

City of Melville

# Canning Bridge Masterplan (Final Report)

Rev C 28 October 2016



This report has been prepared by GHD for the City of Melville and may only be used and relied on by the City of Melville for the purpose agreed between GHD and the City of Melville as set out in the scope of engagement.

GHD otherwise disclaims responsibility to any person other than the City of Melville arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

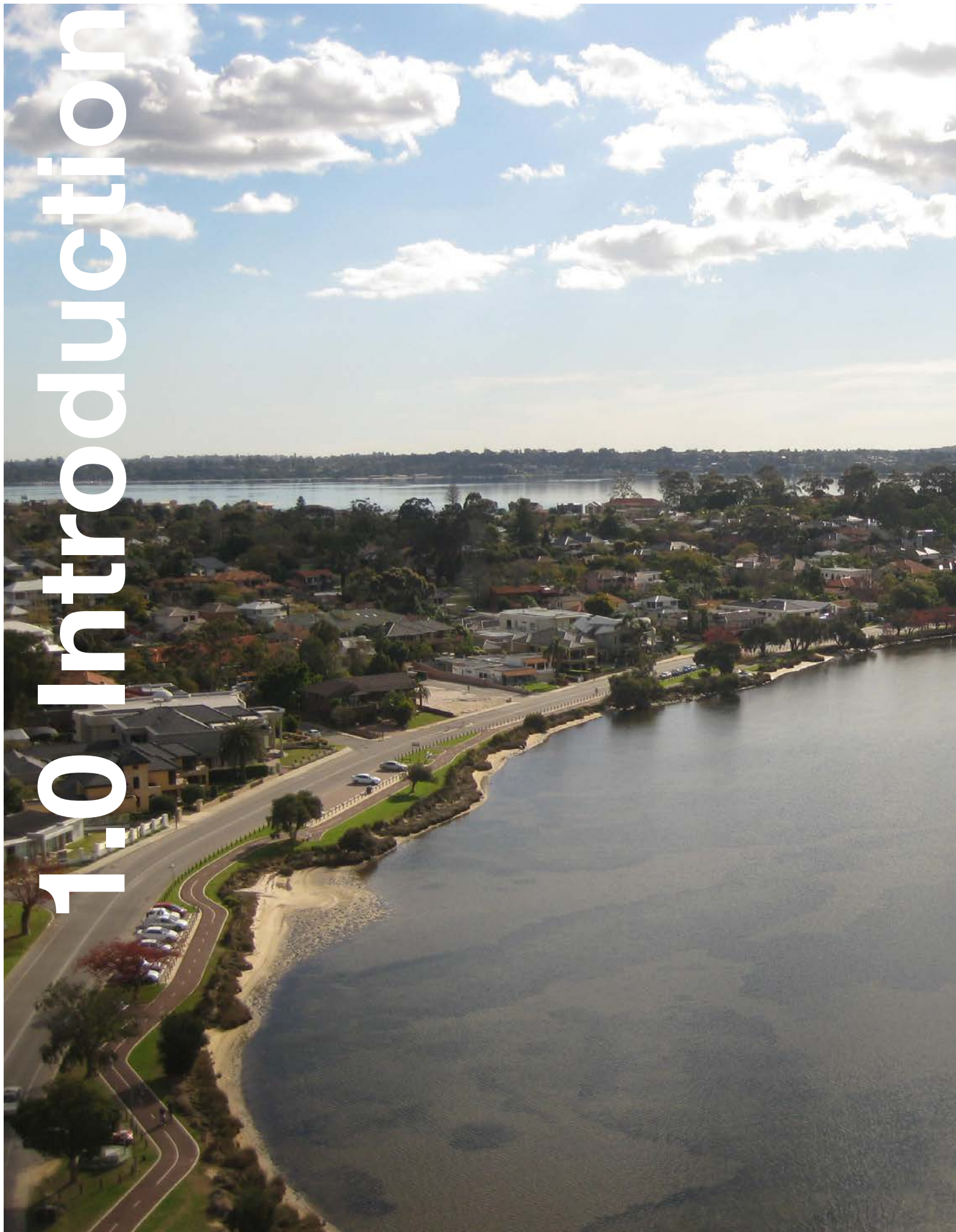
GHD has prepared this report on the basis of information provided by the City of Melville and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

# Contents

<b>1.0</b>	<b>Introduction</b>	<b>2</b>
1.1	Introduction	2
<b>2.0</b>	<b>Existing conditions and background information</b>	<b>6</b>
2.1	Introduction	6
2.2	Streetscapes/Public Realm	7
2.3	Hydrology and Drainage	16
2.4	Movement	20
<b>3.0</b>	<b>Masterplan</b>	<b>32</b>
3.1	Purpose	32
3.2	Vision	33
3.3	Design Principles	34
3.4	Movement Strategy	36
3.5	Masterplan Guidelines	38
3.6	Stormwater quality improvement measures	72
3.7	Traffic improvement measures	76
<b>4.0</b>	<b>Bibliography</b>	<b>80</b>
4.1	Bibliography	80







## 1.1 Introduction

### Project Background

Encompassing approximately 320,000 square metres of residential dwellings, with access to a major transport node and a significant interface with the Swan River Foreshore, the Canning Bridge Activity Centre is an important and rapidly developing secondary activity centre within the City of Melville.

The Canning Bridge Activity Centre Master Plan (masterplan) has been developed to provide additional guidance and detail for the Canning Bridge Activity Centre to achieve the goals and design outcomes as set out in the Canning Bridge Activity Centre Plan (CBACP).

The CBACP was adopted in March 2015 and provides the framework for future planning of the area to align with the State and local planning objectives. Specifically, the CBACP is guided by the Canning Bridge Precinct Vision Statement and the State Planning Policy 4.2 Activity Centres for Perth and Peel, which denotes the CBACP area as an activity centre within the Perth and Peel. The CBACP is crucial to ensuring the area is sufficiently prepared to host increasing growth over the next forty years

and beyond.

The CBACP goals focus on creating a vibrant, engaged community that is centred on an integrated transport node, the Canning Bridge rail station. Furthermore, the CBACP seeks to promote innovation and sustainability in its built form, movement network and natural assets. To support this vision, and the successful implementation of the CBACP, the Master Plan focuses on the following key components:

- Traffic
- Streetscape
- Vegetation
- Drainage





**Fig. 1 Study Area**

### Study Area

The study area for the masterplan encompasses the Kintail and Ogilvie Quarters (Q1 and Q2) of the Canning Bridge Activity Centre Plan (CBACP). The masterplan focusses on the public realm and local streets within the core area of the Canning Bridge Activity Centre, as shown in Fig. 1.

The Kintail Quarter is located north of Canning Highway and 'will be the premier retail area and the driving force behind employment opportunities in the CBACP area'. (CBACP)

The Ogilvie Quarter is located south of Canning Highway and 'will be the 'business' quarter, of the CBACP area and 'playground' of the Western Quarters.' (CBACP)

### Purpose of this Report

The purpose of the masterplan is to provide a guiding document for the development of the public realm to support the redevelopment of private land within the Canning Bridge Activity Centre.

The Canning Bridge Masterplan includes a review and recommendations in relation to guiding the development of:

- Drainage
- Local roads
- Streetscape
- Vegetation

These recommendations will enable the City of Melville to redevelop the public realm to support increasing the density of the area, in a manner which reflects the valued character and supports the vision for Canning Bridge.

Relevant references to the CBACP land use and built form zones can be found on the following pages.





Fig. 2 Canning Bridge Activity Centre Plan



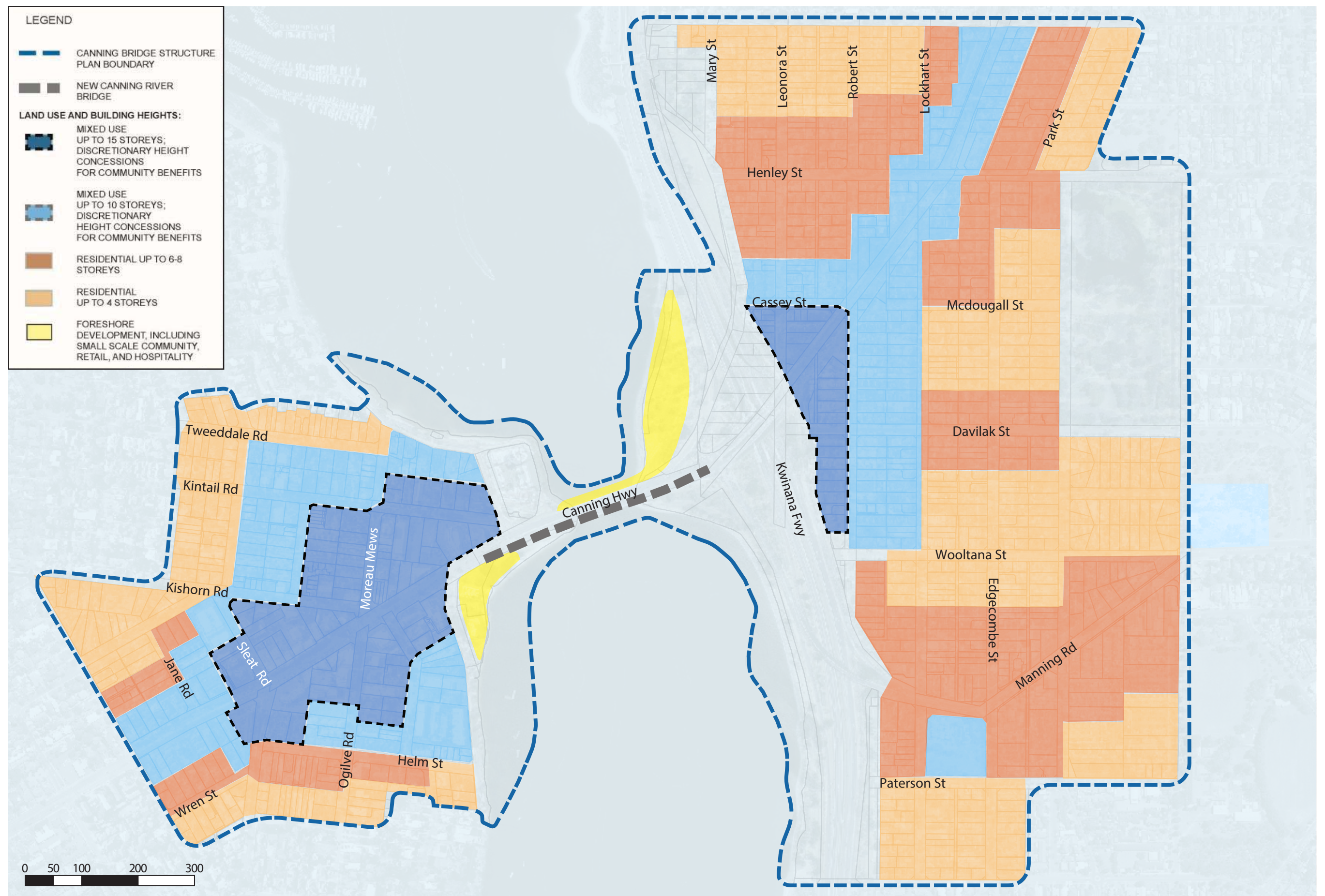
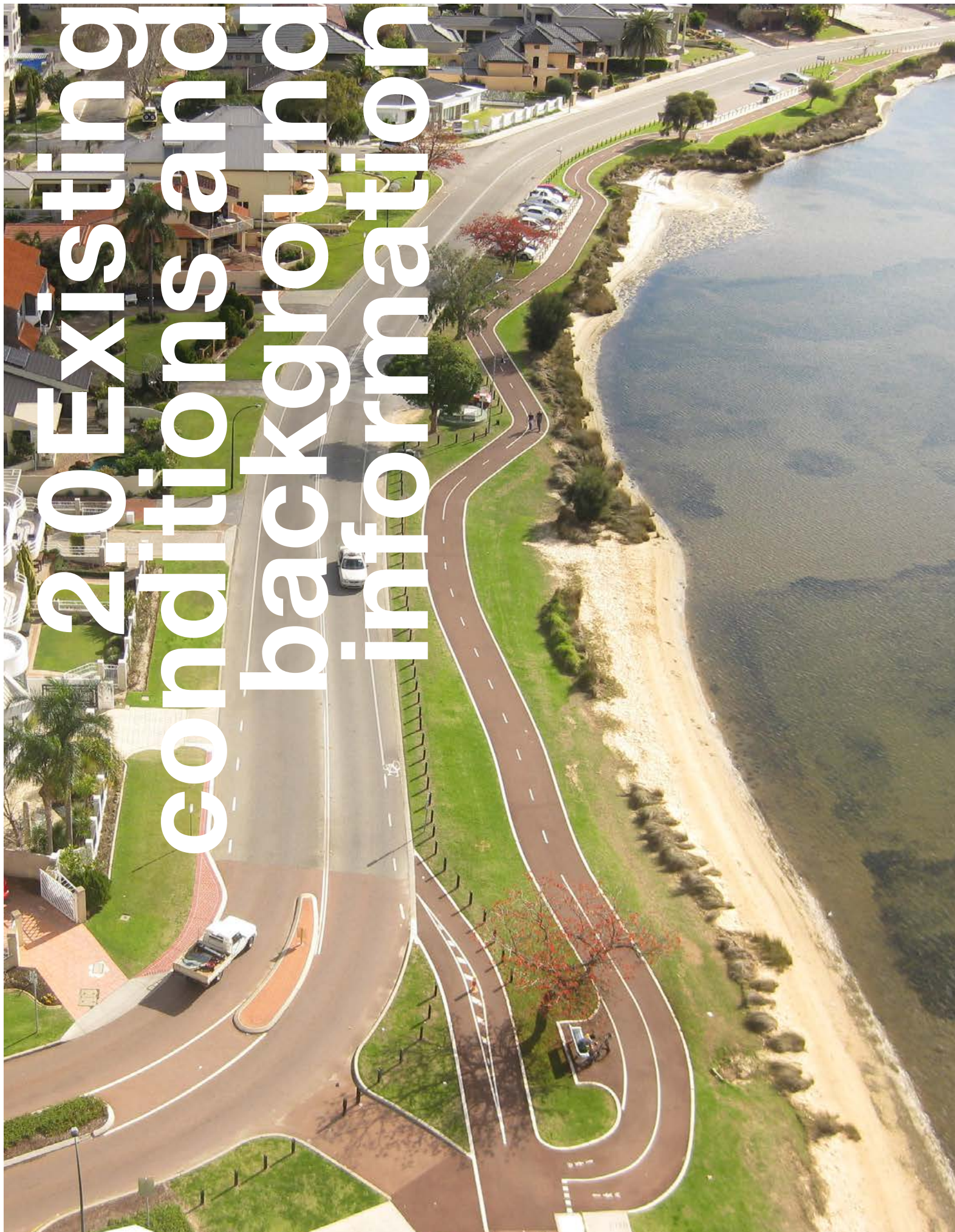


Fig. 3 Canning Bridge Activity Centre Plan Land Use, Built Form and Zones





## 2.1 Introduction

### Introduction

This section reviews existing reports and site conditions in regards to drainage, traffic and landscape within the Activity Centre Study Area. The understandings learnt from the findings of these reports will inform the masterplan.

The first section covers an assessment of the existing landscape character and features is undertaken along with an audit of the existing streetscape environment. The audit presents an analysis of the constraints and opportunities for the public realm.

Following this is a review of the hydrology and drainage in relation to the masterplan area and surrounds such as the local water management strategy and stormwater management strategy, among other documents.

In addition, existing drainage is identified and discussed and a summary of water quality and treatment measures is provided.

Existing traffic and movement reports have also been reviewed and anticipated traffic volumes and their implications are discussed.



# 2.2 Streetscapes/Public Realm

## Existing Public Realm Condition

The facing page and following pages explore the study area through a photograph study to highlight the existing character and key features of the Canning Bridge public realm areas.

This is accompanied by an aerial map highlighting the locations of the key features, showing them in context with the other key features.

A summary of the streetscape audit is also included, which includes road reserve widths, paving materials, tree species, opportunities, constraints and other key features.



Fig. 4 Riverside shared cycle path provides regional connections



Fig. 5 Service centre on Canning Hwy with new mid rise residential development



Fig. 6 Tivoli Hall, former Applecross District Hall , an Art Deco building



Fig. 7 The Raffles Hotel is an iconic river front building (built c.1896).





Fig. 8 Wide riverfront shared path with views to the city



Fig. 9 Low rise residential development with balconies facing the street.



Fig. 10 Swan River Rowing Club provides an community asset



Fig. 11 Mosaic tiles in the shared path near the rowing club



Fig. 12 Existing pedestrian bridge over Canning Highway



Fig. 13 Interpretive signage along the Canning River





Fig. 14 Residential character of First Ave



Fig. 15 Tree lined Tweeddale road



Fig. 16 Kishorn Road (South) with street trees along one side



Fig. 17 Commercial and retail development lines Sleat Road



Fig. 18 Canning Highway forms a barrier for pedestrians

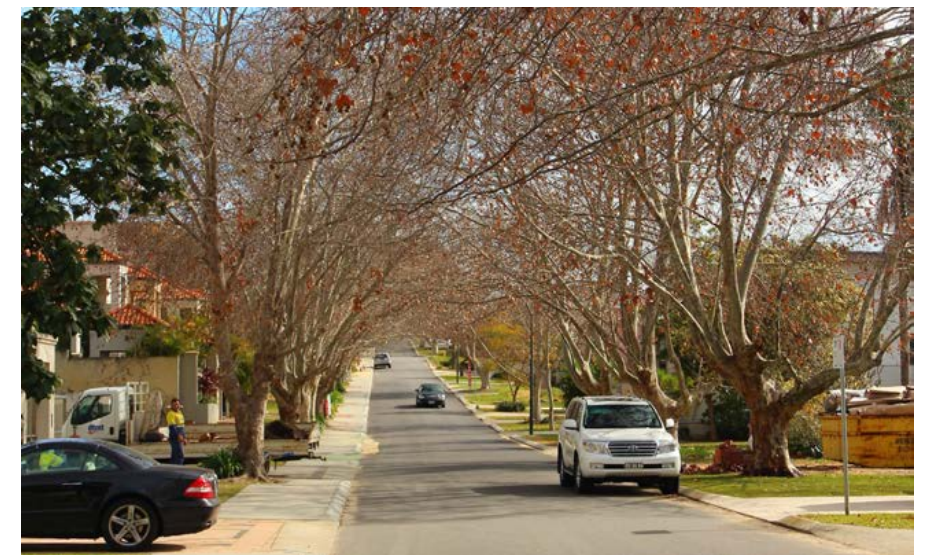


Fig. 19 Tree lined Kintail Road with footpath provision on one side of the street





### Key Features Mapping

- 1 River front views to the city
- 2 Heritage site - old wharf
- 3 Raffles Hotel
- 4 Riverfront shared path
- 5 Relocated and upgraded Canning Bridge Train and Bus station
- 6 Tivoli Theatre and Canning Bridge Library
- 7 Signalised intersection
- 8 Pedestrian and cycling connection under Canning Bridge
- 9 Future upgrade of Canning Bridge proposed
- 10 Canning Highway forms a major pedestrian barrier that divides the study area
- 11 Existing pedestrian bridge across Canning Hwy
- 12 Swan River Rowing Club
- 13 Fast food outlets

Fig. 20 Key Features

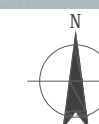






Fig. 21 View of Canning Bridge looking south-east from the Raffles Hotel with key features highlighted



Streetscape Assessment (By Street)						
Street	Road Reserve Width	Streetscape Character	Vegetation	Path Materials and Widths	Constraints	Opportunities
<b>Canning Highway</b>	30.2m (with median of varying width).  (Main Roads WA has a designated widening). Refer Appendix A; Section B	A major arterial road, lined with retail, commercial and food outlets. A fast pace, busy, traffic focused streetscape. Limited tree planting contributes to a <b>hard urban character</b> .	Planted median with Gleditsia triacanthos, Corymbia calophylla (Marri), Corymbia citriodora (Lemon-scented Gum), Agonis flexuosa (Peppermint) and Jacaranda mimosifolia.  Groundcover shrub planting to median.  No tree planting to street verges.	<b>Materials:</b>  Unit paving to verges - red brick and concrete pavers.  Framing pattern.  Red brick paving to median.  <b>Widths:</b>  3500-4500mm typ. Back of kerb to building front (both sides).	Canning Highway is within the MRS or Main Roads WA land.  Varying property boundaries and surface treatments.  Varying footpath cross falls and level changes.  Hostile urban microclimate and conditions for vegetation.	Interplant and over time replace street trees with one or two species to unify the street.  Increase tree planting to medians with suitable large tree species.  Tree planting to road verges/footpaths to better frame road corridor and provide shade and greening to streetscape.  Consistent paving treatment to tie-in with overall activity centre planting style/palette.  Groundcover planting to medians with a wider variety of flowering waterwise plants.
<b>Sleat Road</b>	20.1m (with median).  (Main Roads WA has a designated widening). Refer Appendix A; Section B	Secondary Road.  Sleat is split into two character areas:  North of Canning Highway the street is lined with retail, food outlets and professional services with limited tree planting. High traffic volumes contributing to a <b>hard urban character</b> .  South of the highway the street becomes is primarily residential with limited tree planting contributing to an <b>exposed urban character</b> .	North of Canning Hwy. - Robinia sp.  South of Canning Hwy. - Mix of Agonis flexuosa, Brachychiton populneus, Fraxinus angustifolia 'Raywood' (Claret Ash), Platanus x acerifolia (London Plane Tree) and Prunus persica (Flowering Peach).  Grass verges.	<b>Materials:</b>  North of Canning Hwy. - Red brick unit pavers.  South of Canning Hwy. - Insitu concrete.  Median with insitu concrete - stamped finish.  Road is red asphalt between Canning Hwy. and Kishorn Rd  <b>Widths:</b>  North of Canning Hwy. - 2000-3000mm – (Both sides) Kerb to building with narrow strips of grass.  South of Canning Hwy. - 1600-2000mm - (Both sides).  South of Canning Hwy. - Path on western verge is adjacent to road, path on eastern verge is adjacent to property boundary (grass verge to roadside).	Main Roads WA has a zoning designation to take land to significantly widen this road - any existing trees are unlikely to be retained.  North of Canning Hwy. - Footpaths are not symmetrical - path on western verge is adjacent to property boundary, path on eastern verge is adjacent to road.	Interplant and over time replace street trees with one or two species to unify the street.  Tree planting to medians.  Replace grass verges with locally native waterwise groundcover planting.  Unit paving to footpaths to create more civic streetscape character.  Cycle lanes as part of MRWA road widening.  Footpath widening south of Canning Highway.  Rationalise on-street car bays with rain gardens/tree planting.  Widen medians as part of Main Roads WA widening and increase tree planting to medians.



## Streetscape Assessment (By Street)

Street	Road Reserve Width	Streetscape Character	Vegetation	Path Materials and Widths	Constraints	Opportunities
<b>Forbes Road</b>	20.1m (Main Roads WA has a designated widening). Refer Appendix A; Section B	Residential street. Streetscape with primarily detached homes and established street trees contributing to a <b>'leafy' character</b> .	Primarily Jacaranda mimosifolia (no street trees north of Kintail Road). Grass verges.	<b>Material:</b> Insitu plain concrete. <b>Widths:</b> 1300-1400mm (Eastern side only) North of Kintail Rd. - Footpath is adjacent to road, South of Kintail Rd. - Footpath is adjacent to property boundary.	Designated road widening poses threat to existing street trees - Existing street trees should be retained where possible.	Footpath provision to east and west road verges. Footpath widening. Unit paving to footpath to create civic character to local connector road streetscape. Infill tree planting. Installation of road medians as part of widening with tree planting to medians. Cycle path.
<b>Kintail Road</b>	20.1m	Residential street. A streetscape with a mixture of modern and older buildings up to four storeys high. Mature tree planting creates an <b>enclosed tree lined boulevard character</b> .	Primarily mature Platanus x acerifolia with interplanting of Melia azedarach (Cape lilac) and Jacaranda mimosifolia. Grass verges.	<b>Materials:</b> Insitu plain concrete. <b>Widths:</b> 1400-2200mm (both sides).	Locations of existing trees may create constraints on overall carriageway widths – typically 10m approx. between tree trunks.	Existing boulevard of mature trees that could be used to create a tree lined public transport boulevard. Infill street tree planting. Pave and widen footpaths to full width of verge between Moreau Mews and Canning Hwy. to create a civic boulevard streetscape. High quality paving. Create civic centre at library.
<b>Tweeddale Road</b>	21.1m	Residential street. A streetscape with a mixture of modern and older building stock up to four storeys high. Scattered mature street trees create a <b>semi-enclosed boulevard character</b> .	Primarily Platanus x acerifolia with interplanting of Jacaranda mimosifolia. Grass verges.	<b>Materials:</b> Insitu plain concrete. <b>Widths:</b> 1800-2100 (southern side only).	Locations of existing trees may create constraints on overall carriageway widths. Tightly spaced driveways results in reduced opportunities for infill tree planting.	Retain existing avenue of trees and infill plant to reinforce. Plant locally native waterwise groundcovers to verges. Install footpath to north verge.
<b>Moreau Mews</b>	20.1m	Sleat has three distinctive character areas: In the southern segment red asphalt and significant areas of paving creates a <b>local urban character</b> . In the middle segment, planting of mature agonis creates an <b>enclosed local character</b> . The northern segment has limited tree planting so has a more <b>open character</b> with river views.	Primarily mature Agonis flexuosa with interplanting of other natives. Grass verges.	<b>Materials:</b> Insitu plain concrete. Road is red asphalt around shops. <b>Widths:</b> 1300-1800mm (both sides).	Multiple driveways results in reduced opportunities for on street parallel parking and street trees. Existing Agonis flexuosa trees have large trunks which visually dominate the street. Additionally, they are relatively small trees for future built form height and the dense foliage and low canopy makes the street very dark.	Opportunity to replace Agonis flexuosa with a more suitable larger shade species. Space for infill planting with suitable large shade tree species. Plant verges with locally native waterwise groundcover planting. Add footpath to eastern verge north of Kintail Road. Opportunities for parallel car bays and rain gardens.



Streetscape Assessment (By Street)						
Street	Road Reserve Width	Streetscape Character	Vegetation	Path Materials and Widths	Constraints	Opportunities
<b>First Avenue</b>	20.1m	Residential street.  Streetscape with a mixture of modern and older buildings up to four storeys high. Established street trees and a narrow carriageway contribute to an <b>enclosed ‘leafy’ neighbourhood character</b> .	Primarily Jacaranda mimosifolia.  Grass verges.	<b>Materials:</b> Insitu plain concrete.  <b>Widths:</b> 1500-1600mm (Eastern side only).	Existing street trees should be retained where possible.	Provide footpath to western verge.  Groundcover planting to verges.  Provide parallel on-street car parking whilst creating rain gardens and tree planting opportunities.
<b>Kishorn Road</b>	20.1m	The street is physically divided into two distinct characters by Canning Hwy.  North of Canning Hwy is primarily commercial use. This building stock is a mixture of modern and older buildings up to four storeys high. Established street trees contribute to a <b>‘leafy’ character</b> .  South of Canning Hwy is a mix of residential and commercial. The buildings are a mixture of modern and older buildings up to four storeys high. Limited street tree planting and a narrow carraigeway creates an <b>open, low speed, local character</b> .	Jacaranda mimosifolia, Tipuana tipu and Lophostemon confertus.  Grassed and paved verges.	<b>Materials:</b> Insitu plain concrete  <b>Widths:</b> 1500-1800mm (Both sides).	Existing street trees should be retained where possible.  Southern side of street has poor frontage with several car parks and ‘backs’ of businesses.  High demand for car parking.	Infill plant and over time replace street trees with one species to unify the street.  Widen footpaths.  Create parallel on-street car parking bays to replace perpendicular bays.  Create rain gardens and increase opportunities for tree planting.  Mixed tree species.  Plant verges with locally native waterwise groundcover plants.
<b>Helm Road</b>	21.5m	Residential street.  A streetscape with detached and semi-detached dwellings up to two storeys. Wide grass verges, views to Canning River and a narrow carriageway create a <b>local road character with a strong sense of place</b> .	Primarily Agonis flexuosa with Tipuana tipu, Callistemon sp., Jacaranda mimosifolia and Paulownia tomentosa (Foxglove tree).	<b>Materials:</b> Footpath on north side only. Path is typically insitu concrete.  <b>Widths:</b> 1200mm Typ wide (North side only).	Existing Agonis flexuosa tree trunks are large in girth and visually dominate the street.  Foliage is dense which makes the street very dark.  Views to river at eastern end of road.	Maintain views to river.  Infill planting with large shade trees.
<b>Canning Beach Road</b>	20.1m	This street has two distinct character areas.  A riverfront road with residential development to one side. Dwellings are up to three storeys and typically detached. Wide grass verges, river views, a narrow carriageway and limited tree planting creates a <b>lower speed environment with an open character and a strong sense of place</b> .  Southern segment near Raffles has a more urban character with a four story modern apartment block lining on side of the street. Mature street trees and views to the river creates a <b>‘leafy’ character with a strong sense of place</b> .	Beside Raffles – Erythrina sykesii (Coral tree).  Along foreshore – mix of Eucalyptus camaldulensis (Red River gum), Lophostemon confertus (Queensland Brush Box), Quercus suber (Cork oak), Erythrina sykesii, Agonis flexuosa and Melaleuca (paperbarks).  Corymbia citriodora in public carpark.  Grass verges.	<b>Materials:</b> Insitu plain concrete. Red asphalt to the shared path.  <b>Widths:</b> 2200-2500mm (Within study area only one section near the Raffles has a path).  1300-2000mm outside of study area.  Paths are typically on riverside and Raffles side only with some paths around the theatre/ carpark.	Prime real estate with river views - pressure from local residents to maintain these open views to the river.	Maintain select open views to the river.  Add footpaths to both sides of road throughout the study area.  Increase provision of on-street parallel parking.  Plant locally native waterwise groundcover plants to verges.  Opportunities for rain gardens and tree planting whilst maintaining select open views.  High quality paved verges along frontage of Raffles to connect library plaza with foreshore.



Streetscape Assessment (By Street)						
Street	Road Reserve Width	Streetscape Character	Vegetation	Path Materials and Widths	Constraints	Opportunities
<b>The Esplanade</b>	20.1m typ (Varies)	Riverfront road with residential development to one side. The building stock is a mixture of modern and older buildings up to eight storeys high. Tall upright street trees along the riverside and a naturally lower speed environment creates a <b>narrow street character which has a local road feel</b> .	No street trees except some Araucaria heterophylla (Norfolk Island Pines) near Canning Hwy.	<b>Materials:</b> Western side south – insitu concrete. Western side north - Red brick pavers. Eastern side – Red asphalt (PSP). <b>Widths:</b> 2200mm wide typ. (Western side). Shared path 2500-3000mm wide (eastern side).	Prime real estate with river views. Existing Araucaria trees should be retained for their shade value. Narrow verge width along the western side in some segments.	Maintain open view of river. Infill planting to reinforce streetscape whilst maintaining open views. Widen verge on western side where possible.
<b>Ogilvie Road</b>	20.1m	Mixed residential and commercial street with modern and older buildings up to nine storeys high. Scattered street trees and grass verges create <b>a softened but open character</b> . Red asphalt treatment and parking provisions near Canning Highway contribute to a <b>local urban road character</b> .	Selection of Tipuana tipu, Lophostemon confertus, Jacaranda mimosifolia, Corymbia citriodora and Alnus (Alder).	<b>Materials:</b> Red asphalt on carriageway at Canning Hwy end of road. Unit pavers and insitu concrete to footpath. <b>Widths:</b> 1500-2200mm (Both sides).	Existing street trees should be retained where possible. Street trees are a broad mix of species. Existing commercial/office developments create high demand for on street parking.	Infill planting with large shade trees. Unify the street through the use of a select palette of tree species for infill planting
<b>Jane Road</b>	20.1m	Residential road  A streetscape with detached and semi-detached dwellings up to two storeys. Wide grass verges, mature street trees and narrow carriageway create a <b>'leafy' local road character</b> .	Jacaranda mimosifolia.	<b>Materials:</b> Plain insitu concete path. <b>Widths:</b> 1800mm approx from back of kerb (Eastern side only).	Existing trees are mature and generally in good form and health - these trees should be retained.	Infill planting to reinforce street character.



## 2.3 Hydrology and Drainage

### Background and Existing Reports

#### Canning Bridge Activity Centre Local Water Management Strategy (LWMS) (GHD 2014)

GHD was commissioned by the City of Melville and City of South Perth to prepare a Local Water Management Strategy (LWMS) for the CBACP. The CSBP covers an area of 164 ha within the City of Melville and the City of South Perth.

Existing drainage within the City of Melville consists of a piped network of local authority drains, discharging to the Canning River.

The LWMS proposes a stormwater management system for the CBACP using a major/minor approach to convey and detain stormwater. The principle is “to maintain water discharge volumes and peak flows post-development, relative to pre-development conditions” (GHD 2014). For the road catchments, the proposed design criteria for

stormwater management system comprises:

- A minor drainage system that considers the first flush and 1 in 10 year average recurrence interval (ARI) storm events and is defined as the system of swale drains, side entry pits, gullies, pipes, kerbs, gutters etc designed to carry and/or infiltrate runoff.
- Proposed swale drains and pipe networks within the road reserve that will be designed to cater for storm events up to the 10 year ARI event. For major events exceeding the 10 year ARI event the road reserve will convey stormwater via flooding of the pavement areas.
- A major drainage system to cater for the 1 in 100 year ARI storm event, defined as the roads, drainage reserves and flood storage areas planned to convey the stormwater runoff

from extreme events that exceed the capacity of the minor system, to the defined flood storage areas.

There is currently little treatment of stormwater drainage within the site. The overarching principle for water quality from the LWMS is “to improve the quality of surface and ground water leaving the development area to maintain and restore ecological systems”. The LWMS recommends taking a hierarchy approach with the following principles:

- Implement controls at or near the source to prevent pollutants entering the system and/or treat stormwater
- Install in-transit measures to treat stormwater, addressing any remaining pollutants prior to discharging to receiving environments
- Implement end-of-pipe controls to treat stormwater, addressing any remaining

pollutants prior to discharging to receiving environments.

The proposed design criteria for water quality within the CBACP area are:

- Ensure that all stormwater from constructed impervious surfaces receives treatment through water sensitive urban design (WSUD) measure prior to infiltration of discharge consistent with the Stormwater Management Manual (Department of Water 2004 – 2007).
- Incorporate best management practice stormwater management into stormwater design and retrofit.
- Swales/vegetated bioretention systems (also referred to as rain gardens) are to be sized at two percent of the constructed impervious area from which they receive runoff. (CRC for Water Sensitive Cities Adoption Guidelines for

Stormwater Biofiltration Systems).

- Outflows from subsoils, where implemented, shall receive treatment prior to discharge to the stormwater system.
- Achieve concentration targets for nutrients in stormwater discharging to the Canning River in accordance with the Swan Canning Water Quality Improvement Plan (Swan River Trust 2009), of 0.1 mg/L for total phosphorus and 1.0 mg/L for total nitrogen.
- Ensure adequate resourcing and budgets for the planning, implementation and maintenance for all WSUD projects and assets.

Groundwater within the site is generally of sufficient depth for infiltration of stormwater, except along the low-lying areas adjacent to the Canning River.



**Water and sediment quality in the Bull Creek catchment and City of Melville lakes 2013 (SERCUL, September 2014)**

SERCUL was commissioned, in 2014 by the City of Melville, to develop a water and sediment quality report for the Bull Creek catchment. Water quality within the Bull Creek catchment is reported annually. The monitoring measures stormwater quality entering the Canning River from the Bull Creek catchment, and monitors water and sediment. Monitoring has identified a trend of higher concentrations of metals and nutrients at certain locations have been recommended for further investigation. The report recommended restoration works for water entering the Canning River, including:

- Living stream style of inlet to reduce sediment, and include weed management, riffle construction and native plants.
- Pollution management to reduce gross litter, soluble nutrients and heavy metals.

**City of Melville Natural Areas Asset Management Plan (NAAMP) (City of Melville 2011)**

Woodgis was commissioned by the City of Melville to develop an asset management plan for the natural areas within the City's boundaries. Stormwater was identified as one of the significant threats to biodiversity assets. The NAAMP recommends that the measures outlined in the Stormwater Management Strategy are implemented.

**Stormwater Management Strategy Review (GHD 2015)**

GHD was commissioned by the City of Melville to review the current drainage system and recommend improvements. This involved a review of the treatment measures for each catchment area within the City of Melville and where necessary, recommendations for further treatment were made. A program of works for both a five and twenty year outlook was developed, prioritising areas draining to sensitive receiving environments. Both structural and non-structural controls were recommended. For the masterplan, the priority receptor is the Swan River estuary.



Existing drainage

The highest point in the site is 20mAHD at the south-west end, on Canning Highway. The general slope across the site averages approximately two percent, falling away from Canning Highway towards the Swan River estuary, as per figure to the right.

Stormwater drains through a pit and pipe network to a number of outlets into the Swan River estuary. The drainage network captures stormwater from an area slightly larger than the site. On the northern side of Canning Highway drainage pits and pipes on Macrae Road, Forbes Road, Kintail Road and Moreau Mews

collect and convey stormwater to outlets along Canning Beach Road. On the southern side of Canning Highway, drainage pits and pipes collect and convey stormwater down Olgilvie Road and Helm Street towards outlets along The Esplanade. Small sections of drainage are located on Kishorn Road and The Esplanade, however it is unclear how these connect and discharge into the Swan River estuary.

Table 1 on the following page presents the catchments that make up the site, together with existing and proposed stormwater treatment measures (GHD 2015).

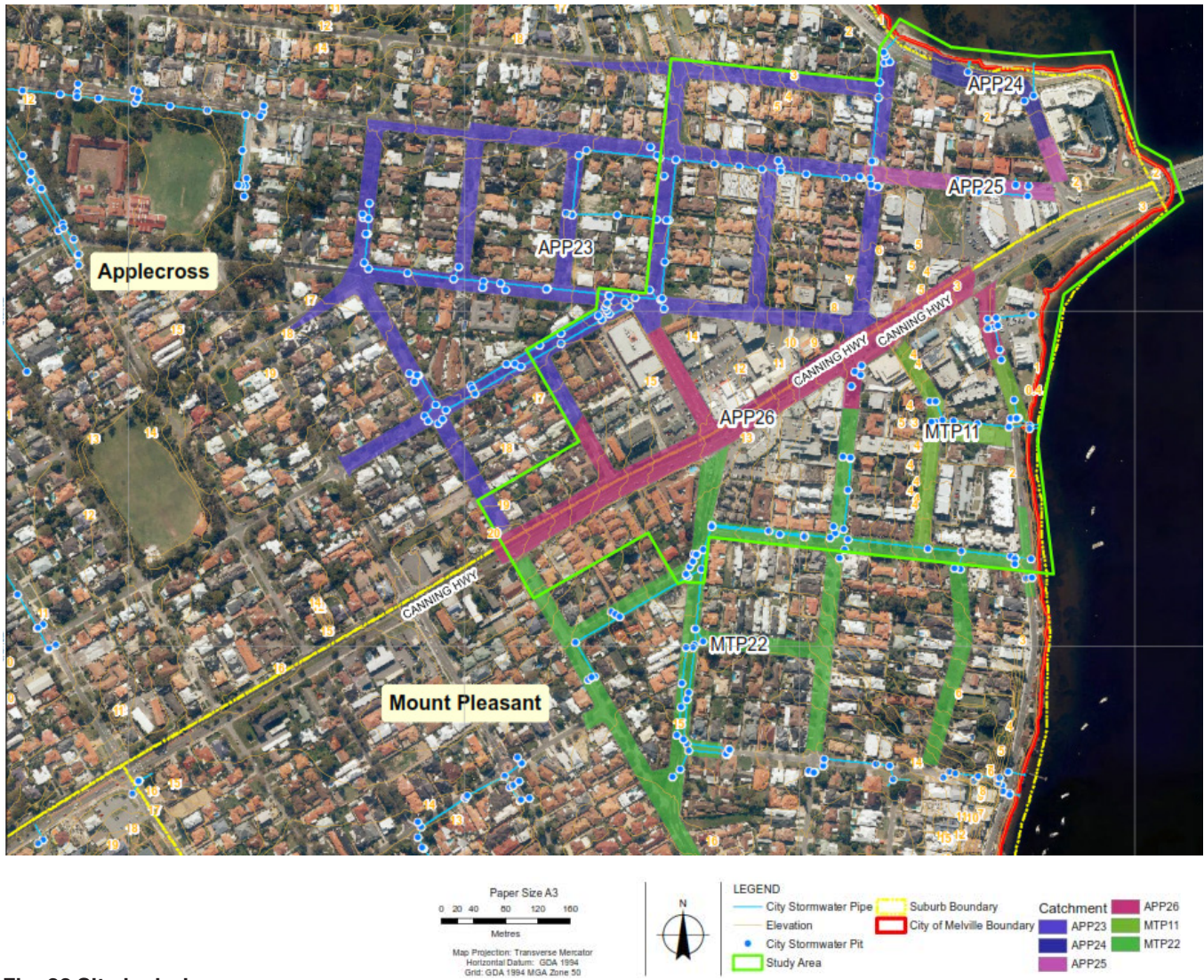


Fig. 22 Site hydrology



**Water quality and treatment measures**

Pollutant loads modelled previously demonstrated that pollutant loads were typical of urbanised catchments (GHD 2015). The only sensitive environmental receptor for runoff from the site is the Swan River estuary, classified as a Conservation Category wetland by the Department of Parks and Wildlife (DPAW).

Table 1 presents existing and proposed treatment measures for the site (GHD 2015).

**Table 1 Catchment Summary**

Catchment (GHD 2015)	Area (ha)	Existing treatment	Proposed treatment
APP23	7.29	None	Tree pits for future trees, and a GPT at the outlet
APP24	0.42	None	In-pit trash baskets
APP25	0.58	None	GPT at outlet
APP26	2.81	None	GPT at outlet
MTP11	0.88	None	GPT at outlet
MTP22	5.09	GPT	Tree pits and rain gardens at opportunistic locations



## 2.4 Movement

### Existing condition

The following section reviews the background reports including the Transport @ 3.5m Perth Transport Plan and the CBACP and Integrated Transport Strategy (August 2014). A summary of the outcomes of liaison with key stakeholders is provided to inform the transport assessment.

Additionally, existing traffic data including crash history and forecast traffic volumes derived from landuse data, have been considered as the basis for review.



Fig. 23 Canning Bridge Train Station and Kwinana Freeway



## Background and Existing Reports

### Transport @ 3.5 million Perth Transport Plan

The Department of Transport recently published the Transport @ 3.5 million Perth Transport Plan. The following section of the report refers to the portion of Canning Highway adjacent to the masterplan area.

Canning Highway extends from The Causeway, in Burswood to Fremantle, providing an important link between Perth Central Business District (CBD) and the Fremantle strategic metropolitan centre. It carries a mix of general and commercial traffic, serving various activity centres including Canning Bridge and Booragoon. East of Kwinana Freeway, Canning Highway is constructed to 4-lane undivided standard and is planned to a 6-lane divided standard to the Victoria Park transfer station, including dedicated bus lanes. 2050 modelling suggests these lanes are not required as bus lanes. West of the freeway, Canning Highway is constructed to 4-lane divided standard to Preston Point Road, and 4-lane undivided standard to Fremantle.

Planning for the Canning Highway between Kwinana Freeway and Riseley Street has been recently reviewed, allowing for duck-and-divide grade separation at Sleat Road, Reynolds Road and Riseley Street. The review provides four centre lanes for through traffic and four adjacent lanes for local traffic, which will be implemented by 2050. West of Riseley Street is planned to 4-lane standard with bus priority at major intersections.

The transport plan has identified the requirement for bus priority along key corridors that connect a high number of transit passengers to activity centres and key destinations. Priority will be given to those major routes connecting to and from the heavy rail network. A High Priority Public Transit Corridor is planned along Canning Highway between North Lake Road and Canning Bridge.

### Canning Bridge Structure Plan (CBSP), Integrated Transport Strategy (August 2014)

The Integrated Transport Strategy completed in August 2014 considered the regional growth in the Perth Metropolitan Region

with 3.5 million people planned by 2050. Forecast regional movements through the area to 2031 were identified, as shown in adjacent figure, and confirm significant regional traffic flow will continue to impact the CBSP area.

Regional modelling indicates that the area may experience an increase in regional flows in the order of 36% to 2031, irrespective of the implementation of the CBSP.

Mode share targets for the CBSP were proposed as part of the Transport Strategy for 2031 and 2050 to reduce demand on the regional road network.

An action plan was developed as part of the Transport Strategy to support the CSBP and also mode share targets. The action plan was for:

- Critical zero to 10 years
- Medium term 11 to 20 years
- Long term beyond 16+ years

The action plan is provided in Appendix A of the CBSP Integrated Transport Strategy report.

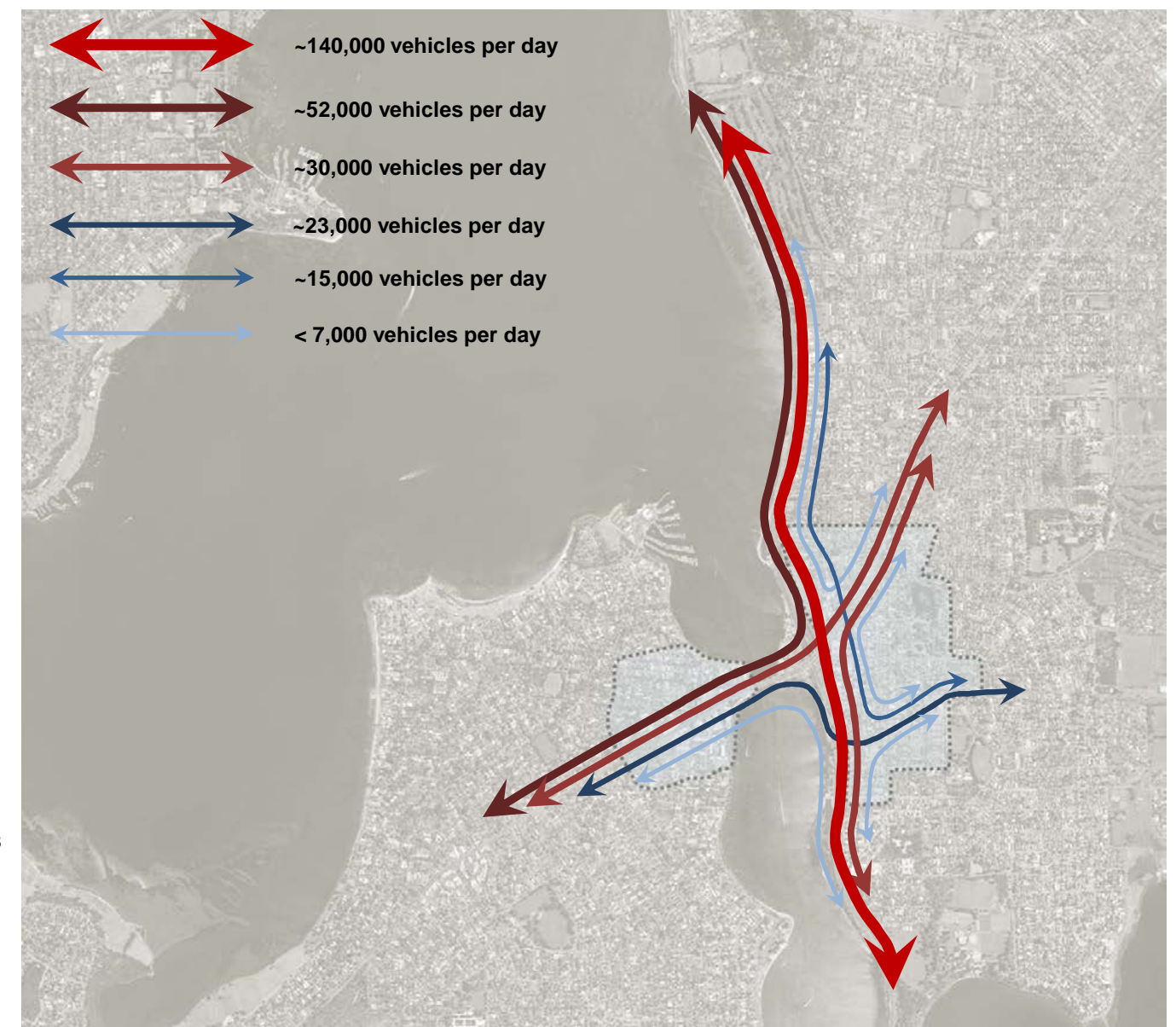


Fig. 24 Indicative 2031 regional transport flows within CBACP area (CBSP Integrated Transport Strategy 2014)



**Existing Paramics Model Network**

Previous Paramics modelling has been undertaken for some intersection scenarios with Canning Highway. figure to the right shows the intersections within the model.



**Fig. 25 Intersections within Paramics model**



Local traffic data, Applecross

The City of Melville has provided base traffic volumes as shown in Table 2.

Daily traffic volumes in Kintail Road (Distributor B) are currently in excess of 8000 vehicles per day (vpd) and confirm the importance of this road for access through the precinct and to the Canning Highway. Sleat Road and Forbes Road each carry in excess of 4000 vpd reflecting their key function for access to and from Canning Highway. Similarly Sleat Road and The Esplanade (Local Distributor) to the south of Canning Highway (greater than 4000 vpd) provide important connections into and through the area.

Main Roads WA's *'Road Hierarchy for Western Australia Road Types and Criteria'* indicates anticipated daily volumes of 6000 vpd on a District Distributor B, 6000 vpd on a Local Distributor and 3000 vpd on an Access Road. Kintail Road currently carries traffic volumes in excess of the anticipated threshold for a District Distributor B Road, indicating external through traffic is using this road. Daily volumes in Sleat Road and Forbes Road (Access Roads) are also higher than the anticipated threshold of 3000 vpd.

It is anticipated that future upgrade to Canning Highway as planned by Main Roads WA will influence through traffic demand to the area.

Table 2 Base daily traffic volumes

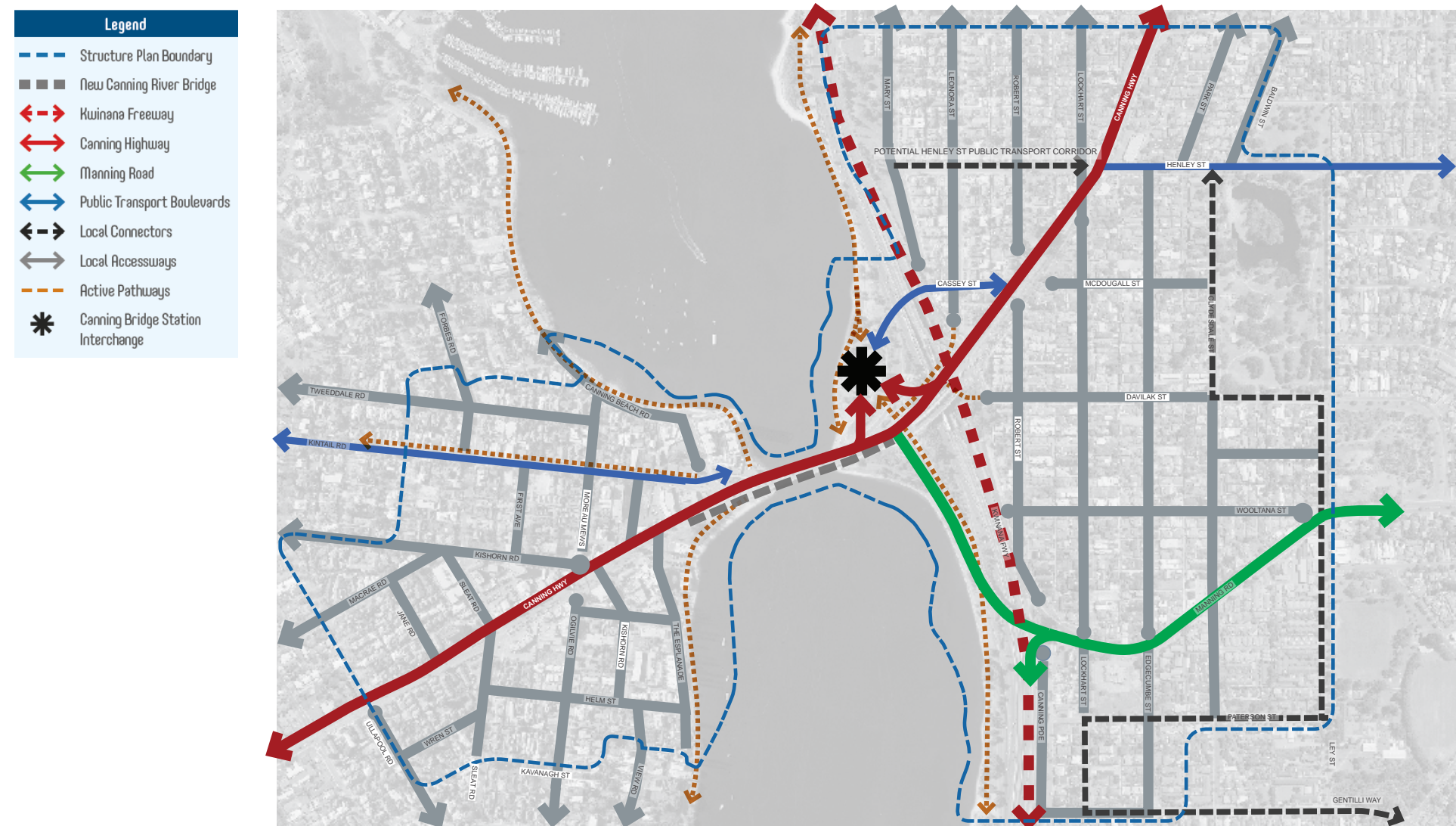
Road	Base Volume	Year
North of Canning Highway		
Canning Beach Road (South of Moreau Mews)	3282	2012
Canning Beach Road (North of Kintail Road)	3335	2012
Kintail Road (West of Canning Bridge Rd)	8226	2016
Kintail Road (West of Moreau Mews)	8186	2016
First Ave	415	2012
Sleat Road (North of Canning Highway)	4308	2012
Kishorn Road (East of Forbes Road)	749	2016
Tweeddale Road (West of Moreau Road)	643	2012
Moreau Mews (South of Kintail Rd)	1407	2012
Forbes Road (North of Kishorn Road)	4222	2012
Moreau Mews (South of Tweeddale)	837	2012
South of Canning Highway		
The Esplanade (South of Canning Highway)	4517	2014
Kishorn Road (South of Canning Highway)	502	2012
Ogilvie Road (South of Canning Highway)	1180	2004
Sleat Road (South of Canning Highway)	4517	2014
Helm Street (East of Sleat Road)	2486	2012
Helm Street (West of The Esplanade)	2289	2013



## Stakeholder views

GHD's transport team have liaised with the City of Melville, Public Transport Authority and Main Roads WA to confirm current proposals for transport that may impact the CBACP (adjacent figure shows the CBACP movement hierarchy) as well as discuss ideas from the study team. A number of proposals and cross sections were discussed as input to the study. Main Roads have provided their long terms plans for Canning Highway and identified planning control areas along Sleat Road and Kintail Road.

Full details of discussions are shown in Appendix A.



**Fig. 26 CBACP Movement Hierarchy**



Current safety issues

The road network within the CBACP has been assessed to identify any safety issues that may focus or influence proposed traffic/transport measures.

The crash summary in Table 3 indicates a significant safety issue at the Canning Beach Road/ Kintail Road intersection, confirming the need to improve the operation of this intersection.

Major signalised intersections with Canning Highway are identified as having a large number of crashes, typically rear end collisions.

Of the internal intersections examined, Kintail Road/Forbes Road roundabout has the highest number of reported crashes with 12 in five years. The east-west/ north-south collisions could be influenced by the poor sight distance to the west for southbound traffic.

Table 3 Crash summary at key locations within the CBACP area

Location	Intersection Type	Reported Crashed (January 2011 to December 2015)	Comment
Kintail Road/Canning Beach Road	Signalised intersection	47 (4 Hospitalisation, 7 Medical, 30 PDO Major, 6 PDO Minor)	A high proportion involve northbound traffic colliding with traffic turning right from Kintail Road.
Canning Beach Road/Canning Highway	(Signals)	76, (1 Hospitalisation, 11 Medical, 37 PDO Major, 27 PDO Minor)	46 (60%) rear end collisions involving eastbound traffic on Canning Highway colliding with traffic at the traffic signals.
Sleat Road/Canning Highway	(Signals)	46 (1 Hospitalisation, 13 Medical, 34 PDO Major, 28 PDO Minor)	A high proportion of crashes are rear end collisions on Canning Highway
Kintail Road/Moreau Mews	(Roundabout)	6 (1 Medical, 2 PDO Major, 3 PDO Minor)	Predominant patterns are rear end collisions.
Kintail Road/Forbes Road	(Roundabout)	12 (1 Hospitalisation, 2 Medical, 5 PDO Major, 4 PDO Minor)	5 right angle collisions.
Kintail Road/First Avenue	3 Way – Give way control	0	
Sleat Road/Kishorn Road/ Forbes Road	4 Way Intersection - Stop sign controlled	6 (1 PDO Major, 5 PDO Minor)	Right/through and right angle collisions.
Moreau Mews/Canning Beach Road	3 Way – Give way control	3 (2 Medical, 1 PDO Major)	Right angle and sideswipe.
Moreau Mews/Tweeddale Road	3 Way - Uncontrolled	0	
Kishorn Road/First Avenue	3 Way - Uncontrolled	0	
Tweeddale Road/Forbes Road)		2 (2 PDO Major)	
Sleat Road/Helm Street	3 Way - Give way control	4 (3 PDO Major, 1 PDO Minor)	Right angle, right turn from Helm Street colliding with through traffic on Sleat Road.
Helm Street/The Esplanade	3 Way - Give way control	0	



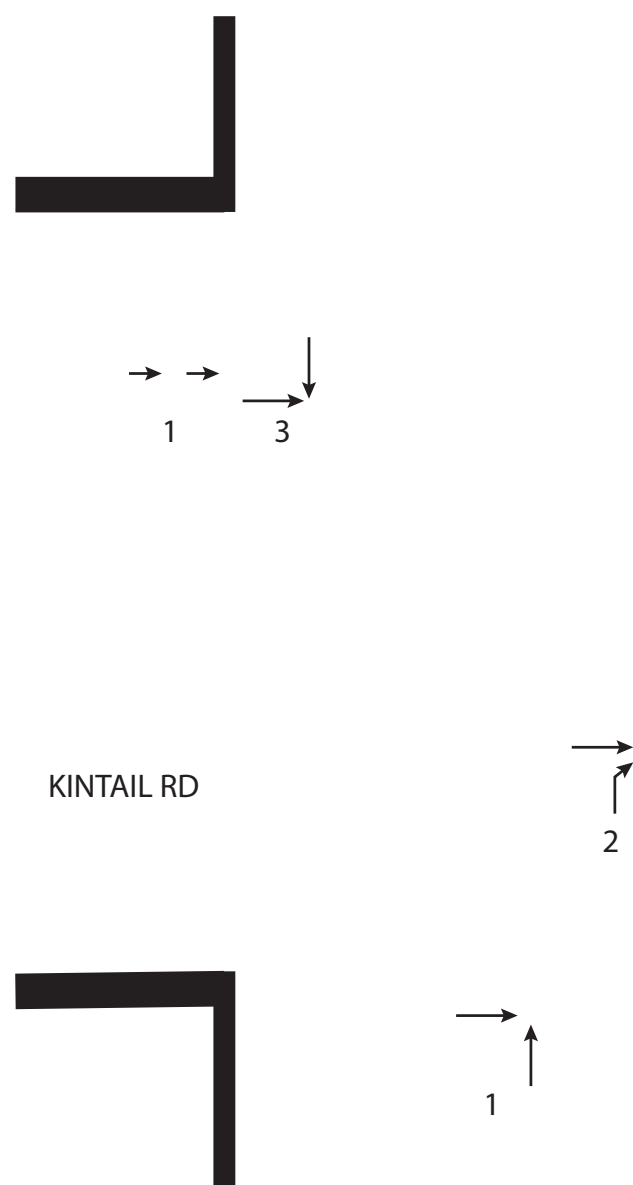


Fig. 27 Kintail Road/Forbes Road - Collision Diagram

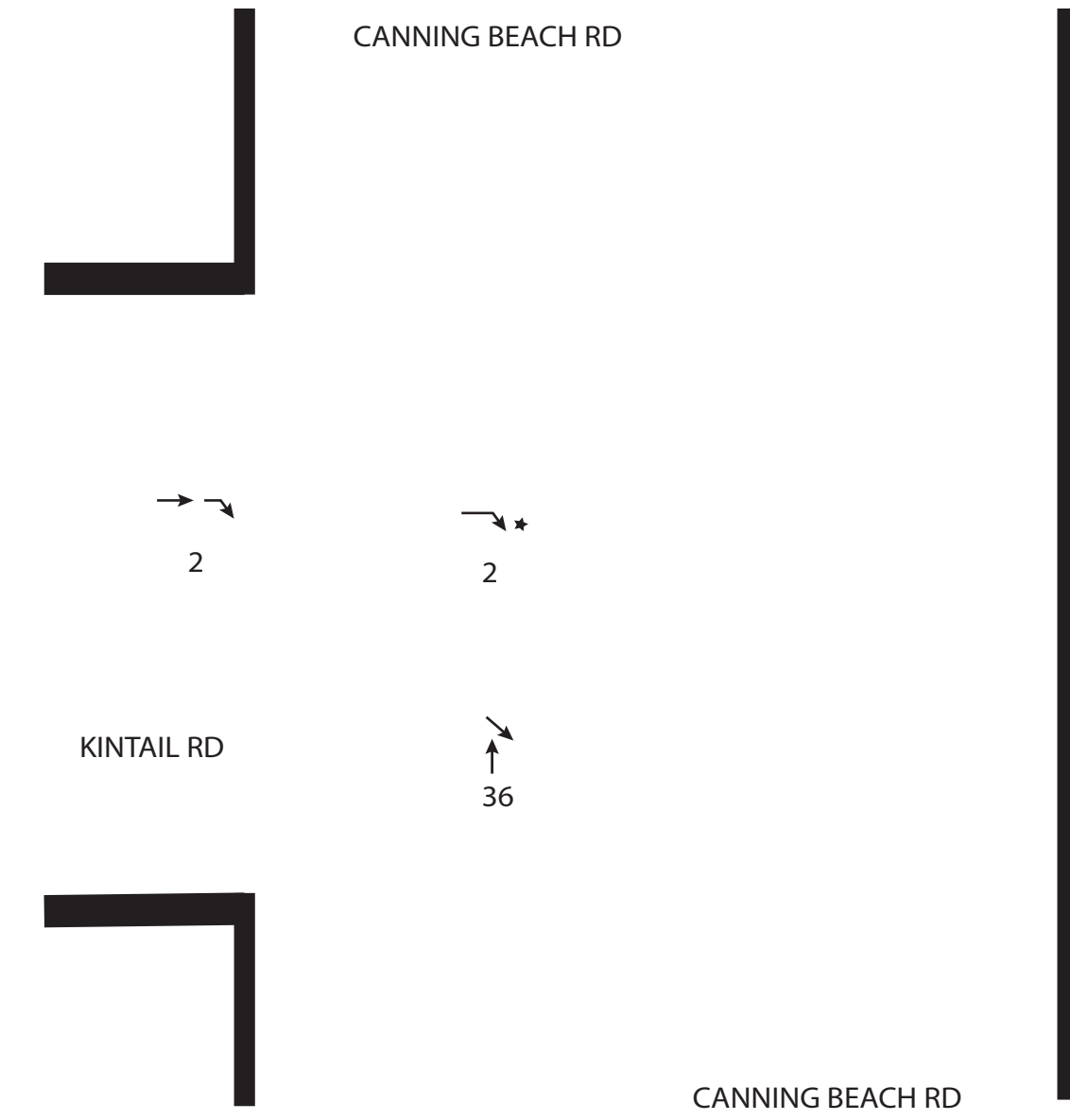


Fig. 28 Kintail Road/Canning Beach Road - Collision Diagram



Forecast traffic growth

The CBSP Integrated Transport Strategy forecasts private vehicle demand between 2011 and 2051 (Table 4) as shown in Figure 29.

The trips generated in 2011 have been factored to 2016 (21,956 vehicles per day) assuming 2% per annum.

All current data has been updated to 2016 where required using a 2% per annum growth factor.

Current volumes will include traffic generated by the CBSP area and other traffic from outside of the structure plan area. In order to establish the generated traffic within the structure plan area, trip rates have been applied and then compared with the traffic volumes crossing the screen line. The growth rate is then applied to the

precinct volume only. A nominal 1.5% per annum is applied to the other through traffic (based on historic growth and the likelihood that 2% per annum will not be sustained for 35 years).

A daily trip rate of nine vehicles (current zoning) per dwelling and 10 trips per 100 m<sup>2</sup> of commercial land use is applied to identify likely precinct volumes (see Fig. 30 for land use yields).

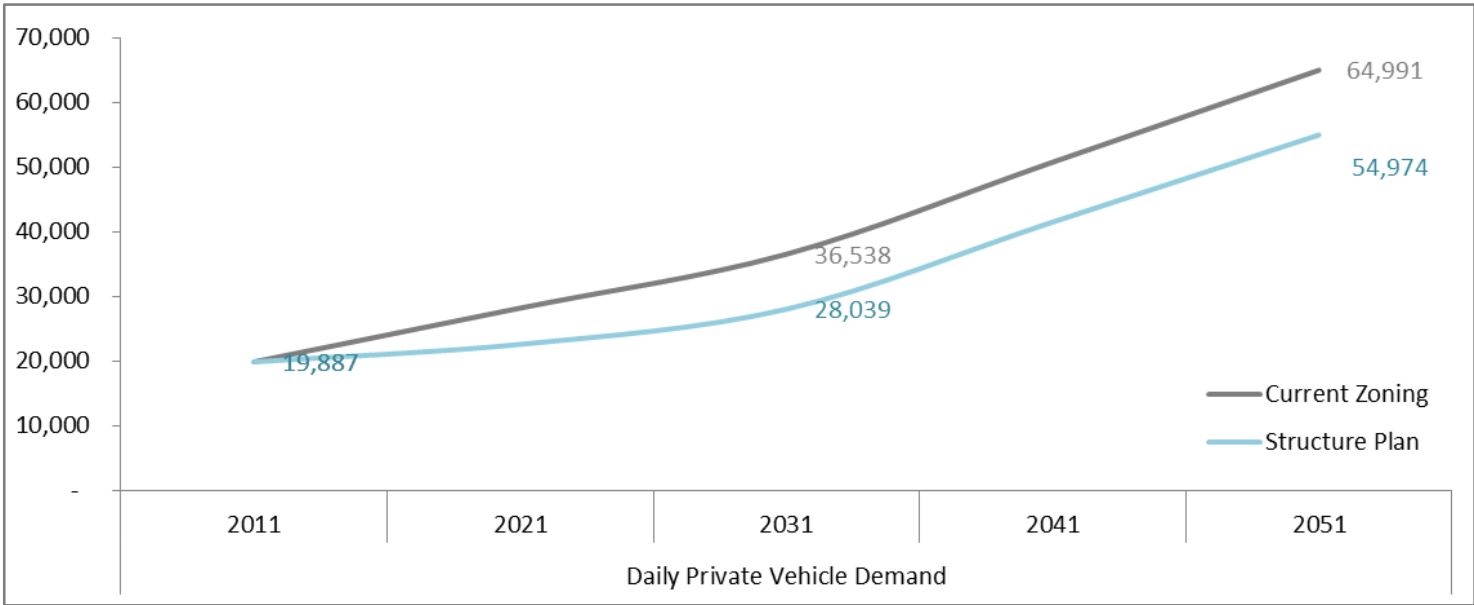


Fig. 29 Private vehicle demand - Current zoning vs implementation of Canning Bridge Structure Plan (CBSP Integrated Transport Strategy 2015)

Households (2011)		
	Dwellings	Population
Applecross	331	535
Mount Pleasant	256	476

Commercial Floorspace			
Manufacturing/processing	231	Office	25,232
Storage/distribution	200	Health/wellbeing	662
Service Industry	584	Entertainment	5041
Shop/retail	4714	Utilities	43
Other retail	710	Vacant	1206
TOTAL			38,623

Fig. 30 Lot yield of structure plan areas



Table 4 depicts the forecast traffic volumes on the local network including through traffic, assuming no road closures or changes.

The table indicates that traffic volumes in the precinct roads will continue to increase based on the assumed precinct growth to 2051 and assumed through traffic growth. The volumes indicated in Kintail Road and Sleat Road would confirm the requirements for upgrade to the major road network, specifically Canning Highway to alleviate pressure on the local roads caused by through traffic. Forecast traffic on Sleat Road south of Canning Highway is also forecast to increase significantly and will require broader measures to reduce through traffic.

It should be acknowledged that traffic patterns will change significantly when the future ultimate upgrade of Canning Highway is implemented and access to Kintail Road and Canning Beach Road from Canning Highway is removed. The impacts of this has not been modelled as part of this study.

On the facing page are diagrams illustrating the current daily traffic volumes and forecast daily traffic volumes (2051).

**Table 4 Existing and forecast traffic volumes 2051**

Road	Base Volume	Year	2016 Volume (vpd)	% Precinct Traffic	Precinct Traffic (vpd)	Precinct Traffic Factored to 2051 (vpd)	% Other Traffic	Other Traffic (vpd) 2016	Other traffic factored to 2051	Total (vpd)
North of Canning Highway										
Canning Beach Road (South of Moreau Mews)	3282	2012	3553	19.25%	684	1709	80.75%	2869	4820	6529
Canning Beach Road (North of Kintail Road)	3335	2012	3610	19.25%	695	1737	80.75%	2915	4897	6634
Kintail Road (West of Canning Bridge Rd)	8226	2016	8226	19.25%	1583	3958	80.75%	6643	11160	15118
Kintail Road (West of Moreau Mews)	8186	2016	8186	19.25%	1575	3939	80.75%	6611	11106	15044
First Ave	415	2012	449	19.25%	86	216	80.75%	363	609	826
Sleat Road (North of Canning Highway)	4308	2012	4663	19.25%	897	2244	80.75%	3766	6326	8570
Kishorn Road (East of Forbes Road)	749	2016	749	19.25%	144	360	80.75%	605	1016	1377
Tweeddale Road (West of Moreau Rd)	643	2012	696	19.25%	134	335	80.75%	562	944	1279
Moreau Mews (South of Kintail Rd)	1407	2012	1523	19.25%	293	733	80.75%	1230	2066	2799
Forbes Road (North of Kishorn Road)	4222	2012	4570	19.25%	880	2199	80.75%	3690	6200	8399
Moreau Mews (South of Tweeddale)	837	2012	906	19.25%	174	436	80.75%	732	1229	1665
South of Canning Highway										
The Esplanade (South of Canning Highway)	4517	2014	4699	26.26%	1234	3085	73.74%	3465	5822	8907
Kishorn Road (South of Canning Highway)	502	2012	543	26.26%	143	357	73.74%	401	673	1030
Ogilvie Road (South of Canning Highway)	1180	2004	1496	26.26%	393	982	73.74%	1103	1853	2835
Sleat Road (South of Canning Highway)	4517	2014	4699	26.26%	1234	3085	73.74%	3465	5822	8907
Helm Street (East of Sleat Road)	2486	2012	2691	26.26%	707	1767	73.74%	1984	3334	5100
Helm Street (West of The Esplanade)	2289	2013	2429	26.26%	638	1595	73.74%	1791	3009	4604





Fig. 31 Existing traffic volumes



Fig. 32 Forecast traffic volumes 2051 (indicative)



### Planned road hierarchy and capacity

Previous Paramics™ modelling has been undertaken for some intersection scenarios with Canning Highway, however there are no plots of forecast volumes on the CBACP road network available. A scenario preventing access from Canning Highway to Canning Beach Road has been modelled utilising existing volumes and the results indicate improvements to the level of service and delay at the Canning Highway/Kintail Road/Canning Beach Road intersection with little impacts at the Canning Highway/Sleat Road intersection.

It is recommended that the modified Canning Highway/Canning Beach Road intersection be supported. In addition, the Paramics modelling should be updated to include the CBACP network to confirm likely forecast volumes for 2031 taking into account Main Roads WA data.

The figure to the right identifies the current road hierarchy. All roads within the masterplan area have a speed limit of 50 km/h.

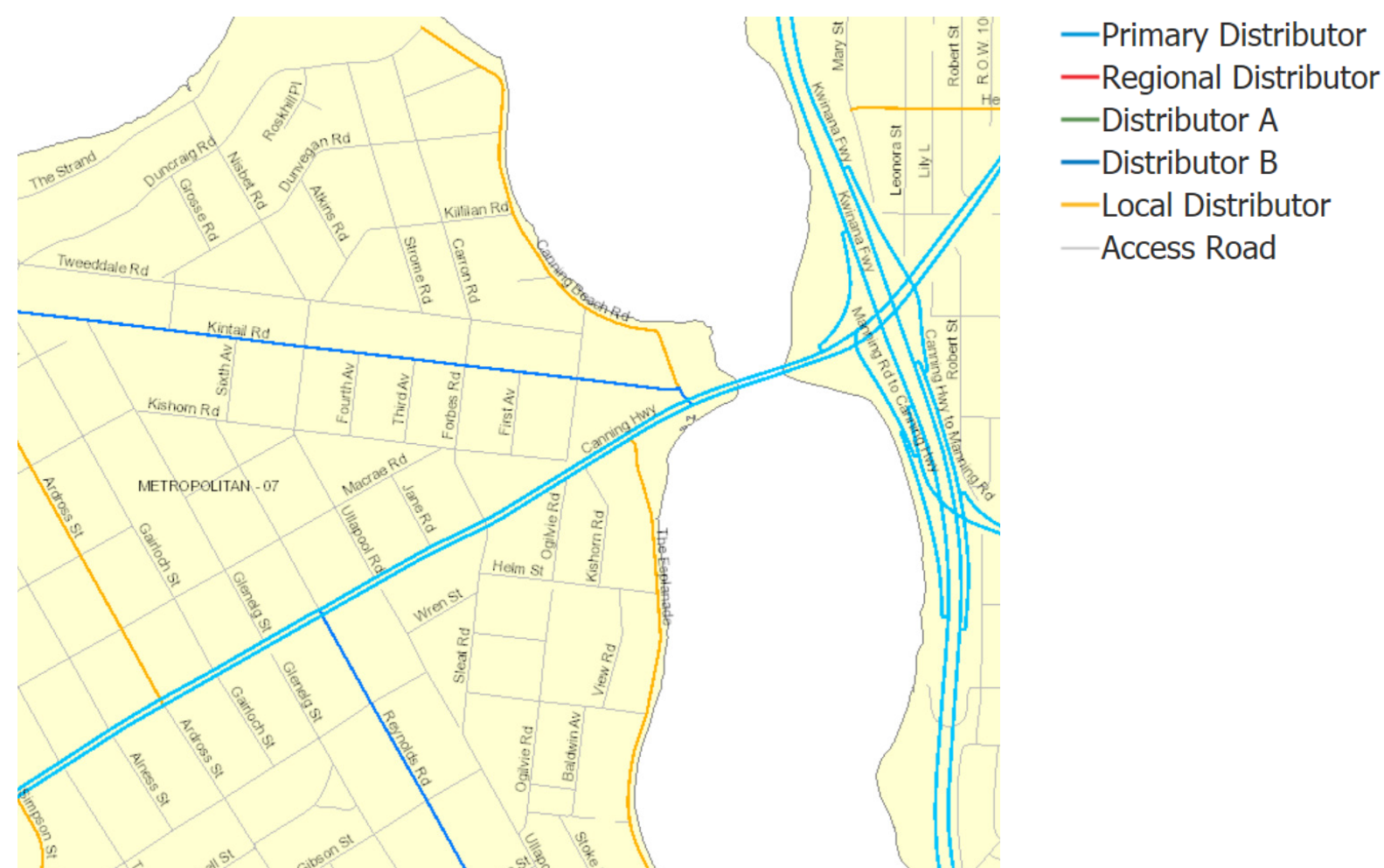
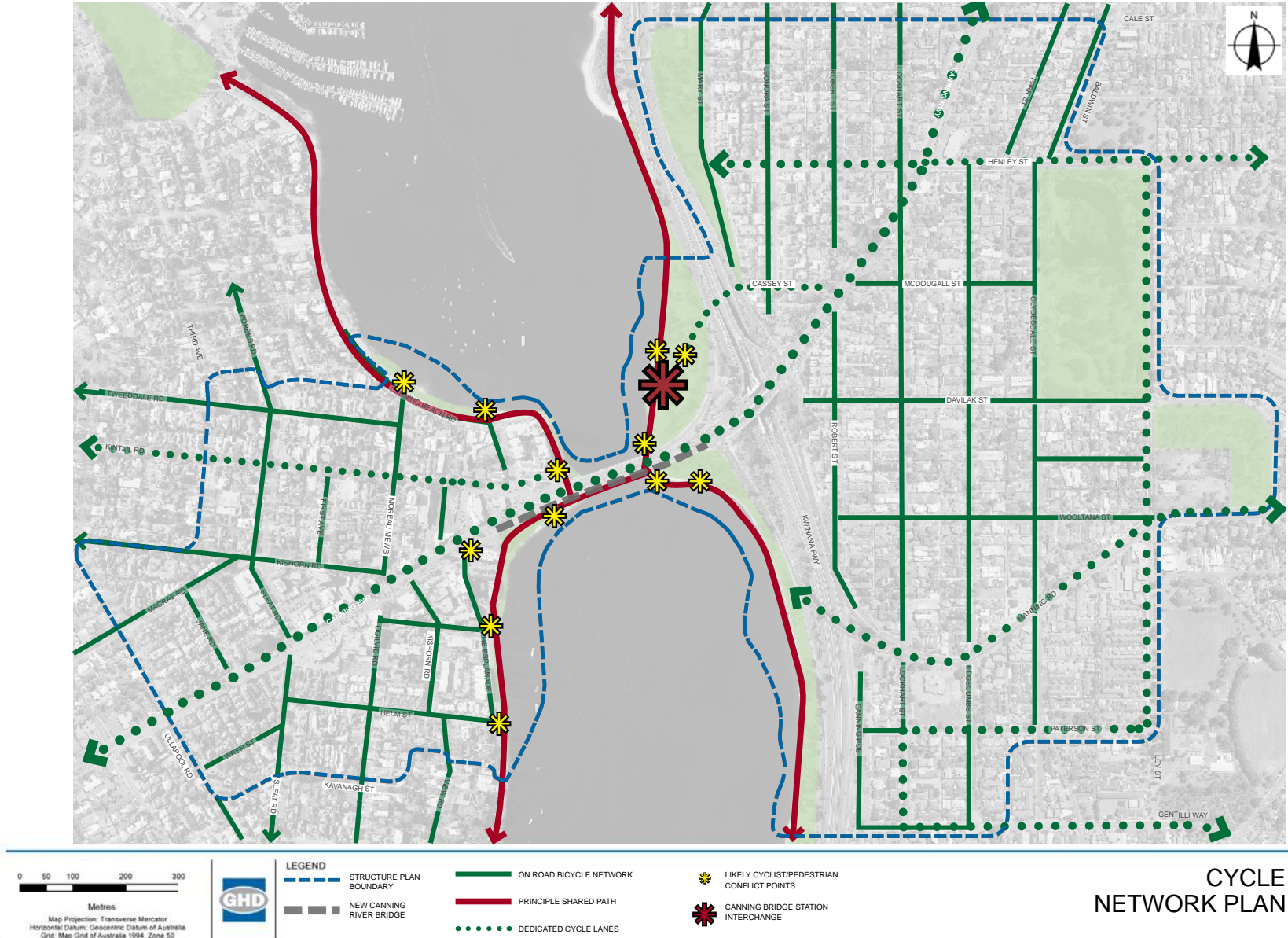


Fig. 33 Current road hierarchy (<https://mrapps.mainroads.wa.gov.au/publicmaps/rim>)



This figure details the planned cycle network as part of the CBSP Integrated Transport Strategy.



**Fig. 34 Planned cycling network (CBPS Integrated Transport Strategy 2015)**





## 3.1 Purpose

### Purpose of this section

The purpose of this section is to create a guiding framework for delivering a high quality public realm design that is responsive to the anticipated growth of Canning Bridge. It will provide guidance on spatial arrangements of streetscape and public open space, locate key features, as well as provide recommendations for material, furniture and vegetation selections.

The specific elements covered in this section are:

- The vision;
- The design principles;
- The masterplan;
- The movement strategy; and
- The guidelines to delivering the masterplan



## 3.2 Vision

### The Canning Bridge Precinct Vision Statement

The Canning Bridge precinct will evolve to become a **unique, vibrant, creative community** centred on the integrated transport node of the Canning Bridge rail station. The precinct will be recognised by its **unique location**, its integrated mix of office, retail, residential, recreational and cultural uses that create areas of excitement, the promotion of its **local heritage** and as a **pedestrian friendly** precinct that **integrates** with regional transport networks whilst **enhancing** the **natural attractions** of the Swan and Canning Rivers. (CBACP)





# 3.3 Design Principles

*“First life, then spaces, then buildings: the other way around never works” - Jan Gehl*

## Design Principles

The Masterplan is an integration of:

- 1

A thorough understanding of the site.

The layering of natural, cultural and social features of the study area provides clarity about the major influences that have shaped the site.

This includes environmental factors, open space, transport and the location of community facilities.
- 2

An understanding of the current strategic planning framework.

  - Local Planning Scheme
  - Canning Bridge Activity Centre Plan
- 3

The vision to create a liveable and sustainable place for people through integration of design excellence.

  - Liveable Neighbourhoods (Draft 2015) by the Department of Planning
  - Creating Places for People: An Urban Design Protocol for Australians Cities (November 2011)

The urban design principles that underpin the masterplan are listed adjacent.

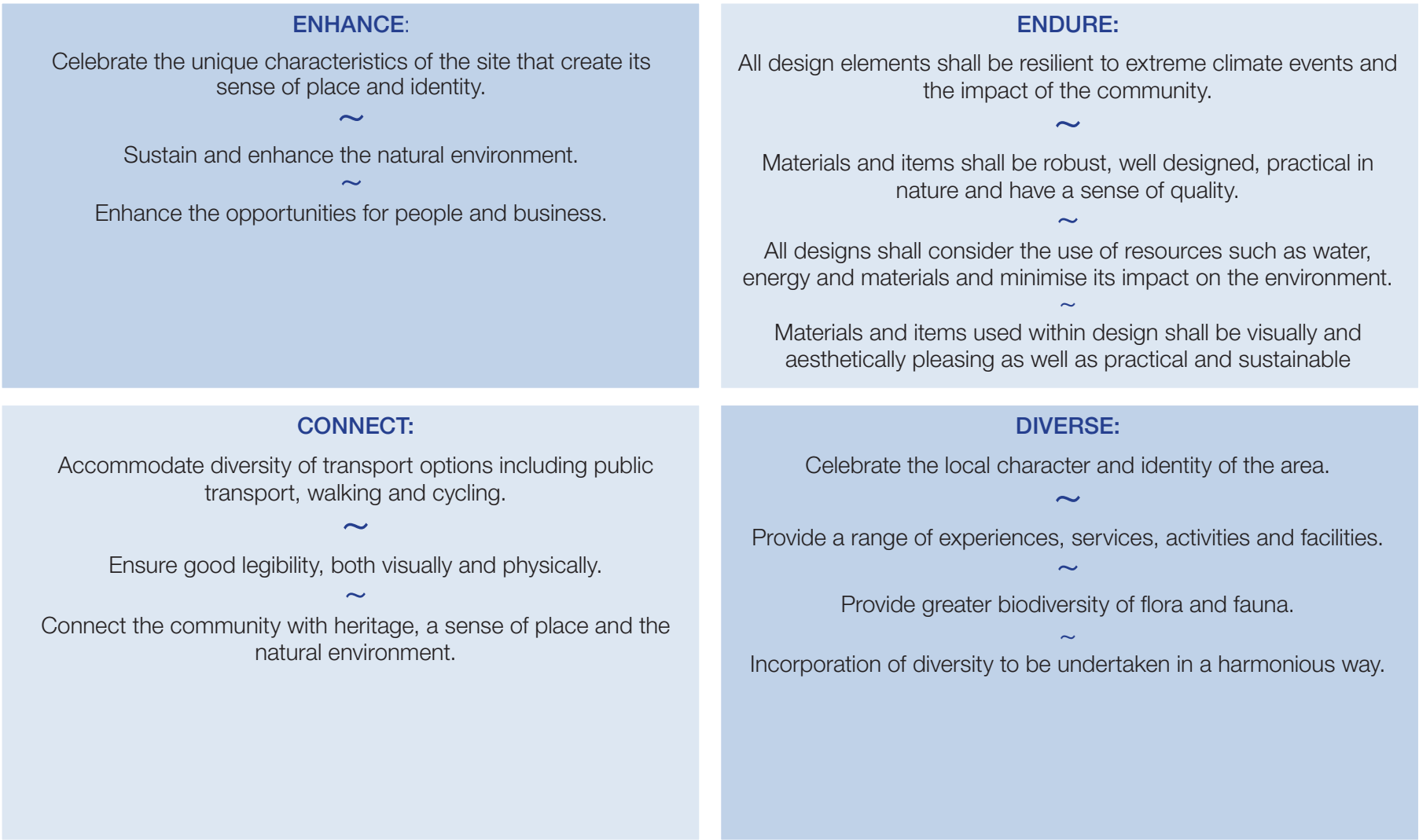






Fig. 35 Rendered master plan



# 3.4 Movement Strategy



## Movement -Walking

Walking is the priority mode of transport around Canning Bridge and the public realm has been designed to encourage and support pedestrians.

This is because walking promotes:

- Improved health
- Social interactions
- Safer communities
- Activated streets and places

Key features that will be implemented to encourage walking are:

- Increase provision of shelter and shade for more comfortable and safer environments
- Traffic calmed streets with generous footpaths and upgraded high quality materials with level surface treatments in key areas
- Upgraded pedestrian bridge over Canning Highway with weather protection and DDA accessibility
- Activated linkages that provide interest with public art and views for a more enjoyable experience
- Improved connectivity with the majority of the area within a 1000m or 15 minute walk to the train station
- Provision of seating, water stations and other amenities throughout the area especially in public open spaces
- An inclusive public realm which complies with AS 1428 (where practicable)



## Movement - Cycling

Cycling is a preferred mode of transport around the Canning Bridge area and the public realm has been designed to encourage and support cyclists.

Cycling is a sustainable mode of transport that can provide access to, from and around the site and requires minimal road and parking space and improves health.

Key features that will be implemented to encourage cycling are:

- All verges will incorporate a shared zone for cyclists and pedestrians
- Shared and/or dedicated cycleway along the riverfront that connects into the regional network
- Provision of facilities in key locations for maintenance stations with air pumps and tools for changing tires etc
- Bicycle parking will be provided throughout the study area with extra provision in plaza and public space areas of sheltered or covered parking.
- End of trip facilities will be incorporated into all office buildings and provision for secure cycle parking will be made in all residential developments.

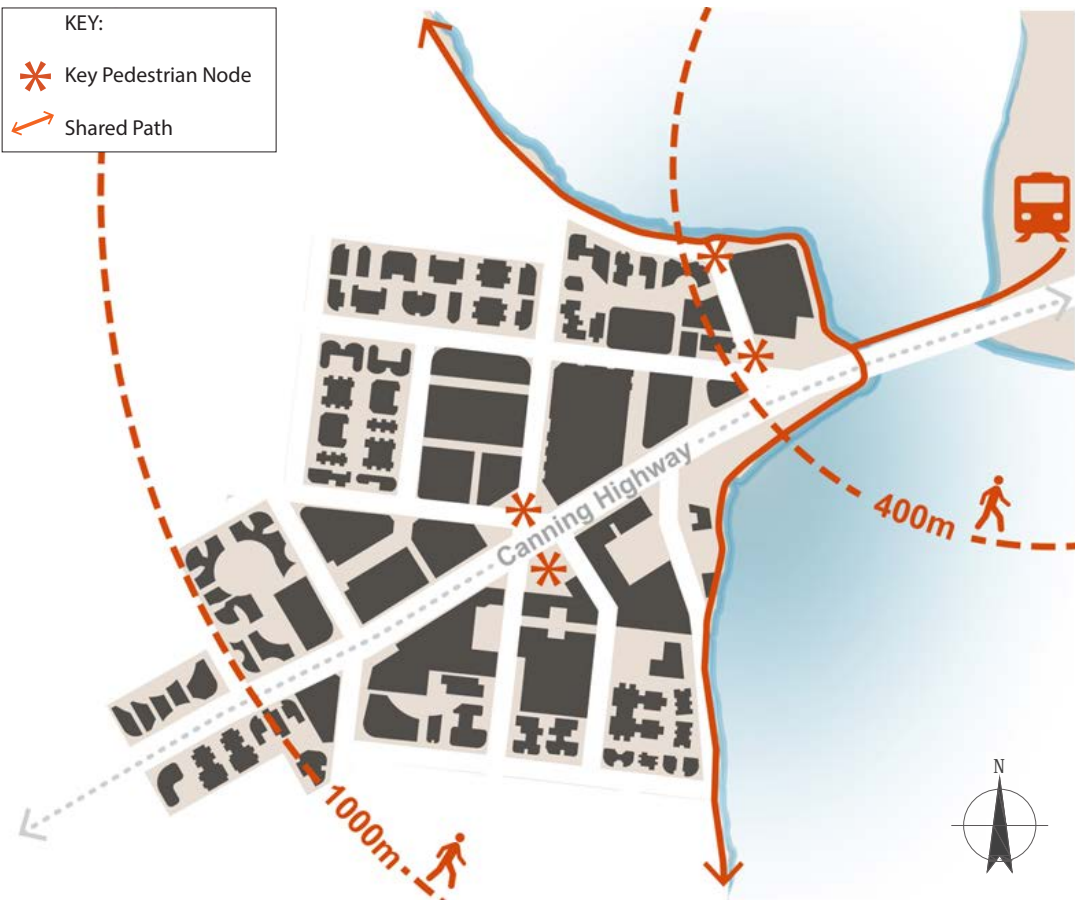


Fig. 36 Walking Network Diagram

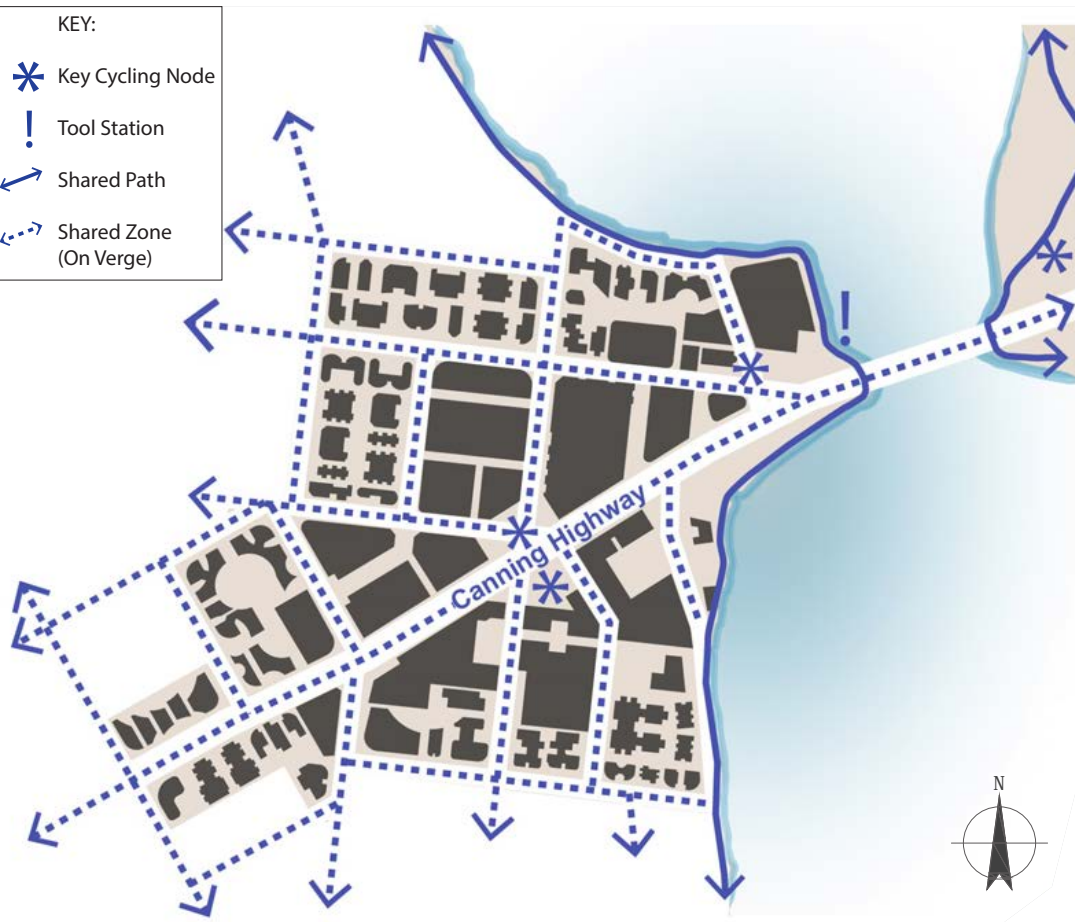


Fig. 37 Cycling Network Diagram



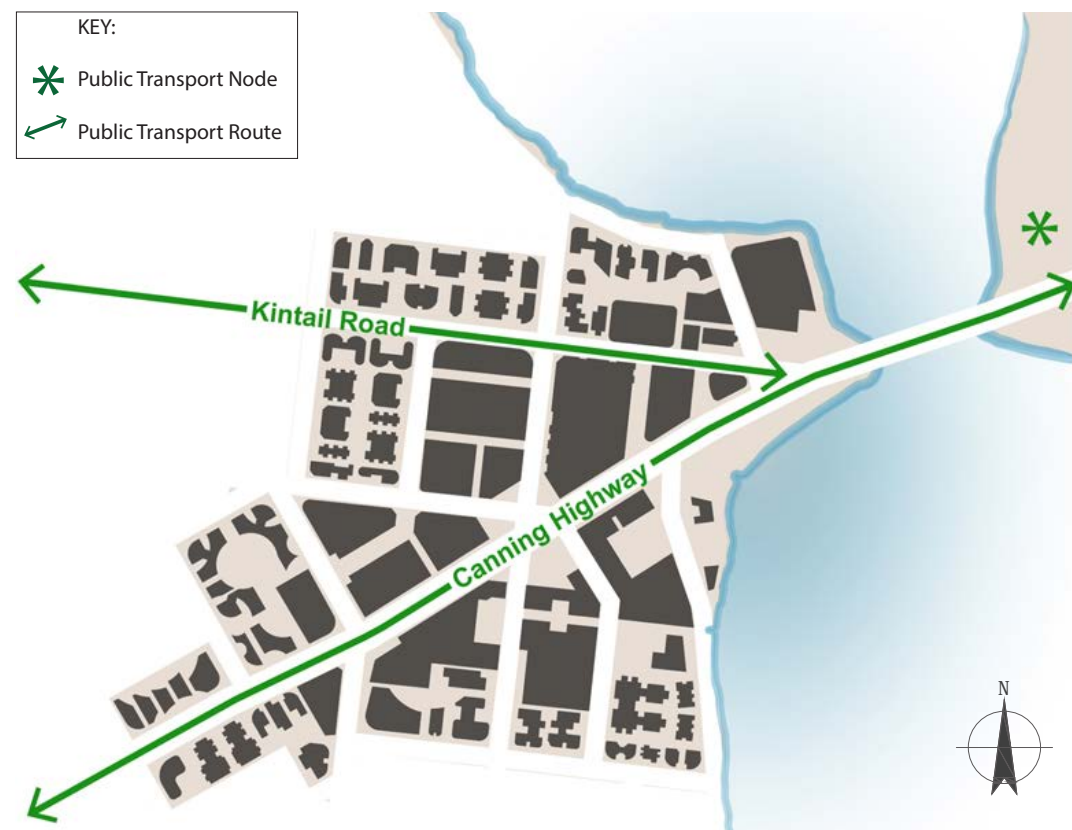


Fig. 38 Public Transport Network Diagram

### Movement -Public Transport

The Canning Bridge area is reliant on quality public transport access and facilities. Public transport provides fast and efficient transport to regional and other local centres for commuters, residents and visitors. Increased patronage of public transport reduces congestion, reduces emissions, increases social interactions and provide some incidental exercise for patrons.



Key features that are included in the masterplan to promote public transport use are:

- A major dedicated bus route along Kintail Road and Canning Highway which will improve reliability and efficiency
- Increased frequency of bus and rail services
- All bus stops will have seating and shelters for passenger comfort while waiting
- All bus stops and their surrounding area will be well lit for safety. Bus stops should be positioned close to street lights where practicable. Where this is not achievable, then additional lights should be installed
- An upgrade of old Canning Bridge to provide a desirable link pedestrians and cyclists to the relocated Canning Bridge train station
- The most intensive development is planned within an 1000m or 15-minute walk to the train station
- Provision of cycle racks and lockers at key bus stops and train station locations

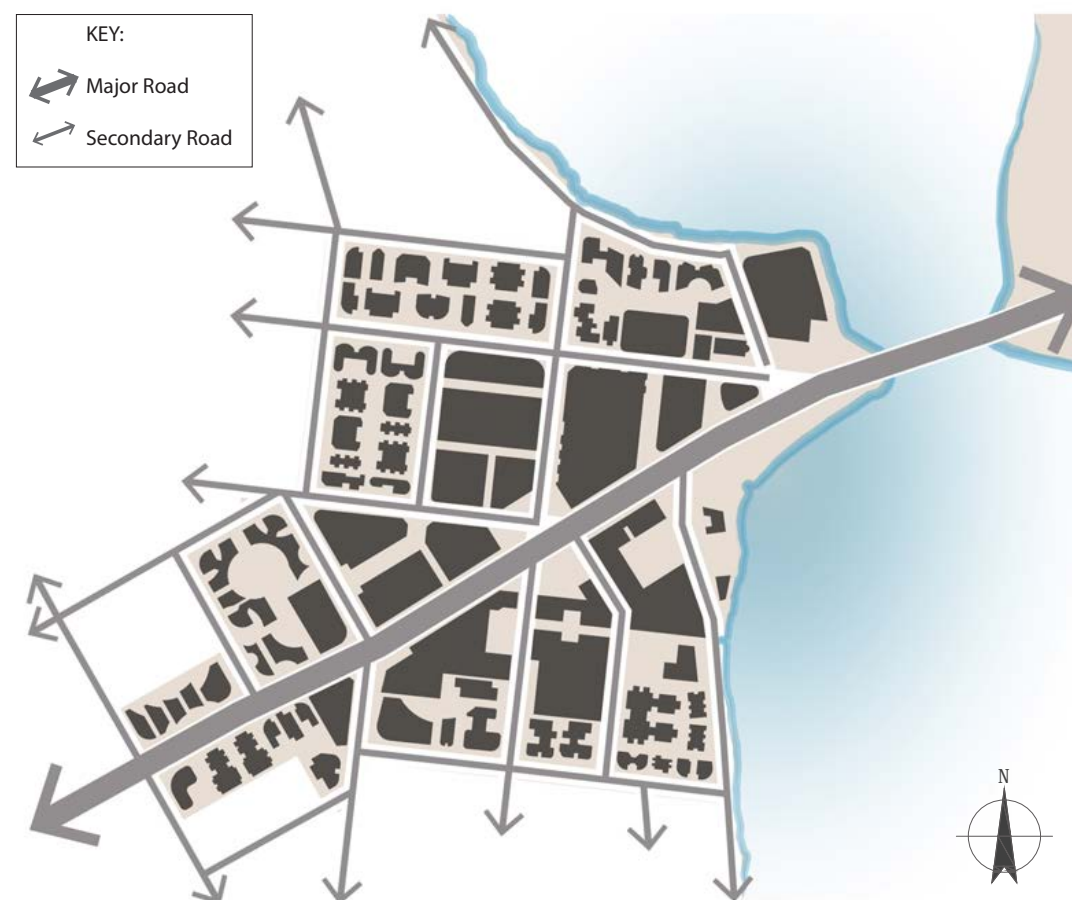


Fig. 39 Private Vehicle Network Diagram

### Movement - Private Vehicle

The use of private vehicles is generally discouraged throughout the Canning Bridge area and the public realm will be designed to support this principle. Private vehicles increase congestion, clutter the street, increase air and noise pollution and discourage the number of people walking.



Key features that have been integrated into the masterplan to discourage the use of private transport are:

- Limiting parking opportunities
- Slower traffic calmed environments with narrower lanes
- Making walking, cycling and public transport usage more appealing
- Developing Sleat Road, Forbes Road and Canning Highway as major private vehicle routes to reduce the number of 'rat runners' through the area

*Note: The use of electric cars and scooters is supported with provision for charging points to be provided around the precinct.*



# 3.5 Masterplan Guidelines

## Introduction

The purpose of this section is to create a framework of guidelines for delivering a high quality public realm design that is responsive to the anticipated growth of Canning Bridge. It will provide guidance on spatial arrangements of the streets as well as material, furniture and vegetation selections.

The specific elements that will be covered are:

- Street hierarchy including cross sections and plans of each street typology
- Public open space
- Public art
- Colour strategy
- Vegetation including street trees, amenity planting and rain gardens
- Paving materials
- Furniture elements
- Lighting
- Water sensitive urban design (WSUD) and,
- Designing out crime (CPTED)

## Street Hierarchy

The following street hierarchy has been developed by combining the understanding of the Canning Bridge context and character with the aspirational masterplan vision and movement strategy.

Streetscapes make up the greater part of the public domain, and well-designed streets contribute significantly to the quality of the built environment. They also play a key role in the creation of sustainable communities and places where people want to live, work and play.

‘Liveable Neighbourhoods’ states that neighbourhoods should aim to:

*‘Create a permeable street network that prioritises pedestrians, cyclists and public transport and is integrated with surrounding land use’*

The following street typologies, as highlighted in the figure opposite, were used for the masterplan:

- Canning Highway
- Local Connector
- Public Transport Boulevard
- Local Accessway
- Waterfront Accessway

Canning Highway is the major arterial road that cuts through the site which provides the major access to and from Canning Bridge. As Canning Highway is a Main Roads WA asset only materials and vegetation have been suggested for this typology. Main Roads WA are developing a comprehensive design which includes significant land acquisition and a new bridge over Canning River.

The local connector joins with Canning Highway with a signalised intersection. It primarily provides for high volumes of private vehicles.

The public transport boulevard addresses the bus network and access to and from the network. It aims to integrate this function into the public realm.

Both the local connector and public transport boulevard have designated planning control areas with future widening proposed. To address this an interim and ultimate option have been provided for both.

The local accessways and waterfront access roads are slower speed environments that focus on prioritising pedestrians.



Fig. 40 Road Hierarchy and Existing Road Reserves Widths

### KEY:

- Site Extents
- Canning Highway (MRWA Details)
- Local Connector
- Public Transport Boulevard
- Local Accessway
- Water-front Accesway
- Active Pathway



*We go back to some street more often than to others.. maybe a street unlocks memories or offers expectation of something pleasant to be seen... streets are places of social and commercial encounter and exchange... a place to be comforted by the presence of others. – Great Streets by Allen B Jacobs*

### Street Typology Design Principles

The general design principles for the Canning Bridge Activity Centre are to create streets that:

- are naturally legible,
- promote walking, cycling and public transport use (in that order) while discouraging the use of private vehicles,
- are safe with traffic calming and natural surveillance,
- are activated and vibrant,
- provide an enjoyable pedestrian experience; and
- are a place for people to meet, gather and socially interact.
- and perform their required transport function.

To achieve this, generally all streets have a 2.5m minimum wide shared zone to accommodate cyclist and pedestrian. This is intended to be a low speed zone for local bicycle users only.

Verges have been designed to accommodate space for utility services, street trees, footpath, shared paths and landscaping at a minimum verge width of 4.3m

metres. Vegetation and street furniture (including light poles and traffic signs) are located in the verge, and not within footpaths/ shared use zones, but rather along the back of kerb.

Services are typically aligned with the property boundaries at a standard offset shown in the diagram to the right. To accommodate this service corridor, a 2.3m minimum zone set off the property boundary has been incorporated into all cross sections. This zone is free of furniture, trees, planting and creates clear paths for DDA access. The diagrams to the right show a typical service arrangement.

The follow pages show typical sections and plans to show how the crossing points, furniture, existing trees and parking could work with each other.

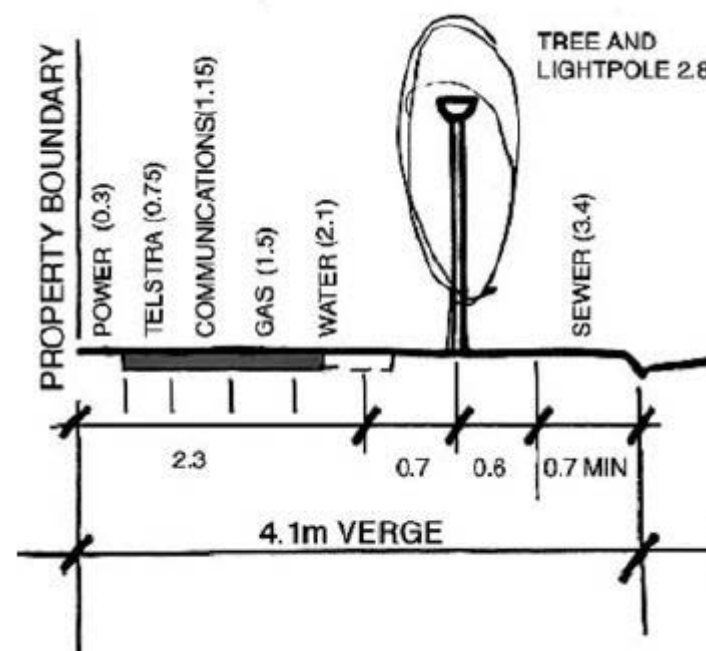
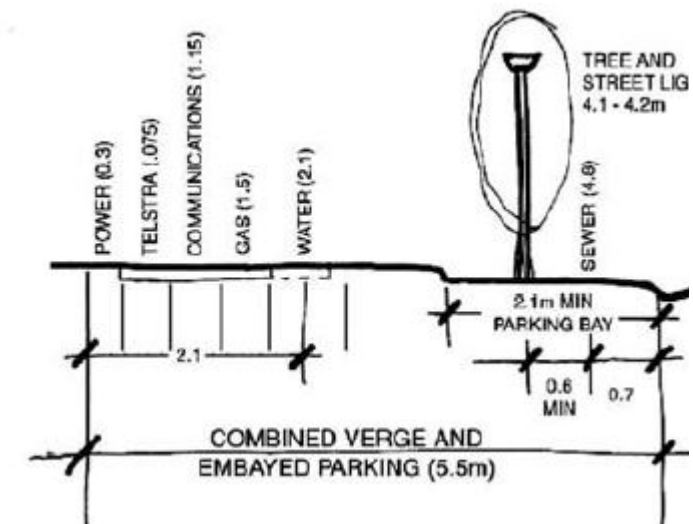


Fig. 41 Typical services arrangement in verge. (Liveable Neighbourhoods 2007)





# Local Connector - Interim

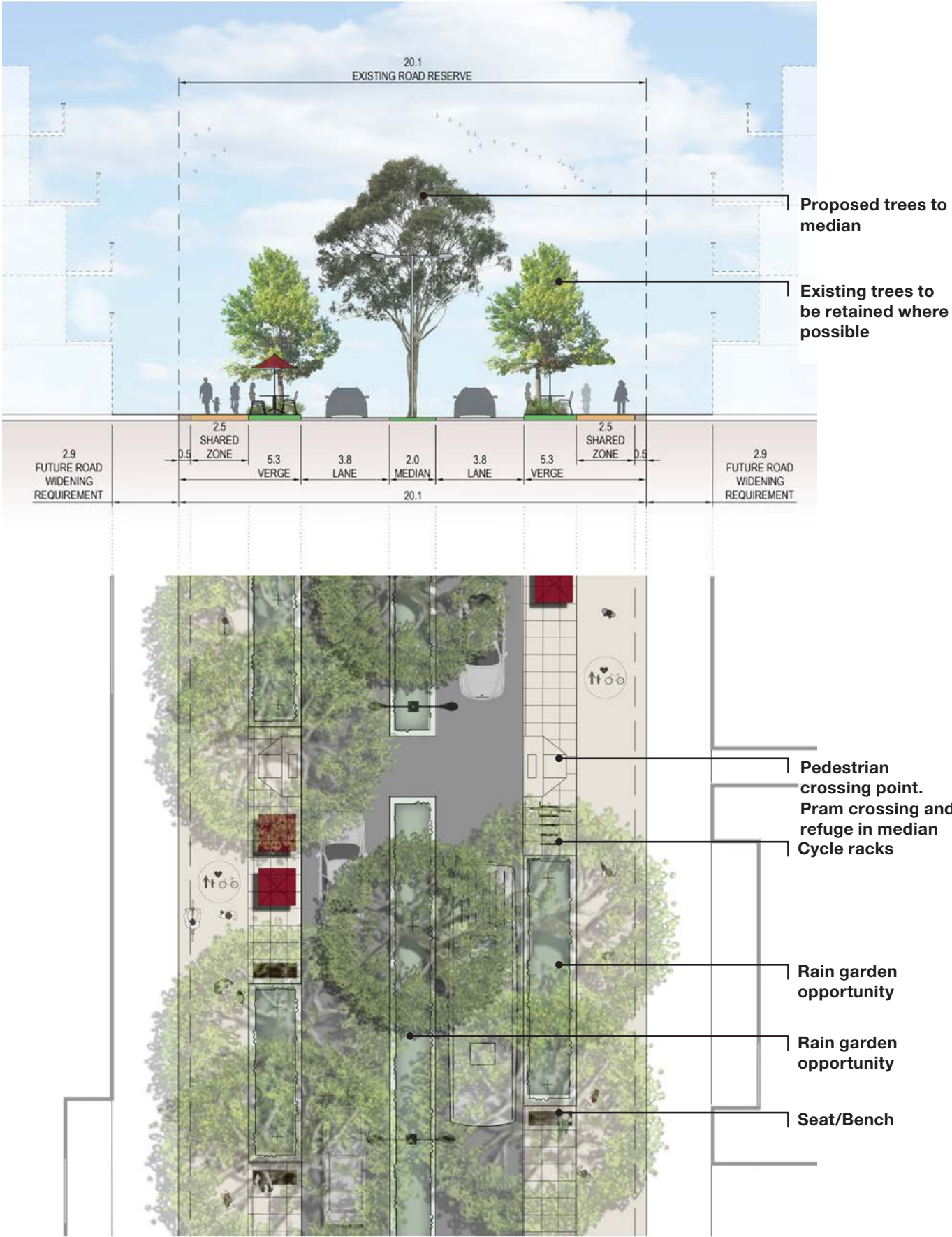
## Local Connector Interim (Sleat Road/Forbes Road)



**Description**

Local connectors will link local development areas to public transport boulevards, and facilitate pedestrian and cycling movements in the context of vehicle congestion. These links will also provide public transport and private vehicle access into the residential and commercial areas. These roads will provide prioritised pedestrian and cycle areas to encourage active transport into and out of the area. This section and plan is based on the current road reserve widths while future proofing for the MRWA Planning Control Area (refer to Appendix B).

- Key Features**
- Total verge width of 5.3m including:
    - » 2.3m parking, planting and furniture zone to back of kerb
    - » 2.5m shared zones which are low speed clear zones along the verge for both bicycles and pedestrians
    - » 0.5m buffer against building. Edge of shared zone should be delineated by trading markers such as recessed discs in the paving
    - » Note: A clearzone of 1.5m wide and 2.0m high is required against the building line for DDA compliance
  - Rain garden opportunities in median and back of kerb
  - Tree planting in median in preparation for the ultimate design
  - Existing street trees (Jacaranda mimosifolia) are considered high value and will be retained in the interim
  - Tree retention measures in accordance with AS4970 to be undertaken to protect and maintain high value street trees within development sites
  - Covered awnings should be provided where buildings abut property boundary. Minimum height clearance 2.2m in accordance with Austroad standards
  - Sleat Road (Canning Highway to Helm Street) – The interim cross section will remain as existing
  - Due to the high traffic volumes anticipated for this street a mid-block controlled pedestrian crossing is not considered appropriate. Pedestrians will be encouraged to cross at the dedicated crossings, intersections and pedestrian refuges





# Local Connector - Ultimate

## Local Connector Ultimate (Sleat Road/Forbes Road)

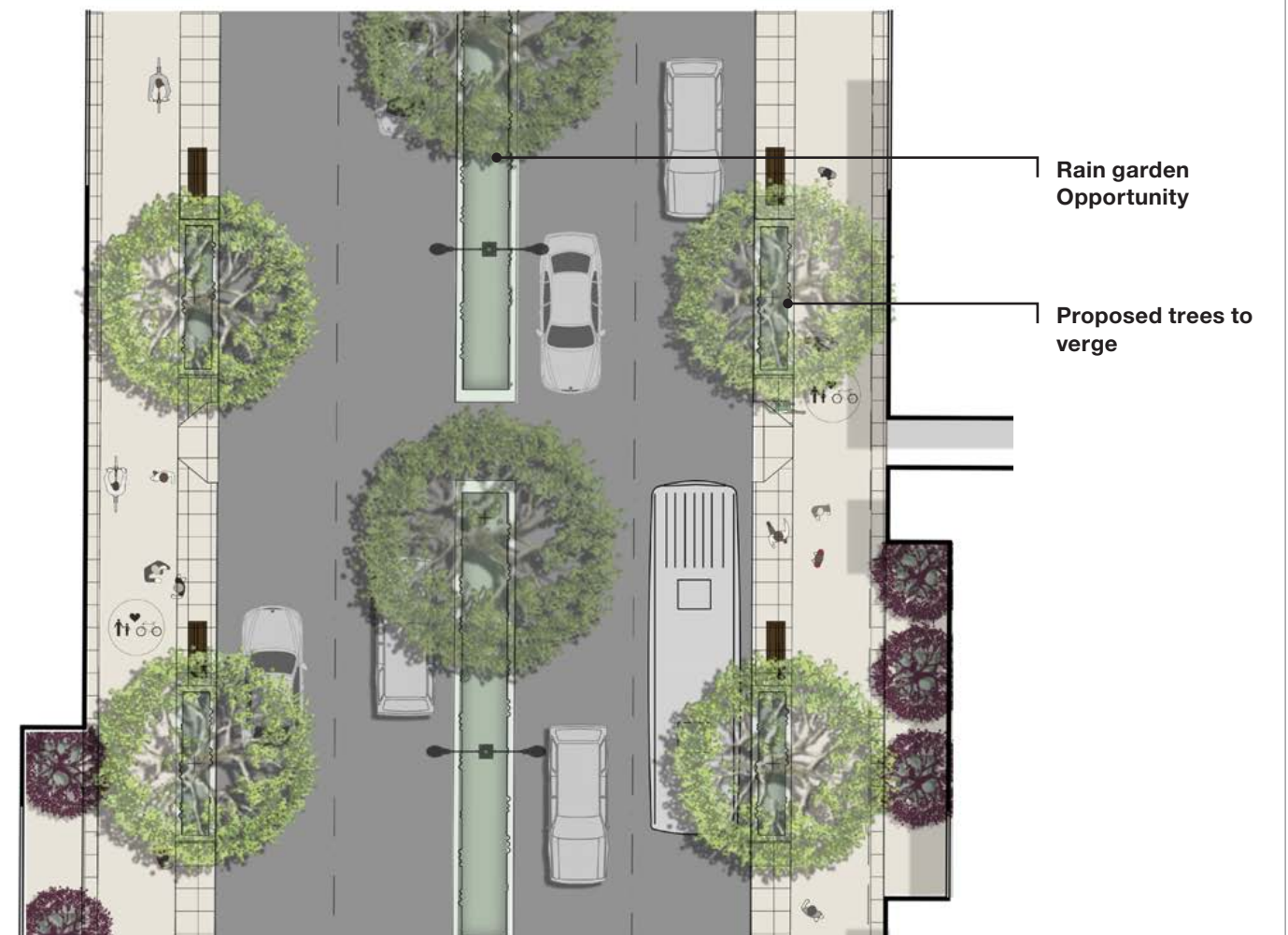
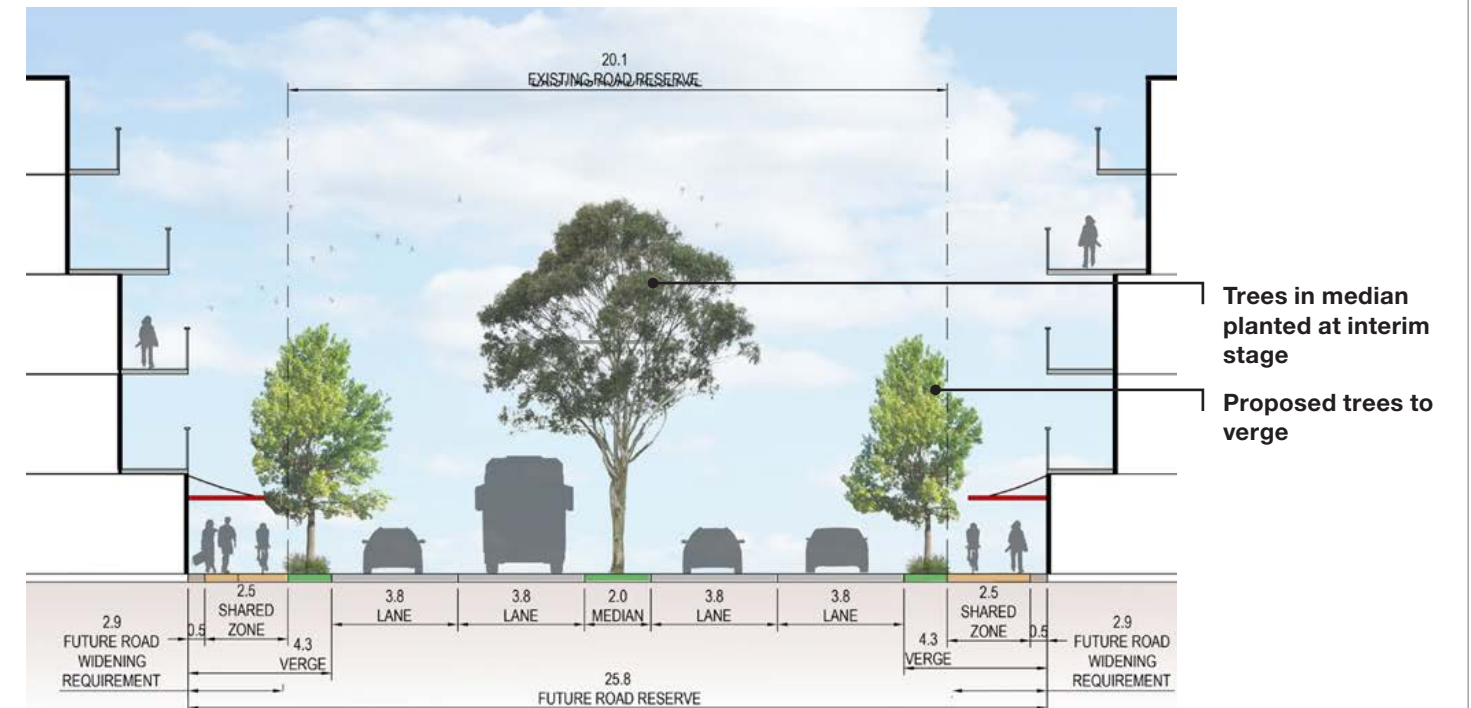


### Description

Local connectors will link local development areas to public transport boulevards, and facilitate pedestrian and cycling movements in the context of vehicle congestion. These links will also provide public transport and private vehicle access into the residential and commercial areas. These roads will provide prioritised pedestrian and cycle areas to encourage active transport into and out of the area. This section and plan incorporates the land acquisition of the MRWA Planning Control Area which adds approximately 2.9m width to both sides of the road.

### Key Features:

- Total verge width of 4.3m including:
  - » 1.3m parking, planting and furniture zone to back of kerb
  - » 2.5m shared zones which are low speed clear zones along the verge for both cyclists and pedestrians
  - » 0.5m buffer against building. Edge of shared zone should be delineated by trading markers such as recessed discs in the paving
  - » Note: A clearzone of 1.5m wide and 2.0m high is required against the building line for DDA compliance
- Rain garden opportunities in median and back of kerb
- Existing trees in the verge will need to be removed to allow for widening
- New tree planting on verge and infill planting to the median as required
- Covered awnings should be provided where buildings abut property boundary. Minimum height clearance 2.2m in accordance with Austroad standards
- Due to the high traffic volumes anticipated for this street a mid-block controlled pedestrian cross is not considered appropriate. Pedestrians will be encouraged to cross at the dedicated crossings, intersections and pedestrian refuges
- The ultimate cross section will be dependent upon Main Roads requirements following the future upgrade of Canning Highway. At this stage is likely to be two lanes in each direction. MRWA Planning control area plan can be found in Appendix B





# Public Transport Boulevard - Interim

## Public Transport Boulevard Interim (Kintail Road)

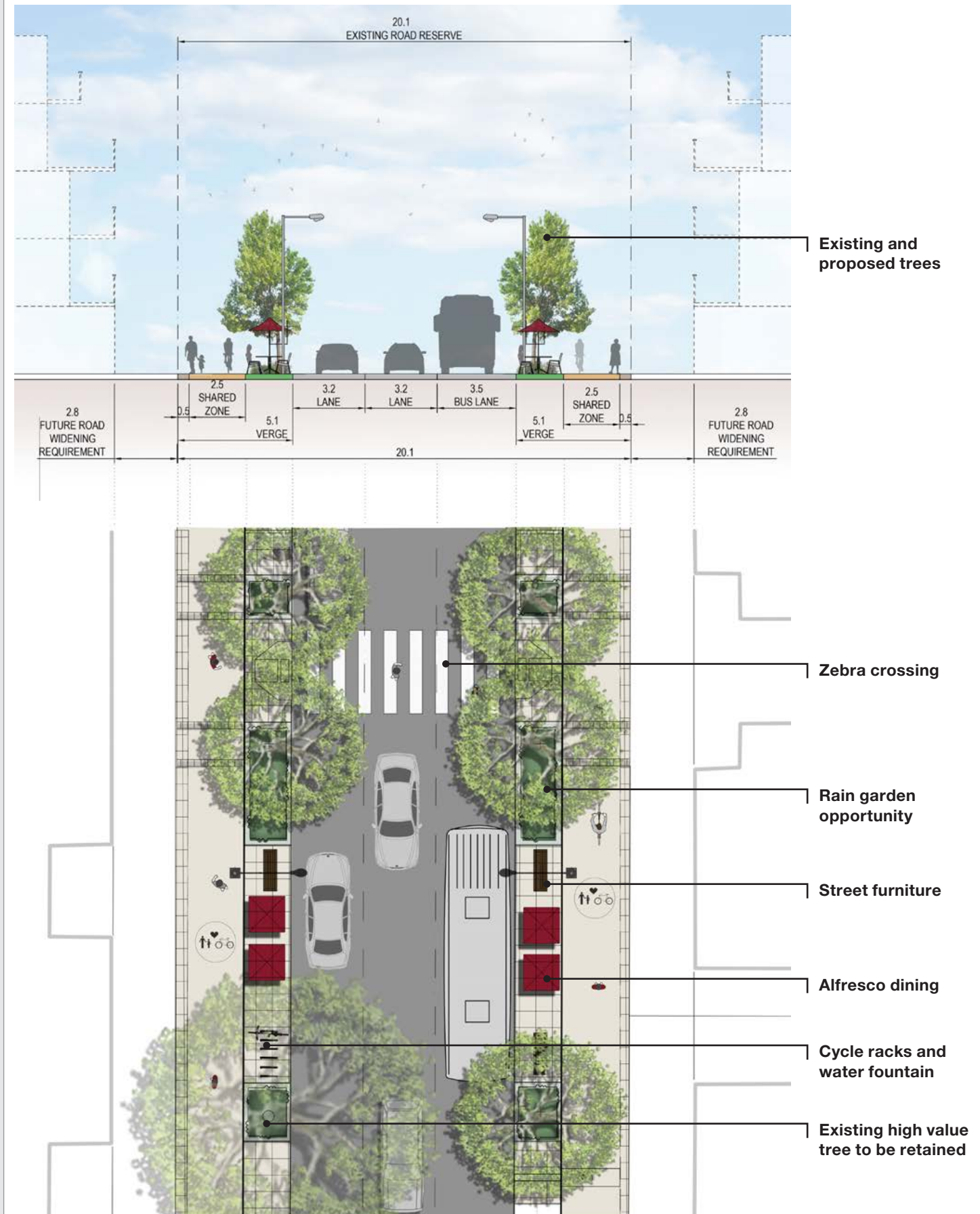


### Description

The public transport boulevard links residents with the public transport network. It will prioritise public transport and integrate with the activity centre plan vision for the area. The section and plan is based on the current road reserve widths while future proofing for the MRWA Planning Control Area (refer to Appendix B).

### Key Features

- Total verge width of 5.1m including:
  - » 2.1m furniture and planting zone to back of kerb
  - » 2.5m shared zones which are low speed clear zones along the verge for both cyclists and pedestrians
  - » 0.5m buffer against building. Edge of shared zone should be delineated by trading markers such as recessed discs in the paving
  - » Note: A clearzone of 1.5m wide and 2.0m high is required against the building line for DDA compliance
- Retains existing high value Platanus x acerifolia trees (subject to further investigations). Trees are located  $\pm$  350mm from back of kerb with about 10.6m between the trunks
- Interplanting with Platanus x acerifolia as required to reinforce the boulevard character
- Rain garden opportunities at back of kerb
- Covered awnings should be provided where buildings abut property boundary. Minimum height clearance of 2.2m in accordance with Austroad standards
- Dedicated bus lane towards Perth only and two traffic lanes
- The treatment at the roundabouts is subject to further design, however it is likely that a queue jump facility or a merge lane will be accommodated
- Pedestrian zebra crossing is subject to conditions satisfying current MRWA requests





# Public Transport Boulevard - Ultimate

## Public Transport Boulevard Ultimate (Kintail Road)

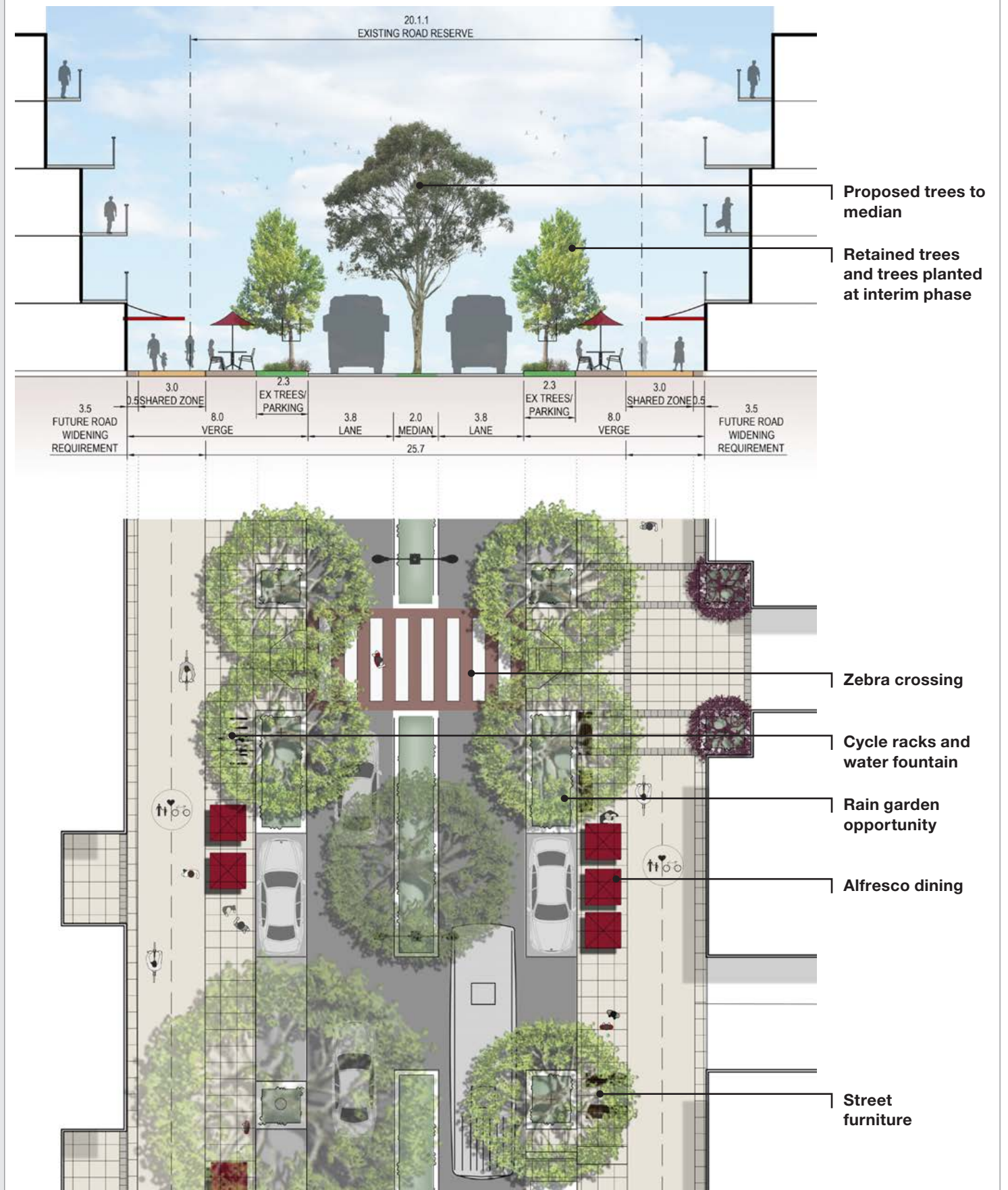


### Description

The public transport boulevard links residents with the public transport network. It will prioritise public transport and integrate this into the activity centre plan vision for the area. This section and plan incorporates the land acquisition of the planning control area which adds approximately 3.5m width to both sides of the road.

### Key Features

- Total verge width of 8.0m including:
  - » 2.3m furniture and planting zone to back of kerb
  - » 2.2m furniture and alfresco dining zone
  - » 3.0m shared zones which are low speed clear zones along the verge for both cyclists and pedestrians
  - » 0.5m buffer against building. Edge of shared zone should be delineated by trading markers such as recessed discs in the paving
  - » Note: A clearzone of 1.5m wide and 2.0m high is required against the building line for DDA compliance
- Retains existing high value Platanus x acerifolia trees (subject to further investigations) Trees are located  $\pm$  350mm from back of kerb with about 10.6m between the trunks
- Interplanting with Platanus x acerifolia as required to reinforce the boulevard character
- Rain garden opportunities at back of kerb and in median
- Covered awnings should be provided where buildings abut property boundary. Minimum height clearance of 2.2m in accordance with Austroad standards
- Median provides refuge for ease of crossing for pedestrians and an opportunity for zone double outreach light pole with banners
- Local traffic access only will be available
- This cross section will only be possible if the Main Roads WA plans for Canning Highway eventuate which include bus only access from Canning Beach Road to Canning Highway
- One traffic lane in each direction
- MRWA Planning Control Area plan can be found in Appendix B
- Pedestrian zebra crossing is subject to conditions satisfying current MRWA warrants





# Local Accessway

## Local Accessway

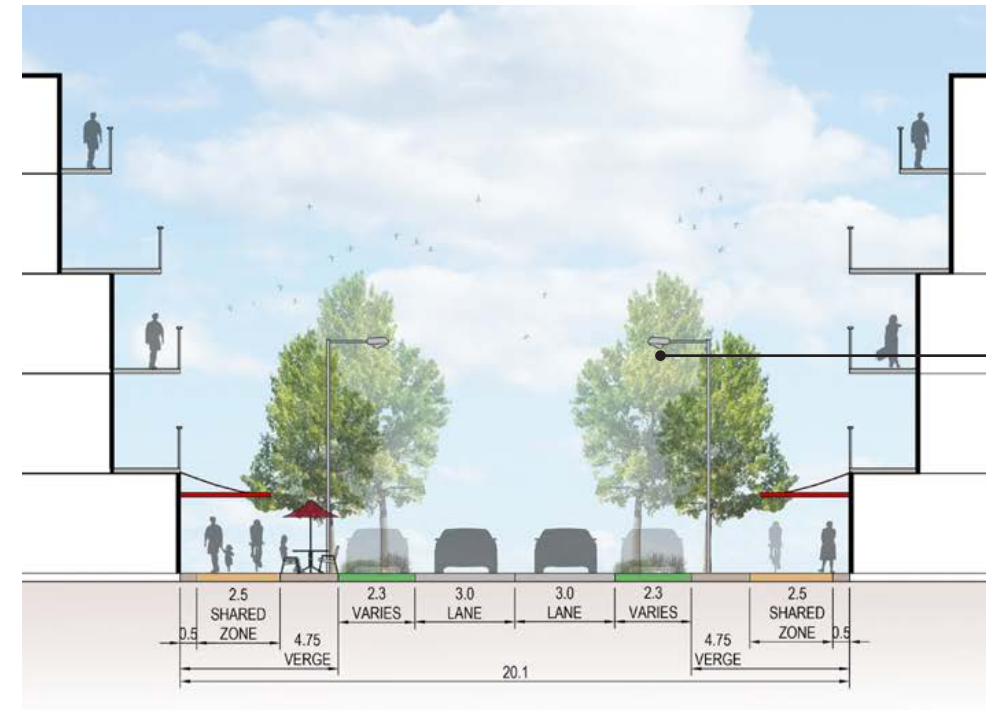


### Description

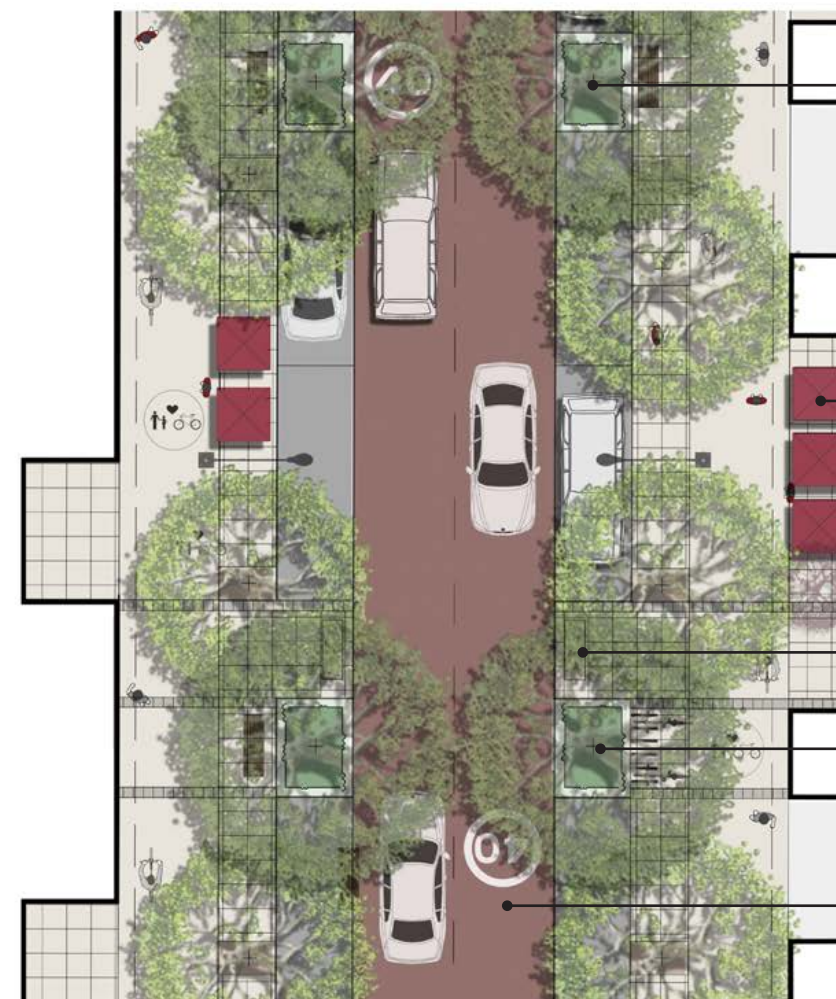
Local accessways provides for local vehicle access whilst encouraging pedestrian and cyclist safety and comfort. Road design will encourage pedestrians and cyclists rather than private vehicle movements.

### Key Features

- Total verge width of 4.75m including:
  - » 1.75m furniture and planting zone to back of kerb
  - » 2.5m shared zones which are low speed clear zones along the verge for both bicycles and pedestrians
  - » 0.5m buffer against building. Edge of shared zone should be delineated by trading markers such as recessed discs in the paving
  - » Note: A clearzone of 1.5m wide and 2.0m high is required against the building line for DDA compliance
- Level/shared surface to prioritise pedestrians and cyclists
- Opportunities for kerb build-outs for traffic calming, tree planting and rain gardens
- High value street tree to be incorporated into any future design and new street tree planting in accordance with the street tree masterplan
- Tree retention measures in accordance with AS4970 to be undertaken to protect and maintain high value street trees within development sites
- A red asphalt treatment to the road is recommended for the shared zone treatment as a visual signal for drivers and pedestrians to 'share with care'
- Covered awnings should be provided where buildings abut property boundary. Minimum height clearance of 2.2m in accordance with Austroad standards
- Due to the low speed and shared zone nature of the road, crossings are intended to be informal with tactile indicators positioned at narrow points to demarcate appropriate crossing points
- A 40km/hr speed zone is recommended but it would need to comply with the Main Roads WA policy. Currently the typology wouldn't comply as the 85 percentile speed are currently a little higher than 50km/h, but it could be an option worth considering. Refer to section 3.6 for more detailed traffic information



Existing and proposed trees



Rain garden opportunity

Alfresco dining on private land

Narrow crossing point delineated with tactiles

Cycle racks and water fountain

Red asphalt to carriageway



# Waterfront Accessway and Active Pathway

## Waterfront with Active Pathway (Canning Beach Road and The Esplanade)

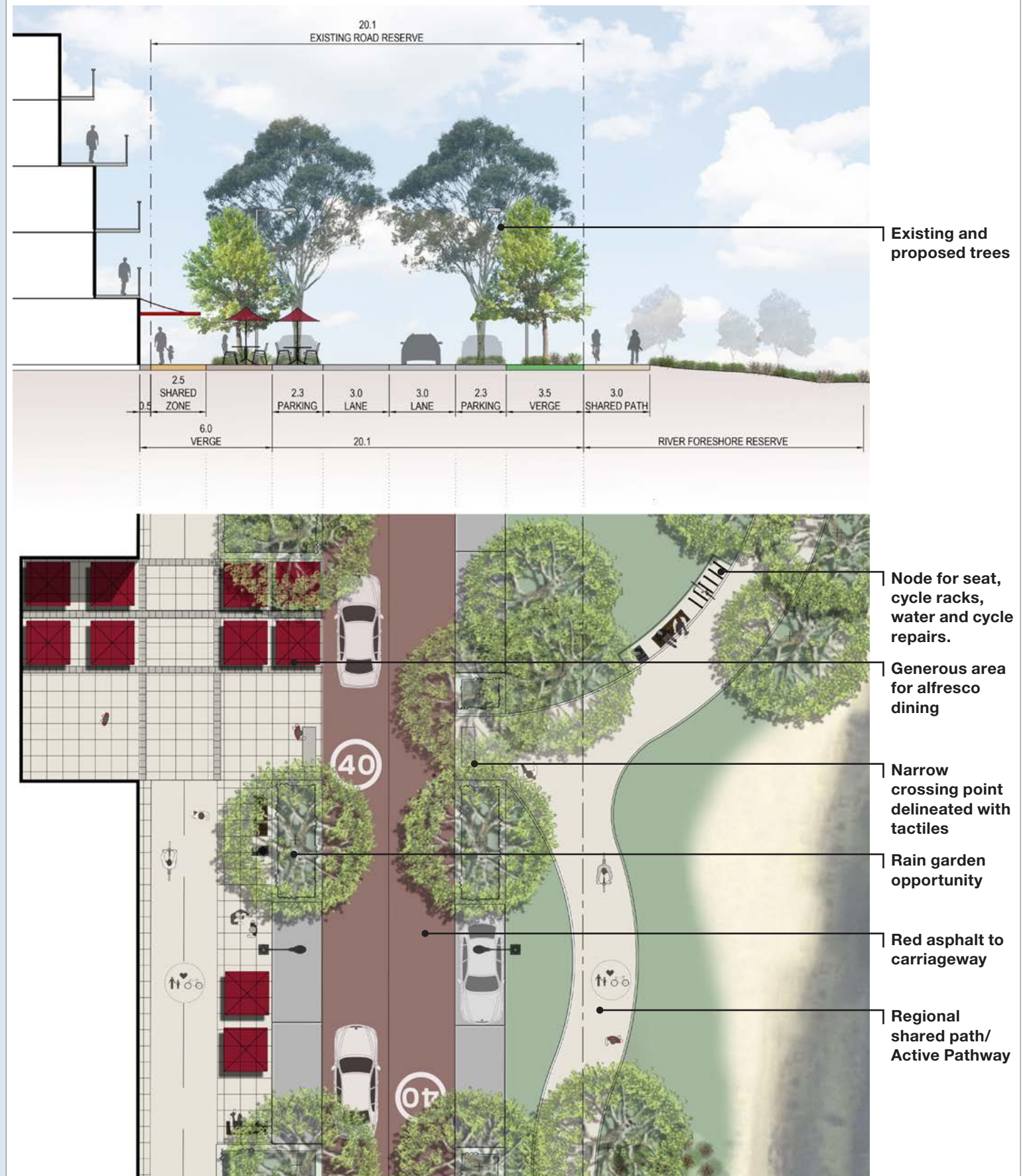


### Description

Waterfront accessways provides for local vehicle access whilst encouraging pedestrian and cyclist safety and comfort. Road design will encourage pedestrians and cyclist rather than private vehicle movements. Focus is on providing a generous verge along the built form edge for alfresco dining. Along the river an active pathway has been incorporated.

### Key Features

- Total verge width of 6.0m including:
  - » 3.0m furniture and planting zone to back of kerb
  - » 2.5m shared zones which are low speed clear zones along the verge for both cyclists and pedestrians
  - » 0.5m buffer against building. Edge of shared zone should be delineated by trading markers such as recessed discs in the paving
  - » Note: A clearzone of 1.5m wide and 2.0m high is required against the building line for DDA compliance
- Level/shared surface treatment to prioritise pedestrians and cyclists
- Opportunity for rain garden but this is subject to groundwater and saline level study
- Provides an 'active pathway' along the river's edge to provide exclusive links for pedestrians and cyclist for regional links. This is typically existing on site but widening of the path is encouraged where feasible
- Covered awnings should be provided where buildings abut property boundary. Minimum height clearance of 2.2m in accordance with Austroad standards
- Offset carriageway alignment to allow for generous paths on built form side for alfresco dining
- Canning Bridge Road to have parking both sides of street
- The Esplanade to have parking on river side only
- A red asphalt treatment to the road is recommended for the shared zone treatment as a visual signal for drivers and pedestrians to 'share with care'
- Due to the low speed and shared zone nature of the road, crossings are intended to be informal with tactile indicators positioned at narrow points to signalise the easier areas to cross at. Formal crossing points will be provided at intersections
- A 40km/hr speed zone is recommended but it would need to comply with the Main Roads WA policy. Currently the typology wouldn't comply as the 85 percentile speed are currently a little higher than 50km/h, but could be an option worth considering. Refer to section 3.6 for more detailed traffic information.





## Public Open Spaces

The CBACP area lacks large expanses of green open space with the exception of the foreshore area. Therefore the design of the public open spaces should maximise their potential by accommodating a range of uses, carefully combining both soft and hard landscape, activating for longer hours from early morning to late at night and accommodate the programming of events such as fitness classes, outdoor movies or markets.

Public open space opportunities are identified at:

- A** River foreshore
- B** Market square and community hub (near Raffles and Theatre)
- C** Re-purposed Canning Bridge Promenade
- D** Central Plaza around pedestrian bridge over Canning Hwy

Design principles for the open spaces seek to:

- protect and enhance the environmental, cultural and heritage values of the Canning Bridge
- assist with placemaking
- create pleasant and welcoming spaces
- create safe spaces which are in accordance with CPTED principles
- provide high quality, well maintained and actively managed space
- ensure that they are adaptable, catering for multiple users and types of activities
- be inclusive and accessible to the whole community by being designed in accordance with AS 1428
- encouraging activated edges and uses responsive to the edge treatments

To contribute to the under supply of open space, private developers should be encouraged to provide space within their development which are accessible to the public and contribute to the public realm. This has the added economic benefit of drawing more people into their site, potentially increasing the foot traffic for retail and food outlets.

The design of the streets also contribute to the overall POS provision and provide linkages and local spaces to meet, socialise or enjoy the sun.

The following pages highlight the vision and recommendations for these public open spaces.



Fig. 42 Locations of public open space



# A

## Riverfront Esplanade Enhancements

The Riverfront Esplanade is a premier landscape that provides significant regional and local recreational and amenity opportunities. Views across the river provide a strong sense of place and an amenity that attracts many people. It is currently well utilised but it is anticipated that as the density of the Canning Bridge area increases the use of this space will significantly increase too. The Esplanade must be enhanced to cater for this increase in use while working within the constraints of the limited land availability.

### Vision

*Develop a desirable high quality space that balances the requirements of both recreational and commuter cyclists, runners and walkers while maximising the experience of the high value riverfront location.*

An ancillary vision is to then draw visitors back into the Canning Bridge community, boosting the local economy and vibrancy.

The design of this space must take into consideration the rowing club requirements south of the bridge.

### Recommendations:

- Improve user experience through the provision of practical amenities such as shade through tree planting, seating for rest, water fountains, exercise equipment and cycle repair stations. Where possible, widen the shared path to cater for additional users. Facilities should be high quality and well maintained
- Enhance the local character and sense of place through integrated and interactive art pieces, creative wayfinding and interpretive signage, provision of nodes at key points to appreciate the view and providing photo opportunities.
- Protect and enhance the local foreshore environment through locally native planting and river wall upgrades where necessary.
- Connect users of the Esplanade back into the Canning Bridge community by developing the waterfront roads into pedestrian friendly spaces as per the streetscape recommendations in the previous section.

# B

## Community Hub and Market Square

Currently the home of the local library and historic Tivoli theatre, this space presents the opportunity to develop a vibrant community hub and market square. The site is further supported by the Raffles Hotel and its gardens, the Swan/Canning River foreshore and excellent access to the train station. Furthermore, the CBACP and the masterplan propose significant mixed use development immediately surrounding the site and also the rejuvenation of the perimeter streets into pedestrian prioritised spaces. The carpark to the north also presents a development opportunity which could reinforce and support the market square.

### Vision

*A community activity hub that is vibrant and dynamic and has a strong sense of place and local culture. It will be provide essential services and cultural facilities and be an attractive destination- connecting the Raffles Gardens and Tivoli Theatre with the Canning River foreshore.*

### Recommendations:

- Provide facilities that attract and retain people such as seating, trees and structures for wind and shade protection, free wifi and charging points, cafes and lighting for safety and night time activation.
- Redevelop the carpark site to include an underground parking facility with mixed use development and POS above. Retain and incorporate existing high value trees where possible.
- Activate the place through the programming of events such as fresh food markets, summer movie nights, busking/live music or seasonal night time art and craft markets.
- Activate edges with alfresco dining and retail shopping. Ensure ample windows, doorways and balconies to promote an inviting vibrant and safe place.
- Reinforce the community hub character through art pieces by local artists, bespoke furniture and temporary installations.
- Development of the space should have a holistic approach by encompassing the adjoining roads and verges, Raffles gardens and Canning Beach Road to where it reaches the water.
- Improve linkages to the foreshore through paving, tree planting and wayfinding in surrounding streets.
- A feature 'pedestrian' focused paved zone extending across Canning Beach Road and Kintail Road linking the community hub to the Raffles hotel, apartments, local shops and primary transport nodes.
- Commercial future development opportunities may include a purpose built community facility to the north of the site, with an open alfresco café to the west boundary and a market square located centrally amongst retained feature trees.
- Create connection between Canning Beach Road and Kintail Road Community Hub with The Esplanade- through surface crossing or landmark pedestrian footbridge that will also create an iconic gateway to the Canning Bridge Activity Centre.



## C

### Re-purposed Canning Bridge Pedestrian Promenade

The new Canning Bridge replacement project will cause the northern structure of Canning Bridge to become redundant. With a north facing aspect, elevated river views and excellent connectivity to the surrounding community and train station there is a strong case to develop this into a key open space and linkages.

#### Vision

*The Canning Bridge Pedestrian Promenade will be a unique space that provides the opportunity to experience the river through elevated views and physical access. It will provide an attractive east-west linkage, for pedestrians and cyclists, between the communities either side of the river and also with the train station. The character will draw upon and celebrate the rustic nature of the old timber bridge.*

Recommendations:

- Develop a unique rustic character that draws on the characteristics of the old timber bridge structure. This can be expressed through material and furniture selections
- Encourage interactions with the river by providing jetty(s) for fishing, observing and berthing kayaks.
- Reinforce the unique character and location by providing interpretive signage about the old bridge and the environment of the Swan/Canning Rivers
- Clearly delineate movement routes and passive areas to support efficient movement for commuters while provide safe spaces for people to rest and meander.
- Provide amenities that encourage activation such as seating, bicycle parking and shelter from sun and rain
- Consider the opportunity for a coffee cart or food truck along the promenade.

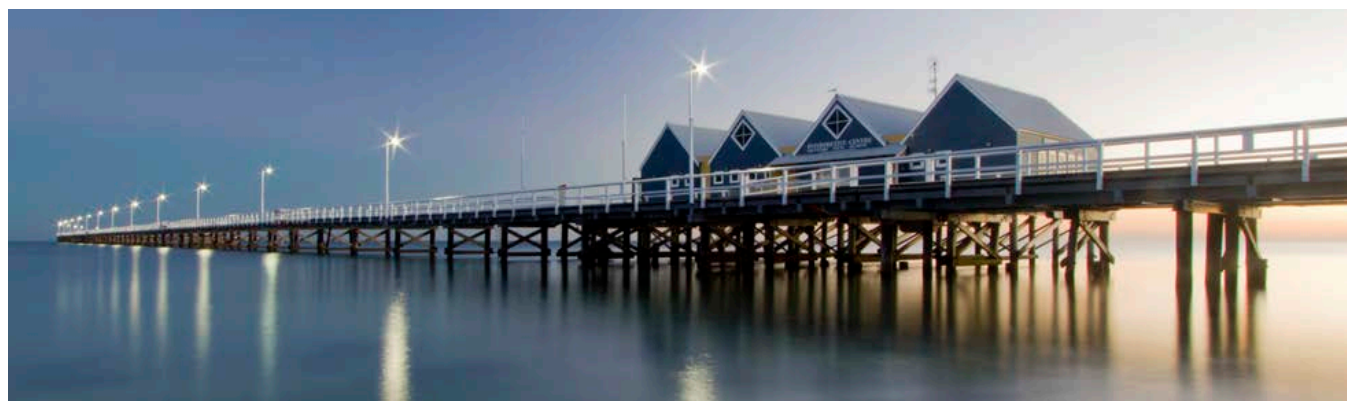


Fig. 43 Busselton Jetty © Imogen Brand Rakers

## D

### Central Plaza

This is the only public open space to service the central area of the activity precinct. It currently performs a function of connecting pedestrians across Canning Highway but is disused and disconnected. It is a space that people tend to move through rather than a destination.

The activity centre plan proposes high density mixed use development around the perimeter of the plazas.

#### Vision

*The area will read as one space and will provide a north south connection while being attractive for people to spend some time which will create a community of local residents, workers and visitors. The space will be dynamic, vibrant and active and provide for a range of activities to cater for day time office workers, night time local residents and weekend visitors.*

Recommendations:

- Upgrade the pedestrian bridge to be attractive and comfortable for users and integrated into the northern and southern plaza areas. Consideration should also be given to the inclusion of a lift for inclusive access.
- Develop the space as one area incorporating the northern plaza, pedestrian bridge, Canning Highway verge, southern plaza and adjoining shared space roads.
- Activate edges with alfresco dining, doorways, windows and balconies to promote an inviting vibrant and safe place.
- Provide facilities that attract people and encourage them to spend time such as comfortable seating, tree planting for shade and habitat, structures for wind and shade protection, free wifi and charging points, cafe and lighting for safety.
- Reinforce the central plaza character through art pieces by local artists, bespoke furniture and temporary installations.
- Have discussions with the adjoining land developers, particularly in the south, to consider the inclusion of the private plaza space to be accessed by the public to further support the plaza.



## Public Art

### Vision and Objectives

The public art vision and objectives for the Canning Bridge Activity Centre are:

- To provide for an exciting and enticing public realm which supports the extensive growth of the CBACP area to promote cultural vitality within the CBACP area. (Activity centre plan Pg 37 Element 17)
- To support local artists
- To provide a sense of place and wayfinding landmarks
- To create activated and vibrant spaces and blank walls
- To be high quality and enduring
- To be a highlight focal point for the community
- To reinforce the vision and colour themes of the masterplan.

### Themes

Potential themes for the art around the Canning Bridge activity centre could be:

- River activities; water, sailing rowing, boating, wildlife.
- Civic activities; theatre, library and child care
- Existing prominent vegetation; jacaranda and plane trees
- Past and present prominent people or events in the community including Aboriginal and European history.

### Existing Art Pieces

There are a few existing art pieces throughout the area. These are:

- A statue of a guitar (E) in the central plaza near the pedestrian bridge
- The 'Fragment' sculpture by Kevin Draper (C) on the river foreshore
- Rowing themed art tiles incorporated into the shared path around the rowing club

These existing art pieces should be retained and integrated into any redevelopment projects.

Photos of these pieces can be found on the following page.

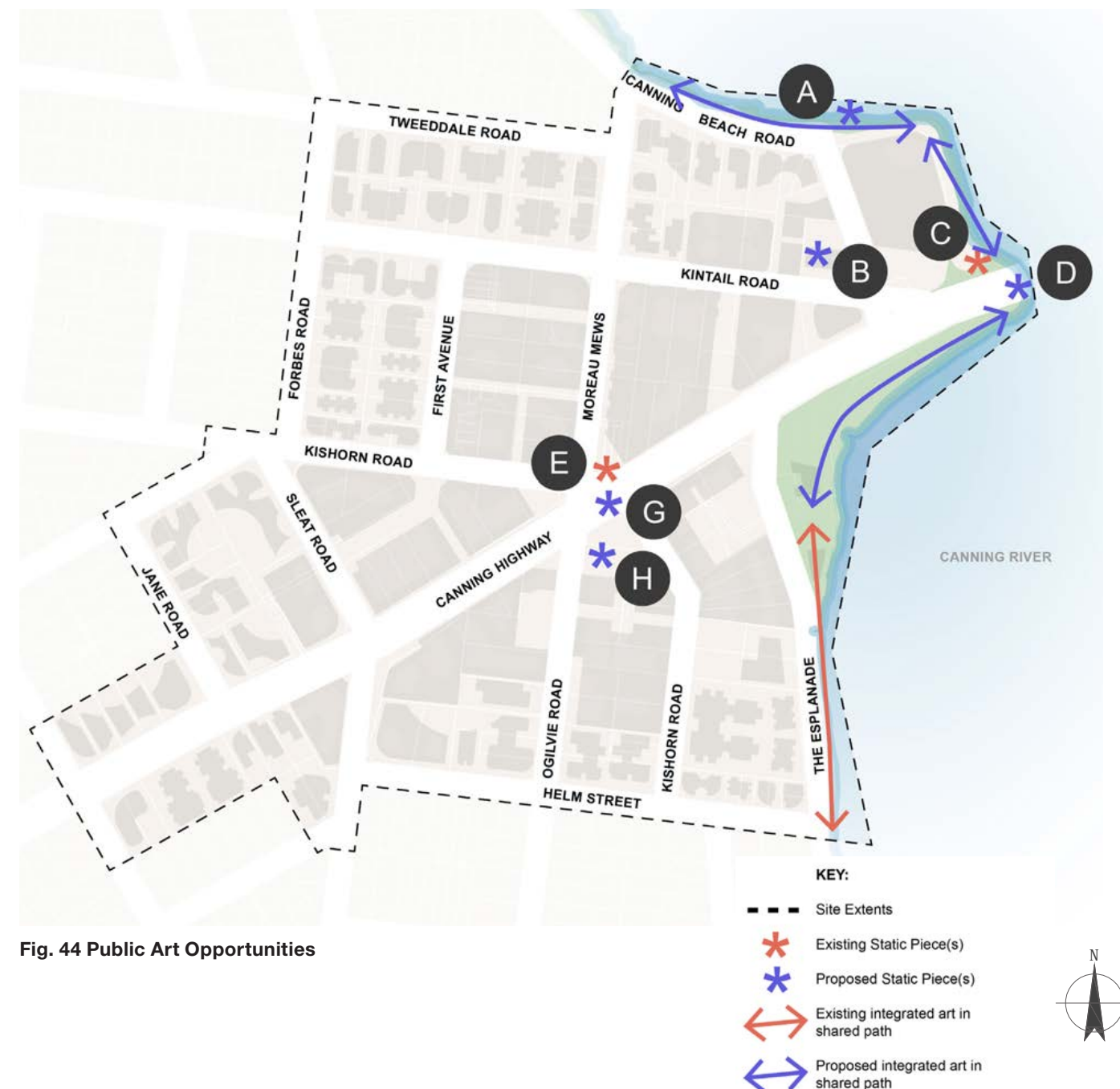


Fig. 44 Public Art Opportunities



Opportunities

Public Art has the opportunity to express the character of a place, create a sense of place and create interest that is attractive to visitors and local residents.

There are many opportunities to implement art throughout the Canning Bridge area, whether it is a standalone commissioned sculpture, a functional element or integrated into the infrastructure. Below are some specific opportunities for Canning Bridge:

- Mural on Bridge Wall – Enhance the pedestrian and cycling connection under Canning Bridge by commissioning a local artist to design and paint a mural that celebrates the character of the area. Suggested location ‘D’
- Bespoke seating or furniture in Plazas – bespoke seating and other furniture items should be designed for plaza areas. The seating should integrate the functional purposes of a seat while being unique for Canning Bridge. It should encourage a range of uses from balancing, sitting at different heights and promote interaction with a friend or stranger. These elements could also integrate

light for interest at night. Materials selection should celebrate West Australia’s unique environment.

- Sculptures – There are various opportunities for sculptures around the study area. These should be dynamic and interactive with moving parts which are either wind or human operated. They should also be an appropriate scale to either walk under, over, around, etc. Each piece should tell a story of the local history or celebrate the current character of the area.
- Incorporation of art into street furniture elements (refer to ‘furniture’ section) - There is an opportunity to create a sense of place and branding for the area through the integration of art into the street furniture. The selected suite of furniture provides an opportunity for the integration of art into one off pieces or across the whole range. i.e. the bin enclosure could include local images in the perforated metal, cycle racks could have a local motif, drinking fountains could be covered in mosaic tiles.
- Reinforcement of local art along riverside shared path

- there are existing tiles and mosaics inset into the river side shared path. The majority of these are representative of the rowing activity of the area. There is an opportunity to expand this treatment along the entire length of the path and represent a wider range of Canning Bridge’s unique character. This could include any of the earlier themes suggested as well as creative mileage markers. The art could either be produced by the local schools or professional commission.

- Pedestrian bridge over Canning Highway (Location G) - There is an opportunity to incorporate art into this bridge. In the interim the art could be ‘bolt on’ and reinforce the colour themes of the area. In the ultimate design, when the bridge is replaced for the highway widening, the art could be integrated into the structure and form of the bridge. The bridge can provide a bold large scale gateway statement of Canning Bridge’s identity which will be experienced by all road users.

In addition to these, there is also the opportunity for temporary art installation in plazas, along key routes and at key nodes.

Temporary installations keep the area interesting and attract visitors. Where practicable, the integration of lighting into all art pieces should be considered, so that they can be appreciated outside of daylight hours.



Fig. 45 Futian Footbridge, Hong Kong



Fig. 46 Peace Bridge by Santiago Calatrava, Calgary





Fig. 47 Existing tile art insets in the shared path represents local themes of rowing along the Canning/Swan rivers.



Fig. 48 Themed art installation outside the library that can be climbed and interacted with. Suggested location 'B'



Fig. 49 Oversized people sculptures on the Geelong create an iconic photo opportunity for visitors to pose with. Suggested location 'A'



Fig. 50 Existing guitar sculpture to be retained and/or relocated when plaza is redeveloped. Existing location 'E'



Fig. 51 Existing 'Fragment' sculpture by Kevin Draper along foreshore. existing location 'C'



Fig. 52 Mural on wall brightens up a laneway way. Opportunity to install similar beside shared path under Canning Bridge. Suggested location 'D' and any blank walls/laneways.



Fig. 53 Nature themed sculpture, of an appropriate scale to walk through, provides interest to a simple space. Suggested location 'H'.

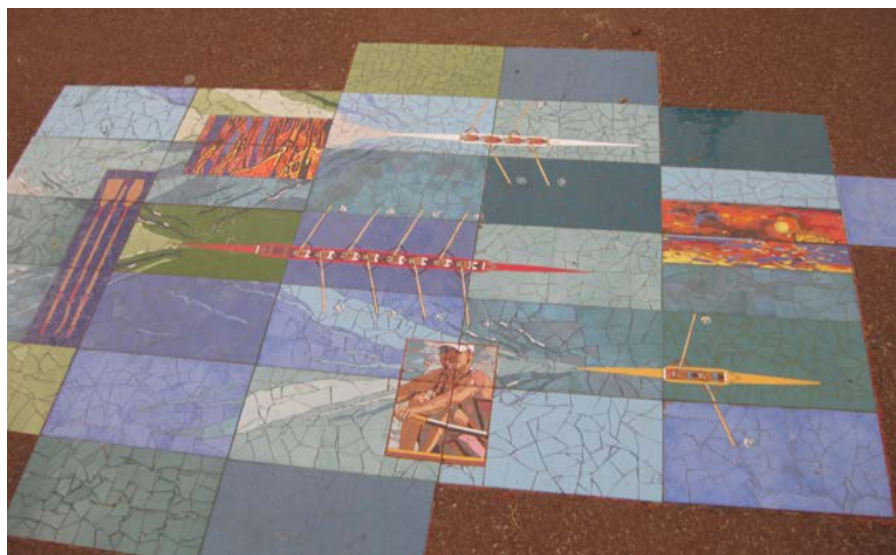


Fig. 54 Existing tile art insets in the shared path represents local themes of rowing along the Canning/Swan rivers.

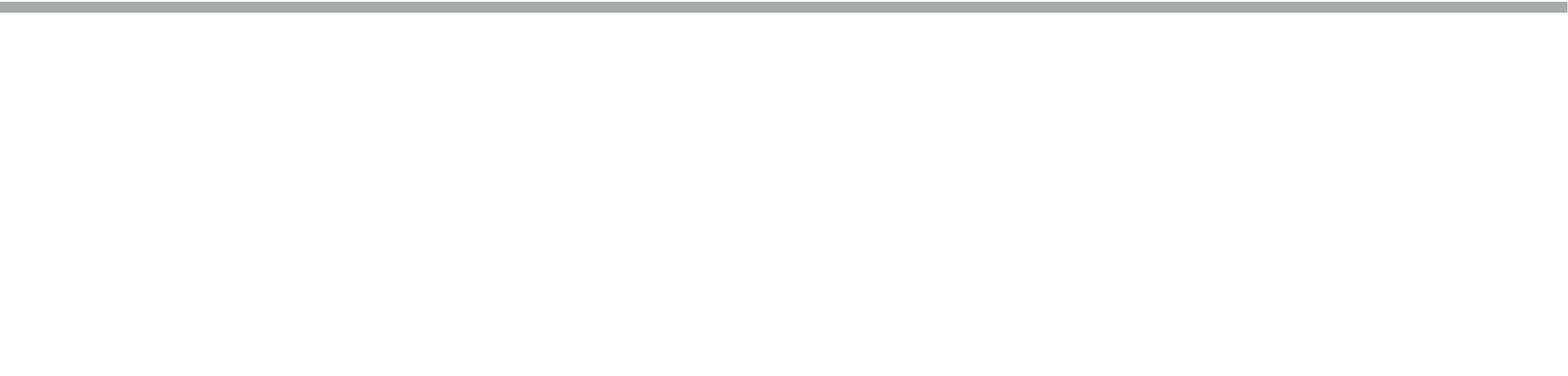


Fig. 55 Colourful irregular seats activate the verge and provide character. This could be incorporated into local accessways street typology.



Fig. 56 Bespoke seating adds interest to a plaza and provides an opportunity to interact with other visitors. Free wi-fi could be provide by the library and these seat could have power points to provide a comfortable space to spend a while. A feature like this would activate a space.





Colour Strategy	Primary Colours	Accent Tones	Application
<p>The colours of the natural, cultural and social landscapes are strong factors that contribute to the character and identity of the site.</p> <p>The colours within the natural and cultural landscape are particularly bold and form a great catalyst for the basis of a suite of colour palettes.</p> <p>The following primary colours and accent tones will enhance the character and reinforce the unique identity of the Canning Bridge activity centre.</p>	<p>The blue colours of the Swan and Canning River and the Perth sky are prominent in the character of this precinct. The river provides recreational amenity, vistas and habitat for wildlife. It is a significant natural feature of the activity centre.</p> <p>Blue grey tones of the river have been selected as the primary colours for the Canning Bridge activity centre. These can be found on the facing page.</p>	<p>These accent tones will provide a vibrant ‘pop’ of colour to the palette. River activities include rowing, kayaking and sailing. The tones are drawn from the spinnakers sails during a yacht race on the Swan and the hulls of the ever popular kayaking explorations.</p> <p>Avenues of Jacarandas are valued by residents and visitors alike. During the months of September and October each year the avenues of Applecross become an attraction for many visitors to Perth.</p> <p>“The Perth suburb of Applecross, Western Australia, has streets lined with Jacaranda trees, and hosts a “Jacaranda Festival” each year in November. The festival is held in the Applecross Village district, and surrounding local businesses sell products and foods in aid of the local Rotary Club chapter.” <a href="https://en.wikipedia.org">https://en.wikipedia.org</a></p> <p>Jacaranda purple has been included in the accent tones to represent the significance of the Jacaranda.</p> <p>The range of accent colours can be found on the facing page.</p>	<p>Colours selected from the precinct colour palettes could be reflected in:</p> <ul style="list-style-type: none"><li>• Street furniture</li><li>• Street signage</li><li>• Light poles</li><li>• Festival banners</li><li>• Trail/wayfinding markers</li><li>• Interpretation signage</li><li>• Trading boundary markers</li><li>• Public art commissions</li><li>• Base colours to council publications</li><li>• Highlight tones on new public buildings</li></ul>



Reference Photos

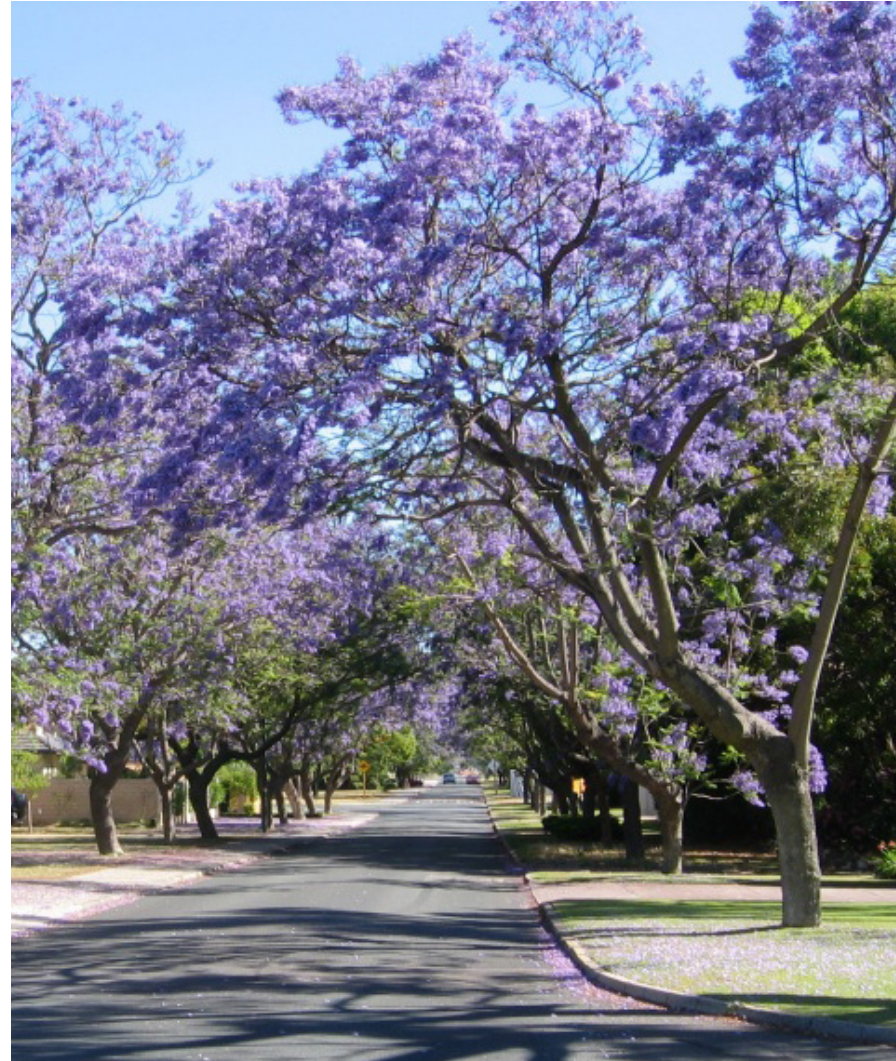
## Primary Colour

River Blue (Natural)

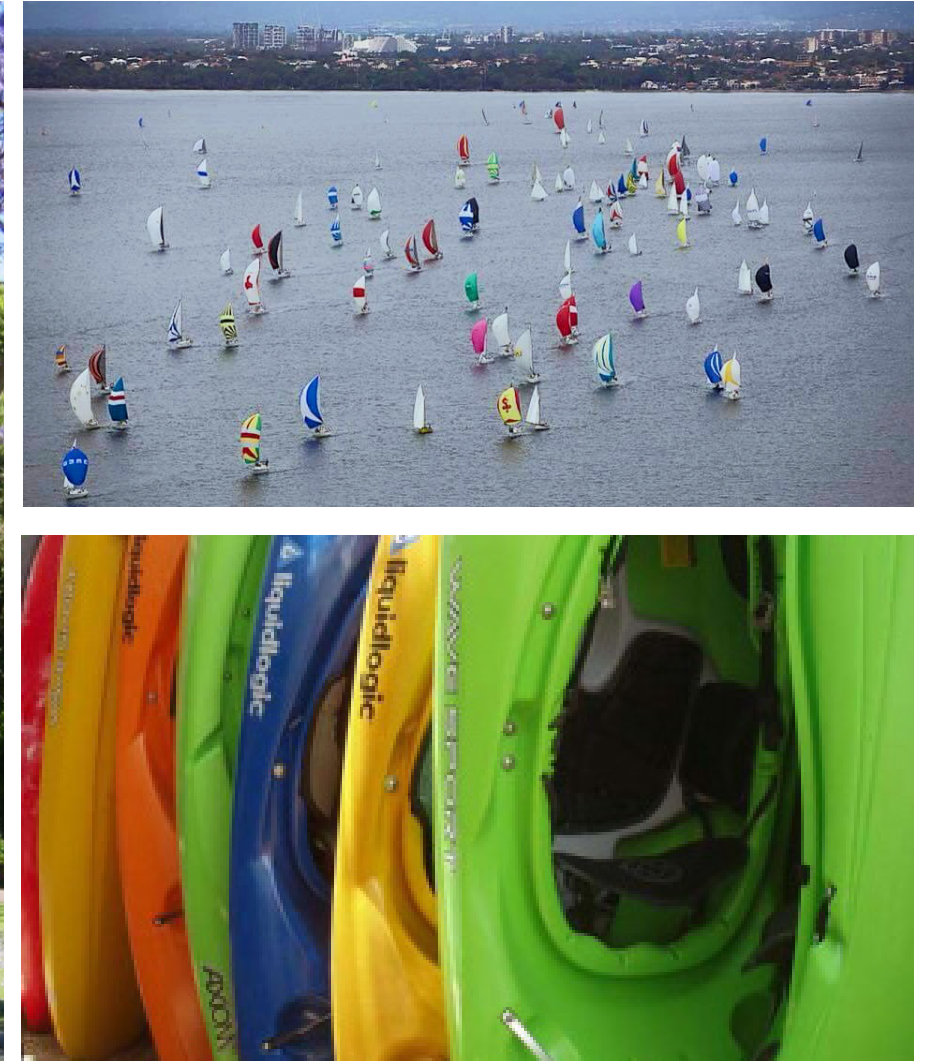


## Accent Colours

Jacaranda Purple



Culture - River Activities



Tones



Fig. 57 Colour Strategy Diagram



Urban forests provide critical ecosystem services such as air and water filtration, shade, habitat, oxygen, carbon sequestration and nutrient cycling. The urban forest also provides opportunities for experiencing a connection to nature, something that is often perceived to be missing in the urban areas. . 202020 Vision - Urban Forestry Strategy

Vegetation - Trees

The City’s street trees are one of our most important assets. These trees are crucial to maintaining the high quality of our public realm and provide numerous environmental, social and health benefits to the City and community

The City’s vision is to:

- Pro-actively manage, protect and replenish our tree stock in ways that meet the needs of our present and future generations
- Increase the overall number of trees / canopy cover across the City

Street trees are important for the provision of shade and shelter whilst reducing the impact of the built form. They enhance the character of a streetscape and play a major role in contributing to the identity of an area.

Existing Street Trees

There is a diverse tree population within the Activity Centre’s streets and foreshore areas which help define the character of the area and provide seasonal interest, shade and habitat. An inventory of the existing trees found in specific streets is provided in the Tree Planting Matrix. The most

common street trees found in the area include *Platanus x acerifolia* (London Plane), *Jacaranda mimosifolia* (Jacaranda) and *Agonis flexuosa* (Western Australian Peppermint).

A number of individual tree specimens and collections of trees are major contributing elements in shaping of the local character and unique identity that defines several of the streetscapes in the Activity Centre, as highlighted in the Canning Bridge Activity centre plan, March 2015.

These specimens and collections of trees have each been identified as ‘significant’ and of ‘high value’ in consultation with City of Melville. The significant trees in the Activity Centre include *Casuarina obesa* (Sheoak) trees in the foreshore; *Corymbia citriodora* (Lemon Scented Gums) at the Tivoli Theatre Car Park and at the Canning Highway pedestrian bridge; *Quercus suber* (Cork Oak) on Canning Beach Road; row of *Erythrina sykesii* (Coral Tree) along Canning Beach Road; avenues of *Platanus x acerifolia* (London Plane) on Kishorn Road (North), Kintail Road and Tweeddale Road; and avenues of *Jacaranda mimosifolia* on Jane Street,

Forbes Road, and First Avenue. Significant trees are also highlighted in the Tree Planting Matrix.

Any future design within close proximity to ‘high value’ trees shall be required to incorporate measures to protect and maintain the trees in accordance with AS 4970-2009 Protection of Trees on Development Sites.

Existing Trees:

- » *Agonis flexuosa*
- » *Araucaria heterophylla*
- » *Brachychiton populneus*
- » *Callistemon viminalis*
- » *Casuarina obesa*
- » *Corymbia citriodora*
- » *Erythrina sykesii*
- » *Eucalyptus* sp.
- » *Ficus rubiginosa*
- » *Fraxinus angustifoli* var. *oxycarpa* ‘Raywoodii’
- » *Grevillea robusta*
- » *Jacaranda mimosifolia*
- » *Lophostemon confertus*
- » *Melaleuca quinquenervia*
- » *Melaleuca raphiophylla*
- » *Phoenix canariensis*

- » *Platanus x acerifolia*
- » *Quercus suber*
- » *Sapium sebiferum*
- » *Tipuana tipu*
- » *Ulmus chinensis*



Fig. 58 High value trees to be retained

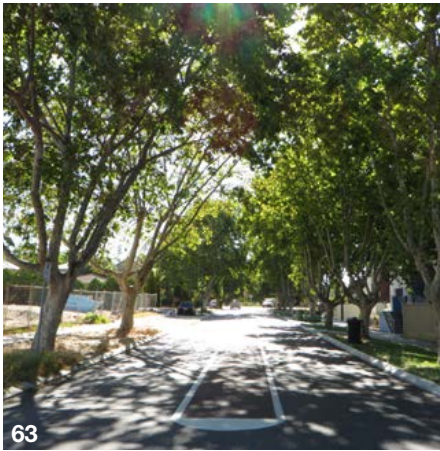
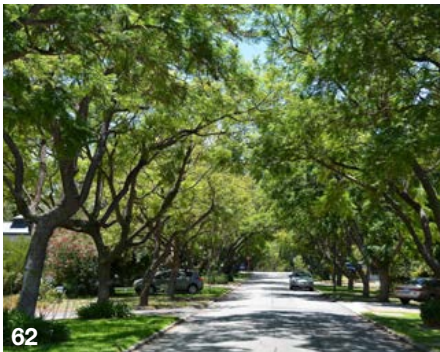


Fig. 59 Erythrina sykesii

Fig. 60 Jacaranda mimosifolia

Fig. 61 Platanus x acerifolia



## Recommended Street Trees

As part of the ongoing management of the City's urban forest and street trees the City will plant new trees as necessary to replenish and increase the tree canopy across the city. The masterplan proposals and new hierarchy of streets will result in some tree removals and replacement tree planting. There will also be opportunities for new tree planting in the new streetscapes as the road arrangements change in the future. Trees will be planted at a density appropriate to the scale of the street and where practical will create a close canopy in the future.

## Tree Selection

The recommended trees for Canning Bridge have been selected for their suitability for the various street types and individual street context as well as the following environmental, management and cultural factors. The following criteria have influenced tree selection:

Context, Ornamental and Cultural Factors:

- Tie-in with and reinforce existing street character
- Create distinctive character
- Civic Identity and City of Melville requirements
- Locally native trees to add local distinctiveness and habitat value
- Amenity value and ability to provide shade
- Colour and seasonal display

Environmental Factors:

- Proven to be urban tolerant and adaptable to the local conditions
- Trees that are tolerant of the urban micro-climate such as wind tunnels, constant shade

and radiated heat from buildings and paved surfaces

- Ability to improve the streetscape micro-climate such as shade provision, cooling, wind reduction and noise buffer
- Tolerance of sandy, low nutrient, compacted soils with low water holding capacity
- Tolerance of atmospheric pollution
- Drought tolerant species with low watering requirements
- Pest and disease resistant species where possible to reduce maintenance requirements
- Habitat value

Management Factors:

- High performing trees - proven to grow well in Perth's urban environment
- Leaf, branch and fruit litter - minimal or acceptable levels of litter so as to reduce maintenance and hazard
- Limb failure risk - Minimal risk from limb failure. Some existing trees in the Canning Bridge area such as *Erythrina sykesii* and *Corymbia citriodora* pose a higher risk of limb failure and therefore will not be proposed for future street tree planting
- Medium to long-lived species thus reducing rate of tree replacement and prolonging amenity and shade provision
- Low watering, fertiliser and pruning requirements

## Street Hierarchy

The Canning Bridge precinct has a diverse range of street types which vary in character, arrangement and functionality. Proposed tree planting will therefore take into account this

hierarchy of streets. Trees have been selected for their suitability for these street types and will reinforce street character, legibility and provision of amenity. A major factor which will determine or restrict the tree species selection is the width of street and therefore size of tree than can be accommodated. To a large extent this will correlate with the street hierarchy, since the major roads will tend to be wider streets.

## Canning Highway (MRWA)

Tree planting along the Canning Highway is out of the scope of this masterplan and falls under the requirements and guidelines of Main Roads Western Australia. However, there are opportunities for street tree planting along the street verges and medians. Tree planting would greatly improve the visual amenity of the road corridor and immediate area as well as provide shade, greening, and wind/noise buffer.

## Local Connector

The local connector roads (Sleat Rd and Forbes Rd) link the activity centre's local accessway roads with the Canning highway and as such focus on traffic and pedestrian movement. There are interim and long term proposals affecting existing and proposed street trees. In the interim the road width will remain the same and existing trees will be retained, whilst medians will be added that will provide an opportunity for planting with tall trees to reinforce the civic character. Longer term as the road is widened the existing trees will need to be removed and the need for new street trees will arise. The street's built form will also change as will the micro climate and character. Future tree planting and species selection will reflect these changes.

## Public Transport Boulevard

The Activity Centre's Public Transport Boulevard (Kintail Road) will be developed in the interim and long-term, however the road width will remain the same allowing for the existing London Plane trees to be retained into the future. There are spaces in the street for infill tree planting in the interim period to reinforce the existing tree avenue. In the long-term a median will be added to the road as part of the transition to bus only access. This will provide an opportunity for planting with tall trees, reinforcing a civic character similar to the Local Connector streets. Future development of this boulevard will see changes to the streetscape built form, micro-climate and

character. The existing London Plane trees are considered to be an urban tolerant and adaptable species that will cope with these changing conditions.

## Local Accessway

The local accessway road widths will be maintained and existing trees retained in the interim where possible. As the streets are developed the road arrangement and streetscape will evolve to accommodate wider footpaths, traffic calming, car parking bays, rain gardens and additional planting opportunities. Future street trees will need to be selected to accommodate future changes to the built form and micro climate. These residential type streets have a more informal character suitable for a more

informal and mixed planting selection. Therefore, in line with best practice urban forestry principles it is recommended to allow for a more diverse mix of species in these local accessway streets.

## Waterfront Accessway & River Foreshore

The waterfront accessway road width shall remain the same and existing trees retained where possible. Changes to the streetscape arrangement, such as reconfigured road alignments, footpath widening and car parking bays will also allow opportunities for new infill tree planting whilst maintaining waterfront views. Trees will be selected for their suitability to the foreshore environment and aesthetic.



Fig. 62 Planting Typologies



Recommended Street Tree Species

The following is a description of the trees recommended for future planting in the Canning Bridge Activity Centre. These species have been selected as per the tree selection criteria. Some of these species are currently used in the Canning Bridge study area whilst other species are not currently used, but are proven to be excellent street trees proven elsewhere in the Perth metro area. Of the existing trees, a number of species have been found to be a problematic species or would not adapt well to the changing conditions e.g. Erythina sykesii and Corymbia citriodora (limb drop risk) - these trees are not recommended for future planting.

Table 5 Recommended Street Tree Species List:

Scientific Name	Common Name
» Agonis flexuosa	» Western Australian Peppermint
» Allocasuarina fraseriana	» Western Sheoak
» Angophora costata	» Smooth-Barked Apple Myrtle
» Casuarina obesa	» Swamp Sheoak
» Corymbia maculata	» Spotted Gum
» Eucalyptus rudis	» Flooded Gum
» Eucalyptus sideroxylon	» Red Ironbark (Mugga)
» Jacaranda mimosifolia	» Jacaranda
» Melaleuca raphiopylla	» Swamp Paperbark
» Platanus x acerifolia	» London Plane Tree

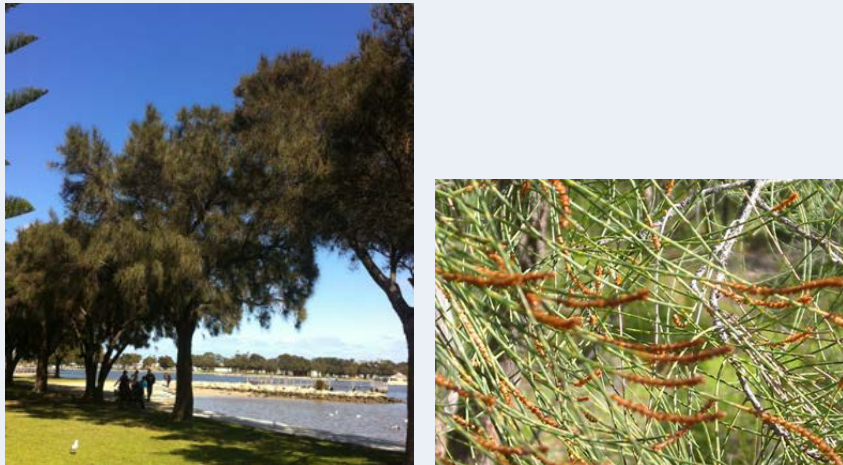
Agonis flexuosa

Common Name: Western Australian Peppermint  
Height: 10m  
Spread: 8m  
Description: Small to medium sized, locally native tree with a weeping habit. It has fibrous brown bark, long narrow green leaves, and tightly clustered small white flowers (August-December) on the axis. It is well known for the powerful odour of peppermint emitted when the leaves are crushed or torn. Quick growing, the tree produces a large amount of detritus and its trunk sometimes becomes large and disproportionate to the rest of the tree. Whilst it prefers full sun and sandy soils it is a very hardy tree that can tolerate a range of soil types, coastal exposure, salt and drought.  
Suitable Street Application: Foreshore applications



Allocasuarina fraseriana

Common Name: Western Sheoak  
Height: 15m  
Spread: 5m  
Description: Medium sized, locally native evergreen tree with needle-like foliage & woody fruits. Thrives in most soil types including those of poor fertility. It is drought resistant and tolerant of salty and coastal conditions.  
Suitable Street Application: Waterfront Accessway and Foreshore



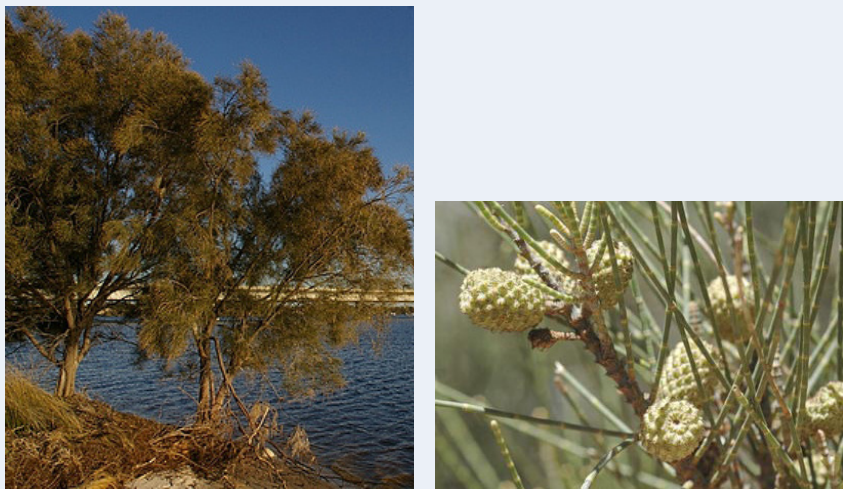
Angophora costata

Common Name: Smooth-Barked Apple Myrtle / Apple Blossom Gum  
Height: 20m  
Spread: 10m  
Description: Medium-sized to large, spreading, woodland tree of Eastern Australia. The trunk is often gnarled and crooked with a pink to pale grey, sometimes rusty-stained bark. Clusters of white flowers spring to summer. New foliage flushes are often deep red wine. Adapted to grow on many soil types and especially likes sandy soils. It will tolerate drought conditions but will not tolerate waterlogging. It thrives on most sites, including fully coastal sites. There are few pest and disease problems and the tree is easily-grown in most streetscapes.  
Suitable Street Application: Foreshore and Local Accessway street applications



Casuarina obesa

Common Name: Swamp Sheoak  
Height: 10m  
Spread: 5m  
Description: An erect tree, locally native, found along rivers creeks and salt lakes. Long slender, grey-green pine like needles and coarse, dark brown bark. Grows in a variety of soils but not recommended for Coastal. More suited to inland around rivers and swamps. Used for growing in salt tolerant swamp areas.  
Suitable Street Application: Waterfront Accessway and Foreshore





### **Corymbia maculata**

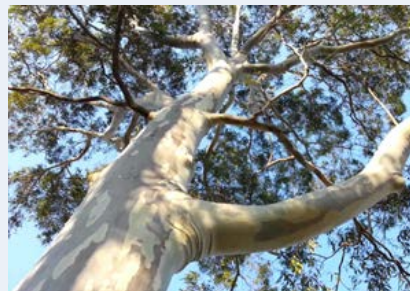
Common Name: Spotted Gum

Height: 30m

Spread: 8m

Description: Large tree, native to NSW and VIC, commonly planted as a street tree for its stately, tall habit and distinctive trunk which is blotched with patches of old bark contrasting with smooth, cream bark beneath. It grows in drier climates if water is available. It adapts to a wide range of soils provided they are not waterlogged. The bark sheds in early summer causing litter for a few weeks.

Suitable Street Application: Local Connector & Boulevard



### **Eucalyptus rudis**

Common Name: Flooded Gum

Height: 20m

Spread:

Description: Medium-sized, fast-growing, locally native tree with rough, dark and light grey bark. Grows on sandy or loam soils and is tolerant of moderate levels of salinity and waterlogging. Suited to planting in foreshore and seasonally wet areas.

Suitable Street Application: Foreshore and Local Accessway street applications



### **Eucalyptus sideroxylon**

Common Name: Red Ironbark (Mugga)

Height: 10m

Spread: 5m

Description: Medium-sized, relatively slow-growing, hardy tree, native to QLD, NSW and VIC. It is a popular street tree throughout temperate urban Australia with furrowed, dark, almost black bark. The leaves are narrow, drooping and greyish green. Showy flowers produced in hanging clusters in winter. It is relatively drought tolerant and will tolerate poor shallow soils. It is only slightly salt tolerant.

Suitable Street Application: Local Accessway



### **Jacaranda mimosifolia**

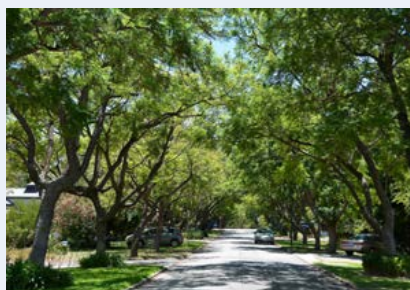
Common Name: Jacaranda

Height: 15m

Spread: 8m

Description: Medium to large, fast-growing, sub-tropical, exotic tree native to South America. It is an attractive open tree with branches upwardly ascending. It has thin, grey-brown bark and large bi-pinnately compound leaves. The flowers are purple, bell shaped, are grouped in 30 cm (12 in) panicles and cover the canopy. They appear in spring and early summer, and last for up to two months. They are followed by woody seed pods, about 5 cm (2.0 in) in diameter, which contain numerous flat, winged seeds. Prefers most soils in a full sun position and can handle periods of drought. Profuse flowering is regarded as magnificent by some and quite messy by others.

Suitable Street Application: Local Accessway



### **Melaleuca raphiophylla**

Common Name: Swamp Paperbark

Height: 10m

Spread: 4m

Description: Small, locally native tree with narrow, needle-like leaves and profuse spikes of white or yellowish flowers from July to January. It is usually found in salt marshes, or swamps or along watercourses and occurs over a variety of soils throughout the south-west of WA. It tolerates salt and waterlogging.

Suitable Street Application: Waterfront Accessway and Foreshore



### **Platanus x acerifolia**

Common Name: London Plane Tree

Height: 15m

Spread: 10m

Description: Large deciduous round headed exotic tree, common to Perth. Moderate growth rate. Large leaves mid to dark green turning yellow to brown in autumn. Adapts to most soils. Moderate tolerance to a range of conditions, high pollution tolerance. Though susceptible to anthracnose and powdery mildew, makes a good urban tree.

Suitable Street Application: Local Connector; Boulevard; and Local Accessway street applications





## Street Tree Planting Matrix - by Street

Street Type	Existing Species	Recommended Masterplan Species	Tree Removals Required	Space For More Trees	Future Median	Deciduous Trees (Winter solar access)	Specific Comments
<b>Canning Highway (MRWA)</b>							
	Agonis flexuosa, Gleditsia triacanthos, Corymbia calophylla, Corymbia citriodora, Jacaranda mimosifolia. <b>Significant Trees:</b> Group of Corymbia citriodora at pedestrian bridge.	Corymbia maculata	×	✓	✓	×	Tree planting with Corymbia maculata to verges and medians.
<b>Local Connector</b>							
<b>Sleat Road</b>	Platanus x acerifolia, Brachychiton populneus, Jacaranda mimosifolia, Fraxinus angustifolia, Robinia sp., Prunus persica, Agonis flexuosa.	Platanus x acerifolia, Corymbia maculata	✓	✓	✓	✓	Phased removal of select trees to reinforce tree avenue.  Corymbia maculata planting to medians.
<b>Forbes Road</b>	Jacaranda mimosifolia. <b>Significant Trees:</b> Avenue of Jacaranda mimosifolia.	Platanus x acerifolia, Corymbia maculata	✓	✓	✓	✓	Tree removal due to long-term road widening.  Tree planting of Platanus x acerifolia and Corymbia maculata to tie-in with Sleat Rd.
<b>Public Transport Boulevard</b>							
<b>Kintail Road</b>	Platanus x acerifolia, Melia azedarach, Jacaranda mimosifolia. <b>Significant Trees:</b> Avenue of Platanus x acerifolia.	Platanus x acerifolia, Corymbia maculata	×	✓	✓	✓	Phased removal of street trees to reinforce tree avenue.  Corymbia maculata planting to medians.
<b>Local Accessway</b>							
<b>Tweeddale Road</b>	Platanus x acerifolia, Jacaranda mimosifolia, Brachychiton populneus. <b>Significant Trees:</b> Avenue of Platanus x acerifolia.	Platanus x acerifolia	✓	✓	×	✓	Phased removal of Brachychiton populneus and Jacaranda mimosifolia to reinforce Platanus x acerifolia avenue.
<b>First Avenue</b>	Jacaranda mimosifolia. <b>Significant Trees:</b> Avenue of Jacaranda mimosifolia.	Jacaranda mimosifolia	×	✓	×	✓	Infill planting to verges with Jacaranda mimosifolia.
<b>Moreau Mews</b>	Agonis flexuosa, Tipuana tipu, Callistemon sp., Jacaranda mimosifolia, Olea europaea, Sapium sebiferum, Ficus sp., Grevillea robusta.	Angophora costata, Eucalyptus sideroxylon, Jacaranda mimosifolia	✓	✓	×	×	Phased removal of select trees in long term e.g.: Agonis flexuosa, Callistemon sp. and Olea europaea and replacement with larger shade trees with higher canopies.
<b>Kishorn Road (North)</b>	Ulmus chinensis, Sapium sebiferum, Callistemon sp., Platanus x acerifolia, Eucalyptus sp. <b>Significant Trees:</b> Specimens of Platanus x acerifolia.	Angophora costata, Eucalyptus sideroxylon, Jacaranda mimosifolia	✓	✓	×	×	Phased removal of select trees in long term and infill planting with large shade trees.



Street Type	Existing Species	Recommended Masterplan Species	Tree Removals Required	Space For More Trees	Future Median	Deciduous Trees (Winter solar access)	Specific Comments
Jane Road	Ficus rubiginosa, Jacaranda mimosifolia, Agonis flexuosa. <b>Significant Trees:</b> Avenue of Jacaranda mimosifolia.	Jacaranda mimosifolia	×	✓	×	✓	Infill planting with Jacaranda trees to reinforce streetscape character.
Ogilvie Road	Corymbia citriodora, Jacaranda mimosifolia, Lophostemon confertus, Agonis flexuosa, Alnus sp., Tipuana tipu, Fraxinus angustifolia 'Raywood'.	Angophora costata, Eucalyptus sideroxylon, Jacaranda mimosifolia	×	✓	×	×	Infill planting with large shade trees.
Kishorn Road (South)	Jacaranda mimosifolia, platanus x acerifolia, Callistemon viminalis, Melaleuca sp., Corymbia citriodora, Agonis felxuosa, Sapium sebiferum, Lophostemon confertus.	Angophora costata, Eucalyptus sideroxylon, Jacaranda mimosifolia	✓	✓	×	×	Phased removal of select trees in long term, replacement with larger shade trees.
Helm Street	Agonis flexuosa, Jacaranda mimosifolia, Tipuana tipu, Callistemon Sp., Paulownia tomentosa.	Angophora costata, Eucalyptus sideroxylon, Jacaranda mimosifolia	×	✓	×	×	Infill planting with large shade trees.
Waterfront Accessway & Foreshore							
Canning Beach Road	Erythrina sykesii, Corymbia citriodora, Ulmus sp., Eucalyptus camaldulensis, Lophostemon confertus, Quercus suber, Agonis flexuosa, Melaleuca sp. <b>Significant Trees:</b> Avenue of Erythrina sykesii, specimen Quercus suber, specimen Corymbia citriodora.	Allocasuarina fraseriana	×	✓	×	×	Phase out planting of Erythrina sykesii, infill planting with Allocasuarina fraseriana to reinforce foreshore character.
The Esplanade	Araucaria heterophylla, Ficus rubiginosa, Phoenix canariensis, Sapium sebiferum, Agonis flexuosa. <b>Significant Trees:</b> Specimen Araucaria heterophylla.	Allocasuarina fraseriana	×	✓	×	×	Phase out planting of Erythrina sykesii, infill planting with Allocasuarina fraseriana to reinforce foreshore character.
Foreshore Reserve	Phoenix canariensis, Melaleuca raphiophylla, Araucaria heterophylla, casuarina obesa. <b>Significant Trees:</b> Specimen Phoenix canariensis at Raffles, specimen Casuarina obesa at Canning River foreshore.	Eucalyptus rudis, Casuarina obesa, Melaleuca raphiophylla, Agonis flexuosa, Allocasuarina fraseriana	×	✓	×	×	Infill planting with locally native Swan River trees to reinforce foreshore character and provide habitat.



Vegetation - Shrub and Groundcovers

Shrub and groundcover planting contributes to the character of the area, providing seasonal interest and habitat creation, whilst reducing maintenance and water use. Given the diverse street and public open space typologies proposed in the Activity Centre Masterplan there is scope for a variety of shrub and groundcover planting typologies to cater for these different spaces and conditions. The following shrub and groundcover planting typologies are recommended:

- Locally native groundcover to street verges and medians;
- Exotic/non-native groundcover to street verges and medians
- Seasonal/feature planting to public open spaces
- Locally native shrub and groundcover planting to foreshore areas
- Rain garden planting

Species Selection

Recommended species have been selected for the following attributes:

- enhance the local character
- provide seasonal interest and off seasonal form and foliage
- be appropriate for local environmental conditions, including:
  - » adapted to local sandy soils;
  - » salt and wind tolerant; and
  - » full sun and drought tolerant.
- consider safety and maintaining open sightlines for pedestrians and vehicles
- include locally native plants to support the local biodiversity and habitat creation
- be waterwise for hardiness and have a low water intake.

Locally Native Groundcover to Street Verges and Medians (<1m height)

Locally native, waterwise groundcover shrubs and herbaceous plants are recommended for planting in street medians and verges in the Activity Centre. These plantings will add colour, seasonal interest, habitat value and local distinctiveness to the streetscapes. Plants have been selected for their low height (<1m), compact form and suitability for planting in road corridors. There is an opportunity to replace many of the existing grass verges with these plantings in order to reduce water requirement and maintenance. This locally native plant selection is recommended for the local accessway and waterfront accessway streetscape typologies.

Table 6 Recommended Plant List:

Scientific Name	Common Name
» <i>Acacia pulchella</i>	» Prickly Moses (Mindaleny)
» <i>Anigozanthos manglesii</i>	» Mangle’s Kangaroo Paw (Kurulbrang)
» <i>Anigozanthos viridus</i>	» Green Kangaroo Paw (Koroylbardany)
» <i>Banksia dallanneyi</i>	» Couch Honeypot
» <i>Banksia nivea</i>	» Honeypot Dryandra (Bulgalla)
» <i>Calothamnus sanguineus</i>	» Silky-leaved Blood Flower (Boolgalla)
» <i>Carpobrotus virescens</i>	» Coastal Pigface (Kolbogo)
» <i>Conostylis candicans</i>	» Grey Cottonhead
» <i>Dianella revoluta</i>	» Blueberry Lily (Mangarel)
» <i>Eremophila glabra</i> ‘Kalbarri Carpet’	» Kalbarri Carpet Emu Bush
» <i>Ficinia nodosa</i>	» Knobby Club Rush (Yangjet)
» <i>Grevillea crithmifolia</i> ‘Green Carpet’	» Green Carpet Grevillea
» <i>Grevillea preissii</i> ‘Sea Spray’	» Sea Spray Grevillea
» <i>Hardenbergia comptoniana</i>	» Native Wisteria (Koorla)
» <i>Hemianдра pungens</i>	» Snakebush
» <i>Hibbertia racemosa</i>	» Stalked Guinea Flower
» <i>Myoporum insulare</i> ‘Coastal Carpet’	» Coastal Carpet Native Juniper
» <i>Olearia axillaris</i> ‘Little Smokie’	» Little Smokie Olearia
» <i>Patersonia occidentalis</i>	» Purple Flag (Komma)
» <i>Pimelea ferruginea</i>	» Pink Rice Flower
» <i>Rhagodia baccata</i>	» Berry Saltbush
» <i>Scaevola crassifolia</i>	» Thick-leaved Fan-flower





**Exotic/non-locally Native Groundcover to Street Verges and Medians (<1m height)**

Robust, urban tolerant, Perth proven low groundcover shrubs and herbaceous plants are also recommended, where appropriate, for planting in street medians and verges in the Activity Centre. These plants give additional robust options to add colour and seasonal interest to the streetscapes. Plants have been selected for their low height (<1m), compact form and suitability for planting in road corridors. The following plant selection is recommended for the Canning Highway, local connector and transport boulevard streetscape typologies.

**Table 7 Recommended Plant List:**

Scientific Name	Common Name
» Adenanthos cuneatus ‘Coral Carpet’	» Coral Carpet Jug Flower
» Anigozanthos hybrids	» Kangaroo Paw Hybrids
» Atriplex cultivars	» Saltbush
» Callistemon ‘Little John’	» Little John Bottlebrush
» Dianella cultivars	» Blueberry Lily
» Eremophila glabra ‘Kalbarri Carpet’	» Emu Bush
» Grevillea cultivars	» Grevillea
» Hibbertia scandens	» Snake Vine
» Leucophyta brownii	» Cushion Bush
» Lomandra cultivars	» Mat Rush Cultivars
» Myoporum parvifolium	» Creeping Myoporum
» Rhamphiolepis indica (compact cultivars)	» Indian Hawthorn
» Rhoeco spathacea	» Moses-in-the-Cradle
» Scaevola cultivars	» Fan Flower
» Syzygium australe (dwarf cultivars)	» Creek Lilly Pilly
» Trachelospermum jasminoides	» Chinese Star Jasmine
» Westringia fruticosa	» Native Rosemary





Seasonal/Feature Planting to Public Open Spaces and Key Nodes

Western Australian native small trees, shrubs, herbaceous plants and annuals are recommended for planting in key street nodes and public open spaces e.g. Market Plaza and Central Plaza. These plantings will celebrate the wildflowers of the state and add colour, seasonal interest, architectural form and local distinctiveness to key nodes. Planting mixes and seasonal colour themes can be selected from the following recommended plant list.

Table 8 Recommended Plant List:

Scientific Name	Common Name	Scientific Name	Common Name
<u>Shrubs/Herbs/Annuals:</u>		<u>Large Shrubs/Small Trees:</u>	
» Acacia pulchella	» Prickly Moses (Mindaleny)	» Banksia menziesii	» Firewood Banksia (Bulgalla)
» Anigozanthos hybrids	» Kangaroo Paw Hybrids	» Callistemon 'kings Park Special'	» Kings Park Special Bottlebrush
» Banksia menziesii (dwarf form)	» Dwarf Firewood Banksia (Bulgalla)	» Corymbia ficilifolia 'Summer Red'	» Red Flowering Gum
» Brachyscome iberidifolia (annual)	» Swan River Daisy	» Eucalyptus caesia 'Silver Princess'	» Silver Princess Caesia (Gungurru)
» Chrysocephalum apiculatum	» Yellow Buttons	» Eucalyptus macrocarpa	» Mottlecak
» Conostylis candicans	» Grey Cottonhead	» Xanthorrhoea preissii	» Grass Tree (Balga)
» Dampiera linearis	» Common Dampiera		
» Grevillea cultivars	» Grevillea		
» Kennedia prostrata	» Running Postman (Wollong)		
» Lechenaultia biloba	» Blue Leschenaultia		
» Melaleuca seriata			
» Olearia axillaris 'Little Smokie'	» Little Smokie Olearia		
» Orthrosanthus laxus	» Morning Iris		
» Patersonia occidentalis	» Purple Flag (Komma)		
» Pimelea ferruginea	» Pink Rice Flower		
» Rhodanthe chlorocephala (annual)	» Pink and White Everlasting		
» Rhodanthe manglesii (annual)	» Mangles Everlasting		
» Schoenia filifolia (annual)	» Everlasting Daisy		
» Verticordia sp.	» Feather Flower		
» Waitzia suaveolens (annual)	» Everlasting (Dangalang)		



Eucalyptus macrocarpa



Pimelea ferruginea



Orthrosanthus laxus



Schoenia filifolia



Melaleuca seriata



Brachyscome iberidifolia



Dampiera linearis



Banksia menziesii



Chrysocephalum apiculatum



Lechenaultia biloba



Rhodanthe chlorcephala



Calistemon 'Kings Park Special'



Foreshore Revegetation

There are opportunities for revegetation to the foreshore areas shoreline as per the City’s Foreshore Restoration Strategy Review. The Strategy recommends revegetation as a control method to prevent future erosion. Such revegetation would provide amenity, habitat and foreshore protection. The following is a list of recommended locally native species suitable for revegetation of the South of Perth Yacht Club shoreline and Canning River Shoreline within the Activity Centre.

Table 9 Recommended Plant List:

Scientific Name	Common Name
» Juncus pallidus	» Pale Rush
» Juncus kraussii	» Salt Marsh Rush
» Ficinia nodosa	» Knobby Club Rush (Yangjet)
» Cyperus gymnocaulos	» Spiny Flat Sedge
» Bolbopschoenus caldwellii	» Marsh Club Rush
» Sarcocornia quinqueflora	» Beaded Samphire
» Sarcocornia blackiana	» Thick-head Glasswort



Rain garden Planting

There are opportunities for the incorporation of rain gardens as part of the WSUD for the streetscapes. These rain gardens will be planted with locally native, water and drought tolerant, robust plants suited to these locations. In addition to the rush and sedge like species there will also be flowering shrubs/herbs to add interest and seasonal colour. Rain gardens have the potential to be incorporated into all streetscape typologies. The following is a list of recommended species for planting in rain gardens.

Table 10 Recommended Plant List:

Scientific Name	Common Name
» Anigozanthos manglesii	» Mangle’s Kangaroo Paw (Kurulbrang)
» Anigozanthos viridis	» Green Kangaroo Paw (Koroylbardany)
» Conostylis aculeata	» Prickly Conostylis
» Dianella revoluta	» Blueberry Lily (Mangarel)
» Ficinia nodosa	» Knobby Club Rush (Yangjet)
» Patersonia occidentalis	» Purple Flag (Komma)
» Schoenus curvifolius	» Feather Flower
» Verticordia acerosa	» Plumed Feather Flower
» Verticordia plumosa	





## Paving

Paving not only provides a functional and usable surface but also is a key contributor to the character of a place. With the increase in density there will be extensive paving required through the streets and POS. The selection of paving is key to creating a successful place that is functional, legible and aesthetically pleasing.

General design principles that informed the material/paving selection for the Canning Bridge Activity Centre are:

- Locally sourced products
- Colours in keeping with the overall vision for Canning Bridge
- Easy to replace/repair
- Use of a mixture of concrete, exposed aggregate and segmental paving dependant on the use of the location.
- In accordance with Australian standards be DDA compliant
- Sealed for ease of cleaning and maintenance

## Paving Types

### Paving Type 1:

Located in all plazas and public open spaces. Treatments should be either large format unit pavers or exposed aggregate concrete. Detailing and arrangement should be bold and civic in nature.

Suggested material: Insitu concrete with exposed local aggregate finish or Urban Stone precast engineered series.

### Paving Type 2:

Located in high use pedestrian streetscape areas. Treatments should be large format rectangular precast concrete unit paver (400x200mm) in a modern neutral or warm colour.

Suggested Material: Urban Stone engineered series 'river topaz' as a primary colour and 'casino grey' and 'golden gunmetal' as a secondary colours.

### Paving Type 3:

Located in lower use pedestrian streetscape areas. This will typically be for interim use until the densities of the CBACP are realised.

Suggested material: grey insitu concrete with broom finish. Expansion joints and control joints may be aligned with property

boundaries and any architectural features such as protruding columns. They should not exceed 3 metres apart so that whole portions of the path can be replace if required.

### Tactile Indicators:

Provide tactile ground surface indicators in accordance with Australian Standards. Preference is for tactile indicators to be laid in modular units for longevity and consistently across the precinct.

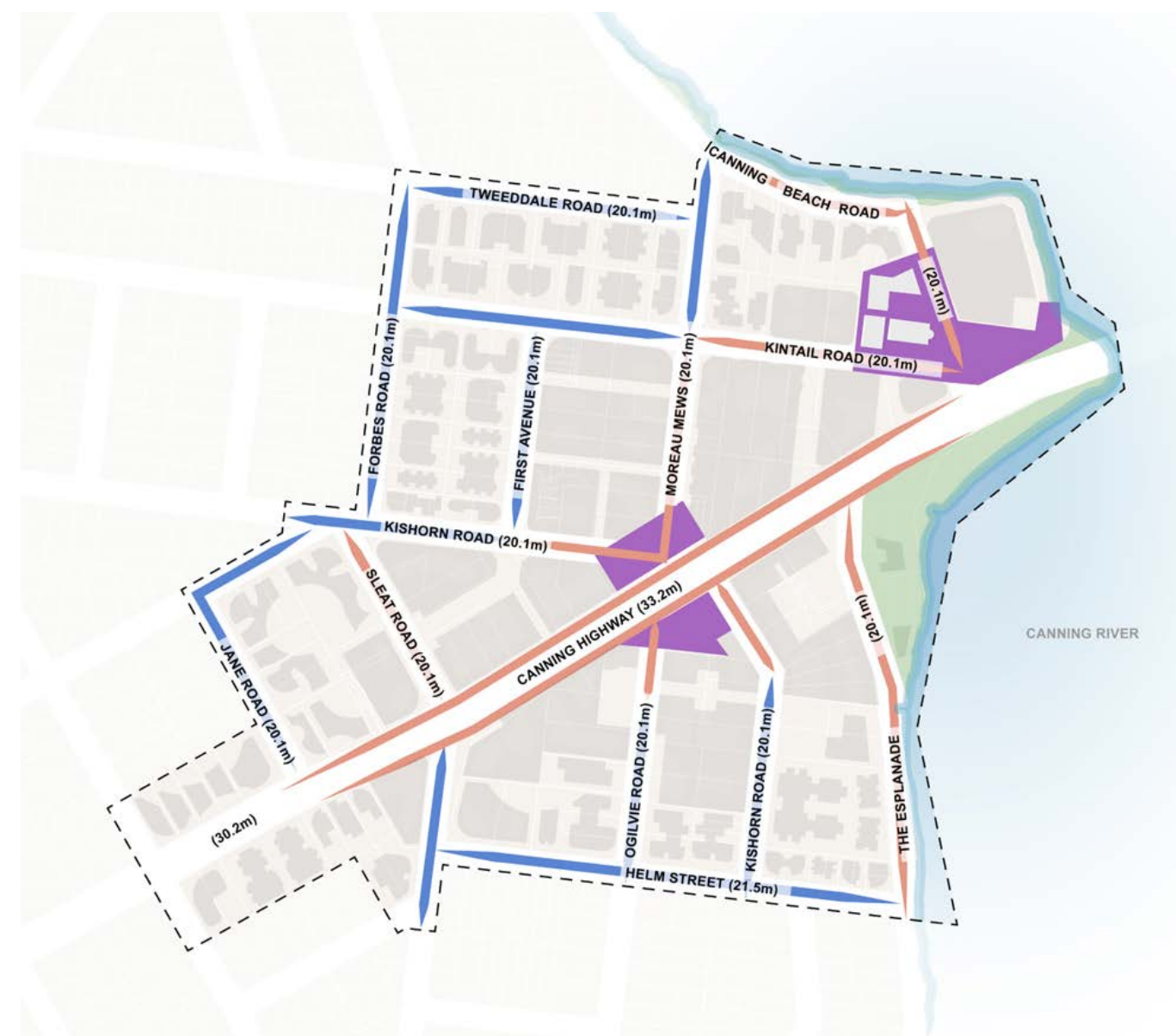
### Carbays:

Located in all on road carbays. Treatments should have appearance of small square cobbles (100x100mm approx) but for structural stability should use rectangular pavers in a 90 degree interlocking herringbone patterned arrangement. This is similar to the existing parking areas along Canning Beach Road.

Suggested material: Easilock 80

### Permeable pavements:

Provide in accordance with water management requirements. Materials should be reflective of the street type. These could be incorporated into carbays with a product similar to Boral's 'Hydrapave' or in tree pits using resin bound gravel.





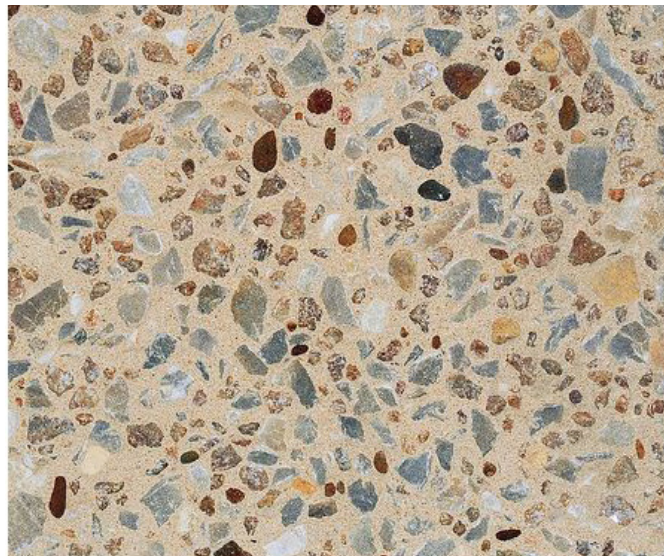


Fig. 64 Type 2 - Unit paving: Urban Stone - River Topaz



Fig. 65 Type 1 - Coloured Concrete in irregular shaped blocks provides interest and character to a space while providing for ease of maintenance/ replacement.



Fig. 66 Subtle pattern of neutrally toned unit pavers contribute to the legibility of a space

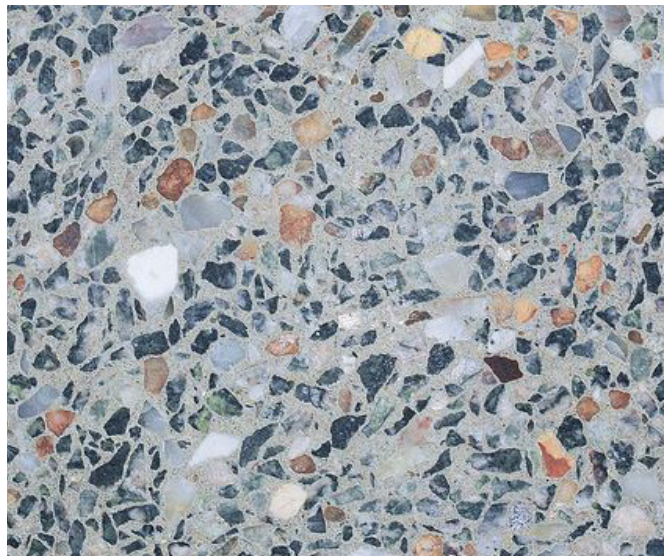


Fig. 67 Type 2 - Unit paving: Urban Stone - Casino Grey



Fig. 68 Type 1 - Numbers and words inset into concrete providing sense of place and an opportunity to narrate local history events and people.



Fig. 69 Type 2 -Logo/Motif etched into pavers can be implemented throughout the plaza area



Fig. 70 Type 2 - Unit pavers in three complimentary neutral tones

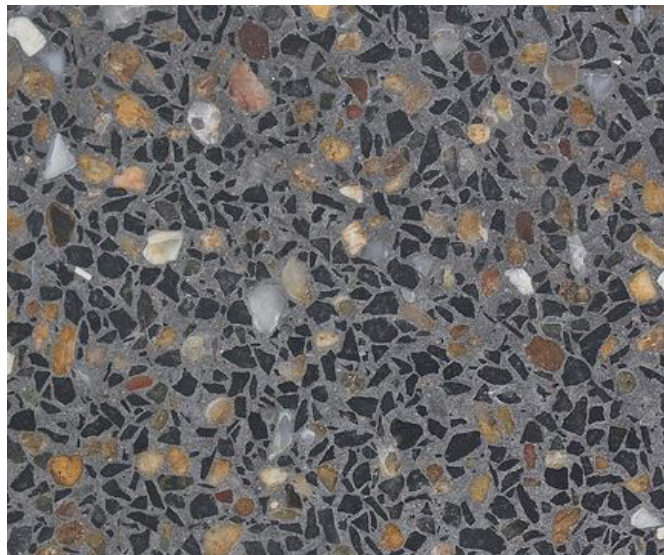


Fig. 71 Type 2 - Unit paving: Urban Stone - Golden Gunmetal

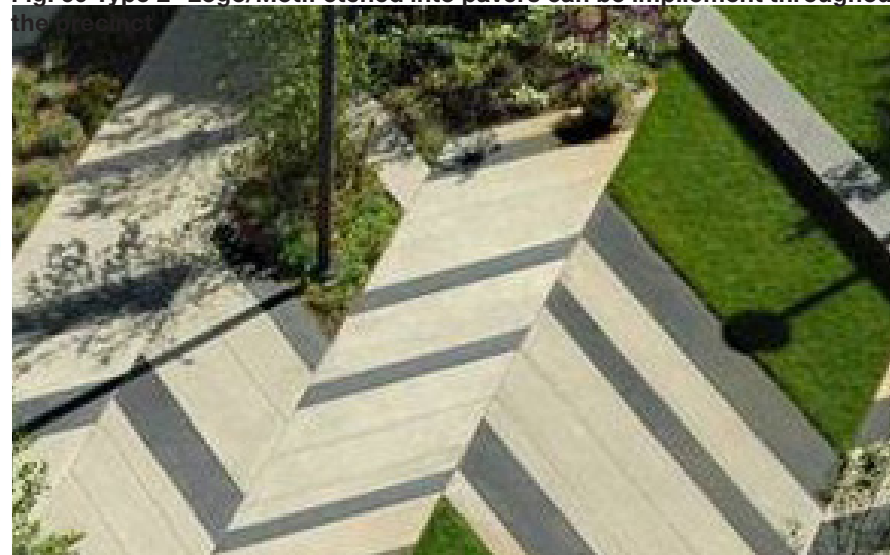


Fig. 72 Type 1 - Large scale in situ concrete patterned treatment to plaza area. The geometric pattern allows for ease of replacement for maintenance purposes. Green spaces punctuate the paving to providing relief and tree planting opportunities.



Fig. 73 Type 2 - Large format grey pavers could be used along a wide verge or plaza space and punctuated with 'crazy paving' and/or trees.



Furniture

General design principles that inform the furniture selection for the Canning Bridge Activity Centre are:

- A cohesive suite of furniture with complementary styles and materials and the option to adapt for specific requirements i.e. back, no back, arm rests.
- Reflect the local character
- Option to integrate local art
- Robust and sustainable materials suitable for the West Australian riverside environment
- Low ongoing maintenance requirements
- Vandal proof and anti-graffiti coated
- Locally made is preferable
- Surface mounted for ease of replacement
- DDA compliant. Handrails and balustrade should be used where necessary in the public realm

Street Furniture Australia and Altiform are the preferred suppliers as their lead time is 4-5 weeks.

Street Furniture Australia have a comprehensive range of ‘off the shelf’ products which can easily incorporate art.

Altiform are a West Australian manufacturer and have a proven track record in delivering bespoke furniture items.

Seating

There are different types of seats; with back, without back or attached to wall.

Generally, seating should be:

- Simple and easy to replace either the entire seat or damaged parts. Surface mounted is preferred
- Contribute to the aesthetics of the street without being visually dominating
- Be adaptable for specific requirements i.e. arm rest, backs will keeping with the same style
- Plaza areas should be bespoke and of an appropriate scale - refer to public art
- Seating opportunities should also be incorporated into other elements such as walls and planter boxes
- Located frequently to allow for vulnerable people to walk i.e. the elderly

Suggested Product: SFA Classic Plaza range with hardwood timber battens and surface mounted pedestal legs. Frame to be powder coated in colour which is neutral or in keeping with the colour palette.

Rubbish Bin Enclosures

Generally, rubbish bin enclosures should be:

- Easy to clean and access,
- Have a cover so that it is not accessible for birds and other pests,
- Recycle and rubbish bins should be provide in plaza areas and key nodes,
- Reflect the materials of the seating and other elements and colour themes of the precinct.
- Powder-coating is not recommended for this product as there is a high chance of damage

Suggested Product: SFA 240L bin enclosure with lid. Either timber battens to match the seats or stainless steel with art incorporated into the perforated metal.

Bicycle Racks

Generally, bicycle racks should be:

- Of a style that adequately supports a bicycle upright
- Simple, elegant and not over designed
- Provided in larger clusters in open space/plaza areas
- Powder-coating is not recommended for this product as there is a high chance of it getting knocked and chipped

Suggested Product: SFA stainless steel ‘Key’ bicycle hoops with perforated metal tag at neck for the City’s logo or motif.

Water Fountain

Generally, water fountains should be:

- Along major pedestrian routes and hubs
- Capable of allowing refill of bottles and dog bowls
- Accessible and inclusive
- Option to powder coat to reinforce the colour palette.

Suggested Product: SFA Arqua station with bottle filler, fountain and dog bubbler.

Bollards

Generally, bollards should be:

- Strong and sturdy to restrict access to areas where vehicles are not permitted
- Simple and visually recessive
- Located in areas where access needs to be controlled
- Powder-coating is not recommended for this product as there is a high chance of it getting knocked and chipped

Suggested Product: SFA wide bollard range in stainless steel.





Fig. 74 SFA Classic Plaza DDA seat with hardwood battens, arm rests and pedestal legs



Fig. 75 SFA Classic Plaza DDA bence with pedestal legs



Fig. 76 Classic plaza setting with powder coated frame.



Fig. 77 SFA Arqua station with bottle filler, fountain and dog bubbler.



Fig. 78 240L timber panel bin surrounds with cover to discourage birds and pests.



Fig. 79 240L bin stainless steel surrounds with perforated metal for inclusion of art.



Fig. 80 SFA Wide bollard range



Fig. 81 Mosaic on SFA Arqua station

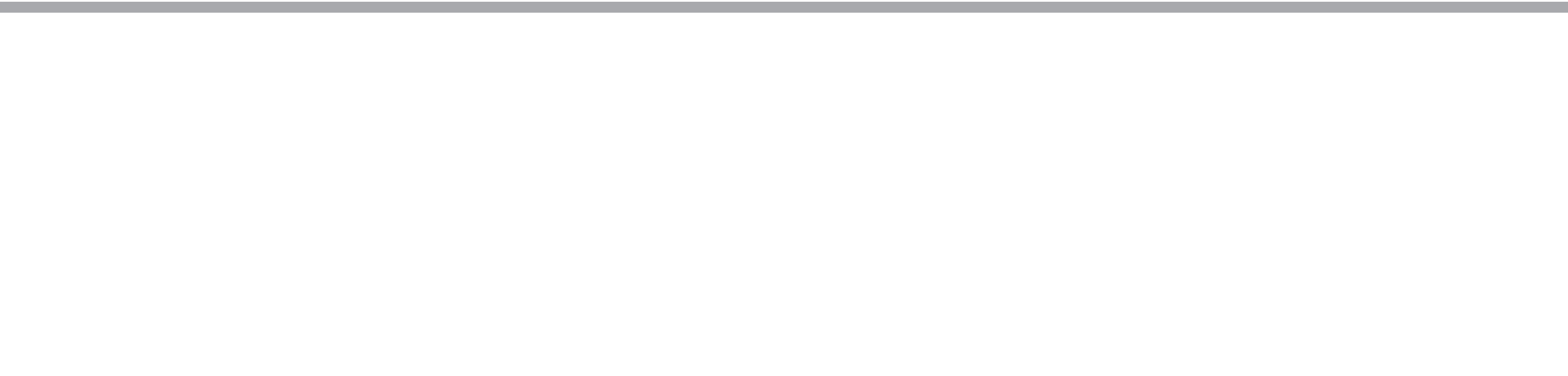


Fig. 82 SFA Stainless steel Key bike hoop. Panel at neck can incorporate the City's logo or a motic.



Fig. 83 Custom concrete boulders seats for informal seating





Lighting	Streetscape Lighting	Public Open Space Lighting
<p>Lighting is an integral element of the masterplan for Canning Bridge as it provides safety, ambiance and activation of spaces in the evening. General principles include;</p> <ul style="list-style-type: none"><li>• All lighting shall be in accordance with Australian Standards and Western Power standards and where applicable, be Main Roads WA approved</li><li>• Where possible, lighting should be integrated into elements to reduce visual clutter, for example, within walls, shelters, seats and bollards</li><li>• Lighting elements shall be efficient and energy saving where possible</li><li>• The lighting style shall reflect the overall vision for the Canning Bridge and tie into the furniture and colour palettes</li></ul> <p>Within the Canning Bridge Activity Centre there are two identifiable lighting types. These are:</p> <ul style="list-style-type: none"><li>• Streetscape</li><li>• Public open space.</li></ul>	<p>Street lighting shall be in keeping with the Canning Bridge vernacular and be in accordance with the following general principles:</p> <ul style="list-style-type: none"><li>• Be in accordance with Main Roads WA, Western Power and Australian standards</li><li>• Use low energy use fittings</li><li>• Poles should be HDG or powder coated in a neutral colour</li><li>• Poles should be of an appropriate scale for the street typology. i.e. local accessways should use the lowest acceptable pole height for more intimate ambience</li></ul> <p>Pole accessories could include (subject to MRWA approval):</p> <ul style="list-style-type: none"><li>• Banners to promote local events</li><li>• CCTV for safety and traffic management</li><li>• Street Signs</li><li>• Traffic lights</li><li>• Catenary</li><li>• Relevant colours of the colour themes</li></ul>	<p>In the instance where Main Roads WA does not approve accessories on the light pole, stand alone banner poles should be considered along Canning Highway, the local connectors and the public transport boulevard.</p> <p>Public open space areas such as plazas, nodes (e.g.. BBQ areas) and linkage paths should be lit to encourage night time activation and also to provide real and perceived safety for users.</p> <p>The selection and design of lighting for POS should follow these general principles:</p> <ul style="list-style-type: none"><li>• Lighting shall be integrated into furniture items such as seats, walls and bollards to reduce visual clutter</li><li>• Should up-light significant trees and art features</li><li>• Be robust and suitable for the environment of the river's edge</li><li>• Be designed for ease of maintenance and replacement</li><li>• Should be of an appropriate scale for use ( i.e. 4-6m high pole for pedestrian areas)</li><li>• Catenary lighting should be considered to activate pedestrian places by creating a sense of enclosure, safety and ambience.</li></ul>





Fig. 84 Light bollard along a pedestrian pathway with the option of colour  
Fig. 85 Luminaire of suitable style for a public open space



Fig. 89 Plaza/Pedestrian walkway lighting provide nighttime activation



Fig. 87 Standard MRWA Approved Street Lightpoles by INGAL EPS



Fig. 90 Catenary lighting to assist in night time activation of a street



Fig. 91 Catenary lighting to activate a plaza



Fig. 86 Lighting incorporated into seawall could be used around the upgraded Canning Bridge



Fig. 88 Lighting incorporated into feature seating in a plaza or wide verge creates a gathering point for pedestrians



Fig. 92 Lighting in feature seating changes colour for variety and theming for events



## Water Sensitive Urban Design

The design principles for urban water management include:

- Protect natural systems – protect and enhance natural water systems (creeks, rivers, wetlands) within urban developments
- Protect water quality – improve the quality of water draining from urban developments into creeks, rivers and bay environments
- Integrate stormwater treatment into the landscape – use stormwater treatment systems in the landscape by incorporating multiple uses that will provide multiple benefits, such as water quality treatment, wildlife habitat, public open space, recreational and visual amenity for the community
- Reduce runoff and peak flows – reduce peak flows from urban development by the use of on site temporary storage measures (with potential for reuse) and minimise impervious areas
- Add value while minimising development costs – minimise the drainage infrastructure cost of development
- Reduce potable water demand – use stormwater as a resource through capture and reuse for non-potable purposes (e.g. toilet flushing, garden irrigation, laundry).
- Support local biodiversity and habitat creation - plant locally native species that are appropriate to the conditions of the WSUD device. Species selection should consider surrounding use for example in high use pedestrian areas species should have a tidy and attractive appearance and not cause a trip hazard or block sight lines.

In relation to specific localities within the masterplan area, the design principles seek to:

- Where possible, biofilter treatment should occur at the entry to existing drainage, with a filter area of two percent of the impervious catchment area.
- Source treatment measures such as tree pits, biofilters and bioretention swales and rain gardens are all suitable for implementing within the verges along the Local Connector, Public Transport Boulevard and Local Accessways.
- Water-front accessways may have high groundwater, limiting the infiltration capacity. Treatment options in these locations include Gross Pollutant Traps, filter socks and in-pit trash baskets.
- Parking spaces along Local Accessways are an opportunity to use permeable paving and/or replace occasional parking spaces with rain gardens in the form of blister islands.
- Roads and other impervious surfaces to be graded towards pervious areas, with flat kerbs to be used to allow direct flow into these areas.



Fig. 93 WSUD incorporated into carpark



Fig. 94 Planted WSUD incorporated into verge



Fig. 95 Kerbside rain garden incorporating tree planting, gravel mulch and sedge planting (Telethon Ave).



### Designing Out Crime

Safety and security has been considered in all aspects of the masterplan however in summary, the objective for Canning Bridge is to ensure a well integrated urban form that provides a safe environment for all users by;

- Maximising visibility and surveillance
- Increasing pedestrian activity and maximising connections between precincts, and
- Clearly defining private and public space responsibilities

Crime Prevention Through Environmental Design (CPTED) uses the built environment to reduce the opportunity for crime, increase the perception of safety by authorised users of a space, while increasing the perception of risk by unauthorised users of a space.

Development should promote the safety and security of the public environment. Buildings should overlook streets to promote natural supervision. Blank walls onto streets, or large distances between the footpath and openings are discouraged.

### Safer Design

Access to and through a development should be safe and efficient

- Entrances shall be positioned so that pedestrian movement is adequately lit and directly visible from a public space. Access to and from car parking areas and building entrances shall be adequately sign-posted with provision of good lighting to enable safe out of hours use
- To maximise visibility and surveillance of the public environment the incorporation of active edge uses, including those at ground level that spill out onto public space and those located at the front of a building on the first floor that enable overlooking into public space, are encouraged. Windows can be positioned to overlook pedestrian routes, provided that privacy concerns are met
- Clearly define private and public space responsibilities
- The function and ownership of an area can be clarified by paving, lighting and planting. Planting shall not create concealed spaces near paths

and lighting should allow clear lines of visibility. Where the ownership of an area is ambiguous and undefined, it can become the focus of anti-social and criminal behaviour

- Street furniture and lighting shall be made of durable materials to a vandal-resistant design. Graffiti-resistant materials and surface finishes are appropriate at street level in all developments. Graffiti should be reduced by rapid removal, increased lighting and general design features which promote visibility and discourage crime

For further information see WAPC Planning Bulletin 79, 'Designing Out Crime' Planning Guidelines.

CPTED strategies will be employed as far as practicable to enhance natural surveillance, natural access control and territorial reinforcement around the site. Where CPTED cannot provide the desired level of security, target hardening strategies using security measures, such as CCTV, may be considered.



Fig. 96 Clearly define public/private space



Fig. 97 Open sightlines along the path for safety



Fig. 98 Facades of buildings are activated through windows and doors providing activation and passive surveillance.



# 3.6 Stormwater quality improvement measures

## Recommended measures

The improvement of stormwater quality within the activity centre is possible with several different options, including:

- New biofilters and bioretention swales
- Opportunistic rain gardens and tree pits
- Biofilter upgrades to existing sumps and parks
- Gross Pollutant Traps
- In-pit trash baskets and filter socks
- Updating maintenance plans where appropriate

water levels are higher. Tree pits are more suitable where space is limited (figure to the far right). These can be used:

- Adjacent to built infrastructure
- For removal of sediment, which can contain heavy metals from road runoff and also solubles such as nitrogen and phosphorus from excess fertiliser use.
- For climates with long dry spells, such as Perth.
- For initial treatment for stormwater harvesting.

Bioretention zones, including tree pits, rain gardens, biofilters, and bioswales treat the first 15mm of stormwater. The figure to the right shows a general schematic. These would be suitable in verges and green spaces throughout the site, ideally adjacent to existing drainage inlets, where there is sufficient separation from groundwater to allow infiltration. Lined bioretention allows better use of stormwater, and reduces the need for other sources of irrigation in the summer months, and can be used where ground

Pervious paving may be an option in car parking areas adjacent to green spaces and bioretention (Figure on the opposite page). Pervious paving can be installed on a slope that is not steeper than five percent, where high permeability soils are present. Private developers and land owners should be also be encouraged to implement the discussed measures. Main Roads WA and The City should consider integrating these measures into new works and upgrade projects.

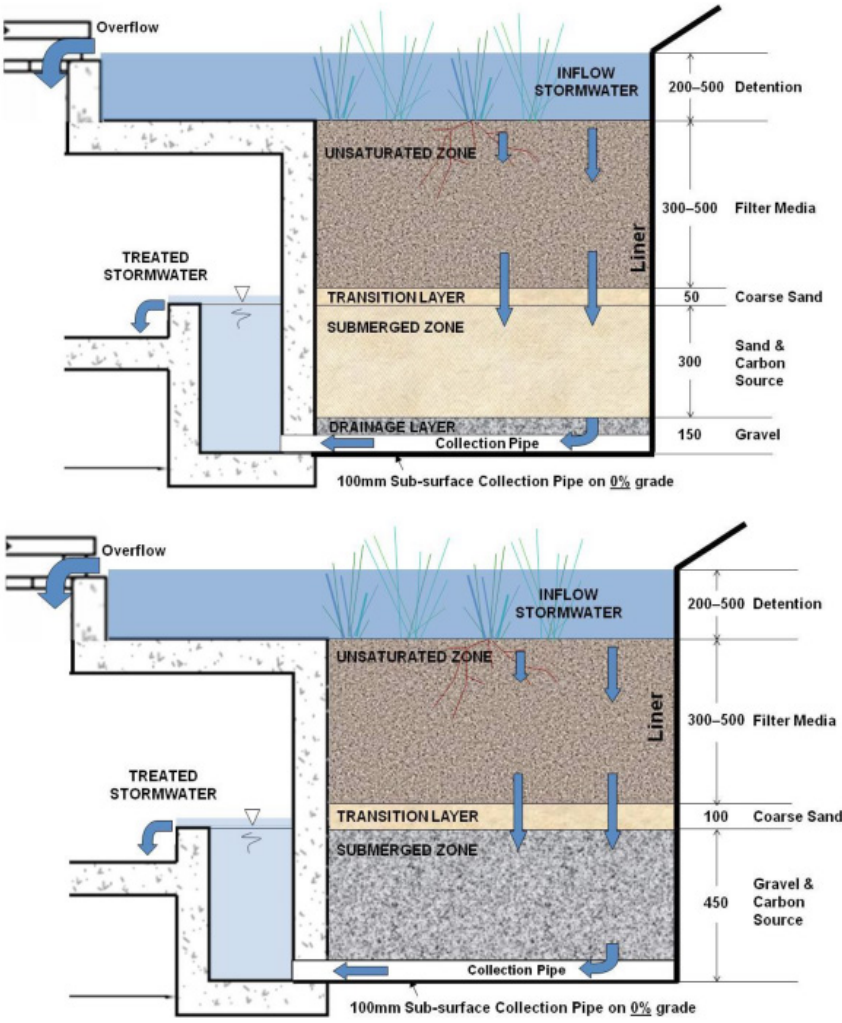


Fig. 99 Lined biofiltration system with a submerged zone (FAWB 2009)

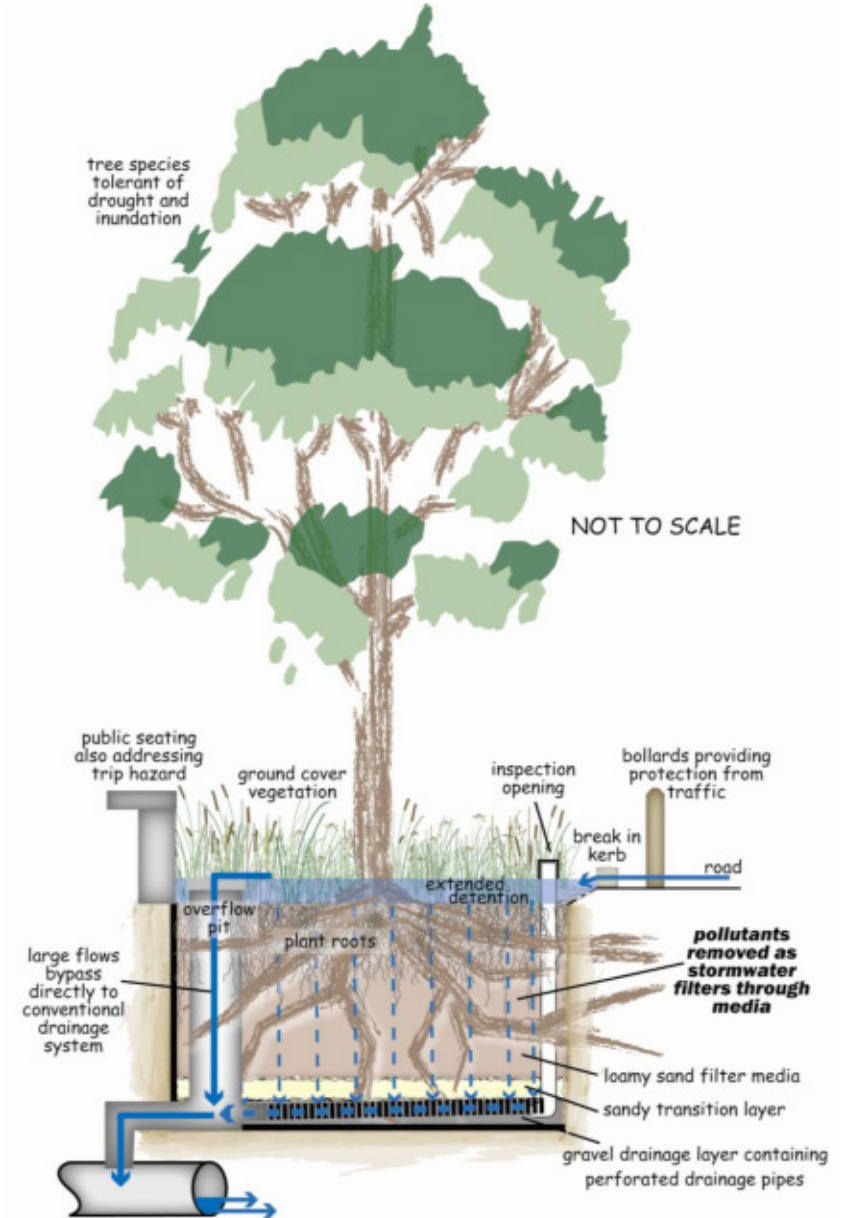


Fig. 100 Tree pit (FAWP 2009)



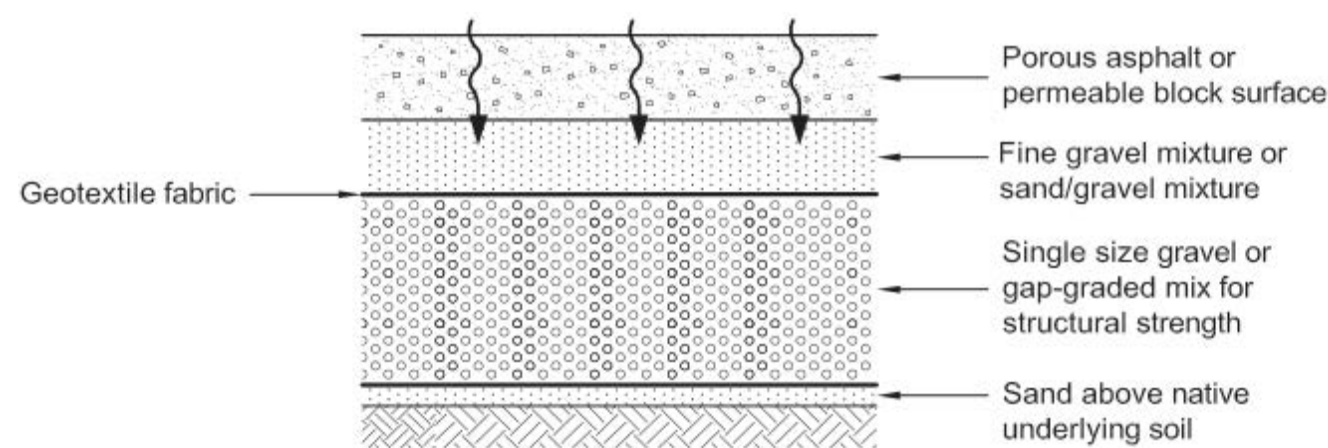


Fig. 101 Schematic of pervious pavement (DoW and SRT 2007)

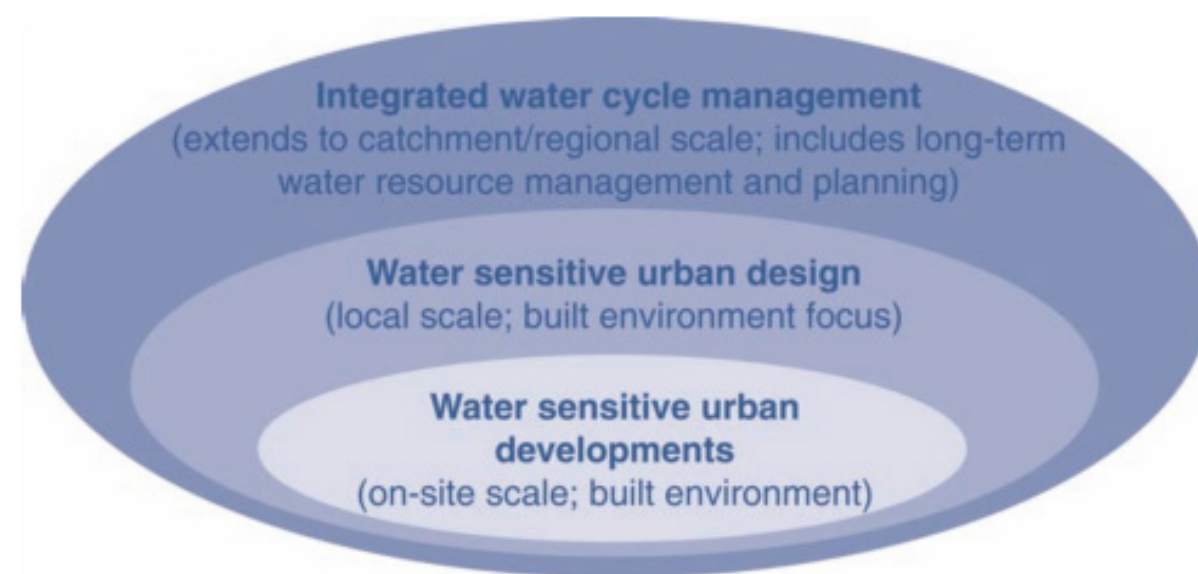


Fig. 102 Managing stormwater (BUWM and WAPC 2008)

### Managing stormwater in future developments

This masterplan proposes a stormwater management system for the area using a major/minor approach to convey and detain stormwater, see figure top left.

The principle of “maintaining water discharge volumes and peak flows post-development, relative to pre-development conditions” (GHD 2014) is applied to the site. Road catchments are the primary concern. Consequently, the proposed design criteria for stormwater management consists of the following:

#### First flush event

- Events producing up to 15mm of rainfall will be retained and infiltrated in-situ.

#### 10 year ARI

- Flows up to the 10 year ARI will be carried within road reserves.
- The drainage system will be a network of swale drains, side entry pits, gullies, pipes, kerbs, gutters etc designed to carry and/or infiltrate runoff.
- For major events exceeding the 10 year ARI event the road reserve will convey stormwater via flooding of the pavement areas.

#### 100 year ARI.

- Major flows will be carried by the entire drainage reserve and road network, with serviceability of roads based on their use.
- Canning Highway, Local Connector Roads and public transport boulevards will be serviceable up to the 100 year event, defined as no more than 200 mm of water on the road surface.

Development of the site offers the opportunity to introduce new water quality treatment to the area. This masterplan, consistent with the LWMS’s overarching principle for water quality “to improve the quality of surface and ground water leaving the development area to maintain and restore ecological systems”, proposes the following design criteria:

- Swales/vegetated bioretention systems (also referred to as rain gardens) are to be sized at two percent of the constructed impervious area from which they receive runoff.
- Treat the first flush event runoff from impervious

surfaces at or near the source, using a combination of biofilters, bioretention swales, rain gardens and trees, consistent with the Stormwater Management Manual (DoW 2007).

- Implement gross pollutant traps, in-pit trash baskets or filter socks at outlets to the Canning River to treat stormwater not intercepted by biofilters.
- Achieve concentration targets for nutrients in stormwater discharging to the Canning River in accordance with the Swan Canning Water Quality Improvement Plan (SRT 2012), of 0.1 mg/L for total phosphorus and 1.0 mg/L for total nitrogen.
- Ensure adequate resourcing and budgets for the planning, implementation and maintenance for all WSUD projects and assets.

Where possible, stormwater will be used to meet non-potable demands, however opportunities for harvesting and reuse are limited to where a suitable aquifer is available for infiltration and abstraction.



---

### Potential Biofilter Areas

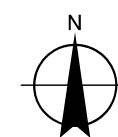
Areas for source treatment have been identified as shown in the figure on the follow page, based on existing development. Whilst it is recognised that development will alter verges and therefore the exact location of biofilters, amalgamation of lots has the potential to reduce the number of driveways and increase verge biofilter opportunities.

Identified biofilters are adjacent to entry pits for the existing drainage system. An area of 0.61 ha was identified from a total road catchment area of 9.68 ha, which is six percent. Given that this exceeds the recommended filter area of 0.19 ha for a catchment of this size, the most suitable areas can be selected and refined for upgrades.





Fig. 103 Potential biofilter areas



LEGEND

- City Stormwater Pit
- City Stormwater Pipe
- Elevation
- Cadastre
- Study Area
- Potential Biofilter Area



# 3.7 Traffic improvement measures

## Recommended measures

Following stakeholder liaison, the literature review and assessment of available traffic data, GHD's Transport team have considered the network and future movement requirement and suggestions for traffic management.

### Canning Highway/Kintail Road/Canning Beach Road

It is recommended that the intersection of Canning Highway/Kintail Road/Canning Beach Road is considered for modification to include restricted movement to Canning Beach Road from Canning Highway, see figure to the right.

There are currently high numbers of right angle collisions occurring at the intersection involving traffic travelling from Canning Highway to Canning Beach Road and traffic exiting Kintail Road.

Access to the Raffles Hotel will be impacted by the proposal, however alternative access is available via Sleat Road or via Kintail Road.

A signage strategy will need to be developed if the modified plan is adopted to direct traffic to the Raffles Hotel.

Based on current volumes, around 1800 vpd (NB on Canning

Bridge Road) are required to divert via Sleat Road or Kintail Road due to the proposed modification.

Of the current 1800 vpd diverting to other routes it is assumed that 33 percent or 600 vpd could use Moreau Mews to access Canning Beach Road. Increasing current volumes from around 900 vpd to 1500 vpd. Traffic volumes on Canning Beach Road are around 3600 vpd. If the peak hour is assumed to be 10 percent then approaching volumes in Moreau Mews will be 105 vph (70% directional split assumed) and 180 vph on Canning Beach Road.

Of the remaining 1200vpd it could be assumed that 600vpd would use Kintail Road to access Forbes Road and 600vpd would continue along Canning Highway to Sleat Road. As discussed, earlier Paramics modelling undertaken as part of the Structure Plan indicated little impact at the Sleat Road/Canning Highway intersection. An additional 600vpd (60vph) accessing the Forbes Road roundabout is not anticipated to impact the operation of the roundabout based on a Sidra analysis using reassigned current volumes (a

level of service of A/B is maintained). Based on Austroads Guidelines no measures are required to accommodate these volumes, as referred to in Table 5.

The modified intersection design for Kintail Road/Canning Beach Road must include opportunity for Fire and Emergency Services Authority (FESA) access across the median.

The modified Kintail Road/Canning Beach Road intersection has been modelled previously with Paramics using existing volumes and the results indicate improvements to the level of service and delay at the Canning Highway/Kintail Road intersection with little impacts at the Canning Highway/Sleat Road intersection.

It should also be acknowledged that there will be no access to Canning Highway other than for buses in the ultimate plan as proposed by Main Roads.

The figure on the opposite page illustrates the likely configuration of Kintail/Canning Beach intersection. It is to be noted that the shown configuration is the ultimate configuration and accesses in the interim and earlier stages may be different.



Fig. 104 Kintail Road/ Canning Beach Road proposal



### Helm Street/Sleat Road Intersection

As previously raised following discussion with the City of Melville early development within the masterplan area will commence around the Helm Street location which will add pressure to the Helm Street/Sleat Road intersection. Sleat Road currently has significant queuing in the am peak hour caused by traffic accessing Canning Highway. The intersection is located approximately 90 m from Canning Highway.

A roundabout at the intersection whilst addressing likely traffic volumes is influenced by its proximity to Canning Highway and the existence of residential driveways.

A preliminary assessment of the required geometry indicates that a roundabout is unlikely to fit at this location due to site constraints. The driveway on the west side of Sleat Road would also need to be positioned and could not easily be achieved.

Additional traffic calming measures in Sleat Road should also be considered to deter through traffic.

In view of the site constraints, the intersection of Helm Street/Sleat Road is likely to preclude the construction of a roundabout. It is recommended that additional traffic calming measures along Sleat Road be considered.

Additional traffic calming measures in Sleat Road/Ullapool Road should include a continuation of the current slow points and/or diamond slow points. A transport model of the broader area is not available to consider the wider impacts of traffic calming however with current volumes around 5,000vpd rat running through other roads must be avoided. It is recommended a broader precinct study is undertaken to review and develop a traffic management plan. The feasibility/justification of installing roundabouts on the Sleat Road/Underwood Road route should be considered.

Options to upgrade the intersection could include the implementation of a right turn lane in Sleat Road, however the slowing effect of turning traffic (by not providing a turn lane) may assist in deterring through traffic and higher traffic speed. A review of the site would indicate that a

modification to include a separate through lane in Sleat Road and a separate right turn facility from Helm Street into Sleat Road is unlikely to fit. There is only 90m between Helm and Canning Highway creating a safety issue for traffic from Helm Street then subsequently turning left into Canning Highway. This is also likely to impact the path provision on the east side of Sleat Road.

A further option considered is a mini roundabout 2m dia island. Refer figure 108. However, the residential access on the west side prevents this unless the residential accesses are rationalised to intersect with the roundabout. Refer figure 107

A changed priority giving Helm Street priority into Sleat Road north has also been considered but is likely to cause significant congestion in Sleat Road both northbound and southbound and could not be recommended.

### Forbes Street

At 85 percentile, speeds along Forbes Road are higher than the posted speed. Traffic calming in Forbes Road may be required.

If Sleat Road becomes part of the future public transport route

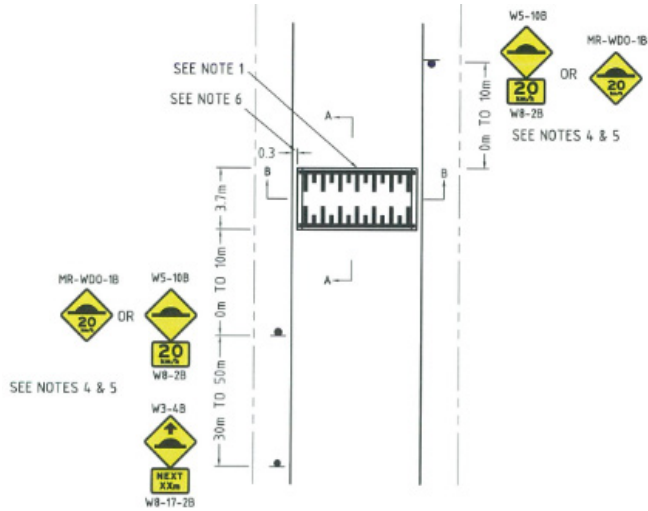


Fig. 105 Example of a bus friendly speed cushion (refer Main Roads DWG200331-128-5)

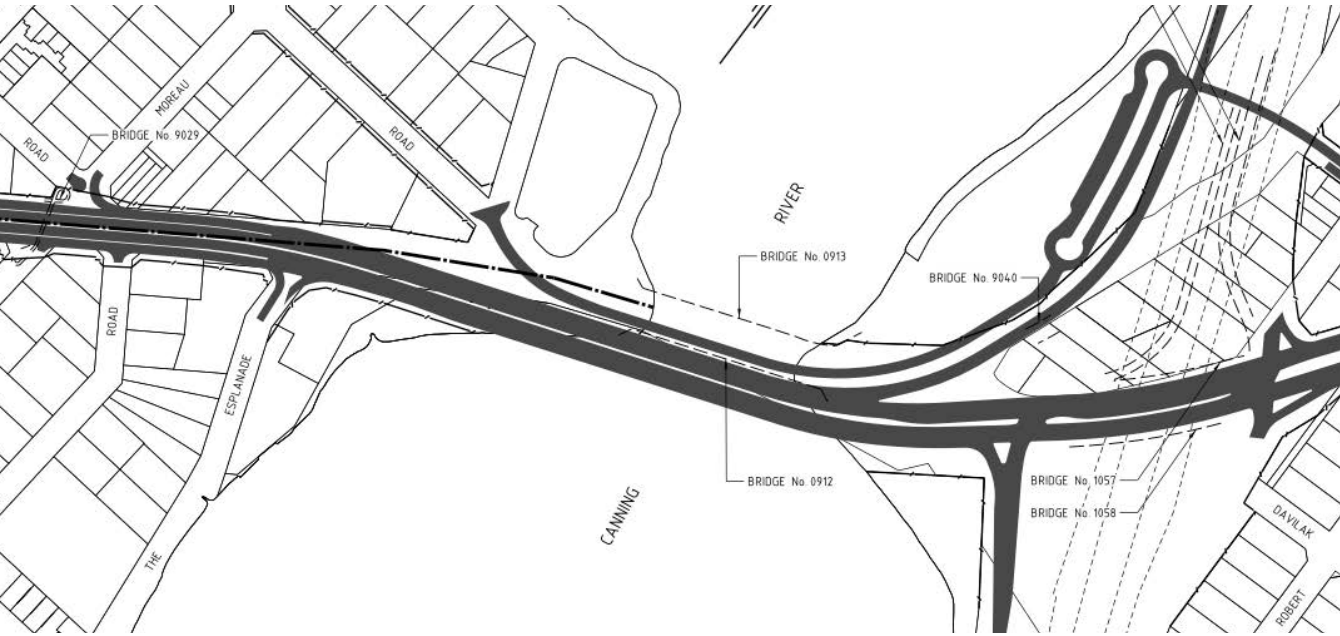


Fig. 106 Main Roads future ultimate plan

Table 11 Major road volumes

Major Road Type <sup>1</sup>	Major Road Flow (vph) <sup>2</sup>	Minor Road Flow (vph) <sup>3</sup>
Two-lane	400	250
	500	200
Four-lane	650	100
	1000	100
	1500	50
	2000	25

- Notes:
1. Major road is through road (i.e. has priority).
  2. Major road design volumes include through and turning movements.
  3. Minor road design volumes include through and turning volumes.



together with Kintail Road the type of traffic calming needs to be carefully considered. Bus friendly speed cushions may be an option, an example is shown in Figure 105. However, the City are not supportive of speed humps and a further option is the implementation of a diamond slow point similar to those in Bishopsgate St, Carlisle.

#### **Ogilve Street**

Car parking bays exist on both sides of Ogilve Street and adequate width for two-way traffic is not available particularly at the southern end where kerbside parallel parking exists.

It is recommended that parking is provided on one side of Ogilve Street at the southern end to facilitate two way traffic.

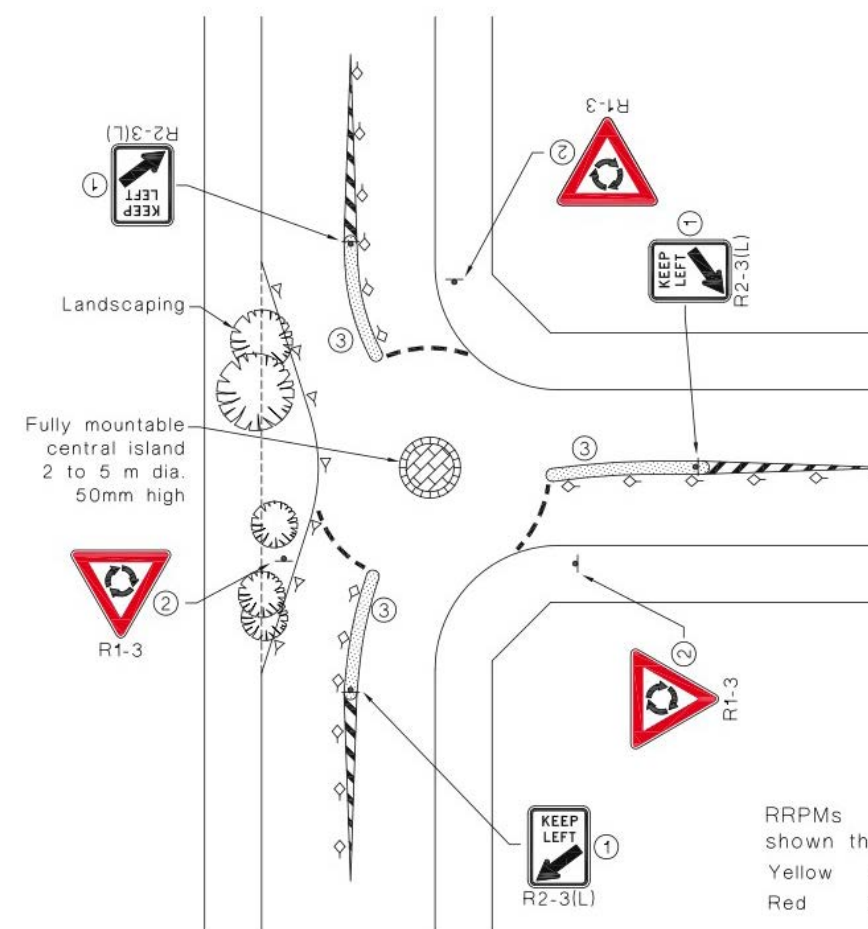
#### **Additional Modelling**

It is recommended that AIMSUN modelling or similar is undertaken to assess the impacts of the overall movement change following the completion of the Canning Highway upgrade.



**Fig. 107 Diamond slow point along Bishopsgate St, Carlisle**





**NOTES:**

- 1 Sign R2-3(L) may not be necessary where traffic is clearly required to pass to the left of the island
- 2 Sign R1-3 should be placed to create maximum conspicuity for approaching drivers.
- 3 Walk-through gaps at pavement level may be provided in median islands.

**Fig. 108 AS 1742.13-2009 Small diameter roundabout diagram**

### 40km/hr for Local & Waterfront Accessways

A 40km/hr speed zone is recommended for the local and waterfront accessway but it would need to comply with the Main Roads WA policy. Currently the typology wouldn't comply as the 85 percentile speed are currently a little higher than 50km/h but could be an option worth considering.

Main Roads WA policy section 4.1.2 linear Speed Zones of 40km/h states:

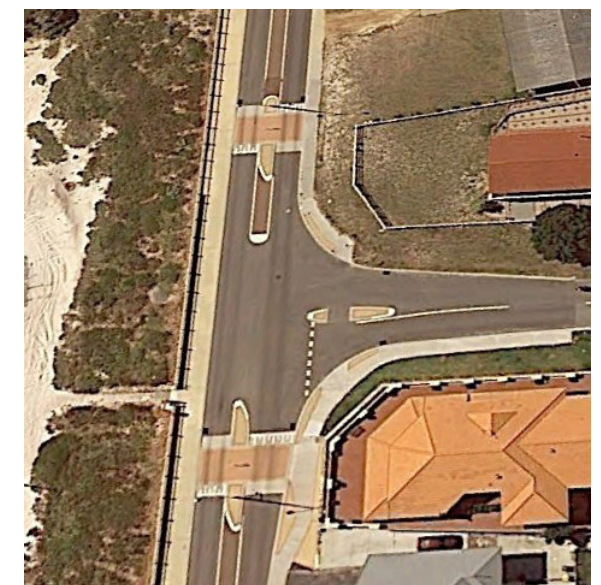
*The road sections shall be fully contained within a recognisable and dedicated tourist, recreation, conservation, shopping, commercial or industrial area / precinct / reserve subject to the following:*

- » Two-way single carriageway roads shall have a seal width of at least 5.0m,
- » Traffic volumes shall exceed 100 vpd on a typical weekday
- » The start and end of the road section should have a threshold treatment,
- » Minimum length of the speed zone shall be 400m,
- » Mid-block speed reducing devices shall be provided where the length exceeds 400m or where devices are necessary to create a speed environment

*consistent with the speed zone, and*

» *The 85th percentile speed for motor vehicles on existing roads, or expected on new roads, shall not be greater than 50km/h or less than 30km/h*

It is recommended that a 40km/h speed zone is pursued with Main Roads WA together with suitable entry statements and traffic calming measures (similar to Melville Beach Road and Ocean Drive)



**Fig. 109 Examples of Melville Beach Road and Ocean Drive traffic calming measures**





## 4.1 Bibliography

### Websites

- Apace WA; Vegetation Complexes Planting Lists, [www.apacewa.org.au](http://www.apacewa.org.au), Western Australia
- Ellenby Tree Farm. [www.ellenbytreefarm.com](http://www.ellenbytreefarm.com) Western Australia
- FloraBase: The Western Australian Flora, Department of Parks and Wildlife, <https://florabase.dpaw.wa.gov.au>, Western Australia
- Main Roads WA Information Mapping System, <https://mrapps.mainroads.wa.gov.au/PublicMaps/RoadInformationMapping>, Western Australia.
- Main Roads WA; Crash Analysis Reporting System (CARS) <https://www.mainroads.wa.gov.au/OurRoads/RoadSafety/CrashIncidentManagement/Pages/crashtool.aspx>

### Publications/Books/Guidelines and Standards

- Australian Standard AS1742.13; Roads and Marine Services.
- Australian Standard AS1428 Design for access and mobility
- Austroads (2009) Guide to Road Design - Set
- City of Melville, City of South Perth, The Government of Western Australia (2016) Canning Bridge Activity Centre Plan.
- City of Melville, GHD, (2014) Foreshore Restoration Strategy Review;
- City of Melville, GHD (2014) Canning Bridge Structure Plan; Integrated Transport Strategy.
- City of Perth (Date unknown) Street Tree Framework
- Department of Infrastructure and Transport (Major Cities Unit) (2011) Creating Places for People, An Urban Design Protocol for Australian Cities;
- Department of Planning and Infrastructure and Department of Water Western Australia, Western Australian Planning Commission; (2008) Better Urban Water Management;



- 
- Department of Transport, Public Transport Authority, Main Roads WA (2016) Transport @3.5 Million Perth Transport Plan
  - Department of Transport, Department of Planning, Public Transport Authority and Main Roads Western Australia (2012) Planning and designing for pedestrians: guidelines;
  - Department of Water Western Australia; (2009) Towards a water sensitive city: The urban drainage initiative;
  - Department of Water (WA). (2008). Guidelines for Preparing Plans and for Complying With Subdivision Conditions.
  - Department of Water, WA. (2009). WA Stormwater Management Manual.
  - Gehl, J (2010) Cities for People, Island Press, Washington, DC, Roads and Traffic Authority (2002) Guide to Traffic Generating Development, NSW
  - Government of Western Australia (2000) Bush Forever: Keeping the bush in the City
  - Horticulture Innovation Australia and the Victorian Department of Environment, Water, Land and Planning; (Date unknown) 2020 Vision- How to Grow an Urban Forest;
  - Jacobs, A. B. (1993). Great Streets, MIT Press
  - Main Roads WA ( Guideline Drawings #200331-128-5 - Typical treatment for road humps)
  - Main Roads WA (2014) Speed Zones Policy (40km/h)
  - Payne, E. G., Pham, T., Cook, P. L., Fletcher, T. D., Hatt, B. E., & Deletic, A. (2014, March). Biofilter design for effective nitrogen removal from stormwater – influence of plant species, inflow hydrology and use of a saturated zone. Water Science & Technology(69(6)), 1312-9. doi:DOI: 10.2166
  - Payne, E., Hatt, B., Deletic, A., Dobbie, M., McCarthy, D., & Chandrasena, G. (October 2015). Adoption Guidelines for Stormwater Biofiltration Systems (Version 2). CRC for Water Sensitive Cities.
  - Pilgrim, D. (1987). Australian Rainfall & Runoff - A Guide to Flood Estimation. Barton, ACT: Institution of Engineers, Australia.
  - Swan River Trust. (2009). Swan Canning River Water Quality Improvement Plan. East Perth: Swan River Trust.
  - Water and Rivers Commission. (November 2001). Determining Foreshore Reserves. Perth WA.
  - Western Australian Planning Commission. (2008). Better Urban Water Management . Perth.
  - Western Australian Planning Commission, WA (2009 & 2015) Liveable Neighbourhoods: A Western Australian Government sustainable cities initiative;
  - Witheridge, G. (2008). Best Practice Erosion and Sediment Control. Picton, NSW, Australia: International Erosion Control Association, Australasia Chapter.



# Appendices

## *A. Stakeholder Views*



THIS PAGE HAS BEEN LEFT INTENTIONALLY BLANK



# Appendix A

## Stakeholder Views

- 
- A - Public Transport Authority
  - B - Main Roads WA
  - C - City of Melville



# A - Public Transport Authority

The proposed public transport boulevards were discussed with PTA (Tom Pacey) and the following outcomes are documented.

## New Bus Station at Canning Bridge

Funding for the new station has not yet been secured in view of a number of competing projects in the transport portfolio. The project is a priority for PTA, however has not had traction with the current government. There is no timeframe for this to be constructed.

Bus services from the west will terminate at the station.

## Kintail Road

Six buses per hour are planned for Kintail Road in the longer term. The regional bus services will remain on Canning Highway.

In the broader transport plan for Perth, Canning Highway remains the strategic public transport corridor. There are no foreseen changes to the Kintail Road route in the plan.

## Sleat Road

The Planning Control Area set aside in Sleat Road for the ultimate public transport boulevard for Kintail Road will not be used by Transperth as Kintail

Road to the west will be retained as a bus route to maintain services to this area. Main Roads intent was for buses to use Sleat/Kintail route instead of Canning Highway. This is not supported by PTA.

## Options

PTA would prefer a public transport boulevard to occur on one road only, Kintail Road, which will provide maximum benefit to bus services. The pedestrian barrier issue is acknowledged and PTA are prepared to consider alternative approaches.

Options discussed include:

1. Public transport boulevard as proposed for Kintail Road – Two bus lanes and two traffic lanes.
2. Dedicated transit corridor for Kintail Road within core of activity centre (closed to private cars).
3. One way bus lane inbound only and two traffic lanes in Kintail Road. Bus lane can be 3.2 m wide if adjacent to a traffic lane in same direction (3.5 m if adjacent to opposed traffic lane). PTA would be amenable to considering this option particularly as an interim measure to serve morning peak hour buses

heading to Perth. This also minimises the pedestrian barrier due to only three lanes as opposed to four.

4. Splitting the service into Tweeddale Road inbound and Kintail Road outbound is generally not preferred.

The proposed measures for buses could be staged to include interim measures as development progresses (e.g Option 3 as interim, Option 2 in the long term once major infrastructure improvements – Canning Highway and bus station – are undertaken). Triggers for changes will need to be considered.

The operation of intersections and bus priority measures should also be considered as part of future planning.

Main Roads ultimate plan allows bus only access to the Canning Bridge and bus station. A staged approach will allow the community to adopt behaviours gradually until the closure of Kintail Road to general traffic.

Through the Integrated Transport Strategy for the CBACP, Council have previously supported the longer term objective for mode shift being reinforced by not providing increased capacity for traffic along road networks. PTA

agrees with the focus to de-congest bus paths to facilitate mode shift.

Paramics modelling undertaken as part of the Canning Bridge Transport Plan indicates significant congestion at the Sleat Road/Canning Highway intersection would occur based on current volumes, if Kintail Road/Canning Bridge Road is closed at Canning Highway. Future volumes were not modelled for this study. It is unlikely to be viable to close Kintail Road to private vehicles ahead of major works associated with Canning Highway to manage regional traffic using Sleat and Kintail Roads.

PTA mentioned other precedents for one way bus lanes, i.e. Charles Street currently proposed.

PTA also mentioned the Public Transport Mall planned for Williams Street (Hay Street to Murray Street).



# B - Main Roads WA

Main Roads WA (Main Roads) have advised of the planning control area within Canning Highway and the CBACP area, as shown in Figure to the right.

The purpose of the planning control area is to protect the affected land for future road upgrading of Canning Highway. As stated by the Department of Planning (DoP), the planning control area has been approved by the Minister for Planning to:

*...ensure that Canning Highway would operate effectively in the long term and continue to provide the regional road functionality that is needed to support the overall development and viability of the centres that it connects such as Fremantle, Perth and Canning Bridge.*

The WAPC considers the planning control area necessary to ensure that no development occurs on the land which might prejudice the purpose until it may be reserved for regional roads in the Metropolitan Region Scheme.

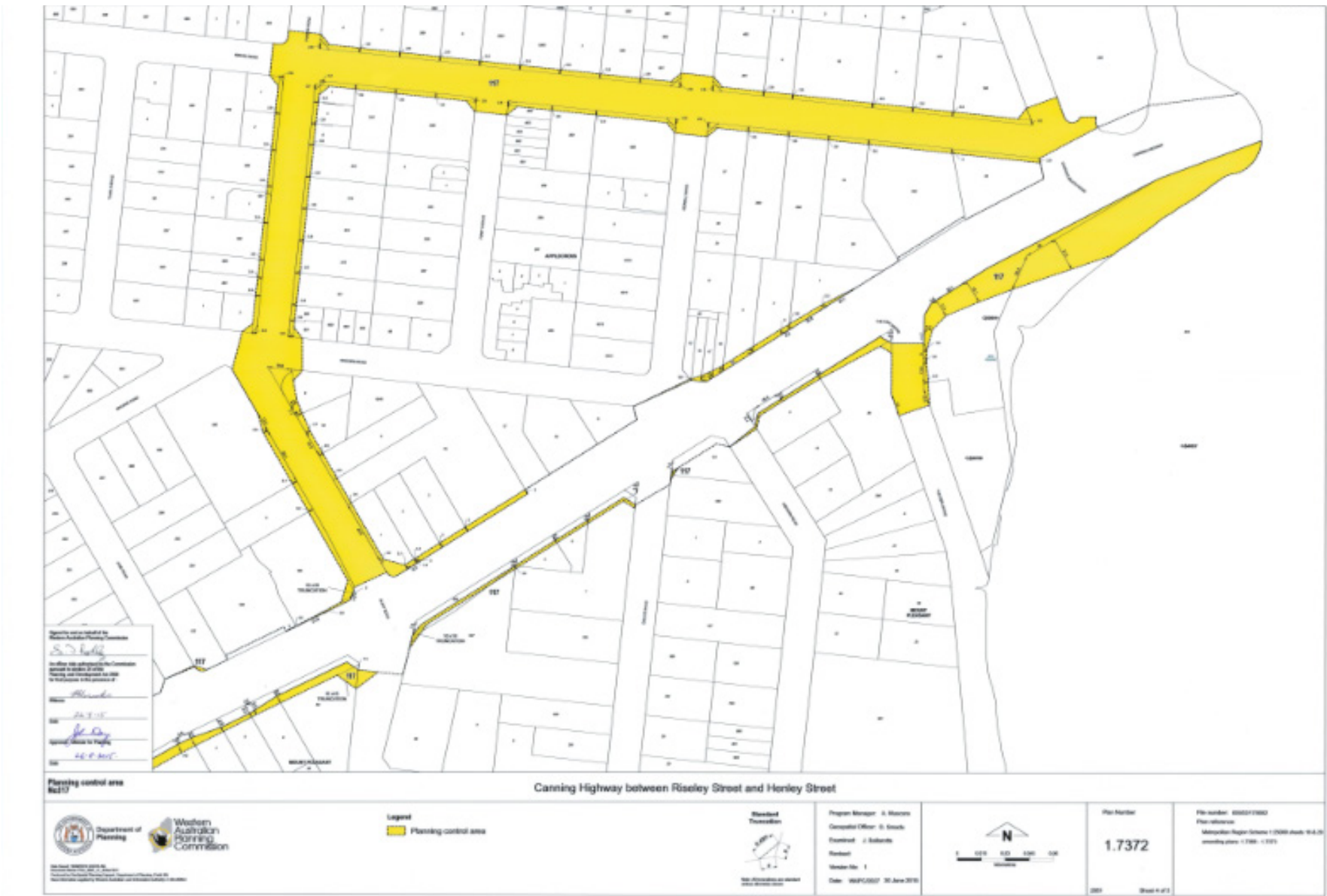


Fig. 110 Planning Control Area (DoP 2016)



Main Roads have also provided schematic plans of the long term proposals for Canning Highway.



GHD | Canning Bridge Masterplan | Rev C - October 2016 | 87



# C - City of Melville

A meeting was held with the City of Melville on 5 August 2016 to discuss the transport issues associated with the masterplan.

## Kintail Road – Public Transport Boulevard

The outcomes of the meeting with PTA were tabled and discussed.

The City are keen to retain as many trees as possible, particularly in Kintail Road in relation to accommodating a Public Transport Boulevard.

Section were tabled as shown in figures to the right.

The City confirmed the requirement for cycle lanes as Kintail Road forms part of the Perth Bicycle Network.

The treatment of bus lanes at roundabouts along Kintail Road will need to be considered. A head start facility similar to a cycle head start facility is suggested at the roundabout allowing a bus to wait and progress ahead of other traffic or alternatively a bus merges with other traffic prior to the roundabout.

### Interim Design

The concept is supported by the City subject to 3.2m traffic lanes and 3.5m bus lane to allow greater separation between it and street trees. Support is subject to street trees being retained. The kerb to kerb requirement is 9.9m.

### Ultimate Design

The concept is supported by the City subject to the requirements for cyclists being accommodated. The kerb to kerb requirement is 8.8m.

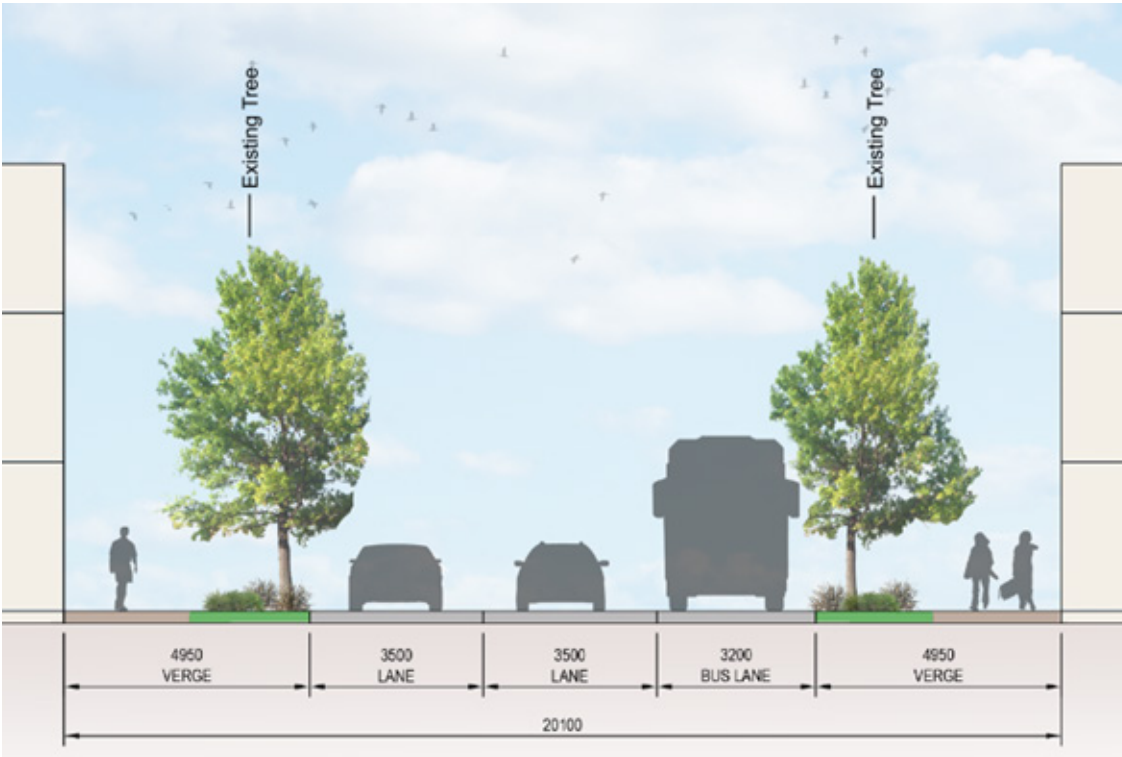


Fig. 113 Interim design: Bus lane (EB) and two traffic lanes (wv)

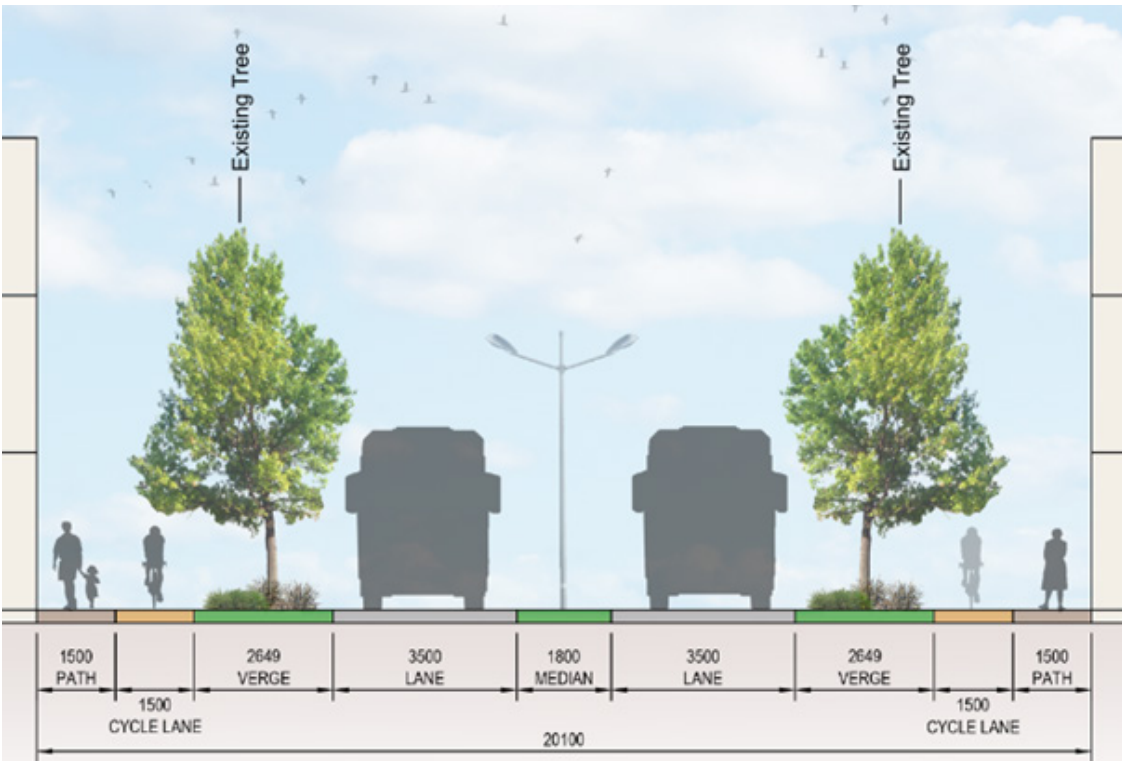


Fig. 114 Ultimate design: Bus and local traffic only. One lane in each direction with median.



### Canning Beach Road/Kintail Road/Canning Highway

The concept outlined in Figure 29 was tabled for discussion. The City has concerns about access to Raffles Hotel and accessibility for residents. However the crash history at the intersection is acknowledged together with the need for improvement (significant number of right angle collisions). The impacts of the closure need to be assessed for the Moreau Mews/Canning Beach Road intersection and also the need to allow for FESA access across the median. A signage strategy would be required to advise of the preferred access to Raffles. Access to Raffles will be retained via Sleaford Road or Moreau Mews.

A further option is to leave the intersection as existing, acknowledging the safety shortfalls of the design. As part of the current Main Roads planning for the intersection only bus access is permitted to/from Canning Highway.



Fig. 115 Canning Beach Road/Kintail Road/Canning Highway concept



**Helm Street/ Sleat Road**

The City have advised that early development within the masterplan area will commence around the Helm Street location which will add pressure to the Helm Street/Sleat Road intersection. Sleat Road currently has significant queuing in the am peak hour caused by traffic accessing Canning Highway. Council have considered a roundabout, however residential property access exists in Sleat Road opposite the intersection. The intersection is located approximately 90m from Canning Highway and any queuing back from the roundabout towards Canning Highway would need to be assessed.

Additional measures in Sleat Road were raised to deter external through traffic.



**Fig. 116 Helm Street/ Sleat Road Intersection**

**Ogilve Street**

Car parking bays exist on both sides of Ogilve Street and adequate width for two-way traffic is not available.

**Forbes Street**

At 85 percentile, speeds in Forbes Road are higher than the posted speed. Traffic calming in Forbes Road may be required.



THIS PAGE HAS BEEN LEFT INTENTIONALLY BLANK



**GHD**

GHD, 999 Hay Street, Perth, WA 6000

P.O. Box 3106, Perth WA 6832

**T:** 61 8 6222 8222**F:** 61 8 6222 8555**E:** permail@ghd.com.au**© GHD 2016**

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

**Document Status - 61/34546**

Rev No.	Author	Reviewer		Authorisation		
		Name	Signature	Name	Signature	Date
B - Draft Report	S McDermott J Stegena M Dalton B Benjamin	Kym Petani	K.Petani	Alex Piper	A.Piper	26.08.2016
C - Final Report	S McDermott N Deeks M Dalton E Maguire	Martin Coyle		Alex Piper		27/10/16.





[www.ghd.com](http://www.ghd.com)