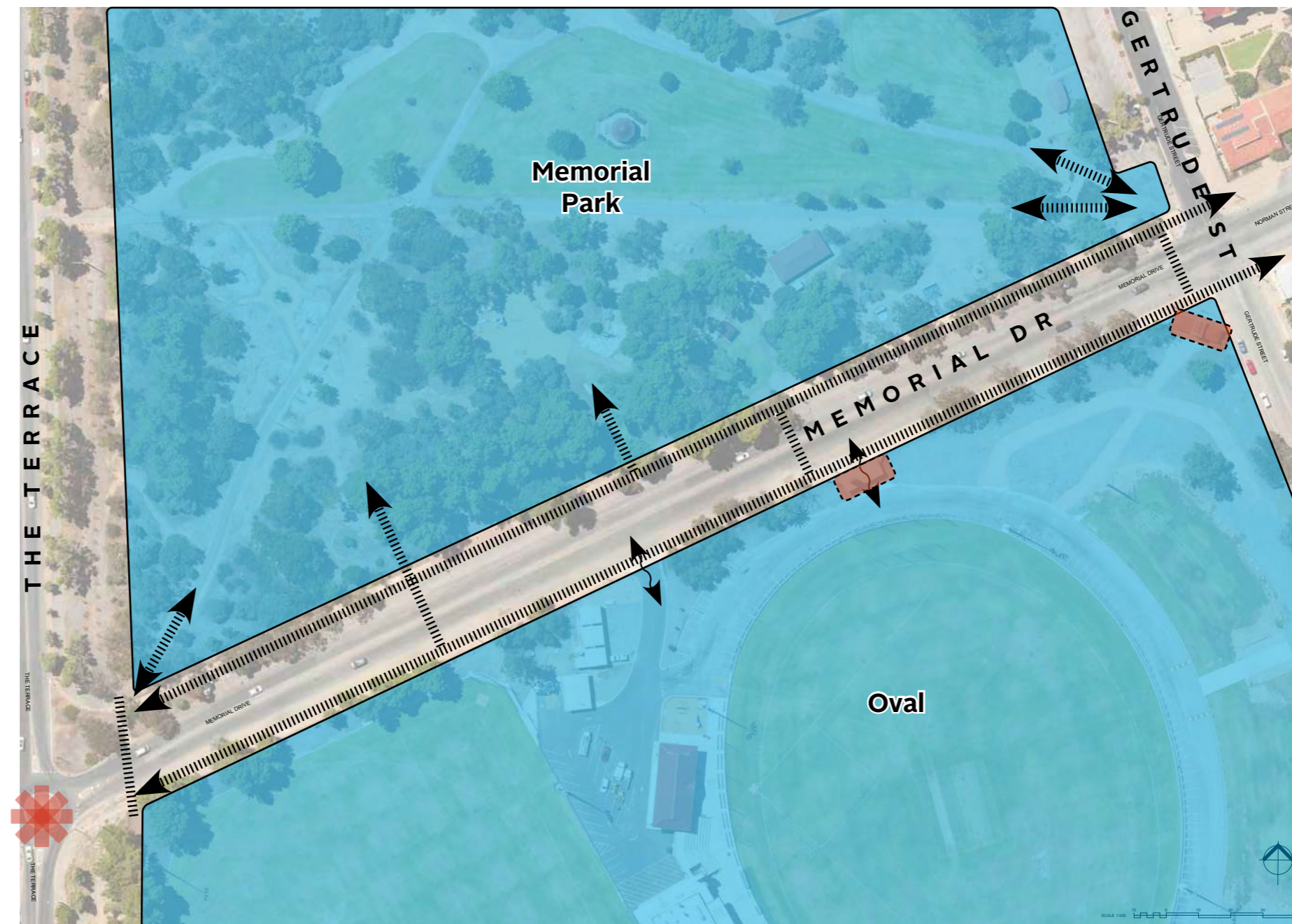
Note: The species list will be updated and confirmed with SA Water and other relevant organisations as the project progresses and develops further.

# Project 2.3 Memorial Drive Concept Design

## Site Analysis

The northern side of Memorial Drive contains Memorial Park, and the southern side is bounded by Memorial Oval. The wide road of Memorial Drive somewhat disconnects these public spaces. Both sides have tall trees providing shade, but lack ground cover. Informal parking spaces are found on both sides.

Memorial Drive has water ponding issues due to poor drainage. This offers an opportunity for future Water Sensitive Urban Design (WSUD), including Inlets + leaky well systems and integration of landscaping.



Map of Memorial Drive (Not to scale)

# Project 2.3 Memorial Drive Concept Design

## Existing Conditions



Very wide road reserve and wide carriageway.



The soil on both sides of the footpath is exposed and lacks vegetation cover.



Memorial buildings are distributed on both sides of the road.



The greenery within the park is influenced by stormwater runoff from the roads.



There are issues with water ponding on both sides of the road.



Irregular footpath/kerb on northern side.



The main entrance of the park has exposed soil, and there is lack of pedestrian accessibility.



There is a demand for events at the War memorial at the intersection with Gertrude Street.

Widen verges to minimise pedestrian crossing lengths if possible (optional), this should be reviewed by traffic engineer.

DESIGN APPROACHES



1 Formalised pedestrian crossing with pram ramps and median refuge  
2 90 degree car park with avenue planted build-outs  
3 Large trees with up to 10m canopies in median (optional)  
4 Inlets + leaky well systems in the kerb and verge to maximise tree health and reduce flooding  
5 Gravel removed and replaced with organic mulch or similar softscape to promote and improve tree health

DESIGN APPROACHES



6 High contrast paving at the intersection to help define pedestrian connections/laneways, slow traffic + reinforce identity of street  
7 Build-outs with slotted kerbs to maximise passive irrigation opportunities  
8 New memorial plaza (optional)  
9 Powerline-friendly trees to be planted under the existing powerlines



Potential to remove asphalt and improve green space (optional), this should be reviewed by traffic engineer.

The location of pram ramp should be reviewed in the next stage based on the detail survey.

Potential to remove asphalt and improve green space (optional), this should be reviewed by traffic engineer.



PAVING

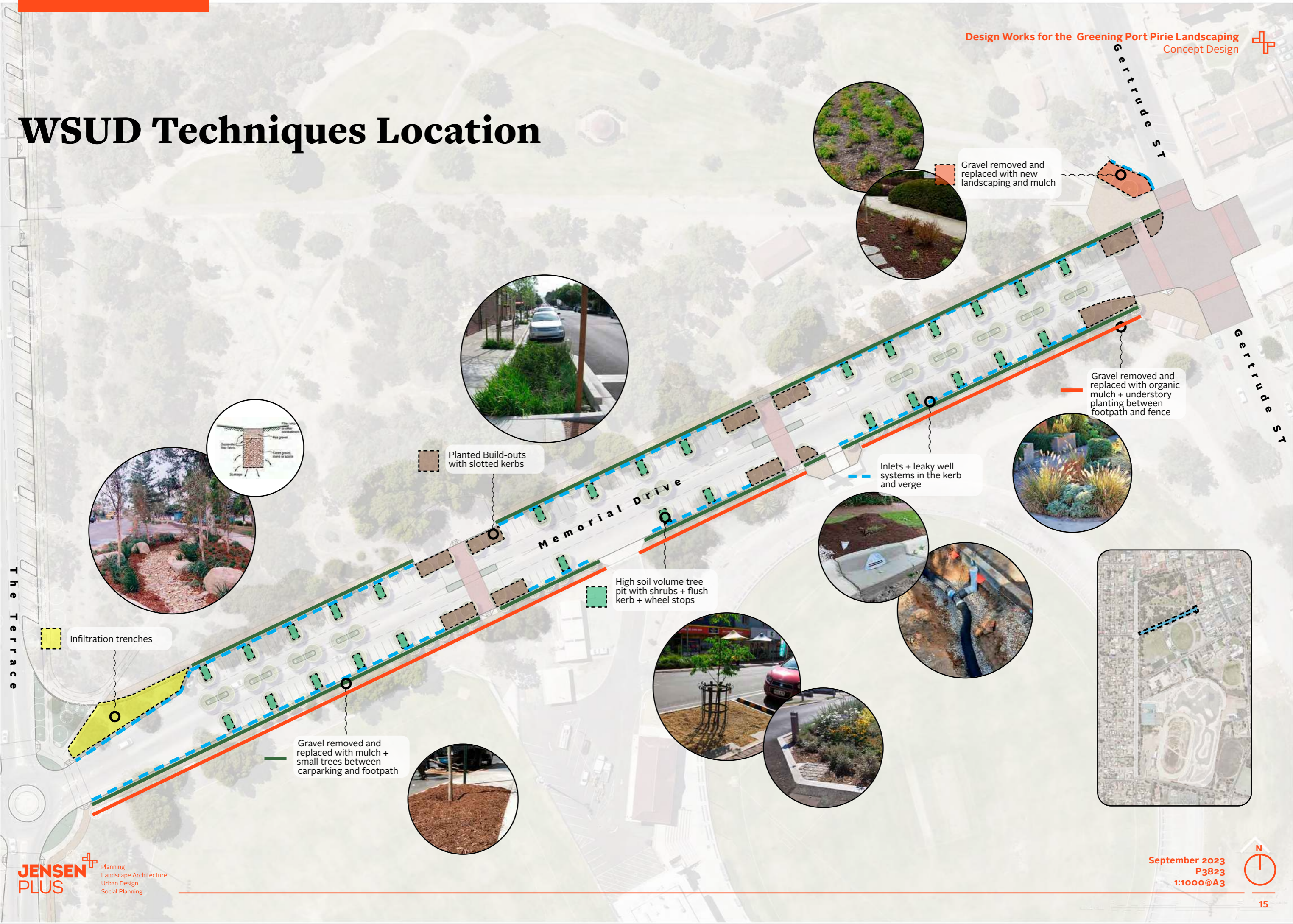


- Exposed aggregate paver
- Plaza space
- Interlocking brick paver
- Pedestrian crossing + Intersection carriageway





# WSUD Techniques Location



Gravel removed and replaced with new landscaping and mulch

Gravel removed and replaced with organic mulch + understory planting between footpath and fence

Inlets + leaky well systems in the kerb and verge

Planted Build-outs with slotted kerbs

High soil volume tree pit with shrubs + flush kerb + wheel stops

Infiltration trenches

Gravel removed and replaced with mulch + small trees between carparking and footpath

The Terrace



# Project 2.3 Memorial Drive Concept Design

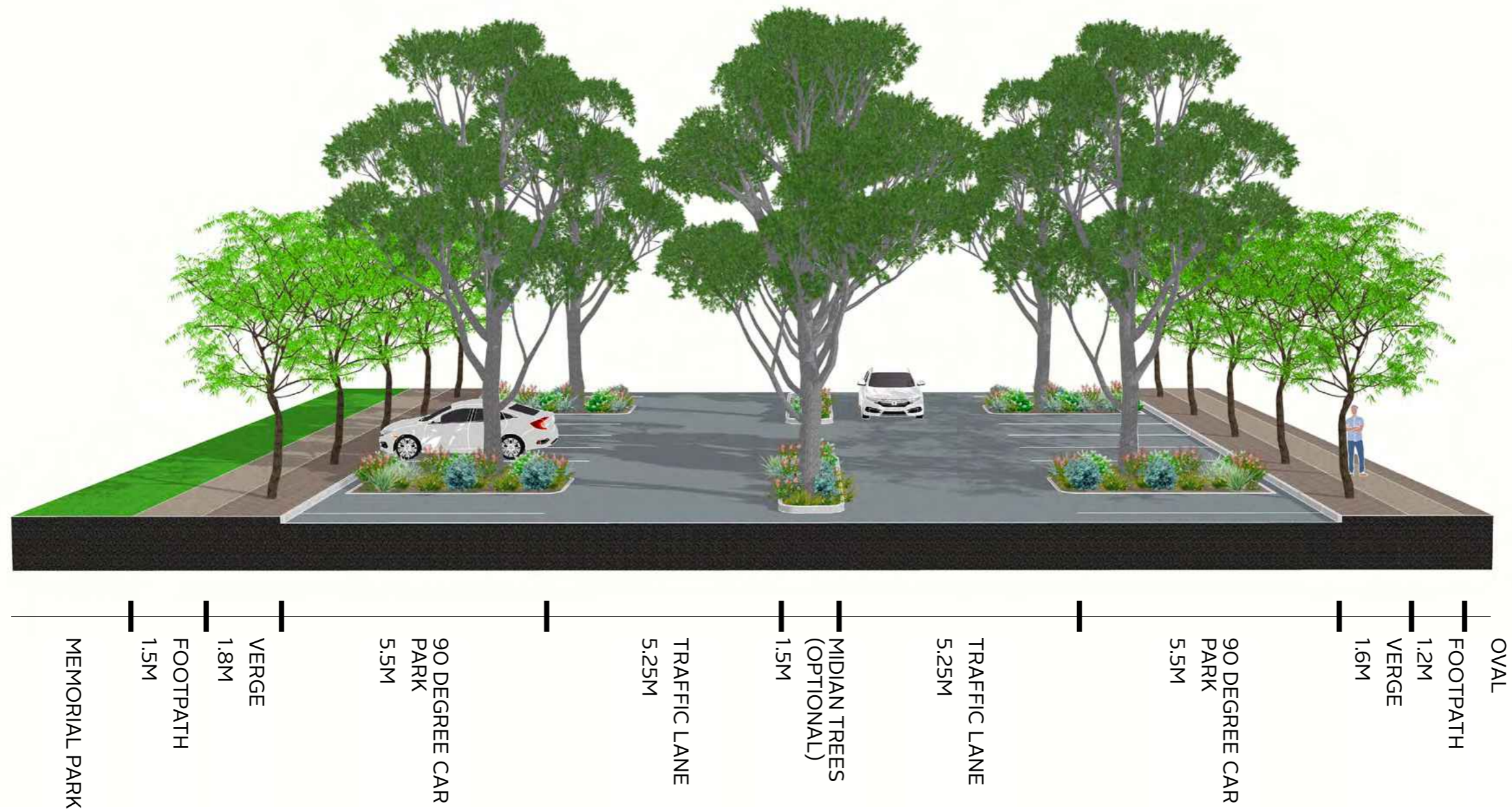
Detailed Plan





# Project 2.3 Memorial Drive Concept Design

Typical section





## Memorial Drive and Gertrude Street intersection



- \_ Gravel removed and replaced with low level shrubs to verges for dust suppression,
- \_ New tree plantings,
- \_ Contrast paving at the intersection
- \_ Formalised crossing with new treatment to help define pedestrian connections / laneways, slow traffic
- \_ Planted build-outs with slotted kerbs
- \_ New Wayfinding





## New formalised crossing



- \_ Gravel removed and replaced with low level shrubs to verges for dust suppression
- \_ New large trees with up to 10m canopies
- \_ Planted verge with tree inlet
- \_ Formalised pedestrian crossing with ramps and median refuge.
- \_ Planted build-outs with slotted kerbs
- \_ New Wayfinding



# Project 2.3 Memorial Drive Planting Palette

Selection is based on ornamental plants and trees creating an attractive formal boulevard

## Planting Types

- TR** Avenue trees - recommended
- TA** Avenue trees - alternative
- SH** Shrubs
- GC** Groundcovers



**TR**  
\_Acer x freemanii / Jeffersred  
\_Autumn Blaze or Jeffers Red Maple  
\_Ornamental deciduous tree growing to 15m. Rich green leaves changing to intense red in Autumn.  
\_Requires supplementary watering.



**TA**  
\_Corymbia maculata / Spotted Gum  
\_growing straight and tall up to 30m.  
\_Leaves are glossy and dark green and the small fragrant flowers attract birds and bees.  
\_Sheds bark in summer.



**SH**  
\_Rosmarinus officinalis / Gallipoli  
\_Gallipoli Rosemary  
\_Tough shrub growing to 1m with aromatic foliage and pretty flowers.  
\_Rosemary is widely used in cooking.



**SH**  
\_Nandina domestica / Moon Bay  
\_Moon Bay Nandina  
\_Colour-changing foliage ranging from bright green, pink, orange and red.  
\_Grows to 0.75m and can be an attractive border to garden edges.



**SH**  
\_Leucophyta brownii / Silver Nugget  
\_Dwarf Cushion bush  
\_Dense, compact, rounded shrub with silver foliage, growing to 0.5m.  
\_Very hardy in most conditions, especially coastal areas.



**GC**  
\_Goodenia ovata 'Gold Cover'  
\_Goodenia Gold Cover  
\_Low maintenance groundcover with showy yellow flowers.  
\_Can be used under shrubs and trees.



**TR**  
\_Angophora costata / Smooth-barked Apple  
\_Ornamental, evergreen tree with white flowers, growing 10-20m tall.  
\_Ideal avenue tree for harsh median and roadside environments.  
\_Not suitable for waterlogged areas.



**TA**  
\_Pyrus calleryana / Chanticleer or Capital  
\_Callery Pear  
\_Ornamental, narrow tree varieties growing to 12m.  
\_Deciduous, with attractive leaf colour change in Autumn.  
\_Recommended for narrow verges



**SH**  
\_Limonium perezii / Sea lavender  
\_Small shrub producing big purple flower clusters.  
\_Tough, resilient and low maintenance.



**SH**  
\_Westringia hybrid / Aussie Box  
\_Aussie Box Westringia  
\_Dense foliage with small mauve flowers. Grows to 0.7 metres.  
\_Suitable for hedging.



**SH**  
\_Anigozanthos / Big Red  
\_Big Red Kangaroo Paw  
\_Strappy leaf with attractive tall red flowers.  
\_Bird-attracting.  
\_Longer-lived than smaller Kangaroo Paw varieties.



**GC**  
\_Carprobrotus rossii / Pigface or Karkalla  
\_Perennial succulent which can spread to 3m wide. Large purple flowers.  
\_Fast-growing. Leaves and ripened fruit are edible.

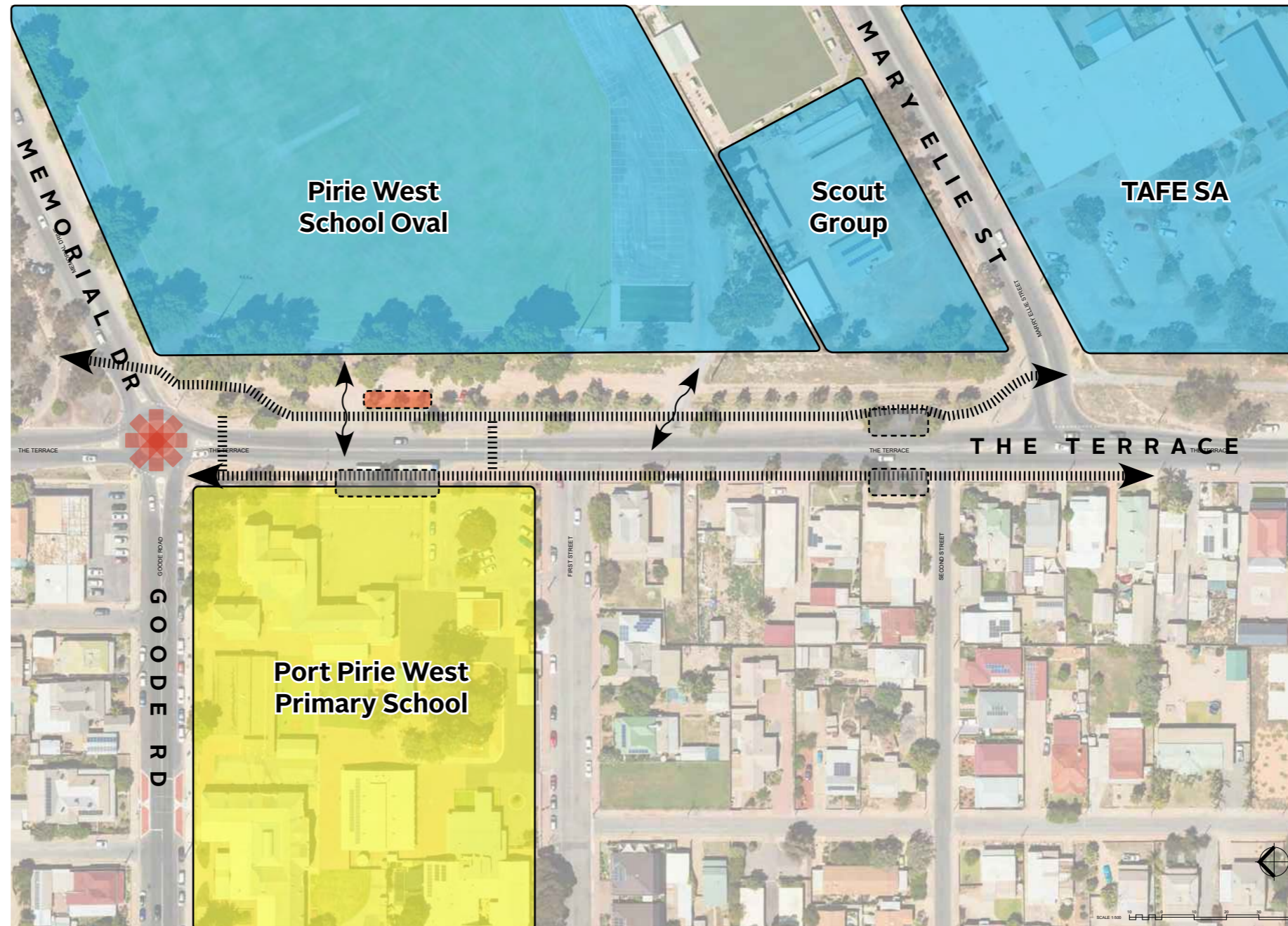
# Project 2.1 + 2.2 The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark + The Terrace/Memorial Dr Intersection

## Site Analysis

The west side of The Terrace/Memorial Drive intersection is occupied by Port Pirie West Primary School, creating a high demand for pedestrian traffic.

Additionally, the open space on the west side of Pirie West School Oval serves as an informal drop-off parking area for Port Pirie West Primary School, and is lacking proper pedestrian and vehicular planning.

This open space area is planted with tall pine trees to provide shade, but the lack of ground cover has led to issues with dust exposure.



### Legend:

- Regional facilities
- Community facilities
- Pedestrian connection
- Vehicular parking connection
- Roundabout
- Bus stop
- SA Water facilities

Map of The Terrace (Not to scale)

# Project 2.1 + 2.2 The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark + The Terrace/Memorial Dr Intersection

## Existing Conditions



The informal parking area lacks proper planning, and the road surface is unsealed.



The informal entrance to the car park intersects with a footpath without clear signage, posing a safety hazard.



The roundabout lacks a pedestrian crossing, causing safety and accessibility concerns.



There is no vegetation cover around the roundabout, and the crossing is not connected to the footpath.



The row of *Lagunaria patersonia* to be removed (due to causing irritation).



The footpath width is insufficient to meet the requirements of a shared path and will be widened.



There is a possibility of greening some areas within the school premises.



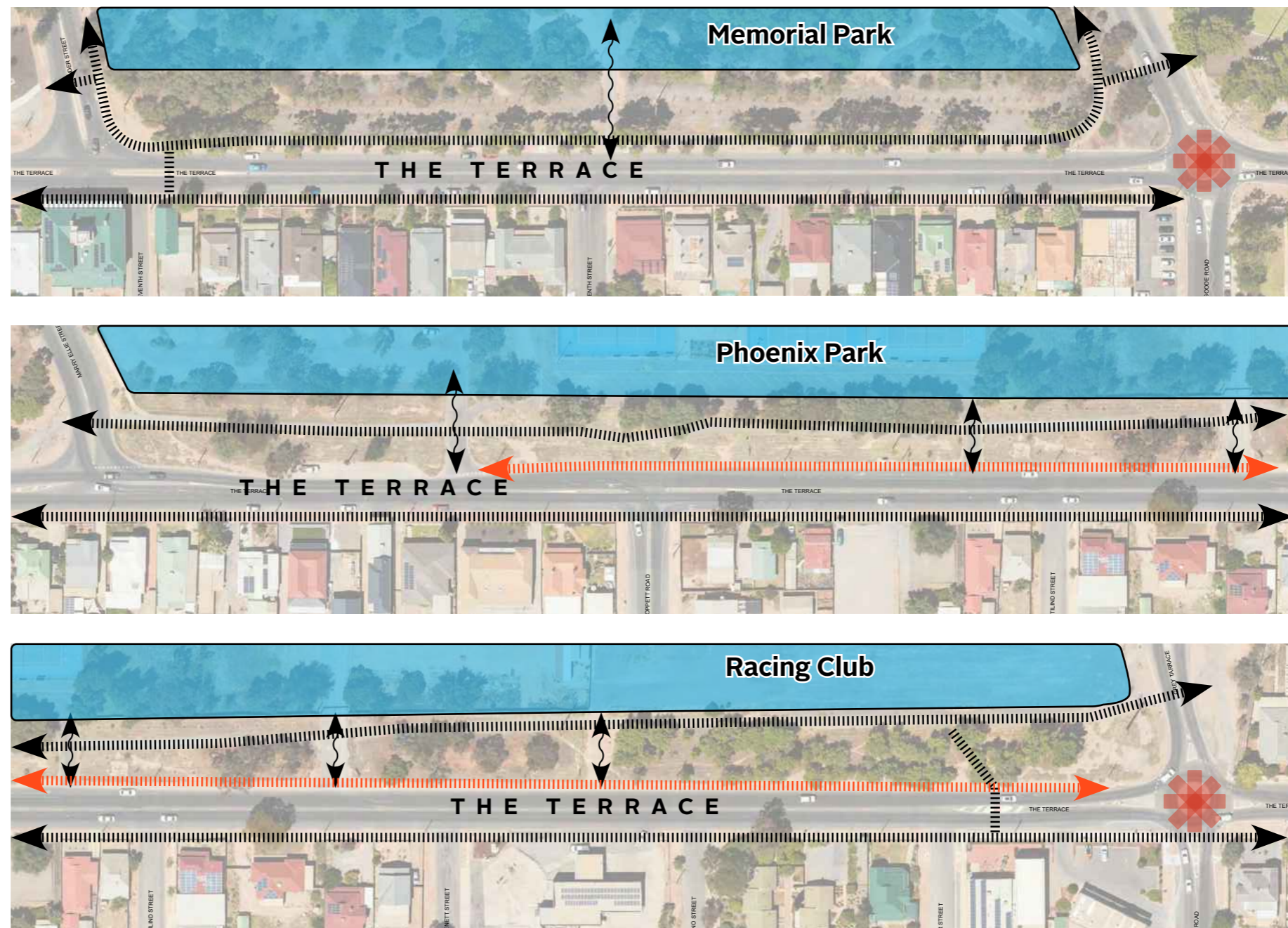
Existing row of *Pinus halepensis* by the oval are to be protected as they are considered 'heritage trees' in Port Pirie.

# Project 2.5 The Terrace: Alexander Street to Memorial Drive + Mary Elie Street to Grey Terrace

## Site Analysis






On the east side of The Terrace, tall trees provide shade, but the footpath isn't wide enough for a shared path, and there's a lack of shrubs and ground cover. On the west side, there's a sealed footpath but no shade-providing trees.

Additionally, the Lagunaria trees need removal in the Alexander Street to Memorial Drive section for increased parking capacity on The Terrace. In the Mary Elie Street to Grey Terrace section, gravel replaced with low level shrubs for dust suppression and add rest nodes along the footpath.



Map of The Terrace (Not to scale)

### Legend:

-  Regional facilities
-  Sealed pedestrian connection
-  Vehicular parking connection
-  Roundabout
-  Unsealed pedestrian connection

# Project 2.5 The Terrace: Alexander Street to Memorial Drive + Mary Elie Street to Grey Terrace

## Existing Conditions



Wide mulched area then 2 rows of juvenile trees-planted by community? High and low voltage powerlines overhead.



The street is an important parking area for the hospital to the north.



The row of Lagunaria patersonia to be removed (due to causing irritation).



Angle new shared use path to connect up with path through reserve.



An informal footpath and ramp connects to the crossing.



Footpath and ramp in poor condition?



Wide verge with narrow footpath along the kerb.



Bitumen shared use path with row of mature Eucalypts.





The angles of car parks should be reviewed by traffic engineer in the next stage based on the detail survey.

Potential to remove asphalt and improve green space (optional). this should be reviewed by traffic engineer.

Potential to remove asphalt and improve green space (optional). this should be reviewed by traffic engineer.

Alexander Street

Memorial Drive

Eleventh Street

Tenth Street

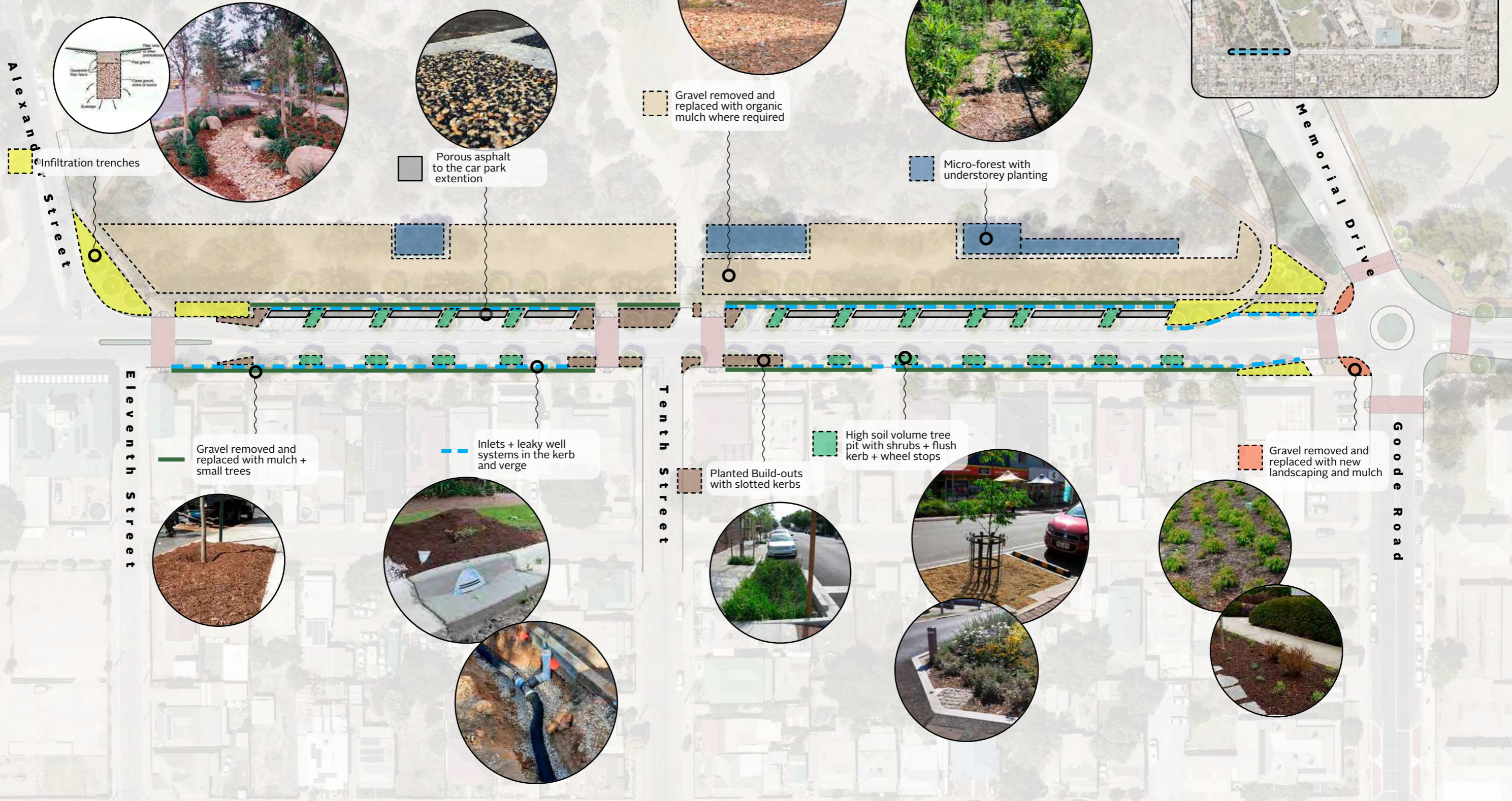
Goode Road

The Terrace

DESIGN APPROACHES	1	2	3	4	5	6	7	8	9
	Formalised pedestrian crossing with pram ramps	WSUD high soil volume tree pit with flush kerb enable passive irrigation from stormwater runoff	Build-outs with slotted kerbs to maximise passive irrigation opportunities	3m wide shared path with colour bitumen treatment	Gravel removed and replaced with organic mulch or similar softscape to promote and improve tree health	Opportunity for Micro-forest planting	Formalised parallel car park with planted build-outs to maximise passive irrigation opportunities (optional)	Small trees in verge provide additional shade for pedestrians	WSUD Infiltration trenches

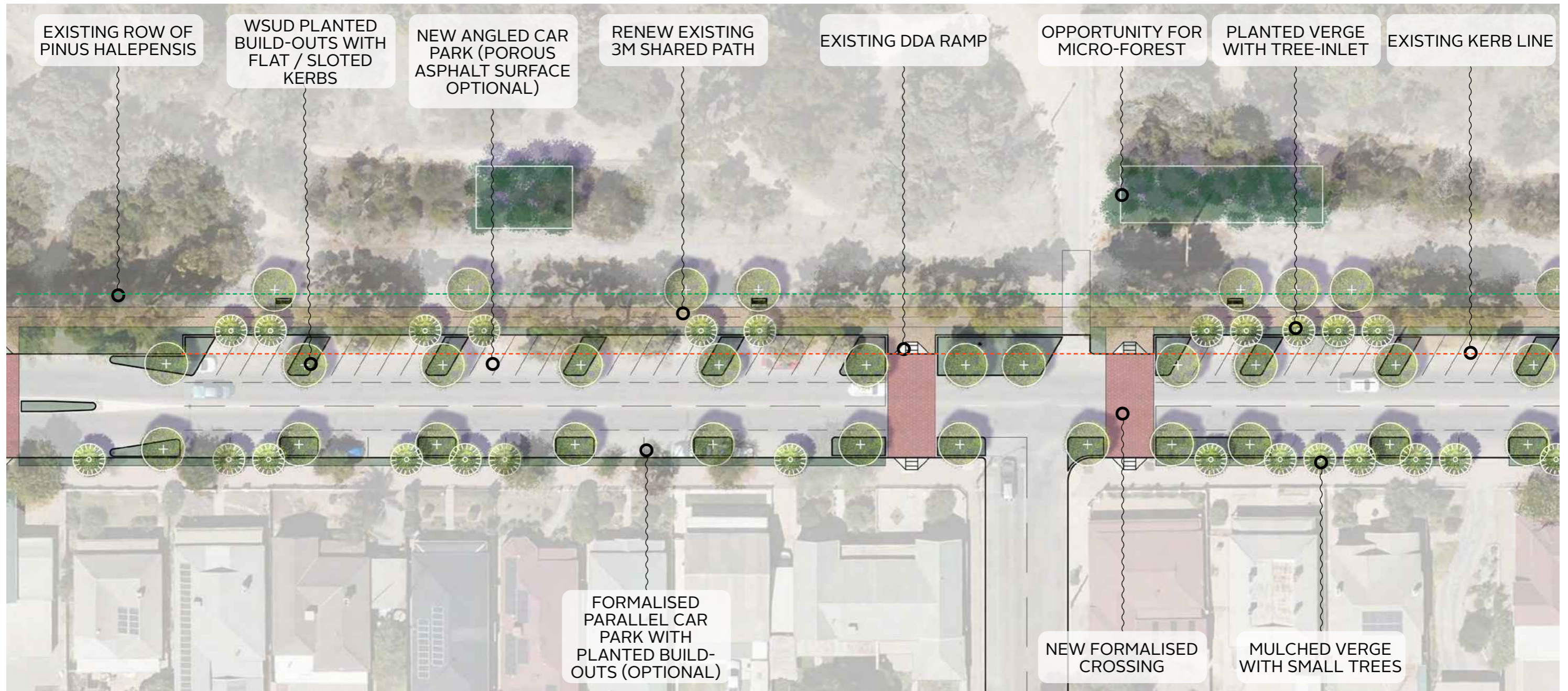


# WSUD Techniques Location



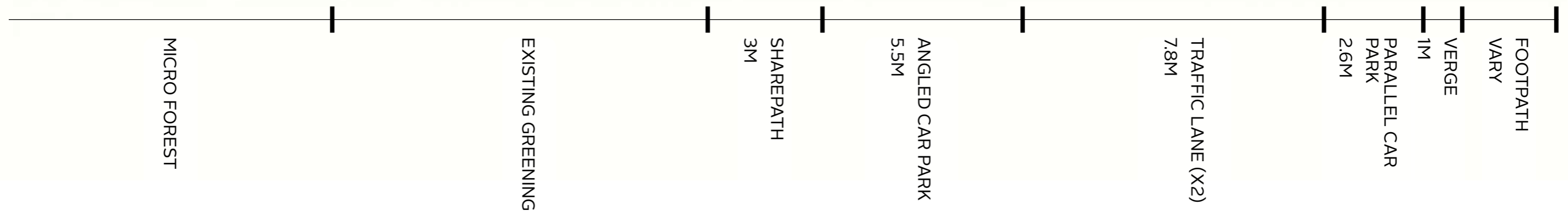
# Project 2.5 The Terrace: Alexander Street to Memorial Drive

Detailed Plan



# Project 2.5 The Terrace: Alexander Street to Memorial Drive

Typical section





## New formalised crossing + angled car park



- \_ Gravel removed and replaced with low level shrubs to verges for dust suppression,
- \_ New native tree plantings,
- \_ Formalised crossing with new treatment
- \_ New angled car park (Porous asphalt surface optional)
- \_ Planted verge with tree inlet
- \_ Painted build-outs with flush / slotted kerbs





The orientation and angles of car parks should be reviewed in the next stage based on the detail survey.

Potential to replace asphalt with green space or parallel car park (optional), this should be reviewed by traffic engineer.

DESIGN APPROACHES



1 Formalised pedestrian crossing with pram ramps



2 Spray seal / Asphalt surface carriageway.



3 Permeable paver or Porous asphalt surface to the car park and footpath to improve tree health



4 3m wide shared path with coloured bitumen treatment



5 Gravel removed and replaced with organic mulch or similar softscape to promote and improve tree health



6 Opportunity for Micro-forest planting



7 Formalised parallel car park with planted build-outs to maximise passive irrigation opportunities (optional)



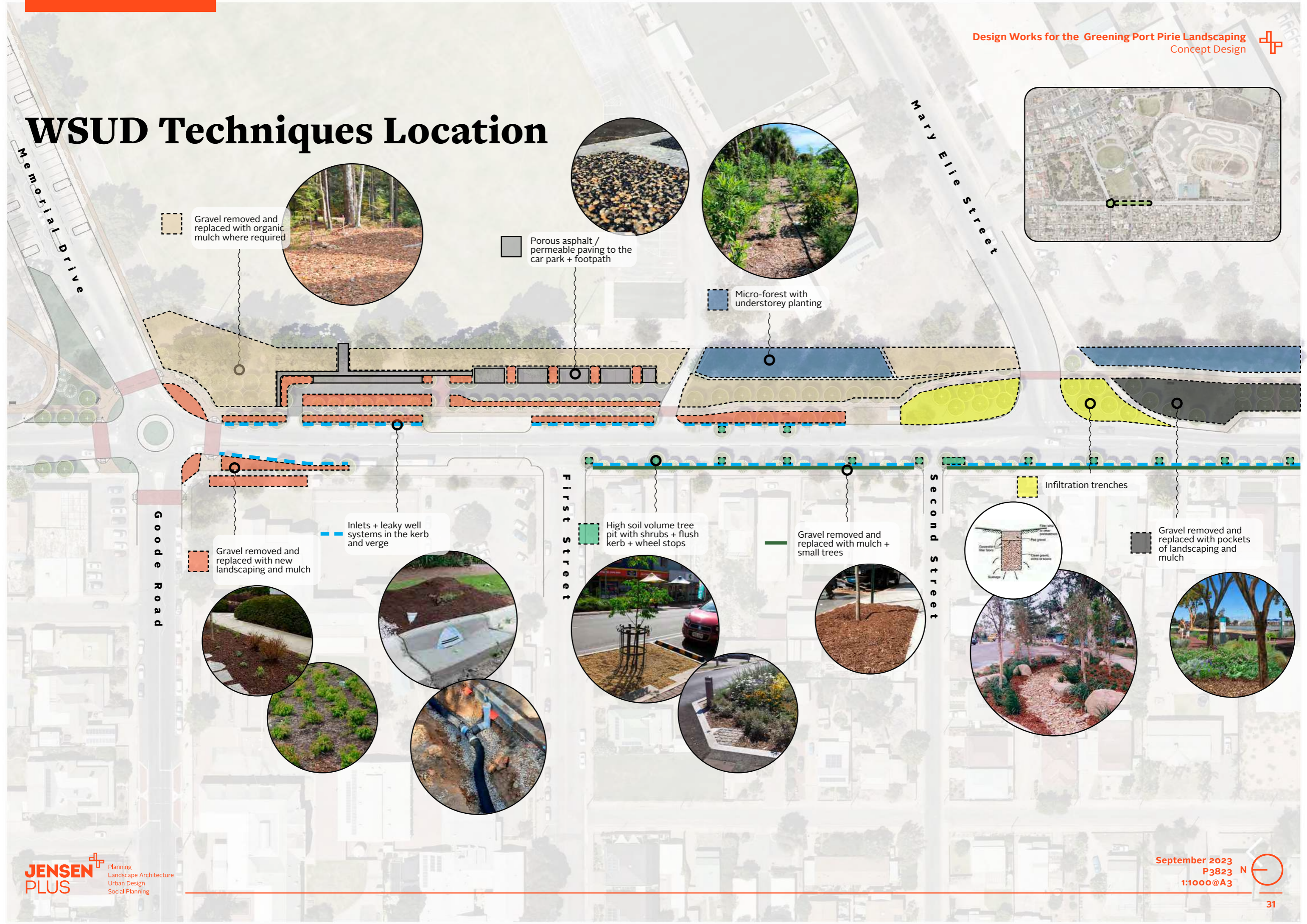
8 coloured bitumen surface secondary footpaths for improved accessibility and dust suppression



9 WSUD Infiltration trenches



# WSUD Techniques Location



Gravel removed and replaced with organic mulch where required



Porous asphalt / permeable paving to the car park + footpath



Micro-forest with understorey planting



Gravel removed and replaced with new landscaping and mulch



Inlets + leaky well systems in the kerb and verge



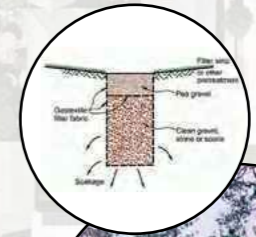
High soil volume tree pit with shrubs + flush kerb + wheel stops



Gravel removed and replaced with mulch + small trees



Infiltration trenches



Gravel removed and replaced with pockets of landscaping and mulch



# Project 2.1 + 2.2 The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark + The Terrace/Memorial Dr Intersection

Detailed Plan (option A with easy pedestrian access + drop off zone + continue shade along sharepath)





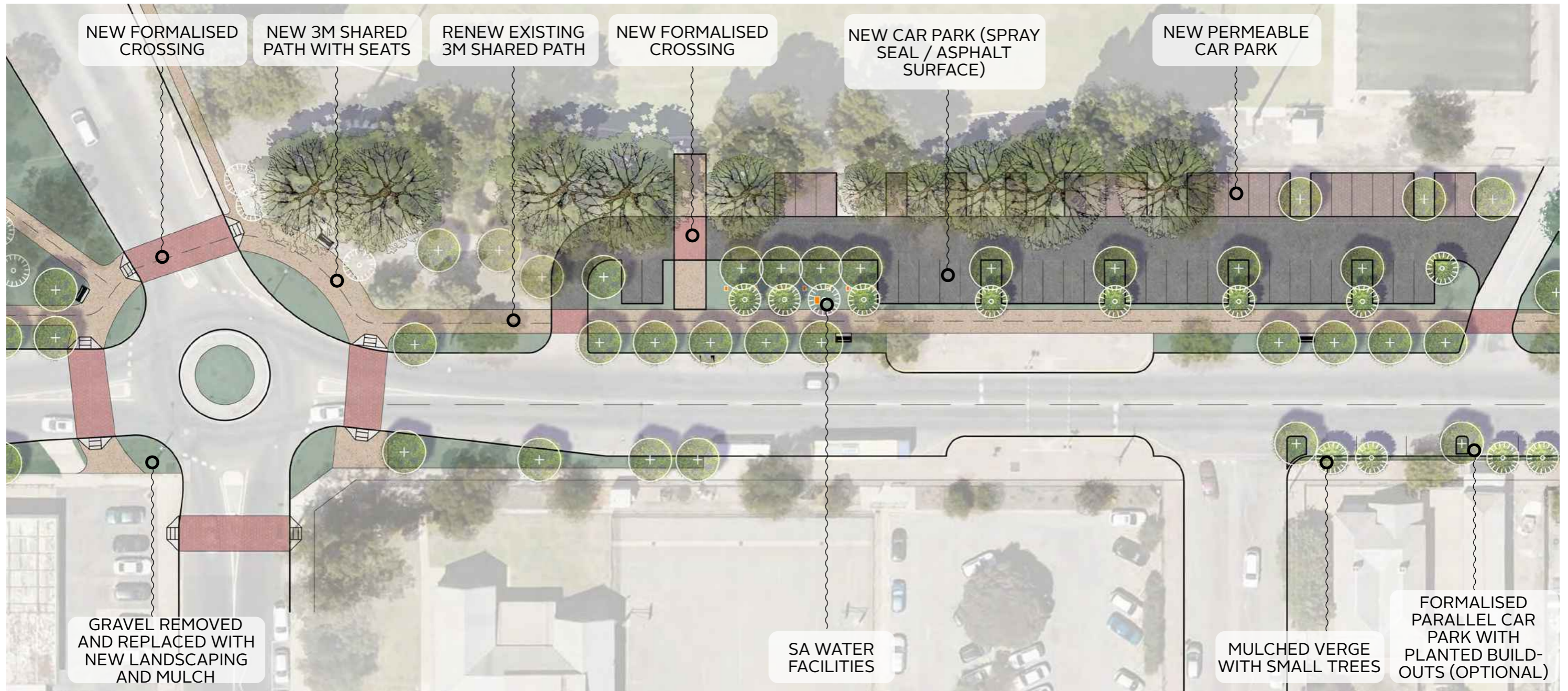
# Project 2.1 + 2.2 The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark + The Terrace/Memorial Dr Intersection

Typical section



# Project 2.1 + 2.2 The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark + The Terrace/Memorial Dr Intersection

Detailed Plan (option B with maximum car park space + 90 degree car parks toward oval)





## New formalised crossing + WSUD planting at roundabout



Existing



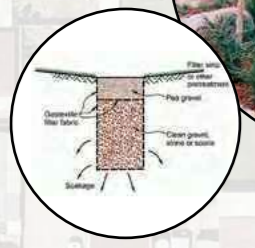
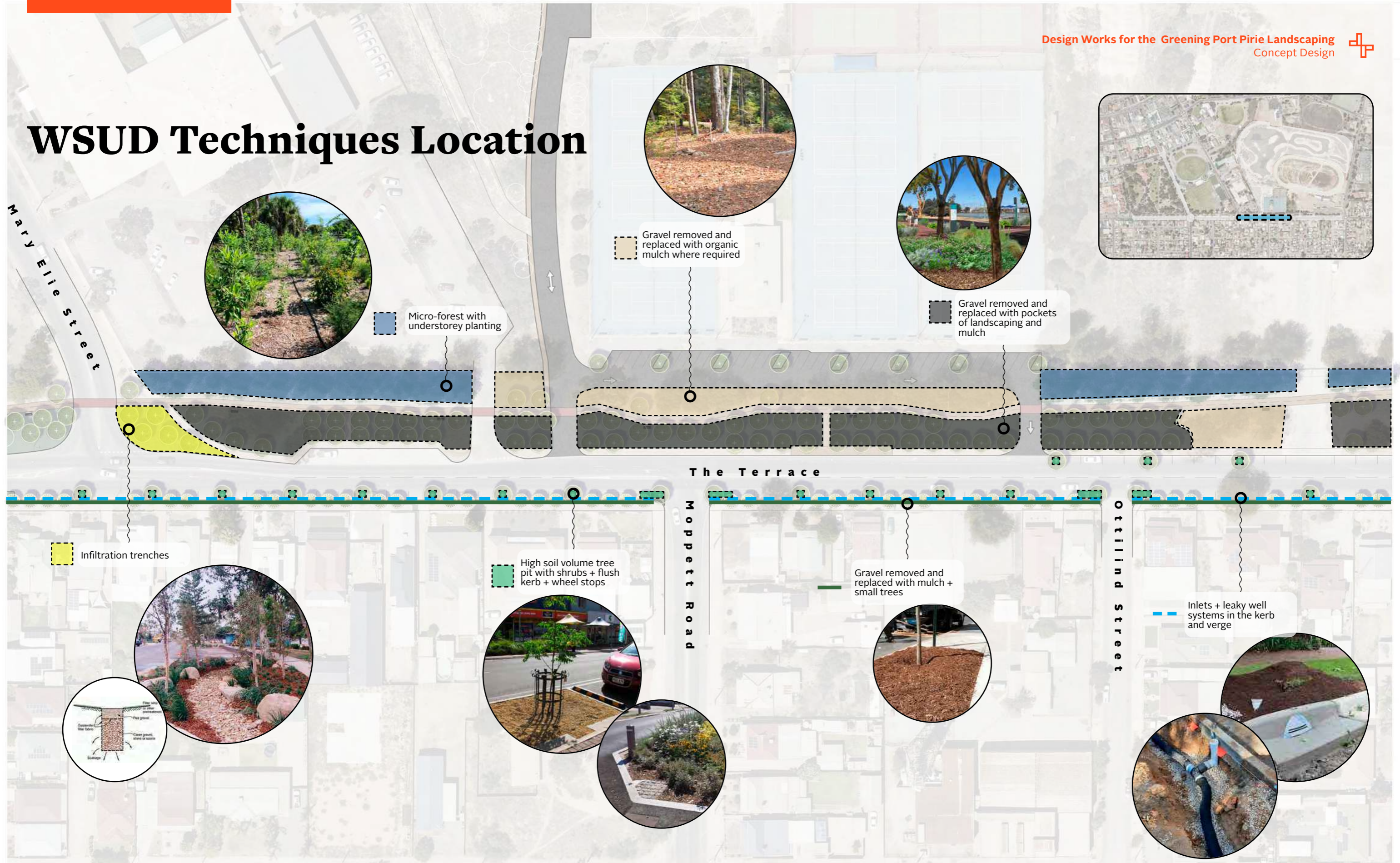
- \_ Gravel removed and replaced with low level shrubs to verges for dust suppression,
- \_ Formalised crossing with new treatment to help define pedestrian connections / bike laneways, slow traffic
- \_ New Wayfinding





<b>DESIGN APPROACHES</b>	<b>1</b>		Formalised pedestrian crossing with pram ramps
	<b>2</b>		Small trees in verge providing shade for pedestrians
	<b>3</b>		New coloured bitumen footpath connecting the bus stop and shared path
	<b>4</b>		3m wide shared path with colour bitumen treatment
	<b>5</b>		Gravel removed and replaced with organic mulch or similar softscape to promote and improve tree health
	<b>6</b>		Opportunity for Micro-forest planting
	<b>7</b>		Formalised parallel car park with planted build-outs to maximise passive irrigation opportunities (optional)
	<b>8</b>		coloured bitumen surface secondary footpaths for improved accessibility and dust suppression
	<b>9</b>		WSUD Infiltration trenches

# WSUD Techniques Location





Potential opportunity to remove mounds and continue planting scheme



DESIGN APPROACHES



1 Formalised pedestrian crossing with pram ramps



2 Small trees in verge providing shade for pedestrians



4 3m wide shared path with colour bitumen treatment



5 Gravel removed and replaced with organic mulch or similar softscape to promote and improve tree health



6 Opportunity for Micro-forest planting



7 Formalised parallel car park with planted build-outs to maximise passive irrigation opportunities (optional)

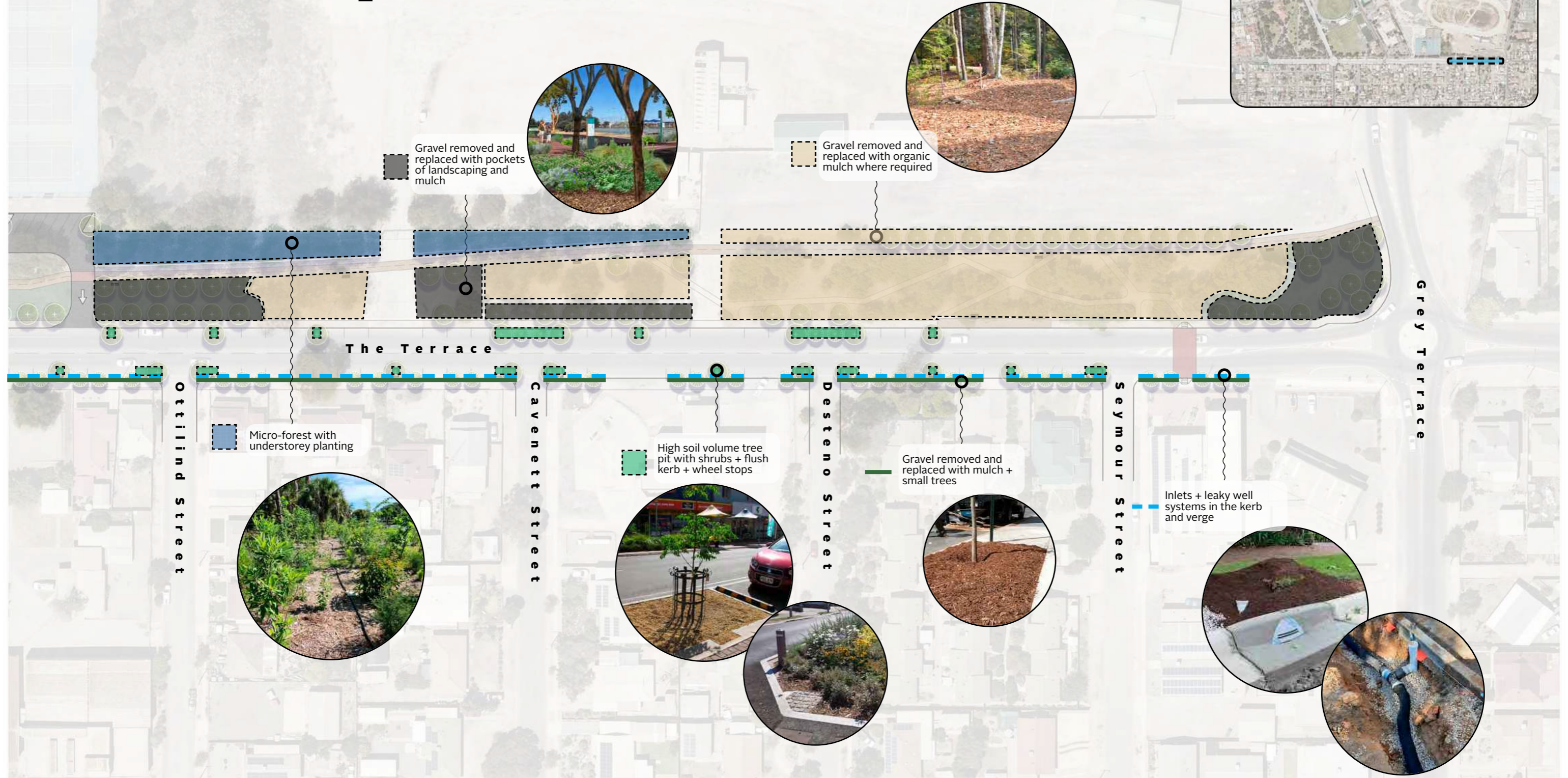


8 coloured bitumen surface secondary footpaths for improved accessibility and dust suppression



9 WSUD Infiltration trenches

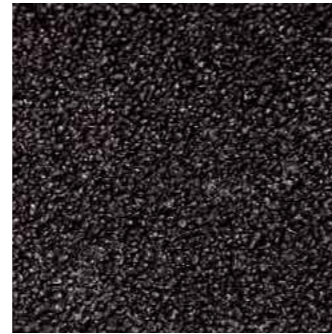
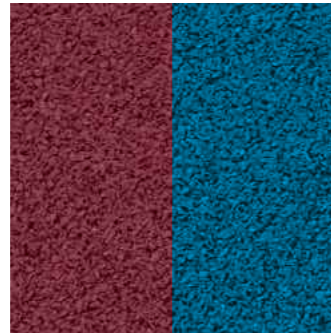
# WSUD Techniques Location



# Materials + Elements Tool Kit

Public realm elements, surfaces + treatments

PAVING



**Name**  
**Design Application**

- \_ Coloured bitumen
- \_ Shared path + Secondary path

- \_ Bitumen (Spray seal or Asphalt)
- \_ oval car park

- \_ Porous asphalt (option A)
- \_ Angled car park / oval car park

- \_ Permeable interlocking paver (option B)
- \_ Angled car park / oval car park

- \_ Interlocking brick paver
- \_ Pedestrian crossings + Intersection carriageway

WAYFINDING



LIGHTING



SEAT



**Name**  
**Design Application**

- \_ Steel wayfinding signage
- \_ Feature wayfinding in key areas

- \_ Cree Edge Series pathway luminaires
- \_ Along shared path

- \_ Proprietary seating
- \_ Every 60m along the shared path



# Project 2.1 + 2.2 + 2.5 The Terrace Tree Planting Palette

Selection is based on native, low maintenance, attractive and shady trees

## Tree Planting Zones

**N** Northern end of The Terrace

**S** Southern end of The Terrace

**E** Eastern side of The Terrace

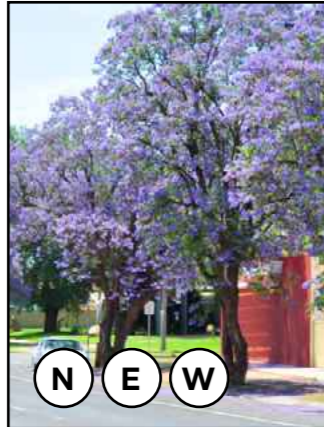
**W** Western side of The Terrace

**OS** Wider verges & open spaces

**NV** Narrow verges

**PP** Entrance into Phoenix Park

**L** Lawn area adjacent to tennis courts



**N E W**  
\_Jacaranda mimosifolia  
\_Jacaranda  
\_Exotic, fast growing ornamental tree growing to 10m in height and producing masses of violet-blue flowers in Summer.  
\_Commonly used as a street tree.



**S E PP**  
\_Pistacia chinensis  
\_Chinese Pistachio  
\_Ornamental deciduous tree with attractive foliage changing colour in Autumn.  
\_Tough species suitable for street tree planting.



**OS**  
\_ Eucalyptus leucoxylon subsp. leucoxylon  
\_SA Blue Gum  
\_Large native tree growing to 30m with bluish-grey bark.



**NV**  
\_Pyrus calleryana / Chanticleer or Capital  
\_Callery Pear  
\_Ornamental, narrow tree varieties growing to 12m.  
\_Deciduous, with attractive leaf colour change in Autumn.



**OS**  
\_Eucalyptus camaldulensis  
\_River Red Gum  
\_Endemic to Australia, found along waterways, it can grow up to 45m tall.



**L**  
\_Platanus acerifolia  
\_Plane Tree  
\_Large deciduous shady tree with attractive maple leaves changing colour in Autumn.  
\_Grows to 14m tall.



**N E W**  
\_Eucalyptus leucoxylon / Euky Dwarf  
\_Euky Dwarf Gum  
\_Dwarf variety growing 4-10m with grey-green leaves.  
\_Great habitat for birds and tolerant of most soils and coastal conditions.  
\_Suitable for street tree.



**S W**  
\_Cupaniopsis anacardioides  
\_Tuckeroo  
\_Dense evergreen tree growing to 8-15m tall.  
\_Fast-growing, low maintenance and drought resistant.



**OS PP**  
\_Allocasuarina verticillata  
\_Drooping Sheoak  
\_Ornamental shady tree growing to 9m tall.  
\_Weeping branches with pine needles orange in colour.



\_Eucalyptus torquata  
\_Coral Gum  
\_Ornamental Gum growing to 12m with attractive flowers.  
\_Very low maintenance & prefers dry conditions.  
\_Recommended for the NW corner of Gertrude St & Memorial Dr.



**OS**  
\_Corymbia citriodora  
\_Lemon Scented Gum  
\_Gum tree that grows to 10-35m.  
\_Highly ornamental with a cream-coloured trunk and lemon-scented leaves.  
\_Best in locations with more space to grow.



**PP**  
\_Lagerstroemia indica x L. fauriei / Natchez  
\_Crepe Myrtle  
\_Small ornamental deciduous tree with white flowers, growing to 8m.

# Project 2.1 + 2.2 + 2.5 The Terrace Planting Palette

Selection is based on native, low maintenance, and attractive shrubs and groundcovers

## Shrub Planting Zones

- OS** Open spaces
- SV** Streetscape verges
- S** Swales
- FG** Food garden adjacent Tafe



**OS**  
\_Correa glabra var. turnbullii  
\_Turnbull's Smooth Correa  
\_Shrub growing to 1-2m with pink bell-like flowers and scented leaves.  
\_Benefits from tip pruning to prevent bare trunks.



**OS**  
\_Chrysocephalum semipapposum  
\_Clustered Everlasting  
\_Native perennial herb with narrow grey foliage and small yellow flowers growing to 0.6-1m tall.



**OS**  
\_Eremophila glabra / Roseworthy  
\_Prostrate Emu-Bush 'Roseworthy'  
\_Native groundcover with tiny green leaves and tubular soft brick-red to orange flowers, spring to autumn.



**OS S**  
\_Wahlenbergia stricta  
\_Common Bluebell  
\_Clumping groundcover with blue flowers.



**SV**  
\_Rhagodia spinescens  
\_Spiny Saltbush  
\_Small to medium (0.5-1.5m) hardy shrub with silvery foliage and dense habit.  
\_May require light annual pruning or can be trimmed to a hedge.



**SV**  
\_Westringia hybrid / Aussie Box  
\_Aussie Box Westringia  
\_Dense foliage with small mauve flowers. Grows to 0.7 metres.  
\_Suitable for hedging.



**SV S**  
\_Pycnosorus globosus  
\_Billy Buttons  
\_Perennial plant growing to 1m tall.  
\_It has an underground rhizome, silver grey leaves and tall golden flowers on stalks.  
\_For streetscape planting or the border of swales.



**OS**  
\_Chrysocephalum apiculatum  
\_Common Everlasting  
\_Perennial herb with yellow flowers growing to 0.7m high.



**OS FG**  
\_Disphyma crassifolium  
\_Round Pig-face  
\_Well adapted groundcover succulent.  
\_Leaves are edible.



**OS SV**  
\_Myoporum parvifolium / Yareena  
\_Creeping Boobialla Yareena  
\_Longer lived than other Myoporums.  
\_Produces masses of white flowers. Successful in many locations.



**OS SV S**  
\_Poa labillardieri  
\_Common Tussock Grass  
\_Wispy grass growing to 1m with blue-grey foliage



**SV FG**  
\_Enchylaena tomentosa var. tomentosa  
\_Ruby Saltbush  
\_Very drought tolerant local native plant, less than 1m tall.  
\_Contains edible red berries.



**SV**  
\_Grevillea / Fireworks  
\_Grevillea Fireworks  
\_Shrub with bright red and yellow flowers and soft blue-green foliage.  
\_Grows to around 1m. Performs best in a full sun position. Requires native fertiliser.



**S**  
\_Ficinia nodosa  
\_Knobby Club Rush  
\_Clumping sedge growing to 1.5m with tall spindles and round brown heads.



## Appendix A Sample planting techniques

Providing improved growing conditions for trees  
Water Sensitive Urban Design (WSUD)  
Trees and underground services  
Planting location and spacing for greener streets

# Planting techniques

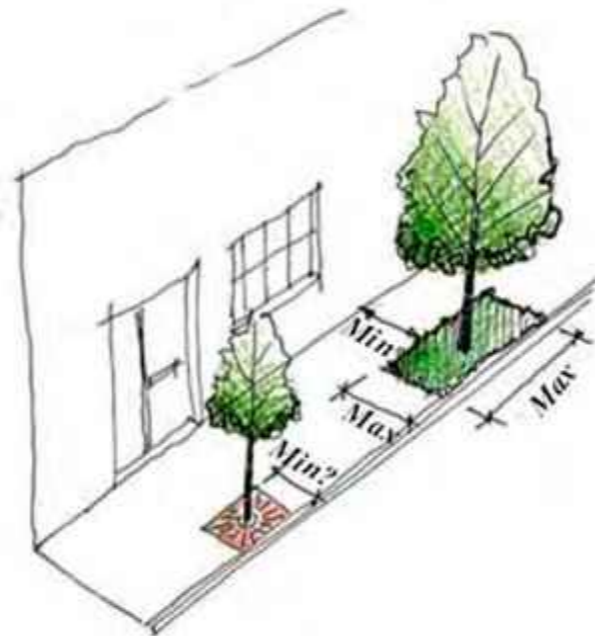
## Providing improved growing conditions for trees

Trees in urban settings are often surrounded by hard impervious surfaces with decreased water infiltration, reduced soil moisture, reduced oxygenation and gaseous exchange.

A number of recent innovations can help enhance the growing environment of urban trees, including permeable paving, and WSUD techniques.

### Larger tree pits

Ensure enough space is given to allow for trunk expansion, buttressing and surface root development. Cut outs can be increased for existing trees to improve tree health.



### Soil Volumes

The below ground space or rooting volume required by a tree is proportional to its canopy volume. Trees planted with inadequate soil volumes (e.g. small tree pits dug in highly compacted soils) often suffer from a range of setbacks including dwarfing, declining health and reduced life span.

Ultimate Tree Size	Soil Volume Required
ft <sup>2</sup> /m <sup>2</sup>	inch/cm
1,200/111.5	24/60
900/83.6	20/50
640/59.5	16/40
480/44.6	12/30
320/29.7	8/20
140/13.0	4/10

Example: 640 square feet Crown Projection

Requires Approx. 1,000 cubic feet of soil

Soil Volume Required	200	400	600	800	1,000	1,200	1,400	1,600/m <sup>3</sup>
	5.6	11.3	17.0	22.6	28.3	34.0	39.6	45.3/m <sup>3</sup>

(For an individual tree in a contained soil volume area not exceeding 3 feet deep)

Soil volume requirements (Urban 2008)

### Expanding the root zone below pavements

A number of innovations have been developed to extend tree root zones in urban settings, including suspended pavements, structural soils and plastic root cells. These approaches are more expensive, but may be cost effective in confined urban settings where tree planting is needed.

### Structural Soil

Structural soils are engineered soils which meet the dual requirements of providing the required support for pedestrian and vehicle loads, while maintaining uncompacted soil conditions conducive to root growth.

Previously such soils have comprised 80% rock and only 20% rooting volume, however recent developments have produced a structural soil with 100% rooting volume.



SPACE structural soil with 100% rooting volume being installed on Pulteney Street in Adelaide.

### Plastic Root Cells

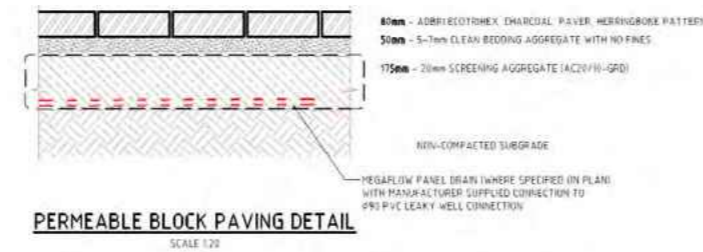
Plastic root cells also provide load bearing support for pavements by creating a matrix of soil filled voids which can support root growth. They can be integrated with WSUD practices such as permeable paving and harvesting of stormwater runoff.



## WSUD/sustainable landscape initiatives

### Permeable Paving/asphalt

Pervious pavement systems are pavement systems that allow stormwater to percolate through to a sub-surface course, from where it either infiltrates to the soil or is filtered back to the drainage system to subsurface soils or storage to reduce stormwater runoff. Underlying pavement layers can also include perforated pipes that allow the release of stormwater runoff into the receiving drainage system. Single-sized gravel can also be used as an effective method of reducing stormwater runoff in low-traffic footpath and driveway areas.



Permeable pavement systems provide two main advantages over regular impervious pavements: improved water quality through filtering, interception and providing biological treatment; and reduced stormwater flow through infiltration and storage. Permeable pavement systems commonly include interlocking block paving, porous concrete or plastic grids that provide structural stability to gravel or grassed paths, driveways and car parks.



Laura Avenue, St Marys porous asphalt surface, City of Mitcham

Porous surface can be installed over tree pits or tree root trenches to enable water infiltration and gaseous exchange, allowing for healthier trees. Permeable paving systems such as Ecotrihex (below) can support vehicle loads while retaining surface permeability.



Ecotrihex permeable paving

### Stormwater Inlets

Examples of stormwater inlets include grates, channels, and breaks or slots in kerbs. Inlets can be used to passively irrigate garden beds without the use of energy (i.e. no pumps). This typically involves using gravity to direct rainfall runoff from adjacent surfaces onto vegetation or into reservoirs below or beside the planting media. Inlets are an essential component of other WSUD techniques, including rain gardens and storage reservoirs.

It is important to note that relying purely on passive irrigation without additional techniques may not be suitable for Port Pirie.



Kegworth & Wheaton Roads- Melrose Park



Laura Avenue, St Marys porous asphalt surface, City of Mitcham

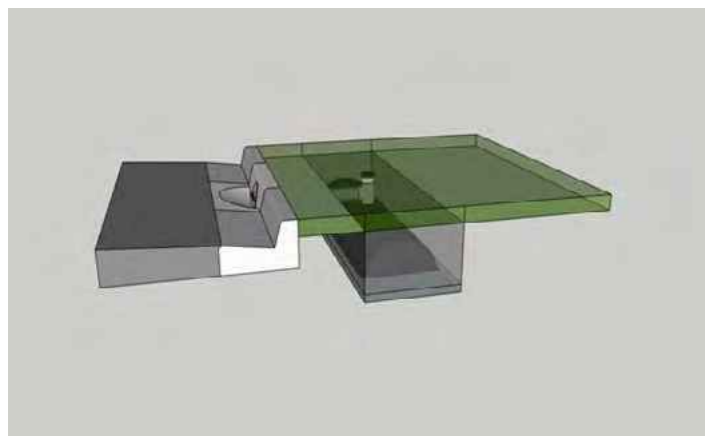


Raingarden/swales including lowered garden area for passive irrigation, and slotted kerbs allowing infiltration from roadway, on Wright Street in Adelaide

## Storage Reservoirs

Storage reservoirs are techniques that utilise stormwater harvesting to collect and store water that can be available beyond rainfall events. Techniques include infiltration trenches and wells, and extended detention.

Extended detention is where the surface levels are lowered from the inlet to allow water to pond and soak into the trees soils. It most recognisable in rain gardens and similar WSUD techniques.



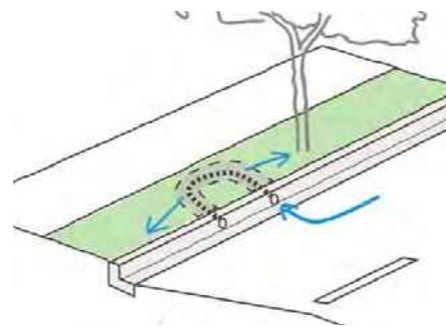
Leaky well connected to a plastic trench drain (Treenet)

Kerb inlets and leaky (or infiltration) wells are innovative means of redirecting road runoff to verge infiltration pits or 'leaky wells'. These can be installed around existing trees as well as new trees. The 'Treenet' kerb inlet and leaky well (shown below) is a great example of a



R750 kerb inlet (Treenet)

more recent innovative approach to storage reservoirs, and has become widely adopted in SA and interstate.



Infiltration trenches are a similar system to leaky wells and involve a gravel trench and slotted ag-pipe. Both infiltration wells and trenches mean that soil surface levels can be flush with surrounds, instead of lowered for ponding.

Infiltration devices allow water to soak into the ground, provided that the subsoil is sufficiently permeable.

Infiltration systems consist of infiltration trenches, soakage wells or pits, and swales

and basins, and are designed to retain a certain volume of stormwater runoff. The stored water permeates into surrounding soils, significantly reducing runoff volumes, having provided a pathway for treated runoff to recharge local groundwater aquifers.

## Swales

Swales and buffer strips are typically linear, shallow and wide. They can become features of a landscape, require minimal maintenance once established and are hardy enough to withstand large flows.

Swales are used to convey runoff in lieu of, or with, underground pipe drainage systems. Swales provide a number of functions including:

- \_ Removing coarse to medium sized sediments (and attached pollutants) by filtration through the vegetated surface;
- \_ Reducing runoff volumes (by promoting some infiltration to the subsoils);



Park 18, Southern Parklands bioretention swale, Adelaide

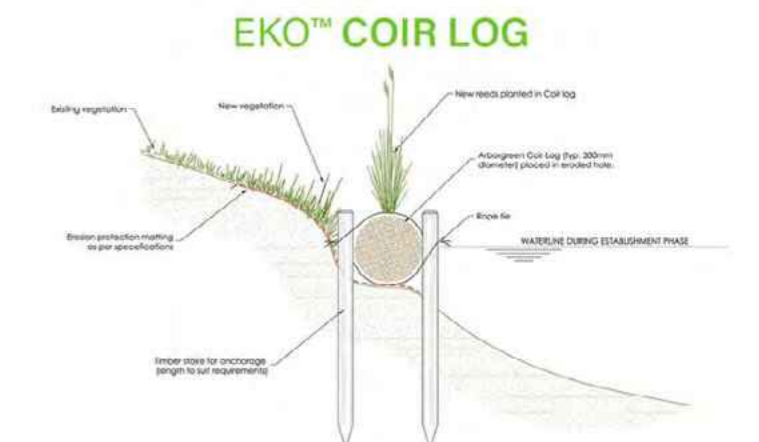
- \_ Delaying runoff peaks by reducing flow velocities;
- \_ Accommodating pedestrian movement across and along them; and
- \_ Pre-treatment for other WSUD measures.

## Mulch

Mulch is the preferred surface treatment for trees, and specifically 70mm of coarse organic mulch. It provides multiple benefits to the trees root system.

## EKO Coir Logs

Coir Logs are a natural solution for sediment and erosion control and shoreline stabilizing requirements. Because coir logs are eco-friendly and biodegradable, they are the perfect, cost-effective coir erosion control BMP for environmentally-sensitive areas that need to protect wildlife habitats and natural resources.





## Trees and underground services

Planting trees in urban settings has traditionally been a challenge, due to the intensity of constraints including proximity of buildings, narrowness of streets, traffic and in particular, intensity of underground services.

Recent developments and advancements in preventative measures for protecting services from trees has expanded the scope of what is achievable in terms of trees and greening in an urban setting.

Preventative measures includes mitigation techniques placed around the tree at the time of planting, with the intent being to control the spread, direction and depth of the tree root growth to protect adjacent infrastructure.

Specific techniques include tree root barriers, impermeable poly membrane liners, compacted or stabilised sand, tree vaults with concrete form-work, or a combination of the above.

It is worth noting that trees are often blamed for damage to services and infrastructure, however this can be unfair as conflicts can be equally due to inadequate infrastructure design. Improved infrastructure design could accommodate both infrastructure and trees. Additionally, tree based practices to minimise conflict include species selection and appropriate separation, while infrastructure based practices include appropriate design

and construction, and remediation of any initial damage (e.g. relining of leaky sewer pipes).

**Note: when using the above techniques, sub-soil drainage and ventilation will need to be considered to prevent water logging and ensure soil and tree health.**



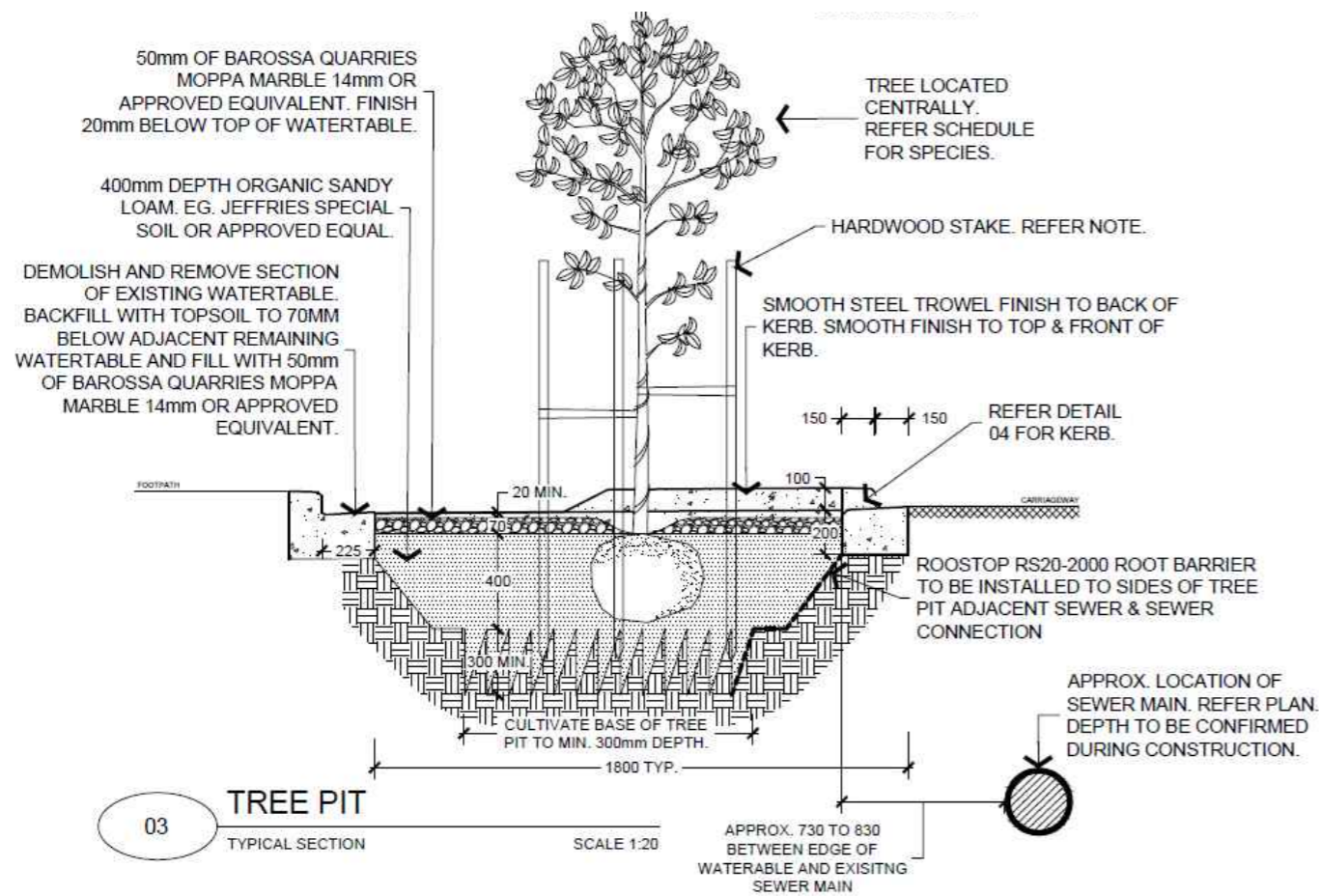
Poly membrane liner being laid at the base of tree pit to protect underground wastewater pipes.

**Note: when using any kind of root barrier or liner technique, it is critical to incorporate sub-soil drainage and ventilation to prevent water logging and ensure soil and tree health.**

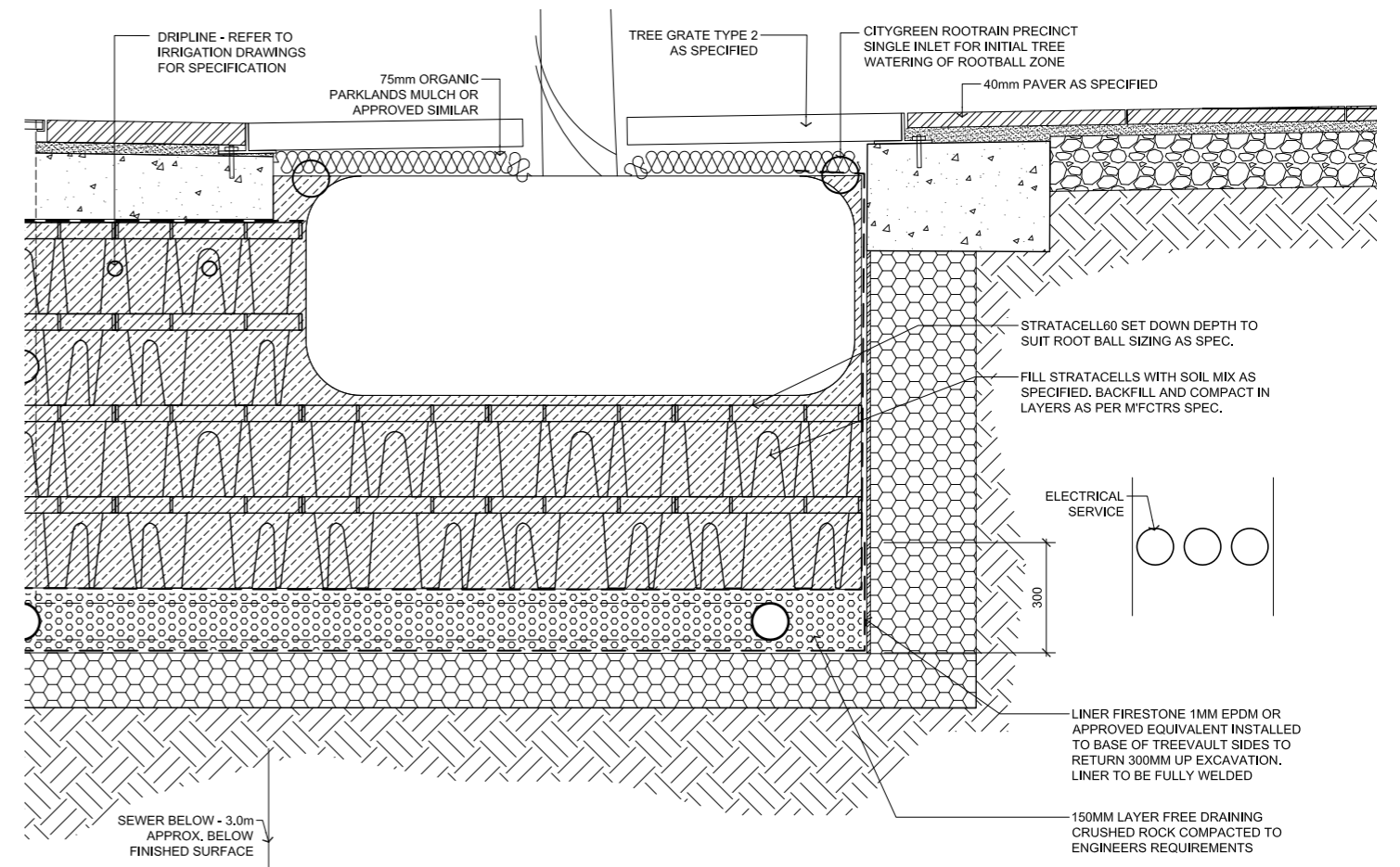
Distance from Gas Asset	Required Root Mitigation Methods
Greater than 3m	A minimum buffer of 3 metres is required between trees and gas mains for deep-rooted trees if root arrestors or other mitigation methods are not used.
1 – 3 metres	Inside the 3-metre buffer zone, specific tree types may be accommodated after further consultation with Engineering Services and the use of special root barriers that would mitigate any damage to gas pipelines and other services in the vicinity.  Root arrestors normally consisting of properly wrapped and secured robust polyethylene / nylon sheeting or solid concrete cylinders must be employed to a minimum depth of 1m; or 250mm deeper than the gas pipeline, whichever is greater.
0.5 – 1 metres	With less than a 1-metre buffer to pipeline, additional robust physical root barriers are required. These must extend 250mm deeper than the gas pipe as a minimum and allow for a minimum 300mm lateral clearance between the root barrier wall and the gas pipe wall, after consultation with Engineering Services.  In this case, heavy preformed concrete or polyethylene pipe / liners used as root barrier are mandatory (e.g., Rocla or similar type concrete pipe or PE stormwater / sewer pipe). Concrete soakwells used as a root barrier around the tree next to a gas main are another approved option subject to blocking all holes on the full half side facing the gas main.
0 – 0.5 metres	Planting directly over gas mains is not permitted in any location, as it prevents emergency and maintenance access. Local tree roots may eventually break the gas pipe and leaking Natural Gas will likely kill any vegetation in contact.

Root mitigation for planting of vegetation near gas pipelines. Source: APA

## Trees and underground services



Detail showing example of a root barrier location. (SA Water)



Detail demonstrating a tree planted in a 'tree vault' with tree cells and sub-soil drainage considerations for tree health, and poly-membrane liner and compacted sand/earth collar for underground electrical service in close proximity.



## Planting location and spacing for greener streets

Traditional street tree spacing often assumed one tree positioned in front of each property in a street (especially in residential areas). With an increased priority placed on greening of urban streets and a goal of increased canopy cover (e.g. 30%), increased density of street tree planting is required.

Cluster planting of two, three or more street trees in verges is now a preferred approach, often replacing one older tree (sometimes a large tree) with two or three new trees.

Tree planting in roadways, for example in a "parking" lane, is another design technique that is often needed when footpaths are narrow or underground infrastructure restricts tree planting in verges.



Recent street tree planting using cluster and in-road techniques in inner-suburban Unley, SA





**Appendix B**  
**Summary of site visit**

Project 1 Phoenix Park Wet Lands	Project 2.1 2.2 The Terrace - Port Pirie West Primary School/ Pirie West Oval Carpark + The Terrace/Memorial intersection	Project 2.3 Memorial Drive Concept design Permeable Paving
<b>Scope</b> Paths and revegetation only in budget. Allow paths to and space for shelters seats boardwalks etc.	<b>Existing</b> Existing row of Pinus halepensis by oval to be protected-closet thing to 'heritage trees' in Port Pirie. Then wide, open earth verge.	<b>Existing</b> Very wide road reserve.
<b>Northern basin</b> Northern basin is the main visitor focus. Secondary loop around southern basin. Walked over potential tracks. Upgrade existing trail.	Then row of Lagunaria patersonia to be removed (cause itching). Then bitumen footpath. Then a narrow verge with small trees.	Parts subject to stormwater ponding. Unusual footpath/kerb on northern side.
Lookout site on 'island'.		<b>Proposed</b> 'Port Pirie's Victoria Square'
Parking at start of track. Casuarina thickets to be removed.	<b>Proposed</b> Sealed car park with runoff directed to row of pines (inlets, infiltration pits). Mulch around pines?	90 degree parking in roadway. On both sides of street. Retain existing kerb?
Phragmites thickets. Remnants of abandoned boardwalks etc.	Remove Lagunaria patersonia. Upgrade footpath to shared path?	Street trees in parking lane. One per 5 spaces? Divert road runoff to trees. To infiltration trenches using SDU inlets and pipes. This approach preferred to permeable paving of car parks. Also helps solve ponding issues.
Amenity tree planting in this area. The two abandoned bench locations on-site offer excellent bird-watching viewpoints, and these abandoned benches can be repurposed for use.	New street trees in verge with understory planting. Collect road runoff. Allow for vehicle entry at existing gate.	Define crossing points. War memorial at intersection with Gertrude Street. Make the intersection pedestrian friendly for Anzac Day events etc. Interlocking pavers in red colour? Raising the roadway to footpath level may have traffic malmanagement issues?
Black swans have been spotted in the open water area in the northeast corner. The northern side of the tower structure offers a splendid view of the Flinders Ranges.	The build-out in the roundabout needs to be replaced with greenery instead of gravel. The parking area should serve the school's drop-off and pick-up functions, and a green buffer should be added between the parking lot and the oval fence. The area near the roundabout is not suitable for planting medium trees.	Enhance the connectivity between Memorial Park and the oval.
<b>Aldi area</b> Aldi site boundary. New service access road required within wetland area. Pedestrian link to Wandearah Road ? Ownership of land by Aldi. Location of drain/easement. Retain existing stone bridge over basin.	<b>Other</b> New diagonal footpath to cut corner at Memorial Drive intersection. Opposite side of road by school-widen footpath. Existing garden bed in school. Plant out protuberance at Goode Road corner. Numerous underground services though.	
<b>Southern basin</b> Southern basin. Trotting club requires access road to tower structure. Track by edge of water would be preferable, but walking track in this area required to follow vehicle track. Trotting club owns whole site-wetland leased to Council. Chenopod vegetation. Shade trees needed. Section by Grey Terrace. Chenopods only. Development site? Shared path on Grey Street. Access to Grey Street? Select appropriate plant species to create a low-water-demand plant community on the South Island. Avoid having the irrigation system crossing through wetlands.		
The purpose of the undeveloped land on the south side is known, and the council recommends adding a footpath across from KFC to connect to Grey Terrace. However, they advise against planting a large number of trees and recommend that the park loop does not pass through this area.		
<b>Other facilities</b> Indigenous food garden-as in Clare Lawn for families by tennis courts. Parking. People drive to walk. Overflow parking at tennis courts and TAFE? Proposed levee will hide buildings. The car park on the west side of the tennis court needs to be upgraded to provide parking space for Phoenix Park The construction of the Indigenous food garden can serve as a TAFE teaching activity. TAFE has the capability to organize the construction of footpaths, arbors, and other elements.		

Project 2.5 The Terrace: Alexander Street to Memorial Drive	Project 2.5 The Terrace: Mary Elie Street to Grey Terrace
<b>Existing</b>	<b>Existing</b>
Street is an important parking area for hospital to north.	Wide verge with narrow footpath by kerb.
Narrow verge, small street trees.	Bitumen shared use path.
Bitumen footpath-poor condition?	Row of mature Eucalypts.
Row of Pinus halepensis.	
Wide mulched area then 2 rows of juvenile trees-planted by community?	<b>Proposed</b>
High and low voltage powerlines over.	Develop planting scheme for a section which can be 'rolled out' over the rest of the street.
	E.g. Eucalyptus leucoxyton with diverse native understory.
<b>Proposed</b>	Don't emphasize the footpath by kerb, encourage use of shared use path.
Demolish existing kerb, Lagunaria trees and pathway.	Pedestrian lighting may be required.
Replace with new angle parking.	Infiltration trenches?
	Services?
Existing stobie poles now in roadway-in protuberances or with bollards around.	A foodpath design is needed to connect the bus station with the shared path.
Plant new trees in roadway between parking spaces?	A footpath design is required to connect "The Terrace" with the Racing Club car park.
Whether to use a 60° or 90° parking angle requires further research by an engineer.	
Design a buffer zone between the roadside parking spaces and the roadway.	
New shared use path to east of existing Pinus trees.	
Mulch under Pinus trees (underplantings unlikely to succeed under these trees).	
Crossover, pram ramp locations?	
<b>Corner to Alexander Street</b>	
Angle new shared use path to connect up with path through reserve.	
Demolish existing footpath or retain. Pedestrians still likely to use it.	

# Thank You

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