City of Rockingham

Rockingham Strategic Centre

Precinct Structure Plan

September 2025



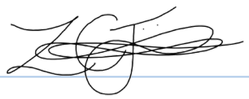
Endorsement Page

This Precinct Structure Plan is prepared under the provisions of the City of Rockingham Local Scheme No. 2.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

14 January 2026

Signed for and on behalf of the Western Australian Planning Commission:



An officer of the Commission duly authorised by the Commission pursuant to section 24 of the *Planning and Development Act 2005* for that purpose, in the presence of:

Witness: Anne Woodin

Date: 15 January 2026

Date of Expiry: 15 January 2036

Table of Amendments

Amendment No.	Summary of the Amendment	Amendment Type	Date approved by WAPC

Acknowledgement of Country

Rockingham, ngala kaaditj moondang-ak kaaradjiny nidja boodja, Bi njareb wer Whadjuk Nyoongar moort, wer baalabang kalyogool dandjoo boodja, kep wer moort.

The City of Rockingham acknowledges the Traditional Owners and Custodians of this land, the Binjareb and Whadjuk Nyoongar* peoples and their continuing connection to the land, waters and community. We pay our respects to all members of Aboriginal communities and their cultures, and to Elders past and present.

**The word Nyoongar is identified as a single language but can be pronounced several ways. This document uses the spelling Nyoongar to represent the different spellings including Noongar, Nyungar, Nyoongah, Nyungah, Nyugah, Yungar and Noongah.*



Executive Summary

As the primary centre in one of Western Australia's fastest growing regions, the Rockingham Strategic Centre **(RSC)** fulfils a critical role as a major destination for housing, employment, and entertainment in the City of Rockingham.

Both its planning framework and physical form have been established over many years. Each period of development has brought its own contributions which have influenced this rich tapestry of urban life. The character of the RSC's sub-precincts is varied, and reflective of many distinct patterns of development.

Three primary urban interventions set the course for the RSC, these include:

- Initial establishment of the original town centre along the foreshore (circa 1950s);
- Development of the new shopping centre on Council Avenue in the 1970s; and
- Establishment of Rockingham Train Station in the early 2000s.

These interventions have shaped the RSC's physical layout, influencing not only why people come to the RSC, but also how they may move throughout it to access these three key activity nodes.

The Rockingham Strategic Centre Precinct Structure Plan **(RPSP)** has been prepared to coordinate future subdivision and development of land within this important precinct.

The plan has been drafted in accordance with the provisions of: the City of Rockingham Local Planning Scheme No. 2; State Planning Policy 4.2 - *Activity Centres for Perth and Peel*; State Planning Policy 7.2 – *Precinct Design*; and the *Planning and Development (Local Planning Schemes) Regulations 2015*.

The RPSP's contents align with the Precinct Design Guidelines and Manner and Form documents which form part of State Planning Policy 7.2 – *Precinct Design*, it includes:

- Part One: Implementation
- Part Two: Explanatory Report
- Technical Appendices

RPSP Vision

Rockingham leverages off its unique coastal atmosphere to establish a green and walkable centre that offers a diversity of uses and building types, celebrates local culture, and promotes a relaxed lifestyle. It is a regional employment destination that connects its distinct activity hubs via high-frequency public transport.

Looking to the future, the RPSP is underpinned by three core principles:

Enable

Despite its maturity, the Rockingham Strategic Centre still has enormous potential with major development opportunities existing in many of its sub-precincts, namely the City Centre and Foreshore. The RPSP focuses on ways to unlock the precinct by stimulating urban development in these areas, which will be necessary to support the larger population of residents and workers that is envisioned.

Celebrate

Explores how the RPSP can embrace the welcoming ambiance of coastal life in the design of streets and public spaces. It focuses on celebrating the proud legacy of the Rockingham Foreshore as the pre-eminent coastal location in the sub-region. However, there is also an eye to the past, with an acknowledgement that Aboriginal stories and heritage could be better reflected to improve sense of place and belonging throughout the RSC.



Connect

The primary focus of the RPSP from a connectivity perspective is to reduce car dependency for local trips. The approach to achieving this is multi-faceted. Many of the RSC's streets are wide and have been designed for the car. This separates neighbourhoods and limits safety and permeability for active transport.

The RPSP promotes a City-wide focus on green streets and links, which is just one way in which existing streets/crossings can be designed beyond car movement.

It is acknowledged too that the RSC is large and linking its key nodes just through active transport has limitations. As such, establishment of the Rockingham City Centre Transit System will bring the Rockingham Train Station, City Centre and Foreshore together in a sustainable, accessible and reliable way.

Structure Plan Summary Table

Item	Data	Structure Plan Ref
Total area covered by the structure plan	534 hectares	Part One - Section 1.1
Area of each land use proposed		Part Two - Section 5.5.3 Land Use Mix
Land Use		
• Mixed Use	68 hectares	
• Commercial	26 hectares	
• Service Commercial	26 hectares	
• Residential R80	34 hectares	
• Residential R60	77 hectares	
• Residential R40	55 hectares	
• Private Clubs and Institutions	8 hectares	
Reserve		
• Public Purposes	39 hectares	
• Public Open Space	49 hectares	
• Primary Regional Roads	21 hectares	
• All Other Road Reserves	131 hectares	
Estimated Number of Dwellings	Current: 3967 dwellings Capacity: 15,093 dwellings (estimate)	Part Two - Section 5.5.3 Residential Densities
Estimated Residential Site Density	61 dwellings/hectare (estimate)	Part Two - Section 5.5.3 Residential Densities
Estimated Population	30,000 people (estimate) Note: based on average household size of 2.07 people	Part Two - Section 5.5.3 Residential Densities
Number of High Schools	0	
Number of Primary Schools	1 (required beyond 2035)	Part Two - Section 5.5.6 Schools
Estimated Area and Percentage of Public Open Space given over to:	49.74 hectares (9%)	Part One - Section 4.1 Land Use Zones and Reserves
• Pocket Park	1.6 hectares	
• Local Park	4.62 hectares	
• Neighbourhood Park	8.82 hectares	
• District Park	22.38 hectares	
• Other	12.32 hectares	

Part One

Implementation



Contents



01 Implementation **10**

1.1 Precinct Plan Area **11**
1.2 Objectives **11**
1.3 Operation **15**
1.4 Staging **16**

02 Subdivision and Development Requirements **18**

2.1 General Requirements **19**
2.2 Local Development Plans **19**
2.3 Built Form Design **19**
2.4 Land Use **27**

03 Sub-Precinct Development Requirements **28**

3.1 P1 - City Centre Sub-Precinct **29**
3.2 P2 - Waterfront Village Sub-Precinct **33**
3.3 P3 - Coastal Lots Sub-Precinct **38**
3.4 P4 - TOD Village Sub-Precinct **41**
3.5 P5 - City Park Sub-Precinct **45**
3.6 P6 - Southern Residential Sub-Precinct **48**
3.7 P7 - Education Sub-Precinct **51**
3.8 P8 - Dixon Road Sub-Precinct **52**

List of Tables

P1 - Table 1: Urban Ecology Actions **16**

P1 - Table 2: Urban Structure Actions **16**

P1 - Table 3: Public Realm Actions **16**

P1 - Table 4: Movement Actions **17**

P1 - Table 5: RPSP Parking Requirements **25**

P1 - Table 6: RPSP Deep Soil Requirements **26**

P1 - Table 7: New Provision Ancillary Accommodation **26**

P1 - Table 8: City Centre Built Form Controls **31**

P1 - Table 9: Waterfront Village Built Form Controls **36**

P1 - Table 10: Coastal Lots Built Form Controls **40**

P1 - Table 11: TOD Village Built Form Controls **43**

P1 - Table 12: City Park Built Form Controls **46**

P1 - Table 13: Southern Residential Built Form Controls **50**

P1 - Table 14: Dixon Road Built Form Controls **53**

List of Figures

P1 - Figure 1: RPSP Map **12**

P1 - Figure 2: RPSP Residential Density Plan **13**

P1 - Figure 3: RPSP Movement **14**

P1 - Figure 4: RPSP Two Storey Height Requirements **20**

P1 - Figure 5: Suburban Frontage Type **21**

P1 - Figure 6: Urban Street R60 Frontage Type **22**

P1 - Figure 7: Urban Street R80 Frontage Type **22**

P1 - Figure 8: Urban Mixed Use Frontage Type **22**

P1 - Figure 9: Main Street Frontage Type **23**

P1 - Figure 10: Main Street Frontage Type **23**

P1 - Figure 11: Boulevard Frontage Type **24**

P1 - Figure 12: Commercial Frontage Type **24**

P1 - Figure 13: City Centre Sub-Precinct Requirements **29**

P1 - Figure 14: Waterfront Village Sub-Precinct Requirements **33**

P1 - Figure 15: Coastal Lots Sub-Precinct Requirements **38**

P1 - Figure 16: TOD Village Sub-Precinct Requirements **41**

P1 - Figure 17: City Park Sub-Precinct Requirements **45**

P1 - Figure 18: Southern Residential Sub-Precinct Requirements **48**

P1 - Figure 19: Education Sub-Precinct Requirements **51**

P1 - Figure 20: Dixon Road Sub-Precinct Requirements **52**



01

Implementation



1.1 Precinct Plan Area

The RPSP shall apply to the land contained within the inner edge of the line denoting the activity centre boundary as shown on **P1 - Figure 1**.

The RSC has a total area of 534ha.

1.2 Objectives

The following objectives apply to all areas within the RPSP. Planning and development in the RSC shall have due regard for the following objectives:

1.2.1 Urban Ecology

- Adopt an environmentally sustainable approach to development within the RSC which appropriately manages environmentally sensitive areas including remnant vegetation and potential fauna habitats, and encourages conservation of resources, reduced waste, energy, and water use.
- Create a green urban centre supported by open spaces, streets, and development sites which promote enhanced tree canopy to lessen impacts of climate change and urban heat island effect.
- Celebrate local Aboriginal, cultural, and built heritage in the design of buildings and public spaces to enhance Rockingham's place identity.

1.2.2 Urban Structure

- Establish a highly interconnected urban environment that links key precincts together through a network of green links and enhanced public transport connections.
- Ensure that new development provides lot and block configurations that are flexible and adaptable, to change with the centre's needs over time.
- Planning provisions support high-quality development outcomes in nominated infill areas.

1.2.3 Public Realm

- Create high quality connected public spaces that permit a range of recreation and social activities, retain mature trees where possible, and foster high quality development along their edges.
- Encourage an attractive urban environment through the use of high-quality design, materials, street furniture, and public art.
- Enhance the quality and consistency of streetscapes through targeted greening which includes new planting and retention of existing vegetation where appropriate.

1.2.4 Movement

- Establish the Rockingham City Centre Transit System **(RCCTS)** as a high amenity, street based public transit system that will catalyse transit oriented development, and provide for sustainable movement.
- Create a permeable, well connected network of public streets and spaces that provide legible and high amenity linkages, prioritised towards pedestrians and cycle movement.

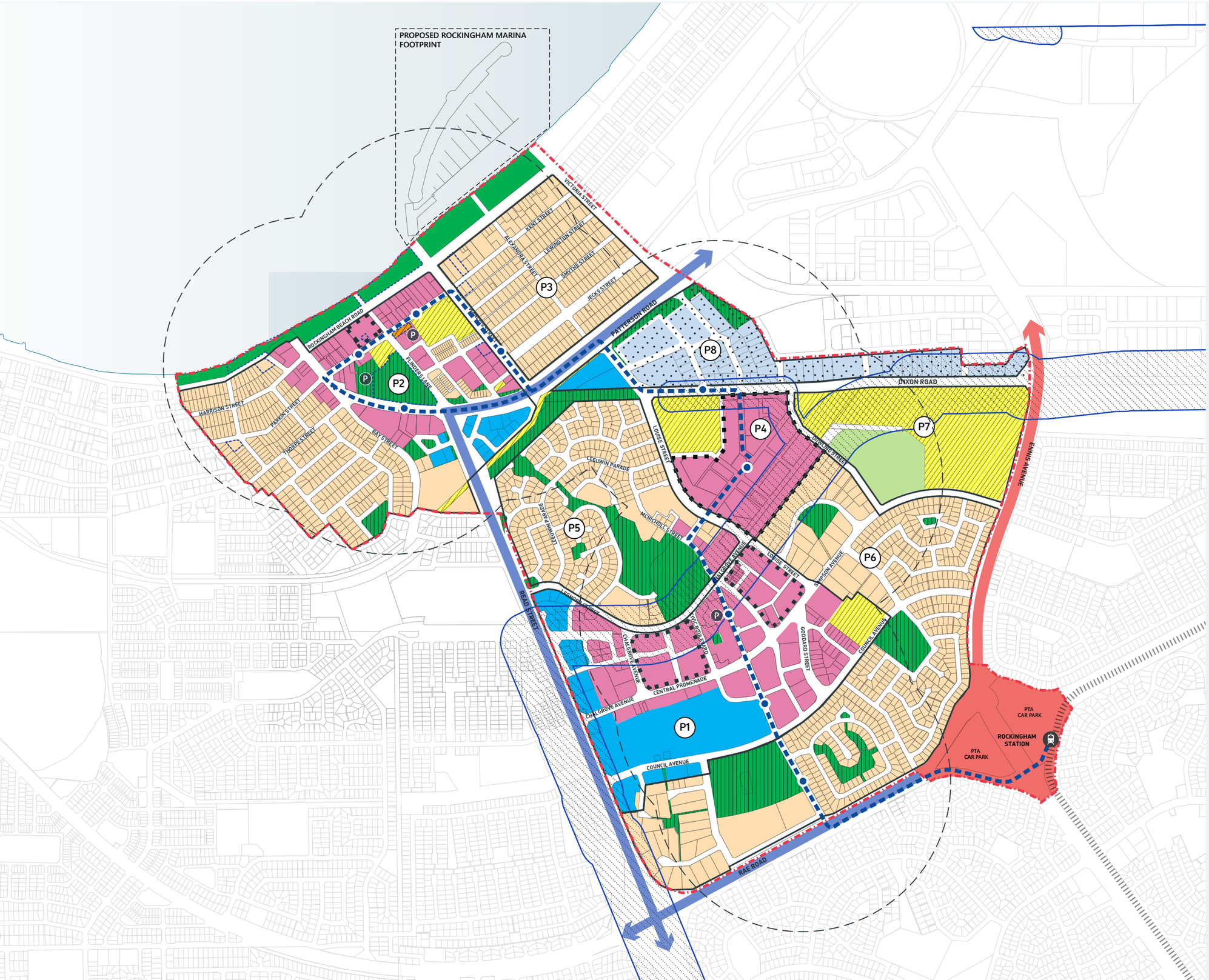
1.2.5 Land Use

- Encourage and facilitate a broad range of employment opportunities to promote diversity and help meet the self-sufficiency targets of the sub-region.
- Foster the provision of a balanced and diverse mix of uses which contribute to the development of an active and interesting character in the public and private realm of the Strategic Centre.
- Encourage increased development intensity, through mixed use and high density in key sub-precincts and along transport corridors to increase the Strategic Centre's population base.
- Promote active day and night time retail and social environments.

1.2.6 Built Form

- Foster the development of a Strategic Centre which possesses a diversity of built form typologies, framed around a legible public street pattern guided by the movement and place framework.
- Provide high-quality streetscapes through well considered approaches to building frontages, which ensure generally contiguous and active street front buildings in the mixed use/commercial precincts.
- Achieve appropriate built form outcomes, including a range of medium to high density housing, within the walkable catchment of the Rockingham City Centre Transit System.

P1 - Figure 1: RPSP Map



Legend

- Precinct Structure Plan Boundary
- Sub-Precinct Boundaries
  - P1 City Centre
  - P2 Waterfront Village
  - P3 Coastal Lots
  - P4 TOD Village
  - P5 City Park
  - P6 Southern Residential
  - P7 Education
  - P8 Dixon Road
- Future Development Site
- Heritage Sites
- Kwinana Air Quality Buffer

Metropolitan Region Scheme Reserves

- Primary Regional Road
- Other Regional Road
- Parks and Recreation

Structure Plan Sub-Zones And Reserves

- Residential
- Mixed Use
- Commercial
- Service Commercial
- Private Clubs/Institutions
- Public Purpose
- Civic and Community
- Public Open Space

Movement

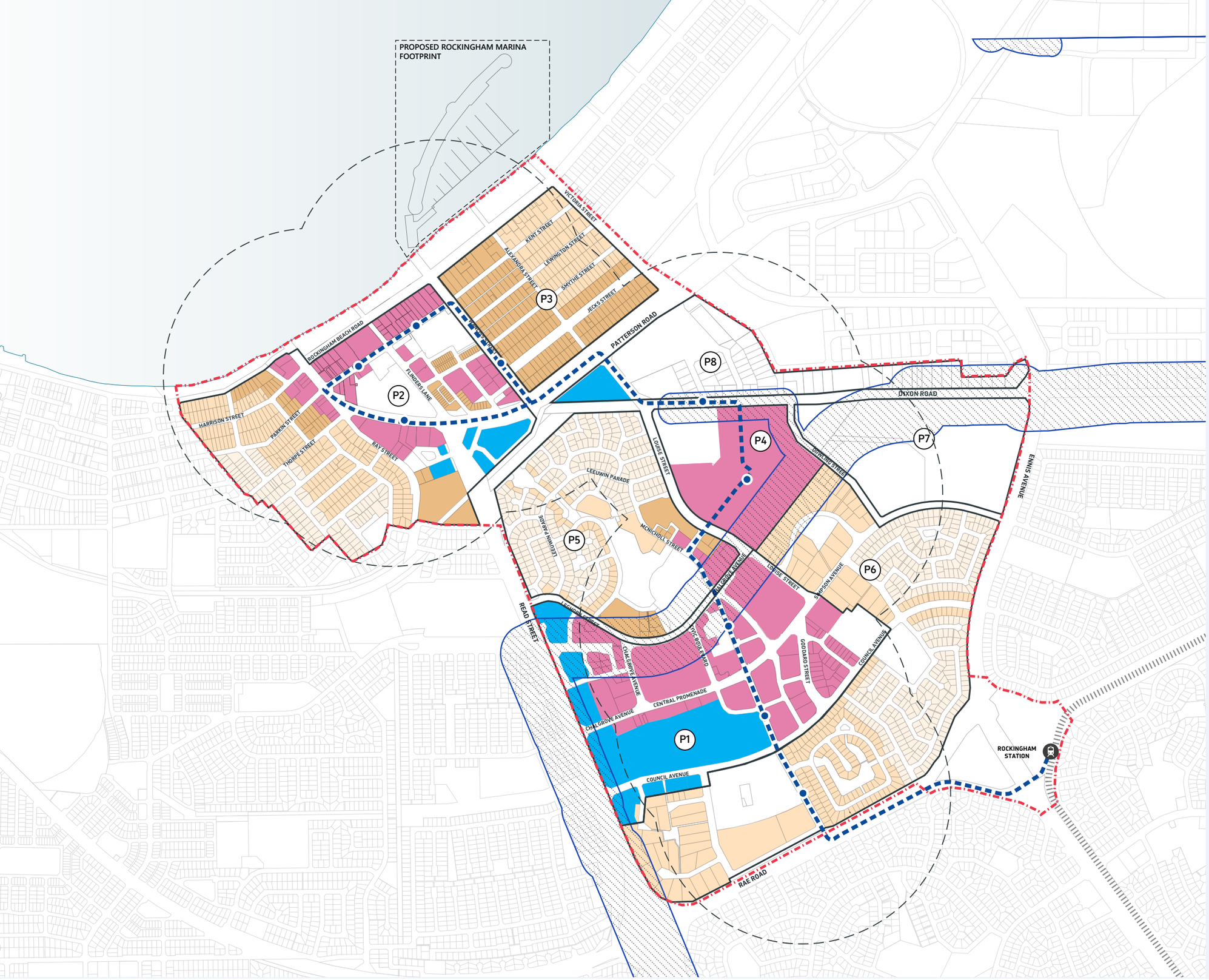
- Mandurah Train Line
- Rockingham Train Station
- Proposed RCCTS Route/Stops
- RCCTS Walkable Catchment (800m)
- Proposed Multi-Deck Carpark

Other

- ATCO Gas Pipeline Trigger Distance

Notes:

Provision is to be made for an integrated primary school, in collaboration with the Department of Education.



Legend

- Precinct Structure Plan Boundary
- Sub-Precinct Boundaries
  - P1 City Centre
  - P2 Waterfront Village
  - P3 Coastal Lots
  - P4 TOD Village
  - P5 City Park
  - P6 Southern Residential
  - P7 Education
  - P8 Dixon Road

Residential Density

- Residential - R40
- Residential - R60
- Residential - R80
- Mixed Use - R-AC0
- Commercial - R-AC0

Movement

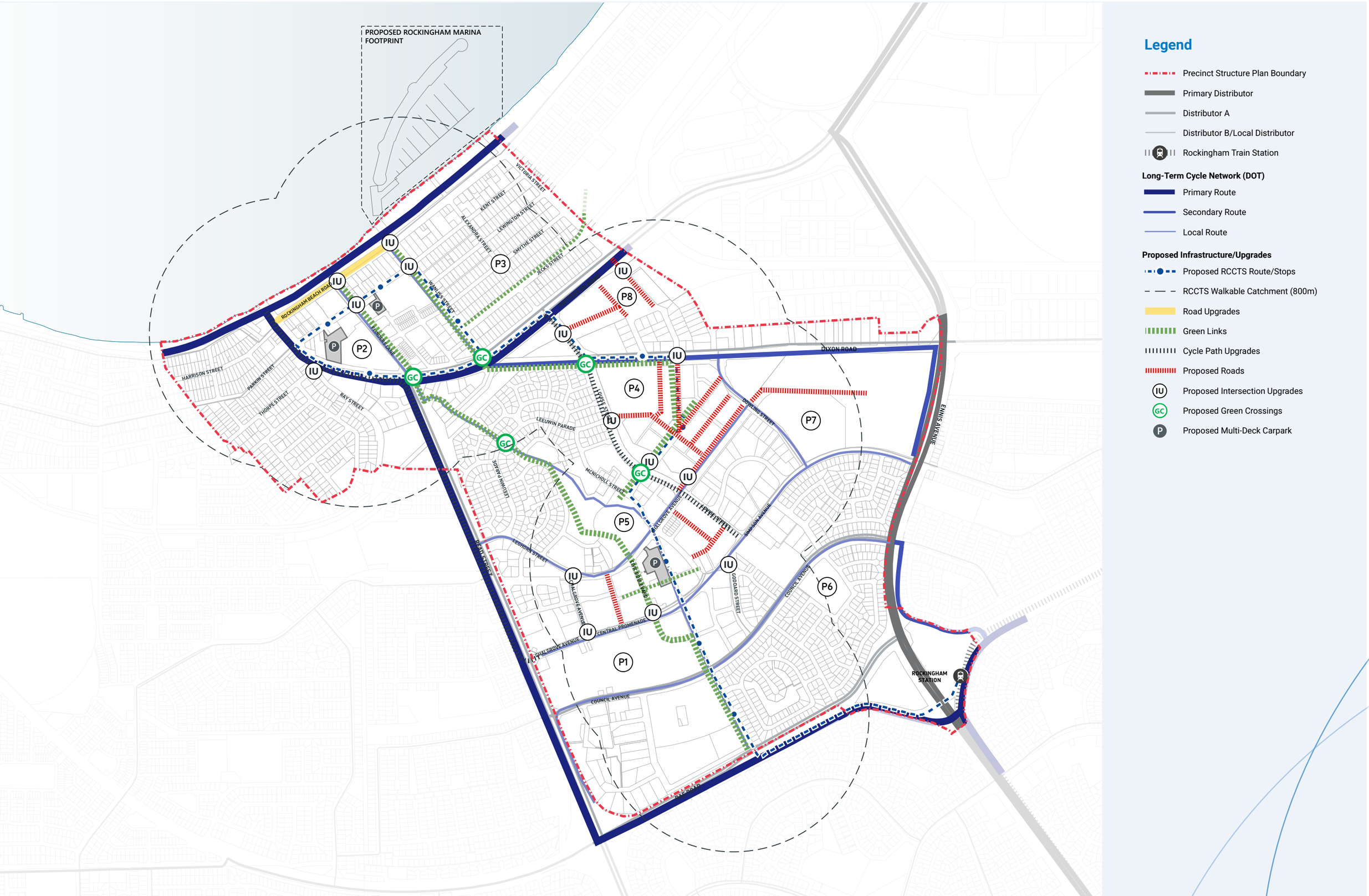
- Mandurah Train Line
- Rockingham Train Station
- Proposed RCCTS Route/Stops
- RCCTS Walkable Catchment (800m)

Other

- ATCO Gas Pipeline Trigger Distance

P1 - Figure 2: RPSP Residential Density Plan

P1 - Figure 3: RPSP Movement



Legend

- Precinct Structure Plan Boundary
- Primary Distributor
- Distributor A
- Distributor B/Local Distributor
- Rockingham Train Station

Long-Term Cycle Network (DOT)

- Primary Route
- Secondary Route
- Local Route

Proposed Infrastructure/Upgrades

- Proposed RCCTS Route/Stops
- RCCTS Walkable Catchment (800m)
- Road Upgrades
- Green Links
- Cycle Path Upgrades
- Proposed Roads
- IU — Proposed Intersection Upgrades
- GC — Proposed Green Crossings
- P — Proposed Multi-Deck Carpark


Rockingham
Centre
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1.3 Operation

The RPSP shall come into operation when it is approved by the Western Australian Planning Commission **(WAPC)** pursuant to Part 4, Clause 22(1)(a) of the Deemed Provisions.

The RPSP has been prepared in accordance with *State Planning Policy 4.2 Activity Centres for Perth* **(SPP 4.2)** and *Peel, and State Planning Policy 7.2 Precinct Design* **(SPP 7.2)**.

1.3.1 Scheme Relationship

The RPSP has been prepared under the City of Rockingham **(the City)** Local Planning Scheme No.2 **(LPS2)**. Zones and Reserves for the RPSP are set out on the Scheme Maps.

The objectives and development standards of the RPSP are complementary to the provisions, standards or requirements of LPS2.

Where it is otherwise not covered, the provisions of LPS2 and the Residential Design Codes Volume 1 and Volume 2 **(R-Codes)** shall prevail. All applicable State Planning Policies of WAPC and City of Rockingham Local Planning Policies apply.

Where a Local Development Plan, Development Application or Subdivision Plan prepared pursuant to the RPSP varies the development standards and requirements of the RPSP, it will be assessed against the design principles of relevant State Planning Policy 7.0 and the objectives set out in the RPSP.

Due regard must also be given to any adopted Local Development Plans, which shall operate in accordance with the requirements of **Section 2.3**.

The RPSP supersedes the following documents, which will be rescinded upon approval of the RPSP:

- *Rockingham Strategic Regional Centre - Centre Plan (2010);*
- *Planning Policy No 3.2.1 - Development Policy Plan City Centre Sector;*
- *Planning Policy No 3.2.2 - Development Policy Plan Smart Village Sector;*
- *Planning Policy No 3.2.5 - Development Policy Plan Waterfront Village Sector;*
- *Planning Policy No 3.2.6 - Development Policy Plan Northern Waterfront Sector;*
- *Planning Policy No 3.2.8 - Development Policy Plan Campus Sector;*
- *Planning Policy No 3.2.9 - Development Policy Plan Eastern Sector; and*
- *Planning Policy No 3.2.12 - Development Policy Plan Southern Gateway Sector.*



1.3.2 R-Codes Application

The R-Codes are applied to the RPSP in the following ways:

P1 - Table 1: RPSP R-Code Application

R-Code	Single Dwellings	Grouped Dwellings	Multiple Dwellings
R40	**Volume 1 Part B** Some modifications to Volume 1 Part B are proposed. Modifications are summarised for each relevant sub-precinct in **Section 03**.	**Volume 1 Part C** Some modifications to Volume 1 Part C are proposed. Modifications are summarised for each relevant sub-precinct in **Section 03**.	
R60	**Volume 1 Part C** Some modifications to Volume 1 Part C are proposed. Modifications are summarised for each relevant sub-precinct in **Section 03**.		
R80/R-AC0	**Volume 1 Part C** Some modifications to Volume 1 Part C are proposed. Modifications are summarised for each relevant sub-precinct in **Section 03**.		**Volume 2** Some modifications to Volume 2 are proposed. Modifications are summarised for each relevant sub-precinct in **Section 03**.

1.3.3 Interpretations

The RPSP applies the same definitions as set out in the *Planning and Development Act 2005* or the R-Codes. Unique definitions or interpretations for the RPSP are set out as follows:

"Frontage Type" refers to the various frontage types set out in Part 2 of the RPSP. These frontage types are used as an organising tool for the built form controls to ensure desired streetscape approaches can be met.

"Frontage Build Out" means the percentage of a street frontage which is occupied by a building.

"Green Link" refers to specific streets or pathways where an enhanced landscape treatment is desired. These links provide important connections and include enhanced amenity (e.g. lighting, shade, furniture).

"Outdoor Uses" refers to a land use conducted in an open-air environment without permanent buildings, including markets, pop-up bars, and similar temporary development activities.

"Street Level Interface" refers to the space between a building edge and a street. The design standards included in the RPSP focus on how future development responds to this interface (primarily at ground level).

"Temporary Development" Development that is intended to be temporary in nature that addresses (but is not limited to) the following considerations:

- Does not provide significant structures and uses materials and construction techniques that allows for the development to be easily removed from the site;
- Proposed access and parking does not change existing traffic conditions;
- Development does not provide for environment impacts;
- Development to be in operation within two years of development approval being granted; and
- Any other matter considered relevant by the City at the time of application.

"Transit Oriented Development" means development that is planned and designed to encourage and enhance the use of public transport. Specifically it refers to development with an 800 metre walkable catchment of Rockingham Train Station or the RCCTS.

"Visual Gateway" refers to an urban design approach which uses the built form to help curate views into an important place.

1.4 Staging

Due to size of the RSC and complex land assembly, a traditional approach to staging is not deemed appropriate. Rather, the RPSP advocates for a development priority based approach. Staging of built form and development in the RSC is largely based on the timing and willingness of individual landholders to develop their sites, such as the redevelopment of the various Local Development Plan areas. It is also dependent on a number of key transport and infrastructure triggers.

The key actions or upgrades critical to the implementation of the RPSP are set out below, with consideration for short (0-5 years), medium (5-10 years), and long (10+ years) term aspirations. Noting that those actions listed as long-term, extend beyond the initial life of this structure plan.

P1 - Table 2: Urban Ecology Actions

Priority	Action	Responsibility	Stakeholders
Short	Undertake Aboriginal Heritage cultural interpretation study to investigate opportunities to enhance representation of Aboriginal people through a more inclusive sense of place in the RPSP.	City of Rockingham	City of Rockingham, community members
	Implement Stage 1 of proposed street greening: Wanliss Street, Louise Street, Dixon Road, Contest Parade, Read Street, Charlgrove Avenue.	City of Rockingham	City of Rockingham
	Undertake flora/vegetation/fauna surveys and tree retention plans for urban greening and black cockatoos for proposed development parcels south of Patterson Road in P8 and P4 to determine development suitability. To be complete prior to clearing and/or subdivision/development application is submitted.	Developer	Department of Water and Environmental Regulation **(DWER)**, Environmental Protection Authority **(EPA)**, Department of Biodiversity, Conservation and Attractions **(DBCA)**
	Conduct a wetland identification and/or delineation investigation for Lot 201 Chalgrove Avenue and Lot 103 Council Avenue to reclassify existing Conservation Category Wetland prior to development and/or subdivision of the site adjacent to the existing Aquatic Centre.	City of Rockingham/ Private landowner	DBCA
	Detailed surface water modelling will be required to support future water management strategies. This modelling will need to include consideration of the risks associated with surface and groundwater interaction both now and in the future taking into consideration sea level rise **(SLR)**. The establishment of appropriate antecedent conditions in drainage infiltration basins and at outfalls will need to consider changing groundwater levels and SLR.	City of Rockingham	DWER
	Investigation and identification of mature trees to be retained for black cockatoo habitat along Louise Street and Patterson Road.	City of Rockingham	Adjacent landowners
Medium	Implement Stage 2 of proposed street greening: Simpson Avenue, Victoria Street, Alexandra Street, Council Avenue, Rae Road, Leeuwin Parade, Dowling Street.	City of Rockingham	City of Rockingham

P1 - Table 3: Urban Structure Actions

Priority	Action	Responsibility	Stakeholders
Short	Monitor development activity to ensure proposed subdivision and amalgamation controls are leading to positive built outcomes.	City of Rockingham	City of Rockingham
	Undertake investigations, in collaboration with the Department of Education (and other stakeholders) to determine timing and necessary steps involved in planning for a future primary school site.	City of Rockingham/ Department of Education	DPLH
Medium	Establish new dedicated mid-block connections between Rockingham Beach Road and Kent Street in P2 Waterfront Village.	City of Rockingham Landowners	Private landowners

P1 - Table 4: Public Realm Actions

Priority	Action	Responsibility	Stakeholders
Short	Develop a more detailed Public Realm Style Guide for priority areas identified on P2-Figure 25: Public Realm Investment Priority. Style Guide should include an audit of existing assets and identify a preferred approach for elements such as materiality, furniture, public art, and signage.	City of Rockingham	City of Rockingham
	Develop Public Art Strategy for the RPSP Area to coordinate delivery of public art throughout the RPSP.	City of Rockingham	Mooriboordap Advisory Group, local artists
	Implement Patterson Road/Flinders Lane and Patterson Road/ Wanliss Street 'Green Link Crossings' as trials.	City of Rockingham	Main Roads Western Australia **(MRWA)**
	Complete City Park Green Link with new path connections and planting from Bunbury Place to Patterson Road.	City of Rockingham	Landowners
	Establish Wanliss Street and Jecks Street Green Links.	City of Rockingham	Landowners
	Deliver Public Open Space **(POS)** in P4 - TOD Village in accordance with approved layout as part of delivery.	DevelopmentWA, City of Rockingham	
	City to prepare a Public Realm Plan to define new public realm improvements and acknowledge existing planned works and plans to determine public realm improvements for the 10 year life of the Precinct Plan.	City of Rockingham	Landowners
	City to prepare a Street Tree Master Plan for Strategic Centre to guide street greening prioritisation including species selection and planting. Future updates to the Greening Plan to ensure implementation.	City of Rockingham	Landowners
Medium	Implement Louise Street/Market Street 'Green Link Crossing' as part of P4 - TOD Village delivery (timing can therefore vary).	City of Rockingham	MRWA, DevelopmentWA
	Establish Dixon Road Green Link to Wanliss Street, including 'Green Link Crossing' at Louise Street.	City of Rockingham	City of Rockingham, MRWA
	Implementation of Rockingham Beach Foreshore Master Plan (Area One) to deliver on the proposed vision for Bell and Churchill Parks.	City of Rockingham	Landowners

P1 - Table 5: Movement Actions

Priority	Action	Responsibility	Stakeholders
Short	Undertake investigations and detailed design and construction of the Central Promenade/Civic Boulevard intersection to enhance safety for all modes, in alignment with the intended land use vision.	City of Rockingham	MRWA, Public Transport Authority **(PTA)**
	Undertake investigations and detailed design and construction of the Flinders Lane/Kent Street intersection to enhance safety for all modes, in alignment with the intended land use vision.	City of Rockingham	MRWA
	Undertake investigations and detailed design of RCCTS Route to support delivery of P4 - TOD Village.	City of Rockingham	DevelopmentWA, MRWA, PTA
	Undertake investigations, design and construction of the following Green Crossings: • Louise Street and Dixon Road. • Patterson Road and Wanliss Street. • Patterson Road and Flinders Lane. • Leeuwin Parade.	City of Rockingham	MRWA, PTA, Landowners
	Undertake investigations, design and construction of following Intersection upgrades: • Central Promenade and Chalgrove Avenue. • Rockingham Beach Road and Flinders Lane. • Kent Street and Wanliss Street. • Rockingham Beach Road and Wanliss Street.	City of Rockingham	MRWA, PTA, Landowners
Medium	Undertake investigations and detailed design and construction of Central Promenade/Simpson Avenue intersection to enhance movement permeability and safety in the City Centre.	City of Rockingham	MRWA
	Multi-deck Car Parks to be constructed as demand dictates in accordance with City's Parking Strategy.	City of Rockingham	MRWA, Department of Transport
	Detailed design and construction of Read Street/Louise Street cycle path upgrades.	City of Rockingham	
	Undertake investigations, detailed design and construction of the following Intersection upgrades: • Louise Street and Chalgrove Avenue extension. • Louise Street and Market Street extension (to also include Green Crossing). • Patterson Road and Thorpe Street.	City of Rockingham	MRWA, PTA, Landowners
	Upgrade of Rockingham Beach Road between Railway Terrace and Wanliss Street in accordance with the Rockingham Beach Foreshore Master Plan.	City of Rockingham	PTA, Landowners
Long	Expand RCCTS from Chalgrove Avenue to Waterfront Village. To be delivered as part of future development of P4 – TOD Village.	PTA, City of Rockingham	MRWA, PTA, METRONET
	Investigation for design and construction of new intersection at Patterson Road/Ambrose Street (extension). Subject to environmental approvals associated with development of proposed commercial lots.	Proponent	City of Rockingham, MRWA, DWER, EPA
	Formalisation/construction of nominated laneways in P3 Coastal Lots (subject to land availability).	City of Rockingham	Landowners
	Undertake investigations and detailed design of following Intersection upgrades: • Patterson Road and new North-South extension of Ambrose Street (P8 – Dixon Road). • Louise Street and new East-West Road (P8 – Dixon Road).	City of Rockingham	MRWA, PTA, Landowners

02

Subdivision and Development Requirements



2.1 General Requirements

2.1.1 Bushfire Management

1) Development and subdivision on lots identified as being bushfire prone on the *Department of Fire and Emergency Services bushfire prone mapping* shall be required to prepare and submit a Bushfire Management Plan with any development or subdivision application, in accordance with *State Planning Policy 3.7 Bushfire*.

2.1.2 Heritage Management

1) Existing local heritage places (as shown on **P1 - Figure 1**) have been assessed and recognised to have cultural heritage significance to the local community. The places which are included on the City's Heritage List are protected under the provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015* and owners of these places should conserve the property in a manner that retains the assessed cultural heritage significance.
2) All development to be delivered in accordance with the requirements set out in the City's *Local Planning Policy No.3.3.21 - Heritage Development and Design*.

2.1.3 Public Art

1) A public art contribution is required pursuant to the City's *Local Planning Policy 3.3.25 - Percent for Public Art - Private Developer Contribution*.

2.1.4 Environmental Considerations

Coastal Hazard Risk Management and Adaptation Plan (CHRMAP)

1) Development and subdivision on lots impacted by the City's CHRMAP will be required to be developed in accordance with its requirements. Conditions of approval will be imposed on all impacted development sites.

2.1.5 Urban Water Management

1) All major development sites (1ha or greater) shall require the preparation of a water management strategy prior to applying for subdivision and development.
2) The water management strategy is to be prepared by the developer in accordance with this Precinct Structure Plan. It should demonstrate to the satisfaction of the WAPC and the City (and if required the DWER):
    - How the key principles and criteria of the RPSP Water Management Strategy have been met;
    - How the urban structure will address water use and management; and
    - Existing and required water management infrastructure.
3) The water management strategy must demonstrate proof of concept including how the water management strategy addresses the issues and criteria identified in the RPSP Water Management Strategy and will achieve the criteria in Section 2.2 (of **Appendix 1**).

2.1.6 Future Primary School Site

1) The Department of Education, in conjunction with the City of Rockingham, will need to investigate potential locations for an integrated primary school site, within the precinct structure plan area, anticipated to be required beyond the 10 year approval of the precinct structure plan.

2.2 Local Development Plans

This section provides an overview of the development standards which apply to all subdivision and development in the RPSP area. These standards shall be read in conjunction with the Sub-Precinct Development Requirements **(Section 03)**.

1) Local Development Plans **(LDP)** may be required as a condition of subdivision for specific sites within the RPSP Area. A Local Development Plan shall be prepared and approved in accordance with the Part 6 of the Deemed Provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

2.3 Built Form Design

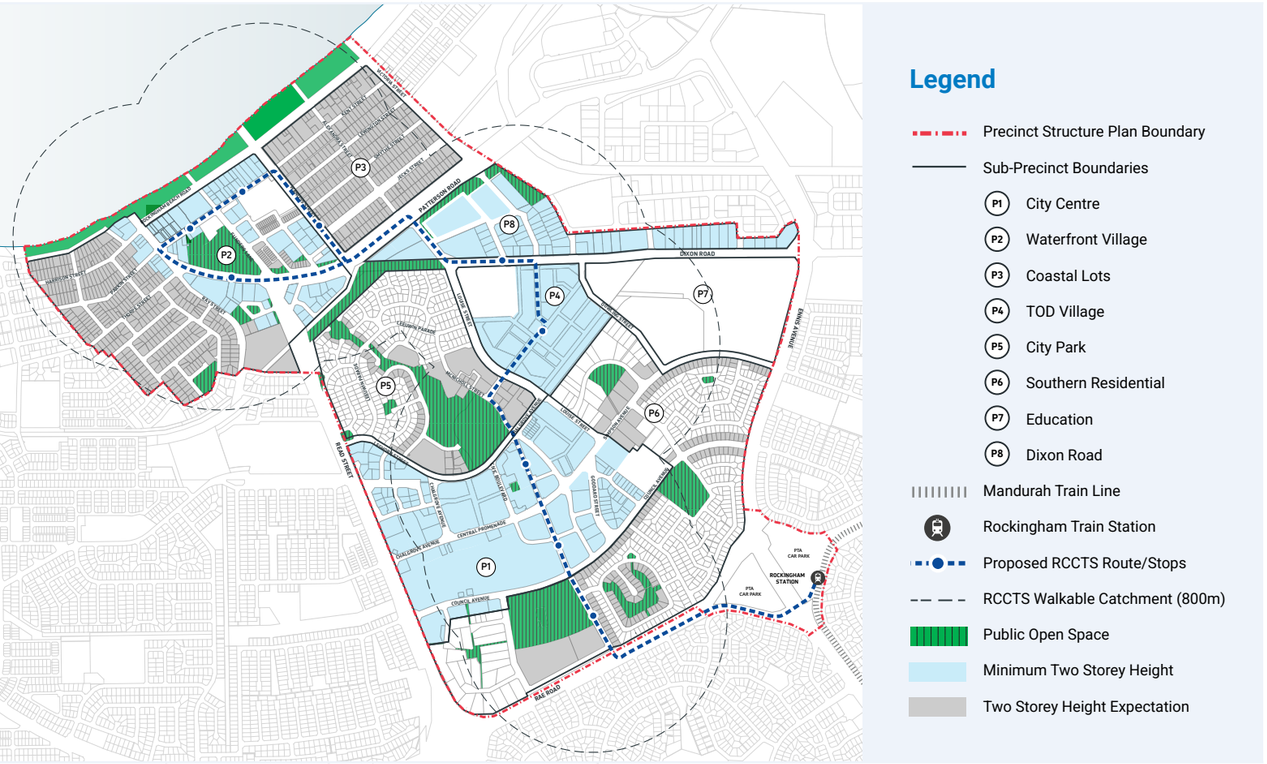
2.3.1 SPP 7.0 -Design of the Built Environment

1) All new development proposals within the RSC should demonstrate the following:
    a) Alignment with the 10 principles set out in *State Planning Policy 7.0: Design of the Built Environment* to the satisfaction of the City and/or it's Design Review Panel (or the State Design Review Panel if applicable).
    b) Consistency with the objectives of both the RPSP and relevant sub-precinct.

2.3.2 Building Heights

General

1) Building heights shall comply with the minimum and maximum building heights set out in LPS2, and the RPSP. Building height should typically be expressed in storeys to allow flexibility of design solutions at ground and roof levels. Section 2.2 of the R-Codes (Volume 2) links storeys to metres (Table 2.2), but offers flexibility to the developers which is required for large mixed use development.
2) A minimum building height of two storeys is required within the 'Mixed-Use', 'Commercial' and 'Service Commercial' zones of the RPSP as shown on **P1 - Figure 4**.
3) It is the City's expectation that development has a minimum two storey building height in the following locations of the RPSP as shown on **P1 - Figure 4**:
   a) P2 - Waterfront Village, P3 - Coastal Lots Sub-Precincts.
   b) R80 zone within P5 - City Park.
   c) Adjacent to the RCCTS route.
   d) Adjacent/fronting areas of public open space.
   e) Along Simpson and Council Avenues.
4) A minimum two storey height will not apply in the following circumstances within the RPSP area:
   a) Proposals for temporary developments/uses on designated sites; and
   b) Additions and alterations to existing developments.



P1 - Figure 4: RPSP Two Storey Height Requirements

Bonus Height Criteria

5) In the P2 Waterfront Village Sub-Precinct lots designated for bonus height (on **P1 - Figure 14**) are permitted a maximum height up to 16 storeys subject to the following criteria:
   a) Can demonstrate that the design permits winter sun (mid-day, June 21) penetration to the main kerb line of the footpath along the southern side of Kent Street between Railway Terrace and Wanliss Street; and
   b) Contributes to improvements to local character and amenity (to a standard supported by the City's Design Review Panel/State Design Review Panel if applicable) through provision of a mid-block connection (with a minimum width of 8m) framed with development that provides passive surveillance and ground floor activation between Kent Street and Rockingham Beach Road (in dedicated locations).
6) In the P2 Waterfront Village Sub-Precinct lots designated for bonus height (on **P1 - Figure 14**) are permitted on the Rockingham Beach Hotel Future Development Site to a maximum height up to 24 storeys subject to the following criteria:
   a) Can demonstrate that the design permits winter sun (mid-day, June 21) penetration to the main kerb line of the footpath along the southern side of Kent Street between Railway Terrace and Wanliss Street.
   b) Contributes to improvements to local character and amenity (to a standard supported by the City's Design Review Panel/State Design Review Panel if applicable) through:
      i) Provision of a mid-block connection (with a minimum width of 8m) framed with development that provides passive surveillance and ground floor activation between Kent Street and Rockingham Beach Road (in dedicated locations); and
      ii) Reinterpretation of places of cultural heritage significance such as the reuse of heritage fabric on the site.

2.3.3 Setbacks

1) All setback requirements to be in accordance with the standards set out in **Section 03**, except for:
   a) Outbuildings and other incidental structures which shall be guided by the R-Codes.
   b) No outbuildings are to be located within the front setback area.

2.3.4 Street Interface

Building Frontages

1) Building frontages shall be in accordance with the precinct development requirements set out in **Section 03**.

   Guidance on how to interpret the development requirements is illustrated on **P2 - Figure 30 - P2 - Figure 37**.

2) RCCTS Interface as a general requirement will be required for P1, P2, P3, P4, P5, P6 and P8. For sites fronting the RCCTS route, a Frontage Build Out greater than 70% and orientation of openings and habitable rooms towards the RCCTS route are encouraged to provide passive surveillance and activity.

Prominent Corners

3) In locations identified as 'Prominent Corner' in **Section 03** the design response should provide a special architectural emphasis including elements such as additional height, distinct roof forms, canopies, curved walls and tower elements. Discretion may be applied through the design review process to relax standard street setback requirements in these locations.

Facade Design

4) In the case of multiple dwelling developments, including all mixed-use residential developments refer to **Section 03** and Part 4 'Designing the Building' of the R-Codes Volume 2.

5) For non-residential development, facade design includes:
   - Scaling, articulation, materiality and detailing at lower levels that reflect the scale, character and function of the public realm.
   - Rhythm and visual interest achieved by a combination of building articulation, the composition of different elements and changes in texture, material and colour.

6) In buildings with height greater than four storeys, façades include a defined base, middle and top for the building.

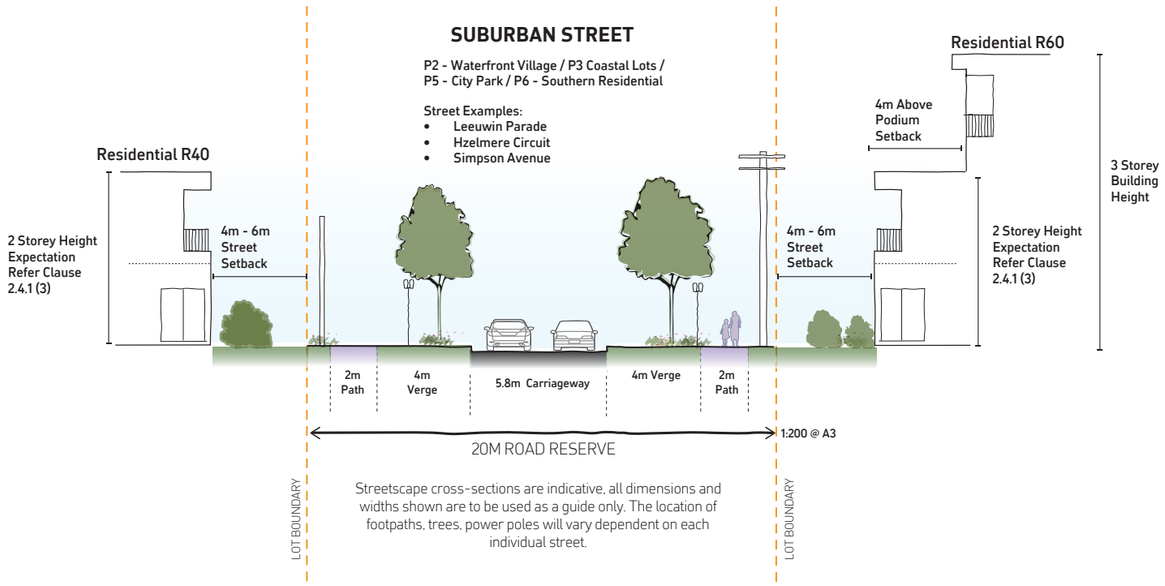
7) The facade includes design elements that relate to key datum lines of adjacent buildings through upper level setbacks, parapets, cornices, awnings or colonnade heights.

8) Building services fixtures are integrated in the design of the façade and are not visually intrusive from the public realm.

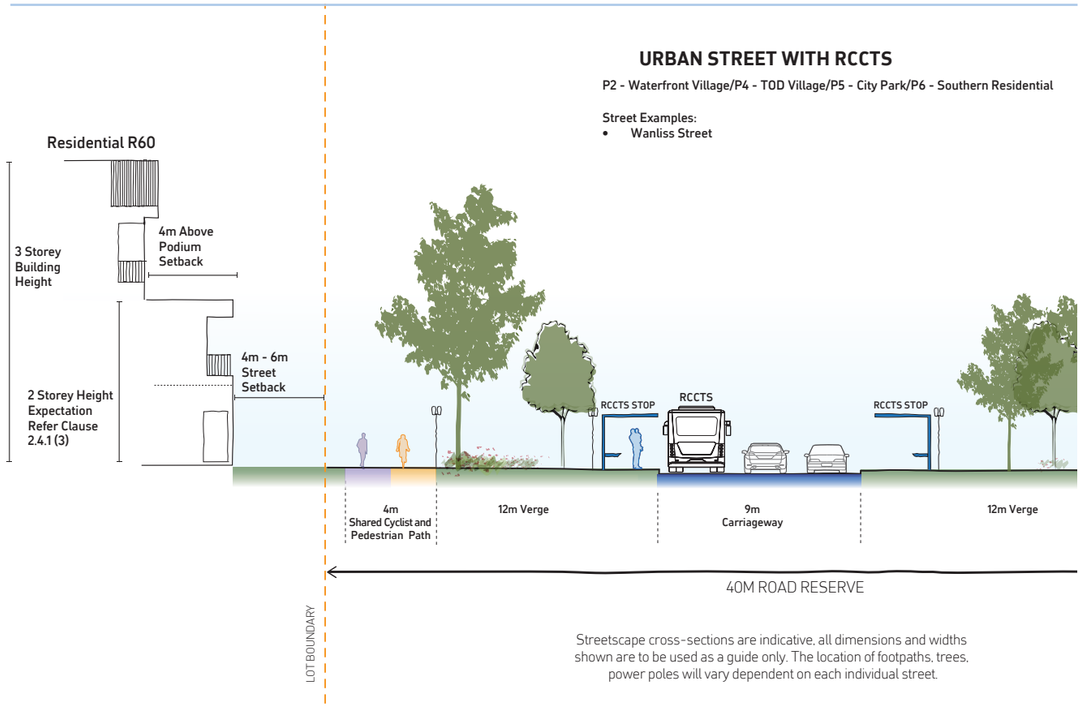
9) Development with a primary setback of 1m or less to the street includes awnings that:
   - Define and provide weather protection to entries.
   - Are integrated into the facade design.
   - Are consistent with the streetscape character.

Street Cross-Sections

P1 - Figure 5: Suburban Frontage Type

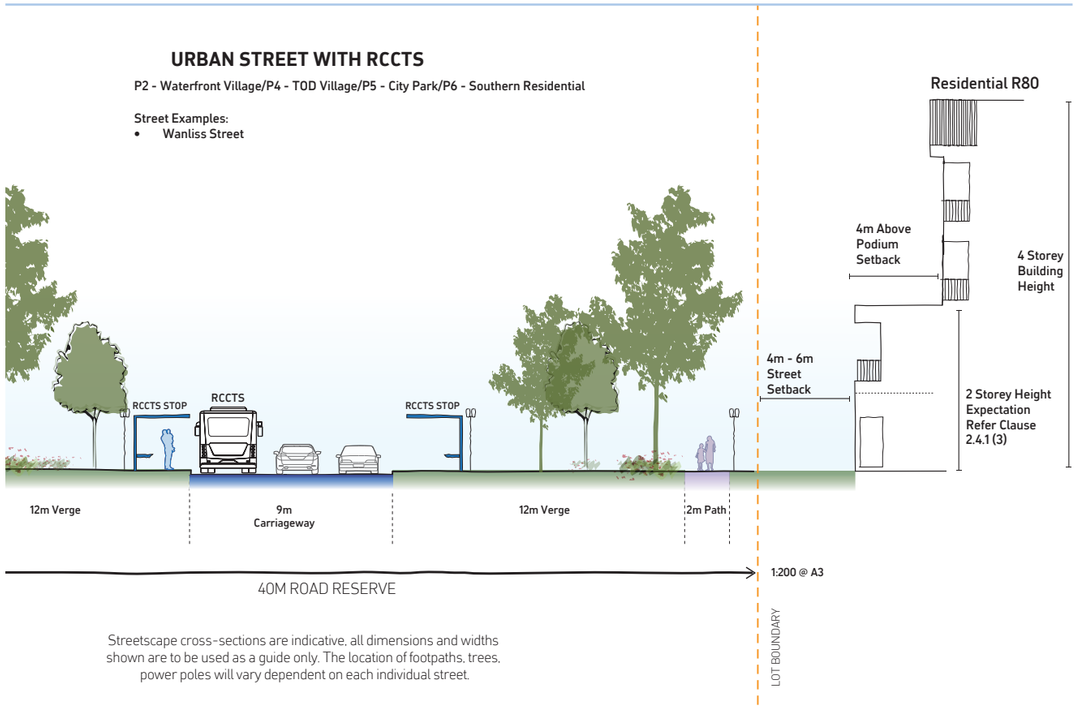


P1 - Figure 6: Urban Street R60 Frontage Type



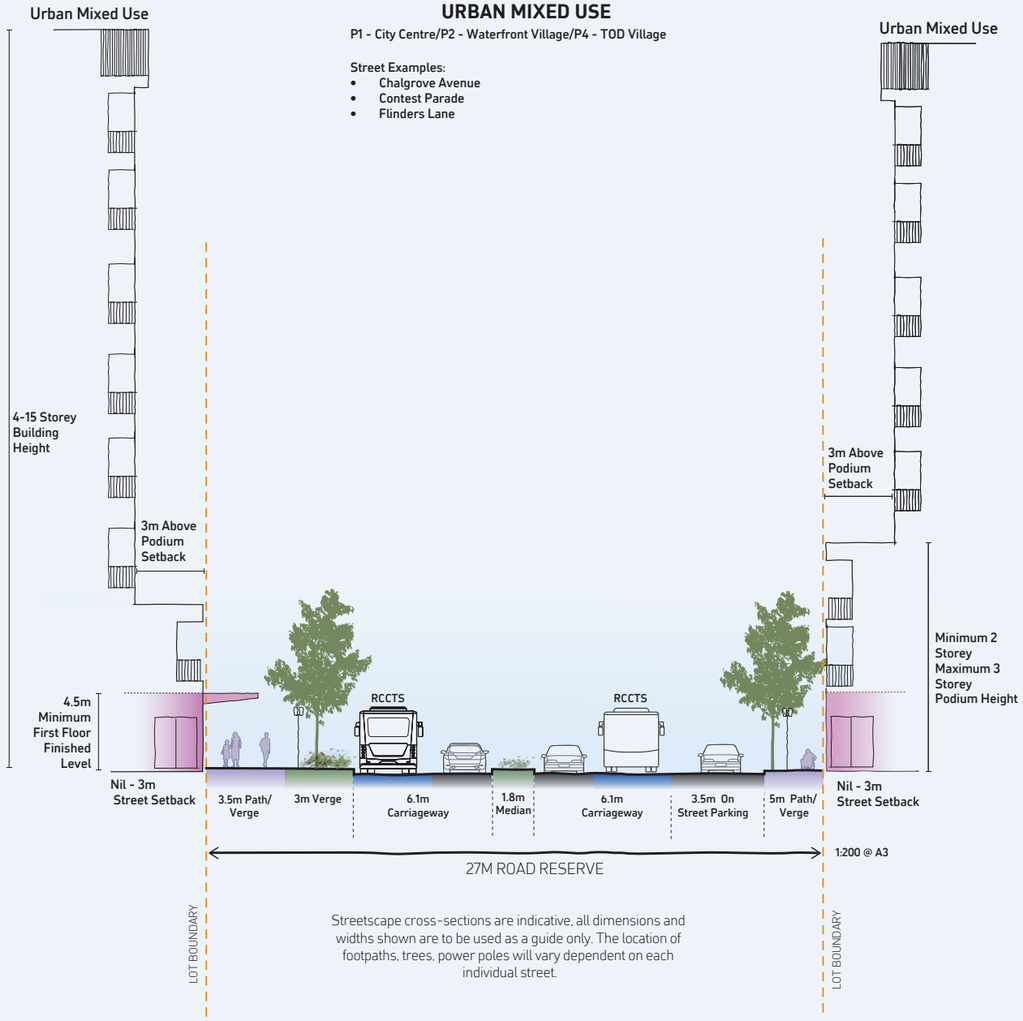
Streetscape cross-sections are indicative, all dimensions and widths shown are to be used as a guide only. The location of footpaths, trees, power poles will vary dependent on each individual street.

P1 - Figure 7: Urban Street R80 Frontage Type



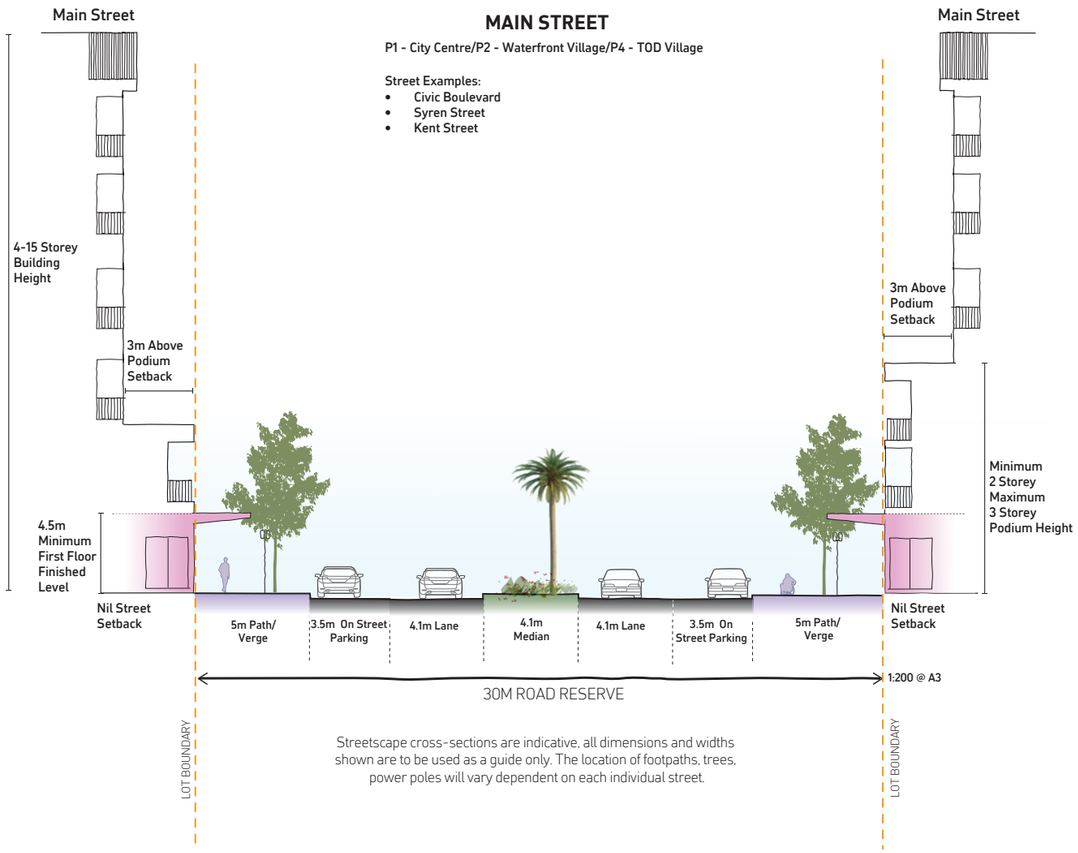
Streetscape cross-sections are indicative, all dimensions and widths shown are to be used as a guide only. The location of footpaths, trees, power poles will vary dependent on each individual street.

P1 - Figure 8: Urban Mixed Use Frontage Type



Streetscape cross-sections are indicative, all dimensions and widths shown are to be used as a guide only. The location of footpaths, trees, power poles will vary dependent on each individual street.

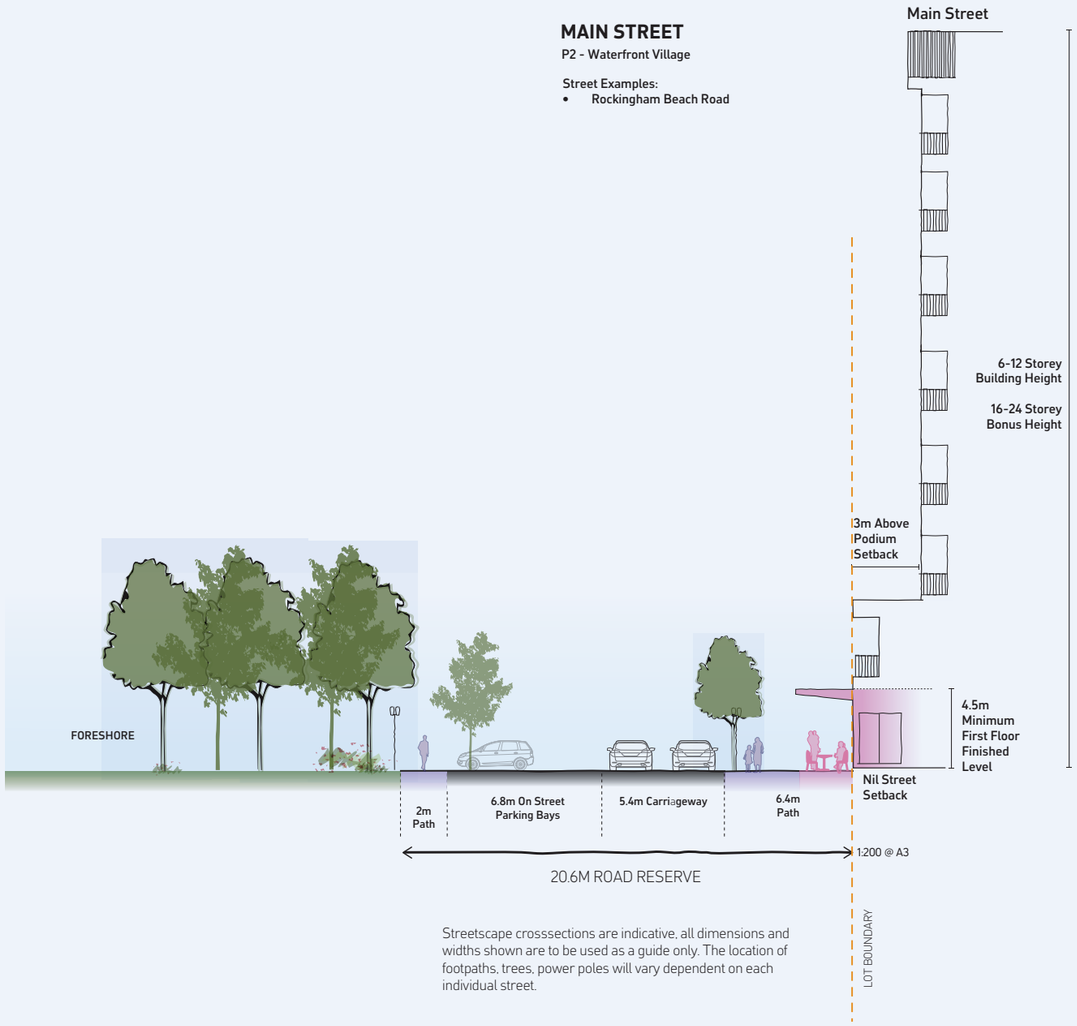
P1 - Figure 9: Main Street Frontage Type



Streetscape cross-sections are indicative, all dimensions and widths shown are to be used as a guide only. The location of footpaths, trees, power poles will vary dependent on each individual street.

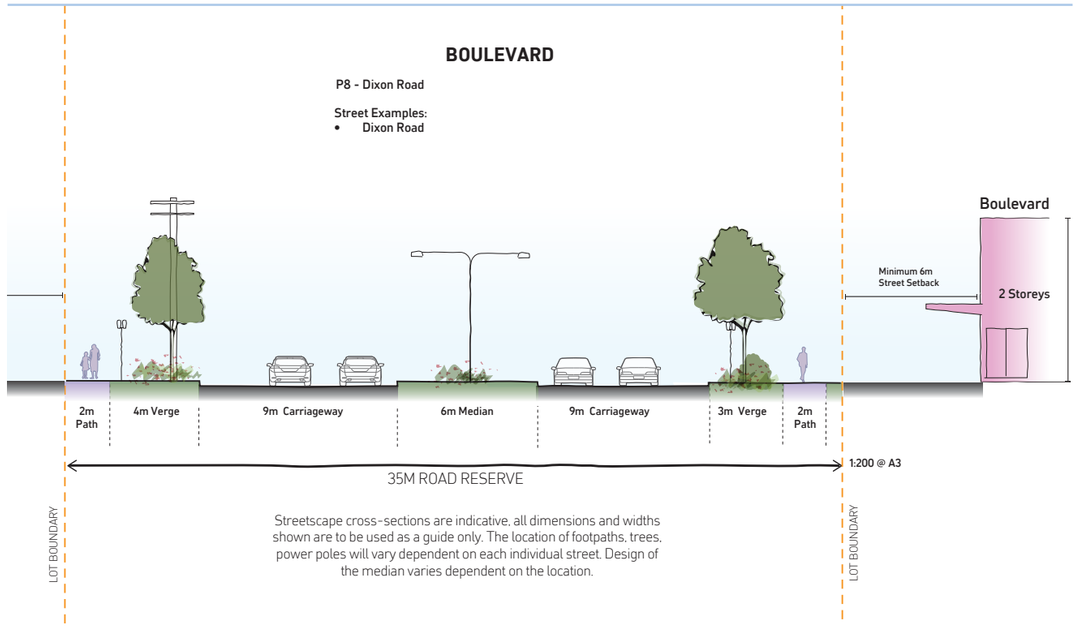
P1 - Figure 10: Main Street Frontage Type

Note: Rockingham Beach Road only

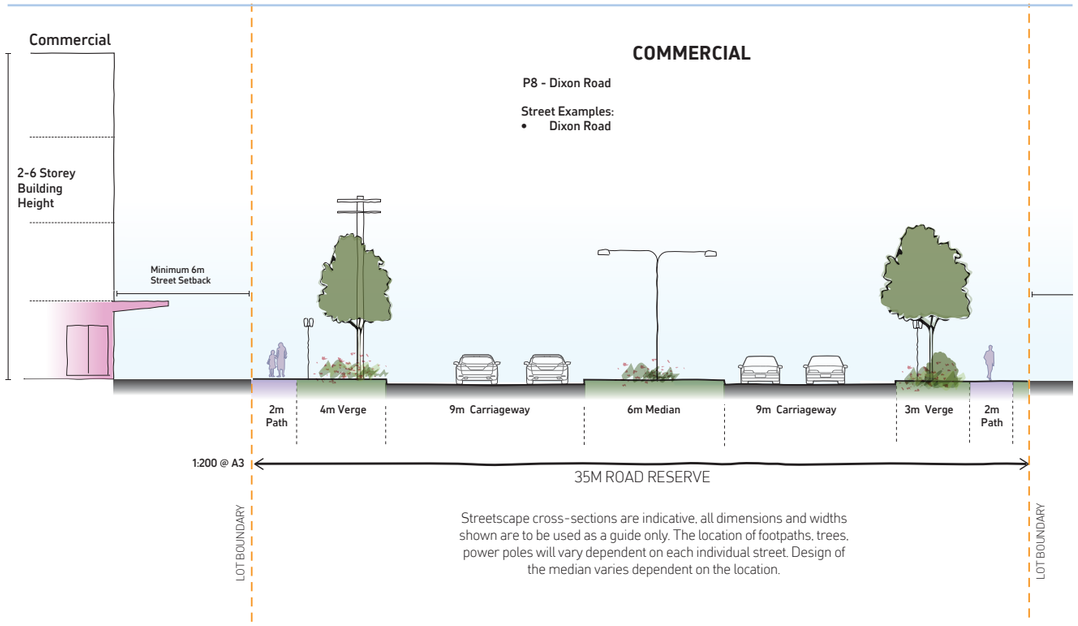


Streetscape crosssections are indicative, all dimensions and widths shown are to be used as a guide only. The location of footpaths, trees, power poles will vary dependent on each individual street.

P1 - Figure 11: Boulevard Frontage Type



P1 - Figure 12: Commercial Frontage Type





2.3.5 Subdivision and Amalgamation

1) In the **P1 - City Centre** and **P7 - Education Sub-Precincts**, subdivision will not be supported unless the following criteria are met to the satisfaction of the City:
   a) It is adequately demonstrated that the resultant lots are of a size which will accommodate development with a form and scale that reflects the relevant development provisions and objectives of the RPSP; or
   b) The subdivision relates to development which has been approved and the construction of which is substantially commenced; or
   c) Subdivision is not associated with an interim or temporary use.
2) In the **P2 - Waterfront Village**, **P3 - Coastal Lots**, **P5 - City Park**, and **P6 - Southern Residential Sub-Precincts**, new development needs to address the following criteria to the satisfaction of the City:
   a) The resultant lot/s have a minimum lot size of 1000m². Development on lots less than 1000m² may be acceptable where a site meets the below additional criteria:
      - Has a minimum site area of 800m²; and
      - Is situated on a corner lot.

      OR
   b) For lots under 1000m², development concept plans will be required at subdivision application stage which demonstrate development can be built in accordance with the RPSP to the satisfaction of the City. This must include demonstration that:
      - Street and lot boundary setbacks of the RPSP can be met;
      - Deep soil and/or landscape requirements of the R-Codes are achieved;
      - Street interface requirements are met, in accordance with requirements of relevant frontage type;
      - Desired vehicle access and location/design of vehicular parking requirements are met; and
      - Amenity of occupants is not compromised, by ensuring all minimum standards can be met for private open space, outdoor living areas, and primary garden areas.
   c) Meets the development requirements set out in **Section 03**.

   Note: The refurbishment or replacement of a single house is excluded from the above.
3) In the **Waterfront Village (P2)**, **Coastal Lots (P3)**, **City Park (P5)**, and **Southern Residential (P6) Sub-Precincts**, the battle-axe subdivision is not favoured. The City's preference is for survey-strata subdivision (with common property) to meet the planning objectives of residential infill development and to limit the proliferation of driveway crossovers into the streetscape. Use of battle-axe lot configuration is not favoured. Direct street frontage or dual street and rear laneway access is the preferred configuration. Exceptions may be considered in the following circumstances:
   a) Battle-axe legs used to provide alternative access for lots fronting major roads with access controls or public open space.
   b) To facilitate vehicular access to significantly sloping sites where acceptable street gradient can not be achieved.
   c) Retention of existing heritage or character development.
   d) Retention of verge trees where recommended by the local government.

2.3.6 Car Parking Requirements

General

1) Basement car parking or parking sleeved behind residential or non-residential is encouraged within the RPSP area (unless otherwise stated in **Section 03**).
2) For all residential development (excluding land identified as Mixed Use on the Structure Plan Map) the following applies:
   a) Consolidated access is encouraged with one crossover per lot. This also applies to lots that may be amalgamated in accordance with **Section 2.3.5 (1) and (2)**.
3) Parking within the RPSP shall be provided at the ratios specified in **P1 - Table 6**:

P1 - Table 6: RPSP Parking Requirements

Land Use	Parking Standards
Residential Uses (All Sub-Precincts)	• Shall be provided in accordance with the R-Codes.
Non-Residential Uses (P1, P2, P4, P5)	• Parking for non-residential uses to be provided at a rate of 1 bay per 25m² NLA.
Non-Residential Uses (P7)	• Educational Establishment: 10 bays per 100 students and 1 bay per 5 employees. • All other non-residential uses: 1 bay per 25m² NLA.
Non-Residential Uses (P8)	• Parking for Bulky Goods Showroom, Warehouse/Storage uses to be provided at a rate of 1 bay per 60m² NLA. Parking for all other non-residential uses to be provided at a rate of 1 bay per 25m² NLA for all.
Outdoor Uses Without NLA	• 1 bay for every 10 persons accommodated (excluding alfresco dining). Refers to a land use conducted in an open-air environment without permanent buildings, including markets, pop-up bars and similar temporary development activities.

** Net Lettable Area **(NLA)***

Cash-In-Lieu of Car Parking

4) Where an applicant proposes a development which is required to provide car parking bays in accordance with **Section 2.3.6 (3)** that person may, if agreed by the City, make a cash payment to the City in lieu of the provision of all or any of the required number of car parking spaces. The cash payment shall be in accordance with the requirements of the City's LPS2.
   a) For change of use applications less than 300m² NLA in size cash-in-lieu of parking requirements do not apply.

2.3.7 Bicycle Parking and End of Trip Facilities

1) For residential development, bicycle parking and end of trip facilities shall be provided in accordance with the R-Codes.
2) For non-residential development, bicycle parking and end of trip facilities shall be provided in accordance with the City's *Local Planning Policy No.3.3.14 Bicycle Parking and End-Of-Trip Facilities*.

2.3.8 Landscape and Deep Soil

All non-residential development (commercial/mixed use) where the R-Codes do not apply, is required to achieve the following:

1) Retention of existing trees in the front and rear setback areas of a site that meet the following criteria:
   a) Healthy specimens with ongoing viability and
   b) Species is not included on a State or local area weed register and
   c) Height of at least 4m and/or
   d) Trunk diameter of at least 100mm, measured 1m from the ground and/or
   e) Average canopy diameter of at least 4m.
2) The removal of existing trees in the front and rear setback area that meet any of the criteria in **Section 2.3.8 (1)** shall only be permitted when:
   a) It can be relocated to another portion of the site or
   b) Is supported by an arboriculture report or
   c) It can be reasonably demonstrated to the satisfaction of the City that retention of the tree will adversely compromise the development potential of the site, impacting its ability to meet sub-precinct objectives.
3) Deep soil areas are provided in accordance with **P1 - Table 7**, and the below standards:

P1 - Table 7: RPSP Deep Soil Requirements

Site Area	Minimum Deep Soil	Minimum Requirement For Trees*
Less than 700m²	10% **OR** 7% if existing tree(s) retained on site (% site area) *Note: Variations to the above may be considered for land identified as Commercial or Service Commercial on the Structure Plan Map (at the discretion of the City)*	1 medium tree and small trees to suit area
700 – 1000m²		2 medium trees **OR** 1 large tree** and small trees to suit area
> 1000m²		1 large tree** and 1 medium tree for each additional 400m² in excess of 1000m² **OR** 1 large tree** for each additional 900m² in excess of 1000m² and small trees to suit area

**Tree sizes to be in accordance with those set out in Table 3.3b of the R-Codes Volume 2.*
*** Where 1 large tree cannot be provided due to site constraints, 2 medium trees can be provided in its place.*

   a) Deep soil areas are to be co-located with existing trees for retention and/or adjoining trees (where possible), or alternatively provided in a location that is conducive to tree growth and suitable for communal open space.
   b) The extent of permeable paving or decking within a deep soil area does not exceed 20 per cent of its area and does not inhibit the planting and growth of trees.
   c) Where the required deep soil areas cannot be provided due to site restrictions, planting on structure with an area equivalent to two times the shortfall in deep soil area provision is provided.

2.3.9 Fencing

All fencing shall be in accordance with the following standards:

a) **Residential/Mixed Use Development:** Where fences are proposed in front setback areas, the fencing requirements of the relevant R-Codes Volume shall apply.
b) **Commercial/Service Commercial Development:** Fencing forward of the predominant building line is not permitted.
c) **Commercial/Service Commercial Development:** Fencing behind the predominant building line must be of a high quality material and finish.

2.3.10 Ancillary Accommodation

The following provisions apply to ancillary accommodation development in the RSC. See **P1 - Table 8**.

P1 - Table 8: New Provision Ancillary Accommodation

New provision	R-Code Application Volume 1 Part B	R-Code Application Volume 1 Part C
The use of materials and colours which are compatible with the main dwelling.	Augments 5.5.1	Augments C2.8.1
Ancillary dwellings must be located behind or as an extension to the primary dwelling.	Modifies 5.5.1 C1 iv.	Augments C2.8.1

2.4 Land Use

1) Land use permissibility within the RPSP shall be determined in accordance with the Rockingham Strategic Centre Land Use table set out in LPS2.

   Land use permissibility is based on the RPSP 'sub-zones' as defined on the Structure Plan Map (**P1 - Figure 1**).

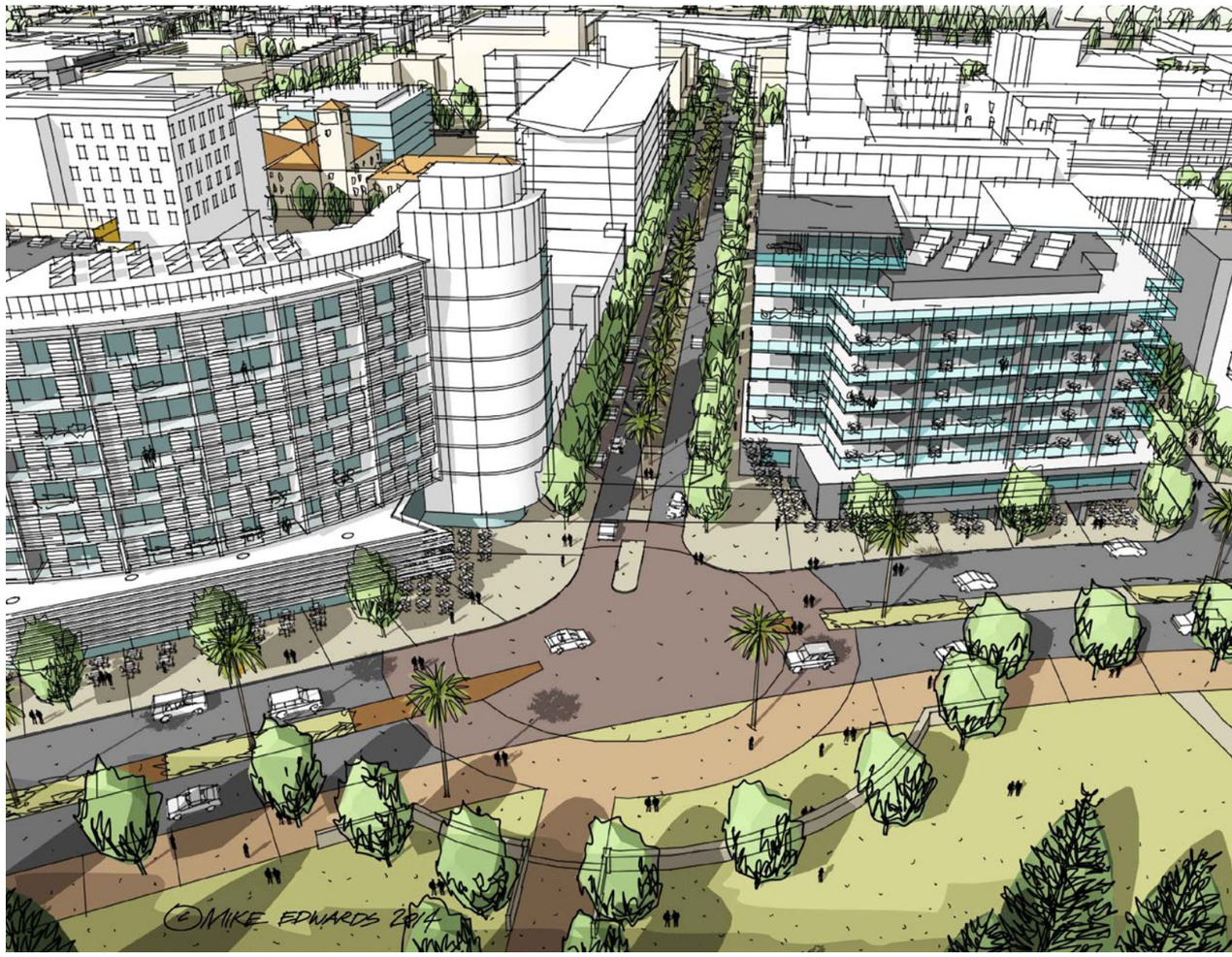
2.4.1 Temporary Development Approvals

Development and activation of existing large vacant lots within strategic locations of the RSC is an important consideration to meet economic objectives of the RPSP. To promote these economic objectives, nominated interim uses on the following sites may be eligible for a time limited development approval that relaxes certain development provisions set out in LPS2, and this Precinct Structure Plan where the application can demonstrate the development is of a temporary nature (to the satisfaction of the City based on the City's definition of Temporary Development).

1) Temporary development approvals for interim uses will only be considered in the following geographical areas (as identified on **P1 - Figure 13**):
   a) Future Development Site 1 (bounded by Charlgrove Avenue, Civic Boulevard, and Central Promenade).
   b) Future Development Site 2 (bounded by Charlgrove/Simpson Avenues, and Whitfield/Louise Streets).
2) Temporary development approvals for interim uses shall meet all provisions set out in LPS2 and the RPSP, with the exception of minimum height provisions and open space provisions only where:
   a) The development demonstrates that it is temporary in nature (to the satisfaction of the City based on the City's definition of Temporary Development).
   b) The development demonstrates how it meets the economic objectives of the PSP.
   c) The development is for any of the following uses (to the exclusion of all other uses):
      i) Amusement Parlour
      ii) Art Gallery
      iii) Cinema/Theatre
      iv) Community Purpose
      v) Convenience Store
      vi) Exhibition Centre
      vii) Market
      viii) Restaurant/Cafe
      ix) Shop
      x) Small Bar
   d) The development does not impact an area designated with a 'Main Street' Frontage Type.
3) The proponent must demonstrate how the site will be restored back to its former condition within five years (to the satisfaction of the City).
4) After the expiry of the time limited development approval the landowner must apply for a new time limited development approval to continue using the land for that purpose.

2.4.2 Residential Density

1) Residential density shall be in accordance with **P1 - Figure 2**.
2) For sites zoned 'Commercial R-AC0', built form requirements are required to be accordance with the tables provided in **Section 03**.

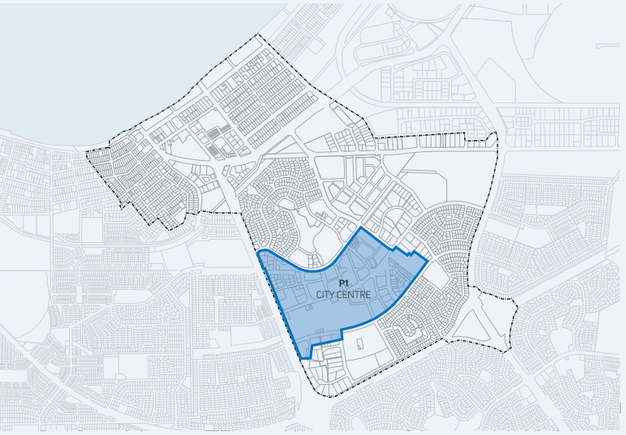


03

Sub-Precinct Development Requirements



3.1 P1 - City Centre Sub-Precinct



Sub-Precinct Intent

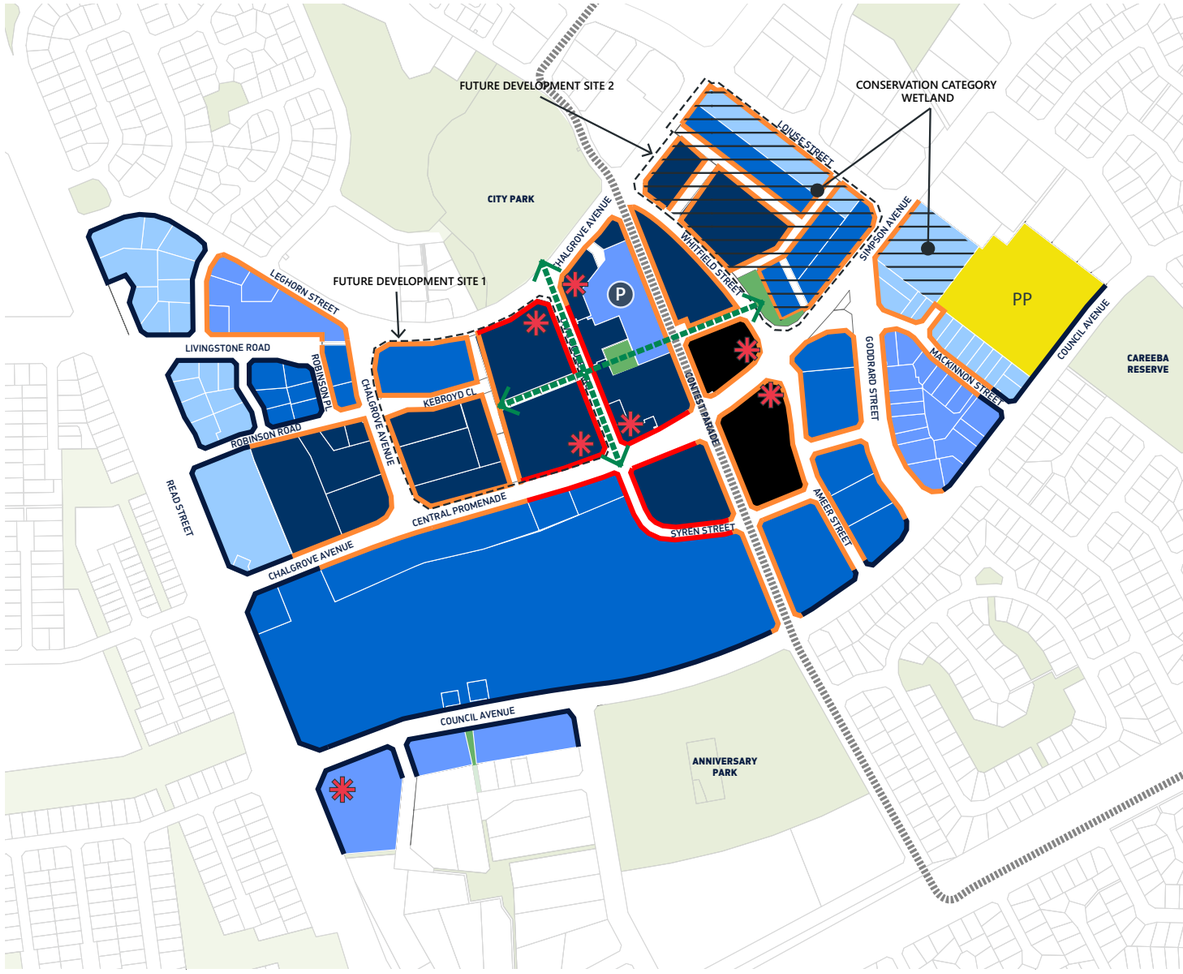
Anchored by the shopping centre and civic precinct, the City Centre will provide the primary economic and employment focus of the RSC. Higher density housing and new commercial development creates a critical mass of people who enjoy highly permeable and walkable urban streets, that connect major public spaces with public transport on Contest Parade. New development provides a positive and well-defined urban street interface, where pedestrians and cyclists enjoy priority over vehicles.

Sub-Precinct Objectives

- Provide for an attractive and compact City Centre, supported by green and walkable streets.
- Concentrate a mix of uses in the central core including high density residential and employment intensive land uses.
- Establish the land interfacing with the Syren Street/Civic Boulevard/Central Promenade intersection (and surrounds) as the primary retail heart of the City Centre.
- Unlock vacant development sites through flexible urban structure and planning controls that allow short term development that does not impact on the long term vision for the City Centre.
- Achieve a gradation of height to visually define the activity core of the City Centre and on Contest Parade along the RCCTS route.
- Realign the Whitfield Street/Louise Street/Simpson Avenue intersection to allow an eastern extension of Central Promenade to enhance sub-precinct legibility.
- Sleeving of Rockingham Central Shopping Centre to activate Central Promenade and Civic Boulevard.
- Prominent corner sites provide development responses that create a visual gateway to the City Centre.

3.1.1 Development Requirements

In addition to the requirements provided in **Section 02**, the provisions set out in **P1 - Table 9** shall apply to the area included within the City Centre Sub-Precinct Plan **(P1 - Figure 13)**.



P1 - Figure 13: City Centre Sub-Precinct Requirements

Legend

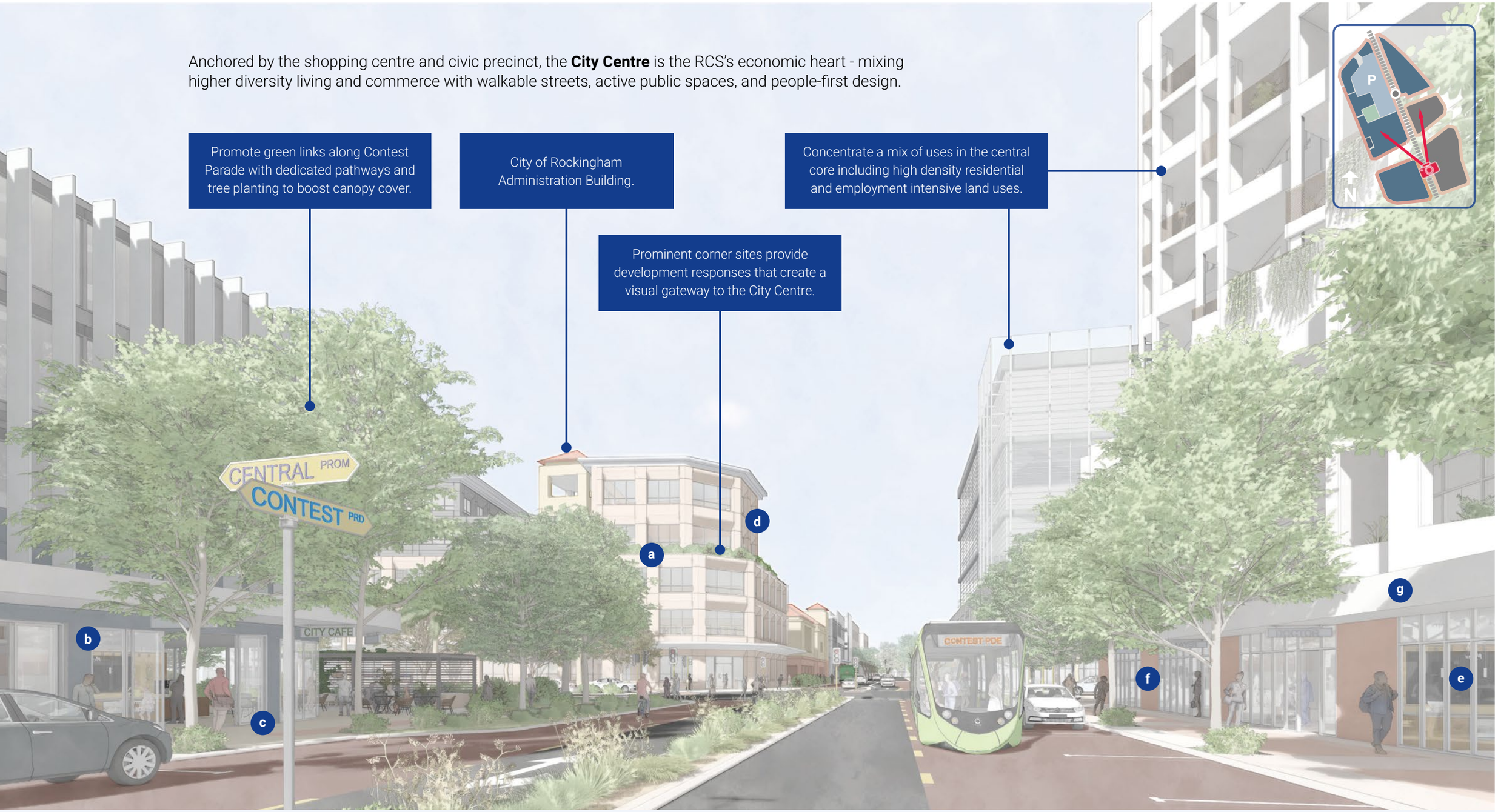
Building Height
- 3 Storeys
- 4 Storeys
- 6 Storeys
- 8 Storeys
- 12 Storeys

Frontage Types
- Urban Mixed Use
- Main Street
- Commercial/Boulevard

Other Elements
- Future Development Sites 1 and 2
- Public Open Space
- Public Purpose
- Prominent Corners

Movement
- Proposed RCCTS Route/Stops
- Green Links
- Multi-Deck Car Park (Public)

Anchored by the shopping centre and civic precinct, the **City Centre** is the RCS's economic heart - mixing higher diversity living and commerce with walkable streets, active public spaces, and people-first design.



Key Built Form Control For City Centre Main Street

a) Maximum Podium Height - 3 Storeys

b) Minimum Ground Floor Height - 4.5m

c) Minimum and Maximum Primary/Secondary Street Setback (Podium) - Nil

d) Minimum Primary/Secondary Street (Above Podium) - 3m

e) Minimum Clear Glazing - 80% of Building Frontage or 2/3 Lot Frontage

f) Minimum Frontage Build Out - 100%

g) Awnings Minimum Standards - Height 3m/Width - 2.4m

P1 - Table 9: City Centre Built Form Controls

Provision	Provision	Frontage Type		R-Codes Application Volume 2
		Main Street (R-AC0)	Urban Mixed Use (R-AC0)	
Land Use	Preferred Land Use at Street Level	**Non-Residential:** Shop, Convenience Store, Restaurant/Cafe, Small Bar	**Non-Residential:** Shop, Convenience Store, Restaurant/Cafe, Small Bar	-
Building Height	Minimum Podium Height	2 Storeys	2 Storeys	Augments A2.2.1
	Maximum Podium Height	3 Storeys	3 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 13** for maximum building heights.		Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	4.5m	4.5m	Modifies A4.3.3
Street Setbacks	Minimum Primary/Secondary Street (Podium)	Nil	Nil	Augments A 2.3.1
	Maximum Primary/Secondary Street (Podium)	Nil	3m	Augments A 2.3.1
	Minimum Primary/Secondary Street (Above Podium)	3m	3m (additional to podium setback)	Augments A 2.3.1
Side and Rear Setbacks	Side Setbacks (Podium)	Nil	Nil	Augments A2.4.1
	Rear Setbacks (Podium)	Nil	Nil	Augments A2.4.1
	Minimum Side and Rear Setbacks (Above Podium)	Per Element 2.7 of the R-Codes		-
Plot Ratio	Plot Ratio	Plot ratio does not apply.		Modifies A2.5.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted	Not Permitted	Augments A3.6.2
	Vertical Separation	Ground floor apartments are not permitted.	Average less than 1m and does not exceed 1.2m	Replaces A3.6.1 and A3.6.5 (Main Street only)
Vehicle Access/ Parking	Direct Vehicle Access	Not Permitted* Unless no access can be provided from secondary frontage or rear laneway.	Permitted in locations nominated by the City.	Replaces A3.8.1
Facade Design (Street Level)	Minimum Clear Glazing %	80% of building frontage or 2/3 of lot frontage (whichever is greater)	50% of building frontage	Replaces A3.8.2
	Minimum Frontage Build Out	100%	70% (up to 30% for crossover/side setbacks)	Augments A4.10.1
	Awnings as a Minimum % of Building Frontage	100%	70%	Augments A4.10.1
	Awnings Minimum Standards	Height - 3m Width - 2.4m	Height - 3m Width - 2.4m	Augments A4.10.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type	R-Codes Application Volume 2
		Commercial/Boulevard (R-AC0)	
Land Use	Preferred Land Use at Street Level	**Non-Residential:** Shop, Brewery, Child Care Premises, Consulting Rooms, Medical Centre, Liquor Store Large	-
Building Height	Minimum Podium Height	2 Storeys	Augments A2.2.1
	Maximum Podium Height	3 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 13** for maximum building heights.	Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	4.5m	Modifies A4.3.3
Street Setbacks	Minimum Primary/Secondary Street (Podium)	Nil	Augments A 2.3.1
	Maximum Primary/Secondary Street (Podium)	3m	Augments A 2.3.1
	Minimum Primary/Secondary Street (Above Podium)	3m	Augments A 2.3.1
Side and Rear Setbacks	Side Setbacks (Podium)	Nil	Augments A2.4.1
	Rear Setbacks (Podium)	Nil	Augments A2.4.1
	Minimum Side and Rear Setbacks (Above Podium)	Per Element 2.7 of the R-Codes	-
Plot Ratio	Plot Ratio	Plot ratio does not apply.	Modifies A2.5.1
Public Domain Interface	On-Site Parking Between Street and Building	Permitted	Modifies A3.6.2
	Vertical Separation	Average less than 1m and does not exceed 1.2m	-
Vehicle Access/ Parking	Vehicle Access	Permitted in locations nominated by the City and/or MRWA.	Replaces A3.8.1 Replaces A3.8.2
Facade Design (Street Level)	Minimum Clear Glazing %	70% of building frontage	Augments A4.10.1
	Minimum Frontage Build Out	70% (up to 30% for crossover/side setbacks)	Augments A4.10.1
	Awnings as a Minimum % of Building Frontage	70%	Augments A4.10.5
	Awnings Minimum Standards	Height - 3m Width - 1.8m	Augments A4.10.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			

3.1.2 Land Use Permissibility

1) The land use permissibility for the following sub-zones is modified in P1-City Centre as set out below:
   a) **Mixed Use Sub-Zone:** Nightclub, Amusement Parlour, and Betting Agency will only be an 'A'.
   b) **Mixed Use and Commercial Sub-Zone:** Brewery will only be an 'A' use.
   c) **Commercial and Service Commercial Sub-Zone:** Liquor Store Large will only be an 'A' use.

3.1.3 Integrated Development Guide Plans

The Integrated Development Guide Plan for the corner of Council Avenue and Goddard Street, Rockingham **(Appendix 11)** guides the built form framing and provision of car parking in this location.

3.1.4 Environmental Considerations

A conservation category wetland is mapped within P1 - City Centre, Lot 201 Chalgrove Avenue and Lot 103 Council Avenue, and must undertake the following prior to subdivision and development:

a) Conduct a wetland identification and/or delineation investigation to investigate and update the environmental significance of the mapped wetland.
b) Development of an environmental management plan at development stage detailing mitigation strategies, triggers and contingency actions for clearing for the proposed development.

3.1.5 Future Development Site 1

The primary focus of Future Development Site 1 is to provide a framework to coordinate future subdivision and development of the lots shown on **P1 - Figure 13**. The lot layout shown is indicative only and is intended to inform future subdivision and development proposals.

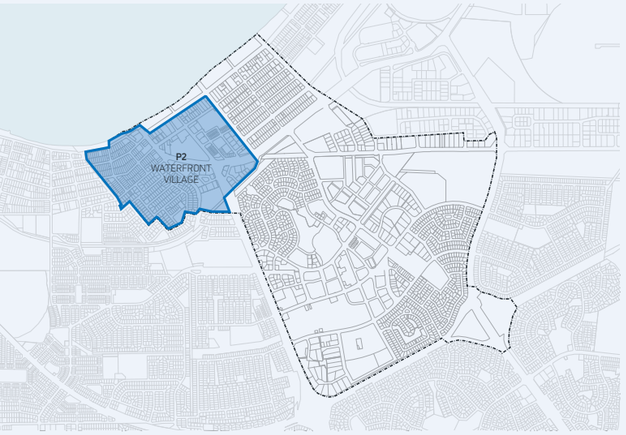
1) Future proposals must satisfy the following design objectives:
   a) Establish a new north-south mid-block connection (for all transport modes) between City Park and Central Promenade to provide a more permeable urban structure underpinned by direct and legible links.
   b) Establish a new east-west mid-block connection and green link between Civic Boulevard and the new north-south road as described in **3.1.5 (1) (a)**. The mid-block connection will ensure a pedestrian entry onto Civic Boulevard connecting with Ako Lane to the east. No vehicle cross-overs are permitted on Civic Boulevard.

3.1.6 Future Development Site 2

The primary focus of Future Development Site 2 is to provide a framework to coordinate future subdivision and development of the lots shown on **P1 - Figure 13**. The lot layout shown is indicative only and is intended to inform future subdivision and development proposals.

1) Future proposals must satisfy the following design objectives:
   a) Establish a new public open space at the end of Ako Lane as part of the east-west green link that connects to Civic Boulevard. Park to ensure a minimum area of 1800m² and width of 20m.
   b) New development provided adjacent to the park should ensure that building design increases overlooking opportunities through orientation of windows, balconies and other living spaces towards the POS for passive surveillance.
   c) Establish at a minimum the following mid-block connections:
      i) 1 x new primary connection between Whitfield Street and Louise Street.
      ii) 1 x new secondary connection from Whitfield Street.
      iii) 1 x new connection from Charlgrove Avenue.
      iv) 1 x new connection from Central Promenade.

3.2 P2 - Waterfront Village Sub-Precinct



Sub-Precinct Intent

As an identified coastal node, the Waterfront Village will continue the transformation of Rockingham Beach into a regionally significant entertainment, culture, and tourism hub. Redevelopment of underutilised public and private land provides an attractive mix of medium to high density residential, short–stay accommodation, hospitality-focussed retail, and high quality public spaces. Combined, these ingredients will see Rockingham's coastline, established as a priority destination for locals and visitors.

Sub-Precinct Objectives

- Support transformation into a contemporary waterfront activity node servicing local residents and tourists through enhanced entertainment, short-stay accommodation, and cultural development opportunities.
- Rockingham Beach Road is established as the sub-precinct's focal point of activity, with uses such as alfresco dining spilling out onto the street. Traffic calming helps to reduce speeds, enhancing safety and useability.
- Reinforce Kent Street as a secondary main street with a focus on heritage, culture and the arts. Its prominence is enhanced by leveraging off the realigned RCCTS Route and creating new mid-block connections to Rockingham Beach Road.
- Respond to the rare combination of a northerly coastal aspect, a sheltered beach and shady foreshore parklands with land uses that promote active recreation, living and business activities.
- Concentrate larger development typologies in the mixed use areas on Rockingham Beach Road, Kent Street, and Patterson Road.
- Carefully manage infill residential development to create high-quality residential neighbourhoods that respect the landscape qualities of these places to support Waterfront Village businesses.
- Encourage residential density along Wanliss Street and Patterson Road to help frame and support the RCCTS Route.
- Manage provision of adequate parking facilities and encourage integration of car parking with adjoining sites which are convenient, safe and sustainable.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and quality urban water management outcomes through well-considered approach to landscape and deep soil for infill development sites.



P1 - Figure 14: Waterfront Village Sub-Precinct Requirements

Legend

Building Height
- 2 Storeys
- 3 Storeys
- 4 Storeys
- 6 Storeys
- 8 Storeys
- 12 Storeys
- 12 Storeys *Bonus up to 16 or 24 Storeys* See Clause 2.3.2

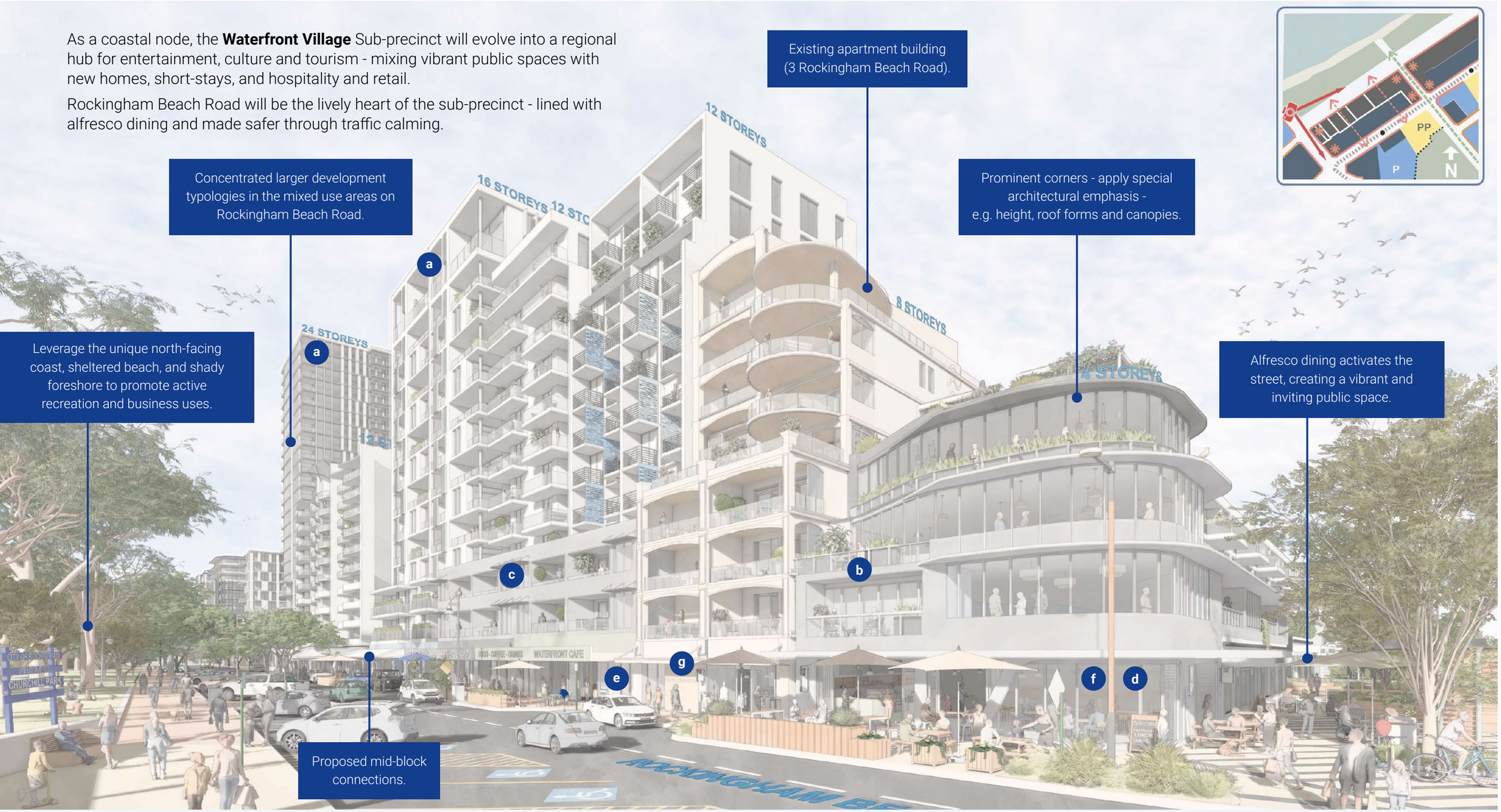
Frontage Types
- POS/PAW
- Suburban Street
- Urban Street
- Urban Mixed Use
- Main Street
- Commercial/Boulevard

Other Elements
- Future Development Sites
- Public Open Space
- Public Purpose
- Kent Street Cultural Precinct
- Prominent Corners

Movement
- Proposed RCCTS Route/Stops
- Green Links
- Proposed Mid-Block Connections
- Multi-Deck Car Park (Public)

As a coastal node, the **Waterfront Village** Sub-precinct will evolve into a regional hub for entertainment, culture and tourism - mixing vibrant public spaces with new homes, short-stays, and hospitality and retail.

Rockingham Beach Road will be the lively heart of the sub-precinct - lined with alfresco dining and made safer through traffic calming.



Key Built Form Control For Main Street

a) Maximum Storey Height - 12 Storeys/Bonus up to 16 or 24 Storeys **(See clause 2.3.2)**

b) Minimum Podium Height - 2 Storeys

c) Maximum Podium Height - 3 Storeys

d) Minimum Ground Floor Height - 4.5m

e) Minimum and Maximum Street Setbacks - Nil

f) Minimum Clear Glazing - 80% of Building Frontage or 2/3 Lot Frontage

g) Awnings Minimum Standards - Height 3m/Width - 2.4m

3.2.1 Development Requirements

In addition to the General Development Standards provided in **Section 02**, the provisions set out in **P1 - Table 10** shall apply to the area included within the Waterfront Village Sub-Precinct Plan **(P1 - Figure 14)**.

1) The minimum two storey building height referenced in **P1 - Table 10** in the Residential sub-zone, is an expectation not a requirement.
2) Where grouped dwellings are proposed Urban Street R60 provisions in **P1 - Table 10** apply.
3) For sites abutting POS/Pedestrian Access Way **(PAW)**, setback greater than 1m with generous landscaping (for privacy and visual amenity for POS/PAW users) is encouraged. The building design should increase overlooking opportunities through orientation of windows balconies and other living space openings towards POS/PAW for passive surveillance. Where sites back onto POS, consider providing direct access from private open space to POS.

3.2.2 Land Use Permissibility

1) The land use permissibility for the following sub-zones is modified in P2-Waterfront Village as set out below:
   a) **Mixed Use Sub-Zone:** Nightclub, Amusement Parlour, and Betting Agency will only be an 'A'.
   b) **Mixed Use and Commercial Sub-Zone:** Brewery will only be an 'A' use.
   c) **Commercial and Service Commercial Sub-Zone:** Liquor Store Large will only be an 'A' use.

3.2.3 Contaminated Sites

1) Lot 99 (26-40) Kent Street is classified as 'Contaminated - Remediation Required' by DWER. The following must be undertaken prior to subdivision and development:
   a) Conduct further environmental assessment prior to ground disturbance to determine remediation requirements and land use suitability.
   b) Development of an environmental management plan at development stage detailing mitigation strategies, triggers and contingency actions.

3.2.4 Rockingham Beach Hotel Future Development Site

1) Future proposals at Lot 99 (26-40) Kent Street as shown on **P1 - Figure 23** must satisfy the following design objectives:
   a) Define pedestrian access to be provided and with commercial 'active' uses at ground floor, open to public at all times. No vehicle access is to traverse the access way.
   b) Existing heritage walls and vegetation to be retained and incorporated into the design of the development.
   c) An active development frontage is required to address Rockingham Beach Road, Flinders Lane and Kent Street.
   d) No vehicle access and egress being permitted to Rockingham Beach Road and specify access points from Flinders Lane and Kent Street.
   e) Development over this site is to provide consolidated parking and reciprocity of use attributed to visitors for commercial land use components of a development.
   f) Contaminated site requirements per **Clause 3.2.3**.

P1 - Table 10: Waterfront Village Built Form Controls

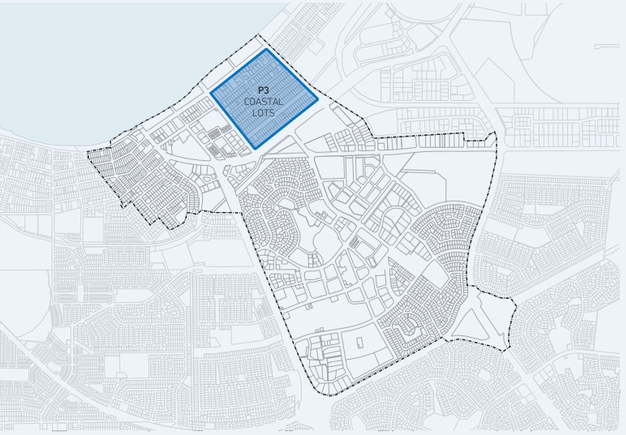
Provision	Provision	Frontage Type		R-Codes Application Volume 2
		Main Street (R-AC0)	Urban Mixed Use (R-AC0)	
Land Use	Preferred Land Use at Street Level	**Non-Residential:** Shop, Convenience Store, Restaurant/Cafe, Small Bar	**Non-Residential:** Shop, Convenience Store, Restaurant/Cafe, Small Bar	-
Building Height	Minimum Podium Height	2 Storeys	2 Storeys	Augments A2.2.1
	Maximum Podium Height	3 Storeys	3 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 14** for maximum building heights.		Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	4.5m	4.5m	Modifies A4.3.3
Street Setbacks	Minimum Primary/Secondary Street (Podium)	Nil	Nil	Augments A 2.3.1
	Maximum Primary/Secondary Street (Podium)	Nil	3m	Augments A 2.3.1
	Minimum Primary/Secondary Street (Above Podium)	3m	3m (additional to podium setback)	Augments A 2.3.1
Side and Rear Setbacks	Side Setbacks (Podium)	Nil: Where major openings are provided, setbacks to comply with BCA.	Nil: Where major openings are provided, setbacks to comply with BCA.	Augments A2.4.1
	Rear Setbacks (Podium)	Nil: Where major openings are provided, setbacks to comply with BCA.	Nil: Where major openings are provided, setbacks to comply with BCA.	Augments A2.4.1
	Minimum Side and Rear Setbacks (Above Podium)	Per Element 2.7 of the R-Codes		-
Plot Ratio	Plot Ratio	Plot ratio does not apply.		Modifies A2.5.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted	Not Permitted	Augments A3.6.2
	Vertical Separation	Ground floor apartments are not permitted.	Average less than 1m and does not exceed 1.2m	Replaces A3.6.1 and A3.6.5 (Main Street only)
Vehicle Access/ Parking	Direct Vehicle Access	Not Permitted* Unless no access can be provided from secondary frontage or rear laneway.	Permitted in locations nominated by the City.	Replaces A3.8.1 Replaces A3.8.2
Facade Design (Street Level)	Minimum Clear Glazing %	80% of building frontage or 2/3 of lot frontage (whichever is greater)	50% of building frontage	Augments A4.10.1
	Minimum Frontage Build Out	100%	70% (up to 30% for crossover/side setbacks)	Augments A4.10.1
	Awnings as a Minimum % of Building Frontage	100%	70%	Augments A4.10.5
	Awnings Minimum Standards	Height - 3m Width - 2.4m	Height - 3m Width - 2.4m	Augments A4.10.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type		R-Codes Application Volume 2
		Commercial/Boulevard (R-AC0)	Urban Street (R80)	
Land Use	Preferred Land Use at Street Level	**Non-Residential:** Shop, Brewery, Child Care Premises, Consulting Rooms, Medical Centre, Liquor Store Large	**Residential:** Multiple Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	2 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 14** for maximum building heights.		Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	4.5m	N/A	Modifies A4.3.3
Street Setbacks	Minimum Primary Street	Nil	4m	Augments A 2.3.1
	Minimum Secondary Street	Nil	2m	Augments A 2.3.1
	Maximum Primary/ Secondary Street	Nil	6m	Augments A 2.3.1
Side and Rear Setbacks	Minimum Side Setbacks	Nil: Where major openings are provided, setbacks to comply with BCA.	2m	Augments A2.4.1
	Minimum Rear Setbacks	Nil: Where major openings are provided, setbacks to comply with BCA.	4m	Augments A2.4.1
Plot Ratio	Plot Ratio	Plot ratio does not apply.		Modifies A2.5.1
Public Domain Interface	On-Site Parking Between Street and Building	Permitted	Not Permitted (unless visitor parking)	Augments A3.6.2 (Commercial Only)
Vehicle Access/ Parking	Direct Vehicle Access	Permitted in locations nominated by the City and/or MRWA.	Permitted	Compliant
Facade Design (Street Level)	Minimum Clear Glazing %	70% of building frontage	N/A	Augments A4.10.1
	Minimum Frontage Build Out	70% (up to 30% for crossover/side setbacks)	70% (up to 30% for crossover/side setbacks)	Augments A4.10.1
	Awnings as a Minimum % of Building Frontage	70%	Discretionary	Augments A4.10.5
	Awnings Minimum Standards	Height - 3m Width - 1.8m	Height - 3m Width - 1.8m	Augments A4.10.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type		R-Codes Application Volume 1: Part C
		Urban Street (R60)	Suburban (R40)	
Land Use	Preferred Land Use at Street Level	**Residential:** Grouped Dwellings, Multiple Dwellings	**Residential:** Grouped Dwellings, Multiple Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	2 Storeys	Modifies C3.2.1
	Maximum Building Height	4 Storeys	3 Storeys	Compliant
	Minimum Ground Floor Finished Level to First Floor Finished Level	N/A	N/A	-
Street Setbacks	Minimum Primary Street	4m	4m	Modifies C3.3.1
	Minimum Secondary Street	2m	2m	Modifies C3.3.1
	Maximum Primary/Secondary Street	6m	6m	Modifies C3.3.1
Lot Boundary Setbacks	Minimum Side Setbacks	In accordance with the R-Codes.		Compliant
	Minimum Rear Setbacks	4m	4m	Modifies C3.4.1
Site Cover	Maximum Site Cover	70%	65%	Compliant
Streetscape	Garage Location	Garages or carports are located behind the building line to ensure that they are not visible from the primary street.		Replaces C3.6.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type	R-Codes Application Volume 1: Part B
		Suburban (R40)	
Land Use	Preferred Land Use at Street Level	**Residential:** Single Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	Augments C6
	Maximum Building Height	Refer to **P1 - Figure 14** for maximum building heights.	Replaces C6
	Minimum Ground Floor Finished Level to First Floor Finished Level	N/A	N/A
Street Setbacks	Minimum Primary Street	3m	Replaces C2.1
	Minimum Secondary Street	1m	Replaces C2.2
	Maximum Primary/ Secondary Street	6m	Augments C2.1 and C2.2
Side and Rear Setbacks	Minimum Side Setbacks	In accordance with the R-Codes	N/A
	Minimum Rear Setbacks	4m	Augments C3.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted (unless visitor parking)	Augments C3.6.1
Vehicle Access/ Parking	Direct Vehicle Access	Permitted	Replaces C.3.7.1
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			

3.3 P3 - Coastal Lots Sub-Precinct



Sub-Precinct Intent

High-quality medium density development supports quality urban infill outcomes within the catchment of the RCCTS. A combination of grouped and multiple dwelling typologies enable an increased density, balanced with generous street setbacks and open space to encourage improved tree canopy as the neighbourhood evolves.

Sub-Precinct Objectives

- Guide the progressive urban consolidation and transformation of this area into a high-quality residential infill setting.
- Jecks Street reinforced as a green link to enhance connections between parkland and Wanliss Street transit stop.
- Design approaches to building envelopes, vehicle access, and landscape ensure existing neighbourhood character can be preserved.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and urban water management through well-considered approaches to on-site landscape design.
- Land ceded from properties adjacent to existing laneways helps to formalise two-way vehicle movement unlocking new development opportunities.

3.3.1 Development Requirements

In addition to the requirements provided in **Section 02**, the provisions set out in **P1 - Table 11** shall apply to the area included within the Coastal Lots Sub-Precinct Plan **(P1 - Figure 15)**.

1) The minimum two storey building height referenced in **P1 - Table 11** is an expectation not a requirement.
2) For sites abutting POS/PAW, setback greater than 1m with generous landscaping (for privacy and visual amenity for POS/PAW users) is encouraged. The building design should increase overlooking opportunities through orientation of windows balconies and other living space openings towards POS/PAW for passive surveillance. Where sites back onto POS, consider providing direct access from private open space to POS.



P1 - Figure 15: Coastal Lots Sub-Precinct Requirements

Legend

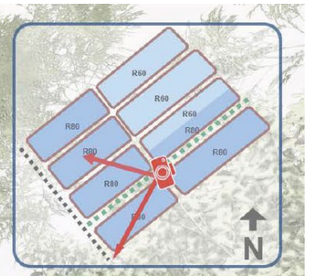
Building Height
- 3 Storeys
- 4 Storeys

Frontage Types
- Laneway Widening
- Urban Street

Movement
- Proposed RCCTS Route/Stops
- Green Links

The **Coastal Lots** Sub-precinct will progress with high-quality medium density housing near the RCCTS. It supports smart infill, combining diverse dwelling types with setbacks and open space to boost tree canopy.

Jecks Street reinforced as a green link to enhance connections between parkland and Wanliss Street transit stop with dedicated pathways and tree planting to boost canopy coverage.



Enhance and retain existing mature tree canopy within the urban environment to promote climate resilience, improve shade and shelter, enhance sense of place and improve biodiversity outcomes.

Garage location behind building line to ensure they are not visible to the street.

Promote native plants for landscaping to enhance local ecosystems.

Key Selected Built Form Control for Urban Street (R80)

a) Preferred Minimum Building Height - 2 Storeys

b) Maximum Building Heights - 4 Storeys

c) Minimum Primary Street Setbacks - 4m

d) Maximum Primary/Secondary Street Setbacks - 6m

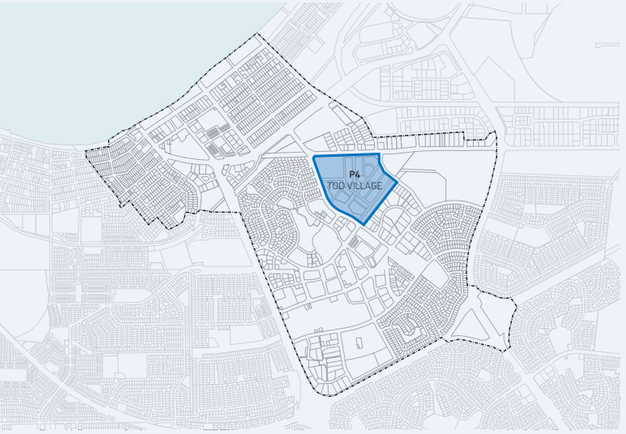
e) Minimum Side Setbacks - 2m

P1 - Table 11: Coastal Lots Built Form Controls

Provision	Provision	Frontage Type Urban Street (R80)	R-Codes Application Volume 2
Land Use	Preferred Land Use at Street Level	**Residential:** Multiple Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 15** for maximum building heights.	Augments A2.2.1
Street Setbacks	Minimum Primary Street	4m	Augments A 2.3.1
	Minimum Secondary Street	2m	Augments A 2.3.1
	Maximum Primary/ Secondary Street	6m	Augments A 2.3.1
	Minimum Laneway Setback	1m	Augments A 2.3.1
Side and Rear Setbacks	Minimum Side Setbacks	2m	Augments A2.4.1
	Minimum Rear Setbacks	4m	Augments A2.4.1
Plot Ratio	Plot Ratio	Plot ratio does not apply	Modifies A2.5.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted (unless visitor parking)	Augments A3.6.2
Vehicle Access/ Parking	Direct Vehicle Access	Permitted	Replaces A3.8.1 Replaces A3.8.2
Facade Design (Street Level)	Minimum Frontage Build Out	70% (up to 30% for crossover/side setbacks)	Augments A4.10.1
	Awnings as a Minimum % of Building Frontage	Discretionary	Augments A4.10.5
	Awnings Minimum Standards	Height - 3m Width - 1.8m	Augments A4.10.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			

Provision	Provision	Frontage Type Urban Street (R60)	R-Codes Application Volume 1: Part C
Land Use	Preferred Land Use at Street Level	**Residential:** Grouped Dwellings, Multiple Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	Modifies C3.2.1
	Maximum Building Height	Refer to **P1 - Figure 15** for maximum building heights.	Compliant
Street Setbacks	Minimum Primary Street	4m	Modifies C3.3.1
	Minimum Secondary Street	2m	Modifies C3.3.1
	Maximum Primary/ Secondary Street	6m	Modifies C3.3.1
Lot Boundary Setbacks	Minimum Side Setbacks	In accordance with the R-Codes.	Compliant
	Minimum Rear Setbacks	4m	Modifies C3.4.1
Site Cover	Maximum Site Cover	70%	Compliant
Streetscape	Garage Location	Garages or carports are located behind the building line to ensure that they are not visible from the primary street.	Replaces C3.6.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			

3.4 P4 - TOD Village Sub-Precinct



Sub-Precinct Intent

Extension of the RCCTS represents a strategic Transit Oriented Development (TOD) to provide contemporary medium to high density development and employment opportunities that support a more compact urban form. The transit stop will be enhanced via quality public open spaces and the capacity for non-residential uses that creates a focus for community life and localised amenity.

Sub-Precinct Objectives

- Promote a highly flexible urban structure that enables block and lot configurations that can accommodate a range of building typologies that can adapt with Rockingham's needs at the time of development.
- Promote a range of building heights and densities to support housing diversity with a minimum target of 1000 dwellings.
- Promote transit use by strengthening the accessibility to the transit stop and allowing efficient movement of the transit mode through the precinct.
- Leverage off proximity to the P7 - Education Precinct and promote new employment opportunities and attractiveness of that precinct.
- Create high-quality and attractive public amenity to support increased density, making the TOD Village a place that encourages people to live, work, and recreate in the RSC.
- New development integrates with the existing landscape and a retained Mike Barnett Sports Complex, which will form an identifiable part of the TOD Village.
- Facilitate the priority construction of a direct access and movement corridor between Dixon Road and the City Centre.
- Provide a legible and well-connected arrangement of streets, laneways and public spaces.
- New development to integrate mature trees along Louise Street to protect existing vegetation.

3.4.1 Development Requirements

In addition to the requirements provided in **Section 02**, the provisions set out in **Section 3.4.2** shall apply to the area included within the TOD Village Sub-Precinct Plan **(P1 - Figure 16)**.

1) For sites abutting POS/PAW, setback greater than 1m with generous landscaping (for privacy and visual amenity for POS/PAW users) is encouraged. The building design should increase overlooking opportunities through orientation of windows balconies and other living space openings towards POS/PAW for passive surveillance. Where sites back onto POS, consider providing direct access from private open space to POS.



P1 - Figure 16: TOD Village Sub-Precinct Requirements

Legend

Building Height
- 2 Storeys
- 3 Storeys
- 4 Storeys
- 6 Storeys
- 8 Storeys
- 15 Storeys

Frontage Types
- POS/PAW
- Urban Street
- Urban Mixed Use
- Main Street

Other Elements
- Future Development Sites
- Public Open Space
- Public Purpose
- Prominent Corners

Movement
- Proposed RCCTS Route/Stops
- Green Links
- Intersection Upgrade

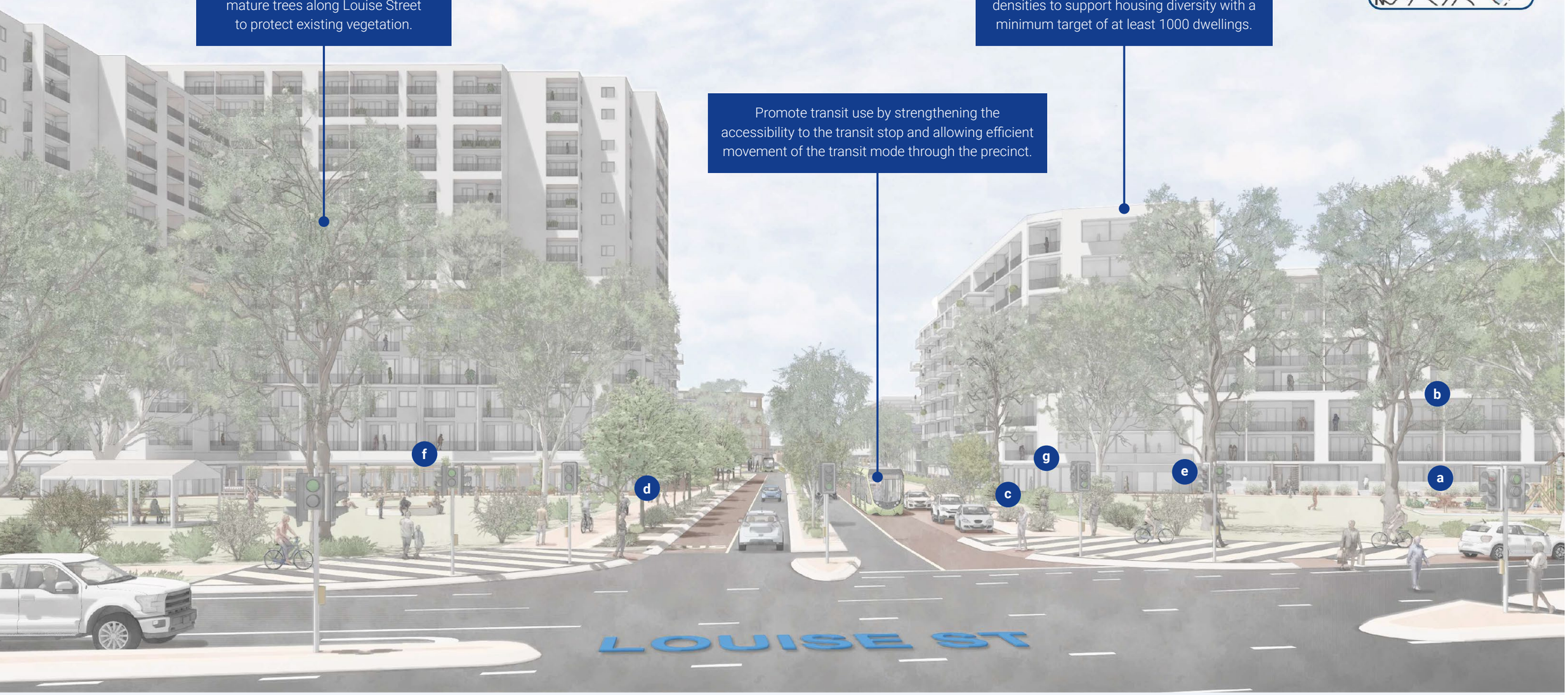
The **TOD Village** Sub-precinct represents a strategic Transit Oriented Development, supporting medium to high density living, jobs and a compact urban form - centred around quality public spaces and mixed-use activity.



New development to integrate mature trees along Louise Street to protect existing vegetation.

Promote transit use by strengthening the accessibility to the transit stop and allowing efficient movement of the transit mode through the precinct.

Promote a range of building heights and densities to support housing diversity with a minimum target of at least 1000 dwellings.



Key Selected Built Form Control for Urban Street

a) Preferred Land Use at Street Level - Multiple Dwellings

b) Maximum Podium Height - 3 Storeys

c) Minimum Primary/Secondary Street Setbacks - 2m

d) Maximum Primary/Secondary Street Setbacks - 4m

e) Minimum Clear Glazing - 2 Storeys

f) Minimum Frontage Build Out - 70%

g) Awnings Minimum Standards - Height 3m/Width - 1.8m

P1 - Table 12: TOD Village Built Form Controls

Provision	Provision	Frontage Type		R-Codes Application Volume 2
		Main Street (R-AC0)	Urban Mixed Use (R-AC0)	
Land Use	Preferred Land Use at Street Level	**Non-Residential:** Shop, Restaurant/Cafe, Small Bar	**Non-Residential:** Shop, Restaurant/Cafe, Small Bar	-
Building Height	Minimum Podium Height	2 Storeys	2 Storeys	Augments A2.2.1
	Maximum Podium Height	3 Storeys	3 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 16** for maximum building heights.		Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	4.5m	4.5m	Modifies A4.3.3
Street Setbacks	Minimum Primary/Secondary Street (Podium)	Nil	Nil	Augments A 2.3.1
	Maximum Primary/Secondary Street (Podium)	Nil	Nil	Augments A 2.3.1
	Minimum Primary/Secondary Street (Above Podium)	3m	3m (additional to podium setback)	Augments A 2.3.1
Side and Rear Setbacks	Side Setbacks (Podium)	Nil	Nil	Augments A2.4.1
	Rear Setbacks (Podium)	Nil	Nil	Augments A2.4.1
	Minimum Side and Rear Setbacks (Above Podium)	Per Element 2.7 of the R-Codes		-
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted	Not Permitted	Augments A3.6.2
	Vertical Separation	Ground floor apartments are not permitted.	Ground floor apartments are not permitted.	Replaces A3.6.1 and A3.6.5 (Main Street and Urban Mixed Use)
Facade Design (Street Level)	Minimum Clear Glazing %	80% of building frontage of 2/3 of lot frontage (whichever is greater)	50% of building frontage	Augments A2.2.1
	Minimum Frontage Build Out	100%	70% (up to 30% for crossover/side setbacks)	Augments A2.2.1
	Awnings as a Minimum % of Building Frontage	100%	70%	Augments A2.2.1
	Awnings Minimum Standards	Height - 3m Width - 2.4m	Height - 3m Width - 2.4m	Modifies A4.3.3
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type	R-Codes Application Volume 2
		Urban Street (R-AC0)	
Land Use	Preferred Land Use at Street Level	**Residential:** Grouped Dwellings, Multiple Dwellings	-
Building Height	Minimum Podium Height	2 Storeys	Augments A2.2.1
	Maximum Podium Height	3 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 16** for maximum building heights.	Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	N/A	Modifies A4.3.3
Street Setbacks	Minimum Primary/Secondary Street (Podium)	2m	Augments A 2.3.1
	Maximum Primary/Secondary Street (Podium)	4m	Augments A 2.3.1
	Minimum Primary/Secondary Street (Above Podium)	3m (additional to podium setback)	Augments A 2.3.1
Side and Rear Setbacks	Side Setbacks (Podium)	2m	Augments A2.4.1
	Rear Setbacks (Podium)	4m	Augments A2.4.1
	Minimum Side and Rear Setbacks (Above Podium)	Per Element 2.7 of the R-Codes	-
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted	Augments A3.6.2
	Vertical Separation	Average less than 1m and does not exceed 1.2m	Replaces A3.6.1 and A3.6.5 (Main Street and Urban Mixed Use)
Facade Design (Street Level)	Minimum Clear Glazing %	50% of building frontage for non-residential uses at street level.	Augments A2.2.1
	Minimum Frontage Build Out	70% (up to 30% for crossover/side setbacks)	Augments A2.2.1
	Awnings as a Minimum % of Building Frontage	70%	Augments A2.2.1
	Awnings Minimum Standards	Height - 3m Width - 1.8m	Modifies A4.3.3
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			

3.4.2 Future Development Considerations

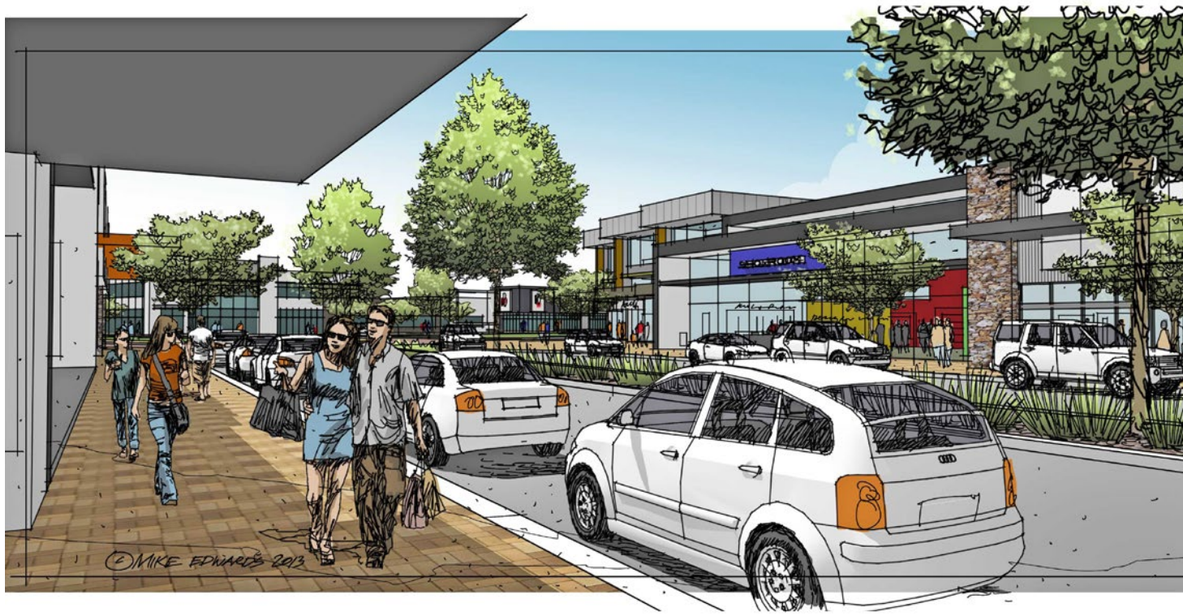
The primary focus of **P1 - Figure 16** is to provide a framework to coordinate future subdivision and development. The lot layout shown is indicative only and is intended to inform future detailed subdivision.

1) The following design considerations must be included in any future development or subdivision application/s:
   a) New development frames the centrally located transit route, with a proposed stop located in the heart of the precinct. Connection to Dixon Road must align with Ambrose Street to allow for potential future expansion to the north.
   b) New crossover provided from Louise Street specifically for the RCCTS and pedestrians/cyclists. No car access is permitted from this crossover.
   c) Green link established and provided between Louise Street and Dowling Street. Green link to also provide connectivity to a series of public open space nodes.
   d) New development provided adjacent to the park should ensure that building design increases overlooking opportunities through orientation of windows, balconies and other living spaces towards the POS for passive surveillance.
   e) Prior to development/subdivision, a vegetation and flora and fauna assessment is to be undertaken by the landowner/developer, areas identified for protection shall be retained.
   f) The location of public open space on Louise Street is a fixed requirement, it serves important functions associated with vegetation retention **(Clause 3.4.2 e)**, provides visual outlook and amenity for future residents, and assists with managing the built form scale transition between both sides of Louise Street.
   g) The proposed boundary of the Mike Barnett Sports Complex cannot be changed.
   h) Any new development which adjoins medium density housing to the southeast is limited to two storeys in height.
2) The following matters, are to be considered in any future development or subdivision application/s:
   a) Proposed lot configuration and road network to ensure highly permeable and flexible urban structure that can accommodate a range of building types/residential densities.
   b) Ensuring adequate noise mitigation for lots located adjacent to the Mike Barnett Sports Complex.
   c) Maximum building heights are to generally be in accordance with **P1 - Figure 16**.

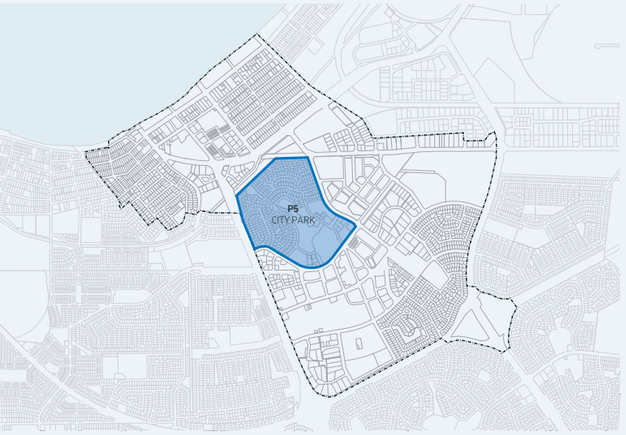
3.4.3 Environmental Considerations

1) Future development at Lot 1511 Dowling Street must undertake the following prior to subdivision and development:
   a) Conduct appropriate Flora and Fauna surveys and impact assessments prior any clearing of vegetation and/or bushland. Retain areas of threatened fauna habitat as identified by these surveys.
   b) Development of an environmental management plan at development stage detailing mitigation strategies, triggers and contingency actions.
   c) Obtain any necessary clearing permits under the relevant environmental legislation.





3.5 P5 - City Park Sub-Precinct



Sub-Precinct Intent

High-quality medium density development support sensitive and quality urban infill outcomes, primarily in the form of grouped dwellings and small scale apartment typologies. Heights are generally between two-four storeys, and generous street setbacks align with the existing suburban character of the area in the northern part of the sub-precinct. The southern portion of the sub-precinct is characterised by high-quality medium and high density urban development in proximity to the RCCTS and City Centre.

Sub-Precinct Objectives

- Guide the progressive development of this area consistent with best practice infill residential development principles.
- Ensure future development responds to existing suburban neighbourhood character.
- Promote increased density in areas with access to high quality amenities such as City Park and connected linear parklands, and along the RCCTS route.
- Encourage amalgamation of lots adjacent to the green link to support new development which provides passive surveillance of the adjacent park land.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and urban water management through well-considered approach to landscape and deep soil.

3.5.1 Development Requirements

In addition to the requirements provided in **Section 02**, the provisions set out in **P1 - Table 13** shall apply to the area included within the City Park Sub-Precinct Plan **(P1 - Figure 17)**.

1) The minimum two storey building height referenced in **P1 - Table 13** is an expectation not a requirement.
2) For sites abutting POS/PAW, setback greater than 1m with generous landscaping (for privacy and visual amenity for POS/PAW users) is encouraged. The building design should increase overlooking opportunities through orientation of windows balconies and other living space openings towards POS/PAW for passive surveillance. Where sites back onto POS, consider providing direct access from private open space to POS.



P1 - Figure 17: City Park Sub-Precinct Requirements

Legend

Building Height
- 2 Storeys
- 3 Storeys
- 4 Storeys

Frontage Types
- POS/PAW
- Suburban Street
- Urban Street

Other Elements
- Public Open Space
- Prominent Corners

Movement
- Proposed RCCTS Route/Stops
- Green Links

P1 - Table 13: City Park Built Form Controls

Provision	Provision	Frontage Type		R-Codes Application Volume 1: Part C
		Urban Street (R80)	Urban Street (R-AC0)	
Land Use	Preferred Land Use at Street Level	**Residential:** Multiple Dwellings	**Non-Residential:** Shop, Convenience Store, Restaurant/Cafe, Small Bar	-
Building Height	Preferred Minimum Building Height	2 Storeys	2 Storeys	Augments A2.2.1
	Maximum Podium Height	-	3 Storeys	Augments A2.2.1
	Maximum Building Height	Refer to **P1 - Figure 17** for maximum building heights.	4 Storeys	Augments A2.2.1
	Minimum Ground Floor Finished Level to First Floor Finished Level	-	4.5m	Modifies A4.3.3
Street Setbacks	Minimum Primary Street	4m	Nil	Augments A 2.3.1
	Minimum Secondary Street	2m	2m	Augments A 2.3.1
	Maximum Primary/ Secondary Street	6m	3m	Augments A 2.3.1
	Minimum Primary/Secondary Street (above podium)	-	3m (additional to podium setback)	Augments A 2.3.1
Side and Rear Setbacks	Minimum Side Setbacks	2m	Nil	Augments A2.4.1
	Minimum Rear Setbacks	4m	Nil	Augments A2.4.1
	Minimum Side and Rear Setback (above Podium)	Per Element 2.7 of the R-Codes		-
Plot Ratio	Plot Ratio	Does not apply	Does not apply	Modifies A2.5.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted (unless visitor parking)	Not Permitted	Augments A3.6.2
Vehicle Access/ arking	Direct Vehicle Access	Permitted	Permitted in Locations nominated by the City	Replaces A3.8.1 Replaces A3.8.2
Facade Design (Street Level)	Minimum Clear Glazing %	-	50% of Building Frontage	-
	Minimum Frontage Build Out	70% (up to 30% for crossover/side setbacks)	70% (up to 30% for crossover/side setbacks)	Augments A4.10.1
	Awnings as a Minimum % of Building Frontage	Discretionary	100%	Augments A4.10.5
	Awnings Minimum Standards	Height - 3m Width - 2.4m	Height - 3m Width - 2.4m	Augments A4.10.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type		R-Codes Application Volume 1: Part C
		Suburban Street (R60)	Suburban Street (R40)	
Land Use	Preferred Land Use at Street Level	**Residential:** Grouped Dwellings, Multiple Dwellings	**Residential:** Grouped Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	2 Storeys	Modifies C3.2.1
	Maximum Building Height	Refer to **P1 - Figure 17** for maximum building heights.		Compliant
Lot Boundary Setbacks	Minimum Side Setbacks	In accordance with R-Codes.		-
Street Setbacks	Minimum Primary Street	4m	4m	Modifies C3.3.1
	Minimum Secondary Street	2m	2m	Modifies C3.3.1
	Maximum Primary/ Secondary Street	6m	6m	Modifies C3.3.1
Lot Boundary Setbacks	Minimum Side Setbacks	In accordance with the R-Codes.		Compliant
	Minimum Rear Setbacks	4m	4m	Modifies C3.4.1
Site Cover	Maximum Site Cover	70%	65%	Compliant
Streetscape	Garage Location	Garages or carports are located behind the building line to ensure that they are not visible from the primary street.		Replaces C3.6.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.			
Landscape				

Provision	Provision	Frontage Type Suburban (R40)	R-Codes Application Volume 1: Part B
Land Use	Preferred Land Use at Street Level	**Residential:** Single Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	Augments C6
	Maximum Building Height	Refer to **P1 - Figure 14** for maximum building heights.	Replaces C6
	Minimum Ground Floor Finished Level to First Floor Finished Level	N/A	N/A
Street Setbacks	Minimum Primary Street	3m	Replaces C2.1
	Minimum Secondary Street	1m	Replaces C2.2
	Maximum Primary/ Secondary Street	6m	Augments C2.1 and C2.2
Side and Rear Setbacks	Minimum Side Setbacks	In accordance with the R-Codes	N/A
	Minimum Rear Setbacks	4m	Augments C3.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted (unless visitor parking)	Augments C3.6.1
Vehicle Access/ Parking	Direct Vehicle Access	Permitted	Replaces C.3.7.1
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			



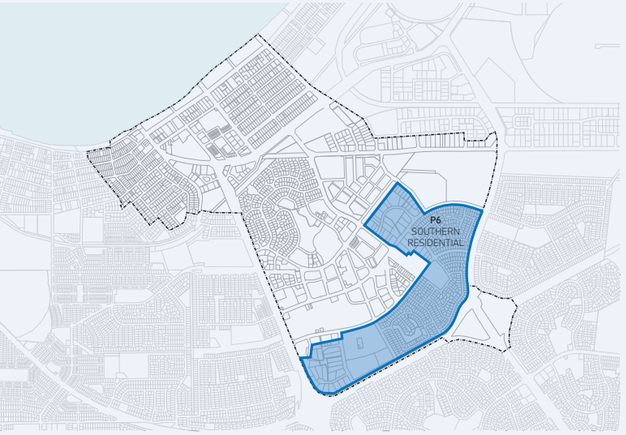
3.5.2 Contaminated Sites

1) Lot 9001 (No. 7) McNicholl Street, Lot 9 (No. 5) Market Street and Lot 10 (No. 81) Louise Street are classified as 'Remediated for Restricted Use' by DWER. The following must be undertaken prior to subdivision and development:
   a) Develop and implement an asbestos management plan and construction environmental management plan as required.
   b) Development of an environmental management plan at development stage detailing mitigation strategies, triggers and contingency actions.

3.5.3 Integrated Development Guide Plans

1) The following provisions of the Integrated Development Guide Plan located at Lot 359 Bounded by Goddard Street, Market Street, McNicholl Street, and Marks Place, Rockingham apply:
   a) Develop and implement an asbestos management plan and construction environmental management plan as required.
   b) Development of an environmental management plan at development stage detailing mitigation strategies, triggers and contingency actions.
   c) Street treatments and configurations that align with the intended built form are a fundamental element of the IDGP design. Detailed proposals for each street treatment within the IDGP area can be found on pages 38-40 of the Integrated Development Plan (refer to **Appendix - 11**.)

3.6 P6 - Southern Residential Sub-Precinct



Sub-Precinct Intent

High-quality medium density development support sensitive and quality urban residential infill outcomes, responding to existing open spaces in the area. Heights are generally between two-three storeys, and generous street setbacks align with the existing suburban character of the area.

Sub-Precinct Objectives

- Guide the progressive development of this area consistent with best practice infill residential development principles.
- Ensure future development responds to existing suburban neighbourhood character.
- Promote increased density in areas with access to high quality amenities such as parkland and along the RCCTS route.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and urban water management through well-considered approach to landscape and deep soil.

3.6.1 Development Requirements

In addition to the requirements provided in **Section 02**, the provisions set out in **P1 - Table 14** shall apply to the area included within the Southern Residential Sub-Precinct Plan **(P1 - Figure 18)**.

1) The minimum two storey building height referenced in **P1 - Table 14** is an expectation not a requirement.
2) For sites abutting POS/PAW, setback greater than 1m with generous landscaping (for privacy and visual amenity for POS/PAW users) is encouraged. The building design should increase overlooking opportunities through orientation of windows balconies and other living space openings towards POS/PAW for passive surveillance. Where sites back onto POS, consider providing direct access from private open space to POS.



P1 - Figure 18: Southern Residential Sub-Precinct Requirements

Legend

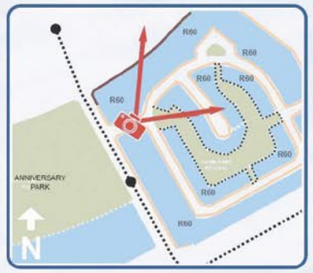
Building Height
- 2 Storeys
- 3 Storeys

Frontage Types
- POS/PAW
- Suburban Street
- Urban Street

Other Elements
- Public Open Space

Movement
- Proposed RCCTS Route/Stops

The **Southern Residential** Sub-precinct will have high-quality medium density infill that responds to local open space and suburban character, with 2-3 storey heights and generous setbacks.



Ensure future development responds to existing suburban neighbourhood character.

Orient windows and balconies toward POS/PAWs for passive surveillance: provide direct access when sites back onto POS.

Promote increased density in areas with access to high quality amenities such as parkland and along the RCCTS route.

Garages are located behind the building line to ensure that they are not visible from the primary street.

Support retention of existing mature trees and urban water management through well-considered approach to landscape and deep soil.

Design public spaces to facilitate flexible use, safe environments for users and create sense of public ownership.

Key Selected Built Form Control for Suburban Street (R60)

a) Preferred Minimum Building Heights - 2 Storeys

b) Maximum Building Heights - 3 Storeys

c) Minimum Primary Street Setbacks - 4m

d) Minimum Secondary Street Setbacks - 2m

e) Maximum Primary/Secondary Street Setbacks - 6m

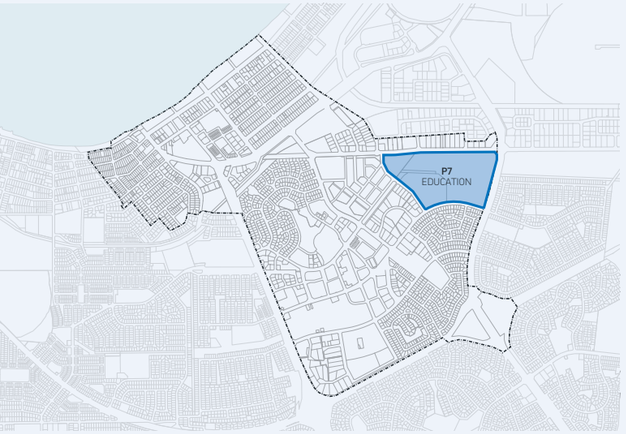
f) Minimum Side Setbacks - 2m

P1 - Table 14: Southern Residential Built Form Controls

Provision	Provision	Frontage Type			R-Codes Application Volume 1: Part C
		Urban Street (R60)	Suburban Street (R60)	Suburban Street (R40)	
Land Use	Preferred Land Use at Street Level	**Residential:** Grouped Dwellings, Multiple Dwellings	**Residential:** Grouped Dwellings, Multiple Dwellings	**Residential:** Grouped Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	2 Storeys	2 Storeys	Modifies C3.2.1
	Maximum Building Height	Refer to **P1 - Figure 18** for maximum building heights.			Compliant
Street Setbacks	Minimum Primary Street	4m	4m	4m	Modifies C3.3.1
	Minimum Secondary Street	2m	2m	2m	Modifies C3.3.1
	Maximum Primary/ Secondary Street	6m	6m	6m	Modifies C3.3.1
Lot Boundary Setbacks	Minimum Side Setbacks	In accordance with the R-Codes.			Compliant
	Minimum Rear Setbacks	4m	4m	4m	Modifies C3.4.1
Site Cover	Maximum Site Cover	70%	70%	65%	Compliant
Streetscape	Garage Location	Garages or carports are located behind the building line to ensure that they are not visible from the primary street.			Replaces C3.6.5
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.				
Landscape					

Provision	Provision	Frontage Type	R-Codes Application Volume 1: Part B
		Suburban Street (R40)	
Land Use	Preferred Land Use at Street Level	**Residential:** Single Dwellings	-
Building Height	Preferred Minimum Building Height	2 Storeys	Augments C6
	Maximum Building Height	Refer to **P1 - Figure 18** for maximum building heights.	Replaces C6
	Minimum Ground Floor Finished Level to First Floor Finished Level	N/A	N/A
Street Setbacks	Minimum Primary Street	3m	Replaces C2.1
	Minimum Secondary Street	1m	Replaces C2.2
	Maximum Primary/ Secondary Street	6 m	Augments C2.1 and C2.2
Side and Rear Setbacks	Minimum Side Setbacks	In accordance with the R-Codes	N/A
	Minimum Rear Setbacks	4m	Augments C3.1
Public Domain Interface	On-Site Parking Between Street and Building	Not Permitted (unless visitor parking)	Augments C3.6.1
Vehicle Access/ Parking	Direct Vehicle Access	Permitted	Replaces C.3.7.1
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			

3.7 P7 - Education Sub-Precinct



Sub-Precinct Intent

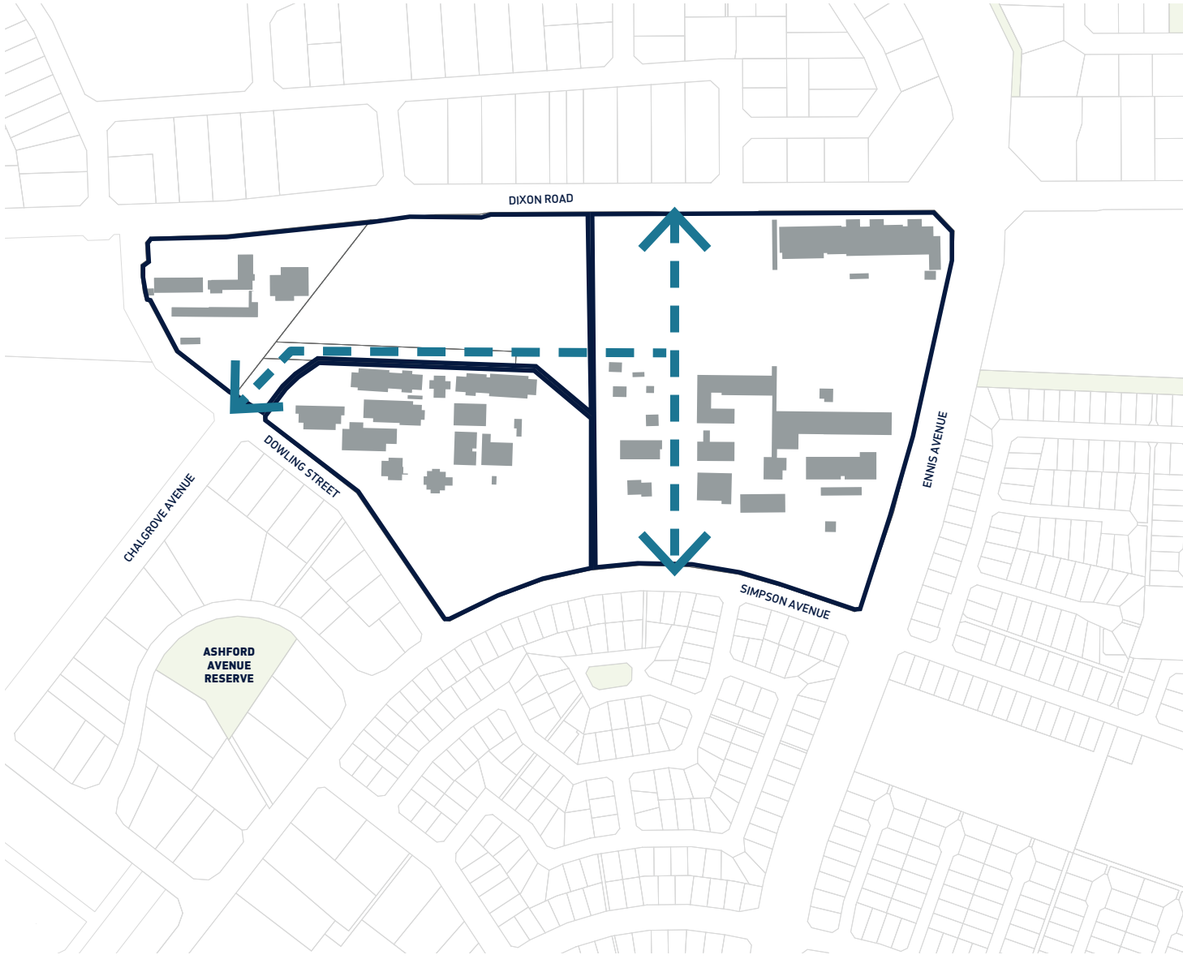
The Education Sub-Precinct is a place of learning and discovery, linking local residents to trade, research and recreation opportunities. Campus buildings are arranged around an internal loop which enhances connectivity between institutions and the neighbouring TOD Village. Sufficient capacity for new development ensures spaces between buildings supporting establishment of playing fields to provide for organised sport.

Sub-Precinct Objectives

- Maintain and enhance high-quality refurbishment and redevelopment for each individual campus. Ensure that campuses are developed in a complementary way, to share resources where feasible and to present an integrated urban character.
- Urban design of campuses to ensure a high-quality and attractive environment, with buildings presented in a landscape setting, including orientation around centralised public open space.
- The Dixon Road and Simpson Avenue entry points use planting, lighting and signage to convey a clear sense of arrival into the Rockingham Strategic Centre.

3.7.1 Development Requirements

In addition to the requirements provided in **Section 02**, development within the Education Precinct will need to be delivered in accordance with **P1 - Figure 19**.

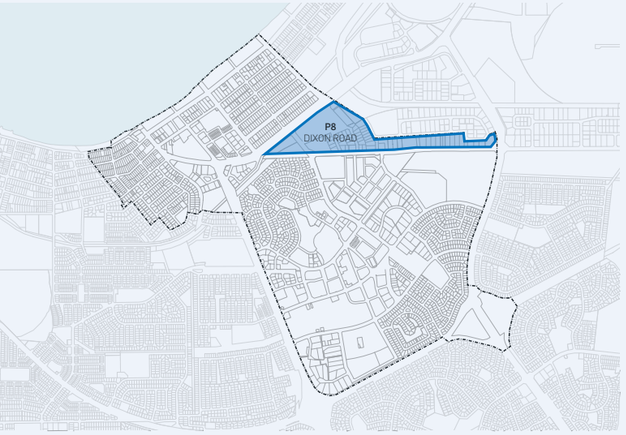


P1 - Figure 19: Education Sub-Precinct Requirements

Legend

Proposed Roads

3.8 P8 - Dixon Road Sub-Precinct



Sub-Precinct Intent

Dixon Road fulfils a dual role as a service and employment hub. A gateway statement at the corner of Dixon Road and Ennis Avenue frames the entry into the RSC, with an enhanced streetscape supported by a green buffer which screens the light industrial and commercial development to the north. The area south of Patterson Road is developed with a flexible urban structure to create a new business park with an employment focus.

Sub-Precinct Objectives

- Maintain and enhance the sector as an important service commercial area at the north eastern gateway to the RSC.
- Give particular attention to the landscape treatment of Ennis Avenue and Dixon Road.
- Patterson Road and Dixon Road where planting, lighting and signage should convey a clear sense of arrival at the gateway to a major urban centre.
- Upgrade the streetscapes of the long established light industrial area consistent with the changing function of the Sub-Precinct.
- Ensure the environmental factors associated with the environmentally sensitive area are managed appropriately in accordance with relevant environmental legislation and regulations (i.e. clearing permits and Flora and Vegetation/Terrestrial Fauna).

3.8.1 Development Requirements

In addition to the requirements provided in **Section 02**, the provisions set out in **P1 - Table 15** shall apply to the area included within the Dixon Road Sub-Precinct Plan **(P1 - Figure 20)**.

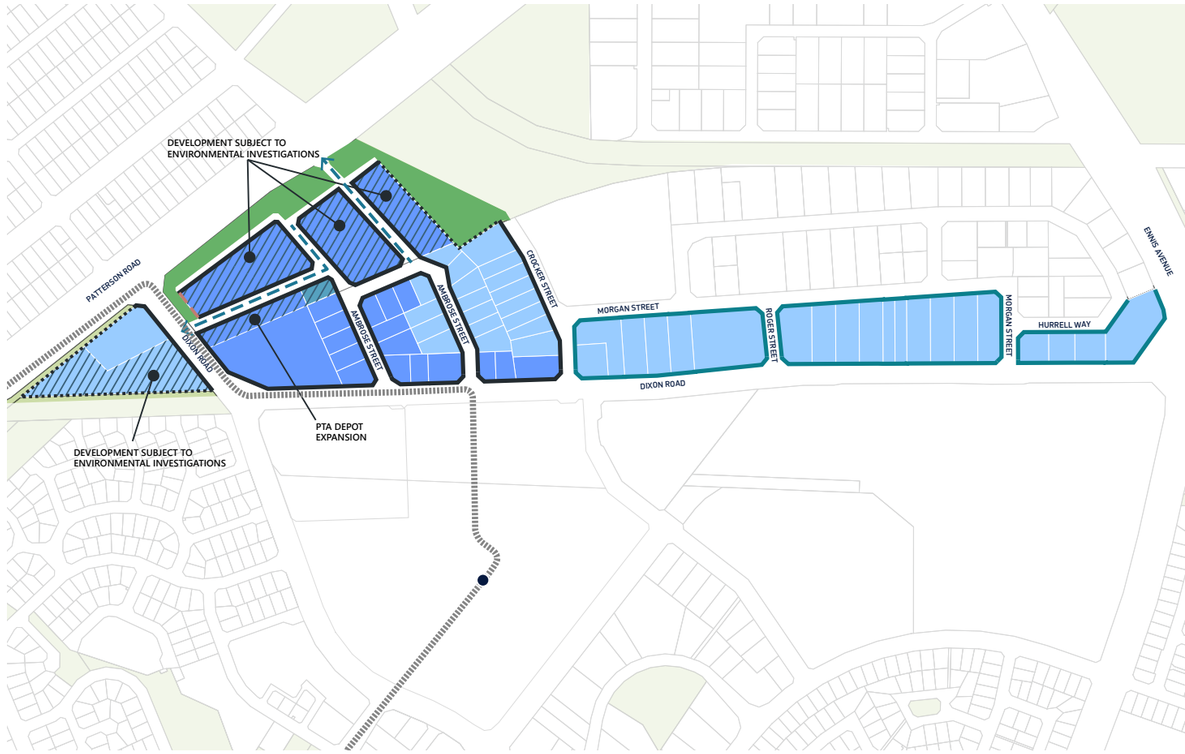
1) For Commercial Sub-Zoned Areas (Lot 1515 and Lot 502 Patterson Road) with an R-Code of R-AC0, built form requirements are guided by Commercial Frontage Type in **P1 – Table 9**.

3.8.2 Land Use Permissibility

1) The land use permissibility for the following sub-zones is modified in P2 - Waterfront Village as set out below:
   a) **Commercial and Service Commercial Sub-Zone:** Liquor Store Large will only be an 'A' use.

3.8.3 Environmental Considerations

1) Future development of Lots 501 Patterson Road and Lots 502 and 503 Dixon Road must undertake the following prior to subdivision and development:
   a) Conduct appropriate Flora and Fauna surveys and impact assessments prior any clearing of vegetation and/or bushland. Retain areas of threatened fauna habitat as identified by these surveys.
   b) Development of an environmental management plan at development stage detailing mitigation strategies, triggers and contingency actions.
   c) Obtain any necessary clearing permits under the relevant environmental legislation.



P1 - Figure 20: Dixon Road Sub-Precinct Requirements

Legend

Building Height
- 3 Storeys
- 4 Storeys

Frontage Types
- POS/PAW
- Commercial
- Boulevard/Major Road

Other Elements
- Public Open Space
- Environmental Investigations

Movement
- Proposed RCCTS Route/Stops
- Proposed Roads

P1 - Table 15: Dixon Road Built Form Controls

Provision	Provision	Frontage Type	
		Commercial	**Boulevard/Major Road**
Land Use	Preferred Land Use at Street Level	**Non-Residential:** Office	**Non-Residential:** Bulky Goods Showroom, Light Industry, Motor Vehicle Repair, Warehouse/Storage, Trade Supplies
Building Height	Minimum Building Height	2 Storeys	2 Storeys
	Maximum Building Height	Refer to **P1 - Figure 20** for maximum building heights.	
	Minimum Ground Floor Finished Level to First Floor Finished Level	4.5m	4.5m
Street Setbacks	Minimum Primary Street	6m	6m
	Minimum Secondary Street	4m	4m
	Maximum Primary/ Secondary Street	21m where car parking is provided *(Note: Nominally 2m walkway, 5.5m parking, 6m access, 6m landscaping)*	21m where car parking is provided *(Note: Nominally 2m walkway, 5.5m parking, 6m access, 6m landscaping)*
Side and Rear Setbacks	Minimum Side Setbacks	No openings: Nil With openings: 4m	No openings: Nil With openings: 4m
	Minimum Rear Setbacks		
Plot Ratio	Plot Ratio	Plot ratio does not apply.	
Public Domain Interface	On-Site Parking Between Street and Building	Permitted	Permitted
Vehicle Access/ Parking	Direct Vehicle Access	Permitted, unless fronting Dixon Road. No new crossovers on Dixon Road are permitted.	Permitted, unless fronting Dixon Road. No new crossovers on Dixon Road are permitted.
Facade Design (Street Level)	Minimum Clear Glazing %	70% of building frontage	50% of building frontage
	Minimum Frontage Build Out	70% (up to 30% for crossover/side setbacks)	70% (up to 30% for crossover/side setbacks)
	Awnings as a Minimum % of Building Frontage	70%	70%
	Awnings Minimum Standards	Height - 3m	Height - 3m
Deep Soil	Landscaping and deep soil shall be provided in accordance with the requirements set out in **Section 2.3.8**.		
Landscape			
Other Requirements	Environmental Investigations	In addition to **Clause 3.8.3**, lots designated on **P1 - Figure 20** as requiring 'future investigation' shall require necessary environmental approvals including: • A clearing permit assessed under *Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004*; • Potential retention of black cockatoo habitat trees under *Planning and Development Act 2005*; • Potential retention of existing mature trees on Patterson Road; and • Fauna Relocation and Management Plan to the satisfaction of the City.	
	POS/PAW Edge	For sites abutting POS, the building design should increase overlooking opportunities through orientation of windows and openings towards POS for passive surveillance.	



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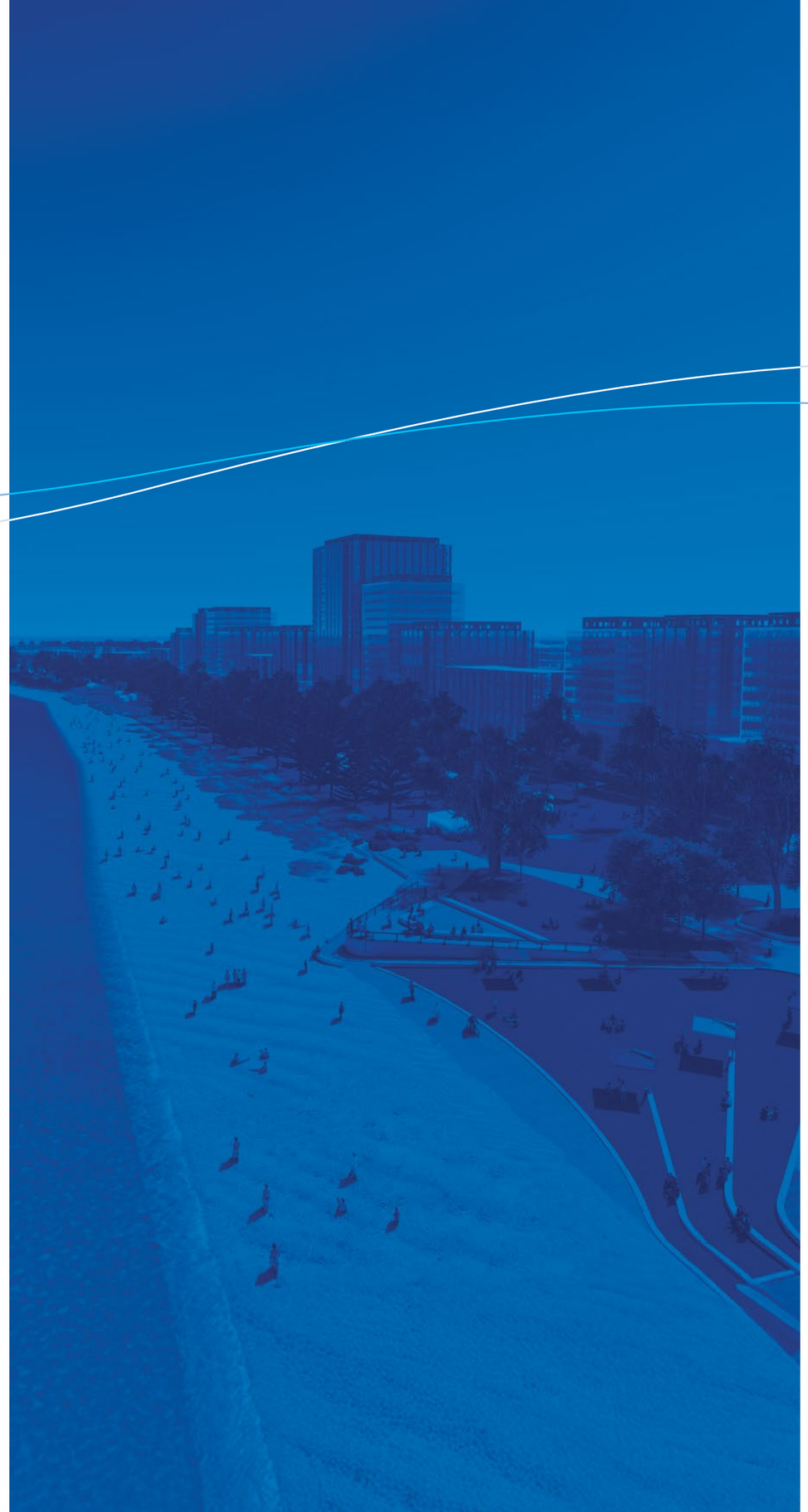


City of Rockingham

Rockingham Strategic Centre

Precinct Structure Plan

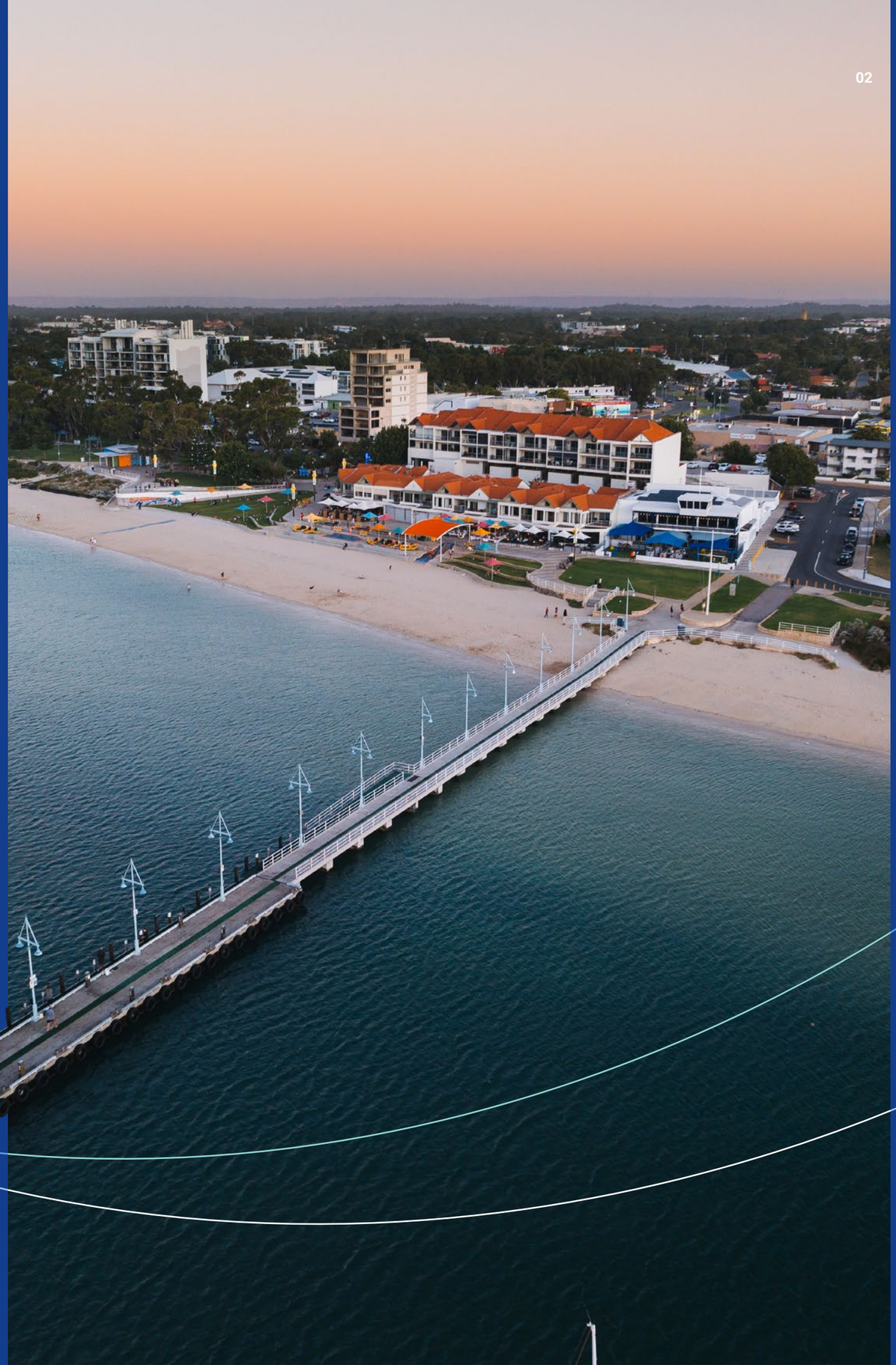
Part Two

September 2025



Part Two

Explanatory Section



Contents



01 Introduction and Purpose **06**

1.1 Introduction and Purpose **07**

02 Site and Context Analysis **08**

2.1 Governance Context **09**

2.2 Community Context **14**

2.3 Economic Context **17**

2.4 Physical Context **21**

2.5 Response to Context **34**

03 Stakeholder and Community Participation **38**

3.1 Engagement Summary **39**

04 Vision **42**

4.1 Vision **43**

05 Design Elements **44**

5.1 Urban Ecology **45**

5.2 Urban Structure **53**

5.3 Public Realm **57**

5.4 Movement **71**

5.5 Land Use **83**

5.6 Built Form **95**



List of Tables

P2 - Table 1: State Planning Framework Summary **09**

P2 - Table 2: Local Planning Framework Summary **12**

P2 - Table 3: Rockingham (suburb) Residential Property Data - Sales **16**

P2 - Table 4: Rockingham (suburb) Residential Property Data - Sales **16**

P2 - Table 5: Employment Gap Without Future Employment Land **19**

P2 - Table 6: Economic SWOT Analysis **20**

P2 - Table 7: POS Hierarchy **28**

P2 - Table 8: PSP - Key Design Considerations **35**

P2 - Table 9: Environmental Mitigation Strategies **46**

P2 - Table 10: Intended Sub-Precinct Character **54**

P2 - Table 11: POS Types and Function **58**

P2 - Table 12: Proposed POS Design Guidance **60**

P2 - Table 13: Proposed Intersection Upgrades **75**

P2 - Table 14: Economic Resilience Assessment Findings **85**

P2 - Table 15: RSC Population and Employment Scenarios **86**

P2 - Table 16: RPSP Land Use Mix **86**

P2 - Table 17: Strategic Employment Target **88**

P2 - Table 18: Non-Retail Floorspace Gaps **89**

P2 - Table 19: Ultimate RSC Floorspace Projections (2041) **89**

P2 - Table 20: Walkable Catchment **90**

P2 - Table 21: RPSP Density Targets **91**

P2 - Table 22: Potential Interim Uses **92**

P2 - Table 23: Frontage Types **103**

P2 - Table 24: RPSP R-Codes Application **110**

P2 - Table 25: RPSP R-Codes Modifications Volume 1 **111**

P2 - Table 26: RPSP R-Codes Modifications Volume 2 **111**

List of Figures

P2 - Figure 1: Demographic Catchment Map **14**
P2 - Figure 2: City of Rockingham Population Forecasts **14**
P2 - Figure 3: Rockingham household income quartiles relative to mortgage repayment quartiles **17**
P2 - Figure 4: City of Rockingham GRP Measure **18**
P2 - Figure 5: Registered Businesses by Industry in Rockingham 2020 **18**
P2 - Figure 6: Top 10 industries which have Outperformed High and Low Growth Industries **19**
P2 - Figure 7: Top 10 Industries that have Underperformed High and Low Growth Industries **19**
P2 - Figure 8: City of Rockingham Employment Self Sufficiency **20**
P2 - Figure 9: Broader Area Context **21**
P2 - Figure 10: Development Patterns **23**
P2 - Figure 11: Development Characteristics **23**
P2 - Figure 12: Development Potential **24**
P2 - Figure 13: Land Use **25**
P2 - Figure 14: Public Spaces and Heritage **29**
P2 - Figure 15: Natural Environment **31**
P2 - Figure 16: Public Transport **32**
P2 - Figure 17: Private Vehicle Movement **34**
P2 - Figure 18: PSP - Response to Context **37**
P2 - Figure 19: Urban Ecology Plan **48**
P2 - Figure 20: Urban Structure Plan **55**
P2 - Figure 21: Public Realm Plan **59**
P2 - Figure 22: Proposed Jecks Street Treatment **61**
P2 - Figure 23: Louise Street Green Link Crossing **61**
P2 - Figure 24: Patterson Road Green Link Crossing **61**
P2 - Figure 25: Public Realm Investment Priority **63**
P2 - Figure 26: Proposed Read Street Treatment **74**
P2 - Figure 27: Movement Plan **76**
P2 - Figure 28: Movement and Place Values **78**
P2 - Figure 29: Movement and Place Assessment **79**
P2 - Figure 30: Suburban Frontage Type **79**
P2 - Figure 31: Main Street Frontage Type **79**
P2 - Figure 32: Main Street Frontage Type **80**
P2 - Figure 33: Urban Mixed Use Frontage Type **80**
P2 - Figure 34: Urban Street R60 Frontage Type **81**
P2 - Figure 35: Urban Street R80 Frontage Type **81**
P2 - Figure 36: Boulevard Frontage Type **81**
P2 - Figure 37: Commercial Frontage Type **81**
P2 - Figure 38: Land Use and Density Plan **87**
P2 - Figure 39: Desired Infill Design Outcomes **100**
P2 - Figure 40: Waterfront Village Height Study Preferred Scenario **101**
P2 - Figure 41: Movement and Place Frontage Types **102**
P2 - Figure 42: City Centre Axonometric Diagram **106**
P2 - Figure 43: Waterfront Village Axonometric Diagram **107**
P2 - Figure 44: Coastal Lots Axonometric Diagram **108**
P2 - Figure 45: TOD Village Axonometric Diagram **108**
P2 - Figure 46: City Park Axonometric Diagram **109**

01

Introduction and Purpose



1.1 Introduction and Purpose

As the primary centre in one of Western Australia's fastest growing regions, the Rockingham Strategic Centre **(RSC)** fulfils a critical role as a major destination for housing, employment, and entertainment.

Both its planning framework and physical form have been established over many years. Each period of development has brought its own contributions which have influenced this rich tapestry of urban life. The character of the RSC's sub-precincts is varied, and reflective of many distinct patterns of development.

Three primary urban interventions set the course for the RSC, these include:

- Initial establishment of the original town centre along the Foreshore (mid 1800s);
- Development of the new shopping centre on Council Avenue in the 1970s; and
- Establishment of Rockingham Train Station in the early 2000s.

These interventions have shaped the RSC's physical layout, influencing not only why people come to the RSC, but also how they may move throughout it to access these three key activity nodes.

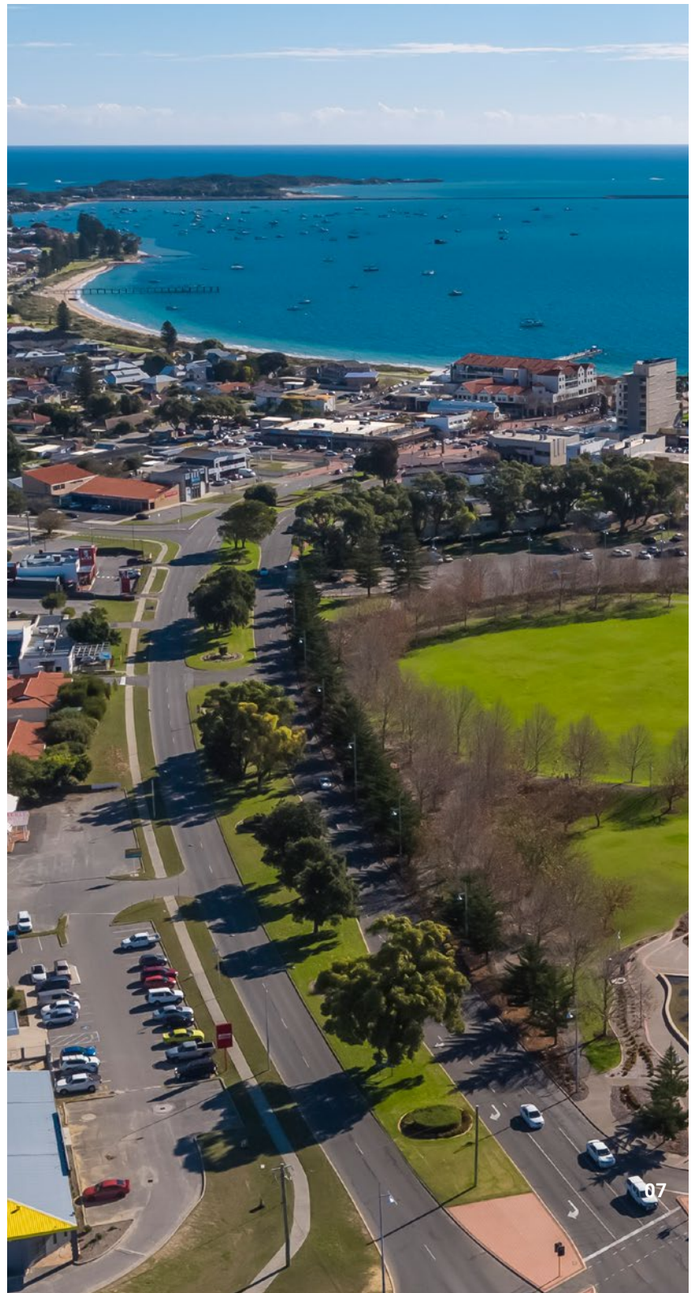
The Rockingham Strategic Centre Precinct Structure Plan **(RPSP)** has been prepared to coordinate future subdivision and development of land within this important precinct. The RPSP is a thorough review of the Rockingham Strategic Regional Centre - Centre Plan, adopted for the RSC in 2009.

This contemporary planning framework will guide future subdivision and development for the next 10 years and beyond, and will be prepared in accordance with the following key State planning documents:

- State Planning Policy 7.0 - Design of the Built Environment;
- State Planning Policy 7.2 - Precinct Design; and
- WA Planning Manual - Guidance for Structure Plans.

It incorporates the following:

- Part One - Implementation: Is the 'rule book', it sets out the structure plans purpose/objectives, staging considerations, and includes provisions to help guide preparation and assessment of future subdivision and development applications.
- Part Two - Explanatory Section: Includes detailed background investigations, this includes a thorough analysis of the governance, community, and physical context. These findings inform the design approach, framed around six key elements of precinct design: Urban Ecology, Urban Structure, Public Realm, Movement, Land Use, and Built Form.
    - Supporting Technical Appendices:
    - Appendix 1 - Water Management Strategy
    - Appendix 2 - Environmental Report
    - Appendix 3 - Transport Report
    - Appendix 4 - Economic Resilience Assessment
    - Appendix 5 - Site Feasibility Assessment
    - Appendix 6 - Infrastructure Servicing Strategy
    - Appendix 7 - Stakeholder Engagement Summary Report
    - Appendix 8 - Rockingham Beach Height Study
    - Appendix 9 - City of Rockingham Needs Assessment
    - Appendix 10 - City of Rockingham CHRMAP



02

Site and Context Analysis



2.1 Governance Context

2.1.1 State Planning Framework

Planning in the RSC is guided by a range of documents including a range of strategies, State Planning Policies **(SPP)**, and other key documents. Those relevant to the RPSP are summarised in **P2 - Table 1**.

P2 - Table 1: State Planning Framework Summary

Document	Overview	Relevance to RSC
Metropolitan Region Scheme	The Metropolitan Region Scheme **(MRS)** outlines objectives for regional development and provides a statutory mechanism to assist strategic planning, by setting out broad land-use zones, setting aside areas for regional open space, protection of environmental values and other regional infrastructure purposes, and assisting in coordinating the provision of major infrastructure. Local government planning (including local planning schemes) is required to be consistent with the broad land uses under the MRS.	The RSC is largely zoned as Central City Area under the MRS, but also contains areas of land currently zoned Industrial, and a small area reserved for Public Purpose on Contest Parade. It is generally surrounded by land zoned Urban, Industrial and Parks and Recreation Reserve. To the east it is bound by the Primary Regional Road Reserve of Ennis Avenue, and the Other Regional Road Reserve of Rae Road and Read Street. Additionally, it is bisected in the north by the Other Regional Road Reserve of Patterson Road.
Perth and Peel @3.5 Million Southern Metropolitan Peel Sub-Regional Framework	Perth and Peel @3.5million is a suite of strategic land use planning documents which provide a framework for future growth to 2050. The framework recognises the benefits of a consolidated and connected city utilising the region's previous historic patterns of urban growth. It is divided into four sub-regional frameworks, which provide more detailed guidance on future land use and development for a city of 3.5 million people. The RSC is situated within the South Metropolitan Peel Sub-Regional Planning Framework area. The framework suggests infill development should be focussed in activity centres, station precincts and along urban corridors in line with the ten principles for urban consolidation.	The framework acknowledges that Rockingham is the principal centre of the southwestern sector. Its large and increasingly urban catchment will support population-driven growth in retail activity and the activity centre is planned to be a focus of office and commercial development for much of the area. The ability to attract development and investment has been constrained by the need for better connectivity between the heavy rail system and City Centre. Transit corridors connecting the City Centre with the surrounding urban catchment are proposed. A key objective of the Sub-Regional Framework is to promote employment opportunities and increase the number of people who live and work within the sub-region, with a focus on attracting strategic economic and employment land uses within the strategic metropolitan centres such as RSMC. Employment self-sufficiency levels in the South Metropolitan Peel sub-region are projected to increase from 65% to 83 % in the southwestern sector with a target of 12,290 jobs in the City of Rockingham **(the City)** by 2050. Regarding housing, the City have a target of 14,680 infill dwellings by 2050 (93,590 dwellings total). Given the high-level of amenity in the RSC, it is expected to fulfil a significant role in meeting the City's infill housing targets.
SPP 2.0 – Environment and Natural Resources Policy	SPP 2.0 is a broad sector policy and guides the protection, management, conservation and enhancement of the natural environment. The policy promotes responsible planning by integrating environment and natural resource management with broader land use planning and decision-making. SPP 2.0 outlines general measures for matters such as water, air quality, soil and land quality, biodiversity, agricultural land and rangelands, basic raw materials, marine resources, landscapes and energy efficiency. These general measures should be considered in conjunction with environmentally-based, issue-specific state planning policies which supplement SPP 2.0.	The RSC is a highly urbanised area, therefore as shown on **P2 - Figure 15** only a few natural areas remain. Integration of these areas into the RPSP design where possible should be a key focus, as large parts of the RSC are located within an environmentally sensitive area **(ESA)**.
SPP 2.6 – State Coastal Planning	SPP 2.6 provides for the long-term sustainability of Western Australia's coast and is relevant to those local governments that contain coastal areas. The purpose of the policy is to guide decision-making within the coastal zone including managing the development and land use change, the establishment of foreshore reserves and protecting, conserving and enhancing coastal values. SPP 2.6 outlines criteria for the consideration of development and settlement arrangements, including building height limits within local planning frameworks and management of water resources. It further acknowledges the importance of coastal planning strategies, coastal hazard risk management approaches, coastal foreshore reserves and community participation in coastal planning. SPP 2.6 is supplemented by the State Coastal Planning Policy Guidelines and Coastal Hazard Risk Management and Adaptation Planning Guidelines.	The northern part of the RSC abuts the ocean, as such considerations must be had for coastal hazards such as erosion and inundation. In 2019, the City prepared a Coastal Hazard Risk Management and Adaptation Planning **(CHRMAP)** in accordance with the requirements of SPP 2.6, of which two sectors (Sector 1 and Sector 2A are within the RSC). Outcomes of the study are summarised in Section 2.4 (Part 2).

Document	Overview	Relevance to RSC
Draft SPP 2.9 – Planning for Water	SPP 2.9 and the associated SPP 2.9 Planning for Water Guidelines outline how water resource management should be integrated into planning processes, such as the preparation of structure plans. It recognises that planning should contribute to the protection and management of water resources through the implementation of policy measures that identify significant water resources, prevent the degradation of water quality and wetland vegetation, promote restoration and environmental repair and avoid incompatible land uses. It also provides guidance on how future development can be better suited to addressing climate change, and protect public health by ensuring appropriate delivery of wastewater infrastructure. As such, when finalised, the policy will replace existing guidelines such as the Government Sewerage Policy, and Better Urban Water Management.	There are a small number of conservation status geomorphic wetlands within the RSC. These are generally located on Lot 201 adjacent to the north east of the Rockingham Courthouse, and 61 (Lot 103) Council Avenue, Rockingham adjacent to the north west of the Rockingham Aquatic Centre. Analysis of historical aerial imagery demonstrates that these wetlands have been predominantly cleared and built over (in some areas). Further investigations may be required to confirm their status as a conservation wetlands. With regard to wastewater, there are parts of the precinct where reticulated sewerage is not currently provided. Future subdivision and development will need to have consideration for provision of this infrastructure.
SPP 3.7 – Planning in Bushfire Prone Areas	SPP 3.7 provides a framework in which to implement effective, risk-based land use planning and development outcomes to preserve life and reduce the impact of bushfire on property and infrastructure. The policy emphasises the need to identify and consider bushfire risks in decision-making at all stages of the planning and development process whilst achieving an appropriate balance between bushfire risk management measures, biodiversity conservation and environmental protection. The policy applies to all land that has been designated as bushfire prone by the Fire and Emergency Services Commissioner as well as areas that may have not yet been designated as bushfire prone but is proposed to be developed in a way that introduces a bushfire hazard. SPP 3.7 should be read in conjunction with the deemed provisions, Guidelines for Planning in Bushfire in Prone Areas and Australian Standard 3959: Construction of buildings in Bushfire Prone Areas.	There are a number of identified bushfire prone areas located within the RSC, such areas are identified on **P2 - Figure 15** which is based on data received from the Department of Fire and Emergency Services **(DFES)**. Designation of an area as being bushfire prone reflects the potential of bushfire to affect that site. It acts as a mechanism for initiating further assessment in the planning and building processes. SPP 3.7 and the associated Guidelines for Planning in Bushfire in Prone Areas provide clear guidance for the role of structure plans. For the RSC, this means that adequate provisions will be required in Part One to ensure that the risks associated with planning and development in bushfire prone areas is appropriately managed and mitigated.
SPP 4.1 – Industrial Interface	SPP 4.1 guides planning decisions to protect the long-term future operation of industry and infrastructure facilities, by avoiding encroachment from sensitive land uses and potential land use conflicts. The policy encourages the use of statutory buffers; facilitating industrial land uses with off-site impacts within specific zones and a compatible interface between strategic/general industry zones and sensitive zones. Draft SPP 4.1 supports land use conflict being addressed as early as possible in the planning process. It is also expected that land use conflict will be subsequently considered at each stage of the planning framework, increasing in detail at each level. The policy recognises the overlap of various environmental, health and safety regulations and guidelines and outlines considerations for decision-makers in this regard.	The RSC is located south of the Kwinana Strategic Industrial Area which includes the Rockingham Industrial Zone, which is one of Western Australia's most important strategic industrial areas and is part of the State's premier heavy industrial zone, at the Western Trade Coast. The operation of heavy industry in this area saw the establishment of the Kwinana Air Quality buffer. Under SPP 4.1, the role of a structure plan is primarily to manage land use conflict by ensuring that compatible land uses are provided in buffer areas and at their interface. Minimising sensitive land uses such as residential, are to be avoided where possible.
SPP 4.2 – Activity Centres for Perth and Peel	SPP 4.2 and its guidelines apply to the preparation and assessment of the relevant components of planning instruments that relate to activity centres within the Metropolitan (Perth), Peel and Greater Bunbury Region Scheme areas. SPP 4.2 seeks to provide a consistent approach for the planning and development of a hierarchy and network of activity centres that meets community needs, and provides economic and environmental benefits, enables the distribution of a broad range of goods and services, and facilitates retail, commercial and mixed used developments. SPP 4.2 encourages the preparation of precinct structure plans for strategic, secondary, district and specialised activity centres.	Under SPP 4.2 the RPSP is identified as a Strategic Centre with its main role and typical attributes as follows: "Strategic centres are the main regional activity centres. They are multi-purpose centres that provide a diversity of uses. These centres provide the full range of economic and community services necessary for the communities in their catchments. These centres are expected to service substantial populations, providing health, community and social services, be integrated with public transport and provide opportunities for business agglomeration. Access is a priority for these centres. As a Strategic Centre, the RPSP is an essential tool in guiding future subdivision and development. SPP 4.2 provides the necessary guidance which has helped inform approaches to land use, employment, urban form, movement, and access.
SPP 5.4 – Road and Rail Noise	SPP 5.4 guides the performance-based approach for managing and mitigating transport noise associated with road and rail operations. This policy applies where noise sensitive land uses are located within a specified distance of a transport corridor, new or major road or rail upgrades are proposed or where works propose an increase in rail capacity resulting in increased noise. The policy also sets out specific exemptions for where the policy requirements do not apply. SPP 5.4 supports noise impacts being addressed as early as possible in the planning process for the purpose of avoiding land use conflict and achieving better land use planning outcomes. Considerations for decision-makers include ensuring that the community is protected from unreasonable levels of transport noise, whilst also ensuring the future operations of transport corridors. SPP 5.4 is supplemented by the Road and Rail Noise Guidelines.	In regards to structure plans, activity centre plans, and precinct plans; SPP 5.4 states that noise will be addressed through: • Identification of appropriate compatible land-use zoning that is commensurate with the function of the transport corridor; • Design solutions that utilise street and lot configuration to screen and/or buffer noise; • Consideration of density and built form outcomes that will help alleviate and/or manage noise; • Outlining the need for additional noise mitigation measures through quiet house requirements and/or noise barriers in accordance with the guidelines; and • Consideration to appropriate future planning provisions to ensure more detailed planning is undertaken at the subdivision and development stage. This Policy applies to land within: • 300m of Ennis Avenue • 200m of parts of Patterson Road and Read Street

Document	Overview	Relevance to RSC
SPP 7.0 – Design of the Built Environment	SPP 7.0 is a broad sector policy relevant to all local governments. The policy sets out the objectives, measures, principles and processes which apply to the design and assessment of built environment proposals through the planning system. It is intended to apply to activity precinct plans, structure plans, local development plans, subdivision, development and public works. The policy contains ten design principles which set out specific considerations for decision-makers when considering the above proposals. These include, context and character, landscape quality, built form and scale, functionality and build quality, sustainability, amenity, legibility, safety, community and aesthetics. The policy also encourages early and on-going discussion of design quality matters and the use of design review.	SPP 7.0 and SPP 7.2 are inextricably linked. Section 1.3 of the Precinct Design Guidelines demonstrates how the objectives and outcomes of each policy relate. The RPSP will be required to be delivered with consideration for the SPP 7.2 Policy Outcomes that are set out in Table 1 of the Precinct Design Guidelines.
SPP 7.2 – Precinct Design	SPP 7.2 provides guidance for precinct planning with the intent of achieving good planning and design outcomes for precincts within Western Australia. The policy recognises that there is a need to plan for a broader range of precinct-based contexts and conditions to achieve a balance between greenfield and infill development. Objectives of the policy include ensuring that precinct planning and design processes deliver good-quality built environment outcomes that provide social, economic and environmental benefit to those who use them. Precinct types include activity centres, station precincts, urban corridors, residential infill and heritage precincts. These areas are recognised as requiring a high-level of planning and design focus.	Under SPP 7.2, activity centres such as the RSC are identified as a type of precinct. Activity Centre Plans (as they exist today) will be replaced by Precinct Structure Plans as these must be prepared for Strategic Centres. Just like Activity Centre Plans, a Precinct Structure Plan will outline land use, density and built form outcomes, movement and access arrangements, infrastructure, environmental assets and community facilities to facilitate future subdivision and development. This guidance will come primarily from the design elements identified in the SPP 7.2 Precinct Design Guidelines, which will replace the Model Centre Framework (currently provided in Appendix 2 of SPP 4.2).
Residential Design Codes Volumes 1 and 2	The Residential Design Codes Volume 1 and Volume 2 **(R-Codes)** provides planning and design provisions for residential development across Western Australia. The R-Codes aim to facilitate an appropriate standard of housing, encourage more diverse types of housing, promote sustainability and outline assessment pathways to facilitate better residential outcomes for occupants.	The RPSP uses the R-Codes as a reference document when creating built form controls. Using similar terminology will ensure consistency and certainty to development in the RSC. The R-Codes outlines which elements can and cannot be varied by a local government in documents such as the RPSP. Where R-Code modifications do require WAPC approval, adequate justification is provided.
Draft Operational Policy 1.12 Planning Proposals Adjoining Regional Roads in WA	This policy applies to planning proposals affecting lots adjoining Regional Roads which are identified in a region and/or local planning schemes in Western Australia. It provides guidance on vehicular access from adjoining lots, road reserve widening, road upgrading, scenic route considerations, infrastructure contributions and corner lot truncations. The policy seeks to promote an efficient and safe regional road network by providing general guidance to decision makers, land use planners and proponents.	The RPSP includes a number of regional roads (per the policy's definition) such as Ennis Avenue, Patterson Road, Read Street and Rae Road. The majority of these roads form part of the RPSP's boundary. Where new and existing development directly interfaces with a regional road, the requirements of OP 1.12 will apply, the RPSP aligns with therefore ensure that any future development proposals align with these principles and where necessary supplementary guidance can be provided.
Draft Operational Policy 2.3 Public Open Space	The draft Operational Policy 2.3: Planning for Public Open Space **(POS)** has been prepared on the underlying principle that additional residential lots generate additional community demand for POS, whether that be in new suburbs that are being developed, or via infill development in established suburbs. The draft policy reinforces the existing POS policy requirement for a minimum 10 per cent POS provision in all residential areas. Addressing the increased demand can be met in two ways, either: • More land is provided to allow for new POS to be established; or • By providing additional and improved facilities within existing POS areas.	Under the draft policy, the role of a structure plan is to address any existing POS and assess the need for new POS to cater for all current and anticipated community needs. Any staging of POS land provision is to be outlined at the structure plan stage. The RPSP will include a detailed assessment of existing POS relative to future population growth and community needs. Where gaps are identified, strategies will be developed to ensure adequate open space can be provided.
Operational Policy 2.4 Planning for School Sites	This policy contains the Western Australian Planning Commission's **(WAPC)** general requirements for school sites to meet the existing and future community needs. It sets criteria for the selection of sites, includes requirements for the design and location of school sites and outlines the development contribution methodology for government primary schools.	The RPSP provides a framework for substantial urban growth, with the potential to trigger a need for provision of additional school infrastructure in the precinct. In planning for any future schools, the requirements of OP 2.4 will be considered, this needs to be balanced against the overall vision and proposed land use approach for the RPSP.

2.1.2 Local Planning Framework

The City's local planning framework and its relationship to the RPSP is summarised in **P2 - Table 2**.

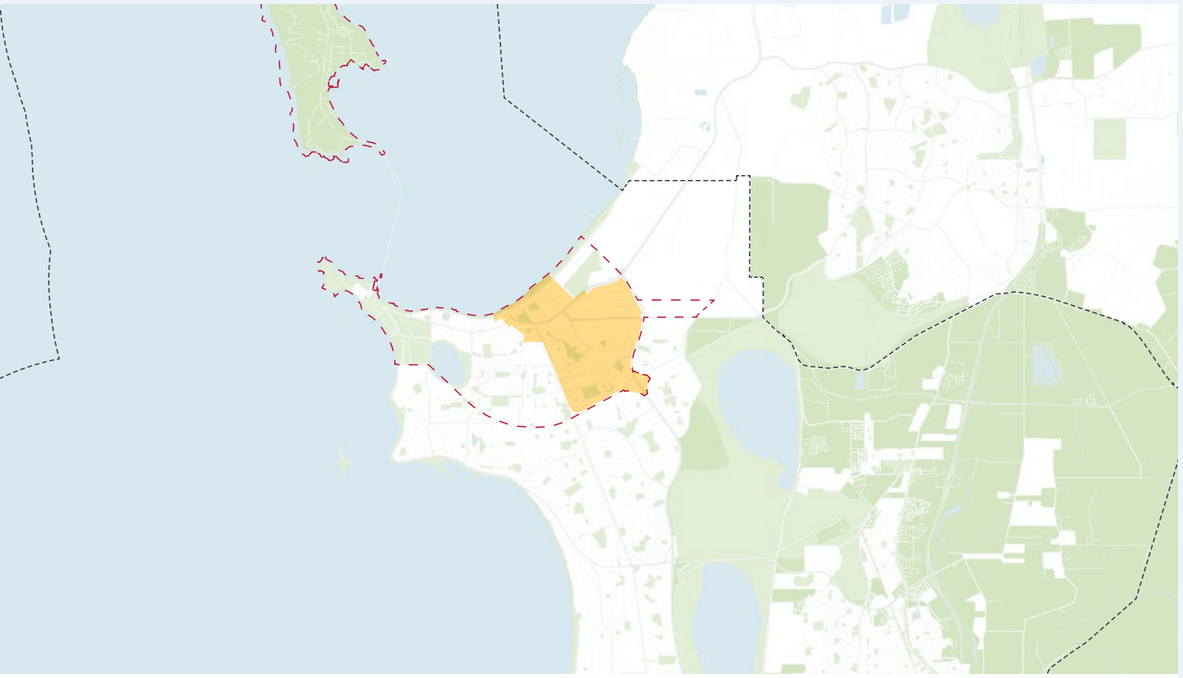
P2 - Table 2: Local Planning Framework Summary

Document	Overview	Relevance to RSC
City of Rockingham Local Planning Strategy	The City is in the process of preparing a Local Planning Strategy. When complete it will become the City's primary strategic planning document, setting out localised strategies for employment, housing, transport and environment.	To support the Local Planning Strategy, the City have already commenced preparation of numerous studies, which all reflect the primacy of the RSC as the City's largest activity centre and employment hub.
Public Open Space Community Plan Strategy	The City's Public Open Space Community Plan Strategy **(POS Strategy)** was prepared to guide the planning, development and management of POS within the City, to ensure it best meets the needs of the community and balances competing demands for space.	The POS Strategy sets out a range of objectives which guide the planning, development, and management of POS. As the RSC is an area expected to experience major changes in development and density, it is important that this is delivered with consideration for the POS needs of a predominantly urban centre.
Tourist Destination Strategy	The purpose of the Tourist Destination Strategy **(TDS)** is to establish the City's strategic direction and priority actions that would inform the Rockingham region's future direction with tourism and marketing. The State Government's renewed focus on tourism and the focus on emerging markets presents a great opportunity for Rockingham to undertake increased activities in tourist destination marketing. The key strategic objective of the TDS is to effectively and measurably promote Rockingham as Western Australia's premium coastal destination - as a place to visit, live and invest in.	One of the primary strategic objectives of the TDS is to "Facilitate and promote the development of a more vibrant foreshore and coastal strip, including the consideration of infrastructure, pedestrian traffic, and parking". The RSC has a critical role in assisting with this by ensuring that built form and public realm outcomes at the waterfront assist with its continued transformation into a preeminent coastal destination.
City of Rockingham Local Planning Scheme No.2	Local Planning Scheme No. 2 **(LPS2)** sets out the way land is to be used and developed within the Scheme area (including the RSC) and classifies areas for land use and includes provisions to coordinate infrastructure and development.	
LPP No. 3.1.2 – Local Commercial and Activity Centres Strategy	Prepared in, the City's Local Commercial and Activity Centres Strategy **(LCACS)** establishes the objectives, principles and key strategies for retailing and commercial development in the City. Its primary function is to define a hierarchy of centres and to provide guidance on the role, function and floorspace requirements for key centres to provide sound guidance for strategic planning.	The RSC is clearly defined in the LCACS as the 'Strategic Regional Centre' performing an essential role as the City's primary retail and employment hub. The LCACS is underpinned by a needs assessment which was prepared by Pracsys in 2021. It is currently under review, outcomes of this review have informed the RPSP in the following ways: • Objectives and intent for centres of this hierarchy level as they relate to the SPP 4.2 guidance; • Population forecasts for the RSC and the associated floorspace by type that this indicates; • Employment targets to achieve the Self Sufficiency rate set within the Sub-Regional Framework.
LPP 3.3.21 – Heritage Development and Design	This policy applies to all places entered in the Local Heritage Survey pursuant to LPS2. Aboriginal heritage is protected by the *Aboriginal Heritage Act 1972*. This Policy does not apply to the conservation of Aboriginal heritage, except in cases where Aboriginal heritage places are entered into the Heritage List or a designated Heritage Area.	39 places included on the Local Heritage Survey are located in the suburb of Rockingham, in which the RSC precinct is found. As per the *Heritage Act 2018* these are categorised into five management categories, depending on their level of significance (or if it is an historic site in regard to Category E). Consideration should be given to each of these local heritage survey places and their level of protection when preparing the RPSP.
LPP 3.3.25 – Percentage for Public Art - Private Developer Contribution	This policy aims to facilitate the City's public realm improvement by providing a funding mechanism for the provision of public art in publicly visible locations as part of private sector development. It specifies land uses and other development parameters that trigger the artwork provision requirement.	Whilst this policy applies to the majority of the RSC area, it will play an important role in facilitating positive public realm outcomes in key activity areas within the Centre. The area exempt from this policy include sites zoned 'Service Commercial' and 'Public Purpose' (P2 - Figure 38).
LPP 3.4.3 – Urban Water Management	The purpose of this policy is to: • Ensure the application of Better Urban Water Management **(BUWM)** (WAPC, 2008), and any future versions of BUWM, as part of the planning approvals process; • Provide guidance on the City's urban water management requirements to ensure that planning and development proposals are dealt with in a consistent manner; • Ensure that appropriate measures are taken to manage catchments in order to maintain or improve surface and groundwater resources; • Promote alternative water conservation and sustainability practices that reduce reliance on traditional supplies.	A Local Water Management Strategy **(LWMS)** is to be prepared to inform and guide the RPSP from a water management perspective. The LWMS must demonstrate how the proposed change in land use/future intensification will address water use, the protection of water dependent environments and management, and identify existing and required water management infrastructure, including detailed land requirements.

Document	Overview	Relevance to RSC
LPP 7.2 – Local Bushland Strategy	This policy deals with bushland of local significance rather than regionally significant bushland. The ultimate purpose of this policy is to provide Council with guidance in the assessment of proposals to rezone, subdivide and develop land within the City where remnant bushland of local significance is present. This is achieved by establishing: • Assessment Criteria against which the values of the bushland can be established; • A Local Bushland Data Collection Form to be used to collect information on the attributes of a piece of bushland; • An Assessment of Significance Form which uses the data collected in the questionnaire and the Assessment Criteria to arrive at a measure of the value of the bushland at the local level; and • Guidelines in using the results of the assessment process in dealing with proposals to rezone, subdivide and develop land.	The RSC has some minor areas of local bushland contained within this precinct. The most significant area of local bushland is located between Dixon Road and Patterson Road **(P2 - Figure 15)**. Any proposal to develop this area should be accompanied by an Environmental Assessment Report prepared by a suitably qualified consultant in accordance with the City's information sheet – Preparation of Environmental Assessment Reports to Inform Structure Plan Applications.
LPP 7.4 – Design Review Panel	This policy enables the provision of independent expert advice to the Council, City's Administration and proponents on the planning and design matters to ensure positive urban design, public realm and built form outcomes. The policy outlines the development categories that would require review, which generally involve proposals that depart from the primary controls, fall within $2-10 million construction cost category or will likely have a significant impact on the City.	Any proposed development within the RSC that falls within the development categories outlined in this policy will be referred to the Design Review Panel for comment. The considerations provided by the Panel should be addressed to ensure high quality development outcomes in the RSC.

2.2 Community Context

P2 - Figure 1: Demographic Catchment Map



The RSC lies within the Rockingham-Peron-Garden Island statistical area, as defined in profile.id (refer to **P2 - Figure 1**). This statistical areas have been identified as best representing the demographic profile of the RSC. The characteristics of this demographic area are detailed in the analysis below, providing an understanding of the current community context for the RSC.

The City of Rockingham Local Government Area and Greater Perth statistical areas have been used as benchmarks.

The purpose of the socio-economic and housing affordability overview of the RSC is to highlight some of the anticipated needs of the resident population that the RPSP can potentially address.

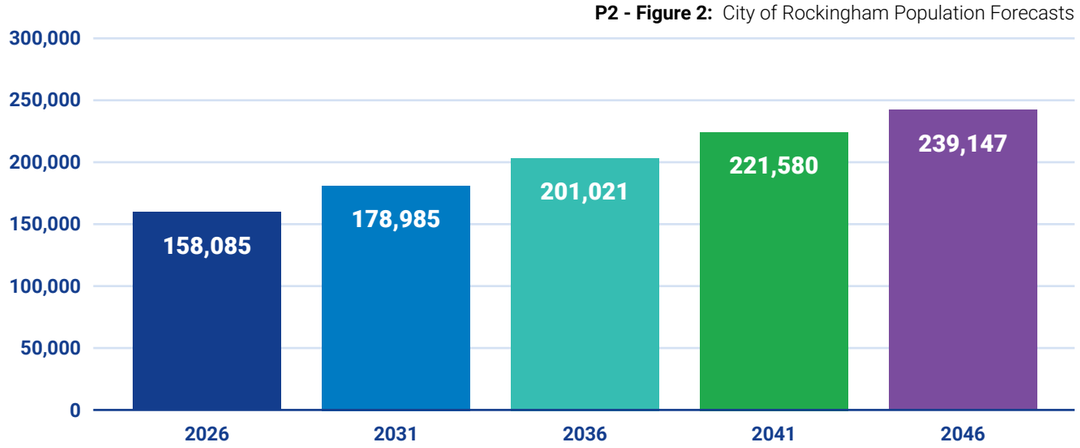
2.2.1 People

Population

The City has and continues to experience substantial population growth. Its population grew by 8% between 2016 and 2021, which is significantly higher than the WA average. This represents an annual average growth rate of approximately 4,250 persons per year. The population growth of Rockingham in 2031 (39%) is estimated to be much higher than the growth rate of WA (27%).

These figures demonstrate that the RSC services a large and growing population, it will require the RPSP to carefully consider and plan for the future land use needs of this expanding population.

P2 - Figure 2: City of Rockingham Population Forecasts



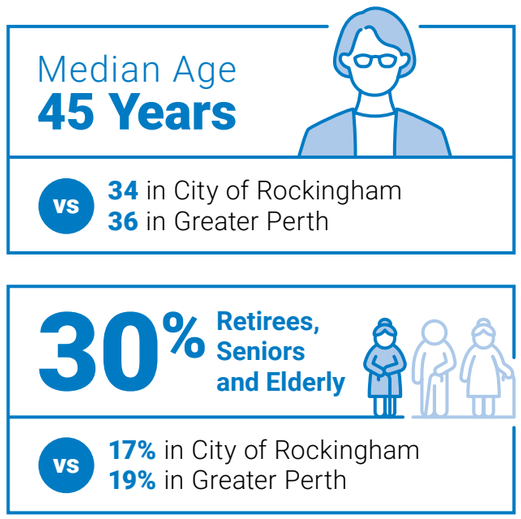
Source: Population and household forecasts, 2016 to 2046, prepared by .id (informed decisions), June 2020. FAR Lane, 2021.

Age and Life Stage

The RSC population has a median age of 45 years, contrasting with 34 years in the City and 36 years across Greater Perth.

This is driven by an above average percentage of over 60 year olds with 30% of the catchment in this retirees/seniors/elderly age group, compared to just 17% in the City and 19% in Greater Perth.

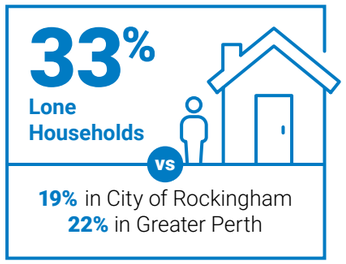
Conversely, the proportion of babies/toddlers and school aged children in the catchment (16%) are well below the City's 26%. Equally, young adults and the parents of these children are not prominent age groups in the RSC.

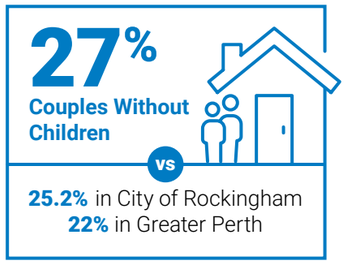


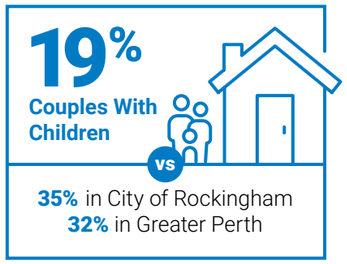
Household Types

Reflective of the age and life stage profile, 33% of people in the RSC live alone, which is much higher than the broader City of Rockingham (19%). Couples without children in the home represent 27% of households, well above the 22% in this group across Greater Perth.

Given the age structure outlined above, couple families with children represent less than one fifth of households, compared to 35% of City of Rockingham households.







Cultural Diversity

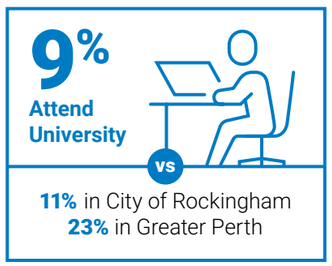
The proportion of First Nations peoples in the RSC is 1.7% which is on par with Greater Perth and slightly below the City of Rockingham (2%).

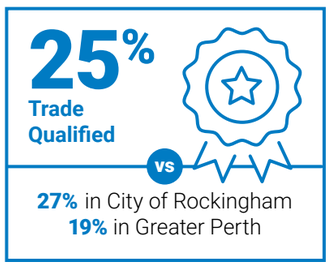
Whilst 35% of the RSC was born overseas, which is similar to Greater Perth, language diversity is not as common. Just 10% speak a language other than English at home versus 20% in Greater Perth. The underlying reason for this is the top two countries of origin in the RSC are the United Kingdom (18%) and New Zealand (5%), both above Greater Perth (10% and 3% respectively).

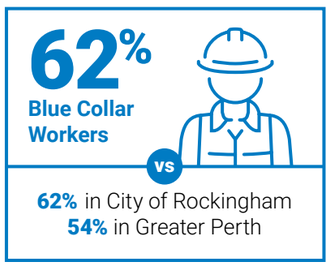
Education and Qualifications

Due to the low proportion of children and teens in the RSC, just 11% of the population attend primary or secondary school, well below the City of Rockingham at 18%. In people aged over 15 years, only 9% attend university and 1.7% TAFE, which is a large contrast to 23% of Greater Perth adults attending university.

Of those in the RSC that hold a qualification, one quarter have a trade (certificate) above the 19% in Greater Perth. Far fewer people are university qualified with just 9% in this group, whereas 23% of Greater Perth adults hold tertiary qualifications.



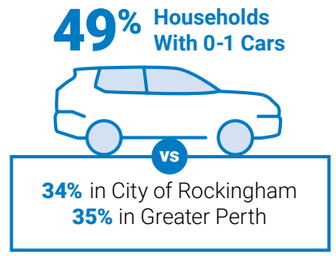


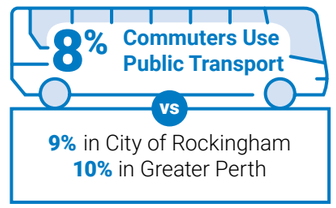


Car Ownership and Method of Travel to Work

Smaller households, older residents that are often not working, and the accessible and highly amenable environment in the precinct are likely factors contributing to the lower-than-average car ownership in the RSC. Almost half have no or one car in the household, which is well above 35% across Greater Perth demonstrating low car ownership. Conversely, just 13% of households have more than three cars, compared to one fifth of City of Rockingham and Greater Perth households.

In 2016, 69% of Rockingham's labour force drove to work. This was even higher in the RSC with 76% of employed persons driving to work. As a result, there was a lower proportion of people using public transport when compared to Greater Perth.



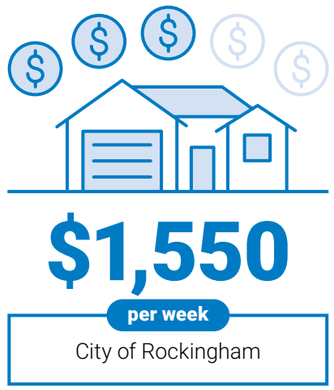


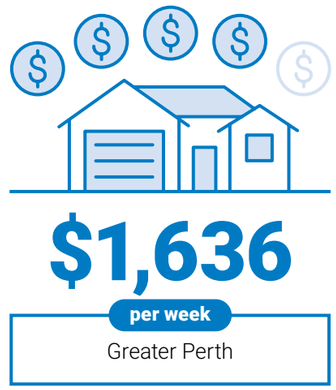
Incomes

Median weekly household incomes in the RSC are at $1,012, which is below City of Rockingham ($1,550) and Greater Perth median incomes ($1,636). This relates to the older, smaller households, prevalence of lone person households, low labourforce participation rate and lower proportions of people employed in higher earning occupations.

There is more representation of RSC households in the lower income bands with two fifths earning under $999 pw, whereas 28% of City of Rockingham households are in this group.







2.2.2 Housing

Dwelling Mix

29% of dwellings in the RSC are medium density, which is higher than both the City of Rockingham (10%) and Greater Perth (20%). High density at 5% in the catchment is on par with Greater Perth. The current aged persons/seniors living villages that exist in the catchment area are one contributor to the high proportion of medium density housing stock.

Consequently, the percentage of separate houses (64%) is well below the City of Rockingham (89%) and outer metropolitan area levels generally, highlighting that the RSC is performing 'acceptably' from a housing diversity perspective. Households are generally smaller than the benchmark areas, related to the ageing population and prevalence of lone person households/smaller housing types.

29% Medium Density
vs
9% in City of Rockingham
20% in Greater Perth

64% Separate House
vs
89% in City of Rockingham
75% in Greater Perth

2.07 Household Size
vs
2.63 in City of Rockingham
2.6 in Greater Perth

Tenure

Renting is the dominant tenure type in the RSC (34%), which is much higher when compared to the City of Rockingham (25%). However, there is also a greater proportion of people who own their home without a mortgage (31%) when compared to the City of Rockingham (22%), likely due to the prevalence of older couples (comprising both retirees and empty nesters).

Similarly, without a strong family-based demographic in the catchment, there is less tendency to be purchasing a home with a mortgage (traditionally linked with this life stage and household structure), with only 25% of households in this tenure, versus nearly half (45%) in the City of Rockingham.

Housing Commitments

Median weekly rents at $303 per week in the RSC are below those in the City of Rockingham and Greater Perth. So too are median weekly mortgage repayments, at $373 per week whereas Greater Perth households pay a median of $467 per week.

These lower housing commitments are linked with the greater percentage of medium density and therefore generally smaller dwellings in the catchment relative to separate houses on larger lots (often costing more) in the City of Rockingham.

$303 Rent
per week
$355 in City of Rockingham
$372 in Greater Perth

$373 Mortgage Repayments
per week
$453 in City of Rockingham
$467 in Greater Perth

34% Renting
25% in City of Rockingham
26% in Greater Perth

Residential Property Data

Through an understanding of the current availability and cost of purchasing or renting dwellings of various types within the RSC together with the household characteristics examined above we are able to gain insight into likely future housing product opportunities.

P2 - Table 3 and **P2 - Table 4** below provide median house, unit and land prices as well as growth rates over time for both Rockingham and the Greater Perth area for comparison. Over the long term Rockingham has fared better.

P2 - Table 3: Rockingham (suburb) Residential Property Data - Sales

	2021 Median Sale Price		Growth Rate					
			>1 Year		5 Years		10 Years	
	Rockingham	Greater Perth	Rockingham	Greater Perth	Rockingham	Greater Perth	Rockingham	Greater Perth
Houses	$405,000	$515,000	12.10%	5.10%	-1.50%	-0.90%	0.00%	0.40%
Units	$266,000	$390,000	14.20%	2.60%	-1.80%	-2.30%	-0.20%	-0.70%
Land	$295,000	$242,000	-6.00%	-1.60%	-10.50%	-2.20%	2.50%	-0.20%

Source: REIWA, based on settled sales as at 31 May 2021

P2 - Table 3 demonstrates that median house and unit prices in Rockingham are well below Greater Perth. However, residential land is selling for a median of $295,000, well above the metropolitan price-point of $242,000.

Over the longer term 10 year timeframe, land in Rockingham has experienced 2.5% price growth. Additionally in recent times, houses and to a greater degree units in Rockingham have surged (12.1% and 14.2% growth respectively) with prices growing much faster than Greater Perth as a whole. These recent growth rates are particularly strong given Perth's annual house price growth rate has been 5.9% over the past 15 years.

With Rockingham offering waterfront, shopping and services, good transport accessibility as well as the remaining residential land development opportunities focused in the City Centre or nearby, there are several factors likely influencing demand and hence land prices.

P2 - Table 4: Rockingham (suburb) Residential Property Data - Sales

Dwelling Type	Number of Bedrooms	Number of Properties Rented		
			Rockingham	Perth Metro Region
House	1–2	17	$250	$345
	3	29	$350	$400
	4	14	$400	$490
	5+	5	$495	$625
	ALL	**65**	**$355**	**$435**
Multi Residential	1	6	$350	$340
	2	31	$278	$390
	3	15	$370	$435
	ALL	**52**	**$330**	**$390**

Source:REIWA, January – March 2021

P2 - Table 4 highlights house rents in Rockingham are below Greater Perth medians across all dwelling sizes (numbers of bedrooms).

It reveals that smaller one bedroom multi-residential product is more comparable to the Perth median whereas larger (two to three bedroom apartments) generally rent for rates below Greater Perth.

Affordability

The Australian Institute of Health and Welfare outlines that affordability can be expressed as the ratio of housing costs to gross household income (ABS 2017). Noting that these costs include: rent payments, rate payments (water and general), and housing–related mortgage payments (ABS 2019).

Source: https://www.aihw.gov.au/reports/australias-welfare/housing-affordability

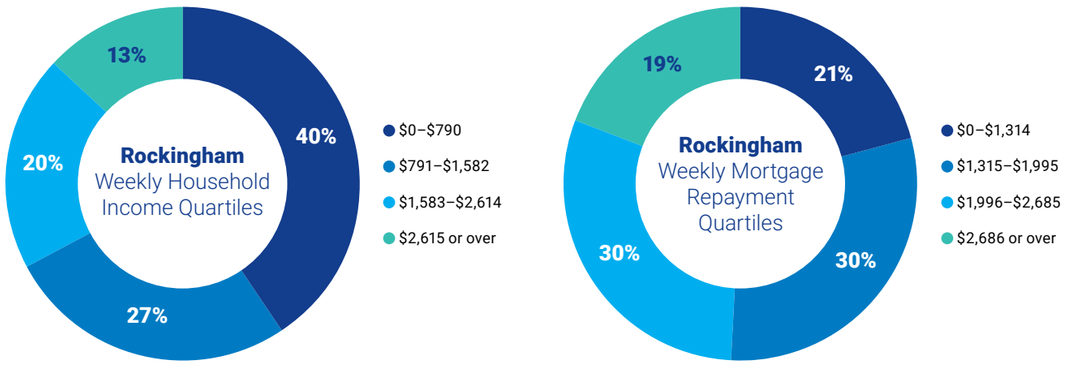
In the case of the RSC, it is reasonable to evaluate the affordability of housing through the relationship between household incomes and the percentage of income that is spent on housing (either through renting or mortgage costs).

Importantly, within the discussion on affordability is the concept of "housing stress" or the point where housing becomes unaffordable. It means to measure the impact of this cost of living on the lowest income earners in a catchment. This group are evaluated, to ensure that they are not expending in excess of 30% of their gross income on housing costs.

Therefore, where a low income household is needing to spend greater than a third of their income on housing, they are assessed as experiencing "housing stress" or affordability issues.

P2 - Figure 3 highlights the catchment household income quartiles relative to the median mortgage repayment quartiles per week. Broadly it is apparent that more than two thirds of households earned less than $1,582 per week, whilst nearly 80% of households paid a weekly mortgage repayment of $1,315 per week and above. This highlights that RSC households in the lower two income earning quartiles would be experiencing some housing stress.

P2 - Figure 3: Rockingham household income quartiles relative to mortgage repayment quartiles



Renters are also part of housing affordability considerations. As outlined in **P2 - Table 4** the current median rent of a three bedroom house in Rockingham is $350 per week or a two bedroom townhouse $280 per week. Although household incomes have changed since the 2016 Census, it is considered likely that income earners in the lowest quartile (notionally under $790 per week) would find these rents difficult to manage and proportionally they would represent more than 30% of the gross household income.

2.3 Economic Context

To develop an understanding of site characteristics, and the overall local, sub-regional and regional economic context of the RSC.



The RPSP reflects the principles of a "main street" Strategic Centre with mixed use, street front development framing an activated public transport system. With continuing growth of the Region and the construction of the City Centre Transit System, a broader and more comprehensive domain was required to provide a long-term vision.

The City's Economic Development Strategy 2025-2030 reflects an ongoing commitment to addressing the needs of local businesses and attracting new/diverse investment that delivers increased economic and social benefits to the community. The Economic Development Strategy aims to grow a diverse, vibrant, resilient and balanced economy that provides growth and drives sustainable economic success. Economic development aspirations include:

- Investment attraction;
- Establishing a Strategic Metropolitan Centre;
- Local business development; and
- Advocacy and lobbying.

Occupations

The older age profile of the catchment influences the labour force participation rate with 51% aged 15+ not engaged in the workforce, compared to 63% across the City of Rockingham and Greater Perth.

Closely related to these education trends, the occupations of RSC workers are heavily dominated by trades/labourer/machinery operator/driver jobs. With 42% working in these "blue collar" roles whereas less than a third of Greater Perth workers do.

Conversely, only one fifth of the RSC's population catchment work in managerial or professional roles versus one third of Greater Perth workers in this group.

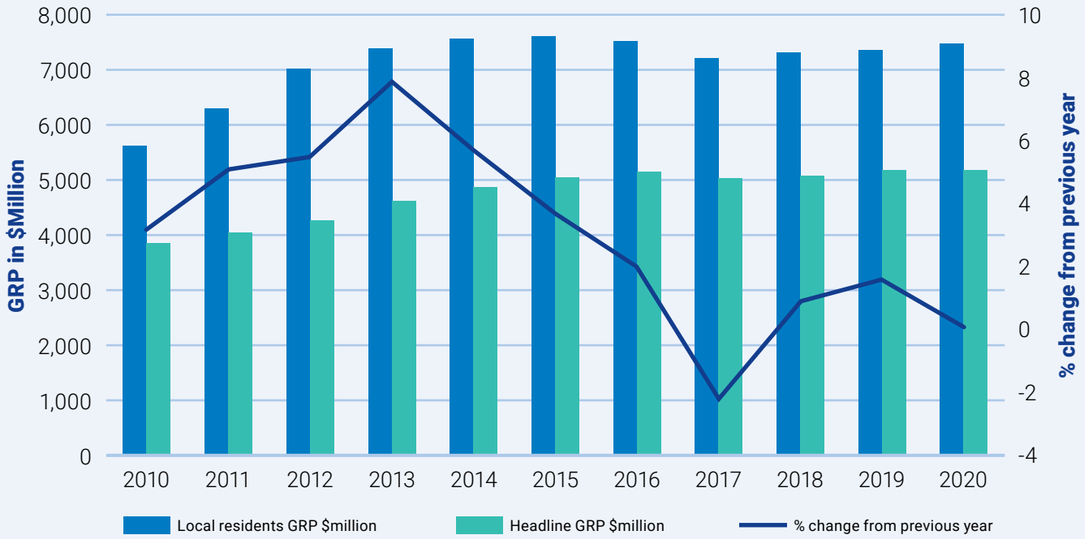
2.3.1 Rockingham Economic Performance

Gross Regional Product (GRP)

Headline GRP is a measure of net wealth generated by the local economy. Changes in this figure over time can represent changes in employment productivity or types of industries within the area.

Local resident GRP refers to the economic output of the residents of the area. Resident GRP in Rockingham is relatively high to the headline GRP, indicating that residents are contributing their economic productivity to other areas.

The impact of Covid-19 appears to be more substantial for Rockingham than Perth, where the growth of GRP has reduced significantly from 1.62% in 2019 to 0.09% in 2020. This can be largely attributed to high unemployment rates within industries that were largely affected by Covid-19. These industries include retail, food and accommodation – all of which dominate employment areas within Rockingham.



P2 - Figure 4: City of Rockingham GRP Measure

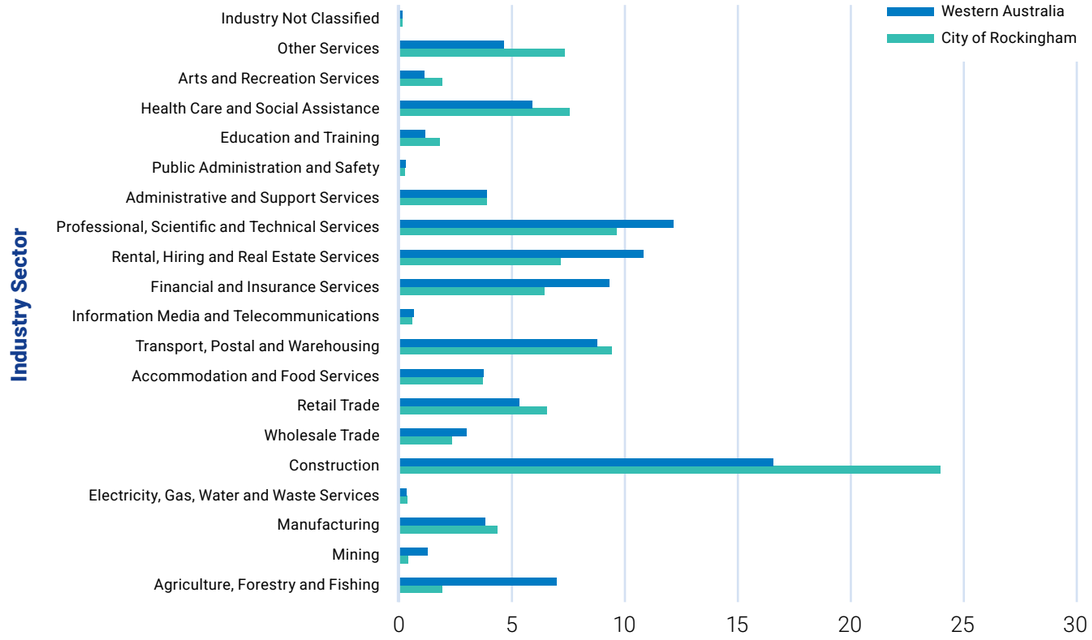
Source: National Institute of Economic and Industry Research (NIEIR), 2021. FAR Lane, 2021.

Business Growth

FAR Lane have undertaken a review of the 2020 Australian Business Register, which has found that the number of businesses in Rockingham has increased from 5,435 (June 2018) to 5,937 (December 2020). There has also been an increase in GST registered businesses between 2015-2020. The increase of businesses is a result from a decreased number of cancelled businesses and a stagnant number of new GST registrations each year. If this trend continues, there is a chance for additional economic output and employment opportunities within the area.

With regards to businesses by industry type, **P2 - Figure 5** indicates that construction is the biggest industry sector in Rockingham. This is followed by professional, scientific and technical services, and transport, postal and warehousing.

Registered businesses in construction have decreased by 120% since 2019. The construction decrease is linked with the slowing of the state population growth and new house production over the same time period.



P2 - Figure 5: Registered Businesses by Industry in Rockingham 2020

Source: ABS, Counts of Australian Businesses, including Entries and Exits, 2016 to 2020. FAR Lane, 2021.

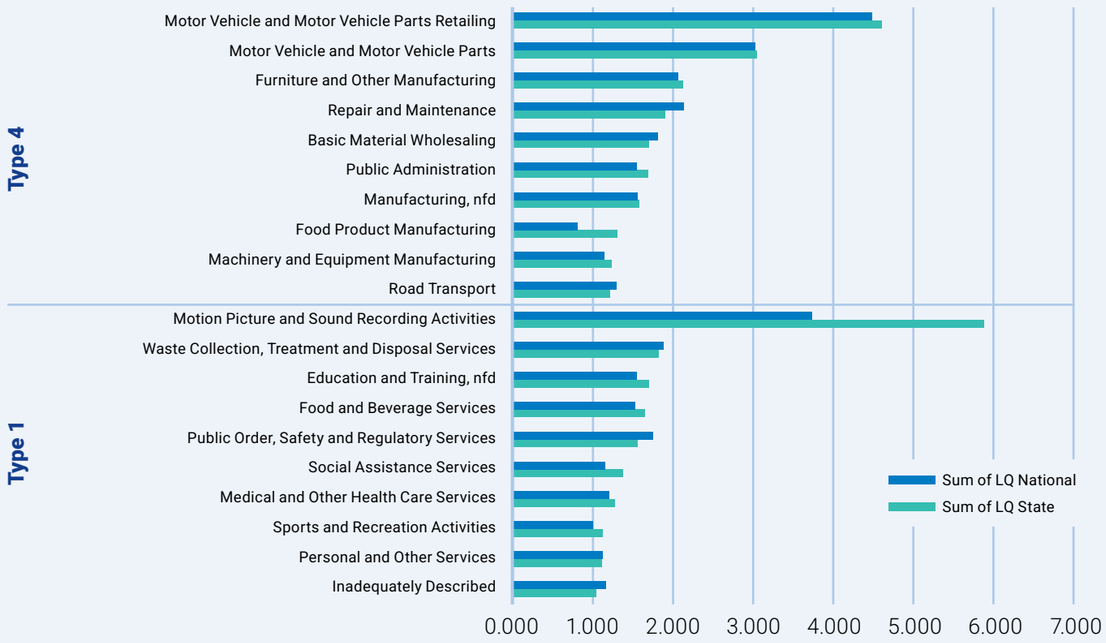
Shift Share Analysis

A shift share analysis helps identify industries where a regional economy has a competitive advantage over the larger economy. There are four types presented below:

- **Type 1** - Local Firms outperforming in a high growth Industry
- **Type 2** - Local Firm underperforming in a high growth industry
- **Type 3** - Local Firm underperforming in a low growth industry
- **Type 4** - Local Firms outperforming in a low growth Industry

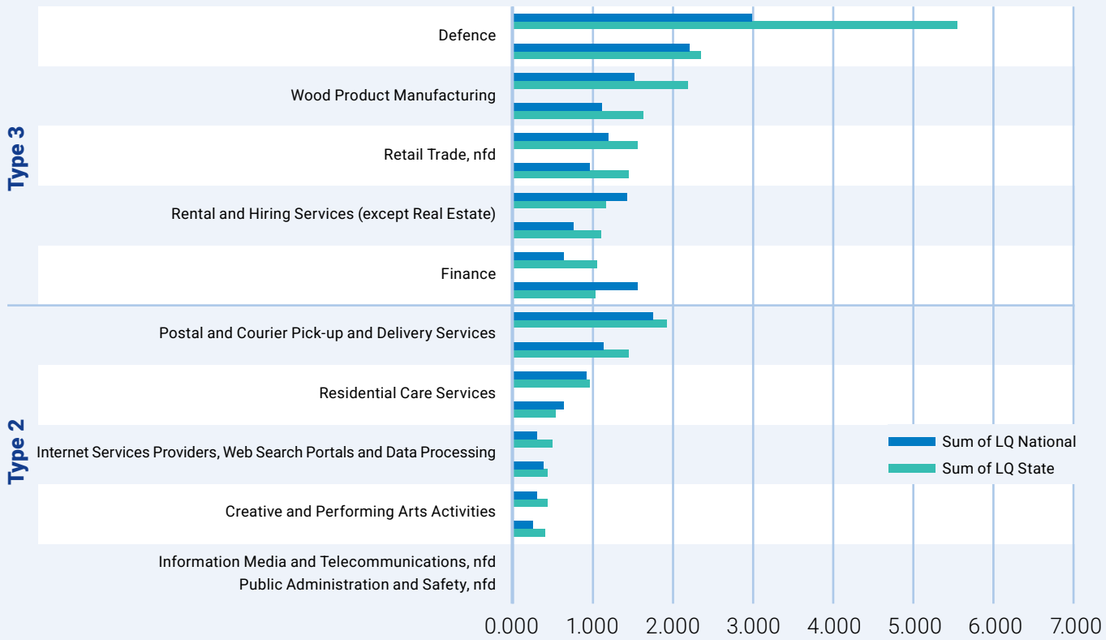
FAR Lane's assessment determined that there were a number of low-growth and high-growth industries which were outperforming the regional economy **(P2 - Figure 6)**. This included some of the City's more popular industries of employment such as health care and social assistance.

With regards to underforming industries **(P2 - Figure 7)**, retail sector was highlighted as one which raises concerns as it is the biggest employer in the City of Rockingham. This emphasises the importance of diversifying the industries of employment in RSC.



P2 - Figure 6: Top 10 industries which have Outperformed High and Low Growth Industries

Source: ABS Census, 2011 and 2016. FAR Lane, 2021.



P2 - Figure 7: Top 10 Industries that have Underperformed High and Low Growth Industries

Source: ABS Census, 2011 and 2016. FAR Lane, 2021.

2.3.2 Employment Statistics

Employment Status and Industry of Employment

According to the 2016 Census, 90% of the City's labour force is employed and 10% is unemployed, in contrast to 92% and 8% respectively in Greater Perth. In 2016, there was a lower proportion in employment, and a higher proportion unemployed compared to Greater Perth. Within the RSC, there are 2,246 employed residents. With the biggest industries of residential employment being those that do not necessarily require any formal tertiary education – with big proportions in construction, health care and social assistance, public administration and safety as well as retail trade.

These figures align closely with the broader City of Rockingham, with retail trade, health care, social assistance and public administration and safety among the biggest industries. Together they make up 45.5% of local employment.

Employment Self Sufficiency

The South Metropolitan Peel Sub-Regional Planning Framework provides Employment Self-Sufficiency (ESS) targets for the region. ESS represents the jobs available in a sub-region compared to the labour force of the sub-region. An ESS of 100% means that a sub-region has an equal number of jobs and labour force. The assessment has estimated the employment supportable at the City's Activity Centres based on population growth. The 2020 Rockingham Employment Study considered the potential employment requirements of the City with projections based on population growth and other development opportunities.

Employment estimates from the Rockingham Employment Study for non-activity centre employment have been combined with activity centre estimates to approximate the additional employment required to achieve an ESS target of 74%. The additional employment will need to be strategic in nature and suitable to the RSC and other employment lands such as industrial areas. The estimated gap in employment without considering future employment land (not activity centre based) and catalyst projects in the RSC amounts to between 31,000 and 40,000 **(P2 - Table 5)**.

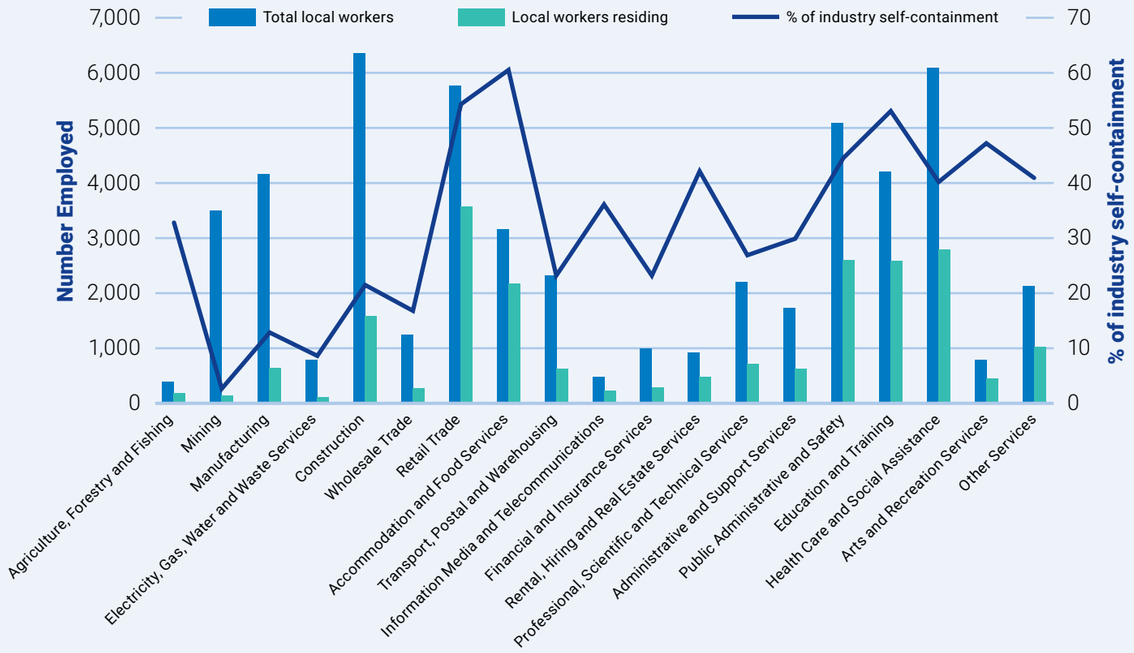
P2 - Table 5: Employment Gap Without Future Employment Land

Employment Category	WAT Employment	COR Employment
Employment Target 2041 (74% ESS)	70,833	88,292
Needs Assessment 2041 - RSC	10,697	14,252
Needs Assessment 2041 – Other Centres	13,139	15,442
Jobs Rest of City	15,572	18,984
Gap to Target ESS	31,425	39,614

Source: Syme Marmion & Co 2020, Pracsys 2021

Existing ESS in Rockingham was 39.6% in 2016, which is a relatively low number. However, this is higher than other outer metropolitan LGAs (in 2016) such as City of Swan (32.6%) and Joondalup (30%). A number of factors can contribute to low ESS, the most common being quantum of jobs available, diversity of jobs on offer, and location of the industry (e.g. jobs in mining and construction typically located outside of the City). **P2 - Figure 8** indicates that the ESS differs across industry groups:

- High ESS in popular local industries such as Retail Trade (61.5%), Education and Training (60.6%) and Accommodation and Food Services (68.9%).
- Low ESS in knowledge and office-based employment industries such as Professional, Scientific and Technical Services (30.4%), Financial and Insurance Services (25.7%) and Administrative and Support Services (34.1%). This is likely impacted by limited concentration of local employers and businesses.
- Low ESS in labour intensive industries such as Construction (24.2%), Manufacturing (14.4%), and Mining (2.6%). This is likely impacted by proximity to major industrial hubs such as Kwinana and Henderson which attract a lot of local workers, and high proportion of fly-in-fly-out workers in mining.



P2 - Figure 8: City of Rockingham Employment Self Sufficiency

Source: ABS, Census of Population and Housing 2016. FAR Lane, 2021.

In addition to low ESS, the City of Rockingham also has a relatively high level of unemployment compared to the Greater Perth region and has a particular issue with youth unemployment. Should current trends continue, the issue is likely to be exacerbated as employment opportunities in the City could grow slower than the population.

2.3.3 SWOT Analysis

P2 - Table 6 provides a summary of the strengths, weaknesses, opportunities and threats of the RSC economy.

P2 - Table 6: Economic SWOT Analysis

Strengths	Weaknesses
• Location – Coastal City with good proximity to road, and rail infrastructure and an internationally competitive heavy industry zone at the Rockingham/Kwinana Industrial complex; • Availability of land and commercial space to support future economic growth; • Proximity to major defence establishment at Garden Island; • Proximity to an internationally competitive naval and maritime industries construction, maintenance and services complex at Henderson in the Western Trade Coast; and • A City Centre designated as the primary activity centre for a very large region, connected to regional transport systems and with an attractive ocean-front location for part of it.	• Unemployment rates. • Local workforce is not highly specialised. • Heavy reliance on local retail sector and other population-based employment industries. • Workforce is significantly larger than local jobs (major contributor to low ESS). • Employment opportunities in the City of Rockingham are specialised in construction and defence, reflective of the expansion in residential dwellings currently happening and due to Garden Island. So additional strategic employment opportunities need to be generated over time to increase the current level of ESS in the City of Rockingham. • Current employment-generating land is under threat from competing non-industrial uses.
Opportunities	**Threats**
• Stronger public transport infrastructure. • Diversification of jobs and employment industries. • Better use of floorspace/increased floorspace to provide jobs that match local skills.	• Limited or slower than anticipated population growth. • Low participation rates in education and employment.



2.4 Physical Context

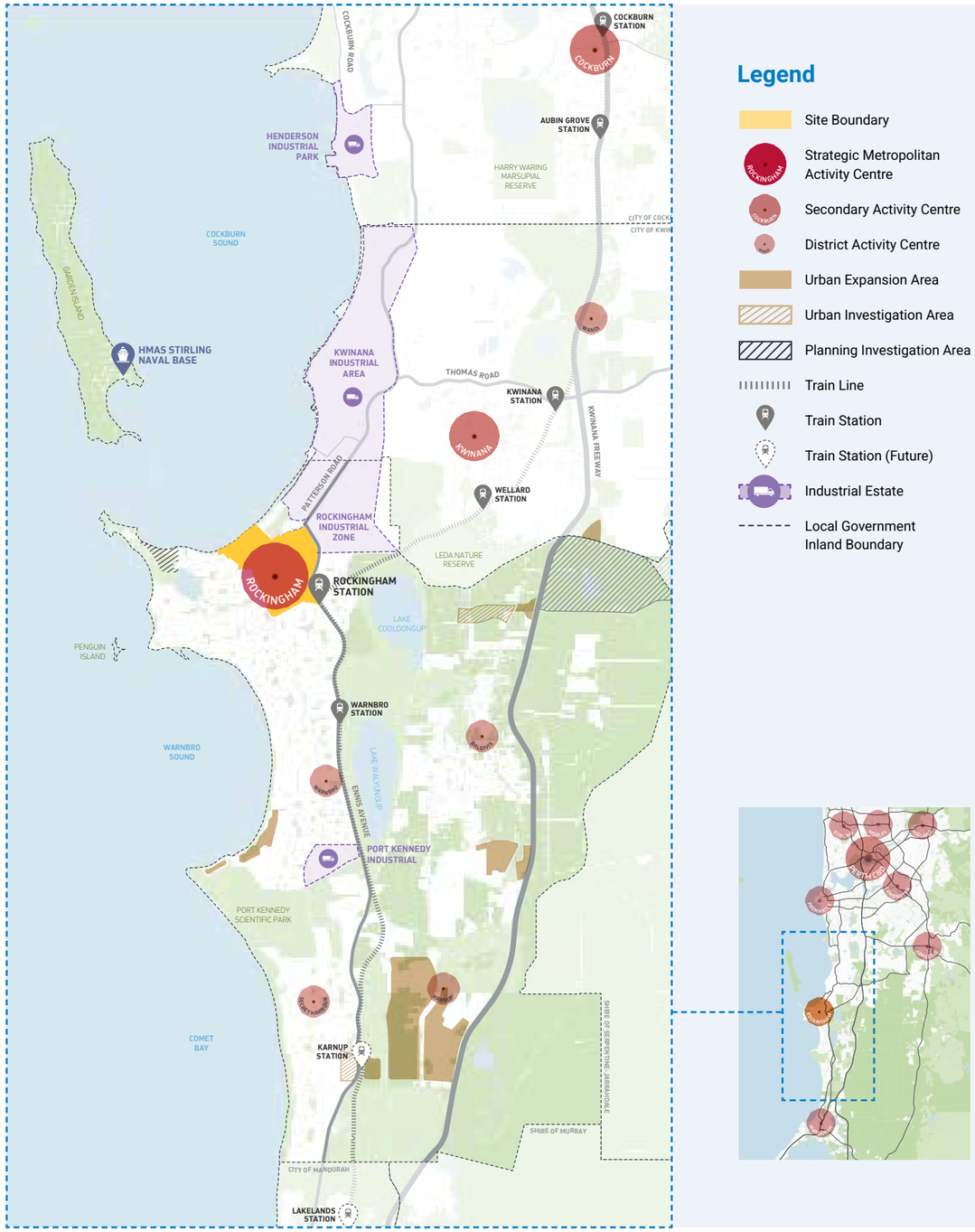
2.4.1 Broader Context

The RSC is identified as one of ten designated Strategic Centres in WA's activity centre hierarchy. The RSC is located approximately 40km south of Perth and as shown on **P2 - Figure 9**, it is the primary activity centre between Fremantle and Mandurah servicing a broad urban catchment that captures people from the Cities of Rockingham, Kwinana, Mandurah and parts of the Shire of Serpentine Jarrahdale.

Within the City, the RSC is located in the north, with good proximity to State-significant employment generators such as the Global Advanced Industries Hub and HMAS Stirling. The RSC itself is also an economic hub in the area, and primary location for a range of major services. It is supported by the Kwinana Secondary Centre, and Baldivis and Warnbro District Centres (and a number of neighbourhood centres) which provide for more localised retail needs.

Historically, the bulk of the urban population in the City has been located between the Perth-Mandurah rail line and the ocean. However, in the early 2000s development expanded eastward with the Baldivis areas becoming one of the fastest growing suburbs in the State. This growth is set to continue further south, with Karnup identified for urban expansion, demonstrating that the RSC catchment is growing and will continue to grow for some time.

P2 - Figure 9: Broader Area Context



2.4.2 Precinct History

The City has a proud history. The Traditional Owners of the area now known as Rockingham are the Nyoongar people. The City sits on the boundary of the Whadjuk and Binjareb Nyoongar peoples territories[1].

The City was first settled by Europeans when Sulphur Town was established on Garden Island in 1829. Port Rockingham was once the busiest port in the State by tonnage of goods shipped through the jetties at the end of Railway Terrace. However, when the viability of loading timber declined the associated beachfront and townsite was subsequently transformed into one of the States favourite family holiday and day trip destinations. As such, initial development occurred along the waterfront capitalising on the coastal amenity.

Rockingham began to grow steadily in the 1950s following the development of nearby Kwinana as a major industrial area. The 1970s to 1980s saw the establishment of the urban structure we know today, including major local roads such an Ennis Avenue, Read Street, and Patterson, Rae and Dixon Roads.

It also saw the TAFE facility, Mike Barnett Sports Complex, light industrial development and a shopping centre established, with two primary residential areas:

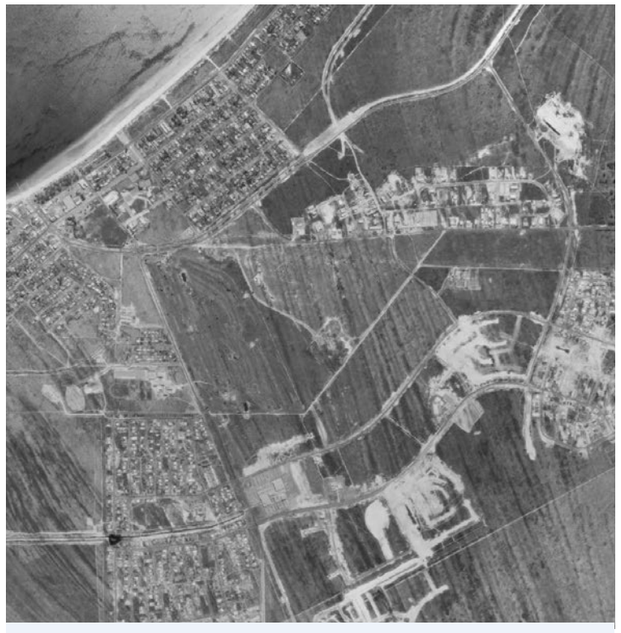
- One in the north, which is adjacent to the waterfront and an extension of original urban footprint; and
- An area in the south, west of Ennis Avenue.

In the 1990s to 2000s, Rockingham began to mature. The waterfront area experienced some transition to a more dense urban form along the Foreshore, and the City Centre began to form around the shopping centre and the City's Administration Building. A new residential estate was also established over the former golf course.

Passenger rail was introduced in 2007 as part of the Perth-Mandurah railway line. The original intent was for the station to be in the City Centre, however, changes in design thinking saw it constructed at the corner of Ennis Avenue and Rae Road. Despite being disconnected from the City Centre, the rail extension did improve the RSC's connectivity with the broader metropolitan region via high frequency public transport.

From 2007 onwards, there have not been any major changes experienced in the RSC.

Over a 50 to 60 year journey, the RSC has undergone many transitions. From small holiday destination to satellite city and major centre in the South Metropolitan Region. The purpose of the RPSP will be to guide the centre's next transition over the decades ahead.



RSC 1975



RSC 2005



RSC 1985



RSC 2015

1 https://rockingham.wa.gov.au/events-culture-and-tourism/heritage

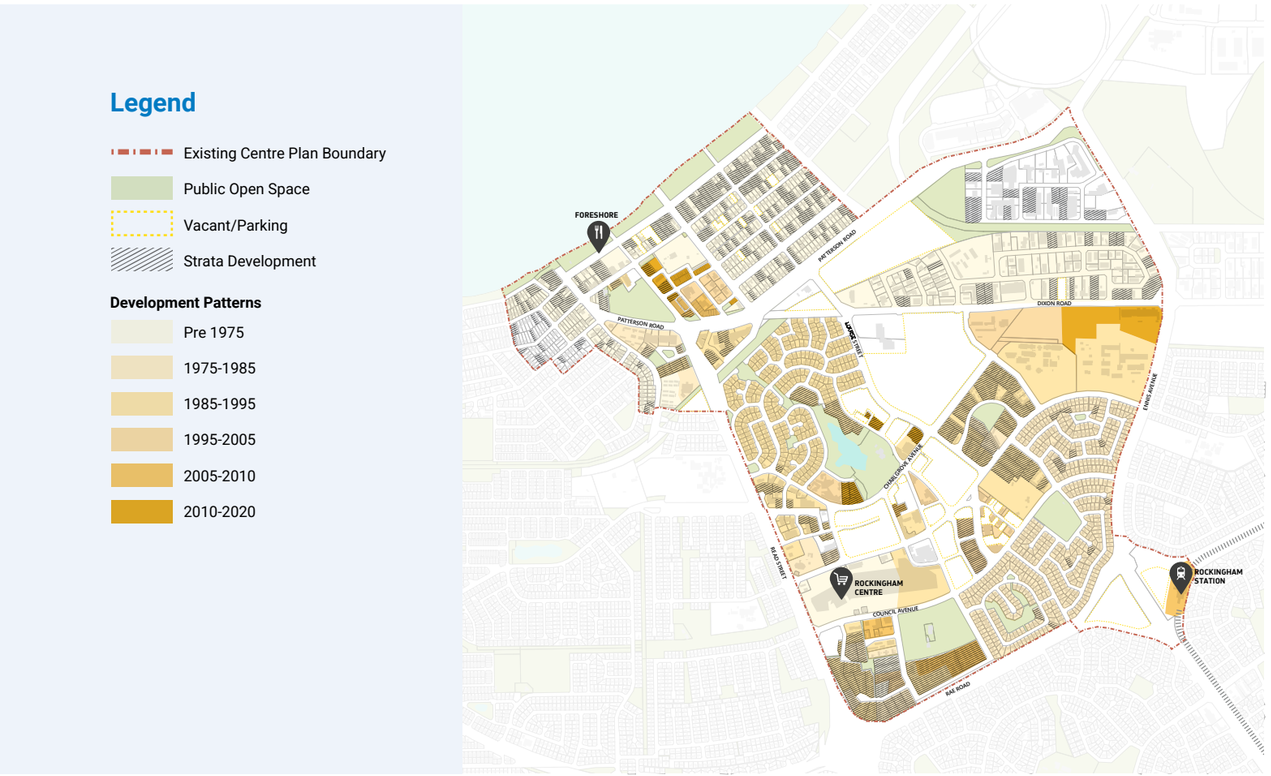
2.4.3 Development Potential

Centre Plan Development Vision

The development vision for the RSC was based around the establishment of the RCCTS, which connects the Rockingham Train Station with the City Centre, education campuses and the renowned beachfront. This Transit Oriented Development **(TOD)** based approach was centred on the route of the proposed street–based transit system.

The route of the RCCTS was developed initially as a busway with the understanding that it will be upgraded to a more fixed system (e.g. trackless tram or light rail) once a more supportive level of development has been achieved along the route. The City is committed to achieving the vision of a fixed route, streetcar transit system as the focus of a corridor of high intensity, mixed use development between the Rockingham Train Station and the beachfront. Though it is acknowledged that the ultimate alignment is subject to review in the RPSP.

The approach proposed in the Centre Plan would allow for establishment of approximately 16,793 dwellings (30,227 people @ 1.8 persons per dwelling). There is an expectation that the RPSP use this figure as a benchmark, to ensure similar levels of residential density can be achieved.



P2 - Figure 10: Development Patterns

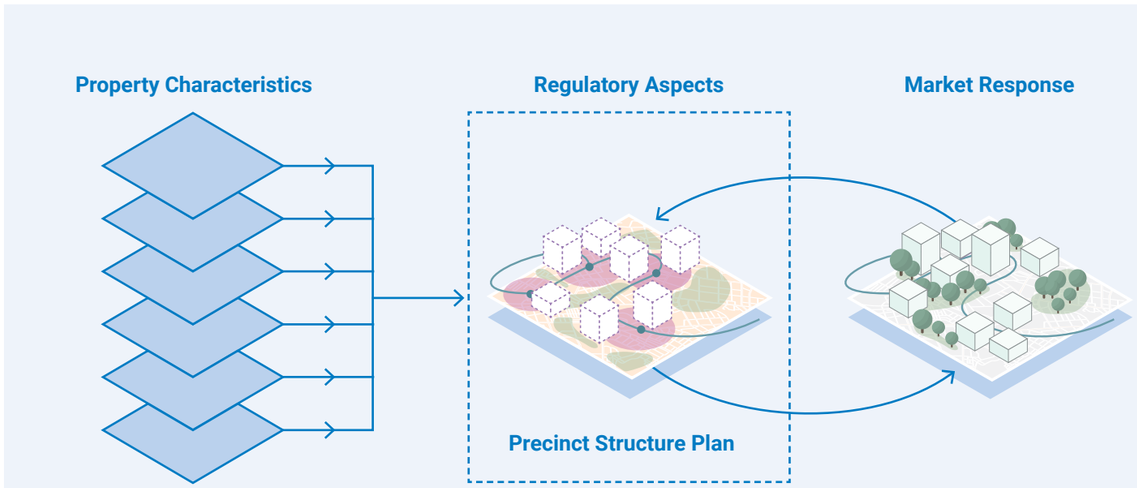
Development Since the Centre Plan

An analysis of historical aerial imagery assisted with mapping development patterns throughout the RSC over time. This has been translated on **P2 - Figure 10**. One of the primary observations is that limited development has occurred since 2010, which is around the time the previous Centre Plan was endorsed. This is reflected by the fact that in 2016, there were an estimated 4,352 residents living in the RSC (well below the density target), suggesting that significant development potential still exists.

When assessing factors that impact development, the following themes are considered as the primary factors:

1) **Property** – attributes and characteristics that influence the physical possibility of a property to be developed for residential or retail use, including access and infrastructure services;
2) **Regulatory** – governance, legal and planning provisions that influence the built form, density and land use types that can be provided within the precinct; and
3) **Market** – characteristics influencing the supply, demand, price and feasibility of developing for a particular use or development outcome. The market can ultimately be influenced by a range of factors which could impact the rate at which development occurs. This could include government interventions such as public transport investment, or transformative projects such as the proposed Rockingham Marina.

When considering future development in the RSC, it is important to consider how the above characteristics relate to each other. This relationship is illustrated on **P2 - Figure 11**, and demonstrates that the RPSP will influence the regulatory aspects. However, it is still important to consider how local market characteristics may respond. In the long-term, this market response would likely guide future reviews of the RPSP.



P2 - Figure 11: Development Characteristics

Future Development Potential

A key principle of transit oriented development is to facilitate an increase in both residential (housing diversity and density) and non-residential (employment generating land) development. This ensures that the urban environment supports affordable opportunities to live and work in the area. The RSC is currently characterised as a low-medium density, retail-centric precinct with limited high-density residential and diversity of employment on offer when compared to the development vision.

From a residential stand point, this stems from the fact that new dwelling supply in the broader region has largely emerged from greenfield estates, where the buyer profile is dominated by first home buyers seeking entry level product. These buyers are very much driven by affordability with lot size and space a key consideration. Therefore, the challenge in developing within the RSC is the ability for developers to achieve sufficient built form price points in order for projects to be financially viable.

To provide an evidence base to support the RPSP design, a preliminary development potential assessment was undertaken to understand (spatially) where future development should be focussed.



P2 - Figure 12: Development Potential

Assessment Methodology

The development potential assessment included a combination of quantitative and qualitative analysis. From a spatial perspective, the quantitative analysis considered a number of critical influencing factors:

- Tenure - which assessed lots based on their land ownership and tenure.
- Lot size - which assessed lots based on their size.
- Existing use - which assessed whether a lot is vacant or developed.
- Age/condition - which assessed the age and condition of existing development (if present).

The above indicators were supported by weighted criteria which allowed each development parcel in the RSC to be assigned a 'development potential rating'. These ratings were assessed further, having consideration for a range of qualitative factors (e.g. proximity to open space, transport, or land use amenity), and feedback received during the stakeholder engagement process.

The development potential ratings are illustrated on **P2 - Figure 12**, they include:

- Low potential - being land that is highly unlikely to be developed in the next 10-20 years. This typically includes new development, or properties with complex strata ownership structures.
- Medium potential - being land that is likely to be devloped in the next 10-20 years. This typically includes single residential lots that have ageing stock and have capacity to support infill development.
- High potential - being land that is highly likely to be devloped in the next 10 years. This typically includes large, vacant lots which are in sole ownership. Or large single residential lots that have ageing stock ready for redevelopment.

The analysis determined that the following areas have the highest development potential:

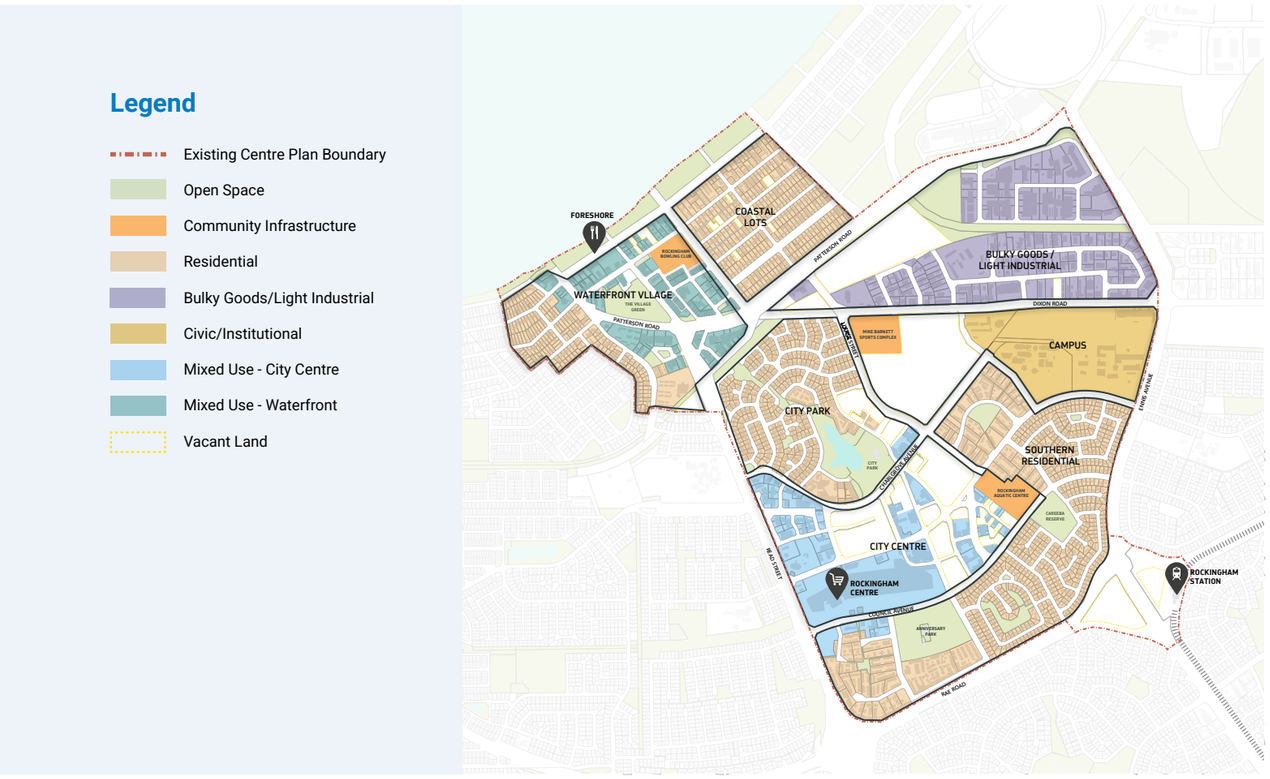
- **Area 1** - is the waterfront area along Rockingham Beach Road. It offers substantial natural and entertainment amenity, and also includes a number of large development parcels which have good flexibility in the existing framework.
- **Area 2** - includes the large 'coastal lots' located generally between Rockingham Beach Road and Wanliss/Regan and Victoria Streets. The large lots, grid pattern and coastal proximity in this area offer good potential, however, land fragmentation is a challenge particularly when seeking to implement medium density development.
- **Area 3** - these proposed villages were based on the RCCTS alignment, and presented opportunities to generate employment opportunities and increased residential density. Development potential here, and in the surrounding campuses will ultimately be guided by the final transit alignment.
- **Area 4** - includes the City Park residential areas, this area shares many similar characteristics with Area 3, however, the lots are slightly smaller.
- **Area 5** - is the City Centre, it also offers good amenity and transport infrastructure. There are a number of substantial vacant development parcels with consolidated ownership.
- **Area 6** - includes the 'southern residential' lots, this area shares many similar characteristics with Area 3. However, the lots are slightly smaller and access to amenity varies throughout.

2.4.4 Land Use and Urban Structure

With an extent of 533ha, the RSC has and is proposed to include a diverse land use mix. **P2 - Figure 13** illustrates that there is a variety of residential and non-residential uses are distributed throughout the RSC as described below:

- There are two primary mixed-use nodes being the City Centre and Waterfront Village. These areas provide a variety of retail, food and beverage, commercial and residential uses. They are also the primary attractors for medium-high density residential;
- South Metropolitan TAFE, Murdoch University and Kolbe Catholic College form an education/campus precinct in the northeast;
- A Service Commercial/Light Industrial area exists between Dixon and Patterson Roads;
- There are a three (broad) existing residential areas, being the northern waterfront, central and southern residential. All areas comprise low-scale housing stock, however, the lots sizes and character varies throughout; and
- Two large undeveloped areas (Dixon Road playing fields, and Patterson Road) provide an opportunity for future development precincts with a mix of uses.

Site visits and analysis of these land uses determined that there were a number of distinct character qualities that applied to these areas, based on their existing built and landscape qualities.



P2 - Figure 13: Land Use

City Centre

The City Centre consists of large urban blocks, with grand winding streets and boulevards providing connectivity between the arterial roads that frame the RSC boundary. The shopping centre lot acts as an impervious barrier, due to its sheer size activation becomes difficult. Lots to the north and east of the shopping centre come in many shapes and sizes, with the road network forming an incongruous street pattern that limits wayfinding and sense of arrival.

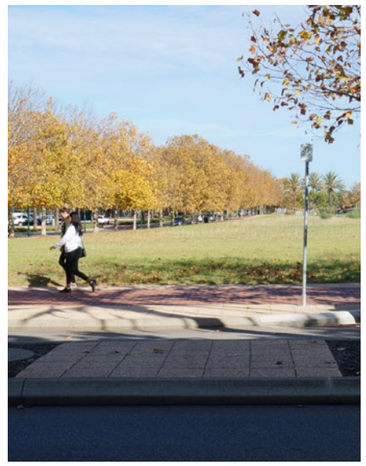
Key aspects of the City Centre:

- **Civic** - Grand, formal, and organised. The City's administration building acts as a prominent feature and wayfinding tool. An avenue of trees on Civic Boulevard adds to the formality, providing greenery, shade and an important link between City Park and Syren Street.
- **Rockingham Central** - From the air, the shopping centre appears as a place dominated by parking and concrete. At ground level, it is a tale of two very different street experiences. The majority of the building's interface is typified by blank walls and loading docks. In contrast, Syren Street is an oasis, with greenery, alfresco dining and a diversity of shop fronts creating a positive street interface and environment where the pedestrian reigns supreme.
- **Urban Commercial** - Nil setbacks and glazing are prominent in the area between Ameer and MacKinnon Streets. However, tenancies trade to car parks at the rear, leading to streets without true activation. Streets are formal and organised with good landscaping, though vacant lots make the area feel underutilised.
- **Read Street/Council Avenue** - Wide road reserves, large building setbacks and car parking dominate these thoroughfares. Presenting as a somewhat harsh environment for pedestrians, these areas are difficult to activate and more suited for vehicles than pedestrians or cyclists.

Character Statement - 'Varied character and undefined heart'

Developed over many years, the City Centre represents a tapestry of architectural and landscape styles. Its varied character and lack of coordination have led to a centre without a defined heart or cohesive theme. Though it emblemises potential, large vacant lots provide the opportunity to stitch it together.







Waterfront Village

As Rockingham's pre-eminent destination, the Foreshore area is unique in Perth with a predominantly north facing, foreshore reserve that is one of the best shaded and tree lined foreshores in Perth. Patterson Road and Read Street are the major arteries that connect to the Foreshore area to the remainder of Rockingham. Due to the amenity on offer, it is an attractive place to live translating into a noticeably higher scale of development in this area.

Key aspects of Foreshore:

- **Rockingham Beach Road/Foreshore** - Active street frontages interact with the Foreshore, where a constant hive of activity can be experienced during the day. Taller buildings are common, but trees mask their height from the Foreshore/beach front.
- **Kent Street** - One street back from the Foreshore, Kent Street has the potential to become a defined place for local art and culture. It is already the location of the Rockingham Arts Centre, Visitors Centre, and Rockingham Museum. Safer, better defined mid-block connections to the Foreshore could unlock its potential.
- **Village Green/Flinders Lane** - The area east of Flinders Lane offers a good example of local housing density and diversity with apartments and terraces. Whilst beautiful, the Village Green is often ignored with wide east-west oriented buildings prominent, as everyone is 'chasing the view'.
- **South of Patterson** - The width of Patterson Road and Read Street results in these areas being disconnected. They do not feel 'part of the area', reinforced by the style and types of buildings found here.

Character Statement - 'The beating heart where everyone wants to be'

Rockingham's Foreshore is part of its identity, buildings, businesses and people want to be here. Scale and height veiled by rows of prominent coastal trees stand aside to give generous room for a vibrant place along the coast for everyone to enjoy.







Coastal Lots

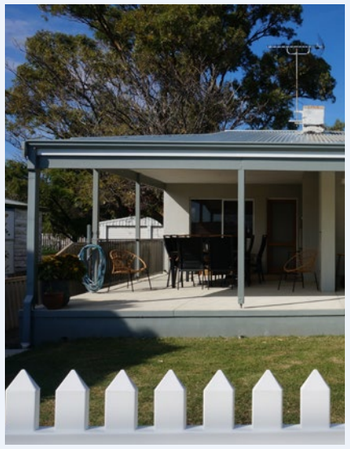
The urban structure of the coastal lots area includes a typical grid with quarter acre blocks. This type of development was common at the time of its establishment. Lot sizes and dwelling types are relatively consistent, though intermittent redevelopment has introduced new typologies over time.

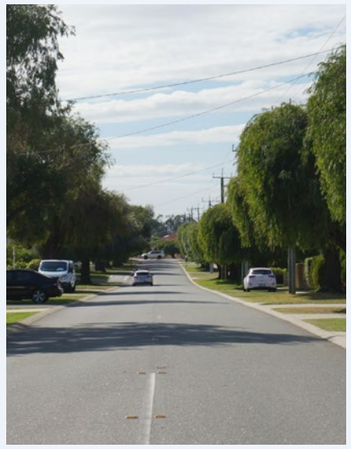
Key aspects of Coastal Lots:

- **Large Lots** - The area is typified by large lots with a diversity of low-scale housing types. Whilst there has been some redevelopment, previous planning controls required amalgamation of at least two lots to support development as such the original character has mostly been retained.
- **Modest Gardens and Houses** - Small houses on large lots are the most common typology in the area. Modest homes and gardens create a relaxed holiday feel. Interestingly, the tree canopy increases away from the coast where views of the ocean are no longer possible due to the flat topography.
- **Spacious** - Large front setbacks and wide roads create a sense of openness. If preserved, these qualities could support sensitive infill and redevelopment that does not diminish character.

Character Statement - 'Large lots and modest houses'

Traditional in nature, the existing development pattern reflect a previous era where large suburban lots reigned supreme. Introduction of new typologies has been intermittent, though a relaxed coastal feel has largely been preserved.







Southern Residential/City Park

Established throughout the 1970s to 1990s, these low density residential areas are typical of suburban development throughout these periods. A curvilinear street pattern with wide, winding streets and a prevalence of cul-de-sacs creates a car centric environment where permeability for pedestrians is limited. There are two dominant development types, referred to as 'relaxed suburbia' and 'compact suburbia'.

Key aspects of Southern Residential:

- **Relaxed Suburbia** - Typically larger traditional suburban blocks with low scale detached housing and large front setbacks. Winding streets create a relaxed feel, with trees found mainly within the private lot. A consistent approach in materials and building style reflect the period of establishment and a defined character.
- **Compact Suburbia** - Typically neat, compact homes that are part of grouped housing sites. Trees and greenery are replaced by roofs and driveways making for a substantially different type of character. Strata titling prominence makes redevelopment difficult, however, prominence of seniors/retirement living perform an important social role.
- **Radburn Pockets** - There are two notable examples of a Radburn Design influence with linear parks such as Haselmere Reserve (Southern Residential) and Warramunga/Kybra Mews Reserves (City Park) interspersed between pockets of housing.

Character Statement - 'Contrasting styles'

The contrasting styles of development are ever present: large lots versus compact lots; greenery versus hardscape. A blend of their positive qualities that could support quality infill.







Campus

The area is formed through a combination of sporting fields and three education institutions. Established at various points, there is little integration between these areas with each operating indepedently. There is a significant amount of vacant space which is difficult to activate. Outside of operating hours, it feels empty and desolate.

Key aspects of the Campus area:

- **Existing Campuses** - Buildings are typically set within the landscape in a traditional campus style. Spaces between buildings create public places and provide opportunities for greenery and trees. Substantial space exists to support future growth and development.
- **Dixon Road playing fields** - The proposed 'smart village' is currently occupied by the Dixon Road playing fields. The Mike Barnett Sports Complex will remain, however, there is an opportunity to consider how future development can help grow local knowledge industries, stimulate investment in the university, and support residential density.
- **Louise Street vegetation** - Environmental qualities of bushland to be determined through appropriate vegetation and flora and fauna surveys and retention of these values are guided by the environmental assessment.

Character Statement - 'Pockets of development, but largely empty'

Existing development includes low scale buildings set within the landscape with space between buildings and prominent greenery. Outside of these pockets, large, vacant underutilised spaces create a desolate and empty feel.

Dixon Road

The light industrial/service commercial area bounded by Dixon Road, Patterson Road and Ennis Avenue performs an important role in providing local employment. It was developed in two periods, the initial development occurred on Dixon Road in the 1970s and 1980s. Original sheds and workshops were eventually replaced by larger, bulkier buildings and an increased dominance of car parking. A substantial amount of local bushland exists south of Patterson Road.

Key aspects of the Light Industrial/Service Commercial area:

- No defined character or quality to signify entry into RSC.
- Environmental qualities of bushland to be determined through appropriate vegetation and flora and fauna surveys and retention of these values are guided by the environmental assessment.

Character Statement - 'Harsh and hard'

Minimal landscaping and a dominance of car parking and hardstand make for a harsh urban environment, with contrasting edge treatments either side of Dixon Road.

2.4.5 Public Open Space and Community Infrastructure

Landscape Context and Character

The Rockingham promontory did not exist 8,000 years ago. It developed as the offshore chains of islands eroded and deposited sand to form much of the coastline that exists today.

Pre-development the site was typical of coastal dunes of the Swan Coastal Plain, with the calcareous deep and yellow sands. Due to its coastal location the soil was never suitable for agricultural purposes rather it was primarily developed for residential with some industrial (which has since evolved further).

Over time, a series of different landscape nodes and types have emerged. These include natural areas, formal landscape (both parks and civic squares), playing fields, and of course the streets themselves. Analysis of the precinct has determined the following key public realm nodes:

- **Rockingham Beach Road** - The Foreshore/Rockingham Beach Road is one of the most unique foreshores in Perth as it is predominantly north facing and is densely populated with trees providing substantial shade. It is a hive of activity, ground floor uses spill out onto the street and the precinct is well used and loved by the community and visitors alike.
- **Rockingham Beach Plaza** - As part of the Rockingham Foreshore upgrades, the plaza was established in 2019. Unlocking new viewing and alfresco opportunities for neighbouring ground floor uses, it has become a popular destination amongst the local youth due to its openness and generous room to play.
- **Railway Terrace** - Creates a pedestrian-orientated link between the other waterfront nodes by providing uniquely broad, shaded, and buffered pathways with frequent inclusions of seating, landscaping, and colourful shade structures.
- **Kent Street** - A collection of attractions and uses including the Rockingham Arts Centre, Visitors Centre, Rockingham Museum, Creative Arts shop and the Village Green offer potential to become a culture and arts precinct.
- **Civic Plaza** - Nestled behind the City's Administration Building, the civic plaza is characterised by a grove of trees and seating nodes. It is formal in nature, but provides opportunities for respite for local workers.
- **Syren Street** - Rockingham's local 'eat street' is the most recent expansion of Rockingham Central. Numerous eateries, and entertainment venues (including a cinema) assist with activation throughout the day and night. A series of landscape and traffic calming initiatives make for an attractive and pedestrian-focussed environment.

The site topography prior to development notes longer linear dunes that lay perpendicular to the prevailing south west winds. Whilst much of these formations have been levelled and built upon, evidence of these dunes are still seen in some places and are a key part of the character of Rockingham. Whilst there are some smaller localised higher points, the current topography for the area is reasonably flat with levels generally 6m AHD in the south falling toward the coast which is generally 4m AHD.

Public Open Space

Given the value of POS within the community, the City has a responsibility to ensure there is appropriate provision for multi-purpose public open spaces which offer a range of functions and are accessible to the local community. The City's POS hierarchy includes four categories, the typical size, catchment and function is provided in **P2 - Table 11**, with a quantification of the spaces currently provided in the RSC.

P2 - Table 7: POS Hierarchy

Type	Size	Function	Existing RSC POS
Pocket 200m/3 min walk	<0.4ha	Passive Recreation	Haselmere Circus (0.06ha) Sepia Court Reserve (0.48ha) Derwent Park (0.26ha) Leghorn Street Park (0.20ha) Sycamore Park (0.13ha) **Pocket Park Total = 1.13ha**
Local 400m/5 min walk	0.4ha - 1ha	Passive Recreation Active Sport Nature	Benjiman Reserve (0.57ha) Emerald Park (0.57ha exc. Foreshore reserve) Phoebe Hymus Park (0.75ha exc. Foreshore reserve) Houston Reserve (0.90ha) Warramunga Reserve (0.81ha) **Local Park Total = 3.60ha**
Neighbourhood 800m/10 min walk	1ha - 5ha	Passive Recreation Active Sport Nature	Kybra Mews Reserve (1.20ha) Ashford Avenue Reserve (1.30ha) Churchill Park (1.35ha) Bell Park Reserve (1.65ha) Haselmere Reserve (1.89ha) Careeba Reserve (3.20ha) Village Green (3.40ha) **Neighbourhood Park Total = 13.99ha**
District 2km from home	5ha - 15ha	Passive Recreation Active Sport Nature	Anniversary Park (6.68ha exc. buildings and car park) City Park (9.38ha) **District Park Total = 15.98ha**
Total Useable POS			**34.70ha**

This demonstrates that there is currently an approximate 34.7ha of useable POS, as the above excludes the Foreshore reserve and vegetated areas. The estimated 34.7ha also does not include the following areas, demonstrating that there are opportunities to increase the amount of useable open space should the need arise:

- Dixon Road Playing Fields = 11.45ha (only includes historical playing fields not vegetated area on Louise Street);
- Murdoch University/TAFE = 6.23ha (vacant, not used for public open space); and
- Kolbe College = 3.4ha (privately owned, access could be restricted).

P2 - Figure 14: Public Spaces and Heritage

Legend

- Existing Centre Plan Boundary
- POS Catchments
- District Open Pace (800m)
- Neighbourhood Open Space (800m)
- Local Open Space (400m)
- Pocket Park (200m)
- Existing Playing Fields
- Nature/Other Reserve
- Community Infrastructure
- Local Heritage Survey
- Public Realm Nodes
  1. Rockingham Beach Road
  2. Rockingham Beach Plaza
  3. Railway Terrace
  4. Secondary Main Street (Kent Street)
  5. Civic Plaza
  6. Syren Street





In comparison to other Strategic Centres, the RSC has substantially more useable open space. Joondalup, the most comparable in size and scale only has 11.58ha (2.4%). Morley (6.76ha or 3%) and Armadale (5.95ha or 7.5%) provide more (than Joondalup), whilst Canning was one of the better performing centres (19.41ha or 9.9%), however, a substantial amount of this is associated with the Canning River Foreshore. What the high-level comparative analysis demonstrates, is that highly urbanised centres typically have limited access to quality public open space. Despite this, the RSC is well positioned as it is currently better serviced by a diversity of open space types when compared to other centres of its type **(P2 - Figure 14)**.

Community Infrastructure

With regards to community infrastructure, the RSC is currently serviced by a variety of community infrastructure facilities such as:

- Gary Holland Community Centre;
- Autumn Centre;
- Rockingham Bowls Club;
- Rockingham Aquatic Centre;
- Anniversary Park Hall/Rockingham Men's Shed;
- Rockingham Library; and
- Mike Barnett Sports Complex.

The Mike Barnett Sports Complex, is currently the only dedicated indoor recreation centre in the RSC. Further detailed analysis of the current form and function of Mike Barnett Sports Complex and any necessary facility upgrades are included in the City's Community Infrastructure Plan, with a master plan to guide the ultimate footprint of the facility.

Regarding education, the RSC currently includes the following collocated facilities:

- Kolbe Catholic College;
- South Metropolitan TAFE; and
- Murdoch University.

Rockingham Senior High School is also on the border, located on Read Street. Regarding future provision, the RPSP will need to have consideration for potential growth impacts and what that may mean for future education facilities. The Department of Education and the main non-government education providers typically require one primary school site per 1,500 and 1,800 housing units for government schools.

2.4.6 Heritage

The term "Cultural heritage significance" means aesthetic, historic, scientific, social or spiritual value for past, present or future generations (ICOMOS Burra Charter, 2013). When using the word heritage, the City considers: Natural Heritage; First Nations Heritage; Historic Heritage; and Tangible and Intangible Heritage. In 2020 the City prepared a Heritage Strategy, which sets the future direction for heritage management.

First Nations Heritage

The First Nations peoples of the south-west of Western Australia are collectively known as the Nyoongar (also spelt Noongar, Njonga, Nyungar, Nyunga, Yunga, Nyungah) peoples. The histories of First Nations peoples in connection to what is now known as the City of Rockingham today relates to mainly the social organisation, land relationships, events and experiences in the area, as the current boundaries of the City do not reflect the First Nations cultural groupings prior to the contact and settlement period.

A search of the Department of Planning, Lands and Heritage **(DPLH)** controlled Aboriginal Heritage Inquiry System **(AHIS)** was conducted on 22 July 2021 (by Cardno). This database incorporates both the Heritage Site Register and the Heritage Survey Database. The Heritage Site Register is held pursuant to Section 38 of the State's *Aboriginal Heritage Act 1972* and contains information on over 22,000 Aboriginal sites throughout Western Australia.

The search of the AHIS Site Register database did not identify any registered sites within the RSC, though it is acknowledged that RSC is on land within the Gnaala Karla Booja Indigenous Land Use Agreement.

There are major opportunities for the RPSP to explore how planning for the RSC can improve and enhance the sense of place and belonging for First Nations people.

Historic Heritage

The presence of historical or current European Heritage sites was investigated using the Commonwealth Department of Agriculture Water and Environment, Australian Heritage database and the State Heritage Council database. The Heritage Council WA database contains information regarding natural and historic places throughout Western Australia.

Several heritage sites listed on the City's Local Heritage Survey are located within the RSC. As shown on **P2 - Figure 14**, these are typically concentrated around the Foreshore and on Kent Street reinforcing its potential as a place to celebrate local culture and the arts. No State Heritage sites are identified. A review of these sites has since been undertaken, with those worthy of protection identified in Section 5.1.



2.4.7 Environment

Cardno, UDLA and Hames Sharley undertook a high-level assessment of the existing environmental conditions in the RSC. The objective of the assessment was to gather relevant environmental data associated with the RSC to support the context analysis. Background information and data was sourced from government agency database searches, requests and other publicly available information.



P2 - Figure 15: Natural Environment

Vegetation

There is evidence (observed by historical aerial photography) that the remnant vegetation within the study area has been a fairly recent addition through revegetation efforts and self seeding of these plants. The taller vegetation is the Eucalyptus gomphocephala 'Tuart' which is the dominant tall tree of the Swan Coastal Plain. Much of the remnant vegetation is typical of the lower growing Acacia species and coastal heathland species. The foredune area appears to be only recently revegetated during the 90s to 2000s.

The remaining dune vegetation and heathland provides important broader ecological and biodiversity corridors from the 'Bush Forever' sites located to the east of Ennis Avenue and beyond. Whilst this vegetation would not be characterised as the original pre-colonial vegetation it does add to the landscape character, particularly its location adjacent a key road (Patterson Road) into the RSC and importantly adjacent the beach and Foreshore area.

These remnant vegetation areas are important today as they are into the future so the people that inherit these landscapes will have them in the areas they will want them the most; near the coast and urban areas.

Wetlands and Surface Water Bodies

Conservation category wetlands were identified within the RSC (see **P2 - Figure 15**), which have the highest priority for conservation. However, these sites have been previously earmarked for development. Analysis of historical aerial photography suggests that this designation could be a legacy as the site is predominantly cleared. The Department of Biodiversity, Conservation and Attractions (DBCA) is the current custodian of the wetland mapping dataset for the Swan Coastal Plain. Justification (i.e. through a wetland identification and/or delineation investigation) must be provided to the DBCA for an existing mapped wetland area to be modified to the status of 'No longer a wetland'.

Coastal Hazards

In 2019, the City prepared the CHRMAP. In the context of the RSC, this includes Sector 1 (municipal boundary to Wanliss Street) and Sector 2A (Wanliss Street to Garden Island Causeway). **P2 - Figure 15** illustrates the potential erosion and inundation risks, as defined in the CHRMAP. Findings include:

- The risk of erosion in both sectors increases substantially by 2070, with the majority of the Foreshore at risk. By 2110, the risk extends beyond Rockingham Beach Road impacting adjacent properties.
- The risk of inundation in both sectors is quite limited (within the RSC). Localised flooding can be expected for 1:50, 1:100 and 1:500 Average Recurrence Interval storm events in parts of Rockingham Beach Road (near Wanliss Street).

The CHRAMP identifies that both short and long-term measures will be required to protect these areas from coastal erosion. The role of the PSP, will be to ensure that these risks are understood and factored in to future planning decisions.

Other Environmental Considerations

A summary of additional environmental findings is presented below.

- Surface geology comprises Calcareous Sand of the Safety Bay Sand.
- No area of the site is mapped as having a known risk of acid sulfate soil occurring within 3m of ground surface.
- Priority and Threatened species are likely to occur within the RSC.
- Most of the planning envelope is within an Environmentally Sensitive Area (ESA) due to the presence of Threatened Ecological Communities (TECs) and a conservation significant wetland within the area. Any clearance permit application will require a flora and fauna survey to be conducted.
- There are no Bush Forever sites located in the RSC. There is a Bush Forever site located directly to the east of the RSC.
- A number of areas within the RSC are identified as being bushfire prone.
- The Kwinana Industrial Area air quality buffer limits development of 'sensitive' land uses within this area.
- Five land parcels within a 1 km radius of the RSC have been assigned a contaminated sites classification by the DWER.

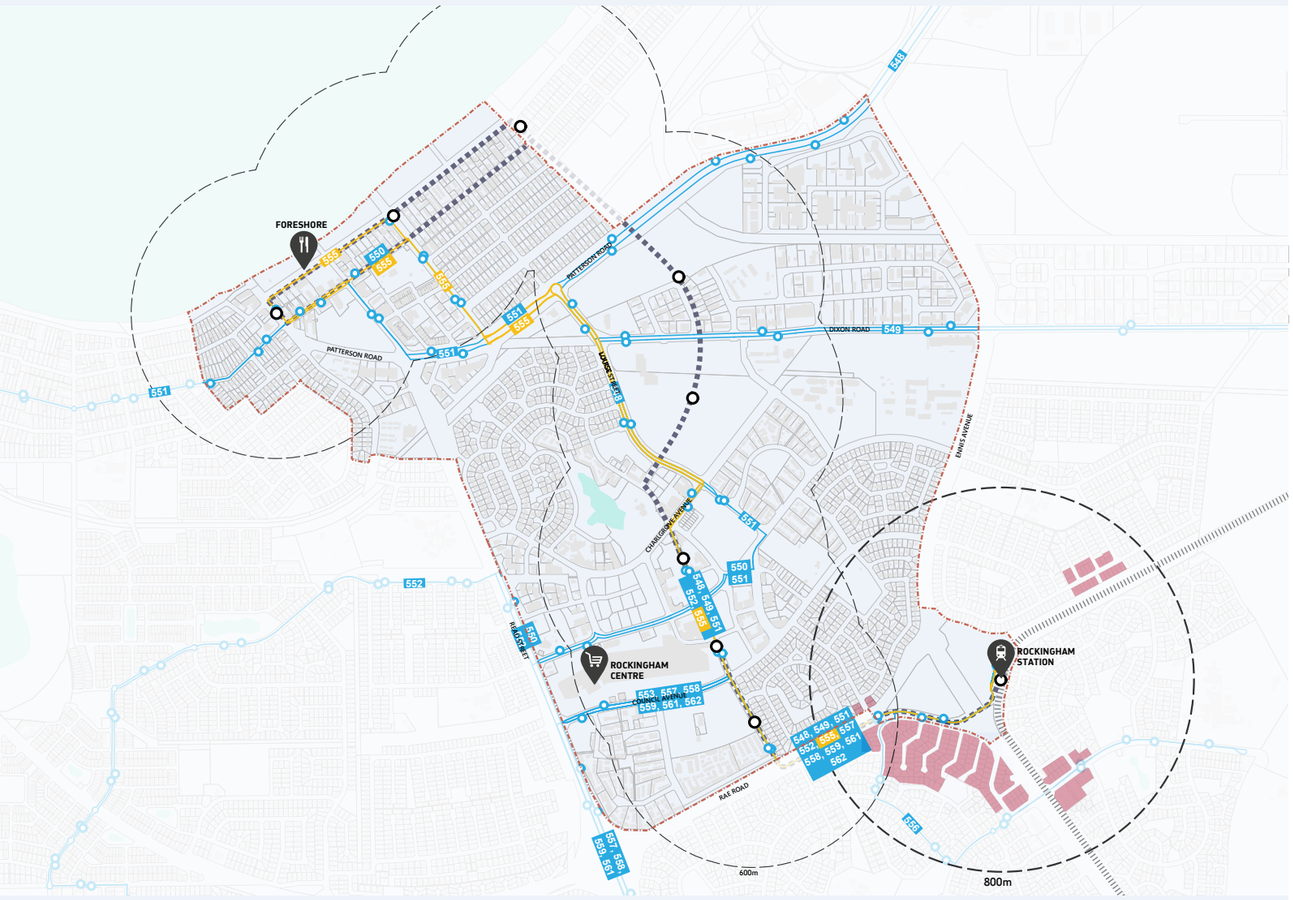
In summary, there are a number of environmental considerations in the RSC, however, no major constraints on future development are identified. **Appendix 2** provides further information.

2.4.8 Public Transport

Passenger Rail

The RSC is currently serviced by rail, with high frequency services connecting passengers to the Perth CBD in 40 minutes. Unfortunately, one of the primary limitations of passenger rail in the RSC is the location of the Rockingham Train Station itself. The majority of patrons access the station via park and ride, and bus. Major physical barriers such as Ennis Avenue, Rae Road and PTA parking areas limit cycling and walking access. Pedestrian access is noticeably poor, with only a small proportion of households in the walkable catchment truly able to access the station on an 800m (see **P2 - Figure 16**) walk. As such, interventions which consider how to improve station access to properties within the RSC need to be explored.

P2 - Figure 16: Public Transport



Buses

The RSC is serviced by a number of buses, most of which connect surrounding residential areas with Rockingham Central and Rockingham Train Station. Of these routes, Bus 555 (the Rockingham Shuttle) is the best performing Rockingham area bus route. It connects key RSC nodes such as the Rockingham Train Station, Rockingham Central and the Rockingham Foreshore. Buses typically run every 10 minutes in off-peak, to run in parallel with the frequency of trains.

Advice from the PTA is that the shuttle bus's high frequency and long span of hours is critical to its success. However, as the route is completely funded by the State it is not currently a priority for upgrades (unless costs can be offset by additional funding partners).

Future Public Transport

As explained in the 'development potential' section to cater for future population growth and support the City's LPS, the City has supported establishment of the RCCTS, a fixed route transit streetcar system that is designed to link major activity nodes starting at the Rockingham Train Station and traversing through the Rockingham City Centre, proposed TOD Village and the Rockingham Foreshore.

The implementation of the RCCTS is expected to result in the following:

- Increase connectivity between major activity nodes;
- Support growth of existing and new business opportunities;
- Increase public transport access from the Rockingham Train Station; and
- Unlock potential to incentivise development, through TOD opportunities around transit stops.

Bus priority measures between Rockingham Train Station and Charlgrove Avenue perform an important role in future proofing the proposed route. Similar measures could be implemented in other parts of the RSC.

To ensure the RCCTS route is safe and functions to meet the City's vision, potential risks with the proposed expanded RCCTS route have been identified. Locations have been identified where the proposed RCCTS route poses a potential risk to the existing road and public transport network. Traffic controls at the four-way intersections in the form of signals or roundabouts at the following locations are likely to alleviate potential risks at Patterson Road, Dixon Road and Louise Street.

The ultimate preferred alignment of the RCCTS, was explored in **Section 5.4.1** to support the vision and deliverability of the PSP.

2.4.9 Active Transport

Cycling

The existing pedestrian and cyclist network in the RSC is generally in good condition providing direct, continuous links to key destinations. Extensive shared path and good road riding infrastructure have been identified in strategic mapping. However, there are some routes that have been incorrectly identified and require amendment. Additionally, there is an opportunity to recognise and strategically represent existing good quality walking and cycling environments that are currently not identified. Extending existing shared path infrastructure will improve connectivity and continuity throughout the RSC, especially to direct people from the Rockingham Train Station and City Centre to the Rockingham Foreshore.



Pedestrian

Given the size and scale of the RSC, pedestrian movement is focussed more on localised trips within key areas such as the City Centre and Foreshore. Broader pedestrian movement is somewhat limited, with a number of factors such as physical distance, lack of amenity (e.g. shading and weather protection); and safety (due to prioritisation of cars in most areas). Some areas observed as providing a high quality pedestrian environment include Syren Street and the Rockingham Beach Foreshore. Traffic calming and reduced road speeds have been implemented in these areas to promote safety as they are highly pedestriansed areas.

2.4.10 Vehicle Movement

Roads

As a mature centre, the RSC road network is well established, providing important connections to local neighbourhoods, surrounding activity centres, and strategic employment areas such as the Global Advanced Industries Hub. The RSC's boundary is effectively framed by major roads such as Ennis Avenue, Patterson Road, Read Street and Rae Road.

The arrival experience into the City Centre is one where potential improvements could be made. The existing urban structure has resulted in a somewhat convoluted road network that impacts on legibility. Whilst major upgrades to local roads are not expected, some potential changes in the City Centre could be of value. Some new connections are also to be expected in areas where future development is proposed.

An assessment of the Main Roads Western Australia (MRWA) functional road hierarchy has determined that the following classifications are present in the RSC:

- **Primary Distributors:** These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast-moving traffic. Some are strategic freight routes and all are National or State roads. They are managed by MRWA and include Ennis Avenue.
- **District Distributor A:** These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by the City, and include key local routes such as Patterson Road, Dixon Road, Read Street and Council Avenue.
- **Local Distributors:** Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the local distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks.
- **Access Roads:** Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by the City.

The Traffic Impact Assessment provided in **Appendix 3** has undertaken an assessment of Regional Operations Model (ROM) data, and a high-level road network safety review. A number of potential intersection upgrades are identified, which is summarised in **Section 5.4.1**.

Parking

As a predominantly car dominant centre, the RSC is serviced by a range of public and private car parks - the largest of which is provided at Rockingham Central.

With regard to delivery of public parking, this is guided by the City's 'Rockingham Strategic Metropolitan Centre Public Parking Strategy'. Using Licence Plate Recognition cameras in three timeslots between 9.30 am and 5.30 pm, 1,130 on-street and off-street bays were surveyed in the Waterfront Village and 816 bays in the City Centre, plus approximately 500 of the 3,229 bays in the Rockingham (Shopping) Centre, this determined that:

- In the City Centre, the average occupancy for all on-street parking was generally below 75% across the entire day. Several streets reached a peak occupancy of over 80%.
- The average occupancy for the off-street public carparks within the City Centre was above 60% for almost all carparks, with the peak occupancy being above 80%.
- In the Waterfront Village, the average occupancy for all on-street parking was less than 70%, with the busiest areas located on Rockingham Beach Road, Railway Terrace and Val Street.
- The average occupancy for the off-street public carparks was quite high for the parking areas adjacent to Rockingham Beach Road, which included the carparks at the end of Railway Terrace and Flinders Lane. These carparks had an average occupancy of 92% and 68% respectively.

Based on this assessment, it can be determined that due to the number of vacant bays observed during both surveys that the two precincts are likely experiencing more of a parking management problem, rather than a parking supply problem as all of the available parking is not being used effectively.



P2 - Figure 17: Private Vehicle Movement

2.5 Response to Context

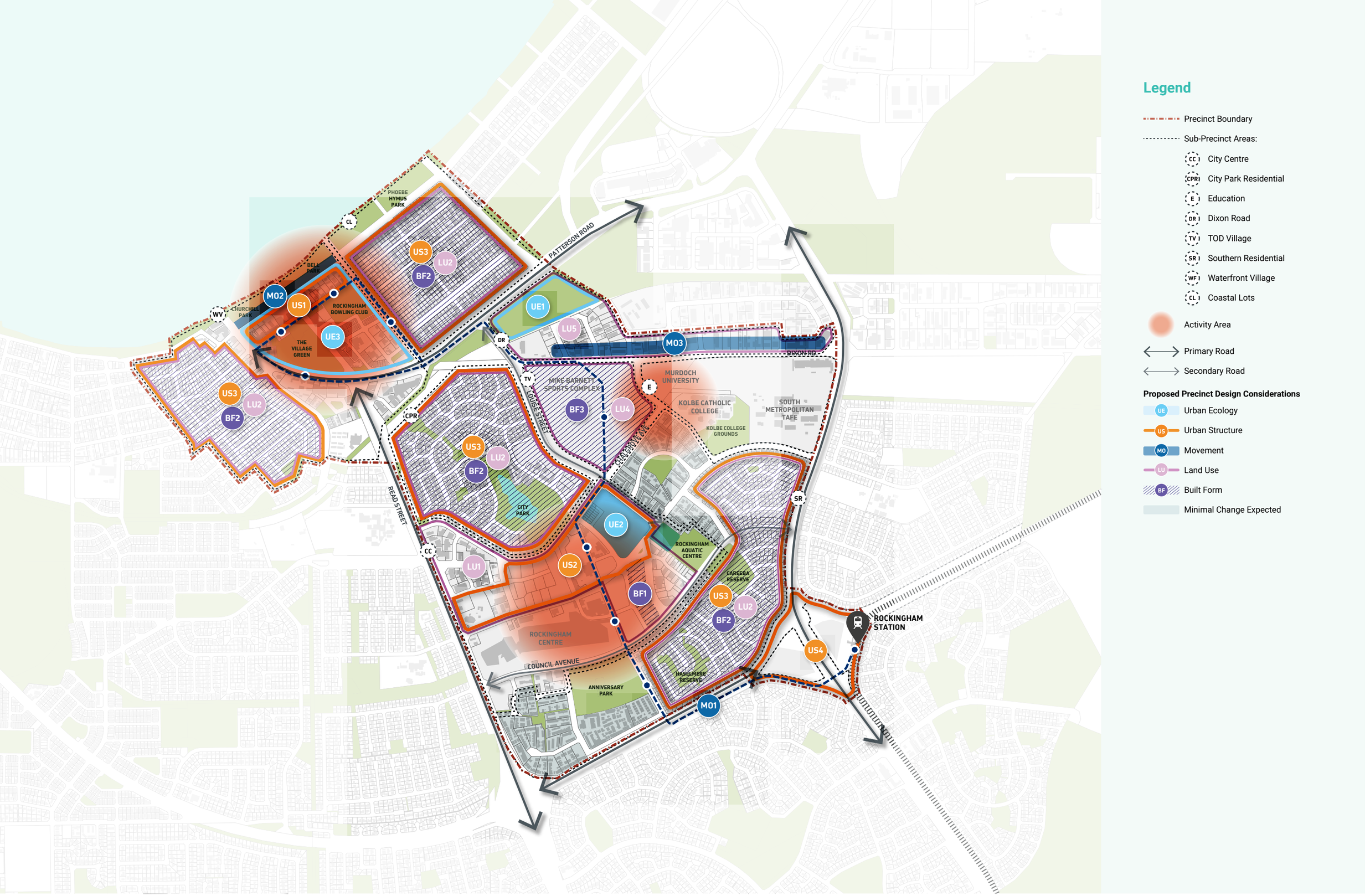
Sections 1.1-1.4 provide a thorough analysis of the RSC, the outcomes of which will directly inform the design process. **P2 - Table 8** and **P2 - Figure 18** provide a detailed summary and visual illustration of the key design considerations, including recommendations/actions for elements which require further interrogation and testing. The responses have been framed using the six key design elements from SPP 7.2. It is acknowledged that some of the design considerations/actions are closely linked across multiple design elements, these instances are reference in **P2 - Table 8**.

As part of this process, the boundary of the RSC has been reviewed, the proposed boundary is illustrated on **P2 - Figure 18**. The primary change is that parts of the light industrial area north of Dixon Road have been removed due to their separation from the broader RSC.

P2 - Table 8: PSP - Key Design Considerations

Ref.	Issue/Opportunity	Design Considerations/Actions
UE-1	The existing remnant vegetation on Lot 501 Patterson Road and Lots 502 and 503 Dixon Road is located within a defined ESA. The current RCCTS alignment runs through part of this area, however, it needs to be considered that any clearing would require a flora and fauna study to be undertaken by the proponents prior to development and/or subdivision unless otherwise exempt.	Due to the identified environmental considerations and limited tree canopy in the light industrial area, it is recommended that the PSP design considers retention of some vegetation/green space in this area. However, this would need to be balanced against employment objectives and the RCCTS operational requirements. Consideration could also be given to an alternate realignment for the RCCTS, if required.
UE-2	Lot 201 (Charlgrove Avenue) and Lot 103 (61 Council Avenue) contain conservation category wetlands. These areas require the highest level of protection, however, analysis of aerial imagery suggests that ongoing development and historic clearing have diminished their roles and function as wetlands.	Liaison with DBCA should be prioritised to ensure that development is possible, particularly on Lot 201. Analysis of aerial photography suggests that vegetation on Lot 103 looks to be in much better condition, further environmental investigations to determine quality are required.
UE-3	There is a concentration of properties listed on the municipal heritage inventory in the waterfront area on Kent Street and Rockingham Beach Road. These properties combined with various cultural and tourism facilities such as the Rockingham Arts Centre, Visitors Centre, Rockingham Museum and the Village Green.	Explore opportunity to build on this concentration of uses, possibly through the establishment of a cultural/arts precinct in the Kent Street area to celebrate Rockingham's heritage.
US-1	Kent Street is identified as having the potential to become a secondary main street, supporting the retail and entertainment functions in the Foreshore area. However, there are currently limited defined and safe mid-block connections between Rockingham Beach Road and Kent Street.	PSP design to map key desire lines and consider where appropriate mid-block connections could be provided.
US-2	The urban structure of the City Centre will be essential in delivering the RSC's vision. A number of large, vacant lots and a convoluted road network both impact the existing urban morphology. Interventions in these areas are likely to be delivered over many years and development may be subject to future subdivision. Therefore, to ensure that the City Centre supports a highly permeable and flexible urban structure, consideration should be given to a revised road network with appropriate lot sizes that can accommodate different types of development in the short or medium term, while reducing the impact of achieving a long term vision.	PSP design to carefully consider design and provisions for large vacant lots to ensure they can cater for a diversity of short, medium and long term uses and are future proofed to adapt to long-term change if/when the City Centre's needs change. ***Linked to LU-1***
US-3	Larger single residential lots offer opportunities to support medium density infill development. High fragmentation of ownership in these areas resulted in the previous planning framework including minimum lot provisions that require amalgamation. Stakeholders have raised some concerns with these requirements, highlighting that a review is required.	Design testing (supported by economic testing) should be undertaken to determine if the existing requirements are appropriate. It is imperative that any provisions ensure that quality infill can occur, guidance should be sought from the draft Medium Density Policy (SPP 7.3 - Volume 1). ***Linked to LU-2*** ***Linked to BF-2***
US-4	Existing physical barriers significantly limit the efficiency and effectiveness of the Rockingham Train Station walkable catchment. Interventions that improve station access (for pedestrians and cyclists) should be considered.	PSP to explore opportunities for new connections/infrastructure investment that could improve walkability in the Rockingham Train Station catchment.
PR-1	The RSC is a highly urbanised environment. Large road carriageways, at-grade parking and denser housing forms are all contributing to a limited tree canopy and present challenges for water sensitive urban design (WSUD). With major density increases proposed, it is imperative that these design elements are considered and prioritised.	PSP to explore opportunities to retain and increase the urban tree canopy and provide guidance on measures which can be implemented to support WSUD. Where possible, planting of natives should be considered as recommended by community.
PR-2	As described in LU-1 development and activation of the City Centre has been challenging due to a number of contributing factors. It has been observed that the City Centre lacks a defined heart. Key nodes such as Syren Street and the civic square have good qualities, but are not clearly linked. Due to wide roads and vacant lots, the human scale is sometimes lost. There is an opportunity for the public realm to play a leading role in activating underutilised parts of the City Centre.	PSP design to carefully consider opportunities for public realm interventions in the City Centre to assist with activation. Special attention should be paid towards Syren Street/Civic Boulevard, as these roads and frontages are proposed as being high activity areas.
PR-3	Developed over many years, the built and landscape character of the RSC varies. Each period of development brings unique qualities, though this has resulted in stark contrasts which make branding, wayfinding and 'place awareness' difficult.	PSP design to explore opportunities for a more consistent approach to delivery of public realm infrastructure (e.g. signage, furniture, paving). It is important though that localised sub-precinct character is still celebrated. An example could include the RCCTS and supporting infrastructure (e.g. stops, shelters, paving and signage) being used to create a suite of unifying landscape elements that define the RSC. This could allow the broader public realm design in each sub-precinct to reflect the unique character qualities.
MO-1	Establishment of the RCCTS will allow public transport to be strengthened throughout the RSC. Exploration of modes such as light rail or trackless tram will allow a defined Tier 2 transport system to be established, providing enhanced connectivity between the Rockingham Train Station, City Centre, Education Sub-Precinct and Rockingham Foreshore. It also offers the added benefit of supporting increased densities, reducing pollution, easing traffic congestion, and incentivising development in the area, supporting precinct-wide sustainability.	PSP to ensure that RCCTS remains a central focus of design, with a focus on residential density and activation, as appropriate. Exploration of a refined alignment could be considered in light of new technology and other factors (such as feedback from PTA on current operations considerations, improved connections to TAFE). As delivery is likely to occur over many years, opportunities to future proof the alignment through short-medium term interventions (such as bus priority and enhanced bus stop amenity) should also be considered.
MO-2	Due to its popularity, the Rockingham Foreshore area and surrounds is a hive of activity, particularly at peak visitor times (e.g. on weekends). This has resulted in traffic increases and major demand for parking along Rockingham Beach Road. Parking demand management is recommended throughout the RSC, though addressing it in the Waterfront Village should be a matter of priority.	PSP to explore opportunities for a revised approach to traffic movement and parking management in high-activity areas such as the Foreshore and City Centre. Review of Rockingham Strategic Metropolitan Centre Parking Strategy should be undertaken to inform analysis.

Ref.	Issue/Opportunity	Design Considerations/Actions
MO-3	Businesses within the light industrial area north of Dixon Road suffer from poor connectivity between each other. There are issues with easements which leads to traffic movements in and out of access driveways that increase congestion and crash risk.	PSP to explore opportunities to establish a more coordinated approach to access and parking in the light industrial area (along Dixon Road).
MO-4	Key activity areas such as the City Centre, Foreshore and Education Sub-Precincts are likely to support the greatest concentration of pedestrian and cyclist journeys. The current design of the movement network in the RSC still prioritises vehicle movement, with pedestrian movement only prioritised in some targeted areas (e.g. Syren Street and Rockingham Beach Road). Improving safety and quality of active transport journeys will be essential in supporting greater precinct activation.	PSP to define key pedestrian/cyclist routes and desire lines to ensure that built form, public realm and intersection design responses support safe and high-amenity connections. This will also include careful consideration of stops along the RCCTS alignment.
LU-1	Due to challenging market conditions and land ownership patterns, development in the City Centre has stagnated over the last decade. Many large lots have remained vacant, due to a conflict between long term vision and short term development feasibility. To stimulate activity and attract investment, consideration for more flexibility or interim development opportunities has been identified as a potential way forward by stakeholders.	PSP to interrogate and review existing planning provisions to identify where opportunities for flexibility could be considered. It is likely that this be focussed primarily in the City Centre, where development activity/interest is more pronounced. ***Linked to US-2***
LU-2	The existing large residential lots in the Coastal Lots and Southern Residential sub-precincts (refer US-3) are currently permitted residential densities between R60-R100, and heights ranging from three to eight storeys. The community raised concerns about what this density looks like, and how it is delivered with such highly fragmented ownership. In addition, consideration for SPP 7.2 feasibility requirements and draft principles and provisions set out in the draft Medium Density Policy (SPP 7.3 - Volume 1) will also be required with new approaches to deep soil, site cover potentially impacting existing Centre Plan controls.	Design/economic testing proposed in US-3 to also consider different approaches to residential density in light of draft Medium Density Policy (SPP 7.3 - Volume 1). ***Linked to US-3*** ***Linked to BF-2***
LU-3	The existing Centre Plan proposed concepts over the Dixon Road playing fields, in what is referred to as the 'Smart Village'. It is expected that the design would need to be revisited due to the following reasons: • The potential realignment of the RCCTS; • Confirmed retention of the Mike Barnett Sports Complex; • Strong community desire to retain some open space; • Consideration for retention of bushland and trees; and • Community identified some concerns with the proposed built form controls in the existing Centre Plan.	PSP to review and explore alternative design options for the Smart Village, having consideration for the existing context and any potential changes to the RCCTS. Any new development will be required to provide public/urban spaces, and should focus on residential density and white collar employment opportunities. Relevant urban structure and built form considerations will also need to be factored into the review. ***Linked to BF-3***
LU-4	Key stakeholders such as Kwinana Industries Council and Development WA signalled a clear intent that encroachment of sensitive land uses (e.g. residential) into the Kwinana Industrial Area buffer need to be avoided at all costs.	PSP to provide clear guidance on land use permissibility within the Kwinana Industrial Area buffer to ensure continuity and integrity of employment lands adjacent to the RSC.
LU-5	Rockingham's employment profile has the opportunity to create additional jobs which support greater diversity of employment within the RSC, and improve employment self-containment. Planning of future floorspace in the RSC needs to consider how employment generating land can be clustered, to establish defined commercial hearts.	PSP design should consider design testing that explores different approaches to street activation to deal with active street edges. It is acknowledged that different building types and sub-precincts in the RSC will require unique approaches.
BF-1	The previous Centre Plan promotes development types that embody 'main street' principles and high street activation. Whilst sound in theory, the current models that have been delivered in the City Centre are not operating effectively. Many businesses use blinds and other measures to block out glazed areas, with access to businesses promoted from the rear car parks not the street meaning true activation is not being achieved. New research into how buildings interface with the street should be considered to get the balance right. A blurring of the private/public sphere through landscaping and other measures can promote greater opportunities for people to interact in the street, be it a commercial or residential use.	PSP design should consider design testing that explores different approaches to street activation to deal with active street edges. It is acknowledged that different building types and sub-precincts in the RSC will require unique approaches.
BF-2	See LU-2.	Review of planning provisions proposed in LU-2 to also consider built form envelopes, focussing specifically on elements such as building heights, setbacks, street activation. ***Linked to US-3*** ***Linked to LU-2***
BF-3	See LU-3.	Design testing proposed in LU-3 to also consider built form envelopes, focussing specifically on elements such as site cover, building heights, setbacks, deep soil and open space. Privacy and open space will also need to be considered. ***Linked to LU-3***



P2 - Figure 18: PSP - Response to Context

03

Stakeholder and Community Participation



3.1 Engagement Summary

In preparing the RPSP, preliminary stakeholder and community engagement was undertaken between June and August 2021. In order to seek feedback, the following engagement activities were undertaken for the project:

- Community and business workshops
- Individual stakeholder meetings
- Online interactive mapping tool
- Online survey

A summary of the feedback received and the outcomes that have informed the RPSP are provided below.
A copy of the full engagement report is provided in **Appendix 7**.



3.1.1 Summary and Outcomes

The community and businesses who engaged with this first phase of the planning framework review, were extremely passionate about the area. The project team received a broad range of feedback. The key themes identified throughout the engagement period are outlined and categorised based on the design principles of SPP 7.2. A high-level summary is provided below.

Urban Ecology

- Strong support for use of native plants.
- Support for more greenery, landscaping, wildlife corridors etc.

Public Realm

- Support for improved pedestrian environment - paths, lighting, crossings etc.
- Support for play spaces and recreation facilities.
- Support for more greenery.
- Support for activating the Foreshore.
- Support for beautification of area (e.g. through artwork, colour, greenery etc).

Land Use

- Support for more entertainment and active uses.
- Support for community, arts and culture facilities.
- Support for sport and recreation facilities.
- Support for proposed marina.

There was divergent perspectives on dwelling types and land uses dependent on the area within the RSC.

Urban Structure

- Suggestion for improved permeation for pedestrian movement.
- Suggestions around traffic movement along Rockingham Beach Road.

Movement

- Support for improved cycling networks/facilities.
- Support for good pedestrian network (paths, crossings).
- Suggestion to reduce traffic speeds and volumes along Rockingham Beach Road.
- Support for more parking.
- Suggestion for a free CAT service/shuttle through the precinct.

Built Form

- Support to update and modernise old buildings
- Suggest for design that reduces concrete on buildings.

There were divergent views on building types, densities and building heights dependent on the area within the RSC.

Vision and Principles

During the engagement there were no direct comments from the community regarding the validity of the previous Centre Plan vision. Notwithstanding this, some clear themes and elements (highlighted in **Appendix 7**) were valued by the community, but not adequately captured in the existing vision.

In reviewing the existing vision there was an opportunity to include greater reference to some of these themes. Interweaving commonly reported elements such as 'greenery', 'pedestrian focused' and 'unique coastal atmosphere' will allow for a tangible response to the pre-engagement outcomes, and a more distinguished precinct vision.

These common themes were carried through and referenced in the RPSP Vision and Principles (provided in **Section 03**).

Planning System and Framework

A key theme raised by the business community was the need to ensure greater flexibility in the planning framework to respond to market needs. However, this needs to be balanced with enough robustness to provide certainty.

Having a robust, flexible planning framework will provide land owners and developers greater scope to develop and activate their property whilst also ensuring the long term vision of the RSC can be achieved.

Raising Public Awareness

During the engagement process it became evident that there was a lack of awareness of the previous Centre Plan. This represents an opportunity for this process to enable a greater level of awareness of the RPSP, providing a clear framework for all.

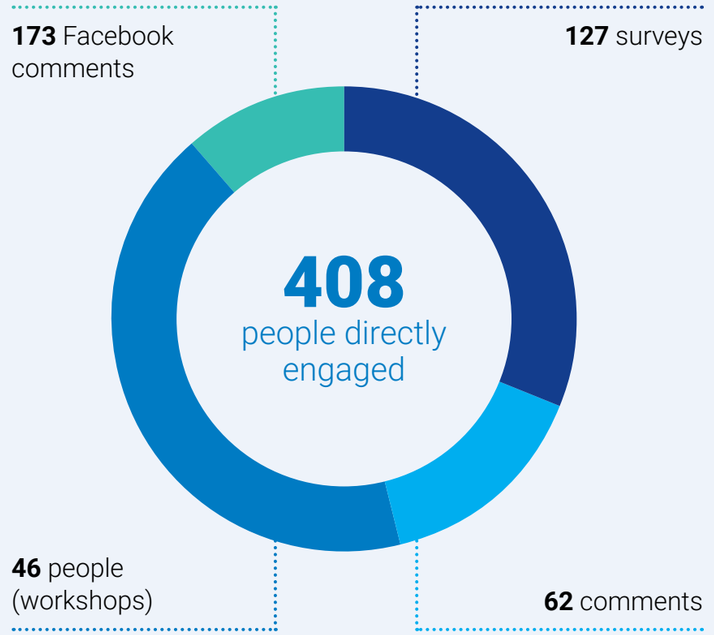
3.1.2 Key Engagement Statistics

2076
total visits to socialpinpoint with
532 unique users

10,000 people aware
(impressions on social media, website visits, document downloads etc)

Approximately 15 meetings were also held with key stakeholders
(e.g. government departments, major landowners etc.)

119 contributors on socialpinpoint





04

Vision



4.1 Vision

The vision for the RPSP is:

Rockingham leverages off its **unique coastal atmosphere** to establish a **green** and **walkable** centre that offers a **diversity of uses** and **building types**, **celebrates local culture**, and promotes a relaxed lifestyle. It is a **regional employment destination** that connects its ***distinct activity hubs*** via a **high-frequency public transport**.



Enable

- Unlock opportunities for diverse housing options to attract residents through different life stages.
- Realise land and development potential that activates vibrant urban centres along Rockingham's transit route.
- Encourage business opportunities and local employment to support sustainable growth of the City.

Connect

- Enhance a City-wide green network that links people, businesses and neighbourhoods through natural landscapes.
- Promote a transit alignment that brings Rockingham Train Station, City Centre and Foreshore together in a sustainable, accessible and reliable way.
- Design streets beyond car movement, with important place values promoted through urban development and street upgrades.

Celebrate

- Embrace the relaxed, welcoming ambiance of a coastal lifestyle in streets and public spaces.
- Value the rich tapestry of cultural and social experiences found throughout Rockingham's diverse neighbourhoods.
- Promote the Rockingham Foreshore as a unique natural place that builds on a proud legacy.

05

Design Elements



Objective	Considerations	Reference
O1.1 To protect, enhance and respond to the ecological systems of the precinct	**C1.1.1** Identify and respond to the topography and landscape of the precinct and its surrounding area.	
	C1.1.2 Identify opportunities to develop and/or enhance the extent, connectivity and quality of the green network.	
	C1.1.3 Consider the total water cycle and how any proposed management responds to the hydrological system, the site and its development context.	
	C1.1.4 Identify opportunities to support habitat protection and enhancement in the precinct.	
O1.2 To enhance sense of place by recognising and responding to First Nations, cultural and built heritage	**C1.2.1** Acknowledge and incorporate local First Nations knowledge, concepts and stories of place.	
	C1.2.2 Consider and integrate cultural heritage of the area into the precinct design.	
	C1.2.3 Identify and incorporate unique built features, including built heritage, into precinct design.	
O1.3 To reduce the environmental and climate change impacts of the precinct development	**C1.3.1** Identify opportunities to retain existing trees and enhance the tree canopy through new planting.	
	C1.3.2 Consider the influence of the precinct design on energy demand and review the potential for precinct scale energy generation, distribution and storage.	
	C1.3.3 Prioritise consideration of waste management at the relevant scale in line with low-waste, circular economy objectives.	
	C1.3.4 Promote water conservation including water reuse and recycling.	
	C1.3.5 Evaluate the performance of precinct development proposals against leading Australian sustainability performance standards.	

5.1 Urban Ecology

Response to Context

As described in **Section 2.5** key design considerations for Design Element 1: Urban Ecology can be summarised as follows:

- The RSC is 'urban' in nature, the natural environment has gradually been replaced by buildings. Tree canopy is quite limited throughout the majority of the precinct, as such tree retention and tree planting are a high priority.
- A range of environmental factors such as environmentally sensitive areas, conservation category wetlands and bushfire prone land are all important considerations from a development perspective.
- The concentration of heritage listed properties and various cultural and tourism facilities in the Kent Street area represent a good opportunity to promote establishment of a heritage and cultural precinct.

Desired Outcomes

A site responsive and holistic design approach that carefully considers the interrelationship of the built, cultural and natural characteristics that make Rockingham special.

- Development in Rockingham considers the natural environment, enhancing existing ecological systems through public realm design.
- Local culture and heritage is referenced in landscape and building design to establish a sense of place that is uniquely Rockingham.
- Enhance the tree canopy within the urban environment to promote climate resilience, improve shade and shelter, enhance sense of place, and improve biodiversity outcomes.
- Promote environmentally sustainable practices, including resource efficiency (energy, water, waste, air quality, material selection and urban green infrastructure) at all stages of development.

5.1.1 Natural Environment

As a predominantly flat, built up urban environment the general approach taken for the RSC has been to celebrate, enhance and better connect existing natural areas and parklands. This is demonstrated on **P2 - Figure 20** (Urban Structure Plan) and **P2 - Figure 21** (Public Realm Plan), where enhanced green spaces are interlinked to form more defined ecological corridors. The area of most environmental significance to the RSC is that contained within the Foreshore reserve, the RPSP design ensures protection and celebration of this area. With regard to the potential environmental impacts of the proposed RPSP design, an assessment was undertaken by Cardno which found the following:

Environmental Sensitive Areas (refer to **Appendix 2** for further details)

- A conservation category wetland is mapped within an area proposed for clearing as part of the implementation of the RPSP.
- Priority and threatened species are known to occur in the area and might be disturbed as part of the RPSP proposals.

Contaminated Sites (refer to **Appendix 2** for further details)

- The land parcel at 25 Rockingham Beach Road is classified 'Contaminated – remediation required' by the DWER. This site is proposed for a major development site, it is anticipated that some level of environmental investigation/potential remediation will be required to ascertain the site is suitable for the proposed land use.
- The land parcels at 7 McNicholl Street have been classified 'remediated for restricted use' by DWER. It is noted that the RPSP plans for a residential use (Major Development Site) at this site. The development is likely to involve earthworks and the disturbance of the asbestos in soil contained beneath the capping layer in place.

Mitigation strategies associated with the above environmental impacts are summarised in **P2 - Table 9**, with relevant information included within the Part One Subdivision and Development Requirements to ensure all appropriate measures are taken to mitigate the environmental impact.

P2 - Table 9: Environmental Mitigation Strategies

Item	Potential Impact	Mitigation
ESA	Clearing of a conservation category wetland	Conduct a wetland identification and/or delineation investigation on Lot 201 Chalgrove Avenue and Lot 103 Council Avenue to reassess the wetland's status in consultation with DBCA for the existing mapped wetland area to be modified wholly, or in part to the status of 'No longer a wetland'. Proponents to prepare development of an environmental management plan and obtain any necessary clearing permits at development and/or subdivision stage.
	Disturbance of endangered/critically endangered TEC	Conduct appropriate Flora and Fauna Studies and impact assessments on Lot 501 Patterson Road, Lots 502 and 503 Dixon Road, and Lot 1,511 Dowling Street (Mike Barnett Sports Complex) and obtain any necessary clearing permits prior to any clearing of existing vegetation and/or bushland. Proponents to prepare an environmental management plan at development and/or subdivision stage.
Contaminated Sites	Disturbance of asbestos/ contaminated soil	Develop and implement an asbestos management plan (AMP) and construction environmental management plan (CEMP) as required. Development of an environmental management plan at development stage.
	Suitability of site for proposed land use	Conduct further environmental assessment prior to ground disturbance to determine remediation requirements and land use suitability. Development of an environmental management plan at development stage.





5.1.2 First Nations, Cultural and Built Heritage

Section 2.4.6 provides a high-level overview of the existing heritage qualities and sites located within the RSC. This section sets out the ways in which the RPSP can help meet the City's vision for heritage:

> *To improve awareness and foster a greater appreciation of the City's rich and diverse heritage; and to collaborate with our community and key stakeholders to protect, preserve, enhance and celebrate our heritage for the benefit of the current and future generations.*
>
> ***City of Rockingham Heritage Strategy 2020***

Heritage in the RPSP is addressed with consideration for the tangible and intangible aspects of Natural Heritage, First Nations Heritage, and Historic Heritage (as defined in the Heritage Strategy).

Natural Heritage

Due to ongoing urban development, the tangible natural heritage of the RSC is primarily emblemised by the Rockingham Beach Foreshore and the coastline itself. Foreshore conservation, combined with the heritage listed Churchill and Bell Parks ensures an attractive urban park which features over 100 trees planted in wide avenues. These spaces have historic value for their association with the beautification of the Rockingham Beach Foreshore which begun in the 1920s and has since been enjoyed for many decades.

The RPSP seeks to preserve and celebrate the Foreshore through continued implementation of the Rockingham Beach Foreshore Master Plan.

First Nations Heritage

Celebrating local First Nations cultural heritage, including intangible elements such as language, traditional skills, stories, songs, oral history and knowledge is identified as an area of improvement. Developing a shared understanding of the significance of the Rockingham landscape to First Nations people can help improve sense of belonging and create more inclusive places. The Rockingham Beach Foreshore Master Plan, through engagement with the City's Mooriboordap Advisory Group begun to identify opportunities where recognition or interpretation of local Nyoongar stories could be delivered in the public realm.

Beyond the Foreshore, the City are in the process of conducting a broader study which looks at how the representation of First Nations people can be enhanced through built and landscape design. The RPSP supports and acknowledges the need to implement the outcomes of this study when complete.

The link between First Nations Heritage and how this could be translated into improved sense of place and belonging through public realm design is provided in **Section 5.3.3**.

Historic Heritage

As described in Section 2.4.2 Precinct History development in Rockingham was first established in areas surrounding the waterfront. The patterns of use throughout the RSC's history has seen the majority of local heritage sites located in this area as shown on **P2 - Figure 19**.

In more recent times, establishment of cultural uses such as the Rockingham Visitor Centre, Rockingham Museum, and Rockingham Arts Centre have helped form an important hub. Recognition of this unique blend of historic, cultural, and social significance is celebrated through the Kent Street Cultural Precinct. Which is envisioned as a place that embellishes local history and stories, helping to shape the distinct identity and sense of place in the Rockingham Foreshore area.

P2 - Figure 19: Urban Ecology Plan



5.1.3 Tree Canopy

The *City of Rockingham Urban Forest Strategy* advocates that the retention, protection and enhancement of green space has a multitude of environmental, social and economic benefits for the City. The approach aligns with the intent of the State Government's *Perth and Peel Urban Greening Strategy*.

Trees provide shade to buildings, outdoor recreational spaces, pavements and parking areas, lowering ambient temperatures and assisting in reducing adverse Urban Heat Island **(UHI)** effects and electricity use. This issue is increasingly important due to current patterns of tree canopy loss and forecast temperature increases due to climate change. Improving tree canopy also supports habitat protection, provides cleaner air, stormwater infiltration, and reduces energy use for cooling.

In the suburb of Rockingham, it was determined that 83% of canopy cover was located within private land[1]. This highlights that whilst street tree planting will be essential, putting measures in place to promote tree retention within existing private lots will also be required.

The RPSP proposes the following measures to improve tree canopy:

- Street tree planting of key streets and public spaces to promote active transport through creation of quality, attractive links (refer to Public Realm Plan on **P2 - Figure 21** for further details); and
- Development controls which promote tree retention where infill development is proposed (refer lot testing provided in **Section 5.6.2**).

Strategies to Increase Urban Tree Canopy Diversity

Current best practice suggests that a diverse range of tree species and types is vital to a healthy urban forest.

The existing convention of planting avenues of consistent tree species, can limit species diversity. Whilst is noted that avenue plantings are important to local character in many streets within the City, in order to balance these two differing planting strategies, the following strategies can be used:

- Establish existing streets most important to maintain with continuous avenues and limit use elsewhere;
- Where logical 'breaks' occur in existing avenues, such as intersections, trees species should reflect similar size, form and character;
- Where existing trees within avenues need replacing, trees species should reflect similar size, form and character;
- Use asymmetrical planting within some streets where one side of the street may retain avenue planting, with the other side a mixed range of species;
- Use informal mixes of species, including deciduous and evergreens with a preference for deciduous trees adjacent to heritage buildings; and
- Use existing parks and open spaces to plant a diverse range of species to augment existing residential areas.

Recommended tree species are stipulated in the Street Tree Master Plan and within Section 5.3.4.

1 City of Rockingham Greening Plan 2017.

Tree Planting Principles

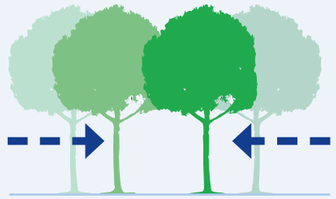
In meeting the RPSP's vision for creating a more green Rockingham, the following tree planting principles are proposed to guide future greening initiatives.



1. Diversity of Species
Plant a diversity of tree species to provide a resilient urban forest, and a range of different trees for different conditions.

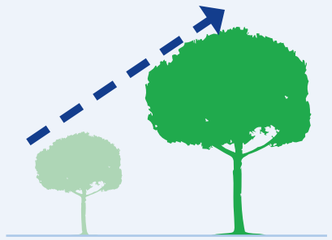


2. Habitat and Biodiversity
Promote the use of appropriate endemic and native tree species that offer biodiversity and habitat benefits, and utilise species that are a food source for Carnaby's Cockatoo's.

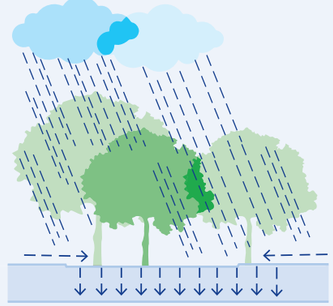


3. Close Spacing
Planting trees with a close spacing to provide a quick increase in canopy cover and a continuous and connected canopy cover.

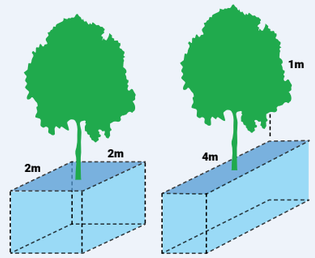
Trees planted closely will develop more upright forms, and be less susceptible to wind damage.



4. Preference Large
Large, broad canopied trees provide significantly greater benefits when compared to smaller trees. These include greater shade and cooling, reduction in stormwater flows and reducing air pollution.



5. Water Sensitive Urban Design
Utilising best practice WSUD to reduce and treat storm water flows, and promote sustainable water management.



6. Maximise Soil Width and Volume
To enable proposed trees to thrive into the future, a minimum surface area of 4m², with deep soil is to be provided. In areas where multiple trees are planted in groups this can be reduced to 3m².

The 4m² can be modified to account for varying urban conditions.

5.1.4 Water Management

To support the RPSP, Cardno prepared a Water Management Strategy **(WMS)** which considers best practice water management principles, that can be embedded into the precinct planning. The WMS outlines stormwater infrastructure and water management approaches required to accommodate land use changes resulting from the proposed development. Implementation of the WMS will maximise opportunities for sustainable long-term use of the precinct, balanced against the growth, climate and environmental challenges for the site.

The WMS is provided in **Appendix 1**, it has been developed to achieve the following objectives;

- Present WSUD options that could be applied to the precinct;
- Determine the proposed drainage parameters and existing flood capacity of the development site;
- Consider stormwater management options which could be utilised, including reuse opportunities;
- Consider precinct level, total water cycle management options and provide a multi-criteria analysis for consideration including economic, environmental and other constraints; and
- Consider alternative water sources to be used within the development (potable and non-potable).

In achieving the above objectives, the WMS has reviewed and provided an assessment of the following aspects:

- **Water Balance** - to understand the change in regime between aspects of the total water cycle;
- **Water Supply and Wastewater** - to understand how future development can adequately be serviced by long-term water and wastewater planning;
- **Water Efficiency Measures** - which explore how the City can achieve its water efficiency targets in accordance with its accreditation as a Gold Waterwise Council;
- **Stormwater Management** - which considers the impacts of future density increases on major and minor drainage infrastructure;
- **Stormwater Detention Measures** - which explores how future development will impact the ability of urban areas to appropriately detain water;
- **Water Quality Management** - which ensure that appropriate non-structural and structural controls and be put in place to manage water quality; and
- **Groundwater Management** - which seeks to manage and protect groundwater resources.

Based on the review of the proposed RPSP land use approach the following options have been deemed the most relevant to the study area and were reviewed within the Multi Criteria Analysis;

- Soakage well systems on lot level;
- Regional bioretention/detention basins;
- Bioswales along road frontage;
- Rainwater tanks;
- Treated stormwater and wastewater for irrigation; and
- Aquifer re-injection.

5.1.5 Energy and Climate Change

In a rapidly urbanising environment, it is fundamental to the prosperity, identity and lifestyle of RSC residents that the City commits to the protection and enhancement of the environment, to ensure it is sustainably managed for future generations to enjoy.

The City have prepared a *Sustainability Strategy* (2020) which sets out a series of priorities and actions across energy and emissions, water, waste and resources, and health and nature. These actions relate to a number of key issues.

How the RPSP can assist in supporting implementation of the City's *Sustainability Strategy* is summarised below:

Key Issue 3 - The City is not currently working towards carbon neutral or carbon negative status, in line with best practice climate change adaptation.

The subdivision and development requirements included within Part One of the RPSP strongly advocate for the use and implementation of renewable energy measures to assist the City in reducing its energy use. This is especially important, as the RSC is proposed to increase its urban footprint substantially over the next few decades.

Key Issue 9 - To date, there has been no overarching strategic framework for the analysis, prioritisation and provision of sustainable transport infrastructure.

Section 5.4 Movement provides details on the measures and opportunities which the RPSP has put in place to assist with a reduction in localised vehicular traffic. More specifically, it focusses on initiatives which could see an increase in more sustainable transport modes such as public transport and active transport.

Key Issue 10 – Environmentally sustainable design principles and green infrastructure initiatives are encouraged through the existing planning framework in broad terms, however, the need for a local policy position to address gaps and promote sustainable development outcomes requires further investigation.

The RPSP acknowledges that new development needs to be better at considering its impact on the built and natural environment. A well-considered design testing exercise has explored how new development can contribute to an improvement in the overall landscape of the RSC through a greater focus on landscaping and greenery, to help combat climate change and the impacts of UHI. This also includes measures associated with planting of waterwise plant species.



5.1.6 Bushfire Management

Per the requirements of SPP 7.2, the role of documents such as the RPSP is to provide a framework which guides future subdivision and development. It provides a vision and a preferred spatial framework, and sets out the requirements which a proponent must consider in preparation of a subdivision or development application.

From a bushfire perspective, the RPSP does this in two ways:

Part One - Implementation - provides an overview of the development standards which apply to all land prior to subdivision and development. This will include a specific sub-clause which states:

> *Development and subdivision on lots identified as being Bushfire Prone on the Department of Fire and Emergency Services Bushfire Prone Mapping shall be required to prepare and submit a Bushfire Management Plan with any development or subdivision application, in accordance with State Planning Policy 3.7.*

Part Two - Explanatory Section - The site and context analysis has determined that there are seven primary areas identified as being 'bushfire prone' by the DFES. These are identified within Section 1.4.7 and illustrated on P2 - Figure 15.

The RPSP's approach is to ensure that detailed bushfire assessment is the responsibility of individual proponents at the time that applications for development and/or subdivision are lodged, since the post-development conditions and specific design details are unknown for these sites. It is therefore appropriate for the proponents to conduct the Bushfire Assessment as part of an application package, prior to submission. Furthermore, some of the identified bushfire prone areas possess other environmental qualities which require further assessment (e.g. vegetation and wetlands). The proposed proponent-led approach will allow holistic consideration of all these elements, prior to determining the ultimate subdivision/development potential.



5.1.7 Coastal Hazard Risk Management and Adaptation Plan

The City's Coastal Hazard Risk Management and Adaptation Plan **(CHRMAP)** provides a long term view of the potential future coastal hazards for the City, and highlights pathways to adapt to the changing future oceanic and coastal conditions. The CHRMAP aims to ensure the City is well placed to deal with impacts to the coastal zone, if and when those hazards arise. Development of the City's CHRMAP has followed the requirements of *Western Australian State Planning Policy No. 2.6: State Coastal Planning Policy (SPP2.6)* and supporting guideline documents.

A coastal hazard assessment was undertaken to determine potential extents of coastal erosion and inundation hazards over future planning timeframes to 2110. A risk and vulnerability assessment was then applied according to different sectors, with results highlighting the most vulnerable assets and areas along the City's coastline, for which a more detailed investigation of adaptation options was undertaken.

The CHRMAP includes an evaluation of eight coastal sectors, the RSC intersects with Sector 1 - Municipal Boundary to Wanliss Street and Sector 2 - Wanliss Street to Garden Island Causeway. Throughout this area, the CHRMAP identifies that there is significant public infrastructure, residential, and commercial property is predicted to be highly vulnerable in the short term, requiring interim protection. Long term protection is identified and likely to be triggered when Esplanade and/or Rockingham Beach Road is subject to intolerable risk as the interim protection is no longer sufficient. Long term protection is identified in this sector, as opposed to managed retreat, given:

- The importance of commercial, residential, and community areas in P2 - Waterfront Village;
- The social value of Bell and Churchill Parks to the community; and
- The dual function of addressing coastal erosion and inundation hazards in this area, protecting a significant portion of private and public assets.

Given that these areas are identified for protection, there are limitations to what the RPSP is required to do to help manage impacts of coastal hazards. This will be primarily managed through the City's LPS2.


rústico
tapas & bar
pink duck

Objective	Considerations	Reference
O2.1 To ensure the pattern of blocks, streets, buildings and open space responds and contributes to a distinct, legible precinct character	**C2.1.1** Design the urban structure in response to the existing or intended future precinct character.	
	C2.1.2 Create blocks and lots of the appropriate size, proportion and orientation to support the intended character and functions of the precinct.	
	C2.1.3 Identify existing key landmarks to create view corridors and highlight destinations and focal points within the urban structure.	
O2.2 To promote an urban structure that supports accessibility and connectivity within and outside the precinct	**C2.2.1** Design a legible, interconnected and functional urban structure that supports ease of movement to and through the precinct.	
	C2.2.2 Develop an urban structure that gives priority to safe walking and cycling, with a focus on achieving 400m and 800m walkable catchments around nodes of activity and public transport hubs.	
	C2.2.3 Identify opportunities to create new or enhance existing connections to and through the precinct.	
O2.3 To ensure the urban structure supports the built form, public realm and activity intended for the precinct	**C2.3.1** Provide block configurations that support the function and amenity of the precinct.	
	C2.3.2 Design lots (size and configuration) that can support intended retail, commercial and mixed use development.	
	C2.3.3 Design lot layouts to respond to local climate, topography and existing natural features, while supporting intended built form.	
	C2.3.4 Design an urban structure that can accommodate lots for large format uses outside the precinct core where desired.	
	C2.3.5 Create an urban structure that contributes to the development of accessible, safe and well located public spaces.	
O2.4 To ensure an adaptable urban structure that can respond to and facilitate change within a precinct	**C2.4.1** Develop a street block pattern that can accommodate change over time.	
	C2.4.2 Identify long-term strategic opportunity/catalyst sites and detail how they are to be protected from under-development.	
	C2.4.3 Illustrate the relationship between the proposed urban structure and precinct staging.	

5.2 Urban Structure

Response to Context

As described in **Section 2.5** key design considerations for Design Element 2: Urban Structure can be summarised as follows:

- The RSC's two primary mixed use nodes (City Centre and Waterfront Village) include large urban blocks, which in some cases lack clear, defined and safe connections. There is a need to 'break down' these blocks to create more permeable and walkable urban environments.
- There is a prevalence of larger single residential lots throughout the RSC, these areas offer opportunities to support medium density infill development. However, high fragmentation of ownership presents land assembly challenges, which require further exploration to ensure quality outcomes can be achieved.
- Access to Rockingham Train Station is notably poor, the true walkable catchment is severely limited by the existing urban structure with major roads and a lack of pedestrian/cyclist connections, interventions which explore enhanced connectivity are desired.

Desired Outcomes

Rockingham's urban structure is flexible and adaptable. Lot and street block sizes respond to context, support active transport, and can accommodate a variety of land uses and building types.

- Street and block configurations in the City Centre and Foreshore are "fine grained", supporting a highly-permeable urban scaled townscape that promotes pedestrian movement.
- Connectivity for pedestrians and cyclists throughout the RSC is improved through creation of interconnected 'Green Links' which bridge the gap between green nodes and urban areas.
- Development in existing low density residential areas provides an urban framework that supports delivery of high-quality infill outcomes.
- New development to consider flexibility and adaptability to accommodate future change.
- The orientation and configuration of new lots/street blocks carefully considers local climate, optimising solar access and natural ventilation.
- Interventions into the existing urban environment ensure improved access to Rockingham Train Station within its walkable catchment.

5.2.1 Urban Structure Approach

The urban structure of the RSC has been considered at two scales: precinct and sub-precinct. At the precinct scale, there are a number of influencing factors driven primarily by existing land use, movement, and public open space patterns. Having been developed over more than 50 years the context analysis (undertaken in **Section 2.4.4**) determined that there were a number of defined sub-precincts in the RSC.

The sub-precincts are illustrated on **P2 - Figure 20**. These sub-precincts are used in the RPSP as a way of developing localised design responses and development controls where required.

Land Use/Sub-Precincts

Eight distinct sub-precincts have been identified, they typically include clear land use agglomerations and unique character qualities. This is influenced by historical development patterns and land use types guided by the previous Centre Plan.

To enable place responsive urban structure outcomes in each of the sub-precincts, their desired future character is summarised in **P2 - Table 10**. Resultant land use and built form responses at the sub-precinct scale are provided in **Section 5.5** and **Section 5.6**.

Walkable Catchment and Key Connections

One of the primary challenges in the RSC is that the various sub-precincts are somewhat isolated and independent of each other. Large internal roads such as Dixon Road, Patterson Road, Louise Street and Council Avenue perform important functions as key connectors, however, in some cases their scale contributes to a severance of neighbourhoods which limits pedestrian and cyclist connectivity between sub-precincts.

A primary focus of the proposed RSC urban structure is to blur the lines between sub-precincts, contributing to a more integrated and interconnected centre that is less car oriented. Specific initiatives include:

- Realignment of the RCCTS to provide defined public transport links between sub-precincts. This link provides the impetus to concentrate development activity within an 800m walkable catchment of key stops and nodes along the link (refer to **Section 5.4.1**).
- A landscaped network of pearls is also proposed, with the intent being to use greenery and the public realm to connect key nodes and sub-precincts together through 'Green Links'. For example this includes a continuation of the existing City Centre-Waterfront Village link which currently terminates at the northern extent of the City Park Sub-Precinct (refer **Section 5.3.2**).

Vacant and Underutilised Land

The City Centre, Waterfront Village, and TOD Village Sub-Precincts include a number of large underutilised and/or vacant land parcels. These catalysts sites are identified on **P2 - Figure 20**, proposed lot configurations demonstrate an approach that focusses on flexibility and adaptability. Street block widths promote greater opportunities for walkability, and lot depths ensure that a range of residential and non-residential uses could be accommodated.

Protecting these sites from 'under development' is essential in delivering on the PSP vision. As such, specific land use and built form outcomes are provided in **Section 5.6**.

P2 - Table 10: Intended Sub-Precinct Character

Sub-Precincts	Key Features	Desired Precinct Character
P1 - City Centre	• Rockingham Central • Civic and administrative functions • Syren Street food and beverage precinct • Large vacant super lots • Rockingham Aquatic Centre	Anchored by the shopping centre and civic precinct, the City Centre will provide the primary economic and employment focus of the RSC. Higher density housing and new commercial development creates a critical mass of people who enjoy a highly permeable and walkable urban structure, that connects major public spaces with public transport on Contest Parade. New development provides a positive and well-defined street interface, where pedestrians and cyclists enjoy priority over vehicles.
P2 - Waterfront Village	• North facing Foreshore reserve and beachfront • Village Green • Concentration of art, cultural and other community functions.	The Waterfront Village will continue its transformation into a regionally significant beachfront hub with further redevelopment of under–utilised public and private properties. An attractive mix of medium to high density residential and short–stay accommodation, hospitality–focussed retail, offices and recreation uses will combine to make this a priority destination on the Rockingham coastline for locals and tourists alike.
P3 - Coastal Lots	• Large quarter acre lots are prominent • Surrounded by recreation nodes to north, east and west	High-quality medium density development supports quality urban infill outcomes along the RCCTS. A combination of grouped and multiple dwelling typologies enable an increased density, balanced with generous street setbacks and open space to ensure improved tree canopy.
P4 - TOD Village	• Mike Barnett Sports Complex • Existing mature trees • Largely vacant	Extension of the RCCTS represents a strategic TOD opportunity that provides for contemporary higher density development opportunities, which integrate with the existing landscape and retained Mike Barnett Sports Complex. The transit stop includes a well landscaped central park and local centre that creates a destination and amenity to support growth in the precinct.
P5 - City Park	• City Park • Autumn Centre (community centre) • Existing low density residential	The Autumn Centre is expanded and existing single detached dwellings are largely retained, with the framework supporting future long-term growth and development through infill. New development is focussed primarily on Louise and McNicholl Streets providing density along the RCCTS.
P6 - Southern Residential	• Rockingham Station/park and ride • Well serviced by local parks (Anniversary Park, Haselmere Reserve, Careeba Reserve) • High concentration of strata properties • Curvilinear street pattern	High-quality medium density development support sensitive and quality urban infill outcomes, primarily in the form of grouped dwellings and small scale apartment typologies. Heights are generally between two-four storeys (along the RCCTS route and adjacent/fronting POS), and generous street setbacks align with the existing character of the area. Existing areas with high concentrations of strata properties are highly unlikely to change in the near term. The Rockingham Train Station is serviced by park and ride car parks located on either side of Ennis Avenue, with long-term redevelopment aspirations on the western-most car park presenting possible opportunities to increase density in close proximity to the station.
P7 - Education	• South Metropolitan TAFE • Kolbe Catholic College • Rockingham Library • Murdoch University	Existing campuses are linked by an internal link road which enhances connectivity between the Education and TOD Village Sub-Precincts. Sufficient capacity for new development ensures large spaces are provided between buildings supporting the establishment of greenery and tree planting, which creates an attractive place to work and recreate.
P8 - Dixon Road	• Primarily light industrial and bulky goods commercial • Some vacant bushland	A gateway statement at the corner of Dixon Road and Ennis Avenue frames the entry into the RSC. Enhancement of the streetscape supports a green buffer which screens the light industrial and commercial development to the north. The bushland south of Patterson Road is developed in the long-term, with a flexible urban structure supporting a range of commercial and employment generating land uses.

PROPOSED ROCKINGHAM MARINA
ROCKINGHAM BEACH
PHOEBE HYMUS PARK
BELL PARK
FORESHORE
ROCKINGHAM JETTY
CHURCHILL PARK
ROCKINGHAM BOWLING CLUB
VILLAGE GREEN
PATTERSON ROAD
ENNIS AVENUE
DIXON RD
MIKE BARNETT SPORTS COMPLEX
SOUTH METROPOLITAN TAFE
KOLBE CATHOLIC COLLEGE
KOLBE COLLEGE GROUNDS
CHERRY LANE
CITY PARK
READ STREET
ROCKINGHAM AQUATIC CENTRE
CAREEBA RESERVE
CITY OF ROCKINGHAM
ROCKINGHAM CENTRAL
ROCKINGHAM STATION
ANNIVERSARY PARK
PALLEMERE RESERVE
RAE ROAD
P1
P2
P3
P4
P5
P6
P7
P8

Legend

- Precinct Structure Plan Boundary
- Sub-Precinct Boundaries
  - P1 City Centre
  - P2 Waterfront Village
  - P3 Coastal Lots
  - P4 TOD Village
  - P5 City Park
  - P6 Southern Residential
  - P7 Education
  - P8 Dixon Road
- Major Development Sites (>1ha)
- Infill Development Sites
- Public Open Space
- Public Open Space Nodes/Green Links
- Landmark
- Proposed RCCTS Route
- RCCTS Catchment
- Primary Road
- Secondary Road
- Proposed Midblock Connections

P2 - Figure 20: Urban Structure Plan



Objective	Considerations	Reference
O3.1 To ensure the public realm is designed to promote community health and wellbeing	**C3.1.1** Provide a range of public spaces that support and contribute to the community's health and wellbeing, in response to identified community need.	
	C3.1.2 Design public spaces for multiple uses, to efficiently accommodate a range of functions and activities.	
	C3.1.3 Consider year-round user comfort in the design of the public realm.	
O3.2 To enable local character and identity to be expressed in public realm design to enhance sense of place	**C3.2.1** Public realm design should incorporate local natural topography, habitats and vegetation to enhance sense of place.	
	C3.2.2 Demonstrate appropriate interpretation of First Nations knowledge, history and heritage within public realm design.	
	C3.2.3 Design the public realm to reflect the heritage significance of the precinct and support the precinct's intended character and identity.	
O3.3 To ensure that key environmental attributes are protected and enhanced within the public realm	**C3.3.1** Integrate environmental features of the precinct within the public realm.	
	C3.3.2 Ensure the public realm contributes to creating and/or improving the urban tree canopy within the precinct and its surrounds.	
	C3.3.3 Incorporate waterwise species into the green network and public realm where appropriate.	
	C3.3.4 Incorporate water sensitive urban design into the public realm.	
	C3.3.5 Provide opportunities for urban greening, such as community gardens and rooftop gardens.	
O3.4 To ensure the public realm is designed to be inclusive, safe and accessible for different users and people of all ages and abilities	**C3.4.1** Develop legible routes and intersections, connected by identifiable landmarks to aid navigation through the public realm.	
	C3.4.2 Accommodate and promote inclusion and accessibility for people of all ages and abilities in the public realm.	
	C3.4.3 Design the public realm according to the principles of Crime Prevention through Environmental Design (CPTED).	
O3.5 To ensure public realm design is integrated with the built form, movement network and landscape of the precinct	**C3.5.1** Design well-proportioned and appropriately scaled public spaces and streets.	
	C3.5.2 Consider and enhance relationships between the public realm and surrounding land uses and activities to create mutual benefit.	
	C3.5.3 Design the public realm as a series of well-connected, legible spaces.	
	C3.5.4 Integrate services and utilities to minimise impact on function and amenity of public spaces, streets and surrounding built form.	

5.3 Public Realm

Response to Context

As described in **Section 2.5** key design considerations for Design Element 3: Public Realm can be summarised as follows:

- Exploration for opportunities to improve tree canopy, this has been addressed in **Section 5.1.1** and **Section 5.6**.
- Design to consider new public open space design interventions in the City Centre to assist with activation of the precinct.
- RPSP to explore opportunities for how best to enhance place branding across the RSC, given its size, scale and therefore the physical separation of certain areas.

Desired Outcomes

Rockingham's public realm celebrates its unique coastal atmosphere, providing active and attractive streets and public places.

- The quality, identity, comfort, accessibility and useability of streets, parks and civic spaces is enhanced.
- Urban tree canopy is increased through improved tree retention and integration of established vegetation into new development proposals.
- A coordinated approach to tree planting which promotes use of suitable trees to improve shade and shelter, enhance sense of place, and improve biodiversity outcomes.
- New development contributes to the quality of the public domain through well considered interfaces at the street level and considerations for creating inviting streetscapes (noting overshadowing and wind tunnels etc).
- Design of the RCCTS and supporting infrastructure (e.g. stops, shelters, paving and signage) creates a suite of unifying landscape elements that define the RSC. This allows the broader public realm design in each sub-precinct to reflect the unique character qualities.
- Design public spaces to facilitate flexible use, safe environments for users and create a sense of public ownership.
- Defined entry statements/gateways at key junctures announce arrival into the RSC to assist in defining an identity for the precinct.

5.3.1 Public Open Space (POS) Network

As the RSC evolves to a more urban form, high quality public spaces will perform an important role in contributing to the vitality of the centre as a lively place, both during the day and night. This includes attracting local residents and visitors as active participants in urban life, which will:

- Enhance liveability, diversity and inclusion through access to a range of activities for all residents and visitors;
- Enhance the cultural tourism potential of the RSC; and
- Provide safer POS environments through enhanced built form integration and passive surveillance.

Existing POS

As demonstrated on **P2 - Figure 21**, the RPSP's Public Realm Plan is comprised primarily of existing spaces. The hierarchy aligns with the City's POS Community Plan Strategy. A review of the existing POS hierarchy reveals that passive activity and sporting are the two primary functions of the existing POS, and as demonstrated on **P2 - Figure 14** RSC residents are very well serviced by existing public open space from a spatial perspective. However, some of these spaces offer limited diversity of activity and function. As the RSC evolves, demand for a broader range of activities and functions may be required, resulting in upgrades to some of the existing POS areas.

Improving existing POS will also require considerations for how to better incorporate CPTED design principles, particularly where houses back onto parkland (e.g. Sepia Park, Haselmere Reserve). In these instances, the built form approach (set out in **Section 5.6.2**) demonstrates how infill development can improve the interface between POS and private residences through enhanced passive surveillance.

Organised Sport

As the RSC and its population grows, it is acknowledged that there may be a desire/requirement to provide additional land for organised sport. The development of the playing fields in P4 - TOD Village will see loss of existing playing fields, however, given the strategic importance of this precinct to provide housing and jobs (along the RCCTS) in the short-medium term it was determined that playing fields are not considered to be the highest and best use of this land when ultimate demand is not known. Alternatively, the Public Realm Plan **(P2 - Figure 21)** identifies two investigation areas for consideration:

- **INV 1** - Exploration for establishment of playing fields on Dixon Road (in the Education Sub-Precinct). This utilises existing (and vacant) government land in a highly accessible location. It would allow for future education uses/functions to be developed around a central green which becomes the focal point of the precinct.
- **INV 3** - A potential temporary (or long-term solution) which explores a shared use agreement with Kolbe Catholic College for use of their grounds as is common in other parts of the City.

Public Realm Plan POS

The different spaces which make up the RSC Public Realm Plan include both green and urban nodes:

- **Public Domain Nodes** - include public plazas, squares and main streets where high concentrations of people gather to socialise, engage, and dwell in the urban environment.
- **Green Nodes** - include a diverse mix of natural, formal, and active reserve spaces. Some spaces such as Rockingham Foreshore are major destinations which perform a regional function, whilst other nodes provide a more localised function for adjacent residents. Each is important in its own right, as they service the diverse needs of the RSC community.

P2 - Figure 21 illustrates the location of proposed new POS areas, with **P2 - Table 11** illustrating their size and place in the hierarchy. In summary new POS incorporates one neighbourhood space, two local spaces, and four pocket parks. All of which are proposed within identified 'major development sites'. As such, their design and implementation will be delivered by individual landowners/ proponents. In lieu of concept designs, guidance on their design is provided in **P2 - Table 12**.

As demonstrated in **P2 - Table 11**, the RPSP provides 49.74ha of public open space which equates to 9% of the PSP area. There is potential for this figure to be increased, evidenced by the three identified investigation areas.

P2 - Table 11: POS Types and Function

Type	Size	Function	Existing POS	Proposed POS
Pocket 200m/3 min walk	<0.4ha	Passive Recreation	Haselmere Circus (0.06ha) Sepia Court Reserve (0.48ha) Derwent Park (0.26ha) Leghorn Street Park (0.20ha) Sycamore Park (0.13ha)	POS5 (0.20ha) POS3 (0.27ha)
			Pocket Park Total = 1.6ha	
Local 400m/5 min walk	0.4ha - 1ha	Passive Recreation Active Sport Nature	Benjiman Reserve (0.57ha) Emerald Park (0.61ha) Phoebe Hymus Park (0.90ha) Houston Reserve (0.90ha) Warramunga Reserve (0.81ha)	POS4 (0.46ha) POS2 (0.56ha)
			Local Park Total = 4.62ha	
Neighbourhood 800m/10 min walk	1ha - 5ha	Passive Recreation Active Sport Nature	Kybra Mews Reserve (1.20ha) Ashford Avenue Reserve (1.30ha) Haselmere Reserve (1.89ha) Careeba Reserve (3.20ha)	POS1 (1.23ha)
			Neighbourhood Park Total = 8.82ha	
District 2km from home* **Catchment shown on Figure 25 uses an 800m walkable catchment)*	5ha - 15ha	Passive Recreation Active Sport Nature	Churchill Park (1.35ha) Bell Park Reserve (1.65ha) Village Green (3.40ha) Anniversary Park (6.68ha excluding buildings and car parks) City Park (9.38ha)	
			District Park Total = 22.38ha	
Total Useable POS			**37.68ha**	
Reserves and Other Typically includes foreshore reserve and landscaping adjacent major roads.			**Reserves Total = 12.32ha**	
Total POS			**49.74ha**	



Legend

- Precinct Structure Plan Boundary
- District Open Pace (800m)
- Neighbourhood Open Space (800m)
- Local Open Space (400m)
- Pocket Park (200m)
- Public Domain Nodes

Proposed POS

- POS Catchment
- Green Links
- Nature/Other Reserve
- POS 1 — Proposed POS
- INV 1 — POS Investigation

P2 - Figure 21: Public Realm Plan

P2 - Table 12: Proposed POS Design Guidance

POS Area	Design Intent	Precedent
POS1 1.23ha 'Neighbourhood'	**Purpose:** Provide 'Neighbourhood POS' for passive and informal active recreation and social activities. **Design Guidance:** Design to integrate with high-density residential providing amenity for residents, workers, and visitors alike. To be multi-purpose in nature with a variety of features and facilities. Ensures preservation of existing mature trees on Louise Street, serving important function in the area's broader ecological system. **POS Programming:** Passive lawn spaces (kick-a-bout), broad canopied shade trees, play areas, pathways, seating and toilets.	**Totterdell Park, West Perth (7,500m²)** 
POS2/POS4 0.56/0.46ha 'Local'	**Purpose:** Provide 'Local POS' for day to day recreation opportunities for the immediate residential population. **Design Guidance:** Design to integrate with high-density residential providing amenity for residents, workers, and visitors alike. Ensures preservation of existing mature trees on Louise Street, serving important function in the area's broader ecological system. **POS Programming:** Passive lawn spaces, broad canopied shade trees, play areas, pathways and seating.	**Socrates Park, North Coogee (3,800m²)**

POS Area	Design Intent	Precedent
POS3 0.27ha 'Local'	**Purpose:** Provide 'Local' urban node adjacent to the proposed RCCTS stop within P4. **Design Guidance:** Design to integrate with adjacent mixed-use development. Design includes a combination of hard and soft elements. To be multi-purpose in nature with a variety of features and facilities that enable small-scale community events to be held. **POS Programming:** Open areas for events, high-quality lighting, shade trees, custom furniture.	**Northbridge Piazza, Northbridge (1,800m²)** 
POS5 0.20ha 'Pocket'	**Purpose:** Provide 'Pocket POS' for passive recreation. **Design Guidance:** Design to integrate with high-density residential providing amenity for residents and visual outlook. Primary function to provide green node at end of east-west green link. **POS Programming:** Passive lawn spaces, broad canopied shade trees, seating.	**Thelma Street Park, West Perth (2,000m²)** 

For any potential POS provisions or improvements within the Foreshore area, further design guidance is provided in the Rockingham Beach Foreshore Master Plan. For detailed information, please refer to **Appendix 12**.



5.3.2 Green Links

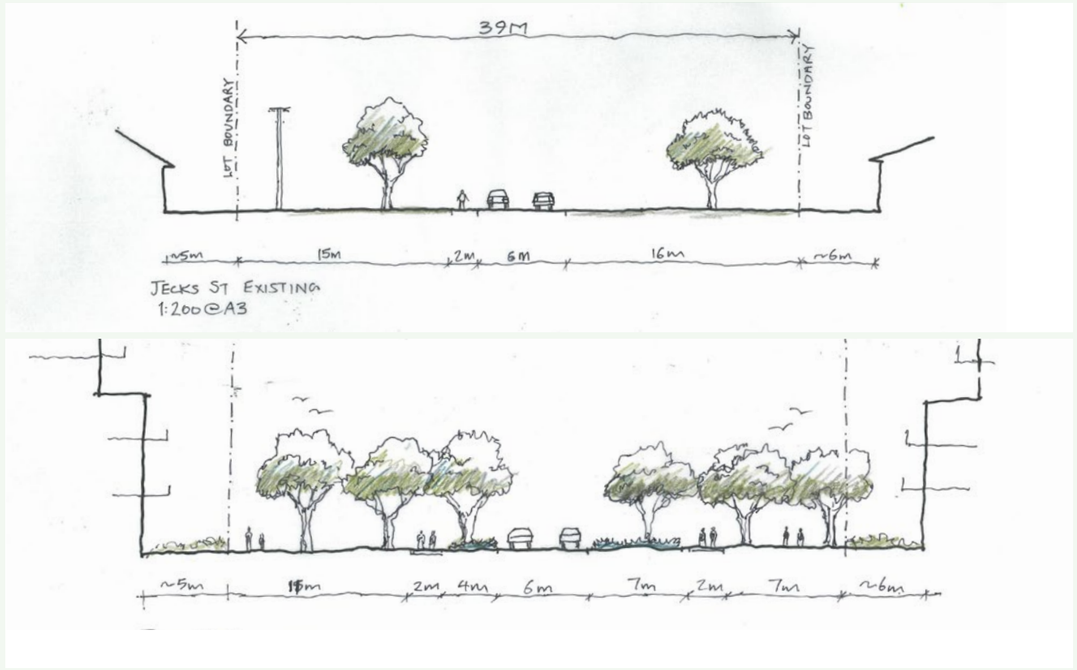
As described in **Section 5.3.1** the majority of POS nodes in the RSC are existing. It is recognised though, that the current urban form is characterised by large roads and setbacks which are barriers to access and connectivity across the RSC. Improvements to the access, function and quality of the existing POS has been identified as a key opportunity in the RPSP. This includes the enhancement of the existing urban form as a means to provide improved access and connectivity to POS through a cohesive and integrated network of green nodes. The opportunity to build on the City's Greening Plan by significantly increasing tree planting across the RSC will assist in providing shaded and comfortable journeys, and enhance the sense of place (see Urban Ecology Plan).

To facilitate the above, the RPSP identifies a network of 'green links' (as illustrated on **P2 - Figure 21**). These links include:

- Primary north-south links which seek to enhance connectivity to the Waterfront Village to build on the recent Foreshore redevelopment, and further establish this as one of the premier coastal locations in Perth. Providing dedicated pedestrian and bicycle/e-bike pathways will improve access and liveability for residents and reduce the reliance on vehicles for shorter, local trips.
- Secondary east-west links, which better connect sub-precincts together.

This approach seeks to build on and enhance the existing urban form to connect existing isolated POS into a broader network of spaces. This includes utilising the existing urban structure which includes generous road reserves and verges which support opportunities for streetscape upgrades that allow safe, shaded, and comfortable journeys for pedestrians and low speed cyclists.

P2 - Figure 22 provides an example showing how Jecks Street could be reimagined into a green link, with dedicated pathways and tree planting to boost canopy coverage.



P2 - Figure 22: Proposed Jecks Street Treatment

Upgrading key connections on these links across major roads is also important.

The current streetscapes are visually open which may encourage higher speeds for motorists and a reduction in safety for pedestrians. The proposed approach includes lining the streets with trees and planting to visually enclose the street as tree-lined roads are generally perceived to be safer in both urban and suburban conditions with individual driving speeds generally significantly reduced. Line marking and/or a material change designates a clear crossing point for pedestrians is also proposed.

Examples of potential treatments at Louise Street and Patterson Road are illustrated on **P2 - Figure 23** and **P2 - Figure 24** respectively.



P2 - Figure 23: Louise Street Green Link Crossing



P2 - Figure 24: Patterson Road Green Link Crossing

5.3.3 Improved Quality, Function, Access and Diversity

As the population grows within the RSC, and with limited opportunities for new POS areas, consideration should be given to increasing the quality, function, access and diversity of POS to support the community.

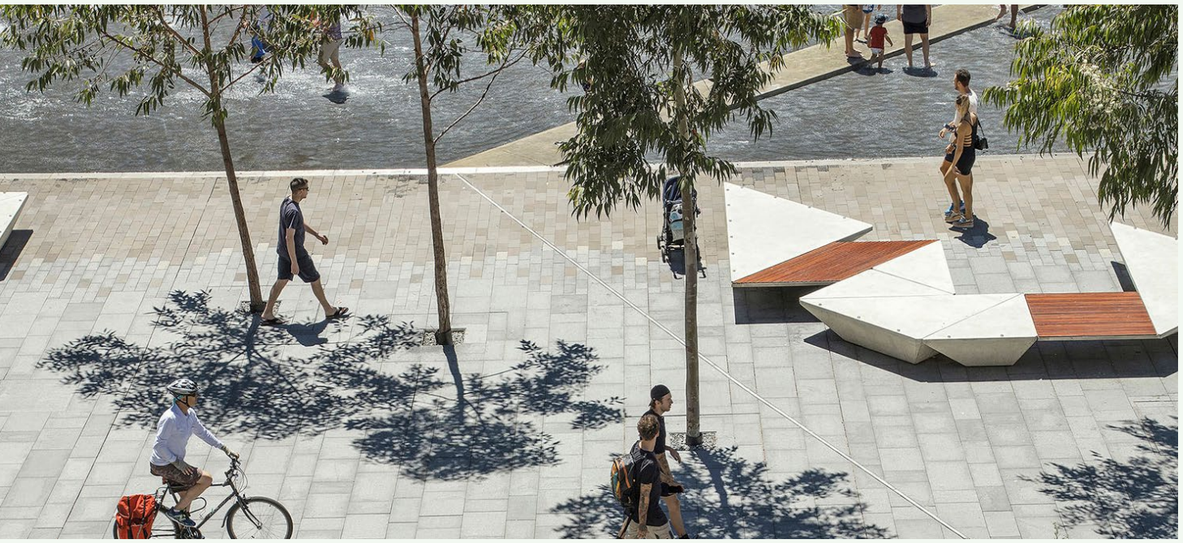
High quality, diverse and accessible POS should support a range of activities for the community. Ensuring POS is simple and flexible to accommodate the future needs of the community over time should be considered (refer to **Section 5.3.1**).

Sense of place and belonging for a range of cultural backgrounds should also be considered. In particular, the recognition and inclusion of First Nations people through a broad range of interpretations and programs. The use of cultural knowledge in design must be undertaken respectfully and with correct protocol. This includes

- Utilising the City's **Mooriboordap Advisory Group** to identify Traditional Owners and Elders who can speak for the area.
- Acknowledgement that ownership of cultural knowledge remains with Traditional Owners and as such they must be continually involved in the planning, design, implementation, and management process to ensure memories and stories shared are being utilised correctly. This should be undertaken through the development of an **First Nations Engagement Framework** for the project/s.
- Payment for consultation services are allowed for to ensure this ongoing engagement.
- Approaches support the City's **Reconciliation Action Plan (RAP)**.
- **Cultural Context documents** and key themes for the area to capture appropriate stories and memories relevant to the site. Ensure engagement with Traditional Owners every time the document is utilised.
- Interpretation of First Nations Cultural Heritage is integrated into the public realm design and delivery through materials, art, wayfinding, sound and light installations and events.
- Acknowledge that the translation of First Nations Cultural Heritage into public realm is a minimum approach to acknowledging Traditional Owners. Inclusivity at all levels of a project is important and roles should be considered on design teams for First Nations project management, capacity building roles created where appropriate, procurement approaches considered to ensure **employment of First Nations workers** and that design approaches ensure the finalised public spaces are welcoming and safe spaces for First Nations people. This should all be directed via engagement of local First Nations community.



5.3.4 Public Realm Style Guide



Introduction and Purpose

This high level style guide outlines elements of the public domain including materiality, surface finishes, furniture, wayfinding and planting.

The style guide focuses primarily on three key precincts - P1 City Centre, P2 Waterfront Village and P4 TOD Village. Further detail and investigation is recommended, including creating a detailed Public Realm Style Guide which considers existing furniture, fixtures and finishes and future upgrades.

The style guide will use the following principles:

- Appropriate to the existing character and context.
- Proposed selections are of a 'timeless' appearance and complementary with existing selections.
- Robust 20+ year lifespan.
- Multiple configurations within the same supplier and family of product type (e.g. seats that are backless, back rest, arm rest, wheel chair accessible etc).
- Replaceable elements, e.g. battened seating surface interchangeable between hardwood timber and powder coated aluminium.
- Surface mounted and sub-surface fixture options.
- Ease of maintenance and cost effectiveness over entire lifecycle.

A more detailed Public Realm Style Guide should be developed, beginning with a comprehensive audit of existing assets to identify opportunities for improvement and integration. It should establish clear design principles that align with the character and vision of each sub-precinct, ensuring consistency in streetscape elements. The guide should define standards for landscaping, including species selection and maintenance requirements, as well as street furniture, lighting, and signage to create a cohesive and functional public realm across the RSC. It should also provide guidance on incorporating public art, wayfinding strategies, and sustainable materials to enhance the identity and usability of spaces.

Investment Priority

P2 - Figure 25 identifies the investment priority for key locations in the RPSP, with the material quality summarised as follows:

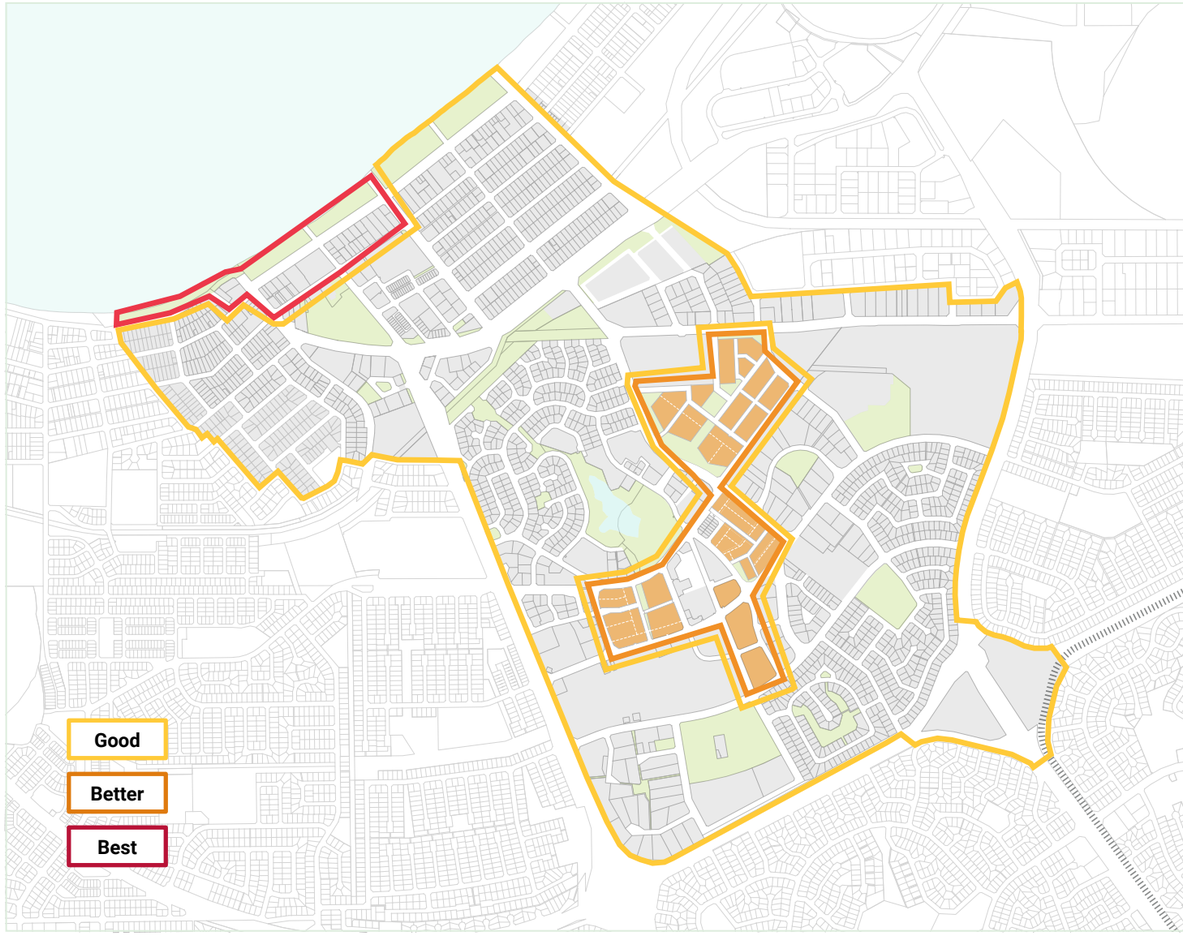
'Good' - Simple, robust, cost effective materials and finishes suitable for the existing suburban and adjacent environments.

'Better' - Good quality, contemporary materials and finishes suitable for existing and proposed urban environments.

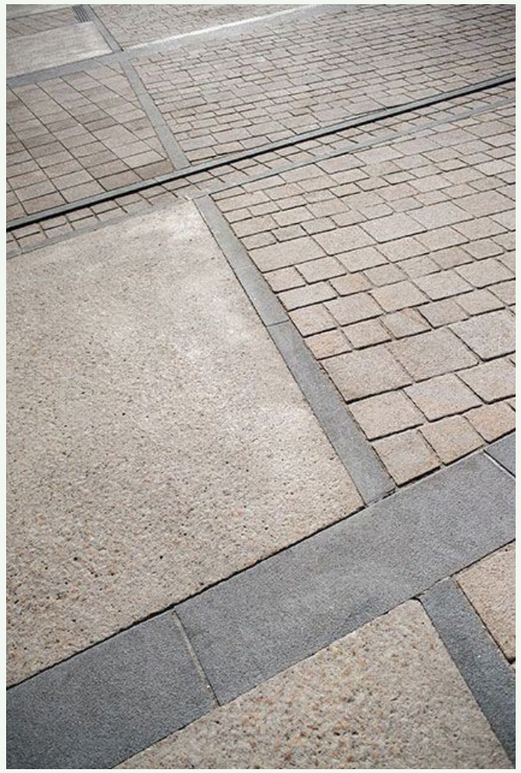
'Best' - Custom and high quality materials and finishes that build on and enhance the recent Foreshore development.

Whilst the proposed quality levels are a general guideline the City may at its discretion modify these based upon the nature of the proposed works.

P2 - Figure 25: Public Realm Investment Priority







Materiality

Surface treatments across the City will be varied due to the different uses and functions, and the hierarchy as proposed in this style guide. Material finishes selected will need to be robust, durable, and suitable for local climatic conditions in Rockingham.

The following considerations should be applied:

- Functionality: Appropriate to the functional requirements (e.g. universal access, vehicle traffic-ability, foot traffic, services, existing trees, maintenance, wayfinding etc).
- Accessibility: Consideration of all user abilities prior to material selections, ensuring universal access. Provide a consistent style and design palette for future works to the public realm and streetscape to build on and enhance the existing public realm.

Enhance and celebrate the unique character of the RSC and recognise and respond to identified areas or precincts of a similar nature.

- Create comfortable and safe places for people to use and encourage walking, cycling and use of public transport.
- Provide clear guidance to those involved in planning, designing and constructing public realm spaces on the quality of design expected.
- Consolidation: Materials are coherent across the different sub-precincts and do not clash with one another.

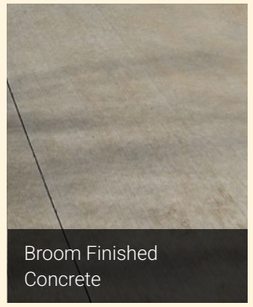
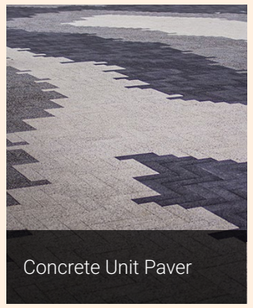
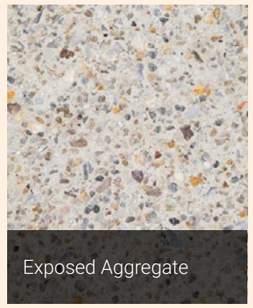
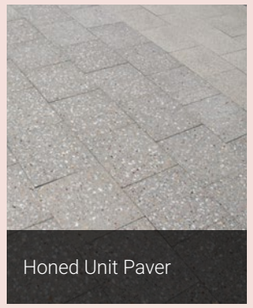
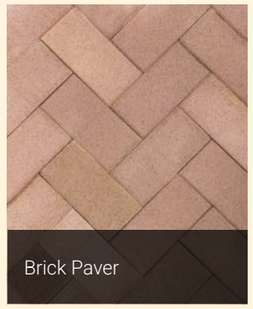
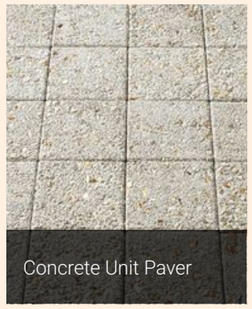
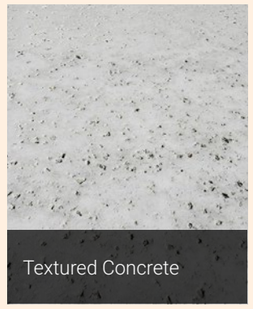
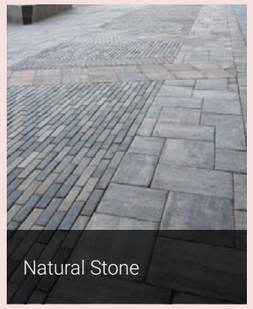
Placement and selection is critical to the success of surface treatments within the public realm. Whilst this style guide provides general advice it is recommended that for any major redevelopment, detailed surface treatment design be undertaken.

Surface Treatments

Surface treatments across the RSC will vary due to the different uses and functions of the sub-precincts.

This section provides a general guide to the proposed quality of surface treatments for each sub-precinct. Selections should ensure the following:

- Selections align with intended functional requirements of the proposed area;
- Selections consider the existing adjacent treatments to ensure a coherent and consolidated approach; and
- Detailed paving design is undertaken prior to selections.

Good	Better		Best
 Broom Finished Concrete	 Concrete Unit Paver	 Exposed Aggregate	 Honed Unit Paver
 Brick Paver	 Concrete Unit Paver	 Textured Concrete	 Natural Stone

Furniture

The **RSC's** coastal location **dictates** that selections are required to be robust and durable.

Placement is critical to the success and usability of furniture as it must respond to its intended function and user.

The following considerations should be applied:

- Ease of maintenance and cost effectiveness over entire lifecycle.
- Where practicable, offer *Disability Discrimination Act* compliant options.
- Co-locating furniture and elements within parks and POS (e.g. BBQ's with shelters and seating).
- Seats generally aligned with path whilst still allowing a clear path of travel and oriented towards a view.
- Consider shade from trees and allow for clear sight-lines.
- Groupings of seats should be arranged to promote social interactions between people.
- Where close to a street, shared path or car park, locate elements a minimum of 600mm back from the edge to avoid collisions by vehicles.
- Space seats a minimum of 1,200mm apart to allow for easy access.
- Not within large areas of open space which prevents use of the area for organised/formal activities.

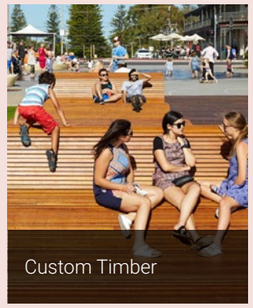
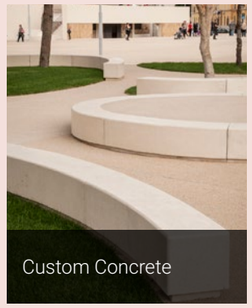
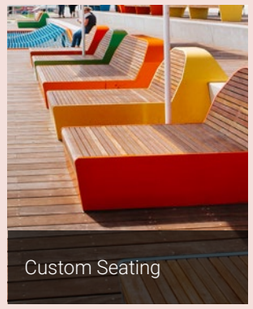
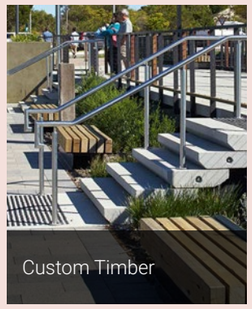




Seating

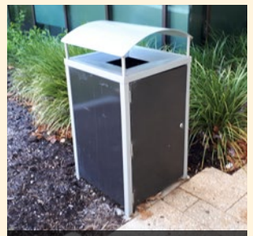
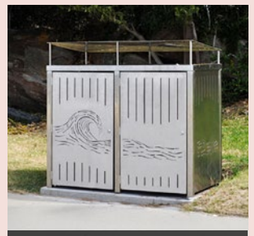
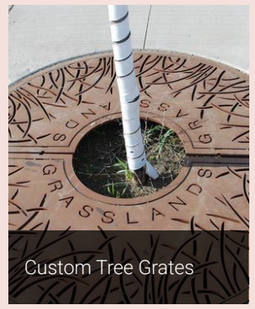
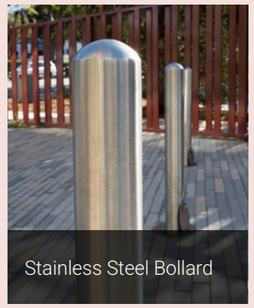
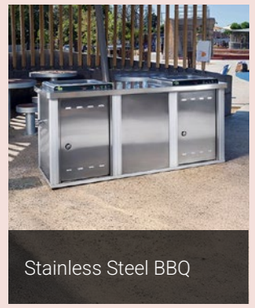
As set out in this style guide, the Waterfront Village Sub-Precinct will generally consist of medium to high quality custom products, in line with the 2019 Foreshore redevelopment.

Whilst these guidelines provide general advice it is recommended that for any major redevelopment, detailed furniture design and or selection is undertaken.

Good	Better	Best	
 Aluminum Bench	 Seat - Arm/Backrest	 Custom Timber	 Custom Concrete
 Aluminum Bench	 Bench - No Arm/Back	 Custom Seating	 Custom Timber

Fixtures

Placement and selection is critical to the success of fixtures within the public realm. The use of stainless steel within the Waterfront Village Sub-Precinct is used due to the coastal conditions.

Good	Better	Best	
 Galvinised Bubbler	 Powder Coated Bubbler	 Stainless Steel Bike Rack	 Stainless Steel Bubbler
 Aluminum Bin	 Stainless Steel Bin	 Stainless Steel Bin	 Custom Tree Grates
 Galvinised Steel Bike Rack	 Stainless Steel BBQ	 Stainless Steel Bollard	 Stainless Steel BBQ

Public Art

Public art is an important component of place-making and the creation of both artistic and family-friendly spaces. Public art can create a strong community identity, community pride and sense of place across a variety of cultural settings. Public art in the RSC has the opportunity to provide an artistic voice that helps communicate Rockingham's history, community and future directions. A strong sense of place, guided by iconic public art, plays an important part in cultural development, contributes to urban renewal and design, and helps the City's tourism industry.



In delivering public art in the RPSP area, the following considerations should be applied:

- Collaboration and liaison with the City's Mooriboordap Advisory Group to explore opportunities to reflect, recognise and celebrate Aboriginal history and culture through public art where appropriate;
- Enhance a sense of place by encouraging public art forms which provide an interpretation and expression of the natural physical characteristics and social values of the local area;
- Improve interpretation of cultural, environmental and built heritage; and
- Improve way finding and legibility of streets, open spaces and buildings.

Public Art in the RPSP should be coordinated through delivery of a Public Art Strategy to provide a clear direction for the delivery of public art in the precinct.

Wayfinding and Directional Signage

Wayfinding is the process of how people navigate and orientate themselves in an environment. Good wayfinding design – which involves graphic design, sensory design, architectural design and landscape design – can minimise the need for excessive freestanding directional signage. When a public space is well-considered and well-signed, it can help the users of the space feel safe and confident, as well as help to ensure the recognisability and memorability of a place.

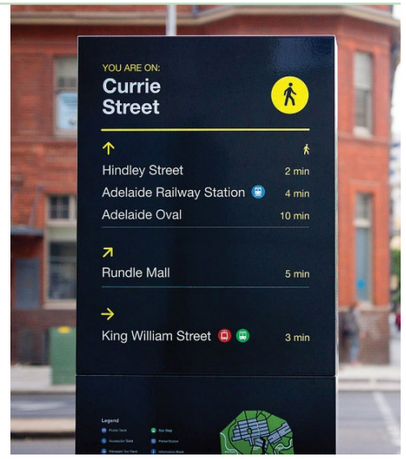
When developing wayfinding and directional signage strategies the following should considered:

- Consideration should be given to develop and manage clear navigation routes throughout the public realm.
- An integrated and cohesive approach to architectural and landscape cues, graphic communication, audible communication and tactile communication.
- Consideration should be given to coherence and consistency, both locally and more broadly. From a local point of view, consider how the wayfinding and directional signage relates to other precincts throughout the City. Consider the design of a signage suite; an expandable and hierarchical family of signs that can be implemented across multiple sites. More broadly, incorporate universally recognised symbols and colours where appropriate.
- Scale and placement should be carefully considered to ensure effectiveness and accessibility. When determining sign placement and design, consider access, sight lines, paths of movement and speed of movement. For example, large nodal signage should be placed at intersections and edges to facilitate navigation and play a role in welcoming visitors to the site.
- When designing directional signage, keep it simple, clear and to-purpose. Consider the scale of the content (words, symbols and images) in relation to the purpose of the sign. Where possible, use universal symbols to promote inclusiveness while also catering for non-English speaking people.
- Colour is an important variable in delineating signage. Keep colour-coding consistent and in line with recommended visual accessibility contrast ratios.
- Consider the connections and distances between the wayfinding and signage elements – the physical and visual connections between signs play an important role in helping to guide people to follow particular paths through an environment.

Interpretive Signage

Interpretive signage communicates additional information about a site, including its history, its stories and its context. Interpretive signage can contribute to the wayfinding system of a site, but its primary role is to enhance the visitor experience to encourage people to consider, linger and explore.

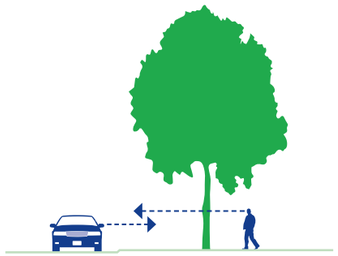
- When developing a wayfinding strategy, include interpretive signage as a complementary component of the overall signage system.
- Consider integrating and embedding interpretive information into site features and materials.



Planting

Tree Selection Principles

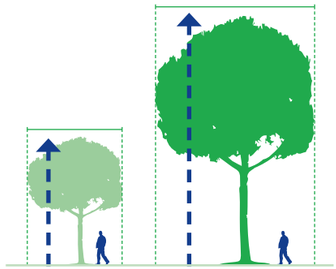
As described in the Urban Ecology section, improving and enhancing tree canopy is a primary focus of the RPSP. The style guide presents the following principles for street tree selection and placement.



1. Clear Sightlines
Prioritise clear trunked tree species to offer clear sightlines. Ensure trees are located at a suitable distance from crossovers and street intersections.



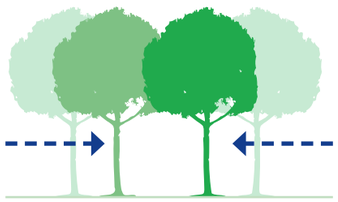
2. Diversity
Planting a diverse range of tree families, genus, and species will provide visual and seasonal interest, and resilience from pest and disease.



3. Verge Width to Tree Ratio
Select tree species to ensure selections are in scale and in harmony with the existing streetscape and its functions.



4. Large Canopied Trees
Prioritising taller, broad canopied tree species to maximise shade and cooling benefits.



5. Close Spacing
Planting trees with a close spacing to provide a quick increase in canopy cover and a continuous and connected canopy cover.

Trees planted closely will develop more upright forms, and be less susceptible to wind damage.

Planting Selection Principles

The City's 2017 Greening Plan shall be referenced in the first instance with the selection and location of tree and plant species.





The pattern of existing plants of the site is determined primarily by the landforms, soil types and fertility, and location to the coast.

Whilst there is less variation and numbers of species within the Quindalup dune complex than other areas of the Swan Coastal Plain, it nonetheless contains a large number of endemic plants.

Planting should be selected with a focus on endemic planting to provide habitat and biodiversity benefits, and to provide a sense of place in keeping with the sites coastal context.

Planting selection criteria shall ensure the right plant for the right location is used and include:

- Maintain sightlines (<600mm), within urban environment;
- Site specific analysis (soils, pH, verge width);
- Plants suitable for projected future climate conditions (reduced rainfall and increased temperatures);
- Desired ecosystem services (i.e. urban shade/cooling, storm water mitigation, biodiversity, feature planting etc);
- Functions and uses of the space;
- Ongoing maintenance, watering and other inputs; and
- Suitability for irrigated or non-irrigated garden beds.

Tree Selection Matrix

The following trees have been selected for placement throughout the precincts.

Genus	Species	Common Name	Deciduous (D) Evergreen (E)	Medium Verge 2-5m	Large Verge >5m	Public Open Space
Agonis	*flexuosa*	Native Peppermint	E	●	●	●
Allocasuarina	*fraseriana*	Fraser's Sheoak	E	●	●	
Angophora	*costata*	Sydney Red Gum	E	●	●	●
Araucaria	*columnaris*	Cook Pine	E		●	●
Araucaria	*heterophylla*	Norfolk Island Pine	E		●	●
Brachychiton	*populenus*	Kurrajong	E	●	●	
Callistemon	*var. 'Kings Park Special'*	Bottlebrush	E			
Callitris	*preissii*	Rottnest Island Pine	E			●
Casuarina	*equisitifolia*	Coast Sheoak	E			●
Casuarina	*obesa*	Swamp Sheoak	E			●
Ceratonia	*siliqua*	Carob	E	●	●	
Cinnamomum	*camphora*	Camphor Laurel	E		●	●
Cupaniopsos	*anacardioides*	Tuckeroo	E	●		
Corymbia	*exemia*	Yellow Bloodwood	E	●	●	●
Eucalyptus	*sideroxylon*	Ironbark	E	●	●	●
Eucalyptus	*erythrocorys*	Red Cap Gum	E			
Eucalyptus	*gomphocephala*	Tuart	E		●	●
Eucalyptus	*leucoxylon*	White Ironbark	E	●		●
Eucalyptus	*spathulata*	Swamp Mallett	E	●		
Eucalyptus	*utilis*	Coastal Moort	E	●		●
Erythrina	*skii*	Coral Tree	D	●	●	●
Ficus	*macrophylla*	Moreton Bay Fig	E			●
Ficus	*microcarpa var. hilliai*	Hills Fig	E			●
Fraxinus	*angustifolia*	Claret Ash	D	●		
Jacaranda	*mimosifolia*	Jacaranda	D	●		
Melaleuca	*cuticularis*	Saltwater Paperbark	E			●
Melaleuca	*lanceolata*	Rottnest Tea Tree	E	●		●
Melaleuca	*leucodendra*	Weeping Paperbark	E			●
Melaleuca	*quinquinervia*	Broad Leaved Paperbark	E			●
Melaleuca	*viridifolia*	Broad Leaved Paperbark	E			●
Metrosideros	*excelsa*	New Zealand Christmas Tree	E	●		●
Olea	*europaea*	Common Olive Tree	E			●
Olea	*europaea 'Swan Hill'*	Low-fruiting Olive Tree	E			
Phoenix	*canariensis*	Canary Island Date Palm	E			●
Pistachia	*chinensis*	Chinese Pistachio	D	●		
Pyrus	*calleryana "Bradford'*	Bradford Pear	D	●		
Sapium	*sebiferum*	Chinese Tallow	D	●		
Schinus	*molle*	Pepper Tree	E	●	●	
Tipuana	*tipu*	Pride of Bolivia	SD	●	●	
Ulmus	*parvifolia*	Chinese Elm	D	●		

Legend

● Suitable for use D: Deciduous E: Evergreen SD: Semi-Deciduous

P1 City Centre Sub-Precinct - Tree Selections



Phoenix canariensis

Canary Island Date Palm

Height: 15m
Width: 5m
Evergreen



Ficus macrophylla

Moreton Bay Fig

Height: 15m
Width: 18m
Evergreen



Melaleuca leucodendra

Canary Island Date Palm

Height: 15m
Width: 4m
Evergreen



Tipuana tipu

Pride of Bolivia

Height: 14m
Width: 12m
Semi-deciduous

P2 WaterFront Village Sub-Precinct - Tree Selections



Agonis flexuosa

Native Peppermint

Height: 10m
Width: 5m
Evergreen



Araucaria heterophylla

Norfolk Island Pine

Height: 18m
Width: 8m
Evergreen



Casuarina obesa

Swamp Sheoak

Height: 9m
Width: 5m
Evergreen



Eucalyptus gomphocephala

Tuart

Height: 18m
Width: 10m
Evergreen

P4 TOD Village Sub-Precinct - Tree Selections



Erythrina skii

Coral Tree

Height: 10m
Width: 8m
Deciduous



Metrosideros excelsa

New Zealand Christmas Tree

Height: 15m
Width: 12m
Evergreen



Jacaranda mimosifolia

Jacaranda

Height: 10m
Width: 8m
Deciduous



Angophora costata

Sydney Red Gum

Height: 18m
Width: 10m
Evergreen


KD
KD CYCLES
GreenEDGE
Jayco
SCOTT
SUBARU
SIDI

Objective	Considerations	Reference
O4.1 To ensure the movement network supports the function and ongoing development of the precinct	**C4.1.1** Address the current and future access needs of the precinct through an integrated transport planning and land use assessment process.	
	C4.1.2 Design the movement network in balance with place considerations, local access and neighbourhood/district/regional access requirements for travel to, through and around the precinct.	
	C4.1.3 Develop a movement network that enables convenient and comfortable travel and access for users of all ages and abilities.	
	C4.1.4 Design transport infrastructure that provides a safe network for all users.	
O4.2 To ensure a resilient movement network that prioritises affordable, efficient, sustainable and healthy modes of transport	**C4.2.1** Prioritise walking, cycling, public transport and shared mobility, to minimise car dependency.	
	C4.2.2 Establish mode share targets for the precinct.	
O4.3 To enable a range of transport choices that meet the needs of residents, workers and visitors	**C4.3.1** Prioritise provision of direct and legible pedestrian routes within the precinct and to adjacent areas.	
	C4.3.2 Provide a bicycle network within the precinct that integrates with the broader cycle network and connects safely and conveniently to key destinations.	
	C4.3.3 Identify public transport services and infrastructure to be upgraded or established to improve coverage, frequency, connection and user choice.	
	C4.3.4 Design public transport infrastructure to integrate with and be appropriate for the intended mode share, patronage and place character of the precinct.	
	C4.3.5 Consider access requirements for service vehicles and logistical freight movements within the precinct.	
	C4.3.6 Design the movement network to allow for private vehicle access and movement that is appropriate to the precinct function.	
O4.4 To ensure the quantity, location, management and design of parking supports the vision of the precinct	**C4.4.1** Provide the minimum amount of car parking appropriate for the precinct.	
	C4.4.2 Manage and locate car parking to prioritise access according to the needs of different user groups.	
	C4.4.3 Design parking to be integrated with the urban form.	
	C4.4.4 Design parking for adaptability over time to accommodate potential future change of use.	
	C4.4.5 Consider parking requirements and end of trip facilities for other transport modes.	

5.4 Movement

Response to Context

As described in **Section 2.5** key design considerations for Design Element 4: Movement can be summarised as follows:

- The RCCTS will continue to act as the focal point of the public transport network in the RSC, ensuring essential links and connections are provided between key sub-precincts such as the City Centre, TOD Village, and Waterfront Village.
- Broad improvements to active transport are desired, particularly for local trips. This will contribute to ensuring that mode share targets can be reduced, resulting in a host of environmental and social benefits to the community.
- Design of the movement network will need to ensure that it is delivered with careful consideration for the needs of all users (not just private cars). Promoting pedestrian priority, safe cyclist movements and universal access are all critical considerations.

Desired Outcomes

The RSC's integrated movement network is safe and efficient, promoting sustainable transport options that reduce the need for private vehicle trips.

- Walking is prioritised as the most important mode of transport. Streets, public places and buildings are all designed to provide a safe, shaded, secure, stimulating and pleasant walking environment for people of all ages and abilities.
- The RCCTS provides a dedicated tier two public transport link that connects the Rockingham Train Station with the City Centre, TOD Village, and Waterfront Village Sub-Precincts.
- Key cycle routes are defined, and infrastructure provided to promote cycling as a safe and viable mode of transport.
- An integrated urban design and traffic management approach is adopted within the City Centre and Foreshore to deliver low speed traffic environments that promote and prioritise pedestrian safety in high activity areas.
- Intersection treatments throughout the RSC prioritise pedestrian safety and consider the safe and efficient movement of all transport modes.
- Parking demand management promotes short-term car parking in high activity areas. Mid–long term parking is consolidated on the periphery of the City Centre and Waterfront Village Sub-Precincts to reduce the parking footprint in these areas.

5.4.1 Proposed Movement Network

A preferred movement network has been adopted by the City, taking into account the vision and principles of the RPSP which seek to substantially improve connectivity (for non-car-based trips) within the RSC.

The adopted movement network for the RPSP is illustrated on **P2 - Figure 27**. It includes a wide range of street types which consider a range of existing and emerging transport modes that can support a range of functions. The key elements of the movement network are summarised below.

Public Transport Network

The primary function of the RCCTS is to enhance connectivity between key nodes in the RSC, and to catalyse development along the route. This dedicated route provides a link between Rockingham Train Station, City Centre, TOD Village, and the Waterfront Village Sub-Precincts.

Through the RPSP design process, an alternate route has been considered and adopted for the RCCTS. This new route will first be based on bus movements, with a transition to trackless trams or an alternate mode considered in the future. The proposed route includes three key segments:

- **Segment 1:** The southern segment runs from Rockingham Train Station to Charlgrove Avenue (via Contest Parade). It traverses through the City Centre Sub-Precinct with large sections of bus priority. No changes to the route are proposed in this segment.
- **Segment 2:** The central segment travels from Charlgrove Avenue through the TOD Village to Dixon Road. It crosses Louise Street (from Market Street) in a dedicated green crossing (active and public transport only). At Dixon Road, the route travels westward to Patterson Road (via Louise Street). This represents a change from the existing alignment, however, the design ensures that future extension into the service commercial area north of Dixon Road is possible in the future if desired.
- **Segment 3:** The northern segment runs along Patterson Road into the Waterfront Village. The route traverses the precinct in a clockwise route, via Kent Street and Wanliss Street (before reaching Patterson Road and heading back to Rockingham Train Station). A terminus on Wanliss Street is possible.

From an operational and development perspective, the following benefits are identified with this new alignment:

- The new RCCTS route aims to reduce the number of transit stops along the route, especially along major distributor routes to potentially reduce the journey time while maintaining the accessibility within the RPSP.
- The new RCCTS route is relocated away from the Rockingham Beach Road to minimise the conflict with pedestrian traffic. New stops on Kent Street provide the impetus to encourage development on Kent Street, and provide new midblock connections (to Rockingham Beach Road).
- The extended coverage along Patterson Road expands the walkable catchment westward, now capturing high amenity residential areas in the Waterfront Village Sub-Precinct. It also assists in activating commercial developments between the Waterfront Village and City Centre.
- Flexibility to extend the route in accordance with the initial alignment (if required).

In addition to the RCCTS, the RSC will continue to be served by Rockingham Train Station and the various bus services which currently exist.

Transition to Trackless Tram

The transition to trackless tram along the RCCTS route is expected to be largely driven by the overall route patronage. When the popularity of the route dictates a higher frequency or larger capacity buses to accommodate the passenger demand, trackless trams should be considered financially viable. Additionally, the residential density of the catchment surrounding the RCCTS route would need to increase noticeably over the current level of development to justify the implementation of future trackless tram infrastructure.

It is noted that the running of trackless trams would require wider turning paths at intersections than that of a typical bus, which makes roundabouts less desirable for intersection treatments. As such, consideration of intersection treatments on the future trackless tram route should also be noted.



Active Transport

The RPSP focuses heavily on the integration of key activity nodes. Whilst the RCCTS is one primary measure in which this can be achieved, there is also a desire to explore opportunities to enhance active transport allowing more local trips to be generated by these modes.

Within the RSC, it is identified that pedestrian and cyclist infrastructure is good in isolated pockets. However, precinct-wide connectivity is lacking. There is also a notable lack of quality and defined north-south links which presents challenges for encouraging active transport between key destinations such as the City Centre and Waterfront Village.



Cyclist Infrastructure

To support the RPSP Vision, the following upgrades are proposed (refer **P2 - Figure 27**):

- **Read Street Upgrades** - Read Street is identified as the most direct cycle link between the City Centre and Waterfront Village Sub-Precincts. There is currently a shared path on the western side of the road reserve, however, there are opportunities to significantly enhance this link, turning it into the primary cycle route within the RSC. The width of the road reserve means that there are opportunities to explore creation of two new dedicated pathways on the eastern side, which would include a dedicated and separated cycle/personal mobility device (PMD) link, and a new pedestrian path which will be adequately shaded to improve the link's amenity.
  P2 - Figure 26 provides an illustration of what the future street upgrades could look like.
- **New Shared Path Village Green** - Flinders Lane from Patterson Road to Kent Street has been recognised as containing a shared path on the western side of the road. This route has a wide, comfortable path that many pedestrians and cyclists may opt to use to access the Foreshore from Patterson Road. However, the path beyond Kent Street to the Foreshore also contains a shared path, albeit of different form, that should be recognised. Patterson Road is recognised as having a shared path up until Flinders Lane which ends before the Village Green. However, it has been identified that this path continues through Village Green to Kent Street. This route is shaded by extensive tree coverage that makes for a pleasant, scenic cycle or walk. Plans should be amended to reflect this high-quality route.
- **New Shared Path Victoria Street** - Victoria Street is currently not recognised as being a significant route of any kind, however, possesses many qualities of a high-quality shared path. Victoria Street could be recognised for its existing shared path. There is also an opportunity to promote cycling along this path with the addition of an on-road bicycle lane or creation of a bicycle boulevard, which Victoria Street can comfortably accommodate.
- **Shared Path Upgrade Wanliss Street** – Wanliss Street is recognised as containing a shared path. The existing path infrastructure is not in the greatest condition and requires an upgrade in path quality and width, especially as it is a significant route that provides access to the Foreshore. Wanliss Street has a large road reserve which provides ample opportunity to create a high-quality shared path in concert with the proposed RCCTS Route.
- **Louise Street Cycle Path Extension** - The most significant high-quality north-south route currently exists on Louise Street between Patterson Road and Chalgrove Avenue. There is an opportunity to extend this shared path south to Council Avenue. The benefits of developing a shared path along this route could help reduce through traffic demand from the current Goddard Street/Simpson Avenue/ Whitfield Street area and create potential for a more pedestrian activated commercial precinct.
- **City Centre Good Road Riding Environment** - The area in the City Centre that includes Contest Parade/Central Promenade/Whitfield Street (from Council Avenue to Chalgrove Avenue) has potential to be recognised as a good road riding environment. From Council Avenue, cyclists can ride north along Contest Parade then on to Central Promenade followed by Whitfield Street to Chalgrove Avenue. Ensuring future road treatments promote cyclists in these areas is a priority.
- **Jecks Street Path Upgrade** - Jecks Street is identified as being part of the RSC's future green link network. The wide road reserve is conducive to path improvements and tree planting on both sides - which would support the density increases proposed here. This will provide an important link between the Victoria Street POS and the RCCTS on Wanliss Street. **P2 - Figure 22** provides an illustration of what the future street upgrades could look like.
- **Green Crossings** - As described in **Section 5.3.2** a number of green crossings are proposed for investigation. These are illustrated on **P2 - Figure 27** and include:
  - Louise Street and Dixon Road.
  - Patterson Road and Wanliss Street.
  - Patterson Road and Flinders Lane.
  - Leeuwin Parade.



Pedestrian Movement

With regards to pedestrian movement, the upgrades proposed above will all have a bearing and positive influence on enhancing the quality of key links for pedestrians.

The hard infrastructure plays an essential role in the quality, safety, and amenity of pedestrian journeys. The Urban Structure and Built Form Sections provide commentary on how the proposed urban design will enhance walkability in the RSC. This includes careful consideration of the size and width of urban blocks. It also considers what is happening on these journeys, where possible green nodes are created, these micro-destinations add visual interest and help to 'break up the journey'. With regards to the proposed built form approach, the focus on street interface and frontage types ensures that future development has special consideration for how people and buildings will interact with each other. For example in denser, main street areas awnings, alfresco dining, and other measures add to the pedestrian experience.

Proposed Read Street Upgrade

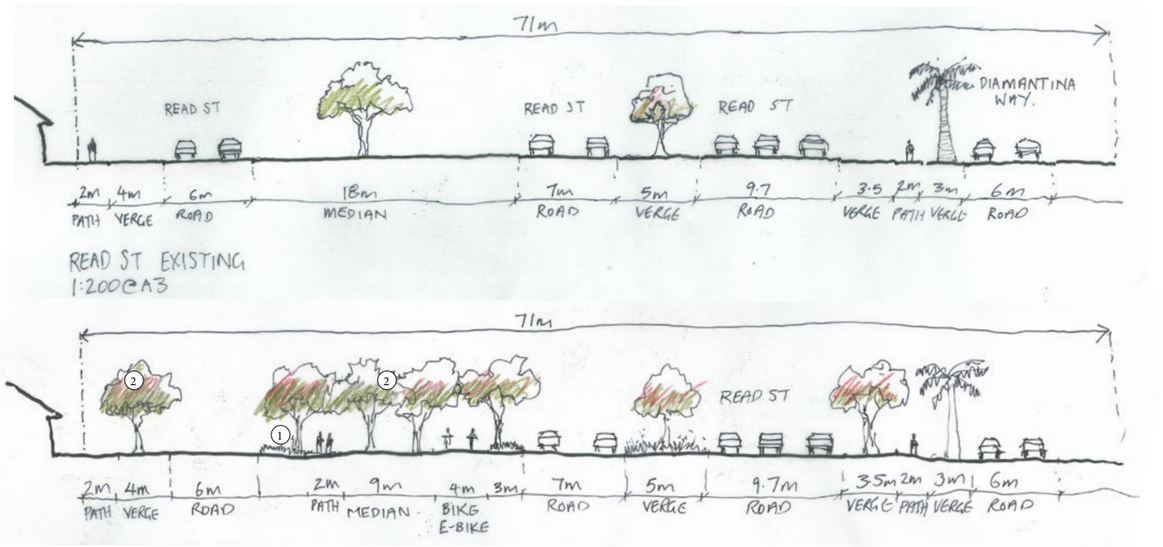
A key design principle of the RPSP is to improve links between key nodes, with a focus on modes other than the private car. Providing safe, and pedestrian separated bicycle/PMD path ways has been identified as an opportunity which could help reduce the 'tyranny of distance' across the RSC and offer alternative modes of transport for the community.

The current urban form of many places in the RSC is not conducive for the community to adopt alternative (non-vehicular) means of transport. Use of PMD's such as e-scooters, e-bikes, and e-skateboards is growing rapidly in Perth. These devices have the potential to change the way we travel with shorter journeys and commuting being undertaken.

Current barriers to the community using PMD's and bicycles include poor urban design and lack of dedicated bicycle infrastructure[1]. To overcome this, an enhanced Read Street is proposed to better connect the City Centre and Waterfront Village, allowing it to act as a key gateway and wayfinding element in the RSC. Enhancements will require major interventions within the road reserve, which could include:

- Construction of new (and separated) pedestrian and dedicated cycle/PMD pathways; and
- Major planting and other upgrades to provide lighting, shade, and comfort to make it safe and attractive.

1 Cycling Getting Australia Moving - Barriers, facilitators and interventions to get more Australians physically active through cycling.



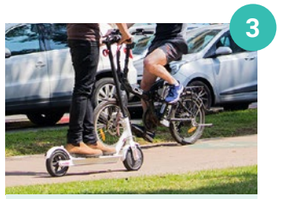
P2 - Figure 26: Proposed Read Street Treatment



1 Separated pedestrian paths with native planting to provide safe, shaded pedestrian paths.



2 Additional tree planting to medians to shade users, provide traffic calming, and increase urban canopy.



3 Separated bike, e-scooter/ e-bike paths to provide direct connections to the beach from the Civic Centre.



4 Rich, diverse native flower planting to provide a 'botanic gateway' to the Foreshore.

Vehicle Transport

The maturity of the RSC means that provision of new roads is limited primarily to larger vacant future development sites such as the TOD Village and within the City Centre. In these cases, roads will serve a localised movement function, connecting local traffic to higher order roads.

The future mode share (as defined in **Section 5.4.3**) emphasises a strong desire to reduce the amount of localised trips made by car. Despite this, it is acknowledged that due to its location the RSC will always rely on vehicles for a high number of trips, particularly those made by non-local workers and visitors. To ensure that the proposed movement network moves cars in a safe and efficient manner, Cardno have undertaken a review of road safety data, and Regional Operations Model (ROM) 24 Link Volume Plots for 2021 and 2041 (which were provided by MRWA). This review determined that a number of intersections would require upgrades to enhance performance. These are illustrated on **P2 - Figure 27** and summarised in **P2 - Table 13**.

P2 - Table 13: Proposed Intersection Upgrades

Precinct	Intersection	Proposed Approach
P1 - City Centre	1. Central Promenade/Syren Street	Exploration of new mini-roundabout to address safety issues – driven by crash data. Design to consider impacts of on-street parking which restricts available sightlines – contributing to crashes.
	2. Central Promenade/Charlgrove Avenue	New intersection design to address issues associated with poor sight lines which contribute to drivers turning through intersection at speed without proper assessment of pedestrian movements across carriageways. Legibility of right of way to be addressed.
	3. Central Promenade/Whitfield Street/Goddard Street	New road/intersection designs to improve legibility of movement network into City Centre. Legibility of right of way to be addressed.
	4. Charlgrove Avenue/Leghorn Street	Upgraded intersection required to improve safety and legibility of connection.
P2 - Waterfront Village	5. Patterson Road/Thorpe Street	New intersection design to improve safety issues (driven by crash data).
	6. Flinders Lane/Kent Street	
	7. Flinders Lane/Rockingham Beach Road	Exploration of new mini-roundabout to address safety issues (driven by crash data), and observed vehicle speeds late evening and early morning (while pedestrian activity is still significant).
	8. Rockingham Beach Road/ Wanliss Street	Exploration of new mini-roundabout to address safety issues (driven by crash data). Also provide entry treatment to reinforce low speed environment within precinct.
	9. Wanliss Street/Kent Street	Intersection design improved to provide a priority route along Wanliss Street for cyclists travelling to/from beach front and help reduce speeds of traffic along Kent Street as they transition from the residential to Beach front village.
	10. Flinders Lane/Patterson Road	Green Crossing proposed to improve access and connectivity to isolated POS into a broader network of spaces.
	11. Wanliss Street/Patterson Road	
P4 - TOD Village	12. Louise Street/RCCTS	New intersection required to facilitate implementation of RCCTS.
	13. Louise Street/New Roads	New road connection to Louise Street required to assist with local connectivity for new development.
	14. Louise Street/Dixon Road	Green Crossing proposed to improve access and connectivity to isolated POS into a broader network of spaces.
	15. Louise Street/Market Street	
	16. Leeuwin Parade	
	17. Leeuwin Parade/Louise Street	New intersection required to facilitate safer crossing.
	18. Leeuwin Parade/New Roads	New road connection to Leeuwin Parade required to assist with local connectivity for new development.
P8 - Dixon Road	19. Patterson Road	Potential new road connection to Patterson Road to assist with local connectivity for new development.
	20. Dixon Road/Ambrose Street	Potential new four-way intersection to allow creation of new road connection. Design to be future proofed to allow for potential expansion of the RCCTS.
	21. New Dixon Road Connection	New left-in left-out intersection to facilitate new road connection from Dixon Road (north of the PTA depot).

Potential intersection treatment options and their justification are provided in the Traffic Impact Assessment **(Appendix 3)**.

The intersection upgrade options considered generally include:

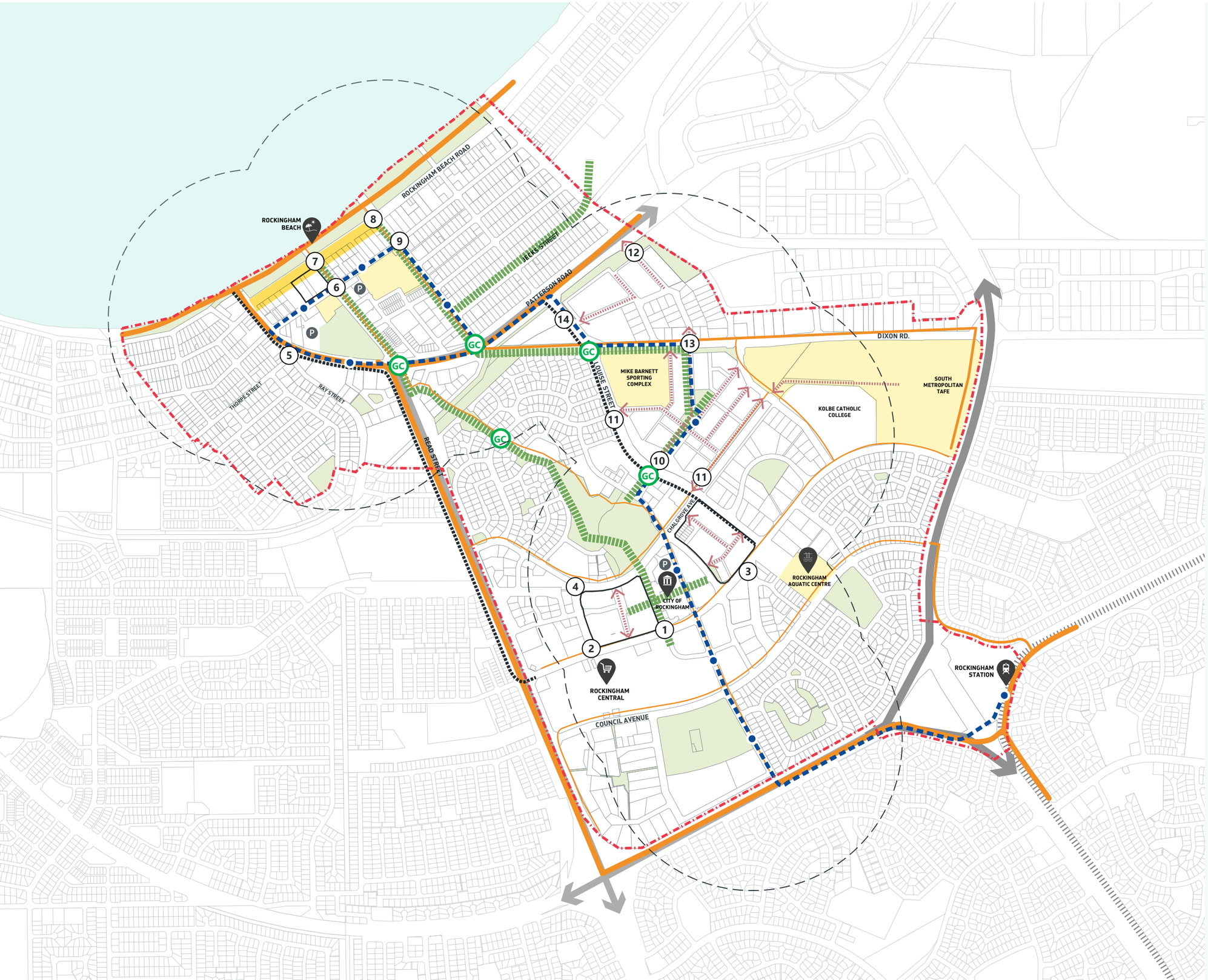
- Standard roundabout;
- Mini roundabout;
- Signalised intersection;
- Four-way raised intersection treatment; and
- Minor upgrades such as intersection layout improvements and local area traffic management.

It is noted that the data currently available is insufficient to fully inform the required treatment footprint and future timing of upgrades.

In delivering future intersection/road upgrades, the RPSP advocates for strong consideration of the following principles, which are derived from the objectives and considerations set out in SPP 7.2:

- **Response to Place Requirements** – proposals should consider how well the option responds to the street classifications and frontage types associated with the proposed Movement and Place Plan **(P2 - Figure 29)** proposed in the RPSP.
- **Accessible Streets** – consider how well the solution caters for universal design, promoting access for members of all ages and abilities in accordance with the City's Disability Access and Inclusion Plan.
- **Pedestrian and Cyclist Priority** – consider how the solution can assist with prioritising walking, cycling, public transport and shared mobility, to minimise car dependency.
- **Safe Pedestrian Connections** – consider how the solution performs in providing safe pedestrian connections through the intersection.
- **Safe Cyclist Connections** – consider how the solution performs in providing safe cyclist connections through the intersection.
- **Public Transport Integration** – consider how well the solution integrates with existing and proposed public transport infrastructure.
- **Safe Vehicle Movements** – consider how well the solution responds to the desired function and movement priority of the precinct.
- **Safe On-Street Parking** – consider how well the solution supports provision of safe and integrated on-street parking commensurate to the desired urban form.

P2 - Figure 27: Movement Plan



Legend

- Precinct Structure Plan Boundary
- Primary Distributor
- Distributor A
- Distributor B/Local Distributor
- Rockingham Train Station
- Public Purpose
- Public Open Space
- Future Development Sites

Proposed Infrastructure/Upgrades

- Primary Route
- Secondary Route
- Local Route

Long-Term Cycle Network (DOT)

- Proposed RCCTS Route/Stops
- RCCTS Walkable Catchment (800m)
- Road Upgrades
- Green Links
- Cycle Path Upgrades
- Proposed Roads
- (1) Proposed Intersection Upgrades
- (GC) Proposed Green Crossings
- (P) Proposed Multi-Deck Carpark

5.4.2 Parking and Parking Management

Within the RSC, it is important that a balance is achieved between meeting the access and parking needs for vehicles and the movement needs of pedestrians and cyclists. As set out in the City's Public Parking Strategy (for the RSC) it was determined that quantum of parking is not currently an issue, rather revised approaches to parking management are desired.

The distribution of car parking in the RSC focusses primarily on the City Centre, Waterfront Village and TOD Village Sub-Precincts, areas where there is a greater focus on employment and residential density and therefore parking. Better management of parking in these areas will help to increase accessibility and encourage use of alternative transport modes such as public transport, cycling and walking. Over the long-term, as patronage increases on alternative transport modes, reductions in the need for parking could then be expected.

The key focus areas of the RPSP as it relates to the Parking Strategy are as follows:

- Demand for parking across the RSC is reduced through increased use of alternative transport modes.
- Carpark designs reduce the amount of ground-level space required and the impact upon the urban form.
- Reciprocal parking opportunities are maximised.
- Pedestrian links within parking areas are provided and are safe, legible and connect with surrounding activity uses.
- Formalised on-street parking is encouraged in appropriate locations as a traffic calming tool.
- Timed and paid parking is used strategically to manage parking demand and occupancy, and revenue is utilised to support sustainable travel modes.
- Demand generators are responsible for managing and reducing the parking demand they create and the promotion and support of alternative transport modes.
- Centralised and controlled parking.

Proposed Parking Improvements

The following parking improvements are proposed to assist with implementation of the RPSP:

- **City Centre Decked Car Park** - The City has identified a decked car park location within the City Centre which could accommodate the future parking demand increase. The multi-decked car park located adjacent to the bus transit lane is expected to provide a significant public parking resource for the City Centre with the proposed 500 bay public parking station.
- **Waterfront Village Parking** - The proposed strategy is to promote longer-term parking in the off-street locations predominantly south of Kent Street. The existing 'Village Green Carpark' and 'Museum Carpark' have been designed to accommodate parking decks to increase supply.
- **Foreshore Reserve Parking** - The Rockingham Beach Foreshore Master Plan intends to provide public parking within the Foreshore reserve and street parking within Railway Terrace and Rockingham Beach Road. The parking rationalisation was associated with a desire to create more pedestrian orientated public spaces and remove public parking from areas of high social value.
- **Overflow Parking** - The Public Parking Strategy advocates that the City should develop guidelines that facilitate the use of suitable City controlled land to be made available for overflow parking for major events and in peak summer periods.
- **Reciprocal Parking Easement Dixon Road** - An accessibility issue that has been identified in the Dixon Road Sub-Precinct, is that there is poor connectivity between businesses of similar function. There are partial easements between some of these businesses, however, some sites can only be accessed via Dixon Road, leading to traffic movements in and out of access driveways, increasing congestion and crash risk. In the future it is likely that many of these buildings may be redeveloped and there will be an opportunity to create a parking/access easement along the Dixon Road frontage, which will improve access and connectivity between businesses and improve overall safety.

Cash-In-Lieu Parking Requirements

In 2024, the City's RSC Payment in Lieu of Parking Plan **(PILPP)** became operational. The PILPP, together with the Regulations, governs the application of payments in lieu of providing car parking for development in the area(s) identified in this Plan. The PILPP outlines the purposes for which payment in lieu of car parking will be used in the area(s) identified and how money collected will be administered.

The PILPP operates in the RSC's two primary commercial areas, being P1 - City Centre and P2 - Waterfront Village. Funds obtained are to be used for the construction of multi-deck parking infrastructure as shown on **P2 - Figure 27**.

5.4.3 Mode Share

Existing mode share targets within the RSC are heavily weighted toward private vehicle trips, for both local resident trips, and employee trips (which include a greater proportion of people travelling from outside the RSC). This is common in outer metropolitan centres such as the RSC, however, as set out in the City's Draft Local Planning Strategy there is an aspiration to reduce private vehicle trips by 10-15%. Improving mode share in the RPSP will be achieved via the following strategies:

Public Transport Improvements - Improvement to public transport links and frequency within the RSC is likely to result in a step change of public transport usage. In dense urban locations supported by high-frequency public transport services, a reduced driving mode share for employees and residents is reasonable. The RCCTS will allow the RSC to be well connected by public transport via the Perth-Mandurah Train Line. Increasing usage of public transport by 15% for local trips is an aspiration of the City's LPS.

Cycling/E-Ridables/Walking - Emerging technologies are providing the opportunity for bike and scooter sharing platforms to thrive. These platforms allow for one-way travel, and particularly when e-bikes are provided, can support much lower 'car as-driver' mode shares for short distance travel. In addition to bike shares, infrastructure improvements are proposed across the RSC with enhanced linkages and crossings (e.g. green crossings). These enhancements will improve safety making walking (aspiration for 17%) and cycling (aspiration for 8%) more viable for local trips.

5.4.4 Movement And Place Approach

Buildings, public spaces and streets all work together to create the urban places that locals use throughout the RSC. There are a range of different experiences walking, cycling or driving through the RSC on the street network, often in competing roles. All streets are different with different movement and place requirements.

- **Movement** is the transport of people and goods. The movement role is to provide a seamless connection from the beginning to the end of the journey.
- **Place** refers to the qualities of the streets and roads. The place role recognises that these are places and destinations in their own right understanding the activities that are occurring.

SPP 7.2 introduces the notion of 'movement and place', and the Department of Transport (in collaboration with the DPLH) are developing a 'Movement and Place' framework that can assist in the precinct planning process. While this framework is in draft it is a useful tool to apply. It will help to guide:

- The way buildings address streets, and the land uses that can be contemplated within;
- Public works and landscape design and investment; and
- Priorities for 'movement' and 'place' outcomes, which may compete in strategic locations of the RSC.

P2 - Figure 28: Movement and Place Values



Note: A high place value does not mean that a street should be active with retail development at nil setbacks. There are different frontage types and activities that can occur on streets with higher place values. Examples include: Green living edges with residential courtyards and balconies; active retail and frontage; landscaped edges with commercial development set back behind.

How these classifications relate to different street frontage types is explained in Section 5.6.3.

How It Works

An assessment was undertaken which assigned 'very low, low, mid, high or very high' values to each road (or portion of road), on a sub-precinct basis. The general considerations for movement value included the street's length, daily volume of traffic (for all modes), the road's classification according to MRWA hierarchy and its connections to other higher order roads, regional and local destinations. The considerations for place included residential density and the number and variety of activities occurring on, or adjacent to, the street.

Movement and place values are interrogated for each street to suggest building frontages that may be suitable for that place. These frontages are expressed with sections and photo examples.

A priority rating is applied to some streets to highlight the benefit of streetscape upgrades to assist with urban redevelopment. This can be used by the City, and adjacent landowners to coordinate public works and landscaping projects in the RSC.

Defining The Values

P2 - Figure 28 provides a graphic representation of these values. When combined, the movement and place values form distinct groups which becomes a way of organising and distilling the desired outcomes. These are explained further below.

Movement Corridors (high movement/low place) are routes that facilitate broader connections to, through and within the precinct. Their design prioritises efficient movement of people and freight, and is characterised by broader carriageways, minimised traffic disruptions and higher speed limits. Key examples of this street environment are Read Street, Ennis Avenue and Patterson Road.

Activity Streets and Connectors (mid movement and place) form the precinct's secondary internal movement network and facilitate connections to schools, smaller-scale retail, commercial and industrial centres within the RSC. These streets prioritise vehicle access, whilst providing convenient pedestrian connections to the premises. Livingstone Road, Leach Crescent and Morgan Street are examples illustrating this street type.

City Destinations (high movement and place) are focal RSC locations characterised by both high 'place' and 'movement' values. These streets are shaped by a variety of uses and activities, often have a prominent built environment, including heritage and civic places, and attract high volumes of movement. They are often pedestrian priority, shared spaces. The examples include Railway Terrace, Civic Boulevard and Syren Street.

City Streets (mid movement/high place) value environments that have lower movement activity. These streets are characterised by high residential density and accommodate walkable connections to open space and public transport. This street typology forms the core network for the TOD Village sub-precinct.

City Places (low movement/high place) are links to local destinations that have a higher 'place' value but are characterised by 'low' or 'very low' movement. They facilitate local connections to parks, small-scale retail, commercial and community uses. Moresby Grove is an example of this street type.

Local Streets (low movement and place) form the majority of streets in the RSC. Albeit lower in activity, they can have significant meaning to the residents, offering places to play, socialise and exercise.

P2 - Figure 29: Movement and Place Assessment



Legend

- Precinct Boundary
- Landmark

Movement Value

- Very High
- High
- Middle
- Low
- Very Low

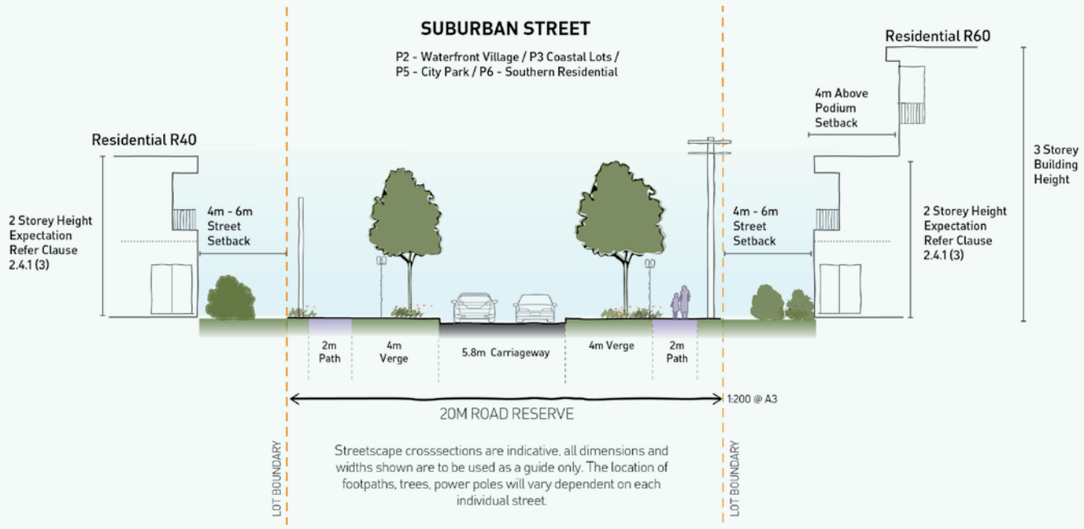
Place Value

- Very High
- High
- Middle
- Low
- Very Low

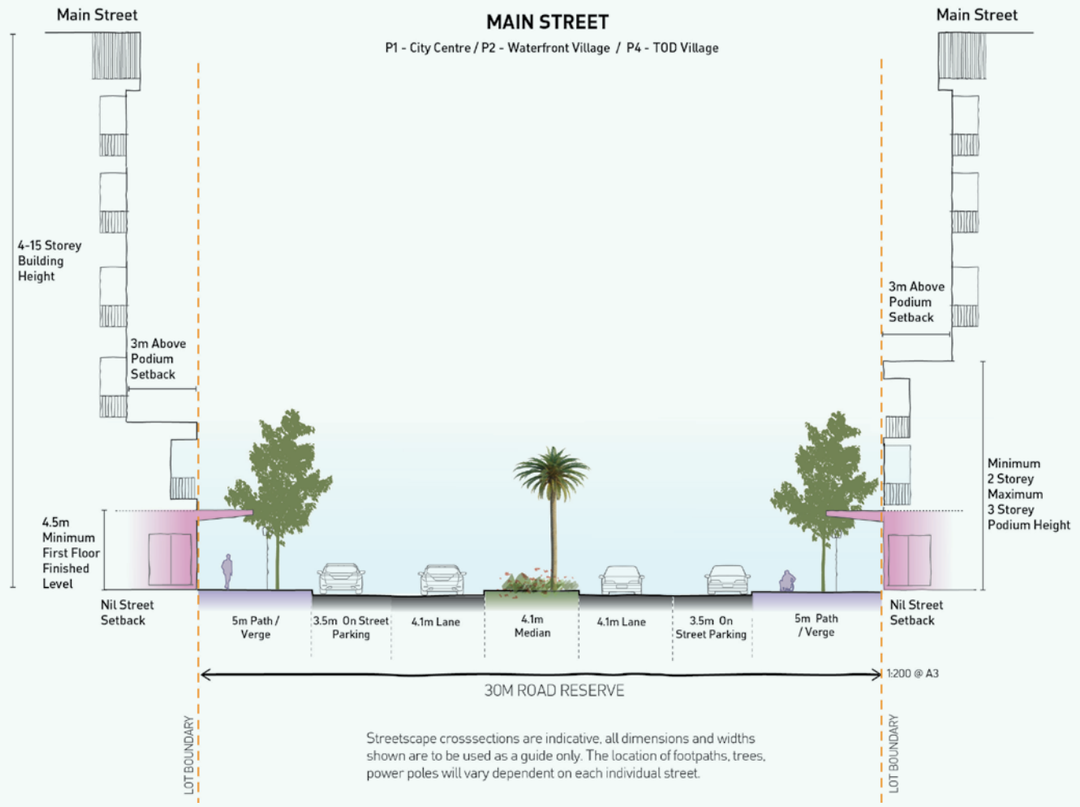
Based on the movement and place assessment a number of typical street typologies have been identified for implementation across the RPSP. Their typical characteristics are shown on **P2 - Figure 30** to **P2 - Figure 37**.

The built form aspects are summarised in Section 5.6.3.

P2 - Figure 30: Suburban Frontage Type

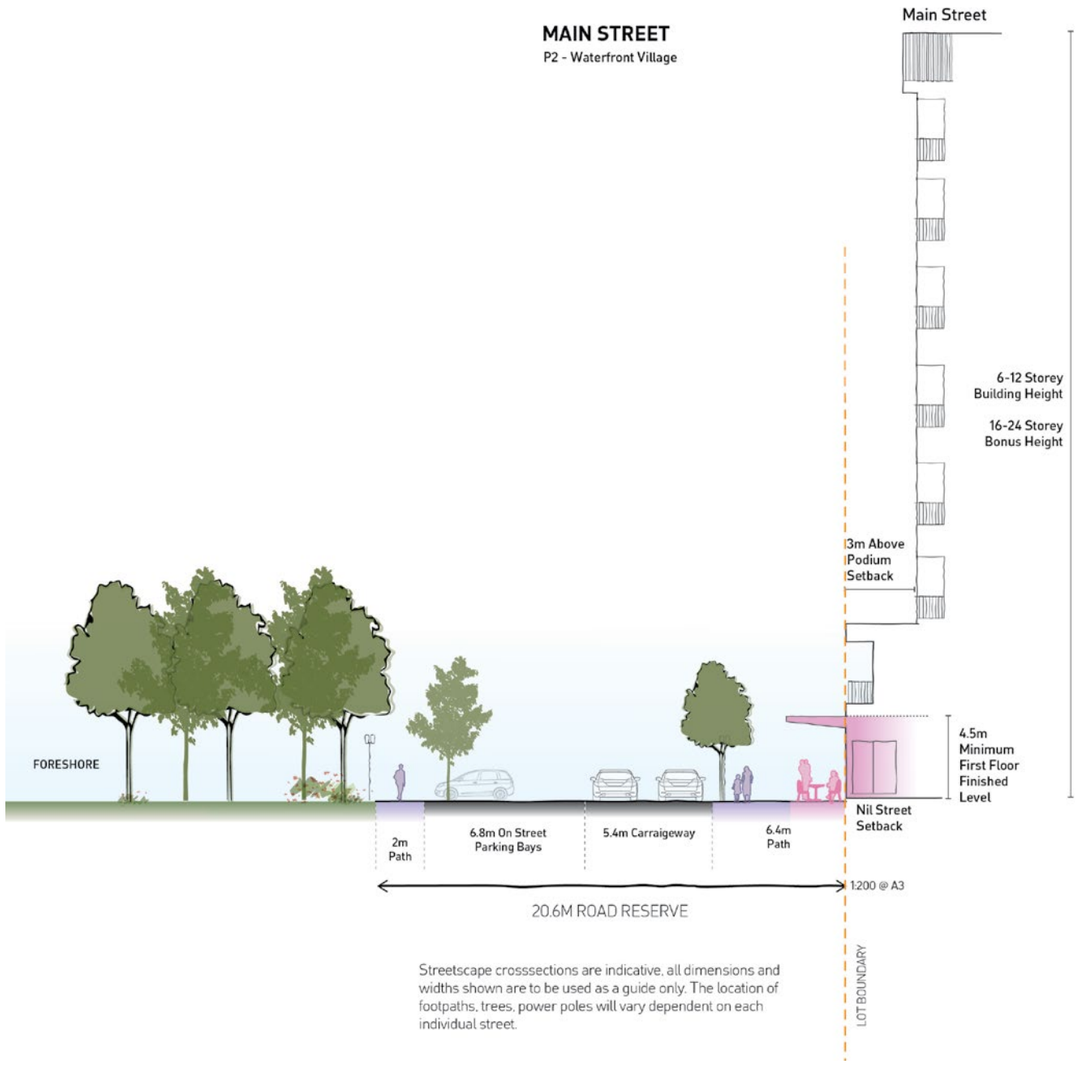


P2 - Figure 31: Main Street Frontage Type

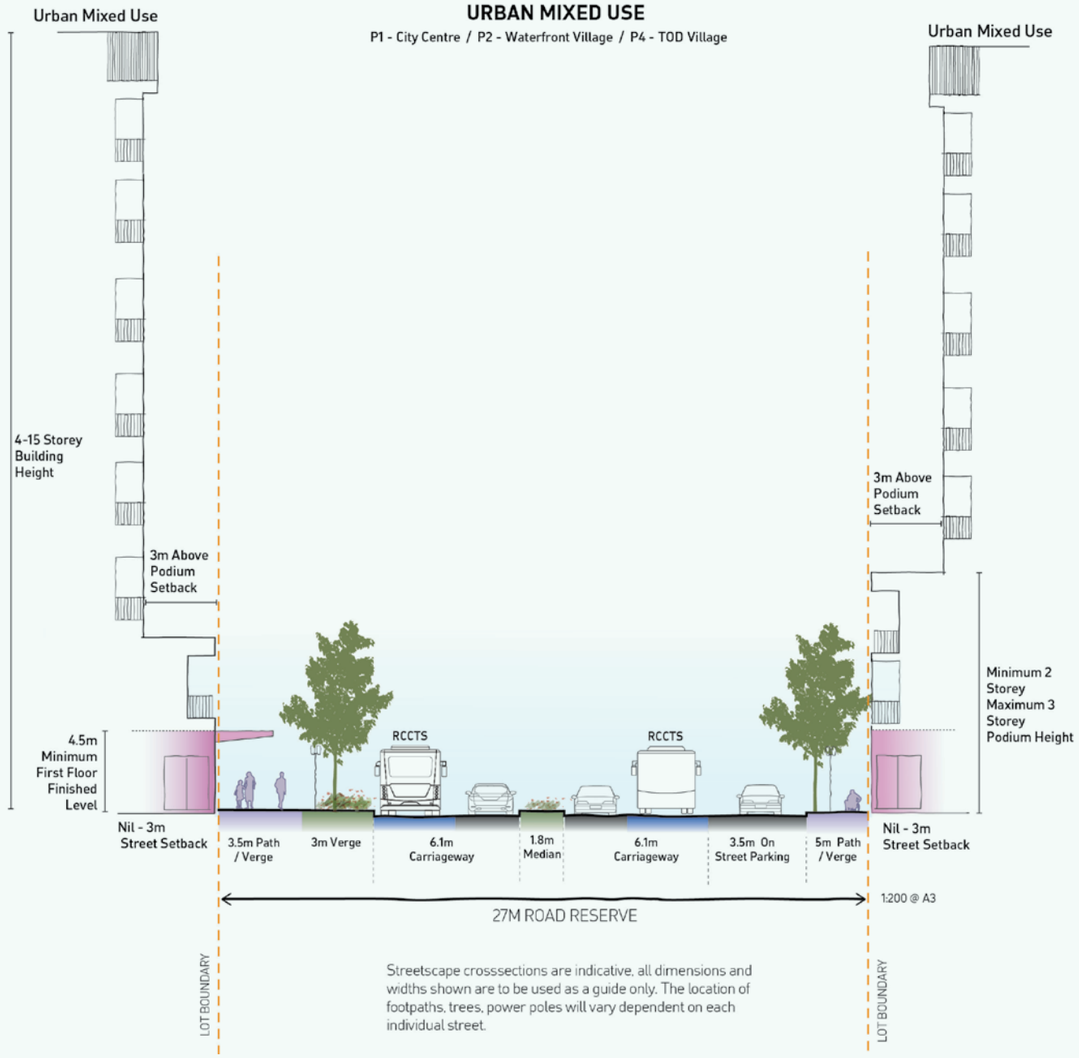


P2 - Figure 32: Main Street Frontage Type

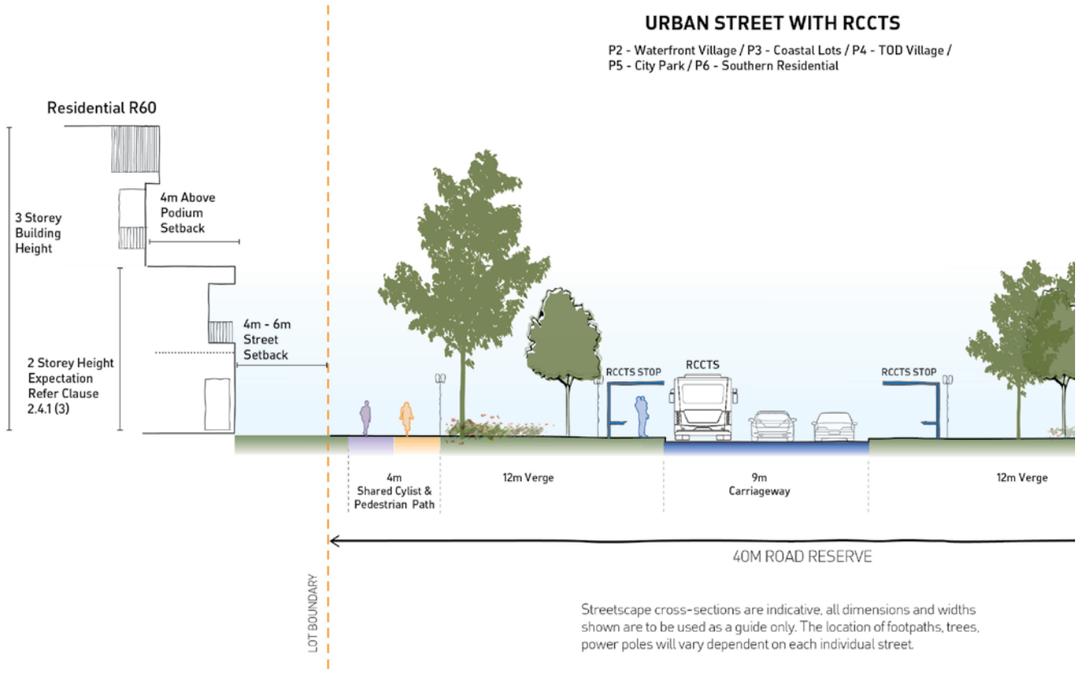
Note: Rockingham Beach Road only



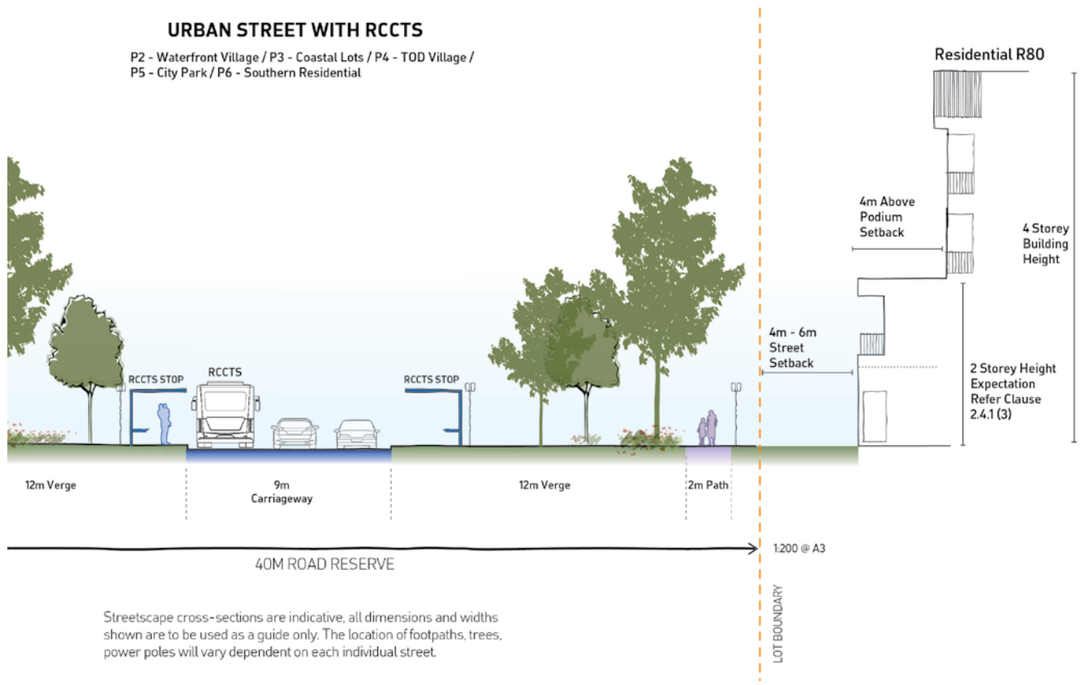
P2 - Figure 33: Urban Mixed Use Frontage Type



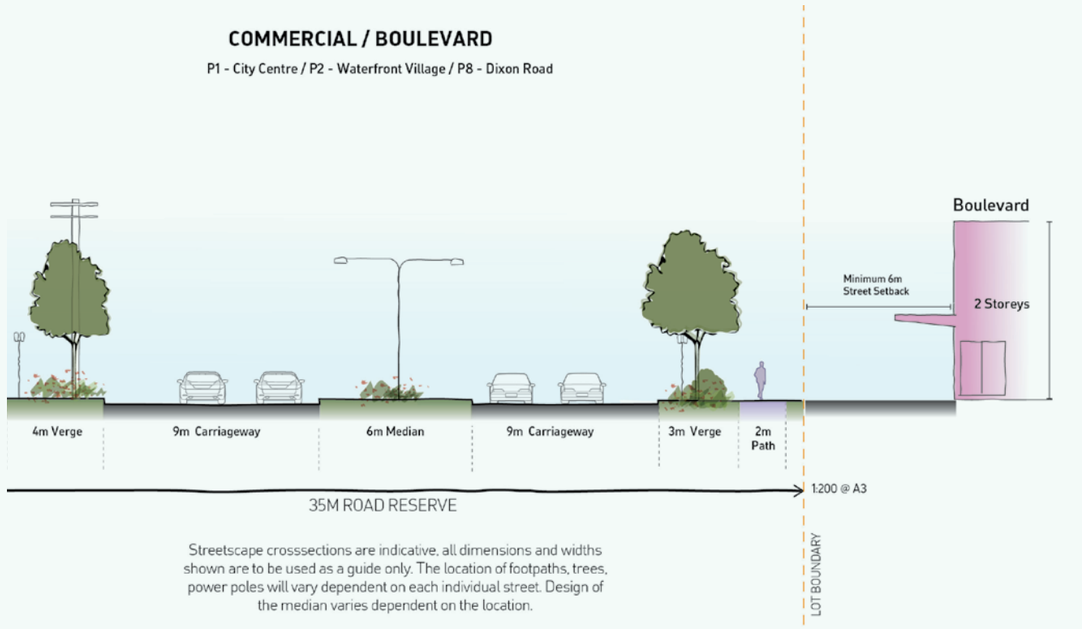
P2 - Figure 34: Urban Street R60 Frontage Type



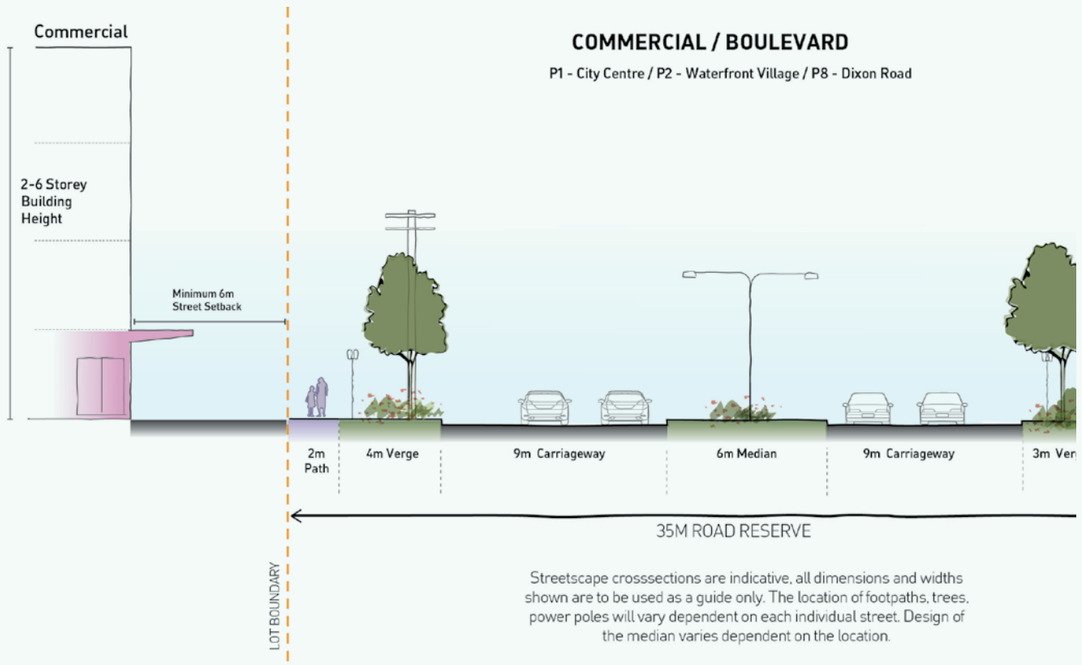
P2 - Figure 35: Urban Street R80 Frontage Type



P2 - Figure 36: Boulevard Frontage Type



P2 - Figure 37: Commercial Frontage Type





Objective	Considerations	Reference
O5.1 To ensure current and planned land uses respond to the needs and expectations of the community	**C5.1.1** Review existing zonings and land uses within and adjacent to the precinct to identify gaps and determine the appropriate zones and land use mix.	
	C5.1.2 Consider the current and future need for services, utilities and social infrastructure, including community, civic and cultural facilities.	
	C5.1.3 Identify locations for staged land use transition to meet changing community needs.	
O5.2 To ensure the planned land use types contribute positively to the precinct character and amenity	**C5.2.1** Co-locate land uses that have a mutual, positive benefit.	
	C5.2.2 Locate and distribute land uses to manage amenity impacts such as noise, visual and air pollution.	
	C5.2.3 Distribute land uses across the precinct to support and benefit from the movement network.	
O5.3 To achieve a mix of land uses and activity that supports the precinct vision	**C5.3.1** Determine the appropriate land use mix for the precinct.	
	C5.3.2 Determine the appropriate distribution of residential density to support the intended character and function of the precinct.	
	C5.3.3 Provide for land uses that appropriately activate and promote safety in the public realm.	
	C5.3.4 Identify a land use mix that supports local employment and the local economy.	
	C4.3.5 Consider access requirements for service vehicles and logistical freight movements within the precinct.	
	C4.3.6 Design the movement network to allow for private vehicle access and movement that is appropriate to the precinct function.	

5.5 Land Use

Response to Context

As described in **Section 2.5** key design considerations for Design Element 5: Land Use can be summarised as follows:

- Opportunities to consider more flexible approaches to development, that have consideration for staging and interim development to promote development activity.
- Consideration for how density is distributed across the RSC, and how infill development can be addressed.
- A land use approach for the TOD Village Sub-Precinct that responds to the new proposed urban structure.
- Consideration for how employment generating land is distributed throughout the RSC.
- Residential land uses to be excluded from areas impacted by the Kwinana Industrial Area air quality buffer.

Desired Outcomes

The RSC fulfils its role as a strategic centre by providing a mix of uses that improve housing density and diversity, promote employment/education growth, and provide entertainment for a broad population catchment.

- Provide a range of housing choices (densities, ownership patterns, price and building types) to ensure a diverse population can be housed.
- Provide sufficient land for employment opportunities to support economic growth aspirations.
- Promote development along the RCCTS to support implementation of a TOD model.
- Encourage land uses and developments that attract high numbers of people, and have the potential to activate the RSC throughout the day and night. Such uses should include medium to high density residential, retail, civic and community facilities, educational and cultural facilities, cafes, restaurants, hotels, offices and other intensive employment uses.
- Reinforce the ‘main street’ model (in key areas of the RSC) by giving priority to pedestrians and active street–oriented land uses.
- Appropriate forms of interim development are provided to support short-medium term activation in key sub-precincts.
- Ensure timely and efficient provision of community and social infrastructure to meet the future service needs of the population.

5.5.1 Economic Resilience Assessment

As one of ten designated Strategic Centres in the Perth and Peel Region, and the primary centre between Fremantle and Mandurah, the RSC is envisioned to fulfil an important function as a multi-purpose centre that provides a mix of retail, office, community, entertainment, residential and employment activities. Its role is not only to provide services and amenities to its diverse population, but also to provide a full range of economic and community services to support the surrounding region.

The RSC is a major hub of economic activity and employment within the surrounding region, it currently provides approximately 9,000 jobs accounting for 25% of the City's total offer. It provides an array of local employment opportunities for residents across various industries, with retail (19%), public administration and safety (12%) and, health care and social assistance (10%) the most prominent. It is home to a range of institutions across the retail, public administration, and education fields as well as a thriving business sector with 600 local businesses (11% of City's total).

The RSC has been at the centre of the rapidly expanding southwest corridor, with an additional 93,000 people expected to call the City home by 2041. The RSC is well-positioned and expected to continue its evolution into a major urban centre. Guiding this evolution is the identification of a set of land use projections which have informed the RPSP design and process. This has enabled the identification of aspirational but achievable targets for growth in economic output and employment.

To inform the RPSP design, FAR Lane have undertaken an Economic Resilience Assessment **(Appendix 4)** of the RSC. The assessment focuses particularly on the elements of uniqueness, connectivity, and fit-for-purpose to ensure competitiveness and resilience, creating the basis to realise economic prosperity:

- **Competitiveness** - The ability of the regional economy to compete in state, national and international markets.

  Competitiveness is the foundation for attracting and retaining investment, as well as creating wealth in an economy (Snowdon and Stonehouse, 2006). Economies evolve from being product-driven, to investment-driven, and eventually become innovation-driven (Porter, 2005). This is a process that local economies need to plan for, as it is the key challenge to achieving competitiveness.

- **Resilience** - The ability of the economy to respond effectively to change and shocks.

  Resilience is increasingly being recognised as a critical component of economic development. Systems and economies need to be resilient to disruptions and shock to ensure adverse impacts are minimised and can be managed effectively by promoting and sustaining diversity, innovation, competition, and entrepreneurship.

Competitiveness and resilience need to be considered equally in attracting and retaining investment to create jobs, boost public amenity, and create economic prosperity. In undertaking the Economic Resilience Assessment, FAR Lane considers the following to be the key economic issues for the RPSP to address:

- Meeting the needs of a growing population.
- Lack of density.
- Increasing employment needs.
- Underdeveloped tourism visitation.

For these key issues, the Economic Resilience Assessment determines key success factors, potential Precinct Plan Responses, and impacts as shown in **P2 - Table 14**.



P2 - Table 14: Economic Resilience Assessment Findings

	Issue	Success Factors	PSP Response	Impact

Growing Population	• Insufficient capacity to service an extra 93,000 residents by 2041. Including:
	  • Demand for secondary schooling and aged care.
	  • Service and retail needs for young families.
	• A retail floor space gap between 17,140m² (WA Tomorrow) and 78,300m² (City forecast).
		• Being able to meet the demand for a growing population by providing a diversified set of offerings and services for the local community.
		• Ensuring that there will be sufficient floor space to cater for the needs of an increased population.
		• Developing universally accessible infrastructure.
			• Provide diversified floorspace with emphasis on fit-for-purpose, accessible and unique offers.
			• Planning for required amenities including schools and medical facilities.
			• Plan for a population with a lower proportion of high-income earners compared to Greater Perth.
			• Provide a range of housing options, including high and medium density.
			• Planning that requires universal accessibility.
				• A precinct that meets the residential, retail, and employment requirements for its increasing number of residents.
				• Increased economic activity through new retail opportunities, and tapping into aged care and other emerging markets.

Lack of Density	• Currently, the RSC is underutilising space, which discourages vibrancy. • Beachfront infrastructure is not well connected to other RSC sub-precincts, particularly the City Centre and Rockingham Train Station.	• Using available land for high-density purposes, including consideration for interim uses on key developments sites to stimulate activity. • Supporting public transport and active transport infrastructure both to and within the RSC and beyond. • Diversity of offerings for residents, workers and visitors.	• Supporting high-density development. • Provide enhanced pedestrian, bike and public transport infrastructure providing better connectivity between key sub-precincts throughout the RSC. • Better utilisation of unused land by introducing interim uses for long-term development sites.	• Improved housing density and diversity, leading to a greater range of amenities, activities, and increased vibrancy. • Improved employment opportunities. • Increased tourism visitation and spend.
Increasing Employment Needs	• A gap in office floor space between 30,500m² (WA Tomorrow) and 52,700m² (City forecast). • Current lack of office space and start-up infrastructure. • Employment opportunities are concentrated among a few industries making the RSC vulnerable to external shocks.	• Supporting business environment, including for startups. • Creating sufficient additional floor space (in employment precincts) to realise a diverse and unique set of offerings for a wide range of users, including boutique micro-retail offerings. • Office and event space with good linkages to other business precincts as well as to transport linkages. • Space where local businesses can network and meet.	• Plan for office precincts and environments which promote creativity, startups, and innovation. • Providing land opportunities for businesses to create jobs by leveraging the local defence industry; and Global Advanced Industries Hub (GAIH).	• More businesses want to operate in the RSC due to the favourable business environment which exists there. • A variety of new businesses and startups emerge. • The City becomes an important hub for the Defence industry that brings professionals and skills from across the world. • New businesses have been established due to supply chain opportunities from the GAIH. • New infrastructure that maximises and supports events and creates new jobs.
Tourism Visitation	• Insufficient supply of short-stay accommodation in the RSC. • Non-unique tourism attractions. • Lack of infrastructure for major conferences.	• Short and long-term accommodation options. • Unique tourism attractions and event conference facilities, underpinned by the City's coastal location, and are not found in other Perth beachfront locations.	• Plan for increased short-stay accommodation. • Diversity in floorspace with emphasis on uses, including boutique micro-retail offerings. • Promoting the development of major conference facilities.	• Increased tourism, including overnight stays. • Major conferences are held in the RSC.

5.5.2 Future Population

As demonstrated in **Section 2.3** the City's population growth is expected to increase substantially with an extra 93,000 people expected by 2041. As the largest centre in the City and surrounding region, the RSC is expected to perform a significant role.

The Needs Assessment prepared for the City's Local Planning Strategy (by Pracsys) has tested two distinct growth scenarios for the RSC based on State Government projections (WA Tomorrow) and research undertaken by the City (forecast id). The scenarios are described below:

- **Scenario 1 WA Tomorrow** – Referred to as the 'low population growth scenario' the City's Needs Assessment defines that under this scenario a population of approximately 200,000 people could be achieved in the City by 2041.
- **Scenario 2 City of Rockingham** – Referred to as the 'medium population growth scenario' the City's Needs Assessment defines that under this scenario a population of approximately 250,000 people could be achieved in the City by 2041.

The key population and jobs targets for each scenario have been summarised in **P2 - Table 15**.

P2 - Table 15: RSC Population and Employment Scenarios

Scenario	Population				Jobs			
	2026	2031	2036	2041	2026	2031	2036	2041
Scenario 1 WA Tomorrow	6,212	6,462	6,722	6,992	8,851	9,365	9,974	10,697
Scenario 2 City of Rockingham	13,903	18,370	24,272	32,070	9,199	10,367	11,917	14,252

Source: City of Rockingham 2021, Pracsys 2021

In the RSC, a target of approximately 30,000 residents and 14,000 jobs are desired by 2041.

The Economic Resilience Assessment outcomes set out in **P2 - Table 14** identified specific areas where the RPSP could help improve economic performance. The general land use approach can be summarised as follows:

- Supporting increased housing density and diversity;
- Providing floorspace to meet retail need;
- Providing floorspace to support greater employment diversification; and
- Support increased tourist visitation.

5.5.3 Land Use Mix

P2 - Table 10 identifies the desired sub-precinct character, **P2 - Figure 38** provides the broad land use response[1] for these sub-precincts which can be summarised as follows:

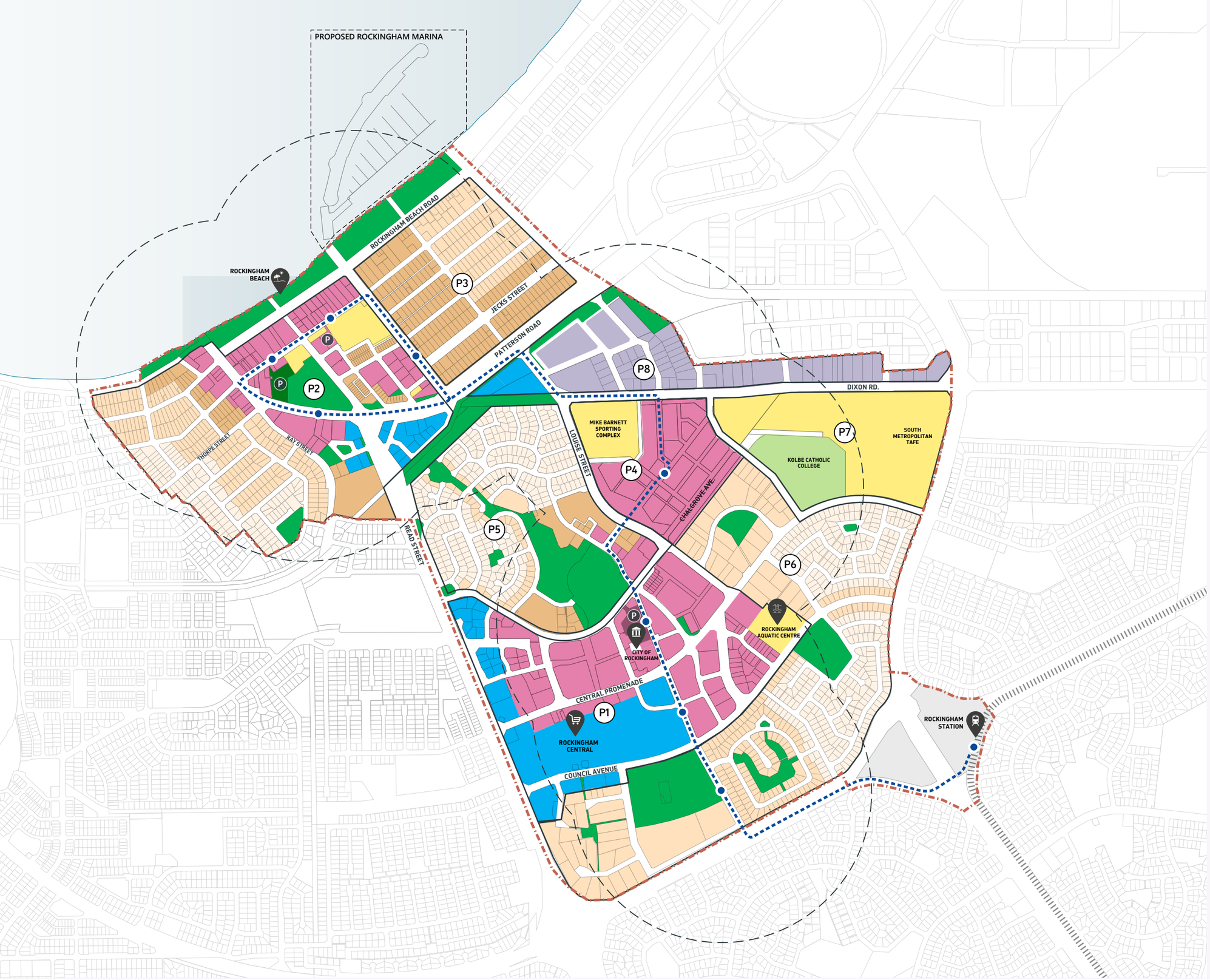
- **Mixed Use** - Two primary mixed used nodes are proposed in P1 - City Centre and P2 - Waterfront Village. The intent is that these two sub-precincts remain the primary focus for retail, entertainment, commercial and high-density development with both horizontal and vertical distribution of uses considered. A range of employment opportunities are enabled with access to transport and other public amenity acting as drivers for growth. A third, smaller node is also proposed in P4 - TOD Village to provide retail and employment opportunities.
- **Retail/Commercial** - Areas designated as retail/commercial are located in more car dominated environments. Uses such as shopping centres (Rockingham Central), bulky goods retail, and showrooms rely on strong vehicle access. As such, these uses are proposed on key vehicle thoroughfares such as Council Avenue, Read Street and Patterson Road where the place value is not as high.
- **Service Commercial** - These uses are concentrated in the area north of Dixon Road. The land is used exclusively for businesses, with a focus on employment generating uses. Bulkier business types more akin to the prevailing light industrial use will remain the focus, with opportunities to leverage off the GAIH. Residential uses are not permitted due to the Kwinana Industrial Area Air Quality Buffer.
- **Residential** - In addition to the mixed use areas, residential is the most predominant use. Densities range between R40 and R100, with higher densities proposed in areas with good access to public open space and transport amenity. P4 - TOD Village is proposed as a new high-density village, with the balance of residential growth expected to be in an infill setting in P2 - Waterfront Village, P3 - Coastal Lots, P5 - City Park and P6 - Southern Residential.
- **Public Purpose** - These areas include major community infrastructure nodes such as Mike Barnett Sports Complex, Rockingham Aquatic Centre and Rockingham Bowls Club.
- **Private Clubs and Institutions** - The RSC also includes numerous education institutions (both public and private) located in P7 - Education.
- **Public Open Space** - Form and functionality of public open space areas as described in **Section 5.3**.

The breakdown of uses proposed in the RPSP is summarised in **P2 - Table 16**. The approach taken ensures that the character, diversity and intended activity of the sub-precinct is, achieved through a mix of housing types, community facilities, business uses, as well as public spaces.

P2 - Table 16: RPSP Land Use Mix

Land Use Type	Area (ha)
Mixed Use	68
Commercial	26
Service Commercial	26
Residential R80	34
Residential R60	77
Residential R40	55
Private Clubs and Institutions	8
Public Open Space	49
Public Purpose	39

1 Detailed land use permissibility and zones are defined in Part 1.



Legend

- Precinct Boundary
- Sub-Precinct Areas
- RCCTS Route
- 800m Walkable Catchment

Sub-Precincts

- P1 City Centre
- P2 Waterfront Village
- P3 Coastal Lots
- P4 TOD Village
- P5 City Park
- P6 Southern Residential
- P7 Education
- P8 Dixon Road

Land Uses

- Residential - R40
- Residential - R60
- Residential - R80
- Mixed Use - R-AC0
- Commercial - R-AC0
- Service Commercial
- Public Purpose
- Public Open Space
- Private Clubs and Institutions

P2 - Figure 38: Land Use and Density Plan



5.5.4 Employment and Non-Residential Floorspace

Employment Gap

It is estimated that the employment gap to reach a target ESS of 74% (for the City) would require an additional 2,100 to 5,100 jobs in the RSC. These results reflect the importance of the RSC in providing employment opportunities to meet sub-regional employment targets. The Southern Metropolitan Peel Sub-Regional Framework currently provides a target of only 12,290 jobs in the RSC. Under the COR scenario **(P2 - Table 15)** the RSC will need at least 14,252 jobs to meet the goods and services needs of the surrounding population to contribute to an ESS of 74%. The findings of the Rockingham Employment Study and our analysis indicate that regional ESS targets would not be achievable unless a greater concentration of employment is planned for in the RSC. This additional employment would be in line with its role as a Strategic Centre.

Activity Centre Employment is population driven and found in businesses and uses within the hierarchy of centres. Whereas Strategic Employment is that which comes from industries which are mostly separate to the drivers that activity centre employment is as it mainly relies on the comparative advantages of an area (i.e. resources, location) and individual decisions of businesses. Growth in Strategic Employment can be achieved through promoting the unique advantages of the area to businesses, encouraging business collaboration and other business-friendly policies. The primary locations that can accommodate strategic employment within the City are the RSC and Rockingham Industrial Area.

The Employment Study defines a number of employment activities in line with the Strategic Centre role of the RSC that could be targeted to achieve greater strategic employment levels. These include:

- Primary regional institutions including a full-service university, major health campus with teaching capabilities, State government administration, and high-level arts and entertainment;
- Business services for nearby industrial areas, HMAS Stirling, and the GAIH;
- Tourist activities including business travel and visitation for the surrounding area; and
- Defence, heavy industry and port related uses.

Strategic employment targets in the RSC as set out in the Needs Assessment are provided in **P2 - Table 17**. These employment figures are provided for in the City's LCACS **(LPP No. 3.1.2)** and to identify floorspace gaps within the City of Rockingham (the City) to support strategies and directions identified for the Local Commercial and Activity Centre Strategy and Local Planning Strategy.

P2 - Table 17: Strategic Employment Target

Scenario	Strategic Employment Jobs			
	2026	2031	2036	2041
Scenario 1 WA Tomorrow	1,738	1,839	1,959	2,101
Scenario 2 City of Rockingham	3,263	3,677	4,227	5,055

Source: Pracsys 2021

Employment Generating Land

As the primary centre in the surrounding region, the RSC is expected to fulfil its role as a strategic employment hub that provides a diverse range of jobs commensurate to the needs of its community. The economic analysis **(Section 2.3)** determined that currently, the jobs on offer in the City do not match the needs of its community with the majority of residents seeking employment outside of the City. This can impact quality of life, with potentially long commute times and other factors impacting overall liveability in the City and RSC.

The issue is exacerbated further due to the fact that the City's population growth is not matched by commensurate employment growth. The amenity and economic advantages that can be available with a successful City Centre is a key focus for future employment in the City. This requires an expanded role for the RSC with a focus on increasing employment (as evidenced by the Economic Resilience Assessment) opportunities.

The key focus of the RPSP is to ensure that there is enough employment generating land to enable the jobs targets to be met. As described in **Section 5.5.3** and illustrated on **P2 - Figure 38**, the RPSP proposes this to occur in four primary employment areas, being the City Centre, Waterfront Village, TOD Village, and Dixon Road Sub-Precincts. These sub-precincts are expected to accommodate between 11,000 - 14,000 jobs based on the low and medium growth scenarios.

The proposed employment targets are higher than that included within the Perth and Peel @ 3.5 Million framework, however, the additional employment within the RSC is expected to come from catalytic projects that support strategic employment opportunities. The Employment Study defines employment activities in line with the role of the RSC that could be targeted to achieve greater employment levels.

The significant population relying on the RSC as their primary centre would benefit from having access to higher-order services such as a university, reducing their need to travel significant distances to access the services elsewhere in the Perth Metropolitan Area. It would also facilitate access to residents of surrounding areas that have lower socio-economic status and may be limited in their ability to access services elsewhere.

The announcement of Westport at the GAIH is a significant opportunity for development at the RSC, which is the closest higher order centre. The Employment Study identified a significant proportion of office floorspace currently at the GAIH. Strategic port-related uses will create significant demand for land as Westport develops and will likely lead to a transition of uses in the GAIH. The uses that are most likely to transfer are those that are population-related and/or do not need to be located on strategic industrial land.

The RSC is ideally located near the GAIH to attract office related uses, which could be accommodated in the Dixon Road and City Centre Sub-Precincts.

Floorspace Gap Analysis

In order to meet the 15,000 job target, major floorspace increases are proposed across all major sectors. Floorspace modelling undertaken for the RSC as part of the City's Needs Assessment is summarised below. The provision of floorspace across the RSC was compared to the identified benchmarks to determine and quantify current gaps by Planning Land Use Categories **(PLUC)** floorspace use.

Shop/Retail and Other Retail

The gap in Shop/Retail and Other Retail floorspace was assessed by estimating expenditure at each activity centre through gravity modelling. This expenditure was then divided by the required floorspace to productivity ratio for activity centres to ensure adequate retention of tenants. For the RSC this ranged between $6,422 - $6,997 per m².

Based on this, the level of supportable floorspace that the RSC should provide was calculated. This was compared to the current provision of floorspace which determined that there is a gap of 15,500m² of Shop/Retail and Other Retail floorspace.

Non-Retail

Non-Retail Floorspace gaps were calculated by identifying a suitable floorspace per person ratio by PLUC code based on a number of benchmarked areas. The areas used as benchmarks were 25km catchments from the Mandurah, Armadale and Joondalup Strategic Centres. Based on these benchmarks, provision ratios were identified for Entertainment **(ENT)**, Health/Welfare/Community **(HEL)**, Manufacturing **(MAN)**, Office **(OFF)**, Service **(SER)** and Storage **(STO)**.

The identified Floorspace Provision Gap was then multiplied by the population in the City at each time interval assessed to determine the current gap in Non-Retail Floorspace. The floorspace gap by PLUC Code is shown in **P2 - Table 18**:

P2 - Table 18: Non-Retail Floorspace Gaps

Scenario	ENT	HEL	MAN	OFF	SER	STO	Total
Precinct 1*	7,070	46,084	6,175	16,415	8,141	4,090	87,976

Source: DPLH 2017, Pracsys 2021

**Note Precinct 1 in the Needs Assessment also includes a range of other smaller local and neighbourhood centres which will also contribute to addressing this gap.*

Floorspace Projections

P2 - Table 19: Ultimate RSC Floorspace Projections (2041)

Scenario		ENT	HEL	MAN	OFF	SER	STO	Total
Scenario 1 WA Tomorrow	2021 (existing)	29,500	54,559	1,135	48,662	4,533	1,890	140,279
	2041 (ultimate)	16,088	94,511	7,595	29,538	9,948	4,760	162,441
	Total	**45,588**	**149,070**	**8,730**	**78,200**	**14,481**	**6,650**	**302,720**
Scenario 2 City of Rockingham	2021 (existing)	29,500	54,559	1,135	48,662	4,533	1,890	140,279
	2041 (ultimate)	29,393	112,765	11,047	51,513	16,238	9,438	230,395
	Total	**58,893**	**167,324**	**12,182**	**100,175**	**20,771**	**11,328**	**370,674**

Source: City of Rockingham Needs Assessment, 2021, Pracsys

To achieve the City's desired target of 74%, it is estimated that the RSC would need an additional 126,000m² to 273,000m² in commercial floorspace to support the additional employment.

5.5.5 Residential Density

Dwelling Targets and Walkable Catchment

Section 5.5.2 identifies that the RSC has a population target of 30,000 people. In meeting this aspirational target, it is important to consider how residential density is approached, and more importantly staged. The SPP 4.2 Implementation Guidelines identify that an interim target should be established (to be achieved within 10 years of approval) and an ultimate target. These targets are described in the residential yield section below.

As a Strategic Centre, SPP 4.2 defines a residential density target of between 30-50 dwellings per gross urban zone hectare within the walkable catchment. Given the physical separation and limited access to Rockingham Train Station, the walkable catchment for the RSC encompasses the land within 800m of a high-frequency stop on the proposed RCCTS. The route allows for proposed density increases along the 10.5km route.

P2 - Table 20 demonstrates that the 800m walkable catchment (measured from stops on the RCCTS) for all urban zoned land (excluding roads, public open space, public purpose) would total 245 hectares. If the Dixon Road Sub-Precinct is removed (as residential is not permitted), the total of available residential zoned land totals 198 hectares or 206 hectares for the entire RSC.

As such, for the purposes of defining a density target for the RPSP the 206 hectares of gross residential land has been used - equating to a dwelling target between 6,180-10,300 additional dwellings.

P2 - Table 20: Walkable Catchment

PSP Area	Area (ha)	Walkable Catchment	Area (ha)
Urban Zoned Land (PSP)	257	Urban Zoned Land (Walkable Catchment)	245
Residential Zoned Land (PSP)	206	Residential Zoned Land (Walkable Catchment)	198
Total PSP Area 533ha			

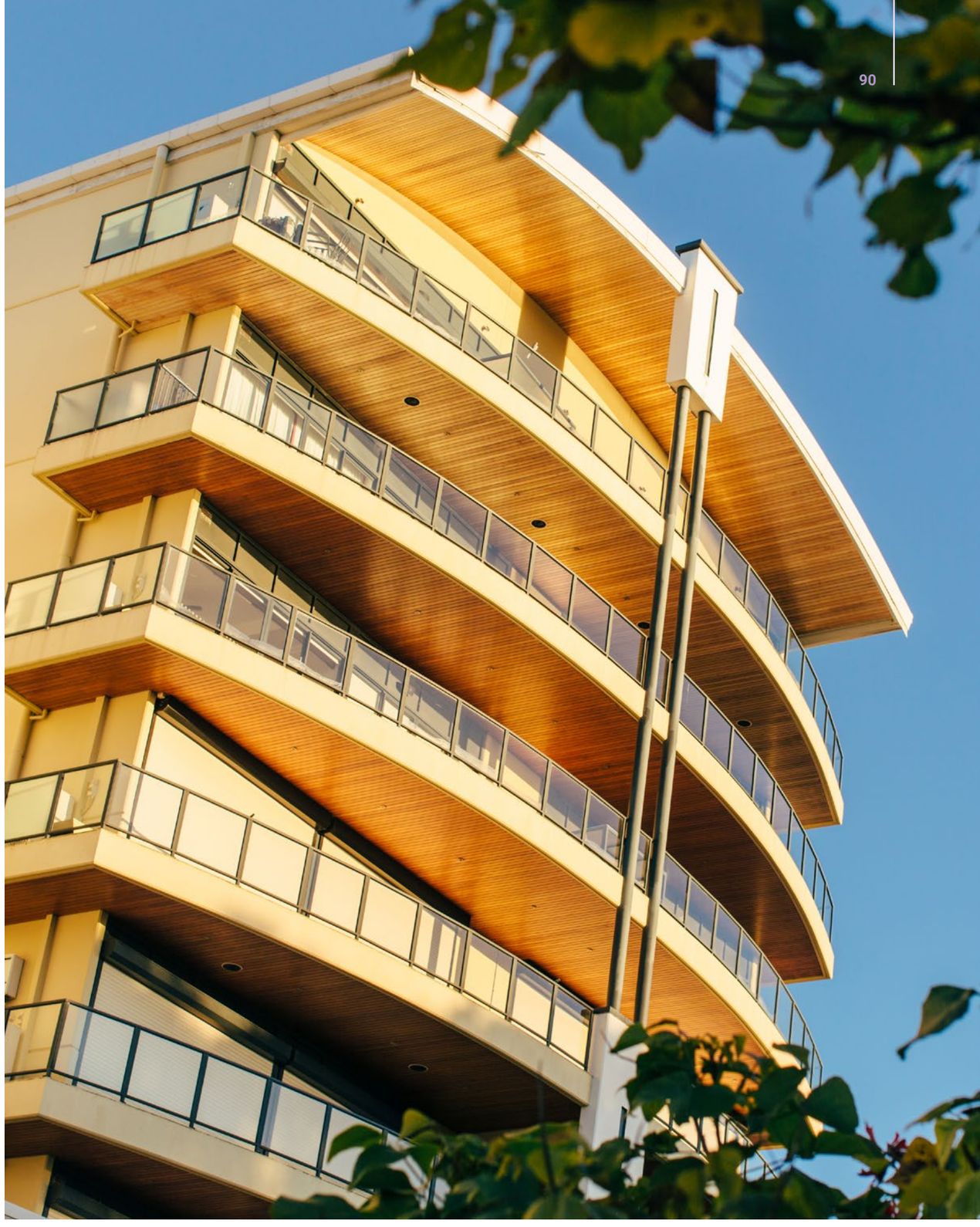
At an average of 2.07 persons per household, 10,300 dwellings would see the RSC fall short of the 30,000 population target. The following sections demonstrate how the target is proposed to be achieved.

Density Distribution

In terms of density distribution, **P2 - Figure 38** demonstrates the following:

- As demonstrated in the development potential analysis and Urban Structure Plan **(P2 - Figure 20)** the City Centre, TOD Village, Waterfront Village, and (part of the) Coastal Lots Sub-Precincts have the highest potential for redevelopment and density increases. Therefore dependent on location, densities in these areas include R60, R80, R100 and R-AC0, signalling a clear focus for change in these areas.
- In areas where medium density infill development of a lower scale is expected to be more prominent (i.e. Southern Residential, City Park, and part of Waterfront Village) an R40-R60 density is considered most appropriate. Design testing provided in **Section 5.6.2** demonstrates how this can be delivered in a sensitive manner which preserves existing character qualities.
- No residential development is proposed in the Education and Dixon Road Sub-Precincts.

The above approach is consistent with the guidance provided in SPP 4.2 and SPP 7.2.



Residential Yield

To ensure that the proposed density and population targets can be met, estimates of residential yield are provided to ensure that the land use response adequately meets the needs of the RSC. The RPSP envisions a diversity of residential typologies including single houses, terraces, mid-rise apartments, and high-rise apartments (the latter two could be either standalone or mixed-use). The proposed residential yields have been informed by the Land Use and Density Plan **(P2 - Figure 38)** which is underpinned by the redevelopment analysis **(P2 - Figure 10)**. The redevelopment analysis graded development potential based on the likelihood of each individual lot being redeveloped, the purpose of which is to ensure that the densities proposed are realistic.

From a spatial perspective, factors such as lot characteristics (tenure and size), land use (whether it is vacant or has an existing use), building characteristics (quality and age of existing development); and amenity on offer (public transport access, natural amenity, public amenity):

- **Development Ready Land** – The availability of vacant, undeveloped land situated in proximity to amenity is a key indicator of development potential. Importantly, the zoning of this land should be flexible enough to encourage development to occur.
- **Lot Size and Land Ownership** – Larger lots in sole ownership (both government and private) can be catalysts for redevelopment as there are fewer complexities involved. Areas comprised of such lots are typically viewed more favourably than those which have a high number of smaller lots in private ownership. Multiple land owners, sometimes with conflicting interests, can make redevelopment difficult, and usually results in redevelopment occurring over a much longer timeframe.

When combined, the above factors provide an accurate picture of the true development potential that exists in the RSC. This assists with staging and prioritisation of land for development. The residential yield analysis has also had consideration for the staging guidance provided in the SPP 4.2 Implementation Guidelines. It therefore considers the following:

- An 'interim' density target which is to be achieved within 10 years of the approval of the RPSP; and
- An 'ultimate' density target, which is to be achieved through future reviews of the RPSP following 10 years of its implementation.

A breakdown of these targets by sub-precinct is provided in **P2 - Table 21**, which demonstrates that the land use and density approach for the RPSP provides capacity for the RSC to exceed the density target set out in SPP 4.2.



P2 - Table 21: RPSP Density Targets

Precinct	Existing Dwellings	Interim Target	Ultimate Target
P1 - City Centre	432	3,005	4,248
P2 - Waterfront Village	1,097	2,522	3,634
P3 - Coastal Lots	536	1,379	1,762
P4 - TOD Village	0	805	1,205
P5 - City Park	347	347	1,326
P6 - Southern Residential	1,555	1,855	2,917
P7 - Education	0	0	0
P8 - Dixon Road	0	0	0
TOTAL	**3,967**	**9,914**	**15,093**

Notes and high-level assumptions:

- Interim Density Target - Assumes 80% of high potential land, and 20% of medium potential land is developed/redeveloped.
- Ultimate Density Target - Assumes 100% of high potential land, and 80% of medium potential land, and 20% low potential land is developed/redeveloped.

The RPSP acknowledges that the majority of the RSC's density will be in the form of medium - high density development. As such, meeting the interim target proposed above will be dependent on the overall uptake of high density dwellings. Dwelling targets needs to consider the challenge in delivering apartment/high density development in precincts such as the RSC, as in current market conditions it is difficult for developers to achieve sufficient built form price points (for larger developments) that enable projects to be financially viable. This is especially true in instances where basement parking is needed.

Appendix 5 includes a high-level feasibility analysis which explores the commercial viability of apartment developments throughout various sub-precincts in the RSC.

5.5.6 Schools

Due to the projected population growth set out in the RPSP it is likely that an additional primary school may be required to be accommodated in the area. A location for a primary school site will need to be determined in collaboration with the Department of Education, having regard to the guidance contained in Operational Policy 2.4 - Schools, having consideration for:

- Locational requirements of schools;
- Physical site requirements, servicing and access;
- Movement network and road safety;
- Relationship to nearby land uses; and
- Additional or supplementary services.

5.5.7 Staging and Development Priority

Unlocking Vacant Development Sites

The SPP 7.2 Precinct Design Guidelines outline the importance of "balance between the long-term vision of the precinct plan and the economic reality of the desired outcomes". This is pertinent for the RSC, where its strategic importance requires high quality development that meets the ultimate vision for the place, though there are large vacant landholdings that have not yet developed.

Stakeholder engagement has highlighted the need for some flexibility and nuance in the planning framework, to encourage further development of larger vacant landholdings in the City Centre Sub-Precinct. There are two approaches to meet this objective, outlined below.

Prioritising Development on Areas of Sites Through a Tiered Approach

The physical dimensions of most vacant sites in the RSC are such that they can deliver a range of lots to accommodate larger building types (such as multi-level apartments, commercial, retail, and mixed-use developments) on multiple edges. This is advantageous for development staging, as it allows for new streets, paths and lots to set up a structure for each site and deliver development over multiple stages. With the objective of balancing long-term development and economic realities of the RSC, development could feasibly be encouraged earlier on some parts of these sites where edges are deemed to be 'less critical' where facing a street that has a lower 'place value'.

The planning provisions in Part One shows the areas of sites where development responses are deemed to be 'less critical' based on a lower 'place value' for that portion of street. In these areas there may be an opportunity to relax land use, development standards and car parking requirements to encourage economic activity and employment.

Encouraging Short Term Development and Land Uses

While some areas of sites may be deemed 'less critical' to achieving the long-term vision for the RSC, there are areas facing onto important streets that are highly critical in delivering the long-term vision for the RSC.

There is an opportunity for the PSP to encourage short term activity on lots that does not result in long term development. These uses need to balance community benefit with economic reality, the focus should be on uses which will generate activity and help stimulate development.

Short term land uses and development that are proposed in the City Centre Sub-Precinct have been suggested in **P2 - Table 22** based on their ability to generate economic activity, and offer a 'short term return on investment' to the proponent. This is likely to result in a life span that is shorter than a typical building, therefore can be timed for land redevelopment to 'highest and best use' when economic conditions allow.

Clause 72 of the *Planning and Development Local Planning Scheme Regulations 2015* offer the opportunity for temporary development approvals, which may assist with this approach.

> **Temporary Development Approval**
> The local government may impose conditions limiting the period of time for which development approval is granted. Note: A temporary development approval is where the local government grants approval for a limited period. It does not have any effect on the period within which the development must commence.

P2 - Table 22: Potential Interim Uses

Land use	Definition (Local Planning Scheme Regulations 2015)	Considerations For a Time Limited Approval in the RPSP	LPS2 Permissibility
Amusement Parlour	means premises — a) that are open to the public; b) that are used predominantly for amusement by means of amusement machines including computers; and c) where there are two or more amusement machines.	Outdoor, low investment pursuits only. Temporary amusement installations.	**D**
Art Gallery	means premises — a) that are open to the public; and b) where artworks are displayed for viewing or sale.	Low investment pursuits only. Temporary installations.	**D**
Cinema/Theatre	means premises where the public may view a motion picture or theatrical production.	Outdoor, low investment pursuits only. Examples such as drive-in movies.	**D**
Community Purpose	means premises designed or adapted primarily for the provision of educational, social or recreational facilities or services by organisations involved in activities for community benefit.	Outdoor, low investment pursuits only.	**D**
Convenience Store	means premises — a) used for the retail sale of convenience goods commonly sold in supermarkets, delicatessens or newsagents; b) operated during hours which include, but may extend beyond normal trading hours; and c) the floor area of which does not exceed 300m² net lettable area.	Low investment pursuits only.	**D**
Exhibition Centre	Exhibition centre means premises used for the display, or display and sale, of materials of an artistic, cultural or historical nature including a museum.	Outdoor, low investment pursuits only.	**D**
Market	means premises used for the display and sale of goods from stalls by independent vendors.	Outdoor, low investment pursuits only.	**D**
Restaurant/Cafe	means premises primarily used for the preparation, sale and serving of food and drinks for consumption on the premises by customers for whom seating is provided, including premises that are licenced under the *Liquor Control Act 1988*.	Outdoor, low investment pursuits only.	**D**
Small Bar	means premises the subject of a small bar licence granted under the *Liquor Control Act 1988*.	Outdoor, low investment pursuits only.	**D**
Shop	means premises other than a bulky goods showroom, a liquor store — large or a liquor store — small used to sell goods by retail, to hire goods, or to provide services of a personal nature, including hairdressing or beauty therapy services.	Low investment pursuits only.	**D**

Utilities and Services

The RSC is planned to undergo significant change, it is therefore important to understand existing and planned infrastructure such as energy supply, sewerage, water and waste systems.

Cardno have undertaken a review of existing utility infrastructure within the RSC, which has identified the potential infrastructure upgrades which would be required to meet the density targets proposed in the RPSP.

This assessment will help inform the City on decisions around the long-term provision of electrical energy, potable water and sewage disposal, natural gas, along with high-speed data/ telecommunications and stormwater drainage for the RSC.

The findings and advice presented in this report is based on Cardno's observations, experience from similar projects and responses from various service providers and stakeholders. Detailed analysis and mapping of existing infrastructure is provided in **Appendix 6**.

The methodology followed for this study included:

- Engaging with key stakeholders;
- Reviewing available data and identifying proposed works;
- Investigating existing infrastructure capacity; and
- Investigating and assessing future servicing requirement.

Potential Infrastructure Upgrades Summary

A key focus of this preliminary study was to understand how well existing infrastructure capacity could meet needs of future development. The proposed yields in the previous Centre Plan were used as a baseline for the assessment. The key findings and recommendations of the study were:

- **City Centre Sub-Precinct** - Significant gas, power, communications, water, wastewater and stormwater infrastructure required within the 'major development sites' identified within the City Centre. These parcels of land are currently underutilised and vacant.
- **Waterfront Village Sub-Precinct** - An increase of gas, power, communications, water and sewer main line capacity will be required to accommodate future medium and high-density areas, contemporary residential apartments and transit terminal. There is also staged development of Challenger Lodge sites to the south of the sub-precinct which will require future utility infrastructure. The extent of future infrastructure will need to be confirmed with relevant authorities prior to development.
- **Coastal Lots Sub-Precinct** - The current mains infrastructure is consistent with that proposed in the existing development policy plan and hence no major utility service upgrades are required within this sub-precinct. There is potential for medium and high-density residential apartments, major streetscape enhancement and a marina development which will require future investigation of servicing requirements.
- **TOD Village Sub-Precinct** - The TOD Village Sub-Precinct will require the most significant utility infrastructure upgrades within the RSC. Currently, this parcel of land is predominately vacant with the indicative development proposing new roads, high-density mixed-use areas, terrace style medium density areas, carparks and the RCCTS route. New infrastructure will be required for all utilities with the extent and demand to be confirmed with relevant authorities.
- **City Park Sub-Precinct** - The current mains infrastructure is consistent with that proposed and hence no major utility service upgrades are required within this sub-precinct. Opportunity to progressively upgrade residential capacity and introduce an urban built form will require further investigation of servicing requirements.
- **Southern Residential Sub-Precinct** - The current mains infrastructure is consistent with that proposed and hence no major utility service upgrades are required within this sub-precinct. Opportunity to progressively upgrade residential capacity and introduce an urban built form will require further investigation of servicing requirements.
- **Education Sub-Precinct** - The current infrastructure is mostly consistent with that proposed in the existing development policy plan with refurbishment predominantly occurring to existing structures. There is an education/training campus and campus square proposed which will require minor utility upgrades but no changes to the existing main lines. A proposed low speed access road running north-south through the sub-precinct will also require stormwater infrastructure.
- **Dixon Road Sub-Precinct** - This sub-precinct will require utility infrastructure upgrades, primarily in the currently undeveloped parcel between Patterson and Dixon Roads. New infrastructure will be required for all utilities with the extent and demand to be confirmed with relevant authorities. For existing development sites, there is also an opportunity to progressively upgrade capacity if required, subject to further investigation of servicing requirements.

The above high-level advice on engineering servicing for the proposed future development of the RSC has identified areas where future utility infrastructure will be required to support future development. The report **(Appendix 6)** demonstrates that with appropriate upgrades, future development can be supported. These findings will also be used to inform the PSP through recommendations on staging and subdivision and development requirements for key areas/major development parcels.


Coffee
EYE SCREAM cafe
coffee juice
coffee smoothies shakes
coffee icecream
FISH & CHIPS
Fish & Chips
EYE SCREAM cafe

Objective	Considerations	Reference
O6.1 To ensure that the built form is responsive to the purpose, context and intended character of the precinct	**C6.1.1** Address how the precinct built form will respond to the physical and cultural characteristics of the precinct.	
	C6.1.2 Manage the built form transitions between and within the precinct.	
	C6.1.3 Promote a diversity of built form types appropriate to the precinct.	
	C6.1.4 Identify buildings with potential for retention and adaptive reuse (including temporary use) with a priority on heritage buildings and buildings that contribute to place character.	
O6.2 To ensure building placement, scale and massing is appropriate for the intended precinct and streetscape character	**C6.2.1** Set height controls to ensure buildings within a precinct have a positive impact on the surrounding streetscape and public spaces.	
	C6.2.2 Develop setback controls in consideration of the intended relationship between buildings, and between buildings and the street.	
	C6.2.3 Apply built form envelopes to define the streetscape and reinforce the precinct character.	
	C6.2.4 Determine plot ratio controls appropriate for the existing or intended future character of the precinct, where relevant.	
O6.3 To ensure that built form design reduces energy demand across the precinct by facilitating climate-responsive design	**C6.3.1** Locate and arrange buildings to optimise solar access to buildings and the public realm.	
	C6.3.2 Consider the placement and layout of buildings to optimise natural ventilation and minimise wind impact at street level and on adjoining properties and public spaces and streets.	
O6.4 To ensure that built form design is responsive to the streetscape and contributes to a safe and comfortable public realm	**C6.4.1** Design and setback buildings to enable passive surveillance and outlook to the street.	
	C6.4.2 Design for weather protection for pedestrian priority streets and public spaces, where appropriate.	

5.6 Built Form

Response to Context

As described in **Section 2.5** key design considerations for Design Element 6: Built Form can be summarised as follows:

- The RPSP is to consider new approaches to street activation, having consideration for how the building interface can relate to the 'movement' and 'place' value of a street.
- Planning provisions and building envelopes to be reviewed in the City Centre, Waterfront Village, and TOD Village Sub-Precincts to ensure that the proposed approach is market responsive.
- Design testing in areas where infill development is likely to ensure appropriate density allocations and design responses that are site responsive and cognisant of existing neighbourhood character.

Desired Outcomes

Buildings in the RSC promote an urban scale and character that is reflective of a contemporary, coastal centre.

- Massing and scale of development supports targeted density and intensity, with a human scale retained at street-level.
- Locate and configure buildings to positively interact with the street, using diverse frontage types to create interesting streetscapes.
- Buildings contribute to a comfortable pedestrian environment, providing opportunities for weather protection, including shelter from local sun and wind conditions.
- New development ensures that access ways and parking facilities do not visually dominate the public realm or create obstructions to the pedestrian environment and minimising potential conflicts.
- Prominent corners and sites.
- Built form controls provide flexibility, allowing proponents to adapt and change in line with market trends.

5.6.1 Built Form Approach

At 534 hectares, the RSC is the largest activity centre in WA. Having evolved over a long period of time, its built character reflects many periods of development, emphasised by the unique qualities observed in each of the RPSP's eight sub-precincts. In future, the quality of the experience in the RSC will largely be defined by the quality of its buildings, and their interplay with streets, and public spaces. The proposed built form approach supports a highly urbanised environment, one that is reflective of its primacy in the region.

All urban places are varied and diverse in their built form character and public realm experience, the RSC is no exception, providing a wide range of functions for its diverse user group. Therefore the standard and quality of design implemented through the RPSP will be essential in ensuring that the Rockingham experience is a positive one, particularly as it embarks on its next urban transition. Future investment in the RSC can then be assured that certain qualities will be carried through the various stages of the centre's development.

The other primary considerations that have influenced the built form approach is the need to be site responsive. Driven both by a physical response to the context, and local market conditions, the built form needs to be fit for purpose. A delicate balance between long-term vision and market realism is sought, emphasised through the approach taken to density and height (as explored in **Section 5.5.7**), which addresses a desire to promote activity and stimulate investment.

Due to the size, complexity, and unique character of the RSC the built form approach is organised through its sub-precincts. Design Element 2 (Urban Structure) and Design Element 5 (Land Use) consider the RSC as a holistic urban system, this provides the broad spatial framework that sets the scene for the built form approach. An approach that emphasises the need for localised responses.

When considering the built form approaches explored within this section, three primary approaches are considered (relative to the needs of each sub-precinct):

- **All Development Sites** - As described in **Section 5.4.4**, our approach considers that movement and place are inextricably linked. Therefore the qualities and potential planning controls for all frontage/building types have been considered.
- **Major Development Sites** - The Urban Structure Plan **(P2 - Figure 20)** identifies a number of major development sites. These areas are deemed as critical to the success of the RPSP given that their likelihood of development is high, and contribution to housing and employment targets substantial.
- **Infill Development Sites** - Infill development is likely to be the most prevalent type of development in the RSC due to the quantum of land, size of blocks, and age of stock. In an ever evolving medium density market, design testing has been undertaken to ensure a site responsive approach in key infill precincts.

The research and analysis undertaken in Design Elements 1-5 has directly informed the built form approach. The approach taken ensures that the Development Standards in Part One are tested and functionally sounds, ensuring an appropriate response to character, intensity, bulk and scale.

5.6.2 Built Form Testing

Infill Development

Urban structure and development analysis undertaken for the RSC determined that there is substantial opportunities to deliver infill development in the Waterfront Village, Coastal Lots, City Park, and Southern Residential Sub-Precincts. This approach supports the RPSP's residential density targets, which seek to promote infill in areas with good access to amenity and future public transport linkages. Further to this, community feedback suggested that there was a desire to explore a review of the amalgamation provisions included within the previous Centre Plan, highlighting that they were to onerous. These provisions included a minimum development site between 1,200m² - 1,500m² dependent on location.

Design Testing Scope

To ensure that the RPSP is providing an appropriate response to infill, a high-level design testing exercise was undertaken on typical sites across the precinct. Given that infill development can take decades to occur due to complex land assembly, the primary intent was to ensure that infill could be delivered in a way that is responsive to both existing neighbourhood character, and local market conditions. The schematic tests are cognisant of the latest design requirements in the R-Codes (including draft Medium Density Code provisions). It has therefore included consideration of: building siting, vehicle access and parking, building entrances and vehicle access locations, landscaping/tree provisions, and dwelling mix (for apartments).

In the Coastal Lots Sub-Precinct, the exercise tested the following scenarios:

- Front loaded single lot development for grouped and multiple dwellings.
- Front loaded amalgamated lot for multiple dwellings.
- Rear loaded (laneway access) single lot development for grouped and multiple dwellings.
- Rear loaded (laneway access) amalgamated lot development for grouped and multiple dwellings).

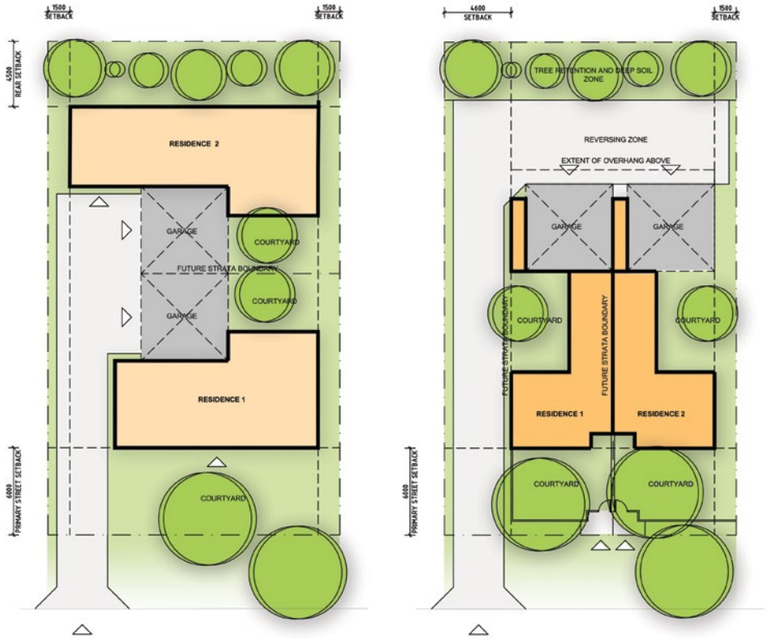
In the Waterfront Village. City Park and Southern Residential Sub-Precincts (referred to as 'other' infill areas below), the exercise tested the following scenarios:

- Front loaded single lot development for grouped dwellings.
- Front loaded amalgamated lot for grouped dwellings.
- Front loaded single lot development for multiple dwellings.

The primary difference between the two areas were lot size, and access. The Coastal Lots Sub-Precinct includes lots that are typically greater than 1,000m² some which have access to a rear laneway. The other three precincts have lots that typically range from 680m² - 900m². One consistent feature is that the majority of lots have a frontage that is 20m or greater.

The overall purpose of this exercise was to assist with informing preparation of the built form controls in Part One.

Single Lot - Grouped (Front Loaded)



Amalgamated Lot - Grouped (Front Loaded)



Other Infill Areas - Grouped Dwellings

The site tested represents a typical residential lot found throughout the RSC, located primarily within suburban streets. The tests explore how a single, front loaded lot could be redeveloped. They have had consideration for the following:

- Two development scenarios, one being retention of the existing house at the front with a new dwelling at the rear. The other being demolition and redevelopment of two new homes in a side by side arrangement. Two storeys is assumed for new dwellings.
- A generous landscaped setback is promoted to improve resident outlook to the street in keeping with the existing neighbourhood character.
- Access to the site is limited to one crossover, while still allowing for generous landscaped spaces on both sides to minimise impacts.
- Car parking and garages are located towards the rear of the lot and are screened from view. This allows living spaces to open out onto the street, ensuring a high-quality interface.
- Rear setbacks provide adequate provision for deep soil and allow for retention of existing mature trees which are prevalent across many lots.
- Assumes visitor parking can be accommodated on or close to the street.

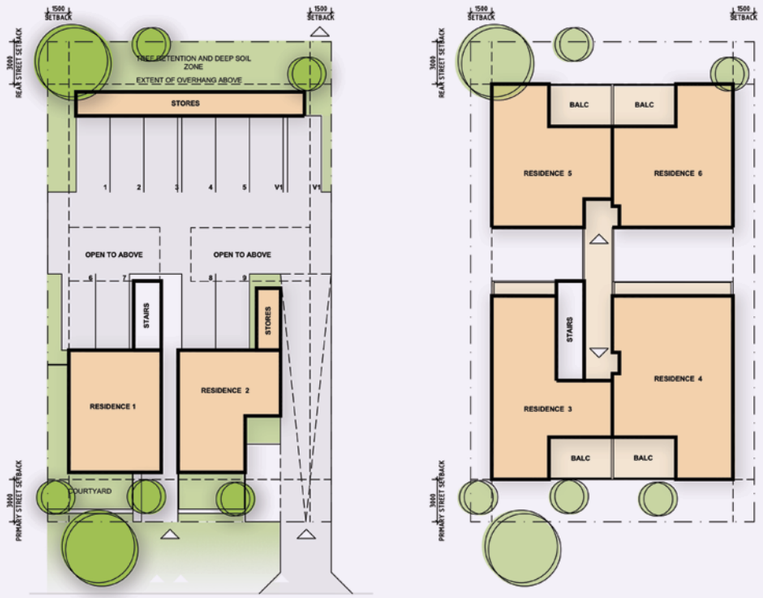
In both instances, to achieve desired open space and street interface outcomes a maximum of two dwellings per lot is likely. This type of development is okay in some areas, however, in parts of the RSC where greater density is desired the outcome has some limitations and is not preferred where a more urban outcome is desired.

This test explores what happens when two lots are amalgamated. The design follows the same principles, ensuring that:

- Deep soil can be achieved at the rear of the lot (to retain trees) and in both front/central courtyards;
- One crossover is provided, with garages provided at the rear; and
- Houses open out onto the street, ensuring a quality interface.

In this instance, five grouped dwellings (at an R60 density) can be achieved demonstrating that amalgamation can offer a net increase to grouped dwelling yield.

Single Lot - Multiple Dwelling (Front Loaded)



Other Infill Areas - Multiples Dwellings

This test explores the possibility of delivering multiple dwellings on a single front loaded lot. Six apartments are possible, serviced by a single crossover with undercroft parking at the rear. Visitor parking is provided on-site and deep soil at the rear allows for retention of trees.

However, whilst this option does allow a greater yield to be delivered it does rely on a minimised front setback which can detract from existing character. It could also result in visual privacy issues to the rear.

This outcome is only recommended where a lot backs on to public open space, as rear apartments could provide passive surveillance.

Single Lot - Grouped (Front Loaded)



Single Lot - Grouped (Rear Loaded)



Amalgamated Lot - Grouped (Rear Loaded)



Single Lot - Apartment (Front Loaded)



Single Lot - Apartment (Rear Loaded)



Coastal Lots Sub-Precinct - Grouped Dwellings

The site tested represents a typical residential lot found throughout the Coastal Lots Sub-Precinct. They have had consideration for the following:

- A combination of development scenarios, which explore front vs rear loaded lots, and single vs amalgamated lots.
- A generous landscaped setback is enabled in all scenarios to improve resident outlook to the street in keeping with the existing neighbourhood character.
- Access to the site for front loaded product is limited to one crossover, while rear loaded sites are able to leverage off the laneway allowing courtyards/front gardens to occupy the street frontage.
- Car parking and garages are located towards the rear of the lot and are screened from view. This allows living spaces to open out onto the street, ensuring a high-quality interface.
- Rear loaded product is able to provide a generous sized garden area, front loaded product is more limited but can still allow for tree retention at the back of the lot.
- Assumes visitor parking can be accommodated on or close to the street.

In all scenarios, to achieve desired open space and street interface outcomes two storey dwellings are most likely. Whether they are amalgamated or not, rear loaded lots allow for a more generous open space/deep soil approach. Comparatively, front loaded product loses more space to vehicle parking and access. Regarding amalgamation, the testing demonstrates that similar density outcomes can be achieved, however, amalgamation can lead to a more consolidated street interface outcome.

Coastal Lots Sub-Precinct - Multiple Dwellings (Single Lot)

The site tested represents a typical residential lot found throughout the Sub-Coastal Lots Precinct. The below tests have had consideration for the following:

- A single lot multiple dwelling development that explores the comparison between a front and rear loaded lot.
- Both scenarios allow the potential to deliver a small-scale apartment development which could range from two-three storeys dependent on the approach taken. A generous landscaped setback is enabled in all scenarios to improve resident outlook to the street in keeping with the existing neighbourhood character.
- Both scenarios enable a positive street interface, with a landscaped frontage and dwellings opening out onto the street at ground level.
- Parking is located at the rear in both scenarios, with development over the top forming an undercroft. The rear loaded option provides the added benefit of not requiring a crossover in the street frontage enabling a higher quality street edge and more room for landscaping.
- Visual privacy of adjacent lots is managed through an appropriately scaled rear setback, with lots either overlooking the deep soil area (front loaded) or laneway (rear loaded).
- Assumes visitor parking can be accommodated on the lot.

The test has determined that ultimately, the yield is driven by how much parking can be provided on the site. It also demonstrates that a positive development outcome could be achieved for both a front and rear loaded apartment typology in this precinct.

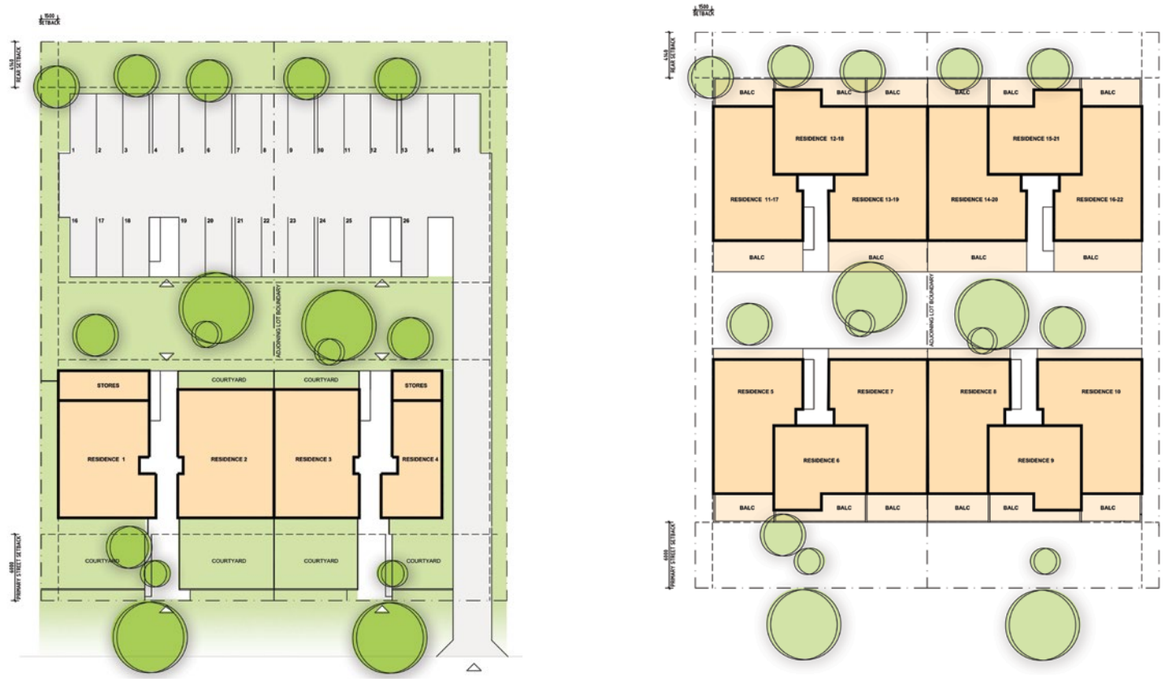
Coastal Lots Sub-Precinct - Multiple Dwellings (Amalgamated Lot)

The site tested represents a typical residential lot found throughout the Coastal Lots Sub-Precinct that has been amalgamated with its neighbour. The below tests have had consideration for the following:

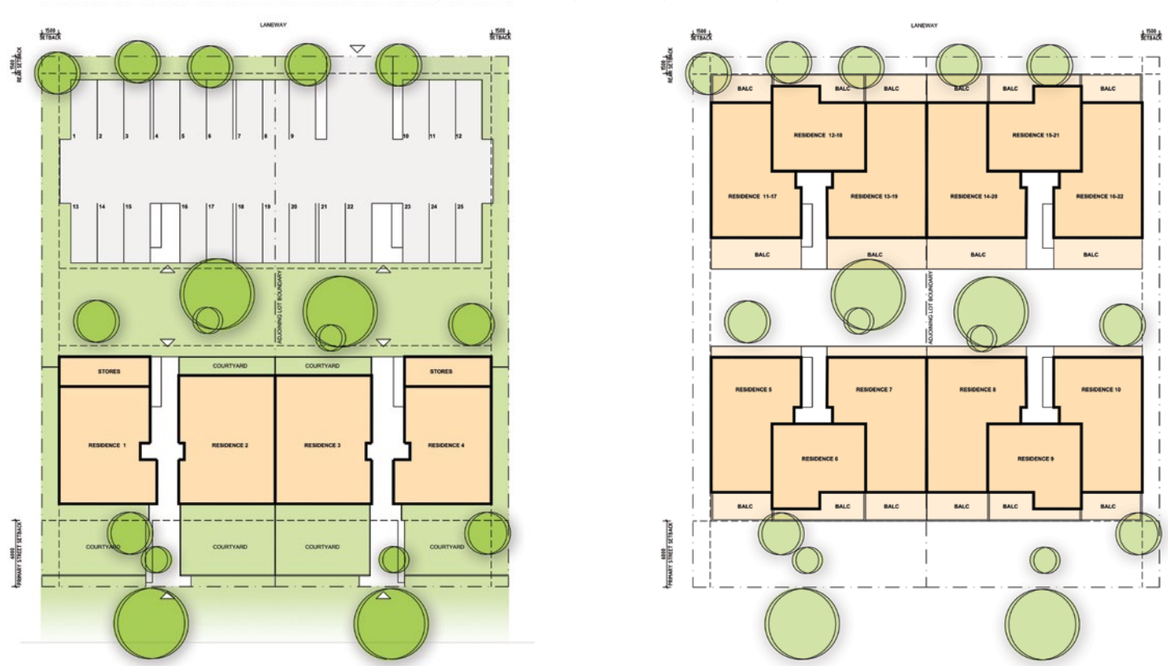
- An amalgamated lot multiple dwelling development that explores the comparison between a front and rear loaded configuration.
- Both scenarios allow the potential to deliver a small-scale apartment development which could range from three-four storeys dependent on the approach taken. Where three-four storeys is desired, greater side and rear setbacks may need to be considered. There would also be a desire to curate views towards the street to mitigate potential privacy impacts.
- A generous landscaped setback is enabled in all scenarios to improve resident outlook to the street in keeping with the existing neighbourhood character. This enables a positive street interface, with a landscaped frontage and dwellings opening out onto the street at ground level.
- Parking is located at the rear in both scenarios, with development over the top forming an undercroft. The rear loaded option provides the added benefit of not requiring a crossover in the street frontage enabling a higher quality street edge and more room for landscaping.
- Assumes visitor parking can be accommodated on the lot.

In comparison to the single lot tests, these scenarios enable the yield to be doubled (though still driven by the amount of cars which can be accommodated). The primary benefit of the amalgamated lot scenario is that you can provide a more consolidated street interface, particularly for front loaded products where the crossovers can be coordinated and reduced to one per development.

Amalgamated Lot - Apartment (Front Loaded)



Amalgamated Lot - Apartment (Rear Loaded)



Design Testing Outcomes

The outcomes of the design testing will directly inform the planning provisions developed in Part One: Implementation. Key considerations can be summarised as follows:

Preserving and enhancing space for deep soil, trees and landscaping

The design testing has focussed on ways to deliver density while still offering suitable opportunities for redevelopment on lots. To achieve this project principle, space for backyards, front yards and courtyards of varying size and function are proposed. This is particularly relevant where there is suitable space for deep soil and retention of existing mature trees.

Built form design which enhances streetscape character

The testing has sought to ensure that the built form responds to and enhances street character. Spaces created from setbacks can be well calibrated and designed so that they become an extension of living spaces. To achieve this project principle, space for front yards and courtyards of varying size and function should be maintained.

Promote active living spaces that address the street

Redevelopment of detached dwellings can impact the relationship between buildings and the street edge. The tests have therefore focussed on practical ways to locate garages away from the street edge (giving more opportunities for living spaces to be orientated towards the street), encouraging new dwellings to promote passive surveillance.

Consolidated access

Where lot amalgamation occurs, the design testing seeks to ensure that consolidated access via one crossover per development site is provided. This approach assists in delivering on the outcomes referenced above by minimising the amount of space taken up by parking and driveways, particularly as the economic testing has demonstrated that basement parking solutions are highly unlikely.

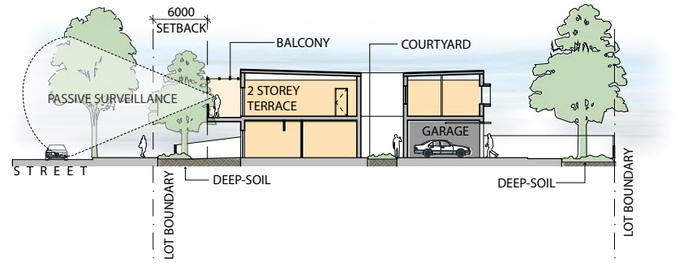
P2 - Figure 39 illustrates these desired outcomes, demonstrating the standard expected for infill development in the RPSP.

In addition to the above design outcomes, the testing has also influenced approaches taken to residential density, height, and lot amalgamation as summarised below:

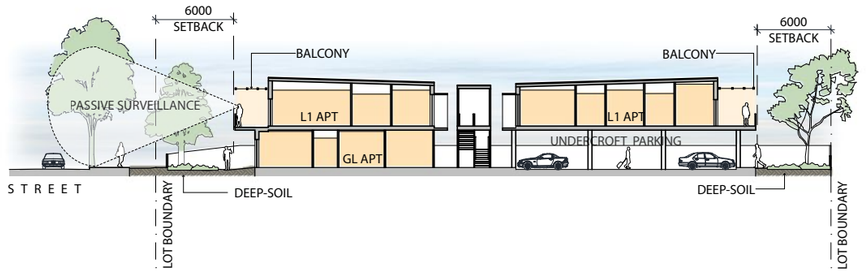
- **Density and Height** - Infill development is likely to occur at three scales, influenced by location, lot configuration, and development likelihood. This will include new residential development at R40 (two storey maximum), R60 (three storey maximum), and R80 (four storey maximum).
- **Lot Amalgamation** - In the Coastal Lots Sub-Precinct, it has been determined that due to the urban structure and lot configuration, amalgamation may not be likely as desired built form outcomes can be achieved. In the Waterfront Village (western residential area), City Park, and Southern Residential Sub-Precincts it is envisioned that amalgamation provisions will remain as the smaller lot sizes do have an impact on the outcomes that can be achieved.

P2 - Figure 39: Desired Infill Design Outcomes

Front Loaded Terrace



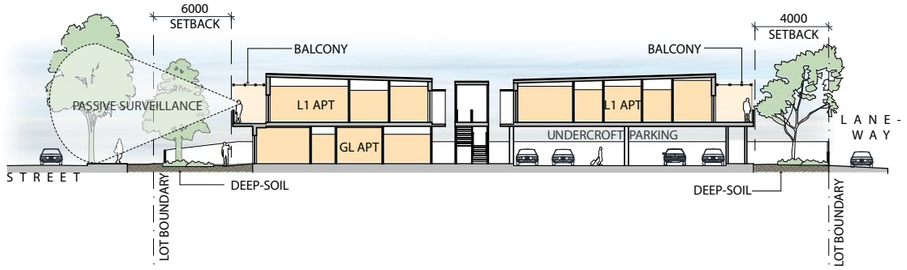
Front Loaded Apartment



Rear Loaded Terrace



Rear Loaded Apartment



Waterfront Village

The City and Mackay Urbandesign undertook the *Rockingham Beach Building Height Study* **(Appendix 8)**, the focus of this study was the urban block bounded by Rockingham Beach Road, Railway Terrace, and Kent/Wanliss Streets. The study considered the appropriateness of taller buildings in the urban environment in relation to a range of factors that include:

- The broader landscape context;
- Strategic planning objectives such as the relationship to desired urban consolidation and the sustainability agenda;
- Local townscape and environmental impacts such as streetscape character, building overshadowing and overlooking; and
- Development economics, and economic impact.

The preferred scenario is detailed in **Appendix 8**, it has informed the primary controls for P2 - Waterfront Village set out in Part One of the RPSP. The preferred scenario is illustrated on **P2 - Figure 40** can be described as follows:

- For lots with a frontage to Kent Street, the preferred built form is for mid-rise 'European' urban buildings creating a defined urban edge along the RCCTS, whilst also limiting potential overshadowing of the public realm.
- On Rockingham Beach Road, the preferred built form is a 'Tower and Podium'. The maximum podium height should generally be three storeys. Additionally, there is capacity to allow an additional storey in height to podiums on prominent corners to provide legibility and greater emphasis.
- The approach relies on the need for public pedestrian connections with a minimum width of 8m between Rockingham Beach Road and Kent Street for a number of locations within the sub-precinct. The preferred locations for the pedestrian connections are intended to connect through key development sites.

P2 - Figure 40: Waterfront Village Height Study Preferred Scenario

View from the North



View from the South



Source: Mackay Urbandesign

5.6.3 Street Interface

The interface of a building with the street can create a strong and lasting impression of the quality of both the public space and the buildings that define it. The street interface determines the way in which people relate to a building, enter it, and use it. The street interface also determines how a building's occupants relate to the public outside. In essence, the quality of the street interface is central to the way in which it allows people to use the urban environment, and therefore, the success of the City as a centre for human interaction is dependent on the success of the street interface.

Movement, Place, and Street Frontages

The RPSP has been formulated in accordance with a 'movement and place' philosophy **Section 5.4.4**, an approach which considers that each street in the RSC has different qualities. For example, the City Centre promotes active 'main street' buildings with generous spaces for community, retail and food, and beverage activities to spill out onto. Places where people recreate in an urban setting, day and night. Conversely, in the Southern Residential Sub-Precinct, streets become places for local residents. Generous front setbacks and landscaping see a more subtle built form response.

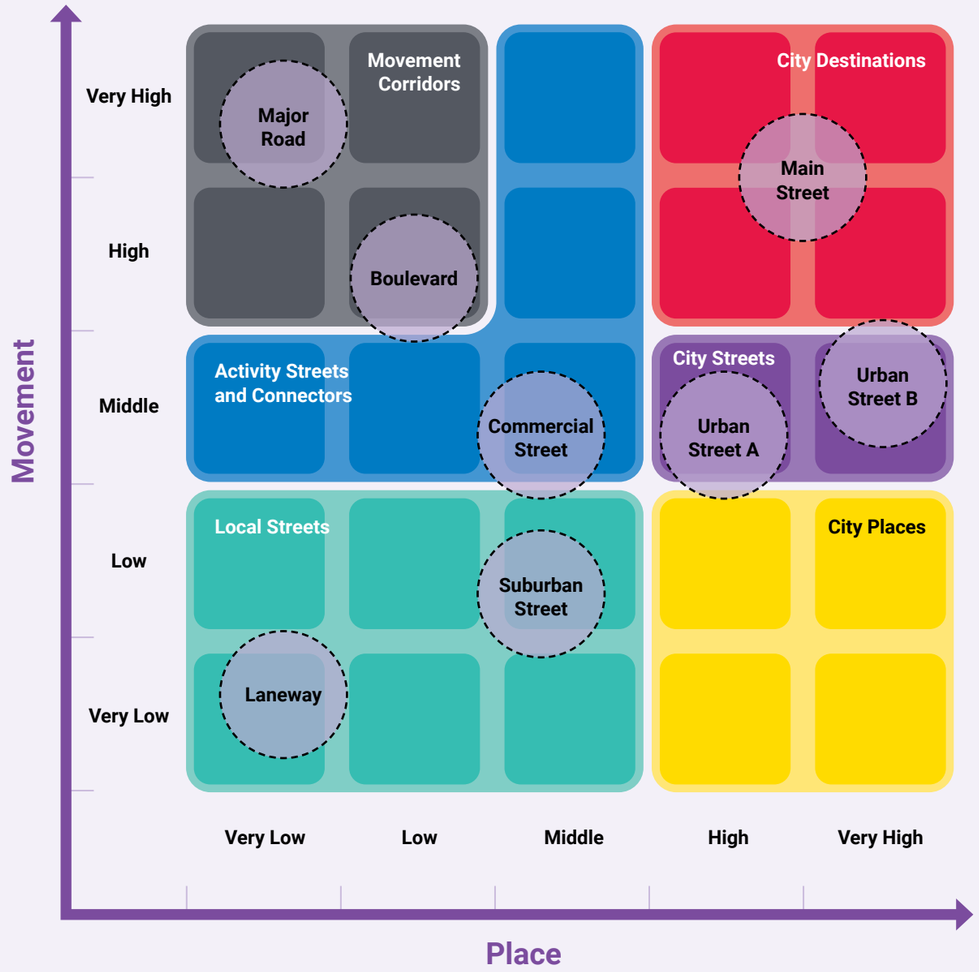
The RPSP considers that the movement and place qualities of a street shape the built form setting and should encourage specific design elements. The right combination of design elements helps to shape the building's frontage, which defines its interface with the street.

Different streets require different frontage design that balances the movement and place qualities. As such, the RPSP has explored how this framework can be used to drive built form outcomes. This is displayed visually on **P2 - Figure 41**, which defines eight unique frontage types for the RPSP, these include:

- Laneway
- Suburban Street
- Urban Street A (residential)
- Urban Street B (mixed use)
- Main Street
- Commercial
- Boulevar
- Major Road.

The typical qualities of these frontage types are expressed in **P2 - Table 23**, highlighting the relationship between building and streets, specifically setback dimensions, vertical separation between the street, promotion of landscape, and other elements. These qualities are not a 'catch-all', as each frontage type may have different requirements dependent on its location within the RSC. As such, planning controls ensure that localised responses can be provided in accordance with the proposed built form approach outlined in **Section 5.6.1**.

P2 - Figure 41: Movement and Place Frontage Types



P2 - Table 23: Frontage Types

Features	Laneway	Suburban Street	Urban Street A Residential	Urban Street B Mixed Use	Main Street	Commercial	Boulevard	Major Road (PRR)
Movement Value Association	Mid, Low	Mid, High	Low, Mid	Mid	Mid, High	Mid	High	High, Very High
Place Value Association	Mid, Low	Mid, High	Mid, High	High	High, Very High	Mid	Low, Mid	Low
Typical Land Uses	Residential	Residential houses, terraces, apartments	Terraces, apartments	Mixed use	Mixed Use, Retail	Retail	Retail, Landscape	N/A
Typical Building Setbacks	1m-2m	2m-6m	1m-3m	1m-3m	Nil	3m+	3m+	3m+
Direct Development Access	Yes	Yes	Yes	Yes	Place specific	Yes	Place specific	No
Awnings	No	No	Place specific	Place specific	Yes	Place specific	No	No
Vertical Separation Consideration	Place specific	Place specific	Yes	Place specific	No	Place specific	No	No
Footpaths	No	Yes	Yes	Yes	Yes	Yes	Yes	Place specific
Street Furniture	No	No	No	Place specific	Yes	Place specific	Place specific	No
Street Dining	No	No	No	No, Yes	Yes	No	No	No
Landscaped Median	No	No, Yes	No, Yes	No, Yes	No, Yes	No	Yes	No, Yes
Landscaped Edges (on public land)	No	Yes, Street trees	Yes, Street trees	Yes, Street trees	Yes, Street trees	Yes	Yes	No, Yes
Landscape in Setback (on private land)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No, Yes
Landscape Quality	Typical	Typical	Typical	Typical	Above Typical	Typical	Typical, Above Typical	Typical
Jurisdiction	Local	Local	Local	Local	Local	Local	Local, State	State

Note: The above qualities represent the 'typical' approach and considerations for each frontage type. In most cases, a place specific response is required to determine the most appropriate built form response. Specific planning controls/provisions for frontage types are provided in Part One: Implementation, this is provided on a sub-precinct basis.

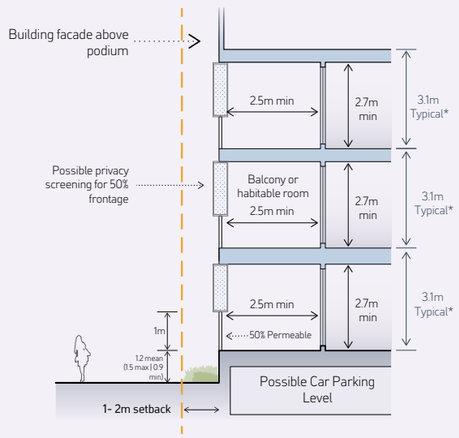


Laneway

Dependent on location, buildings interfacing with laneways should prioritise activation at ground level, with safety (commercial/public areas), and privacy (residential areas) key considerations. Typical qualities include:

- A 1-2 metre setback which allows for separation between buildings and the laneway with space for landscaping and services/utilities.
- It is likely that many laneways will host service functions at ground floor, like car parking. Screening, lighting and permeable space is important in these environments.
- If residential dwellings are provided in a laneway setting, they need to be separated vertically from the laneway for privacy.

Typically found in higher density precincts where development is more urban in nature.



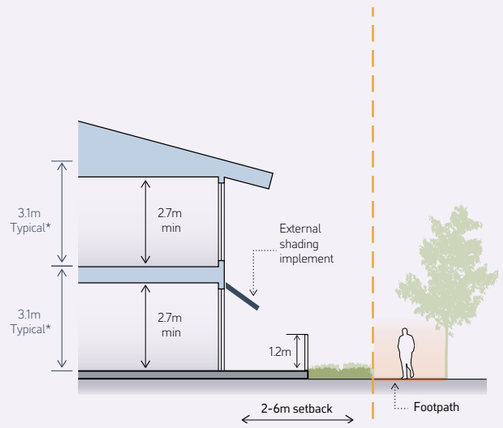


Suburban Street

Suburban streets are residential in nature, with single houses, terraces, low-scale apartments interfacing with the street environment. They have a moderate relationship with the public realm, while creating amenity and maintaining a visual connection to streets:

- Buildings are set back from the boundary to allow for landscaping, increased privacy and amenity for residents. The front setback is prominent, in response to the prevailing neighbourhood character.
- A second layer of courtyards, gates and low permeable fences will encourage living on the street, particularly when infill development (i.e. terraces and apartments) make their way into suburban streets.

Typically found in low density residential precincts and where low-scale infill is proposed.



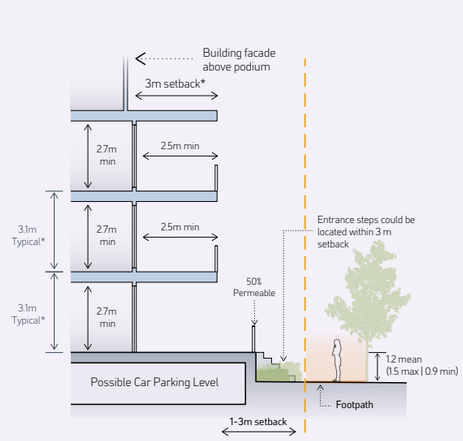


Urban Street A (Residential)

Urban residential streets are similar to suburban streets in that their sole function is for residential uses. The primary difference is the scale of development, with terraces and mid-rise apartments more prominent:

- Front setbacks are more modest, it still allows for landscaping, however, the building becomes a more prominent feature on the street with balconies/ courtyards ensuring good passive surveillance of streets.
- Design approach will encourage living on the street, with appropriate vertical separation ensuring a clear delineation of the private/public domain.

Typically found in residential precincts and where new development or a more dense scale infill is proposed.



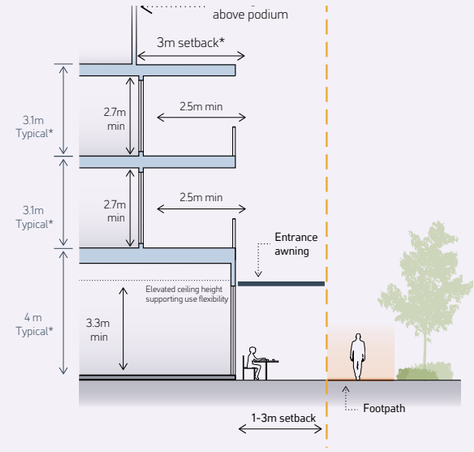


Urban Street B (Mixed Use)

Mixed use urban streets provide a combination of commercial and residential buildings interfacing with the urban street environment. They typically have an active ground floor use with a strong relationship to the public realm, prioritising permeability and a visual connection to the street:

- A 1-3 metre setback allows for street awnings above entrances to shelter the footpath in front of buildings. Allowing opportunities for uses to spill out onto the street.
- There is a more generous scale (through greater floor to ceiling heights and canopies) to create greater flexibility of internal spaces on the ground floor.

Typically found in urban environments as the City Centre and Waterfront Village Sub-Precincts.



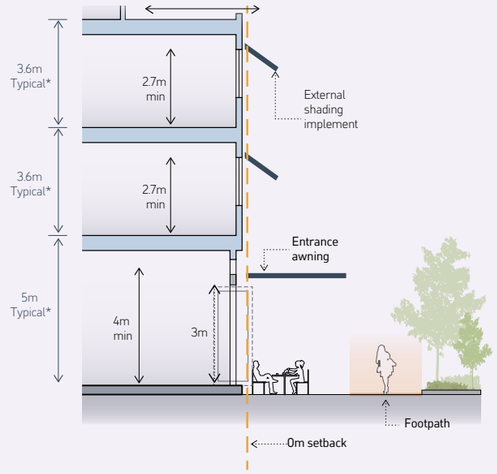


Main Street

Commercial and residential buildings interfacing with the main street environment have a strong relationship to the public realm:

- Building edges meet the lot boundary with a nil setback at ground floor.
- There is a more generous scale (through greater floor to ceiling heights and canopies) that meets the higher order of the main street environment as the centre of the city.
- Where there is space at ground level, development should explore opportunities for further activation of streets through initiatives such as alfresco dining.

Typically found in urban environments such as the City Centre and Waterfront Village Sub-Precincts.



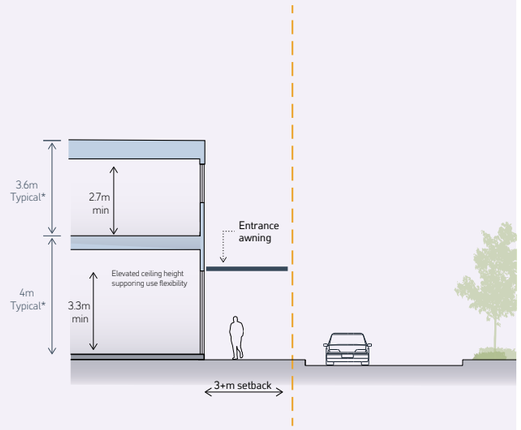


Commercial

The low-scale commercial edge is located in areas where vehicle access is promoted over pedestrian access. These edges typically include one-two storey development which can either be built to the boundary with parking at the rear, or more commonly parking will be provided at the front to optimise customer experience.

Whilst this edge type is not aspirational, it is highly functional and representative of the diverse uses and activities that are provided in the RSC.

This edge applies to a number of building types found in the RSC, it can also include large format retail, education, and light industrial uses.



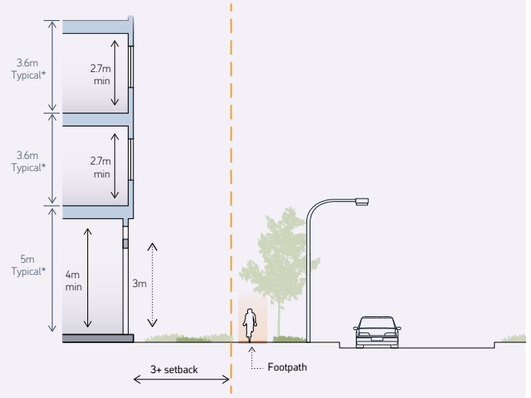


Boulevard

Boulevards represent streets that have a high movement function and low place role. Road reserves are typically large, as a result the relationship between the buildings and the street is limited:

- Buildings have a range of setback approaches, but generally orientate towards the street.
- Vehicle movement priority is high, as such in some cases landscaping or parking is provided between the road carriageway and building setback line.

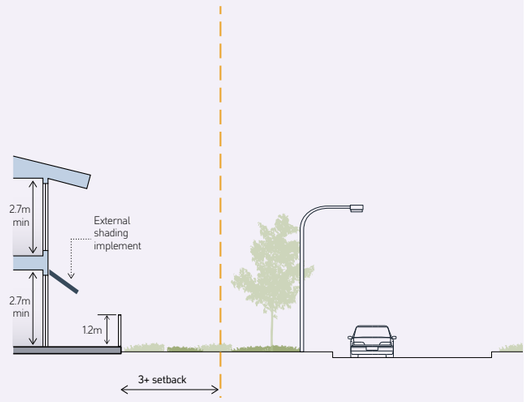
Typically found on the periphery of urban precincts, a primary example in the City Centre is the western portion of Council Avenue.





Major Road

Major roads represent streets that have a high movement function and no place role. In most cases they are the peripheral roads of the RSC such as Read Street, Rae Road, Ennis Avenue and Patterson Road. There is almost no relationship between the built form and the street.



5.6.4 P1 - City Centre

Sub-Precinct Intent

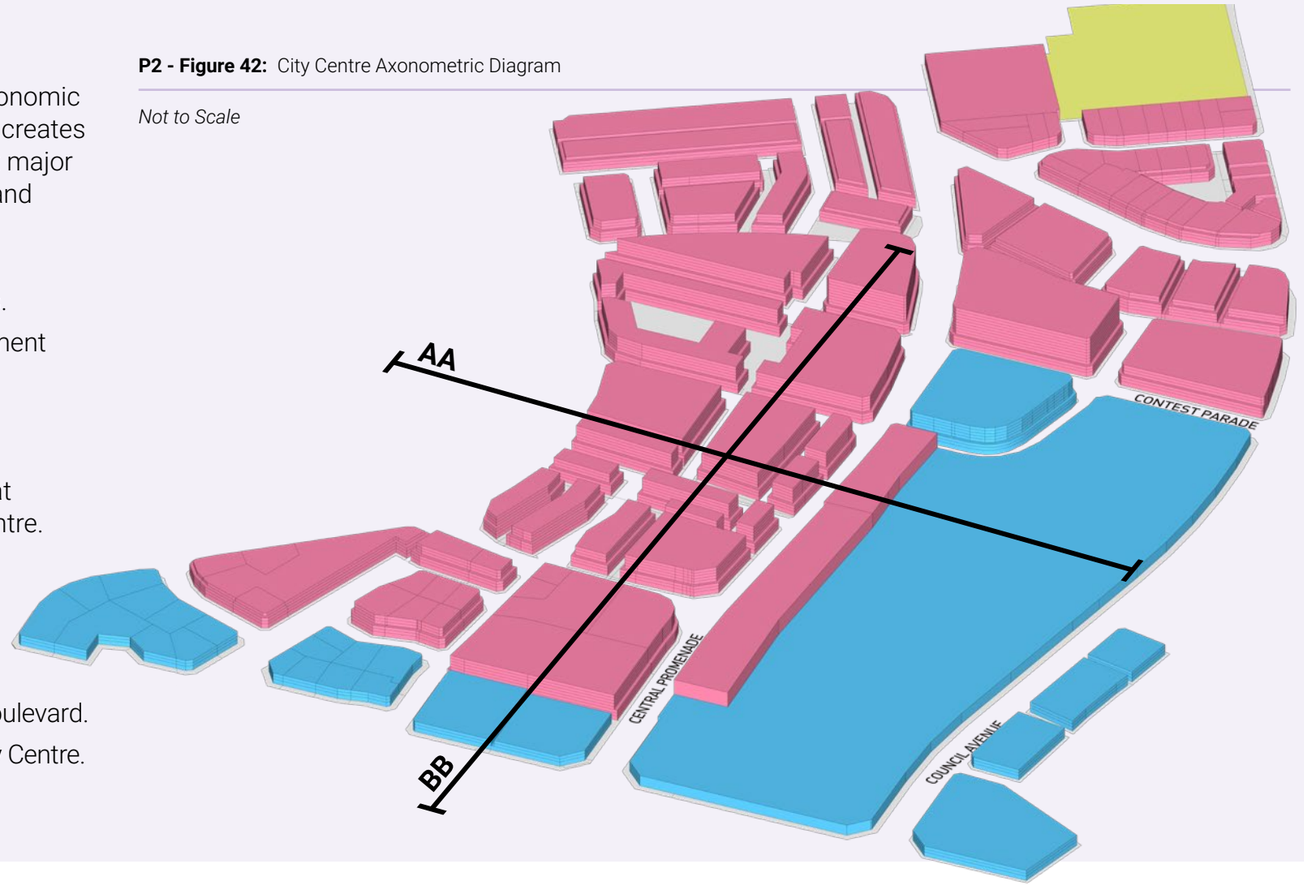
Anchored by the shopping centre and civic precinct, the City Centre will provide the primary economic and employment focus of the RSC. Higher density housing and new commercial development creates a critical mass of people who enjoy highly permeable and walkable urban streets, that connect major public spaces with public transport on Contest Parade. New development provides a positive and well-defined urban street interface, where pedestrians and cyclists enjoy priority over vehicles.

Sub-Precinct Objectives

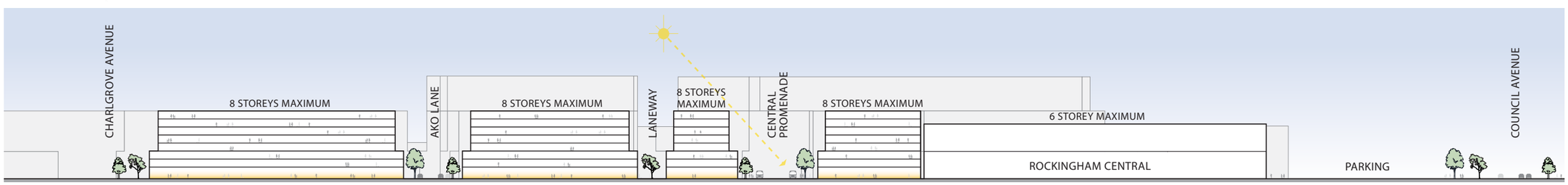
- Provide for an attractive and compact City Centre, supported by green and walkable streets.
- Concentrated mix of uses in the central core including high density residential and employment intensive land uses.
- Establish the land interfacing with the Syren Street/Civic Boulevard/Central Promenade intersection (and surrounds) as the primary retail heart of the City Centre.
- Unlock vacant development sites through flexible urban structure and planning controls that allow short term development that does not impact on the long term vision for the City Centre.
- Achieve a gradation of height to visually define the activity core of the City Centre and on Contest Parade along the RCCTS route.
- Realign the Whitfield Street/Goddard Street/Simpson Avenue intersection to allow an eastern extension of Central Promenade to enhance sub-precinct legibility.
- Sleeving of Rockingham Central Shopping Centre to activate Central Promenade and Civic Boulevard.
- Prominent corner sites provide development responses that create a visual gateway to the City Centre.

P2 - Figure 42: City Centre Axonometric Diagram

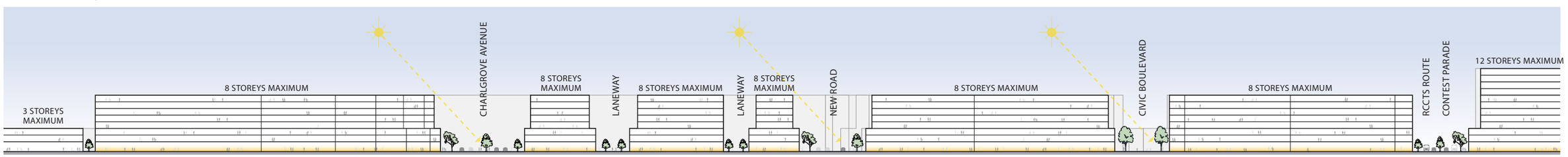
Not to Scale



Section AA - City Centre



Section BB - City Centre



5.6.5 P2 - Waterfront Village

Sub-Precinct Intent

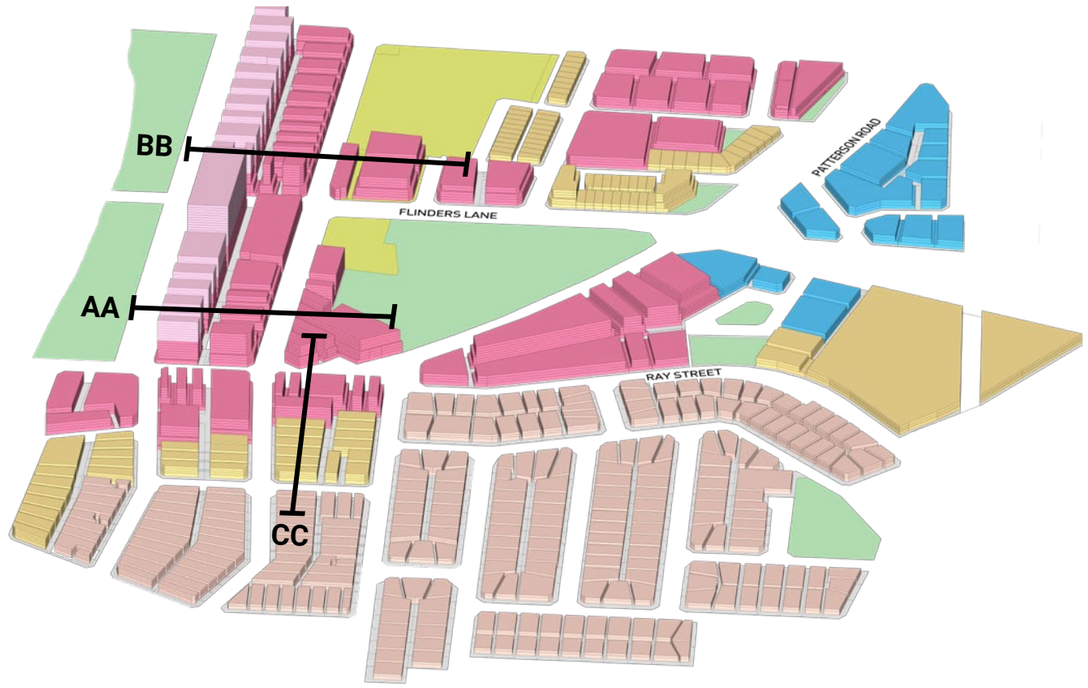
As an identified coastal node, the Waterfront Village will continue the transformation of Rockingham Beach into a regionally significant entertainment, culture, and tourism hub. Redevelopment of underutilised public and private land provides an attractive mix of medium to high density residential, short–stay accommodation, hospitality-focussed retail, and high quality public spaces. Combined these ingredients will see Rockingham's coastline established as a priority destination for locals and visitors.

Sub-Precinct Objectives

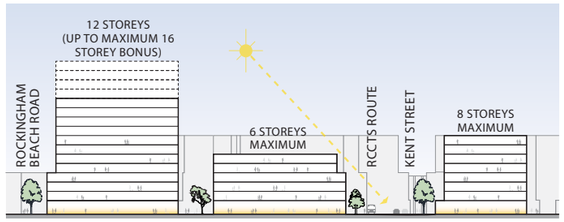
- Support transformation into a contemporary waterfront activity node servicing local residents and tourists through enhanced entertainment, short-stay accommodation, and cultural development opportunities.
- Rockingham Beach Road is established as the sub-precinct's focal point of activity, with uses such as alfresco dining spilling out onto the street. Traffic calming helps to reduce speeds, enhancing safety and useability.
- Reinforce Kent Street as a secondary main street with a focus on heritage, culture and the arts. Its prominence is enhanced by leveraging off the realigned RCCTS Route and creating new midblock connections to Rockingham Beach Road.
- Respond to the rare combination of a northerly coastal aspect, a sheltered beach and shady foreshore parklands with land uses that promote active recreation, living and business activities.
- Concentrate larger development typologies in the mixed use areas on Rockingham Beach Road, Kent Street, and Patterson Road.
- Carefully manage infill residential development to create high-quality residential neighbourhoods that respect the landscape qualities of these places to support Waterfront Village businesses.
- Encourage residential density along Wanliss Street and Patterson Road to help frame and support the RCCTS Route.
- Manage provision of adequate parking facilities and encourage integration of car parking with adjoining sites which are convenient, safe and sustainable.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and quality urban water management outcomes through well-considered approach to landscape and deep soil for infill development sites approach to landscape and deep soil.

P2 - Figure 43: Waterfront Village Axonometric Diagram

Not to Scale



Section AA - Waterfront Village



Section BB - Waterfront Village



Section CC - Waterfront Village



5.6.6 P3 - Coastal Lots

Sub-Precinct Intent

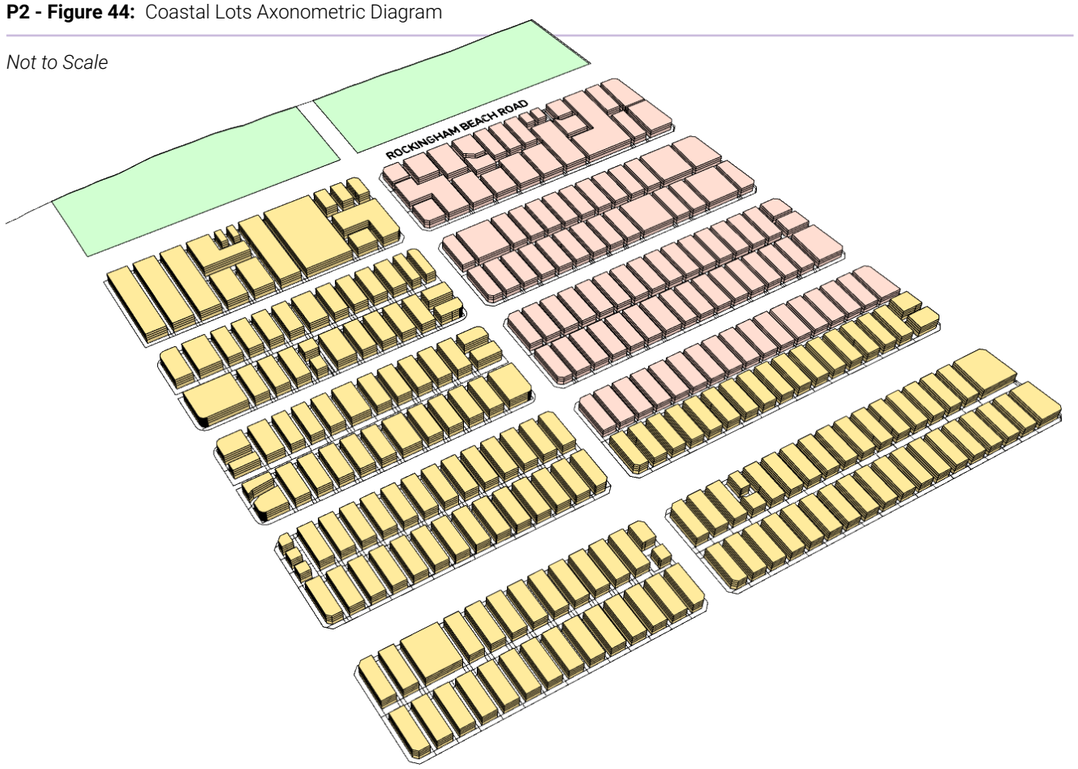
High-quality medium density development supports quality urban infill outcomes within the catchment of the RCCTS. A combination of grouped and multiple dwelling typologies enable an increased density, balanced with generous street setbacks and open space to encourage improved tree canopy as the neighbourhood evolves.

Sub-Precinct Objectives

- Guide the progressive urban consolidation and transformation of this area into a high-quality residential infill setting.
- Jecks Street reinforced as a green link to enhance connections between parkland and Wanliss Street transit stop.
- Design approaches to building envelopes, vehicle access, and landscape ensure existing neighbourhood character can be preserved.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and urban water management through well-considered approaches to on-site landscape design.
- Land ceded from properties adjacent to existing laneways helps to formalise two-way vehicle movement unlocking new development opportunities.

P2 - Figure 44: Coastal Lots Axonometric Diagram

Not to Scale



5.6.7 P4 - TOD Village

Sub-Precinct Intent

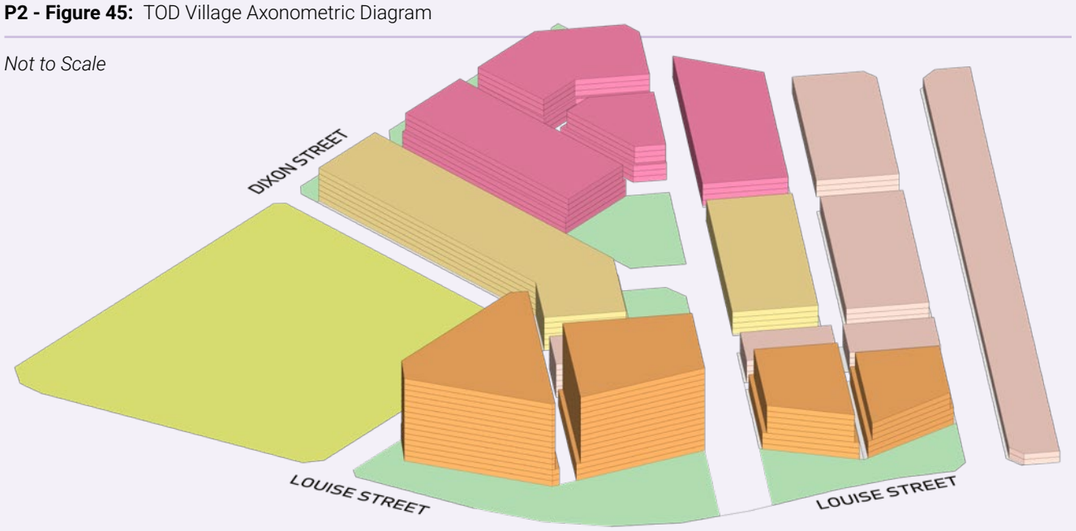
Extension of the RCCTS represents a strategic TOD to provide contemporary medium to high density development and employment opportunities that support a more compact urban form. The transit stop will be enhanced via quality public open spaces and the capacity for non-residential uses that creates a focus for community life and localised amenity.

Sub-Precinct Objectives

- Promote a highly flexible urban structure that enables block and lot configurations that can accommodate a range of building typologies that can adapt with Rockingham's needs at the time of development.
- Promote a range of building heights and densities to support housing diversity with a minimum target of at least 1,000 dwellings.
- Promote transit use by strengthening the accessibility to the transit stop and allowing efficient movement of the transit mode through the precinct.
- Leverage off proximity to the Education Sub-Precinct and promote new employment opportunities and attractiveness of that precinct.
- Create high-quality and attractive public amenity to support increased density, making the TOD Village a place that encourages people to live, work, and recreate in the RSC.
- New development integrates with the existing landscape and a retained Mike Barnett Sports Complex, which will form an identifiable part of the TOD Village.
- Facilitate the priority construction of a direct access and movement corridor between Dixon Road and the City Centre.
- Provide a legible and well-connected arrangement of streets, laneways and public spaces.
- New development to integrate/protect mature trees along Louise Street. There will be a requirement for flora and fauna surveys to manage any potential clearing prior to subdivision/development.

P2 - Figure 45: TOD Village Axonometric Diagram

Not to Scale



5.6.8 P5 - City Park

Sub-Precinct Intent

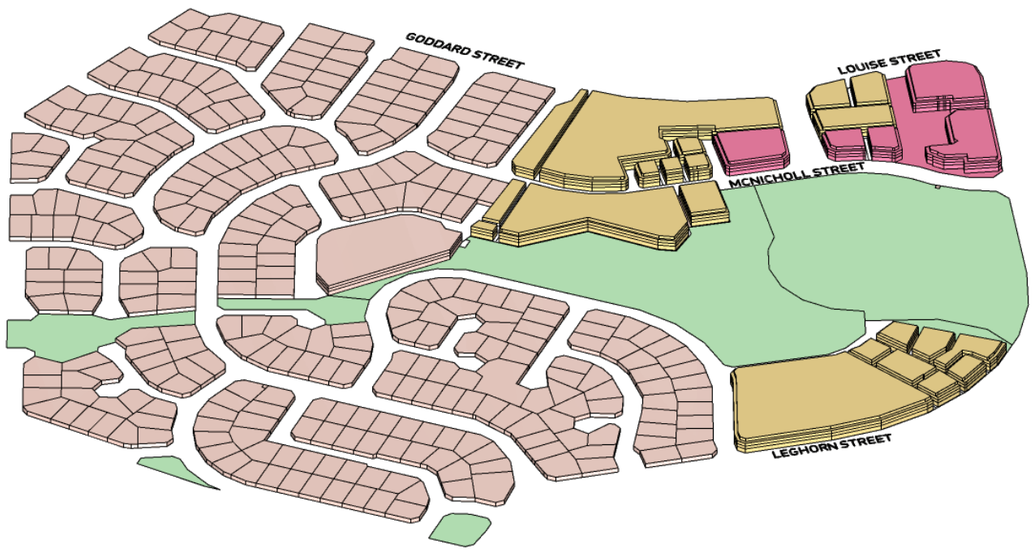
High-quality medium density development support sensitive and quality urban infill outcomes, primarily in the form of grouped dwellings and small scale apartment typologies. Heights are generally between two-four storeys, and generous street setbacks align with the existing suburban character in the northern part of the sub-precinct. The southern portion of the sub-precinct is characterised by high-quality medium and high density urban development in proximity to the RCCTS and fronting areas of public open space.

Sub-Precinct Objectives

- Guide the progressive development of this area consistent with best practice infill residential development principles.
- Ensure future development responds to existing suburban neighbourhood character.
- Promote increased density in areas with access to high quality amenities such as the City Park and connected linear parklands, and along the RCCTS route.
- Encourage amalgamation of lots adjacent to the green link to support new development which provides passive surveillance of the adjacent park land.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and urban water management through well-considered approach to landscape and deep soil.
- Land ceded from properties adjacent to existing laneways helps to formalise two-way vehicle movement unlocking new development opportunities.

P2 - Figure 46: City Park Axonometric Diagram

Not to Scale



5.6.9 P6 - Southern Residential

Sub-Precinct Intent

High-quality medium density development support sensitive and quality urban residential infill outcomes, in proximity to the RCCTS, Council Avenue and fronting areas of public open space. Heights are generally between two-three storeys, and generous street setbacks align with the existing suburban character of the area.

Sub-Precinct Objectives

- Guide the progressive development of this area consistent with best practice infill residential development principles.
- Ensure future development responds to existing suburban neighbourhood character.
- Promote increased density in areas with access to high quality amenities such as parkland and along the RCCTS route.
- Battle-axe subdivision is discouraged to ensure desired streetscape and density outcomes can be achieved.
- Support retention of existing mature trees and urban water management through well-considered approach to landscape and deep soil.

5.6.10 P7 - Education

Sub-Precinct Intent

The Education Sub-Precinct is a place of learning and discovery, linking local residents to trade, research and recreation opportunities. Campus buildings are arranged around an internal loop which enhances connectivity between institutions and the neighbouring TOD Village. Sufficient capacity for new development ensures spaces between buildings supporting establishment of playing fields to provide for organised sport.

Sub-Precinct Objectives

- Maintain and enhance high-quality refurbishment and redevelopment for each individual campus.
- Ensure that campuses are developed in a complementary way, to share resources where feasible and to present an integrated urban character.
- Urban design of campuses to ensure a high-quality and attractive environment, with buildings presented in a landscape setting, including orientation around centralised public open space.
- The Dixon Road and Simpson Avenue entry points use planting, lighting and signage to convey a clear sense of arrival into the RSC.

5.6.11 P8 - Dixon Road

Sub-Precinct Intent

Dixon Road fulfils a dual role as service and employment hub. A gateway statement at the corner of Dixon Road and Ennis Avenue frames the entry into the RSC, with an enhanced streetscape supported by a green buffer which screens the light industrial and commercial development to the north. The area south of Patterson Road is developed with a flexible urban structure to create a new business park with an employment focus.

Sub-Precinct Objectives

- Maintain and enhance the sector as an important service commercial area at the north eastern gateway to the RSC.
- Give particular attention to the landscape treatment of Ennis Avenue and Dixon Road.
- Patterson Road and Dixon Road where planting, lighting and signage should convey a clear sense of arrival at the gateway to a major urban centre.
- Upgrade the streetscapes of the long established light industrial area consistent with the changing function of the Sub-Precinct.
- Ensure the environmental factors associated with the environmentally sensitive area are managed appropriately in accordance with relevant environmental legislation and regulations (i.e. clearing permits and flora and vegetation/terrestrial fauna).
- Ensure planning can support the Public Transport Authority's intent to expand the footprint of the existing Rockingham Bus Depot to allow it to support the future growth of the RSC.

5.6.12 R-Codes Application

The previous sections provide a detailed summary of the approach taken in developing the built form approach for the RPSP. The purpose of this section is to summarise how the R-Codes will be applied to ensure that this vision and intent can be achieved across the various sub-precincts, it also provides justification for any proposed modifications. **P2 - Table 24** provides a high-level overview of how the different parts of the R-Codes are intended to apply to the different residential dwelling typologies.

P2 - Table 24: RPSP R-Codes Application

R-Code	Single Dwellings	Grouped Dwellings	Multiple Dwellings
R40	**Volume 1 Part B** Some modifications to Volume 1 Part B are proposed. Modifications are summarised for each relevant sub-precinct in P2 - Table 25.	**Volume 1 Part C** Some modifications to Volume 1 Part C are proposed. Modifications are summarised for each relevant sub-precinct in P2 - Table 25.	
R60	**Volume 1 Part C** Some modifications to Volume 1 Part C are proposed. Modifications are summarised for each relevant sub-precinct in P2 - Table 25.		
R80/R-ACO	**Volume 1 Part C** In the RPSP, R60 standards shall apply to single and grouped dwellings in areas coded R80 or R-AC0.		**Volume 2** Some modifications to Volume 2 are proposed. Modifications are summarised for each relevant sub-precinct in P2 - Table 26.

Proposed R-Code Modifications

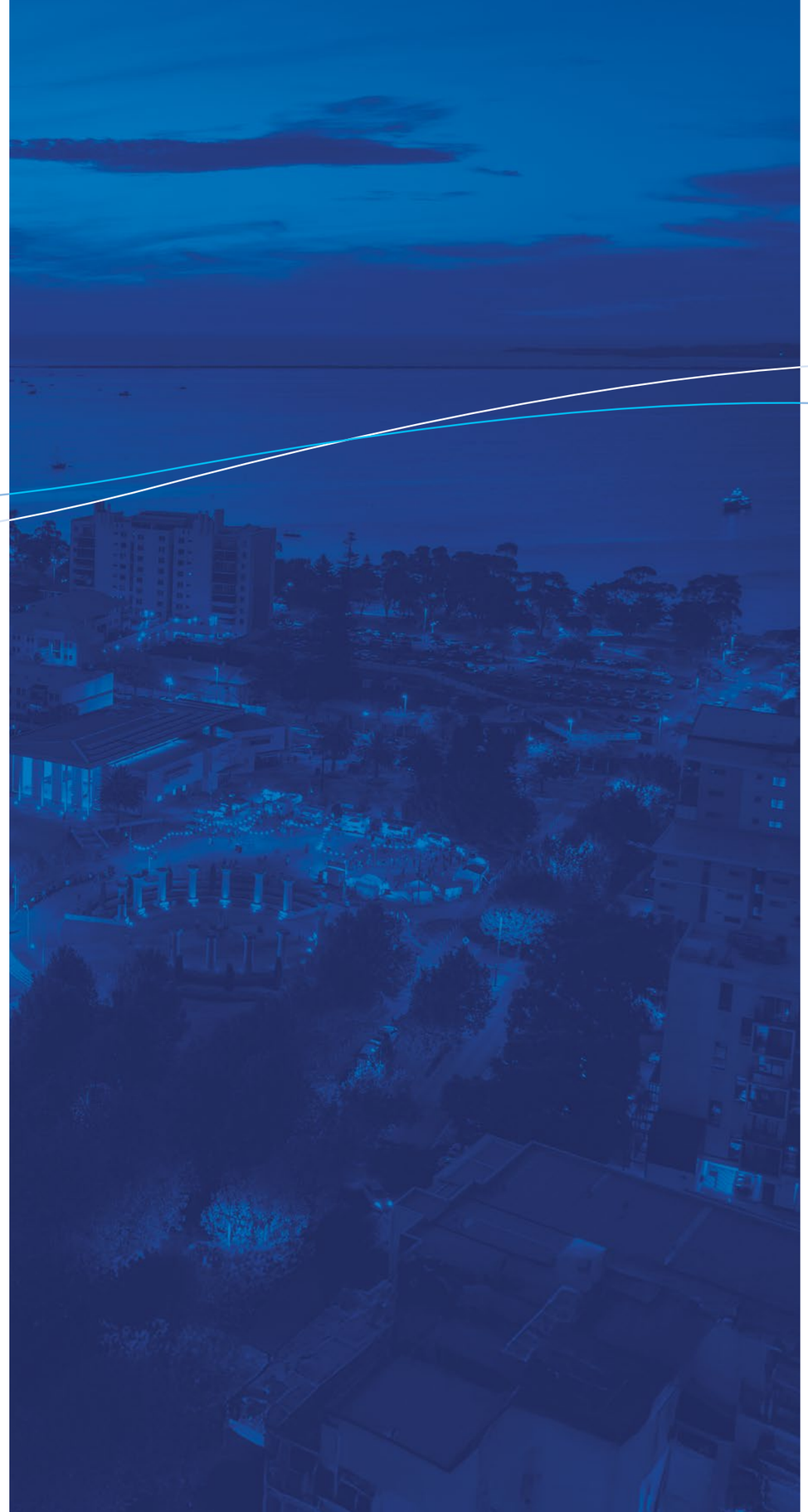
R-Code Modifications contemplated in the RPSP are summarised in **P2 - Table 25** and **P2 - Table 26**.

P2 - Table 25: RPSP R-Codes Modifications Volume 1

R-Codes	Sub-Precincts	Modification	Justification
VOLUME 1 - PART B R40 Single Dwellings	P2 - Waterfront Village P5 - City Park P6 - Southern Residential	**Clause 5.1.2 Street Setback** C2.1 is Augmented by the RPSP to introduce a maximum 6m primary street setback and increases the secondary street setback to 2m.	Street setbacks are modified to ensure that new development is delivered consistent with existing suburban development patterns.
		Clause 5.1.3 Lot Boundary Setbacks C3.1 is Augmented by the RPSP to introduce a minimum 4m rear setback.	Larger rear setbacks are introduced to ensure that new development is delivered consistent with existing suburban development patterns and to promote tree canopy growth on private lots.
		Clause 5.5.1 Ancillary Dwellings C3.1 is Augmented by the RPSP by introducing new clauses which guide the siting and quality of ancillary dwellings.	New clauses ensure the use of materials and colours which are compatible with the main dwelling and restrict substandard forms of development such as sheds, dongas and sea containers. It also ensures that ancillary dwellings are located behind or as an extension to the primary dwelling.
VOLUME 1 - PART C R40 Grouped Dwellings R60 Single/ Grouped/ Multiple Dwellings R80 Single/ Grouped Dwellings R-AC0 Single/ Grouped Dwellings	P1 - City Centre P2 - Waterfront Village P3 - Coastal Lots P4 - TOD Village P5 - City Park P6 - Southern Residential	**Clause 3.2 Building Height** C3.2.1 Modified by the RPSP which introduces a minimum two storey height or minimum two storey height expectation (dependent on location).	As a designated strategic centre, the RPSP intends to establish a more urbanised built form. A minimum two storey height requirement for residential development has therefore been proposed in all areas zoned Mixed Use and Commercial. • A minimum two storey height expectation is also established for: • All properties located in P2 - Waterfront Village and P3 - Coastal Lots, and R80 properties in P5 - City Park. • Properties located adjacent to POS or along the RCCTS route. • Properties on key urban corridors such as Council and Simpson Avenues.
		Clause 3.3 Street Setbacks C3.3.1 Modified by the RPSP which introduces a larger minimum primary and secondary street setbacks.	The RPSP's neighbourhoods possess a defined urban character. Larger street setbacks will allow for more sensitive infill development to occur, balancing existing development patterns with desired built form and density outcomes.
		Clause 3.4 Lot Boundary Setbacks C3.4.1 Modified by the RPSP which introduces larger side and rear setbacks.	Larger side and rear setbacks are introduced to ensure that new development is delivered consistent with existing suburban development patterns and to promote tree canopy growth on private lots. This modification will primarily focuses on P2 and P3 for lot boundary setbacks.
		Clause 3.6 Streetscape C3.6.5 Is replaced by the RPSP which does not allow garages to front the primary street.	To ensure high quality streetscapes garages are not permitted to front the primary street in the RPSP's medium density areas. They are proposed to be located towards the rear of lots as evidenced in the design testing.

P2 - Table 26: RPSP R-Codes Modifications Volume 2

R-Codes	Sub-Precincts	Modification	Justification
VOLUME 2 R80 Multiple Dwellings R-AC0 Multiple Dwellings	P1 - City Centre P2 - Waterfront Village P3 - Coastal Lots P4 - TOD Village P5 - City Park	**Element 2.2 Building Height** A2.2.1 Modified by the RPSP which introduces a minimum two storey height or minimum two storey height expectation (dependent on location).	As a designated strategic centre, the RPSP intends to establish a more urbanised built form. A minimum two storey height expectation is established for: • All properties located in P2 - Waterfront Village and P3 - Coastal Lots, and R80 properties in P5 - City Park. • Properties located adjacent to POS or along the RCCTS route.
		Element 2.3 Street Setbacks A2.3.1 Modified by the RPSP which introduces a larger minimum primary and secondary street setbacks.	The RPSP's neighbourhoods possess a defined urban character. Larger street setbacks will allow for more sensitive infill development to occur, balancing existing development patterns with desired built form and density outcomes.
		Element 2.4 Side and Rear Setbacks A2.4.1 Modified by the RPSP which introduces a reduced side setback and larger rear setback.	Side and rear setbacks are introduced to ensure that new development is delivered consistent with existing suburban development patterns and to promote tree canopy growth on private lots.
		Element 2.5 Plot Ratio A2.5.1 Modified by the RPSP which removes plot ratio as a control.	The RPSP proposes to control building envelopes through application of building heights and setbacks which were deemed appropriate to manage building bulk and scale in this infill setting, particularly on smaller residential lots. For larger sites, the Building Depth and Building Separation controls of the R-Codes will be used to help manage taller tower forms on large lots.
		Element 3.6 Public Domain Interface A3.6.2 Modified by the RPSP for sites zoned 'Commercial' which allows car parking in the primary setback area.	To provide greater design flexibility for commercial zoned properties, car parking is permitted in the primary street setback area. This modification does not apply to mixed use or residential areas.
		Element 3.8 Vehicle Access A3.8.1/A3.8.2 Replaced by the RPSP for sites zoned with a Main Street or Urban Mixed Use Frontage where vehicle access from the primary street frontage is not permitted.	To ensure high quality Main Street frontages with continuous active urban edges, vehicle access is not permitted in these areas. Urban Mixed Use frontages have greater flexibility, with vehicle access to be at the discretion of the City.
		Element 4.10 Facade Design A4.10.1/A4.10.5 Augmented by the RPSP which provides additional design guidance on street interface and awnings.	To ensure high quality frontages that provide active engaging streetscape experiences, and adequate weather protection the RPSP includes additional design guidance which supported existing R-Codes acceptable outcomes.



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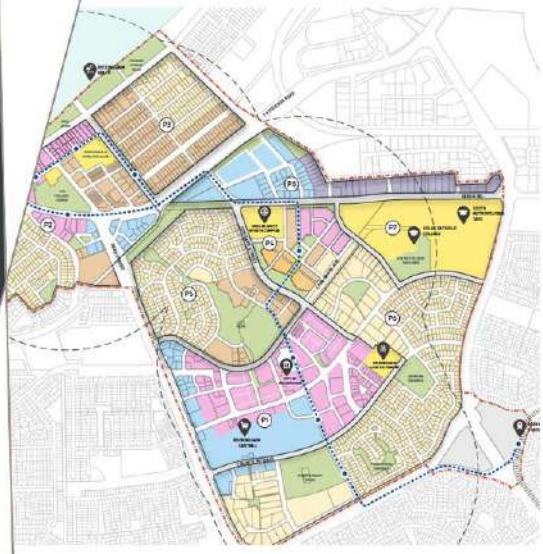
Rockingham City Centre

Precinct Structure Plan

CW1181500



Prepared for
City of Rockingham

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Executive Summary

This Water Management Strategy (WMS) has been prepared by Cardno on behalf of City of Rockingham (CoR) in support of the development of the Rockingham Strategic Centre (RSC) located approximately 37km south of Perth Central Business District.

The study area is approximately 525 ha in size which includes city centre zoning, residential areas, commercial lots, and public open spaces. There are a portion of lots within the study area that are currently zoned for development but remain undeveloped.

This WMS provides the framework for the application of total water cycle management to the RSC, consistent with Department of Water (DoW) guiding document, City of Rockingham Policies and the WAPC (2008) Better Urban Water Management framework.

The WMS has been developed to address the following project objectives;

- Present Water Sensitive Urban Design (WSUD) options that could be applied to the precinct;
- Determine the proposed drainage parameters and existing flood capacity of the development site;
- Consider stormwater management options which could be utilised, including reuse opportunities;
- Consider precinct level, total water cycle management options and provide a multi-criteria analysis for consideration including economic, environmental and other constraints; and
- Consider alternative water sources to be used within the development (potable and non-potable).

The proposed Rockingham Strategic Centre indicates an intensification of development when compared to current development and zoning, with a reduction in pervious areas and an increase in density within city centre areas. In order to preserve the existing environment and ensure no adverse impacts to surface and ground water within the study area, objectives have been established for water quality, water quantity, water conservation and ground water management.

The options which were developed and deemed most suitable to be embedded into the Rockingham Strategic Centre Precinct Structure Plan and achieve project objectives include;

- Soakage well systems on lot level
- Regional bioretention/ detention basins
- Bio-swales along road frontage
- Rainwater tanks
- Treated stormwater and wastewater for irrigation
- Aquifer re-injection

The MCA assessment indicated that options 1, 2 and 3 provided the highest ranking, suggesting that these methods are most suitable in addressing project objectives while achieving reasonable cost outcomes. It is noted that most options only address some components (i.e. water quality and groundwater) of the total water cycle, and it will likely be a combination of different options that will provide a holistic, practical approach for managing water within the study area.

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Table of Contents

1	Introduction		1
	1.1	Background	1
	1.2	Location	1
	1.3	Report Purpose	2
	1.4	Policy Framework	2
	1.5	Data Sources	4
2	Proposed Development		5
	2.2	WMS Objectives	7
3	Pre-Development Environment		9
	3.1	Existing Land Use	9
	3.2	Climate	9
	3.3	Topography and Soils	9
	3.4	Surface Geology	10
	3.5	Acid Sulfate Soils	10
	3.6	Wetlands	10
	3.7	Surface Hydrology	10
	3.8	Water Supply	11
	3.9	Groundwater	11
4	Water Management Strategy		14
	4.1	Water Balance	14
	4.2	Water Supply and Wastewater	14
	4.3	Water Efficiency Measures	15
	4.4	Stormwater Management	15
	4.5	Stormwater Detention Measures	17
	4.6	Water Quality Management	18
	4.7	Groundwater Management	20
	4.8	Summary of Recommended Actions	20
5	Multi Criteria Analysis		21
6	Conclusion		24
7	References		25

Tables

Table 2-1 Pre-development land use zoning 5
Table 2-2 Post-development land use zoning 5
Table 2-3 Summary of WMS Principles and Objectives 7
Table 3-1 Existing Water Quality Data – Bore 8282 12
Table 4-1 Minimum Specification for bio-retention systems 18
Table 5-1 Criteria and Weighting for MCA 22
Table 5-2 Outcome of MCA for each option 23

Figures

Figure 1-1 Rockingham Location Plan 1
Figure 2-2 Land use comparison for Study Area 6
Figure 3-1 Study Area Topography 9
Figure 3-2 Rockingham stormwater Sub-catchment plan 11
Figure 3-3 Superficial Aquifer groundwater flownet (Rockingham MAR feasibility study – EWP18157 2018) 13
Figure 3-4 Subject site groundwater contours 13
Figure 4-1 Major Drainage Paths for Study Area 16
Figure 4-2 Opportunities for stormwater detention infrastructure 17
Figure 4-3 Typical Bioretention Swale Layout 19

1 Introduction

1.1 Background

Rockingham is situated within the South Metropolitan Peel Sub-Regional Planning Framework area. The framework recognises the benefits of a consolidated and connected city utilising the region's previous historic patterns of urban growth.

To align with Western Australia's contemporary state planning policy framework, the City of Rockingham (CoR) is in the process of preparing an updated *Rockingham Strategic Centre Precinct Structure Plan* (RPSP) to provide guidance for future development within the region. The RPSP is intended to supersede the *Rockingham Strategic Regional Centre – Centre Plan* (2009) which previously underpinned planning and development within the Rockingham city area.

As part of the RPSP, a multidisciplinary approach has been adopted for the strategic planning, by setting out broad land-use zones, setting aside areas for regional open space, protection of environmental values and other regional infrastructure purposes, and assisting in coordinating the provision of major infrastructure.

This report provides a Water Management Strategy (WMS) for the RPSP that makes recommendations for solutions which consider best practice water management principles, to be embedded into the precinct planning. The WMS will outline stormwater infrastructure and water management approaches required to accommodate land use changes resulting from the precinct development. Implementation of the WMS will maximise opportunities for sustainable long-term use of the precinct, balanced against the growth, climate and environmental challenges for the site.

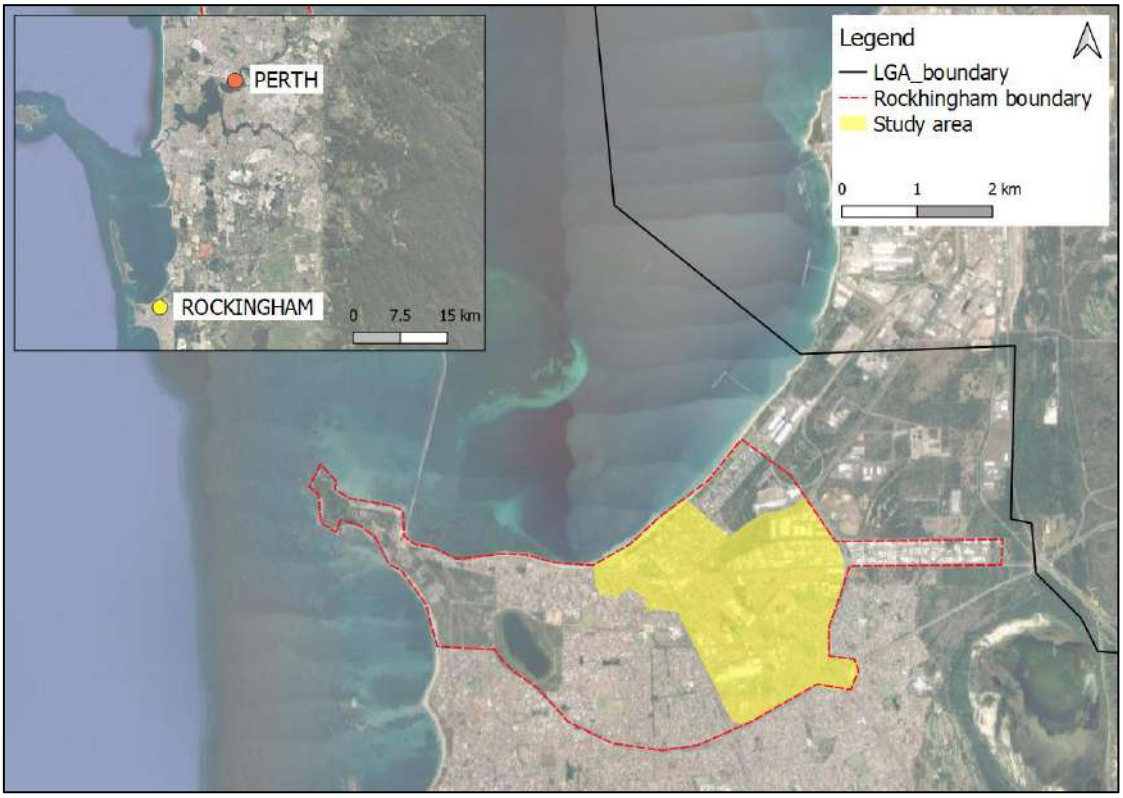
1.2 Location

The Rockingham Strategic Centre (RSC), referred to as the Study Area herein, is located in the City of Rockingham (CoR), located approximately 37km south of the Perth CBD.

Within the City of Rockingham, the Study Area is situated within the suburb of Rockingham, in the northern area of the City of Rockingham as illustrated within Figure 1-1.

The Study Area covers approximately 525 ha and is bounded by Ennis Avenue to the east, Rae Road to the south, Reed Street to the west and Rockingham Beach Rd to the north.

Figure 1-1 Rockingham Location Plan



1.3 Report Purpose

This Water Management Strategy (WMS) has been developed to accompany the RPSP to ensure that relevant water management objectives are incorporated into the plan's development. This WMS will outline stormwater infrastructure and water management approaches required to accommodate land use changes resulting from the precinct development. This WMS has been developed to achieve the following project objectives;

- Present Water Sensitive Urban Design (WSUD) options that could be applied to the precinct;
- Determine the proposed drainage parameters and existing flood capacity of the development site;
- Consider stormwater management options which could be utilised, including reuse opportunities;
- Consider precinct level, total water cycle management options and provide a multi-criteria analysis for consideration including economic, environmental and other constraints; and
- Consider alternative water sources to be used within the development (potable and non-potable).

1.4 Policy Framework

The WMS provides the framework for the application of total water cycle management to the proposed urban structure. The WMS has been prepared to be consistent with the following guidance documents from the Western Australian Planning Commission (WAPC), Department of Water (DoW) and City of Rockingham (CoR) in defining its key principles and objectives as summarised in Section 2.2:

- Better Urban Water Management Framework (WAPC, 2008);
- Liveable Neighbourhoods Edition 4 (WAPC, 2009);
- Stormwater Quantity Management Manual for WA (DoW, 2007);
- Planning Bulletin 92 – Urban Water Management (WAPC, 2009);
- Planning Policy No. 3.4.3 – Urban Water Management (CoR);
- Lake Richmond Management Plan (CoR, 2020); and
- Rockingham Lakes Regional Park Management Plan (CoR, 2010).

A summary of the guidance obtained through key design principles and objectives from these documents is outlined in the following sections.

1.4.1 Better Urban Water Management (WAPC, 2008)

The guideline document *Better Urban Water Management* (BUWM) (WAPC, 2008) focuses on the process of integration between land use and water planning and specifying the level of investigations and documentation required at various decision points in the planning process.

1.4.2 Liveable Neighbourhoods (WAPC, 2009)

The WMS has been developed in accordance with regional and local principles and objectives of Integrated Urban Water Management (IUWM) established in the guideline document, *Liveable Neighbourhoods* (WAPC,2009).

IUWM (also known as total water cycle management) is defined as promoting 'management of the urban water cycle as a single system in which all urban water flows are recognised as a potential resource and where the interconnectedness of water supply, stormwater, wastewater, flooding, water quality, waterways, estuaries and coastal waters is recognised'.

IUWM also promotes water conservation measures, reuse and recycling of water and best practice in stormwater management. The objectives in this WMS are consistent with *Liveable Neighbourhoods*.

1.4.3 Stormwater Quality Management Manual for WA (DoW, 2007)

The Water and Rivers Commission released A Manual for Managing Urban Stormwater Quality in Western Australia in 1998 to define Best Management Practices (BMP) necessary to reduce pollutant and nutrient inputs to stormwater drainage systems. The Manual also provides guidelines for the incorporation of water sensitive design principles into urban planning and design, to promote the improvement of water quality from urban development.

The document was released to provide a guideline for best planning and management practices for use by the Water and Rivers Commission, other State and Local Government Authorities and sectors of the urban development industry.

The Department of Water (DoW, now the Department of Water and Environment Regulation, DWER) completed a major review of the Manual in consultation with a working team comprising industry and government representatives, published in August 2007. Principal objectives for managing urban water in Western Australian are stated as:

- Water Quality: To maintain or improve the surface and groundwater quality within the Study Area relative to pre-development conditions;
- Water Quantity: To maintain the total water cycle balance within the Study Area relative to the predevelopment conditions;
- Water Conservation: To maximise the reuse of stormwater;
- Ecosystem Health: To retain natural drainage systems and protect ecosystem health;
- Economic Viability: To implement stormwater systems that are economically viable in the long term;
- Public Health: To minimise the public risk, including risk of injury or loss of life to the community;
- Protection of Property: To protect the built environment from flooding and waterlogging;
- Social Values: To ensure social, aesthetic and cultural values are recognised and maintained when managing stormwater; and
- Development: To ensure the delivery of best practice stormwater management through planning and development of high-quality developed areas in accordance with sustainability and precautionary principles.

1.4.4 Planning Bulletin 92 – Urban Water Management

The document *Planning Bulletin 92* provides guidance on urban water management principles to be adopted by the Western Australian Planning Commission (WAPC) and local governments when preparing planning proposals. The aim of the document is to ensure that relevant and appropriate information is utilised when making decisions for water planning.

The bulletin outlines which policies and framework documents are to be considered in the planning process for different phases and different types of development work. The information presented within this WMS adheres to the advice within *Planning Bulletin 92- Urban Water Management.*

1.4.5 City of Rockingham policies and guidance

Planning Policy No. 3.4.3 Urban Water Management

The intent of this Planning Policy is to ensure that the processes outlined within *Better Urban Water Management (WAPC, 2008)* are applied throughout the planning process in a consistent manner. More specifically, the policy provides guidance on appropriate measures to manage catchments to maintain or improve groundwater and surface water resources and promote water sustainability practices. The methods for water management outlined within *Planning Policy No. 3.4.3* have been incorporated into this WMS.

Lake Richmond Management Plan This management document provides key direction for the protection and enhancement of the conservation and recreation values within the Lake Richmond reserve. It has been ensured that the guiding principles of the *Lake Richmond Management Plan* were aligned with the recommendations made within this WMS.

Rockingham Lakes Regional Park Management Plan

The purpose of this management plan is to provide the overarching approach for the protection and enhancement of the conservation, recreation and landscape values of Rockingham Lakes Regional Park. The strategies for conserving the features of the park were considered in the water management approaches for this study.

1.5 Data Sources

The information and data sources used to guide the recommendations of this WMS have been obtained from local, state and national organisations. At the time of preparing this report it has been assumed that the data represents the most up to date and accurate version available. Where practicable, Cardno has undertaken due-diligence to review the data provided by external sources.

The key sources of data which have informed this study are summarised below.

- Concept planning advice from Water Corporation;
- Current catchment and drainage information from City of Rockingham; and
- Precinct planning data received by Hames Sharley (Dated 26-11-2021 Revision B).

A full range of reference are detailed within Section 7 of this report.

2 Proposed Development

The proposed RSC covers an area of approximately 525ha and incorporates a range of land uses.

There are residential areas situated in the south, central and northern areas with a range of lot sizes and characters. Two main mixed used regions exist, the City Centre and Waterfront Village, which are anticipated to provide a range of retail, food and beverage and commercial uses. The industrial zoned region is in the north east corner, with the Campus situated on the southern side of Dixon Road.

Compared to current land use planning, there has been an increase in areas zoned as residential and open spaces. However, it is noted that review of the latest aerial imagery reveals that there are some lots which are currently undeveloped and do not reflect current zoning potential.

The pre-development and post-development land uses have been summarised in Table 2-1 and Table 2-2 respectively, and illustrated in Figure 2-2.

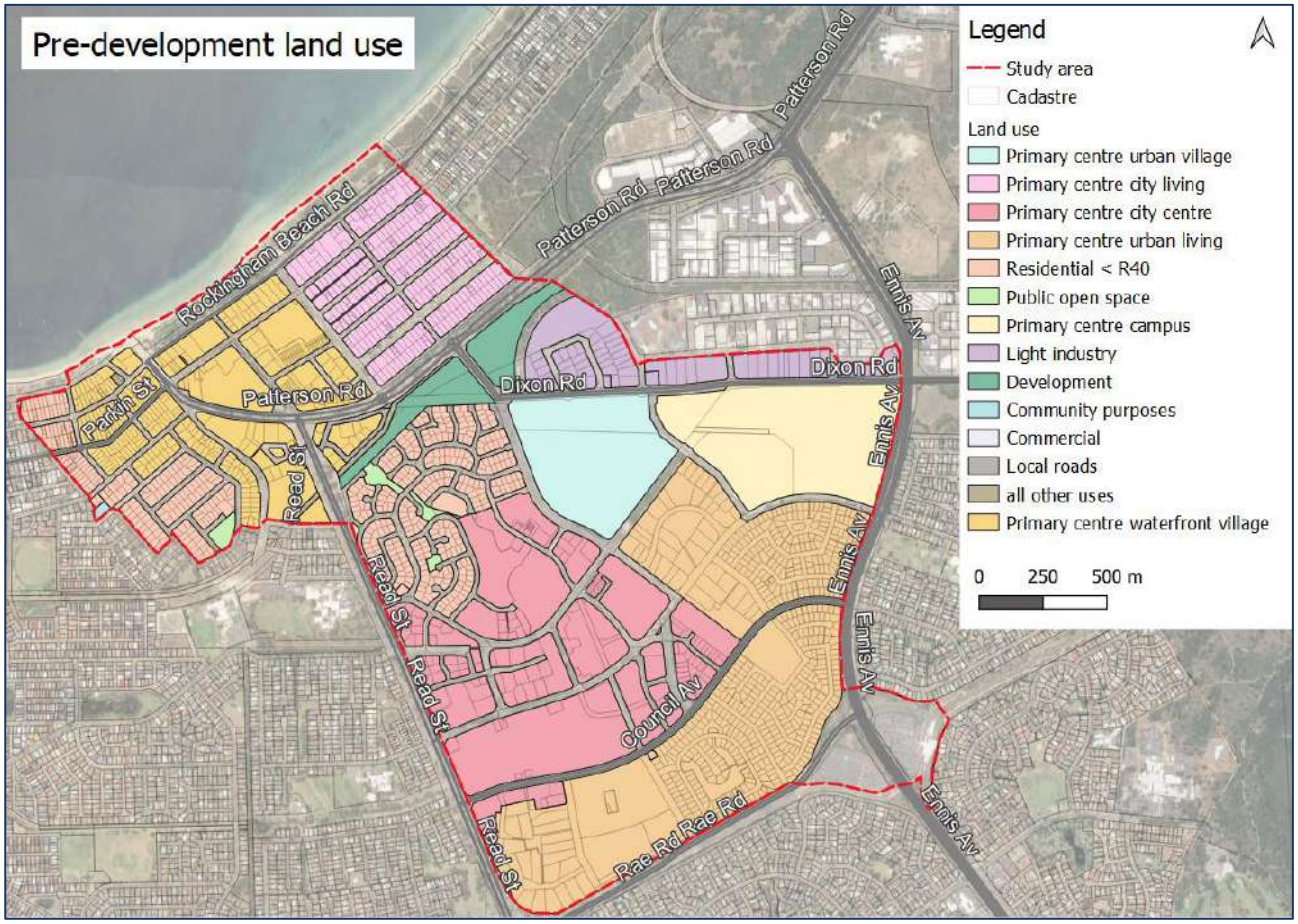
Table 2-1 Pre-development land use zoning

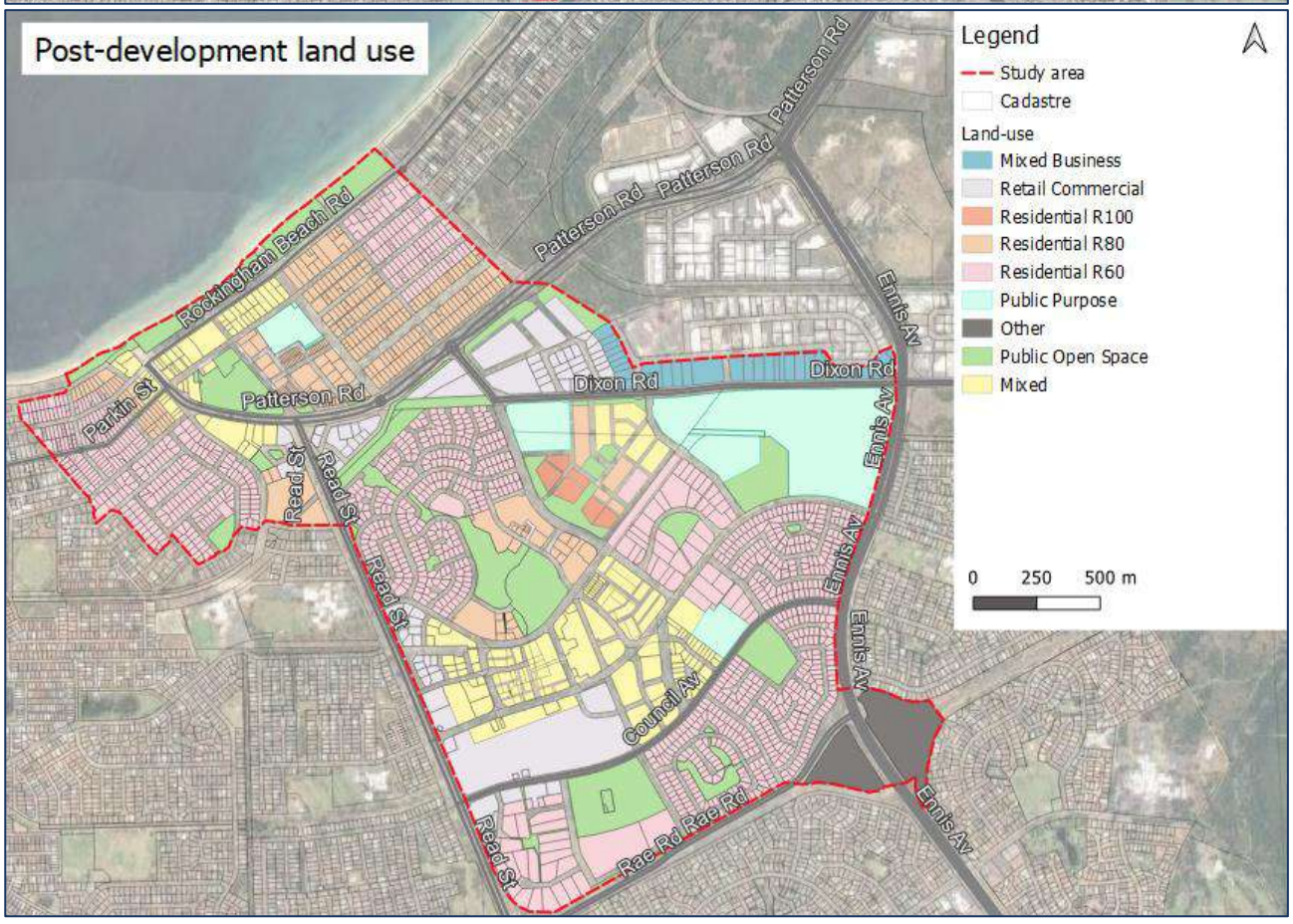
Land Use	Area (ha)
Special use	0.5
Residential	40
Public purposes	1
Public open space	3
Primary centre waterfront village	49
Primary centre urban village	25
Primary centre urban living	104
Primary centre city living	31
Primary centre city centre	78
Primary centre campus	35
Local roads	1
Light industry	20
Development	11
Community purposes	0.5
Other	126
TOTAL	525

Table 2-2 Post-development land use zoning

Land Use	Area (ha)
Residential R60	133
Residential R80	44
Residential R100	3
Mixed Use	47
Commercial	40
Public Purpose	40
Service Commercial	11
Public Open Space	60
Other	147
TOTAL	525

Figure 2-2 Land use comparison for Study Area





2.2 WMS Objectives

The key guiding principles for this WMS are to:

- Facilitate implementation of sustainable best practice urban water management practices;
- Provide integration with planning processes and clarity for agencies involved with implementation;
- Minimise public risk, including risk of injury or loss of life;
- Protect infrastructure and assets from flooding and inundation;
- Encourage environmentally responsible development; and
- Facilitate adaptive management responses to the monitored outcomes of development.

The above principles have been applied to all aspects of this WMS and are described in Table 2-3.

Table 2-3 Summary of WMS Principles and Objectives

Category	Objective	Criteria
Stormwater Quantity Management *Refer note 1,2**	> Prevent impacts on receiving environments from changes to catchment hydrology. > Protect infrastructure and assets from major storm and flooding events. > Protect people and property from flooding.	> Manage first 15mm of lot runoff within road reserves > Maintain peak flow rates to the pre-development condition in the critical 1 in 1-year annual exceedance probability event. > Manage the catchment run-off to the pre-development condition for up to the 1% AEP event. > Construct residential, commercial and industrial building habitable floor levels at least 0.3 m above the 1% AEP flood level of the urban drainage system and at least 0.5 m above the 1% AEP flood level
Stormwater Quality Management *Refer note 1,2**	> Protect the downstream receiving environment through the application of WSUD principles and nutrient load reduction design objectives for stormwater runoff.	> Treat all stormwater captured in the drainage infrastructure prior to discharge to the receiving environment. > Achieve water quality improvement in scenario where the pollutant outputs exceed the catchment ambient conditions by meeting reduction targets of: – 80% total suspended solids – 60% total phosphorus – 45% total nitrogen – 70% gross pollutants > Implement structural treatment measures (infiltration storages, bio-retention/treatment structures sized to minimum 2% of connected impervious area. > Infiltrate all stormwater in retention devices in less than 96 hrs. > Maintain or restore desirable environmental flows and hydrological cycles as specified by DoW.

Category	Objective	Criteria
Groundwater *Refer note 1,2**	> Managing and minimising changes in groundwater levels and groundwater quality following development. > Protect infrastructure and assets through management of groundwater levels. > Protect groundwater-dependent ecosystems by maintaining groundwater regimes within the catchment. > Protect the value of groundwater resources.	> Achieve nutrient load reduction design objectives for discharges to groundwater. > Sub-surface drainage (subsoils) and drainage infrastructure set at or above the groundwater. > Achieve free drainage for sub-surface drainage outlets. > Provide sufficient separation distances appropriate to acceptable levels of risk and amenity for critical elements of built form and infrastructure.
Water Conservation *Refer note 1**	> Preserve natural resources through the development of a water conservation strategy that considers factors such recycling, re-use, reduction. > Progress the water supply and sewage disposal strategy.	> Implement alternative fit-for-purpose water sources where appropriate and cost-effective. > Achieve consumption target for water use of 100 kL/person/yr with no more than 60 kL/person/yr of scheme water. > Irrigated areas will be watered at an average rate of 7500 kL/ha/yr.

Note 1: Information sourced from *Western Australian Planning Commission (WAPC). (2008). Better Urban Water Management.* Perth: WAPC.

Note 2: Information sourced from City of Rockingham (CoR). *Planning Policy No. 3.4.3 – Urban Water Management, (LUP/1265-05; D19/204775)*

3 Pre-Development Environment

3.1 Existing Land Use

City of Rockingham's Planning & Development mapping was used to define the existing land uses for the Study Area. Mapping indicates that the majority of the Study Area comprises of various city centre zoning, with residential, public open spaces and parks/recreation areas becoming more prominent towards Rockingham Beach Road in the north. It is noted that a portion of lots within the current Study Area remain undeveloped lots. Refer to Figure 2-2 for the land uses currently comprising the Study Area.

3.2 Climate

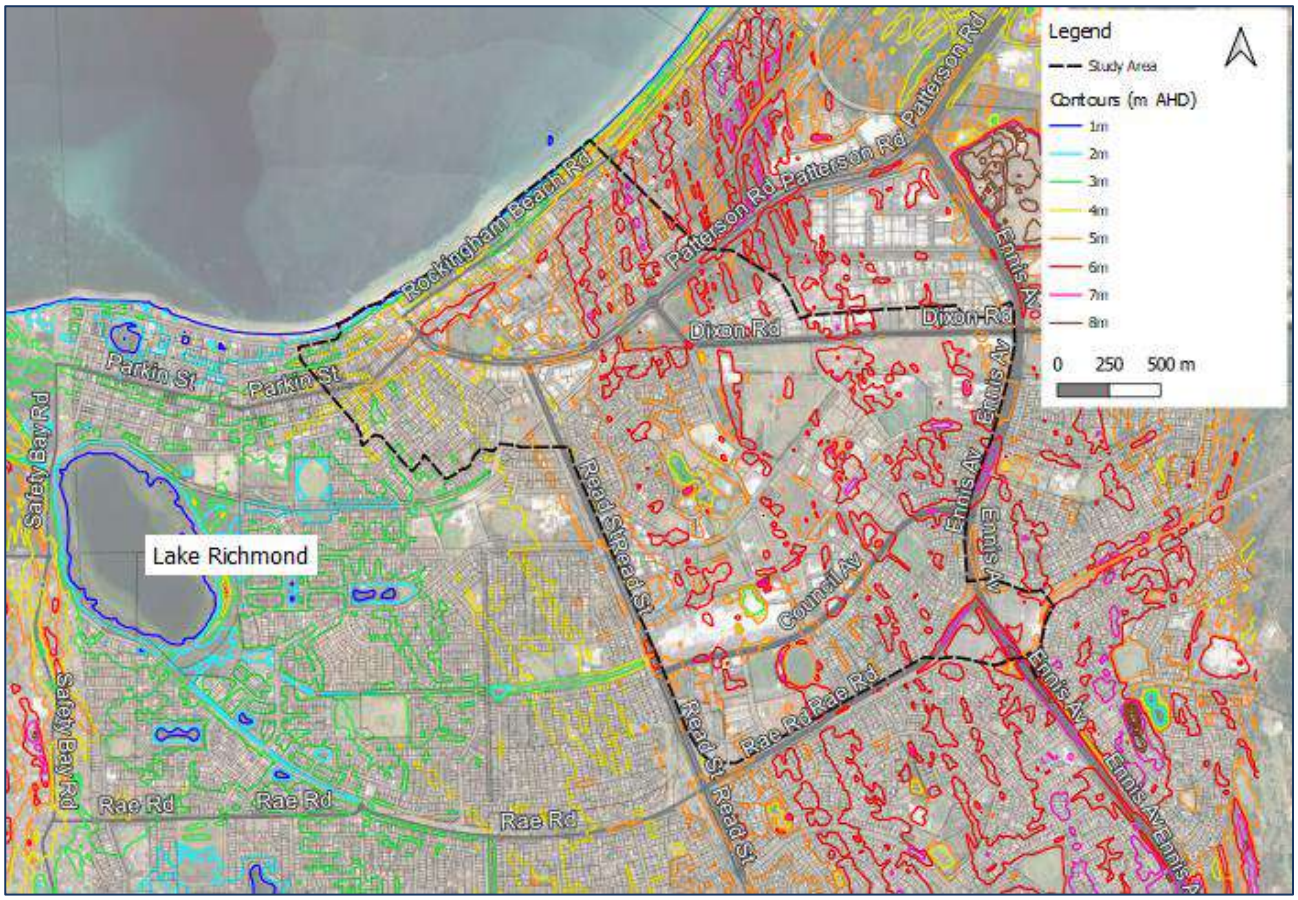
The Rockingham area is characterised by a Mediterranean climate with warm dry summers and cool wet winters. Mean daily temperatures vary from 30˚C in summer to 18˚C in winter. The mean annual rainfall is 788mm, with most falling from May through to October (Bureau of Meteorology).

3.3 Topography and Soils

The landforms that occur within the City of Rockingham are all relatively young with the majority of the region located upon Aeolian (wind-blown soils) that have been laid down relatively recently. Remnants of linear dunes that lay perpendicular to the south west winds are still evident throughout the Rockingham City Centre and are a key characteristic of the region.

A majority of the Study Area has been levelled and developed and no longer represents the natural landform of the region. The Study Area is generally flat and drains slightly to the west towards Lake Richmond. Spot levels on site range from 7 m AHD in the south-eastern corner near the train station to 3 m AHD along Rockingham Beach as illustrated in Figure 3-1.

Figure 3-1 Study Area Topography



Mapping published from the Department of Primary Industries and Regional Development has indicated that calcareous deep sand exists over the entire Rockingham District. This type of soil type is generally prone to

wind erosion and contains high airborne salt loads. The soil is generally characterised by high pH levels and low water-holding capacity and may therefore influence the growth potential for vegetation.

3.4 Surface Geology

The Study Area exhibits characteristics typical of coastal dunes of the Swan Coastal Plain, with calcareous deep sands and yellow sands. Review of the Rockingham Sheet of the *1:50,000 Environmental Geology Series* confirms that the Study Area consists solely of Calcareous sand (Classification S13).

3.5 Acid Sulfate Soils

There are no known areas of Acid Sulfate soils mapped within Study Area and based on the local geology they are unlikely to be encountered.

3.6 Wetlands

The City's online mapping service indicates that there is an Environmental Planning Policy (EPP) buffer area delineated along Dixon Road in the northern corner of the Study Area. However, as this area has previously been flagged for development and noting that the site is predominantly cleared, it is possible that the designated wetland could be redundant based on ground truthing. Further investigation is required prior to reclassification.

No further environment significant areas or wetlands have been identified within the Study Area.

It is noted that Lake Richmond, situated approximately 2.5km to the west of the Study Area is one of the largest freshwater lakes on the Swan Coastal Plain and of environmental significance to the region. The major stormwater conveyance drains that traverse the Study Area, owned by the Water Corporation, discharge into Lake Richmond. As such, maintaining the flow regime of these drainage elements will be a key consideration in the water management strategy for the precinct centre.

3.7 Surface Hydrology

3.7.1 Existing Surface Drainage

Review of 5m LiDAR data, plus drainage network and catchment data provided by CoR indicated that the Study Area is influenced by runoff from local sub-catchments only, with no regional surface water catchments discharging through the Study Area.

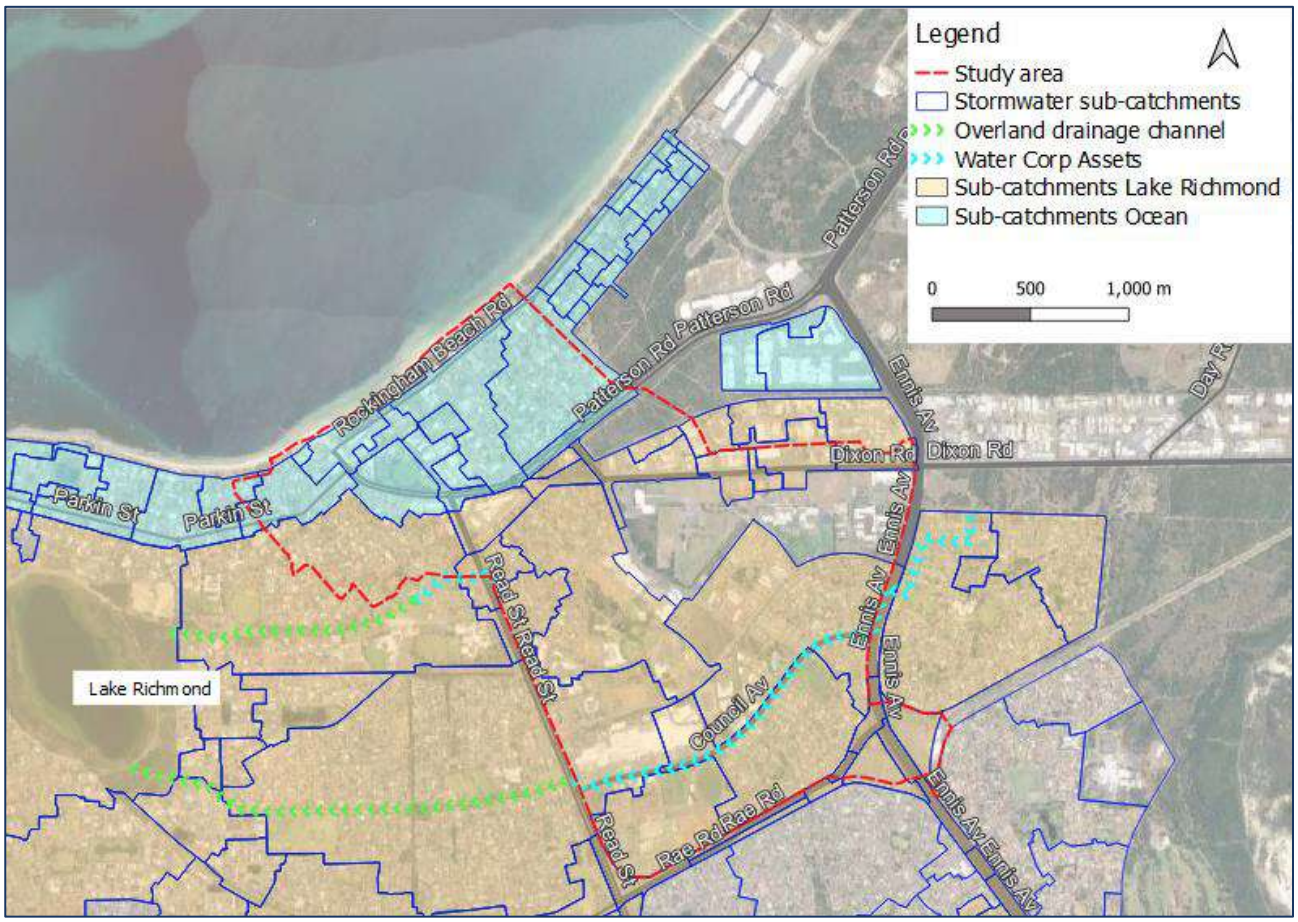
The Study Area receives runoff from one external catchment which is situated to the north east of the proposed transit centre. The external catchment drains into the Study Area under Ennis Avenue through a Water Corporation Drain which traverses the Study Area.

A majority of the Study Area is captured and conveyed by CoR underground stormwater network and Water Corporation drains. The Water Corporation drains convey flow westward into an overland flow channel that ultimately discharges into Lake Richmond.

The northern portion of the site is collected by CoR stormwater network and discharged to Rockingham Beach to the north.

Refer to Figure 3-2 for the local drainage regime in and around the Study Area.

Figure 3-2 Rockingham stormwater Sub-catchment plan



3.8 Water Supply

The Water Corporation supplies potable water to Rockingham. The water is sourced from dams, groundwater extraction and desalination plants. Treated water is stored at the Tamworth Hill reservoir from where it supplies the reticulation network.

The Study Area is situated within established systems of water and wastewater reticulation (water mains generally 100 mm or 150 mm diameter; gravity sewers generally 150 mm or 225 mm diameter).

3.9 Groundwater

Groundwater within the Rockingham region consists of unconfined, semi-confined and confined aquifers that exist as separate layered systems. The three aquifers which exist over the region, listed in order of increasing depth are;

- The Superficial and Rockingham Sand Aquifers (unconfined);
- The Leederville Aquifer (semi-confined to confined); and
- The Yarragadee Aquifer (confined).

The City of Rockingham has an abstraction licence of which 4.2 GL/annum is utilised for the irrigation of 560 ha of parks and reserves at a standard application rate of 7,500 kL/ha. Groundwater is the only form of non-potable water that is used as part of City operations

3.9.1 Superficial Aquifer

The superficial aquifer in this region is referred to as the Safety Bay Mound and consists primarily of medium grained sands as illustrated within Figure 3-3. Information obtained from the Rockingham Managed Aquifer Recharge (MAR) indicates hydraulic conductivity ranges of 5 to 50 m/day for the sands.

3.9.1.1 Groundwater Levels

The Perth Groundwater Map (DWER, 2017) indicates that the maximum groundwater contours in the Study Area range from 4 m AHD to 1 m AHD, with the minimum groundwater contours ranging from 2 m AHD to 1 m AHD. The groundwater profile for the subject site is illustrated in Figure 3-4.

3.9.1.2 Groundwater Quality

Groundwater data compiled for Hydrogeochemical Assessment of the Superficial Aquifer (DoW, 2010) was used to establish the pre-development groundwater quality. Table 3-1 below outlines water quality parameters for the Study Area as obtained from this document.

Bore 8282, located approximately 3km to the east of the Study Area, is the closest Superficial Aquifer sampling point and has been used as a benchmark in the absence of the other data. The water quality from Bore 8282 is assumed to be indicative of the water quality within our Study Area.

Table 3-1 Existing Water Quality Data – Bore 8282

Parameter	Bore 8282
Salinity	630
pH	7.97
HCO_3	236
Total Hardness ($CaCo_3$)	252.16
Iron (Fe^{2+})	0.05
Nitrate (NO_3^-)	0.44
Phosphate (PO_4^{3-})	0.28
Sulfate (SO_4^{2-})	41.0
Consumed Dissolved Oxygen (DO)	76%

3.9.2 Leederville Aquifer

The Leederville Aquifer is of Cretaceous age and consists of interbedded sandstone, siltstone and shales made up by the Mariginiup, Wanneroo and Pinjar Members and the Henley Sandstone Formation. The Leederville Aquifer is a major regional aquifer, from which large yields of fresh groundwater can be obtained.

The groundwater in the Leederville Formation is confined with the potentiometric surface in this area at approximately ground level (Davidson, 1995). In the Rockingham area the Leederville Formation ranges in thickness from approximately 150 m to 250 m and is conformably underlain by the South Perth Shale. (*Rockingham MAR Feasibility Study*, 2018)

It is noted that the Leederville Aquifer is part of the Rockingham MAR feasibility study.

3.9.3 Yarragadee Aquifer

The Yarragadee Aquifer is a confined aquifer that is too deep in the Rockingham area to provide a feasible source for groundwater abstraction.

Figure 3-3 Superficial Aquifer groundwater flownet (Rockingham MAR feasibility study – EWP18157 2018)

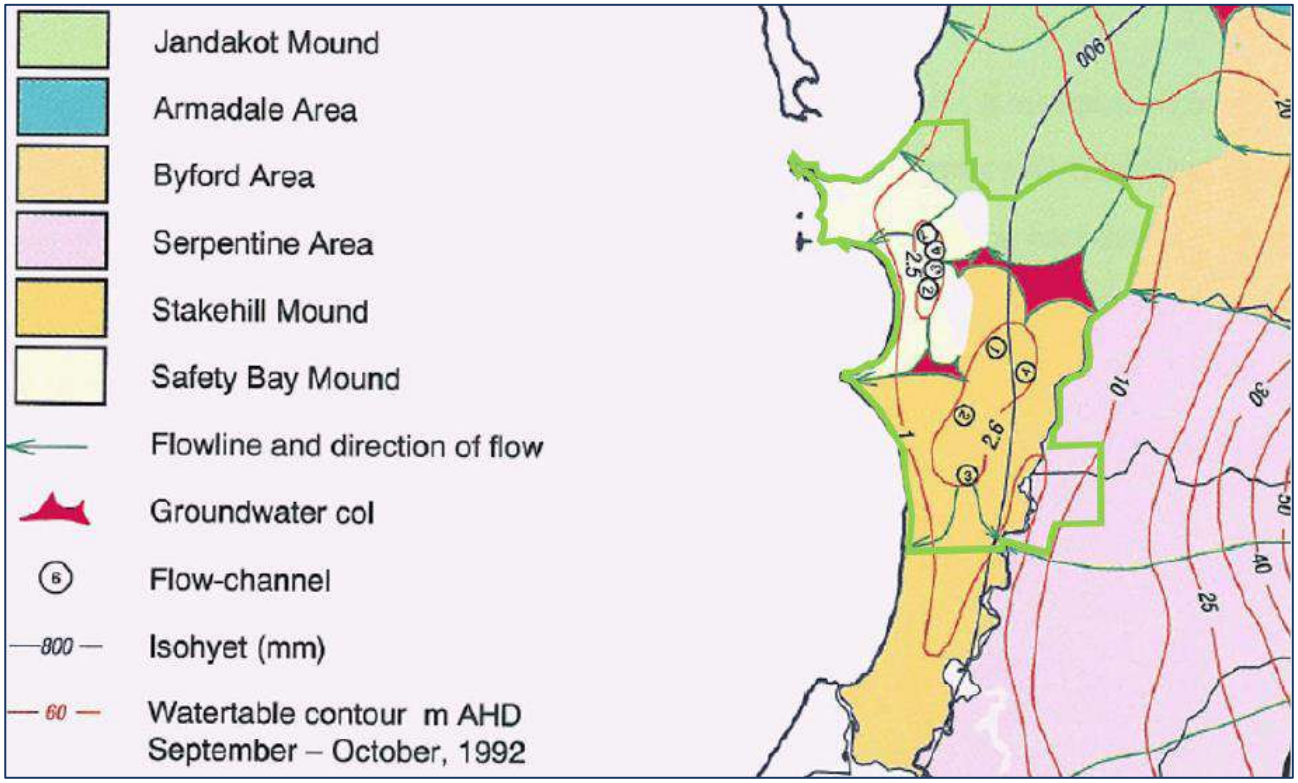
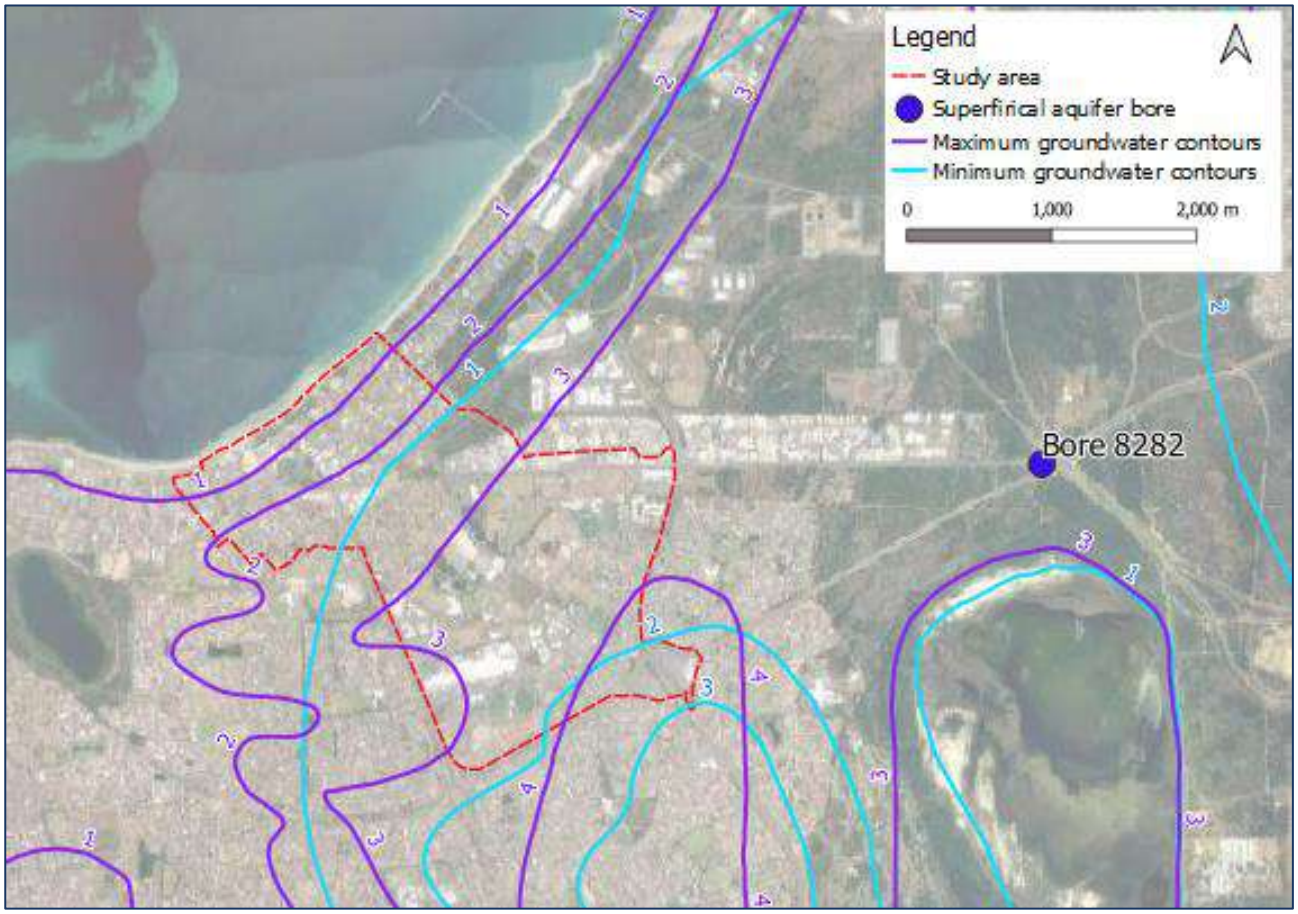


Figure 3-4 Subject site groundwater contours



4 Water Management Strategy

A holistic approach has been taken when developing this WMS to ensure that catchments in and around the Study Area are managed appropriately to maintain and improve the surface and groundwater resources for the region. The following sections will outline the strategies recommended to address all aspects of the total water cycle management applicable for the Rockingham Strategic Centre.

4.1 Water Balance

A water balance assessment is recommended to be undertaken for the RSC to understand the change in regime between aspects of the total water cycle. The water balance for the Study Area will be influenced by the frequency and intensity of rainfall and evapotranspiration and should consider precinct level scale estimates for annual rainfall, evaporation, transpiration, surface runoff and recharge. It is recommended that a water balance model be conducted as part of district planning, at future phases in the planning process.

4.2 Water Supply and Wastewater

The additional development that may ultimately arise in the area over many years will mostly be served by connection to or extension from the existing reticulation mains that serve the area. However, in some areas developers will need to undertake some upgrades to existing infrastructure and install new infrastructure to adequately service new, higher density developments.

The Study Area is traversed by existing water and sewerage pipes, which may affect the nett development potential of some building sites, such as the need for adequate building setbacks from the rear boundary of lots because of sewer easements along the rear of the lots. If feasible, water or sewer reticulation may need to be rationalised or relocated to another suitable alignment at the developer's cost at the building stage.

4.2.1 Long term wastewater planning

The Water Corporation has developed long term wastewater planning for the Rockingham Sewer District, which includes the Study Area. This planning has made provision for wastewater flows from the relatively high development densities (R60, R80, R100) and mixed land uses contemplated in the 'Indicative Development' plan. Further adjustments to the Water Corporation's wastewater infrastructure planning will be made in future reviews, where necessary.

The nearest wastewater treatment plant is the East Rockingham wastewater treatment plant, situated approximately 3km northeast of the Study Area along Chesterfield Road in the Rockingham Industrial Estate. It is estimated that by 2070 the treatment plant will have the capacity to treat 160 million litres of waste water per day. Due to its close proximity to the Study Area, treated water from this scheme may be a viable future source of recycled wastewater.

4.2.2 Long term water planning

The city centre precinct is currently served by a large (760mm diameter) water distribution main as part of the Tamworth Gravity Scheme. Water is conveyed from the Tamworth Hill Reservoir along Rockingham Road, Dixon Road, Ennis Avenue and Council Avenue. This main provides a robust system of water supply through the city centre precinct.

Several smaller water reticulation mains (typically 100mm and 150mm diameter) branch off the distribution main and run along the road reserves through the city centre and serve existing residences and businesses in the area. It is likely that some sections of these smaller water reticulation mains will need to be upgraded by land developers with larger mains in order to meet the flow and pressure demands of high-density developments, in particular to achieve fire flow requirements for multi-storey commercial and mixed-use buildings. The need for any water reticulation mains upgrades will be determined at the future planning or building stages and undertaken at the developers' cost.

4.3 Water Efficiency Measures

The CoR was recognised as a Gold Waterwise Council by the Water Corporation and the Department of Water and Environment Regulation (DWER) in May 2019. The CoR is required to adhere to a Water Efficiency Action Plan (WEAP) to maintain this accreditation.

To achieve water efficiency targets, the following measures are proposed for consideration to reduce scheme water usage in
the development:

- All buildings and public toilets are designed to include water efficient fixtures and fittings, such as dual flush toilets, flow control valves and spring-loaded taps;
- Use of native plants in streetscapes to reduce the demand for water;
- Turf areas to be minimised (if any);
- Use of fit-for-purpose groundwater resources for irrigation of vegetated areas;
- Stormwater harvesting or recycled wastewater for open space irrigation; and
- Use of smart rainwater tanks to obtain and release stormwater as required.

Review of the proposed precinct layout plan indicated an increase in areas zoned as public open spaces. The increase in open spaces presents an opportunity to integrate water efficiency measures into the precinct.

Consistent with the fit-for-purpose water use strategy, irrigation water needed for streetscapes will be sourced from a Superficial Aquifer groundwater supply. Alternatively, stormwater harvesting and/or recycled wastewater could be investigated for feasibility of use, depending on broader long-term plans for the region.

The irrigation system should be designed to water-wise standards with local native plants making up at least 50% of plantings. It should be noted that xeriscape planting (landscaping which reduces or eliminates the need for irrigation) considerations should be balanced against liveability gains from plants with higher evapotranspiration rates, which would reduce urban heat effects, depending on the aforementioned feasibility of recycled water for irrigation.

4.4 Stormwater Management

The stormwater drainage approach has been developed using a major/minor approach. In accordance with the CoR Urban Water Management Policy, the major drainage system is required to service storm events greater than the 10% AEP and includes the use of roads, Water Corporation drains, swales and drainage reserves to provide safe passage and disposal of stormwater runoff.

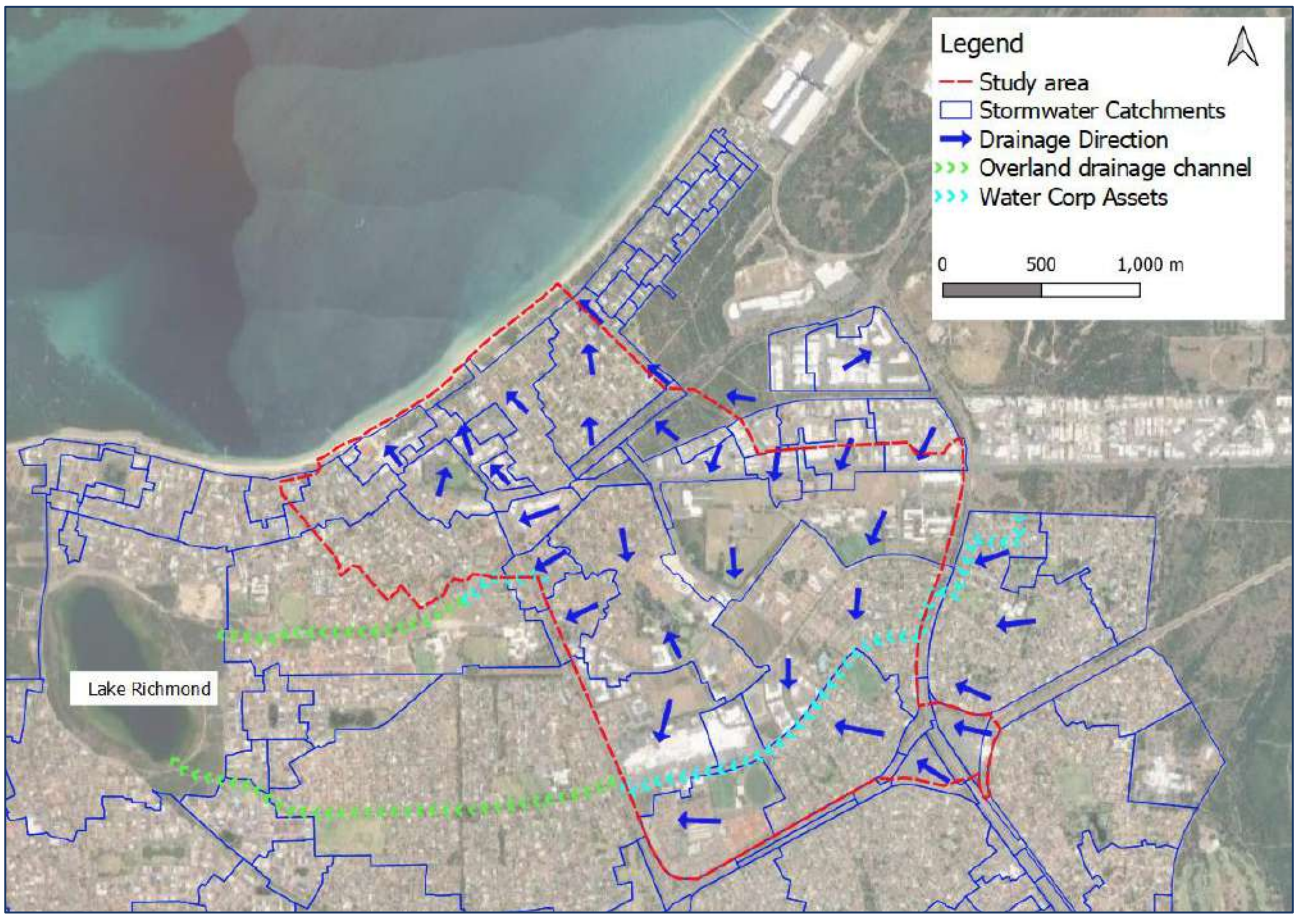
4.4.1 Major Drainage

The Rockingham city centre and adjoining land to the east and south fall within the catchment of the Rockingham North Main Drain and the Rockingham Central Main Drain (refer to Figure 4-1.). These drains are operated and maintained by the Water Corporation under licence conditions stipulated by the Economic Regulation Authority. Water Corporation has been consulted as part of this water management strategy to provide preliminary advice in regard to the management and future planning of their assets. The aim for managing major stormwater runoff through the Study Area is to ensure that no adverse impacts are experienced within the Water Corporation assets or downstream receiving waterways.

The urban drainage system through the city centre area was originally designed and constructed to serve development of much lower density compared to what is proposed. The Water Corporation drains have piped and open sections that have finite hydraulic capacity. The Water Corporation's 2008 review of its drainage system concluded that the system was currently operating within the required levels of service stipulated in its operating licence. However, higher density, mixed use development across the city centre catchment could have a major impact on the operation of the drainage system in the future. The Corporation is not able to accept increased rates of flow into the main drains.

The Water Corporation drains flow to the west and discharge into Lake Richmond and ultimately into the ocean. Water Corporation is required to operate the system under conditions that maintain existing surface levels at Lake Richmond and to manage water quality at the site.

Figure 4-1 Major Drainage Paths for Study Area



In order to satisfy conditions for the receiving waterway of Lake Richmond, Water Corporation assets, the following stormwater management outcomes will need to be achieved within the Study Area:

- Maintain peak flow rates and regimes within Water Corporation drains to current conditions. This is proposed to be achieved through the implementation in lot-scale, street scale and sub-catchment scale detention measures upstream of the Water Corporation drains to ensure that peak flow volumes and rates mimic present day conditions;
- In accordance with local guidelines, the first 15mm of rainfall is to be captured at the upstream source and allowed to infiltrate into the groundwater table. Soak well systems have demonstrated success in delivering this objective. Where runoff is from roadways or other potentially dirty sources the runoff should be directed to bioretention areas to assist filtering of the storm water.
- Ensure water quality objectives for Lake Richmond are achieved through the implementation of water quality treatment devices upstream of the Water Corporation discharge points.

4.4.2 Minor Drainage

Increasing the density of development and the extent of impervious surfaces across this part of the drainage catchment will require CoR to review its local drainage strategies to ensure that stormwater runoff to the Water Corporation main drainage system is not increased. Additional flows generated by the proposed developments in the area should be detained at source or within the local catchment until the peak flows subside in the main drain.

If necessary, CoR may need to identify and set aside additional areas within public open space across the catchment for local drainage infrastructure to detain stormwater runoff in the catchment. CoR should also ensure that commercial and residential developments in the catchment make adequate provision for on-site soakage as a condition of any planning and building approvals.

Any upgrades to the minor drainage system are to include a treatment train of Best Management Practice (BMP) water quality structural controls such as vegetated swales that provide water quality treatment in the Study Area.

Key points for the design of the minor drainage system are as follows:

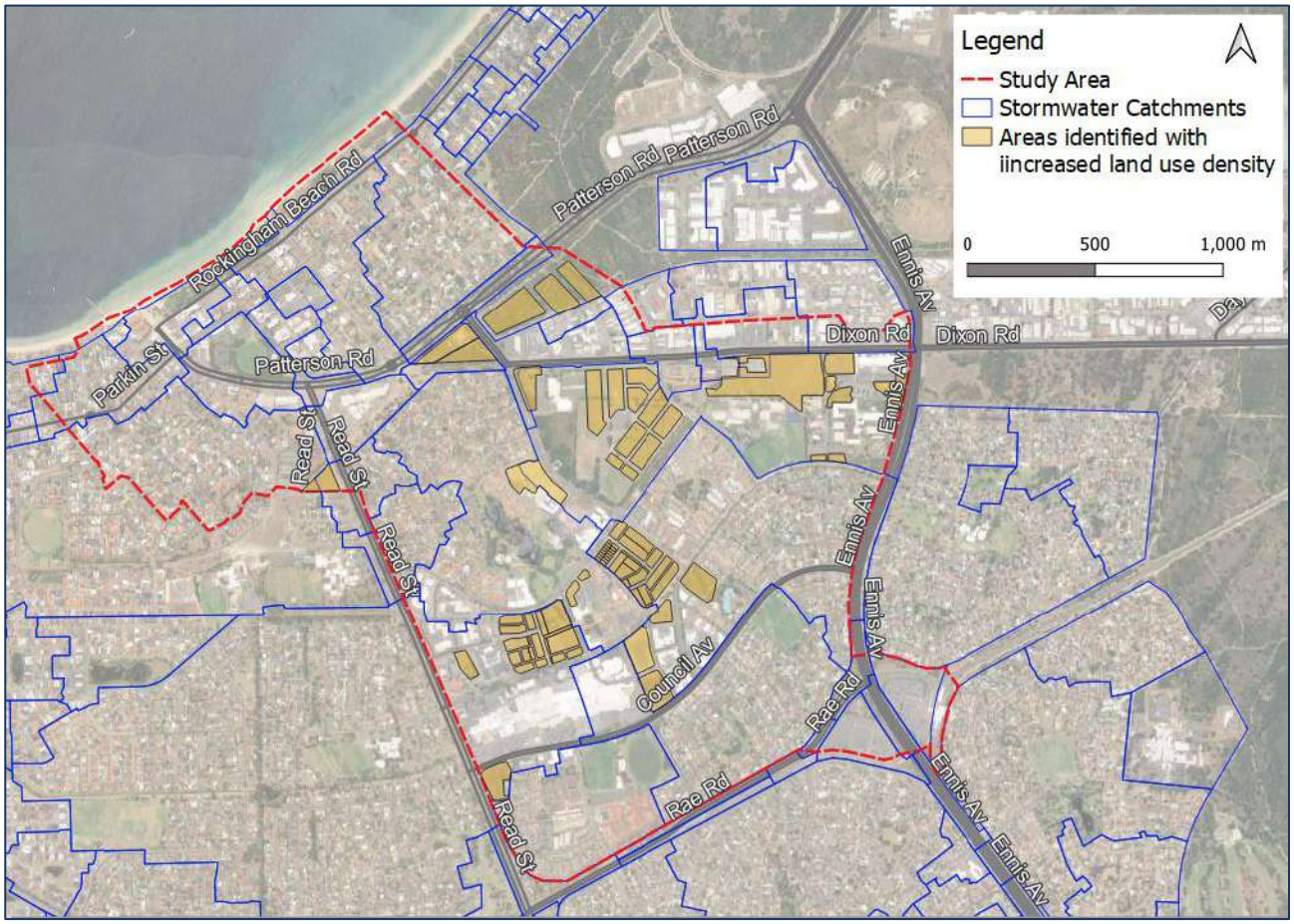
- Extensive use of roadside swales and central median swales to limit the use of piped drains as far as practical;
- Kerb breaks and flush kerbing to be utilised to encourage overland flow;
- Where required, piped drains sized to convey runoff from the 10% AEP storm event;
- Runoff from residential, mixed use and commercial lots for the first 15 mm of rainfall to be infiltrated in soak wells, as a minimum;
- Drainage treatment train of roadside swales, central median swales and raingardens for all roads with capacity to treat 15 mm of rainfall; and
- The first 15 mm of rainfall from road runoff should be treated within a bio-retention zone in proposed detention basins (if it is not possible to achieve this in upstream structures such as a raingarden). Bio-retention should be co-located with stormwater detention basins with appropriate landscape features and landscaping to ensure amenity can be derived from the area.

4.5 Stormwater Detention Measures

Review of the proposed developed layout has indicated that the Study Area has a reduction in designated pervious surface areas from 92ha (9%) in the pre-development scenario, to 60ha (6%) in the proposed development scenario. The reduction in pervious areas generally correlates to an increase in stormwater runoff volume, frequency and peak flow rates in the absence of stormwater detention measures. Given the sensitive nature of the downstream environment, and capacity constraints within the Water Corporation drains, it is a requirement that there is no increase in peak flow rates within the Study Area.

Figure 4-2 illustrates the regions within the Study Area that are subject to the largest increase in land-use density, which generally correlates to the change from pervious lots to developed lots.

Figure 4-2 Opportunities for stormwater detention infrastructure



A coordinated approach to stormwater quantity management should be applied in future planning stages. Where substantial redevelopment occurs that includes reduction in pervious areas and general civil works there the opportunity to provide a coordinated basin which allows for increased runoff from private lots. This may be advantageous compared to lot scale management of the excess runoff as the lot scale management is likely to be via small underground structures.

4.6 Water Quality Management

As mentioned previously, the downstream receiving waterways are subject to stringent environmental conditions and water quality objectives. The *Lake Richmond Management Plan* (CoR, 2021) states that the Water Corporation drains have increased the fresh water and nutrient discharge into the lake which has resulted in the increase in detrimental algae species. As such, it is paramount that water quality management controls are incorporated into the structure plan to ensure no further degradation of water quality discharging to the downstream water bodies.

Recommendations to manage water quality for the site have been categorised into structural and non-structural controls. The effective implementation of the structural and non-structural controls as part of the water management strategy aims to enhance the quality of water discharged from the Study Area as a result of the land use change.

Non-structural source controls aim to reduce nutrient export from the site by focusing on reducing the need for nutrient inputs into the landscape. The following strategies are proposed:

- Local endemic species are to be used in vegetated and drainage areas;
- Controls to be put in place around the use of fertilisers and irrigation to minimise nutrient export; and
- Street sweeping and waste management/collection to be co-ordinated with the CoR.

Structural source controls are proposed to complement the non-structural source controls and provide a complete stormwater treatment train. The following structural controls are considered appropriate for the Study Area:

- The use of bioretention zones within swales, rain gardens and basins;
- Open bottom maintenance holes; and
- Gross Pollutant Traps to capture larger pollutants.

The minimum specifications for all bioretention systems (swales and storages) are presented in Table 4-1.

Table 4-1 Minimum Specification for bio-retention systems

Item	Specification
Amended soil media (DoW, 2011)	1. Minimum 500 mm thick. 2. Hydraulic Conductivity, ksat = 3 m/day. 3. PRI ≥ 10. 4. Light compaction only. 5. Infiltration testing of material prior to installation and again once construction is complete. On-going testing as per an appropriate monitoring program.
Plant selection, planting density and distribution	6. Species and densities to be in accordance with the Vegetation Guidelines for Stormwater Biofilters in the South-West of Western Australia (Oversby et al., 2014).

Biofiltration systems should be considered as part of an overall strategy for managing stormwater in a development where the depth to Maximum Groundwater Level (MGL) is less than 5 m.

The bioretention systems should be sized to function correctly with a saturated hydraulic conductivity (k_{sat}) of 3 m/day. Recent research conducted by the Facility for Advancing Water Biofiltration (FAWB, 2008) indicates that the desirable range for k_{sat} is 2.5 to 7 m/day to fulfil the drainage requirements as well as retain sufficient moisture to support the vegetation. The FAWB (2008) research specifies that for vegetated systems some clogging will occur in the first few years until the vegetation is established. Once the plants are established, the roots and associated biological activity maintain the conductivity of the soil media over time.

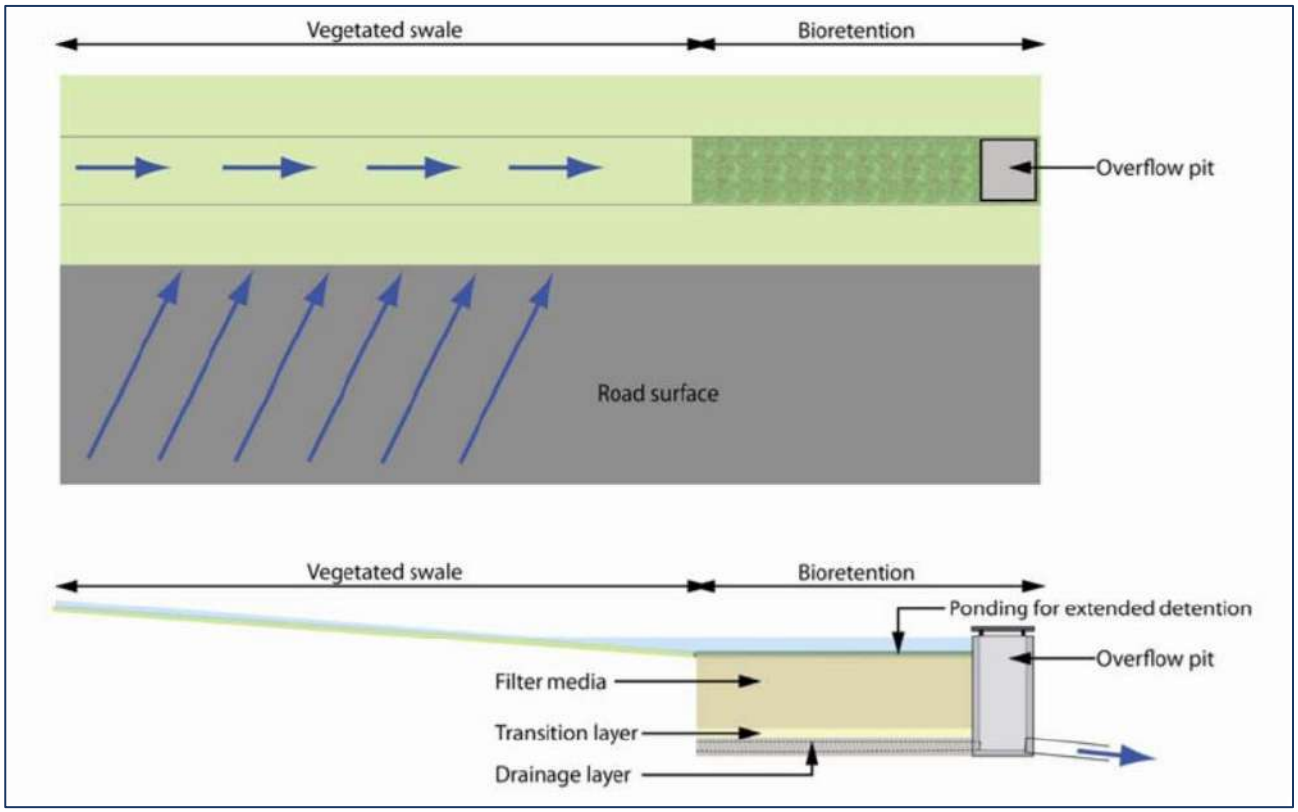
It should be recognised that data currently guiding the design of bioretention systems is only recent and largely based on laboratory testing. The specifications provided in this document should be considered as

the best available information at the time. Some flexibility in the specifications will be required as the knowledge base increases.

4.6.2 Typical Bioretention swales

Bioretention swales are swales that have a bioretention system installed in the base such that they provide both treatment and conveyance functions. The vegetated swale component provides conveyance (and retardation of flow) and pre-treatment of the stormwater through the removal of coarse to medium sediments as the flow passes through the vegetation. The bioretention system, often placed at the end of the swale, removes finer particulates and associated contaminants through fine filtration, extended detention treatment and some biological uptake. Bioretention swales are limited to flows that are not excessive as this will result in scouring of the filter media. A typical layout of a bioretention swale is shown in Figure 4-3.

Figure 4-3 Typical Bioretention Swale Layout



Key Water Quality Options for this Study:

- Gross pollutant traps at end-of-line pits prior to discharge into trunk infrastructure or basins;
- Bioretention-swales along street frontages to treat stormwater prior to entering underground network (where this does not conflict with the orderly placement of crossovers); and
- Regional bio-retention / detention basins for larger scale development or redevelopment (such as development extending over multiple lots).

4.7 Groundwater Management

In accordance with the CoR Urban Water Management Planning Policy, if the maximum groundwater level is at or within 1.2 m of the surface a subsoil drainage system or additional imported fill is required. It is not expected that this condition will apply to Study Area.

It is understood that the wetlands within the greater Rockingham region are largely groundwater dependent. As such it is not recommended that there is an increase in groundwater abstraction as it may adversely impact the health of these systems. In order to preserve and replenish the groundwater system the following objectives for groundwater management are recommended for the Study Area;

- Incorporate soakage well systems on a lot basis to maximise the infiltration into the groundwater table;
- Manage and monitor groundwater levels to protect infrastructure and assets;
- Maintain groundwater regimes for the protection of groundwater dependent ecosystems;
- Protect the value of groundwater resources; and
- Adopt nutrient load reduction design objectives for discharges to groundwater.

Key Groundwater Options for this Study include:

- Incorporate soakage systems on a lot basis to maximise the infiltration into the groundwater table; and
- Aquifer reinjection in accordance with a managed Aquifer Recharge Scheme

4.8 Summary of Recommended Actions

Based on the review of the proposed Rockingham Strategic Centre the following options have been deemed the most relevant to the study area and will be reviewed within the Multi Criteria Analysis;

1. Soakage well systems on lot level;
2. Regional bioretention/ detention basins;
3. Bio-swales along road frontage;
4. Rainwater tanks;
5. Treated stormwater & wastewater for irrigation; and
6. Aquifer re-injection.

5 Multi Criteria Analysis

Throughout this study a range of options have been presented to address components of the total water cycle in the fields of stormwater quantity, stormwater quality, water efficient measures, and groundwater management.

In order to determine which recommendations are best suited to the proposed Rockingham Strategic Centre, a Multi-Criteria-Analysis (MCA) has been developed and implemented. The MCA focuses on scoring the project objectives as outlined within Table 2-3 and details whether the proposed water management options address the criteria.

It is noted that most options only address some components (i.e. water quality and groundwater) of the total water cycle, and it will likely be a combination of different options that will provide a holistic, practical approach for managing water within the study area.

The criteria and weighting for the MCA have been summarised in Table 5-1, with the results of each option presented in Table 5-2.

Table 5-1 Criteria and Weighting for MCA

No.	Criteria	Score and Description					Weighting
		0		5		10	
1	**Stormwater Quantity Management** Protect infrastructure, property and downstream environment from major storm and flooding events.	Does not mitigate peak flow rates in any events	↔	Mitigates peak flow rates in some events	↔	Mitigates peaks flow rates in all events and manages catchment runoff for the Study Area including projected increases due to climate change	20%
2	**Water Quality Management** Protect the downstream receiving environment through the application of WSUD principles and nutrient load reduction design objectives for stormwater runoff.	Does not manage or improve stormwater quality	↔	Maintains or partially improves stormwater quality discharging from site	↔	Achieves pollutant reduction targets from the BUWM	20%
3	**Groundwater Management** Managing and minimising changes in groundwater levels and groundwater quality following development.	Does not manage impacts to groundwater	↔	Addresses some components of groundwater management	↔	Satisfies all groundwater management objectives	20%
4	**Water Conservation** Preserve natural resources through the development of a water conservation strategy and considers factors such as recycling, re-use, reduction	Does not consider any water conservation measures	↔	Address some factors of water conservation	↔	Satisfies objectives of a holistic water management strategy	20%
5	**Cost** Cost of implementing option	$1,000,000 high cost to implement	↔	$100,000 moderate cost to implement	↔	$10,000 low cost to implement	20%

Table 5-2 Outcome of MCA for each option

Options	Criteria 1: stormwater quantity	Criteria 2: water quality	Criteria 3: groundwater management	Criteria 4: water conservation	Criteria 5: cost	Overall Score
Option 1 soakage well systems on lot level	5	5	5	0	10	25
Option 2 regional bioretention/ detention basins	10	10	5	0	5	30
Option 3 bio-swales along road frontage	5	10	5	0	10	30
Option 4 rainwater tanks[1]	5	0	0	5	5	15
Option 5 treated stormwater and wastewater for irrigation	5	0	5	10	0	20
Option 6 aquifer re-injection	0	5	10	5	0	20

Note 1: Option 4 could be enhanced to manage stormwater quantity through smart tanks which pre-release stored water in advance of expected rainfall.

6 Conclusion

A Water Management Strategy has been prepared for the proposed Rockingham Strategic Centre to support the Rockingham Strategic Centre Precinct Structure Plan. The key objectives for the WMS were to review the existing conditions of the site and make recommendations for the best WSUD and total water cycle management options that could be incorporated into the RPSP to address the criteria of water quality, water quantity, water conservation and groundwater management within the study area.

The options that were deemed the most suitable for the RSC and assessed within the MCA were;

1. Soak well systems at the lot level
2. Regional bioretention/ detention basins
3. Bioretention swales along road frontage
4. Rainwater tanks
5. Treated stormwater and wastewater for irrigation
6. Aquifer re-injection

It is noted that the recommendations and options presented within this WMS are concept level only and provide high level planning guidance only. Further investigation is must be undertaken to develop options to enable the options to progress to detailed design and construction.

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Rockingham Strategic Centre
Environment Assessment Report

Rockingham Strategic Centre
Precinct Structure Plan (RPSP)

CW1181500



Prepared for
Hames Sharley

11 July 2025

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Executive Summary

Cardno was engaged by Hames Sharley to provide environmental services to support the review of local planning framework and preparation of a Precinct Plan for the Rockingham Strategic Centre (RSC). The objective of the assessment is to gather relevant environmental data associated with the RSC to support the review of local planning framework and the preparation of a Precinct Structure Plan.

The scope of works comprised a

review of background information and data through government agency database searches, requests and other publicly available information sources.

- Surface geology comprises Calcareous Sand of the Safety Bay Sand (section 2.2.3).
- No area of the site is mapped as having a known risk of acid sulfate soil (ASS) occurring within 3m of ground surface (Section 2.2.4).
- Conservation category wetlands were identified within the planning envelope (Section 2.2.6)
- Priority and Threatened species are likely to occur within the planning envelope (Section 2.2.8)
- Most of the planning envelope is within an environmentally sensitive area (ESA) due to the presence of threatened ecological communities (TECs) and a significant wetland across the area (Section 0).
- No Bush Forever site is located on the planning envelope. A Bush Forever site is located directly to the east of the planning envelope (Section 2.2.10).
- An historical aerial photography review did not identify any areas of potential environmental concern (Section 2.3)
- No registered aboriginal heritage sites are located within the planning envelope. The RSC is on land within the Gnaala Karla Booja Indigenous Land Use Agreement (ILUA) (Section 2.4).
- Several heritage listed sites under the Heritage Council WA are present within the RSC (Section 2.4.3).
- Five land parcels within a 1km radius of the RSC have been assigned a contaminated sites classification by the Department of Environmental Regulation (DWER) (Section 2.5).

Table of Contents

	Executive Summary		iii
1	Introduction		1
	1.1	Background	1
	1.2	Objectives	2
	1.3	Scope of Works	2
	1.4	Relevant Guidelines	2
	1.5	Standards of Assessment and Limitations	2
2	Site Condition and Surrounding Environment		4
	2.1	Site Description and Planning	4
	2.2	Environmental Setting	4
	2.3	Aerial Photography Review	7
	2.4	Cultural Heritage	9
	2.5	Contaminated Sites Database	10
3	RPSP Assessment		12
	3.1	Potential Environmental Impacts of RPSP	12
	3.2	Mitigation Strategies	12
4	Conclusions		14
5	References		15

Appendices

Appendix A Figures

Appendix B Desktop Searches

Appendix C About ESA

Tables

Table 2-1	Approximate Site coordinates	4
Table 2-2	Priority and Threatened Species	6
Table 2-3	Historic Aerial Photograph Review	8
Table 2-4	Native Title Applications	9
Table 2-5	Registered Contaminated Sites	10
Table 3-1	Mitigation Strategies	12

Figures

Figure 1-1 Rockingham Strategic Metropolitan Centre Planning Envelope 1
Figure 2-1 Hydrological cross section through the southern end of Garden Island and Cockburn Sound (CSIRO, 2001) 5
Figure 2-2 Heritage Council WA listed places 10

1 Introduction

Cardno was engaged by Hames Sharley to provide environmental services to support the review of local planning framework and preparation of a Precinct Structure Plan for the Rockingham Strategic Centre (RSC). The planning envelope covers an area of approximately 600 hectares (ha) and is situated within the City of Rockingham. The RSC is bordered by Ennis Avenue to the east, Rae Road to the south, Read Street to the west and the Rockingham foreshore to the north (Figure 1-1).

Figure 1-1 Rockingham Strategic Metropolitan Centre Planning Envelope



1.1 Background

Rockingham is considered a Strategic Metropolitan Centre in the Perth and Peel Region. A review of the local planning framework for the RSC, triggered by Policies updates, is being progressed by the City of Rockingham. As part of this process, a Precinct Structure Plan must be prepared for the RSC and approved by the State Government.

1.2 Objectives

The objective of the assessment is to gather relevant environmental data associated with the RSC to support the review of local planning framework and the preparation of a Precinct Structure Plan.

The specific objectives of the assessment, subject to the limitations stated in Section 1.5 are to:

1. Identify the site and surrounding landholding characteristics and current conditions.
2. Assess the potential for current and past activities to impact the environment, health and safety conditions, or result in liability upon review of all reasonably available desk-based information;
3. Prepare a report detailing the findings of the assessment.

1.3 Scope of Works

Cardno carried out a review of background information and data through government agency database searches, requests and other publicly available information sources, including:

- A review of historical aerial photographs and site plans to ascertain historical land use and determine the timeline for historical development;
- A search of the Department of Water and Environmental Regulations (DWER) Contaminated Sites Database;
- Department of Water (DoW) and Water Information Network (WIN) database and summary records as applicable (data pertaining to the water table);
- Historical local government records; and
- Existing shire plans.
- Review of information pertaining to the environmental setting of the site, including (but not limited to):
  - Geological, hydrogeological and hydrological setting, including surface and groundwater drainage conditions;
  - Acid Sulfate Soils (ASS) risk mapping and desktop investigation;
  - Relevant environmental values of the site and its surrounds (wetlands, Bush Forever sites, significant flora and fauna); and
  - Determine the environmental value of the site and surrounding environment.
- Review of information pertaining to the social and cultural setting of the site, including (not limited to):
  - Aboriginal heritage; and,
  - European heritage.

1.4 Relevant Guidelines

This assessment has been prepared in general accordance with the applicable industry standards and guidelines to the extent relevant to an assessment of this type. Key industry standards and guidelines applicable include (but are not limited to) the following:

- ***Contaminated Sites Act 2003 (CS Act).***
- ***Biodiversity Conservation Act 2016.***
- Department of Environment and Regulation (DER), 2014, ***Assessment and Management of Contaminated Sites***.
- ***Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).***
- National Environment Protection Council (NEPC), 1999, ***National Environmental protection (Assessment of Site Contamination) Measure*** (as amended), registered May 2013.

1.5 Standards of Assessment and Limitations

This assessment has been undertaken in general accordance with the current “industry standards” for the purpose, objectives and scope identified in this report.

The agreed scope of this assessment has been limited for the current purposes of the Client. This assessment report is not any of the following:

- A Mandatory Audit Report (MAR) or Voluntary Audit Report (VAR) as defined under the ***Contaminated Sites Act*** 2003 (CS Act).
- A Preliminary Site Investigation (PSI) or Detailed Site Investigation (DSI).
- A Geotechnical Report, and the soil descriptions may not be suitable as the basis for geotechnical advice.
- A detailed Hydrogeological Assessment.
- An assessment of the groundwater contaminants potentially arising from other sites or sources nearby.

An overview of Environmental Site Assessments is included in Appendix C.

2 Site Condition and Surrounding Environment

2.1 Site Description and Planning

The RSC is bordered by Ennis Avenue to the east, Rae Road to the south, Read Street to the west and the Rockingham foreshore to the north. A summary of the approximate site boundaries as determined by Cardno is presented in Table 2-1.

Table 2-1 Approximate Site coordinates

Site Boundary	Easting (m)	Northing (m)
North-East	381,204.65	6,429.160.92
South-East	383,287.73	6,426,587.59
North-West	381,204.65	6,429,160.92
South-West	381,681.25	6,426,024.90
Note: ***Map Grid Area (MGA) 94, Zone 50***		

2.1.2 Land uses and zoning

The Planning of the RSC is guided by the City of Rockingham Town Planning Scheme No.2 (Appendix B). Land uses of the RSC mainly include residential, light industrial and primary regional roads land use.

2.2 Environmental Setting

2.2.1 Climate

Rockingham has a Mediterranean climate, characterised by hot dry summers and cool wet winter. The Bureau of Meteorology (BoM) records (BoM, 2025) indicate mean monthly rainfall amount varies from 15mm in December to 150mm in July; and mean maximum temperature ranges from 18°C in July/August to 28°C in February.

2.2.2 Topography

The site topography is relatively flat with elevations ranging from 0 mAHD at the coastline to 20 mAHD towards the east.

2.2.3 Regional Geology

The WA Department of Mines, Industry Regulation and Safety (DMIRS) 1:50,000 geological map series indicates the surface is Calcareous Sand (S13), i.e. Safety Bay Sand, described as white medium grained rounded quartz and shell debris well sorted of eolian origin.

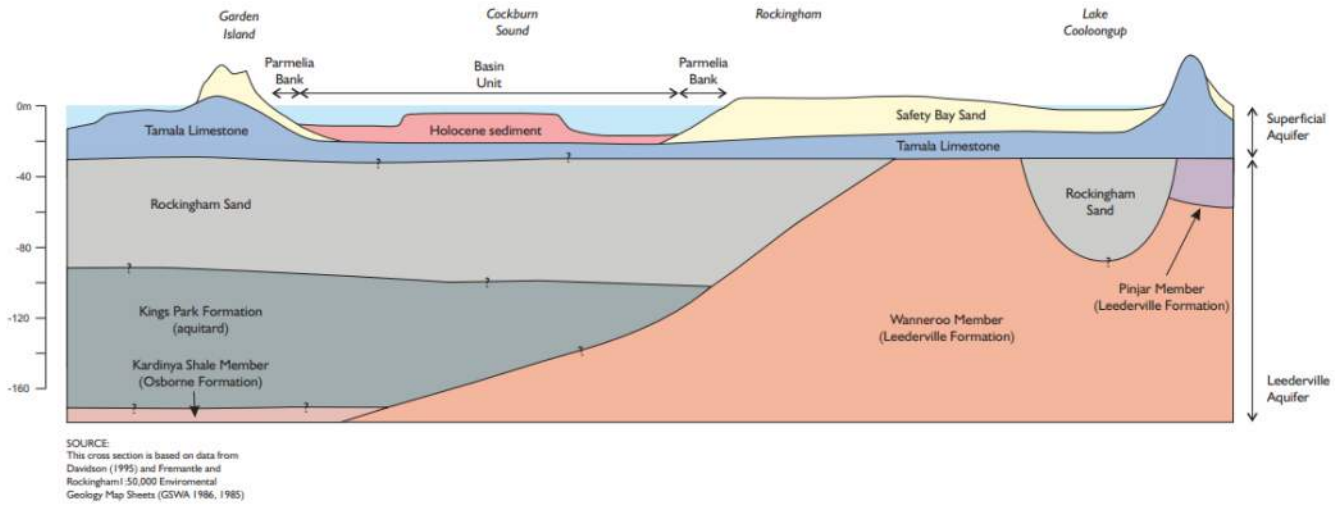
2.2.4 Acid Sulfate Soil

No area of the site is mapped as having a known risk of acid sulfate soil (ASS) occurring within 3m of ground surface.

2.2.5 Hydrogeology

The superficial formations (Tamala Limestone and Safety Bay Sand) overlie the Rockingham Sand to the Northwest of the site and the deeper Leederville formation (Wanneroo Member) to the southeast (Figure 2-1).

Figure 2-1 Hydrological cross section through the southern end of Garden Island and Cockburn Sound (CSIRO, 2001)



2.2.6 Wetlands and Surface Water Bodies

A Conservation category wetland (sumpland – ID 6321) occurs within the planning envelope (Figure 3, Appendix A). Conservation category wetlands support a high level of attributes and functions and are the highest priority wetlands. These are the most valuable wetlands, and any activity that may lead to further loss or degradation is inappropriate. The management objective for these wetlands is to preserve and protect the existing conservation values of the wetlands through various mechanisms, including:

- Reservation in national parks, crown reserves and state-owned land;
- Protection under Environmental Protection policies; and
- Wetland covenanting by landowners.

No development or clearing of a conservation category wetland is considered appropriate. The Department of Biodiversity, Conservation and Attractions (DBCA) is the current custodian of the wetland mapping dataset for the Swan Coastal Plain. Justification (i.e. through a wetland identification and/or delineation investigation) must be provided to the DBCA for an existing mapped wetland area to be modified to '***No longer a wetland***'.

An artificial surface water body is present within the HMAS Warramunga Park (City Park).

2.2.7 Groundwater Uses

A search of the Department of Water (DoW) water register indicated the presence of a groundwater abstraction licence within the superficial aquifer beneath the RSC (issued 29/5/2020, expired 29/10/2024) held by the City of Rockingham for an allocation of 2,746,285 kL.

Groundwater depth is anticipated to be approximately 3 to 5 meters below ground level (mbgl) across the RSC. Groundwater flow direction is expected to be westerly, towards Cockburn Sound.

Registered groundwater bores are depicted on Figure 4, Appendix A.

The site is not located within a Priority Drinking Water Source Area (PDSA).

2.2.8 Priority and Threatened Flora and Fauna

On 1 January 2019 the provisions of the ***Biodiversity Conservation Act 2016*** (BC Act) relating to threatened ecological communities (TECs) came into effect replacing both the ***Wildlife Conservation Act 1950*** and the ***Sandalwood Act 1929*** and their associated regulations. TECs are ecological communities listed in the following categories under section 27 of the BC Act:

- critically endangered, or
- endangered, or
- vulnerable.

Under section 45 of the BC Act the Minister may authorise a person to modify an occurrence of a TEC. Under provisions of the BC Act, significant penalties (up to $500,000) are prescribed under section 48 where

a TEC is modified without authorisation. Modification results from an impact that will permanently alter the species composition and/or the structure of, or will destroy, the occurrence of the TEC.

The DBCA classifies specially protected flora and fauna into eight categories (conservation codes):

- Threatened species (T);
- Critically endangered species (CR);
- Endangered species (EN);
- Vulnerable (VU);
- Presumed extinct species (EX);
- Migratory birds protected under an international agreement (IA);
- Conservation dependant fauna (CD); and
- Other specially protected fauna (OS).

These categories also include potentially threatened species that do not meet survey criteria or are otherwise data deficient; such species are listed as Priority 1, 2 or 3. While species that are adequately known, are rare but not threatened, are listed as Priority 4 (P4).

Searches for Priority and Threatened species likely to occur within the planning envelope were performed using the Department of Biodiversity, Conservation and Attractions (DBCA) NatureMap and EPBC Act Protected Matters databases. Full reports are provided within Appendix B and a summary is provided in Table 2-2 below.

Table 2-2 Priority and Threatened Species

Name	Status	Details
Listed Threatened Ecological Communities (TEC)		
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area.
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area.
Thrombolite (microbial) community of coastal freshwater lakes of the Swan Coastal Plain (Lake Richmond)	Endangered	Community known to occur within area.
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area.
Listed Threatened Species		
32 bird species	Vulnerable, endangered	§ Species or species habitat likely to occur within area. § Foraging, feeding or related behaviour known to occur within area.
6 mammals	Vulnerable, endangered, critically endangered	§ Species or species habitat likely to occur within area. § Breeding known to occur within area.
3 plants	Vulnerable, endangered	Species or species habitat likely to occur within area.
4 reptiles	Vulnerable, endangered	Species or species habitat likely to occur within area.
5 sharks	Vulnerable, conservation dependent	Species or species habitat likely to occur within area.

Name	Status	Details
Listed Migratory Species		
20 migratory birds	Vulnerable, endangered	§ Species or species habitat likely to occur within area. § Foraging, feeding or related behaviour known to occur within area.
18 migratory marine species	Vulnerable, endangered	§ Species or species habitat likely to occur within area. § Breeding known to occur within area.
1 migratory terrestrial species	N/A	Species or species habitat likely to occur within area.
10 migratory wetland species	Vulnerable, endangered, critically endangered	Species or species habitat likely to occur within area.

A flora and fauna survey may be required to confirm TEC occurrence within the area (if it is proposed for clearance) and should be conducted by a qualified ecologist/botanist in accordance with relevant guidelines.

The results of the flora/fauna surveys shall inform the development of Environmental Management Plans (as required) to be implemented during development phases, which will include mitigation strategies, triggers and contingency actions.

2.2.9 Environmental Sensitive Areas

The DWER maintains a dataset of Environmentally Sensitive Areas (ESA) prescribed and regulated under the ***Environmental Protection (Clearing of Native Vegetation) Regulations 2004*** (DEC, 2004). ESAs are areas of land deemed to support conservation, heritage or marine environment value, or an area protected through existing State Policy and includes the following:

- Declared world Heritage Property;
- An area that is registered on the Register of National Estate;
- Within 50 m of a defined wetland;
- The area covered by vegetation within 50 m of flora declared as Rare under the Biodiversity Conservation Act 2016 and Biodiversity Conservation Regulations 2018; and
- An area covered by a Threatened Ecological Community (TEC).

ESAs are only applicable when a clearing permit is required under these regulations. Where a clearing permit is required for an area that is situated within an ESA, then none of the exemptions pursuant to the regulations apply. These areas have been identified to protect the native vegetation values of areas surrounding significant, threatened or scheduled ecosystems or communities. A review of the DWER Clearing Permit System (accessed July 2021) indicated that most of the planning envelope is within an ESA due to the presence of TECs and a wetland across the area. Any clearance permit application will require a Flora and Fauna survey to be conducted to ensure no TEC is disturbed by the proposed development.

ESA are depicted on Figure 3, Appendix A.

2.2.10 Bush Forever Sites

Bush Forever is a Western Australian Government initiative which aims to provide a policy and implementation framework to promote bushland protection and ensure known management issues, are appropriately addressed and integrated with broader land use planning and decision-making. Bush Forever sites cover a wide range of tenures and land use types nominated as part of an overall planning process that was undertaken over many years by the Department of Planning, Lands and Heritage (DPLH) and now overseen by the Western Australian Planning Commission (WAPC).

A review of the DPLH Bush Forever Sites online database (accessed 20 June 2025) indicates that there are no Bush Forever sites located on the planning envelope. A Bush Forever site is located directly to the east of the planning envelope (Figure 3, Appendix A).

2.3 Aerial Photography Review

A review of selected aerial photography of the RSC and surrounds between November 1953 (earliest available) and February 2021 (latest available) is provided within Appendix B.

Table 2-3 Historic Aerial Photograph Review

Date	Site	Surrounding Area
Plate 1 **November 1953**	Very limited residential development is present and most of what is visible occurs close to shoreline.	Surrounding area is composed of agricultural land and residential (Point Peron shoreline). Lake Cooloongup and Lake Richmond are visible.
Plate 2 **July 1970**	Further residential development is visible to the north, paved roads or gravel/dirt tracks are visible on the southern half of the site connecting a few small-scale residential developments surrounded by rural properties and agricultural land	Increased residential development is visible around Point Peron, Lake Richmond, Lake Cooloongup as well as the southern and eastern areas around the site (notably southeast of Lake Richmond.
Plate 3 **September 1974**	Site remains mostly unchanged since 1970 however some new roads are present as well as a what appears to be greater residential development for suburban housing just southeast of the coastline of the site area.	A new jetty has been constructed north of the site as well as what appears to be new construction of buildings at the jetty entrance. The road connecting Point Peron to Garden Island is evident. New developments can be seen directly south of the site in the agricultural areas
Plate 4 **June 1977**	Further residential development is visible to the south of site with several new roads connecting through former agricultural land	Site surrounds remain mostly unchanged however further residential development can be observed to have steadily increased in a south easterly direction.
Plate 5 August 1981	Further residential development visible notably along the southern boundary of the site where roads now connect these residential properties to those near the shoreline.	Increased residential development can be observed directly south and west of the site boundary. The Ennis Avenue main road can be observed connecting the residential developments inside the site boundary south towards Lake Walyungup and beyond.
Plate 6 **June 1985**	There is a small amount of increased in residential development inside the site however there seems to be small addition of open green spaces (such as parks, ovals etc) amongst the eastern side of the site	The Rockingham Golf club and associated green space is visible to the southeast directly adjacent to Lake Cooloongup. Further residential development is visible to the south.
Plate 7 **December 1989**	Inside the residential area adjacent to the shoreline in the northern edge of the site boundary there appears to be few new builds however an addition of four extra features which appear to be tennis courts can be observed near the northwest site boundary. New residential development is visible along the southwest site boundary with new roads appearing to connect soon to be developed land. The artificial water retention at City Park is visible and more agricultural land is seemingly in the process of being converted into open space for future residential developments.	Further industrial development is visible to the East adjacent to Lake Cooloongup along with increasing density of residential development in the surrounding areas west of the site
Plate 8 **February 1995**	Increased residential development can be observed along the western edge of the site boundary. The artificial water feature at City Park appears to have been altered with areas previously containing water appearing to have been reclaimed for future development.	Further industrial development is visible adjacent to the northeast boundary of the site.
Plate 9 **January 2001**	Site remains generally unchanged. Some new residential development visible as well as what appears to be the appearance of new open green spaces (parks, ovals, etc) directly south of the industrial area present in the northeastern corner of the site.	Site surrounds remain mostly unchanged.
Plate 20 **February 2021**	Site and surroundings remain mostly unchanged since 1995.	

The review of historical aerial photography did not identify any areas of potential environmental concern.

2.4 Cultural Heritage

2.4.1 Aboriginal Heritage

A search of the Department of Planning, Lands and Heritage (DPLH) controlled Aboriginal Heritage Inquiry System (AHIS) was conducted on 20 June 2025. This database incorporates both the Heritage Site Register and the Heritage Survey Database. The Heritage Site Register is held pursuant to Section 38 of the State's Aboriginal Heritage Act 1972 and contains information on over 22,000 Aboriginal sites throughout Western Australia. The Heritage Survey Database is a catalogue of the heritage survey reports held by the DPLH. It holds a description of each survey, its boundaries, proponents and participants.

The search of the AHIS Site Register database didn't identify a registered site within the planning envelope.

2.4.2 Native Title

An online search of the AHIS enquiry system was undertaken to determine the presence of Native Titles in the vicinity of the site. The search identified that the site occurs within one Native Title Application. A summary is provided in Table 2-4.

Table 2-4 Native Title Applications

Name	Number	Status	Area (km²)
Gnaala Karla Booja	WC1998/058	Registered	30,415.3

It should be noted that an AHIS enquiry is a basic search for information pertaining to Native Title. If further information is required, a request for information should be submitted to the DLPH Native Title Branch (this is outside the scope of works for this Assessment).

It was also noted that the RSC is on land within the Gnaala Karla Booja Indigenous Land Use Agreement (ILUA).

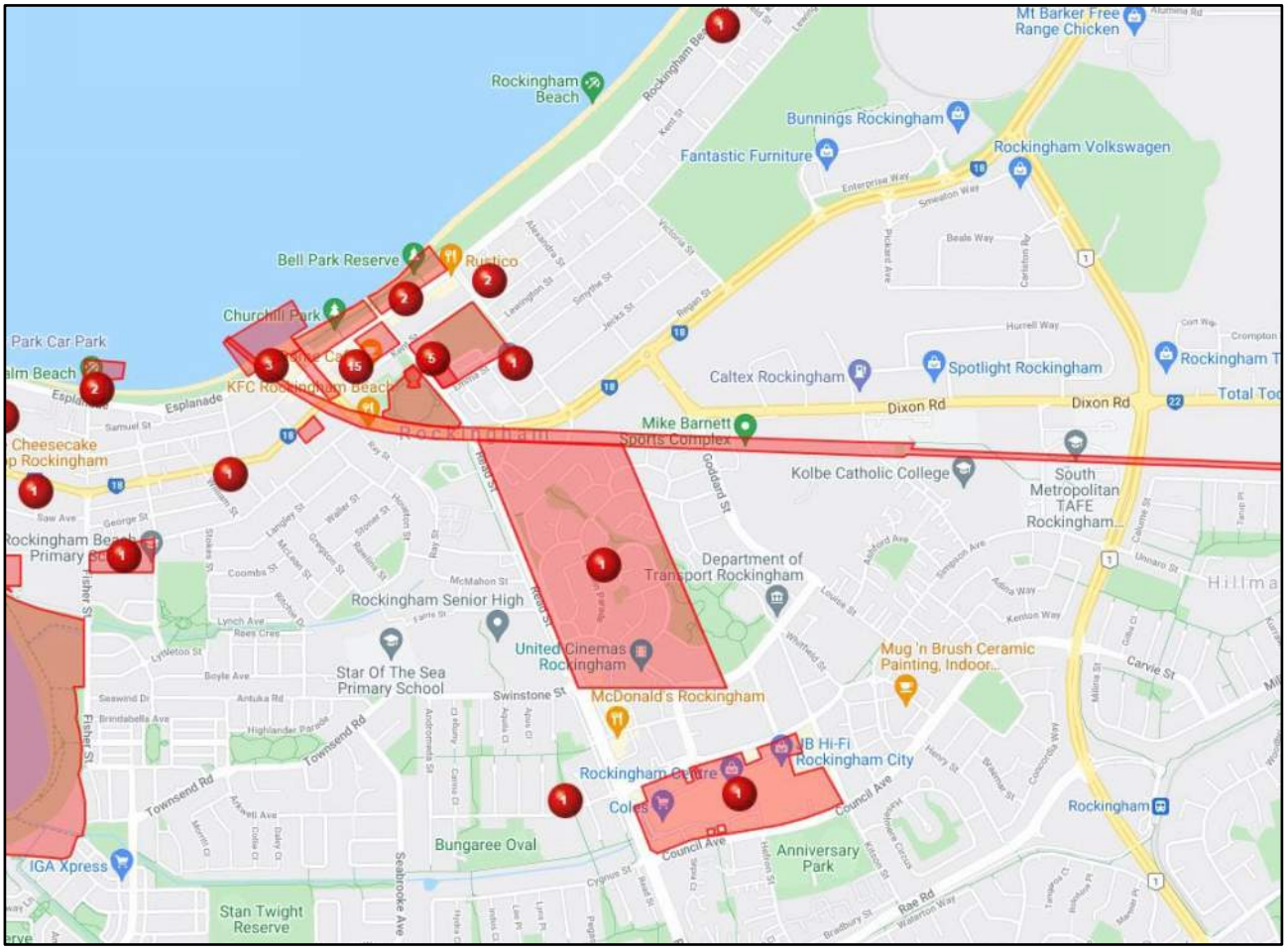
2.4.3 European Heritage

The presence of historical or current European Heritage sites was investigated using the Commonwealth Department of Agriculture Water and Environment (DAWE), Australian Heritage database and the State Heritage Council database. The Heritage Council WA database contains information regarding natural and historic places throughout Western Australia. The Australian Heritage Council database contains information regarding more than 20,000 natural, historic and indigenous places throughout Australia and includes sites recorded on the:

- World Heritage List.
- National Heritage List.
- Commonwealth Heritage List.
- Register of the National Estate.

Several listed heritage sites are present within or in proximity to the planning envelope (Figure 2-2). Further details are included in Appendix B.

Figure 2-2 Heritage Council WA listed places



2.5 Contaminated Sites Database

The State Government, through the Department of Environmental Regulation (DWER), has the overall responsibility for developing, administrating and enforcing the CS Act and its associated procedures. Part of this responsibility includes maintenance of the Contaminated Sites Database. The Contaminated Sites Database holds information on known contaminated sites that have been classified by the DWER as:

- Contaminated – remediation required.
- Contaminated – restricted use.
- Remediated for restricted use.

A search of the Contaminated Sites Database was conducted on 7 April 2022. The search identified seven (7) land parcels within a 1 km radius of RSC which were assigned a classification listed above. Registered contaminated Sites are depicted on Figure 2, Appendix A, further details are provided in Appendix B and summarised in Table 2-5.

Table 2-5 Registered Contaminated Sites

Site ID/ Address	Classification	Summary / Reason for Classification
12867 ***25 Rockingham Beach Rd, Rockingham (lot 99)***	Contaminated – remediation required 31/02/2011	The site is currently used as a service station which has been in operation since the 1980s. Environmental investigations undertaken in 2000 detected the presence of hydrocarbons in both soil and groundwater beneath the site with free phase hydrocarbons as well as a dissolved phase hydrocarbon plume present. The investigations found that hydrocarbons (such as those from petrol) were present in soils at concentrations exceeding the health-based Investigation Levels for commercial and industrial land use and the

Site ID/ Address	Classification	Summary / Reason for Classification
		Ecological Investigation Levels in the vicinity of the remote fill points in the south-eastern corner of the site. Restrictions on Use: § Groundwater abstraction is not permitted other than for analytical testing or remediation due to the nature and extent of contamination in the groundwater.
64538, 64539, 64540 **7 McNicholl Street, Rockingham** (Lot 359 On Plan 17759)	Remediated for restricted use 16/06/2015	Asbestos-containing material is present in the soil within the site and is covered by an approximately 1-meter-thick capping layer. Restrictions on Use: • Due to the presence of asbestos-impacted fill in containment cells below the geotextile warning barrier, the ongoing site management plan must be implemented to avoid any unnecessary disturbance of fill material beneath the warning barrier
46195 ***19 Crompton Rd, Rockingham (Lot 500 on Diagram 75014)*** ~1km east of the site	Remediated for restricted use 29/08/2016	Alkaline-impacted groundwater is present beneath the sump located in the north-east corner of the site. If alkaline water overflows into the sump in the future, groundwater monitoring should be reinstated and a risk assessment carried out to evaluate the risks to human health, the environment, and any environmental values. Restrictions on Use: § The land use is restricted to commercial/industrial land use, which excludes sensitive uses such as residential, childcare centres, kindergartens, pre-schools and primary schools and as such, the site should not be developed for a more sensitive land use without further contamination assessment and/or remediation. § Groundwater abstraction is not permitted other than for analytical testing or remediation.
78438 ***5 Market Street, Rockingham (Lot 9 on Diagram 86080)*** **78439** ***5 Market Street, Rockingham (Lot 10 on Diagram 86080)***	Remediated for restricted use 02/02/2022	Asbestos-impacted fill material is present across the site below a geofabric warning barrier and a layer of clean capping material comprising orange/brown sand. The sand cap above the warning barrier is on average 0.55 metres thick, with a minimum thickness of 0.26 metres along the site's western boundary. Restrictions on Use: § Due to the presence of asbestos-contaminated fill material below the geofabric barrier and orange/brown sand cap, the existing SMP is required to be implemented. § Ground disturbance works are required to be undertaken in accordance with the SMP. § Any changes in land use will require revision of the SMP. § If redevelopment works require disturbance of the asbestos-contaminated fill beneath the geofabric barrier, a project-specific management plan (e.g. a Remediation Action Plan or Construction Environment Management Plan) will be required.

3 RPSP Assessment

The following section presents an assessment of potential environmental impacts associated with the RPSP based on the findings of the desk-based review (**Section 2** of this report).

3.1 Potential Environmental Impacts of RPSP

The following potential environmental impacts of the proposed RPSP have been identified based on the findings of the assessment:

- ***Environmental Sensitive Areas*** (refer to Section 2.2 for further details)
  - A conservation category wetland is mapped within an area proposed for clearing for the proposed development (mixed use).
  - Priority and threatened species are known to occur in the area and might be disturbed by the proposed development.
- ***Contaminated sites*** (refer to Section 2.5 for further details)
  - The land parcel at 25 Rockingham Beach Road is classified '***Contaminated – remediation required***'. This site is proposed for a major development site, and it is anticipated that some level of environmental investigation/potential remediation will be required to ascertain that the site is suitable for the proposed land use.
  - The land parcels at 7 McNicholl Street are classified 'R***emediated for restricted use***'. It is noted that the RPSP plans for a residential use (Major Development Site) at this location. The development is likely to involve earthworks and the disturbance of asbestos in the soil contained beneath the capping layer in place.

3.2 Mitigation Strategies

Mitigation strategies associated with the identified potential environmental impacts are presented in Table 3-1.

Table 3-1 Mitigation Strategies

Item	Potential impact	Mitigation
ESA	Clearing of a conservation category wetland	Conduct a wetland identification and/or delineation investigation to investigate and update the environmental significance of the mapped wetland. Development of an environmental management plan at the development stage, detailing mitigation strategies, triggers and contingency actions
	Disturbance of the endangered/critically endangered TEC	Conduct appropriate Flora and Fauna surveys and impact assessments prior to any clearing of vegetation and/or bushland. Development of an environmental management plan at the development stage, detailing mitigation strategies, triggers and contingency actions
Contaminated Sites	Disturbance of asbestos/contaminated soil	**5 Market Street, Rockingham (Lot 9 and 10 on Diagram 86080)** A works-specific RAP or CEMP, along with an updated SMP, must be developed and reviewed by an accredited contaminated sites auditor, as the proposed development works involve disturbing asbestos-contaminated fill beneath the geo-fabric barrier at the site. A DWER-accredited Contaminated Sites Auditor would need to be engaged to prepare a Mandatory Auditor's Report (MAR). **25 Rockingham Beach Rd, Rockingham (lot 99)** Further risk assessment and management works is required to assess potential unacceptable risks to human health and evaluate suitability under its proposed Mixed Use.

Item	Potential impact	Mitigation
		7 McNicholl Street, Rockingham (Lot 359 On Plan 17759) Further risk assessment and management works may be required to assess potential unacceptable risks to human health and evaluate suitability under its proposed Mixed Use. The City of Rockingham should obtain information from DWER via a Detailed Summary of Records request to confirm that the site has been sufficiently remediated and is suitable for use under the amended scheme.

4 Conclusions

Cardno now Stantec was engaged by Hames Sharley to provide environmental services to support the review of local planning framework and preparation of a Precinct Structure Plan for the Rockingham Strategic Centre (RSC). The objective of the assessment was to gather relevant environmental data associated with the RSC to support the review of the local planning framework and the preparation of a Precinct Structure Plan.

Cardno carried out a review of background information and data through government agency database searches, requests and other publicly available information sources. A summary of findings is presented below:

- Surface geology comprises the Calcareous Sand of the Safety Bay Sand formation.
- No area of the site is mapped as having a known risk of ASS occurring within 3m of ground surface.
- Conservation category wetlands were identified within the planning envelope.
- Priority and Threatened species are likely to occur within the planning envelope.
- Most of the planning envelope is within an ESA due to the presence of TECs and a conservation-significant wetland across the area.
- No Bush Forever site is located on the planning envelope. A Bush Forever site is located directly to the east of the RSC.
- A review of historical aerial photography did not identify any areas of potential environmental concern.
- No registered Aboriginal heritage sites are located within the planning envelope. The RSC is on land within the Gnaala Karla Booja ILUA.
- Several heritage-listed sites are present within the RSC.
- Five land parcels within a 1 km radius of the RSC have been assigned a contaminated sites classification by the DWER.

Based on the above findings, Cardno carried out a high-level assessment of potential environmental impacts associated with the proposed RPSP. Findings are summarised below:

- ESAs associated with a conservation category wetland and TECs cover most of the planning envelope. Any clearance permit application will require a flora and fauna survey or wetland investigation to be conducted.
- The results of the flora/fauna surveys shall inform the development of Environmental Management Plans (as required) to be implemented during development phases, which will include mitigation strategies, triggers and contingency actions.
- Land parcels classified by DWER under the ***CS Act*** have been identified as being proposed for 'major development site'. Further investigation is likely to be required at these sites to inform the development of SMPs/CEMPs and confirm suitability for the proposed land uses.
  - **5 Market Street, Rockingham (Lot 9 and 10 on Diagram 86080)**: A works-specific RAP or CEMP and an updated SMP are required to be developed and reviewed by an accredited contaminated sites auditor, as the proposed development works require disturbance of asbestos-contamination fill beneath the geo-fabric barrier beneath the site. A DWER-accredited Contaminated Sites Auditor would need to be engaged to prepare a MAR.
  - **25 Rockingham Beach Rd, Rockingham (lot 99)**: Further risk assessment and management works is required to assess potential unacceptable risks to human health and evaluate suitability under its proposed Mixed Use.
  - **7 McNicholl Street, Rockingham (Lot 359 On Plan 17759)**: Further risk assessment and management works may be required to assess potential unacceptable risks to human health and evaluate suitability under its proposed Mixed Use. The City of Rockingham should obtain information from DWER via a Detailed Summary of Records request to confirm that the site has been sufficiently remediated and is suitable for use under the amended scheme.

5 References

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APPENDIX A

FIGURES

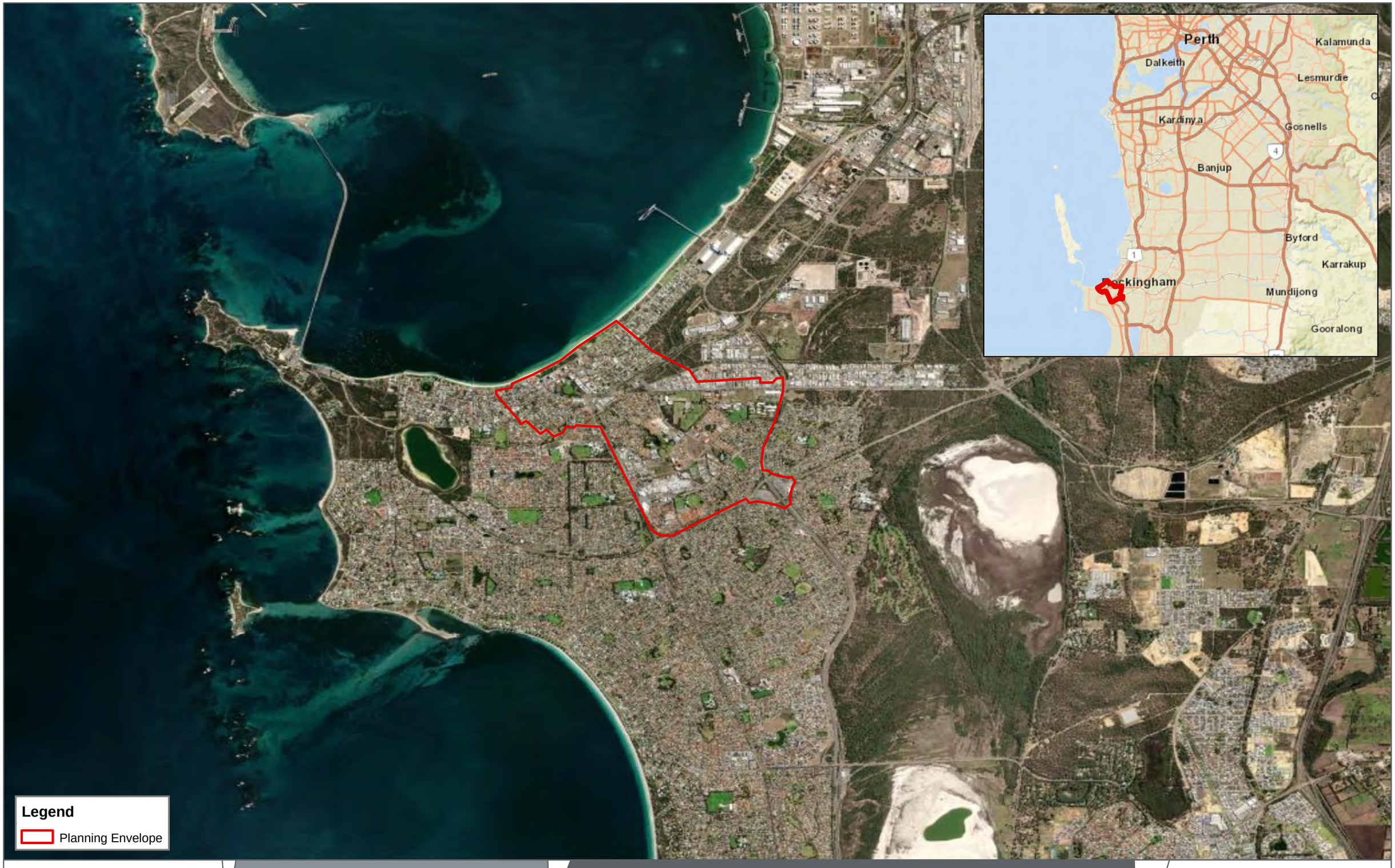

FIGURE 1

1:50,000 Scale at A3

Meters

0 625 1,250 1,875 2,500

Site Locality

ROCKINGHAM STRATEGIC METROPOLITAN CENTRE
HAMES SHARLEY

Cardno

Map Produced by Cardno WA
Date: 2021-12-07 | Project: CW1181500
Coordinate System: GCS GDA 1994
Map: CW1181500-EN-001_Site Locality 02.mxd 01
Aerial Imagery provided by Aerometrex



FIGURE 2

1:15,000 Scale at A3

Meters

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DWER Registered Contaminated Sites

ROCKINGHAM STRATEGIC METROPOLITAN CENTRE
HAMES SHARLEY

Cardno

Map Produced by Cardno WA
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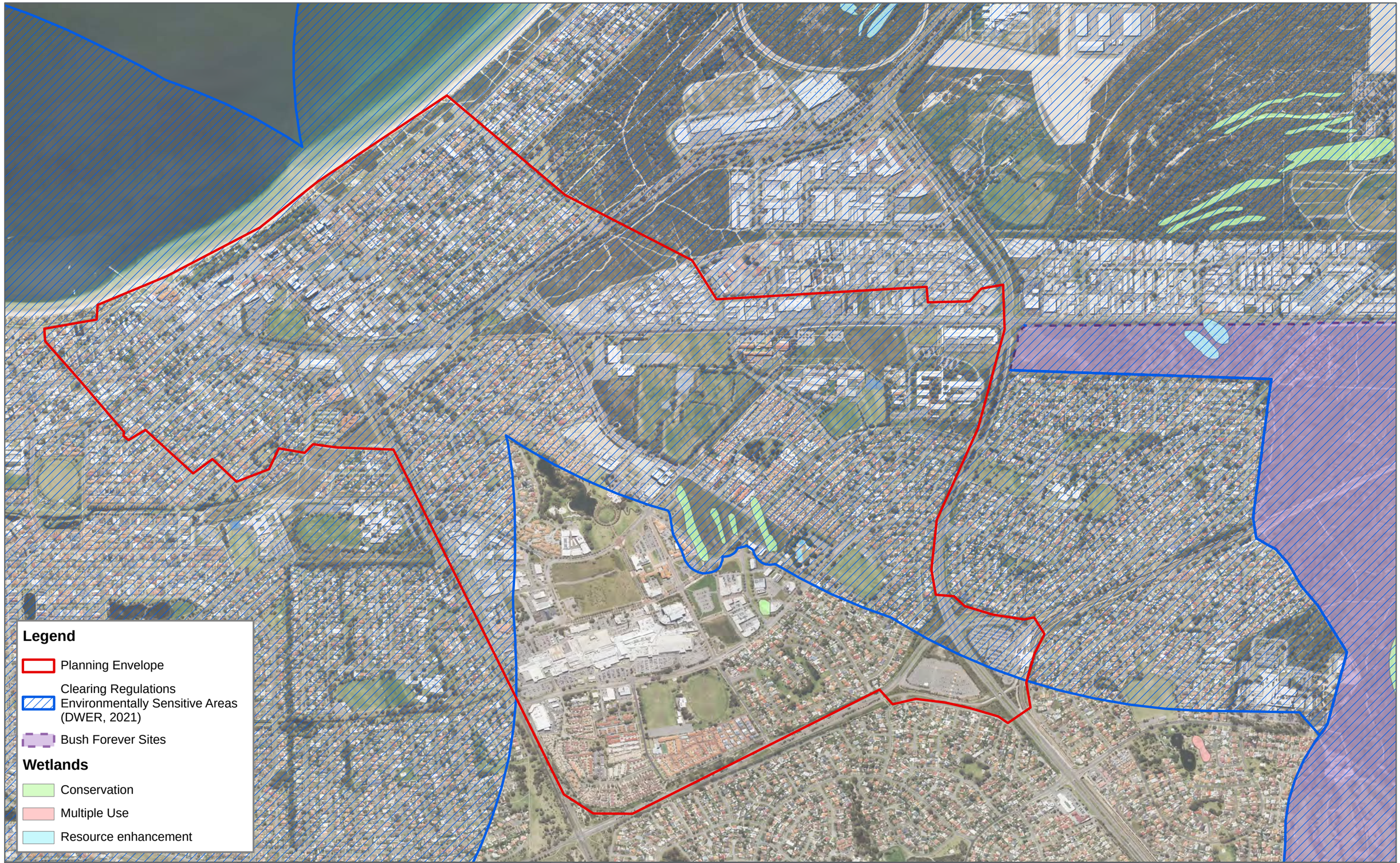

FIGURE 3

1:15,000 Scale at A3

Meters

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Environmentally Sensitive Areas

ROCKINGHAM STRATEGIC METROPOLITAN CENTRE
HAMES SHARLEY

Cardno

Map Produced by Cardno WA
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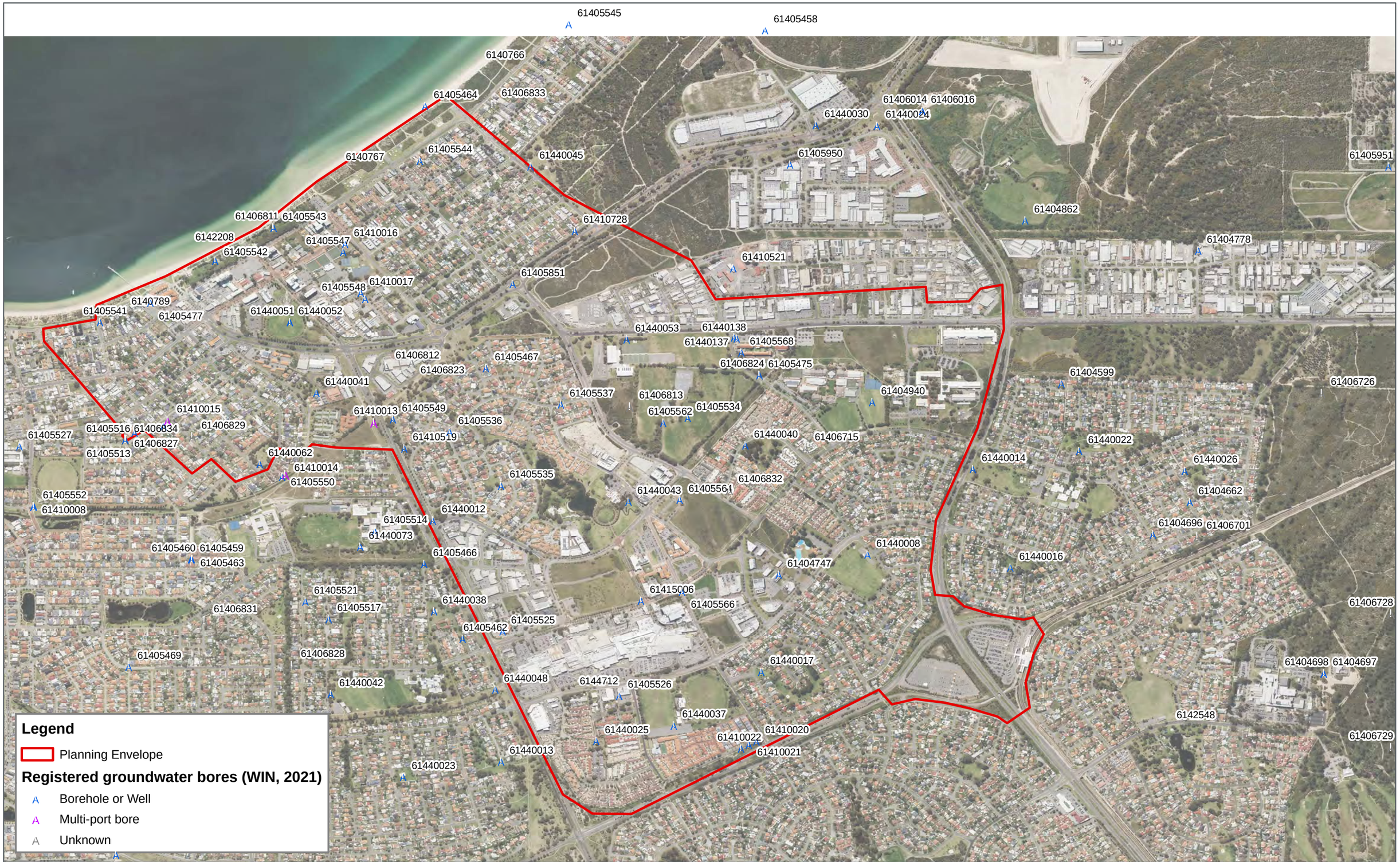
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61440013
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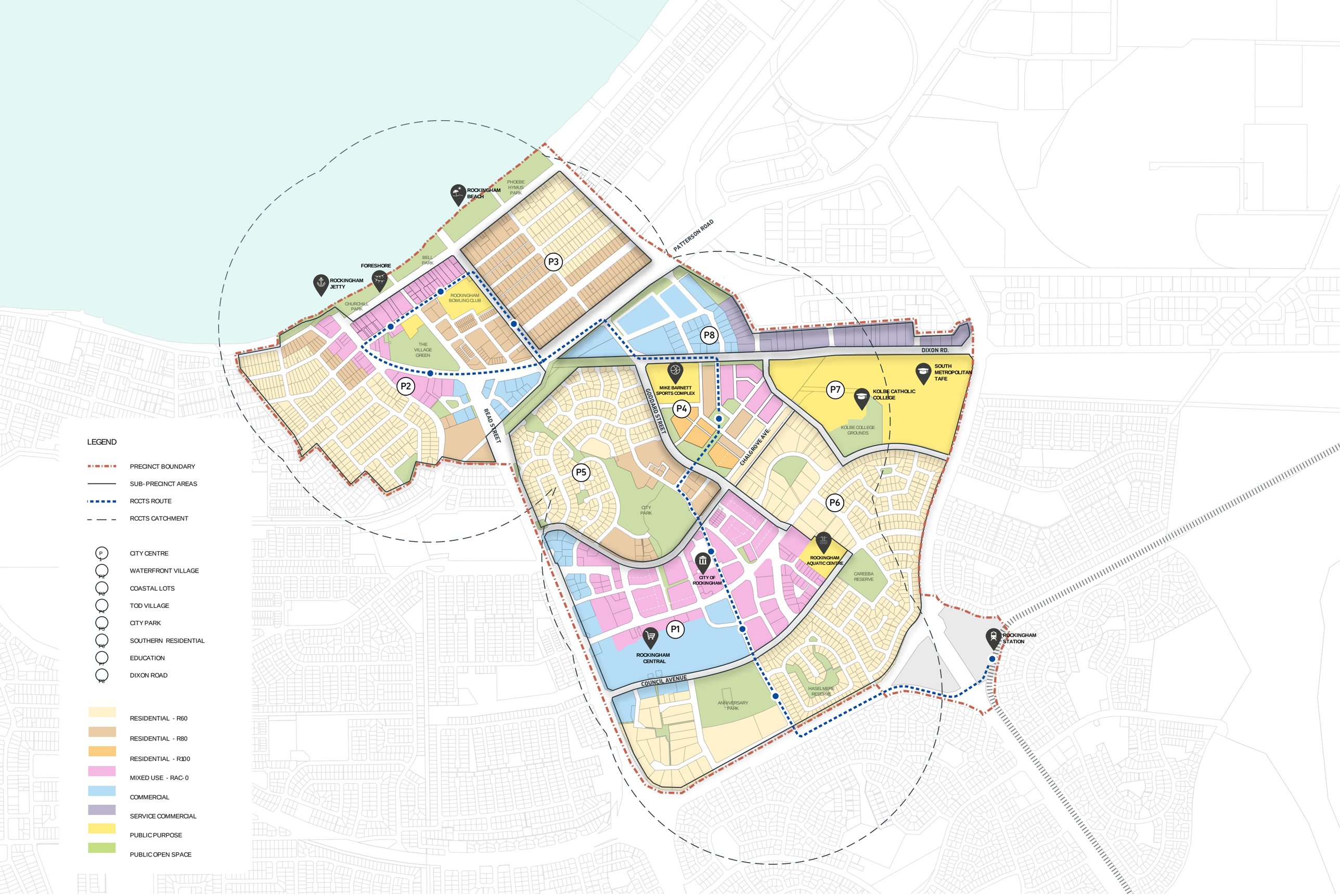
61440023
Legend
Planning Envelope
Registered groundwater bores (WIN, 2021)
Borehole or Well
Multi-port bore
Unknown
FIGURE 4
1:15,000 Scale at A3
Meters
0
190
380
570
760
DoW Registered Groundwater Bores
ROCKINGHAM STRATEGIC METROPOLITAN CENTRE
HAMES SHARLEY
Cardno
Map Produced by Cardno WA
Date: 2021-12-07 | Project: CW1181500
Coordinate System: GCS GDA 1994
Map: CW1181500-EN-004_DoW Bores 02.mxd 01
Aerial Imagery provided by Aerometrex



Design Element 4 - Land Use and Density Plan

Rockingham Strategic Centre Precinct Structure Plan

Status : Draft

Path : P:\44322 Local Planning Framework Review & Rockingham SRC Precinct Plan

0 300 600

Scale: 1:5,000 @ A3

North:

Project Number: 44322

Hames Sharley

© Hames Sharley

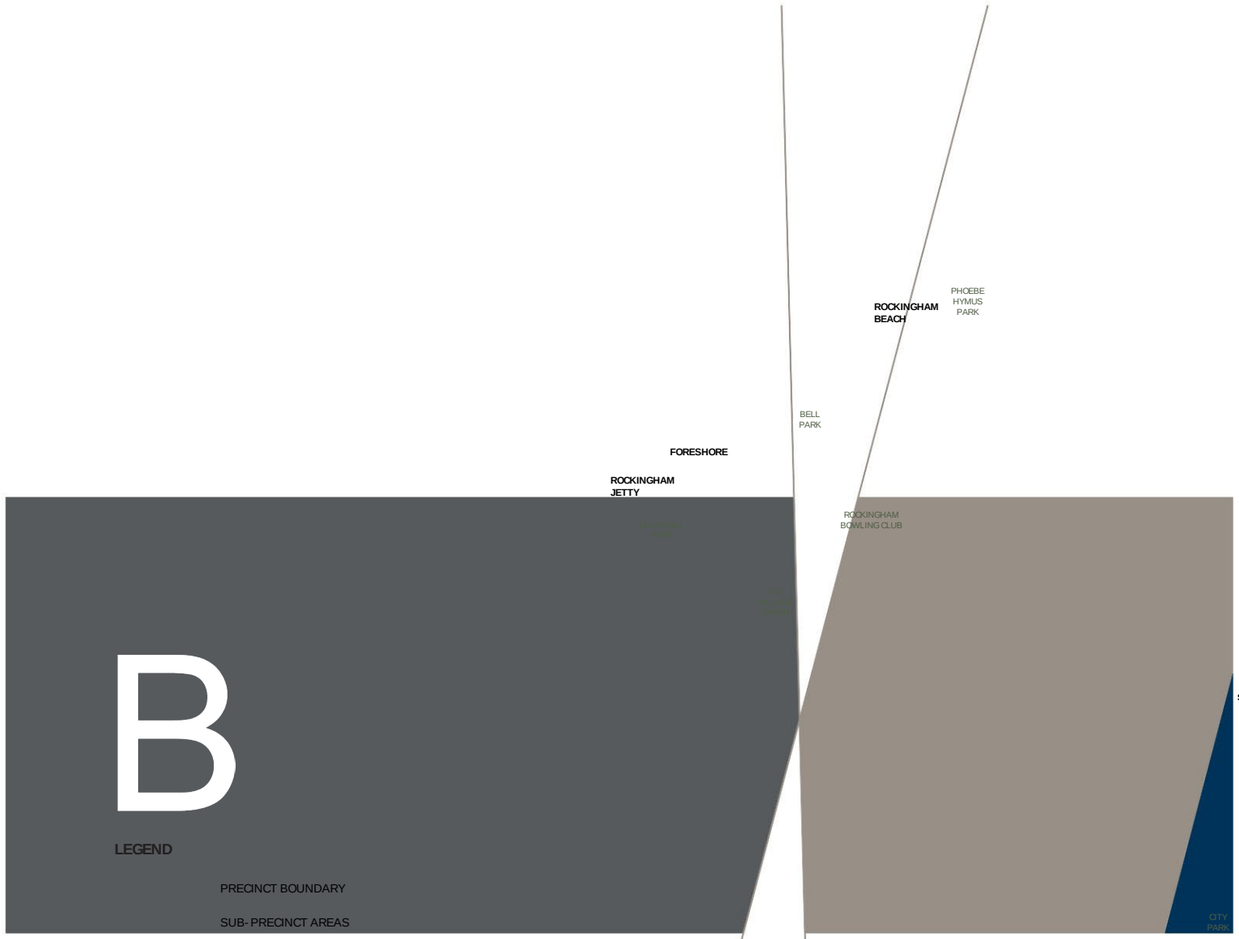
Revision: B
Date: 26/11/21

PATTERSON ROAD
ENNIS AVENUE
READ STREET
RAE ROAD
DIXON RD

P1
P2
P3
P4
P5
P6
P7
P8

City of Rockingham

Hames Sharley



LEGEND

PRECINCT BOUNDARY

SUB- PRECINCT AREAS

P1	CITY CENTRE
P2	WATERFRONT VILLAGE
P3	COASTAL LOTS
P4	TOD VILLAGE
P5	CITY PARK
P6	SOUTHERN RESIDENTIAL
P7	EDUCATION
P8	DIXON ROAD

MAJOR DEVELOPMENT SITES (>1HA)

INFILL DEVELOPMENT SITES

PUBLIC OPEN SPACE NODES

LANDMARK

RCCTS ROUTE

RCCTS CATCHMENT

PRIMARY ROAD

SECONDARY ROAD

PROPOSED MIDBLOCK CONNECTIONS

Design Element 2 - Urban Structure Plan

Rockingham Strategic Centre Precinct Structure Plan

Cardno

Status : Draft

Path : P:\44322 Local Planning Framework Review & Rockingham SRC Precinct Plan

0 300 600

Scale: 1:5,000 @ A3

North:

Project Number: 44322

Revision: B

Date: 26/11/21

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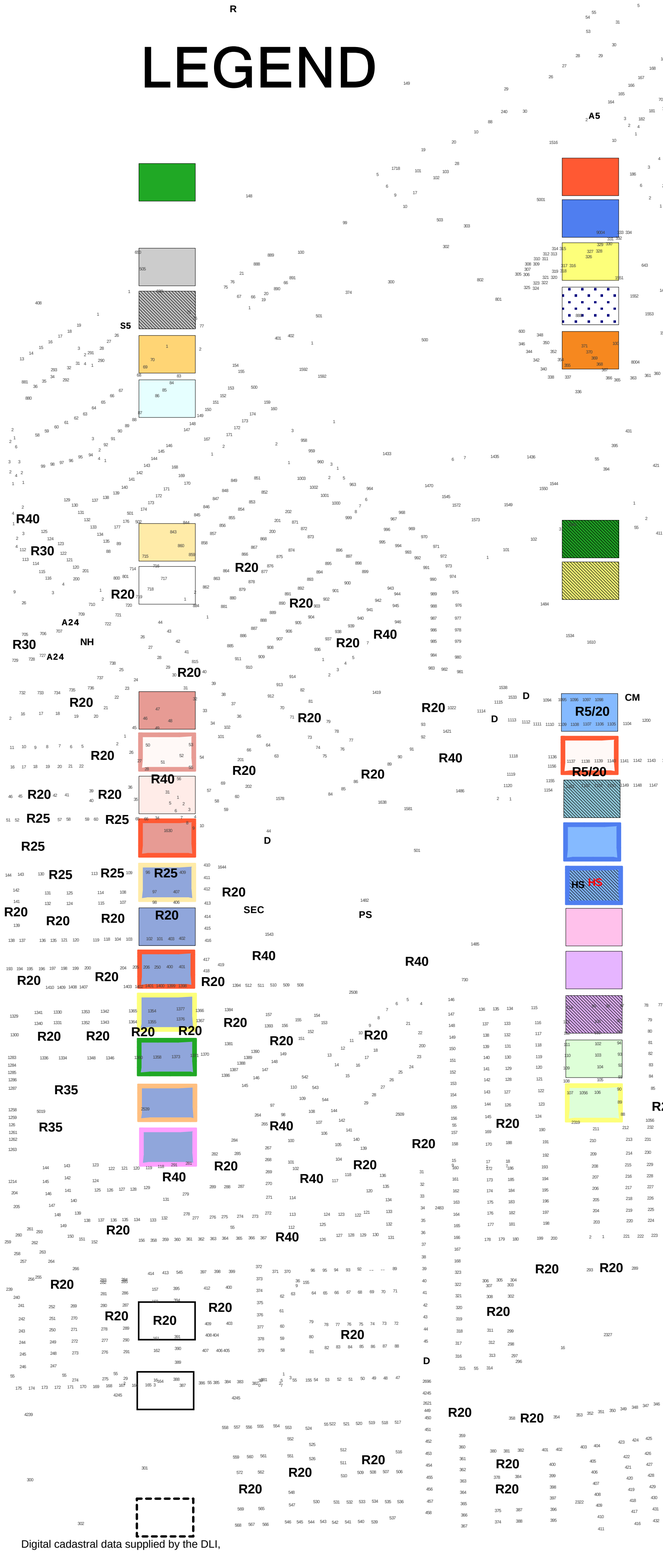
3BRockingham Strategic Centre Precinct Structure Plan (RSSP)

APPENDIX

DESKTOP SEARCHES

city of Rockingham

LEGEND



Digital cadastral data supplied by the DLI,

Perth, Western Australia.

Whilst all care has been taken to accurately portray the current Scheme provisions, no responsibility will be taken for any omissions or errors in this documentation.

CITY OF ROCKINGHAM

TOWN PLANNING SCHEME No. 2
(DISTRICT ZONING SCHEME)

SCALE **1 : 5000**

city of Rockingham

ADOPTION

Adopted by resolution of the Council of the City of Rockingham at the Ordinary meeting of the Council held on the 26th day of August 1997.

Chief Executive Officer

Mayor

FINAL APPROVAL

1. Adopted for Final Approval by resolution of the City of Rockingham at the Ordinary meeting of Council held on the 27th day of August 2002 and the Seal of the Municipality was pursuant to that resolution hereunto affixed in the presence of:-

Chief Executive Officer

Mayor

2. Adopted for Final Approval, as modified, by resolution of the City of Rockingham at the Ordinary Meeting of Council held on the 24th day of August 2004 and the Seal of the Municipality was pursuant to that resolution hereunto affixed in the presence of:-

Chief Executive Officer

Mayor

It is hereby certified that this is a true copy of the Scheme/~~Amendment~~, final approval to which was endorsed by the Minister for Planning and Infrastructure on 2 / 11 / 04

Certified by ...

Officer of the Commission Duly authorised pursuant to Section 24 of the Planning and Development Act 2005 and Regulation 22(3) of the Town Planning Regulations 1967.

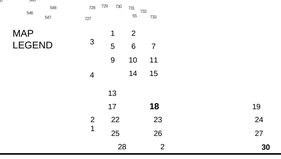
3. Recommended/Submitted for Final Approval by the Western Australian Planning Commission

Delegated Under Section 20 of WAPC Act 1985 — Western Australian Planning Commission — Date 28.10.04

4. Final Approval Granted

Minister for Planning and Infrastructure — Date 2/November/2004

MAP LEGEND



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19th November 2004 - Updated to include AMD 174 GG. 18/02/2020

TOWN PLANNING SCHEME MAP
5 of 34

Cardno
Shaping the Future







Authorised **M. ROSS**

Plot Information :

Date : **07/07/2020**

Govt. Gazette :

METROPOLITAN REGION SCHEME RESERVES

PARKS AND RECREATION

R RESTRICTED PUBLIC ACCESS

RAILWAYS

PORT INSTALLATIONS

STATE FORESTS

WATERWAYS

PRIMARY REGIONAL ROADS

OTHER REGIONAL ROADS

PUBLIC PURPOSES

WATER CATCHMENTS

CIVIC AND CULTURAL

H HOSPITAL
HS HIGH SCHOOL
TS TECHNICAL SCHOOL
CP CAR PARK
U UNIVERSITY
CG COMMONWEALTH GOVERNMENT
SEC WESTERN POWER
SU SPECIAL USES
WSD WATER CORPORATION

LOCAL SCHEME RESERVES

CIVIC AND CULTURAL

LOCAL ROADS

PUBLIC OPEN SPACE

PUBLIC PURPOSES

H HOSPITAL
U UNIVERSITY
WSD WATER CORPORATION
SEC WESTERN POWER

ZONES

RESIDENTIAL

SPECIAL RESIDENTIAL

DEVELOPMENT

COMMUNITY PURPOSES

DISTRICT TOWN CENTRE

PRIMARY CENTRE CITY CENTRE

PRIMARY CENTRE WATERFRONT VILLAGE

PRIMARY CENTRE URBAN VILLAGE

PRIMARY CENTRE CITY LIVING

PRIMARY CENTRE CAMPUS

PRIMARY CENTRE URBAN LIVING

COMMERCIAL

SPECIAL USE

SPECIAL COMMERCIAL

SERVICE COMMERCIAL

PORT KENNEDY BUSINESS ENTERPRISE

LIGHT INDUSTRY

GENERAL INDUSTRY

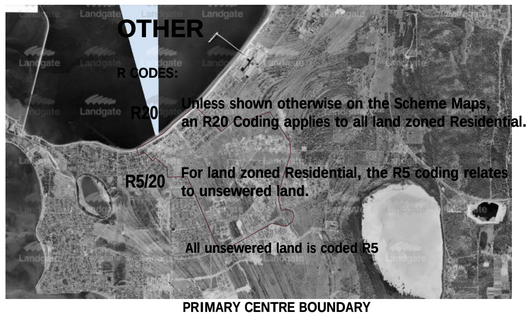
SPECIAL INDUSTRY

RURAL

SPECIAL RURAL

AP AGED PERSONS ACCOMMODATION
C CEMETERY
CB COMMUNITY BUILDINGS
CH CHURCH
CM CHILD MINDING CENTRE
D DRAIN
FC FAMILY CENTRE
FS FIRE STATION
HA HALL
HI HISTORICAL SITE
IHC INFANT HEALTH CLINIC
KG KINDERGARTEN
L LIBRARY
NH NURSING HOME
PS PRIMARY SCHOOL
RI RELIGIOUS INSTITUTION
T TELECOM
YC YOUTH CAMP





Unless shown otherwise on the Scheme Maps, an R20 Coding applies to all land zoned Residential.

For land zoned Residential, the R5 coding relates to unsewered land.

All unsewered land is coded R5

PRIMARY CENTRE BOUNDARY

A1 ADDITIONAL USES
See Schedule 2 in Scheme Text

EC ENVIRONMENTAL CONDITIONS
See Schedule 8 in Scheme Text

DA DEVELOPMENT AREA
See Schedule 9 in Scheme Text

DCA DEVELOPMENT CONTRIBUTION AREA
See Schedule 10 in Scheme Text

SCHEME BOUNDARY - DLI Cadastre

METROPOLITAN REGIONAL SCHEME RESERVES BOUNDARY



PLATE 1: Aerial image of the site – November 1953



PLATE 2: Aerial image of the site – July 1970

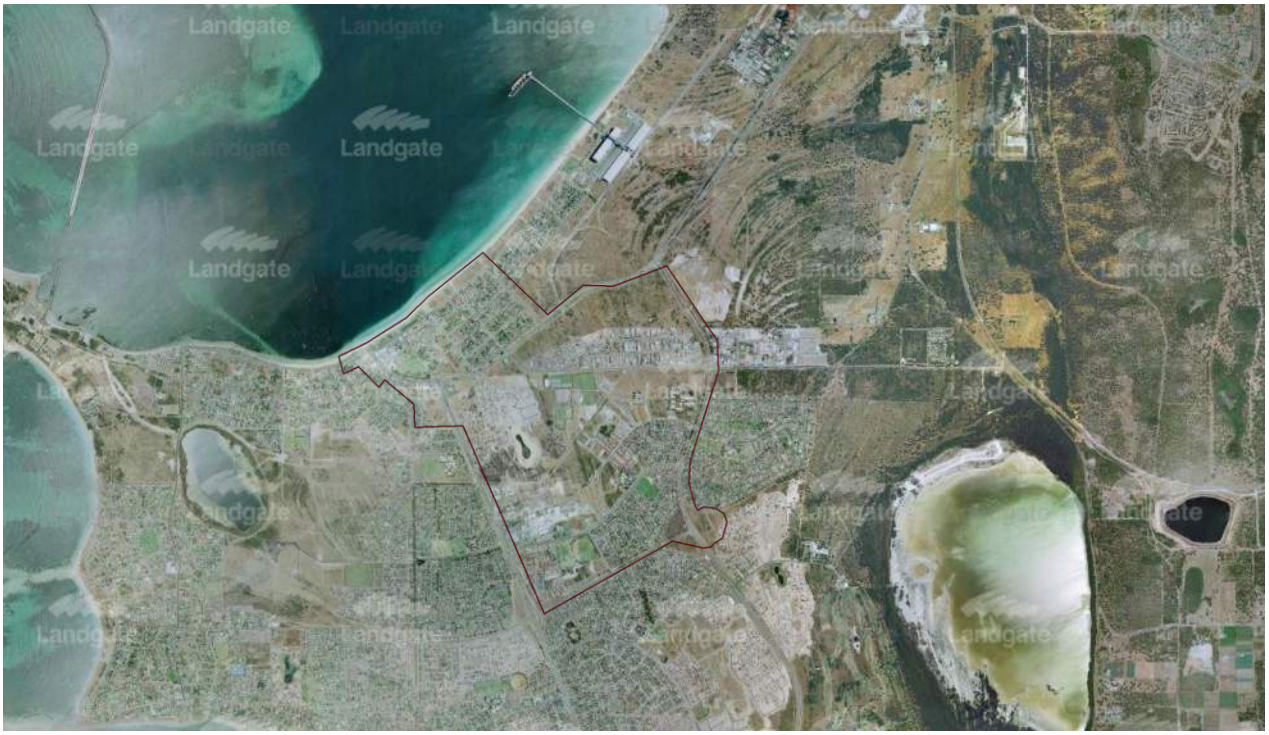


PLATE 3: Aerial image of the site – September 1974



PLATE 4: Aerial image of the site – June 1977



PLATE 5: Aerial image of the site – August 1981



PLATE 6: Aerial image of the site – June 1985



PLATE 7: Aerial image of the site – December 1989



PLATE 8: Aerial image of the site – February 1995



PLATE 9: Aerial image of the site – January 2001



PLATE 10: Aerial image of the site – December 2003

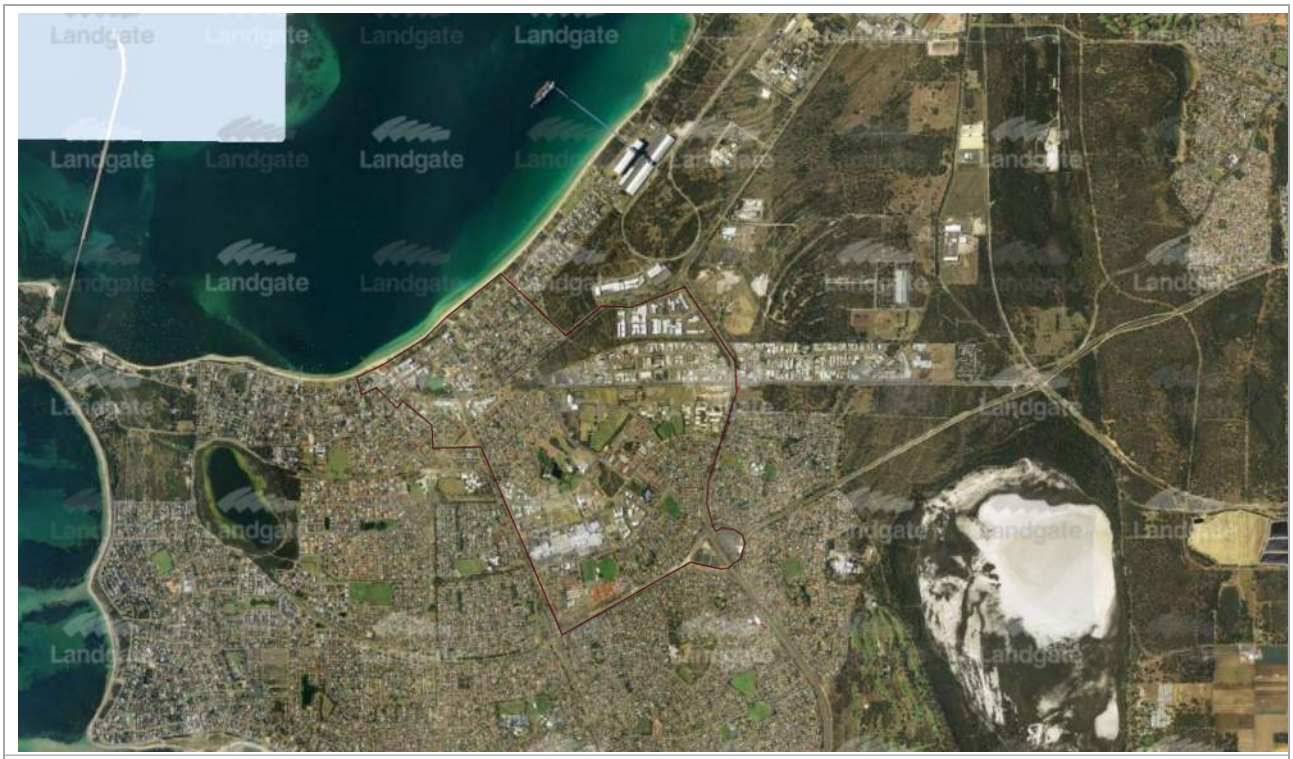


PLATE 11: Aerial image of the site – December 2005



PLATE 12: Aerial image of the site – December 2006

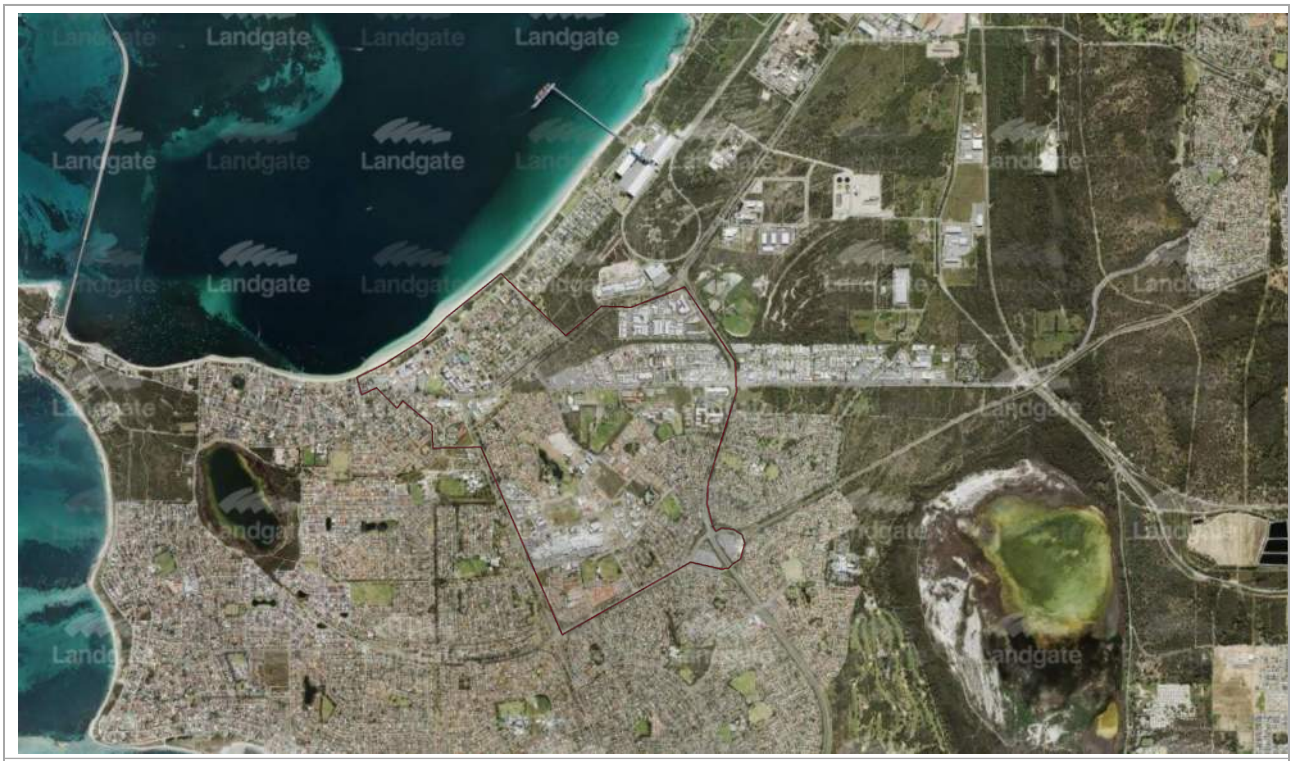


PLATE 13: Aerial image of the site – July 2008



PLATE 14: Aerial image of the site – November 2010

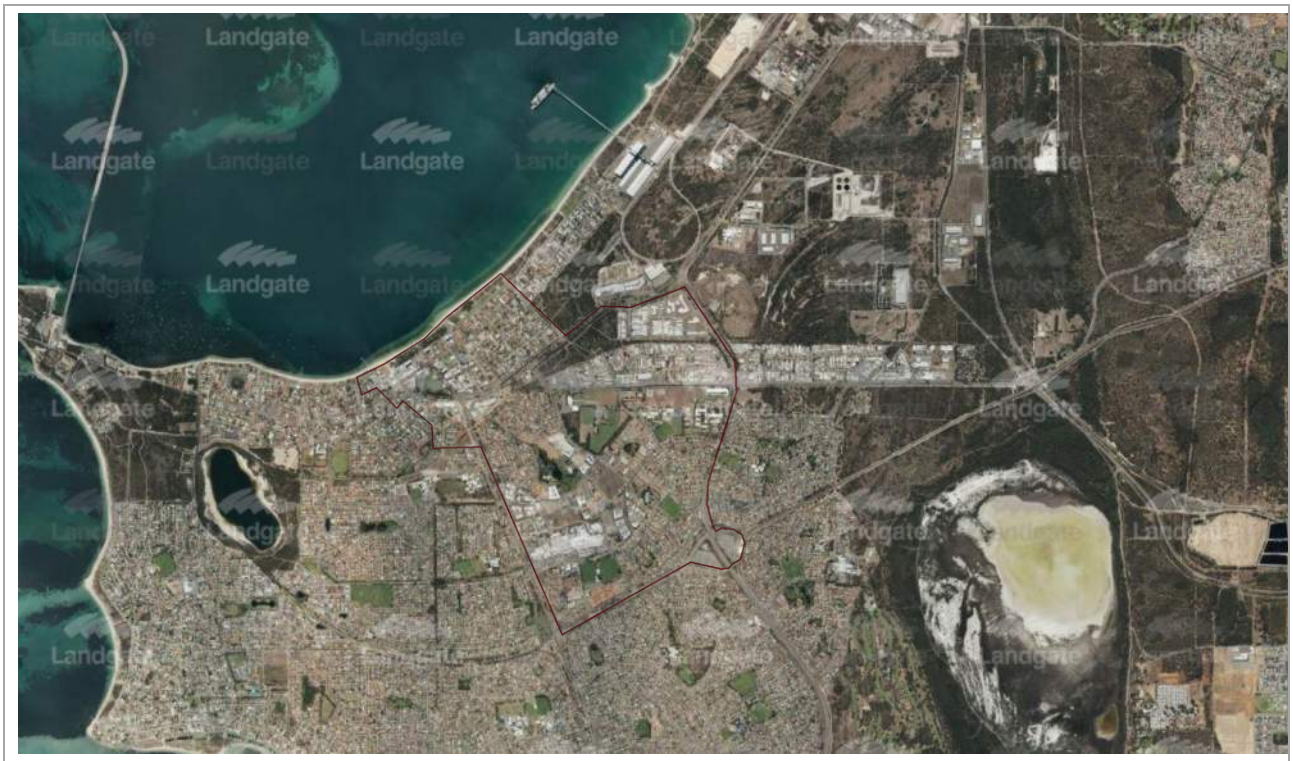


PLATE 15: Aerial image of the site – January 2013



PLATE 16: Aerial image of the site – January 2015

Dandjoo Species List Export

Created by Guest User on 04 Jul 2025

Source	Dandjoo – Department of Biodiversity, Conservation and Attractions
Method	User defined polygon: [[[[115.72559237480165, -32.27697421430311], [115.72588205337526, -32.27792659467156], [115.72709441184999, -32.277482151743925], [115.72769522666933, -32.27856150936218], [115.72957277297975, -32.27977690508792], [115.73039889335634, -32.27920548972289], [115.73079586029054, -32.27785403270967], [115.73364973068239, -32.28163624763077], [115.73657870292665, -32.28198090206089], [115.74405670166017, -32.296710006304], [115.75579404830933, -32.29155902980917], [115.76051473617555, -32.2923389499821], [115.76182365417482, -32.28878391060125], [115.75796127319337, -32.28747794275988], [115.75950622558595, -32.28160085471338], [115.76053619384767, -32.2757596676541], [115.75635194778444, -32.269664114925675], [115.75587987899782, -32.26861186497248], [115.75315475463869, -32.26984553609813], [115.74867010116579, -32.27086148796058], [115.74463605880737, -32.27325618662779], [115.739164352417, -32.26852115319832], [115.72559237480165, -32.27697421430311]]]].
Date time	2025-07-04T11:38:28.691903+08:00

PLATE 17: Aerial image of the site – September 2016

Conservation status summary	Count
CR	3
Cons code inherited from parent	1
EN	5
MI	7
None	42
OS	1
P1	1
P3	4
P4	9
Parent of conservation listed taxa	1
VU	7
Total	**81**

Kingdoms	Count
Animalia	45
Plantae	36
Total unique species	**81**

#	Class	Family	Name	Establishment	Conservation
PLATE 18: Aerial image of the site – February 2018					
Animalia					
1	None	None	Polycera hedgpethi Er. Marcus, 1964		
2	Arachnida	Idiopidae Simon, 1889	Idiosoma sigillatum O. P.-Cambridge, 1870 *(Swan Coastal Plain shield-backed trapdoor spider)*	native	P3
3	Arachnida	Lycosidae	Hogna crispipes (L. Koch, 1877)		
4	Asteroidea	Astropectinidae	Astropecten preissi MÃ¼ller & Troschel, 1843		
5	Aves	Anatidae	Oxyura australis Gould, 1836	native	P4
6	Aves	Ardeidae	Botaurus dubius Mathews, 1912	native	P4
7	Aves	Cacatuidae	Calyptorhynchus banksii naso Gould, 1837 *(Forest Red-tailed*	native	VU

			Black Cockatoo)		
8	Aves	Cacatuidae	Zanda Mathews, 1913		Parent of conservation listed taxa
9	Aves	Cacatuidae	Zanda baudinii Lear, 1832 *(Baudin's Cockatoo)*	native	EN
10	Aves	Cacatuidae	Zanda latirostris Carnaby, 1948 *(Carnaby's Cockatoo)*	native	EN
11	Aves	Charadriidae	Charadrius cucullatus Vieillot, 1818 *(Hooded Plover)*	native	P4
12	Aves	Diomedeidae	Thalassarche chrysostoma (J.R. Forster, 1785)	native	VU
13	Aves	Falconidae	Falco peregrinus Tunstall, 1771 *(Peregrine Falcon)*	native	OS
14	Aves	Laridae	Anous tenuirostris melanops Gould, 1846	native	EN
15	Aves	Laridae	Hydroprogne caspia (Pallas, 1770)	native	MI
16	Aves	Laridae	Onychoprion anaethetus (Scopoli, 1786) *(Bridled Tern)*	native	MI
17	Aves	Laridae	Onychoprion anaethetus anaethetus (Scopoli, 1786)		Cons code inherited from parent
18	Aves	Laridae	Sternula nereis nereis Gould, 1843	native	VU
19	Aves	Laridae	Thalasseus bergii (Lichtenstein, 1823)	native	MI
20	Aves	Procellariidae	Halobaena caerulea (Gmelin, 1789)	native	VU
21	Aves	Procellariidae	Macronectes giganteus (Gmelin, 1789)	native	MI
22	Aves	Rallidae	Porzana fluminea Gould, 1843	native	
23	Aves	Scolopacidae	Actitis hypoleucos (Linnaeus, 1758) *(Common Sandpiper)*	native	MI
24	Aves	Scolopacidae	Calidris ferruginea (Pontoppidan, 1763)	native	CR
25	Aves	Scolopacidae	Calidris ruficollis (Pallas, 1776)	native	MI
26	Aves	Scolopacidae	Calidris tenuirostris (Horsfield, 1821)	native	CR
27	Aves	Scolopacidae	Numenius madagascariensis (Linnaeus, 1766) *(Eastern Curlew)*	native	CR
28	Aves	Stercorariidae	Stercorarius maccormicki Saunders, 1893	native	MI
29	Bivalvia	Ostreidae Rafinesque, 1815	Dendostrea Swainson, 1835		
30	Demospongiae	Geodiidae Gray, 1867	Erylus lendenfeldi Sollas, 1888		
31	Gastropoda	Bullidae Gray, 1827	Bulla quoyii Gray & Dieffenbach, 1843		
32	Hexacorallia	Actiniidae Rafinesque, 1815	Dofleinia armata Wassilieff, 1908		
33	Insecta	Carabidae Latreille, 1802	Pheropsophus verticalis (Dejean, 1825)		
34	Mammalia	Macropodidae	Notamacropus irma (Jourdan, 1837) *(Western Brush Wallaby)*	native	P4
35	Mammalia	Muridae	Hydromys chrysogaster Geoffroy, 1804 *(Water-rat)*	native	P4
36	Mammalia	Otariidae	Neophoca cinerea (Peron, 1816)	native	EN
37	Mammalia	Peramelidae	Isoodon fusciventer (Gray, 1841) *(Southern Brown Bandicoot)*	native	P4
38	Mammalia	Peramelidae	Isoodon obesulus (Shaw, 1797)	native	
39	Polyplacaphora	Ischnochitonidae Dall, 1889	Ischnochiton contractus (Reeve, 1847)		
40	Reptilia	Agamidae	Pogona minor minima (Loveridge, 1933)	native	VU
41	Reptilia	Cheloniidae	Caretta caretta Linnaeus, 1758 *(Loggerhead Turtle)*	native	EN
42	Reptilia	Cheloniidae	Chelonia mydas (Linnaeus, 1758) *(Green Turtle)*	native	VU
43	Reptilia	Dermochelyidae	Dermochelys coriacea (Vandelli, 1761) *(Leatherback Turtle)*	native	VU
44	Reptilia	Elapidae	Neelaps calonotos (A.M.C. DumÃ©ril, Bibron & A. DumÃ©ril, 1854) *(Black-striped Snake)*	native	P3
45	Reptilia	Scincidae	Lerista lineata Bell, 1883 *(Perth Slider)*	native	P3

PLATE 19: Aerial image of the site – April 2019

PLATE 20: Aerial image of the site – February 2021

Plantae

46	Florideophyceae	Areschougiaceae J.Agardh	Erythroclonium muelleri Sond.	native	
47	Florideophyceae	Ceramiaceae Dumort.	Antithamnion armatum (J.Agardh) G.De Toni	native	
48	Florideophyceae	Ceramiaceae Dumort.	Antithamnion hanovioides (Sond.) G.De Toni	native	
49	Florideophyceae	Claviclonaceae Kraft & G.W.Saunders	Claviclonium ovatum (J.V.Lamour.) Kraft & Min-Thein	native	
50	Florideophyceae	Corallinaceae J.V.Lamour.	Jania rosea (Lam.) Decne.	native	
51	Florideophyceae	Cystocloniaceae KÃ¼tz.	Craspedocarpus venosus (KÃ¼tz.) Min-Thein & Womersley	native	
52	Florideophyceae	Cystocloniaceae KÃ¼tz.	Hypnea ramentacea (C.Agardh) J.Agardh	native	

53	Florideophyceae	Delesseriaceae Bory	Hypoglossum revolutum (Harv.) J.Agardh	native	
54	Florideophyceae	Gracilariaceae NÃ¤geli	Gracilaria salicornia (C.Agardh) E.Y.Dawson	native	
55	Florideophyceae	Halymeniaceae Bory	Carpopeltis elata (Harv.) G.De Toni	native	
56	Florideophyceae	Halymeniaceae Bory	Gelinaria ulvoidea Sond.	native	
57	Florideophyceae	Hapalidiaceae J.E.Gray	Mesophyllum incisum (Foslie) W.H.Adey	native	
58	Florideophyceae	Kallymeniaceae Kylin	Callophyllis rangiferina (Turner) Womersley	native	
59	Florideophyceae	Lithophyllaceae Athanas.	Amphiroa anceps (Lam.) Decne.	native	
60	Florideophyceae	Nizymeniaceae	Nizymenia conferta (Harv.) Chiovitti, G.W.Saunders & Kraft	native	
61	Florideophyceae	Phacelocarpaceae	Phacelocarpus sessilis J.Agardh	native	
62	Florideophyceae	Placentophoraceae Dumilag, W.A.Nelson & Kraft	Callophycus harveyanus (J.Agardh) P.C.Silva	native	
63	Florideophyceae	Placentophoraceae Dumilag, W.A.Nelson & Kraft	Callophycus oppositifolius (C.Agardh) P.C.Silva	native	
64	Florideophyceae	Pterocladiaceae G.P.Felicini & C.Perrone	Pterocladia lucida (Turner) J.Agardh	native	
65	Florideophyceae	Rhodomelaceae Horan.	Corynecladia clavata (Sond.) J.Agardh	native	
66	Florideophyceae	Rhodomelaceae Horan.	Corynecladia elata (C.Agardh) Cassano, M.C.Oliveira & M.T.Fujii	native	
67	Florideophyceae	Rhodomelaceae Horan.	Laurencia dendroidea J.Agardh	native	
68	Florideophyceae	Rhodymeniaceae Harv.	Leptosomia rosea (Harv.) Womersley	native	
69	Florideophyceae	Rhodymeniaceae Harv.	Rhodymenia foliifera Harvey	uncertain	
70	Florideophyceae	Solieriaceae J.Agardh	Sarconema filiforme (Sond.) Kylin	native	
71	Florideophyceae	Wrangeliaceae J.Agardh	Anotrichium crinitum (KÃ¼tzing) Baldock		
72	Florideophyceae	Wrangeliaceae J.Agardh	Wrangelia velutina (Sond.) Harv.	native	
73	Liliopsida	Poaceae Barnhart	Lachnagrostis nesomytica subsp. paralia A.J.Br.	native	P1
74	Magnoliopsida	Asteraceae Bercht. & J.Presl	Ambrosia psilostachya DC.	alien	
75	Magnoliopsida	Fabaceae Lindl.	Jacksonia sericea Benth.	native	P4
76	Magnoliopsida	Myrtaceae Juss.	Eucalyptus foecunda Schauer *(Fremantle Mallee, Narrow-leaved Red Mallee)*	native	
77	Magnoliopsida	Myrtaceae Juss.	Eucalyptus foecunda Schauer subsp. foecunda	native	P4
78	Magnoliopsida	Proteaceae Juss.	Adenanthos cygnorum Diels subsp. cygnorum *(Common Woollybush)*	native	
79	Magnoliopsida	Rubiaceae Juss.	Opercularia vaginata Juss.	native	
80	Magnoliopsida	Sapindaceae Juss.	Dodonaea hackettiana W.Fitzg. *(Hackett's Hopbush)*	native	P4
81	Magnoliopsida	Thymelaeaceae Juss.	Pimelea calcicola Rye *(Coastal Banjine)*	native	P3

Conservation status definitions

Threatened species

- CR – Critically Endangered
- EN – Endangered
- VU – Vulnerable
- EX – Extinct
- EW – Extinct in the Wild
- CD – Species of special conservation interest (conservation dependent)
- OS – Species otherwise in need of special protection (other specially protected)
- MI – Migratory
- SP – Specially protected species

Priority species

- P1 – Priority 1: Poorly-known species – known from few locations, none on conservation lands
- P2 – Priority 2: Poorly-known species – known from few locations, some on conservation lands
- P3 – Priority 3: Poorly-known species – known from several locations
- P4 – Priority 4: Rare, Near Threatened and other species in need of monitoring

Dandjoo specific codes

- Parent of conservation listed taxa
- Cons code inherited from parent, X

Read full definitions at https://bio.wa.gov.au/guide/conservation-status-definitions

Disclaimer

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Further note, precise locations of conservation listed species are considered sensitive. To protect this information, obfuscation has been applied to conservation-listed species records. For these species, the true location is ±10km from the search area used to generate this species list.

Place Number	Place Name(s)	Address	Local Government	
24537	Limestone Quarry	Chesterfield Rd East Rockingham	Rockingham	
3148	Freshwater Coral Site	2 Lodge Dr East Rockingham	Rockingham	
18482	Kwinana Grain Terminal, Granary Museum & Jetty	Lot 1304 & 1585 Rockingham Beach Rd East Rockingham	Rockingham	
3145	East Rockingham Cemetery	231 Mandurah Rd East Rockingham	Rockingham	
2320	Hymus House and Outbuildings **State Registered Place**	303 Mandurah Rd East Rockingham	Rockingham	
19937	Rockingham Roads Board Site (Roads Boards Office and East Rockingham School - Site)	90 Office Rd East Rockingham	Rockingham	

18488	"Rockingham" Cairn	Lot 439 Rockingham Beach Rd East Rockingham	Rockingham	
9250	Jarrahdale to Rockingham Railway (1872 Heritage Railway, Jarrahdale to Rockingham)	Jarrahdale Road to Val Street Jarrahdale to Rockingham	Serpentine-Jarrahdale	
3841	East Rockingham Heritage Precinct	Rockingham	Rockingham	
4375	Tuart Tree	Ansty Swamp Rockingham	Rockingham	
11613	St Nicholas Church & Z-Force Memorial	Cnr Baralda Crt & Council Av Rockingham	Rockingham	
3205	Rockingham Beach Primary School (Heritage Building)	30 Bay View St Rockingham	Rockingham	
16809	Palm Beach Precinct	bounded by Hymus, Lake & Fisher Sts, & beach parallel to The Esplanade Rockingham	Rockingham	
3243	Rockingham Park Kindergarten (fmr) (Bungaree Kindergarten and Pre Primary)	Lot 716 Centaurus St Rockingham	Rockingham	

19947	Residence, 3 Chalwell Street	3 Chalwell St Rockingham	Rockingham	
2325	Chesterfield Inn (fmr), Rockingham (Chesterfield House, Rockingham Arms (fmr)) **State Registered Place**	Chesterfield Rd Rockingham	Rockingham	
2326	Chesterfield Inn Stables (fmr)	Chesterfield Rd Rockingham	Rockingham	
4863	Date Palm Tree	Civic Bvd Rockingham	Rockingham	
18490	Rockingham Beach Post Office - site	Cnr Kent St & Railway Tce Rockingham	Rockingham	
16784	Rockingham Police Station & Courthouse (fmr)	Cnr of Smythe St & Flinders Lane Rockingham	Rockingham	
119	Rockingham Infant Health Centre	Cnr Wanliss and Smythe Sts Rockingham	Rockingham	

3245	Rockingham Park Underpasses	1 Council Av Rockingham	Rockingham	
4015	Day Cottage (Ellendale, Rockingham Inn) **State Registered Place**	Day Rd Rockingham	Rockingham	
14638	Rockingham Fire Station	Dixon Rd Rockingham	Rockingham	
13053	Flinder's Hall and Rose Garden (fmr)	1 Empress Cnr Rockingham	Rockingham	
18494	Palm Beach Jetty - site (Fisher Street Jetty, Naval Jetty (Site of), Pine Beach Jetty)	end of Fisher St, Palm Beach, Mangles Bay Rockingham	Rockingham	
19932	Carinya Court (Esplanade Flats)	153 Esplanade Rockingham	Rockingham	
19936	Racecourse - Site	Flinders Lane Rockingham	Rockingham	

12990	Rockingham Sunday Markets	Flinders Lane Rockingham	Rockingham	
2328	Uniting Church (Lutheran Church, Methodist Church)	11 Florence St Rockingham	Rockingham	
4501	Garden Island (Bauche Island, Meandip)	Garden Island N of Rockingham	Rockingham	
13778	Z-Force Memorial	Garden Island N of Rockingham	Rockingham	
14639	Rockingham Fire Station	Hefron St Rockingham	Rockingham	
2323	Anglican Church (fmr) (St Nicholas Church)	63-65 Kent Rockingham	Rockingham	
3217	Rockingham Hotel Walls	Kent St Rockingham	Rockingham	

19938	Rockingham Theatres - site	Kent St Rockingham	Rockingham	
2321	Rockingham Hotel (Port Hotel (fmr))	26 Kent St Rockingham	Rockingham	
3218	Rockingham Hotel Trees (4 pine trees)	26-40 Kent St Rockingham	Rockingham	
2324	Second Roads Board Office (fmr) (Rockingham Districts Historical Society, Rockingham Museum)	41 Kent St Rockingham	Rockingham	
18486	Rockingham Beach School - site	9 Kent St Rockingham	Rockingham	
18485	Police Station - site	Lot 8002 Kent St Rockingham	Rockingham	
3225	Rockingham Oval and Memorial (Showground, Village Green, War Memorial)	Kent St, Flinders Lane, Patterson St Rockingham	Rockingham	

4502	Paganoni Swamp & Adjacent Areas	Mandurah Rd Rockingham	Rockingham	
2322	Site of Old Chalwell House	Mandurah Rd Rockingham	Rockingham	
2329	Bell Cottage (ruin), Rockingham (Woodbine) **State Registered Place**	371 Mandurah Rd Rockingham	Rockingham	
18779	Rockingham Jetty	Opposite Railway Rd Rockingham	Rockingham	
18496	Sites of Three Timber Jetties	Palm Beach, west of Railway Tce Rockingham	Rockingham	
18487	Fisher's Bakery - site	175 Parkin St Rockingham	Rockingham	
3150	Millars Cottages (fmr) - Site	196 Parkin St Rockingham	Rockingham	

3370	Lucy Saw Home (Lakeside, Saw Family Home, Serenity Lodge)	65 Parkin St Rockingham	Rockingham	
19935	Golf Course - Site	Cnr Patterson Rd and Read St Rockingham	Rockingham	
4646	Point Peron Recreational Camp	Point Peron Rd Rockingham	Rockingham	
3365	Cape Peron K Battery Complex (Cape Peron Battery Complex, Point Peron "K" Battery) **State Registered Place**	End of Point Peron Rd, Cape Peron Rockingham	Rockingham	
18489	Founders' Memorial	Railway Tce Rockingham	Rockingham	
18484	Timber Railway - site	Railway Tce Rockingham	Rockingham	
18483	Lake Richmond **State Registered Place**	Richmond Av Rockingham	Rockingham	

17865	Rockingham Hotel Site	25 Rockingham Beach Rd Rockingham	Rockingham	
3258	Trocadero Dance Hall - Site (Palais de Dance, The Hostel, Trocadero Dance Hall)	25 Rockingham Beach Rd Rockingham	Rockingham	
17814	Elanora - site (Bell House, Music House)	49 Rockingham Beach Rd Rockingham	Rockingham	
3141	Bell and Churchill Parks	Lot 148-149 Rockingham Beach Rd Rockingham	Rockingham	
3174	Pine Tree (site of) (Lone Pine)	Cnr Rockingham Beach Rd & Wanliss St Rockingham	Rockingham	
26778	Reverend Purdy's House (fmr)	67 Rockingham Beach Road Rockingham	Rockingham	
3147	Frank Churcher's Residence - site	163 Rockingham Rd Rockingham	Rockingham	

3637	Site of Bell Homestead and Pine Tree (Bell House, Lone Pine, Malibu Diving)	43 Rockingham Rd Rockingham	Rockingham	
17316	Rockingham Police Station & CIB	Smyth St Rockingham	Rockingham	
13166	Z-Force Memorial, Rockingham (Catalpa Park)	The Esplanade Rockingham	Rockingham	
13651	Iluka	13 The Esplanade Rockingham	Rockingham	
3146	Cruising Yacht Club (Friday Club)	2 Val St Rockingham	Rockingham	
18491	Masonic Hall	13 Wanliss St Rockingham	Rockingham	

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 04-Jul-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	50
Listed Migratory Species:	49

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	136
Commonwealth Heritage Places:	None
Listed Marine Species:	73
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	17
Key Ecological Features (Marine):	None
Biologically Important Areas:	9
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Becher point wetlands	Within 10km of Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area	In feature area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area	In feature area
Thrombolite (microbial) community of coastal freshwater lakes of the Swan Coastal Plain (Lake Richmond)	Endangered	Community known to occur within area	In feature area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Sternula albifrons Little Tern [82849]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat may occur within area	In buffer area only
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area	In feature area
PLANT			
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In feature area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In feature area
SHARK			
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons Little Tern [82849]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
Carcharias taurus Grey Nurse Shark [64469]		Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - ROCKINGHAM - NAVY CPSO [50135]	WA	In feature area
Unknown		
Commonwealth Land - [51123]	WA	In buffer area only
Commonwealth Land - [50570]	WA	In buffer area only
Commonwealth Land - [50461]	WA	In buffer area only
Commonwealth Land - [50462]	WA	In buffer area only
Commonwealth Land - [50463]	WA	In buffer area only
Commonwealth Land - [50464]	WA	In buffer area only
Commonwealth Land - [50466]	WA	In buffer area only
Commonwealth Land - [50465]	WA	In buffer area only
Commonwealth Land - [50468]	WA	In buffer area only
Commonwealth Land - [50467]	WA	In buffer area only
Commonwealth Land - [50460]	WA	In buffer area only
Commonwealth Land - [50539]	WA	In buffer area only
Commonwealth Land - [50538]	WA	In buffer area only
Commonwealth Land - [50416]	WA	In buffer area only
Commonwealth Land - [50428]	WA	In buffer area only
Commonwealth Land - [50658]	WA	In buffer area only
Commonwealth Land - [50451]	WA	In buffer area only
Commonwealth Land - [50500]	WA	In buffer area only
Commonwealth Land - [50470]	WA	In buffer area only
Commonwealth Land - [50645]	WA	In buffer area only
Commonwealth Land - [50528]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50643]	WA	In buffer area only
Commonwealth Land - [50450]	WA	In buffer area only
Commonwealth Land - [50422]	WA	In buffer area only
Commonwealth Land - [50452]	WA	In buffer area only
Commonwealth Land - [50639]	WA	In buffer area only
Commonwealth Land - [50636]	WA	In buffer area only
Commonwealth Land - [50635]	WA	In buffer area only
Commonwealth Land - [50633]	WA	In feature area
Commonwealth Land - [50638]	WA	In buffer area only
Commonwealth Land - [50657]	WA	In buffer area only
Commonwealth Land - [50498]	WA	In buffer area only
Commonwealth Land - [50656]	WA	In buffer area only
Commonwealth Land - [50497]	WA	In buffer area only
Commonwealth Land - [50495]	WA	In buffer area only
Commonwealth Land - [50499]	WA	In buffer area only
Commonwealth Land - [50496]	WA	In buffer area only
Commonwealth Land - [50490]	WA	In buffer area only
Commonwealth Land - [50434]	WA	In buffer area only
Commonwealth Land - [50622]	WA	In feature area
Commonwealth Land - [50492]	WA	In buffer area only
Commonwealth Land - [50432]	WA	In buffer area only
Commonwealth Land - [50493]	WA	In buffer area only
Commonwealth Land - [50431]	WA	In buffer area only
Commonwealth Land - [50456]	WA	In buffer area only
Commonwealth Land - [50457]	WA	In buffer area only
Commonwealth Land - [50458]	WA	In buffer area only
Commonwealth Land - [50459]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50454]	WA	In buffer area only
Commonwealth Land - [50455]	WA	In buffer area only
Commonwealth Land - [50491]	WA	In buffer area only
Commonwealth Land - [50425]	WA	In buffer area only
Commonwealth Land - [50424]	WA	In feature area
Commonwealth Land - [50548]	WA	In buffer area only
Commonwealth Land - [50549]	WA	In buffer area only
Commonwealth Land - [50611]	WA	In buffer area only
Commonwealth Land - [50544]	WA	In buffer area only
Commonwealth Land - [50545]	WA	In buffer area only
Commonwealth Land - [50543]	WA	In buffer area only
Commonwealth Land - [50441]	WA	In feature area
Commonwealth Land - [50646]	WA	In buffer area only
Commonwealth Land - [50446]	WA	In buffer area only
Commonwealth Land - [50443]	WA	In buffer area only
Commonwealth Land - [50437]	WA	In buffer area only
Commonwealth Land - [50438]	WA	In buffer area only
Commonwealth Land - [50628]	WA	In feature area
Commonwealth Land - [50640]	WA	In buffer area only
Commonwealth Land - [50445]	WA	In buffer area only
Commonwealth Land - [50444]	WA	In buffer area only
Commonwealth Land - [50447]	WA	In buffer area only
Commonwealth Land - [50567]	WA	In buffer area only
Commonwealth Land - [50568]	WA	In buffer area only
Commonwealth Land - [51436]	WA	In feature area
Commonwealth Land - [50629]	WA	In feature area
Commonwealth Land - [51117]	WA	In feature area

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50433]	WA	In buffer area only
Commonwealth Land - [51113]	WA	In feature area
Commonwealth Land - [50569]	WA	In buffer area only
Commonwealth Land - [50618]	WA	In buffer area only
Commonwealth Land - [50615]	WA	In buffer area only
Commonwealth Land - [50616]	WA	In buffer area only
Commonwealth Land - [50617]	WA	In buffer area only
Commonwealth Land - [50580]	WA	In buffer area only
Commonwealth Land - [50503]	WA	In buffer area only
Commonwealth Land - [50509]	WA	In feature area
Commonwealth Land - [50613]	WA	In buffer area only
Commonwealth Land - [50614]	WA	In buffer area only
Commonwealth Land - [50478]	WA	In buffer area only
Commonwealth Land - [50501]	WA	In buffer area only
Commonwealth Land - [50476]	WA	In buffer area only
Commonwealth Land - [50477]	WA	In buffer area only
Commonwealth Land - [50474]	WA	In buffer area only
Commonwealth Land - [50475]	WA	In buffer area only
Commonwealth Land - [50472]	WA	In buffer area only
Commonwealth Land - [50473]	WA	In buffer area only
Commonwealth Land - [50661]	WA	In buffer area only
Commonwealth Land - [50471]	WA	In buffer area only
Commonwealth Land - [50572]	WA	In buffer area only
Commonwealth Land - [50479]	WA	In buffer area only
Commonwealth Land - [50602]	WA	In buffer area only
Commonwealth Land - [50605]	WA	In feature area
Commonwealth Land - [50604]	WA	In feature area

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50591]	WA	In buffer area only
Commonwealth Land - [50590]	WA	In buffer area only
Commonwealth Land - [50597]	WA	In buffer area only
Commonwealth Land - [50469]	WA	In buffer area only
Commonwealth Land - [50609]	WA	In feature area
Commonwealth Land - [50603]	WA	In buffer area only
Commonwealth Land - [50515]	WA	In buffer area only
Commonwealth Land - [50619]	WA	In buffer area only
Commonwealth Land - [50571]	WA	In buffer area only
Commonwealth Land - [50421]	WA	In buffer area only
Commonwealth Land - [50655]	WA	In buffer area only
Commonwealth Land - [50427]	WA	In feature area
Commonwealth Land - [50420]	WA	In buffer area only
Commonwealth Land - [50442]	WA	In buffer area only
Commonwealth Land - [50423]	WA	In buffer area only
Commonwealth Land - [50449]	WA	In buffer area only
Commonwealth Land - [50652]	WA	In buffer area only
Commonwealth Land - [50653]	WA	In buffer area only
Commonwealth Land - [50552]	WA	In buffer area only
Commonwealth Land - [50555]	WA	In buffer area only
Commonwealth Land - [50556]	WA	In buffer area only
Commonwealth Land - [50557]	WA	In buffer area only
Commonwealth Land - [50551]	WA	In feature area
Commonwealth Land - [50659]	WA	In buffer area only
Commonwealth Land - [50488]	WA	In buffer area only
Commonwealth Land - [50480]	WA	In buffer area only
Commonwealth Land - [50481]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50482]	WA	In buffer area only
Commonwealth Land - [50483]	WA	In buffer area only
Commonwealth Land - [50484]	WA	In buffer area only
Commonwealth Land - [50485]	WA	In buffer area only
Commonwealth Land - [50486]	WA	In buffer area only
Commonwealth Land - [50487]	WA	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In feature area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area	In feature area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In feature area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Point Peron	Conservation Park	WA	In buffer area only
Point Peron Reserve	5(1)(h) Reserve	WA	In buffer area only
Shoalwater Islands	Marine Park	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Commercial Development of Lots 12 and 13 Lodge Drive, East Rockingham, WA	2021/9069		Post-Approval	In buffer area only
Controlled action				
Industry Zone	2010/5337	Controlled Action	Post-Approval	In feature area
Mangles Bay Marina Based Tourist Precinct	2010/5659	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
'Looping 10' gas transmission pipeline from Kwinana to	2005/2212	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Hopelands				
Expansion of existing Ammonium Nitrate Production Facility	2005/1941	Not Controlled Action	Completed	In feature area
Gas-fired Power Station	2005/2213	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Kennedy Park Estate Residential Development	2003/1044	Not Controlled Action	Completed	In feature area
Kwinana Gas-Fired Power Station	2005/2101	Not Controlled Action	Completed	In feature area
Palm Beach Caravan Park Redevelopment, Rockingham, WA	2013/6853	Not Controlled Action	Completed	In feature area
Sepia Depression Ocean Outlet Landline Duplication	2012/6248	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Lake Richmond Boardwalk installation, Rockingham, WA	2013/6977	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Multipurpose development stage 1 within 340ha	2004/1913	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
South West Metropolitan Railway Project	2003/1175	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Wastewater Treatment Plant	2009/4970	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Biologically Important Areas

[Resource Information]

Scientific Name	Behaviour	Presence	Buffer Status

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur	In feature area
Eudyptula minor Little Penguin [1085]	Foraging (provisioning young)	Known to occur	In feature area
Hydroprogne caspia Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In feature area
Larus pacificus Pacific Gull [811]	Foraging (in high numbers)	Former Range	In feature area
Onychoprion anaethetus Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In feature area
Puffinus assimilis tunneyi Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In feature area
Sterna dougallii Roseate Tern [817]	Foraging	Known to occur	In feature area
Sternula nereis Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In feature area
Whales			
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.





Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:20:16PM, 03/07/2025

Receipt No:	
ID No:	***64538***

Search Results

This response relates to a search request received for:

7 Mcnicholl Street
Rockingham, WA, null
Subject A On Deposited Plan 405099, part of Lot 359 On Plan 17759, Certificate of Title 2061/784 and 2061/785, 7-29 McNicholl St, Rockingham WA 6168

This parcel belongs to a site that contains 3 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address

7 Mcnicholl Street
Rockingham, WA, null
Subject A On Deposited Plan 405099, part of Lot 359 On Plan 17759, Certificate of Title 2061/784

Parcel Status

Classification: 16/06/2015 - ***Remediated for restricted use***

Nature and Extent of Contamination:

Asbestos containing material within soil is present within the footprint of the site and is covered by an approximately 1m thick capping layer.

Restrictions on Use:

Due to the presence of asbestos-impacted fill in containment cells below geotextile warning barrier, the ongoing site management plan must be implemented to avoid any unnecessary disturbance of fill material beneath the warning barrier.

Reason for Classification:

A contamination assessment was carried out between 2011 and 2014 in order to comply with a condition that had been placed by the Western Australian Planning Commission (WAPC) on Lot 359 McNicholl Street, Rockingham as part of the planning approval process. This classification relates only to the three proposed development lots, Subject 'A', 'B', and 'C' on Interest Only Deposited Plan 405099 (the site).

An adjacent site to the east of Lot 359 was used as an uncontrolled landfill prior to 1980 which extended onto the south eastern portion of Lot 359 including this site. An uncontrolled landfill is a land use that has the potential to cause contamination, as specified in the guideline 'Assessment and Management of Contaminated Sites' (Department of Environment Regulation, 2014).

Site investigations and remediation which included soil and groundwater analysis, landfill gas survey, and soil remediation were undertaken between March 2011 and December 2014.

The soil investigations identified the metal zinc in soil at concentrations exceeding Ecological Investigation Levels, but below Health-based Investigation Levels as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment and Conservation, 2010).

Disclaimer
This Summary of Records has been prepared by Department of Water and Environmental Regulation (DWER) as a requirement of the Contaminated Sites Act 2003. DWER makes every effort to ensure the accuracy, currency and reliability of this information at the time it was prepared, however advises that due to the ability of contamination to potentially change in nature and extent over time, circumstances may have changed since the information was originally provided. Users must exercise their own skill and care when interpreting the information contained within this Summary of Records and, where applicable, obtain independent professional advice appropriate to their circumstances. In no event will DWER, its agents or employees be held responsible for any loss or damage arising from any use of or reliance on this information. Additionally, the Summary of Records must not be reproduced or supplied to third parties except in full and unabridged form.

Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:20:17PM, 03/07/2025

Soil investigations identifying potential asbestos containing material (PACM) were conducted between May 2011 and July 2012. Fragments of asbestos cement sheeting were present in soils at quantities in excess of residential use with minimal soil access levels as specified in 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' (Department of Health, May 2009).

Remediation works were completed between September and December 2014. The remedial works involved removing the asbestos impacted fill layer down to virgin soil from across the site and the remainder of Lot 359, and placing it within containment cells within the footprint of the three proposed development lots. The containment cells were excavated to a depth of approximately 4.5m below surface level, filled with the asbestos impacted soil, covered with a geotextile membrane followed by an approximate 1 metre of clean natural virgin soils obtained from the excavation of the containment cells. Surplus asbestos impacted fill was disposed off-site to landfill.

Groundwater was investigated for the presence of nutrients between June 2012 and September 2012. A further groundwater investigation was completed in February 2013 to identify other chemicals of potential concern. No potential contaminants were detected in the groundwater above non-potable use of groundwater, as published in the 'Assessment and management of contaminated sites' (DER, 2014).

A landfill gas survey was conducted in February 2013, to assess the presence of landfill gas associated with the historic uncontrolled landfill. However, no landfill gas impacts were identified.

The investigations and site works were the subject of an independent review by an accredited contaminated sites auditor who provided a mandatory auditor's report (MAR) dated 23 February 2015. The MAR recommended that the site is suitable for the proposed medium-high density residential land use, and mixed use development land use. DER and the Department of Health accept the findings of the MAR.

Based on the information provided, the site is suitable for the proposed high-density residential land use provided as the endorsed Ongoing Site Management Plan for the site dated April 2015 is implemented, including managing any excavation below the geotextile warning barrier.

As the site is contaminated and has been remediated such that it is suitable for the proposed medium-high density residential land use, and mixed use development land use, subject to implementation of the Ongoing Site Management Plan, the site is classified as 'remediated for restricted use'.

No excavation may be undertaken in containment cell areas without a task/project specific risk assessment being first undertaken. In the event that the excavation will result in encountering the asbestos contaminated fill, then a health and asbestos management plan must be implemented. The asbestos management plan will be project specific and as such cannot be produced until such time as the proposed excavation in these areas is being planned.

DER, in consultation with the Department of Health, has classified this site based on the information available to DER at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DER, and as such, the usefulness of this information may be limited.

In accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, DER recommends that analytical testing should be carried out to determine whether the

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:20:17PM, 03/07/2025

	groundwater is suitable for its intended use. **Action Required:** Due to the presence of asbestos-impacted fill in containment cells below geotextile warning barrier, the ongoing site management plan must be implemented to avoid any unnecessary disturbance of fill material beneath the warning barrier. No excavation may be undertaken in containment cell areas without a task/project specific risk assessment being first undertaken. In the event that the excavation will result in encountering the asbestos contaminated fill, then a health and asbestos management plan must be implemented. The asbestos management plan will be project specific and as such cannot be produced until such time as the proposed excavation in these areas is being planned.
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Environment Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** ***Nil*** **Date Issued:** ***Nil***
General	No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:20:45PM, 03/07/2025

Receipt No:	
ID No:	***78438***

Search Results

This response relates to a search request received for:

5 Market St
Rockingham, WA, 6168

This parcel belongs to a site that contains 2 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	5 Market St Rockingham, WA, 6168
Lot on Plan Address	Lot 9 On Diagram 86080
Parcel Status	**Classification:** 02/02/2022 - ***Remediated for restricted use***

Nature and Extent of Contamination:

Asbestos-impacted fill material is present across the site below a geofabric warning barrier and a layer of clean capping material comprising orange/brown sand. The sand cap above the warning barrier is on average 0.55 metres thick, with a minimum thickness of 0.26 metres along the site's western boundary.

Restrictions on Use:

Due to the presence of asbestos-contaminated fill below the geofabric warning barrier and orange/brown sand cap, the site management plan dated 20 December 2021 (Environmental Site Services) is required to be implemented. The Site Management Plan can be requested from the department for a fee via a detailed summary of records request.

In accordance with the SMP, any change in land use or redevelopment of the site will require an update to the SMP.

Ground-disturbing works at the site are required to be undertaken in accordance with the management controls set out in the site management plan.

If redevelopment works require disturbance of the asbestos-contaminated fill beneath the geofabric warning barrier, a project-specific management plan (e.g. a 'remedial action plan' or a 'construction environmental management plan') will be required to be developed and implemented.

Reason for Classification:

This site comprises Lot 9 Market Street and Lot 10 on Diagram 86080, Rockingham, and was reported to the Department of Water and Environmental Regulation (the department) under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006. The site was first classified under section 13 of the Act based on information submitted to the department by January 2021. The site has been classified again under section 13 of the Act to reflect additional

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:20:45PM, 03/07/2025

technical information submitted to the department by December 2021.

The site was reported, along with adjacent land parcels, because fragments of asbestos-containing material (ACM) were found to be present in surface soils across the site. Anecdotal evidence indicates that the site was historically used as an uncontrolled landfill prior to 1953 and is therefore suspected of being the source of the ACM. Landfilling is a land use which has the potential to cause contamination, as specified in the guideline 'Assessment and management of contaminated sites' (Department of Water and Environmental Regulation, 2021). The site was vacant at the time of being reported, and remained vacant at the time of this classification, pending future redevelopment.

A soil investigation, carried out in January 2021, found that a layer of uncontrolled fill material was present across the site to a depth of one metre below ground level (bgl) and is underlain by natural sands. The uncontrolled fill layer was found to extend deeper in the northern portion (i.e. 0.9 to 1 metre bgl) compared to the southern and central portions (i.e. 0.4 to 0.7 metres bgl) of the site. The fill comprised mainly of sand with some inert waste such as concrete, gravel, brick and glass. Soil sampling also found that ACM fragments and asbestos fines were present within the uncontrolled fill layer at quantities exceeding the assessment criteria specified in 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' (Department of Health, 2021) for all land uses.

A remedial action plan (RAP) was developed for the site in May 2021 that proposed the excavation and off-site disposal of asbestos-impacted fill material. Remedial works were commenced in June 2021 and comprised the excavation and offsite disposal of approximately 2620 cubic metres of fill material. A subsequent validation assessment found that ACM and asbestos fines remained at the site within deeper depositions of fill material. The depth of fill material remaining at the site was estimated to be up to 1.2 metres bgl. Due to the depth of fill remaining, further remedial works were ceased and an alternative remedial strategy developed.

An interim site management plan was developed for the site in July 2021 (finalised in September 2021) to mitigate potential risks posed by asbestos at the site pending further remediation and management works being completed.

A further RAP was developed for the site in July 2021 and, following consultation with Department of Health, finalised in September 2021.

Site remediation works were undertaken at the site during October and November 2021 in accordance with the September 2021 RAP. Remedial works comprised the removal of visible ACM from the soil surface prior to the installation of a grey-coloured geofabric warning barrier, followed by the placement of approximately 1814 cubic metres of capping fill material. The imported fill material overlying the warning barrier, an orange-brown coloured sand, was demonstrated to be free of contamination and suitable for use at the site.

Surveys completed prior to and post remedial works confirmed the sand cap above the warning barrier is on average 0.55 metres thick, with a minimum thickness of 0.26 metres along the site's western boundary. At the completion of remedial works the sand cap was 'hydroseeded' to stabilise the soil surface and minimise erosion.

No groundwater investigations have been undertaken at the site and the condition of groundwater beneath the site is unknown. However, based on the nature and extent of contamination identified at the site, there is no evidence to indicate that groundwater quality beneath the site has been impacted.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:20:45PM, 03/07/2025

	Due to the presence of asbestos-contaminated fill material beneath the sand cap and geofabric warning barrier, a site management plan (SMP), dated 20 December 2021, has been prepared for the site. The SMP sets out management controls for ground-disturbing works at the site including disturbance beneath the geofabric warning barrier. Provided the capping system remains undisturbed, and the SMP is implemented, the site appears suitable for potential residential and/or commercial uses consistent with the site's zoning. Any redevelopment of the site will require the SMP to be updated. As noted in the SMP, if future redevelopment of the site requires disturbance of the asbestos-contaminated fill beneath the geofabric warning barrier, a project-specific management plan (e.g. a 'remedial action plan' or a 'construction environmental management plan') will be required to be developed and implemented. The site is contaminated and has been remediated such that it is suitable for future commercial and residential uses, subject to implementation of the SMP. Therefore, the site is classified as 'remediated for restricted use'. The department, in consultation with the Department of Health, has classified this site based on the information available to the department at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to the department, and as such, the usefulness of this information may be limited. In accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, the department recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use. **Other Relevant Information:** Additional information included herein is relevant to the contamination status of the site and includes the department's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification. Where the land is part of a transaction - sale, mortgagee or lease agreement, the land owners MUST PROVIDE WRITTEN DISCLOSURE (on the prescribed Form 6) of the site's status to any potential owner, mortgagee (e.g. financial institutions) or lessee at least 14 days before the completion of the transaction. A copy of the disclosure must also be forwarded to the department. **Action Required:** Please refer to the Restrictions on Use applicable to the site.
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Water and Environmental Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** ***Nil*** **Date Issued:** ***Nil***
General	No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:21:01PM, 03/07/2025

Receipt No:	
ID No:	***78439***

Search Results

This response relates to a search request received for:

Lot 10 On Diagram 86080
Rockingham, WA, 6168

This parcel belongs to a site that contains 2 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	Lot 10 On Diagram 86080 Rockingham, WA, 6168
Lot on Plan Address	Lot 10 On Diagram 86080
Parcel Status	**Classification:** 02/02/2022 - ***Remediated for restricted use*** **Nature and Extent of Contamination:** Asbestos-impacted fill material is present across the site below a geofabric warning barrier and a layer of clean capping material comprising orange/brown sand. The sand cap above the warning barrier is on average 0.55 metres thick, with a minimum thickness of 0.26 metres along the site's western boundary. **Restrictions on Use:** Due to the presence of asbestos-contaminated fill below the geofabric warning barrier and orange/brown sand cap, the site management plan dated 20 December 2021 (Environmental Site Services) is required to be implemented. The Site Management Plan can be requested from the department for a fee via a detailed summary of records request. In accordance with the SMP, any change in land use or redevelopment of the site will require an update to the SMP. Ground-disturbing works at the site are required to be undertaken in accordance with the management controls set out in the site management plan. If redevelopment works require disturbance of the asbestos-contaminated fill beneath the geofabric warning barrier, a project-specific management plan (e.g. a 'remedial action plan' or a 'construction environmental management plan') will be required to be developed and implemented. **Reason for Classification:** This site comprises Lot 9 Market Street and Lot 10 on Diagram 86080, Rockingham, and was reported to the Department of Water and Environmental Regulation (the department) under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006. The site was first classified under section 13 of the Act based on information submitted to the department by January 2021. The site has been classified again under section 13 of the Act to reflect additional

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:21:01PM, 03/07/2025

technical information submitted to the department by December 2021.

The site was reported, along with adjacent land parcels, because fragments of asbestos-containing material (ACM) were found to be present in surface soils across the site. Anecdotal evidence indicates that the site was historically used as an uncontrolled landfill prior to 1953 and is therefore suspected of being the source of the ACM. Landfilling is a land use which has the potential to cause contamination, as specified in the guideline 'Assessment and management of contaminated sites' (Department of Water and Environmental Regulation, 2021). The site was vacant at the time of being reported, and remained vacant at the time of this classification, pending future redevelopment.

A soil investigation, carried out in January 2021, found that a layer of uncontrolled fill material was present across the site to a depth of one metre below ground level (bgl) and is underlain by natural sands. The uncontrolled fill layer was found to extend deeper in the northern portion (i.e. 0.9 to 1 metre bgl) compared to the southern and central portions (i.e. 0.4 to 0.7 metres bgl) of the site. The fill comprised mainly of sand with some inert waste such as concrete, gravel, brick and glass. Soil sampling also found that ACM fragments and asbestos fines were present within the uncontrolled fill layer at quantities exceeding the assessment criteria specified in 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' (Department of Health, 2021) for all land uses.

A remedial action plan (RAP) was developed for the site in May 2021 that proposed the excavation and off-site disposal of asbestos-impacted fill material. Remedial works were commenced in June 2021 and comprised the excavation and offsite disposal of approximately 2620 cubic metres of fill material. A subsequent validation assessment found that ACM and asbestos fines remained at the site within deeper depositions of fill material. The depth of fill material remaining at the site was estimated to be up to 1.2 metres bgl. Due to the depth of fill remaining, further remedial works were ceased and an alternative remedial strategy developed.

An interim site management plan was developed for the site in July 2021 (finalised in September 2021) to mitigate potential risks posed by asbestos at the site pending further remediation and management works being completed.

A further RAP was developed for the site in July 2021 and, following consultation with Department of Health, finalised in September 2021.

Site remediation works were undertaken at the site during October and November 2021 in accordance with the September 2021 RAP. Remedial works comprised the removal of visible ACM from the soil surface prior to the installation of a grey-coloured geofabric warning barrier, followed by the placement of approximately 1814 cubic metres of capping fill material. The imported fill material overlying the warning barrier, an orange-brown coloured sand, was demonstrated to be free of contamination and suitable for use at the site.

Surveys completed prior to and post remedial works confirmed the sand cap above the warning barrier is on average 0.55 metres thick, with a minimum thickness of 0.26 metres along the site's western boundary. At the completion of remedial works the sand cap was 'hydroseeded' to stabilise the soil surface and minimise erosion.

No groundwater investigations have been undertaken at the site and the condition of groundwater beneath the site is unknown. However, based on the nature and extent of contamination identified at the site, there is no evidence to indicate that groundwater quality beneath the site has been impacted.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:21:01PM, 03/07/2025

	Due to the presence of asbestos-contaminated fill material beneath the sand cap and geofabric warning barrier, a site management plan (SMP), dated 20 December 2021, has been prepared for the site. The SMP sets out management controls for ground-disturbing works at the site including disturbance beneath the geofabric warning barrier. Provided the capping system remains undisturbed, and the SMP is implemented, the site appears suitable for potential residential and/or commercial uses consistent with the site's zoning. Any redevelopment of the site will require the SMP to be updated. As noted in the SMP, if future redevelopment of the site requires disturbance of the asbestos-contaminated fill beneath the geofabric warning barrier, a project-specific management plan (e.g. a 'remedial action plan' or a 'construction environmental management plan') will be required to be developed and implemented. The site is contaminated and has been remediated such that it is suitable for future commercial and residential uses, subject to implementation of the SMP. Therefore, the site is classified as 'remediated for restricted use'. The department, in consultation with the Department of Health, has classified this site based on the information available to the department at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to the department, and as such, the usefulness of this information may be limited. In accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, the department recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use. **Other Relevant Information:** Additional information included herein is relevant to the contamination status of the site and includes the department's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification. Where the land is part of a transaction - sale, mortgagee or lease agreement, the land owners MUST PROVIDE WRITTEN DISCLOSURE (on the prescribed Form 6) of the site's status to any potential owner, mortgagee (e.g. financial institutions) or lessee at least 14 days before the completion of the transaction. A copy of the disclosure must also be forwarded to the department. **Action Required:** Please refer to the Restrictions on Use applicable to the site.
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "remediated for restricted use". For further information on the contamination status of this site, please contact Contaminated Sites at the Department of Water and Environmental Regulation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** ***Nil*** **Date Issued:** ***Nil***
General	No other information relating to this parcel.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:18:20PM, 03/07/2025

Receipt No:	
ID No:	***12867***

Search Results

This response relates to a search request received for:

25 Rockingham Beach Rd
Rockingham, WA, 6168

This parcel belongs to a site that contains 1 parcel(s).

According to Department of Water and Environmental Regulation records, this land has been reported as a known or suspected contaminated site.

Address	25 Rockingham Beach Rd Rockingham, WA, 6168
Lot on Plan Address	Lot 99 On Diagram 88032
Parcel Status	**Classification:** 31/03/2011 - ***Contaminated - remediation required***

Nature and Extent of Contamination:

Free-phase hydrocarbons (such as from petrol) are present in groundwater beneath the site and a dissolved phase hydrocarbon plume is present in groundwater.

Soil beneath remote fill points in the south eastern portion of the site is impacted with hydrocarbons.

Restrictions on Use:

Other than for analytical testing or remediation, groundwater abstraction is not permitted at this site because of the nature and extent of groundwater contamination.

Reason for Classification:

This site was reported to the Department of Environment and Conservation (DEC) as per reporting obligations under section 11 of the 'Contaminated Sites Act 2003', which commenced on 1 December 2006. The site classification is based on information submitted to DEC by October 2010.

This site is currently used as a service station, which has been operating since the 1980's. This is a land use that has the potential to cause contamination, as specified in the guideline 'Potentially Contaminating Activities, Industries and Landuses' (Department of Environment, 2004).

The site was reported because environmental investigations undertaken in 2000 detected the presence of hydrocarbons in the soil and groundwater beneath the site.

The investigations found that hydrocarbons (such as from petrol) were present in soils at concentrations exceeding Health-based Investigation Levels for commercial and industrial sites and Ecological Investigation Levels, as published in 'Assessment Levels for Soil, Sediment and Water' (Department of Environment and Conservation, 2010), in the vicinity of the remote fills points in the south eastern corner of the site.

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Contaminated Sites Act 2003
Basic Summary of Records Search Response

Report generated at 02:18:20PM, 03/07/2025

	DEC understands that some soil remediation involving excavation and off-site disposal works were carried out in 2004; however, impacted soil still remains on the site. Several groundwater investigations conducted at the site between 2003 and 2010 indentified hydrocarbons (such as from petrol or diesel) in groundwater at concentrations exceeding Groundwater Intervention Values (Netherlands Ministry for Housing, Spatial Planning and Environment, 2000). Additionally, free-phase hydrocarbons (such as pure petrol) were detected floating on the surface of the groundwater. Groundwater monitoring results from September 2010 indicate that the level of hydrocarbon impact in the groundwater may be naturally attenuating; however further monitoring is required to confirm this. As an appropriate Health Risk Assessment has not been carried out, DEC cannot comment on the suitability of the site for continued use as a service station. As free-phase hydrocarbons (from petrol) are present in the groundwater and hydrocarbons are present in the soil, acting as a significant source of dissolved-phase groundwater contamination, which may present a risk to human health, the environment, or environmental values, the site is classified as 'contaminated - remediation required'. A memorial stating the site's classification has been placed on the Certificate of Title, and will notify any prospective owners of the contamination status of the site. DEC understands that Monitored Natural Attenuation (MNA) has been proposed as a groundwater remediation technology. However, further investigations are required, in accordance with the guideline "Use of Monitored Natural Attenuation for Groundwater Remediation" (Department of Environment, April 2004), to determine whether MNA will be viable at the site. DEC, in consultation with the Department of Health, has classified this site based on the information available to DEC at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to DEC, and as such, the usefulness of this information may be limited.
Certificate of Title Memorial	Under the Contaminated Sites Act 2003, this site has been classified as "contaminated - remediation required". For further information on the contamination status of this site, please contact the Contaminated Sites section of the Department of Environment & Conservation.
Current Regulatory Notice Issued	**Type of Regulatory Notice:** ***Nil*** **Date Issued:** ***Nil***
General	No other information relating to this parcel.

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About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- A factual report of the condition of a portion of the site or one aspect of an entire site.
- Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- Validation of the success of remediation of a site or a portion of a site.
- Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide "environmental sign-off" of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants' duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.12005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the "hot spot" method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as "residential – low density", "commercial" etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a "snapshot" of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

About Cardno

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www.cardno.com

Rockingham Precinct Structure Plan

Transport Impact Assessment

Stantec

Prepared for:
City of Rockingham

Prepared by:
Sophie Gittins

Date:
11 December 2025

Project/File:
300204265

Stantec Australia Pty Ltd

Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer	Independent Reviewer	Project Manager Final Approval
001	09/10/2025	Draft	SG	DH / PM	RI	DH
002	27/10/2025	Final	SG	DH / PM	RI	DH
003	11/12/2025	Final	SG	DH / PM	RI	DH

Disclaimer

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Table of Contents

1 Introduction 5
1.1 Background 5
1.2 Study Area Context 5

2 Road Network Review 8
2.1 Traffic Volumes 9
2.2 High Level Road Network Safety Review 12
2.3 Key Issues and Potential Treatments of Road Network 16
2.4 Future Intersection Upgrades 19
2.5 Potential Upgrades to Other Intersections 21
2.5.1 Central Promenade / Syren Street / Civic Boulevard Intersection 21
2.5.2 Kent Street / Flinders Lane 21
2.5.3 Rockingham Beach Road / Flinders Lane 21

3 Public Transport 22
3.1 Existing Public Transport 22
3.2 Future Public Transport Proposals 23
3.2.1 Endorsed RCCTS 23
3.2.2 Proposed RCCTS 24
3.2.3 Potential Implementation of the Proposed RCCTS 26
3.2.4 Transition to Trackless Tram 27
3.3 Future Planned Public Transport Upgrades 27

4 Active Transportation 28
4.1 Existing Pedestrian and Cycling Network 28
4.2 New Shared Path 29
4.2.1 Goddard / Louise Street to Council Avenue 29
4.2.2 Flinders Lane 29
4.2.3 Anzac Park 29
4.2.4 Victoria Street 29
4.3 Shared Path Upgrade – Wanliss Street 29
4.4 Good Road Riding Environment (Contest Parade / Central Promenade / Whitfield Street from Council Avenue to Chalgrove Avenue) 30
4.5 E-rideable 30

5 Transport Mode Share 31
5.1.1 Employees 31
5.1.2 Residential Journey to Work 31
5.2 Future Mode Share 32
5.2.1 Peripheral Activity Centre 32
5.2.2 Public Transport Improvements 32
5.2.3 Bike Shares 32
5.2.4 Car Sharing and Autonomous Vehicles 33

6 Parking 33
6.1 Existing Key Parking Concerns 33
6.1.1 Waterfront Village Sector 33
6.1.2 City Centre Sector 33
6.1.3 Reciprocal Parking Easement – Along Dixon Road 33
6.2 Future Parking Improvements 34
6.2.1 Decked Car Park – City Centre 34
6.2.2 Foreshore Parking Provision 34
6.2.3 Overflow Parking 34
6.3 Loading Bays within Town Centre 34

7 RAV Network 35
8 Proposed Development Yields 36
8.1.1 2009 City of Rockingham Precinct Structure Plan Development Yields 39
8.1.2 2025 Rockingham Strategic Centre (RSC) Precinct Plan Development Yields 40
8.2 'NET' Yield 41

9 Analysis of Transport Network 43
9.1 Analysis Overview 43
9.1.1 Data Sources 43
9.2 Analysis Scenarios 43
9.3 Key Assumptions 43
9.4 Estimated Growth Rates 44
9.5 Comparison of Traffic Generation 45
9.6 Trip Distribution 49
9.7 Background and Development Traffic 49

10 Key Intersection Analysis 54
10.1.1 SIDRA Results Definition 54
10.1.2 Modelling Limitations 54
10.2 SIDRA Analysis Results 55
10.2.1 Patterson Road and Read Street Intersection 55
10.2.2 Patterson Road and Ennis Avenue Intersection 57
10.2.3 Ennis Avenue and Dixon Road Intersection 59
10.2.4 Ennis Avenue and Council Avenue Intersection 62
10.2.5 Ennis Avenue and Rae Road Intersection 65
10.2.6 Read Street and Chalgrove Avenue Intersection 68
10.2.7 Read Street and Council Avenue Intersection 72
10.2.8 Read Street and Rae Road Intersection 74
10.3 SIDRA Results Summary 78

11 Potential Intersection Mitigation Measures 80
11.1 Future Lane Widening 80
11.1.1 Read Street / Chalgrove Avenue with Mitigation Measure 81
11.1.2 Read Street / Council Avenue with Mitigation Measure 83
11.2 Modal Shift and Public Transport Investment 87
11.2.1 Future Mode Share Targets For the Rockingham Strategic Centre (RSC) Precinct Plan 87
11.2.2 Implementation Plan 88

12 Summary and Conclusions 90
12.1.1 Existing Situation 90
12.1.2 Planned Approach 90

List of Tables

Table 2-1. Chalgrove Avenue – Central Promenade intersection
Table 2-2. Central Promenade – Syren & Civic Boulevard intersection
Table 2-3. Kent Street – Wanliss Street intersection
Table 2-4. Flinders Lane – Kent Street intersection
Table 2-5. Patterson Road – Thorpe Street intersection
Table 2-6. Key issues and potential treatments of intersections identified
Table 5-1. Mode of transportation (Rockingham)
Table 8-1 Difference in Lots - Catchment 963
Table 8-2 Difference in Lots - Catchment 964
Table 8-3 Difference in Lots - Catchment 974
Table 8-4 Difference in Lots - Catchment 975
Table 8-5 Difference in Lots - Catchment 977

Table 8-6 Difference in Floorspace/ Land Area between the 2009 PSP and the 2025 PSP for Precinct 8
Table 8-7. 2009 residential yield (dwellings)
Table 8-8. 2009 non-residential development yield (sqm)
Table 8-9. 2025 residential development yield (dwellings)
Table 8-10. 2025 non-residential development yield (sqm)
Table 8-11. Residential NET yield (dwellings)
Table 8-12. Non-residential NET yield (sqm)
Table 9-1. Estimated growth rates
Table 9-2. Trip generation rate
Table 9-3. Directional distribution
Table 9-4 2009 PSP trip generation
Table 9-5 2025 PSP trip generation
Table 9-6. Estimated NET reduction in trip generation
Table 10-1. Level of Service (LoS) performance criteria
Table 10-2. SIDRA results: Patterson Road / Read Street intersection – scenario 1 - 2025 baseline
Table 10-3. SIDRA results: Patterson Road / Read Street intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-4. SIDRA results: Patterson Road / Ennis Avenue intersection – scenario 1 - 2025 baseline
Table 10-5. SIDRA results: Patterson Road / Ennis Avenue intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-6. SIDRA results: Ennis Avenue / Dixon Road intersection – scenario 1 - 2025 baseline
Table 10-7. SIDRA results: Ennis Ave / Dixon Rd intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-8. SIDRA results: Ennis Avenue / Council Avenue intersection – scenario 1 - 2025 baseline
Table 10-9. SIDRA results: Ennis Avenue / Council Avenue intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-10. SIDRA results: Ennis Avenue / Rae Road intersection – scenario 1- 2025 baseline
Table 10-11. SIDRA results: Ennis Avenue / Rae Road intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-12. SIDRA results: Read Street / Chalgrove Avenue intersection – scenario 1 - 2025 baseline
Table 10-13. SIDRA results: Read Street / Chalgrove Avenue intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-14. SIDRA results: Read Street / Council Avenue intersection – scenario 1 - 2025 baseline
Table 10-15. SIDRA Results: Read St / Council Ave intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-16. SIDRA results: Read Street / Rae Road intersection – scenario 1 - 2025 baseline
Table 10-17. SIDRA results: Read Street / Rae Road intersection – scenario 2 - 2041 future traffic with ultimate development
Table 10-18. SIDRA results summary
Table 11-1. SIDRA results: Read Street / Chalgrove Avenue intersection – 2041 future traffic with ultimate development – mitigated scenario
Table 11-2. SIDRA results: Read Street / Council Avenue intersection – 2041 future traffic with ultimate development – mitigated scenario
Table 11-3 Measures to Facilitate Alternative Transport
Table 11-4 Monitoring Frequency

List of Figures

Figure 1-1. Study area
Figure 1-2. Existing intersection controls within the study area (traffic signal and roundabout)
Figure 2-1. Main Roads WA functional road hierarchy
Figure 2-2. ROM 24 plot link 2021
Figure 2-3. ROM 24 plot link - 2041

Figure 2-4. Main roads identified intersections for further assessment
Figure 2-5. Rockingham City Centre precinct 1
Figure 2-6. Rockingham waterfront precinct 2
Figure 2-7. Rockingham light industrial area precinct 8
Figure 2-8. Initial review outcome - potential treatments and intersection location
Figure 2-9. Patterson Road & Read Street proposed upgrades
Figure 3-1. Public transport network
Figure 3-2. Currently endorsed RCCTS route and network
Figure 3-3. Proposed RCCTS route
Figure 3-4. Suggested route to waterfront village
Figure 4-1. Existing cycling and pedestrian facilities
Figure 4-2. E-rideable rules
Figure 5-1. Journey to work mode split (City of Rockingham)
Figure 7-1. MRWA HVS network map (RAV 4)
Figure 8-1 Difference in Land Area 2009 PSP vs 2025 PSP
Figure 8-2. 2025 Development yields distributed across ROM24 zonal system
Figure 9-1 Traffic Count Locations to obtain 2023-2025 growth rate along Ennis Ave
Figure 9-2. 2025 traffic flow diagrams
Figure 9-3. 2041 traffic flow figures
Figure 10-1. Patterson Road and Read Street intersection
Figure 10-2. Patterson Road and Ennis Aveune intersection
Figure 10-3. Ennis Avenue and Dixon Road intersection
Figure 10-4. Ennis Avenue and Council Avenue intersection
Figure 10-5. Ennis Avenue and Rae Road intersection
Figure 10-6. Read Street and Chalgrove Avenue intersection
Figure 10-7. Read Street and Council Avenue intersection
Figure 10-8. Read Street and Rae Road intersection
Figure 11-1. Existing underpass Read Street
Figure 11-2. Proposed mitigation to intersection layout Read Street / Chalgrove Avenue
Figure 11-3. Proposed mitigation to intersection layout Read Street / Council Avenue

List of Appendices

Appendix A ROM 24 Plots
Appendix B Hames Sharley Technical Memo
Appendix C ROM 24 Zonal Distribution
Appendix D Council Link Counts
Appendix E SIDRA Results
Appendix F SIDRA with Mitigation Results

1 Introduction

1.1 Background

Stantec has been has commissioned by Hames Sharley on behalf of the City of Rockingham to prepare a Traffic Impact Assessment report for the proposed amendment to the Rockingham Strategic Centre (RSC) Precinct Plan and Town Planning Scheme (TPS), focusing on transport requirements, opportunities, constraints, and assessment of potential future transport scenarios.

This Transport Impact Assessment (TIA) is provided as an update to the previous report prepared by Cardno dated March 2022 (CW1181500) and aims to address comments received by Main Roads WA. These comments are as follows:

- *The Transport Impact Assessment (TIA) is uncertain and requires amendment, in accordance with Transport Impact Assessment Guidelines (August 2016) and electronic SIDRA Intersection files (.sip) in Version 9, as appropriate.*
- *The TIA does not provide a development yield or forecast of land-use to projected trips generated by the Structure Plan. This is required to understand future intersection upgrades to Ennis Avenue and impacts to the State Road Network.*
- *Section 2.2 – It is unclear whether the ROM24 forecasts provided can be used without including the impacts of Westport or the Fremantle Rockingham Controlled Access Highway projects.*

This TIA also includes a comparison of the development yields associated with the 2025 Rockingham Strategic Centre (RSC) Precinct Plan and the previous 2009 City of Rockingham Precinct Structure Plan (CoRPSP). This report has been prepared in reference to the *WAPC State Planning Policy 7.2, Precinct Design Guidelines.*

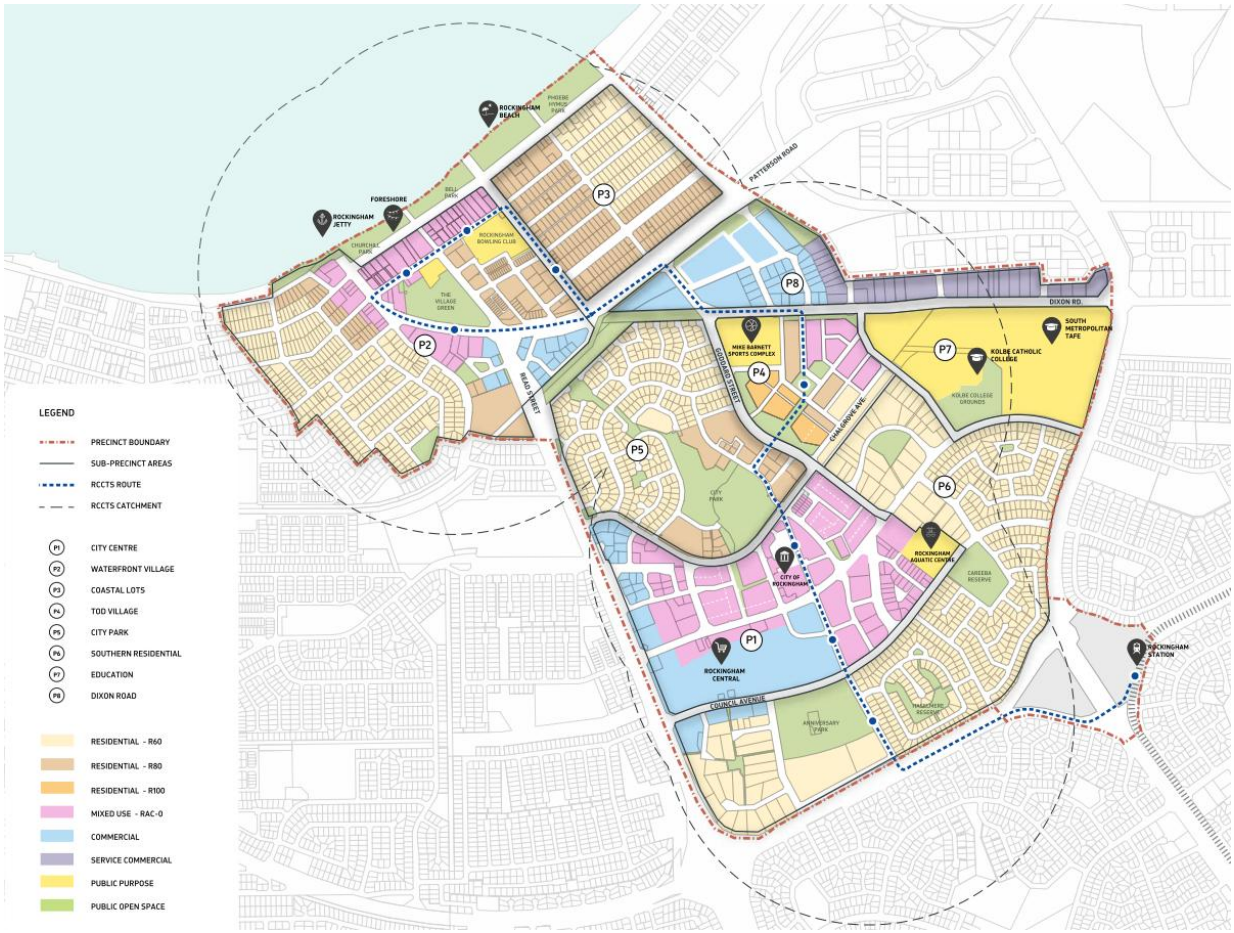
1.2 Study Area Context

The RSC Precinct Plan Study Area is illustrated in **Figure 1-1** and comprises of eight precincts as listed below:

- P1 – City Centre
- P2 – Waterfront Village
- P3 – Coastal Lots
- P4 – TOD village
- P5 - City Park
- P6 - Southern Residential
- P7 – Education
- P8 – Dixon Road

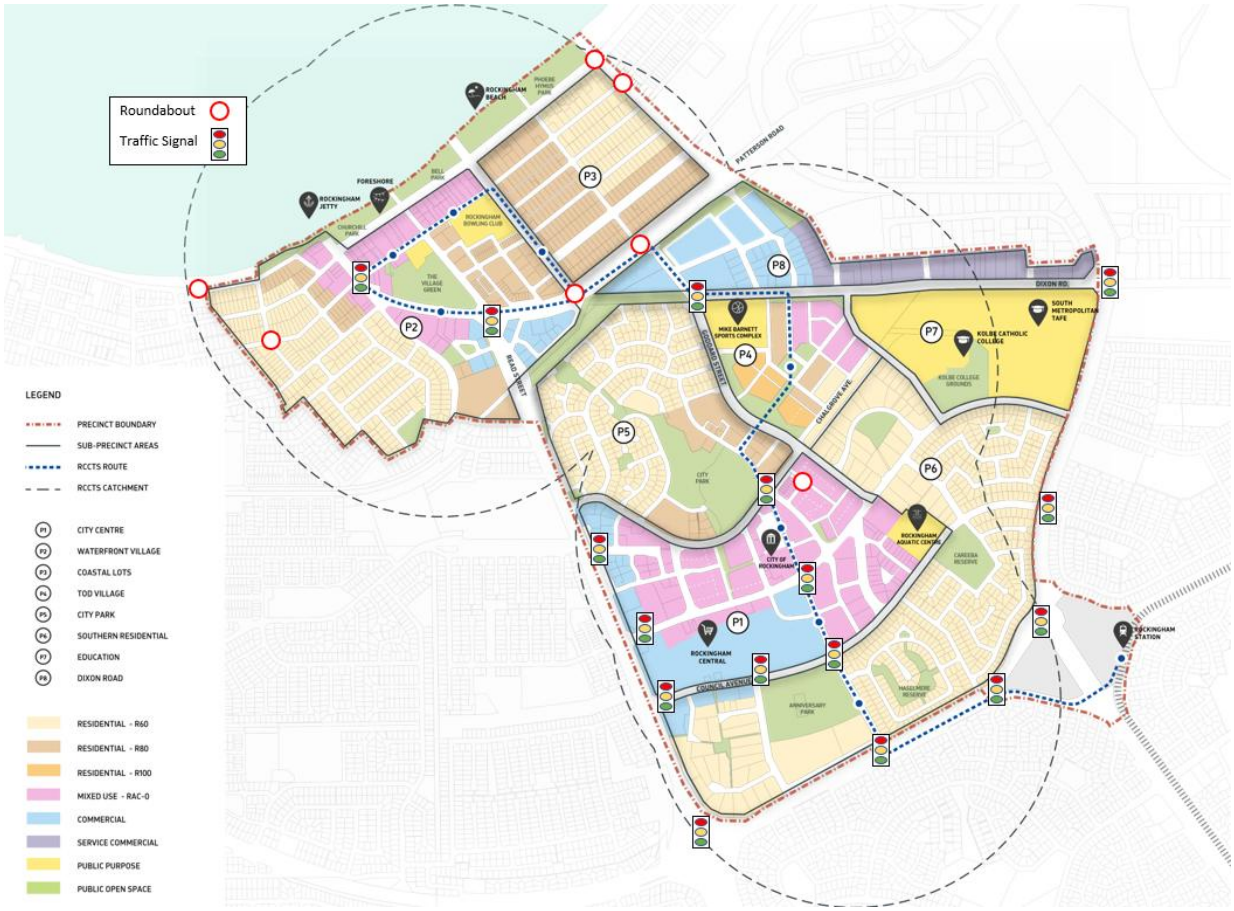
Existing intersection controls (traffic signal and roundabouts) within the RSC Precinct Plan Study Area are shown in **Figure 1-2.**

Figure 1-1. Study area



Source: Hames Sharley

Figure 1-2. Existing intersection controls within the study area (traffic signal and roundabout)



Source: Hames Sharley

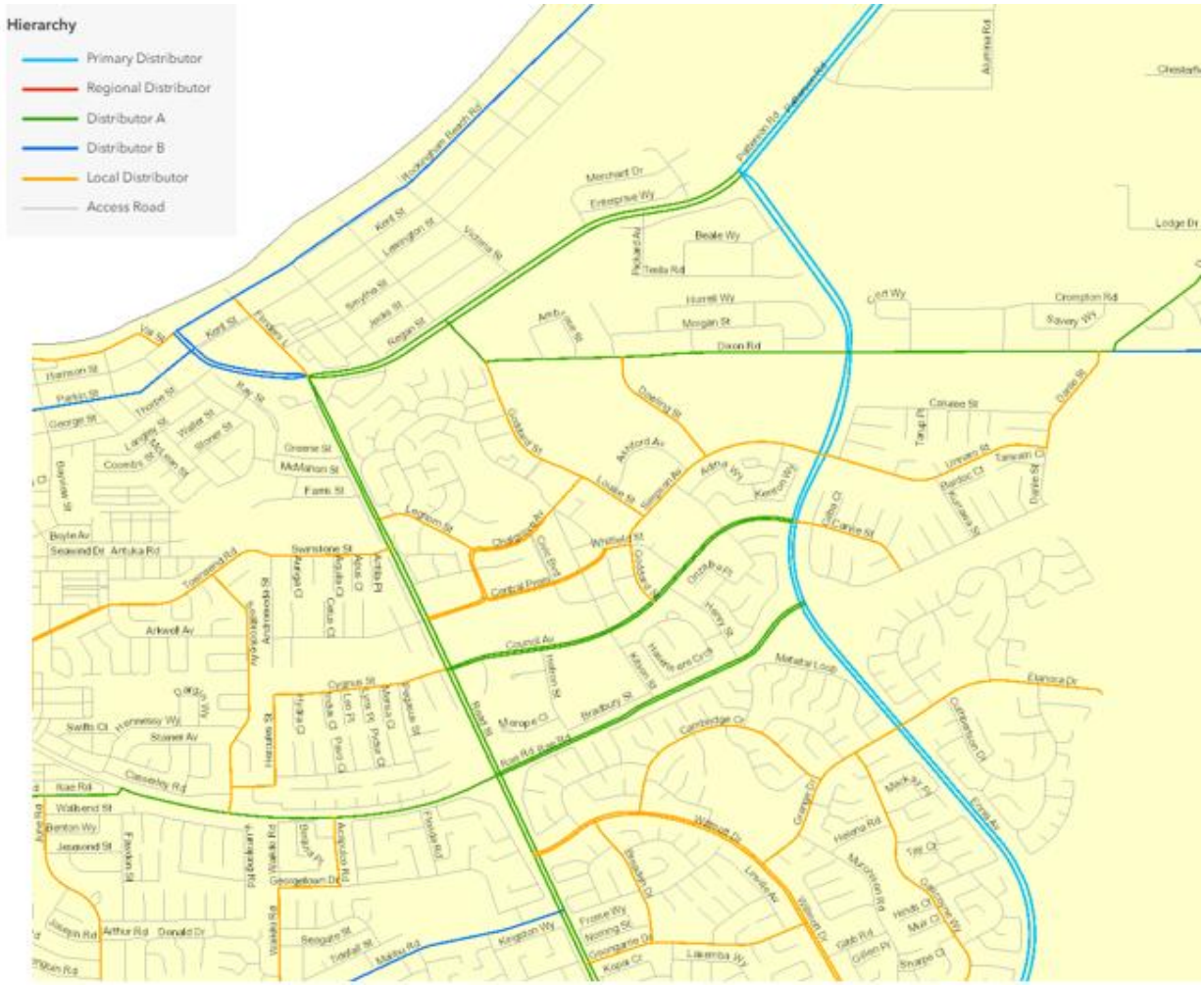
2 Road Network Review

The Main Roads WA Metropolitan Functional Road Hierarchy (MFRH) of the road network in the vicinity of the Rockingham City Centre is presented in **Figure 2-1**.

These classifications are defined in the MFRH as follows:

- **Primary Distributors (light blue):** Form the regional and inter-regional grid of Main Roads WA traffic routes and carry large volumes of fast-moving traffic. Some are strategic freight routes, and all are National or State Roads WA.
- **Regional Distributors (red):** Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by Local Government.
- **District Distributor A (green):** These carry traffic between industrial, commercial and residential areas and connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining properties. They are managed by Local Government.
- **Distributor B (dark blue):** Perform a similar function to District Distributor A but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and not through them, forming a grid that would ideally be around 1.5 kilometres apart. They are managed by Local Government.
- **Local Distributors (orange):** Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local Government.
- **Access Roads (grey):** Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local Government.

Figure 2-1. Main Roads WA functional road hierarchy



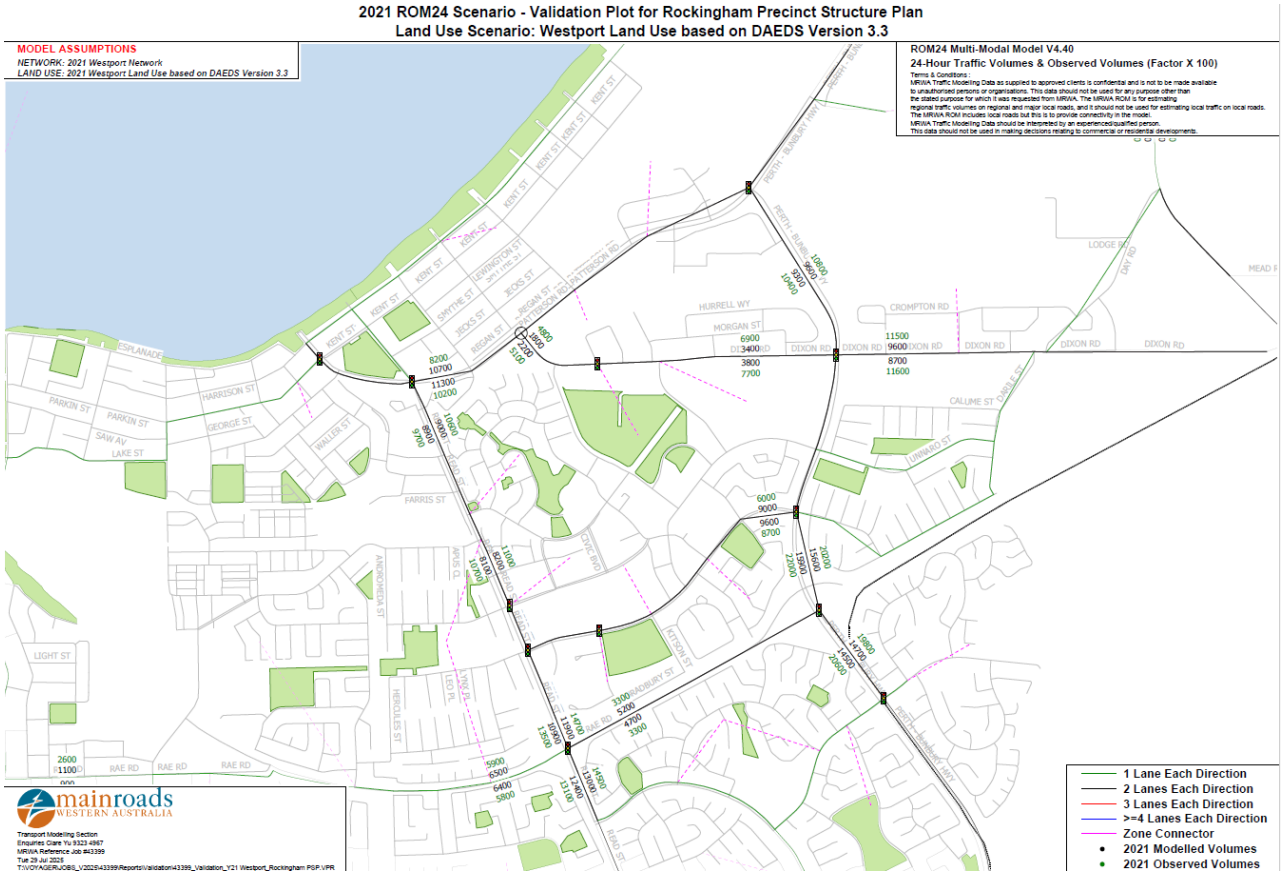
Source: MRWA Road Information Mapping System

2.1 Traffic Volumes

Updated ROM 24 Link Volume Plots for 2021 and 2041 were provided by Main Roads WA (MRWA) in July 2025, as shown in **Figure 2-2**, **Figure 2-3** and included in **Appendix A**. It is noted that the modelling presented is based on plots with the Westport project case land use assumptions. The future traffic and the existing traffic volumes were compared to identify road sections which may be congested due to the anticipated increase in traffic.

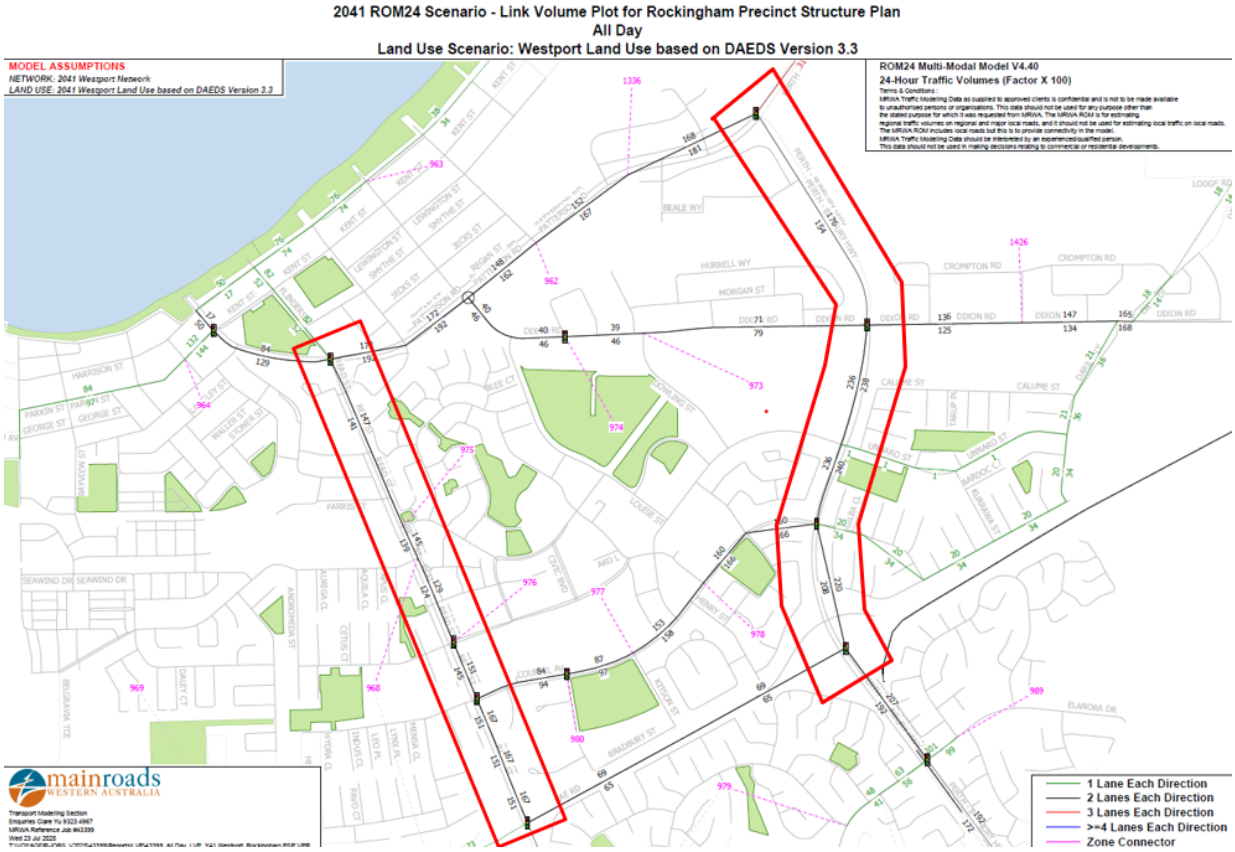
In consultation with Main Roads WA and the City of Rockingham, detailed traffic modelling has been undertaken at key intersections identified along specific roads which may potentially be impacted due to the traffic associated with the proposed RSC Precinct Plan, as discussed further in Section 8.

Figure 2-2. ROM 24 plot link 2021



Source: MRWA

Figure 2-3. ROM 24 plot link - 2041



Source: MRWA

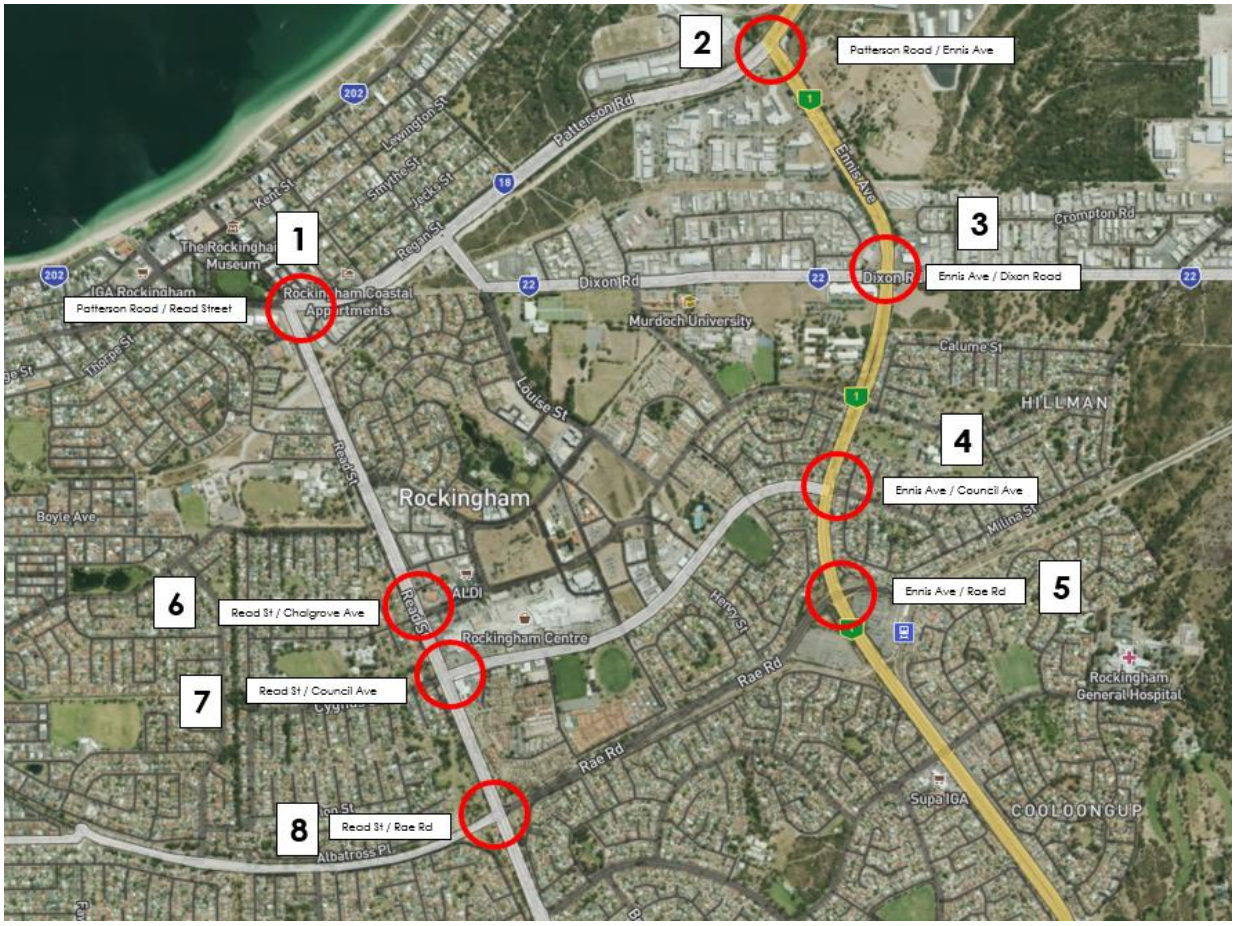
Comparison of the two ROM link plots indicates transport corridors with expected significant traffic volume increase (indicated in **Figure 2-3**) are:

- Read Street Corridor
- Ennis Avenue Corridor

Following consultation between Main Roads WA and City of Rockingham, eight existing signalised intersections along these aforementioned corridors within the RSC Precinct Plan Study Area were identified to be assessed further. The identified intersections are listed below and shown in **Figure 2-4.**

- Patterson Road & Read Street
- Patterson Road & Ennis Avenue
- Ennis Avenue & Dixon Road
- Ennis Avenue & Council Avenue
- Ennis Avenue & Rae Road
- Read Street & Chalgrove Avenue
- Read Street & Council Avenue
- Read Street & Rae Road

Figure 2-4. Main roads identified intersections for further assessment



2.2 High Level Road Network Safety Review

Stantec has reviewed the crash data of the study area for the recent 5-year period (2020 - 2024) obtained from the MRWA Crash report. **Figure 2-5** to **Figure 2-7** summarises the crashes within Precinct 1, Precinct 2 and Precinct 8 of the RSC Precinct Plan Study Area which are representative of the Central City Zone, Mixed-Use Zone and Industrial Zone.

Due to high level nature of this assessment, the crash review undertaken focuses on 5 key unsignalised intersections identified for improvements. Detailed road safety assessment was not conducted for all major roads and intersections along Read Street, Ennis Ave and Dixon Road as the majority of these intersections are developed close to the ultimate form already.

In conjunction with the crash assessment, the review identified crashes occurring at intersections and road sections within the RSC Precinct Plan Study Area which could be considered for upgrading or modified to improve the traffic safety or performance in the future and discussed further in Section 2.4.

Figure 2-5. Rockingham City Centre precinct 1

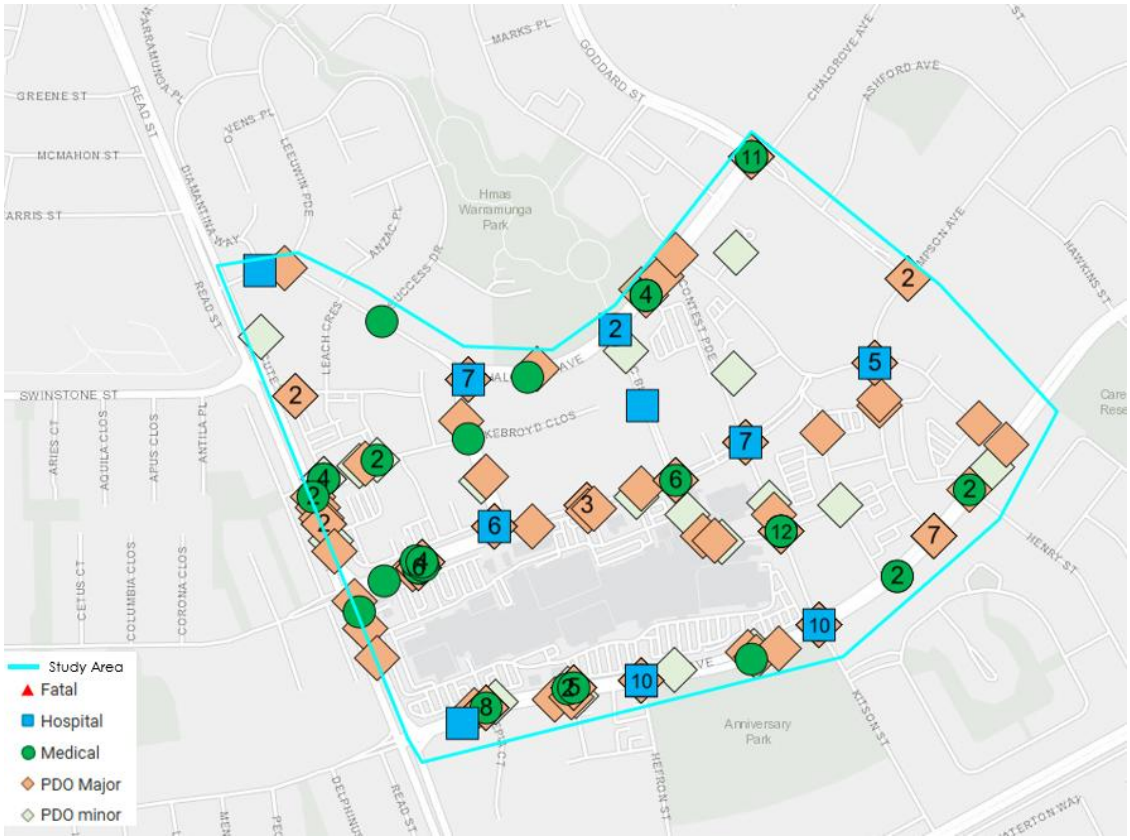
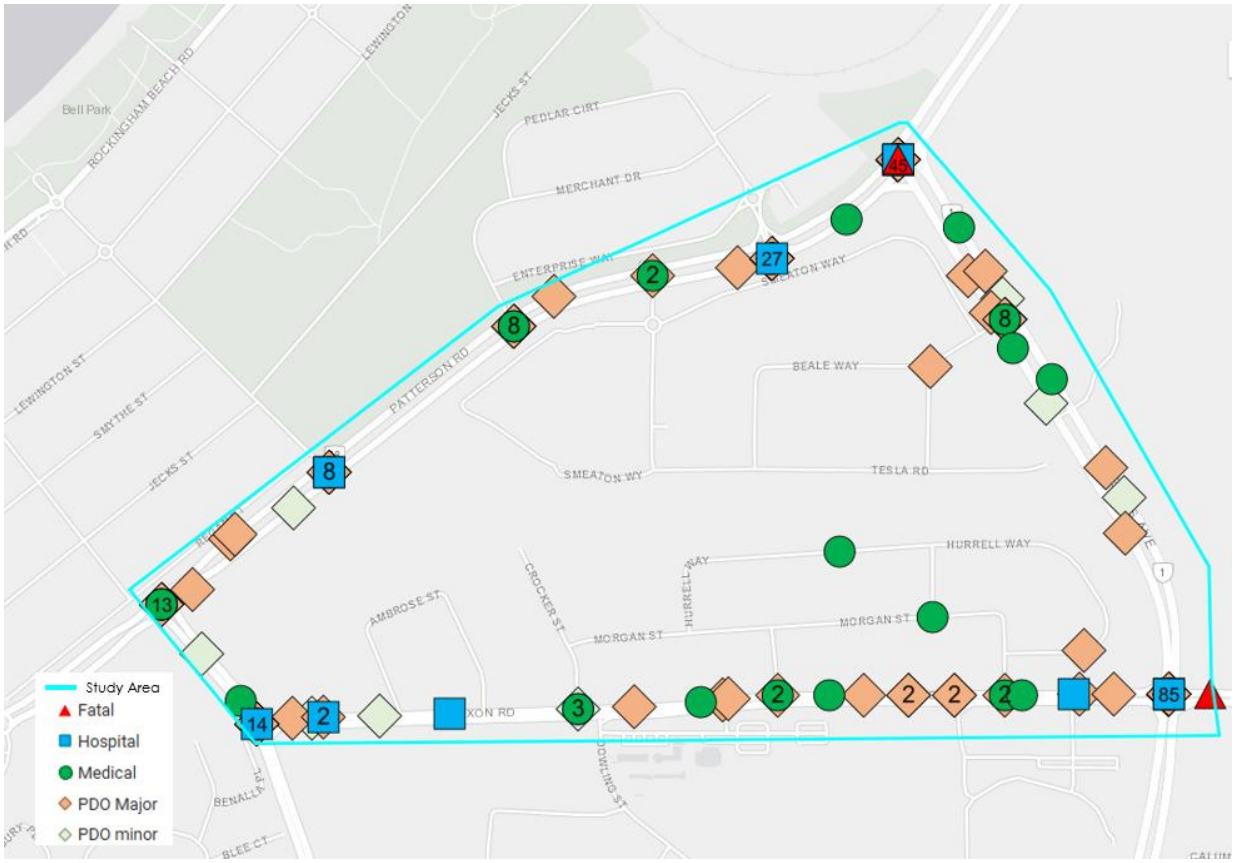


Figure 2-6. Rockingham waterfront precinct 2



Figure 2-7. Rockingham light industrial area precinct 8



The crash data summary of the intersections identified are presented in **Table 2-1 to Table 2-5.**

Table 2-1. Chalgrove Avenue – Central Promenade intersection

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Angle	-	-	-	1	-	1
Right Turn Thru	-	-	-	2	-	2
Hit Object	-	1	-	1	-	2
Rear End	-	-	-	1	-	1
Total	**-**	**1**	**-**	**5**	**-**	**6**

Table 2-2. Central Promenade – Syren & Civic Boulevard intersection

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Angle	-	-	1	2	3	6
Total	**-**	**-**	**1**	**2**	**3**	**6**

Table 2-3. Kent Street – Wanliss Street intersection

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	-	1	-	1
Right Angle	-	1	2	4	1	8
Not Specified		1	-	-	-	1
Total	**-**	**2**	**2**	**5**	**1**	**10**

Table 2-4. Flinders Lane – Kent Street intersection

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Turn Thru	-	-	-	1	-	1
Right Angle	-	-	1	2	-	3
Rear End	-	-	-	-	1	1
Not Specified	-	-	1	-	-	1
Total	**-**	**-**	**2**	**3**	**1**	**6**

Table 2-5. Patterson Road – Thorpe Street intersection

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Angle	-	1	-	2	-	3
Sideswipe Same Direction	-	-	-	1	-	1
Right Turn Thru	-	-	1	-	-	1
Total	**-**	**1**	**1**	**3**	**-**	**5**

2.3 Key Issues and Potential Treatments of Road Network

Table 2-6 summarises the key issues and potential treatments for intersections identified through the initial road network and crash assessment. **Figure 2-8** illustrates the location of these intersections including potential treatment options of each intersection.

The intersection upgrade options considered in this assessment include:

- Standard roundabout
- Mini roundabout
- Signalised intersection
- 4-way raised intersection treatment

Additionally, minor upgrades such as intersection layout improvements and local area traffic management were also considered in this assessment.

Suggested treatments were considered for suitability at each site, with regard to available space and traffic requirements, however no detailed review (such as underground service locations) was undertaken.

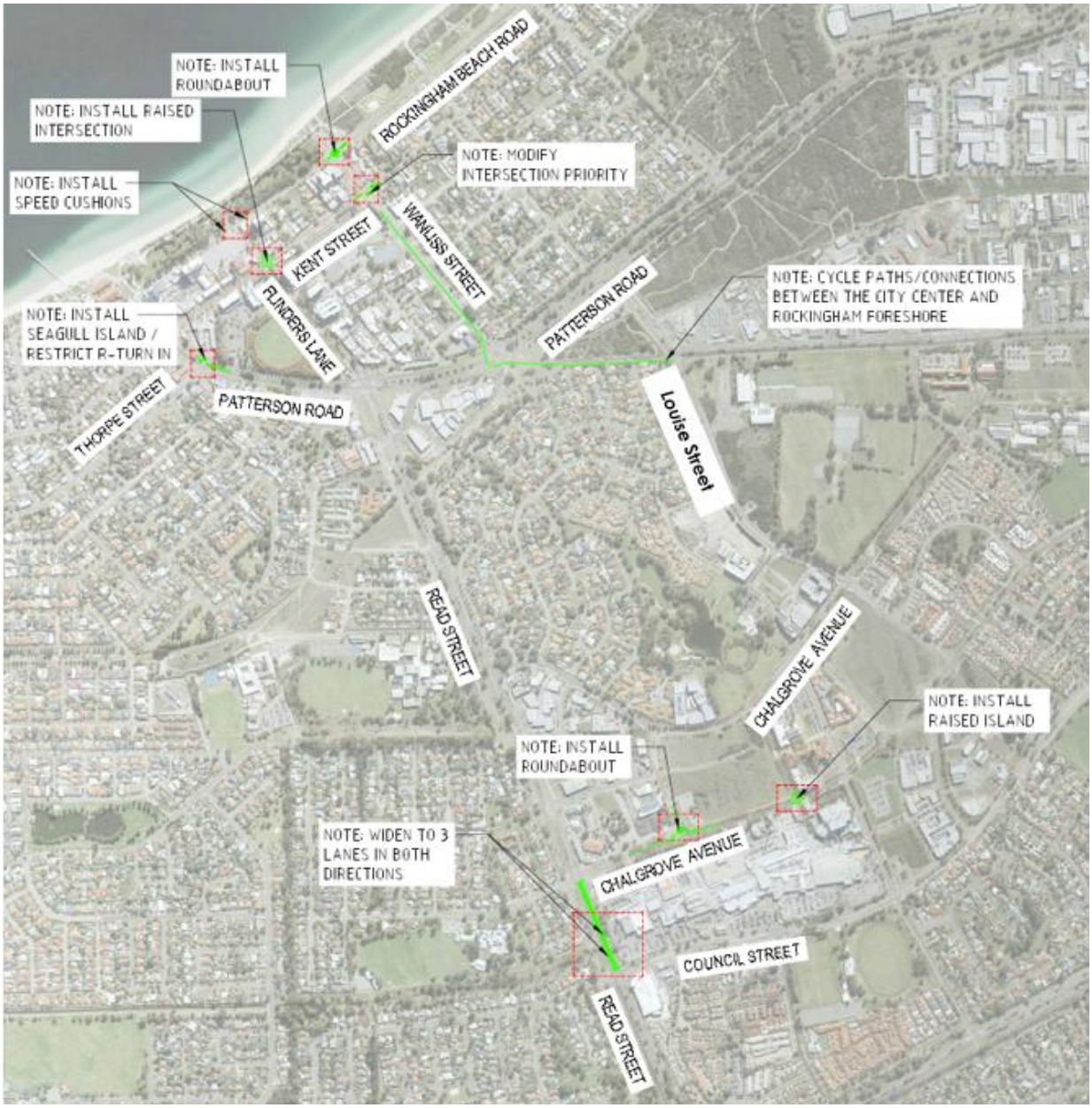
Table 2-6. Key issues and potential treatments of intersections identified

Precinct	Intersection	Key issues / drivers	Urban design considerations	Potential treatment option*
P1 City Centre	Central Promenade / Syren Street	Safety issues – driven by crash data. On street parking restricting available sightlines – contributing to crashes.	Prime city centre location, main street retail and strong building interface proposed. Human scale and pedestrian / cyclist priority over cars essential.	Removal of some on street parking / Raised intersection treatment to slow traffic speeds. Closing parking bays and/or right turn pocket as a trial to gauge crash reduction improvement could be considered prior to major intersection works.
	Central Promenade / Chalgrove Avenue	High level of sight line available can contribute to drivers turning through intersection at speed without proper assessment of pedestrian movements across carriageways. Some confusion as to right of way also observed.	Located on periphery of high activity area. Land use focus more commercial in nature	Roundabout to slow traffic movements through intersection and provide clear intersection priority. Sufficient room for a suitable roundabout design appears to be available.
	Central Promenade / Whitfield Street / Goodard Street	Legibility of movement network into City Centre. Some confusion as to right of way also observed.	The legibility of the urban structure in this part of the City Centre requires improvements. Opportunities to simply entrance points, enhance pedestrian permeability and modify the existing block configuration possible.	Roundabout to slow traffic movements through intersection and provide clear intersection priority. Sufficient room for a suitable roundabout design appears to be available.
P2 Waterfront	Wanliss / Kent Street	Providing a priority route along Wanliss Street for cyclists travelling to / from beach front and help reduce speeds of traffic along Kent Street as they transition from the residential to Beach front village.	Tie in points for RCCTS, intersection design to ensure safe movement for public transport. Pedestrian and cyclist priority desired too with extension of cycling infrastructure down Wanliss Street.	Priority change at intersection to provide a cycle route to foreshore without the need to give way to traffic at Kent Street. Tighten intersection geometry to slow turning traffic movements within intersection.
	Flinders Lane / Kent Street	Safety issues – driven by crash data.	Prime waterfront location, strong building interface proposed. Human scale and pedestrian / cyclist	Raised intersection treatment as less impact on available verge area, tighten up intersection geometry to further

Precinct	Intersection	Key issues / drivers	Urban design considerations	Potential treatment option*
			priority over cars essential. RCCTS alignment also a consideration.	slow turning movements.
	Flinders Lane / Rockingham Beach Road	Safety issues – driven by crash data and observed vehicle speeds late evening and early morning (while pedestrian activity is still significant)	Scale of built form to increase substantially on southern side of Rockingham Beach Road. Pedestrian safety across Rockingham Beach Road is essential in this high activity area.	Traffic calming devices such as speed cushions on the approach to intersection to slow vehicles prior to reaching pedestrian facilities. Speed cushions could be considered further within the 40km/h section of Rockingham Beach Road if speed monitoring warrant, and the devices are removable if required.
	Rockingham Beach Road / Wanliss Street	Safety issues – driven by crash data. Also provide entry treatment to reinforce low speed environment within precinct.	Change in urban scale either side of Wanliss Street. Change in intersection treatment to signify entry into pedestrian priority zone (south west of Wanliss Street). Detailed assessment required to identify feasibility.	Roundabout intersection treatment. Should proposed marina proceed in the future, a roundabout would be key in assisting traffic control at the intersection due to increase traffic using Wanliss Street likely.
	Patterson Road / Thorpe Street	Safety issues – driven by crash data.	Primary vehicle entry point into Waterfront and higher order road. Vehicular priority (until Kent Street).	Seagull Island / Restricted right turn movements into commercial site from Patterson Road West Bound and restrict direct movements into site from Thorpe Street.

*Detailed assessment with sufficient and accurate traffic data and future projection should be conducted to ensure the feasibility of suggested treatments.

Figure 2-8. Initial review outcome - potential treatments and intersection location



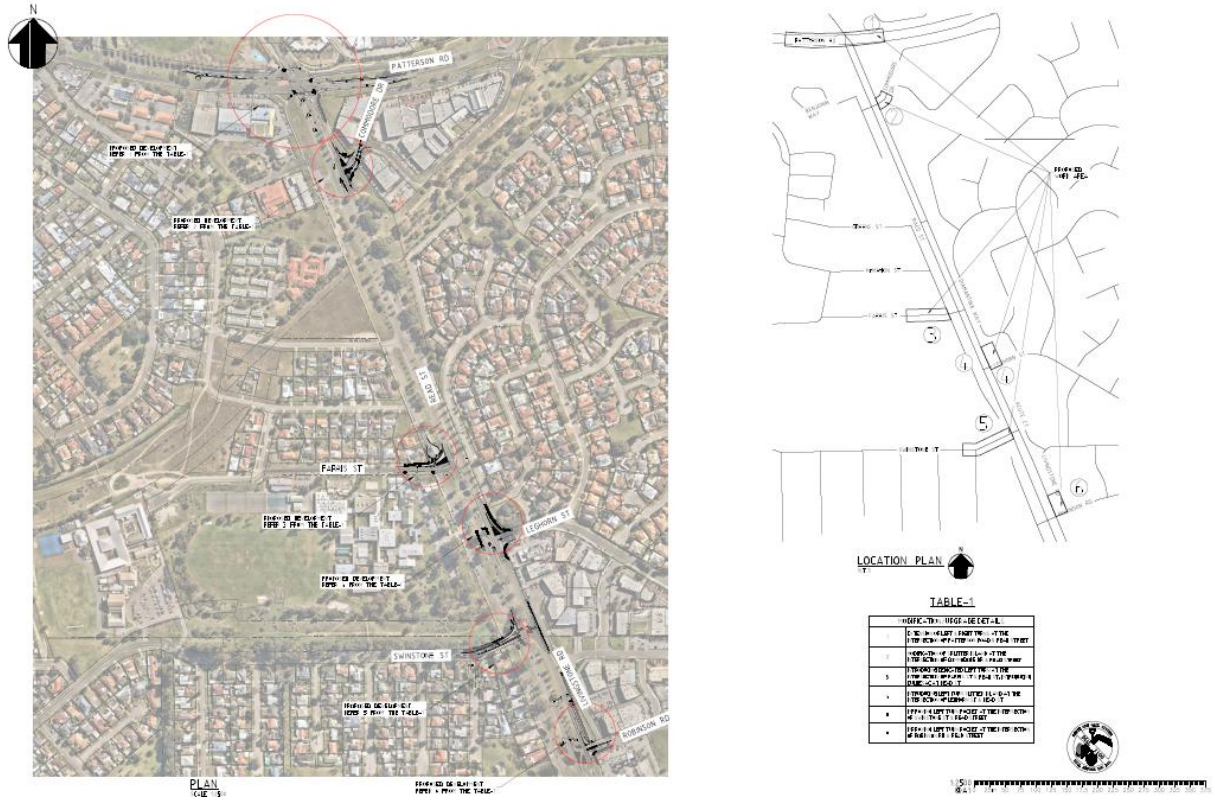
2.4 Future Intersection Upgrades

In consultation with the City of Rockingham, several of the intersections within the study area have been previously upgraded or are scheduled to be upgraded.

2.4.1.1 Patterson Road & Read Street

The City has confirmed a project is anticipated for 2025-2026 for upgrading the signals as shown in **Figure 2-9.**

Figure 2-9. Patterson Road & Read Street proposed upgrades



Source: City of Rockingham

2.4.1.2 Patterson Road and Ennis Avenue

The City of Rockingham is also aware of the Department of Transport's preferred alignment for the completion of the Kwinana Rail Loop. If reserved within the Metropolitan Region Scheme (MRS), grade separated interchanges will be required at Mandurah Road, Day Road and at Patterson and Ennis Avenue. As the reservation has yet to be formally adopted within the MRS, this alignment is not certain. Should this proceed, there will be significant implications to this intersection, likely requiring the entire intersection being grade separated above the freight rail line.

2.4.1.3 Ennis Avenue and Dixon Road

The City of Rockingham have confirmed that Main Roads WA have completed this upgrade. There are no further upgrades currently planned.

2.4.1.4 Read Street and Council Avenue

The City of Rockingham confirmed this intersection has been upgraded within the last few years

2.4.1.5 Read Street & Rae Road

The City of Rockingham confirmed this intersection has been upgraded within the last few years

2.5 Potential Upgrades to Other Intersections

Previous discussions between Hames Sharley and City of Rockingham identified the following three intersections requiring further assessment:

- Central Promenade / Syren Street / Civic Boulevard Intersection
- Kent Street / Flinders Lane Intersection
- Rockingham Beach Road / Flinders Lane

Four treatment options including standard roundabout, mini roundabout, signalised intersection and give way/stop controlled raised safety platform (raised intersection) were assessed taking due regard of the safe movement and priority for pedestrians (of all abilities), cyclists and vehicles (in that order).to identify the most suitable intersection treatments.

Based on previous meetings held with the City of Rockingham, discussions on these intersections are included below:

2.5.1 Central Promenade / Syren Street / Civic Boulevard Intersection

In the short-term (0-5 years), it is suggested that the parking bays adjacent to the intersection along Central Promenade be restricted to avoid vehicle sightline being obstructed by parked vehicles. It was previously identified through sightline assessment that 5 bays on the westbound approach and 1 bay on the eastbound approach of the intersection should be restricted to ensure sufficient sightline is provided.

For longer term (>5years), raised intersection treatment is suggested to encourage vehicles to slow down further and yield to others. Combined with the improved sightline through parking removal or restriction, the traffic safety at the intersection could be significantly improved. This could be implemented along a wider pedestrian/cyclist network improvement in the future to encourage active transport mode shift within the Town Centre area.

2.5.2 Kent Street / Flinders Lane

Based on the available data, a raised intersection treatment outscored other treatments at this location and resulted in a better overall transport safety outcome. However, it is noted that further detailed assessment of the intersection geometry and wider area is required.

2.5.3 Rockingham Beach Road / Flinders Lane

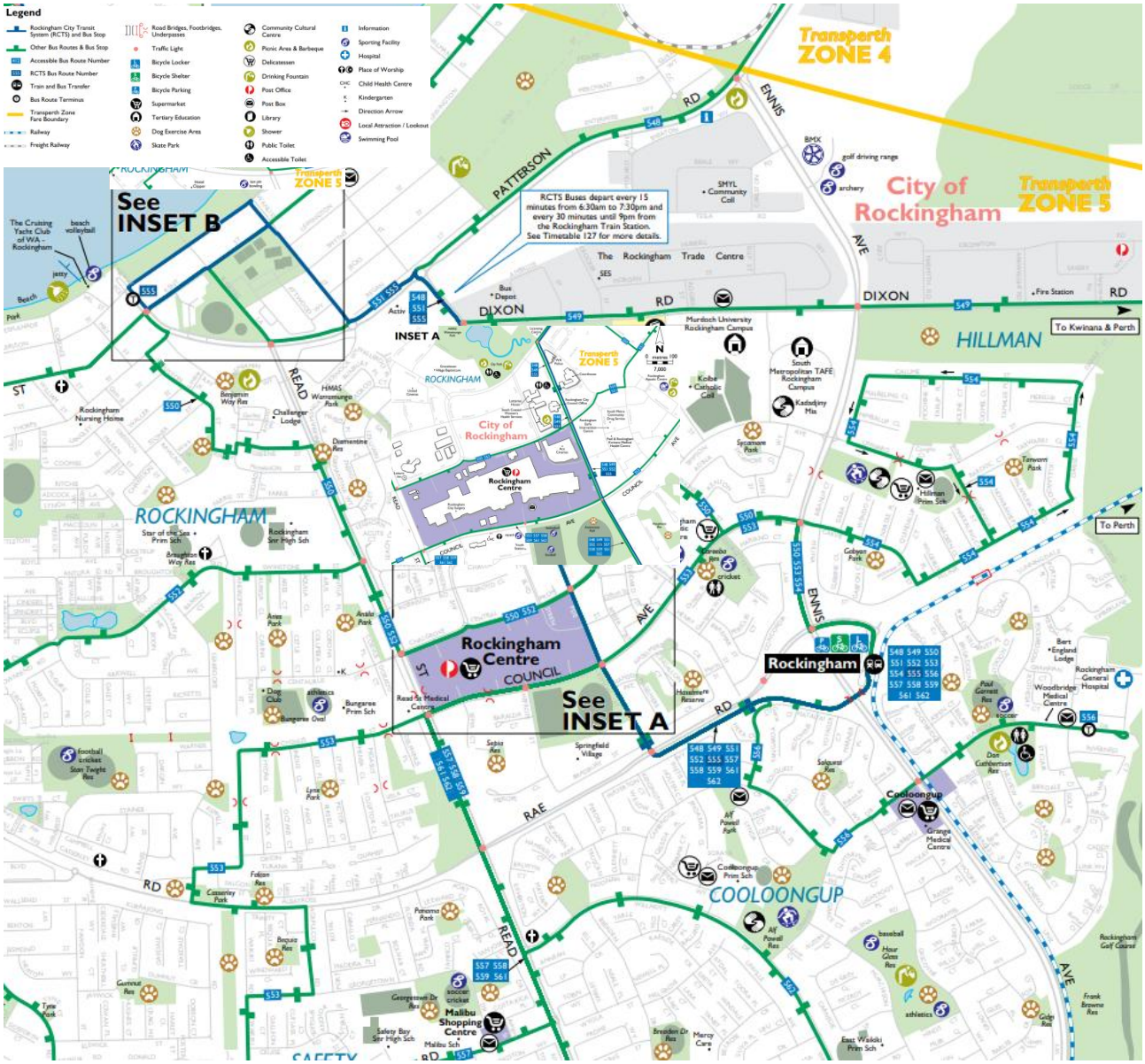
The vehicle speed along Rockingham Beach Road is a concern, particularly when traffic activity drops while the pedestrian activity remains. Assessment of the overall speed behaviour and crash history of this area suggested traffic calming devices such as speed cushions could reduce the risk of pedestrian related crashes at the pedestrian crossing facilities generally located at the intersections along Rockingham Beach Road.

3 Public Transport

3.1 Existing Public Transport

The existing public transport facilities in the vicinity of the Rockingham Precinct Structure Plan are shown in **Figure 3-1**. The precinct currently benefits from good public transport connection, especially on distributor roads.

Figure 3-1. Public transport network



Source: City of Rockingham Make your Move

3.2 Future Public Transport Proposals

3.2.1 Endorsed RCCTS

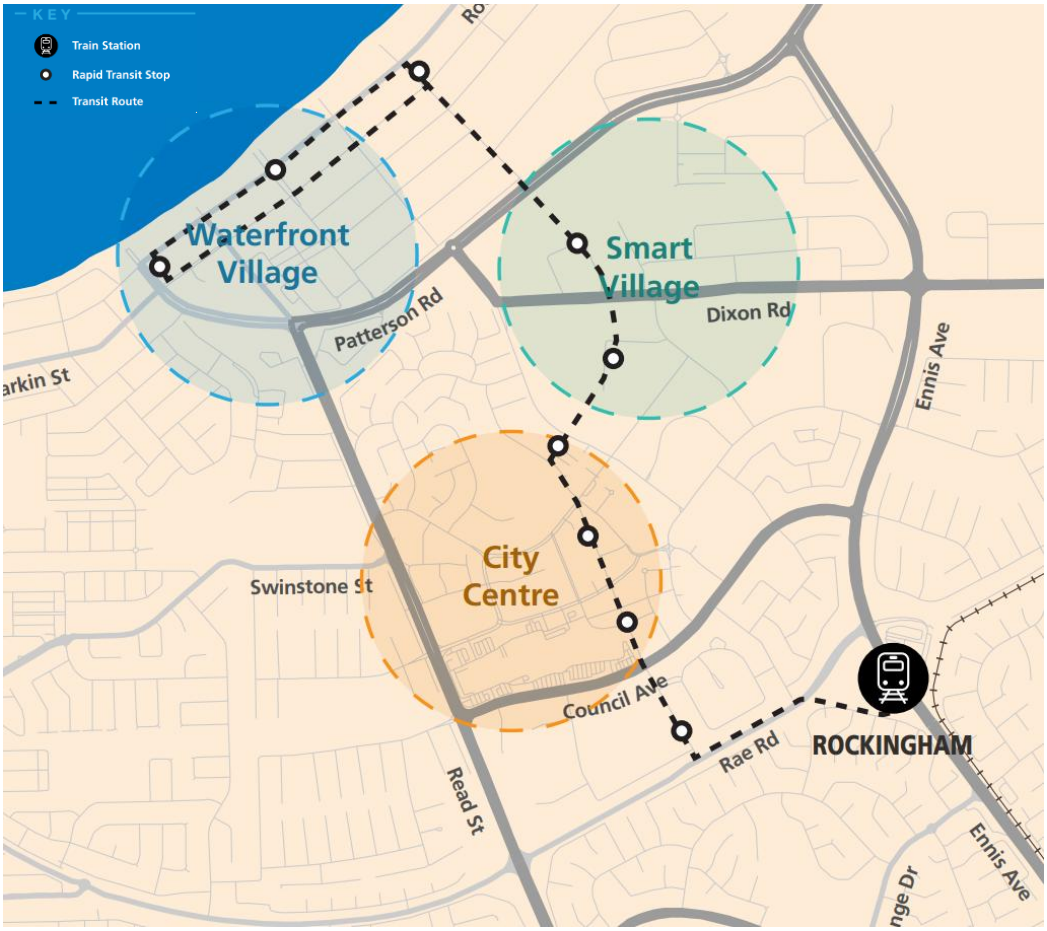
To cater for future population growth and support the City's transit-oriented development (TOD) strategy, the City has supported a Rockingham City Centre Transit System (RCCTS), a fixed route transit streetcar (BUS) system that is designed to link major activity nodes starting at the Rockingham Train Station and traversing through the Rockingham City Centre, Smart Village Sector and the Rockingham Foreshore.

The implementation of the RCCTS is expected to result in the following:

- Increase connectivity between major activity nodes;
- Support growth of existing and new business opportunities
- Increase public transport access from the Rockingham Train Station; and
- Unlock potential for TOD development at route stops.

The existing endorsed RCCTS route and network is shown in **Figure 3-2.**

Figure 3-2. Currently endorsed RCCTS route and network



A high-level assessment has identified several concerns regarding the currently endorsed RCCTS route. These concerns pose a potential risk to the existing road and public transport network which will require further investigation.

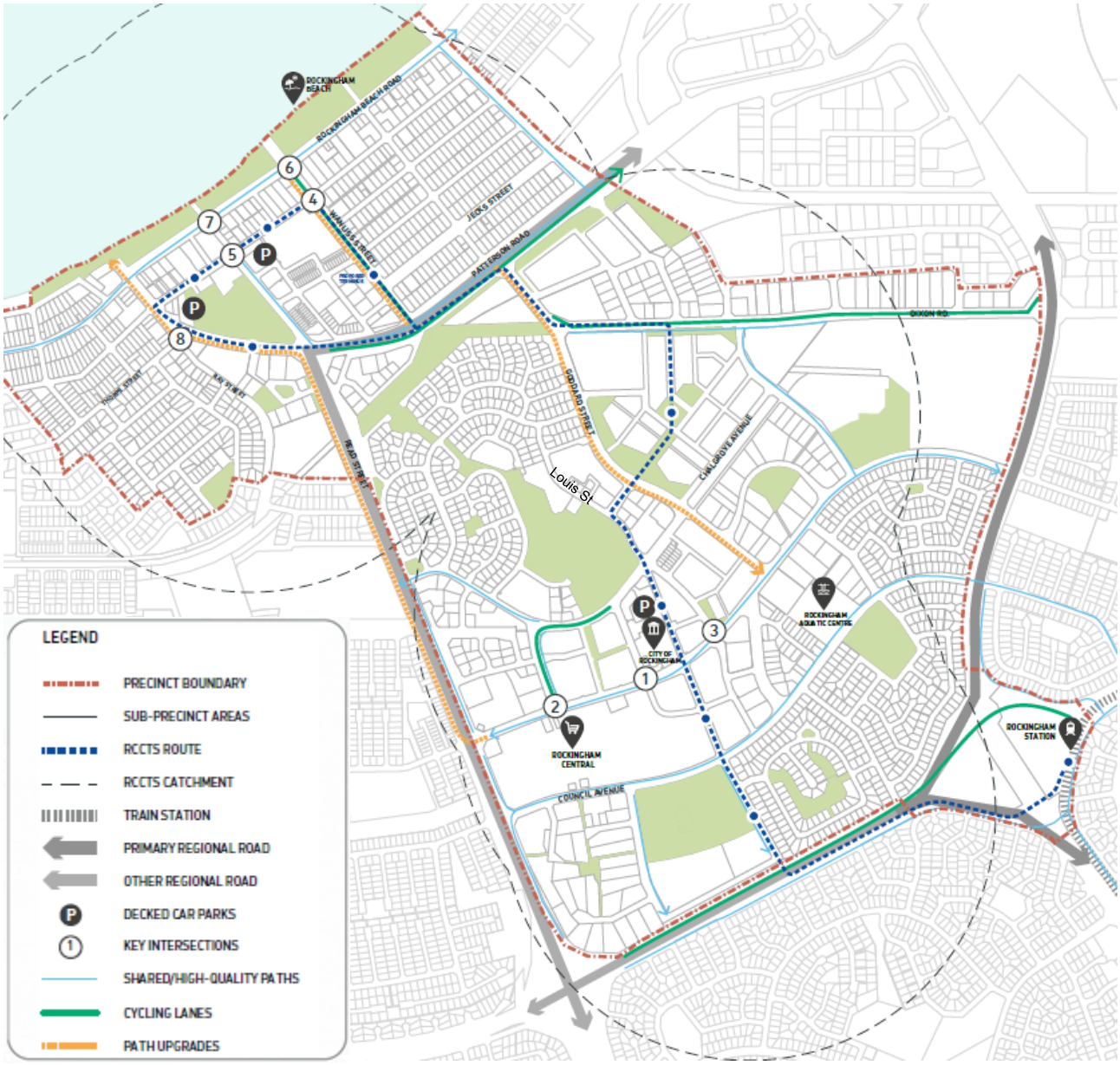
The potential risks include:

- Multiple bus stops and locations along the route that increase the risk of pedestrians being required to crossroads with high traffic volume.
- Multiple bus stops will increase the time of total journey related to the route.
- High pedestrian traffic along the waterfront increasing the risk of conflict with the route required.
- Traffic controls would be required at the new four-way intersections in the form of signals or roundabouts at the identified locations, listed below which will require further investigation. These new intersections are also likely to present a potential crash risk due to additional conflict points:
    - » Route over Patterson Road.
    - » Route over Dixon Road.
    - » Route over Council Avenue.

3.2.2 Proposed RCCTS

As part of this assessment, a new RCCTS route has been proposed as illustrated in **Figure 3-3**. The proposed RCCTS route intend to improve the function of the existing RCCTS in meeting the City's vision, while not compromising on the accessibility and safety of the RCCTS route.

Figure 3-3. Proposed RCCTS route



Source: Hames Sharley

The following summarise the review findings of the proposed RCCTS:

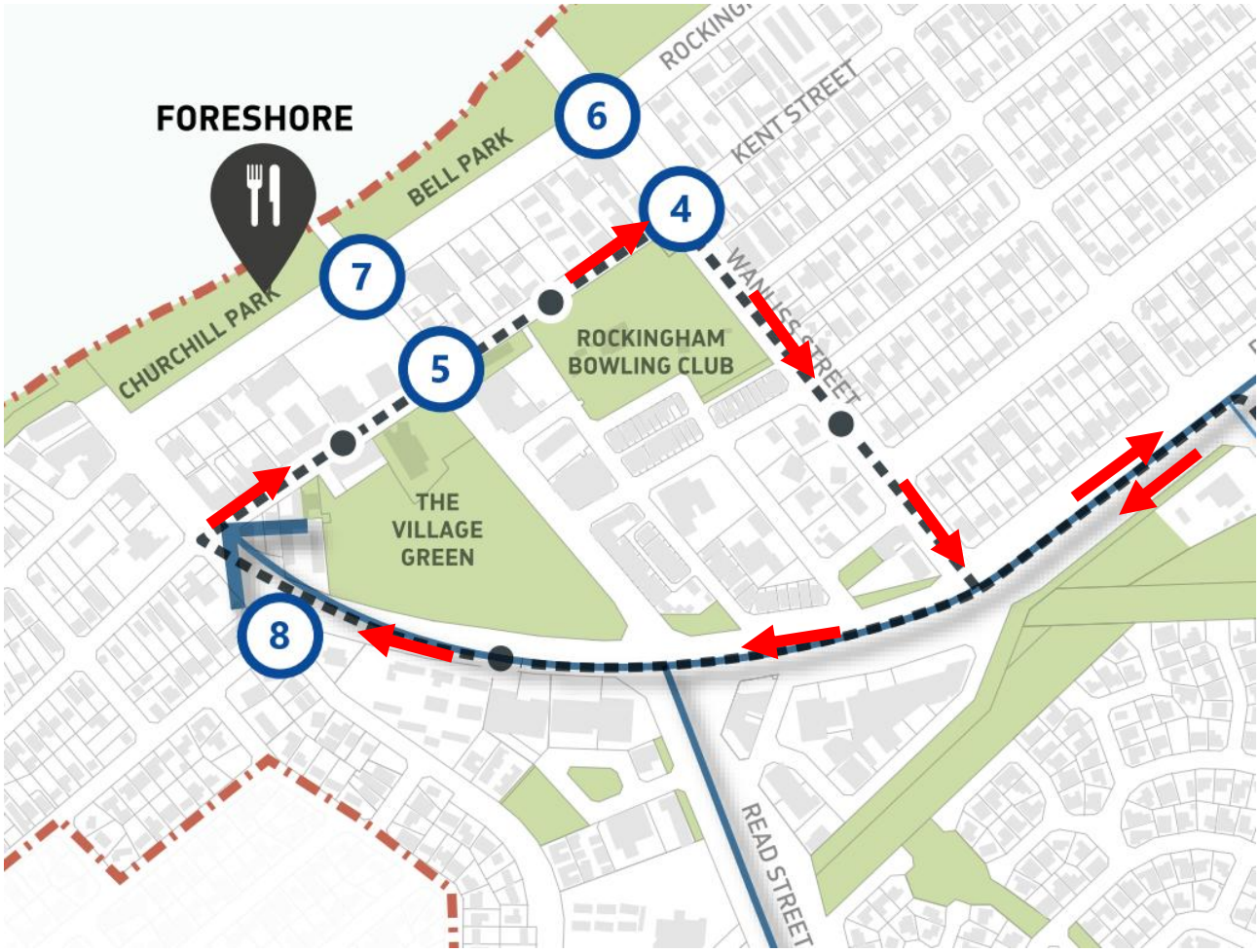
- The proposed RCCTS route aims to consolidate the number of transits stops along the route, especially along major distributor routes to potentially reduce the journey time while maintaining the accessibility within the PSP.
- The proposed RCCTS route is relocated away from the foreshore (Rockingham Beach Road) to minimise the conflict with pedestrian traffic and provides increased opportunity to create a pedestrian only environment along Rockingham Beach Road in the future.
- Extends the coverage along Patterson Road to further activate the commercial developments between the Waterfront Village and City Centre.

- Temporarily route the RCCTS route away from the residential development to the north of Patterson Road, with the opportunity to reintroduce an extended route when the need arises in the future.

3.2.3 Potential Implementation of the Proposed RCCTS

For RCCTS route within the Waterfront Village, it is proposed that the RCCTS services would circulate in a clockwise manner, along Patterson Road and turn right into Kent Street before going back on Patterson Road via Wanliss Street as illustrated in **Figure 3-4**.

Figure 3-4. Suggested route to waterfront village



This arrangement is expected to reduce the need for pedestrians accessing the commercial developments to the south of Patterson Road to cross Patterson Road in order to access the transit stop, minimising the risk of pedestrian related crashes along Patterson Road. This also provide future opportunity to extend the RCCTS route further east along Kent Street to cater for future developments to the east.

The proposed route would potentially require traffic controls at a new four-way intersection at Market Street and Louise Street (with new eastern leg ideally a “bus only” link) in the form of signals or roundabout. The proposed route also eliminates the need for new controlled intersections over Patterson Road, Dixon Road, reducing the potential crash risk due to additional conflict points.

3.2.4 Transition to Trackless Tram

The transition to trackless tram along the RCCTS route is expected to be largely warranted by the overall route patronage. When the popularity of the route dictates a higher frequency or larger capacity buses to accommodate the passenger demand, trackless tram should be considered financially viable. Additionally, the residential density of the catchment surrounding the RCCTS route would need to increase noticeably over the current level of development to justify the implementation of future trackless tram infrastructure.

It is noted that the running of trackless trams would require wider turning paths at intersections that that of a typical bus, which makes roundabouts less desirable for intersection treatments. As such, consideration of intersection treatments on the future trackless tram route should also be noted.

3.3 Future Planned Public Transport Upgrades

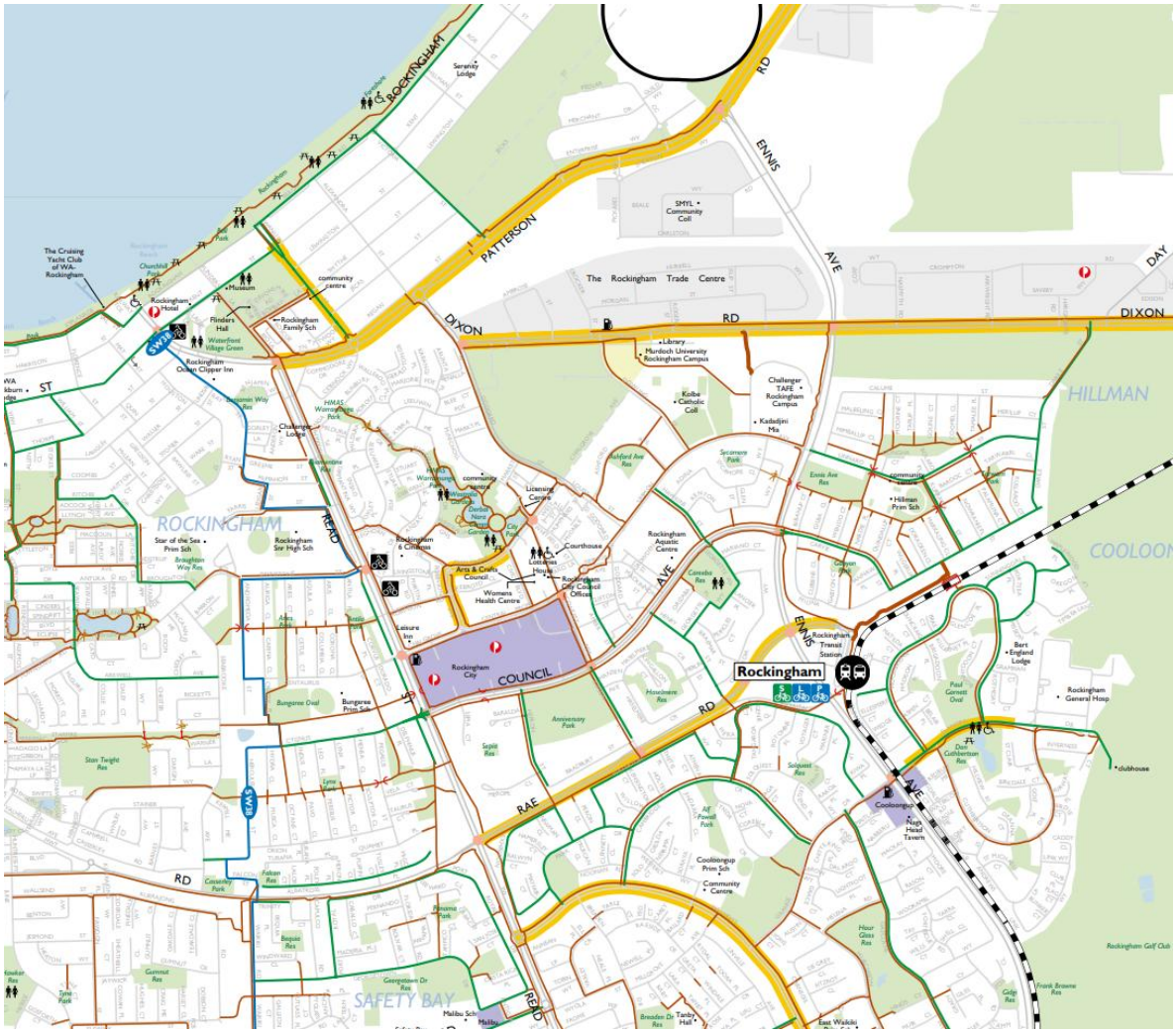
The Public Transport Authority (PTA) has advised that there is no medium to long term changes proposed to the existing bus services that currently operate in the vicinity of the Study Area.

4 Active Transportation

4.1 Existing Pedestrian and Cycling Network

The existing pedestrian and cyclist network in the City Centre are in general, excellent condition and provides direct, continuous links to key destinations. Extensive shared path and good road riding infrastructure have been identified in strategic mapping (**Figure 4-1**).

Figure 4-1. Existing cycling and pedestrian facilities



However, there are some routes that have been incorrectly identified and require amendment. Additionally, there is an opportunity to recognize and strategically represent existing good quality walking and cycling environments that are currently not identified.

For example, extending existing shared path infrastructure will improve connectivity and continuity throughout the City, especially to direct people from the Rockingham Train Station and Rockingham Shopping Centre and Retail Precinct to the Rockingham Foreshore and the Waterfront and Mixed-Use Lifestyle Village. Sites where infrastructure is currently poor but has the potential to be upgraded to aid in creating a better walking and cycling environment will be identified.

4.2 New Shared Path

4.2.1 Goddard / Louise Street to Council Avenue

Many of the shared paths that have been provided run east-west. An issue that has been identified is a lack of high-quality and safe routes facilitating north-south movement. The most significant high-quality north-south route is on Goddard St. from Patterson Road to Chalgrove Avenue. There is an opportunity to extend this shared path south to Council Avenue.

The following benefits of developing a shared path along this route have been identified:

- Remove through traffic demand from the current Goddard St / Simpson Ave / Whitfield Street area and create potential for a more pedestrian activated commercial precinct; and
- Create continuity from the existing shared path on Goddard Street.

4.2.2 Flinders Lane

Flinders Lane from Patterson Road to Kent Street has been recognised as containing a shared path on the western side of the road. This route has a wide, comfortable path that many pedestrians and cyclists may opt to use to access the Foreshore from Patterson Road. However, the path beyond Kent Street to the foreshore also contains a shared path, albeit of different form, that should be recognised.

4.2.3 Anzac Park

Patterson Road is recognised as having a shared path up until Flinders Lane which ends before Anzac Park. However, it has been identified that this path continues through Anzac Park to Kent Street. This route is shaded by extensive tree coverage that makes for a pleasant, scenic cycle or walk. Plans should be amended to reflect this high-quality route.

4.2.4 Victoria Street

Victoria Street is currently not recognised as being a significant route of any kind, however, possesses many qualities of a high-quality shared path. Victoria Street could be recognised for its existing shared path. There is also an opportunity to promote cycling along this path with the addition of an on-road bicycle lane or creation of a bicycle boulevard, which Victoria Street can comfortably accommodate.

4.3 Shared Path Upgrade – Wanliss Street

Wanliss Street is recognised as containing a shared path. The existing path infrastructure is not in the greatest condition and requires an upgrade in path quality and width, especially as it is a significant route that provides access to the Foreshore. Wanliss Street has a large road reserve which provides ample opportunity to create a high-quality shared path infrastructure.

Wanliss Street is also recognised as having on road cycle lanes which is noted as being currently incorrect and should be amended. Opportunities to develop a cycle lane along Wanliss Street are limited as the road is too narrow to comfortably accommodate this use. A greater alternative would be to upgrade the existing shared path capitalising on the potential of the large road reserve.

4.4 Good Road Riding Environment (Contest Parade / Central Promenade / Whitfield Street from Council Avenue to Chalgrove Avenue)

There is a route that has potential to be recognised as a good road riding environment. From Council Avenue, cyclists can ride north along Contest Parade then on to Central Promenade followed by Whitfield Street to Chalgrove Avenue. This route provides a key link from the Rockingham Shopping Centre to the Commercial Precinct.

4.5 E-rideable

It is noted that E-rideable usage are becoming more prevalent in urban area. New e-rideable rules were endorsed in Western Australia in 2021, extracted and shown in **Figure 4-2.**

Figure 4-2. E-rideable rules



For future planning purposes, current and future e-ridable usage should be considered when designing and approving hardscape verge upgrades within the RSC Precinct Plan Study Area to ensure environment is appropriate for the mixing of e-riders and other path users. The verge environment should also be designed to make it easier for the e-riders to accurately differentiate path and road environment. For example, shared paths should be clearly marked to allow e-riders to identify the path environment and their allowable speed limit.

5 Transport Mode Share

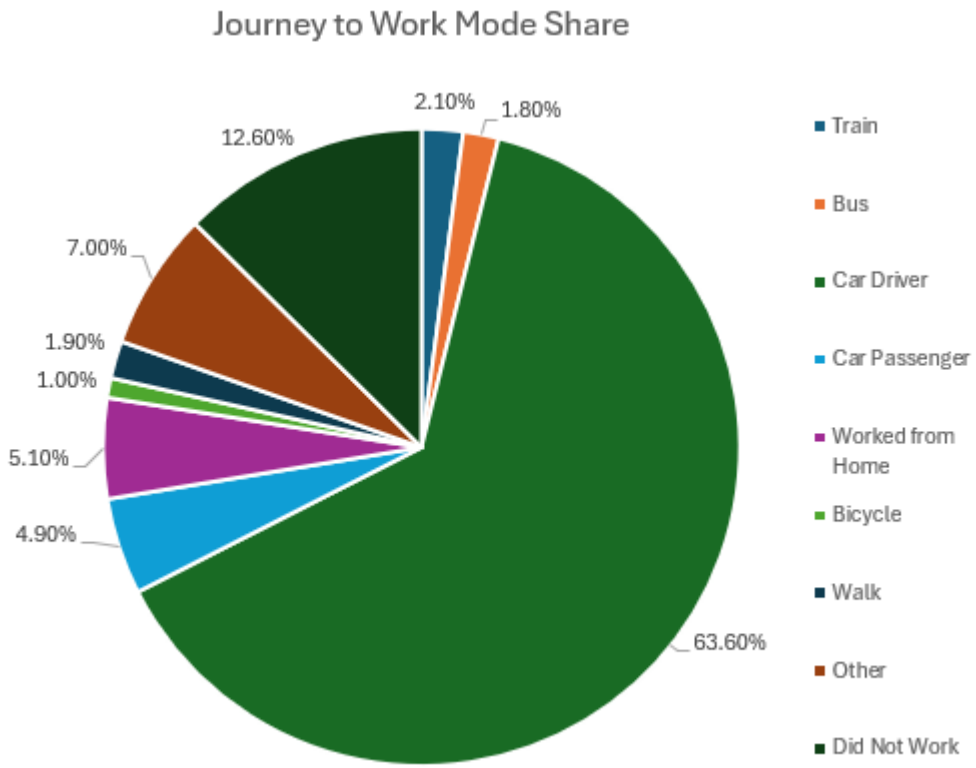
5.1.1 Employees

The existing journey to work transport mode share pattern for the Rockingham Precinct Structure Plan according to the Australian Bureau of Statistics (ABS) is shown in **Figure 5-1.**

Based on the census data, approximately 70% of the existing journey to work are by private vehicle, either as a driver or passenger, and only approximately 6.8% by public transport along with small percentage of active transport mode share.

It should be noted that this data represents the “employee” as residents of City of Rockingham, who do not necessarily work within City of Rockingham.

Figure 5-1. Journey to work mode split (City of Rockingham)



5.1.2 Residential Journey to Work

The transport mode share for existing residents in Rockingham has been extracted from ABS Census data (2021). While journey-to-work does not represent the entirety of travel, it is the dominant trip purpose both during the peak period and across the day.

Based on the data from Victorian Integrated Survey of Travel and Activity 2007 (VISTA 07) and NSW 2008/09 Household Travel Survey Summary Report 2010 Release, both of the documents have the similar distribution of trips purpose. The studies also reported that work related trips has the highest

proportion of 33% in between peak hours compare to other mode shares. These distribution percentage are being implemented in this case to illustrate the mode of transportation in Rockingham (refer **Table 5-1** below).

Table 5-1. Mode of transportation (Rockingham)

Car as Driver Trips by Purpose (approximate)*	Work	Education	Other
Daily	20%	15%	65%
Peak Hours	33%	14%	53%

Although there is great opportunity for journey to work mode shift during peak hours, journey to work would generally only make up to approximately 20% of the total destination trip. However, with the existing high car-as driver and passenger mode share, it represents a considerable capacity for mode shift among employees if sufficient alternatives are available.

5.2 Future Mode Share

5.2.1 Peripheral Activity Centre

The Rockingham Strategic Centre Precinct Structure Plan intends to develop and activate Rockingham Central as a peripheral Activity Centre of Perth Metropolitan area, similar to Midland and Joondalup Activity Centre. Similar to these activity centres, the private vehicle trips are relatively higher compared to other mode shares.

5.2.2 Public Transport Improvements

Improvement of public transport links and frequency within the centre is likely to result in a step change of public transport usage within the centre. In dense urban locations supported by high-frequency public transport service, a reduced driving mode share for employees and residents is reasonable.

The RCCTS allow the PSP to be well connected by public transport via the Perth-Mandurah train line and by car, via the strategic road corridors of the Kwinana Freeway. Future incentive such as reduced public transport fares could see an increased usage of public transport and encourage mode shift from private vehicles to public transport.

5.2.3 Bike Shares

Emerging technology also provides the opportunity for bike and scooter sharing platform to thrive. These platforms allow for one-way travel, and particularly when e-bikes are provided, can support much lower car-as-driver mode shares for short distance travel.

It is acknowledged that a number of bike-share start-ups have been trialled in Perth, with inconsistent results. However, the success of bike share schemes internationally suggests that the benefits of such as system can be extensive.

5.2.4 Car Sharing and Autonomous Vehicles

The rise of autonomous vehicles (AV) is occurring in tandem with a shift away from traditional ownership models, towards sharing and on-demand services. Before AV is fully integrated across the transportation system at all levels, car-sharing supports behaviour change in car-as-driver mode.

6 Parking

The City of Rockingham has advised that they are in the process of preparing a review of the existing Strategic Metropolitan Centre Parking Strategy.

6.1 Existing Key Parking Concerns

A mix of perceived and actual lack of parking supply and restricted public access to parking facilities have been identified as a key parking issue in the City of Rockingham Waterfront Village and Rockingham City Centre. This section of report has been prepared in reference to the adopted RSMC Strategic Metropolitan Centre Public Parking Strategy. The City of Rockingham have confirmed there will be a review undertaken of the SMC.

6.1.1 Waterfront Village Sector

It is noted that the Waterfront Village Sector does not generally have a shortage of available parking. However, it has been demonstrated that parking in close proximity to the popular destinations can reach capacity at certain times. It is also noted that the Waterfront Village is a very dynamic area and the underlying influences of parking can change quickly.

6.1.2 City Centre Sector

The City conducted parking surveys and determined that the public parking provision within the City Centre is currently sufficient for the existing parking demand. However, this could change as more developments occur within the City Centre area.

6.1.3 Reciprocal Parking Easement – Along Dixon Road

An accessibility issue that has been identified in the industrial area adjacent to the Smart Village precinct is that there is poor connectivity between businesses of similar function along Dixon Road. There are partial easements across some of the site's along Dixon Street, however, some sites can only be accessed via Dixon Road, leading to traffic movements in and out of access driveways, increasing congestion and crash risk.

In the future it is likely that many of these buildings in the light industrial area may be redeveloped and there will be an opportunity to create a parking / access easement along the northern frontage of most of the developments, which will improve access and connectivity between businesses and reduce the need for short trips between sites using Dixon Road.

6.2 Future Parking Improvements

6.2.1 Decked Car Park – City Centre

The City has previously identified two decked car park location within the City Centre which could accommodate the future parking demand increase. The multi-decked station located adjacent to the bus transit lane is expected to provide a significant public parking resource for the City Centre with the proposed 500 bay public parking station.

6.2.2 Foreshore Parking Provision

The Rockingham Beach Foreshore Master Plan intend to provide public parking within the foreshore reserve and street parking within Railway Terrace and Rockingham Beach Road. The parking rationalisation was associated with a desire to create more pedestrian orientated public spaces and remove public parking from areas of high social value.

Significant parking reduction within the foreshore area is expected to encourage visitors to take public transport or active transport, reduce the carbon footprint of private vehicle usage and provide more capacity for street-side activities.

6.2.3 Overflow Parking

It was discussed within the RSMC Public Parking Strategy that the City should develop guidelines that facilitate the use of suitable City controlled land to be made available for overflow parking which include prioritising the use of parking, information for motorists to locate the overflow parking and implementation of suitable traffic management.

6.3 Loading Bays within Town Centre

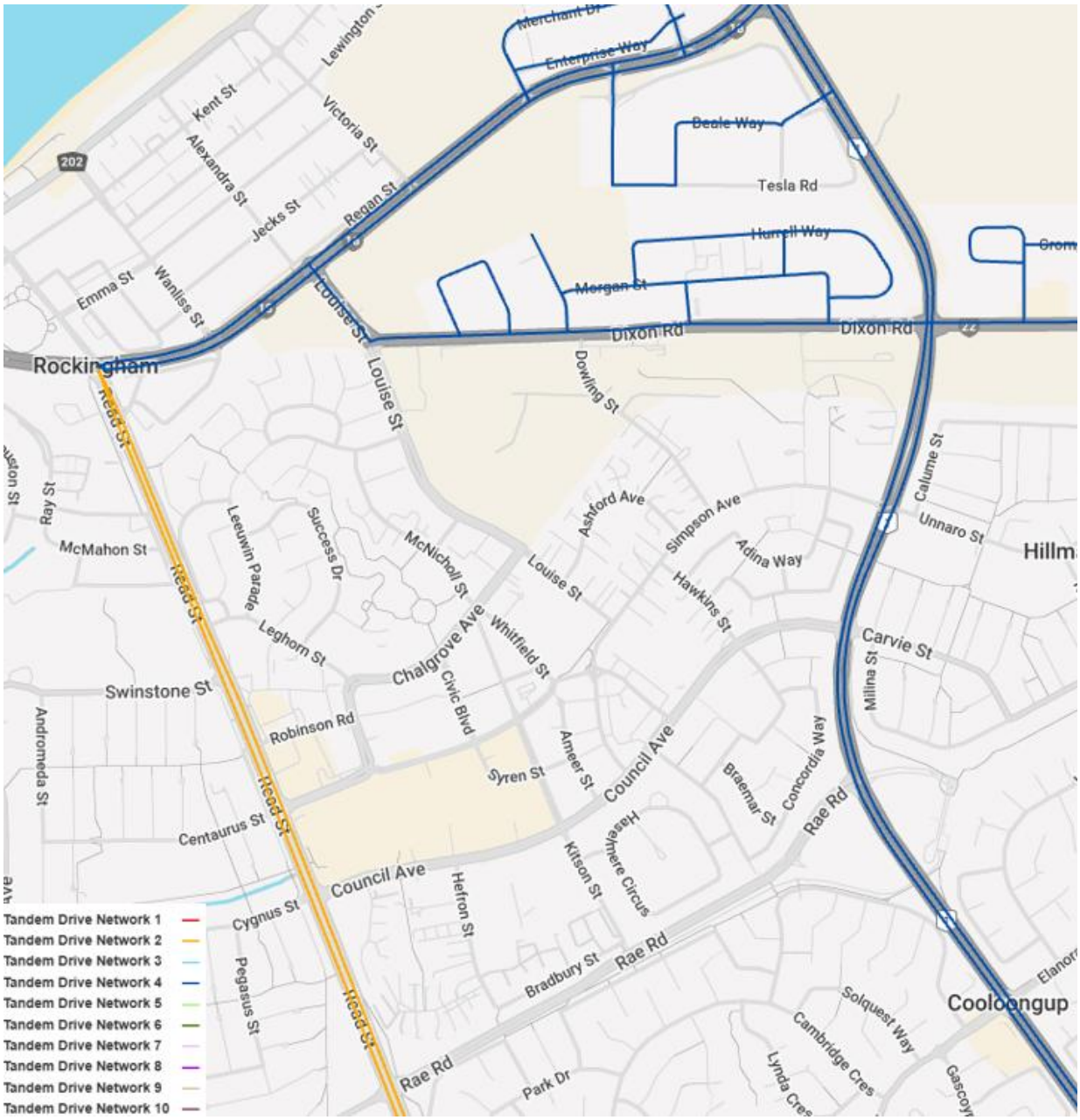
Given that much of the City Centre is still undeveloped, it is likely that future demand for on street loading facilities to facilitate smaller street frontage developments would be required. It is suggested that shared loading bays be considered at strategic locations within the City Centre area as development progresses. The loss of the existing on street parking capacity when these bays are installed should be factored into development parking calculations to ensure that appropriate bays are provided on site to balance the loss of bays required for servicing the sites.

The shared loading bays between developments not only reduces the footprint of redundant space, and it could also improve the overall traffic safety by reducing the potential need for additional crossovers for delivery vehicles entering sites.

7 RAV Network

The existing RAV network within the Study Area is currently suitable. RAV 4 network obtained from MRWA HVS Network Map shown in **Figure 7-1** shows that Ennis Avenue, Patterson Road (east of Read Street), Dixon Road and Read Street is currently covered within the RAV Network in the proximity of the Study Area.

Figure 7-1. MRWA HVS network map (RAV 4)



Source: MRWA HVS Network Map

8 Proposed Development Yields

The development yields associated with the 2025 Rockingham Strategic Centre (RSC) Precinct Plan and the previous 2009 City of Rockingham Precinct Structure Plan are outlined in the following sub-sections.

The 2009 City of Rockingham Precinct Structure Plan development yields were provided by the City of Rockingham.

The 2025 updated development yields have been provided by Hames Sharley in a form of a Technical Memorandum, dated 12/02/2025, which is included in **Appendix B** for reference purposes.

The land uses associated with the 2025 Rockingham Strategic Centre (RSC) Precinct Plan are categorised as follows:

- **Retail (RET)**
- **Health/Welfare/Community (HEL)**
- **Manufacturing (MAN)**
- **Office (OFF)**
- **Service (SER)**
- **Storage (STO)**

The 2009 Precinct Plan covers an area of approximately 600 hectares with the current 2025 Precinct Plan covering approximately 533 hectares, a reduction of approximately 67 hectares. This decrease primarily relates to the industrial land adjoining Patterson Road and Ennis Avenue near the proposed Precinct 8 (Dixon Rd) as shown in **Figure 8-1.** This area is largely developed for industrial purposes, which contains no residential dwellings and offers limited potential for further growth. For the purposes of the traffic assessment, this 2009 land use area has been accounted for within the Precinct 8 yields , as outlined in Section 8.1.1. Although this industrial area was technically part of the 2009 Precinct plan, no policy position was established to quantify or expand the existing floor space. Therefore, removal from the current 2025 Precinct plan does not alter the overall planning approach.

Conversely, it should be noted that the additional residential area to the west, adjacent to the Waterfront Precinct 2 area accommodates 449 dwellings in the 2025 precinct plan.

The SIDRA analysis presented in the following sections reflects the abovementioned changes within the PSP area.

The additional and removed land area when comparing the 2009 precinct plan and the 2025 precinct plan is illustrated in Figure 8-1.

Figure 8-1 Difference in Land Area 2009 PSP vs 2025 PSP



Source: City of Rockingham

To quantify the difference in lots between the 2009 precinct plan and the 2025 precinct plan, the City of Rockingham have provided information summarised in Table 8-1 to Table 8-5 which outline the changes within the 963, 964, 974, 975, and 977 Main Roads WA traffic modelling catchments.

Table 8-1 Difference in Lots - Catchment 963

MRWA Catchment	**Coastal Lots Sub Precinct**	**Waterfront Village Sub Precinct**	Outside the Strategic Centre	Development Yield for Northern Waterfront
963	433	52 Mixed Use	271 Residential 41 Special Residential	

Table 8-2 Difference in Lots - Catchment 964

MRWA Catchment	Sub Precinct	Waterfront Village Sub Precinct	Outside the Strategic Centre	Number of Dwelling Subtracted from the Development Yield
964		27 Mixed Use 449 Residential	449	

Table 8-3 Difference in Lots - Catchment 974

MRWA Catchment	Southern Residential Sub Precinct	TOD Village Sub Precinct	Outside the Strategic Centre	Number of Dwelling Subtracted from the Development Yield
974	96	1 Mixed Use		

Table 8-4 Difference in Lots - Catchment 975

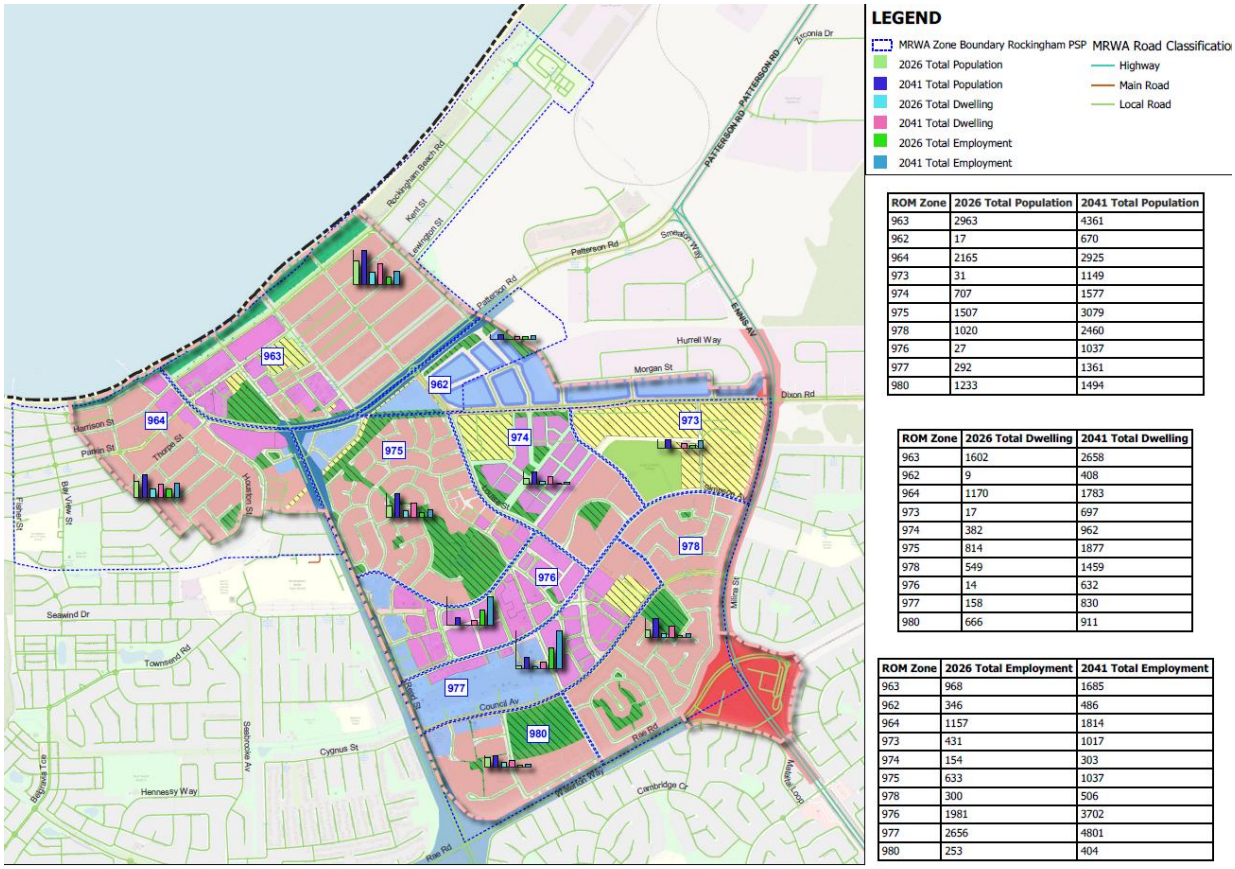
MRWA Catchment	City Park Sub Precinct	Waterfront Village Sub Precinct	Outside the Strategic Centre	Number of Dwelling Subtracted from the Development Yield
975	9 Mixed Use 372 Residential	6 Commercial		

Table 8-5 Difference in Lots - Catchment 977

MRWA Catchment	City Centre Sub Precinct	Southern Residential Sub Precinct	Outside the Strategic Centre	Number of Dwelling Subtracted from the Development Yield
977	13 Commercial 21 Mixed Use	2 Mixed Use 35 Residential		

In addition, the City of Rockingham have also distributed the estimated residential development yields and employment for the proposed 2025 Precinct Structure Plan in accordance with the ROM24 Zonal System as requested by Main Roads WA and illustrated in **Figure 8-2** and included in **Appendix C**.

Figure 8-2. 2025 Development yields distributed across ROM24 zonal system



ROM Zone	2026 Total Population	2041 Total Population
963	2963	4361
962	17	670
964	2165	2925
973	31	1149
974	707	1577
975	1507	3079
978	1020	2460
976	27	1037
977	292	1361
980	1233	1494

ROM Zone	2026 Total Dwelling	2041 Total Dwelling
963	1602	2658
962	9	408
964	1170	1783
973	17	697
974	382	962
975	814	1877
978	549	1459
976	14	632
977	158	830
980	666	911

ROM Zone	2026 Total Employment	2041 Total Employment
963	968	1685
962	346	486
964	1157	1814
973	431	1017
974	154	303
975	633	1037
978	300	506
976	1981	3702
977	2656	4801
980	253	404

Source: City of Rockingham

The removal of the area associated with the 2025 precinct plan correlates to the reduction in development yield floorspace for Precinct 8 which is outlined in Table 8-6 and also presented in Table 8-12. The table illustrates a total reduction of 17,950sqm.

Table 8-6 Difference in Floorspace/ Land Area between the 2009 PSP and the 2025 PSP for Precinct 8

PSP	Retail	ENT	HEL	Manu	Office	Service	Storage	Total
2009 Precinct 8	2,000			9,182	12,000	16,771	11,328	**51,281**
2025 Precinct 8				6,000	10,200	10481	6,650	**33,331**
Difference in Floor Area	-2000			-3182	-1800	-6290	-4678	**-17,950**

8.1.1 2009 City of Rockingham Precinct Structure Plan Development Yields

The 2009 City of Rockingham Precinct Structure Plan development yields were provided by the City of Rockingham and are presented in **Table 8-7** (residential yields) and **Table 8-8** (non-residential yields).

8.1.1.1 Residential

Table 8-7. 2009 residential yield (dwellings)

Residential	Existing Dwellings (number)	Interim Target	Proposed Dwellings (number)
P1-City Centre	432	-	4,894
P2 Waterfront Village	912	-	3,557
P3 Coastal Lots	536	-	2,448
P4 TOD Village	0	-	1,852
P5 City Park	347	-	382
P6 Southern Residential	1,555	-	3,660
P7 Education	0	-	0
P8 Dixon Road	0	-	0
Total	**3,787**	**-**	**16,793**

8.1.1.2 Non-Residential Floorspace

Table 8-8. 2009 non-residential development yield (sqm)

Non-Residential	Retail	ENT	HEL	Manu	Office	Service	Storage	Total
P1-City Centre	111,403	30,000	56,124	3,000	55,000	4,000		**259,527**
P2 Waterfront Village	22,751	23,893	10,000		8,000			**64,644**
P3 Coastal Lots								
P4 TOD Village	10,000	5,000	5,000		20,000			**40,000**
P5 City Park								
P6 Southern Residential								
P7 Education			96,200		5,000			**101,200**
P8 Dixon Road	2,000			9,182	12,000	16,771	11,328	**51,281**
Total	**146,154**	**58,893**	**167,324**	**12,182**	**100,000**	**20,771**	**11,328**	**516,652**

8.1.2 2025 Rockingham Strategic Centre (RSC) Precinct Plan Development Yields

The 2025 updated development yields was provided by Hames Sharley and presented in **Table 8-9** and **Table 8-10.**

8.1.2.1 Residential

Table 8-9. 2025 residential development yield (dwellings)

Residential	Existing Dwellings	Interim Target	Proposed Dwellings
P1-City Centre	432	3,005	4,248
P2 Waterfront Village	1,097	2,522	3,634
P3 Coastal Lots	536	1,379	1,762
P4 TOD Village	0	805	1,205
P5 City Park	347	347	1,326
P6 Southern Residential	1,555	1,855	2,917
P7 Education	0	0	0
P8 Dixon Road	0	0	0
Total	**3,967**	**9,913**	**15,092**

8.1.2.2 Non-Residential Floorspace

Table 8-10. 2025 non-residential development yield (sqm)

Non-Residential	Retail	ENT	HEL	Manu	Office	Service	Storage	Total
P1-City Centre	85,173	30,000	54,070	2,730	40,000	4,000		**215,973**
P2 Waterfront Village	16,000	15,588	10,000		5,000			**46,588**
P3 Coastal Lots								**0**
P4 TOD Village	5,000				10,000			**15,000**
P5 City Park			5,000		8,000			**13,000**
P6 Southern Residential								**0**
P7 Education			80,000		5,000			**85,000**
P8 Dixon Road				6,000	10,200	10481	6,650	**33,331**
Total	**106,173**	**45,588**	**149,070**	**8,730**	**78,200**	**14,481**	**6,650**	**408,892**

8.2 'NET' Yield

An exercise has been undertaken to determine the estimated reduction in the residential dwellings and non-residential floorspace when comparing the proposed 2025 Rockingham Strategic Centre (RSC) Precinct Plan and the 2009 City of Rockingham Precinct Structure Plan development yields.

The net yield difference is presented in **Table 8-11** and **Table 8-12** below.

8.2.1.1 Residential

Table 8-11. Residential NET yield (dwellings)

Residential	2009 Yield	2025 Yield	NET difference of proposed Dwellings
P1 City Centre	4,894	4,248	-646
P2 Waterfront Village	3,557	3,634	77
P3 Coastal Lots	2,448	1,762	-686
P4 TOD Village	1,852	1,205	-647
P5 City Park	382	1,326	944
P6 Southern Residential	3,660	2,917	-743
P7 Education	0	0	0
P8 Dixon Road	0	0	0
Total	**16,793**	**15,092**	**-1,701**

8.2.1.2 Non-Residential Floorspace

Table 8-12. Non-residential NET yield (sqm)

Non-Residential	Retail	ENT	HEL	Manu	Office	Service	Storage	Total
P1-City Centre	-26,230	-	-2,054	-270	-15,000	-	-	**-43,554**
P2 Waterfront Village	-6,751	-8,305	-	-	-3,000	-	-	**-18,056**
P3 Coastal Lots	0	-	-	-	-	-	-	**0**
P4 TOD Village	-5000	-5,000	-5,000	-	-10,000	-	-	**-25,000**
P5 City Park	0	-	5,000	-	8,000	-	-	**13,000**
P6 Southern Residential	0	-	-	-	-	-	-	**0**
P7 Education	0	-	-16,200	-	-	-	-	**-16,200**
P8 Dixon Road	-2,000	-	-	-3,182	-1,800	-6,290	-4,678	**-17,950**
Total	**-39,981**	**-13,305**	**-18,254**	**-3452**	**-21,800**	**-6,290**	**-4,678**	**-107,760**

A comparison between the proposed 2025 Rockingham Strategic Centre (RSC) Precinct Plan and the 2009 City of Rockingham Precinct Structure Plan (PSP) indicates a reduction in both residential and non-residential development yields within the study area. The observed reduction in development intensity would result in a reduction in estimated traffic generated on the surrounding road network when compared to the previous PSP.

9 Analysis of Transport Network

9.1 Analysis Overview

In consultation with Main Roads WA and the City of Rockingham, eight existing signalised intersections along Ennis Avenue and Read Street within the RSC Precinct Plan Study Area were identified to be strategically assessed in further detail. These identified intersections are as follows:

- Patterson Rd and Read St intersection
- Patterson Rd and Ennis Ave intersection
- Ennis Ave and Dixon Rd intersection
- Ennis Ave and Council Ave intersection
- Ennis Ave and Rae Rd intersection
- Read St and Chalgrove Ave intersection
- Read St and Council Ave intersection
- Read St and Rae Rd intersection

9.1.1 Data Sources

The following datasets and information sources were utilised in the preparation of this traffic analysis:

- ROM24 Data
- 2023 SCATS Traffic Signal Vehicle Counts
- City of Rockingham Average Daily Volumes 2024
- MRWA Traffic Counts
- City of Rockingham Observations

Where other sources of data have been relied upon, specific references are provided in the relevant sections of this report.

9.2 Analysis Scenarios

Two analysis scenarios have been determined based on the existing and ultimate proposed growth scenario for the RSC Precinct Plan:

- Scenario 1: 2025 Baseline Scenario (Weekday AM and PM)
- Scenario 2: 2041 Future Traffic with ultimate development (Weekday AM and PM)

9.3 Key Assumptions

The following assumptions were made for the analysis:

- Peak hours were identified using SCATS 2023 data as 08:00 AM to 09:00 AM and 15:00 PM to 16:00 PM on weekdays.

- The previous 2009 Activity Centre Plan vehicular trips have been removed from the traffic analysis. The previous 2009 Activity Centre Plan proposed significantly higher development yield potential than the current 2025 proposal.

9.4 Estimated Growth Rates

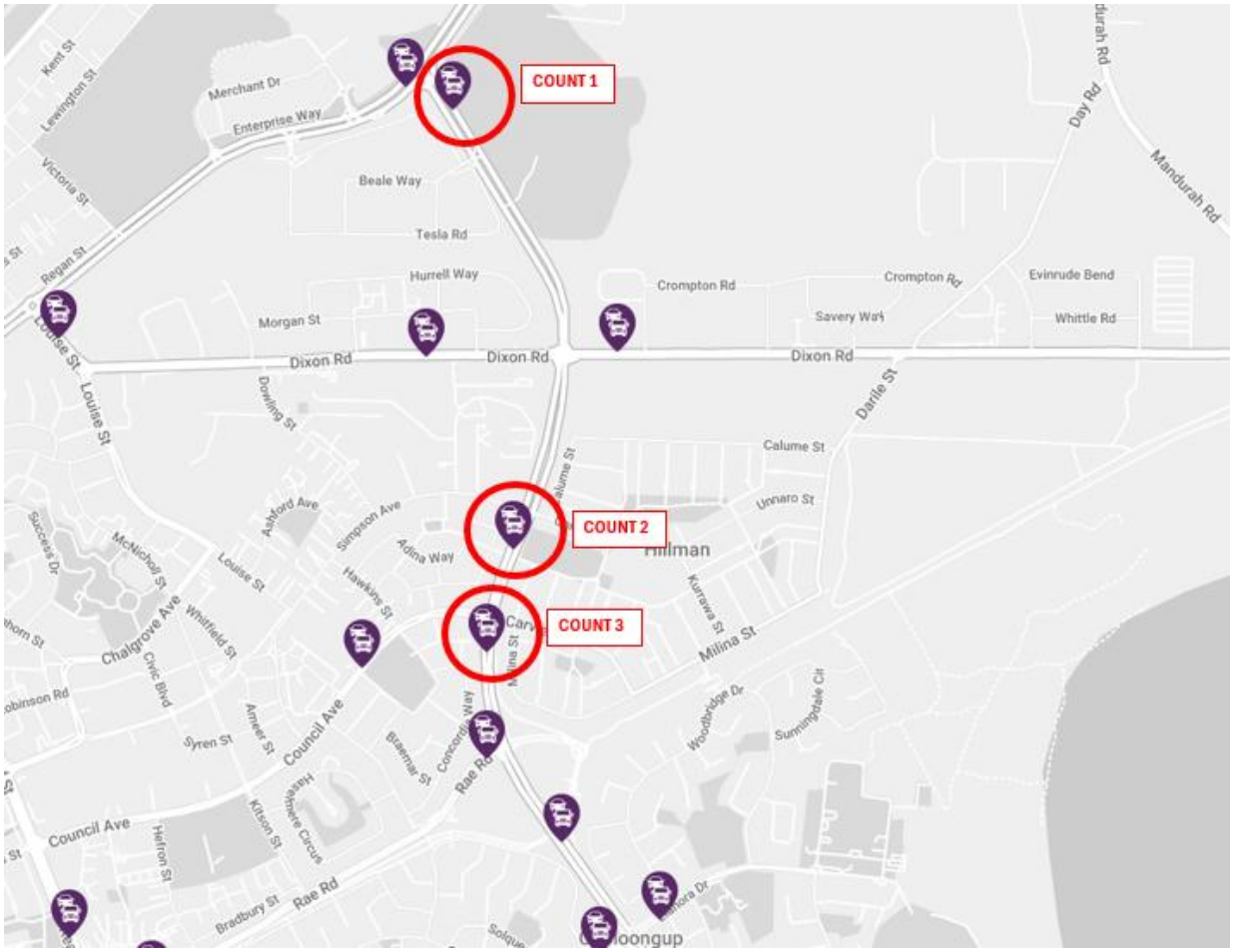
Future forecast growth rates were generated to forecast population growth across the RSC Precinct Plan Study Area.

Different growth rates were generated for each of the key traffic corridors on Ennis Ave and Read Street for the future years as indicated in **Table 9-1**.

For Read Street, the traffic growth rate for 2023 to 2025 has been determined from the Council Link Counts provided by the City of Rockingham for the Read Street traffic corridor. These Council Link Counts are included in **Appendix D**.

For Ennis Avenue, the traffic growth rate for 2023 to 2025 has been derived from the MRWA Traffic Counts obtained from the Main Roads WA Traffic Map. Bi-direction traffic volumes for three traffic counts located along Ennis Avenue were obtained for 2021 and 2023 and the traffic growth factor was calculated by averaging these three counts. It should be noted Count 2 and 3 showed a reduction in traffic growth between 2021 and 2023, hence the growth rate for Count 1 was considered to be the most appropriate. The count locations are illustrated in Figure 9-1 below.

Figure 9-1 Traffic Count Locations to obtain 2023-2025 growth rate along Ennis Ave


COUNT 1
COUNT 2
COUNT 3
Merchant Dr
Enterprise Way
Beale Way
Tesla Rd
Hurrell Way
Crompton Rd
Crompton Rd
Evinrude Bend
Whittle Rd
Savery Way
Morgan St
Dixon Rd
Dixon Rd
Dixon Rd
Louise St
Dowling St
Darlie St
Calume St
Ashford Ave
Simpson Ave
Adina Way
Hillman
Hawkins St
Kurrawa St
Milina St
Chalgrove Ave
Whitfield St
Civic Blvd
Council Ave
Amherst St
Syren St
Concordia Way
Rae Rd
Woodbridge Dr
Council Ave
Kitson St
Bradbury St
Rae Rd
Mandurah Rd
Day Rd
Kent St
Lewington St
Victoria St
Regan St
Success Dr
McNichol St
Louise St
Whitfield St
Civic Blvd
Amherst St
Council Ave
Hasler Circuit
Kitson St
Hefron St
Bradbury St
Rae Rd
Concordia Way
Bluemar St
Woodbridge Dr
Sunningdale Cir
Calume St
Dixon Rd
Darlie St
Unnaro St
Milina St
Kurrawa St
Hawkins St
Adina Way
Simpson Ave
Ashford Ave
Dowling St
Louise St
Morgan St
Hurrell Way
Tesla Rd
Beale Way
Enterprise Way
Merchant Dr
Lewington St
Kent St
Victoria St
Regan St
Mandurah Rd
Day Rd
Evinrude Bend
Whittle Rd
Crompton Rd
Savery Way
Dixon Rd
Darlie St
Calume St
Unnaro St
Milina St
Kurrawa St
Hillman
Adina Way
Hawkins St
Simpson Ave
Ashford Ave
Dowling St
Louise St
Morgan St
Hurrell Way
Tesla Rd
Beale Way
Enterprise Way
Merchant Dr
Lewington St
Kent St
Victoria St
Regan St
Success Dr
McNichol St
Louise St
Whitfield St
Civic Blvd
Chalgrove Ave
Amherst St
Syren St
Council Ave
Hasler Circuit
Kitson St
Hefron St
Bradbury St
Rae Rd
Concordia Way
Bluemar St
Woodbridge Dr
Sunningdale Cir
Council Ave
Rae Rd
Mandurah Rd
Day Rd
Kent St
Lewington St
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Louise St
Whitfield St
Civic Blvd
Chalgrove Ave
Amherst St
Syren St
Council Ave
Hasler Circuit
Kitson St
Hefron St
Bradbury St
Rae Rd
Concordia Way
Bluemar St
Woodbridge Dr
Sunningdale Cir
Calume St
Dixon Rd
Darlie St
Unnaro St
Milina St
Kurrawa St
Hillman
Adina Way
Hawkins St

To assess future traffic growth under the 2041 scenario, forecasted traffic flows have been derived by using this ROM24 data to assess the impact of the 2025 Rockingham Strategic Centre (RSC) Precinct Plan yields on the identified intersections to be assessed.

On this basis, a comparative exercise has been undertaken by using the development yields associated with the 2025 Rockingham Strategic Centre (RSC) Precinct Plan and the previous 2009 City of Rockingham Precinct Structure Plan, to determine an estimation of the vehicular trips to be reduced from the future forecasted traffic flows.

To appropriately distribute this estimated reduction in trips, a comparison was undertaken for the different sub-precincts broken down by different land use.

Trip generation rates were sourced from the *Western Australian Planning Commission Transport Impact Assessment Guidelines (*WAPC*) Volume 5*, based on the land uses proposed for the RSC Precinct Plan Study Area.

The accompanying directional distribution has been based on both the WAPC Guidelines where applicable, as well as the Institute of Transportation Engineers (ITE) “Trip Generation” 10th Ed.

Table 9-2 shows the trip rates for the proposed land uses,

Table 9-3 shows the directional distribution. **Table 9-4** indicates the estimated trip generation associated with the 2009 City of Rockingham Precinct Structure Plan (PSP) and

Table 9-5 indicates the estimated trip generation associated with the 2025 Rockingham Strategic Centre (RSC) Precinct Plan. **Table 9-6** indicates the reduction for each precinct located within the Study Area.

Table 9-2. Trip generation rate

Land Use	Source of Trip Rate	Weekday	
		AM Peak Rate	PM Peak Rate
Residential	WAPC Vol 5 Residential	0.8	0.8
Retail	WAPC Retail (non-food)	1.25	4.00
Entertainment	RTA Guide in accordance with WAPC Vol 5 Page 20	5.00	5.00
Health, Welfare and Community	WAPC Vol 5 Commercial	2.00	2.00
Manufacturing	WAPC Vol 5 Industrial	1.00	1.00
Office	WAPC Vol 5 Commercial	2.00	2.00
Service	WAPC Vol 5 Industrial	1.00	1.00
Storage	WAPC Vol 5 Industrial	1.00	1.00

Table 9-3. Directional distribution

Land Use	Source of Directional Distribution	AM Peak		PM Peak	
		In	Out	In	Out
Residential	WAPC Vol 5 Page 20 Residential Distribution	25%	75%	67%	33%
Retail	ITE Code 820 directional split for retail	54%	46%	50%	50%
Entertainment	ITE Code 820 directional split for retail	54%	46%	52%	48%
Health, Welfare and Community	ITE Code 820 directional split for retail	54%	46%	50%	50%
Manufacturing	WAPC Vol 5 Page 21 Industrial Distribution	80%	20%	20%	80%
Office	ITE Code 710 directional split for commercial	54%	46%	50%	50%
Service	WAPC Vol 5 Page 21 Industrial Distribution	80%	20%	20%	80%
Storage	WAPC Vol 5 Page 21 Industrial Distribution	80%	20%	20%	80%

Table 9-4 2009 PSP trip generation

Land Use	AM Peak		PM Peak	
	In	Out	In	Out
P1-City Centre	3797	5333	6756	5407
P2 Waterfront Village	1704	3004	3163	2148
P3 Coastal Lots	490	1469	1312	646
P4 TOD Village	843	1519	1573	1059
P5 City Park	76	229	205	101
P6 Southern Residential	732	2196	1962	966
P7 Education	1093	931	1012	1012
P8 Dixon Road	441	196	235	458
Total	9177	14878	16217	11797

Table 9-5 2025 PSP trip generation

Land Use	AM Peak		PM Peak	
	In	Out	In	Out
P1-City Centre	3304	4637	5715	4539
P2 Waterfront Village	1418	2785	2823	1803
P3 Coastal Lots	352	1057	944	465
P4 TOD Village	383	844	846	518
P5 City Park	406	915	841	480
P6 Southern Residential	583	1750	1564	770
P7 Education	918	782	850	850
P8 Dixon Road	295	140	148	287
Total	7659	12910	13730	9713

Table 9-6. Estimated NET reduction in trip generation

Land Use	AM Peak		PM Peak	
	In	Out	In	Out
P1-City Centre	-493	-696	-1,042	-868
P2 Waterfront Village	-287	-220	-340	-344
P3 Coastal Lots	-137	-412	-368	-181
P4 TOD Village	-460	-675	-727	-541
P5 City Park	329	686	636	379
P6 Southern Residential	-149	-446	-398	-196
P7 Education	-175	-149	-162	-162
P8 Dixon Road	-146	-56	-86	-171
Total	-1,517	-1,967	-2,487	-2,084

As previously stated, in consultation with the City of Rockingham, it has been concluded that current ROM24 land-use models incorporate the development yields associated with the 2009 City of Rockingham Precinct Structure Plan.

Given the future traffic forecasting is based on ROM 24 traffic growth for the 2041 scenario, it was imperative that the NET reduction of trips associated with the 2025 Rockingham Strategic Centre (RSC) Precinct Plan be calculated.

Therefore, on this basis, the net reduction in vehicular trips in **Table 9.6** above has been removed from the Scenario 2: 2041 Future Traffic with ultimate development (Weekday AM and PM) through proportionally distributing the reduction in traffic across the intersections being assessed.

9.6 Trip Distribution

Vehicular trips were assigned across the network using both Video Surveys (where available) and existing SCATS turning movement data obtained from the Main Roads WA Traffic Map. In instances where specific turning movement data was unavailable, proportional assumptions were applied based on corresponding peak hour opposing movements. For example, it was assumed that the proportion of left-turning vehicles during the AM peak was used to estimate the proportion of right-turning vehicles during the PM peak.

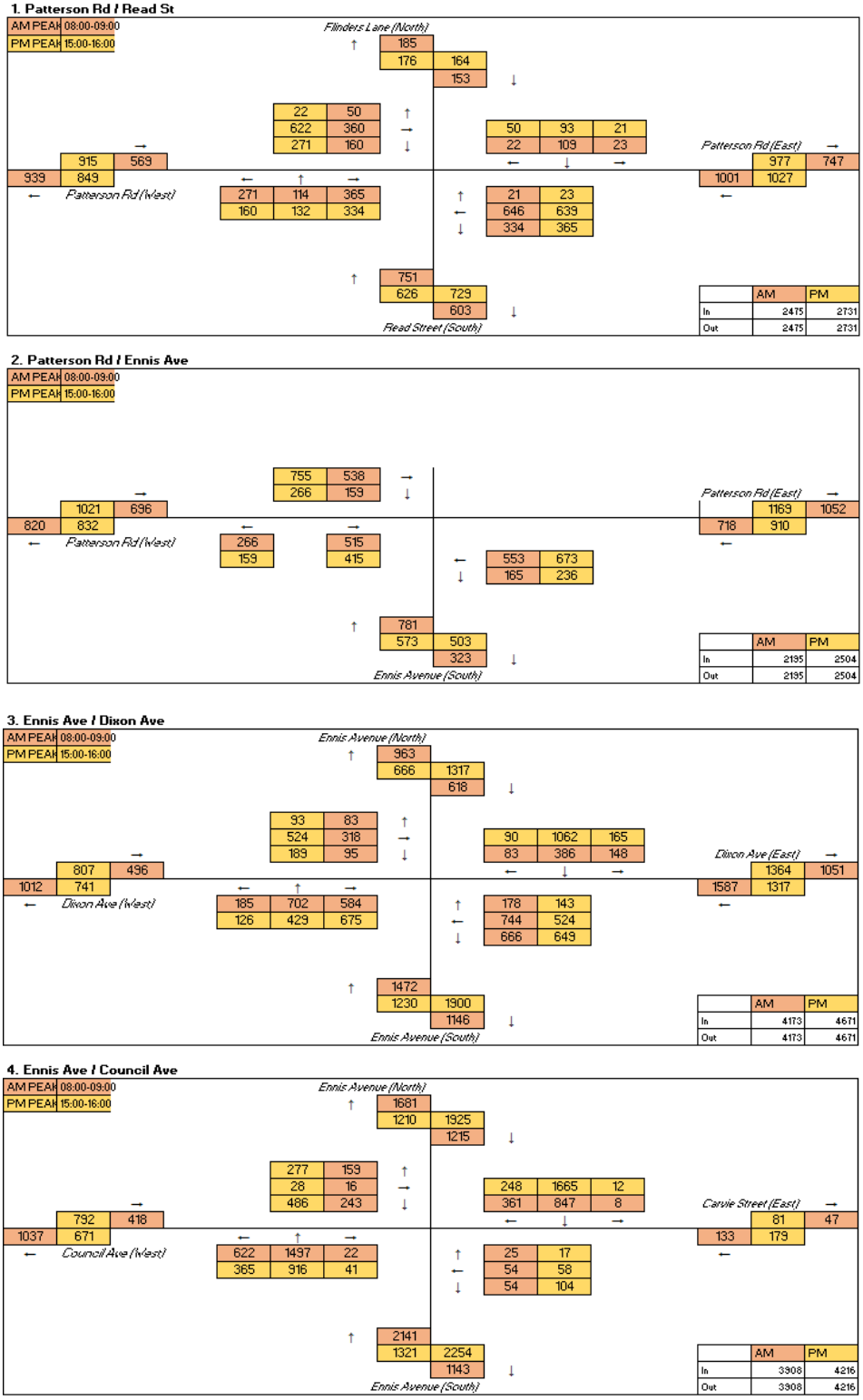
The available Video Survey Data was utilised to obtained turning movements for the following intersections with the other intersections in the PSP study area utilising SCATS.

- Ennis Avenue / Dixon Avenue
- Ennis Avenue / Council Avenue
- Ennis Avenue / Rae Road

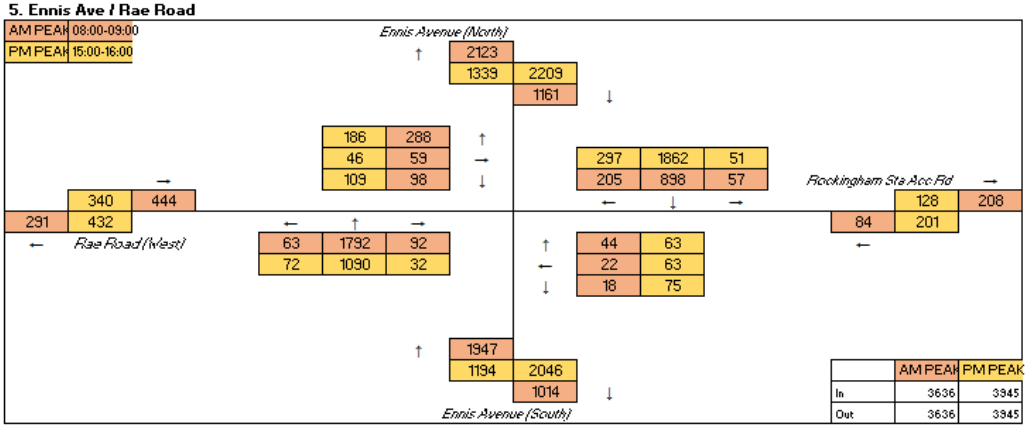
9.7 Background and Development Traffic

Figure 9-2 shows the 2025 background traffic volumes for the assessment intersections, and **Figure 9-3** shows the 2041 scenario peak hour traffic flow of the ultimate development scenario.

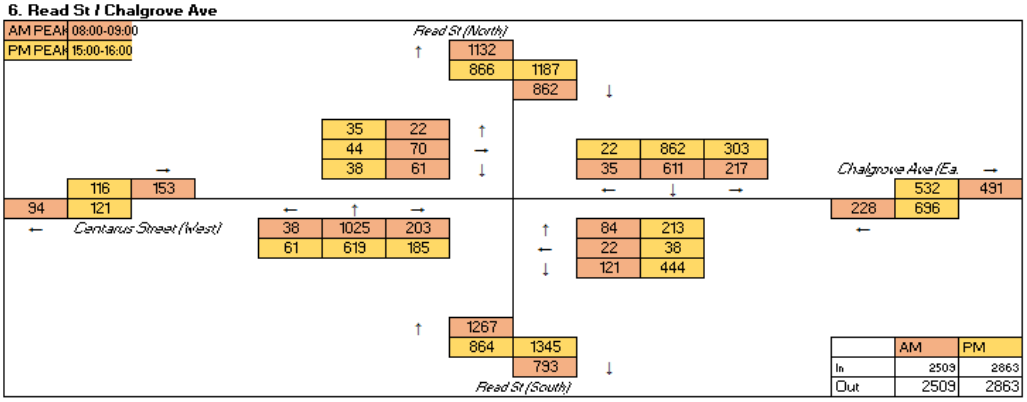
Figure 9-2. 2025 traffic flow diagrams



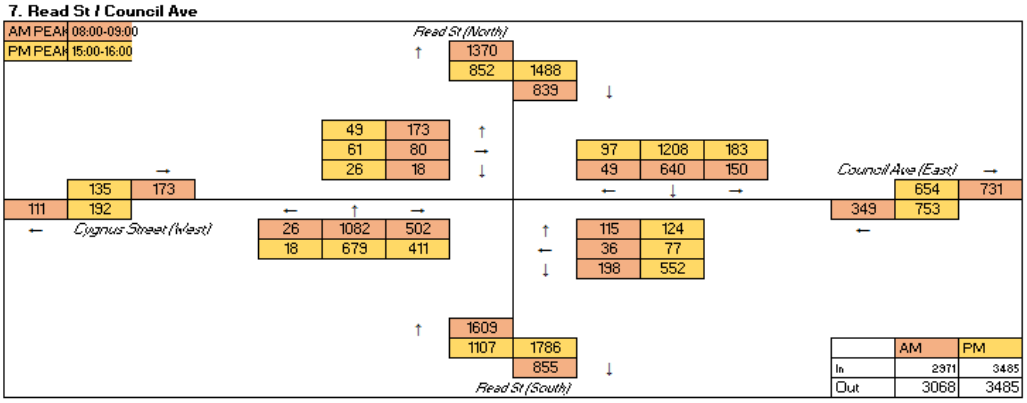
5. Ennis Ave / Rae Road



6. Read St / Chalgrove Ave



7. Read St / Council Ave



8. Read St / Rae Road

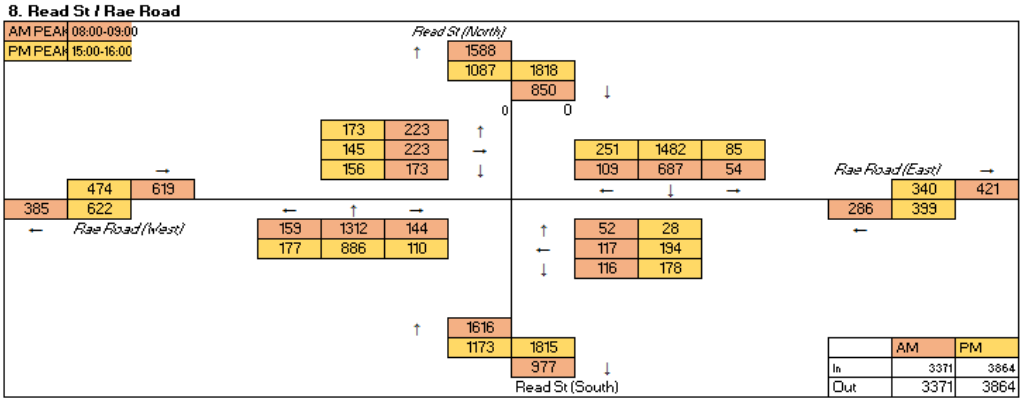
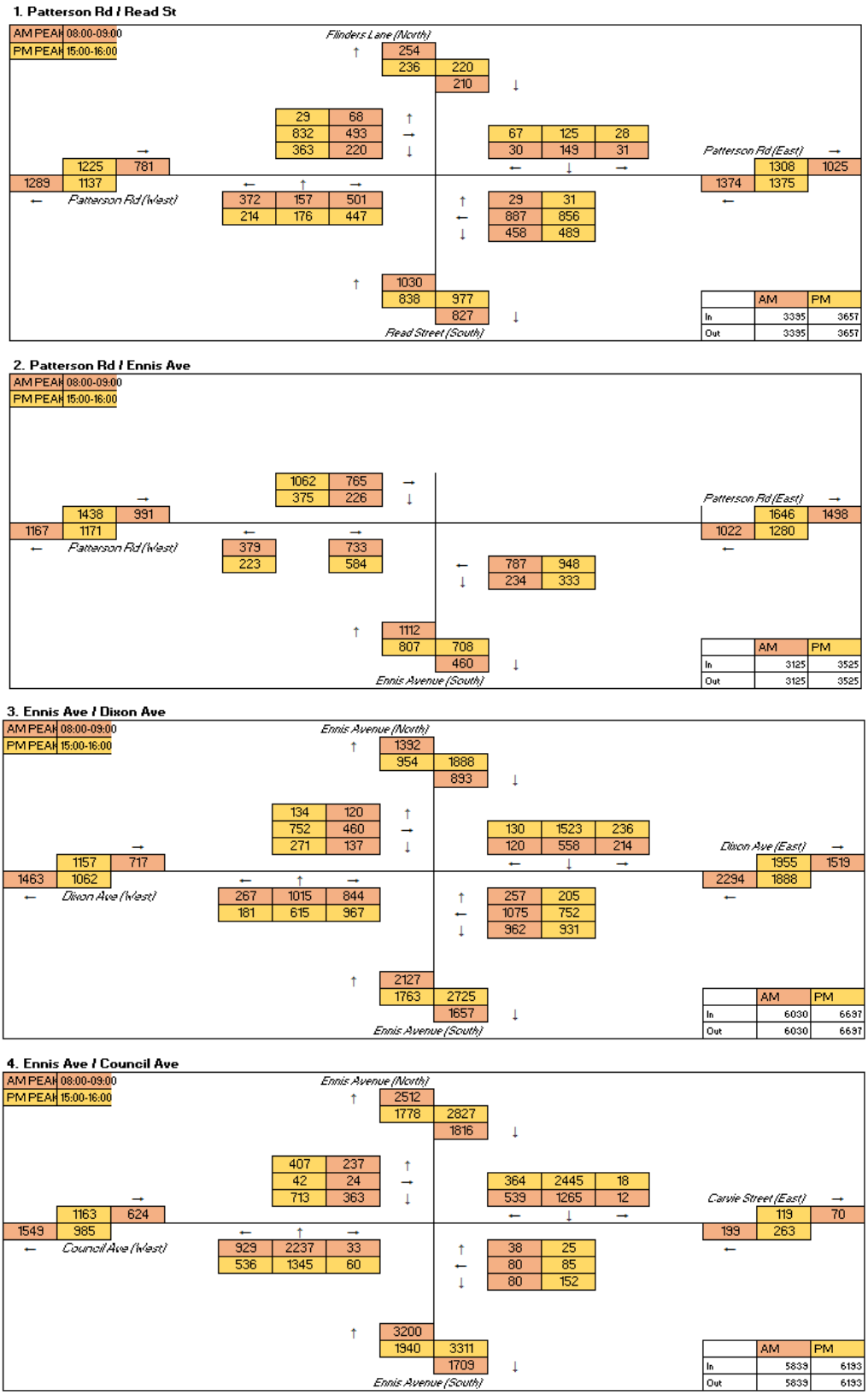
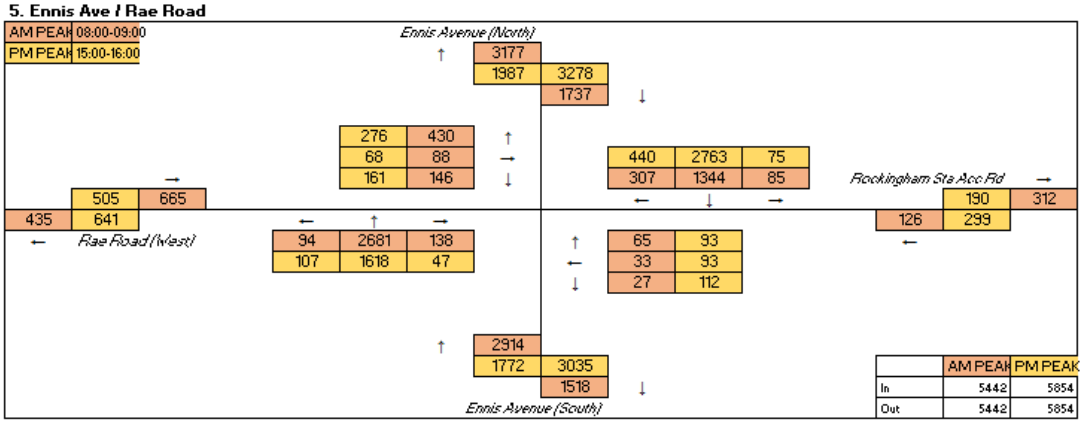


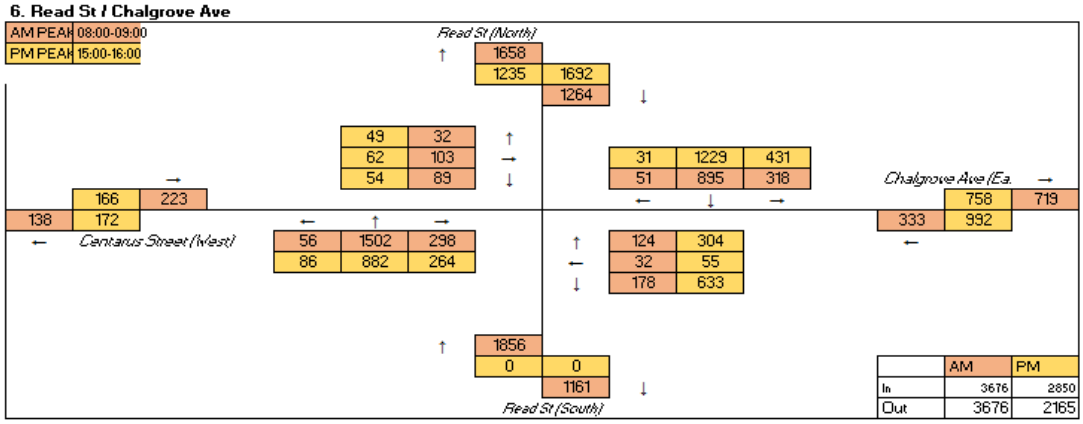
Figure 9-3. 2041 traffic flow figures



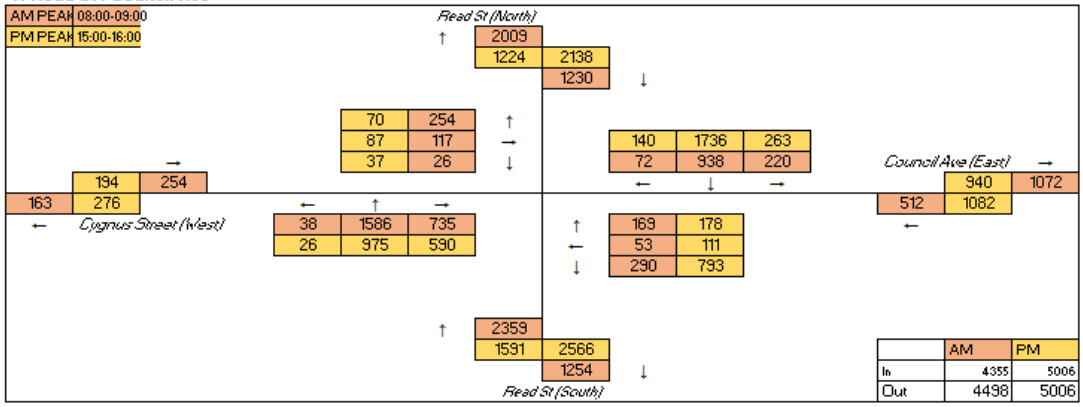
5. Ennis Ave / Rae Road



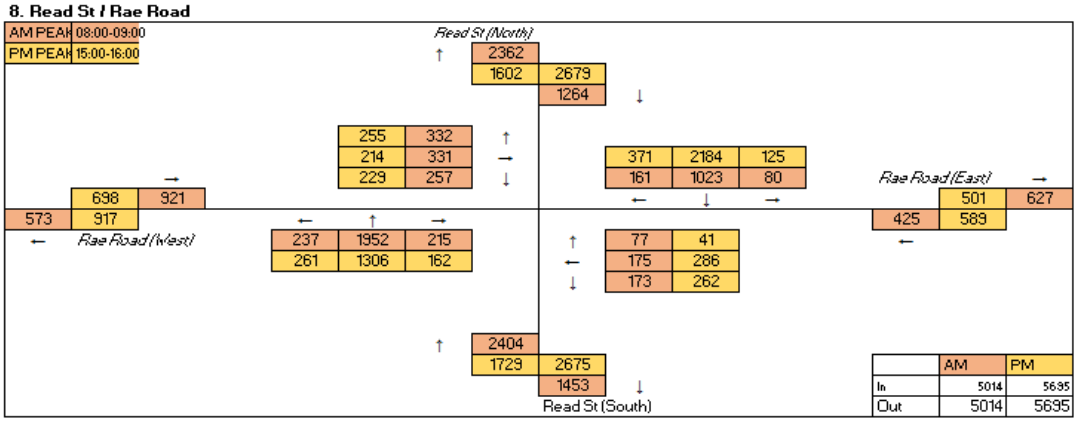
6. Read St / Chalgrove Ave



7. Read St / Council Ave



8. Read St / Rae Road



10 Key Intersection Analysis

10.1.1 SIDRA Results Definition

The key intersections were analysed using the SIDRA analysis software tool. This software calculates the performance of intersections based on input parameters, including geometry and traffic volumes. As an output SIDRA provides values for the Degree of Saturation (DOS), queue lengths, delays, level of service, and 95th Percentile Queue. These parameters are defined as follows:

- **Degree of Saturation (DOS**) is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an unsignalised intersection where DOS > 0.80;
- **95% Queue** is the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected;
- **Average Delay** is the average of all travel time delays for vehicles through the intersection. An unsignalised intersection can be considered to be operating at capacity where the average delay exceeds 55 seconds for any movement; and
- **Level of Service (LOS**) is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be described as shown in **Table 10-1.**

Table 10-1. Level of Service (LoS) performance criteria

LOS	Description	Signalised Intersection	Unsignalised Intersection
A	Free-flow operations (best condition)	≤10 sec	≤10 sec
B	Reasonable free-flow operations	10-20 sec	10-15 sec
C	At or near free-flow operations	20-35 sec	15-25 sec
D	Decreasing free-flow levels	35-55 sec	25-35 sec
E	Operations at capacity	55-80 sec	35-50 sec
F	A breakdown in vehicular flow (worst condition)	≥80 sec	≥50 sec

A LOS exceeding these values indicates that the road section is exceeding its practical capacity. Above these values, users of the intersection are likely to experience unsatisfactory queueing and delays during the peak hour periods.

The SIDRA models have been developed in accordance with the Main Roads WA operational modelling guidelines (version 2.0 January 2021). The SIDRA outputs are provided in **Appendix E**.

10.1.2 Modelling Limitations

It should be noted that there are limitations to the use of traffic modelling tools as they have simplified assumptions about driver behaviour and do not account for demand elasticity and how road users might alter their travel patterns in response to congestion or delays. The modelling does not account for behavioural adaptations, such as route choice changes, departure time shifts, or mode shifts, leading to potentially overestimated delays and queues.

10.2 SIDRA Analysis Results

The analysis was undertaken for the following scenarios:

- Scenario 1: 2025 baseline scenario (weekday AM and PM)
- Scenario 2: 2041 future traffic with ultimate development (weekday AM and PM)

10.2.1 Patterson Road and Read Street Intersection

The SIDRA layout for this intersection is illustrated in **Figure 10-1** and the analysis results for this intersection are summarised in **Table 10-2** and **Table 10-3**.

Figure 10-1. Patterson Road and Read Street intersection

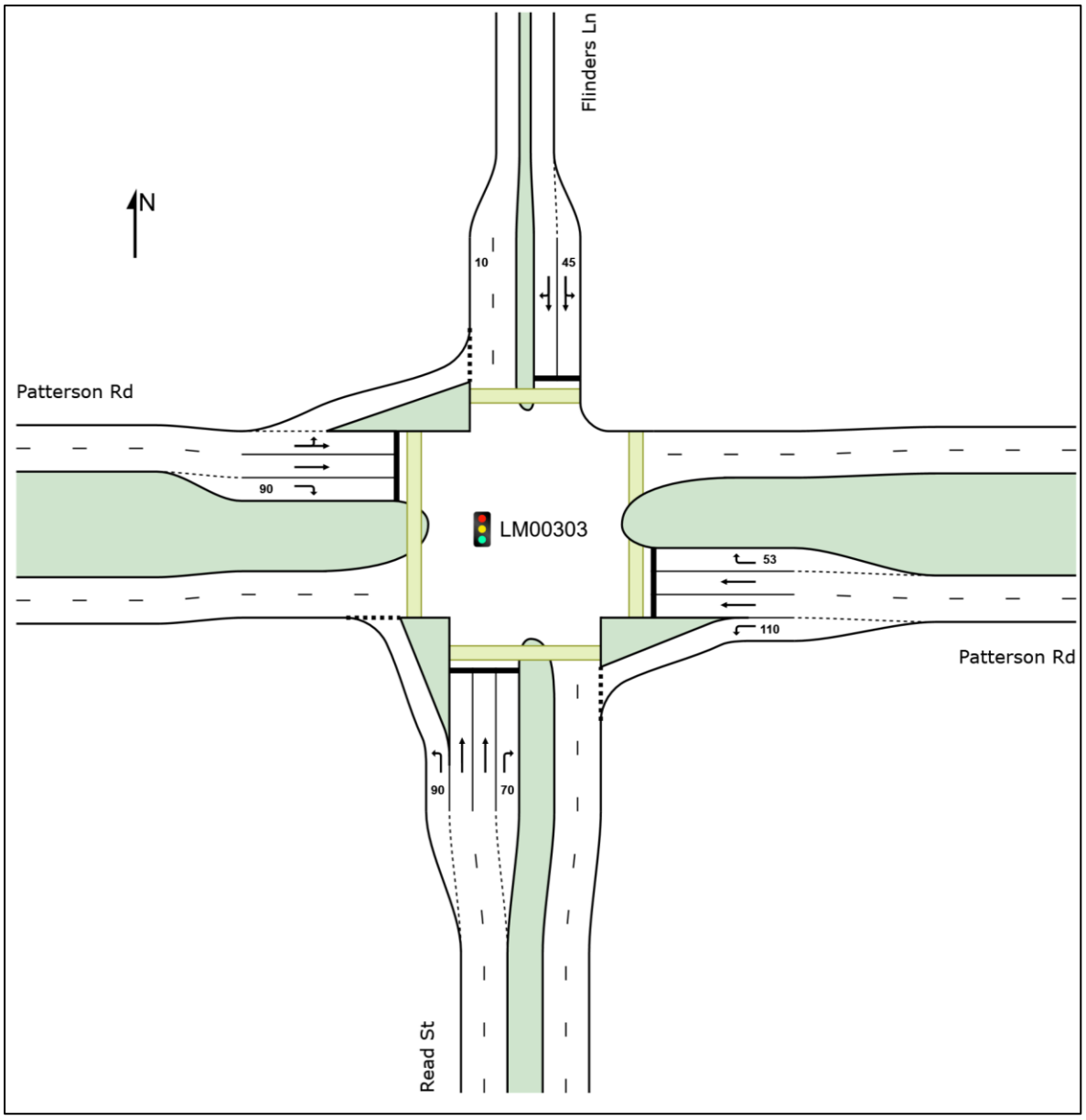


Table 10-2. SIDRA results: Patterson Road / Read Street intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	**Delay (s)**	**LOS**	**95% Queue (m)**	**DOS**	**Delay (s)**	**LOS**	**95% Queue (m)**
South: Read Street	L	0.246	11.5	B	36.4	0.150	11.5	B	21.5
	T	0.131	24.6	C	24.5	0.180	36.4	D	37.5
	R	0.636	31.4	C	111.8	0.726	45.1	D	134.5
Approach		**0.636**	**23.2**	**C**	**111.8**	**0.726**	**34.7**	**C**	**134.5**
East: Patterson Road	L	0.267	8.5	A	33.4	0.315	11.3	B	57.2
	T	0.787	51.4	D	138.6	0.859	70.6	E	173.6
	R	0.099	62.9	E	8.1	0.120	81.2	F	10.6
Approach		**0.787**	**37.3**	**D**	**138.6**	**0.859**	**49.8**	**D**	**173.6**
North: Flinders Lane	L	0.731	64.8	E	36.8	0.819	77.7	E	48.0
	T	0.731	60.3	E	36.8	0.819	73.3	E	48.0
	R	0.731	65.1	E	34.0	0.819	78.4	E	42.8
Approach		**0.731**	**61.7**	**E**	**36.8**	**0.819**	**75.5**	**E**	**48.0**
West: Patterson Road	L	0.492	6.9	A	72.0	0.531	7.1	A	127.8
	T	0.492	42.6	D	75.8	0.531	37.8	D	129.0
	R	0.757	60.2	E	71.0	0.849	42.7	D	93.8
Approach		**0.757**	**44.4**	**D**	**75.8**	**0.849**	**38.5**	**D**	**129.0**
All vehicles		**0.787**	**36.2**	**D**	**138.6**	**0.859**	**44.1**	**D**	**173.6**

The result indicates that the Patterson Road / Read Street intersection is operating at deteriorating operational performance during the AM and PM peak hours for the 2025 base scenario with an overall LOS D and some approaches operating at LOS E with queues of approximately 175 m.

Table 10-3. SIDRA results: Patterson Road / Read Street intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Read Street	L	0.357	18.9	B	77.6	0.210	14.6	B	40.7
	T	0.170	44.4	D	44.5	0.226	53.4	D	56.6
	R	0.917	78.0	E	283.6	1.028	132.2	F	326.8
Approach		**0.917**	**51.5**	**D**	**283.6**	**1.028**	**85.5**	**F**	**326.8**
East: Patterson Road	L	0.369	19.3	B	79.5	0.437	27.5	C	113.0
	T	1.031	146.8	F	389.1	1.153	243.0	F	443.6
	R	0.138	105.0	F	15.1	0.127	103.4	F	15.7
Approach		**1.031**	**103.5**	**F**	**389.1**	**1.153**	**163.3**	**F**	**443.6**
North: Flinders Lane	L	1.069	165.3	F	94.8	1.039	143.7	F	97.0
	T	1.069	161.3	F	94.8	1.039	139.7	F	97.0
	R	1.069	166.5	F	85.6	1.039	146.0	F	82.1
Approach		**1069**	**162.6**	**F**	**94.8**	**1.039**	**142.1**	**F**	**97.0**
West: Patterson Road	L	0.585	7.4	A	135.8	0.821	10.7	B	254.0
	T	0.585	55.9	E	140.1	0.821	61.3	E	254.0
	R	1.046	147.8	F	183.2	1.131	190.2	F	309.7
Approach		**1.046**	**77.6**	**E**	**183.2**	**1.131**	**98.3**	**F**	**309.7**
All vehicles		**1.069**	**85.4**	**F**	**389.1**	**1.153**	**122.5**	**F**	**443.6**

The result indicates that the Patterson Road / Read Street intersection is expected to reach capacity and poor level of service during the AM and PM peak hour periods for the 2041 future traffic with ultimate development scenario with an overall LOS F and queues exceeding 400 m.

10.2.2 Patterson Road and Ennis Avenue Intersection

The SIDRA layout for this intersection is illustrated in **Figure 10-2** and the analysis results for this intersection are summarised in **Table 10-4** and **Table 10-5**.

Figure 10-2. Patterson Road and Ennis Aveune intersection

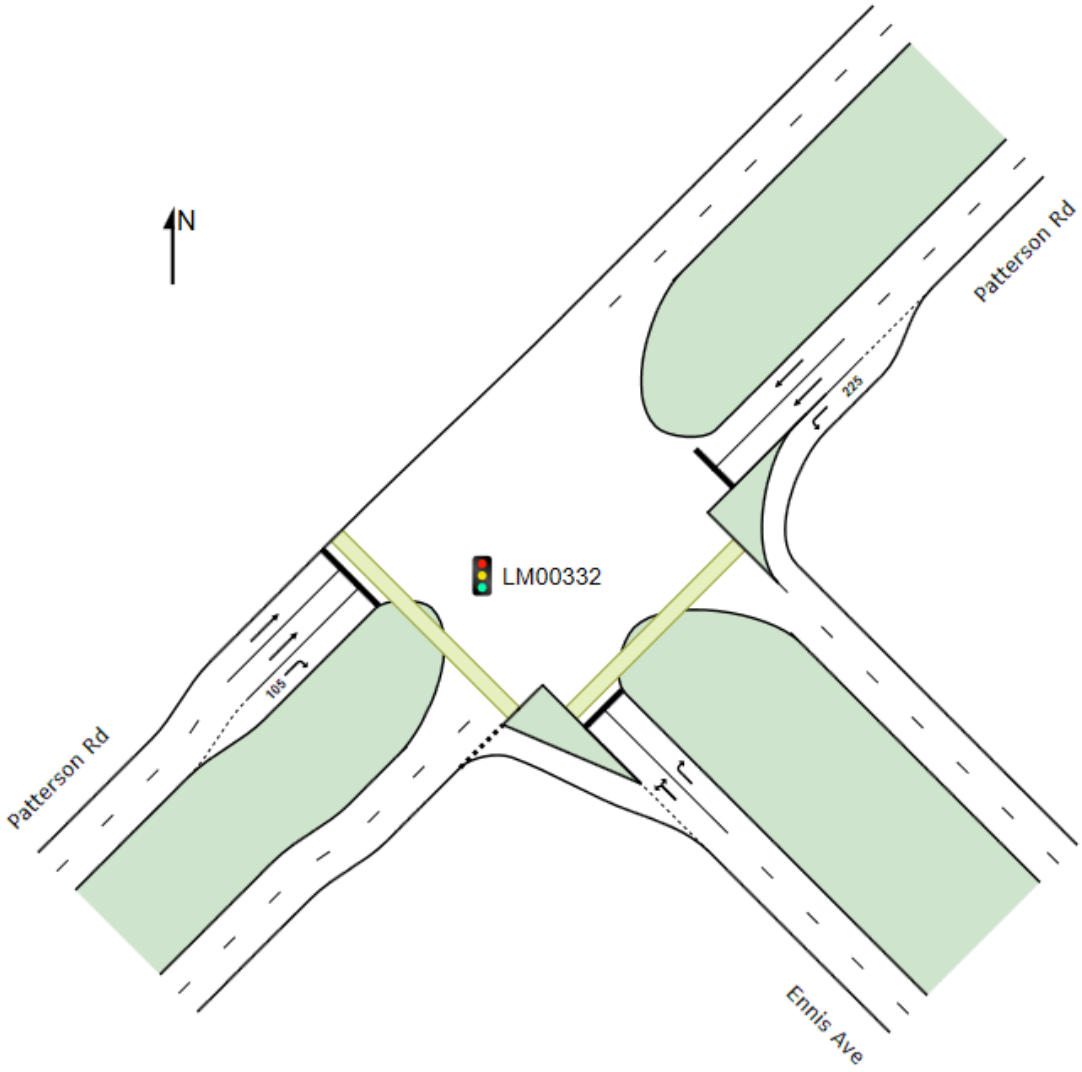


Table 10-4. SIDRA results: Patterson Road / Ennis Avenue intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Southeast: Ennis Avenue	L	0.760	14.7	B	109.5	0.714	14.3	B	90.5
	R	0.760	44.7	D	109.599.5	0.714	51.3	D	90.5
Approach		**0.760**	**34.5**	**C**	**109.599.5**	**0.714**	**41.0**	**D**	**90.5**
Northeast: Patterson Road	L	0.101	6.7	A	0.0	0.144	6.7	A	0.0
	T	0.754	35.2	D	87.7	0.798	39.0	D	121.4
Approach		**0.753**	**28.7**	**C**	**87.7**	**0.798**	**30.6**	**C**	**121.4**
Southwest: Patterson Road	T	0.290	10.9	B	45.7	0.358	9.4	A	65.2
	R	0.648	26.5	C	28.7	0.770	29.0	C	53.0
Approach		**0.648**	**14.5**	**B**	**45.7**	**0.770**	**14.5**	**B**	**65.2**
All vehicles		**0.760**	**26.3**	**C**	**109.5**	**0.798**	**26.4**	**C**	**121.4**

The result indicates that the Patterson Road / Ennis Avenue intersection operates at acceptable levels with LOS C during peak AM and PM peak hours for the 2025 base scenario with average delays of around 26 seconds.

Table 10-5. SIDRA results: Patterson Road / Ennis Avenue intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	**Delay (s)**	**LOS**	**95% Queue (m)**	**DOS**	**Delay (s)**	**LOS**	**95% Queue (m)**
Southeast: Ennis Ave	L	1.021	70.5	E	363.8	1.013	63.6	E	248.0
	R	1.021	96.7	F	363.8	1.013	90.7	F	248.0
Approach		**1.021**	**87.7**	**F**	**363.8**	**1.013**	**83.2**	**F**	**248.0**
Northeast: Patterson Rd	L	0.143	6.7	A	0.0	0.204	6.7	A	0.0
	T	1.044	122.5	F	260.8	1.223	265.3	F	454.4
Approach		**1.044**	**95.9**	**F**	**260.8**	**1.223**	**198.1**	**F**	**454.4**
Southwest: Patterson Rd	T	0.403	13.9	B	85.3	0.495	10.6	B	106.4
	R	1.063	110.9	F	112.6	1.210	229.2	F	310.2
Approach		**1.063**	**36.1**	**D**	**112.6**	**1.210**	**67.6**	**E**	**310.2**
All vehicles		**1.063**	**74.0**	**E**	**363.9**	**1.223**	**118.6**	**F**	**454.4**

The result indicates that the Patterson Road / Ennis Avenue intersection is expected to operate at capacity during the AM and PM peak hours for the 2041 future traffic with ultimate development scenario with an overall LOS E or F.

10.2.3 Ennis Avenue and Dixon Road Intersection

The SIDRA layout for this intersection is illustrated in **Figure 10-3** and the analysis results for this intersection are summarised in **Table 10-6** and Table 10-7.

Figure 10-3. Ennis Avenue and Dixon Road intersection

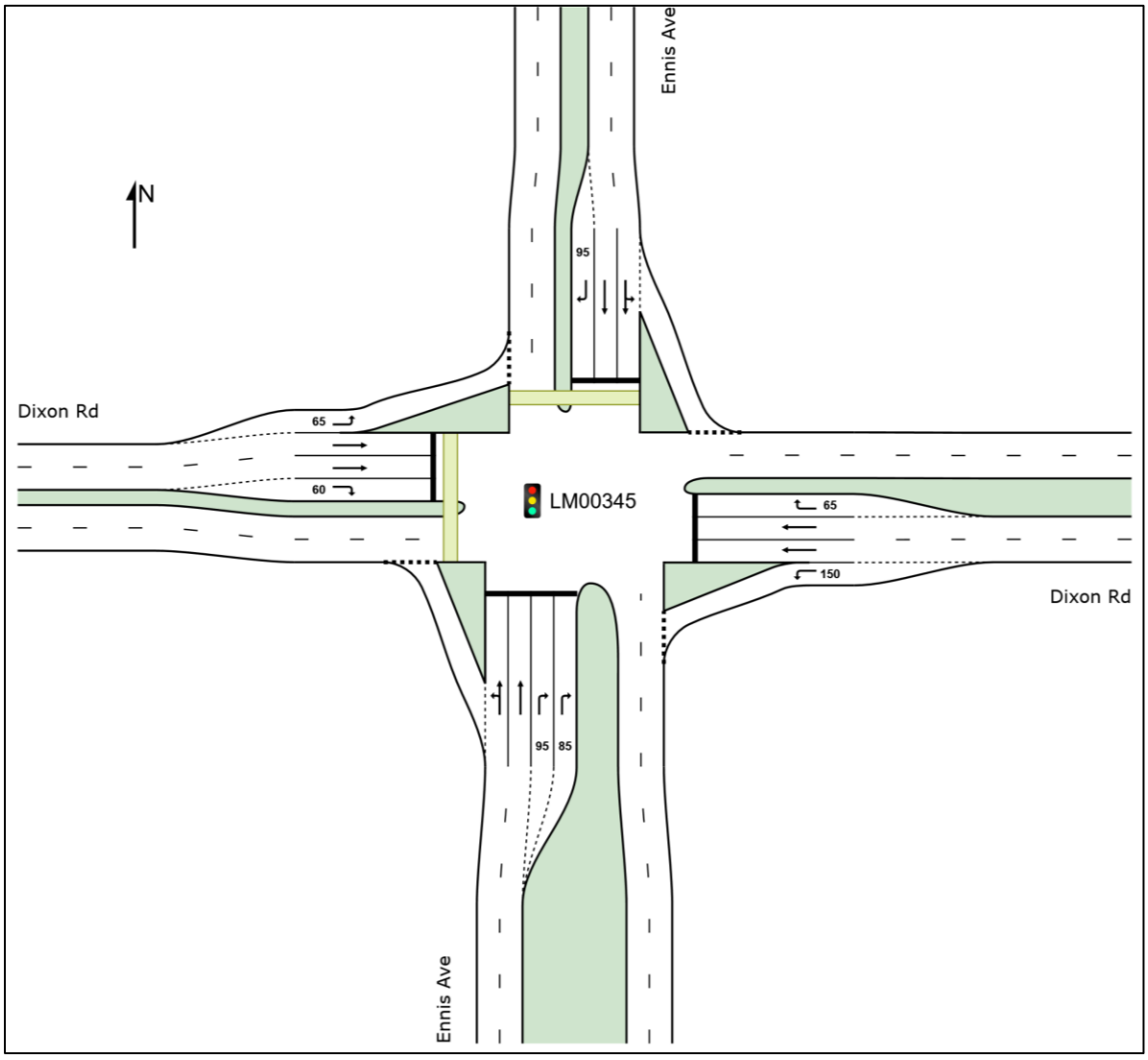


Table 10-6. SIDRA results: Ennis Avenue / Dixon Road intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Ennis Avenue	L	0.908	32.3	C	201.5	0.382	14.8	B	97.4
	T	0.908	61.6	E	201.5	0.382	40.2	D	106.5
	R	1.024	86.3	F	135.1	1.117	164.7	F	277.2
Approach		**1.024**	**67.7**	**E**	**201.5**	**1.117**	**105.9**	**F**	**277.2**
East: Dixon Road	L	0.587	12.2	B	109.4	0.772	49.8	D	236.5
	T	1.080	141.1	F	261.8	1.097	185.1	F	242.8
	R	1.061	139.0	F	114.2	0.852	99.9	F	88.2
Approach		**1.080**	**86.8**	**F**	**261.8**	**1.097**	**109.1**	**F**	**242,8**
North: Ennis Avenue	L	1.029	71.6	E	166.3	1.134	154.4	F	609.0
	T	1.029	105.0	F	166.3	1.134	197.6	F	609.0
	R	0.450	53.6	D	30.9	0.383	97.0	F	47.2
Approach		**1.029**	**90.1**	**F**	**166.3**	**1.134**	**185.3**	**F**	**609.0**
West: Dixon Road	L	0.094	15.3	B	13.7	0.087	34.4	C	13.1
	T	0.450	38.6	D	54.0	1.122	205.5	F	259.2
	R	0.566	54.5	D	36.3	1.126	226.1	F	177.9
Approach		**0.566**	**37.7**	**D**	**54.0**	**1.126**	**190.6**	**F**	**259.2**
All vehicles		**1.080**	**74.7**	**E**	**261.8**	**1.134**	**143.8**	**F**	**609.0**

The result indicates that the Ennis Avenue / Dixon Road intersection is currently reaching capacity during the AM and PM peak hours for the 2025 base year with some approaches at LOS E or F with queues up to about 609 m on Ennis Avenue north approach in the PM peak.

Table 10-7. SIDRA results: Ennis Ave / Dixon Rd intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Ennis Avenue	L	1.325	312.4	F	747.8	0.552	17.3	B	160.2
	T	1.325	339.7	F	747.8	0.552	94.4	F	165.4
	R	1.479	482.6	F	516.3	1.601	663.2	F	722.4
Approach		**1.479**	**393.0**	**F**	**747.8**	**1.601**	**398.4**	**F**	**722.4**
East: Dixon Road	L	0.876	24.5	C	245.7	1.108	166.2	F	689.7
	T	1.560	563.7	F	775.6	1.575	609.6	F	602.2
	R	1.532	560.1	F	353.9	1.222	322.4	F	225.0
Approach		**1.560**	**337.2**	**F**	**775.6**	**1.575**	**359.8**	**F**	**689.7**
North: Ennis Avenue	L	1.488	459.8	F	554.0	1.626	585.1	F	1453.9
	T	1.488	491.7	F	554.0	1.626	634.2	F	1453.9
	R	0.650	55.6	E	46.4	0.553	110.2	F	70.2
Approach		**1.488**	**425.3**	**F**	**554.0**	**1.626**	**592.0**	**F**	**1453.9**
West: Dixon Road	L	0.142	17.6	B	22.3	0.140	75.6	E	26.6
	T	0.651	40.7	D	82.3	1.610	641.1	F	629.3
	R	0.817	60.2	E	57.1	1.615	673.0	F	430.4
Approach		**0.817**	**40.5**	**D**	**82.3**	**1.615**	**583.1**	**F**	**629.3**
All vehicles		**1.560**	**334.7**	**F**	**775.6**	**1.626**	**474.0**	**F**	**1453.9**

The result indicates that the Ennis Avenue / Dixon Road intersection is expected to operate over capacity and poor levels of service during the AM and PM peak hours for the 2041 future traffic with ultimate development scenario.

10.2.4 Ennis Avenue and Council Avenue Intersection

The SIDRA layout for this intersection is illustrated in **Figure 10-4** and the analysis results for this intersection are summarised in **Table 10-8** and **Table 10-9**.

Figure 10-4. Ennis Avenue and Council Avenue intersection

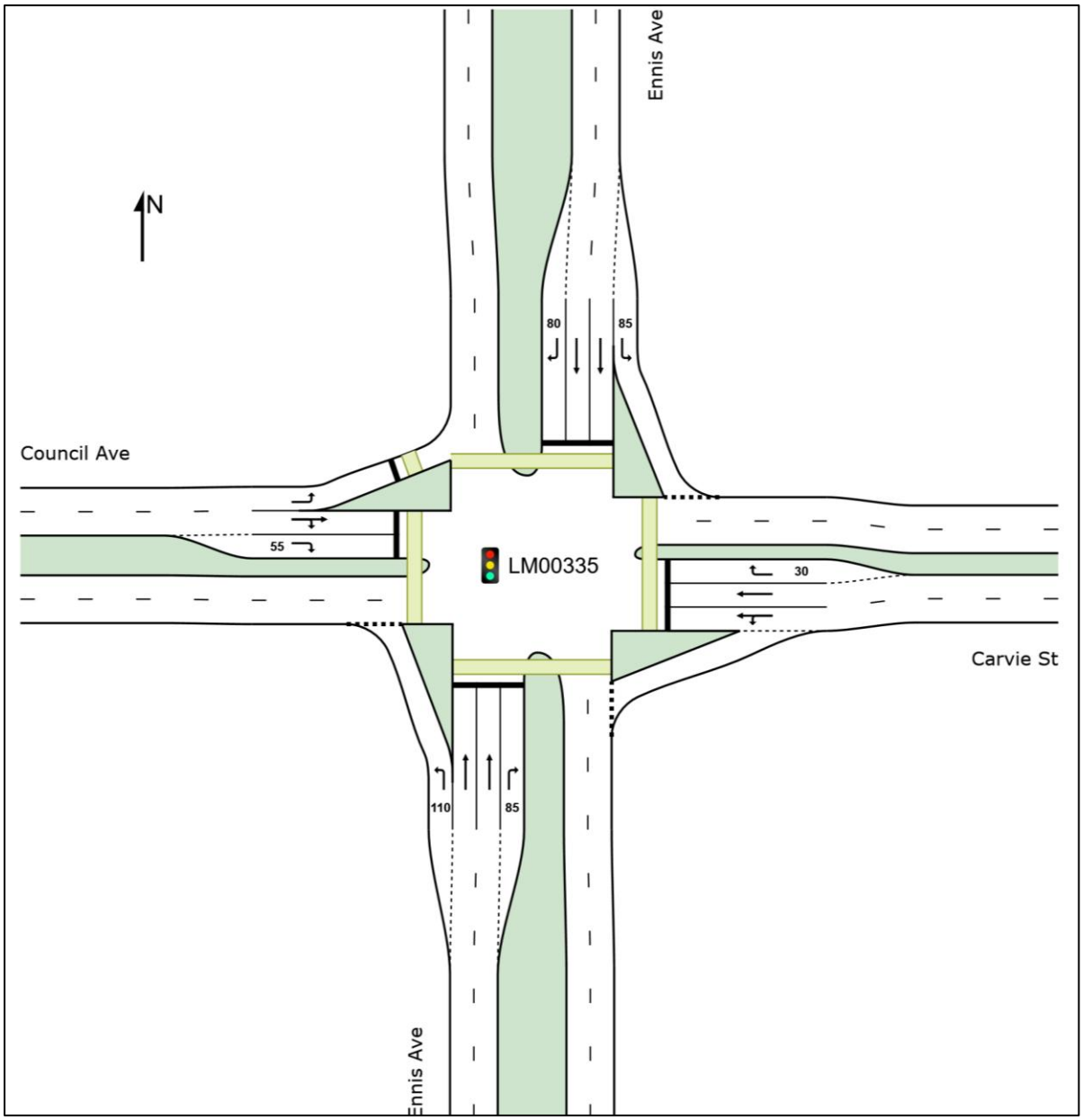


Table 10-8. SIDRA results: Ennis Avenue / Council Avenue intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Ennis Avenue	L	0.526	61.8	E	87.9	0.305	30.1	C	32.5
	T	2.010	990.8	F	1364.4	1.232	281.6	F	459.0
	R	0.213	94.4	F	9.6	0.463	80.4	F	18.5
Approach		**2.010**	**711.7**	**F**	**1364.4**	**1.232**	**206.0**	**F**	**459.0**
East: Carvie Street	L	0.131	13.3	B	13.4	0.175	27.7	C	30.5
	T	0.131	44.7	D	15.0	0.175	44.4	D	30.5
	R	0.085	47.2	D	9.1	0.058	46.8	D	6.1
Approach		**0.131**	**32.4**	**C**	**15.0**	**0.175**	**35.0**	**C**	**30.5**
North: Ennis Avenue	L	0.006	14.0	B	0.3	0.009	60.1	E	0.5
	T	0.738	39.9	D	167.1	1.463	491.1	F	1169.2
	R	1.883	841.8	F	587.5	1.294	356.4	F	233.1
Approach		**1.883**	**277.8**	**F**	**587.5**	**1.463**	**3471.1**	**F**	**1169.2**
West: Council Avenue	L	0.270	20.6	C	26.6	0.470	23.6	C	55.0
	T	0.461	48.4	D	51.8	1.018	112.2	F	165.5
	R	0.461	52.9	D	51.8	1.018	116.7	F	165.5
Approach		**0.461**	**40.4**	**D**	**51.8**	**1.018**	**83.9**	**F**	**165.5**
All vehicles		**2.010**	**481.8**	**F**	**1364.4**	**1.463**	**296.8**	**F**	**1169.2**

The result indicates that the Ennis Avenue / Council Avenue intersection currently operates over capacity with the through movements on Ennis Avenue southern approach and the through and right turn movements on Ennis Ave northern approach expected to operate at poor levels of service during the AM and PM peak hours for the 2025 base scenario.

Table 10-9. SIDRA results: Ennis Avenue / Council Avenue intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Ennis Avenue	L	0.956	120.9	F	419.3	0.460	53.1	D	62.9
	T	3.003	1893.3	F	2533.4	1.809	807.1	F	1128.3
	R	0.320	103.8	F	14.5	0.678	96.2	F	27.9
Approach		**3.003**	**1360.1**	**F**	**2533.4**	**1.809**	**576.9**	**F**	**1128.3**
East: Carvie Street	L	0.200	23.7	C	28.7	0.257	28.5	C	46.1
	T	0.200	45.8	D	28.7	0.257	45.3	D	46.1
	R	0.129	47.6	D	14.0	0.085	47.2	D	9.1
Approach		**0.200**	**37.2**	**D**	**28.7**	**0.257**	**35.7**	**D**	**46.1**
North: Ennis Avenue	L	0.009	50.3	D	0.5	0.013	74.6	E	0.9
	T	1.213	282.7	F	691.1	2.148	1112.0	F	2464.7
	R	2.811	1736.4	F	1194.4	1.899	912.0	F	596.6
Approach		**2.811**	**712 .6**	**F**	**1194.4**	**2.148**	**1079.7**	**F**	**2464.7**
West: Council Avenue	L	0.402	21.5	C	42.0	0.690	31.4	C	113.1
	T	0.688	51.5	D	82.0	1.495	527.7	F	516.7
	R	0.688	55.9	E	82.0	1.495	532.1	F	516.7
Approach		**0.688**	**42.7**	**D**	**82.0**	**1.495**	**356.5**	**F**	**516.7**
All vehicles		**3.003**	**973.0**	**F**	**2533.4**	**2.148**	**742.2**	**F**	**2464.7**

The result indicates that the Ennis Avenue / Council Avenue intersection is expected to operate over capacity and at poor levels of service during the AM and PM peak hours for the 2041 future traffic with ultimate development scenario.

10.2.5 Ennis Avenue and Rae Road Intersection

The SIDRA layout for this intersection is illustrated in **Figure 10-5** and the analysis results for this intersection are summarised in **Table 10-10** and **Table 10-11**.

Figure 10-5. Ennis Avenue and Rae Road intersection

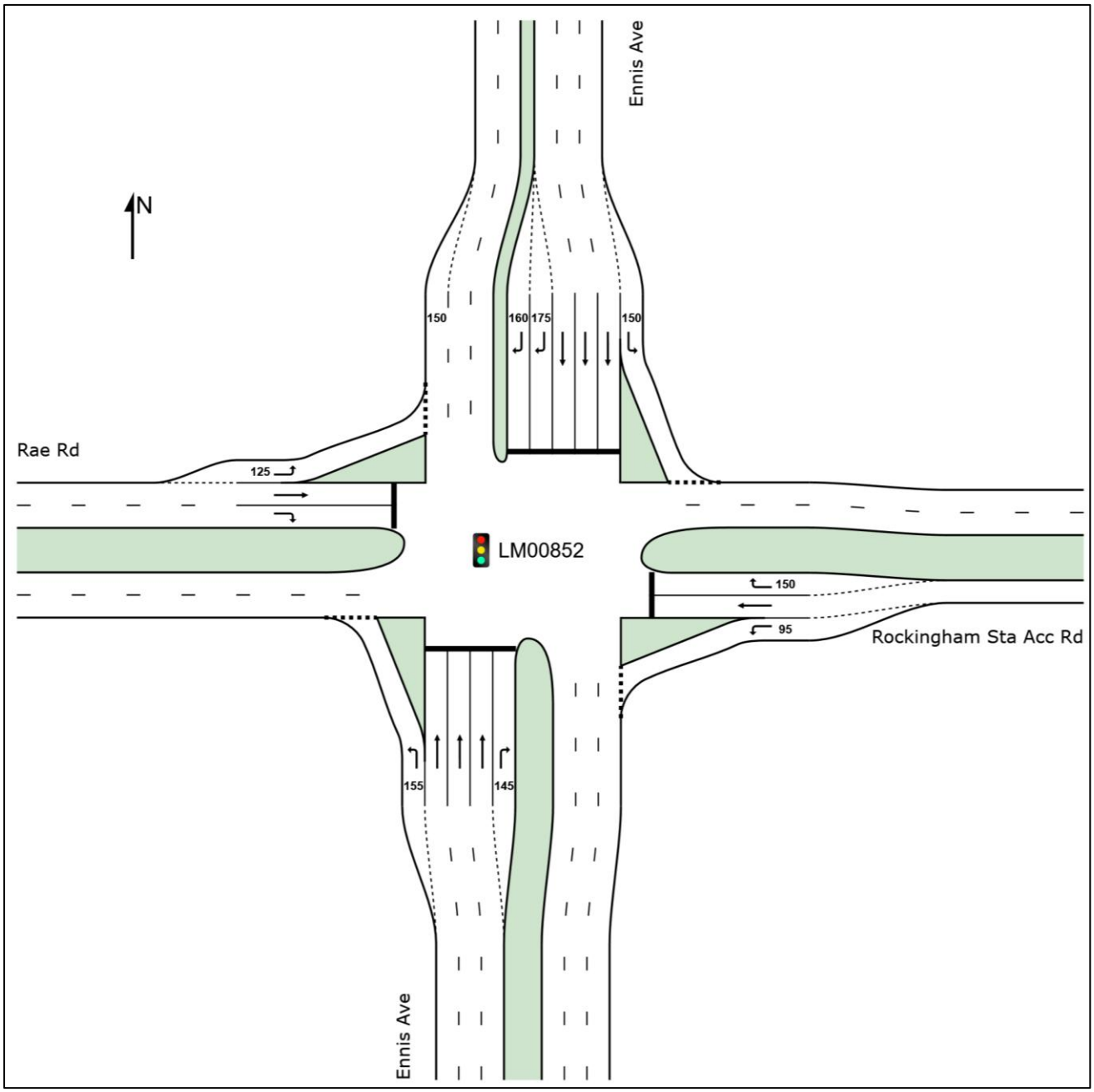


Table 10-10. SIDRA results: Ennis Avenue / Rae Road intersection – scenario 1- 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	**Delay (s)**	**LOS**	**95% Queue (m)**	**DOS**	**Delay (s)**	**LOS**	**95% Queue (m)**
South: Ennis Avenue	L	0.048	7.9	A	3.0	0.059	8.8	A	4.7
	T	0.822	26.3	C	183.7	0.531	20.1	C	87.3
	R	0.721	50.5	D	30.1	0.188	44.2	D	9.3
Approach		**0.822**	**26.8**	**C**	**183.7**	**0.531**	**20.0**	**C**	**87.3**
East: Rockingham Sta Acc Road	L	0.020	7.6	A	1.4	0.107	15.1	B	11.5
	T	0.164	39.7	D	6.6	0.470	41.8	D	19.5
	R	0.345	45.2	D	13.5	0.495	45.9	D	19.6
Approach		**0.345**	**35.7**	**D**	**13.5**	**0.495**	**33.1**	**C**	**19.6**
North: Ennis Avenue	L	0.044	8.1	A	3.0	0.038	7.6	A	2.0
	T	0.394	17.1	B	62.1	0.868	32.4	C	202.5
	R	0.803	52.4	D	34.5	0.874	54.7	D	52.1
Approach		**0.803**	**22.9**	**C**	**62.1**	**0.874**	**34.8**	**C**	**202.5**
West: Rae Road	L	0.395	22.2	C	48.5	0.212	12.3	B	18.8
	T	0.440	43.6	D	18.2	0.343	43.2	D	14.1
	R	0.768	51.5	D	32.6	0.856	54.8	D	37.9
Approach		**0.768**	**31.5**	**C**	**48.5**	**0.856**	**30.1**	**C**	**37.9**
All vehicles		**0.822**	**26.4**	**C**	**183.7**	**0.874**	**29.8**	**C**	**202.5**

The result indicates that the Ennis Avenue / Rae Road intersection is operating at LOS C with some movements at LOS D during the AM and PM peak hours for the 2025 base scenario with queues around 200 m.

Table 10-11. SIDRA results: Ennis Avenue / Rae Road intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Ennis Avenue	L	0.072	22.4	C	6.6	0.089	10.3	B	10.7
	T	1.084	284.0	F	652.1	0.701	24.6	C	169.1
	R	0.903	75.9	E	61.0	0.231	51.1	D	16.5
Approach		**1.084**	**265.7**	**F**	**652.1**	**0.701**	**24.4**	**C**	**169.1**
East: Rockingham Sta Acc Road	L	0.037	10.6	B	3.4	0.194	27.2	C	28.6
	T	0.308	52.3	D	12.7	0.867	60.5	E	39.9
	R	0.478	54.8	D	24.8	0.608	54.8	D	35.8
Approach		**0.478**	**44.6**	**D**	**24.8**	**0.867**	**46.2**	**D**	**39.9**
North: Ennis Avenue	L	0.067	9.0	A	6.6	0.055	25.3	C	3.9
	T	0.511	18.6	B	113.3	1.148	185.8	F	746.6
	R	1.004	96.8	F	83.4	1.079	149.6	F	147.1
Approach		**1.004**	**32.0**	**C**	**113.3**	**1.148**	**177.2**	**F**	**746.6**
West: Rae Road	L	0.772	611.1	F	128.7	0.377	21.5	C	54.9
	T	0.820	60.2	E	36.8	0.634	56.5	E	27.1
	R	1.074	143.2	F	95.4	1.053	127.4	F	99.4
Approach		**1.074**	**435.2**	**F**	**128.7**	**1.053**	**60.0**	**E**	**99.4**
All vehicles		**1.084**	**206.7**	**F**	**652.1**	**1.148**	**114.2**	**F**	**746.6**

The result indicates that the Ennis Avenue / Rae Road intersection is expected to operate at capacity and poor levels of service during the AM and PM peak hours for the 2041 future traffic with ultimate development scenario with an overall LOS F.

10.2.6 Read Street and Chalgrove Avenue Intersection

The SIDRA layout for this intersection is illustrated in **Figure 10-6** and the analysis results for this intersection are summarised in **Table 10-12** and **Table 10-13**.

Figure 10-6. Read Street and Chalgrove Avenue intersection

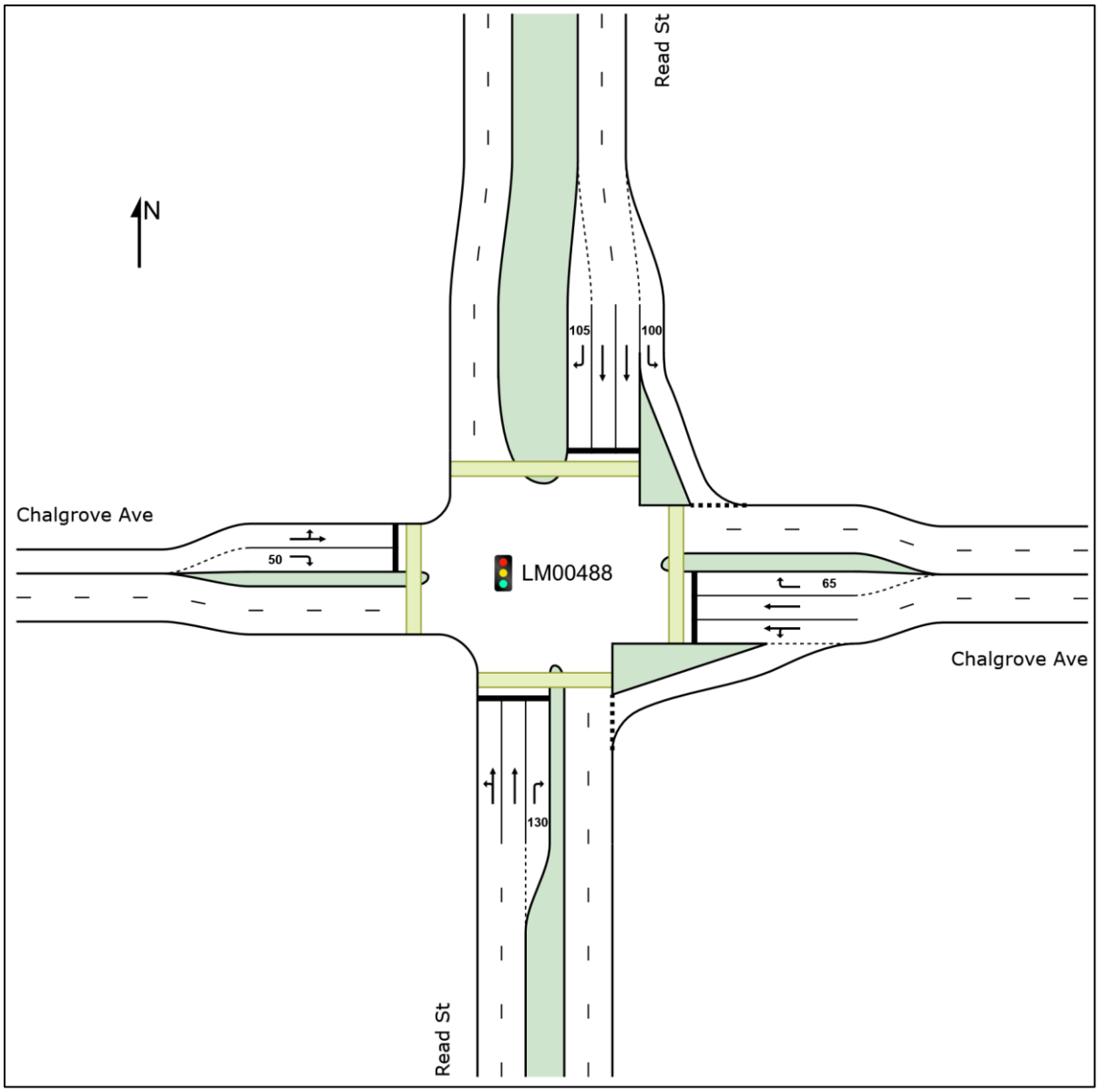


Table 10-12. SIDRA results: Read Street / Chalgrove Avenue intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Read Street	L	0.883	53.6	D	237.7	0.723	47.2	D	130.1
	T	0.883	47.2	D	238.5	0.723	40.7	D	131.2
	R	0.874	67.3	E	94.5	0.854	66.1	E	84.6
Approach		**0.883**	**50.6**	**D**	**238.5**	**0.854**	**46.6**	**D**	**131.2**
East: Chalgrove Avenue	L	0.111	9.3	A	12.6	0.433	14.2	B	82.4
	T	0.059	38.8	D	7.3	0.101	39.3	D	12.7
	R	0.775	66.9	E	37.9	0.860	64.3	E	97.5
Approach		**0.775**	**33.5**	**C**	**37.9**	**0.860**	**30.9**	**C**	**97.5**
North: Read Street	L	0.182	10	A	22.2	0.247	9.4	A	28.9
	T	0.507	31.4	C	100.8	0.912	57.3	E	207.5
	R	0.151	52.7	D	13	0.102	53.3	D	8.2
Approach		**0.507**	**26.9**	**C**	**100.8**	**0.912**	**45.0**	**D**	**207.5**
West: Chalgrove Avenue	L	0.249	44	D	32	0.216	43.7	D	27.2
	T	0.249	39.4	D	32	0.216	39.1	D	27.2
	R	0.563	62.4	E	26.3	0.153	49.6	D	14
Approach		**0.563**	**49.3**	**D**	**32.0**	**0.216**	**43.9**	**D**	**27.2**
All vehicles		**0.883**	**40.8**	**D**	**238.5**	**0.912**	**42**	**D**	**207.5**

The result indicates that the Read Street / Chalgrove Avenue intersection is nearing capacity and operating at LOS D during the AM and PM peak hour periods for the 2025 base scenario.

On-site traffic observations provided by the City of Rockingham would indicate that actual queue lengths on Read Street / Chalgrove Avenue intersection are generally shorter than those predicted by the SIDRA model and hence the modelled results are considered to be conservative. The traffic signal coordination appears to be working reasonably well on Read Street between the Chalgrove Ave and Council Ave intersections.

Table 10-13. SIDRA results: Read Street / Chalgrove Avenue intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Read Street	L	1.114	175.9	F	764.9	0.810	56.5	E	255.2
	T	1.114	179.6	F	764.9	0.810	51.6	D	255.2
	R	1.094	199.8	F	263.2	1.108	196	F	238.5
Approach		**1.114**	**182.7**	**F**	**764.9**	**1.108**	**82.9**	**F**	**255.2**
East: Chalgrove Avenue	L	0.185	14.5	B	35.9	0.793	39	D	224.3
	T	0.107	58.3	E	15.2	0.184	80.7	F	26.7
	R	1.093	184.3	F	108	1.118	220.9	F	280.8
Approach		**1.093**	**81.8**	**F**	**108**	**1.118**	**97.0**	**F**	**280.8**
North: Read Street	L	0.274	15.5	B	58.7	0.351	31.6	C	73.5
	T	0.618	38.7	D	200.4	1.147	228.9	F	664.9
	R	0.187	68.8	E	25	0.130	95.2	F	15.4
Approach		**0.618**	**34.1**	**C**	**200.4**	**1.147**	**176.2**	**F**	**91.0**
West: Chalgrove Avenue	L	0.457	65.8	E	69.2	0.380	64.9	E	56
	T	0.457	61.2	E	69.2	0.380	60.3	E	56
	R	0.784	85.7	F	53.5	0.19	62.7	E	26.3
Approach		**0.784**	**71.6**	**E**	**69.2**	**0.380**	**62.5**	**E**	**56.0**
All vehicles		**1.114**	**115.7**	**F**	**764.9**	**1.147**	**124.2**	**F**	**664.9**

The result indicates that the Read Street / Chalgrove Avenue intersection is expected to operate at over capacity levels during the AM and PM peak hours for the 2041 future traffic with ultimate development scenario.

10.2.7 Read Street and Council Avenue Intersection

The Sidra layout for this intersection is illustrated in **Figure 10-7** and the analysis results for this intersection are summarised in **Table 10-14** and **Table 10-15**.

Figure 10-7. Read Street and Council Avenue intersection

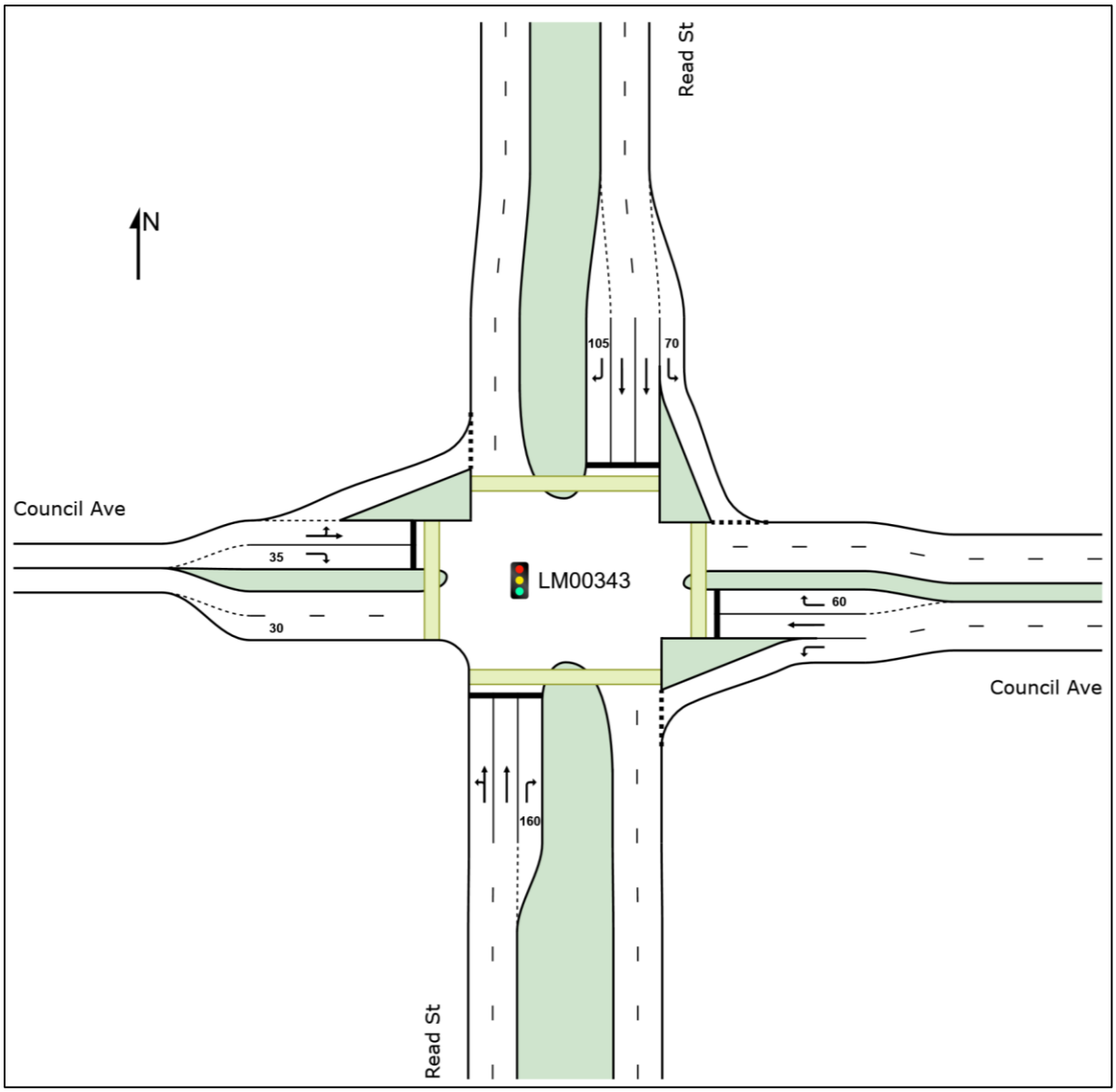


Table 10-14. SIDRA results: Read Street / Council Avenue intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	**Delay (s)**	**LOS**	**95% Queue (m)**	**DOS**	**Delay (s)**	**LOS**	**95% Queue (m)**
South: Read Street	L	1.015	114.9	F	438.6	0.541	47.2	D	153.9
	T	1.015	110.3	F	438.6	0.541	40.6	D	154.3
	R	1.029	129.3	F	398	1.035	134.3	F	328.7
Approach		**1.029**	**116.3**	**F**	**438.6**	**1.035**	**75.4**	**E**	**328.7**
East: Council Avenue	L	0.168	10.1	B	28.1	0.621	31.9	C	173.5
	T	0.125	59.6	E	17.4	0.268	61.4	E	38.3
	R	1.013	128.9	F	86.5	0.993	118.6	F	90.4
Approach		**1.013**	**54.4**	**D**	**86.5**	**0.993**	**49.2**	**D**	**173.5**
North: Read Street	L	0.155	24.7	C	34.5	0.168	43.3	D	35
	T	0.594	49.3	D	157.3	1.06	161.7	F	534
	R	0.1	48.3	D	20	0.244	80	E	44.2
Approach		**0.594**	**44.8**	**D**	**157.3**	**1.060**	**141.8**	**F**	**534.0**
West: Council Avenue	L	0.718	66	E	124.6	0.347	14.7	B	44
	T	0.718	157.6	F	124.6	0.347	93.9	F	44
	R	0.159	105	F	9.9	0.208	77.2	E	14.2
Approach		**0.718**	**95.6**	**F**	**124.6**	**0.347**	**62.2**	**E**	**44.0**
All vehicles		**1.029**	**87.9**	**F**	**438.6**	**1.060**	**97.6**	**F**	**534**

The result indicates that the Read Street / Council Avenue intersection is operating at LOS F, indicating critical congestion, delays around 90 s and queues exceeding 430 m during the 2025 baseline scenario.

On-site traffic observations provided by the City of Rockingham would indicate that actual queue lengths on Read Street / Council Avenue intersection are generally shorter than those predicted by the SIDRA model and hence the modelled results are considered to be conservative. The traffic signal coordination appears to be working reasonably well on Read Street between the Chalgrove Ave and Council Ave intersections.

Table 10-15. SIDRA Results: Read St / Council Ave intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Read Street	L	1.488	509.1	F	1197.1	0.776	52.2	D	247.6
	T	1.488	515.1	F	1197.1	0.776	53.7	D	248.2
	R	1.506	552.9	F	1070.9	1.485	529.8	F	846.4
Approach		**1.506**	**526.8**	**F**	**1197.1**	**1.485**	**230.2**	**F**	**846.4**
East: Council Avenue	L	0.284	18.5	B	72.8	0.909	52.2	D	376.3
	T	0.185	60.3	E	25.9	0.387	62.9	E	56.4
	R	0.1489	530.3	F	244.1	1.426	473.2	F	243.8
Approach		**1.489**	**191.8**	**F**	**244.1**	**1.426**	**122.6**	**F**	**376.3**
North: Read Street	L	0.235	42.8	D	57.3	0.247	53.4	D	56.5
	T	0.961	103.3	F	352.3	1.524	567.5	F	1352.1
	R	0.148	66.1	E	29.8	0.352	93.2	F	65.7
Approach		**0.961**	**90.3**	**F**	**352.3**	**1.524**	**473.3**	**F**	**1352.1**
West: Council Avenue	L	1.011	99.1	F	263.4	0.507	28	C	72.9
	T	1.011	111.9	F	263.4	0.507	105.7	F	72.9
	R	0.229	115.9	F	14.4	0.296	81.7	F	20.5
Approach		**1.011**	**103.9**	**F**	**263.4**	**0.507**	**73.1**	**E**	**72.9**
All vehicles		**1.506**	**332**	**F**	**1197.1**	**1.524**	**304.7**	**F**	**1352.1**

The result indicates that the Read Street / Council Avenue intersection is expected to operate with very high levels of congestion at peak hours during the 2041 future traffic with ultimate development scenario with an overall LOS F, delays >300 s and queues over 1.2 km.

10.2.8 Read Street and Rae Road Intersection

The Sidra layout for this intersection is illustrated in **Figure 10-8** and the analysis results for this intersection are summarised in **Table 10-16** and **Table 10-17**.

Figure 10-8. Read Street and Rae Road intersection

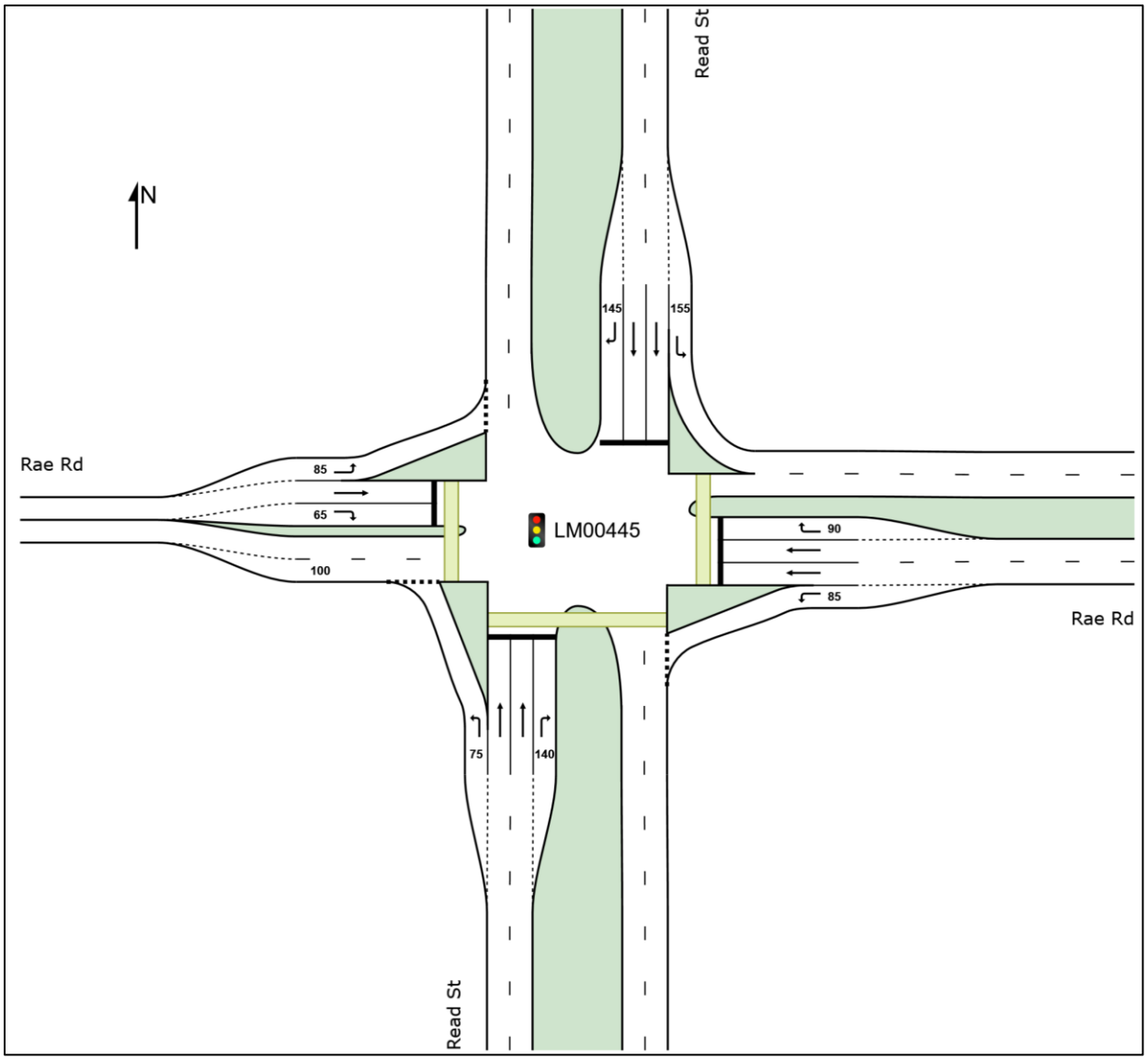


Table 10-16. SIDRA results: Read Street / Rae Road intersection – scenario 1 - 2025 baseline

Intersection Approach		AM peak				PM Peak			
		DOS	**Delay (s)**	**LOS**	**95% Queue (m)**	**DOS**	**Delay (s)**	**LOS**	**95% Queue (m)**
South: Read Street	L	0.119	28.3	C	13.5	0.149	21.5	C	29.1
	T	0.909	66.1	E	382.1	0.605	38.2	D	200.2
	R	0.846	91.2	F	82.1	0.421	69.4	E	56.7
Approach		**0.909**	**64.6**	**E**	**382.1**	**0.605**	**38.6**	**D**	**200.2**
East: Rae Road	L	0.123	13.3	B	18.8	0.265	37.6	D	66.2
	T	0.279	58.1	E	33.9	0.495	65.6	E	62.8
	R	0.267	69	E	25.5	0.176	75.7	E	14.9
Approach		**0.279**	**41.9**	**D**	**33.9**	**0.495**	**53.9**	**D**	**66.2**
North: Read Street	L	0.032	6.7	A	0	0.05	7.1	A	0
	T	0.433	28.5	C	122.4	1.003	106.2	F	583.2
	R	0.640	74.7	E	57.4	0.962	116.1	F	174.1
Approach		**0.640**	**33.0**	**C**	**122.4**	**1.003**	**103.7**	**F**	**583.2**
West: Rae Street	L	0.286	25.5	C	64.4	0.174	13.2	B	29.6
	T	0.874	73.7	E	128	0.607	67.2	E	78.4
	R	0.889	85.4	F	101.8	0.982	114	F	111.6
Approach		**0.889**	**59.6**	**E**	**128.0**	**0.982**	**62.9**	**E**	**111.6**
All vehicles		**0.909**	**53.8**	**D**	**382.1**	**1.003**	**73.4**	**E**	**583.2**

The result indicates that the Read Street / Rae Road intersection is operating at near or at capacity with overall LOS D or E during the 2025 base year scenario.

On-site traffic observations provided by the City of Rockingham would indicate that actual queue lengths on Read Street / Rae Road intersection are generally shorter than those predicted by the SIDRA model and hence the modelled results are considered to be conservative. Furthermore, the vehicles were observed to clear this intersection within one cycle.

Table 10-17. SIDRA results: Read Street / Rae Road intersection – scenario 2 - 2041 future traffic with ultimate development

Intersection Approach		AM peak				PM Peak			
		DOS	**Delay (s)**	**LOS**	**95% Queue (m)**	**DOS**	**Delay (s)**	**LOS**	**95% Queue (m)**
South: Read Street	L	0.185	43.2	D	30.9	0.228	38	D	51.5
	T	1.360	407.7	F	1296.8	0.97	94	F	490.1
	R	1.353	434.7	F	274.3	0.649	86.7	F	87.6
Approach		**1.360**	**374.2**	**F**	**1296.8**	**0.970**	**84.9**	**F**	**490.1**
East: Rae Road	L	0.215	20.5	C	44	0.398	42.2	D	99
	T	0.388	61.8	E	54.6	0.73	68.8	E	97.9
	R	0.399	74.7	E	41.2	0.258	76.5	E	22
Approach		**0.399**	**47.3**	**D**	**54.6**	**0.730**	**57.5**	**E**	**99.0**
North: Read Street	L	0.047	6.7	A	0	0.073	7.2	A	0
	T	0.629	33.2	C	216.7	1.471	506.5	F	1640.4
	R	1.013	129.3	F	122	1.486	549.1	F	532.8
Approach		**1.013**	**43.8**	**D**	**216.7**	**1.486**	**490.5**	**F**	**1640.4**
West: Rae Street	L	0.522	58	E	131.1	0.328	29.9	C	85.4
	T	1.365	432.8	F	426.9	0.951	104.4	F	145.1
	R	1.332	413.5	F	320.4	1.441	496.4	F	317.5
Approach		**1.365**	**292.2**	**F**	**426.9**	**1.441**	**205.8**	**F**	**317.5**
All vehicles		**1.365**	**248.1**	**F**	**1296.8**	**1.486**	**287**	**F**	**1640.4**

The result indicates that the Read Street / Rae Road intersection is expected to operate over capacity with poor levels of service during The AM and PM peak hours for the 2041 future traffic with ultimate development scenario.

10.3 SIDRA Results Summary

The SIDRA 'All Vehicles' results for each scenario and each intersection are summarised in. **Table 10-18**.

Table 10-18. SIDRA results summary

Patterson Rd and Read St intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	0.787	36.2	D	138.6	0.859	44.1	D	173.6
2	2041 Assessment Year	1.069	85.4	F	389.1	1.153	122.5	F	443.6
Patterson Rd and Ennis Ave intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	0.760	26.3	C	109.5	0.798	26.4	C	121.4
2	2041 Assessment Year	1.064	74.0	E	363.9	1.223	118.6	F	454.4
Ennis Ave and Dixon Rd intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	1.080	74.7	E	261.8	1.134	143.8	F	609.0
2	2041 Assessment Year	1.560	334.7	F	775.6.5	1.626	474.0	F	1453.9
Ennis Ave and Council Ave intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	2.0100	481.8	F	1364.4	1.4630	296.8	F	1169.2
2	2041 Assessment Year	3.003	973.0	F	2533.4	2.1480	742.24	F	2464.7
Ennis Ave and Rae Rd intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	0.822	26.44	C	183.7	0.874	29.8	C	202.5
2	2041 Assessment Year	1.084	206.7	F	652.14	1.148	114.23	F	746.6
Read St and Chalgrove Ave intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	0.883	40.8	D	238.5	0.912	42	D	207.5
2	2041 Assessment Year	1.114	115.7	F	764.9	1.147	124.2	F	664.9
Read St and Council Ave intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	1.029	87.9	F	438.6	1.060	97.6	F	534
2	2041 Assessment Year	1.506	332	F	1197.1	1.524	304.7	F	1352.1
Read St and Rae Rd intersection									
Scenario		AM Peak				PM Peak			
		DOS	Delay (s)	LOS	95% Back of Queue	DOS	Delay (s)	LOS	95% Back of Queue
1	2025 Base Scenario	0.909	53.8	D	382.1	1.003	73.4	E	583.2
2	2041 Assessment Year	1.365	248.1	F	1296.8	1.486	287	F	1640.4

It is acknowledged that several intersections within the RSC Precinct Plan Study Area is expected to perform at unsatisfactory capacity levels during the 2041 design year, even with the proposed significantly reduced development yields when compared to the 2009 PSP.

The SIDRA analysis undertaken highlights the need for a wider regional transport assessment particularly in relation to the role of the Patterson Road, Ennis Ave and Read Street which appear to struggle due to amount of traffic travelling through the Rockingham CBD. In addition, it is highly unlikely that the full build-out of the RSC Precinct Plan will be realised by 2041 and that the RSC precinct-generated traffic on its own would trigger the need for any mitigation measures, hence a comprehensive regional transport strategy for this area should be considered.

11 Potential Intersection Mitigation Measures

Mitigation measures were assessed at selected intersections along the Read Street traffic corridor, specifically between Chalgrove Avenue and Council Avenue. This targeted approach was adopted because many other intersections along Read Street and Ennis Avenue have already undergone significant upgrades, as outlined in Section 2.4. With several intersections now operating at their ultimate design form, opportunities for further major infrastructure improvements are limited. Hence, this assessment focused on identifying locations where additional mitigation measures could still potentially be incorporated for the wider betterment of the road network.

11.1 Future Lane Widening

To address the capacity and operational deficiencies identified along Read Street, a mitigation measures involving the provision of an additional lane in each direction (resulting in a six-lane cross-section) between Chalgrove Avenue and Council Avenue was considered.

The specific intersection mitigation treatments analysed are summarised below:

- **Southbound entry (Chalgrove Intersection):** Added a through lane (Short Lane with 105m length) towards the median.
- **Northbound entry (Council Ave):** Added a through lane and kept the curbside lane as a short lane (60m length) with shared through and left movement.
- **Exit lanes:** Set as short lanes of 60m for both intersections.

It should be noted that there is an existing underpass located on Read Street between Chalgrove Avenue and Council Avenue which could be a potential factor for restricting future widening as shown in **Figure 11-1**. However, it should be noted that an existing disused bus embayment exists in the vicinity of this underpass, demonstrating that 3 lanes could potentially be accommodated at this location.

Figure 11-1. Existing underpass Read Street



Source: Metromap

The SIDRA results for the assessment of the above-mentioned mitigation option are discussed below with full outputs available in **Appendix F**.

11.1.1 Read Street / Chalgrove Avenue with Mitigation Measure

The SIDRA layout for the proposed mitigation measure provided at this intersection is illustrated in **Figure 11-2** and the analysis results for this intersection are summarised in **Table 11-1**.

Figure 11-2. Proposed mitigation to intersection layout Read Street / Chalgrove Avenue

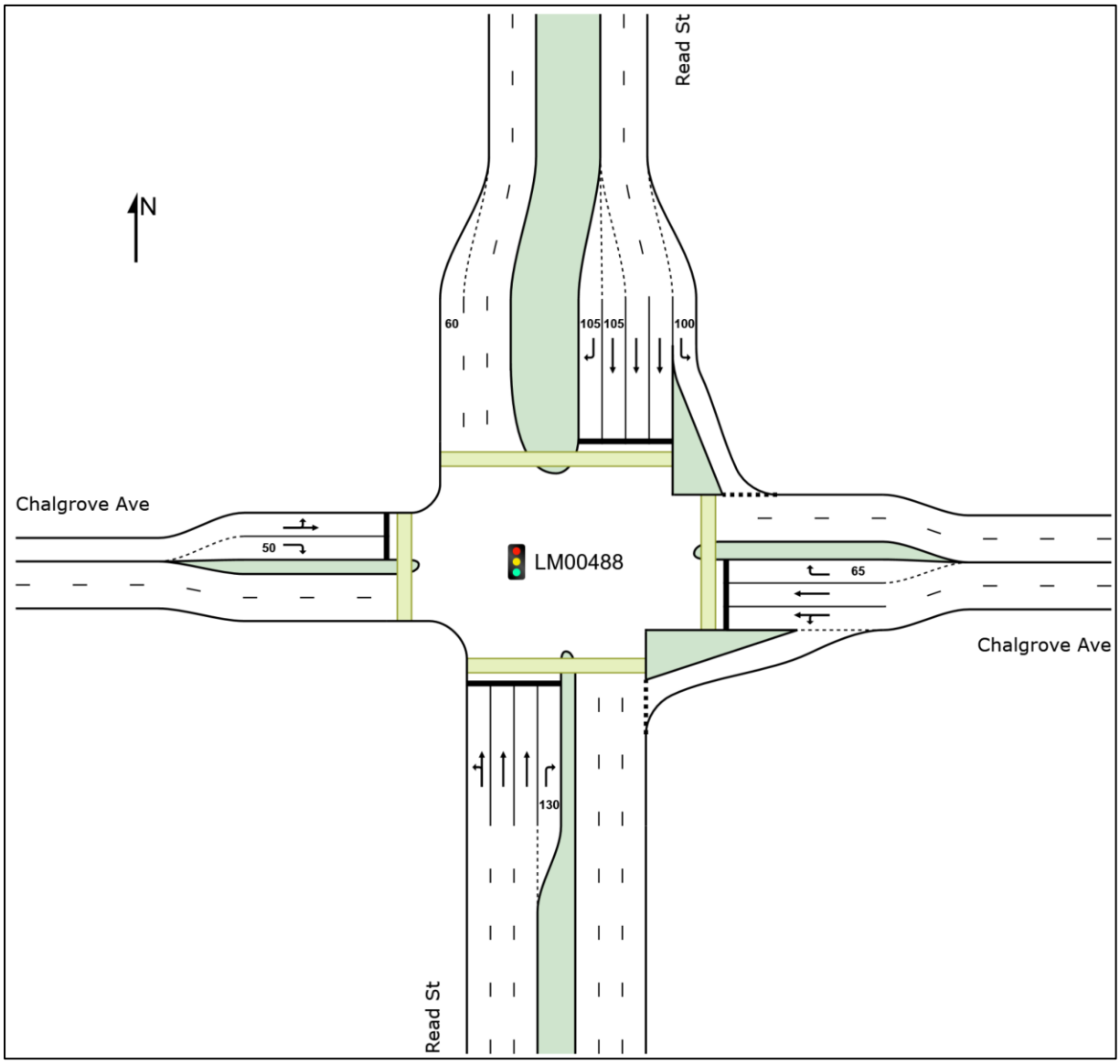


Table 11-1. SIDRA results: Read Street / Chalgrove Avenue intersection – 2041 future traffic with ultimate development – mitigated scenario

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Read Street	L	0.390	41.7	D	107.2	0.305	50.3	D	67.3
	T	0.990	86.9	F	499.7	0.772	52.1	D	210.4
	R	0.972	117.6	F	211.6	0.969	105.3	F	185.9
Approach		**0.990**	**90.4**	**F**	**499.7**	**0.969**	**63.4**	**E**	**210.4**
East: Chalgrove Avenue	L	0.174	10.3	B	26.1	0.648	23.8	C	210.3
	T	0.107	58.4	E	15.2	0.184	78.6	E	26.7
	R	0.910	94.9	F	79.7	0.975	124.4	F	218.1
Approach		**0.910**	**46.3**	**D**	**79.7**	**0.975**	**57.7**	**E**	**218.1**
North: Read Street	L	0.280	14.3	B	62	0.359	19.1	B	78.4
	T	0.430	35.9	D	121.7	0.955	92.3	F	287.8
	R	0.166	62.7	E	24.3	0.114	72.1	E	14.9
Approach		**0.430**	**31.5**	**C**	**121.7**	**0.955**	**73.3**	**E**	**287.8**
West: Chalgrove Avenue	L	0.457	68.2	E	69.2	0.380	65.9	E	56
	T	0.457	61.2	E	69.2	0.380	60.3	E	56
	R	0.653	80.3	F	51.1	0.164	58.7	E	25.3
Approach		**0.653**	**69.8**	**E**	**69.2**	**0.380**	**61.4**	**E**	**56.0**
All vehicles		**0.990**	**64.9**	**E**	**499.7**	**0.975**	**66.0**	**E**	**287.8**

The results indicate that the Read Street / Chalgrove Avenue intersection with the proposed mitigation measure in the 2041 design year is expected to operate near capacity with a LOS E and long queue lengths on critical approaches. Despite some improvement in delay and DoS values, the intersection is expected to experience congestion during both peak hour periods.

11.1.2 Read Street / Council Avenue with Mitigation Measure

The SIDRA layout for the proposed mitigation measure at this intersection is illustrated in **Figure 11-3** and the results for this intersection are summarised in **Table 11-2**.

Figure 11-3. Proposed mitigation to intersection layout Read Street / Council Avenue

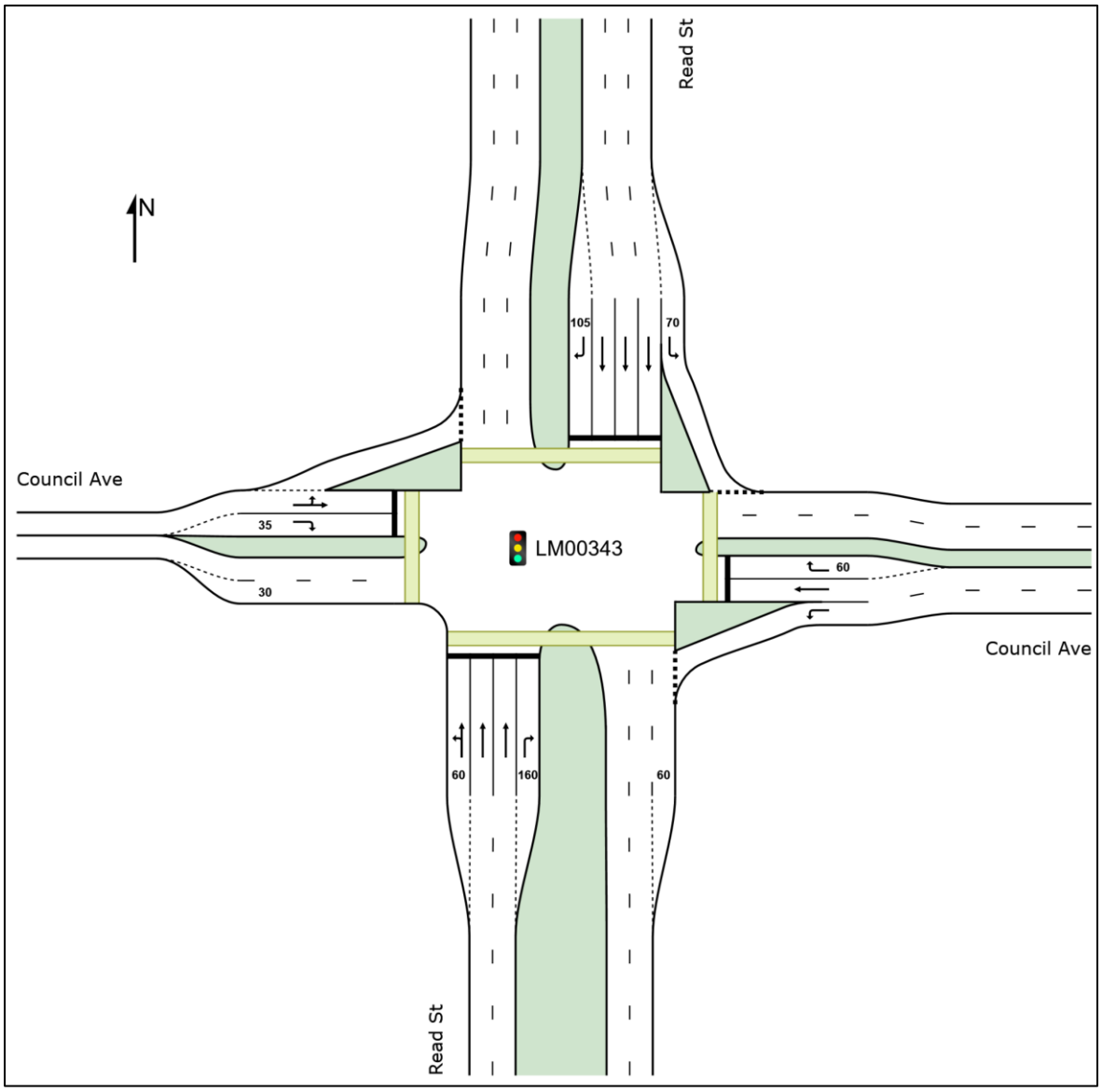


Table 11-2. SIDRA results: Read Street / Council Avenue intersection – 2041 future traffic with ultimate development – mitigated scenario

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Read Street	L	1.392	462.6	F	625.6	0.686	65.1	E	147.5
	T	1.392	450.3	F	902.8	0.686	59.5	E	191.6
	R	1.404	457.0	F	984.9	1.300	360.5	F	709.6
Approach		**1.404**	**452.6**	**F**	**984.9**	**1.300**	**171.2**	**F**	**709.6**
East: Council Avenue	L	0.257	14.3	B	55.3	0.842	74.3	E	286.3
	T	0.185	60.4	E	25.9	0.387	62.9	E	56.4
	R	1.354	409.0	F	216.0	1.307	367.1	F	216.0
Approach		**1.354**	**149.3**	**F**	**216.0**	**1.307**	**121.3**	**F**	**286.3**
North: Read Street	L	0.250	23.6	C	62.3	0.261	19.2	B	62.7
	T	0.805	57.6	E	213.7	1.316	318.4	F	922.7
	R	0.132	49.5	D	28.3	0.308	83.3	F	62.6
Approach		**0.805**	**51.0**	**D**	**213.7**	**1.316**	**266.2**	**F**	**922.7**
West: Council Avenue	L	1.011	98.4	F	263.4	0.507	22.7	C	70.7
	T	1.011	113.2	F	263.4	0.507	107.7	F	70.7
	R	0.208	114.4	F	14.2	0.272	80	E	20.2
Approach		**1.011**	**103.8**	**F**	**263.4**	**0.507**	**71.8**	**E**	**70.7**
All vehicles		**1.404**	**277.5**	**F**	**984.9**	**1.316**	**197.1**	**F**	**922.7**

The results indicate that the Read Street / Council Avenue intersection with the proposed mitigation measure for the 2041 future year would continue to operate at capacity and poor levels of service with multiple approaches performing at LOS E or F and excessive queues indicating persistent capacity constraints and operational inefficiency.

11.1.2.1 Results of the proposed mitigation

Overall, the results indicate that even with the proposed mitigation measures along Read Street between Chalgrove Avenue and Council Avenue, key intersections are expected to operate at or near capacity, with poor levels of service during peak periods if the full development potential of the Precinct Structure Plan (PSP) is to be realised by 2041. The network is expected to experience severe delays, excessive queuing, and overall operational breakdown under future 2041 traffic conditions even with the reduction in development intensity when compared to the current WAPC-approved Precinct Plan.

This suggests that the proposed mitigation measure alone is inadequate to accommodate the forecasted traffic volumes for 2041 and as such, the emphasis of the Precinct Structure Plan and broader Local Planning Strategy to shifting mode share away from private vehicle dependency is essential and in order to support sustainable movement within and to the Rockingham Strategic Centre in the future.

In the short-term, the City of Rockingham and Main Roads WA could consider optimising the traffic signals along Read Street between the Chalgrove Avenue and Council Avenue intersections and determine the most efficient and practicable phasing for these intersections as demand increases over time.

As previously stated in Section 10.1.2, there are limitations to the use of traffic modelling tools as they have simplified assumptions about driver behaviour and do not account for demand elasticity and how road users might alter their travel patterns in response to congestion or delays

The transport movement network within the RSC Precinct Plan Study Area requires a holistic regional approach that considers broader connectivity, encourage public transport and increase active travel mode shares and integrated strategies for managing internal and external vehicular traffic, cycling and pedestrian movements on a wider scale rather than being confined to upgrading specific intersections. It is also highly unlikely that the full build-out of the RSC Precinct Plan will be realised by 2041 and that the RSC precinct-generated traffic on its own would trigger the need for any mitigation measures, hence a comprehensive regional transport strategy for this area should be considered.

It is recommended that the broader transport network requirements should be addressed by Main Roads WA in collaboration with the City of Rockingham, as the identified transport issues extend beyond the precinct study area and the scope of this study.

11.2 Modal Shift and Public Transport Investment

The current operational performance of 4 out of the 8 key intersections assessed within the RSC Precinct Plan Study Area are expected to operate at unacceptable levels, resulting in delays, congestion, and reduced network efficiency in the 2025 base scenario. These issues are symptomatic of a transport system that is heavily reliant on private vehicle use, which has led to excessive demand on intersection capacity and compromised overall movement through the precinct.

Major upgrades to intersection geometry or signal infrastructure are not considered viable due to the risk of pedestrian severance and the negative impact on urban connectivity. Such interventions would likely widen carriageways, increase crossing distances, and reduce pedestrian safety and amenity.

Given these constraints, a strategic modal shift away from car dependency is essential. Encouraging and enabling a transition to public transport will reduce vehicular volumes at intersections, improve operational performance, and support broader sustainability and accessibility goals. This shift aligns with contemporary transport planning principles, including:

- **Reducing intersection pressure** by lowering private vehicle volumes.
- **Improving pedestrian safety and connectivity** by avoiding physical expansion of intersections.
- **Supporting land use and urban development goals** through better access and reduced severance.
- **Enhancing equity and accessibility** by providing viable alternatives to car travel.

Investment in public transport infrastructure, service frequency, and network integration is critical to achieving this modal shift. This includes improving bus priority measures (such as the endorsed RCCTS), enhancing stop accessibility, and ensuring seamless multimodal connections. Without such a shift, the precinct risks continued operational decline, increased emissions, and reduced livability and safety

The SIDRA analysis indicates the existing network has moderate congestion with the future year scenario reflecting widespread operational breakdown with several intersections facing severe delays, excessive queuing, and overall network failure.

Overall, the current operational inefficiencies across multiple intersections within the precinct highlight the need to reduce car dependency and shift towards more sustainable transport modes.

Given that major intersection upgrades are not feasible due to the risk of pedestrian severance, a strategic investment in public transport is essential. Enhancing public transport accessibility and reliability will alleviate pressure on the road network and improve intersection performance.

11.2.1 Future Mode Share Targets For the Rockingham Strategic Centre (RSC) Precinct Plan

The proposed Rockingham Strategic Centre (RSC) Precinct Plan sets out the following future mode share aspirational targets:

- Reduce private vehicle trips by 10–15%.
- Increase public transport usage by 15% for local trips.

- Increase cycling by 8%.
- Increase walking by 17%.

Based on the SIDRA summary results in Section 10.3, it is estimated at a high level that a 10–15% reduction in private vehicle demand, could potentially alleviate pressure on the key intersections assessed within the RSC Precinct Plan Study Area, except for the Read Street/Council Ave, Read Street/Rae Road, Ennis Ave/Council Ave and Ennis Ave/Dixon Road. These results demonstrates that mode share shift alone will not fully resolve the broader traffic challenges and would require a holistic and regional approach that considers broader connectivity and the development of a sustainable transport solution which should be addressed by Main Roads WA in collaboration with the City of Rockingham.

11.2.2 Implementation Plan

To ensure that the intended mode share targets are to be achieved, an established monitoring framework can be considered by the City to be implemented to collate baseline data on travel behaviour around the PSP. Monitoring measures such as conducting travel surveys, traffic counts and emerging sources such as mobile or GPS data to measure the shift in mode share are possible considerations

Developers within the PSP should also consider mode share reduction initiatives. Table 11-3 outlines a number of actions that if considered, will assist the City achieve future aspirational mode shift targets.

Table 11-3 provides detail on the actions that could be considered, specifically:

- What is the type of action;
- What mode it facilitates;
- Whether its implementation should be in the short, medium, or long term.

Table 11-3 Measures to Facilitate Alternative Transport

Strategy		Action	Timeframe (S/M/L Term)
Information	Public Transport	Provide public transport information to prospective developers on RCCTS	S
		Provide directional signage to bus stops, train station, bike racks, taxi ranks on on-site totems	S
	Active Transport	Developers / Tenants consider providing local maps (including walking and cycling routes and time) at info points	S
	Public and Active Transport	Update and distribute the public transport guides to encourage public and active modes further	M
		Seek out opportunities to promote alternative transport modes	S
		Have transport as a standing agenda item in tenant meetings	S
Engagement	Active transport	Identify and engage with local community that may be interested in walking or cycling to work	S
	Public and Active Transport	Promote transport and community events e.g bike month	M
	All	Undertake annual travel surveys to understand performance against mode share targets	S

Enablers and Facilitators	Active Transport	Provide secure public bike racks in highly visible areas (including electric bicycle and scooter charging stations)	M
		Provide legible and safe access for pedestrians and cyclists supported by wayfinding initiatives	M
		Look for opportunities to trial car share schemes with developers	L
		Undertake regular monitoring activities of car parking	S

Monitoring across the PSP should be considered in the form of annual reporting. Examples of regular monitoring activities that could be undertaken is as follows:

- Car park usage surveys
- Bike counts (usage of bike racks)
- Participation in events
- Developer uptake of Travel Planning Initiatives

Table 11-4 shows an indicative monitoring schedule for activities.

Table 11-4 Monitoring Frequency

Activity	Frequency
Car park occupancy	Annually
Bike counts	Annually
Travel Survey	Within 6 months of tenant occupations
Event participation	Ongoing
Review travel information	Semi-annually

12 Summary and Conclusions

This Transport Impact Assessment (TIA) outlines the transport aspects of the proposed Rockingham Strategic Centre (RSC) Precinct Plan and adopted Town Planning Scheme (TPS) amendment. This assessment has been prepared in accordance with the *Western Australian Planning Commission Transport Impact Assessment Guidelines Volume 2: Planning Schemes, Structure Plans & Activity Centre Plans* (2016).

12.1.1 Existing Situation

- Recorded crash data highlights safety concerns at key intersections and road sections, which may warrant future upgrades or modifications.
- Census data shows approximately 70% of journeys to work are currently made by private vehicle, with only 6.8% by public transport and a small proportion by active transport modes. The precinct currently benefits from good public transport connection. The existing pedestrian and cyclist network in the City Centre are in general, excellent condition and provides direct, continuous links to key destinations. Extensive shared path and good road riding infrastructure have been identified in strategic mapping
- The City has previously identified two decked car park location within the City Centre which could accommodate the future parking demand increase. The multi-decked station located adjacent to the bus transit lane is expected to provide a significant public parking resource for the City Centre with the proposed 500 bay public parking station.
- Several intersections within the RSC Precinct Plan Study Area are currently modelled to operate at or near capacity, with poor levels of service during the peak hour periods resulting in delays, congestion, and reduced network efficiency with LOS D and below. On-site observations would indicate that vehicles are able to clear intersections on Read Street within one traffic signal cycle. The poor levels of traffic operations are symptomatic of a transport system heavily reliant on private vehicle use, which has led to excessive demand on intersection capacity and compromised overall movement.

12.1.2 Planned Approach

- The RSC Precinct Plan proposes a reduction in land use intensity compared to the 2009 Activity Centre Plan and is expected to generate lower vehicular trips. The proposed housing in the RSC Precinct Plan is well located to employment which reduces the broader demand on the regional movement network.
- There is limited North-South regional access (especially with the removal of the FRACH) to access employment in the Western Trade Coast. Currently Ennis Ave and Patterson Road provide an alternative regional route from Mandurah towards Perth CBD.

- The transport impact assessment undertaken provides a conservative approach for vehicle traffic scenarios and is based on the premise that the full build-out of the RSC Precinct Plan would occur by 2041. The likelihood of achieving what is capable in this Precinct Plan area within this timeframe, even considering optimal economic conditions for development, is very remote, due to:

  - the size and scope of the PSP area in question.

  - redevelopment of established areas does not occur in a uniform manner.

  - the development potential of the PSP may not be realised in all future proposals

- The assessment of the proposed mitigation measure on Read Street between Chalgrove Avenue and Council Avenue show that the intersections are expected to continue operating at capacity and poor Levels of Service (LOS) during both the AM and PM peak periods. The network is expected to experience severe delays, excessive queuing, and overall operational breakdown for the future 2041 traffic conditions.

  This suggests that the proposed mitigation alone is inadequate to accommodate the forecasted traffic volumes for 2041 and as such, the emphasis of the Precinct Structure Plan and broader Local Planning Strategy to shifting mode share away from private vehicle dependency is essential and in order to support sustainable movement within and to the Rockingham Strategic Centre in the future.

- Major upgrades to intersection geometry or signal infrastructure are not considered viable due to the risk of pedestrian severance and the negative impact on urban connectivity. Such interventions would likely widen carriageways, increase crossing distances, and reduce pedestrian amenities. Given these constraints, a strategic modal shift away from car dependency is essential. Encouraging and enabling a transition to public transport will reduce vehicular volumes at intersections, improve operational performance, and support broader sustainability and accessibility goals.

- Based on the SIDRA summary results, it is estimated at a high level that a 10–15% reduction in private vehicle demand, could potentially alleviate pressure on the key intersections assessed within the RSC Precinct Plan Study Area, except for the Read Street/Council Ave, Read Street/Rae Road and Ennis Ave/Dixon Road and Ennis Ave/ Council Ave. These results demonstrates that mode share shift alone will not fully resolve the broader traffic challenges and would require a holistic and regional approach that considers broader connectivity and the development of a sustainable transport solution in the future which should be addressed by Main Roads WA in collaboration with the City of Rockingham.

- Enhancing public transport accessibility should be prioritised by the City of Rockingham in collaboration with the Public Transport Authority to support the RSC Precinct Plan objectives and reduce private vehicle demand on the surrounding road network.

Overall, a strategic investment in public transport is essential to accommodate the potential traffic demands of the proposed Rockingham Strategic Centre (RSC) Precinct Plan and encouraging a modal shift in travel behaviours is recommended. Enhancing public transport accessibility should be considered by the City of Rockingham in collaboration with the Public Transport Authority to reduce

private vehicle demand on the surrounding road network and improve intersection performance in the future.

Appendices

Appendix A

ROM 24 Plots

2021 ROM24 Scenario - Validation Plot for Rockingham Precinct Structure Plan
Land Use Scenario: Westport Land Use based on DAEDS Version 3.3

MODEL ASSUMPTIONS

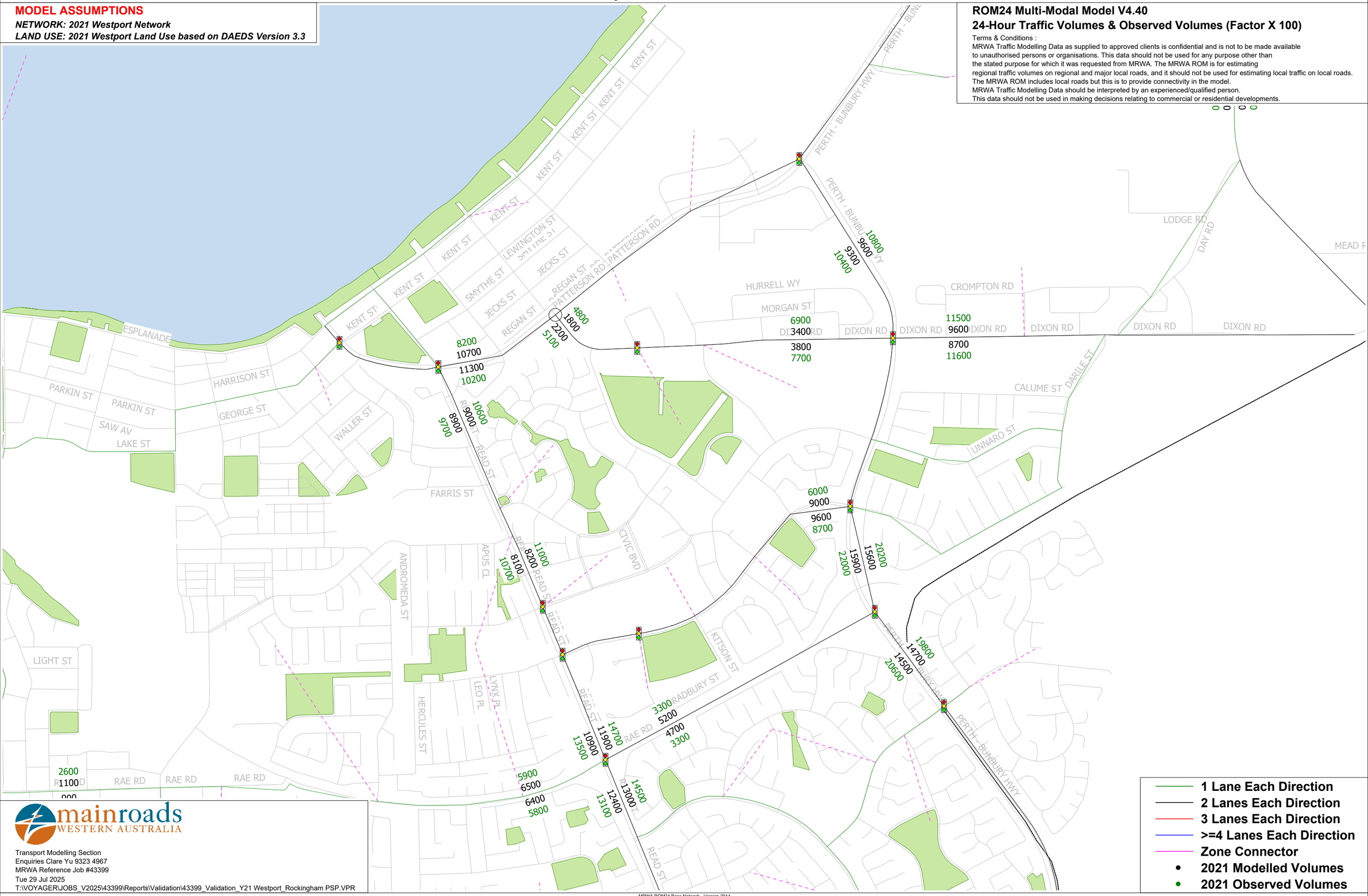
NETWORK: 2021 Westport Network

LAND USE: 2021 Westport Land Use based on DAEDS Version 3.3

ROM24 Multi-Modal Model V4.40

24-Hour Traffic Volumes & Observed Volumes (Factor X 100)

Terms & Conditions :
MRWA Traffic Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations. This data should not be used for any purpose other than the stated purpose for which it was requested from MRWA. The MRWA ROM is for estimating regional traffic volumes on regional and major local roads, and it should not be used for estimating local traffic on local roads. The MRWA ROM includes local roads but this is to provide connectivity in the model. MRWA Traffic Modelling Data should be interpreted by an experienced/qualified person. This data should not be used in making decisions relating to commercial or residential developments.



1 Lane Each Direction
2 Lanes Each Direction
3 Lanes Each Direction
>=4 Lanes Each Direction
Zone Connector
2021 Modelled Volumes
2021 Observed Volumes

mainroads WESTERN AUSTRALIA

Transport Modelling Section
Enquiries Clare Yu 9323 4967

MRWA Reference Job #43399
Tue 29 Jul 2025
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MRWA ROM24 Base Network - Version 2014

MRWA Transport Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations

cube

(Licensed to Main Roads WA - Don Aitken Centre)

2041 ROM24 Scenario - Link Volume Plot for Rockingham Precinct Structure Plan
All Day
Land Use Scenario: Westport Land Use based on DAEDS Version 3.3

MODEL ASSUMPTIONS

NETWORK: 2041 Westport Network

LAND USE: 2041 Westport Land Use based on DAEDS Version 3.3

ROM24 Multi-Modal Model V4.40

24-Hour Traffic Volumes (Factor X 100)

Terms & Conditions :
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MRWA Traffic Modelling Data should be interpreted by an experienced/qualified person.
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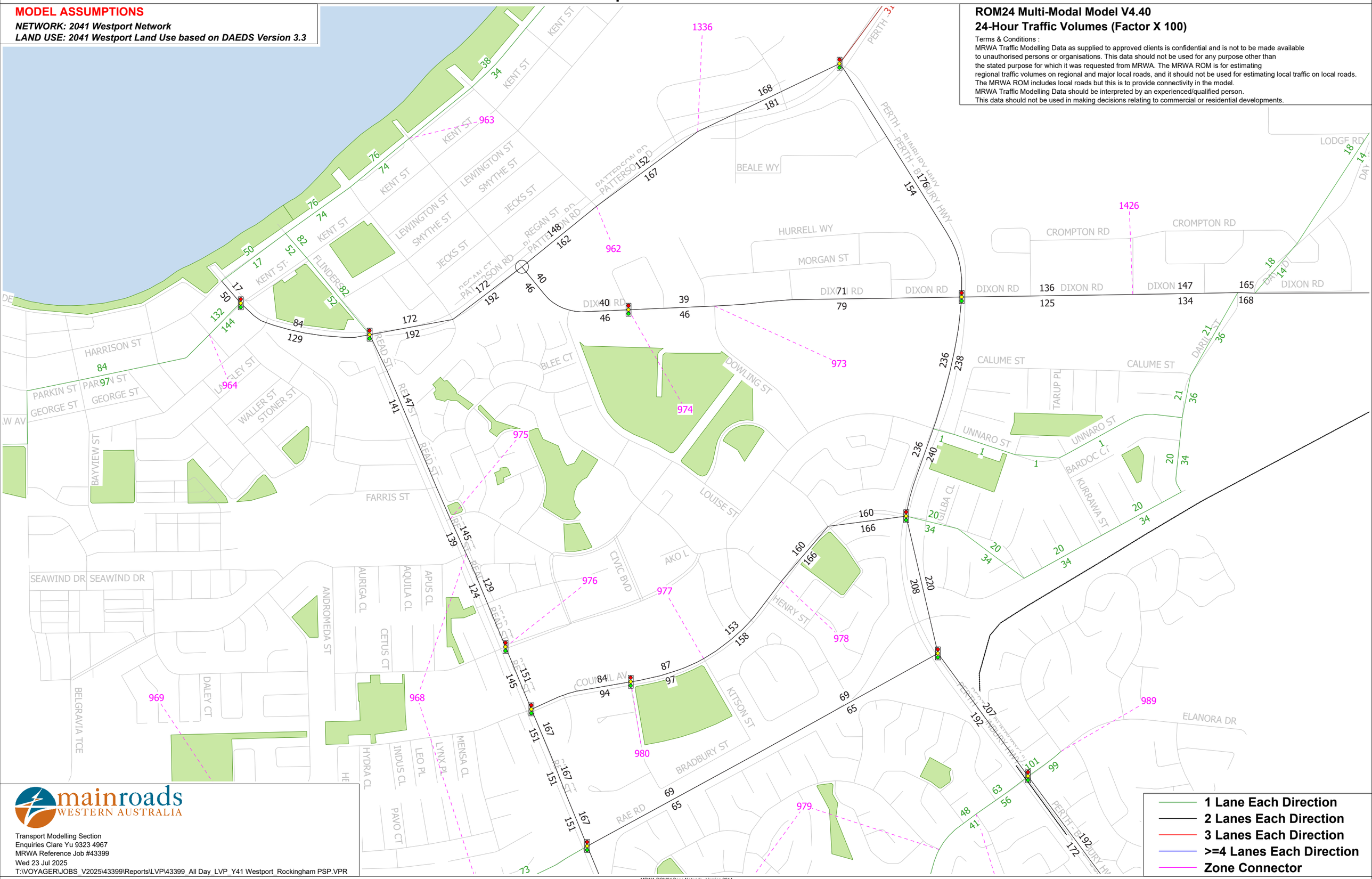

mainroads WESTERN AUSTRALIA
Transport Modelling Section
Enquiries Clare Yu 9323 4967
MRWA Reference Job #43399
Wed 23 Jul 2025
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1 Lane Each Direction
2 Lanes Each Direction
3 Lanes Each Direction
>=4 Lanes Each Direction
Zone Connector

MRWA ROM24 Base Network - Version 2014
MRWA Transport Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations

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Appendix B

Hames Sharley Technical Memo

ARCHITECTURE
INTERIORS
URBAN DESIGN
PLANNING
LANDSCAPE

Whadjuk Noongar Country
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memo

FROM :	**Hames Sharley**	DATE :	**12-02-2025**
PROJECT:	**Rockingham Strategic Centre Precinct Structure Plan**	PROJECT NUMBER:	**44322**

MEMO PURPOSE

This memorandum has been prepared for Main Roads Western Australia (MRWA) on behalf of the City of Rockingham. Its purpose is to assist MRWA in understanding the changes in development yield proposed in the **Rockingham Strategic Centre Precinct Structure Plan** (RPSP), compared to the previous Centre Plan (prepared in 2009).

This comparison will assist MRWA in understanding what changes will be needed to the Traffic Impact Assessment (TIA).

RESIDENTIAL GROWTH

DEVELOPMENT YIELD FORECAST COMPARISON

- Table 1 provides a comparison of the estimated dwellings possible under the 2009 Centre Plan and the RPSP.
- Due to density reductions proposed as part of the RPSP, there is a possible net reduction of 1,700 dwellings under the different frameworks.

Table 1: Estimated Dwellings Comparison

	2009 CENTRE PLAN	RPSP	DIFFERENCE
Estimated Dwellings	16,793	15,093	-1,700 dwellings

RPSP DWELING TARGETS

- Table 2 provides the interim and ultimate dwelling yield estimates based on the RPSP framework, including a breakdown for each of the 8 sub-precincts.

Table 2: RPSP Dwelling Yield Estimates

PRECINCT	EXISTING DWELLINGS	INTERIM TARGET	ULTIMATE TARGET
P1 - City Centre	432	3,005	4,248
P2 - Waterfront Village	1,097	2,522	3,634
P3 - Coastal Lots	536	1,379	1,762
P4 - TOD Village	0	805	1,205
P5 - City Park	347	347	1,326
P6 - Southern Residential	1,555	1,855	2,917
P7 - Education	0	0	0
P8 - Dixon Road	0	0	0
TOTAL	**3,967**	**9,914**	**15,093**

Source: Draft RPSP, 2023, City of Rockingham / Hames Sharley

HAMES SHARLEY (WA) PTY LTD
ABN 42 009 073 563

NON-RESIDENTIAL GROWTH

FLOORSPACE PROJECTIONS

- In order to meet the 15,000 job target set for the Rockingham Strategic Centre (RSC), major floorspace increases are proposed across all major sectors. Floorspace modelling undertaken for the RSC as part of the City's Needs Assessment is summarised in Table 3.

- The provision of floorspace across the RSC was compared to the identified benchmarks to determine and quantify current gaps by Planning Land Use Categories (PLUC) floorspace use.

Table 3: RPSP Floorspace Projections

SCENARIO		ENT	HEL	MAN	OFF	SER	STO	TOTAL
Scenario 1 WA Tomorrow	2021 (existing)	29,500	54,559	1,135	48,662	4,533	1,890	140,279
	2041 (ultimate)	16,088	94,511	7,595	29,538	9,948	4,760	162,441
	Total	**45,588**	**149,070**	**8,730**	**78,200**	**14,481**	**6,650**	**302,720**
Scenario 2 COR	2021 (existing)	29,500	54,559	1,135	48,662	4,533	1,890	140,279
	2041 (ultimate)	29,393	112,765	11,047	51,513	16,238	9,438	230,395
	Total	**58,893**	**167,324**	**12,182**	**100,175**	**20,771**	**11,328**	**370,674**

Source: City of Rockingham Needs Assessment, 2021, Pracsys

FLOORSPACE PROJECTIONS

- Per Table 3, the City's preferred growth scenario is Scenario 2. Based on Scenario 2, the following floorspace gaps are identified to 2041:
  - **Retail (RET)** +15,500 m^2
  - **Health/Welfare/Community (HEL):** +58,206 m^2
  - **Manufacturing (MAN):** +9,912 m^2
  - **Office (OFF):** +2,851 m^2
  - **Service (SER):** +11,705 m^2
  - **Storage (STO):** +7,548 m^2

- Table 4 provides an estimated distribution of the floor space gap, based on land use permissibility across the RPSP area. This will assist with trip generation projections.

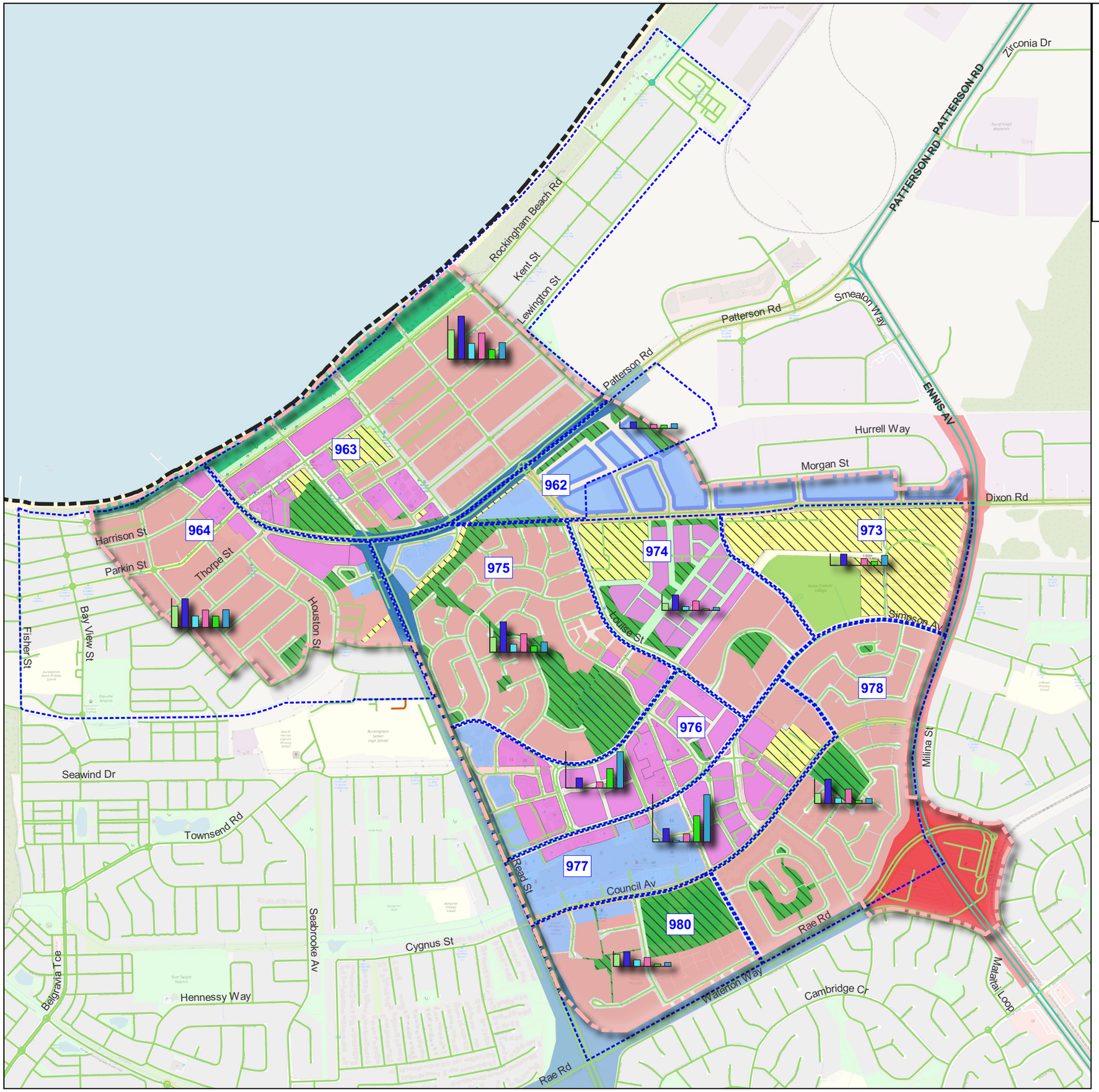
Table 4: Estimated Floorspace Gap Distribution

RPSP SUB-PRECINCT	RET	HEL	MAN	OFF	SER	STO
P1 - City Centre	10,000 m^2	15,000 m^2		2,000 m^2		3,000 m^2
P2 - Waterfront Village	1,500 m^2					548 m^2
P3 - Coastal Lots						
P4 - TOD Village	4,000 m^2	5,000 m^2		851 m^2		
P5 - City Park						
P6 - Southern Residential						
P7 - Education		38,206 m^2				
P8 - Dixon Road			9,912 m^2		11,705 m^2	4,000 m^2
Total	15,500 m^2	58,206 m^2	9,912 m^2	2,851 m^2	11,705 m^2	7,548 m^2

Note: Figures provided are a high-level estimate only, to assist with trip generation assessment.

Appendix C

ROM 24 Zonal Distribution



LEGEND

- MRWA Zone Boundary Rockingham PSP
- 2026 Total Population
- 2041 Total Population
- 2026 Total Dwelling
- 2041 Total Dwelling
- 2026 Total Employment
- 2041 Total Employment

MRWA Road Classification

- Highway
- Main Road
- Local Road

ROM Zone	2026 Total Population	2041 Total Population
963	2963	4361
962	17	670
964	2165	2925
973	31	1149
974	707	1577
975	1507	3079
978	1020	2460
976	27	1037
977	292	1361
980	1233	1494

ROM Zone	2026 Total Dwelling	2041 Total Dwelling
963	1602	2658
962	9	408
964	1170	1783
973	17	697
974	382	962
975	814	1877
978	549	1459
976	14	632
977	158	830
980	666	911

ROM Zone	2026 Total Employment	2041 Total Employment
963	968	1685
962	346	486
964	1157	1814
973	431	1017
974	154	303
975	633	1037
978	300	506
976	1981	3702
977	2656	4801
980	253	404

Appendix D

Council Link Counts

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Read Street - south of Patterson Road
Site name: Read-01 Location: [-32.279312 +115.735570]
Survey duration: 0:00 Wednesday, 8 June 2022 to 0:00 Wednesday, 15 June 2022 (7 days, 1 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 70 km/h **Sensor Balance:** % **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**17599**
Commercial	**4.6%**
Mean Speed	**49.5kp/h**
Speed 85%	**59.8kp/h**
30kp/h Above	**0.997%**
Direction	**North, South (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	32	34	22	37	49	101	121	35	111	**57**
0100-0200	18	29	25	29	25	52	62	25	57	**34**
0200-0300	15	20	23	22	30	37	45	22	41	**27**
0300-0400	35	47	30	40	27	36	37	36	37	**36**
0400-0500	134	130	150	129	146	79	47	138	63	**116**
0500-0600	477	503	530	484	463	143	87	491	115	**384**
0600-0700	581	597	619	584	576	206	151	591	179	**473**
0700-0800	701	743	712	755	705	386	233	723	310	**605**
0800-0900	1215	1198	1287	1305	1240	753	556	1249	655	**1079**
0900-1000	1048	1044	1094	1069	1143	1113	818	1080	966	**1047**
1000-1100	1105	1082	1164	1211	1246	1349	988	1162	1169	**1164**
1100-1200	1255	1244	1270	1217	1345	1565	1232	1266	1399	**1304**
1200-1300	1263	1219	1307	1289	1425	1601	1303	1301	1452	**1344**
1300-1400	1176	1171	1170	1165	1361	1395	1172	1209	1284	**1230**
1400-1500	1321	1343	1360	1450	1625	1260	1158	1420	1209	**1360**
1500-1600	1517	1604	1521	1565	1568	1196	975	1555	1086	**1421**
1600-1700	1559	1629	1468	1550	1562	1115	971	1554	1043	**1408**
1700-1800	1293	1306	1349	1386	1455	1023	859	1358	941	**1239**
1800-1900	779	879	857	968	898	895	623	876	759	**843**
1900-2000	456	503	538	609	589	643	410	539	527	**535**
2000-2100	331	404	397	436	499	515	259	413	387	**406**
2100-2200	199	266	256	287	391	359	205	280	282	**280**
2200-2300	116	148	170	174	302	295	143	182	219	**193**
2300-2400	81	91	79	76	149	194	55	95	125	**104**
Total	**16707**	**17234**	**17398**	**17837**	**18819**	**16311**	**12510**	**17599**	**14411**	**16688**
AM peak	255 (1100)	244 (1100)	287 (0800)	305 (0800)	345 (1100)	565 (1100)	232 (1100)	1266 (1100)	399 (1100)	**304 (1100)**
PM peak	559 (1600)	629 (1600)	521 (1500)	565 (1500)	625 (1400)	601 (1200)	303 (1200)	1555 (1500)	452 (1200)	**421 (1500)**
Day peak	559 (1600)	629 (1600)	521 (1500)	565 (1500)	625 (1400)	601 (1200)	303 (1200)	1555 (1500)	452 (1200)	**421 (1500)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	49.4	49.2	49.1	49.4	48.7	50.2	50.9	49.2	50.5	**49.5**
Speed 85% kp/h	59.9	59.4	59.2	59.6	59.0	59.9	60.8	59.4	60.3	**59.8**
Mean Exceeding kp/h	73.6	73.5	74.2	73.8	73.7	73.1	73.5	73.8	73.3	**73.6**
Vol Exceeding	180	162	172	159	165	155	172	168	164	**166**
% Exceeding	1.077	0.940	0.989	0.891	0.877	0.950	1.375	0.952	1.135	**0.997**

Vehicles 30kph Above	1165	0.997%

Class Data

Commercial	**4.60%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	110690	94.76%	L
2 - SVT	743	0.636%	L
3 - TB2	4869	4.168%	M
4 - TB3	281	0.241%	M
5 - T4	69	0.059%	M
6 - ART3	47	0.040%	H
7 - ART4	68	0.058%	H
8 - ART5	20	0.017%	H
9 - ART6	26	0.022%	H
10 - BD	2	0.002%	H
11 - DRT	1	0.001%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	95.40%
Medium Vehicle	4.47%
Heavy Vehicle	0.14%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Read St north of Council Ave (#) <70>
Site name: Read St north of Council Ave Location: [-32.291390 +115.741552]
Survey duration: 0:00 Friday, 23 May 2025 to 0:00 Monday, 2 June 2025 (10 days, 1.42857 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 70 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**19650**
Commercial	**5.1%**
Mean Speed	**40.1kp/h**
Speed 85%	**52.4kp/h**
30kp/h Above	**0.846%**
Direction	**North, South (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	48	31	56	72	61	113	132	55	122	**82**
0100-0200	26	34	27	36	40	67	96	34	81	**53**
0200-0300	15	21	15	21	34	60	91	23	75	**44**
0300-0400	29	37	49	34	45	50	54	40	52	**45**
0400-0500	91	109	115	135	113	64	49	113	57	**90**
0500-0600	209	287	311	335	213	122	99	261	111	**201**
0600-0700	438	476	514	509	344	214	212	438	213	**348**
0700-0800	714	820	863	891	684	450	343	776	396	**624**
0800-0900	1586	1655	1651	1689	1131	778	587	1474	682	**1157**
0900-1000	1147	1239	1164	1208	1186	1140	833	1188	987	**1108**
1000-1100	1272	1162	1263	1239	1417	1335	1078	1295	1206	**1259**
1100-1200	1304	1407	1400	1407	1586	1528	1251	1448	1389	**1425**
1200-1300	1288	1360	1413	1365	1534	1489	1341	1416	1415	**1415**
1300-1400	1350	1408	1426	1329	1474	1306	1208	1410	1257	**1349**
1400-1500	1748	1770	1818	1836	1727	1273	1111	1771	1192	**1539**
1500-1600	1593	1797	1875	1617	1660	1217	1042	1700	1129	**1472**
1600-1700	1565	1702	1697	1728	1697	1142	1018	1681	1080	**1440**
1700-1800	1490	1475	1653	1545	1586	1030	869	1556	949	**1313**
1800-1900	937	887	1034	1027	1124	733	598	1022	665	**879**
1900-2000	602	627	753	787	747	549	489	711	519	**634**
2000-2100	384	441	622	536	622	473	164	538	318	**450**
2100-2200	244	295	350	387	449	395	95	362	245	**315**
2200-2300	134	167	180	184	303	298	58	212	178	**198**
2300-2400	72	108	108	115	185	219	37	129	128	**128**
Total	**18286**	**19315**	**20357**	**20032**	**19954**	**16038**	**12850**	**19650**	**14444**	**17567**
AM peak	586 (0800)	655 (0800)	651 (0800)	689 (0800)	586 (1100)	528 (1100)	251 (1100)	1474 (0800)	389 (1100)	**425 (1100)**
PM peak	748 (1400)	797 (1500)	875 (1500)	836 (1400)	727 (1400)	489 (1200)	341 (1200)	1771 (1400)	415 (1200)	**539 (1400)**
Day peak	748 (1400)	797 (1500)	875 (1500)	836 (1400)	727 (1400)	528 (1100)	341 (1200)	1771 (1400)	415 (1200)	**539 (1400)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	39.4	38.2	37.9	37.4	41.0	41.5	42.4	39.2	41.9	**40.1**
Speed 85% kp/h	51.7	50.9	51.7	49.9	52.9	52.9	54.0	51.7	53.5	**52.4**
Mean Exceeding kp/h	74.5	74.5	73.7	74.7	97.7	74.4	75.0	92.7	74.7	**89.5**
Vol Exceeding	65	55	82	61	480	65	67	204	66	**149**
% Exceeding	0.355	0.285	0.403	0.305	2.406	0.405	0.521	1.037	0.457	**0.846**

Vehicles 30kph Above	1487	0.846%

Class Data

Commercial	**5.14%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	164539	93.66%	L
2 - SVT	2111	1.202%	L
3 - TB2	4035	2.297%	M
4 - TB3	1296	0.738%	M
5 - T4	952	0.542%	M
6 - ART3	194	0.110%	H
7 - ART4	1866	1.062%	H
8 - ART5	143	0.081%	H
9 - ART6	337	0.192%	H
10 - BD	51	0.029%	H
11 - DRT	107	0.061%	H
12 - TRT	41	0.023%	H

Class (*AustRoads94*)	%
Light Vehicle	94.86%
Medium Vehicle	3.58%
Heavy Vehicle	1.56%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Victoria St - btw Smythe St & Jecks St Rockingham (#21)
Site name: Victoria-01 Location: [-32.272165 +115.743055]
Survey duration: 0:00 Thursday, 8 June 2023 to 0:00 Thursday, 15 June 2023 (7 days, 1 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**3498**
Commercial	**7.7%**
Mean Speed	**55.5kp/h**
Speed 85%	**63.0kp/h**
30kp/h Above	**78.75%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	7	10	11	5	10	20	21	9	21	**12**
0100-0200	9	10	9	6	3	11	17	7	14	**9**
0200-0300	1	10	4	4	5	8	7	5	8	**6**
0300-0400	12	7	8	14	10	12	5	10	9	**10**
0400-0500	30	31	28	18	19	10	9	25	10	**21**
0500-0600	112	97	90	109	107	39	23	103	31	**82**
0600-0700	146	145	153	149	129	75	56	144	66	**122**
0700-0800	188	238	201	216	205	94	87	210	91	**176**
0800-0900	218	224	223	208	227	185	153	220	169	**205**
0900-1000	238	241	233	223	194	257	196	226	227	**226**
1000-1100	211	240	242	206	237	320	256	227	288	**245**
1100-1200	262	224	281	222	253	380	313	248	347	**276**
1200-1300	255	242	270	218	259	270	267	249	269	**254**
1300-1400	229	243	252	250	267	287	253	248	270	**254**
1400-1500	252	260	272	286	303	272	223	275	248	**267**
1500-1600	326	272	288	317	297	241	220	300	231	**280**
1600-1700	337	302	323	268	328	234	227	312	231	**288**
1700-1800	263	269	287	261	261	183	182	268	183	**244**
1800-1900	163	159	166	190	191	129	103	174	116	**157**
1900-2000	67	73	81	90	109	71	68	84	70	**80**
2000-2100	64	51	53	74	64	69	66	61	68	**63**
2100-2200	32	45	40	61	53	54	40	46	47	**46**
2200-2300	18	28	36	35	42	56	17	32	37	**33**
2300-2400	11	13	8	17	24	40	15	15	28	**18**
Total	**3451**	**3434**	**3559**	**3447**	**3597**	**3317**	**2824**	**3498**	**3071**	**3376**
AM peak	262 (1100)	241 (0900)	281 (1100)	223 (0900)	253 (1100)	380 (1100)	313 (1100)	248 (1100)	347 (1100)	**276 (1100)**
PM peak	337 (1600)	302 (1600)	323 (1600)	317 (1500)	328 (1600)	287 (1300)	267 (1200)	312 (1600)	270 (1300)	**288 (1600)**
Day peak	337 (1600)	302 (1600)	323 (1600)	317 (1500)	328 (1600)	380 (1100)	313 (1100)	312 (1600)	347 (1100)	**288 (1600)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	55.1	55.3	55.6	55.6	55.8	55.4	55.8	55.5	55.6	**55.5**
Speed 85% kp/h	62.3	62.8	63.0	63.4	63.2	62.5	63.4	63.0	62.8	**63.0**
Mean Exceeding kp/h	58.1	58.2	58.4	58.4	58.6	58.1	58.6	58.3	58.3	**58.3**
Vol Exceeding	2656	2689	2814	2733	2847	2625	2243	2748	2434	**2658**
% Exceeding	76.96	78.31	79.07	79.29	79.15	79.14	79.43	78.56	79.27	**78.75**

Vehicles 30kph Above	18607	78.75%

Class Data

Commercial	**7.66%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	21581	91.33%	L
2 - SVT	239	1.011%	L
3 - TB2	1639	6.936%	M
4 - TB3	57	0.241%	M
5 - T4	31	0.131%	M
6 - ART3	27	0.114%	H
7 - ART4	46	0.195%	H
8 - ART5	5	0.021%	H
9 - ART6	3	0.013%	H
10 - BD	0	0.000%	H
11 - DRT	1	0.004%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	92.34%
Medium Vehicle	7.31%
Heavy Vehicle	0.35%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Wanliss Street - btw Kent St & Lewington St
Site name: Wanliss-01 Location: [-32.274310 +115.735465]
Survey duration: 0:00 Friday, 22 July 2022 to 0:00 Tuesday, 2 August 2022 (11 days, 1.57143 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**2487**
Commercial	**9.1%**
Mean Speed	**44.1kp/h**
Speed 85%	**50.4kp/h**
30kp/h Above	**16.93%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	5	4	4	10	6	15	21	5	18	**10**
0100-0200	4	0	2	4	3	10	9	3	9	**5**
0200-0300	2	3	3	2	5	4	4	3	4	**3**
0300-0400	3	5	8	1	4	3	5	4	4	**4**
0400-0500	8	14	8	10	7	9	6	9	7	**8**
0500-0600	31	36	46	41	39	16	10	38	13	**29**
0600-0700	67	59	51	73	61	26	21	63	23	**48**
0700-0800	111	128	102	107	113	73	52	112	62	**94**
0800-0900	163	163	225	182	181	135	101	180	118	**157**
0900-1000	153	151	185	175	155	152	148	161	150	**157**
1000-1100	144	138	176	183	182	180	200	164	190	**173**
1100-1200	195	161	202	225	207	186	249	199	217	**206**
1200-1300	185	198	202	228	224	200	236	206	218	**211**
1300-1400	160	165	199	199	204	181	216	184	198	**189**
1400-1500	192	188	247	210	258	156	221	220	188	**209**
1500-1600	209	191	231	216	226	159	196	215	177	**201**
1600-1700	179	192	216	196	194	156	171	193	163	**182**
1700-1800	154	180	203	199	212	152	153	188	152	**175**
1800-1900	87	113	146	137	130	127	114	118	120	**119**
1900-2000	49	46	95	90	108	104	80	78	92	**83**
2000-2100	44	53	67	78	79	64	59	63	61	**63**
2100-2200	24	34	57	62	71	59	36	49	47	**48**
2200-2300	10	20	15	14	35	37	12	20	24	**21**
2300-2400	6	10	13	10	23	19	9	13	14	**13**
Total	**2179**	**2252**	**2703**	**2652**	**2722**	**2219**	**2322**	**2487**	**2270**	**2408**
AM peak	195 (1100)	163 (0800)	225 (0800)	225 (1100)	207 (1100)	186 (1100)	249 (1100)	199 (1100)	217 (1100)	**206 (1100)**
PM peak	209 (1500)	198 (1200)	247 (1400)	228 (1200)	258 (1400)	200 (1200)	236 (1200)	220 (1400)	218 (1200)	**211 (1200)**
Day peak	209 (1500)	198 (1200)	247 (1400)	228 (1200)	258 (1400)	200 (1200)	249 (1100)	220 (1400)	218 (1200)	**211 (1200)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	43.8	43.9	44.0	44.4	44.2	44.2	43.9	44.1	44.1	**44.1**
Speed 85% kp/h	50.6	50.6	50.4	50.8	50.6	50.6	50.0	50.6	50.2	**50.4**
Mean Exceeding kp/h	53.3	53.4	53.7	53.9	53.6	53.5	53.7	53.6	53.6	**53.6**
Vol Exceeding	375	399	443	459	477	381	359	429	370	**408**
% Exceeding	17.21	17.72	16.39	17.31	17.51	17.17	15.46	17.26	16.30	**16.93**

Vehicles 30kph Above	4484	16.93%

Class Data

Commercial	**9.12%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	23921	90.31%	L
2 - SVT	151	0.570%	L
3 - TB2	2242	8.464%	M
4 - TB3	121	0.457%	M
5 - T4	29	0.109%	M
6 - ART3	4	0.015%	H
7 - ART4	16	0.060%	H
8 - ART5	0	0.000%	H
9 - ART6	4	0.015%	H
10 - BD	0	0.000%	H
11 - DRT	1	0.004%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	90.88%
Medium Vehicle	9.03%
Heavy Vehicle	0.09%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: 51 Thorpe St, Rockingham 03(#51) <50>
Site name: 51 Thorpe St, Rockingham 03 Location: [-32.278691 +115.729368]
Survey duration: 0:00 Friday, 22 March 2024 to 0:00 Saturday, 30 March 2024 (8 days, 1.14286 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**2692**
Commercial	**8.2%**
Mean Speed	**50.7kp/h**
Speed 85%	**59.8kp/h**
30kp/h Above	**56.53%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	0	2	5	4	10	16	16	5	16	**8**
0100-0200	1	3	2	3	11	15	8	5	12	**7**
0200-0300	3	3	4	12	6	10	3	6	7	**6**
0300-0400	4	2	5	3	6	3	2	4	3	**4**
0400-0500	25	38	34	29	17	6	12	27	9	**22**
0500-0600	78	74	80	81	43	31	14	66	23	**55**
0600-0700	117	118	121	121	56	39	29	98	34	**82**
0700-0800	190	217	186	157	113	52	55	163	54	**135**
0800-0900	296	312	316	305	191	114	92	269	103	**227**
0900-1000	161	164	138	179	130	148	108	150	128	**145**
1000-1100	169	156	157	173	129	151	139	152	145	**150**
1100-1200	163	145	154	191	155	174	180	160	177	**165**
1200-1300	163	171	176	187	144	172	162	164	167	**165**
1300-1400	152	151	157	210	139	170	135	158	153	**157**
1400-1500	291	267	300	328	222	156	138	272	147	**240**
1500-1600	232	252	245	282	179	149	121	228	135	**205**
1600-1700	259	240	196	225	173	127	105	211	116	**187**
1700-1800	201	208	237	187	157	133	113	191	123	**174**
1800-1900	123	133	148	181	116	100	86	136	93	**125**
1900-2000	75	78	92	95	77	87	87	82	87	**83**
2000-2100	37	48	71	65	59	43	61	57	52	**55**
2100-2200	27	37	44	88	45	50	24	48	37	**45**
2200-2300	16	20	31	29	33	33	29	27	31	**28**
2300-2400	10	12	12	17	21	33	6	15	20	**16**
Total	**2793**	**2851**	**2911**	**3152**	**2224**	**2012**	**1725**	**2692**	**1869**	**2486**
AM peak	296 (0800)	312 (0800)	316 (0800)	305 (0800)	191 (0800)	174 (1100)	180 (1100)	269 (0800)	177 (1100)	**227 (0800)**
PM peak	291 (1400)	267 (1400)	300 (1400)	328 (1400)	222 (1400)	172 (1200)	162 (1200)	272 (1400)	167 (1200)	**240 (1400)**
Day peak	296 (0800)	312 (0800)	316 (0800)	328 (1400)	222 (1400)	174 (1100)	180 (1100)	272 (1400)	177 (1100)	**240 (1400)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	50.1	50.5	51.2	50.8	50.8	50.7	50.1	50.7	50.4	**50.7**
Speed 85% kp/h	59.2	59.8	60.1	59.6	59.9	60.3	59.6	59.8	59.9	**59.8**
Mean Exceeding kp/h	56.9	57.2	57.5	57.1	57.3	57.4	57.4	57.2	57.4	**57.2**
Vol Exceeding	1503	1589	1673	1804	1279	1184	934	1521	1059	**1406**
% Exceeding	53.81	55.73	57.47	57.23	57.50	58.85	54.14	56.49	56.68	**56.53**

Vehicles 30kph Above	11244	56.53%

Class Data

Commercial	**8.16%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	18034	90.66%	L
2 - SVT	234	1.176%	L
3 - TB2	1482	7.451%	M
4 - TB3	36	0.181%	M
5 - T4	23	0.116%	M
6 - ART3	30	0.151%	H
7 - ART4	47	0.236%	H
8 - ART5	0	0.000%	H
9 - ART6	4	0.020%	H
10 - BD	1	0.005%	H
11 - DRT	0	0.000%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	91.84%
Medium Vehicle	7.75%
Heavy Vehicle	0.41%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: 53 Rockingham Beach Rd (#53) <40>
Site name: 53 Rockingham Beach Rd Location: [-32.273351 +115.733397]
Survey duration: 0:00 Tuesday, 24 December 2024 to 0:00 Tuesday, 7 January 2025 (14 days, 2 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 40 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**5362**
Commercial	**8.3%**
Mean Speed	**26.7kp/h**
Speed 85%	**34.0kp/h**
30kp/h Above	**4.469%**
Direction	**North, South (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	13	22	35	22	16	21	19	22	20	**21**
0100-0200	10	8	44	11	13	10	11	17	11	**15**
0200-0300	4	7	25	6	8	9	11	10	10	**10**
0300-0400	7	7	14	5	11	11	6	9	8	**8**
0400-0500	18	17	19	13	12	15	13	16	14	**15**
0500-0600	86	70	53	57	78	54	47	69	51	**64**
0600-0700	139	136	97	114	115	117	107	120	112	**118**
0700-0800	196	207	185	181	202	237	180	194	208	**198**
0800-0900	246	292	314	259	269	332	299	276	315	**287**
0900-1000	388	179	422	366	389	456	489	349	472	**384**
1000-1100	497	221	579	500	496	573	626	458	599	**499**
1100-1200	539	237	589	561	554	612	616	496	614	**530**
1200-1300	476	230	515	546	524	645	610	458	628	**507**
1300-1400	447	202	515	487	509	509	548	432	528	**459**
1400-1500	445	178	501	464	433	519	529	404	524	**438**
1500-1600	399	149	455	414	405	483	472	364	478	**397**
1600-1700	410	137	448	384	368	493	462	349	477	**386**
1700-1800	399	146	462	391	389	468	409	357	439	**380**
1800-1900	341	125	400	345	366	440	358	315	399	**339**
1900-2000	311	153	360	295	287	357	286	281	321	**292**
2000-2100	193	109	243	179	204	232	180	185	206	**191**
2100-2200	107	77	124	97	95	126	99	100	113	**103**
2200-2300	51	52	52	50	80	72	40	57	56	**56**
2300-2400	32	23	26	21	33	40	17	27	28	**27**
Total	**5747**	**2979**	**6474**	**5761**	**5852**	**6826**	**6428**	**5362**	**6627**	**5724**
AM peak	539 (1100)	292 (0800)	589 (1100)	561 (1100)	554 (1100)	612 (1100)	626 (1000)	496 (1100)	614 (1100)	**530 (1100)**
PM peak	476 (1200)	230 (1200)	515 (1200)	546 (1200)	524 (1200)	645 (1200)	610 (1200)	458 (1200)	628 (1200)	**507 (1200)**
Day peak	539 (1100)	292 (0800)	589 (1100)	561 (1100)	554 (1100)	645 (1200)	626 (1000)	496 (1100)	628 (1200)	**530 (1100)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	28.4	30.8	23.9	27.5	28.1	25.7	25.3	27.3	25.5	**26.7**
Speed 85% kp/h	35.6	37.4	31.3	34.6	34.9	32.2	32.0	34.7	32.2	**34.0**
Mean Exceeding kp/h	44.7	44.5	45.3	44.8	44.5	45.8	45.1	44.7	45.4	**44.9**
Vol Exceeding	338	251	187	295	292	217	212	272	214	**256**
% Exceeding	5.873	8.427	2.889	5.112	4.990	3.179	3.291	5.080	3.233	**4.469**

Vehicles 30kph Above	3581	4.469%

Class Data

Commercial	**8.34%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	73090	91.22%	L
2 - SVT	354	0.442%	L
3 - TB2	6154	7.680%	M
4 - TB3	144	0.180%	M
5 - T4	219	0.273%	M
6 - ART3	37	0.046%	H
7 - ART4	70	0.087%	H
8 - ART5	12	0.015%	H
9 - ART6	40	0.050%	H
10 - BD	3	0.004%	H
11 - DRT	4	0.005%	H
12 - TRT	2	0.002%	H

Class (*AustRoads94*)	%
Light Vehicle	91.66%
Medium Vehicle	8.13%
Heavy Vehicle	0.21%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: 73 Rockingham Beach Rd (#73) <50>
Site name: 73 Rockingham Beach Rd Location: [-32.271550 +115.736025]
Survey duration: 0:00 Tuesday, 24 December 2024 to 0:00 Tuesday, 7 January 2025 (14 days, 2 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**4603**
Commercial	**7.6%**
Mean Speed	**43.4kp/h**
Speed 85%	**52.0kp/h**
30kp/h Above	**22.92%**
Direction	**North, South (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	10	21	116	15	13	16	19	35	17	**30**
0100-0200	6	8	27	8	9	10	8	11	9	**11**
0200-0300	3	6	20	5	8	8	9	8	8	**8**
0300-0400	3	5	12	4	6	9	6	6	7	**6**
0400-0500	17	15	14	9	11	11	10	13	10	**12**
0500-0600	78	70	44	49	66	51	44	61	47	**57**
0600-0700	107	109	77	87	90	83	86	94	84	**91**
0700-0800	158	161	135	141	142	164	132	147	148	**147**
0800-0900	189	227	259	206	193	240	224	215	232	**220**
0900-1000	286	238	361	262	285	334	482	286	408	**321**
1000-1100	333	331	469	345	361	422	441	368	431	**386**
1100-1200	389	349	532	376	411	502	508	411	505	**438**
1200-1300	343	305	468	380	366	505	474	372	489	**406**
1300-1400	322	304	479	362	357	396	426	364	411	**378**
1400-1500	346	264	442	383	335	412	411	354	411	**370**
1500-1600	315	247	400	323	304	365	367	317	366	**331**
1600-1700	303	283	399	308	261	402	350	310	376	**329**
1700-1800	287	280	369	294	258	343	303	297	323	**305**
1800-1900	250	326	343	256	262	295	258	287	276	**284**
1900-2000	224	354	291	225	208	287	212	260	249	**257**
2000-2100	149	291	195	121	147	170	134	180	152	**172**
2100-2200	69	152	83	79	69	88	70	90	79	**87**
2200-2300	41	121	43	40	56	47	37	60	42	**55**
2300-2400	29	183	23	17	25	31	15	55	23	**46**
Total	**4251**	**4645**	**5594**	**4288**	**4238**	**5185**	**5020**	**4603**	**5103**	**4746**
AM peak	389 (1100)	349 (1100)	532 (1100)	376 (1100)	411 (1100)	502 (1100)	508 (1100)	411 (1100)	505 (1100)	**438 (1100)**
PM peak	346 (1400)	354 (1900)	479 (1300)	383 (1400)	366 (1200)	505 (1200)	474 (1200)	372 (1200)	489 (1200)	**406 (1200)**
Day peak	389 (1100)	354 (1900)	532 (1100)	383 (1400)	411 (1100)	505 (1200)	508 (1100)	411 (1100)	505 (1100)	**438 (1100)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	48.1	39.4	39.1	46.7	47.4	43.4	41.6	43.8	42.5	**43.4**
Speed 85% kp/h	54.7	52.0	48.2	53.3	53.6	51.1	50.0	52.7	50.6	**52.0**
Mean Exceeding kp/h	55.2	55.1	54.7	54.6	54.8	54.5	54.5	54.9	54.5	**54.8**
Vol Exceeding	1604	1036	573	1285	1402	967	750	1180	859	**1088**
% Exceeding	37.72	22.30	10.23	29.96	33.07	18.65	14.94	25.62	16.83	**22.92**

Vehicles 30kph Above	15229	22.92%

Class Data

Commercial	**7.64%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	60951	91.74%	L
2 - SVT	414	0.623%	L
3 - TB2	4643	6.988%	M
4 - TB3	85	0.128%	M
5 - T4	220	0.331%	M
6 - ART3	51	0.077%	H
7 - ART4	40	0.060%	H
8 - ART5	7	0.011%	H
9 - ART6	21	0.032%	H
10 - BD	6	0.009%	H
11 - DRT	2	0.003%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	92.36%
Medium Vehicle	7.45%
Heavy Vehicle	0.19%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Patterson Rd, Rockingham(#) <80>
Site name: Patterson Rd, Rockingham Location: [-32.270333 +115.752224]
Survey duration: 0:00 Friday, 22 March 2024 to 0:00 Saturday, 30 March 2024 (8 days, 1.14286 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 80 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**19560**
Commercial	**10.4%**
Mean Speed	**71.8kp/h**
Speed 85%	**79.6kp/h**
30kp/h Above	**13.29%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	39	67	68	79	92	115	126	73	121	**85**
0100-0200	40	20	33	36	55	67	83	40	75	**49**
0200-0300	27	36	34	34	54	52	53	40	53	**43**
0300-0400	84	78	79	84	64	62	75	75	69	**74**
0400-0500	265	269	307	253	190	124	101	246	113	**212**
0500-0600	852	908	889	844	521	348	203	756	276	**636**
0600-0700	1108	1181	1154	1085	684	400	278	983	339	**822**
0700-0800	1268	1382	1308	1296	853	602	440	1160	521	**1000**
0800-0900	1412	1382	1455	1409	939	901	744	1256	823	**1148**
0900-1000	1167	1216	1280	1204	1053	1158	1045	1162	1102	**1147**
1000-1100	1186	1171	1165	1286	1158	1361	1203	1187	1282	**1211**
1100-1200	1216	1212	1286	1400	1313	1342	1322	1290	1332	**1300**
1200-1300	1192	1196	1273	1512	1276	1350	1270	1287	1310	**1293**
1300-1400	1217	1206	1232	1528	1357	1219	1188	1316	1204	**1288**
1400-1500	1512	1455	1525	1667	1400	1264	1248	1493	1256	**1434**
1500-1600	1798	1797	1791	1825	1394	1163	1090	1666	1127	**1531**
1600-1700	1801	1863	1836	1806	1351	1081	1004	1668	1043	**1512**
1700-1800	1382	1507	1574	1390	1091	1048	935	1339	992	**1252**
1800-1900	791	862	996	956	782	767	671	861	719	**826**
1900-2000	518	518	621	699	563	581	557	580	569	**578**
2000-2100	331	334	462	464	450	452	403	415	428	**418**
2100-2200	221	262	339	435	375	493	284	334	389	**348**
2200-2300	130	167	220	282	250	304	169	216	237	**221**
2300-2400	76	81	121	147	137	198	87	117	143	**123**
Total	**19633**	**20170**	**21048**	**21721**	**17394**	**16452**	**14579**	**19560**	**15516**	**18549**
AM peak	412 (0800)	382 (0700)	455 (0800)	409 (0800)	313 (1100)	361 (1000)	322 (1100)	1290 (1100)	332 (1100)	**300 (1100)**
PM peak	801 (1600)	863 (1600)	836 (1600)	825 (1500)	400 (1400)	350 (1200)	270 (1200)	1668 (1600)	310 (1200)	**531 (1500)**
Day peak	801 (1600)	863 (1600)	836 (1600)	825 (1500)	400 (1400)	361 (1000)	322 (1100)	1668 (1600)	332 (1100)	**531 (1500)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	71.6	71.9	71.9	71.3	71.9	71.8	72.1	71.8	71.9	**71.8**
Speed 85% kp/h	79.7	79.9	79.7	79.4	79.4	79.4	79.4	79.6	79.4	**79.6**
Mean Exceeding kp/h	83.6	83.6	83.8	83.6	83.5	83.7	83.6	83.6	83.7	**83.6**
Vol Exceeding	2762	2977	2912	2702	2207	2105	1845	2628	1975	**2465**
% Exceeding	14.07	14.76	13.84	12.44	12.69	12.79	12.66	13.43	12.73	**13.29**

Vehicles 30kph Above	19716	13.29%

Class Data

Commercial	**10.36%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	129722	87.42%	L
2 - SVT	3296	2.221%	L
3 - TB2	10824	7.294%	M
4 - TB3	835	0.563%	M
5 - T4	491	0.331%	M
6 - ART3	275	0.185%	H
7 - ART4	1840	1.240%	H
8 - ART5	154	0.104%	H
9 - ART6	707	0.476%	H
10 - BD	52	0.035%	H
11 - DRT	111	0.075%	H
12 - TRT	84	0.057%	H

Class (*AustRoads94*)	%
Light Vehicle	89.64%
Medium Vehicle	8.19%
Heavy Vehicle	2.17%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Patterson Road - east of Parkin Street
Site name: Patterson-07 Location: [-32.277438 +115.730408]
Survey duration: 0:00 Wednesday, 8 June 2022 to 0:00 Wednesday, 15 June 2022 (7 days, 1 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 60 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**11903**
Commercial	**7.3%**
Mean Speed	**46.7kp/h**
Speed 85%	**53.1kp/h**
30kp/h Above	**2.070%**
Direction	**East, West (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	18	28	20	20	21	60	67	21	64	**33**
0100-0200	14	19	13	29	19	33	34	19	34	**23**
0200-0300	14	20	12	9	24	21	16	16	19	**17**
0300-0400	15	26	32	20	16	11	24	22	18	**21**
0400-0500	62	65	66	54	53	50	24	60	37	**53**
0500-0600	308	314	358	333	314	92	54	325	73	**253**
0600-0700	605	577	652	588	593	134	105	603	120	**465**
0700-0800	656	676	705	727	606	332	207	674	270	**558**
0800-0900	710	750	734	752	763	519	429	742	474	**665**
0900-1000	745	735	678	728	832	693	574	744	634	**712**
1000-1100	730	761	769	826	899	891	616	797	754	**785**
1100-1200	813	857	882	887	964	1027	722	881	875	**879**
1200-1300	773	881	908	841	1154	1022	814	911	918	**913**
1300-1400	830	852	852	811	994	936	794	868	865	**867**
1400-1500	860	914	935	908	1081	837	735	940	786	**896**
1500-1600	956	1120	1270	1118	903	743	631	1073	687	**963**
1600-1700	992	1096	934	1033	851	747	608	981	678	**894**
1700-1800	747	864	758	794	835	710	591	800	651	**757**
1800-1900	415	503	491	561	537	586	414	501	500	**501**
1900-2000	307	305	306	337	391	420	253	329	337	**331**
2000-2100	186	241	225	282	316	350	181	250	266	**254**
2100-2200	135	156	145	198	304	255	152	188	204	**192**
2200-2300	66	78	104	95	192	196	69	107	133	**114**
2300-2400	23	47	47	51	89	125	29	51	77	**59**
Total	**10980**	**11885**	**11896**	**12002**	**12751**	**10790**	**8143**	**11903**	**9467**	**11207**
AM peak	813 (1100)	857 (1100)	882 (1100)	887 (1100)	964 (1100)	1027 (1100)	722 (1100)	881 (1100)	875 (1100)	**879 (1100)**
PM peak	992 (1600)	1120 (1500)	1270 (1500)	1118 (1500)	954 (1200)	1022 (1200)	814 (1200)	1073 (1500)	918 (1200)	**963 (1500)**
Day peak	992 (1600)	1120 (1500)	1270 (1500)	1118 (1500)	954 (1200)	1027 (1100)	814 (1200)	1073 (1500)	918 (1200)	**963 (1500)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	46.9	46.6	46.8	47.0	46.1	46.3	47.1	46.7	46.7	**46.7**
Speed 85% kp/h	53.3	52.9	53.3	53.5	52.7	52.7	53.1	53.1	52.9	**53.1**
Mean Exceeding kp/h	63.9	63.5	63.5	63.6	63.4	63.3	63.8	63.6	63.5	**63.6**
Vol Exceeding	232	225	268	271	241	204	183	247	194	**232**
% Exceeding	2.113	1.893	2.253	2.258	1.890	1.891	2.247	2.079	2.044	**2.070**

Vehicles 30kph Above	1624	2.070%

Class Data

Commercial	**7.34%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	72066	91.87%	L
2 - SVT	622	0.793%	L
3 - TB2	4523	5.766%	M
4 - TB3	582	0.742%	M
5 - T4	197	0.251%	M
6 - ART3	34	0.043%	H
7 - ART4	72	0.092%	H
8 - ART5	28	0.036%	H
9 - ART6	319	0.407%	H
10 - BD	2	0.003%	H
11 - DRT	1	0.001%	H
12 - TRT	1	0.001%	H

Class (*AustRoads94*)	%
Light Vehicle	92.66%
Medium Vehicle	6.76%
Heavy Vehicle	0.58%

PO Box 2142 Rockingham DC WA 6967
Civic Boulevard Rockingham Western Australia

Traffic Survey

Location: Pedlar Crt Rockingham (#) <>
Site name: Pedlar Crt Rockingham Location: [-32.269413 +115.752962]
Survey duration: 0:00 Friday, 22 March 2024 to 0:00 Saturday, 30 March 2024 (8 days, 1.14286 weeks)
Profile: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16),
Speed limit: 50 km/h **Sensor Balance:** **%** **Class scheme** = *AustRoads94*

Summary

AWDT (VPD)	**6067**
Commercial	**11.1%**
Mean Speed	**31.4kp/h**
Speed 85%	**36.5kp/h**
30kp/h Above	**0.095%**
Direction	**North, South (bound)**

Average Daily Volume

Hours	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
0000-0100	0	2	2	0	4	0	2	2	1	**2**
0100-0200	2	2	2	2	2	3	0	2	2	**2**
0200-0300	1	2	0	3	2	8	2	2	5	**3**
0300-0400	3	2	2	9	2	4	1	3	3	**3**
0400-0500	19	8	13	20	10	3	1	13	2	**10**
0500-0600	43	49	40	46	23	15	9	37	12	**31**
0600-0700	118	118	124	126	70	41	20	104	31	**86**
0700-0800	247	262	263	296	164	242	169	233	206	**226**
0800-0900	451	446	485	508	267	527	320	404	424	**409**
0900-1000	663	632	636	752	379	767	582	574	675	**599**
1000-1100	805	749	660	795	411	891	803	639	847	**691**
1100-1200	744	713	721	830	455	902	878	653	890	**712**
1200-1300	701	686	619	800	409	809	778	604	794	**651**
1300-1400	639	595	610	796	382	724	629	567	677	**595**
1400-1500	615	605	582	717	359	764	586	540	675	**573**
1500-1600	616	615	613	683	339	595	443	534	519	**530**
1600-1700	560	541	519	595	246	401	358	451	380	**433**
1700-1800	377	372	403	483	165	283	241	328	262	**311**
1800-1900	231	225	253	305	91	149	106	199	128	**181**
1900-2000	88	105	104	176	50	30	27	96	29	**79**
2000-2100	53	31	57	83	31	3	9	48	6	**37**
2100-2200	24	17	11	40	14	11	6	20	9	**17**
2200-2300	16	14	11	21	13	5	1	15	3	**12**
2300-2400	3	0	2	0	2	1	0	2	1	**1**
Total	**7019**	**6791**	**6732**	**8086**	**3887**	**7178**	**5971**	**6067**	**6575**	**6194**
AM peak	805 (1000)	749 (1000)	721 (1100)	830 (1100)	455 (1100)	902 (1100)	878 (1100)	653 (1100)	890 (1100)	**712 (1100)**
PM peak	701 (1200)	686 (1200)	619 (1200)	800 (1200)	409 (1200)	809 (1200)	778 (1200)	604 (1200)	794 (1200)	**651 (1200)**
Day peak	805 (1000)	749 (1000)	721 (1100)	830 (1100)	455 (1100)	902 (1100)	878 (1100)	653 (1100)	890 (1100)	**712 (1100)**

Speed Data kp/h

	MON	TUES	WED	THURS	FRI	SAT	SUN	AWDT	AWET	ADT
Mean kp/h	31.6	31.6	31.9	31.2	31.7	31.1	31.0	31.6	31.1	**31.4**
Speed 85% kp/h	36.5	36.7	36.9	36.5	36.9	36.2	36.2	36.7	36.2	**36.5**
Mean Exceeding kp/h	51.3	54.0	54.3	53.4	52.6	52.7	52.1	53.1	52.5	**53.0**
Vol Exceeding	6	1	11	7	7	5	3	7	4	**6**
% Exceeding	0.085	0.015	0.163	0.087	0.180	0.070	0.050	0.107	0.061	**0.095**

Vehicles 30kph Above	47	0.095%

Class Data

Commercial	**11.07%**

Class (*AustRoads94*)	Number of Vehicles	%	
1 - SV	43441	87.67%	L
2 - SVT	626	1.263%	L
3 - TB2	4990	10.07%	M
4 - TB3	226	0.456%	M
5 - T4	109	0.220%	M
6 - ART3	49	0.099%	H
7 - ART4	81	0.163%	H
8 - ART5	8	0.016%	H
9 - ART6	20	0.040%	H
10 - BD	0	0.000%	H
11 - DRT	1	0.002%	H
12 - TRT	0	0.000%	H

Class (*AustRoads94*)	%
Light Vehicle	88.93%
Medium Vehicle	10.75%
Heavy Vehicle	0.32%

Appendix E

SIDRA Results

MOVEMENT SUMMARY

Site: LM00303 [01_PattersonRd_ReadSt_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	285	8.8	285	8.8	0.246	11.5	LOS B	4.8	36.4	0.40	0.69	0.40	51.9
2	T1	All MCs	120	8.8	120	8.8	0.131	24.6	LOS C	3.3	24.5	0.66	0.63	0.66	42.3
3	R2	All MCs	384	8.8	384	8.8	*0.636	31.4	LOS C	14.8	111.8	0.90	0.83	0.90	40.9
Approach			789	8.8	789	8.8	0.636	23.2	LOS C	14.8	111.8	0.68	0.75	0.68	44.5
East: Patterson Rd															
4	L2	All MCs	352	8.8	352	8.8	0.267	8.5	LOS A	4.4	33.4	0.33	0.65	0.33	51.7
5	T1	All MCs	680	8.8	680	8.8	*0.787	51.4	LOS D	18.4	138.6	1.00	0.92	1.09	34.3
6	R2	All MCs	22	8.8	22	8.8	0.099	62.9	LOS E	1.1	8.1	0.92	0.70	0.92	30.4
Approach			1054	8.8	1054	8.8	0.787	37.3	LOS D	18.4	138.6	0.77	0.83	0.83	37.1
North: Flinders Ln															
7	L2	All MCs	24	8.8	24	8.8	0.731	64.8	LOS E	4.9	36.8	1.00	0.87	1.19	27.9
8	T1	All MCs	115	8.8	115	8.8	*0.731	60.3	LOS E	4.9	36.8	1.00	0.87	1.19	29.3
9	R2	All MCs	23	8.8	23	8.8	0.731	65.1	LOS E	4.5	34.0	1.00	0.88	1.20	28.0
Approach			162	8.8	162	8.8	0.731	61.7	LOS E	4.9	36.8	1.00	0.87	1.19	28.9
West: Patterson Rd															
10	L2	All MCs	53	8.8	53	8.8	0.492	6.9	LOS A	9.6	72.0	0.91	0.78	0.91	34.8
11	T1	All MCs	379	8.8	379	8.8	0.492	42.6	LOS D	10.1	75.8	0.91	0.77	0.91	37.0
12	R2	All MCs	168	8.8	168	8.8	*0.757	60.2	LOS E	9.4	71.0	1.00	0.90	1.14	30.2
Approach			600	8.8	600	8.8	0.757	44.4	LOS D	10.1	75.8	0.94	0.81	0.98	34.6
All Vehicles			2605	8.8	2605	8.8	0.787	36.2	LOS D	18.4	138.6	0.80	0.80	0.84	37.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P2	Full	50	53	46.5	LOS E	0.2	0.2	0.92	0.92	200.3	200.0	1.00
East: Patterson Rd												

P5	Stage 1	25	26	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
P4	Stage 2	25	26	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
North: Flinders Ln												
P1	Full	50	53	46.5	LOS E	0.2	0.2	0.92	0.92	200.3	200.0	1.00
West: Patterson Rd												
P3	Full	50	53	46.5	LOS E	0.2	0.2	0.92	0.92	200.3	200.0	1.00
All Pedestrians		200	211	46.5	LOS E	0.2	0.2	0.92	0.92	200.3	200.0	1.00

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00332 [02_Patterson Rd Ennis Ave_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Ennis Ave															
21	L2	All MCs	280	6.8	280	6.8	0.760	14.7	LOS B	14.4	109.5	0.94	0.95	1.01	42.5
23	R2	All MCs	542	6.8	542	6.8	* 0.760	44.7	LOS D	14.4	109.5	0.96	0.92	1.06	40.8
Approach			822	6.8	822	6.8	0.760	34.5	LOS C	14.4	109.5	0.95	0.93	1.04	41.4
NorthEast: Patterson Rd															
24	L2	All MCs	174	6.8	174	6.8	0.101	6.7	LOS A	0.0	0.0	0.00	0.56	0.00	56.7
25	T1	All MCs	582	6.8	582	6.8	* 0.754	35.2	LOS D	11.6	87.7	0.99	0.90	1.11	43.3
Approach			756	6.8	756	6.8	0.754	28.7	LOS C	11.6	87.7	0.77	0.82	0.86	45.8
SouthWest: Patterson Rd															
31	T1	All MCs	566	6.8	566	6.8	0.290	10.9	LOS B	6.0	45.7	0.58	0.51	0.58	60.3
32	R2	All MCs	167	6.8	167	6.8	* 0.648	26.5	LOS C	3.8	28.7	0.99	0.82	1.05	44.2
Approach			734	6.8	734	6.8	0.648	14.5	LOS B	6.0	45.7	0.68	0.58	0.69	55.7
All Vehicles			2312	6.8	2312	6.8	0.760	26.3	LOS C	14.4	109.5	0.80	0.78	0.87	46.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Ennis Ave												
P1	Full	30	32	26.4	LOS C	0.1	0.1	0.81	0.81	180.3	200.0	1.11
SouthWest: Patterson Rd												
P2	Full	30	32	24.8	LOS C	0.1	0.1	0.79	0.79	178.7	200.0	1.12
All Pedestrians		60	63	25.6	LOS C	0.1	0.1	0.80	0.80	179.5	200.0	1.11

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: LM00345 [03_Ennis Ave_Dixon Rd_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Ennis Ave and Dixon Rd
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	195	4.4	195	4.4	0.908	32.3	LOS C	27.3	201.5	1.00	1.13	1.28	31.1
2	T1	All MCs	739	4.4	739	4.4	0.908	61.6	LOS E	27.3	201.5	1.00	1.10	1.29	34.2
3	R2	All MCs	615	4.4	615	4.4	* 1.024	86.3	LOS F	18.3	135.1	1.00	1.31	1.82	21.8
Approach			1548	4.4	1548	4.4	1.024	67.7	LOS E	27.3	201.5	1.00	1.19	1.50	27.6
East: Dixon Rd															
4	L2	All MCs	701	4.4	701	4.4	0.587	12.2	LOS B	14.8	109.4	0.58	0.75	0.58	49.8
5	T1	All MCs	783	4.4	783	4.4	* 1.080	141.1	LOS F	35.5	261.8	1.00	1.58	2.07	18.6
6	R2	All MCs	187	4.4	187	4.4	* 1.061	139.0	LOS F	15.5	114.2	1.00	1.35	2.09	19.0
Approach			1672	4.4	1672	4.4	1.080	86.8	LOS F	35.5	261.8	0.83	1.20	1.45	25.3
North: Ennis Ave															
7	L2	All MCs	156	4.4	156	4.4	1.029	71.6	LOS E	22.5	166.3	1.00	1.29	1.85	21.5
8	T1	All MCs	406	4.4	406	4.4	* 1.029	105.0	LOS F	22.5	166.3	1.00	1.29	1.87	23.0
9	R2	All MCs	87	4.4	87	4.4	0.450	53.6	LOS D	4.2	30.9	0.98	0.77	0.98	32.2
Approach			649	4.4	649	4.4	1.029	90.1	LOS F	22.5	166.3	1.00	1.22	1.74	23.5
West: Dixon Rd															
10	L2	All MCs	87	4.4	87	4.4	0.094	15.3	LOS B	1.9	13.7	0.52	0.67	0.52	47.9
11	T1	All MCs	335	4.4	335	4.4	0.450	38.6	LOS D	7.3	54.0	0.93	0.76	0.93	36.9
12	R2	All MCs	100	4.4	100	4.4	0.566	54.5	LOS D	4.9	36.3	1.00	0.79	1.01	31.9
Approach			522	4.4	522	4.4	0.566	37.7	LOS D	7.3	54.0	0.87	0.75	0.87	37.2
All Vehicles			4392	4.4	4392	4.4	1.080	74.7	LOS E	35.5	261.8	0.92	1.15	1.44	26.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Ennis Ave												
P2	Full	30	32	37.0	LOS D	0.1	0.1	0.86	0.86	190.9	200.0	1.05
West: Dixon Rd												

P1	Full	30	32	37.0	LOS D	0.1	0.1	0.86	0.86	190.9	200.0	1.05
All Pedestrians		60	63	37.0	LOS D	0.1	0.1	0.86	0.86	190.9	200.0	1.05

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00335 [04_Ennis Ave_Council Ave_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	655	4.3	655	4.3	0.526	61.8	LOS E	11.9	87.9	0.48	0.74	0.48	51.1
2	T1	All MCs	1576	4.3	1576	4.3	* 2.010	990.8	LOS F	185.2	1364.4	1.00	3.33	5.00	3.6
3	R2	All MCs	23	4.3	23	4.3	0.213	94.4	LOS F	1.3	9.6	0.98	0.71	0.98	28.2
Approach			2254	4.3	2254	4.3	2.010	711.7	LOS F	185.2	1364.4	0.85	2.55	3.64	5.0
East: Carvie St															
4	L2	All MCs	57	4.3	57	4.3	0.131	13.3	LOS B	1.8	13.4	0.74	0.69	0.74	42.1
5	T1	All MCs	57	4.3	57	4.3	* 0.131	44.7	LOS D	2.0	15.0	0.85	0.68	0.85	35.1
6	R2	All MCs	26	4.3	26	4.3	0.085	47.2	LOS D	1.2	9.1	0.87	0.70	0.87	32.2
Approach			140	4.3	140	4.3	0.131	32.4	LOS C	2.0	15.0	0.81	0.69	0.81	37.0
North: Ennis Ave															
7	L2	All MCs	8	4.3	8	4.3	0.006	14.0	LOS B	0.0	0.3	0.16	0.60	0.16	50.0
8	T1	All MCs	892	4.3	892	4.3	0.738	39.9	LOS D	22.7	167.1	0.95	0.84	0.96	41.1
9	R2	All MCs	380	4.3	380	4.3	* 1.883	841.8	LOS F	79.7	587.5	1.00	2.28	4.75	4.0
Approach			1280	4.3	1280	4.3	1.883	277.8	LOS F	79.7	587.5	0.96	1.27	2.08	10.9
West: Council Ave															
10	L2	All MCs	167	4.3	167	4.3	0.270	20.6	LOS C	3.6	26.6	0.76	0.75	0.76	44.8
11	T1	All MCs	17	4.3	17	4.3	* 0.461	48.4	LOS D	7.0	51.8	0.95	0.79	0.95	30.9
12	R2	All MCs	256	4.3	256	4.3	0.461	52.9	LOS D	7.0	51.8	0.95	0.79	0.95	32.4
Approach			440	4.3	440	4.3	0.461	40.4	LOS D	7.0	51.8	0.88	0.78	0.88	36.1
All Vehicles			4114	4.3	4114	4.3	2.010	481.8	LOS F	185.2	1364.4	0.88	1.90	2.76	7.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Ennis Ave												
P4	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
East: Carvie St												

P2	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
North: Ennis Ave												
P3	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
West: Council Ave												
P1	Full	25	26	42.2	LOS E	0.1	0.1	0.86	0.86	196.0	200.0	1.02
P5	Slip/ Bypass	25	26	21.3	LOS C	0.0	0.0	0.84	0.84	175.1	200.0	1.14
All Pedestrians		200	211	39.6	LOS D	0.1	0.1	0.86	0.86	193.4	200.0	1.03

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00852 [05_Ennis Ave_Rae Rd_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	66	0.3	66	0.3	0.048	7.9	LOS A	0.4	3.0	0.26	0.64	0.26	57.6
2	T1	All MCs	1886	0.3	1886	0.3	* 0.822	26.3	LOS C	25.2	183.7	0.93	0.88	1.00	47.6
3	R2	All MCs	97	0.3	97	0.3	0.721	50.5	LOS D	4.1	30.1	1.00	0.86	1.21	32.2
Approach			2049	0.3	2049	0.3	0.822	26.8	LOS C	25.2	183.7	0.91	0.87	0.99	46.8
East: Rockingham Sta Acc Rd															
4	L2	All MCs	19	0.3	19	0.3	0.020	7.6	LOS A	0.2	1.4	0.36	0.58	0.36	49.7
5	T1	All MCs	23	0.3	23	0.3	0.164	39.7	LOS D	0.9	6.6	0.97	0.68	0.97	35.7
6	R2	All MCs	46	0.3	46	0.3	0.345	45.2	LOS D	1.9	13.5	0.99	0.73	0.99	33.3
Approach			88	0.3	88	0.3	0.345	35.7	LOS D	1.9	13.5	0.85	0.69	0.85	36.5
North: Ennis Ave															
7	L2	All MCs	60	0.3	60	0.3	0.044	8.1	LOS A	0.4	3.0	0.27	0.64	0.27	50.7
8	T1	All MCs	945	0.3	945	0.3	0.394	17.1	LOS B	8.5	62.1	0.74	0.63	0.74	52.6
9	R2	All MCs	216	0.3	216	0.3	* 0.803	52.4	LOS D	4.7	34.5	1.00	0.91	1.35	34.1
Approach			1221	0.3	1221	0.3	0.803	22.9	LOS C	8.5	62.1	0.76	0.68	0.82	48.0
West: Rae Rd															
10	L2	All MCs	303	0.3	303	0.3	0.395	22.2	LOS C	6.7	48.5	0.68	0.77	0.68	50.5
11	T1	All MCs	62	0.3	62	0.3	* 0.440	43.6	LOS D	2.5	18.2	0.99	0.75	0.99	34.8
12	R2	All MCs	103	0.3	103	0.3	* 0.768	51.5	LOS D	4.5	32.6	1.00	0.89	1.28	34.6
Approach			468	0.3	468	0.3	0.768	31.5	LOS C	6.7	48.5	0.79	0.79	0.86	43.4
All Vehicles			3827	0.3	3827	0.3	0.822	26.4	LOS C	25.2	183.7	0.85	0.80	0.92	46.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: LM00488 [06_Read St_Chalgrove Ave_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	40	5.1	40	5.1	0.883	53.6	LOS D	32.5	237.7	1.00	1.02	1.17	27.7
2	T1	All MCs	1079	5.1	1079	5.1	* 0.883	47.2	LOS D	32.6	238.5	1.00	1.02	1.17	31.7
3	R2	All MCs	214	5.1	214	5.1	* 0.874	67.3	LOS E	12.9	94.5	1.00	0.98	1.31	24.2
Approach			1333	5.1	1333	5.1	0.883	50.6	LOS D	32.6	238.5	1.00	1.01	1.19	30.1
East: Chalgrove Ave															
4	L2	All MCs	127	5.1	127	5.1	0.111	9.3	LOS A	1.7	12.6	0.34	0.64	0.34	48.4
5	T1	All MCs	23	5.1	23	5.1	0.059	38.8	LOS D	1.0	7.3	0.83	0.64	0.83	34.8
6	R2	All MCs	88	5.1	88	5.1	* 0.775	66.9	LOS E	5.2	37.9	1.00	0.89	1.25	28.9
Approach			239	5.1	239	5.1	0.775	33.5	LOS C	5.2	37.9	0.63	0.73	0.72	36.3
North: Read St															
7	L2	All MCs	228	5.1	228	5.1	0.182	10.0	LOS A	3.0	22.2	0.34	0.67	0.34	53.1
8	T1	All MCs	643	5.1	643	5.1	0.507	31.4	LOS C	13.8	100.8	0.85	0.73	0.85	38.9
9	R2	All MCs	37	5.1	37	5.1	0.151	52.7	LOS D	1.8	13.0	0.92	0.73	0.92	31.5
Approach			908	5.1	908	5.1	0.507	26.9	LOS C	13.8	100.8	0.73	0.72	0.73	41.8
West: Chalgrove Ave															
10	L2	All MCs	23	5.1	23	5.1	0.249	44.0	LOS D	4.4	32.0	0.88	0.71	0.88	33.9
11	T1	All MCs	74	5.1	74	5.1	* 0.249	39.4	LOS D	4.4	32.0	0.88	0.71	0.88	34.0
12	R2	All MCs	64	5.1	64	5.1	0.563	62.4	LOS E	3.6	26.3	1.00	0.78	1.04	23.6
Approach			161	5.1	161	5.1	0.563	49.3	LOS D	4.4	32.0	0.93	0.74	0.94	29.7
All Vehicles			2641	5.1	2641	5.1	0.883	40.8	LOS D	32.6	238.5	0.87	0.87	0.97	34.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
East: Chalgrove Ave												

P1	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
North: Read St												
P3	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
West: Chalgrove Ave												
P2	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
All Pedestrians		120	126	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00343 [07 Read St_Council Ave_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	27	5.1	27	5.1	1.015	114.9	LOS F	60.0	438.6	1.00	1.29	1.43	22.1
2	T1	All MCs	1139	5.1	1139	5.1	* 1.015	110.3	LOS F	60.0	438.6	1.00	1.30	1.43	19.6
3	R2	All MCs	528	5.1	528	5.1	* 1.029	129.3	LOS F	54.5	398.0	1.00	1.17	1.49	20.7
Approach			1695	5.1	1695	5.1	1.029	116.3	LOS F	60.0	438.6	1.00	1.26	1.45	19.8
East: Council Ave															
4	L2	All MCs	208	5.1	208	5.1	0.168	10.1	LOS B	3.8	28.1	0.31	0.64	0.31	52.8
5	T1	All MCs	38	5.1	38	5.1	0.125	59.6	LOS E	2.4	17.4	0.89	0.69	0.89	29.2
6	R2	All MCs	121	5.1	121	5.1	* 1.013	128.9	LOS F	11.8	86.5	1.00	1.13	1.66	15.7
Approach			367	5.1	367	5.1	1.013	54.4	LOS D	11.8	86.5	0.60	0.81	0.82	31.0
North: Read St															
7	L2	All MCs	158	5.1	158	5.1	0.155	24.7	LOS C	4.7	34.5	0.48	0.70	0.48	42.4
8	T1	All MCs	674	5.1	674	5.1	0.594	49.3	LOS D	21.5	157.3	0.90	0.78	0.90	33.4
9	R2	All MCs	52	5.1	52	5.1	0.100	48.3	LOS D	2.7	20.0	0.77	0.73	0.77	27.7
Approach			883	5.1	883	5.1	0.594	44.8	LOS D	21.5	157.3	0.82	0.76	0.82	33.0
West: Council Ave															
10	L2	All MCs	182	5.1	182	5.1	0.718	66.0	LOS E	17.1	124.6	0.98	1.04	1.00	22.6
11	T1	All MCs	84	5.1	84	5.1	* 0.718	157.6	LOS F	17.1	124.6	0.98	1.04	1.00	27.2
12	R2	All MCs	19	5.1	19	5.1	0.159	105.0	LOS F	1.4	9.9	0.97	0.70	0.97	26.5
Approach			285	5.1	285	5.1	0.718	95.6	LOS F	17.1	124.6	0.98	1.02	1.00	20.1
All Vehicles			3231	5.1	3231	5.1	1.029	87.9	LOS F	60.0	438.6	0.90	1.05	1.17	23.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Council Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Council Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00445 [08 Read St_Rae Rd_AM_2025 (Site Folder: Base 2025 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	167	5.1	167	5.1	0.119	28.3	LOS C	1.8	13.5	0.23	0.64	0.23	56.0
2	T1	All MCs	1381	5.1	1381	5.1	* 0.909	66.1	LOS E	52.3	382.1	1.00	1.02	1.13	36.2
3	R2	All MCs	152	5.1	152	5.1	* 0.846	91.2	LOS F	11.2	82.1	1.00	0.94	1.24	26.6
Approach			1700	5.1	1700	5.1	0.909	64.6	LOS E	52.3	382.1	0.92	0.98	1.05	32.1
East: Rae Rd															
4	L2	All MCs	122	5.1	122	5.1	0.123	13.3	LOS B	2.6	18.8	0.38	0.68	0.38	52.3
5	T1	All MCs	123	5.1	123	5.1	0.279	58.1	LOS E	4.6	33.9	0.93	0.71	0.93	33.5
6	R2	All MCs	55	5.1	55	5.1	0.267	69.0	LOS E	3.5	25.5	0.95	0.75	0.95	30.7
Approach			300	5.1	300	5.1	0.279	41.9	LOS D	4.6	33.9	0.71	0.71	0.71	38.3
North: Read St															
7	L2	All MCs	57	5.1	57	5.1	0.032	6.7	LOS A	0.0	0.0	0.00	0.57	0.00	58.6
8	T1	All MCs	723	5.1	723	5.1	0.433	28.5	LOS C	16.8	122.4	0.74	0.65	0.74	46.4
9	R2	All MCs	115	5.1	115	5.1	0.640	74.7	LOS E	7.9	57.4	1.00	0.81	1.03	29.0
Approach			895	5.1	895	5.1	0.640	33.0	LOS C	16.8	122.4	0.72	0.66	0.73	43.6
West: Rae Rd															
10	L2	All MCs	235	5.1	235	5.1	0.286	25.5	LOS C	8.8	64.4	0.63	0.75	0.63	46.0
11	T1	All MCs	235	5.1	235	5.1	* 0.874	73.7	LOS E	17.5	128.0	1.00	0.99	1.23	29.4
12	R2	All MCs	182	5.1	182	5.1	* 0.889	85.4	LOS F	13.9	101.8	1.00	0.98	1.30	26.1
Approach			652	5.1	652	5.1	0.889	59.6	LOS E	17.5	128.0	0.87	0.90	1.03	32.6
All Vehicles			3546	5.1	3546	5.1	0.909	53.8	LOS D	52.3	382.1	0.85	0.86	0.94	35.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P3	Full	30	32	61.4	LOS F	0.1	0.1	0.94	0.94	215.2	200.0	0.93
East: Rae Rd												

P1 Full	30	32	61.4	LOS F	0.1	0.1	0.94	0.94	215.2	200.0	0.93
West: Rae Rd											
P2 Full	30	32	61.4	LOS F	0.1	0.1	0.94	0.94	215.2	200.0	0.93
All Pedestrians	90	95	61.4	LOS F	0.1	0.1	0.94	0.94	215.2	200.0	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00303 [01_PattersonRd_ReadSt_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 130 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	168	8.8	168	8.8	0.150	11.5	LOS B	2.9	21.5	0.37	0.68	0.37	51.9
2	T1	All MCs	139	8.8	139	8.8	0.180	36.4	LOS D	5.0	37.3	0.73	0.67	0.73	38.0
3	R2	All MCs	352	8.8	352	8.8	*0.726	45.1	LOS D	17.9	134.5	0.97	0.85	0.98	36.3
Approach			659	8.8	659	8.8	0.726	34.7	LOS C	17.9	134.5	0.77	0.77	0.77	39.1
East: Patterson Rd															
4	L2	All MCs	384	8.8	384	8.8	0.315	11.3	LOS B	7.6	57.2	0.41	0.68	0.41	49.7
5	T1	All MCs	673	8.8	673	8.8	*0.859	70.6	LOS E	23.1	173.6	1.00	1.00	1.17	30.1
6	R2	All MCs	24	8.8	24	8.8	0.120	81.2	LOS F	1.4	10.6	0.93	0.71	0.93	28.1
Approach			1081	8.8	1081	8.8	0.859	49.8	LOS D	23.1	173.6	0.79	0.88	0.89	33.0
North: Flinders Ln															
7	L2	All MCs	22	8.8	22	8.8	0.819	77.7	LOS E	6.4	48.0	1.00	0.94	1.28	25.5
8	T1	All MCs	98	8.8	98	8.8	*0.819	73.3	LOS E	6.4	48.0	1.00	0.94	1.28	26.5
9	R2	All MCs	53	8.8	53	8.8	0.819	78.4	LOS E	5.7	42.8	1.00	0.94	1.30	25.2
Approach			173	8.8	173	8.8	0.819	75.5	LOS E	6.4	48.0	1.00	0.94	1.29	26.0
West: Patterson Rd															
10	L2	All MCs	23	8.8	23	8.8	0.531	7.1	LOS A	17.0	127.8	0.85	0.75	0.85	34.8
11	T1	All MCs	655	8.8	655	8.8	0.531	37.8	LOS D	17.1	129.0	0.86	0.75	0.86	37.6
12	R2	All MCs	285	8.8	285	8.8	*0.849	42.7	LOS D	12.5	93.8	1.00	0.92	1.18	35.2
Approach			963	8.8	963	8.8	0.849	38.5	LOS D	17.1	129.0	0.90	0.80	0.95	36.8
All Vehicles			2876	8.8	2876	8.8	0.859	44.1	LOS D	23.1	173.6	0.83	0.83	0.91	34.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P2	Full	50	53	56.4	LOS E	0.2	0.2	0.93	0.93	210.3	200.0	0.95
East: Patterson Rd												

P5	Stage 1	25	26	56.4	LOS E	0.1	0.1	0.93	0.93	210.2	200.0	0.95
P4	Stage 2	25	26	56.4	LOS E	0.1	0.1	0.93	0.93	210.2	200.0	0.95
North: Flinders Ln												
P1	Full	50	53	56.4	LOS E	0.2	0.2	0.93	0.93	210.3	200.0	0.95
West: Patterson Rd												
P3	Full	50	53	56.4	LOS E	0.2	0.2	0.93	0.93	210.3	200.0	0.95
All Pedestrians		200	211	56.4	LOS E	0.2	0.2	0.93	0.93	210.3	200.0	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00332 [02_Patterson Rd Ennis Ave_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Ennis Ave															
21	L2	All MCs	167	6.8	167	6.8	0.714	14.3	LOS B	11.9	90.5	0.96	0.93	1.00	39.2
23	R2	All MCs	437	6.8	437	6.8	* 0.714	51.3	LOS D	11.9	90.5	0.97	0.89	1.03	38.4
Approach			604	6.8	604	6.8	0.714	41.0	LOS D	11.9	90.5	0.97	0.90	1.02	38.7
NorthEast: Patterson Rd															
24	L2	All MCs	248	6.8	248	6.8	0.144	6.7	LOS A	0.0	0.0	0.00	0.56	0.00	56.7
25	T1	All MCs	708	6.8	708	6.8	* 0.798	39.0	LOS D	16.0	121.4	1.00	0.93	1.13	41.5
Approach			957	6.8	957	6.8	0.798	30.6	LOS C	16.0	121.4	0.74	0.84	0.84	44.6
SouthWest: Patterson Rd															
31	T1	All MCs	795	6.8	795	6.8	0.358	9.4	LOS A	8.6	65.2	0.53	0.48	0.53	61.9
32	R2	All MCs	280	6.8	280	6.8	* 0.770	29.0	LOS C	7.0	53.0	1.00	0.88	1.12	42.9
Approach			1075	6.8	1075	6.8	0.770	14.5	LOS B	8.6	65.2	0.65	0.58	0.69	55.5
All Vehicles			2636	6.8	2636	6.8	0.798	26.4	LOS C	16.0	121.4	0.76	0.75	0.82	46.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Ennis Ave												
P1	Full	30	32	31.3	LOS D	0.1	0.1	0.83	0.83	185.1	200.0	1.08
SouthWest: Patterson Rd												
P2	Full	30	32	29.6	LOS C	0.1	0.1	0.81	0.81	183.5	200.0	1.09
All Pedestrians		60	63	30.5	LOS D	0.1	0.1	0.82	0.82	184.3	200.0	1.09

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: LM00345 [03_Ennis Ave_Dixon Rd_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Ennis Ave and Dixon Rd
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	133	4.4	133	4.4	0.382	14.8	LOS B	13.2	97.4	0.72	0.76	0.72	38.2
2	T1	All MCs	452	4.4	452	4.4	0.382	40.2	LOS D	14.4	106.5	0.74	0.69	0.74	42.4
3	R2	All MCs	711	4.4	711	4.4	* 1.117	164.7	LOS F	37.6	277.2	1.00	1.33	1.87	14.1
Approach			1295	4.4	1295	4.4	1.117	105.9	LOS F	37.6	277.2	0.88	1.05	1.36	20.0
East: Dixon Rd															
4	L2	All MCs	683	4.4	683	4.4	0.772	49.8	LOS D	32.0	236.5	0.88	0.94	0.88	37.7
5	T1	All MCs	552	4.4	552	4.4	1.097	185.1	LOS F	32.9	242.8	1.00	1.41	1.83	15.4
6	R2	All MCs	151	4.4	151	4.4	0.852	99.9	LOS F	12.0	88.2	1.00	0.94	1.24	24.8
Approach			1385	4.4	1385	4.4	1.097	109.1	LOS F	32.9	242.8	0.94	1.13	1.29	23.1
North: Ennis Ave															
7	L2	All MCs	174	4.4	174	4.4	1.134	154.4	LOS F	82.5	609.0	1.00	1.36	1.86	13.8
8	T1	All MCs	1118	4.4	1118	4.4	* 1.134	197.6	LOS F	82.5	609.0	1.00	1.52	1.87	14.6
9	R2	All MCs	95	4.4	95	4.4	0.383	97.0	LOS F	6.4	47.2	0.95	0.78	0.95	28.0
Approach			1386	4.4	1386	4.4	1.134	185.3	LOS F	82.5	609.0	1.00	1.45	1.81	15.0
West: Dixon Rd															
10	L2	All MCs	98	4.4	98	4.4	0.087	34.4	LOS C	1.8	13.1	0.32	0.63	0.32	51.0
11	T1	All MCs	552	4.4	552	4.4	* 1.122	205.5	LOS F	35.1	259.2	1.00	1.46	1.92	14.3
12	R2	All MCs	199	4.4	199	4.4	* 1.126	226.1	LOS F	24.1	177.9	1.00	1.34	1.97	13.6
Approach			848	4.4	848	4.4	1.126	190.6	LOS F	35.1	259.2	0.92	1.34	1.74	15.4
All Vehicles			4915	4.4	4915	4.4	1.134	143.8	LOS F	82.5	609.0	0.94	1.23	1.53	18.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Ennis Ave												
P2	Full	30	32	61.7	LOS F	0.1	0.1	0.91	0.91	215.6	200.0	0.93
West: Dixon Rd												

P1	Full	30	32	61.7	LOS F	0.1	0.1	0.91	0.91	215.6	200.0	0.93
All Pedestrians		60	63	61.7	LOS F	0.1	0.1	0.91	0.91	215.6	200.0	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00335 [04_Ennis Ave_Council Ave_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	384	4.3	384	4.3	0.305	30.1	LOS C	4.4	32.5	0.32	0.68	0.32	52.7
2	T1	All MCs	964	4.3	964	4.3	1.232	281.6	LOS F	62.3	459.0	1.00	1.92	2.65	11.4
3	R2	All MCs	43	4.3	43	4.3	0.463	80.4	LOS F	2.5	18.5	1.00	0.74	1.00	27.6
Approach			1392	4.3	1392	4.3	1.232	206.0	LOS F	62.3	459.0	0.81	1.54	1.96	14.9
East: Carvie St															
4	L2	All MCs	109	4.3	109	4.3	0.175	27.7	LOS C	4.1	30.5	0.71	0.70	0.71	38.4
5	T1	All MCs	61	4.3	61	4.3	* 0.175	44.4	LOS D	4.1	30.5	0.88	0.70	0.88	33.5
6	R2	All MCs	18	4.3	18	4.3	0.058	46.8	LOS D	0.8	6.1	0.86	0.68	0.86	32.3
Approach			188	4.3	188	4.3	0.175	35.0	LOS C	4.1	30.5	0.78	0.70	0.78	36.0
North: Ennis Ave															
7	L2	All MCs	13	4.3	13	4.3	0.009	60.1	LOS E	0.1	0.5	0.18	0.61	0.18	49.9
8	T1	All MCs	1753	4.3	1753	4.3	* 1.463	491.1	LOS F	158.7	1169.2	1.00	2.80	3.56	7.1
9	R2	All MCs	261	4.3	261	4.3	* 1.294	356.4	LOS F	31.6	233.1	1.00	1.67	2.97	9.3
Approach			2026	4.3	2026	4.3	1.463	471.1	LOS F	158.7	1169.2	0.99	2.64	3.46	7.4
West: Council Ave															
10	L2	All MCs	292	4.3	292	4.3	0.470	23.6	LOS C	7.5	55.0	0.82	0.80	0.82	43.2
11	T1	All MCs	29	4.3	29	4.3	* 1.018	112.2	LOS F	22.5	165.5	1.00	1.28	1.73	20.8
12	R2	All MCs	512	4.3	512	4.3	1.018	116.7	LOS F	22.5	165.5	1.00	1.27	1.73	21.4
Approach			833	4.3	833	4.3	1.018	83.9	LOS F	22.5	165.5	0.94	1.10	1.41	26.0
All Vehicles			4439	4.3	4439	4.3	1.463	296.8	LOS F	158.7	1169.2	0.92	1.93	2.49	10.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Ennis Ave												
P4	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
East: Carvie St												

P2	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
North: Ennis Ave												
P3	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
West: Council Ave												
P1	Full	25	26	42.2	LOS E	0.1	0.1	0.86	0.86	196.0	200.0	1.02
P5	Slip/ Bypass	25	26	21.5	LOS C	0.0	0.0	0.84	0.84	175.3	200.0	1.14
All Pedestrians		200	211	39.6	LOS D	0.1	0.1	0.86	0.86	193.5	200.0	1.03

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00852 [05_Ennis Ave_Rae Rd_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	76	3.3	76	3.3	0.059	8.8	LOS A	0.6	4.7	0.31	0.65	0.31	56.0
2	T1	All MCs	1147	3.3	1147	3.3	0.531	20.1	LOS C	12.0	87.3	0.80	0.70	0.80	50.9
3	R2	All MCs	34	3.3	34	3.3	0.188	44.2	LOS D	1.3	9.3	0.95	0.72	0.95	33.7
Approach			1257	3.3	1257	3.3	0.531	20.0	LOS C	12.0	87.3	0.78	0.70	0.78	50.4
East: Rockingham Sta Acc Rd															
4	L2	All MCs	79	3.3	79	3.3	0.107	15.1	LOS B	1.6	11.5	0.61	0.67	0.61	44.6
5	T1	All MCs	66	3.3	66	3.3	* 0.470	41.8	LOS D	2.7	19.5	1.00	0.75	1.00	35.1
6	R2	All MCs	66	3.3	66	3.3	0.495	45.9	LOS D	2.7	19.6	1.00	0.75	1.00	32.8
Approach			212	3.3	212	3.3	0.495	33.1	LOS C	2.7	19.6	0.85	0.72	0.85	37.2
North: Ennis Ave															
7	L2	All MCs	54	3.3	54	3.3	0.038	7.6	LOS A	0.3	2.0	0.23	0.63	0.23	50.1
8	T1	All MCs	1960	3.3	1960	3.3	* 0.868	32.4	LOS C	27.8	202.5	0.99	1.01	1.17	43.3
9	R2	All MCs	313	3.3	313	3.3	* 0.874	54.7	LOS D	7.1	52.1	1.00	1.00	1.47	33.1
Approach			2326	3.3	2326	3.3	0.874	34.8	LOS C	27.8	202.5	0.97	1.00	1.19	41.7
West: Rae Rd															
10	L2	All MCs	196	3.3	196	3.3	0.212	12.3	LOS B	2.6	18.8	0.45	0.70	0.45	54.2
11	T1	All MCs	48	3.3	48	3.3	0.343	43.2	LOS D	1.9	14.1	0.99	0.73	0.99	34.9
12	R2	All MCs	115	3.3	115	3.3	* 0.856	54.8	LOS D	5.2	37.9	1.00	0.96	1.47	33.3
Approach			359	3.3	359	3.3	0.856	30.1	LOS C	5.2	37.9	0.70	0.79	0.85	42.4
All Vehicles			4154	3.3	4154	3.3	0.874	29.8	LOS C	27.8	202.5	0.88	0.88	1.02	43.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: LM00488 [06_Read St_Chalgrove Ave_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	64	5.1	64	5.1	0.723	47.2	LOS D	17.8	130.1	0.97	0.85	0.99	29.4
2	T1	All MCs	652	5.1	652	5.1	0.723	40.7	LOS D	18.0	131.2	0.97	0.85	0.99	34.1
3	R2	All MCs	195	5.1	195	5.1	* 0.854	66.1	LOS E	11.6	84.6	1.00	0.96	1.28	24.5
Approach			911	5.1	911	5.1	0.854	46.6	LOS D	18.0	131.2	0.98	0.87	1.05	31.1
East: Chalgrove Ave															
4	L2	All MCs	467	5.1	467	5.1	0.433	14.2	LOS B	11.3	82.4	0.56	0.73	0.56	44.5
5	T1	All MCs	40	5.1	40	5.1	0.101	39.3	LOS D	1.7	12.7	0.84	0.66	0.84	34.7
6	R2	All MCs	224	5.1	224	5.1	* 0.860	64.3	LOS E	13.4	97.5	1.00	0.99	1.27	29.5
Approach			732	5.1	732	5.1	0.860	30.9	LOS C	13.4	97.5	0.71	0.81	0.79	36.9
North: Read St															
7	L2	All MCs	319	5.1	319	5.1	0.247	9.4	LOS A	4.0	28.9	0.33	0.68	0.33	53.5
8	T1	All MCs	907	5.1	907	5.1	* 0.912	57.3	LOS E	28.4	207.5	1.00	1.08	1.27	28.4
9	R2	All MCs	23	5.1	23	5.1	0.102	53.3	LOS D	1.1	8.2	0.92	0.71	0.92	31.4
Approach			1249	5.1	1249	5.1	0.912	45.0	LOS D	28.4	207.5	0.83	0.97	1.02	33.4
West: Chalgrove Ave															
10	L2	All MCs	37	5.1	37	5.1	0.216	43.7	LOS D	3.7	27.2	0.87	0.71	0.87	33.7
11	T1	All MCs	46	5.1	46	5.1	* 0.216	39.1	LOS D	3.7	27.2	0.87	0.71	0.87	33.8
12	R2	All MCs	40	5.1	40	5.1	0.153	49.6	LOS D	1.9	14.0	0.91	0.72	0.91	26.5
Approach			123	5.1	123	5.1	0.216	43.9	LOS D	3.7	27.2	0.88	0.72	0.88	31.5
All Vehicles			3015	5.1	3015	5.1	0.912	42.0	LOS D	28.4	207.5	0.85	0.89	0.97	33.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
East: Chalgrove Ave												

P1	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
North: Read St												
P3	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
West: Chalgrove Ave												
P2	Full	30	32	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00
All Pedestrians		120	126	46.4	LOS E	0.1	0.1	0.92	0.92	200.3	200.0	1.00

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00343 [07 Read St_Council Ave_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	19	5.1	19	5.1	0.541	47.2	LOS D	21.1	153.9	0.85	0.75	0.85	35.8
2	T1	All MCs	715	5.1	715	5.1	0.541	40.6	LOS D	21.1	154.3	0.85	0.74	0.85	35.6
3	R2	All MCs	433	5.1	433	5.1	* 1.035	134.3	LOS F	45.0	328.7	1.00	1.17	1.54	19.9
Approach			1166	5.1	1166	5.1	1.035	75.4	LOS E	45.0	328.7	0.91	0.90	1.11	26.5
East: Council Ave															
4	L2	All MCs	581	5.1	581	5.1	0.621	31.9	LOS C	23.8	173.5	0.76	0.93	0.76	40.8
5	T1	All MCs	81	5.1	81	5.1	0.268	61.4	LOS E	5.2	38.3	0.92	0.74	0.92	28.8
6	R2	All MCs	131	5.1	131	5.1	* 0.993	118.6	LOS F	12.4	90.4	1.00	1.12	1.58	16.7
Approach			793	5.1	793	5.1	0.993	49.2	LOS D	23.8	173.5	0.82	0.94	0.91	33.4
North: Read St															
7	L2	All MCs	193	5.1	193	5.1	0.168	43.3	LOS D	4.8	35.0	0.41	0.69	0.41	45.1
8	T1	All MCs	1272	5.1	1272	5.1	* 1.060	161.7	LOS F	73.1	534.0	1.00	1.44	1.58	16.6
9	R2	All MCs	102	5.1	102	5.1	0.244	80.0	LOS E	6.1	44.2	0.86	0.77	0.86	25.5
Approach			1566	5.1	1566	5.1	1.060	141.8	LOS F	73.1	534.0	0.92	1.30	1.39	15.8
West: Council Ave															
10	L2	All MCs	52	5.1	52	5.1	0.347	14.7	LOS B	6.0	44.0	0.92	0.85	0.92	24.5
11	T1	All MCs	64	5.1	64	5.1	* 0.347	93.9	LOS F	6.0	44.0	0.92	0.85	0.92	29.2
12	R2	All MCs	27	5.1	27	5.1	0.208	77.2	LOS E	1.9	14.2	0.97	0.72	0.97	26.6
Approach			143	5.1	143	5.1	0.347	62.2	LOS E	6.0	44.0	0.93	0.82	0.93	27.1
All Vehicles			3668	5.1	3668	5.1	1.060	97.6	LOS F	73.1	534.0	0.89	1.08	1.18	21.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Council Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Council Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00445 [08 Read St_Rae Rd_PM_2025 (Site Folder: Base 2025 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	186	5.1	186	5.1	0.149	21.5	LOS C	4.0	29.1	0.36	0.67	0.36	52.7
2	T1	All MCs	933	5.1	933	5.1	0.605	38.2	LOS D	27.4	200.2	0.83	0.73	0.83	43.2
3	R2	All MCs	116	5.1	116	5.1	0.421	69.4	LOS E	7.8	56.7	0.95	0.79	0.95	29.3
Approach			1235	5.1	1235	5.1	0.605	38.6	LOS D	27.4	200.2	0.77	0.73	0.77	40.8
East: Rae Rd															
4	L2	All MCs	187	5.1	187	5.1	0.265	37.6	LOS D	9.1	66.2	0.71	0.76	0.71	38.9
5	T1	All MCs	204	5.1	204	5.1	0.495	65.6	LOS E	8.6	62.8	0.96	0.77	0.96	31.4
6	R2	All MCs	29	5.1	29	5.1	0.176	75.7	LOS E	2.0	14.9	0.96	0.72	0.96	29.1
Approach			421	5.1	421	5.1	0.495	53.9	LOS D	9.1	66.2	0.85	0.76	0.85	34.1
North: Read St															
7	L2	All MCs	89	5.1	89	5.1	0.050	7.1	LOS A	0.0	0.0	0.00	0.57	0.00	58.6
8	T1	All MCs	1560	5.1	1560	5.1	* 1.003	106.2	LOS F	79.8	583.2	1.00	1.27	1.34	26.5
9	R2	All MCs	264	5.1	264	5.1	* 0.962	116.1	LOS F	23.8	174.1	1.00	1.06	1.39	24.0
Approach			1914	5.1	1914	5.1	1.003	103.7	LOS F	79.8	583.2	0.95	1.20	1.28	24.4
West: Rae Rd															
10	L2	All MCs	182	5.1	182	5.1	0.174	13.2	LOS B	4.1	29.6	0.38	0.69	0.38	53.8
11	T1	All MCs	153	5.1	153	5.1	* 0.607	67.2	LOS E	10.7	78.4	0.99	0.81	0.99	30.9
12	R2	All MCs	164	5.1	164	5.1	* 0.982	114.0	LOS F	15.3	111.6	1.00	1.09	1.52	21.7
Approach			499	5.1	499	5.1	0.982	62.9	LOS E	15.3	111.6	0.77	0.85	0.94	31.6
All Vehicles			4068	5.1	4068	5.1	1.003	73.4	LOS E	79.8	583.2	0.86	0.97	1.04	29.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Rae Rd												

P1 Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Rae Rd											
P2 Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians	90	95	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00303 [01_PattersonRd_ReadSt_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	392	8.8	392	8.8	0.357	18.9	LOS B	10.3	77.6	0.48	0.77	0.48	47.0
2	T1	All MCs	165	8.8	165	8.8	0.170	44.4	LOS D	5.9	44.5	0.65	0.64	0.65	39.7
3	R2	All MCs	527	8.8	527	8.8	* 0.917	78.0	LOS E	37.7	283.6	1.00	0.96	1.18	31.0
Approach			1084	8.8	1084	8.8	0.917	51.5	LOS D	37.7	283.6	0.76	0.85	0.85	33.2
East: Patterson Rd															
4	L2	All MCs	482	8.8	482	8.8	0.369	19.3	LOS B	10.6	79.5	0.37	0.72	0.37	49.9
5	T1	All MCs	934	8.8	934	8.8	* 1.031	146.8	LOS F	51.7	389.1	1.00	1.38	1.52	20.0
6	R2	All MCs	31	8.8	31	8.8	0.138	105.0	LOS F	2.0	15.1	0.92	0.72	0.92	26.8
Approach			1446	8.8	1446	8.8	1.031	103.5	LOS F	51.7	389.1	0.79	1.15	1.13	22.3
North: Flinders Ln															
7	L2	All MCs	33	8.8	33	8.8	1.069	165.3	LOS F	12.6	94.8	1.00	1.26	1.84	15.9
8	T1	All MCs	157	8.8	157	8.8	* 1.069	161.3	LOS F	12.6	94.8	1.00	1.25	1.85	16.3
9	R2	All MCs	32	8.8	32	8.8	1.069	166.5	LOS F	11.4	85.6	1.00	1.24	1.86	15.9
Approach			221	8.8	221	8.8	1.069	162.6	LOS F	12.6	94.8	1.00	1.25	1.85	16.2
West: Patterson Rd															
10	L2	All MCs	72	8.8	72	8.8	0.585	7.4	LOS A	18.0	135.8	0.92	0.81	0.92	31.1
11	T1	All MCs	519	8.8	519	8.8	0.585	55.9	LOS E	18.6	140.1	0.92	0.80	0.92	33.1
12	R2	All MCs	232	8.8	232	8.8	* 1.046	147.8	LOS F	24.3	183.2	1.00	1.23	1.67	17.7
Approach			822	8.8	822	8.8	1.046	77.6	LOS E	24.3	183.2	0.94	0.92	1.13	26.4
All Vehicles			3574	8.8	3574	8.8	1.069	85.4	LOS F	51.7	389.1	0.83	1.01	1.09	25.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P2	Full	50	53	66.4	LOS F	0.2	0.2	0.94	0.94	220.3	200.0	0.91
East: Patterson Rd												

P5	Stage 1	25	26	66.3	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
P4	Stage 2	25	26	66.3	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Flinders Ln												
P1	Full	50	53	66.4	LOS F	0.2	0.2	0.94	0.94	220.3	200.0	0.91
West: Patterson Rd												
P3	Full	50	53	66.4	LOS F	0.2	0.2	0.94	0.94	220.3	200.0	0.91
All Pedestrians		200	211	66.4	LOS F	0.2	0.2	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00332 [02_Patterson Rd Ennis Ave_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Ennis Ave															
21	L2	All MCs	399	6.8	399	6.8	1.021	70.5	LOS E	48.0	363.8	1.00	1.24	1.67	23.4
23	R2	All MCs	772	6.8	772	6.8	* 1.021	96.7	LOS F	48.0	363.8	1.00	1.29	1.70	23.8
Approach			1171	6.8	1171	6.8	1.021	87.7	LOS F	48.0	363.8	1.00	1.27	1.69	23.6
NorthEast: Patterson Rd															
24	L2	All MCs	246	6.8	246	6.8	0.143	6.7	LOS A	0.0	0.0	0.00	0.56	0.00	56.7
25	T1	All MCs	828	6.8	828	6.8	* 1.044	122.5	LOS F	34.4	260.8	1.00	1.45	1.88	22.8
Approach			1075	6.8	1075	6.8	1.044	95.9	LOS F	34.4	260.8	0.77	1.25	1.45	26.4
SouthWest: Patterson Rd															
31	T1	All MCs	805	6.8	805	6.8	0.403	13.9	LOS B	11.2	85.3	0.62	0.55	0.62	57.5
32	R2	All MCs	238	6.8	238	6.8	* 1.063	110.9	LOS F	14.8	112.6	1.00	1.36	2.06	19.3
Approach			1043	6.8	1043	6.8	1.063	36.1	LOS D	14.8	112.6	0.71	0.74	0.95	39.5
All Vehicles			3288	6.8	3288	6.8	1.063	74.0	LOS E	48.0	363.8	0.83	1.09	1.37	28.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Ennis Ave												
P1	Full	30	32	36.2	LOS D	0.1	0.1	0.85	0.85	190.0	200.0	1.05
SouthWest: Patterson Rd												
P2	Full	30	32	34.5	LOS D	0.1	0.1	0.83	0.83	188.3	200.0	1.06
All Pedestrians		60	63	35.3	LOS D	0.1	0.1	0.84	0.84	189.2	200.0	1.06

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: LM00345 [03_Ennis Ave_Dixon Rd_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Ennis Ave and Dixon Rd
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	281	4.4	281	4.4	1.325	312.4	LOS F	101.3	747.8	1.00	1.94	3.32	9.0
2	T1	All MCs	1068	4.4	1068	4.4	1.325	339.7	LOS F	101.3	747.8	1.00	2.20	3.32	9.3
3	R2	All MCs	888	4.4	888	4.4	* 1.479	482.6	LOS F	69.9	516.3	1.00	2.14	4.02	6.7
Approach			2238	4.4	2238	4.4	1.479	393.0	LOS F	101.3	747.8	1.00	2.15	3.60	8.0
East: Dixon Rd															
4	L2	All MCs	1013	4.4	1013	4.4	0.876	24.5	LOS C	33.3	245.7	0.88	0.94	0.96	42.7
5	T1	All MCs	1132	4.4	1132	4.4	* 1.560	563.7	LOS F	105.1	775.6	1.00	2.97	4.30	6.0
6	R2	All MCs	271	4.4	271	4.4	* 1.532	560.1	LOS F	47.9	353.9	1.00	2.32	4.24	6.1
Approach			2415	4.4	2415	4.4	1.560	337.2	LOS F	105.1	775.6	0.95	2.05	2.89	9.4
North: Ennis Ave															
7	L2	All MCs	225	4.4	225	4.4	1.488	459.8	LOS F	75.0	554.0	1.00	2.06	4.05	6.6
8	T1	All MCs	587	4.4	587	4.4	* 1.488	491.7	LOS F	75.0	554.0	1.00	2.22	4.06	6.7
9	R2	All MCs	126	4.4	126	4.4	0.650	55.6	LOS E	6.3	46.4	1.00	0.83	1.07	31.7
Approach			939	4.4	939	4.4	1.488	425.3	LOS F	75.0	554.0	1.00	1.99	3.65	7.5
West: Dixon Rd															
10	L2	All MCs	126	4.4	126	4.4	0.142	17.6	LOS B	3.0	22.3	0.57	0.69	0.57	46.4
11	T1	All MCs	484	4.4	484	4.4	0.651	40.7	LOS D	11.2	82.3	0.97	0.82	0.98	36.2
12	R2	All MCs	144	4.4	144	4.4	0.817	60.2	LOS E	7.7	57.1	1.00	0.95	1.27	30.4
Approach			755	4.4	755	4.4	0.817	40.5	LOS D	11.2	82.3	0.91	0.82	0.97	36.2
All Vehicles			6346	4.4	6346	4.4	1.560	334.7	LOS F	105.1	775.6	0.97	1.93	3.02	9.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Ennis Ave												
P2	Full	30	32	37.0	LOS D	0.1	0.1	0.86	0.86	190.9	200.0	1.05
West: Dixon Rd												

P1	Full	30	32	37.0	LOS D	0.1	0.1	0.86	0.86	190.9	200.0	1.05
All Pedestrians		60	63	37.0	LOS D	0.1	0.1	0.86	0.86	190.9	200.0	1.05

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00335 [04_Ennis Ave_Council Ave_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	978	4.3	978	4.3	0.956	120.9	LOS F	56.9	419.3	1.00	1.07	1.24	33.7
2	T1	All MCs	2355	4.3	2355	4.3	* 3.003	1893.3	LOS F	343.9	2533.4	1.00	4.12	6.28	1.9
3	R2	All MCs	35	4.3	35	4.3	0.320	103.8	LOS F	2.0	14.5	0.99	0.73	0.99	28.0
Approach			3367	4.3	3367	4.3	3.003	1360.1	LOS F	343.9	2533.4	1.00	3.20	4.76	2.7
East: Carvie St															
4	L2	All MCs	84	4.3	84	4.3	0.200	23.7	LOS C	3.9	28.7	0.78	0.71	0.78	38.4
5	T1	All MCs	84	4.3	84	4.3	* 0.200	45.8	LOS D	3.9	28.7	0.87	0.71	0.87	34.2
6	R2	All MCs	40	4.3	40	4.3	0.129	47.6	LOS D	1.9	14.0	0.88	0.72	0.88	32.1
Approach			208	4.3	208	4.3	0.200	37.2	LOS D	3.9	28.7	0.83	0.71	0.83	35.3
North: Ennis Ave															
7	L2	All MCs	13	4.3	13	4.3	0.009	50.3	LOS D	0.1	0.5	0.17	0.61	0.17	50.0
8	T1	All MCs	1332	4.3	1332	4.3	1.213	282.7	LOS F	93.8	691.1	1.00	2.03	2.54	12.2
9	R2	All MCs	567	4.3	567	4.3	* 2.811	1736.4	LOS F	156.0	1149.4	1.00	2.74	6.11	2.1
Approach			1912	4.3	1912	4.3	2.811	712.6	LOS F	156.0	1149.4	0.99	2.23	3.58	5.0
West: Council Ave															
10	L2	All MCs	249	4.3	249	4.3	0.402	21.5	LOS C	5.7	42.0	0.80	0.78	0.80	44.3
11	T1	All MCs	25	4.3	25	4.3	* 0.688	51.5	LOS D	11.1	82.0	0.99	0.85	1.04	30.2
12	R2	All MCs	382	4.3	382	4.3	0.688	55.9	LOS E	11.1	82.0	0.99	0.85	1.04	31.5
Approach			657	4.3	657	4.3	0.688	42.7	LOS D	11.1	82.0	0.92	0.82	0.95	35.3
All Vehicles			6144	4.3	6144	4.3	3.003	973.0	LOS F	343.9	2533.4	0.98	2.56	3.85	3.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Ennis Ave												
P4	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
East: Carvie St												

P2	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
North: Ennis Ave												
P3	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
West: Council Ave												
P1	Full	25	26	42.2	LOS E	0.1	0.1	0.86	0.86	196.0	200.0	1.02
P5	Slip/ Bypass	25	26	21.3	LOS C	0.0	0.0	0.84	0.84	175.1	200.0	1.14
All Pedestrians		200	211	39.6	LOS D	0.1	0.1	0.86	0.86	193.4	200.0	1.03

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00852 [05_Ennis Ave_Rae Rd_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	99	3.3	99	3.3	0.072	22.4	LOS C	0.9	6.6	0.27	0.64	0.27	56.2
2	T1	All MCs	2822	3.3	2822	3.3	* 1.084	284.0	LOS F	89.5	652.1	1.00	1.56	1.74	23.7
3	R2	All MCs	145	3.3	145	3.3	0.903	75.9	LOS E	8.4	61.0	1.00	1.02	1.48	27.6
Approach			3066	3.3	3066	3.3	1.084	265.7	LOS F	89.5	652.1	0.98	1.51	1.68	24.3
East: Rockingham Sta Acc Rd															
4	L2	All MCs	28	3.3	28	3.3	0.037	10.6	LOS B	0.5	3.4	0.42	0.61	0.42	47.3
5	T1	All MCs	35	3.3	35	3.3	0.308	52.3	LOS D	1.7	12.7	0.99	0.72	0.99	31.9
6	R2	All MCs	68	3.3	68	3.3	0.478	54.8	LOS D	3.4	24.8	1.00	0.76	1.00	30.4
Approach			132	3.3	132	3.3	0.478	44.6	LOS D	3.4	24.8	0.87	0.72	0.87	33.4
North: Ennis Ave															
7	L2	All MCs	89	3.3	89	3.3	0.067	9.0	LOS A	0.9	6.6	0.29	0.64	0.29	49.2
8	T1	All MCs	1415	3.3	1415	3.3	0.511	18.6	LOS B	15.5	113.3	0.73	0.65	0.73	51.6
9	R2	All MCs	323	3.3	323	3.3	* 1.004	96.8	LOS F	11.4	83.4	1.00	1.17	1.84	24.1
Approach			1827	3.3	1827	3.3	1.004	32.0	LOS C	15.5	113.3	0.76	0.74	0.90	42.8
West: Rae Rd															
10	L2	All MCs	453	3.3	453	3.3	0.772	611.1	LOS F	17.7	128.7	0.96	1.00	1.02	38.1
11	T1	All MCs	93	3.3	93	3.3	* 0.820	60.2	LOS E	5.1	36.8	1.00	0.91	1.34	30.1
12	R2	All MCs	154	3.3	154	3.3	* 1.074	143.2	LOS F	13.1	95.4	1.00	1.28	2.19	18.6
Approach			699	3.3	699	3.3	1.074	435.2	LOS F	17.7	128.7	0.97	1.05	1.32	30.1
All Vehicles			5724	3.3	5724	3.3	1.084	206.7	LOS F	89.5	652.1	0.90	1.19	1.37	29.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: LM00488 [06_Read St_Chalgrove Ave_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	59	5.1	59	5.1	1.114	175.9	LOS F	104.7	764.9	1.00	1.57	1.75	12.4
2	T1	All MCs	1581	5.1	1581	5.1	* 1.114	179.6	LOS F	104.7	764.9	1.00	1.59	1.76	13.1
3	R2	All MCs	314	5.1	314	5.1	* 1.094	199.8	LOS F	36.0	263.2	1.00	1.22	1.80	12.1
Approach			1954	5.1	1954	5.1	1.114	182.7	LOS F	104.7	764.9	1.00	1.53	1.77	12.3
East: Chalgrove Ave															
4	L2	All MCs	187	5.1	187	5.1	0.185	14.5	LOS B	4.9	35.9	0.43	0.68	0.43	44.3
5	T1	All MCs	34	5.1	34	5.1	0.107	58.3	LOS E	2.1	15.2	0.88	0.68	0.88	29.4
6	R2	All MCs	131	5.1	131	5.1	* 1.093	184.3	LOS F	14.8	108.0	1.00	1.24	1.90	15.1
Approach			352	5.1	352	5.1	1.093	81.8	LOS F	14.8	108.0	0.69	0.89	1.02	23.4
North: Read St															
7	L2	All MCs	335	5.1	335	5.1	0.274	15.5	LOS B	8.0	58.7	0.40	0.70	0.40	50.5
8	T1	All MCs	942	5.1	942	5.1	0.618	38.7	LOS D	27.4	200.4	0.84	0.75	0.84	36.4
9	R2	All MCs	54	5.1	54	5.1	0.187	68.8	LOS E	3.4	25.0	0.90	0.75	0.90	28.4
Approach			1331	5.1	1331	5.1	0.618	34.1	LOS C	27.4	200.4	0.73	0.74	0.73	38.0
West: Chalgrove Ave															
10	L2	All MCs	34	5.1	34	5.1	0.457	65.8	LOS E	9.5	69.2	0.95	0.78	0.95	28.2
11	T1	All MCs	108	5.1	108	5.1	* 0.457	61.2	LOS E	9.5	69.2	0.95	0.78	0.95	28.4
12	R2	All MCs	94	5.1	94	5.1	0.784	85.7	LOS F	7.3	53.5	1.00	0.90	1.19	19.7
Approach			236	5.1	236	5.1	0.784	71.6	LOS E	9.5	69.2	0.97	0.83	1.05	24.7
All Vehicles			3872	5.1	3872	5.1	1.114	115.7	LOS F	104.7	764.9	0.88	1.16	1.30	18.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Chalgrove Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Chalgrove Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00343 [07 Read St_Council Ave_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	40	5.1	40	5.1	1.488	509.1	LOS F	163.9	1197.1	1.00	2.53	3.01	6.8
2	T1	All MCs	1669	5.1	1669	5.1	* 1.488	515.1	LOS F	163.9	1197.1	1.00	2.52	3.01	5.4
3	R2	All MCs	774	5.1	774	5.1	* 1.506	552.9	LOS F	146.6	1070.9	1.00	1.85	3.06	6.6
Approach			2483	5.1	2483	5.1	1.506	526.8	LOS F	163.9	1197.1	1.00	2.31	3.03	5.7
East: Council Ave															
4	L2	All MCs	305	5.1	305	5.1	0.284	18.5	LOS B	10.0	72.8	0.51	0.70	0.51	47.4
5	T1	All MCs	56	5.1	56	5.1	0.185	60.3	LOS E	3.5	25.9	0.90	0.71	0.90	29.0
6	R2	All MCs	178	5.1	178	5.1	* 1.489	530.3	LOS F	33.4	244.1	1.00	1.79	3.08	4.8
Approach			539	5.1	539	5.1	1.489	191.8	LOS F	33.4	244.1	0.71	1.06	1.40	14.0
North: Read St															
7	L2	All MCs	232	5.1	232	5.1	0.235	42.8	LOS D	7.8	57.3	0.53	0.72	0.53	41.0
8	T1	All MCs	987	5.1	987	5.1	0.961	103.3	LOS F	48.2	352.3	1.00	1.15	1.29	23.4
9	R2	All MCs	76	5.1	76	5.1	0.148	66.1	LOS E	4.1	29.8	0.78	0.75	0.78	27.5
Approach			1295	5.1	1295	5.1	0.961	90.3	LOS F	48.2	352.3	0.90	1.05	1.13	21.8
West: Council Ave															
10	L2	All MCs	267	5.1	267	5.1	1.011	99.1	LOS F	36.1	263.4	1.00	1.23	1.48	15.5
11	T1	All MCs	123	5.1	123	5.1	* 1.011	111.9	LOS F	36.1	263.4	1.00	1.23	1.48	19.2
12	R2	All MCs	27	5.1	27	5.1	0.229	115.9	LOS F	2.0	14.4	0.98	0.72	0.98	26.4
Approach			418	5.1	418	5.1	1.011	103.9	LOS F	36.1	263.4	1.00	1.20	1.45	14.3
All Vehicles			4735	5.1	4735	5.1	1.506	332.0	LOS F	163.9	1197.1	0.94	1.73	2.18	8.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Council Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Council Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00445 [08 Read St_Rae Rd_AM_2041 (Site Folder: Year 2041 AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	249	5.1	249	5.1	0.185	43.2	LOS D	4.2	30.9	0.30	0.66	0.30	54.5
2	T1	All MCs	2055	5.1	2055	5.1	* 1.360	407.7	LOS F	177.5	1296.8	1.00	2.30	2.64	9.0
3	R2	All MCs	226	5.1	226	5.1	* 1.353	434.7	LOS F	37.5	274.3	1.00	1.61	2.70	8.0
Approach			2531	5.1	2531	5.1	1.360	374.2	LOS F	177.5	1296.8	0.93	2.08	2.41	9.0
East: Rae Rd															
4	L2	All MCs	182	5.1	182	5.1	0.215	20.5	LOS C	6.0	44.0	0.53	0.73	0.53	47.5
5	T1	All MCs	184	5.1	184	5.1	0.388	61.8	LOS E	7.5	54.6	0.94	0.74	0.94	32.4
6	R2	All MCs	81	5.1	81	5.1	0.399	74.7	LOS E	5.6	41.2	0.97	0.77	0.97	29.4
Approach			447	5.1	447	5.1	0.399	47.3	LOS D	7.5	54.6	0.78	0.74	0.78	36.3
North: Read St															
7	L2	All MCs	84	5.1	84	5.1	0.047	6.7	LOS A	0.0	0.0	0.00	0.57	0.00	58.6
8	T1	All MCs	1077	5.1	1077	5.1	0.629	33.2	LOS C	29.7	216.7	0.82	0.74	0.82	43.9
9	R2	All MCs	169	5.1	169	5.1	1.013	129.3	LOS F	16.7	122.0	1.00	1.12	1.61	20.7
Approach			1331	5.1	1331	5.1	1.013	43.8	LOS D	29.7	216.7	0.79	0.78	0.87	38.9
West: Rae Rd															
10	L2	All MCs	349	5.1	349	5.1	0.522	58.0	LOS E	17.9	131.1	0.83	0.92	0.83	38.0
11	T1	All MCs	348	5.1	348	5.1	* 1.365	432.8	LOS F	58.4	426.9	1.00	1.86	2.71	8.1
12	R2	All MCs	271	5.1	271	5.1	* 1.332	413.5	LOS F	43.9	320.4	1.00	1.60	2.63	8.4
Approach			968	5.1	968	5.1	1.365	292.2	LOS F	58.4	426.9	0.94	1.45	2.01	10.9
All Vehicles			5277	5.1	5277	5.1	1.365	248.1	LOS F	177.5	1296.8	0.88	1.52	1.81	12.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Rae Rd												

P1 Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Rae Rd											
P2 Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians	90	95	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00303 [01_PattersonRd_ReadSt_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	225	8.8	225	8.8	0.210	14.6	LOS B	5.4	40.7	0.44	0.69	0.44	49.7
2	T1	All MCs	185	8.8	185	8.8	0.226	53.4	LOS D	7.5	56.6	0.73	0.68	0.73	36.9
3	R2	All MCs	471	8.8	471	8.8	* 1.028	132.2	LOS F	43.4	326.8	1.00	1.20	1.51	19.7
Approach			881	8.8	881	8.8	1.028	85.5	LOS F	43.4	326.8	0.80	0.96	1.07	24.0
East: Patterson Rd															
4	L2	All MCs	515	8.8	515	8.8	0.437	27.5	LOS C	15.0	113.0	0.51	0.77	0.51	47.3
5	T1	All MCs	901	8.8	901	8.8	* 1.153	243.0	LOS F	58.9	443.6	1.00	1.70	1.98	13.2
6	R2	All MCs	33	8.8	33	8.8	0.127	103.4	LOS F	2.1	15.7	0.90	0.72	0.90	27.4
Approach			1448	8.8	1448	8.8	1.153	163.3	LOS F	58.9	443.6	0.82	1.35	1.43	16.4
North: Flinders Ln															
7	L2	All MCs	29	8.8	29	8.8	1.039	143.7	LOS F	12.9	97.0	1.00	1.23	1.73	17.5
8	T1	All MCs	132	8.8	132	8.8	* 1.039	139.7	LOS F	12.9	97.0	1.00	1.22	1.74	18.0
9	R2	All MCs	71	8.8	71	8.8	1.039	146.0	LOS F	10.9	82.1	1.00	1.21	1.76	17.2
Approach			232	8.8	232	8.8	1.039	142.1	LOS F	12.9	97.0	1.00	1.22	1.75	17.7
West: Patterson Rd															
10	L2	All MCs	31	8.8	31	8.8	0.821	10.7	LOS B	33.7	254.0	0.99	0.92	1.04	29.9
11	T1	All MCs	876	8.8	876	8.8	0.821	61.3	LOS E	33.7	254.0	0.99	0.92	1.05	31.8
12	R2	All MCs	382	8.8	382	8.8	* 1.131	190.2	LOS F	41.1	309.7	1.00	1.42	1.92	13.6
Approach			1288	8.8	1288	8.8	1.131	98.3	LOS F	41.1	309.7	0.99	1.07	1.30	21.8
All Vehicles			3849	8.8	3849	8.8	1.153	122.5	LOS F	58.9	443.6	0.88	1.16	1.33	19.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P2	Full	50	53	66.4	LOS F	0.2	0.2	0.94	0.94	220.3	200.0	0.91
East: Patterson Rd												

P5	Stage 1	25	26	66.3	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
P4	Stage 2	25	26	66.3	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Flinders Ln												
P1	Full	50	53	66.4	LOS F	0.2	0.2	0.94	0.94	220.3	200.0	0.91
West: Patterson Rd												
P3	Full	50	53	66.4	LOS F	0.2	0.2	0.94	0.94	220.3	200.0	0.91
All Pedestrians		200	211	66.4	LOS F	0.2	0.2	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00332 [02_Patterson Rd Ennis Ave_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 95 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Ennis Ave															
21	L2	All MCs	235	6.8	235	6.8	1.013	63.6	LOS E	32.7	248.0	1.00	1.25	1.73	23.6
23	R2	All MCs	615	6.8	615	6.8	* 1.013	90.7	LOS F	32.7	248.0	1.00	1.29	1.75	24.2
Approach			849	6.8	849	6.8	1.013	83.2	LOS F	32.7	248.0	1.00	1.28	1.74	24.0
NorthEast: Patterson Rd															
24	L2	All MCs	351	6.8	351	6.8	0.204	6.7	LOS A	0.0	0.0	0.00	0.56	0.00	56.6
25	T1	All MCs	998	6.8	998	6.8	* 1.223	265.3	LOS F	59.9	454.4	1.00	2.06	2.93	12.3
Approach			1348	6.8	1348	6.8	1.223	198.1	LOS F	59.9	454.4	0.74	1.67	2.17	15.5
SouthWest: Patterson Rd															
31	T1	All MCs	1118	6.8	1118	6.8	0.495	10.6	LOS B	14.0	106.4	0.59	0.54	0.59	60.7
32	R2	All MCs	395	6.8	395	6.8	* 1.210	229.2	LOS F	40.9	310.2	1.00	1.73	2.88	12.1
Approach			1513	6.8	1513	6.8	1.210	67.6	LOS E	40.9	310.2	0.70	0.85	1.19	29.5
All Vehicles			3711	6.8	3711	6.8	1.223	118.6	LOS F	59.9	454.4	0.78	1.24	1.67	21.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Ennis Ave												
P1	Full	30	32	33.7	LOS D	0.1	0.1	0.84	0.84	187.6	200.0	1.07
SouthWest: Patterson Rd												
P2	Full	30	32	32.1	LOS D	0.1	0.1	0.82	0.82	185.9	200.0	1.08
All Pedestrians		60	63	32.9	LOS D	0.1	0.1	0.83	0.83	186.7	200.0	1.07

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: LM00345 [03_Ennis Ave_Dixon Rd_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Ennis Ave and Dixon Rd
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	191	4.4	191	4.4	0.552	17.3	LOS B	21.7	160.2	0.80	0.83	0.80	36.5
2	T1	All MCs	647	4.4	647	4.4	0.552	94.4	LOS F	22.4	165.4	0.81	0.76	0.81	40.8
3	R2	All MCs	1018	4.4	1018	4.4	* 1.601	663.2	LOS F	97.9	722.4	1.00	1.88	3.31	5.4
Approach			1856	4.4	1856	4.4	1.601	398.4	LOS F	97.9	722.4	0.91	1.38	2.18	8.8
East: Dixon Rd															
4	L2	All MCs	980	4.4	980	4.4	1.108	166.2	LOS F	93.4	689.7	1.00	1.33	1.71	16.2
5	T1	All MCs	792	4.4	792	4.4	1.575	609.6	LOS F	81.6	602.2	1.00	2.32	3.25	5.6
6	R2	All MCs	216	4.4	216	4.4	1.222	322.4	LOS F	30.5	225.0	1.00	1.45	2.29	10.4
Approach			1987	4.4	1987	4.4	1.575	359.8	LOS F	93.4	689.7	1.00	1.74	2.39	9.0
North: Ennis Ave															
7	L2	All MCs	248	4.4	248	4.4	1.626	585.1	LOS F	196.9	1453.9	1.00	1.98	3.34	5.3
8	T1	All MCs	1603	4.4	1603	4.4	* 1.626	634.2	LOS F	196.9	1453.9	1.00	2.42	3.34	5.4
9	R2	All MCs	137	4.4	137	4.4	0.553	110.2	LOS F	9.5	70.2	0.98	0.80	0.98	27.6
Approach			1988	4.4	1988	4.4	1.626	592.0	LOS F	196.9	1453.9	1.00	2.25	3.18	5.7
West: Dixon Rd															
10	L2	All MCs	141	4.4	141	4.4	0.140	75.6	LOS E	3.6	26.6	0.42	0.67	0.42	48.2
11	T1	All MCs	792	4.4	792	4.4	* 1.610	641.1	LOS F	85.2	629.3	1.00	2.35	3.33	5.4
12	R2	All MCs	285	4.4	285	4.4	* 1.615	673.0	LOS F	58.3	430.4	1.00	2.02	3.36	5.3
Approach			1218	4.4	1218	4.4	1.615	583.1	LOS F	85.2	629.3	0.93	2.08	3.00	6.0
All Vehicles			7049	4.4	7049	4.4	1.626	474.0	LOS F	196.9	1453.9	0.97	1.85	2.66	7.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Ennis Ave												
P2	Full	30	32	61.7	LOS F	0.1	0.1	0.91	0.91	215.6	200.0	0.93
West: Dixon Rd												

P1	Full	30	32	61.7	LOS F	0.1	0.1	0.91	0.91	215.6	200.0	0.93
All Pedestrians		60	63	61.7	LOS F	0.1	0.1	0.91	0.91	215.6	200.0	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00335 [04_Ennis Ave_Council Ave_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	564	4.3	564	4.3	0.460	53.1	LOS D	8.5	62.9	0.41	0.71	0.41	51.9
2	T1	All MCs	1416	4.3	1416	4.3	1.809	807.1	LOS F	153.2	1128.3	1.00	3.07	4.57	4.4
3	R2	All MCs	63	4.3	63	4.3	0.678	96.2	LOS F	3.8	27.9	1.00	0.82	1.15	27.2
Approach			2043	4.3	2043	4.3	1.809	576.9	LOS F	153.2	1128.3	0.84	2.35	3.32	6.1
East: Carvie St															
4	L2	All MCs	160	4.3	160	4.3	0.257	28.5	LOS C	6.3	46.1	0.74	0.72	0.74	38.0
5	T1	All MCs	89	4.3	89	4.3	* 0.257	45.3	LOS D	6.3	46.1	0.89	0.72	0.89	33.3
6	R2	All MCs	26	4.3	26	4.3	0.085	47.2	LOS D	1.2	9.1	0.87	0.70	0.87	32.2
Approach			276	4.3	276	4.3	0.257	35.7	LOS D	6.3	46.1	0.80	0.72	0.80	35.7
North: Ennis Ave															
7	L2	All MCs	19	4.3	19	4.3	0.013	74.6	LOS E	0.1	0.9	0.20	0.61	0.20	49.7
8	T1	All MCs	2574	4.3	2574	4.3	* 2.148	1112.0	LOS F	334.6	2464.7	1.00	4.01	5.24	3.3
9	R2	All MCs	383	4.3	383	4.3	* 1.899	912.0	LOS F	81.0	596.6	1.00	2.29	4.79	3.9
Approach			2976	4.3	2976	4.3	2.148	1079.7	LOS F	334.6	2464.7	0.99	3.77	5.15	3.3
West: Council Ave															
10	L2	All MCs	428	4.3	428	4.3	0.690	31.4	LOS C	15.3	113.1	0.91	0.89	0.91	39.6
11	T1	All MCs	44	4.3	44	4.3	* 1.495	527.7	LOS F	70.1	516.7	1.00	2.32	3.71	6.4
12	R2	All MCs	751	4.3	751	4.3	1.495	532.1	LOS F	70.1	516.7	1.00	2.27	3.71	6.5
Approach			1223	4.3	1223	4.3	1.495	356.5	LOS F	70.1	516.7	0.97	1.79	2.73	9.1
All Vehicles			6518	4.3	6518	4.3	2.148	742.2	LOS F	334.6	2464.7	0.93	2.82	3.94	4.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Ennis Ave												
P4	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
East: Carvie St												

P2	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
North: Ennis Ave												
P3	Full	50	53	42.2	LOS E	0.1	0.1	0.86	0.86	196.1	200.0	1.02
West: Council Ave												
P1	Full	25	26	42.2	LOS E	0.1	0.1	0.86	0.86	196.0	200.0	1.02
P5	Slip/ Bypass	25	26	21.5	LOS C	0.0	0.0	0.84	0.84	175.3	200.0	1.14
All Pedestrians		200	211	39.6	LOS D	0.1	0.1	0.86	0.86	193.5	200.0	1.03

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00852 [05_Ennis Ave_Rae Rd_PM_20241 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Ennis Ave															
1	L2	All MCs	113	3.3	113	3.3	0.089	10.3	LOS B	1.5	10.7	0.34	0.65	0.34	54.7
2	T1	All MCs	1703	3.3	1703	3.3	0.701	24.6	LOS C	23.2	169.1	0.85	0.76	0.85	48.4
3	R2	All MCs	49	3.3	49	3.3	0.231	51.1	LOS D	2.3	16.5	0.94	0.74	0.94	31.7
Approach			1865	3.3	1865	3.3	0.701	24.4	LOS C	23.2	169.1	0.82	0.75	0.82	48.1
East: Rockingham Sta Acc Rd															
4	L2	All MCs	118	3.3	118	3.3	0.194	27.2	LOS C	3.9	28.6	0.75	0.71	0.75	38.9
5	T1	All MCs	98	3.3	98	3.3	* 0.867	60.5	LOS E	5.5	39.9	1.00	0.99	1.44	29.9
6	R2	All MCs	98	3.3	98	3.3	0.608	54.8	LOS D	4.9	35.8	1.00	0.81	1.05	30.4
Approach			314	3.3	314	3.3	0.867	46.2	LOS D	5.5	39.9	0.91	0.83	1.06	32.9
North: Ennis Ave															
7	L2	All MCs	79	3.3	79	3.3	0.055	25.3	LOS C	0.5	3.9	0.22	0.63	0.22	50.0
8	T1	All MCs	2908	3.3	2908	3.3	* 1.148	185.8	LOS F	102.5	746.6	1.00	2.03	2.34	15.8
9	R2	All MCs	463	3.3	463	3.3	* 1.079	149.6	LOS F	20.2	147.1	1.00	1.36	2.15	18.2
Approach			3451	3.3	3451	3.3	1.148	177.2	LOS F	102.5	746.6	0.98	1.91	2.26	16.3
West: Rae Rd															
10	L2	All MCs	291	3.3	291	3.3	0.377	21.5	LOS C	7.5	54.9	0.64	0.77	0.64	49.4
11	T1	All MCs	72	3.3	72	3.3	0.634	56.5	LOS E	3.7	27.1	1.00	0.80	1.10	31.1
12	R2	All MCs	169	3.3	169	3.3	* 1.053	127.4	LOS F	13.6	99.4	1.00	1.26	2.06	20.2
Approach			532	3.3	532	3.3	1.053	60.0	LOS E	13.6	99.4	0.80	0.93	1.15	32.0
All Vehicles			6161	3.3	6161	3.3	1.148	114.2	LOS F	102.5	746.6	0.91	1.42	1.67	22.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: LM00488 [06_Read St_Chalgrove Ave_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	91	5.1	91	5.1	0.810	56.5	LOS E	34.9	255.2	0.98	0.89	1.01	26.7
2	T1	All MCs	928	5.1	928	5.1	0.810	51.6	LOS D	34.9	255.2	0.98	0.89	1.01	30.5
3	R2	All MCs	278	5.1	278	5.1	* 1.108	196.0	LOS F	32.6	238.5	1.00	1.24	1.87	11.5
Approach			1297	5.1	1297	5.1	1.108	82.9	LOS F	34.9	255.2	0.98	0.97	1.19	22.0
East: Chalgrove Ave															
4	L2	All MCs	666	5.1	666	5.1	0.793	39.0	LOS D	30.7	224.3	0.91	1.01	0.91	31.8
5	T1	All MCs	58	5.1	58	5.1	0.184	80.7	LOS F	3.6	26.7	0.90	0.71	0.90	29.2
6	R2	All MCs	320	5.1	320	5.1	* 1.118	220.9	LOS F	38.4	280.8	1.00	1.36	1.89	14.2
Approach			1044	5.1	1044	5.1	1.118	97.0	LOS F	38.4	280.8	0.94	1.10	1.21	20.7
North: Read St															
7	L2	All MCs	454	5.1	454	5.1	0.351	31.6	LOS C	10.1	73.5	0.38	0.70	0.38	51.5
8	T1	All MCs	1294	5.1	1294	5.1	* 1.147	228.9	LOS F	91.0	664.9	1.00	1.68	1.92	11.2
9	R2	All MCs	33	5.1	33	5.1	0.130	95.2	LOS F	2.1	15.4	0.91	0.73	0.91	27.9
Approach			1780	5.1	1780	5.1	1.147	176.2	LOS F	91.0	664.9	0.84	1.41	1.51	13.6
West: Chalgrove Ave															
10	L2	All MCs	52	5.1	52	5.1	0.380	64.9	LOS E	7.7	56.0	0.94	0.77	0.94	28.2
11	T1	All MCs	65	5.1	65	5.1	* 0.380	60.3	LOS E	7.7	56.0	0.94	0.77	0.94	28.3
12	R2	All MCs	57	5.1	57	5.1	0.190	62.7	LOS E	3.6	26.3	0.90	0.74	0.90	23.6
Approach			174	5.1	174	5.1	0.380	62.5	LOS E	7.7	56.0	0.92	0.76	0.92	26.8
All Vehicles			4295	5.1	4295	5.1	1.147	124.2	LOS F	91.0	664.9	0.91	1.18	1.32	17.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Chalgrove Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Chalgrove Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00343 [07 Read St_Council Ave_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	27	5.1	27	5.1	0.776	52.2	LOS D	33.9	247.6	0.96	0.85	0.96	34.3
2	T1	All MCs	1026	5.1	1026	5.1	0.776	53.7	LOS D	34.0	248.2	0.96	0.85	0.96	33.7
3	R2	All MCs	621	5.1	621	5.1	* 1.485	529.8	LOS F	115.9	846.4	1.00	1.81	3.02	6.8
Approach			1675	5.1	1675	5.1	1.485	230.2	LOS F	115.9	846.4	0.97	1.21	1.72	11.9
East: Council Ave															
4	L2	All MCs	835	5.1	835	5.1	0.909	52.2	LOS D	51.5	376.3	0.99	1.12	1.07	33.7
5	T1	All MCs	117	5.1	117	5.1	0.387	62.9	LOS E	7.7	56.4	0.94	0.77	0.94	28.5
6	R2	All MCs	187	5.1	187	5.1	* 1.426	473.2	LOS F	33.4	243.8	1.00	1.76	2.91	5.3
Approach			1139	5.1	1139	5.1	1.426	122.6	LOS F	51.5	376.3	0.99	1.19	1.36	20.1
North: Read St															
7	L2	All MCs	277	5.1	277	5.1	0.247	53.4	LOS D	7.7	56.5	0.46	0.71	0.46	44.1
8	T1	All MCs	1827	5.1	1827	5.1	* 1.524	567.5	LOS F	185.1	1352.1	1.00	2.63	3.10	5.2
9	R2	All MCs	147	5.1	147	5.1	0.352	93.2	LOS F	9.0	65.7	0.88	0.79	0.88	25.2
Approach			2252	5.1	2252	5.1	1.524	473.3	LOS F	185.1	1352.1	0.93	2.28	2.63	5.7
West: Council Ave															
10	L2	All MCs	74	5.1	74	5.1	0.507	28.0	LOS C	10.0	72.9	0.95	0.92	0.95	22.8
11	T1	All MCs	92	5.1	92	5.1	* 0.507	105.7	LOS F	10.0	72.9	0.95	0.92	0.95	27.3
12	R2	All MCs	39	5.1	39	5.1	0.296	81.7	LOS F	2.8	20.5	0.98	0.74	0.98	26.5
Approach			204	5.1	204	5.1	0.507	73.1	LOS E	10.0	72.9	0.96	0.88	0.96	24.9
All Vehicles			5269	5.1	5269	5.1	1.524	304.7	LOS F	185.1	1352.1	0.95	1.65	2.00	9.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Council Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Council Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00445 [08 Read St_Rae Rd_PM_2041 (Site Folder: Year 2041 PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	275	5.1	275	5.1	0.228	38.0	LOS D	7.1	51.5	0.41	0.69	0.41	51.1
2	T1	All MCs	1375	5.1	1375	5.1	0.970	94.0	LOS F	67.1	490.1	1.00	1.17	1.26	29.5
3	R2	All MCs	171	5.1	171	5.1	0.649	86.7	LOS F	12.0	87.6	1.00	0.82	1.00	28.5
Approach			1820	5.1	1820	5.1	0.970	84.9	LOS F	67.1	490.1	0.91	1.06	1.11	27.4
East: Rae Rd															
4	L2	All MCs	276	5.1	276	5.1	0.398	42.2	LOS D	13.6	99.0	0.77	0.87	0.77	37.1
5	T1	All MCs	301	5.1	301	5.1	0.730	68.8	LOS E	13.4	97.9	0.99	0.83	1.03	30.6
6	R2	All MCs	43	5.1	43	5.1	0.258	76.5	LOS E	3.0	22.0	0.97	0.74	0.97	29.0
Approach			620	5.1	620	5.1	0.730	57.5	LOS E	13.6	99.0	0.89	0.84	0.91	33.0
North: Read St															
7	L2	All MCs	132	5.1	132	5.1	0.073	7.2	LOS A	0.0	0.0	0.00	0.57	0.00	58.6
8	T1	All MCs	2299	5.1	2299	5.1	* 1.471	506.5	LOS F	224.5	1640.4	1.00	2.56	2.96	7.3
9	R2	All MCs	391	5.1	391	5.1	* 1.486	549.1	LOS F	72.9	532.8	1.00	1.77	3.04	6.7
Approach			2821	5.1	2821	5.1	1.486	490.5	LOS F	224.5	1640.4	0.95	2.35	2.83	7.1
West: Rae Rd															
10	L2	All MCs	268	5.1	268	5.1	0.328	29.9	LOS C	11.7	85.4	0.67	0.76	0.67	43.8
11	T1	All MCs	225	5.1	225	5.1	* 0.951	104.4	LOS F	19.9	145.1	1.00	1.09	1.39	25.3
12	R2	All MCs	241	5.1	241	5.1	* 1.441	496.4	LOS F	43.5	317.5	1.00	1.74	2.94	6.8
Approach			735	5.1	735	5.1	1.441	205.8	LOS F	43.5	317.5	0.88	1.18	1.64	14.4
All Vehicles			5996	5.1	5996	5.1	1.486	287.0	LOS F	224.5	1640.4	0.92	1.66	1.96	11.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Rae Rd												

P1 Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Rae Rd											
P2 Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians	90	95	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Appendix F

SIDRA with Mitigation Results

MOVEMENT SUMMARY

Site: LM00488 [06_Read St_Chalgrove Ave_AM_2041_MT (Site Folder: Year 2041 AM Peak Mitigation)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	59	5.1	59	5.1	0.390	41.7	LOS D	14.7	107.2	0.77	0.69	0.77	31.1
2	T1	All MCs	1581	5.1	1581	5.1	*0.990	86.9	LOS F	68.4	499.7	0.97	1.15	1.24	22.7
3	R2	All MCs	314	5.1	314	5.1	*0.972	117.6	LOS F	29.0	211.6	1.00	1.07	1.40	18.2
Approach			1954	5.1	1954	5.1	0.990	90.4	LOS F	68.4	499.7	0.97	1.13	1.25	21.0
East: Chalgrove Ave															
4	L2	All MCs	187	5.1	187	5.1	0.174	10.3	LOS B	3.6	26.1	0.33	0.65	0.33	47.5
5	T1	All MCs	34	5.1	34	5.1	0.107	58.4	LOS E	2.1	15.2	0.88	0.68	0.88	29.5
6	R2	All MCs	131	5.1	131	5.1	*0.910	94.9	LOS F	10.9	79.7	1.00	1.01	1.37	23.8
Approach			352	5.1	352	5.1	0.910	46.3	LOS D	10.9	79.7	0.63	0.79	0.77	31.7
North: Read St															
7	L2	All MCs	335	5.1	335	5.1	0.280	14.3	LOS B	8.5	62.0	0.42	0.70	0.42	50.0
8	T1	All MCs	942	5.1	942	5.1	0.430	35.9	LOS D	16.7	121.7	0.79	0.68	0.79	36.5
9	R2	All MCs	54	5.1	54	5.1	0.166	62.7	LOS E	3.3	24.3	0.88	0.75	0.88	29.1
Approach			1331	5.1	1331	5.1	0.430	31.5	LOS C	16.7	121.7	0.70	0.69	0.70	39.3
West: Chalgrove Ave															
10	L2	All MCs	34	5.1	34	5.1	0.457	68.2	LOS E	9.5	69.2	0.95	0.78	0.95	28.3
11	T1	All MCs	108	5.1	108	5.1	*0.457	61.2	LOS E	9.5	69.2	0.95	0.78	0.95	28.4
12	R2	All MCs	94	5.1	94	5.1	0.653	80.3	LOS F	7.0	51.1	1.00	0.82	1.05	20.5
Approach			236	5.1	236	5.1	0.653	69.8	LOS E	9.5	69.2	0.97	0.80	0.99	25.2
All Vehicles			3872	5.1	3872	5.1	0.990	64.9	LOS E	68.4	499.7	0.84	0.92	1.00	26.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Chalgrove Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Chalgrove Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00343 [07 Read St_Council Ave_AM_2041_MT (Site Folder: Year 2041 AM Peak Mitigation)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	40	5.1	40	5.1	1.392	462.6	LOS F	85.6	625.6	1.00	2.09	2.78	7.9
2	T1	All MCs	1669	5.1	1669	5.1	* 1.392	450.3	LOS F	123.6	902.8	1.00	2.17	2.77	6.4
3	R2	All MCs	774	5.1	774	5.1	* 1.404	457.0	LOS F	134.8	984.9	1.00	1.76	2.79	7.9
Approach			2483	5.1	2483	5.1	1.404	452.6	LOS F	134.8	984.9	1.00	2.04	2.77	6.5
East: Council Ave															
4	L2	All MCs	305	5.1	305	5.1	0.257	14.3	LOS B	7.6	55.3	0.40	0.67	0.40	50.9
5	T1	All MCs	56	5.1	56	5.1	0.185	60.4	LOS E	3.5	25.9	0.90	0.71	0.90	29.0
6	R2	All MCs	178	5.1	178	5.1	* 1.354	409.0	LOS F	29.6	216.0	1.00	1.66	2.72	6.1
Approach			539	5.1	539	5.1	1.354	149.3	LOS F	29.6	216.0	0.65	1.00	1.22	16.9
North: Read St															
7	L2	All MCs	232	5.1	232	5.1	0.250	23.6	LOS C	8.5	62.3	0.57	0.73	0.57	39.4
8	T1	All MCs	987	5.1	987	5.1	0.805	57.6	LOS E	29.3	213.7	0.97	0.87	1.01	30.3
9	R2	All MCs	76	5.1	76	5.1	0.132	49.5	LOS D	3.9	28.3	0.75	0.74	0.75	28.7
Approach			1295	5.1	1295	5.1	0.805	51.0	LOS D	29.3	213.7	0.89	0.84	0.92	30.9
West: Council Ave															
10	L2	All MCs	267	5.1	267	5.1	1.011	98.4	LOS F	36.1	263.4	1.00	1.23	1.48	15.5
11	T1	All MCs	123	5.1	123	5.1	* 1.011	113.2	LOS F	36.1	263.4	1.00	1.23	1.48	19.2
12	R2	All MCs	27	5.1	27	5.1	0.208	114.4	LOS F	1.9	14.2	0.97	0.72	0.97	26.7
Approach			418	5.1	418	5.1	1.011	103.8	LOS F	36.1	263.4	1.00	1.20	1.45	14.3
All Vehicles			4735	5.1	4735	5.1	1.404	277.5	LOS F	134.8	984.9	0.93	1.52	1.97	9.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Council Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Council Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00488 [06_Read St_Chalgrove Ave_PM_2041_MT (Site Folder: Year 2041 PM Peak Mitigation)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	91	5.1	91	5.1	0.305	50.3	LOS D	9.2	67.3	0.82	0.74	0.82	27.7
2	T1	All MCs	928	5.1	928	5.1	0.772	52.1	LOS D	28.8	210.4	0.97	0.86	0.98	30.0
3	R2	All MCs	278	5.1	278	5.1	*0.969	105.3	LOS F	25.4	185.9	1.00	1.06	1.41	18.2
Approach			1297	5.1	1297	5.1	0.969	63.4	LOS E	28.8	210.4	0.96	0.89	1.06	26.2
East: Chalgrove Ave															
4	L2	All MCs	666	5.1	666	5.1	0.648	23.8	LOS C	28.8	210.3	0.73	0.83	0.73	38.6
5	T1	All MCs	58	5.1	58	5.1	0.184	78.6	LOS E	3.6	26.7	0.90	0.71	0.90	29.3
6	R2	All MCs	320	5.1	320	5.1	*0.975	124.4	LOS F	29.8	218.1	1.00	1.12	1.40	22.3
Approach			1044	5.1	1044	5.1	0.975	57.7	LOS E	29.8	218.1	0.82	0.91	0.95	28.0
North: Read St															
7	L2	All MCs	454	5.1	454	5.1	0.359	19.1	LOS B	10.7	78.4	0.41	0.77	0.41	51.0
8	T1	All MCs	1294	5.1	1294	5.1	*0.955	92.3	LOS F	39.4	287.8	1.00	1.15	1.30	22.1
9	R2	All MCs	33	5.1	33	5.1	0.114	72.1	LOS E	2.0	14.9	0.89	0.73	0.89	28.6
Approach			1780	5.1	1780	5.1	0.955	73.3	LOS E	39.4	287.8	0.85	1.05	1.07	25.4
West: Chalgrove Ave															
10	L2	All MCs	52	5.1	52	5.1	0.380	65.9	LOS E	7.7	56.0	0.94	0.77	0.94	28.2
11	T1	All MCs	65	5.1	65	5.1	*0.380	60.3	LOS E	7.7	56.0	0.94	0.77	0.94	28.3
12	R2	All MCs	57	5.1	57	5.1	0.164	58.7	LOS E	3.5	25.3	0.87	0.74	0.87	24.5
Approach			174	5.1	174	5.1	0.380	61.4	LOS E	7.7	56.0	0.91	0.76	0.91	27.2
All Vehicles			4295	5.1	4295	5.1	0.975	66.0	LOS E	39.4	287.8	0.88	0.96	1.03	26.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Chalgrove Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Chalgrove Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: LM00343 [07 Read St_Council Ave_PM_2041_MT (Site Folder: Year 2041 PM Peak Mitigation)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Read St															
1	L2	All MCs	27	5.1	27	5.1	0.686	65.1	LOS E	20.2	147.5	0.93	0.81	0.93	33.6
2	T1	All MCs	1026	5.1	1026	5.1	0.686	59.5	LOS E	26.2	191.6	0.93	0.81	0.93	32.9
3	R2	All MCs	621	5.1	621	5.1	* 1.300	360.5	LOS F	97.1	709.6	1.00	1.61	2.47	9.6
Approach			1675	5.1	1675	5.1	1.300	171.2	LOS F	97.1	709.6	0.96	1.10	1.50	15.1
East: Council Ave															
4	L2	All MCs	835	5.1	835	5.1	0.842	74.3	LOS E	39.2	286.3	0.91	1.02	0.91	39.4
5	T1	All MCs	117	5.1	117	5.1	0.387	62.9	LOS E	7.7	56.4	0.94	0.77	0.94	28.5
6	R2	All MCs	187	5.1	187	5.1	* 1.307	367.1	LOS F	29.6	216.0	1.00	1.63	2.57	6.7
Approach			1139	5.1	1139	5.1	1.307	121.3	LOS F	39.2	286.3	0.92	1.10	1.18	24.0
North: Read St															
7	L2	All MCs	277	5.1	277	5.1	0.261	19.2	LOS B	8.6	62.7	0.50	0.72	0.50	42.6
8	T1	All MCs	1827	5.1	1827	5.1	* 1.316	318.4	LOS F	126.3	922.7	0.98	1.92	2.24	8.6
9	R2	All MCs	147	5.1	147	5.1	0.308	83.3	LOS F	8.6	62.6	0.84	0.79	0.84	26.3
Approach			2252	5.1	2252	5.1	1.316	266.2	LOS F	126.3	922.7	0.91	1.70	1.94	9.6
West: Council Ave															
10	L2	All MCs	74	5.1	74	5.1	0.507	22.7	LOS C	9.7	70.7	0.95	0.91	0.95	23.0
11	T1	All MCs	92	5.1	92	5.1	* 0.507	107.7	LOS F	9.7	70.7	0.95	0.91	0.95	27.5
12	R2	All MCs	39	5.1	39	5.1	0.272	80.0	LOS E	2.8	20.2	0.98	0.73	0.98	26.8
Approach			204	5.1	204	5.1	0.507	71.8	LOS E	9.7	70.7	0.95	0.88	0.95	25.2
All Vehicles			5269	5.1	5269	5.1	1.316	197.1	LOS F	126.3	922.7	0.93	1.35	1.60	13.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Read St												
P4	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
East: Council Ave												

P1	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
North: Read St												
P3	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
West: Council Ave												
P2	Full	30	32	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91
All Pedestrians		120	126	66.4	LOS F	0.1	0.1	0.94	0.94	220.2	200.0	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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FAR lane

Economic Resilience Assessment Framework

City of Rockingham

3rd of November 2021

1. TABLE OF CONTENTS

1. Table of Contents 2
2. Reliance and disclaimer 3
3. Purpose and scope 4
4. Introduction 5
5. Economic assessment framework 7
6. City of Rockingham strategic intent 9
State Planning Policy 7.2. Precinct Design Guidelines 9
The City of Rockingham Economic Development Strategy (2020-2025) 10
City of Rockingham Strategic Community Plan (2019-2029) 10
City of Rockingham *Draft* LCACS assessment 11
7. Rockingham Context 13
The City of Rockingham's Economy 13
Floor space 16
8. Defining Success 19
Rockingham's Uniqueness 19
Rockingham's Connectivity 21
Rockingham being Fit for Purpose 22
9. Impact assessment 24
10. Technical appendices 27
11. Reference list 28

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ABN 47 609 529 928

Revision	Date	Prepared By	Approved By
First Draft	29/10/2021	Linnea Edebert and Giles Tuffin	Jason McFarlane
Final	3/11/2021	Linnea Edebert	Jason McFarlane

3. PURPOSE AND SCOPE

The purpose of this draft report is to provide the City of Rockingham (the City) an economic resilience assessment as part of FAR Lane's contribution to inform the City of Rockingham's Precinct Structure Plan (PSP) for the Rockingham Strategic Centre (RSC). This includes:

- Developing a high-level Economic Resilience Assessment Framework that considers alignment with:
    - the State Planning Policy 7.2. precinct guidelines.
    - the City's Strategic documents.
    - The City's *draft* LCACS needs assessment of employment yields and floorspace demand.
- Identifying implications of alignment/gaps in performance on future investment attraction and place vibrancy.

The assessment particularly focuses on the elements of Uniqueness, Connectivity and Fit For Purpose to ensure competitiveness and resilience, creating the basis to realise economic prosperity.

The next phase of FAR Lane's work will be site-specific assessments of locations identified by the City. The consultant team will profile each strategic site, including site-specific characteristics (including testing existing planning controls), yields, and constraints while identifying what needs to be specifically addressed to best support the vision and goals of the strategy – including building resilience and competitiveness.

4. INTRODUCTION

The City of Rockingham experienced substantial population growth, a trend that is expected to continue. Its population grew by 8% between 2016 and 2021, and the City is expected to be home to an additional 93,000 people by 2041. This requires substantial planning, as the City needs to cater for additional public space, employment, services, housing, and amenities. This will create substantial challenges for the City.

To ensure future economic prosperity, two key aspects should be considered:

- Competitiveness - The ability of the regional economy to compete in state, national and international markets; and
- Resilience - The ability of the economy to respond effectively to change and shocks.

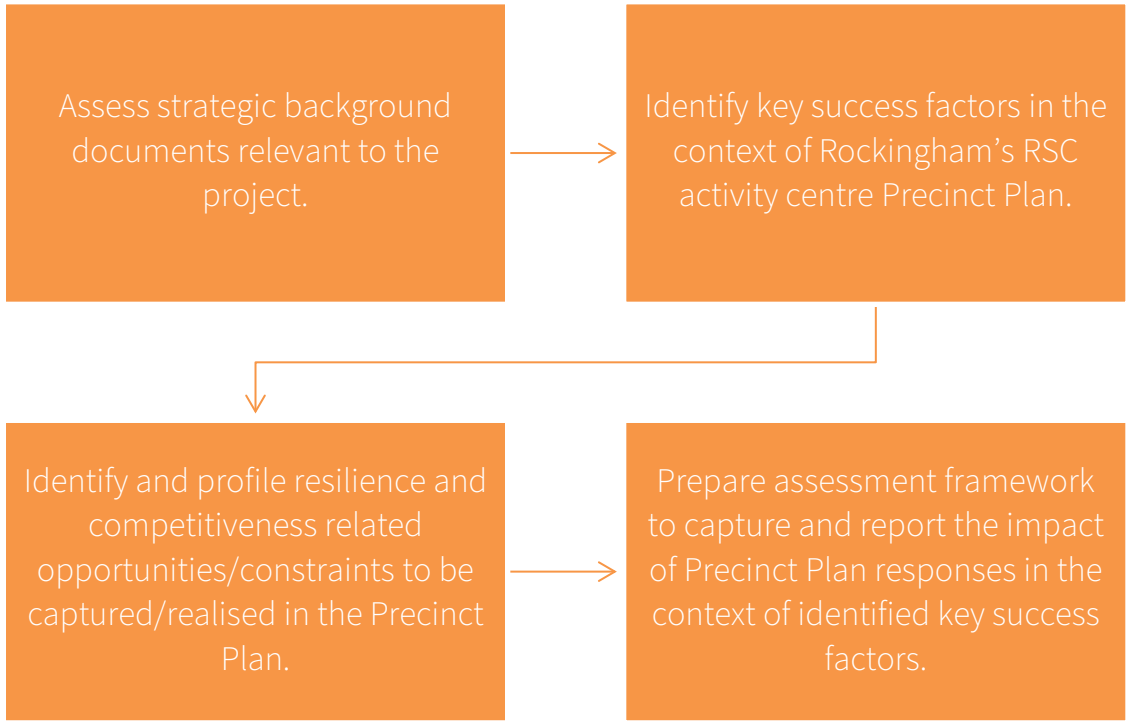
Competitiveness is the foundation for attracting and retaining investment, as well as creating wealth in an economy (Snowdon & Stonehouse, 2006). Economies evolve from being product-driven, to investment-driven, and eventually become innovation-driven (Porter, 2005). This is a process that local economies need to plan for, as it is the key challenge to achieving competitiveness.

Additionally, resilience is increasingly being recognised as a critical component of economic development. Systems and economies need to be resilient to disruptions and shock to ensure adverse impacts are minimised and can be managed effectively by promoting and sustaining diversity, innovation, competition, and entrepreneurship.

Competitiveness and resilience need to be considered equally in attracting and retaining investment to create jobs, boost public amenity, and create economic prosperity. Therefore, it is important to ensure proposed developments across Rockingham's RSC can positively impact one or more of these areas to ensure benefits can be accrued to the local, regional, and state economy.

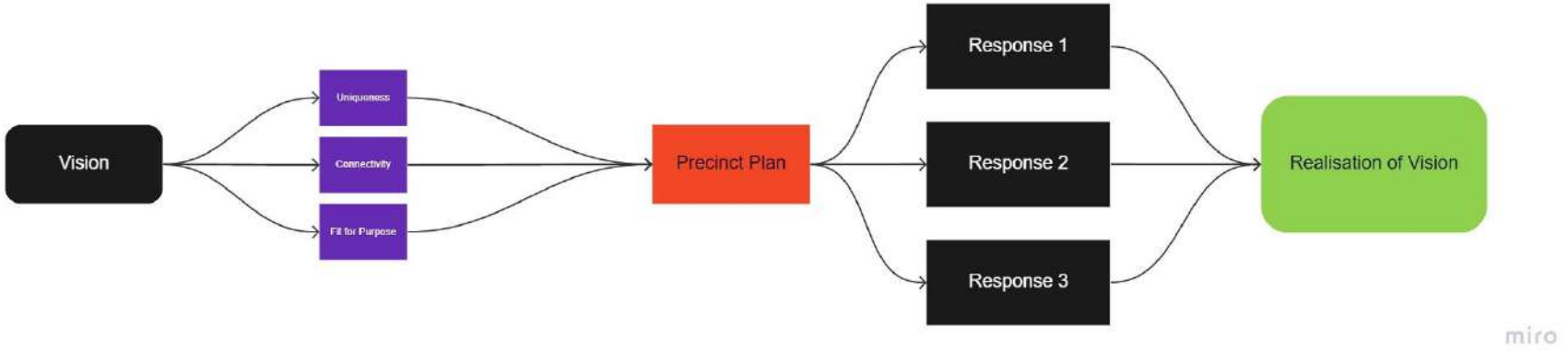
In this report, FAR Lane has developed an assessment framework that captures the above considerations. An overview of our approach to developing the framework is illustrated in Figure 1 below.

Figure 1 – FAR Lane Assessment development approach



5. ECONOMIC ASSESSMENT FRAMEWORK

Figure 2 – Economic Assessment Framework



Source: FAR lane 2021.

The assessment framework is designed to ensure the PSP addresses the City's vision for the RSC. It consists of the following steps:

1. Understand the City's vision for the RSC and region.
2. Assess the RSC against the key criteria of Uniqueness, being Fit For Purpose, and Connectivity (see below) to determine alignment with the vision.
3. Outline the key responses in the PSP that will have the most impact in achieving the City's vision.

Examining the Precinct Structure Plan's Uniqueness, Connectivity, and whether it is Fit For Purpose allows us to assess whether it will increase the RSC's competitiveness and resilience, and therefore its likelihood of achieving the City's strategic vision.

Uniqueness - What a centre, place or economy has that others do not.

Uniqueness is an important foundation for utilising competitive advantages in industry specialisation (see below). Uniqueness is also important in terms of cultural diversification, including different lifestyles, preferences and needs of a population. Therefore, it is important to not impose a one-size-fits-

all approach to ensure all sections of society are catered for, and to create different and unique places. This results in increased and higher quality social and economic transactions. Uniqueness also provides a foundation to ensure a vibrant local business community that attracts start-ups and events, minimising consequences from external shocks. The Precinct Plan should therefore consider:

- What are the existing characteristics that can be leveraged to enhance its Uniqueness in the future? And on this basis:
- Does the proposed development contribute and enhance the economy and centre's Uniqueness?

Connectivity - How the resident catchment and other businesses interact and connect with the centre.

Connectivity is important for precinct development as it ensures local catchment residents can efficiently connect with businesses and services, and that the workforce can efficiently access their place of work. This supports a broader range of local employment options, resulting in increased competitiveness and resilience to shocks. The PSP should therefore consider:

- Does the proposed project have adequate public transport connection, footpaths, cycling infrastructure and roads?
- Does the proposed project enhance Connectivity to other precincts?
- Does the proposed project facilitate new, or utilise existing, infrastructure to meet the needs of current and future types of businesses?
- What are the Connectivity barriers related to the proposed project that could hinder access to markets?

Fit For Purpose - How a centre, place or economy meets the specific needs of a centre's residents, workers, businesses, and visitors.

For a centre to be Fit For Purpose, it needs adequate infrastructure, configuration and alignment that meets local needs and attracts activity to the centre. This helps provide a strong foundation for competitiveness. The PSP should therefore consider:

- Do the centre's current activities meet catchment residents' demands, and provide businesses and the workforce with adequate development opportunities?
- Does the current infrastructure and services attract and support investment?
- How does the centre align with Rockingham's activity centre hierarchy and economic development goals and objectives?

The three above characteristics can create a comparative advantage that leverages Rockingham's economy, eliciting an advantage in producing goods and services. Creating economic impact from exports or place-related opportunities depends on the local economy's capacity to leverage/develop comparative advantages. Therefore, supporting and developing sustainable comparative advantages is crucial to ensuring Rockingham's economy can

remain competitive (across both local and traded economies) and be **resilient** to future shocks. For Rockingham, this is particularly the case for further developing Defence and Road Freight industries.

The PSP should therefore consider:

- Does the activity enhance the industry's comparative advantages (existing or emerging) to support traded economy opportunities?
- Does the proposed centre enhance the characteristics and skillsets of the local workforce through infrastructure and employment?
- Does the proposal contribute to local land and natural resources that are relevant to industry comparative advantages?
- Does the proposal support productive and dynamic efficiency of businesses, effective density, anchor businesses/industries and amenitiesfor business, workers, and residents?

6. CITY OF ROCKINGHAM STRATEGIC INTENT

The alignment of the precinct performance will be guided by the State Planning Policy 7.2. *Precinct Design Guidelines* as well as the City's strategic documents.

State Planning Policy 7.2. Precinct Design Guidelines

The policy gives a framework to the development of desired quality outcomes from the planning and design of projects across Western Australia. The planned developments need to be based upon a clear understanding of the overall feasibility of delivery. Feasibility concerns how a new or redeveloped precinct is responsive to the site, context, precinct vision and stakeholder expectations and should consider social and environmental elements as part of the site and context analysis process. The feasibility component needs to be considered throughout the development of the PSP and work as a guideline for decision making. The plan should consider both long- and short-term options as well as reflect the **market**, such as land economic factors, current development proposal as well as employment and business influences. **Physical elements** such as the existing landscape, infrastructure and existing built form and character should also be considered (DPLH, 2021).

The guidelines identify the following desired characteristics for Strategic Metropolitan Centres:

- An activity centre is supposed to provide for a diversity of uses.

- Full range of economic and community services necessary for the community and catchment residents.
- Focus on public transport networks.
- Wide range of retail types.
- Major offices and state government agencies.
- Walkable catchment – 800 metres.

The City of Rockingham Economic Development Strategy (2020-2025)

The City of Rockingham Economic Development Strategy aims to achieve a long-term economic vision for Rockingham. It includes the following strategic actions:

- Investment Attraction - Market and promote the City as a coastal tourism destination that is progressive, active and investment-ready local government to attract both local and international investment.
- Strategic Metropolitan Centre - Establish Rockingham as the Capital City of the South West Metropolitan Corridor as part of the South Metropolitan Sub-Regional Planning Framework, which includes:
    - Achieving a more consolidated urban form.
    - Facilitating an increased number of people both living and working in the same place.
    - Protecting employment land from other competing land uses.
    - Maximising the use of and value to existing infrastructure, including transport community/social and service infrastructure.
- Local Business Development - Continue to support the growth and development of local businesses and industries through initiatives in the City, and by identifying and attracting high profile businesses and events.
- Advocacy and Lobbying - Facilitate growth of the Rockingham region and economy through strategic advocacy and lobbying programs to establish infrastructure and development opportunities.

City of Rockingham Strategic Community Plan (2019-2029)

The vision of the future Rockingham includes actively pursuing tourism and economic development; growth and community connectivity, wellbeing, planning for future generations, and delivering quality leadership and business expertise. This involves the following actions:

- Coastal destination: Promote the City as a premier metropolitan coastal tourism destination.
- Investment attraction: Attract local and international investment to the City to contribute to the local economy.
- Marketing and promotion: Develop and implement effective marketing approaches to promote the City as a destination of choice for the local community, visitors, investors, and businesses.
- Attractions and events: Seek to host iconic community events and attractions that will entice residents and visitors throughout the year.
- Infrastructure investment – local, regional, and state: Lobby local, state and federal stakeholders to establish infrastructure and development opportunities for the City.
- Business development: Support business development initiatives throughout the City.
- MICE (meetings, incentives, conferences and events): Identify and attract conferences and high-profile business and sporting events to the City to develop its profile as a destination of choice for event organisers.

City of Rockingham *Draft* LCACS assessment

City of Rockingham's draft LCACS assessment themes which will need to be addressed in the Precinct Structure Plan include:

- The current reliance on the retail sector.
- The importance of the defence sector.
- High population growth.
- Lack of high-quality office space.
- Lack of short-stay accommodation in the Waterfront Tourism Precinct.
- Underutilised tourism assets with particular emphasis on Point Peron, which offers a wide variety of opportunities for the development of formal infrastructure and amenities to support visitors to the area.

The draft LCACS, in combination with Syme, Marmion and Co's employment planning strategy, has identified that key avenues for employment growth will be through the defence, tourism, general industries and heavy industries.

The strategies align with facilitating for the following future themes:

- Increased population.

- Increased visitation/tourism by capitalising on the City's favourable location.
- Increased employment and enhanced local business environment by strengthening the relationship between Rockingham RSC and surrounding traded activities.

7. ROCKINGHAM CONTEXT

FAR Lane's previous work of the general context of Rockingham RSC and the City of Rockingham is compared in Table 1. It shows that 25% of all jobs exist within the RSC precinct, which is dominated by Retail Trade. Data also suggest a lack of public transport linkages, as well as a lack of diversified employment opportunities as a large proportion of residents, drive to work.

Table 1 – Snapshot overview of Rockingham RSC and City of Rockingham

Metric	Rockingham RSC	City of Rockingham
Population	4,352	138,581
Local Jobs	9,174	35,871
Largest Industry (by employment) *Place of Work*	• Retail Trade (19%) • Public Administration and Safety (12%) • Health Care and Social Assistance (10%)	• Public Administration and Safety (16%) • Retail Trade (14%) • Health Care and Social Assistance (14%)
Largest industry (by businesses)	Data is not available for the RSC precinct.	• Construction (24%) • Professional, Scientific and Technical Services (10%) • Transport, Postal and Warehousing (9%).
Local businesses	600	5,500
Employed residents	1,500	66,200
Key demographics	17% aged between 0-15 24% aged 65 and over	22% aged between 0-15 12.3% aged 65 and over
Method of travel to work	76% drive to work	69% drive to work

Source: ABS Census 2016. Profile.id 2021.

The City of Rockingham's Economy

By identifying the local and traded industries within the City of Rockingham, industries that have a competitive advantage and contributed to significant economic growth were identified. Specialised industries tend to be traded industries. They are associated with higher average wages and higher

productivity compared to local industries. These industries are also more likely to support employment through supply chain linkages.

FAR Lane examined the City's industries' Employment Concentration Factors, which indicates when a local economy is exporting goods produced by a particular industry, they are therefore globally competitive. The only traded industry identified with a significant ECF was the defence industry. The advantages that make Rockingham a desirable location for defence industry activities may represent an opportunity for a significant source of additional jobs and attract other related businesses to the area – taking advantage of their market position. Therefore, it is important to consider linkages and enabling infrastructure that can benefit the local defence industry's business environment and community.

Start-ups also play a significant role in economic growth and prosperity by creating jobs and supporting local employment through innovation and competition. New entrepreneurs can bring new ideas that enhance innovation and generate competition, which is essential for a prosperous economy. Therefore, Precinct Plans should consider how best to facilitate a business environment that attracts entrepreneurs to the area.

Rockingham is the SW corridor's strategic metropolitan centre with a significant role in supporting a growth corridor whose future growth will be underpinned by major investment in projects and precincts including:

- Kwinana Strategic Industrial Area – WA's most important strategic industrial area as part of the premier heavy industrial zone.[1]
- Australian Marine Complex - Located in Henderson driving an additional 600 construction jobs. The initiative of the AMC is to create a key defence hub enhancing Australia's reputation in defence to help grow WA's economy.[2]
- West Port – Perth's future container port located in Kwinana.[3]

Table 2 summarises the economy of the City of Rockingham.

[1] Department of Jobs, Tourism, Science and Innovation, 2020. *Kwinana Strategic Industrial Area.*
[2] Government of Western Australia, 2021. *Contract awarded for $87.6 million defence infrastructure projects.*
[3] Department of Transport, 2021. *Westport.*

Table 2 - City of Rockingham Economic Snapshot

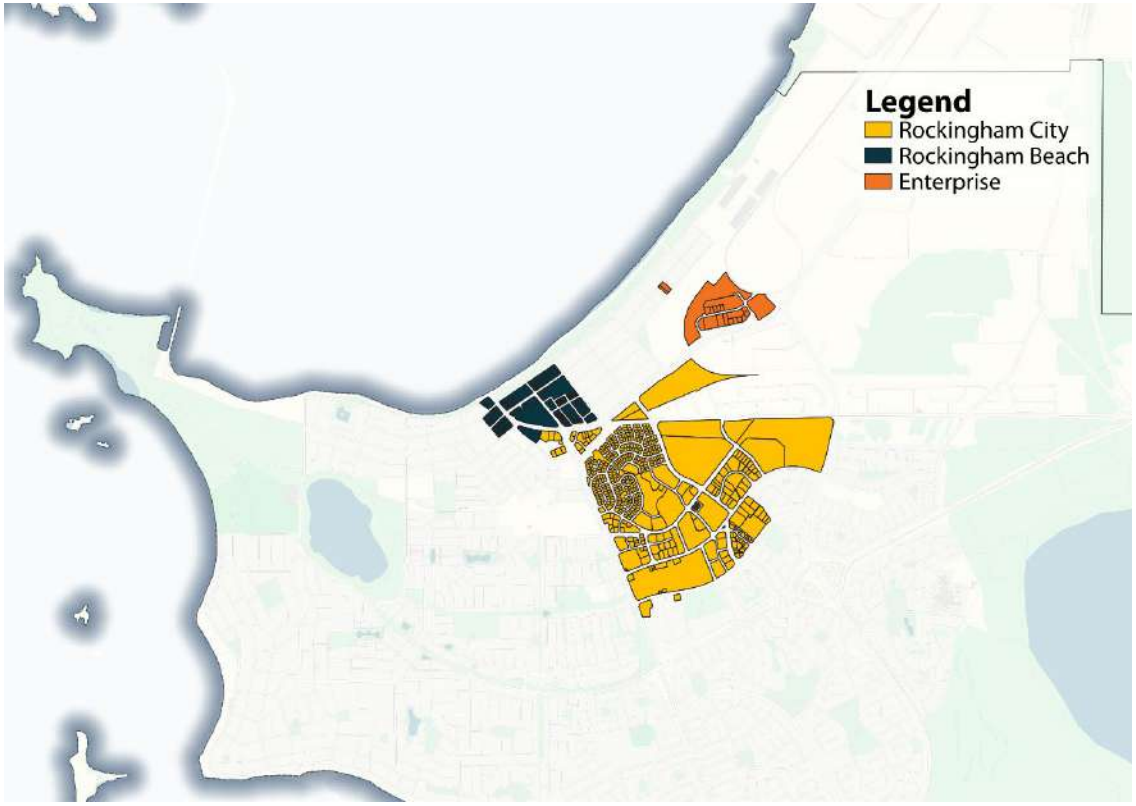
Metric	Trends
Businesses	• The number of total businesses was 5,500 in 2020. • The number of businesses in Rockingham has been increasing since June 2018. The increase of businesses is demonstrated by a decreased number of cancelled businesses, and a stagnant number of new GST registration each year. If the trend continues, additional economic output will result. • Construction businesses dominate in Rockingham (24% of all businesses), followed by Professional, Scientific and Technical Services (10%); and Transport, Postal and Warehousing (9%).
Important **traded** industries for the City	• The defence industry provides approximately 2,500 jobs and has an Employment Concentration Factor of 11.53, which is an indication that the City has a regional advantage in this industry. • The future of Westport in Kwinana has the opportunity to create another regional competitive advantage driving employment.
Important **local** industries for the City	• Local Education and Training. • Local Households Goods and Services. • Local Hospitality Establishments. • Local Food and Beverage Processing and Distribution. • Local Retailing of Clothes and General Merchandise. Together, these industries provide 10,300 jobs.

Source: ABS census 2016. Economy.id. 2020.

Floor space

There are two commercial complexes within the boundary area of RSC - Rockingham City and Rockingham Beach (see Map 1). Rockingham City is the biggest activity centre, consisting of the Rockingham Centre which is a large shopping centre offering a wide range of stores, entertainment, and dining options. Rockingham Beach is located by Rockingham's foreshore and has more residential floor space than any other precinct, offering a more diverse set of business offerings. The floorspace breakdown by planning land use category (PLUC) code is shown in Table 3 and illustrated in Figure 3.

Map 1 – Commercial complexes within Rockingham RSC.



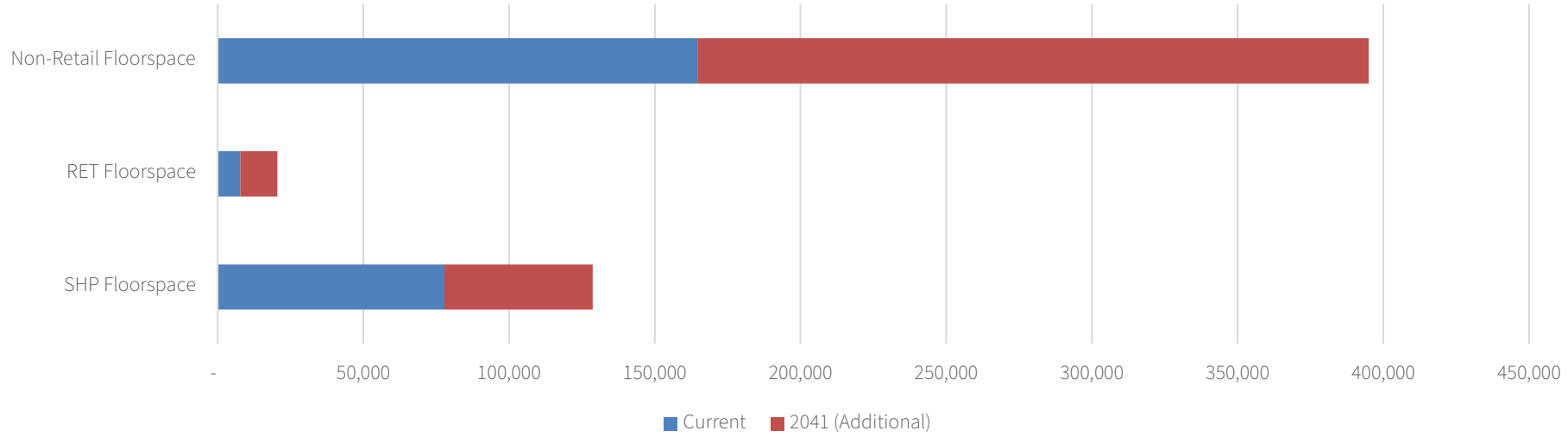
Source: City of Rockingham 2021.

Table 3- Current breakdown of floor space in Rockingham RSC by planning land use category (PLUC).

PLUC	Code	Rockingham Beach	Rockingham City
Entertainment/Recreation/Culture	ENT	14%	11%
Health/Welfare/Community Services	HEL	10%	25%
Manufacturing/Processing/Fabrication	MAN	1%	0%
Office/Business	OFF	13%	21%
Residential	RES	33%	1%
Other Retail	RET	1%	4%
Service Industry	SER	0%	2%
Shop/Retail	SHP	28%	32%
Storage/Distribution	STO	0%	1%
Utilities/Communications	UTE	0%	3%
TOTAL OCCUPIED FLOORSPACE (sqm)		49,815	200,416
TOTAL VACANT FLOORSPACE (sqm)		4,230	8,397

Source: DPLH 2016.

Figure 2– Floors space needed in the MNC based on current ratios by 2041



Source: DPLH 2016, City of Rockingham *Draft* LCACS assessment 2021.

For the City to keep these ratios constant, they need to accommodate an additional 294,000 m^2 of floor space to be distributed throughout the precinct based on the City's population forecast; or 171,200 m^2 based on the WA tomorrow's forecast. It is important to meet these targets to ensure that there will be sufficient floor space to accommodate future residents, workers, and visitors. If the City fails to keep these ratios, it may lose its ability to accommodate and service the additional population.

8. DEFINING SUCCESS

Environmental scan

This chapter explores alignment between strategic priorities identified in Chapter 2 and the resilience themes from FAR Lane's assessment. For an activity centre to be successful, potential future impacts play a significant role. Therefore, it is important to have a good understanding of the external environment and ongoing trends that will impact the demand for future activity centres various offerings.

General points to consider include:

- Current environment – COVID-19 has changed the world, particularly regarding online offerings (see below) and a strong increase in the number of people working from home.
- Technological forces – Technology has made it more viable for people to access services and offerings online, which has significantly impacted the way people shop. For example, people can get anything from groceries to clothes online. The pandemic has strengthened this trend, which has impacted demand for many retailers in activity centres.
- Sociocultural factors – Demographics must be considered. This includes population growth, age, sex distribution, immigration rates, and changes to personal incomes that influence demand for types of services, retail, recreational and service offerings.
- Environmental factors – The importance of the environment and sustainability has been a growing theme around the world. People tend to be more aware of our planet and are valuing ethical and sustainable products more highly.

Determining Rockingham's Uniqueness, Connectivity, and whether it is Fit-for-purpose

As outlined in Section 4 above, competitiveness is the foundation for attracting and retaining investment and creating wealth in an economy; while resilience allows economies to sustain themselves through external shocks and economic disruptions. Examining the Precinct Structure Plan's Uniqueness, Connectivity and whether it is Fit For Purpose allows us to assess whether it will increase the RSC's competitiveness and resilience, and therefore its likelihood of achieving the City's strategic vision.

Rockingham's Uniqueness

Uniqueness is a driver that has a strong differentiating effect, creating authenticity and character for a precinct and attracting visitors.

Current state

Rockingham RSC has several factors that make it unique:

- A recently revitalised foreshore precinct on a calm, family-friendly beach that is Perth's primary north-facing waterfront area.
- Being a jump-off point for accessing Cape Peron, Penguin Island and other nearby islands.
- Proximity to Garden Island Naval Base.
- Access to major logistics and industrial hubs, including Kwinana and Henderson.

Desired future state

- To be a premier coastal destination by diversifying the City's economy and unique offerings.
- To support business development initiatives throughout the City.
- To identify and attract conferences and high-profile business and sporting events to the City.

Key success factors for the Precinct Structure Plan

The City is already actively emphasising and promoting its most unique feature – its popular beach foreshore. Potential exists to further leverage its beachfront location by developing unique offerings (shops, experiences, recreations facilities, events, etc.) that are not available at other rival beachfront locations in Perth. Therefore, the PSP should consider floor space and recreational area allocations that promote smaller retail spaces and activities that promote boutique micro-retail offerings.

Rockingham's beachfront infrastructure is not well connected to other Rockingham hubs, particularly the Rockingham Centre and train centre. Therefore, the PSP should promote land use for high-density residential uses (including apartments and aged care facilities) to fill in currently vacant spaces between the two hubs. Increasing available residential options would also provide choices for workers who wish to live locally and commute to the Kwinana and Henderson industrial centres, and Garden Island Naval Base.

Rockingham's Connectivity

Connectivity makes precincts more easily accessible for residents, workers, and tourists. This includes public transport networks, pedestrian and bike paths, accessibility through universal design, and digital connectivity.

Current state

- Rockingham has good public transport connections to the greater Perth area via the Mandurah train line, as well as the high-frequency shuttle services providing regular links between the train station, Rockingham Centre, and the beachfront. However, within the RSC, 76% of employed persons drive to work, likely resulting from insufficient public transport linkages and a lack of a diverse set of employment opportunities.
- The current PSP is misaligned with the desire for a high-density centre by not utilising existing land (noting that some are put aside for longer-term developments). Higher density will help create vibrancy by making amenities and services more cost-effective.
- The City considers some universal design aspects through its Disability Access and Inclusion Plan, including beach access, charging stations for mobility scooters, and auditing infrastructure accessibility.
- The NBN is available in Rockingham, predominantly through fibre-to-the-node technology.

Desired future state

- A well-connected city with strong public transport options and bike paths, including employment centres in Kwinana and Henderson.
- Alignment with CoR's forthcoming Disability Access and Inclusion Plan 2022-2026, including universally accessible infrastructure.
- Strong digital connectivity, including facilitating fibre-to-the-premises and free public Wi-Fi in key precincts, to support business development and public engagement.

Key success factors for the Precinct Structure Plan

- Allow interim uses for empty lots for sites current set aside for long term development.
- Supporting public transport and bike lane infrastructure both to and within the RSC, and beyond.
- Developing universally accessible infrastructure to help Rockingham tap potential residential aged care and disability services markets, as well as allowing current ageing residents to age locally.

Rockingham being Fit For Purpose

Being Fit For Purpose means ensuring a place has the right quality products, services, infrastructure to deliver on its vision. While Rockingham's unique attributes (including its beachfront location) will attract people, being Fit For Purpose means visitors and residents will be more inclined to spend their time, money and energy in Rockingham.

Current state

Rockingham's beachfront hub is well designed to support tourists and residents. However, as noted above, it is disconnected from the rest of the City. The Rockingham Centre, while functional, does not differentiate itself from other large shopping centres.

Desired future state

- Facilities and services that build on Rockingham's current attractions and allow visitors to increase both the number and duration of their trips.
- Amenities that result in residents not having to leave Rockingham to fill currently unmet needs.
- Meeting the needs of an increasing population in terms of local employment targets, social services, and other demands from residents and workers.

Key success factors for the Precinct Structure Plan

- Promoting short stay accommodation options near the beachfront to encourage overnight tourism.
- Increasing diversity in housing options to provide greater lifestyle options at different life points.
- Targeted infrastructure that maximises and supports events.
- Creating interim uses for sites current set aside for long term development.
- As noted above, creating sufficient additional floor space uses (both near the beach, and in other parts of the RSC) to realise a diverse and unique set of offerings for a wide range of users, including boutique micro-retail offerings. Indicative ratios of the need for future floorspace (by 2041) have been calculated based on population numbers and are identified in Table 4 below.

Table 4 – Additional retail and non-retail floorspace needed by PLUC 2041 based on WA Tomorrow forecast and CoR forecast

	Shop/Retail		Other Retail		Non-Retail Floorspace		Total	
	Low	High	Low	High	Low	High	Low	High
Enterprise	-	620	8,376	14,175	1,880	2,241	10,256	17,037
Rockingham City	2,238	45,329	6,352	12,247	150,887	212,556	159,477	270,133
Rockingham Beach	-	5,588	173	386	11,554	17,839	11,727	23,813
Total	2,238	51,538	14,901	26,809	164,321	232,636	181,460	310,982

Source: WA Tomorrow 2015, DPLH 2016, City of Rockingham 2021.

Low forecasts in Table 4 are based on WA Tomorrow's population forecast, while high forecasts are based on the City of Rockingham's forecasts.

9. IMPACT ASSESSMENT

Having reviewed the City's strategic documents and considered the relevant data, FAR Lane considers the following to be the key economic issues for the RPSP to address:

1. Lack of density.
2. Meeting the needs of a growing population.
3. Increasing employment needs.
4. Underdeveloped tourism visitation.

FAR Lane has examined these four issues based on the above framework to examine their key success factors, potential PSP Responses, and impacts. The results are summarised in Table 5.

Table 5 – Economic Impact Assessment

Issue	Key Success Factor	PSP Response	Impact
Lack of density			
• Currently, the RSC is underutilising space, which discourages vibrancy. • Rockingham's beachfront infrastructure is not well connected to other Rockingham hubs, particularly the City Centre and Rockingham Station.	• Using available land for high-density purposes, including consideration for interim uses on key developments sites to stimulate activity. • Supporting public transport and active transport infrastructure both to and within the RSC and beyond. • Diversity of offerings for residents, workers and visitors.	• Supporting high-density development. • Provide enhanced pedestrian, bike and public transport infrastructure providing better connectivity between key precincts throughout the RSC. • Better utilisation of unused land by introducing interim uses for long-term development sites.	• Improved housing density and diversity, leading to a greater range of amenities, activities, and increased vibrancy. • Improved employment opportunities. • Increased tourism visitation and spend.
Meeting the needs of a growing population			

• Insufficient capacity to service an extra 93,000 residents by 2041. Including: • Demand for secondary schooling and aged care. • Service and retail needs for young families. • A retail floor space gap between 17,140 m^2 (WA Tomorrow) and 78,300 m^2 (City forecast).	• Being able to meet the demand for a growing population by providing a diversified set of offerings and services for the local community. • Ensuring that there will be sufficient floor space to cater for the needs of an increased population. • Developing universally accessible infrastructure.	• Provide diversified floorspace with emphasis on fit-for-purpose, accessible and unique offers. • Planning for required amenities including schools and medical facilities. • Plan for a population with a lower proportion of high-income earners compared to Greater Perth. • Provide a range of housing options, including high and medium density. • Planning that requires universal accessibility.	• A precinct that meets the residential, retail, and employment requirements for its increasing number of residents. • Increased economic activity through new retail opportunities, and tapping aged care and other emerging markets.
Increasing employment needs			
• A gap in office floor space gap between 30,500m^2 (WA Tomorrow) and 52,700 m^2 (City forecast). • Current lack of office space and start-up infrastructure. • Employment opportunities are concentrated among a few industries making the RSC vulnerable to external shocks.	• Supporting business environment, including for startups. • Creating sufficient additional floor space (in employment precincts) to realise a diverse and unique set of offerings for a wide range of users, including boutique micro-retail offerings. • Office and event space with good linkages to other	• Plan for office precincts and environments which promote creativity, startups, and innovation. • Providing land opportunities for businesses to create jobs by leveraging the local defence industry; and Kwinana and Henderson supply chains.	• More businesses want to operate in the RSC due to the favourable business environment which exists there. • A variety of new businesses and startups emerge. • The City becomes an important hub for the defence industry that brings professionals and skills from across the world.

	business precincts as well as to transport linkages. • Space where local businesses can network and meet.		• New businesses have been established due to supply chain opportunities from Kwinana and Henderson. • New infrastructure that maximises and supports events creates new jobs.
Underdeveloped tourism visitation			
• Insufficient supply of short-stay accommodation in the RSC. • Non-unique tourism attractions. • Lack of infrastructure for major conferences.	• Short and long-term accommodation options. • Unique tourism attractions and event conference facilities, underpinned by the City's coastal location, and are not found in other Perth beachfront locations.	• Plan for increased short stay accommodation. • Diversity in floorspace with emphasis on uses, including boutique micro-retail offerings. • Promoting the development of major conference facilities.	• Increased tourism, including overnight stays. • Major conferences are held in the RSC.

Source: WA tomorrow 2015, ABS Census 2016, City of Rockingham *draft* LCACS assessment.
Full non-retail floorspace breakdown is provided below in the Technical appendices.

By addressing the four key issues as outlined above, PSP will help the RSC's economy to be resilient and competitive, and thereby deliver long-term economic prosperity.

10. TECHNICAL APPENDICES

Below is the full breakdown of additional expected non-retail floorspace by 2041 based on WA tomorrow's forecast being **low**, and the City of Rockingham's forecast is **high**.

Table 5 – Breakdown of non-retail floorspace needed by 2041

	Entertainment/Recreation/Culture		Health/Welfare/Community Services		Manufacturing/Processing/Fabrication		Office/Business		Service Industry		Storage/Distribution		Total	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	**Low**	**High**
Rockingham	12,424	23,438	92,576	109,614	5,783	8,699	25,632	45,536	9,948	16,238	4,524	9,031	**150,887**	**212,556**
Rockingham Beach	3,664	5,955	1,936	3,150	1,812	2,348	3,905	5,977	-	-	237	407	**11,554**	**17,839**
Total	16,088	29,393	94,511	112,765	7,595	11,047	29,538	51,513	9,948	16,238	4,760	9,438	162,441	230,395

Source: WA tomorrow 2015, DPLH 2016, City of Rockingham 2021.

11. REFERENCE LIST

Porter, M., (1990). "The Competitive Advantage of Nations". *Harvard Business Review.* Retrieved from: https://hbr.org/1990/03/the-competitive-advantage-of-nations

FAR lane

Site-specific Viability Assessment

City of Rockingham

16 December 2021

1. TABLE OF CONTENTS

1. Table of Contents 2
2. Reliance and disclaimer 3
3. Purpose and scope 4
4. Introduction 5
5. Site assessment methodology 7
6. Case studies – interim site uses and modular buildings 10
7. Site assessments 12
Site 1 - City Centre 12
Site 2 – Waterfront village 18
Site 3 – Coastal lots 23
8. Key take-aways 28
1. Technical appendices - Economic assessment framework 29

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Revision	Date	Prepared By	Approved By
First Draft	13/12/2021	Linnea Edebert and Giles Tuffin	Jason McFarlane
Final	16/12/2021	Linnea Edebert	Jason McFarlane

3. PURPOSE AND SCOPE

The purpose of this draft report is to provide the City of Rockingham (the City) with high-level site-specific viability assessments of three locations identified by the City. This work forms part of FAR Lane's contribution to inform the City of Rockingham's Precinct Structure Plan (PSP) for the Rockingham Strategic Centre (RSC). This work supplements the Economic Resilience Framework developed by FAR Lane for which also complemented the PSP and RSC (see Technical Appendices).

The focus of this report is to prepare an indicative commercial viability model for each of the three sites. This will be based upon benchmark asset yields and sales prices to determine whether they are likely to attract capital investment.

4. INTRODUCTION

The City, via consultants Hames Sharley, has nominated three sites to be assessed for commercial viability.

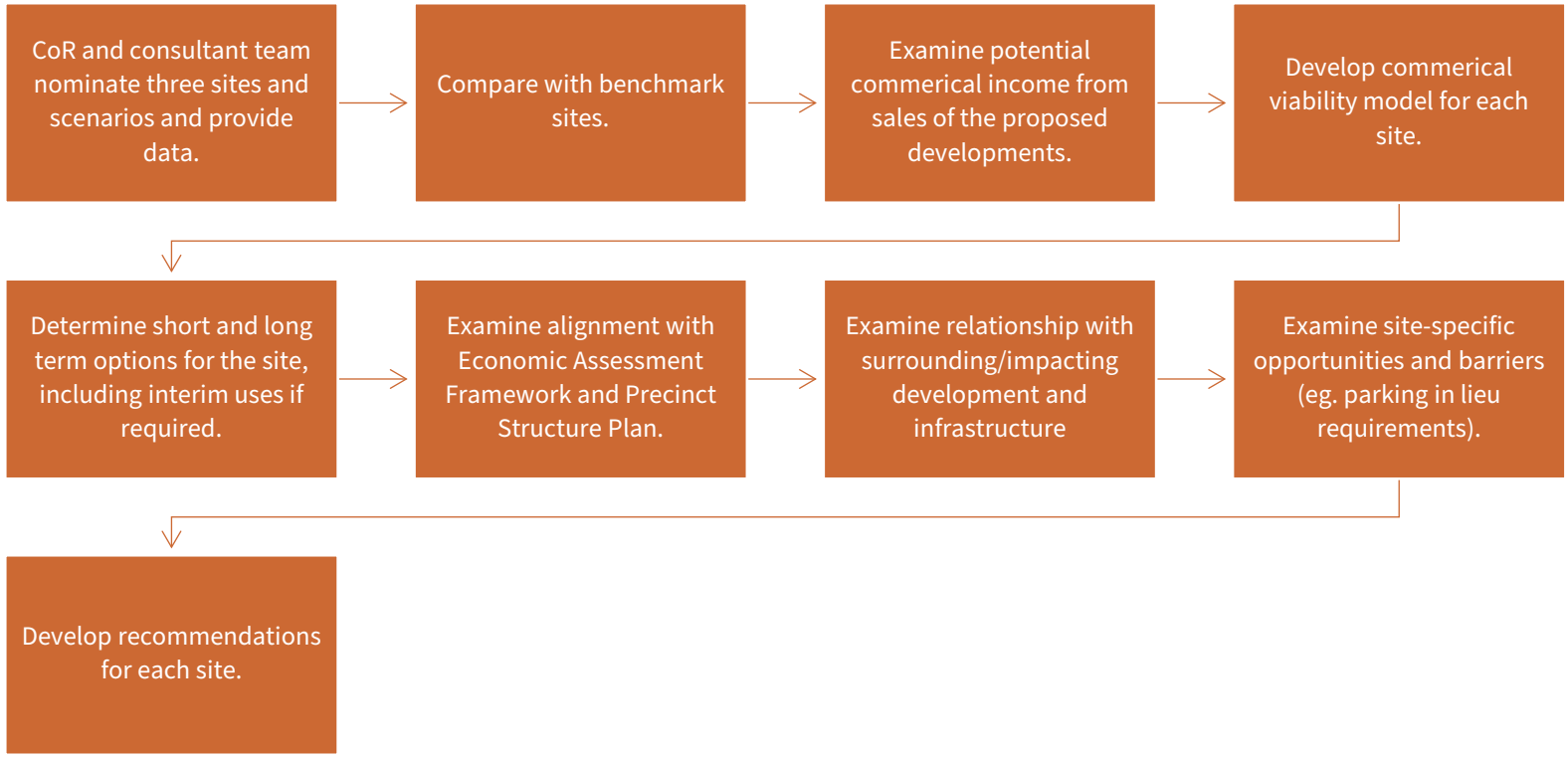
1. Lot 201, City Centre - a large block nominated for mixed-use.
2. Lot 20-26 Rockingham Beach Road – a waterfront block nominated for apartments.
3. Lot 190-191 Lewington Street – a residential block nominated for low rise apartments.

This report conducts a commercial viability model for each site that seeks to answer the following question:

"Would a rational investor see short term moderated risk opportunity in the development of this site under the nominated scenario?"

Answering this question is a practical approach to determining whether each scenario is commercially viable. This is achieved through the following logic.

Figure 1 – FAR Lane commercial viability assessment model



5. SITE ASSESSMENT METHODOLOGY

Assessments have been considered based upon State Planning 7.2. Precinct Design Guidelines' economic, social, and environmental feasibility requirements. This includes long- and short-term options, market conditions, current development proposals, employment and business opportunities, landscape, infrastructure and existing built form (DPLH 2021).

The guidelines identify the following desired characteristics for Strategic Metropolitan Centres:

- Diversity of uses in the activity centre.
- A full range of economic and community services for the community and catchment residents.
- Focus on public transport networks.
- Wide range of retail types.
- The attraction of major offices and state government agencies.
- Walkable catchment distances of 800 metres.

Methodology

Net Present Value (NPV) is used to assess the commercial viability of each site. NPV is determined by:

- Calculating costs (negative cash flows) and benefits (positive cash flows) over separate individual periods (years).
    - Cost includes the cost of land, building and parking spaces (see below).
    - Benefits include revenues from sales.
- The Present Value (PV) of each period's net cash flow is then determined by discounting its future value at a given rate of the market return. Three discount rate scenarios of 5%, 7% and 10% have been modelled to reflect variability in market prices, inflation, and other variables.
- Summing each discounted PV gives the NPV.

Commercial viability is achieved if the net present value of the project is positive. When comparing projects, the project with the highest net present value is preferred.

The NPV in this assessment does not consider the cost of capital (i.e. interest rates). The more debt that is used to finance a project the riskier it becomes. Consideration is required to ongoing cash flows and the ability to pay interest and amortisation of loans.

Other considerations are:

- The model is high-level and does not consider all elements subjected to development.

- Negative cash flows include the following:
    - Land value has been extracted from Landgate as the unimproved land value for the exact lots, or lots next to the assigned lot. Note that the unimproved land value used is a conservative estimate.
    - Construction costs, which are estimated from the BMTQS Construction Cost Table.
    - Parking in lieu requirements (see below)
- Positive cash flow comes from property sales. Benchmark sites have been nominated by Hames Sharley for comparison with the three sites listed below. The sales price for these benchmark sites has been used to determine the approximate sales prices of the nominated sites.
- The model does not directly consider changing market conditions such as inflation, shocks, or different investment approaches.
- All NPV figures assume that the benchmark development was profitable and that similar market conditions exist for the availability of similar properties.

Parking in Lieu (PIL) Requirements in the City of Rockingham

Developments that have car bay shortfalls can be required to make parking-in-lieu payments. This funding allows the local government to develop car bays in other locations to make up for the shortfall. The City states the following:

"The cash-in-lieu payment shall not be less than the estimated cost to the owner or developer of providing and constructing the parking bays required by TPS2, plus the value, as estimated by a sworn valuer appointed by the Council, of that area of his land which would have been occupied by the parking spaces and manoeuvring area".[1]

The following formula has been used to calculate PIL costs:

$$\text{PIL} = (Construction\ cost\ per\ bay) + (land\ value\ x\ car\ bay\ shortfall\ m2)$$

Construction costs per bay vary depending on the type of parking. The land value component differs largely between locations and needs to be valued by a licensed land valuer. Estimations for the construction cost for a 30m^2 car bay (accounting for the car bay, aisle and vehicle access) for various parking options are:

- At grade: $4,500.

[1] City of Rockingham *PLANNING POLICY No.3.3.4 CASH-IN-LIEU OF CARPARKING*

- At grade multi-storey: $30,000.
- Underground/Basement parking: $60,000.[2]

[2] Source: The estimations are taken from DPLH based on a case study done about PIL schemes in Perth and Peel.

6. CASE STUDIES – INTERIM SITE USES AND MODULAR BUILDINGS

Modular buildings have significant advantages compared to traditional construction. They are quicker and cheaper to build, significantly reduce construction waste, can be recycled or repurposed, or simply moved to a new location.[3] Modular buildings can also be used for a wide variety of purposes, including short-stay accommodation, build-to-rent apartments, and pop-up shopping and entertainment precincts. Modular buildings, therefore, provide significant advantages for interim uses for sites the City may wish to keep aggregated for future developments.

Below are two relevant examples of modular constructions that could be emulated by the City for interim uses.

BOXPARK

Launched in London in 2011, BOXPARK is a pop-up precinct built from shipping containers. The precinct combines shopping, eating, drinking, and entertainment, but differently from a traditional shopping centre. Street food is served through a permanent food market, both familiar and independent retail brands are featured, and ag-tech production facilities and a micro-brewery are present. Entertainment events are also held, such as concerts, DJ workshops, and classes with celebrity chefs. BOXPARK has subsequently opened two further sites within London.



Source: Retail & Leisure International, 2021.



Source: Pinterest, 2021.

[3] Blagg, Linda, Video – Modular Manufactured Building, 2014, https://www.hougoumonthotel.com/old--new-collides, last viewed 10 December 2021.

Hougoumont Hotel

The Hougoumont Hotel in downtown Fremantle features 37 luxury rooms made from shipping containers, combined with the built-form of the former Duke of York Hotel (est. 1901). The rooms were constructed in Thailand and shipped to Perth, where they were erected in four days on-site. The hotel also features a bar, microbrewery, event space, and conference facilities.



Source: Time Out 2017.



Source: Hougoumont Fremantle 2021.

7. SITE ASSESSMENTS

Site 1 - City Centre

The site development is proposed as residential mixed-use, potentially with commercial or retail ground floor offerings on Whitfield Street. The development is required to provide a strong presentation to the street with a nil setback and expansive glazing.

Table 1 - Site overview

Site	Street address	Sub Precinct	Proposed zoning	Existing density	Proposed density
Lot 201, City Centre Large, currently vacant block.	Whitfield Street	P6 - Southern residential	Mixed-Use - RAC - 0	1555	3299

The site has been proposed with two options summarised in Table 2.

Table 2 – Options descriptions

Option 1 – 4 Storeys and decked at grade parking	Option 2 – 8 Storeys and Basement parking
50 apartments • 15 x 1 Bedroom • 30 x 2 Bedroom • 5 x 3 Bedroom 85 car bays	140 apartments • 42 x 1 Bedroom • 74 x 2 Bedroom • 14 x 3 Bedroom 218 car bays

Commercial viability

The construction cost variability changes with density, due to lifts and depending on the type of parking. The analysis makes the following assumptions about the cost per m^2 for the 4- and 8-unit respectively.

Table 3 – Cost per sqm assumptions between a 4- and 8-Storey development.

Density	Cost per sqm ($)

4 Level	$2,580
8 Level	$2,849

Source: BMTQS 2021 *Construction Cost Table*

Option 1 – 4-Storey development

The below analysis suggests a 4-storey development has an NPV of up to $1,078,729 which is attractive for developers.

The sales price for apartments within this development is based on a benchmark site nominated by Hames Sharley. It is the Radius Rockingham development on 95 Chalgrove Avenue in the City Centre. Based on the current market the estimated revenue from sales are:[4]

- 1 Bedroom: $250,000
- 2 Bedroom: $320,000
- 3 Bedroom: $400,000

Table 4 –Cash flow analysis and net present value (NPV) of the project for the 4-level development

	Year 0	Year 1
Capital expenditure (Capex)		
Cost of land	$ 719,583	
Building	$ 10,216,800	
Car park	$ 2,550,000	
	$ 13,486,383	
Revenue from Sales		
3 Bedroom		$ 2,000,000
2 Bedroom		$ 9,600,000
1 Bedroom		$ 3,750,000

[4] Source: FAR Lane research based on Realestate.com.au, 2021, https://www.realestate.com.au/buy/property-unit+apartment-in-rockingham,+wa+6168/list-1

Present Value	-$ 13,486,383	$ 15,350,000

Discount rate	NPV of project
5%	$ 1,078,729
7%	$ 803,189
10%	$ 425,603

Source: BMTQS 2021 *Construction Cost table*, DPLH 2021, Landgate 2021, Far lane 2021.

Table 5 - Economic Impact from construction costs of 4-storey development

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect
Output ($M)	$13.40	$8.80	$2.15	$24.35
Employment (Jobs)	23	20	7	50
Wages and Salaries ($M)	$1.94	$1.81	$0.49	$4.24
Value-added ($M)	$4.26	$3.20	$1.26	$8.72

Source: Remplan 2021

Construction of the 4-story development shows a good economic impact for Rockingham's economy, contributing to an additional total effect of approximately $24 million in output and an additional 50 jobs (FTE).

Option 2 – 8-Storey development

The below analysis shows an 8-storey development has an NPV of up to -$1.5 million which is not attractive for developers. Due to additional costs of constructing basement parking, as well as the expected revenues achieved from sales, the construction cost per m^2 must be less than $2,759 for the development to be commercially viable.

This negative NPV is largely influenced by Rockingham's current property market with lower sale prices. Therefore, this type of development may be more feasible in the future when the MNC is more developed and becomes more attractive for individuals.

The sales price for apartments within this development is based on a benchmark site nominated by Hames Sharley. It is the Radius Rockingham

development on 95 Chalgrove Avenue in the City Centre. Based on the current market the estimated revenue from sales are:[5]

- 1 Bedroom : $250,000
- 2 Bedroom: $350,000
- 3 Bedroom: $450,000

These sales prices are slightly higher compared to the 4-storey development as the market suggests that sale prices for apartments on higher levels are worth more. Likely as a result arising from better window/balcony views.

Table 6 - Cash flow analysis and net present value (NPV) of the project for the 8-storey development

	Year 0	Year 1
Costs (Capex)		
Cost of land	$ 719,583	
Building	$ 29,253,532	
Car park (*at grade)*	$ 1,500,000	
Car park (*underground)*	$ 10,080,000	
	$ 41,553,115	
Revenue from Sales		
3 Bedroom		$ 6,300,000
2 Bedroom		$ 25,900,000
1 Bedroom		$ 10,500,000
		$ 42,700,000
Present Value	-$ 41,553,115	$ 42,700,000

Discount rate	NPV of Project
5%	-$ 844,236
7%	-$ 1,538,853

[5] Source: FAR Lane research based on Realestate.com.au, 2021, https://www.realestate.com.au/buy/property-unit+apartment-in-rockingham,+wa+6168/list-1

10%	-$ 2,486,302

Source: BMTQS 2021 *Construction Cost table*, DPLH 2021, Landgate 2021, Far lane 2021.

Table 7 - Economic Impact from construction costs of 8-Storey development

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect
Output ($M)	$41.50	$27.94	$6.83	$76.28
Employment (Jobs)	74	63	22	159
Wages and Salaries ($M)	$6.17	$5.74	$1.56	$13.46
Value-added ($M)	$12.58	$10.11	$4.01	$26.71

Source: Remplan, 2021.

Although the development is not commercially viable currently, the construction of the 8-story development shows a strong overall economic impact on Rockingham's economy, with an additional total effect of approximately $76 million in output and up to 159 additional jobs (FTE).

Strategic alignment

- Uniqueness – A development of this size and density would add to Rockingham's uniqueness.
- Connectivity – located close to the RCCTS route, and is within walking distance from Rockingham Centre. Walking or cycling to the foreshore is difficult.
- Fit for purpose – aligns with the City's objectives of achieving a more consolidated urban form, and facilitating an increased number of people both living and working in the same place.
- Infrastructure – Close to Rockingham Centre.

Interim uses

Due to the low NPV for Option 2, this lot is well suited to interim uses. Options to keep the site aggregated for future development for up to approximately 25 years are summarised in Table 8.

Table 8 – Interim uses options for City Centre lot.

	Short stay accommodation	Pop-up commercial lease	Dedicated space for public markets and festivals	Public open space	Car park	Arts and crafts precinct and studios	Modular build-to-rent accommodation
Suitability	Medium	Good	Good	Low	Good	Good	Good
Notes	The site is a long distance from the waterfront, so may not be popular with tourists.	BOXPARK-like facility would create vibrancy and act as a drawcard to the city centre.	Help create vibrancy in the city centre.	Suitable, but Rockingham is not short of public open space.	Provides extra car parking for the city centre.	Help create vibrancy in the city centre.	Create density and improved accommodation options in the city centre.

Opportunities and barriers

- Keep open to multiple and mixed uses.
- Constructing basement car parking may become viable over the longer term.
- Use strict street activation controls to bring vibrancy, including having commercial space on the ground floor.
- Consider interim uses (see above) to keep the block aggregated for long term development.

Summary of commercial viability

- Option 1 (4-storeys) - evidence suggests a moderate risk-tolerant investor would regard this scenario as a potentially attractive investment.
- Option 2 (8-storeys) – evidence suggests a moderate risk-tolerant investor would *not* regard this scenario as a potentially attractive investment.
- However, Option 2 may be viable in the long-term depending on future property prices which will be impacted by future demand.
- Construction cost variability between the sites becomes higher with height - see construction cost table.
- Interim uses that keep the site aggregated should therefore be considered.

Site 2 – Waterfront village

Table 9 – Site summary

Site	Street address	Sub Precinct	Proposed zoning	Existing density	Proposed density
Lot 20-26 Rockingham Beach Rd Multi-storey apartments on the beachfront.	51 Rockingham Beach Rd	P2 Waterfront village	Mixed Use - RAC - 0	1097	3787

The site has been proposed by Hames Sharley as:

- 450sqm net lettable commercial space.
- 95 apartments total [5 x 3 Bedroom, 62 x 2 Bedroom, 28 x 1 Bedroom].
- 162 Car bays (Private) based on 2 per 2 & 3 bedroom apartment, and 1 bay per 1 bedroom apartment, parking over 4 levels (basement, ground, L1, L2)]

Construction costs have been estimated from BMTQS Construction Cost Table.
The sales price for apartments within this development are based on prices of the current property market for similar developments:[6]

- 1 Bedroom: $300,000.
- 2 Bedroom: $500,000.
- 3 Bedroom: $700,000.

Commercial viability

The below analysis shows the development has an NPV of up to $10.6 million which is an attractive investment for developers and investors.

Table 10 - Cash flow analysis and net present value (NPV) of the project for the Waterfront Village Site

[6] Source: FAR Lane research based on Realestate.com.au, 2021, https://www.realestate.com.au/buy/property-unit+apartment-in-rockingham,+wa+6168/list-1

	Year 0	1
Capex		
Cost of land	$ 3,002,429	
Building	$ 21,891,716	
Car park (At grade)	$ 3,660,000	
Car park (Basement)	$ 2,400,000	
	$ 30,099,445	
Revenue from sales[7]		
3 Bedroom		$ 3,500,000
2 Bedroom		$ 31,000,000
1 Bedroom		$ 8,400,000
Commercial		$ 1,346,797
		$ 42,846,797
Present Value	$ 30,954,145	$ 44,246,797

Discount rate	NPV
5%	$ 10,653,011
7%	$ 9,717,758
10%	$ 8,427,469

Source: BMTQS 2021 *Construction Cost table*, DPLH 2021, Landgate 2021, Far lane 2021.

Parking Considerations

Note that parking in lieu requirements do not apply to this area, as the Waterfront Village Sector is exempted from the policy due to the planning frameworks in place. The City states that only PIL payment is needed for cay bay shortfall:

- "In the case of residential development, the cash-in-lieu contribution shall be the visitor allocation as per the Residential Design Codes.

[7] Source: FAR Lane research based on Realestate.com.au, 2021, https://www.realestate.com.au/buy/property-unit+apartment-in-rockingham,+wa+6168/list-1

- In the case of commercial or non-residential development, the cash-in-lieu contribution shall be a minimum of 60 per cent of the total number of parking spaces required.
- The number of parking spaces provided on-site may be reduced by the number of parking spaces provided through the cash-in-lieu."[8]

In other words, the residential developer does not have to consider car bays as per the City Centre due to the City's Transit Strategy. For commercial uses, PIL is applicable however at a 40% discount.

Based on considering parking for commercial uses, the following should be considered:

- Parking assets such as basement and decked car parks are capital intensive parking assets and are required to generate substantial revenue to realise a return on capital over time.
- Future technology and disruptive innovations are likely to change the need for parking as there will be new ways to travel. As result, there is significant uncertainty over future demand for parking, meaning a higher risk for capital intensive projects with long payback periods.
- At-grade parking may therefore be more suitable for commercial sites as it is the cheaper option and is easier for redevelopment.
- Opportunities for treatment of parking as an interim use that allows for redevelopment/alternative uses as transport technologies and disruptions evolve.

Table 11 - Impact Summary from Construction Costs

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect
Output ($M)	$30.00	$19.05	$4.64	$53.69
Employment (Jobs)	50	43	15	108
Wages and Salaries ($M)	$4.17	$3.91	$1.06	$9.14
Value-added ($M)	$10.12	$6.97	$2.72	$19.81

Source: Remplan 2021

Construction of the development shows a strong economic impact on Rockingham's economy - contributing to an additional total output of approximately $53 Million as well as an additional 108 jobs (FTE).

[8] City of Rockingham Planning *Policy 3.2.5 - DPP - Waterfront Village Sector* https://rockingham.wa.gov.au/forms-and-publications/planning-and-building/policies-and-procedures/planning-policy-3-2-5-development-policy-plan-wate

Strategic alignment

- Uniqueness – A development of this size and density would add to Rockingham's uniqueness and help the City build its brand of being a coastal destination, particularly if used for short stay accommodation.
- Connectivity – located close to the RCCTS route, and is within walking distance to the beach and foreshore precinct. Walking or cycling to the city centre is difficult.
- Fit for purpose – aligns with the City's objectives of achieving a more consolidated urban form; promoting the City as a coastal tourism destination; local business development.
- Infrastructure – close to waterfront precinct.

Interim uses

Table 12 - Interim uses options for Waterfront Village.

	Short stay accommodation	Pop-up commercial lease	Dedicated space for public markets and festivals	Public open space	Car park	Arts and crafts precinct and studios	Modular build-to-rent accommodation
Suitability	Good	Good	Low	Low	Low	Good	Good
Notes	Excellent proximity to the waterfront.	Hospitality options would create vibrancy. See case studies.	The adjacent Bell Park reserve already serves this function.	The adjacent Bell Park reserve already serves this function.	Ample car parking nearby. Fails to create vibrancy.	Helps create vibrancy at the waterfront precinct.	Create density and improved accommodation options in the precinct.

Opportunities and barriers

- Parking in lieu requirements does not apply in this area, meaning the developer does not have to follow the normal PIL scheme.
- Returns on sales are considerably higher for Site 2, creating more opportunities for the developer to build something unique and extensive.
    - With the same cost per sqm, the developer can construct at a higher price per sqm and still return a positive NPV. There is therefore scope for a larger development than nominated by Hames Sharley.

- The developer can budget for higher development costs and still be commercially viable. These margins may allow for a unique and exciting development.

Summary of commercial viability

- Evidence suggests a moderate risk-tolerant investor would regard this scenario as a potentially attractive investment.
- High property sales allow for higher development costs per sqm, allowing for a broader range of development/construction opportunities and still being commercially viable.

Site 3 – Coastal lots

Table 13 – Site Summary

Site	Street address	Sub Precinct	Proposed zoning	Existing density	Proposed density
Lot 190-191 Lewington Street Suburban development close to the waterfront.	10 Lewington St	P3 Coastal lots	Residential R80	536	1,762

The site consists of two lots with a laneway running behind it, and has been proposed as:

- Option 1 - Single Lot Apartments = 8 dwellings
    - 6 x 2 beds and 2 car bays
    - 2 x 1 bed and 1 car bay
- Option 2 - Amalgamated Lot Grouped = 16 dwellings
    - 12 x 2 beds and 2 car bays
    - 4 x 1 bed and 1 car bay

Construction costs have been estimated from BMTQS Construction Cost Table.
The following sales price for apartments has been used:

- 1 Bedroom: $300,000. [9]
- 2 Bedroom: $500,000. [10]

[9] Source: FAR Lane research based on Realestate.com.au, 2021, https://www.realestate.com.au/buy/property-unit+apartment-in-rockingham,+wa+6168/list-1
[10] Source: FAR Lane research based on Realestate.com.au, 2021, https://www.realestate.com.au/buy/property-unit+apartment-in-rockingham,+wa+6168/list-1

Commercial viability

Option 1 - Single Lot Apartments

The below analysis suggests the project has an NPV of up to $1 million, which would be attractive for developers and investors.

Table 14 - Discounted Cash Flow analysis and net present value (NPV) of the project for the Single Lot Apartment (Coastal lot)

	Year 0	Year 1
Capex		
Cost of land	$ 470,000	
Building	$ 1,452,220	
Car park (at grade multi-storey)	$ 420,000	
	$ 2,342,220	
Revenue from Sales		
2 bedrooms		$ 3,000,000
1 bedroom		$ 600,000
		$ 3,600,000
Total Cash flows		
Present Value	-$ 2,342,220	$ 3,600,000

Discount rate	NPV
5%	$ 1,034,620
7%	$ 955,389
10%	$ 845,916

Source: BMTQS 2021 *Construction Cost table*, DPLH 2021, Landgate 2021, Far lane 2021.

Table 15 - Economic impact from construction costs

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect

Output ($M)	$1.872	$1.275	$0.312	$3.459
Employment (Jobs)	$2.34	$1.38	$0.33	$4.05
Wages and Salaries ($M)	4	3	1	8
Value-added ($M)	$0.30	$0.28	$0.08	$0.66

Source: Remplan 2021.

Construction of the development shows a mild economic impact on Rockingham's economy contributing to an additional total effect of approximately $3.50 million in output as well as an additional 8 jobs (FTE).

Option 2 - Amalgamated Lot - Grouped

The below analysis shows the development has an NPV of up to $2.9 million, which is very attractive for developers.

Table 16 - Discounted Cash Flow analysis and net present value (NPV) of the project for the amalgamated development (Coastal lot)

	Year 0	Year 1
Capex		
Cost of land	$ 940,000	
Building	$ 2,904,440	
Car park	$ 840,000	
	$ 4,684,440	
Revenue		
2 beds		6,000,000
1 Bed		1,200,000
		7,200,000
Total Cash flows		
Present Value	-$ 4,684,440	$ 7,200,000

Discount rate	NPV
5%	$ 2,069,241

7%	$ 1,910,778
10%	$ 1,691,831

Source: BMTQS 2021 *Construction Cost table*, DPLH 2021, Landgate 2021, Far lane 2021.

Table 17 – Economic impact of development

Impact Summary	Direct Effect	Supply-Chain Effect	Consumption Effect	Total Effect
Output ($M)	$4.68	$2.75	$0.67	$8.10
Employment (Jobs)	7	6	2	15
Wages and Salaries ($M)	$0.60	$0.57	$0.15	$1.31
Value-added ($M)	$1.77	$1.02	$0.39	$3.19

Source: Remplan 2021.

Construction of the development shows a mild economic impact on Rockingham's economy, with the total effect of approximately $8 million in output as well as an additional 15 local jobs (FTE).

Parking bay considerations

- Underground parking is double the price as at grade multi-story parking. For underground parking to be viable it must be reflected in the returns of sales, which will be influenced by the demand for car bays.
- Improvements to Rockingham's public transport networks may impact this in the long term.

Table 18 - Parking cost variance for the amalgamated lot with 28 car bays.

	At grade	At grade multi-story	Underground
Cost per bay	$ 4,500	$ 30,000	$ 60,000
Total	$ 126,000	$ 840,000	$ 1,680,000

Source: DPLH 2021.

Strategic alignment

- Uniqueness – Higher density coastal lots will increase Rockingham's uniqueness. The block is also located next to Amawind Self Contained

Apartments, which suggests viability to host short stay accommodation and Air BNB facilities.

- Connectivity – located close to the RCCTS route, and is within walking distance to the beach and foreshore precinct. Walking or cycling to the city centre is difficult.
- Fit for purpose – aligns with the City's objectives of achieving a more consolidated urban form, and facilitating an increased number of people both living and working in the same place.
- Infrastructure – Close to the waterfront and several amenities such as the bowls club. Two storey apartments on the corner block (near bowls club) and the block behind, including some which are currently being used for short stay accommodation (see above).

Interim uses

Not applicable at this site as there is limited vacant land.

Opportunities and barriers

- Good location for Airbnb style short stay accommodation.
- Laneway gives broader car park development opportunities.

Summary of commercial viability

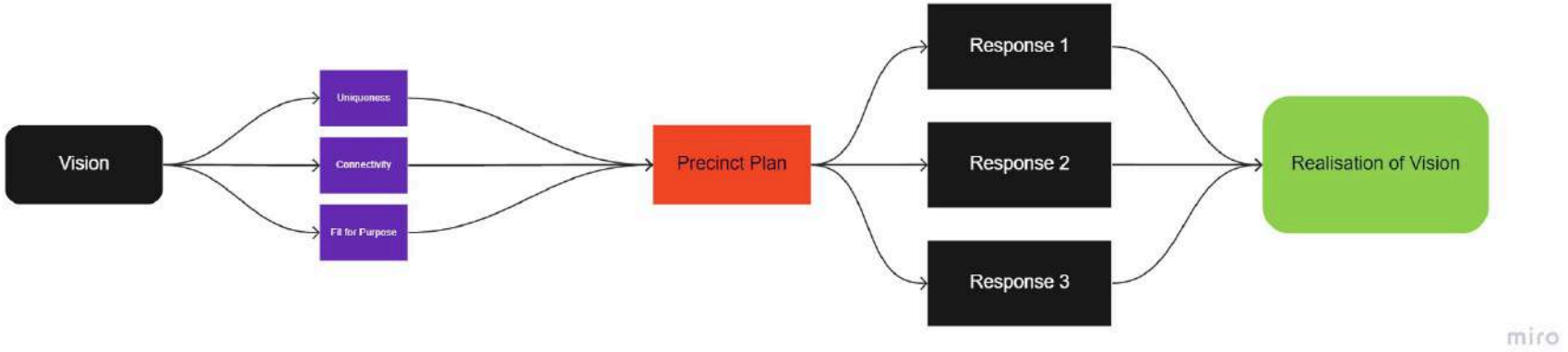
- Evidence suggests a moderate risk-tolerant investor would regard this scenario as a potentially attractive investment for both Option 1 (Single Lot of eight apartments) and Option 2 (Amalgamated Lot Grouped of 16 dwellings).
- Depending on project timeframes, good interim use for the lot is short-stay accommodation alternatives and modular build-to-rent accommodation.

8. KEY TAKE-AWAYS

- City Centre sales prices for apartments are currently not high enough to justify the construction of basement parking (noting this is not the case for the waterfront precinct, which is not subject to PIL). This may change in the longer term.
- Consideration of project timeframes is required to identify appropriate interim uses for vacant lots.
- Medium to long term interim developments can enhance vibrancy within the city centre and increase land and property values, until such time the project becomes feasible for development.
- Modular constructions provide cheaper and quicker development than regular construction that can also create vibrancy for interim use sites.
- Generally speaking, parking assets are capital intensive and requires generating substantial revenue to realise a return on capital over time. Future technology and disruptive innovations are likely to change the need for parking as there will be new ways to travel. Treating parking assets as an interim use allows for redevelopment/alternative uses as transport technologies evolve.

1. TECHNICAL APPENDICES - ECONOMIC ASSESSMENT FRAMEWORK

Figure 2 – Economic Assessment Framework



Source: FAR lane 2021.

The assessment framework is designed to ensure the PSP addresses the City's vision for the RSC. It consists of the following steps:

1. Understand the City's vision for the RSC and region.
2. Assess the RSC against the key criteria of Uniqueness, being Fit For Purpose, and Connectivity (see below) to determine alignment with the vision.
3. Outline the key responses in the PSP that will have the most impact in achieving the City's vision.

Examining the Precinct Structure Plan's Uniqueness, Connectivity, and whether it is Fit For Purpose allows us to assess whether it will increase the RSC's competitiveness and resilience, and therefore its likelihood of achieving the City's strategic vision.

Uniqueness - What a centre, place or economy has that others do not.

Uniqueness is an important foundation for utilising competitive advantages in industry specialisation (see below). Uniqueness is also important in terms of cultural diversification, including different lifestyles, preferences and needs of a population. Therefore, it is important to not impose a one-size-fits-

all approach to ensure all sections of society are catered for, and to create different and unique places. This results in increased and higher quality social and economic transactions. Uniqueness also provides a foundation to ensure a vibrant local business community that attracts start-ups and events, minimising consequences from external shocks. The Precinct Plan should therefore consider:

- What are the existing characteristics that can be leveraged to enhance its Uniqueness in the future? And on this basis:
- Does the proposed development contribute and enhance the economy and centre's Uniqueness?

Connectivity - How the resident catchment and other businesses interact and connect with the centre.

Connectivity is important for precinct development as it ensures local catchment residents can efficiently connect with businesses and services, and that the workforce can efficiently access their place of work. This supports a broader range of local employment options, resulting in increased competitiveness and resilience to shocks. The PSP should therefore consider:

- Does the proposed project have adequate public transport connection, footpaths, cycling infrastructure and roads?
- Does the proposed project enhance Connectivity to other precincts?
- Does the proposed project facilitate new, or utilise existing, infrastructure to meet the needs of current and future types of businesses?
- What are the Connectivity barriers related to the proposed project that could hinder access to markets?

Fit For Purpose - How a centre, place or economy meets the specific needs of a centre's residents, workers, businesses, and visitors.

For a centre to be Fit For Purpose, it needs adequate infrastructure, configuration and alignment that meets local needs and attracts activity to the centre. This helps provide a strong foundation for competitiveness. The PSP should therefore consider:

- Do the centre's current activities meet catchment residents' demands, and provide businesses and the workforce with adequate development opportunities?
- Does the current infrastructure and services attract and support investment?
- How does the centre align with Rockingham's activity centre hierarchy and economic development goals and objectives?

The three above characteristics can create a comparative advantage that leverages Rockingham's economy, eliciting an advantage in producing goods and services. Creating economic impact from exports or place-related opportunities depends on the local economy's capacity to leverage/develop comparative advantages. Therefore, supporting and developing sustainable comparative advantages is crucial to ensuring Rockingham's economy can

remain competitive (across both local and traded economies) and be resilient to future shocks. For Rockingham, this is particularly the case for further developing Defence and Road Freight industries.

The PSP should therefore consider:

- Does the activity enhance the industry's comparative advantages (existing or emerging) to support traded economy opportunities?
- Does the proposed centre enhance the characteristics and skillsets of the local workforce through infrastructure and employment?
- Does the proposal contribute to local land and natural resources that are relevant to industry comparative advantages?
- Does the proposal support productive and dynamic efficiency of businesses, effective density, anchor businesses/industries and amenitiesfor business, workers, and residents?

Rockingham Strategic Centre Infrastructure and Servicing Strategy

Rockingham Strategic Centre Precinct Structure Plan

CW1181500



Prepared for

Hames Sharley

16 December 2021

Cardno

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Executive Summary

Cardno has been engaged by Hames Sharley on behalf of the City of Rockingham to assist in preparing a Local Infrastructure and Servicing Strategy for the Rockingham Strategic Centre (RSC).

This study includes a review of the State Governments Planning Framework for RSC which includes the *Rockingham Strategic Regional Centre – Centre Plan (2010), Town Planning Scheme No.2* and a series of precinct based Local Planning Policies for sectors within the study area.

The Study Area is within the City of Rockingham. The RSC is bordered by Ennis Avenue to the east, Rae Road to the south, Read Street to the west and the Rockingham foreshore to the north.

The purpose of this study is to:

- Review the existing infrastructure and its current condition; and
- Identify any planned infrastructure upgrades and their impact to current assets

Stakeholder Engagement

Targeted stakeholder engagement was undertaken to ensure the desktop assessment for this project was based on the most current information available. Stakeholders contacted include:

> GAS - ATCO Gas;

> POWER - Western Power

> COMMUNICATIONS - AARnet Pty Ltd WA, NBN Co, Nextgen, Optus,Telstra, TPG and Vocus.

> POTABLE WATER - Water Corporation

> WASTEWATER - Water Corporation

> STORMWATER - City of Rockingham

Key Findings

Information on the RSC existing and planned infrastructure was collected and reviewed against the predicted demand to determine if further servicing infrastructure is required. The RSC precinct is divided into eight (8) Sectors, each with an associated Development Policy Plan (DPP). Utilities for each sector were investigated in addition to the utility requirement for the precinct as a whole.

It was found that significant gas, power, communications, water, wastewater and stormwater infrastructure will be required for proposed development within the City Centre (Precinct 1) and TOD Village (Precinct 4) due to vacant land being converted into medium to high-density mixed-use areas, carparks, urban squares, new roads and transit systems.

The mains utility infrastructure within the Waterfront Village (Precinct 2), Education (Precinct 7), Southern Residential (Precinct 6) and Coastal Lots (Precinct 3) sectors is typically consistent with the proposed development plans. An increase in capacity of utilities for the upgrade of residential and commercial capacity with the incorporation of medium to high-density mixed-use areas within some of these sectors will need to be investigated with relevant authorities upon development. Stormwater upgrades will be required for new roads and carparks within the Waterfront Village and Education precincts.

The City Park (Precinct 5) and Dixon Road (Precinct 8) sectors currently have no DPPs and hence future servicing requirements will need to be investigated further when these become available.

Table of Contents

Executive Summary iii
Abbreviations vi
1 Background 1
1.1 General 1
1.2 Methodology 1
1.3 Literature and Documents Reviewed 1
2 Study Area 2
2.1 Location 2
2.2 Rockingham Strategic Centre (RSC) Precinct Plan 2
2.3 Proposed Future Development 3
2.4 Transit Orientated Development (TOD) 4
2.5 Development Yields 6
3 Services 7
3.1 ATCO Gas 7
3.2 Power 9
3.3 Communications 12
3.4 Water 16
3.5 Wastewater 18
3.6 Stormwater 20
4 Summary 22
4.1 Recommendations 22
5 References 24

Appendices

Appendix A Urban Structure Plan
Appendix B Existing Gas Network
Appendix C Existing Power Network
Appendix D Existing Water Network
Appendix E Existing Sewer Network
Appendix F Existing Stormwater Network

Tables

Table 2-1	Sector Zoning Classifications	3
Table 2-2	Residential Density *(Source: Hames Sharley)*	6
Table 2-3	Land Use *(Source: Hames Sharley)*	6
Table 3-1	Future Development Requirements - GAS	7
Table 3-2	Future Residential Gas Demand	8
Table 3-3	Remaining Network Capacity	10
Table 3-4	Remaining Substation Generation Capacity	10
Table 3-5	Future Development Requirements - POWER	11
Table 3-6	Existing Water Mains Infrastructure	16
Table 3-7	Future Development Requirements - WATER	16
Table 3-8	Projected Probable Simultaneous Demand (Water) for Residential	17
Table 3-9	Projected Probable Simultaneous Demand (Water) for Commercial	17
Table 3-10	Existing Wastewater Mains Infrastructure	18
Table 3-11	Future Development Requirements – WASTEWATER	18
Table 3-12	Future Development Requirements - STORMWATER	21

Figures

Figure 2-1	Rockingham Strategic Centre and Regional Location	2
Figure 2-2	Centre Plan Precincts and Generalised Land Use	3
Figure 2-3	Under Utilised Land with Development Potential (Rockingham DPP 3-2-1)	5
Figure 3-1	Current remaining Network Capacity (Networks Capacity Mapping Tool, WP 2021)	9
Figure 3-2	AARnet Existing Service	12
Figure 3-3	Telstra/NBN Existing Services.	13
Figure 3-4	Vocus Existing Service	14
Figure 3-5	Nextgen Existing Service	14
Figure 3-6	Western Side and Eastern Side Optus Existing Services	15
Figure 3-7	City of Rockingham Future Drainage Works.	20

Abbreviations

- CoR – City of Rockingham
- DPP – Development Policy Plan
- HV – High Voltage
- IDP – Indicative Development Policy
- LV – Low Voltage
- MVA – Megavolt Amperes
- NCMT – Network Capacity Mapping Tool
- POS – Public Open Space
- RSC – Rockingham Strategic Centre
- RSRC – Rockingham Strategic Regional Centre
- Scmh – standard cubic metres per hour
- TOD – Transit Orientated Development
- WAER – West Australian Electrical Requirements

1 Background

1.1 General

Cardno has been engaged by Hames Sharley on behalf of the City of Rockingham to prepare an infrastructure and servicing strategy for the Rockingham Strategic Centre (RSC). This document identifies the existing local infrastructure and servicing strategy for the RSC area and identifies potential future requirements for the *RSC Precinct Plan* which will replace the current *Rockingham Strategic Regional Centre (RSRC) Centre Plan.*

The scope of works includes:

- Review of existing utility infrastructure within the existing Rockingham Strategic Regional Centre and associated town planning zoning;
- Identification of potential infrastructure upgrades for the new Rockingham Metropolitan Strategic Centre and updated town planning zoning, accounting for the regional perspective only as it relates to the Rockingham precinct
- Review and update of infrastructure upgrades previously determined for Rockingham Strategic Centre against the latest Town Planning Scheme and subsequent Local Structure Plan, accounting for the regional perspective only as it relates to the Rockingham precinct.;
- Assessment of the infrastructure to inform the City on decisions around the long-term provision of electrical energy, potable water and sewage disposal, natural gas, along with high-speed data/telecommunications and stormwater drainage for the RSC precinct.

The findings and advice presented in this report is based on Cardno's observations, experience from similar projects and responses from various service providers and stakeholders.

1.2 Methodology

The methodology followed for this study included:

- Engaging with key stakeholders;
- Reviewing available data and identifying proposed works;
- Investigating existing infrastructure capacity; and
- Investigating and assessing future servicing requirements as per RSC Precinct Plan.

1.3 Literature and Documents Reviewed

The documents reviewed include:

- Rockingham Strategic Regional Centre – Centre Plan (CoR[1], 2010);
- City of Rockingham Town Planning Scheme No. 2 (CoR[4], 2004);
- City of Rockingham Planning Policies:
  - 3.2.1 – City Centre Sector (CoR[5], 2014)
  - 3.2.2 – Smart Village Sector (CoR[6], 2010)
  - 3.2.5 – Waterfront Village Sector (CoR[7], 2019)
  - 3.2.6 – Northern Waterfront Village Sector (CoR[8], 2014)
  - 3.2.8 – Campus Sector (CoR[9], 2014)
  - 3.2.9 – Eastern Sector (CoR[10], 2014)
  - 3.2.12 – Southern Gateway and Rockingham Station Sectors (CoR[11], 2016)
- Rockingham City Centre Transit System (CoR[3], 2010)

2 Study Area

2.1 Location

The Rockingham Strategic Centre (RSC) precinct plan is located 38km south, south-west of the Perth Central Business District and falls under the local government jurisdiction of the City of Rockingham (the City). The RSC precinct covers an area of approximately 600Ha, within the bounded geographic perimeters of Read Street, Rockingham Beach, Victoria Street, Patterson Road, Ennis Avenue and Rae Road. The area incorporates Rockingham Rail Station, Rockingham Beach, Rockingham Waterfront Village, the joint campus of Murdoch University and Rockingham College of TAFE, the Dixon Road commercial and light industrial area, regional recreation reserves and related residential area. The regional location and boundary of the Rockingham Strategic Centre can be seen below in Figure 2-1.



Figure 2-1 Rockingham Strategic Centre and Regional Location

2.2 Rockingham Strategic Centre (RSC) Precinct Plan

The RSC Precinct Plan will replace the Rockingham Strategic Regional Centre – Centre Plan dated 2010, and includes a vision of a modern, distinctly coastal centre offering a wide range of mixed uses. These uses will include retail, commercial, office, civic, residential, education and recreation areas within an accessible and highly interconnected, urban-scaled townscape, comprising of a major activity centre and related urban villages.

The RSC is divided into eight (8) distinct precincts which provide a higher level of detail to assist in the preferred use of each area. This detail includes residential densities, building heights and frontages for urban development as well as carparking requirements and other urban design requirements. These precincts are identified in Figure 2-2.

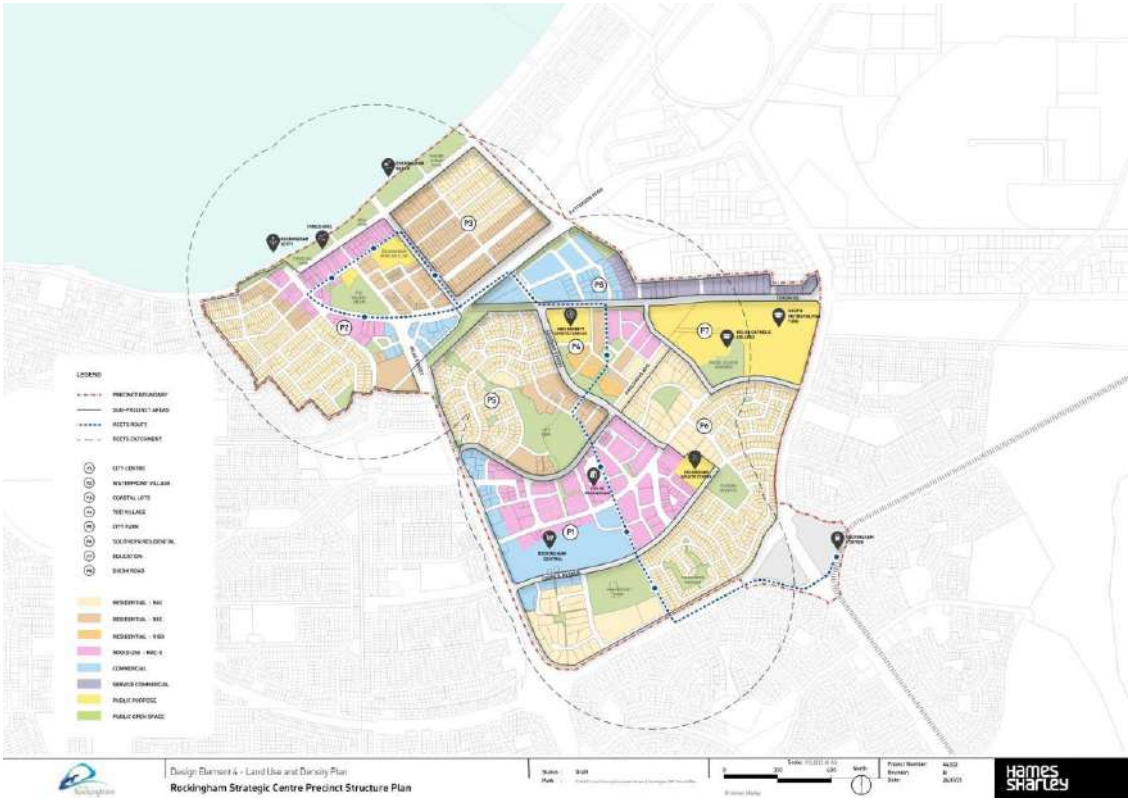

Figure 2-2 Land Use and Density Plan (*Source: Hames Sharley)*

The City's Town Planning Scheme No. 2 with complementary Development Policy plans have provided zoning classifications for each sector. They are identified in Table 2-1 below.

Table 2-1 Sector Zoning Classifications

Sector	Existing Zoning	Proposed Zoning	Adopted
Precinct 1 – City Centre	City Centre Area	Primary Centre City Centre	2010
Precinct 2 – Waterfront Village	City Centre Area	Primary Centre Waterfront Village	2012
Precinct 3 – Coastal Lots	City Centre Area	Primary Centre City Living	2013
Precinct 4 – TOD Village	City Centre Area	Primary Centre Urban Village	2012
Precinct 5 – City Park	City Centre Area	-	Ongoing
Precinct 6 – Southern Residential	City Centre Area	Primary Centre Urban Living	2015/10
Precinct 7 – Education	City Centre Area	Primary Centre Campus	2014
Precinct 8 – Dixon Road	Industrial	General and Light Industrial	Not Commenced

2.3 Proposed Future Development

The proposed urban structure plan for RSC can be seen in Appendix A to gain an understanding of the potential future infrastructure and servicing requirements. The following sections provide a summary of the Indicative Development Plans (IDPs) in relation to each Sector with the RSC Precinct Plan.

2.3.1 Precinct 1 – City Centre

Anchored by the shopping centre and civic precinct, the City Centre will provide the primary economic and employment focus of the RSC. Higher density housing and new commercial development creates a critical mass of people who enjoy a highly permeable and walkable urban structure, that connects major public spaces with public transport on Contest Parade. New development provides a positive and well-defined street interface, where pedestrians and cyclists enjoy priority over vehicles.

2.3.2 Precinct 2 – Waterfront Village

The Waterfront Village will continue its transformation into a regionally significant beachfront hub with further redevelopment of under–utilised public and private properties. An attractive mix of medium to high density residential and short–stay accommodation, hospitality–focussed retail, offices and recreation uses will combine to make this a priority destination on the Rockingham coastline for locals and tourists alike.

2.3.3 Precinct 3 – Coastal Lots

High-quality medium density development supports quality urban infill outcomes along the RCCTS. A combination of grouped and multiple dwelling typologies enable an increased density, balanced with generous street setbacks and open space to ensure improved tree canopy.

2.3.4 Precinct 4 – TOD Village

Extension of the RCCTS represents a strategic TOD opportunity that provides for contemporary higher density development opportunities, which integrate with the existing landscape and retained Mike Barnett Sporting Complex. The transit stop includes a well landscaped central park and local centre that creates a destination and amenity to support growth in the precinct.

2.3.5 Precinct 5 – City Park

The Autumn Centre is expanded and existing single detached dwellings are largely retained, with the framework supporting future long-term growth and development through infill. New development is focussed primarily on Goddard and McNicholl Streets providing density along the RCCTS.

2.3.6 Precinct 6 – Southern Residential

High-quality medium density development support sensitive and quality urban infill outcomes, primarily in the form of grouped dwellings and small scale apartment typologies. Heights are generally between two-three storeys, and generous street setbacks align with the existing character of the area.

Existing areas with high concentrations of strata properties are highly unlikely to change in the near term.

The rail station is serviced by park and ride car parks located on either side of Ennis Avenue, with long-term redevelopment aspirations on the western-most car park presenting possible opportunities to increase density in close proximity to the station.

2.3.7 Precinct 7 – Education

Existing campuses are linked by an internal link road which enhances connectivity between the Education and City Village precincts. Sufficient capacity for new development ensures large spaces are provided between buildings supporting the establishment of greenery and tree planting, which creates an attractive place to work and recreate.

2.3.8 Precinct 8 – Dixon Road

A gateway statement at the corner of Dixon Road and Ennis Avenue frames the entry into the RSC. Enhancement of the streetscape supports a green buffer which screens the light industrial and commercial development to the north. The bushland south of Patterson Road is developed in the long-term, with a flexible urban structure supporting a range of commercial and employment generating land uses.

2.4 Transit Orientated Development (TOD)

2.4.1 Background

The Rockingham City Centre Transit System (RCCTS) connects the Rockingham Train Station with the City Centre, education campuses and the beachfront. The route of the street-based transit system is being developed initially in shuttle-bus mode with the understanding that it will be upgraded to an electric streetcar or light rail operation once a more supportive level of development has been achieved along the route.

The City of Rockingham is committed to achieving the vision of a fixed route, streetcar transit system as the focus of a corridor of high intensity, mixed use development between the train station and the beachfront.

Accordingly, a review of the Centre Plan was commissioned on the understanding that it would demonstrate the application of sustainable development principles with a particular emphasis on TOD (DPP 2.3.2, CoR 2010).

Figure 2-3 shows the location and extent of vacant and under-utilised land in the Centre Plan area. Within the TOD catchment, between Council Avenue and Rockingham Beach, this land comprises a total area of approximately 82 hectares. Of this total area, approximately 54 hectares is situated in the core of the City Centre to the north and east of the shopping centre and extends northwards across existing (soon to be relocated) playing fields through to Dixon Road.



Figure 2-3 Under Utilised Land with Development Potential (Rockingham DPP 3-2-1)

From Figure 2-3, there are eight sites that have been identified as significant land parcels with TOD potential (DPP 3.2.1, CoR 2010):

- **Site 1**- privately owned land that is located adjacent to the transit route within the City Centre Precinct. It can be readily developed for a wide range of inner-city uses, including offices and high-density residential development.
- **Site 105** - the remaining portion of the City of Rockingham superlot bounded by Civic Boulevard, Central Promenade, Whitfield Street and Chalgrove Avenue. The transit route passes through the super-lot that already houses the Rockingham Courthouse and Police Station, the Civic Administration Centre, Council Chambers, City Square and other arts and community buildings. Subdivided mixed use sites are well-suited to TOD.
- **Sites 26 to 35** - privately owned and part of the shopping centre portfolio. They fall within the City Centre Precinct and collectively have ‘Main Street’ frontage to Civic Boulevard and Central Promenade. They are close to the transit route and are readily developable for a mix of inner-city uses.
- **Site 99** - owned by the WAPC. It is close to the transit route and lies opposite Sites 79 and 90 in the TOD Village Precinct where a comprehensive TOD is envisaged.

- **Site 25** - privately owned and part of the shopping centre portfolio. It adjoins the transit route and is within the City Centre Precinct and can be readily developed for a wide range of mixed uses, including high density offices, serviced accommodation and residential.
- **Sites 37 to 40** - privately owned and fall within the City Centre Precinct. They are close to the transit route and are readily developable for a mix of inner-city uses.
- **Site 103** - Department of Housing site that has direct frontage to the transit route and has already been identified as a demonstration TOD project which will be initiated once the adjoining transit route is commissioned.
- **Site 70** - privately owned property adjacent to a church owned aged person's complex. It is well-suited to higher density residential development given its prominent location overlooking the City Park.

2.5 Development Yields

The most recent development yields and land use areas provided by Hames Sharley are summarised in Table 2-2 and Table 2-3 below.

Table 2-2 Residential Density *(Source: Hames Sharley)*

Sub-Precinct	Existing	Residential Dwellings Target
P1 City Centre	432	4248
P2 Waterfront Village	1097	3787
P3 Coastal Lots	536	1762
P4 TOD Village	0	1205
P5 City Park	347	1665
P6 Southern Residential	1555	3299
P7 Education	0	0
P8 Dixon Road	0	0
Total	**3967**	**15966**

Table 2-3 Land Use *(Source: Hames Sharley)*

Land Use	PSP Area Ha
Residential R60	133
Residential R80	44
Residential R100	3
Mixed Use	47
Commercial	40
Public Purpose	40
Service Commercial	11
Public Open Space	60

3 Services

3.1 ATCO Gas

The gas network servicing RMSC is installed, owned and operated by ATCO Gas, who provided information on the existing infrastructure within the study area.

3.1.1 Existing Infrastructure

The existing reticulated gas mains within the Study Area and its surrounds can be found in Figure B1, Appendix B. The network consists of arterial gas main lines with additional servicing pipes. There are also number of abandoned gas mains which have also been identified in the Figure B1.

3.1.2 Planned Future Upgrades

ATCO Gas was contacted in June 2021 to identify planned future gas infrastructure upgrades, future network requirements and demands for development upgrades for residential, commercial and industrial areas as well as standard dwelling consumption rates for residential, commercial and industrial areas. This information could not be confirmed by ATCO however, gas services are typically built to match development requirements rather than forward planned. Therefore, any future developments require ATCO to be contacted to confirm necessary utility upgrades and network additions.

3.1.3 Future Development Requirements

Based on the current gas infrastructure network and the proposed development outlined in the Rockingham DPPs, the follow gas network upgrades are predicted as outlined in Table 3-1.

Table 3-1 Future Development Requirements - GAS

Sector	Future Required Infrastructure
Precinct 1 – City Centre	The following areas (as identified in Figure 2-3) will require significant gas infrastructure including: ▪ Site 1 – gas mains and property connections to residential and commercial dwellings ▪ Site 105 – mains and property connections to High-density mixed-use areas ▪ Site 26 to 35 - gas mains and property connections to residential and commercial dwellings ▪ Site 37 to 40 - gas mains and property connections to residential and commercial dwellings ▪ Site 25 - property connections to high-density mixed-use areas ▪ Site 103 – mains and property connections to medium to high-density mixed-use area ▪ Site 70 – no new infrastructure required
Precinct 2 – Waterfront Village	▪ Mains lines will meet future requirements ▪ Property connections required for staged redevelopment of Challenger lodge sites to the South
Precinct 3 – Coastal Lots	▪ Gas network satisfactory for future requirements
Precinct 4 – TOD Village	▪ Significant gas main network required Residential and commercial property connections required
Precinct 5 – City Park	Currently no DPP to assess future gas requirements
Precinct 6 – Southern Residential	Gas network satisfactory for future requirements
Precinct 7 – Education	▪ Gas mains sufficient ▪ Further property connections required
Precinct 8 – Dixon Road	Currently no DPP to assess future gas requirements

Note the required gas infrastructure identified in Table 3-1 is indicative only based on proposed development planning policies. It is advised to contact ATCO Gas to confirm proposed infrastructure to meet development requirements.

The estimated future residential gas demand for the RSC is provided in Table 3-2. These figures are based on peak and diversified gas load (per hour) not overall usage, as per ATCO Gas advice. The current standard dwelling consumption for RSC is assumed 0.35 scmh (standard cubic metres per hour).

Table 3-2 Future Residential Gas Demand

Precinct	Dwellings	Residential Gas Demand
RSC	15966	5588.1 scmh

*With TOD

3.2 Power

Western Power owns and operates all electricity supply network assets within the development area and therefore all new electricity supply equipment and cables will need to be installed in accordance with Western Power, WAER (West Australian Electrical Requirements), and AS3000 specifications and standards.

3.2.1 Existing Infrastructure and Current Planning

3.2.1.1 Existing High Voltage

The existing Western Power High Voltage (HV) distribution network within the proposed redevelopment area consists of 22kV distribution lines that are supplied from the 132kV/22kV Rockingham Zone Substation located approximately 1km west of Read Street. The network can be seen in Figure C1, Appendix C.

3.2.1.2 Current and Forecast Remaining Network Capacity

Western Power's Network Capacity Mapping Tool (NCMT) shows that there is limited network capacity to provide the proposed loading required for this redevelopment. Additionally, based on our understanding of the limitations of Western Power's network in the vicinity of the development, it is crucial that prior to commitment to any firm power supply arrangements, Western Power undertake an internal review of the current and proposed connections in the area. Refer to Figure 3-1.

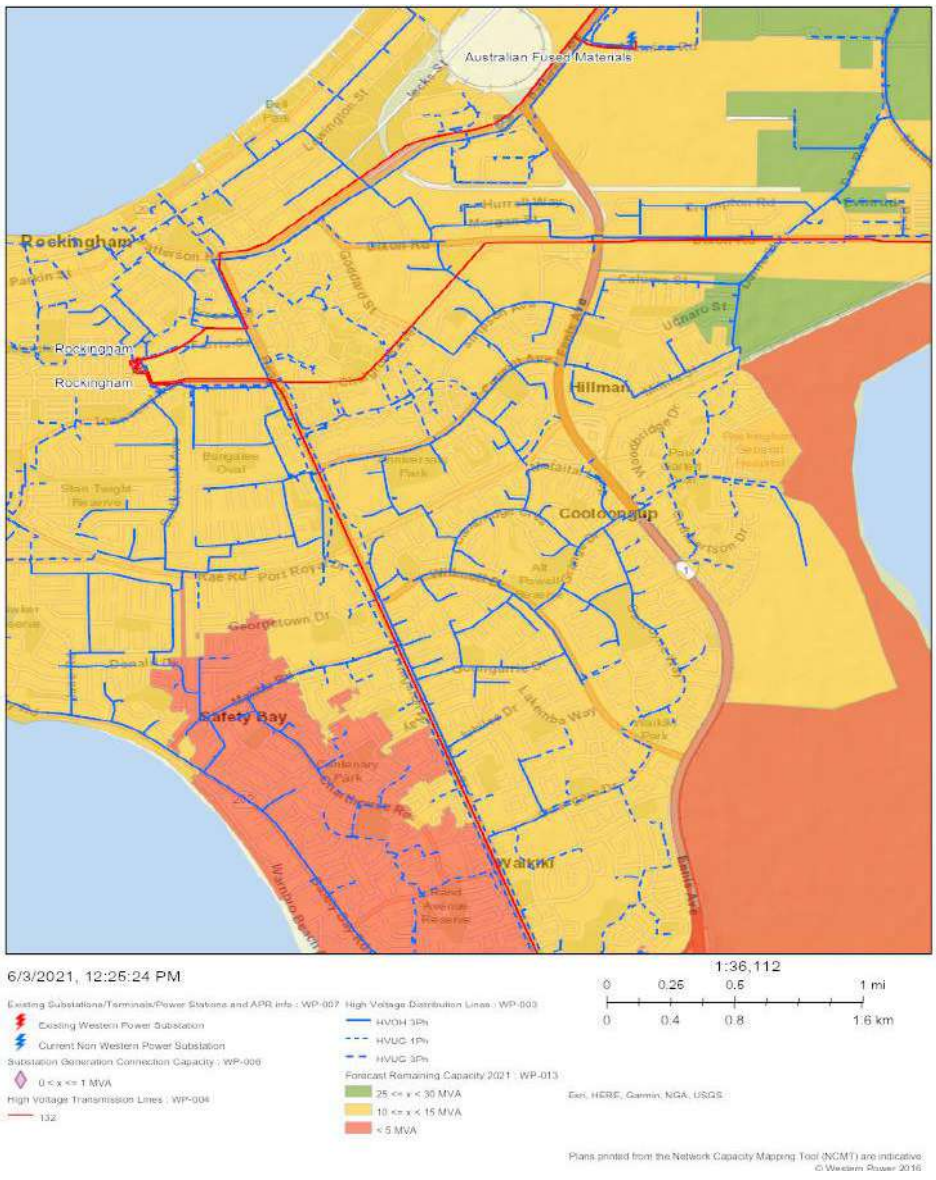

Figure 3-1 Current remaining Network Capacity (Networks Capacity Mapping Tool, WP 2021)

The future forecast network remaining capacity measured in Megavolt Amperes (MVA) can be seen below in Table 3-3.

Table 3-3 Remaining Network Capacity

Year	Remaining Capacity
2021	10 <= x < 15 MVA
2026	5 <= x < 10 MVA
2031	5 <= x < 10 MVA
2036	< 5 MVA

The remaining substation capacity is identified on the Western Power NCMT is identified in Table 3-4 below.

Table 3-4 Remaining Substation Generation Capacity

Year	Remaining Substation Capacity
2021	0 < x <= 1 MVA

Furthermore, due to the location of the development in relation to Western Power's Rockingham Substation, coupled with the dwindling network capacity, it is likely that augmentation will be required to the 22V and 132kV HV network to accommodate the anticipated load increase.

3.2.2 Transmission Network

There are three major Western Power 132kV transmission assets contained within the RSC precinct. Specifically, with the Read Street road reserve on the western boundary of the development, Chalgrove Avenue and Dixon Road road reserve through precincts 5 and 8; and Patterson Road road reserve through precincts 2, 3 and 5.

The overhead 132kV power lines include a typical exclusion zone of 20m (10m from centreline) but this will require detailed assessment to confirm actual values.

Although it is not anticipated that the overhead 132kV lines will impact the development further detailed assessments will be required to confirm.

3.2.2.1 Development Load

The exact electrical load requirements for the development are difficult to determine due to the early stage of planning and lack of detailed information available. When further planning of each sector is undertaken, it is recommended to contact Western Power directly to gain a better understanding of specific network requirements.

3.2.3 Proposed Power infrastructure

The NCMT currently shows no future planned substations, terminals or power stations within the study area.

3.2.4 Future Development Requirements

Based on the current power infrastructure network and the proposed development outlined in the Rockingham DPPs, the follow transition network and power infrastructure upgrades are predicted as outlined in Table 3-5.

Table 3-5 Future Development Requirements - POWER

Sector	Future Required Infrastructure
Precinct 1 – City Centre	The following areas (as identified in Figure 2-3) will require significant power infrastructure including: ▪ Site 1 – extension of distribution lines required for proposed street for medium to high mixed-use area ▪ Site 105 – current infrastructure satisfactory for future use ▪ Site 26 to 35 - extension of distribution lines required for proposed street for medium to high mixed use and towns square area ▪ Site 37 to 40 - extension of distribution lines required for proposed street for medium to high mixed-use area ▪ Site 25 - current infrastructure satisfactory for future use ▪ Site 103 – extension of distribution lines required for proposed street for medium to high mixed-use areas ▪ Site 70 – no new infrastructure required
Precinct 2 – Waterfront Village	▪ Mains lines distribution network will meet future requirements
Precinct 3 – Coastal Lots	▪ Power distribution network infrastructure satisfactory for future requirements
Precinct 4 – TOD Village	▪ Significant additional distribution network required Residential and commercial property connections required
Precinct 5 – City Park	Currently no DPP to assess future power requirements
Precinct 6 – Southern Residential	▪ Power distribution network infrastructure satisfactory for future requirements
Precinct 7 – Education	▪ Power mains sufficient Further property connections required
Precinct 8 – Dixon Road	Currently no DPP to assess future power requirements

Note: the required power infrastructure identified in Table 3-5 above is indicative only based on proposed development planning policies. It is advised to contact Western Power to confirm proposed infrastructure to meet development requirements.

3.3 Communications

A number of communication service providers have infrastructure in the Study Area. AARnet, NextGen, NBN Co, Telstra, Vocus and Optus. All have infrastructure servicing properties within the precinct.

3.3.1 Existing Infrastructure and Current Planning

3.3.1.1 AARnet

AARnet provides internet services to the Australian education and research communities and their research partners.

Currently, AARnet have assets that run from the south east of the Rockingham Train Station, outside the precinct area, along Ennis Avenue road reserve, turning into Simpson Avenue and Dowling Street, running along the boundaries of Precinct 7 – Campus and Precinct 6 - Eastern and coming to an end at Kolbe Catholic College (see Figure 3-2). The existing infrastructure is a P63 and P50 pipe type. At this stage there is no requirement for current or future upgrades.

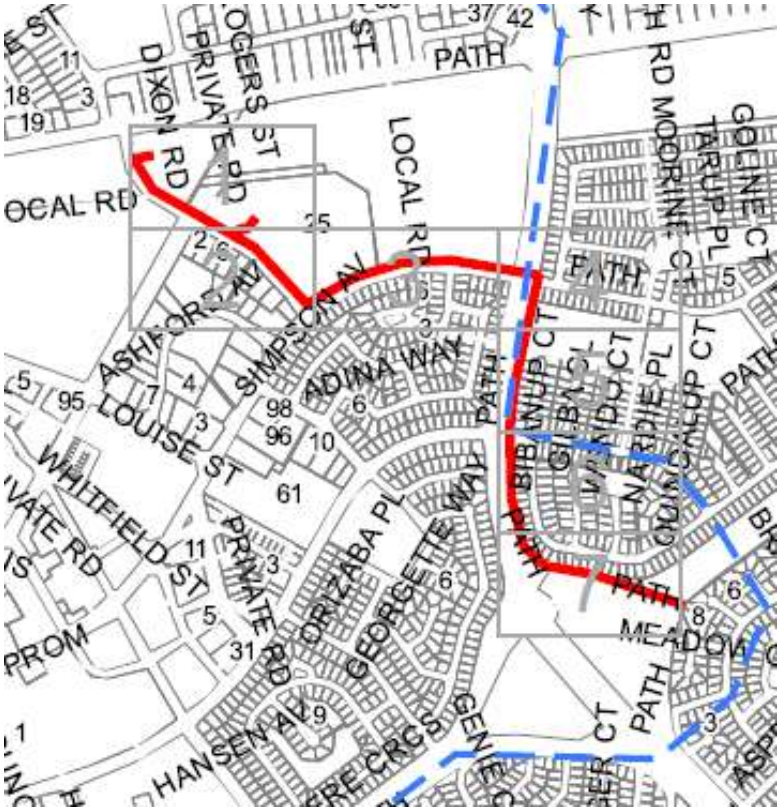

Figure 3-2 AARnet Existing Service

3.3.1.2 Telstra/NBN Co.

3.3.1.2.1 Existing Infrastructure and Current Planning

Currently, there are significant NBN assets within the Study Area as seen in Figure 3-3. The majority of the assets consist of a pit and pipe network within the precinct area.

3.3.1.2.2 Proposed Development Requirements

Future connections are contingent on the developer's communication requirements and communications arrangement preference. Given that multiple properties potentially will be amalgamated as part of redevelopment, multiple existing services will need to be disconnected and resupplied by NBN. It is expected that a new NBN pit and pipe network may be required to provide an efficient supply of service to the amalgamated properties. In addition to this, an assessment by the NBN Planning team will be required to assess the servicing capacity of the existing fibre network and determine if any network reinforcement will be required. At this stage there is no requirement for current or future upgrades.



Figure 3-3 Telstra/NBN Existing Services.

3.3.1.3 Vocus

Based in Sydney, New South Wales, Vocus provides international telecommunications for retail, wholesale and corporate companies. The current network owned and controlled by Vocus can be seen in Figure 3-4 below.

Currently, Vocus have assets that run along Ennis Avenue road reserve and service Precinct 8 – Dixon Road commercial/light industrial area along Seamton Way. This line also services business outside the precinct area to the east of Ennis Avenue. Additionally, a line within Precinct 1 – City Centre and Precinct 6 – Southern Gateway, running through Leghorn Street, Chalgrove Avenue, Civic Boulevard and Central Promenade. At this stage there is no requirement for current or future upgrades.

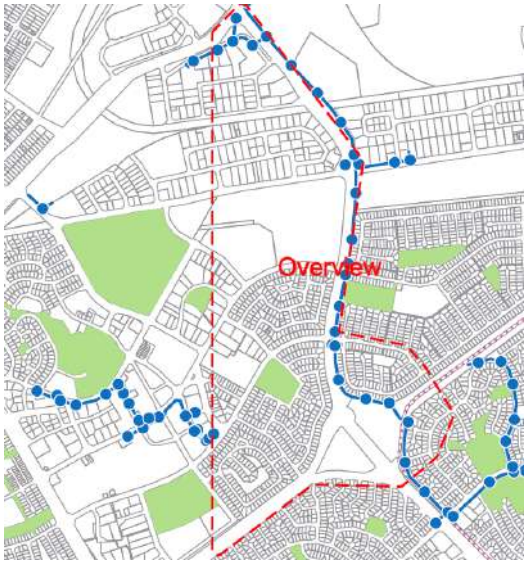

Figure 3-4 Vocus Existing Service

3.3.1.4 NextGen

A subsidiary of Vocus Group, Nextgen provides telecommunications with their network displayed in Figure 3-5 below. Currently, Nextgen runs from the North East of the precinct area in Precinct 8 – Dixon Road along Patterson Road, through Precinct 3 – TOD Village and Precinct 1 – City Centre, along Goddard Street and Central Promenade and through Precinct 6 – Southern Residential along Contest Parade, Kilson Street and out on to Rae Rd. At this stage there is no requirement for current or future upgrades.

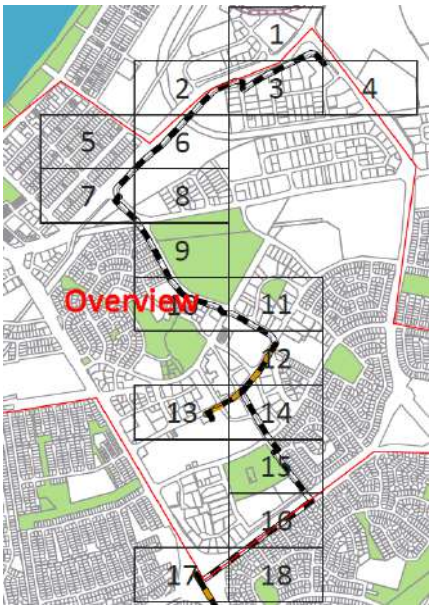

Figure 3-5 Nextgen Existing Service

3.3.1.5 Optus

Currently, Optus has fibre located in the precinct area via its own conduits and third-party conduits (approximately 35-40%) as seen in Figure 3-6 below.

Optus, through its own conduits runs from Precinct 8 – Dixon Road along Ennis Avenue past Precinct 7 – Campus and turns west along Simpson Avenue through Precinct 6 – Southern Residential, following Louise Street and Chalgrove Avenue on to Central Promenade through Sector 1 – City Centre.

Additionally, Optus has optic fibre located in third party conduits, that follows the same path as its own optic fibre conduits. However, continues north along Read Street along McMahon Street, Houston Street and Parkin Street through Precinct 2 – Waterfront Village. At this stage there is no requirement for current or future upgrades.

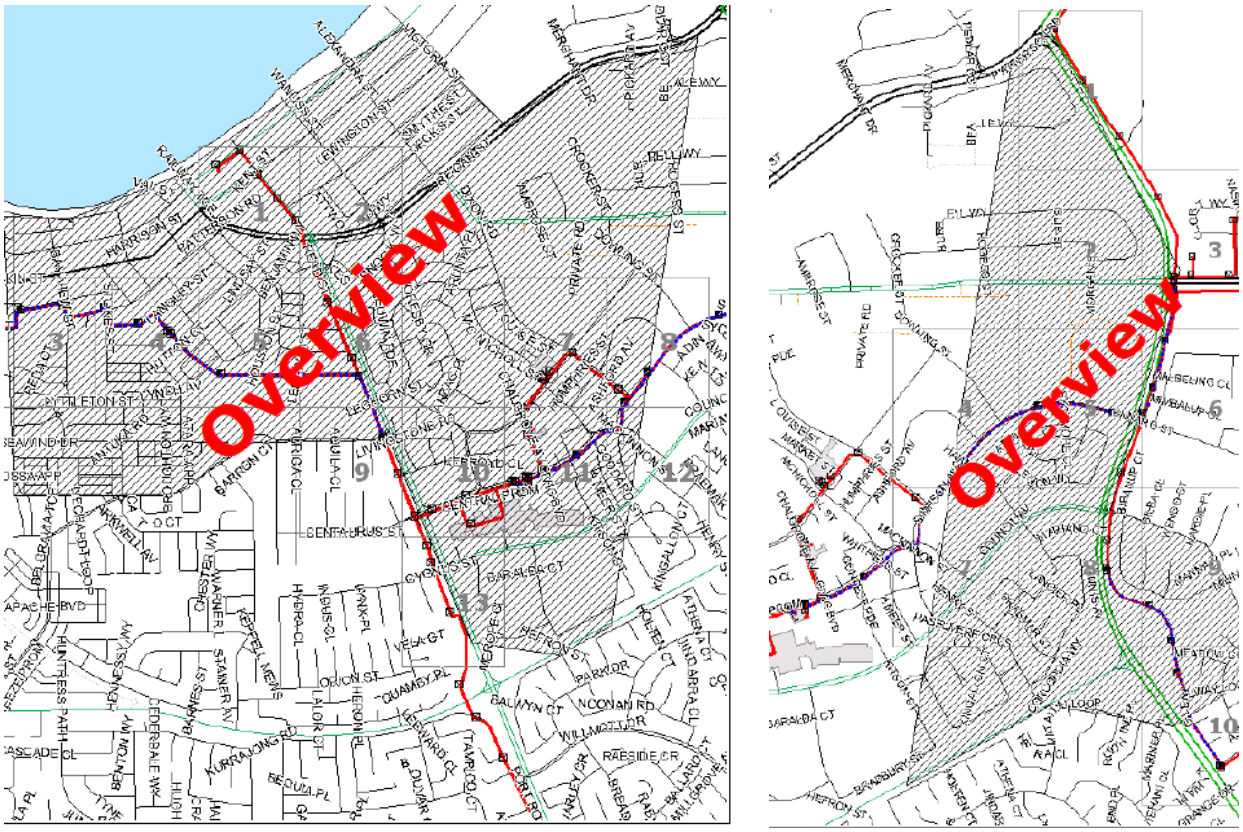

Figure 3-6 Western Side and Eastern Side Optus Existing Services

3.4 Water

Water Corporation is the state authority regulating the distribution infrastructure for water reticulation within the study area.

3.4.1 Existing Infrastructure

The existing water mains within the Study Area and its surrounds can be found in Appendix D Figure D1. The network consists of an arterial network of mains made from various materials including cast iron, steel, ductile iron, PVC and Polyethylene pipe. The mains network typically follows roadways and is contained within the road reserve. The water network also consists of numerous property connections to residential and commercial dwellings.

Table 3-6 Existing Water Mains Infrastructure

Sector	Existing Mains Infrastructure
Precinct 1 – City Centre	760S, 205CI, 150CI, 150P-12
Precinct 2 – Waterfront Village	535S-5, 150CI, 100RC,
Precinct 3 – Coastal Lots	535S, 205CI, 150CI, 100RC
Precinct 4 – TOD Village	305S, 205CI, 150CI, 100RC
Precinct 5 – City Park	200DI, 150DI, 150P-12, 100P-12
Precinct 6 – Southern Residential	150CI, 150DI, 205CI, 100RC
Precinct 7 – Education	150DI
Precinct 8 – Dixon Road	700S-5, 200P-12, 150P-12

3.4.2 Current Planning

Water Corporation provides a spatial dataset representing the spatial extent of the Water Corporation's 5-year capital investment program. All future water capital investment projects that are growth driven are represented. This is to enable effective response for future infrastructure plans/ enquiries, greater inter-government planning coordination and to facilitate the development industry's planning. Water Corporation infrastructure mapping has **not** identified any future upgrades within the precinct area.

3.4.3 Future Development Requirement

Based on the current water infrastructure network and the proposed development outlined in the Rockingham DPPs, the follow water network upgrades are predicted as outlined in Table 3-7.

Table 3-7 Future Development Requirements - WATER

Sector	Future Required Infrastructure
Precinct 1 – City Centre	The following areas (as identified in Figure 2-3) will require significant water infrastructure including: ▪ Site 1 – water mains and property connections to residential and commercial dwellings ▪ Site 105 – water network satisfactory for future requirements. Potential property connections required ▪ Site 26 to 35 - Water mains and property connections to residential and commercial dwellings ▪ Site 37 to 40 – water mains and property connections required for urban square and medium to high-density mixed-use areas. ▪ Site 25 - property connections to High-density mixed-use areas ▪ Site 103 – mains and property connections to medium to high-density mixed-use area ▪ Site 70 – no new infrastructure required
Precinct 2 – Waterfront Village	▪ Water Main lines will meet future requirements ▪ Property connections required for Staged redevelopment of Challenger lodge sites to the South
Precinct 3 – Coastal Lots	▪ Water network satisfactory for future requirements

Precinct 4 – TOD Village	▪ Significant water main network required Residential and commercial property connections required
Precinct 5 – City Park	Currently no DPP to assess future water requirements
Precinct 6 – Southern Residential	▪ Water network satisfactory for future requirements
Precinct 7 – Education	▪ Water mains location sufficient. Potential upgrade in size required to cater for enhanced vegetated street scapes Further property connections required
Precinct 8 – Dixon Road	Currently no DPP to assess future water requirements

Note: the required water infrastructure identified in Table 3-7 is indicative only based on proposed development planning policies. It is advised to contact Water Corporation to confirm proposed infrastructure to meet development requirements.

The estimated future water demand for the RSC are provided in Table 3-8. These requirements are based on the probable simultaneous demand for multiple dwellings from AS3500.1 - plumbing and drainage part 1.

Table 3-8 Projected Probable Simultaneous Demand (Water) for Residential

Number of Dwellings	Proposed Development Flow (L/s)
15,966	598.57

Table 3-9 Projected Probable Simultaneous Demand (Water) for Commercial

Commercial/Retail Area (m^2)	Average Demand ($L/m^2/s$)	Flow L/s
400,000	4.09×10^{-5}	16.36

3.5 Wastewater

The Water Corporation is the state authority regulating the distribution, storage and disposal infrastructure for wastewater in the area. The Water Corporation has provided information on current and future planned wastewater supply infrastructure for the area.

3.5.1 Existing Infrastructure and Current Planning

The existing reticulated wastewater network within the Study Area and its surrounds can be found in Appendix E, Figure E1. The network consists of an arterial network of mains made from various material including cast iron, steel, ductile iron, PVC and Polyethylene pipe. The mains network typically follows roadways and is contained within the road reserve. The sewer network also consists of numerous property connections to residential and commercial dwellings. The pressure main infrastructure identified in Appendix E is summarised in Table 3-10 below.

Table 3-10 Existing Wastewater Mains Infrastructure

Sector	Existing Infrastructure
Precinct 1 – City Centre	610RCPL, 375VC, 230VC, 225PVC-U
Precinct 2 – Waterfront Village	560HDPE, 225PVC-U, 150PVC-U
Precinct 3 – Coastal Lots	200PVC-U,150PVC-U
Precinct 4 – TOD Village	225PVC-U
Precinct 5 – City Park	1400S
Precinct 6 – Southern Residential	230VC, 150VC, 80MDPE, 460RCPL
Precinct 7 – Education	150PVC-U, 80MDPE
Precinct 8 – Dixon Road	1400S, 450PVC-U, 225PVC-U, 80MDPE

3.5.2 Planned Wastewater Infrastructure

Water Corporation provides a spatial dataset representing the spatial extent of the Water Corporation's 5-year capital investment program. All future wastewater capital investment projects that are growth driven are represented. The intent of this dataset is to enable effective response for future infrastructure plans/ enquiries, greater inter-government planning coordination and to facilitate the development industry's planning.

Currently, there is pump station planned for construction in 2027 on Rockingham Beach Road NE of Precinct 3 – Coastal Lots. There is also a pressure main planned for construction between 2026 and 2028 at the East Rockingham Waster Water Plant located approximated 2km NE of the RSC boundary. Water Corporation infrastructure mapping has not identified any future upgrades within the precinct area.

3.5.3 Proposed Development Requirements

Based on the current water infrastructure network and the proposed development outlined in the Rockingham DPPs, the following water network upgrades are predicted as outlined in Table 3-11.

Table 3-11 Future Development Requirements – WASTEWATER

Sector	Future Required Infrastructure
Precinct 1 – City Centre	The following areas (as identified in Figure 2-3) will require significant sewer infrastructure including: ▪ Site 1 – sewer mains and property connections to medium to high-density mixed-use areas ▪ Site 105 – sewer network satisfactory for future requirements. Potential property connections required ▪ Site 26 to 35 - sewer mains and property connections to residential and commercial dwellings in proposed medium to high-density mixed-use areas ▪ Site 37 to 40 – sewer mains and property connections required for high-density mixed-use areas. ▪ Site 25 - property connections to high-density mixed-use areas

	▪ Site 103 – mains and property connections to medium to high-density mixed-use area ▪ Site 70 – no new infrastructure required
Precinct 2 – Waterfront Village	▪ Sewer Main lines will meet future requirements ▪ Property connections required for Staged redevelopment of Challenger lodge sites to the South
Precinct 3 – Coastal Lots	▪ Sewer network satisfactory for future requirements
Precinct 4 – TOD Village	▪ Significant sewer network required ▪ Existing Pressure Mains line satisfactory but may need upgrade/upsize with new development loads Residential and commercial property connections required
Precinct 5 – City Park	Currently no DPP to assess future sewer requirements
Precinct 6 – Southern Residential	▪ Sewer network satisfactory for future requirements
Precinct 7 – Education	▪ Gravity main lines not displayed in available data. Further confirmation of existing network from Water Corporation required. Further property connections required
Precinct 8 – Dixon Road	Currently no DPP to assess future sewer requirements

Note the required sewer infrastructure identified in Table 3-11 is indicative only based on proposed development planning policies. It is advised to contact Water Corporation to confirm proposed infrastructure to meet development loads and requirements.

3.6 Stormwater

The City of Rockingham is the local authority that owns, controls and manages stormwater drainage in the precinct area.

3.6.1 Existing Infrastructure

The existing stormwater system within the Study Area and its surrounds can be found in Appendix F.

The precinct area primarily consists of a pit and pipe network with a number of retention and detention basin capturing stormwater runoff. These basins are typically located within or adjacent to public open spaces (POS) and sporting fields. There are two significant open channels owned by Water Corporation running from the precinct's Western side of the precinct (McMahon St and Read Street) to Lake Richmond.

3.6.2 Planned Upgrades

3.6.2.1 City of Rockingham

Due to current flooding issues and the expansion of impervious areas from development, the addition of detention and retention basins, swales and stormwater storage cells is being investigated.

Currently, there are two stormwater drainage upgrades planned for Rockingham Beach Road and Victoria Street. These include diverting road drainage into underground drainage cells for up the 5-year ARI, as identified in Figure 3-7 below.

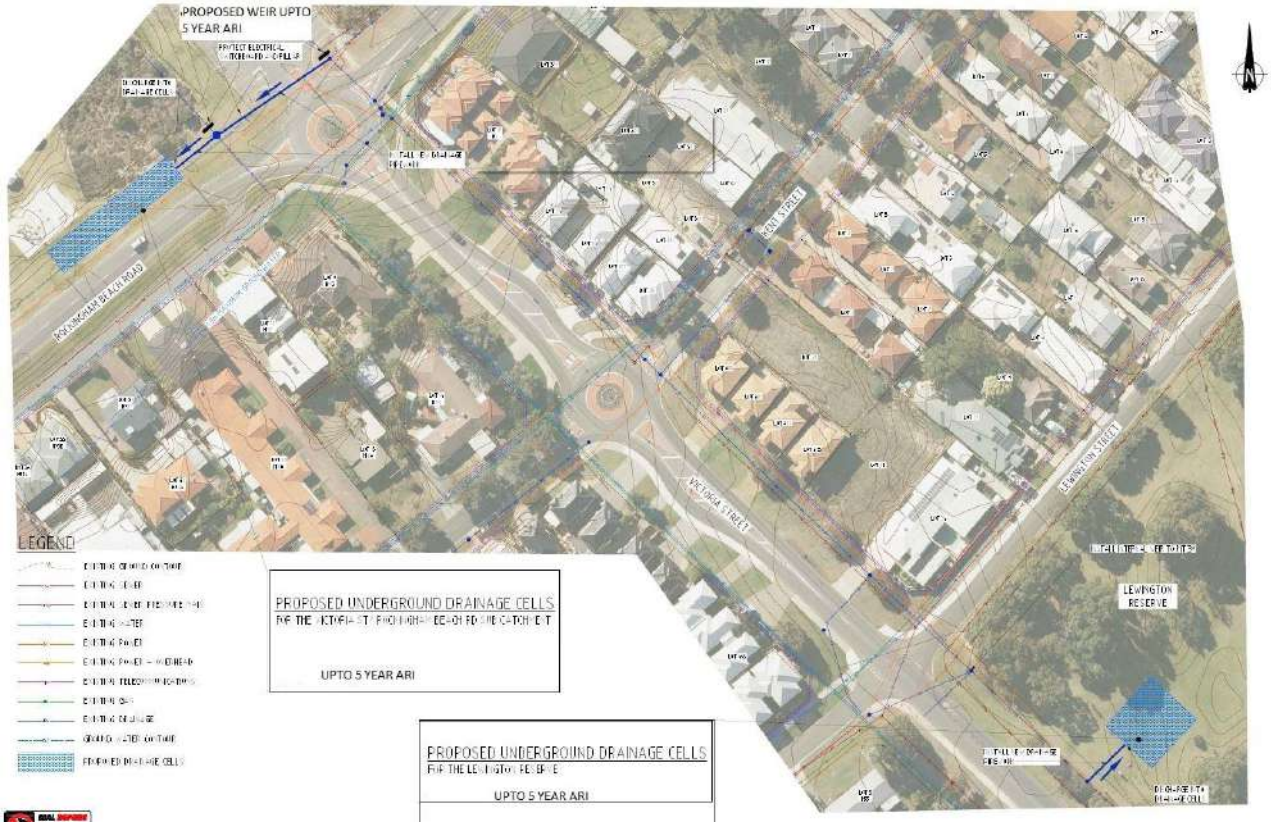

Figure 3-7 City of Rockingham Future Drainage Works.

3.6.2.2 Water Corporation

Water Corporation's spatial dataset representing the spatial extent of their 5- year capital investment program shows a planned pump station for a rising main at Calume Street to the East however, Water Corporation infrastructure mapping has not identified any future upgrades within the precinct area.

3.6.3 Future Development Requirements

Based on the current stormwater network and the proposed development outlined in the Rockingham DPPs, the following stormwater network upgrades are predicted and have been identified in Table 3-12 below.

Table 3-12 Future Development Requirements - STORMWATER

Sector	Future Required Infrastructure
Precinct 1 – City Centre	The following areas (as identified in Figure 2-3) will require the following stormwater upgrades: ▪ Site 1 – no new infrastructure required ▪ Site 105 – significant stormwater infrastructure required to cater for new roads and other impervious surfaces including medium and high-density mixed-use areas. Downstream pit, pipe and storage network will also have to be upgraded to compensate for new impervious runoff loads. ▪ Site 26 to 35 - significant stormwater infrastructure required to cater for new roads and other impervious surfaces including high-density mixed-use areas and a trafficable urban square. Downstream pit, pipe and storage network will also have to be upgraded to compensate for new impervious runoff loads. ▪ Site 37 to 40 - significant stormwater infrastructure required to cater for new roads and high-density mixed-use areas. Downstream pit, pipe and storage network will also have to be upgraded to compensate for new impervious runoff loads. ▪ Site 25 - no new infrastructure required ▪ Site 103 – stormwater infrastructure required to cater for new roads and medium to high-density mixed-use areas. Downstream pit, pipe and storage network will also have to be upgraded to compensate for new impervious runoff loads. ▪ Site 70 – no new infrastructure required
Precinct 2 – Waterfront Village	▪ Current network will meet future requirements ▪ Potential upgrade of pipes at Staged redevelopment of Challenger lodge sites to the South (further assessment required)
Precinct 3 – Coastal Lots	▪ Stormwater network satisfactory for future requirements. Possible upgrade of existing pit and pipe system required if developed from medium to high density.
Precinct 4 – TOD Village	Significant stormwater network required to cater for new roads, car parks and residential and commercial areas
Precinct 5 – City Park	Currently no DPP to assess future stormwater requirements
Precinct 6 – Southern Residential	Stormwater network satisfactory for future requirements
Precinct 7 – Education	Stormwater network required to the North to cater for new roads, car parks and campus facilities
Precinct 8 – Dixon Road	Currently no DPP to assess future stormwater requirements

Note: the required stormwater infrastructure identified in Table 3-12 is indicative only based on proposed development planning policies. It is advised to contact the City of Rockingham to confirm proposed infrastructure to meet stormwater runoff, storage and development requirements.

4 Summary

Cardno was commissioned by Hames Sharley on behalf of the City of Rockingham to provide high-level advice on engineering servicing for the proposed future development of the Rockingham Strategic Centre. Cardno have assessed the precincts existing utility infrastructure attributes and values and identified areas where future utility infrastructure will be required if development occurs as per the Rockingham Strategic Centre Planning Framework and relevant Development Policy Plans for each Sector within the precinct.

4.1 Recommendations

The key utility infrastructure recommendations are:

- *Precinct 1 – City Centre*
  - Significant Gas, Power, Communications, Water, Wastewater and Stormwater Infrastructure required within the 'underutilised land parcels' identified within the City Centre Development Planning Policy (3.2.1). These parcels of land are currently open POS areas which as part of the RSC precinct plan are to be developed into trafficable urban square, commercial, car park, main street development, medium density mixed use and high-density mixed-use areas.
- *Precinct 2 – Waterfront Village*
  - An increase of gas, power, communications, water and sewer main line capacity will be required to accommodate future medium and high-density areas, contemporary residential apartments and transit terminal. There is also staged development of Challenger lodge sites to the South of the Sector which will require future utility infrastructure. The extent of future infrastructure will need to be confirmed with relevant authorities prior to development.
- *Precinct 3 – Coastal Lots*
  - The current mains infrastructure is consistent with that proposed in the development policy plan and hence no major utility service upgrades are required within this sector. There is potential for medium and high-density residential apartments, major streetscape enhancement and marina development which will require future investigation of servicing requirements.
- *Precinct 4 – TOD Village*
  - Precinct 4 will require the most significant utility infrastructure upgrades within the RSC precinct plan. Currently, this parcel of land is predominately vacant with the indicative development proposing new roads, recreation centres, high-density mixed-use areas, terrace style medium density areas, carparks and a Transit system route. New infrastructure will be required for all utilities with the extent and demand to be confirmed with relevant authorities.
- *Precinct 5 – City Park*
  - The development policy plan is currently not available for this sector and hence future servicing requirements will need to be confirmed upon release. There is opportunity to progressively lift residential capacity and introduce an urban built form within this sector which will require utility service upgrades to be assessed.
- *Precinct 6 – Southern Residential*
  - The current mains infrastructure is consistent with that proposed in the development policy plan and hence no major utility service upgrades are required within this sector. Opportunity to progressively upgrade residential capacity and introduce an urban built form will require further investigation of servicing requirements.
- *Precinct 7 – Education*
  - The current infrastructure is mostly consistent with that proposed in the development policy plan with predominantly refurbishment occurring to existing structures. There is an education/training campus and campus square proposed which will require minor utility upgrades but no changes to the existing main lines. A proposed low speed access road running North to South through the Sector will also require stormwater infrastructure.
- *Precinct 8 – Dixon Road*

- The development policy plan is currently not available for this sector and hence future servicing requirements will need to be confirmed upon release. Areas within the sector are planned to be consolidated for commercial uses which will require future utility infrastructure.

5 References

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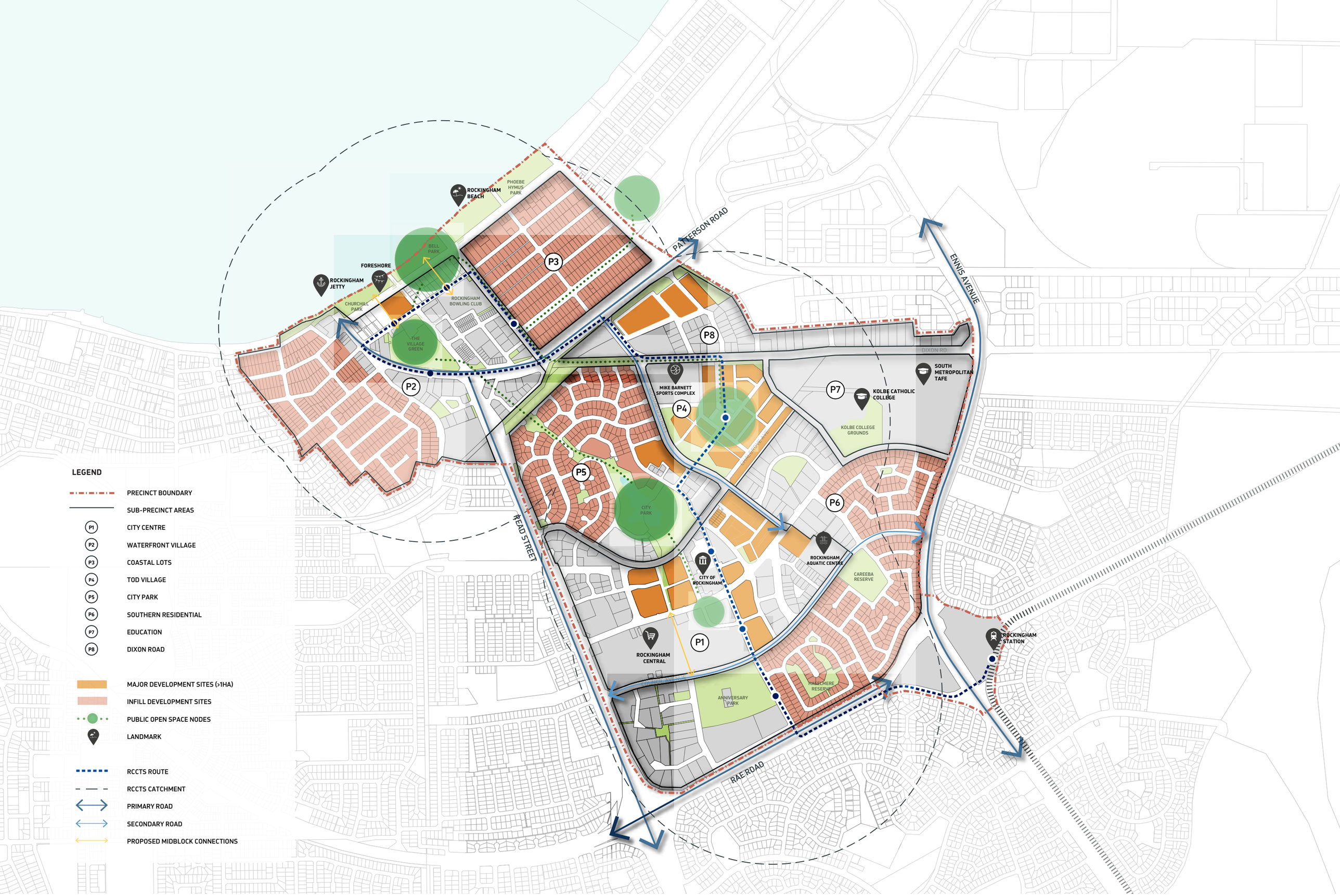
APPENDIX

A

URBAN STRUCTURE PLAN



LEGEND

- PRECINCT BOUNDARY
- SUB-PRECINCT AREAS
- P1 CITY CENTRE
- P2 WATERFRONT VILLAGE
- P3 COASTAL LOTS
- P4 TOD VILLAGE
- P5 CITY PARK
- P6 SOUTHERN RESIDENTIAL
- P7 EDUCATION
- P8 DIXON ROAD
- MAJOR DEVELOPMENT SITES (>1HA)
- INFILL DEVELOPMENT SITES
- PUBLIC OPEN SPACE NODES
- LANDMARK
- RCCTS ROUTE
- RCCTS CATCHMENT
- PRIMARY ROAD
- SECONDARY ROAD
- PROPOSED MIDBLOCK CONNECTIONS

Design Element 2 - Urban Structure Plan

Rockingham Strategic Centre Precinct Structure Plan

Status : Draft

Path : P:\44322 Local Planning Framework Review & Rockingham SRC Precinct Plan

Scale: 1:15,000 @ A3

0 300 600

North:

© Hames Sharley

Project Number: 44322

Revision: B

Date: 26/11/21

Hames Sharley

APPENDIX

B

EXISTING GAS NETWORK

Legend

RSC _Boundary

ATCOGas_Existing_Main

ATCOGas_Existing_Service_Pipes

ATCOGas_Abandoned_Gas_Main

N

1:18,924.504999 Scale at A3

km

4 0 4 8

Existing Gas Network

FIGURE B1

Cardno

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Coordinate System: [% get_crs(@layer_name)%]
Project: <Job Number>_<Phase #>
Map: Existing Power Network.qgz <REV #>

APPENDIX

C

EXISTING POWER NETWORK



Existing Power Network

FIGURE C1

N

1:16,000 Scale at A3

km

4 0 4 8

Cardno

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Date: 2021-7-26
Coordinate System: [% get_crs(@layer_name)%]
Project: <Job Number>_<Phase #>
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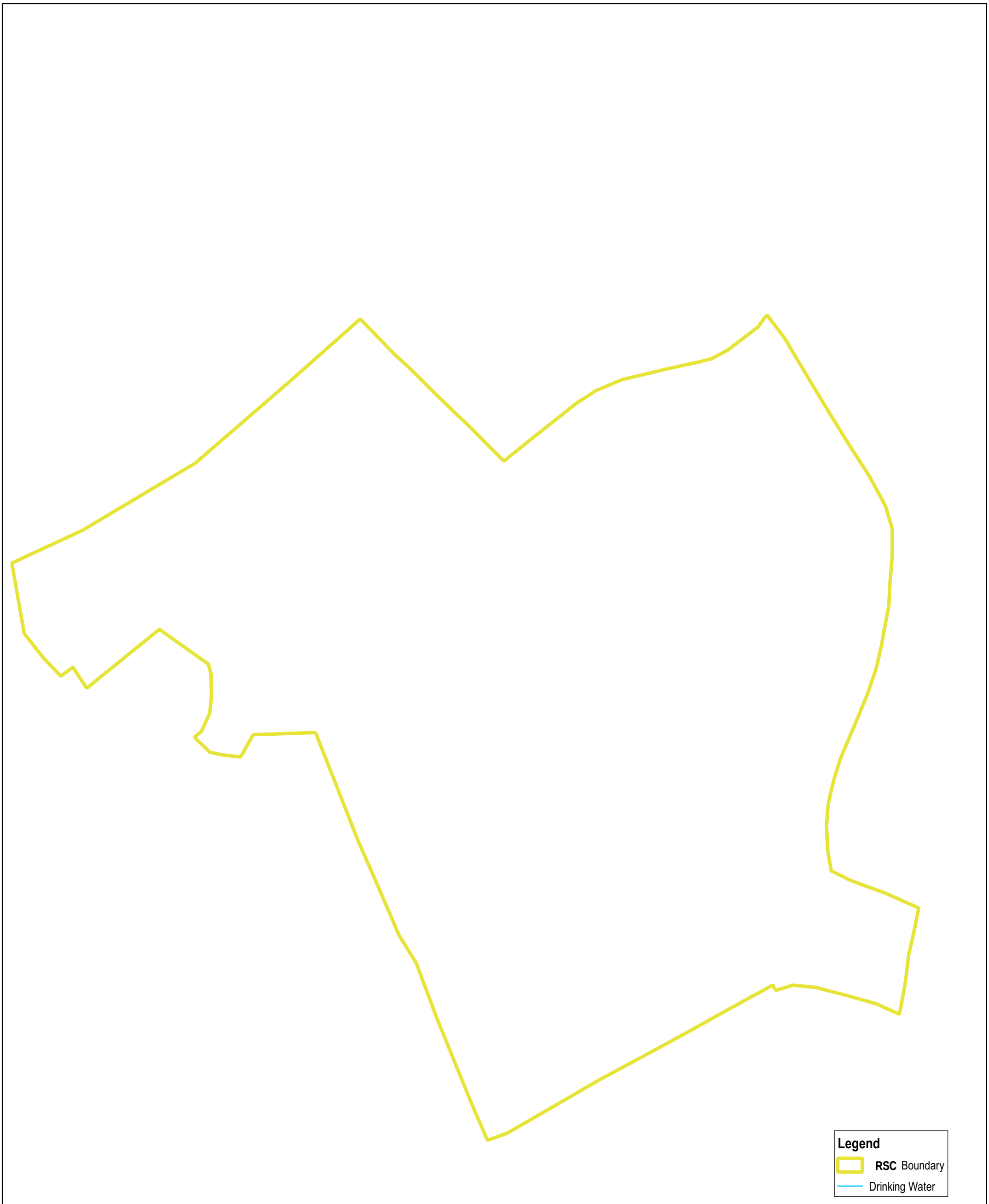
APPENDIX

D

EXISTING WATER NETWORK



Existing Water Network

FIGURE D1

N

1:16,000 Scale at A3

km

4 0 4 8

Cardno

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Project: <Job Number>_<Phase #>
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APPENDIX

E

EXISTING SEWER NETWORK



Existing Sewer Network

FIGURE E1

N

1:16,000 Scale at A3

km

4 0 4 8

Cardno

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Project: <Job Number>_<Phase #>
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APPENDIX

F

EXISTING STORMWATER NETWORK



Existing Drainage Network

FIGURE F1

N

1:16,000 Scale at A3

km

4 0 4 8

Cardno

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About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX: CDD].

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ROCKINGHAM STRATEGIC CENTRE PRECINCT STRUCTURE PLAN - PHASE 1 ENGAGEMENT OUTCOMES REPORT

SHAPE URBAN

ACKNOWLEDGEMENT

Shape Urban acknowledge the Whadjuk Nyoongar people as traditional custodians of the land on which we have worked for this project. We recognise their cultural heritage, beliefs and relationship to the land, which continue to be important to the Whadjuk Nyoongar people today.

We pay our respects to Elders past and present, and to the land which they have cared for.

DISCLAIMER

Shape Urban are proud to partner with Hames Sharley and Franklin Planning to deliver this project.

DOCUMENT TITLE

Rockingham Strategic Centre Precinct Structure Plan - Phase 1 Engagement Outcomes Report

NO.	AUTHOR	REVIEWED BY	DATE	APPROVALS
1	R Doohan	A Kelderman/N Scarfone	16/08/21	Draft for discussion
2	R Doohan	A Kelderman	25/08/21	
3	R Doohan/ N Scarfone	A Kelderman	16/11/21	Update



EXECUTIVE SUMMARY

The Rockingham Strategic Metropolitan Centre (RSMC) Plan was approved in 2009. The plan provided the framework for land use change and development. It was bold for its time, promoting different and diverse land uses and streetfront based development types.

The City is now reviewing the planning framework for the Rockingham centre to develop a more contemporary framework that is aligned with the latest State planning framework including draft *State Planning Policy (SPP) 4.2 - Activity Centres for Perth and Peel* and *SPP 7.2 - Precinct Design*.

This project will deliver a new local planning framework which will include the development of a precinct structure plan (PSP) in line with the requirements of SPP 4.2 and SPP 7.2.

The purpose of this report is to document the outcomes of the community and stakeholder engagement undertaken to inform the development of the plan.

Engagement was undertaken through a number of mediums including:

- Online interactive mapping tool
- Community workshop
- Business workshop
- Individual stakeholder meetings
- Survey

In addition, social media was used to promote the project and some feedback was provided informally there.

ONLINE MAPPING TOOL

An online mapping tool was provided to allow the community to share their thoughts and ideas in a spatial manner. 63 comments were received.

The key themes included:

- Waterfront (Foreshore) - Community and arts facilities, trees, reduced speed and movement on Rockingham Beach Road and play spaces
- Waterfront (Coastal Lots) - coastal paths and boat and marine facilities
- City Centre - recreation facilities
- Education/TOD - trees and recreation facilities
- Outside the focus areas - pathway and bike paths

COMMUNITY WORKSHOP

A community workshop was held to seek input into the planning framework review from the perspective of residents and community members in Rockingham. The workshop was attended by 27 people.

The key themes included:

- Greenery and natives
- Cycle paths
- Parking and traffic
- Mix of land uses
- Pedestrian environment
- Play and active facilities
- Update buildings and under-utilised areas

BUSINESS WORKSHOP

A business workshop was held to seek input into the planning framework review from the perspective of businesses in Rockingham. The workshop was attended by 10 people.

The key themes included:

- Providing flexibility in the planning framework to facilitate development
- The City to work with the businesses to facilitate development.

STAKEHOLDER MEETINGS

Stakeholder meetings were held with government agencies and major landholders in the centre to seek input into the planning framework review. Nine meetings were held.

SURVEY

A community survey was undertaken to build on the outcomes of the workshop with all previous attendees and submitters invited to provide comment/response directly and other advised via e-news and social media advertising. 17 responses were received across the five focus precinct areas.

SUMMARY

The key themes identified throughout the engagement period were:

- Support for more native vegetation, greenery and landscaping.
- Support for improved pedestrian and cycle networks.
- Support for more uses such as entertainment, arts and culture, sport and recreation, play spaces and marina.
- Support for activating the foreshore and suggestions to review road speeds and flow.
- Support for more parking.
- Suggestions for free transport.
- Support for iconic design and updating old buildings and suggestions for design that reduces the amount of concrete.

There were divergent views on dwelling types, land uses, building types, densities and building heights dependent on the area, and within areas.

It is recommended that in the development of the Precinct Plan that the vision be reviewed to incorporate the elements valued by the community and to ensure flexibility in the framework to encourage greater investment in Rockingham.

In addition there is an opportunity to provide a greater level of awareness of the framework within the community.



CONTENTS

EXECUTIVE SUMMARY	4
1. INTRODUCTION	7
2. COMMUNITY WORKSHOP	10
3. BUSINESS WORKSHOP	14
4. STAKEHOLDER MEETINGS	18
5. SURVEY	20
6. ONLINE ENGAGEMENT	28
7. SOCIAL MEDIA	30
8. SUMMARY & RECOMMENDATIONS	32
9. ENGAGEMENT EVALUATION	34
APPENDICES	36

1. INTRODUCTION

The Rockingham Strategic Regional Centre Plan (the Centre Plan) was approved in 2009. The plan provided the framework for land use change and development. It was bold for its time, promoting diverse land uses and streetfront based development types.

The City is now reviewing the planning framework for the Rockingham Strategic Centre (RSC) to develop a more contemporary framework that is aligned with the latest State planning framework including draft *State Planning Policy (SPP) 4.2 - Activity Centres for Perth and Peel* and *SPP 7.2 - Precinct Design*.

This project will deliver a new local planning framework which will include the development of a PSP in line with the requirements of SPP 4.2 and SPP 7.2.

The PSP will guide future subdivision and development and will bring together the following elements that make up a centre:

- Urban Ecology
- Urban Structure
- Public Realm
- Movement
- Land Use
- Built Form

The existing RSC area is shown in Figure 1.

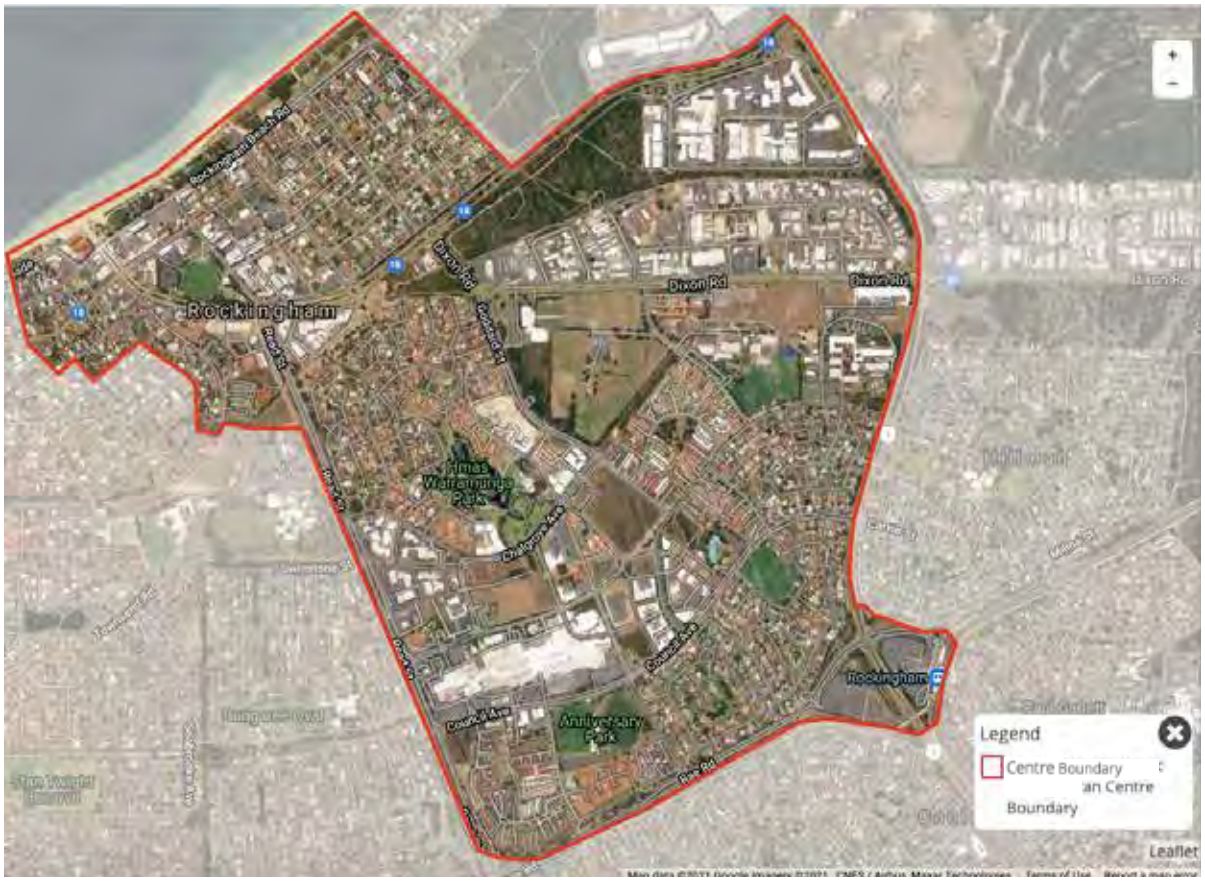


FIGURE 1: ROCKINGHAM STRATEGIC CENTRE (Map source: Social Pinpoint/ Google 2021)

1.1 PURPOSE OF THE REPORT

A key part of reviewing the Centre Plan is to undertake community and stakeholder engagement to understand how the current plan is working and seek input on the elements being reviewed.

The purpose of this report is to document the outcomes of engagement undertaken as part of this review.

1.2 ENGAGEMENT OBJECTIVES

The objective of the engagement process is to facilitate engagement that enables stakeholders to have input into the RSC PSP and provide communication and engagement support through the formal advertising of the PSP.

The engagement objectives more specifically are to:

- Undertake collaborative consultation through active engagement;
- Raise awareness about the project;
- Develop strong relationships between the City and its community;
- To understand the community and businesses values and sentiments about the centre;
- To test and confirm the vision in the existing plan;
- To confirm the objectives in the existing plan; and
- To test and confirm the built form requirements in the existing plan and to understand how well they are working and if anything requires improvement/ review.

1.3 COMMUNICATION AND ENGAGEMENT ACTIVITIES

1.3.1 Communication methods

Engagement for the project was widely advertised through various channels as follows:

- Social media project advice and updates
- Direct mail out to the precinct area
- Information on the City's website
- City's Rockport portal
- City Chronical (community newsletter)

Stakeholders were directed from the City's website to a dedicated project page on Social Pinpoint (https://getinvolved.mysocialpinpoint.com.au/rockingham-strategic-metropolitan-centre/map#/sidebar/tab/about)

The community could view project information, frequently asked questions, access the survey, register for project updates, register for community workshops or do a combination of these things.

1.3.2 Engagement activities

In order to seek feedback, the following engagement activities were undertaken for the project:

- Community and business workshops
- Individual stakeholder meetings
- Online interactive mapping tool
- Online survey





2. COMMUNITY WORKSHOP

2.1 WORKSHOP DETAILS

A community workshop was held on Thursday 17 June 2021. The workshop was attended by 27 community members, three representatives from the City of Rockingham and four members of the consultancy project team.

The workshop was opened by the Director of Planning and Development Services, and facilitated by Shape Urban.

The workshop comprised three components:

1. **Background:** An overview of the state planning framework, rationale behind the review and they key components of the plan being examined.
2. **Activity 1 - Local character:** An activity to understand the communities perspective on local character.
3. **Activity 2 - Build form and land use:** An activity to understand the communities perspective on built form and land use.

2.2 WORKSHOP OUTCOMES

2.2.1 Background

The first part of the workshop focussed on a presentation by Hames Sharley, providing an overview of the project.

It is acknowledged that the current plan was bold for its time and enables a range of development types and densities, however good planning involves constant review to ensure the framework meets the current needs to the community and is achieving its objectives.

The review of the Centre Plan has been driven by the age of the current planning framework and changes in state government planning framework, in particular draft *SPP 4.2 - Activity Centres for Perth and Peel* and *SPP 7.2 - Precinct Design*.

The project team identified that the areas of the current Centre Plan requiring moderate to significant change to align with updated state planning framework are:

- Built form (size, shape and orientation of a building)

- Public realm (the public spaces on the street and between the buildings and its relationship with the surrounding area)
- Urban ecology (elements relating to ecological systems, Aboriginal/cultural/ built heritage and environmental/ climate change impacts)

In addition, the project team provided an overview of the context analysis and what currently exists in relation to landscape, public transport, vehicles, land use and development.

The RSC is large and some areas are unlikely to experience significant change in response to this planning review. As a result, the workshop focussed on five focus areas, where elements of the plan do require a more intensive review.

These focus areas are shown in Figure 2 and listed below:

- Waterfront (Foreshore) Precinct
- Waterfront (Coastal Lots) Precinct
- City Centre Precinct
- Southern Residential Precinct
- Education/TOD Precinct

All workshop presentation material is attached to this summary at Appendix A.



FIGURE 2: ROCKINGHAM STRATEGIC CENTRE - FOCUS AREAS (Map source: Google)

2.2.2 Activity 1 - Local character

Activity 1 was an opportunity for the community to share their thoughts on the urban character of the area.

Urban character relates to elements such as:

- Activities that take place in an area;
- How people move through the space;
- The stories people have of the area;
- The physical elements such as buildings, streets and landscaping; and
- How we describe a place

The workshop participants were provided with a map of each of the focus areas and asked to write down characteristics of the area that they like and characteristics they would like to see less of.

A number of comments often related to features and facilities they would like to see in the area rather than relating to what currently exists on the ground.

The following details the common comments raised for each of the five focus areas. A number of unique responses were provided which have not been listed in the table below, however a full list of the comments received is outlined in Appendix B.

TABLE 1: ACTIVITY 1 - COMMON COMMENTS RAISED

FOCUS AREA	CHARACTERISTICS...	
	YOU LIKE	YOU'D LIKE TO SEE LESS OF
Waterfront (Foreshore)	Mixed views on height and density	Traffic - reduce speeds and volume
	More entertainment, cafes etc	
	More native plants and trees	Parking - limited availability, needs more and is unattractive
	Play opportunities	
		Unsafe pedestrian environment
Waterfront (Coastal Lots)	Bike paths and facilities	Lack/low rate of development opportunities
	Greenery	
	Play and outdoor facilities	Environmental considerations
City Centre	Greenery - landscaping, more native vegetation	Updates/upgrades required in areas
	Active and play spaces	
	City Park	
	Aquatic Centre	
Southern Residential	More natives, nature etc	Not enough natives
Education/ TOD	Greenery - natives, buffers	underutilised, isolated, desolate
	Sporting complex	

2.2.2 Activity 2 - Built form and land use

Activity 2 was an opportunity for the community to view plans that depict the building heights and types allowed under the existing Centre Plan. In groups, the participants were then asked to answer a number of questions specific to the focus areas.

The following details the key comments and feedback received for each of the five focus areas. A full list of the comments and question responses is outlined in Appendix C.

Waterfront (Foreshore) Precinct

- Preference for mixed use residential, (with no clothing to be hung on balconies). Greenery to be provided at the back of each building.
- No more height other than what is currently shown on the map.
- Desire for residential and retail to have gardens, retail/shops to have weather protection less concrete and lots of parking.
- Paths should be wide enough for walking and sitting. CCTV security and lighting to be included.
- People friendly area - potential for a mall. Lots of greenery.

Waterfront (Coastal Lots) Precinct

- More high rise with cafes/restaurants at the front.
- More height suitable on the beach front.
- A minimum lot size of 1500m^2 is not feasible.
- Family and environmental considerations are valued characteristics of the area.

City Centre Precinct

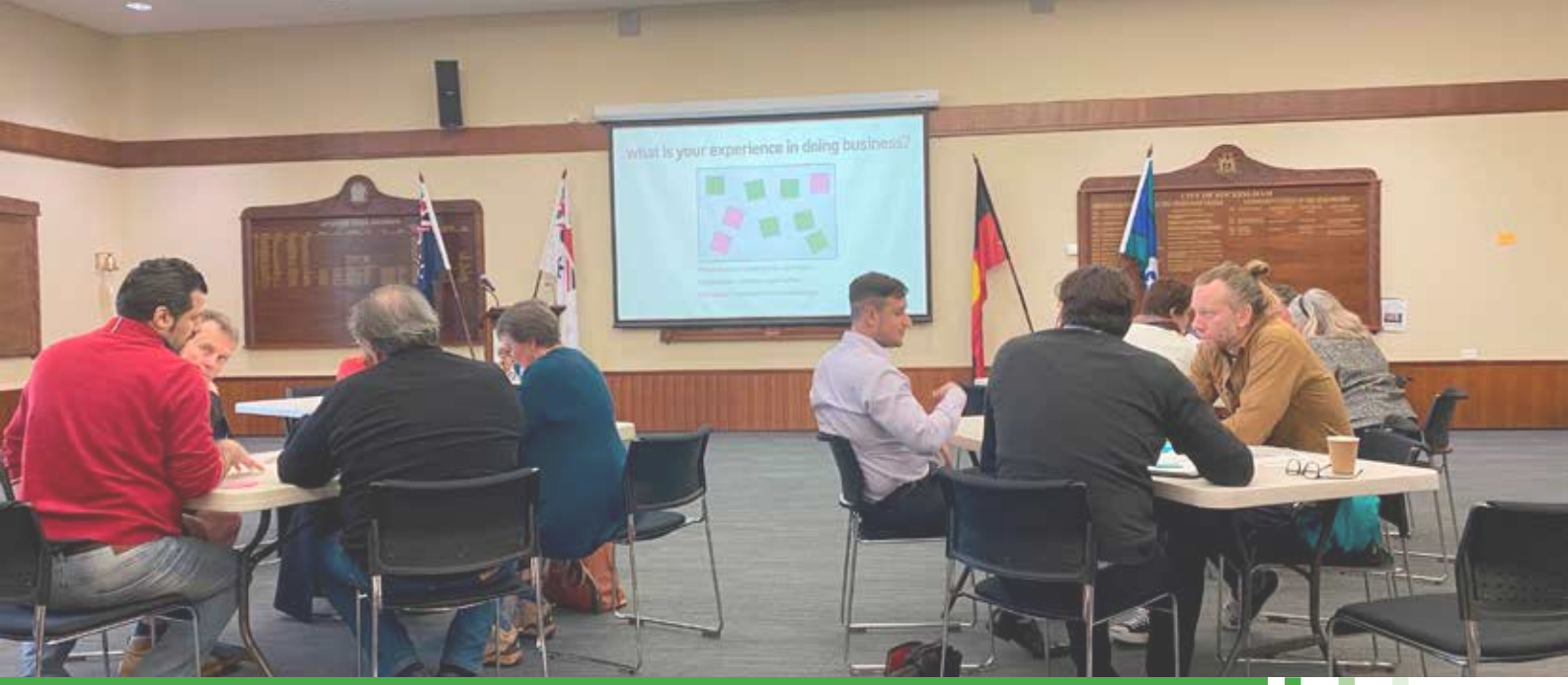
- Consideration of existing landscape, relationship to the coast and sunlight should be considered for buildings
- Commercial area (east of Contest Road) needs more life, community, art. greenery, residential development to improve safety
- Green spaces, community and play facilities would be attractive for living in this area.
- Close, mutistorey parking and passive surveillance to improve shopping centre experience
- More greenery

Southern Residential Precinct

- Preference for single and two storey dwellings.
- The quiet, peaceful characteristic of the area is valued.
- Minimum lot size of 1200m^2 for redevelopment is difficult as would require multiple landowners to sell and develop.

Education/TOD Precinct

- Transit necessary around education and sporting precinct.
- Wildlife corridors, sporting precinct, entertainment, green space, multi use buildings would be attractive for living in this area.
- Potentially more height near TAFE and Kolbe College.
- More commercial/office/entertainment space
- Sustainable design of buildings
- Green spaces and sporting complex is valued
- Notes - play spaces, public open space, cafes, bars, office, retail, mixed use
- No 15 storeys



3. BUSINESS WORKSHOP

3.1 WORKSHOP DETAILS

A business workshop was held on 28 July 2021. The workshop was attended by 10 members of the business community, three representatives from the City of Rockingham and three members of the consultancy project team.

The workshop was originally scheduled for 1 July 2021, however was postponed due to covid restrictions.

The workshop was opened by the Director of Planning and Development Services, and facilitated by Shape Urban.

The workshop comprised three components:

1. **Background:** An overview of the state planning framework, rationale behind the review and they key components of the plan being examined.
2. **Activity 1 - Opportunities and challenges:** An activity to identify the opportunities and challenges/barriers to doing business in Rockingham.
3. **Activity 2 - Built form and land use:** An activity to seek feedback on the impact of the current planning controls on doing business in Rockingham.

The business workshop focused on the Waterfront (Forehore), City Centre and Education/TOD focus areas.

3.2 WORKSHOP OUTCOMES

3.2.1 Activity 1

A number of opportunities and challenges/ barriers were identified by the group. The key themes identified about doing business in Rockingham were:

Opportunities

- Attracting a Government department/ workforce
- Planning regulations - reducing red tape.
- City centre - businesses and shopping.
- Foreshore - opportunities for activation, more residential, high rise and retail, improved parking and footpaths.
- Transport - potential for free shuttle/ CAT system.
- Environment - relationship with the ocean and outdoors and more verge planting.
- Land use - suggestion for different uses that could be considered such as arts, markets, education, bars, offices and green spaces.
- Built form and development - uniformity in design and identification of sites with development potential.

Challenges

- Land use flexibility
- Parking - requirements and linkages
- Planning system - need for City to work with businesses to provide greater support.

A full list of the comments provided is outlined in Appendix F.



3.2.2 Activity 2

In groups, the workshop attendees worked through a series of questions relating to doing business in Rockingham. The key matters raised are summarised below. A full list of the comments is provided in Appendix G.

It is noted that only one comment was provided for the City Centre which suggested a major arts/convention centre and market in the core of the centre.

Question 1: Are there any existing planning rules (specifically land use and built form) that have impacted your ability to grow and change your business?

Waterfront (Foreshore)

- Flexibility in short term use of spaces
- Insufficient parking and office space
- Building heights
- Leisure and creative activities to entertain

Education/TOD

- Utilise Murdoch University for arts and creative opportunities
- City to work with Murdoch University

Question 2: Are there any desired planning rules (specifically land use and built form) that you would suggest that would enable greater or more rapid growth of your business?

Waterfront (Foreshore)

- Streamlining/robust application system
- Parking
- Transport tram
- Larger setbacks
- More alfresco
- One way traffic
- Mixed use development

Education/TOD

- Streamline transport system
- Cycling network
- City to be active with training facilities

Question 3: If you were to identify one challenge associated with doing business in the RSC (related to the planning system), what would it be?

Waterfront (Foreshore)

- Static planning framework not facilitating innovation and change
- High quality apartment housing
- Shopping, entertainment
- Support for entrepreneurs
- Flexible governing regulations
- Faster planning approvals
- Lack of parking

Education/TOD

- Dedicated City staff to focus and drive this precinct

Question 4: Can you identify any opportunities that would encourage others to do business in Rockingham rather than somewhere else?

Waterfront (Foreshore)

- Increased visibility of unique foreshore precinct.
- Environment
- Update old buildings, modernise
- Planning department improvements
- Parking
- Office space
- Laneway construction - pedestrian access and shelter

Education/TOD

- Improve asthetics

Other comments (Waterfront (Foreshore))

- Expansion of Garry Holland as a theatre
- Craft/art centre
- Cultural centre at museum
- Major Council parking station (roughly intersection of Kent and Wanliss Streets)

Other comments (Education/TOD)

- Underutilised spaces





4. STAKEHOLDER MEETINGS

4.1 STAKEHOLDERS

The City identified a number of key stakeholders that could have a keen interest in the project and its outcomes due to the size of their land holding or their strategic role in planning and delivering major infrastructure.

The project team met with representatives from:

- Department of Transport;
- Public Transport Authority;
- Department of Communities;
- Development WA;
- Murdoch University;
- South Metropolitan TAFE;
- Kwinana Industries Council;
- Rockingham Kwinana Chamber of Commerce; and
- Two major land holders

In addition, the project team liaised with the Water Corporation and Western Power.

4.2 STAKEHOLDER FEEDBACK

The purpose of the meetings were to provide an overview of the project, understand the strategic intentions and any future plans of the stakeholders and seek feedback on the current planning framework.

The key matters raised are outlined below.

Department of Transport/ Public Transport Authority

- Supportive of establishing a Tier 2 system in Rockingham but needs to be staged / future proofed, bus priority should be the primary short-term focus.
- Parking demand management needed
- Alternative transport/movement options

Department of Communities

- Availability of housing - need for universal flexibility
- Variety of residential offerings - flexibility for different forms of tenure
- Challenge on small lots to accommodate deep soil planting and parking

Development WA

- Protection of Kwinana Industrial Area Buffer essential due to strategic importance. Sensitive land uses must not be provided within.
- Development between Patterson / Dixon Roads would need to consider existing environmental communities
- Development in RSC needs to be cognisant of economic feasibility
  - Difficult to get returns on apartments.
  - Planning controls should be aware of construction change points in the NCC (as these impact costs)
  - More nuanced approach could be considered, interim and temporary development (e.g. Joondalup) with right controls could help with activation.
  - Need to focus attention on the core before prioritising development in other areas

Murdoch University

- Focus of the campus is for engineering and sciences
- Framework needs to cater for change
- Student accommodation
- Integration of sporting facilities

South Metropolitan TAFE

- No current plans for development, but space available on site for future development
- Would be good for the campus to be connected to proposed rapid transport route

Kwinana Industries Council

- Highlighted the importance of preserving the Kwinana Industrial Area Air Quality Buffer, which seeks to minimise impacts of industrial activities (e.g. noise, light, odour, chemical omissions) on adjoining land uses. Additionally, the PSP should ensure that no sensitive land uses (namely residential) are enabled within this buffer zone.
- Consideration of the Kwinana Loop Rail Reserve

Rockingham Kwinana Chamber of Commerce

- Potential for business hub with Chamber of Commerce offices potentially in proximity to Murdoch and Council administration building.
- Red tape can be a barrier for businesses
- Likely be a need for offices in the future
- City released a Business Prospectus

Major Landholder 1

- The rigidness of the planning framework has limited development opportunities
- Challenges of delivering high rise developments given returns (cost of development vs land)
- Some planning controls are too onerous and require review (e.g. street activation)
- Welcome opportunity for Local Development Plans on larger sites

Major Landholder 2

- Plans to close parts of Syren Street to cars
- Provisions such as parking need to be less prescriptive so they remain flexible over time

Utility Providers

Feedback from Water Corporation, Western Power and other utility providers is included in the Engineering Services Report prepared by Cardno.



5. SURVEY

5.1 SURVEY DETAILS

Following the community workshop, a survey was developed to build on the feedback the project team had received so far. Specifically, we were seeking feedback on

- Built form – the size, shape and orientation of a building
- Land uses – the types of activity that happen on the site or in a building
- Movement – how you move around the precinct
- Public realm – the public spaces on the street and between the buildings and its relationship with the surrounding area
- Character – elements that make the area unique and contribute to the amenity

A separate survey was developed for each of the five focus areas. The survey was open between 19 July 2021 and 9 August 2021.

17 surveys were received, specifically:

- Seven relating to Waterfront (Foreshore)
- Three relating to Waterfront (Coastal Lots)
- Three relating to City Centre
- Two relating to Southern Residential
- Two relating to Education/ TOD

5.2 SURVEY OUTCOMES

The response options are shown below the question, with the number of responses shown in brackets. The results below do not include the options which received no response. A full copy of the survey and options is provided in Appendix H. The unique comments are provided in full in Appendix I.

5.2.1 Waterfront (Foreshore)

There were seven responses to the Waterfront (Foreshore) survey.

Question 1: In the Waterfront (Foreshore) Precinct, do you think the current building height limits are appropriate?

- Yes, the maximum heights shown on the map are appropriate (6)
- No, the maximum heights shown on the map should be increased (0)

Question 2: For new buildings and development in the Waterfront (Foreshore) Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.

- Landscaping – vegetation, trees, plantings etc. (5)
- Space around buildings (2)
- Features that reduce the amount of concrete (4)
- Weather protection – shade, awnings etc. (4)
- On site car parking (4)
- Sustainable waste options (1)
- Modern iconic design (4)
- Other (2) - Ensuring buildings consider impact of wind, reducing building heights, safer and easier crossing to access Kent Street and waterfront.

Question 3: In the Waterfront (Foreshore) Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.

- Apartment (residential focus) (1)
- Mixed use residential (ground floor commercial/retail with residential above) (5)
- Main street retail (6)
- Terrace housing (2)
- I do not want to see more, the existing building types shown on the plan are appropriate. (0)
- Other (1) - art hub on Kent St.

Question 4: In the Waterfront (Foreshore) Precinct, what type of activities would you like to see more of? Please tick those that you agree with and list any we missed.

- Hospitality venues (5)
- Al fresco opportunities (5)
- Entertainment venues (4)
- Shops (1)
- Cultural facilities (3)
- Community and arts facilities (3)
- Marina (5)

Question 5: When you move around the Waterfront (Foreshore) Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.

- Security such as CCTV (4)
- More lighting (5)
- Wide paths that allow movement, but also allow people to sit (7)
- Improved pedestrian crossings (5)
- Reduced car movement along Rockingham Beach Road (3)
- One way traffic on Rockingham Beach Road (4)
- Reduced vehicle speeds (1)
- More parking (5)
- Other (2) - Improved intersection at Kent St and Flinders Ln, pub, nightclub for over 40's, marina, more restaurants, cafes, bands, music.

Question 6: In the Waterfront (Foreshore) Precinct, what qualities and characteristics of the area and public spaces would you like to see more of?

- Greenery – trees, plantings, vegetation etc. (5)
- Connection with local history and culture (3)
- Recreation facilities – play spaces, nature play, water park etc (4)
- Artwork (2)
- Coastal views (4)
- Other (3) - jetty for swimmers, activation of foreshore, arts and cultural activities.

Question 7: Do you have/wish to start a business within this precinct?

- Yes (2)
- No (4)

7a: Are there any design elements in the existing planning framework limiting your ability to do business in Rockingham?

- "Parking and passing traffic"
- "Signage Room for expansion"

7b: Are there any opportunities you have identified that would improve your ability to do business in Rockingham?

- "Room to expand art and cultural activities"

Question 8: Is there anything else you would like to tell us about the Waterfront (Foreshore) Precinct?

- Need for parking
- CAT bus system
- More alfresco
- One way traffic along Rockingham Beach Road
- Being mindful of people wanting to sell and the planning restrictions
- Marina
- Rockingham Art Centre

5.2.2 Waterfront (Coastal Lots)

There were three responses to the Waterfront (Coastal Lots) survey.

Question 1. In the Waterfront (Coastal Lots) Precinct, do you think the current building height limits are appropriate?

- Yes, the maximum heights shown on the map are appropriate (3)

Question 2. In the Waterfront (Coastal Lots) Precinct, a lot must be at least 1,500m2 in order to develop the site. Do you think this requirement is appropriate?

- Yes, a minimum lot size of 1,500m2 is appropriate (1)
- No, lots should be larger than 1,500m2 in order to develop the site (1)
- There should be no minimum lot size for development (1)

Question 3. For new buildings and development in the Waterfront (Coastal Lots) Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.

- Greenery and trees (3)
- Features that reduce the amount of concrete (2)
- Environmentally considerate buildings (2)
- Sustainable waste options (1)
- Artwork (1)
- Modern iconic design (2)
- Other (2) – Native waterwise gardens, screening for privacy, adequate parking and driveways

Question 4. In the Waterfront (Coastal Lots) Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.

- Terrace housing (2)
- Apartment (residential focus) (2)
- Other (1) – oceanic bar with ocean views not more residential.

Question 5. When you move around the Waterfront (Coastal Lots) Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.Please tick those that you agree with and list any we missed.

- Cycle paths (3)
- Paths linking to other areas (2)
- One way traffic on Rockingham Beach Road and Kent Street (2)
- Other (1) – bring it to life (live music, concerts, bars, pool area in the ocean, street food, local crafts, twilight markets, cycle paths)

Question 6. In the Waterfront (Coastal Lots) Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.

- Greenery - green spaces, native plantings, wildlife support, trees, botanical gardens etc. (2)
- Play spaces (2)
- Cycle facilities (3)
- Removal of overhead powerlines (3)
- Improved landscaping and walkways (2)
- Connection with local history and culture (1)
- Beach and open air (3)
- Family friendly atmosphere (2)
- Other (1) – clean it up, develop land better not fill with high rise buildings.

Question 7. Is there anything else you would like to tell us about the Waterfront (Coastal Lots) Precinct?

- "Limit the height of residential appartments [sic] to 3 stories[sic]."
- Parking will bring people back.

5.2.13 City Centre

There were three responses to the City Centre survey.

Question 1. In the City Centre Precinct, do you think the current building height limits are appropriate?

- Yes, the maximum heights shown on the map are appropriate (3)

Question 2. For new buildings and development in the City Centre Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.

- Landscaping (1)
- Relationship to the coast (1)
- Features that reduce the amount of concrete (3)
- Green space between buildings (3)
- Designs that reduce areas that encourage antisocial behaviour (3)
- Art and colour (2)
- Shade (2)
- Other (1) – reduce number of vacant lots

Question 3. In the City Centre Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.

- Apartment (residential focus) (2)
- Office (2)
- Main street retail (1)
- Mixed use residential (ground floor commercial/retail with residential above) (2)
- Large format retail (1)
- Medium and high density development (affordable housing options) (1)
- I do not want to see more, the existing building types shown on the plan are appropriate.
- Other (1) – More affordable housing for seniors and elderly women.

Question 4. In the City Centre Precinct, what type of activities would you like to see more of? Please tick those that you agree with and list any we missed.

- Entertainment venues (1)
- Hospitality venues (2)
- Leisure venues (1)
- Sport facilities (1)
- Community facilities (1)
- Opportunities to support mental and physical health (2)

Question 5. When you move around the City Centre Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.

- Pedestrianising Syren Street (2)
- Removing unnecessary traffic signals (1)
- Multi-storey car park to reduce parking congestion (1)
- Waterfront transport (tram) (3)
- Cycle paths around oval (2)
- Connections between pool, sporting fields and beach (2)
- Other (1) – Modernise pool and and link to existing facilities

Question 6. In the City Centre Precinct, what features would improve the experience at the shopping centre precinct? Please tick those that you agree with and list any we missed.

- Closer parking in hidden multi-storey buildings (2)
- Passive surveillance instead of CCTV (1)
- Other (2) – More parking, clear signage, safe easy access to outdoor undercover green areas with art.

Question 7. In the City Centre Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.

- Greenery – landscaping, green spaces, native vegetation, wildlife corridors, trees, botanical gardens etc. (3)
- Play and exercise spaces (2)
- Reduced number of power poles on Chalgrove Avenue (2)
- Connection with local history and culture (2)
- Welcoming local character (1)
- More seating around oval (3)
- Art and colour (1)
- Shade (2)

Question 8. Do you have/wish to start a business within this precinct?

- No (3)

Question 9. Is there anything else you would like to tell us about the City Centre Precinct?

- "Shopping centre management need to look after their trees in the carparks. ..."
- "Connect shopping precinct to quality dinner areas"
- "Shire building needs a focus hub area to attract people."

5.2.4 Southern Residential

There were two responses to the Southern Residential survey.

Question 1. In the Southern Residential Precinct, do you think the current building height limits are appropriate?

- Yes, the maximum heights shown on the map are appropriate (1)
- No, the maximum heights shown on the map should be increased (1)

Question 2. In the Southern Residential Precinct, a lot must be at least 1,200m2 in order to develop the site. Do you think this requirement is appropriate?

- Yes, a minimum lot size of 1,200m2 is appropriate (1)
- There should be no minimum lot size for development (1)

Question 3. In the Southern Residential Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed

- Single houses (1)
- Terrace housing (2)
- Apartment (residential focus) (2)

Question 4. When you move around the Southern Residential Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.

- Reduce road noise (2)

Question 5. In the Southern Residential Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed

- Quiet, peaceful atmosphere (1)
- Underground power (2)
- Native vegetation (2)
- Nature around future development (2)
- Play spaces (2)
- Community food garden (1)
- Wildlife corridors (1)

Question 6. Is there anything else you would like to tell us about the Southern Residential Precinct?

- Main Roads need to lengthen the lane on Ennis Ave which turns into Council Rd (from the south)
- Council Rd and Council Ave are too busy. Rae Rd is underutilised.

5.2.5 Education/TOD

There were two responses to the Education/TOD survey.

Question 1. In the Education/ TOD Precinct, do you think the current building height limits are appropriate?

- Yes, the maximum heights shown on the map are appropriate (2)

Question 2. In the Education/ TOD Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.

- Campus (2)
- Residential (2)
- Office (2)
- Other (1) – Sporting facilities

Question 3. In the Education/ TOD Precinct, what type of activities would you like to see more of? Please tick those that you agree with and list any we missed.

- Commercial uses (2)
- Office space (2)
- Entertainment space (2)
- Eco tourism (1)
- Bars (small)
- Retail (1)
- Sporting facilities (1)
- Places for youth (2)

Question 4. When you move around the Education/ TOD Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.

- More lighting (2)
- Bike path network (2)

Question 5. In the Education/ TOD Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.

- Greenery - native vegetation, botanical gardens, wildlife corridors, industry green buffers, nature around future development etc (2)
- Facilities for families and youth around Mike Barnett (2)
- Connection with local history and culture (1)
- Sporting facilities (2)

Question 6. Do you have/wish to start a business within this precinct?

- No (2)

Question 7. Is there anything else you would like to tell us about the Education/ TOD Precinct?

- Reduce vacant lots and less empty buildings

5.2.6 Survey Summary

The key themes and comments raised in the survey are outlined below.

- The current heights in the precinct are generally considered appropriate.
- In the Waterfront (Foreshore) Precinct there is support for more extensive targets towards greenery and buildings with good design.
- In the Waterfront (Foreshore) Precinct there is support for more parking, as well as ensuring the area is pedestrian focused in relation to land uses, safety, movement and recreational facilities.
- In the Waterfront (Coastal Lots) Precinct there is support for greenery and cycling infrastructure.
- In the City Centre Precinct there is support for good design, a mix of uses, transport to the waterfront, greenery and seating around the oval.
- In the Southern Residential Precinct there is support for terrace and apartment style housing, reduced car noise, underground power, native vegetation, nature and play spaces.
- In the Education/TOD Precinct there is support for campus, residential and office style buildings, a mix of land uses, greenery, bike networks, facilities around Mike Barnett and sporting facilities.



6. ONLINE ENGAGEMENT

6.1 ONLINE ENGAGEMENT DETAILS

The City's website was used to provide introductory information for the review project and directed the community to a separate engagement portal specifically for the project.

The engagement portal included:

- Project background information
- Frequently asked questions
- Workshop expression of interest registrations
- Project interest registrations
- Online interactive mapping tool

The online mapping tool enabled the community to 'drop' a marker on a map of the precinct plan area and provide comments specific to an area (Figure 3) .

Following the workshops, the engagement platform was used to access surveys. The survey results are outlined in section 6 of this report.

6.2 ONLINE ENGAGEMENT OUTCOMES

A total of 63 comments were received on the interactive map. The breakdown of comments received in the different focus areas is outlined below:

- 27 Waterfront (Foreshore)
- 11 Waterfront (Coastal Lots)
- 4 City Centre
- 9 Education/TOD
- 12 outside the focus areas

The most common feedback comments provided in each of the focus areas is provided on page 27. A verbatim list of the comments received is provided in Appendix J.

Waterfront (Foreshore)

- Community and arts facilities
- Trees
- Reduced speed and movement on Rockingham Beach Road
- Play spaces

Waterfront (Coastal Lots)

- Coastal paths
- Boat and marine facilities

City Centre

- Recreation facilities

Education/TOD

- Trees
- Recreation facilities

Outside the focus areas

- Pathway and bike paths



FIGURE 3: INTERACTIVE MAPPING TOOL COMMENT DISTRIBUTION



7. SOCIAL MEDIA

Social media, specifically Facebook, was used to promote the project and any engagement activities.

Facebook posts were shared by the City through their Facebook page. A summary of the posts and their reach/engagement is outlined below.

Project Launch

A post was shared on 27 May 2021 to notify the community that the Rockingham City Centre planning documents were being review (see figure 4). The post received:

- 27 likes
- 9 comments
- 7 shares

Workshop notice

A post was shared on 11 June 2021 to notify the community of the two upcoming workshops (see Figure 5). The post received:

- 107 reactions (52 likes, 28 angry, 12 sad, 7 love, 5 laugh and 3 surprised)
- 160 comments
- 54 related discussions/shares

A large number of comments were received on this post. The dominant themes related to the graphic representation of the future form of the Rockingham Waterfront (Coastal) lots.

The comments indicate that almost none of the respondents are aware of the existing development opportunities available in the planning framework for Rockingham - with many objecting to the height shown in the artists renders.

Notwithstanding, where comments provided more detailed notes, the absence of trees and vegetation in the renders was a very strong theme, and the current availability of parking was highlighted. The Marina at Wanliss Street was also mentioned multiple times (positively).

Business workshop and survey notice

A post was shared on 19 July 2021 to notify the community of the rescheduled business workshop, due to the COVID19 restrictions and of the release of the surveys. The post received:

- 2 likes
- 4 comments



FIGURE 4: FACEBOOK POST - PROJECT LAUNCH, 27 MAY 2021



FIGURE 5: FACEBOOK POST - WORKSHOP NOTICE, 11 JUNE 2021



8. SUMMARY AND RECOMMENDATIONS

8.1 SUMMARY

The community and businesses who engaged with this first phase of the planning framework review, were extremely passionate about the area.

The project team received a broad range of feedback. The key themes identified throughout the engagement period are outlined and categorised based on the design principles of draft SPP 7.2 - Precinct Design.

Urban Ecology

- Strong support for use of natives.
- Support for more greenery, landscaping, wildlife corridors etc.

Urban Structure

- Suggestion for improved permeation for pedestrian movement.
- Suggestions around traffic movement along Rockingham Beach Road.

Public Realm

- Support for improved pedestrian environment - paths, lighting, crossings etc.
- Support for play spaces and recreation facilities.
- Support for more greenery.
- Support for activating the foreshore.
- Support for beautification of area e.g. through artwork, colour, greenery etc.

Movement

- Support for improved cycling networks/ facilities.
- Support for good pedestrian network (paths, crossings).
- Suggestion to reduce traffic speeds and volumes along Rockingham Beach Road.
- Support for more parking.
- Suggestion for a free CAT service/ shuttle through the precinct.

Land Use

- Support for more entertainment and active uses.
- Support for community, arts and culture facilities.
- Support for sport and recreation facilities.
- Support for proposed marina.

There was divergent perspectives on dwelling types and land uses dependent on the area, and within areas.

Built Form

- Support to update and modernise old buildings .
- Suggest for design that reduces concrete on buildings.
- Support for iconic design.

There were divergent views on building types, densities and building heights dependent on the area, and within areas.

Other comments

- Ensuring flexibility in the planning framework to consider new and innovative ideas and to remain robust.
- A planning system that works with the proponent as a partner rather than a regulator.
- Better utilisation of vacant land.
- Appreciation of the coastal atmosphere, welcoming character and the people.

8.2 RECOMMENDATIONS

Moving forward into the next phase of this project, there were a number of key areas which should be further considered.

Vision and principles

The current centre plan vision is:

'For a modern, distinctly coastal centre offering a wide range of mixed uses including retail, commercial, office, civic, residential, education and recreation within an accessible and highly inter-connected, urban–scaled townscape, comprising a major activity centre and related urban villages based on 'main street' principles.'

During the consultation there was no direct comments from the community regarding the validity or relevance of the existing Centre Plan vision. Notwithstanding this, throughout the consultation there were some clear themes and elements (highlighted in section 8.1) which are valued by the community, but not adequately captured in the existing vision.

In reviewing the existing vision there is an opportunity to include greater reference to some of these themes. Interweaving commonly reported elements such as 'green', 'pedestrian focused' and 'unique coastal atmosphere' will allow for a tangible response to the pre-engagement outcomes, and a more distinguished precinct vision.

These common themes should also be carried through and referenced in the Precinct Structure Plan Design principles.

Planning system and framework

A key theme raised by the businesses and stakeholders was the need to ensure flexibility in the planning framework to respond to the market and the needs of the community. In order to remain robust and adaptable over time, the requirements of the plan should, where possible, have an element of flexibility.

There was also a number of comments raised relating to reducing red tape and the City being more of a partner in innovative thinking and working with proponents to develop concepts, plans and ideas.

Having a robust, flexible planning framework will provide land owners and developers greater scope to develop and activate their property in order to achieve the long term vision of the centre and support the local Rockingham community. This will encourage greater investment in the area.

Raising public awareness

The lack of awareness of the existing framework is also notable, and this review presents an opportunity to provide a greater level of awareness of the framework within the community, and provide a simple explanation of the precinct planning framework and possible timeframes for implementation.

There was also a lack of awareness of the proposed rapid transit system between the train station and foreshore.



9. ENGAGEMENT EVALUATION

Evaluating community engagement involves assessing the quality of the engagement process. It seeks to measure how well the engagement process was planned, implemented and managed and informs continuous improvement of the engagement approach.

At the commencement of the project, targets were set to ensure that the engagement process could be measured and so that the project team could assess if feedback had been received from a good cross section of the subject community. Table 2 provides a quick evaluation of engagement targets established at the start of the process.

TABLE 2: ENGAGEMENT TARGETS

MEASURE	GOAL	ACTUAL
Number of people aware (impressions on social media, website visits, document downloads etc)	10,000	TBA
Reach (total visits to Social Pinpoint/Unique Users to Social Pinpoint)	1,200/ 500	2,076/532
Stakeholders (total number of people who contributed online - Social Pinpoint)	120	119
Number of people directly engaged by the project (submissions, attendees, social comments, emails sent/received, direct stakeholder liaison, activities complete on Social Pinpoint)	200	*127 surveys* *62 comments* *173 Facebook comments* *46 Workshop/meeting attendees* 408 Total
Number of people who received a letter regarding the project	N/A	5,658 letters


-great exercise option
- picturesque
- potential for better flaura + faung + playgrounds ✓✓✓
THE parks
BETER ACCESS BUT
More native planting please!
Aquatic Center
update + expansion
- elderly - splashpad
- young - playground
- families - parkour
- skate P
CITY PARK
CLEANLINESS LAKE
- City park - playground update was not an improvement -
*Nature scape *
* potential
Local Character is welcoming
Should have more flowers around Restaurants
A good Balance of Accesses around the Coast!!
OUTDATED PLAYSPACE
- Streets around shops -
tree lined Streets ✓✓
STREET
Lack of Watergrown Transport (Tram)
ness Update!
Concrete
Old Look
ROCKINGHAM CENTRE
shops bring people - should have more community facilities close by.
parks - playground
library - sports
community center
ect
FLAT BUILD OUT AREAS
more MULTI STORY MAKES For pob more open SPACE
MORE OF GREAT LANDSCAPING DESIGN (LIKE AROUND CITY PARK)
Like how already set out.
Oval is well Kept.

APPENDICES

- APPENDIX A: Community Workshop Presentation Materials
- APPENDIX B: Community Workshop Activity 1 Notes
- APPENDIX C: Community Workshop Activity 2 Notes
- APPENDIX D: Community Workshop Other Notes and Comments
- APPENDIX E: Business Workshop Presentation Materials
- APPENDIX F: Business workshop activity 1 notes
- APPENDIX G: Business workshop activity 2 notes
- APPENDIX H: Survey
- APPENDIX I: Survey comments
- APPENDIX J: Online mapping tool comments
- APPENDIX K: Other comments provided

APPENDIX A

APPENDIX A: COMMUNITY WORKSHOP PRESENTATION MATERIALS



rockingham strategic centre

COMMUNITY WORKSHOP

17 June 2021



welcome and thank you for coming...

city of Rockingham

Hames Sharley

S+U SHAPE URBAN

our team

City of Rockingham

+ Bob Jeans – Director Planning and Development Services
+ Peter Ricci – Manager Major Planning Projects
+ Sharon Peacock – Projects Research Officer

Consultant team

+ Nic Temov - Urban Design & Planning
+ Naden Scarfone - Strategic Planning
+ Anna Kelderman - Engagement
+ Rachel Doohan - Engagement

we’re here to help

every question is a good question

we want to hear from you about what is important

housekeeping

we have some tips about how to get the most out of todays meeting....

+ our team will help you through this and give you all the information you need
+ we will be taking photos - let me know if you do not want us to use photos of you in our reporting
+ mobile phones are fine, but perhaps move away from the table if you are chatting
+ bathrooms are outside the door to the right
+ In case of emergency we will meet at the assembly point, down stairs and in the grassed area by the car park
+ tea/coffee/biscuits are provided - please take advantage of this to keep your energy up for the discussion!
+ be COVID safe - try and keep 1.5m away from others, use the hand sanitiser at the back of the room, hold on to your pen until you leave and please make sure you practice good hygiene if sneezing
+ There is still plenty of time to get involved following today's session

what are we talking about today?

workshop purpose

why?

- Rockingham Strategic Regional Centre - Centre Plan prepared in 2009 / 2010.
- Centre Plan has provided framework for land use change and development.
- It was bold for its time, promoting different development types.
- Review now required.



cities change, so does planning



1985 -->



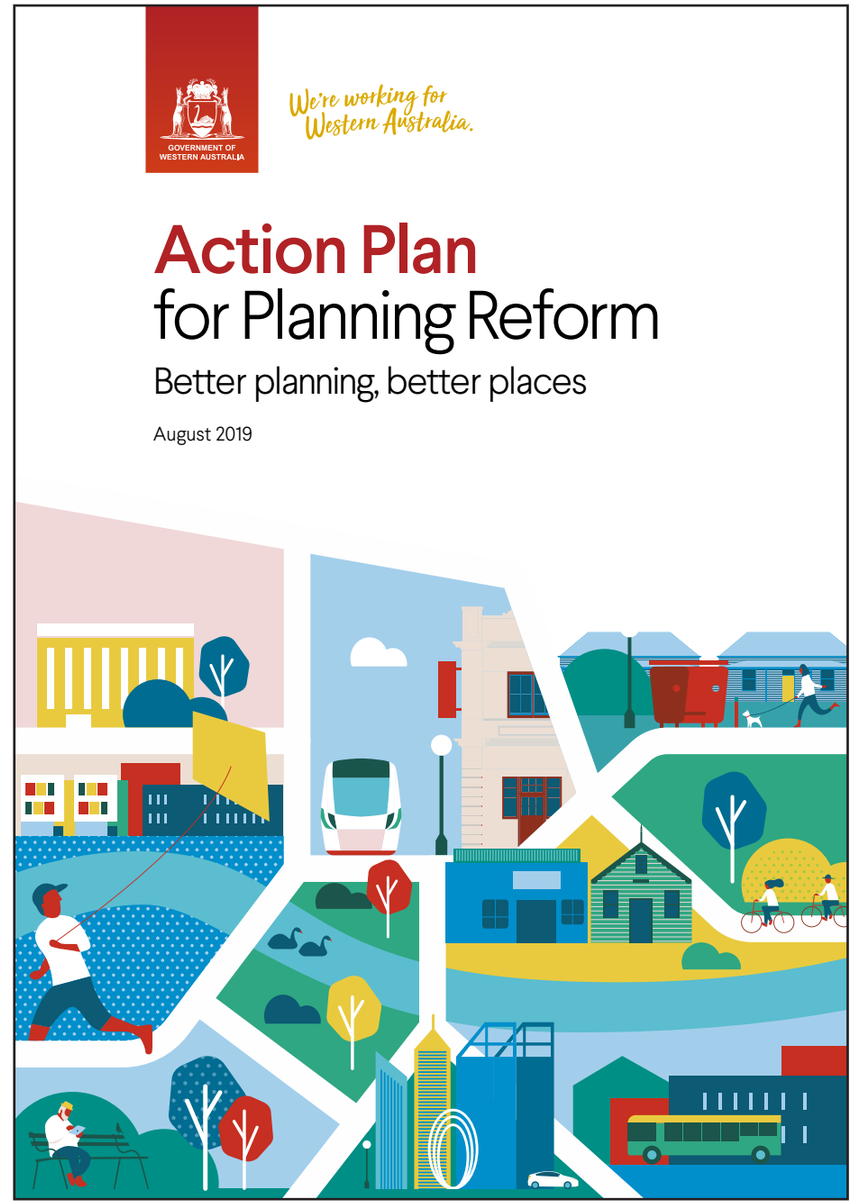
2015 -->

2045?

the need for a review

PLANNING REFORM

+ The State Government has identified three goals for planning reform:
  - Planning creates great places for people
  - Planning is easier to understand and navigate
  - **Planning systems are consistent and efficient**.
+ To achieve greater consistency and efficiency ten initiatives have been identified:
  - **Structure and precinct planning tools are fit-for-purpose**
+ Review of important state design policies is also happening.



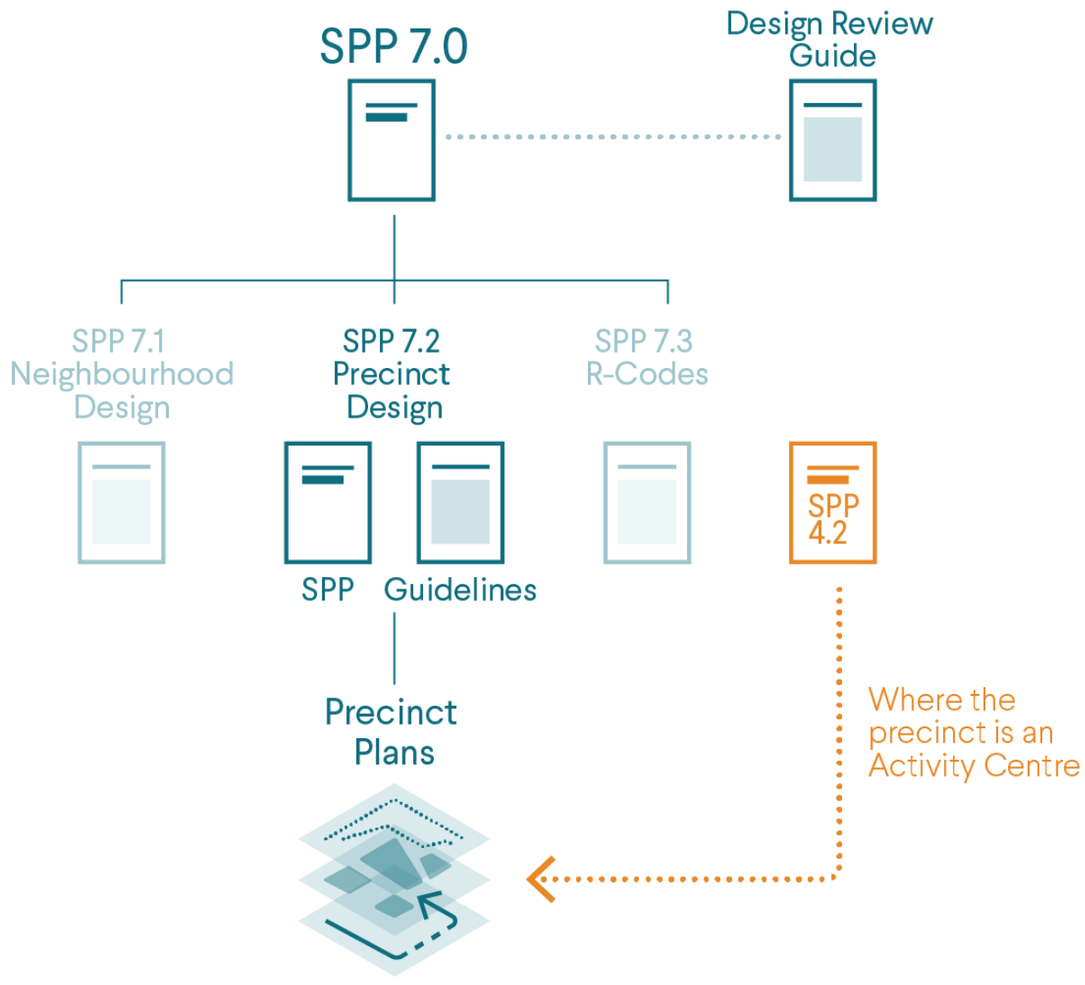
the need for a review

STATE POLICY 4.2 - ACTIVITY CENTRES

+ Policy began in 2010. It is being updated.
+ Sets out how centres are distributed, and coordinated across Perth and Peel.
+ Rockingham is one of ten Strategic Centres identified in the policy.
+ Draft has been prepared to simplify/link to SPP 7.2.

STATE POLICY 7.2 - PRECINCT DESIGN

+ Policy began operating in December 2020.
+ Planning for the Rockingham SC **must be in accordance** with this framework.
+ Requires **'Precinct Structure Plan'. Which is then approved by the State Government.**



what is a precinct structure plan?

- A planning document that **guides future subdivision and development.**
- It is prepared and approved under the provisions of a Local Planning Scheme.
- It bring together all the elements that make a centre:
  - Land use;
  - Density and development;
  - Access arrangements
  - Infrastructure;
  - Environmental assets; and
  - Community facilities



what does the existing centre plan include?

overview of the existing plan

centre plan vision (2010)

For a **modern, distinctly coastal centre** offering a **wide range of mixed uses** including retail, commercial, office, civic, residential, education and recreation within an **accessible and highly inter-connected, urban–scaled townscape**, comprising a major activity centre and related urban villages based on **'main street' principles**.



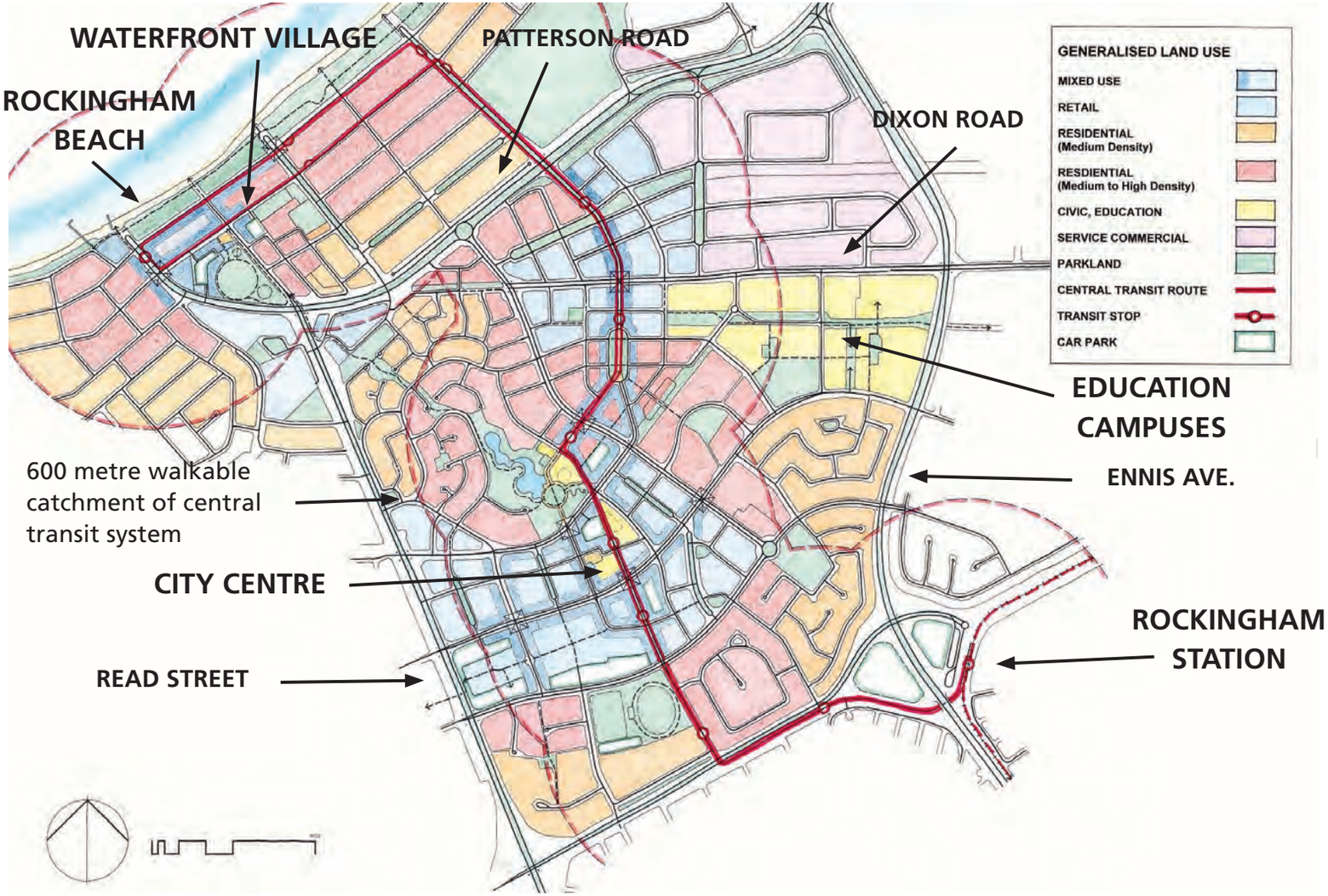




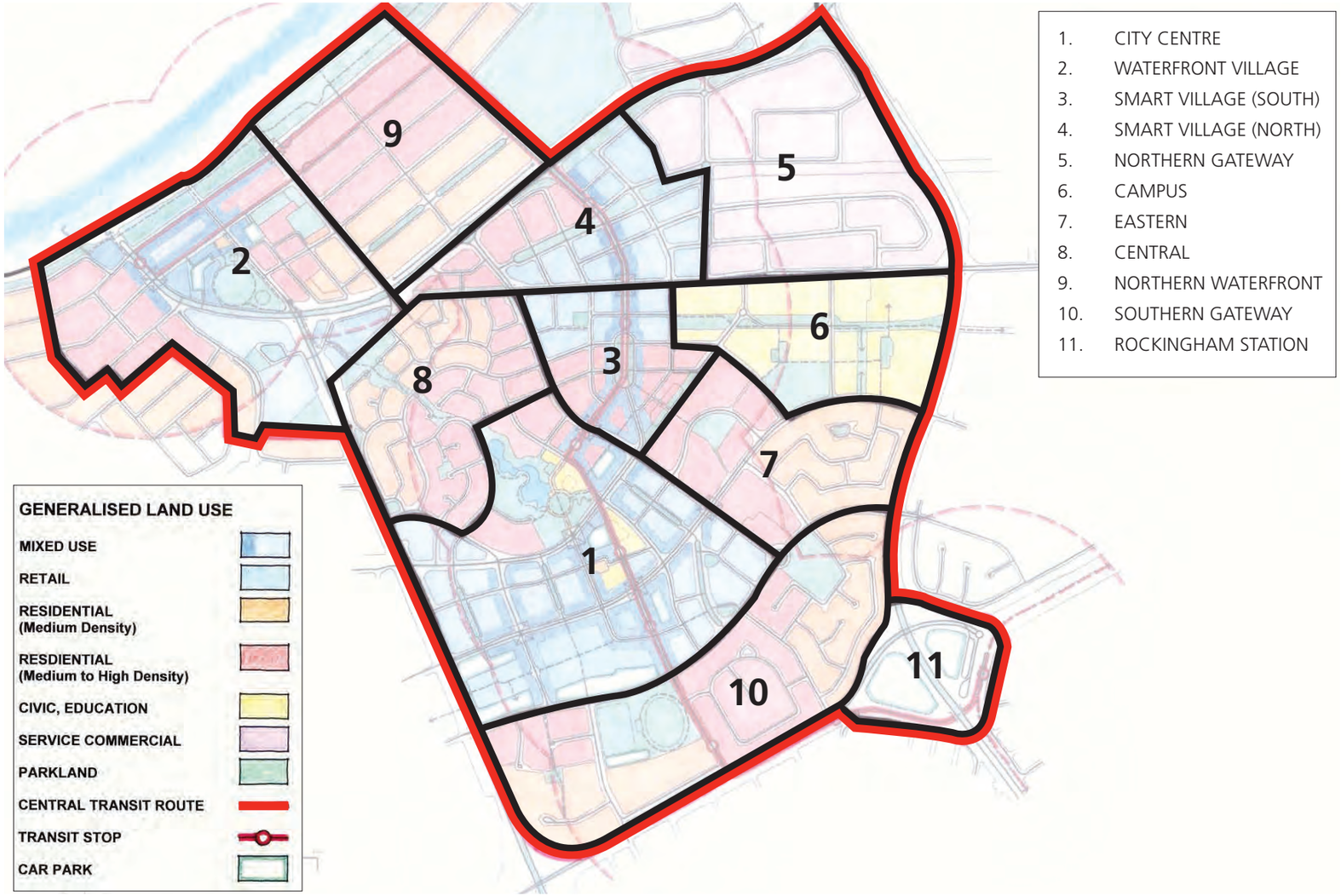
centre plan principles (2010)

- **Medium to high density development** based on **activated, "Main Street"** principles.
- A configuration of generally **contiguous street front buildings** and a **mix of uses** that generate high levels of pedestrian activity.
- A **street–based transit system**, with closely spaced stops.
- A **permeable network of streets, laneways, arcades and public spaces** that provide **high quality linkages**, particularly for pedestrians, to Centre activities from transit stops, street and off-street car parking and from the surrounding walkable catchment.
- An **identifiable City Centre hub** to provide major CBD functions.
- **Connected village precincts** between the City Centre and Rockingham Beach **along the route of the transit system**.
- The new village precincts will make provision for **mixed and consolidated education (university), technology, commercial and medium to high density residential development**, based on sustainable planning principles and design criteria.

centre plan concept (2010)



centre plan sectors (2010)



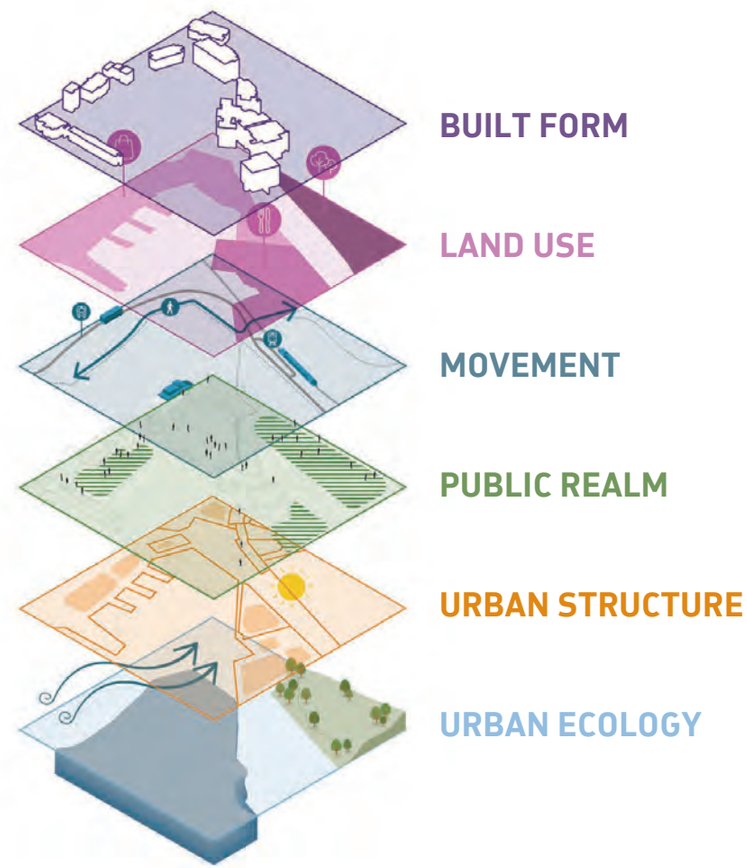
1. CITY CENTRE
2. WATERFRONT VILLAGE
3. SMART VILLAGE (SOUTH)
4. SMART VILLAGE (NORTH)
5. NORTHERN GATEWAY
6. CAMPUS
7. EASTERN
8. CENTRAL
9. NORTHERN WATERFRONT
10. SOUTHERN GATEWAY
11. ROCKINGHAM STATION

+ Each sector includes a 'Sector Policy'
+ Provides detailed guidance on land use and built form.

what needs updating (State expectations)

- We've worked with the State Government to understand what most needs updating, and what matches their expectations.
- Some of these updates are more procedural, other elements need more community input.

DESIGN ELEMENT	AMOUNT OF UPDATE NEEDED		
	MINIMAL	MODERATE	HIGH
Built Form		✓	
Land Use	✓		
Movement	✓		
Public Realm		✓	
Urban Structure	✓		
Urban Ecology			✓



what's unlikely to change from the 2010 plan

+ As the city continues to grow there are certain things that the State expects of this updated plan.
+ Rockingham Strategic Centre is still expected to be major employment, entertainment and residential hub.
  - This means the heights and densities may be adjusted or calibrated, but should generally stay.
+ Structuring Rockingham around a future Rockingham City Centre Transit System is expected.
  - This includes development around future stations.

what have we found so far?

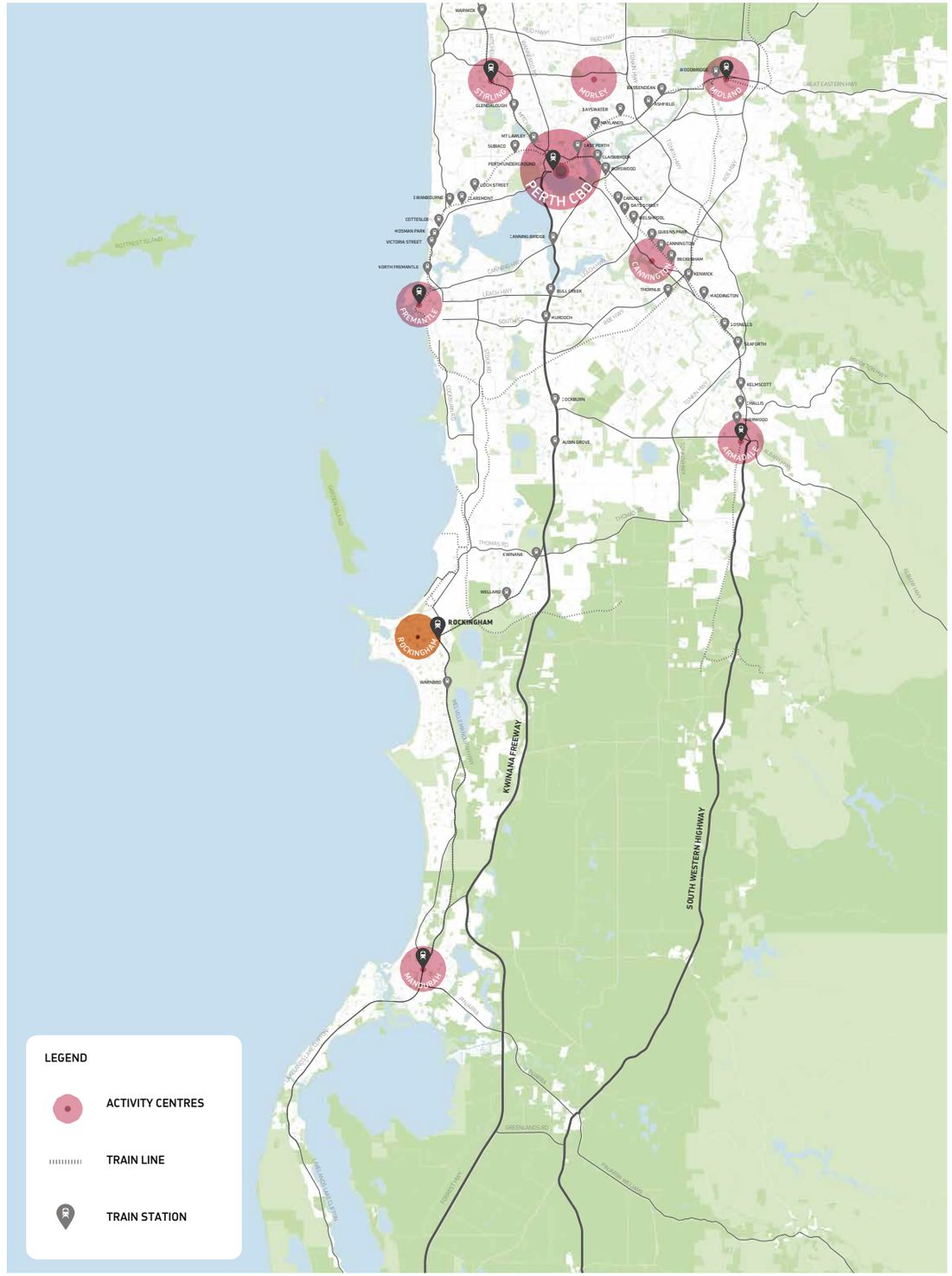
response to context

context analysis

+ **Governance Context**
  - State and local planning policies, strategies
+ **Community Context**
  - Population growth and demographics
  - Housing needs
  - Economic growth
  - Character, values, identity
+ **Physical Context**
  - Regional and local context
  - Precinct context

regional context

+ Rockingham is one of ten Strategic Centres across the Perth Metropolitan Area.
  - Main regional activity centres.
  - Multi-purpose centres that provide a diversity of uses - full range of economic and community services necessary for their catchments.
  - Expected to service substantial populations and provide a diversity of housing.
+ Rockingham is the primary centre between Cockburn and Mandurah.
+ Services a broad catchment which includes Rockingham / Kwinana LGAs and parts of Mandurah and Cockburn LGAs.



landscape











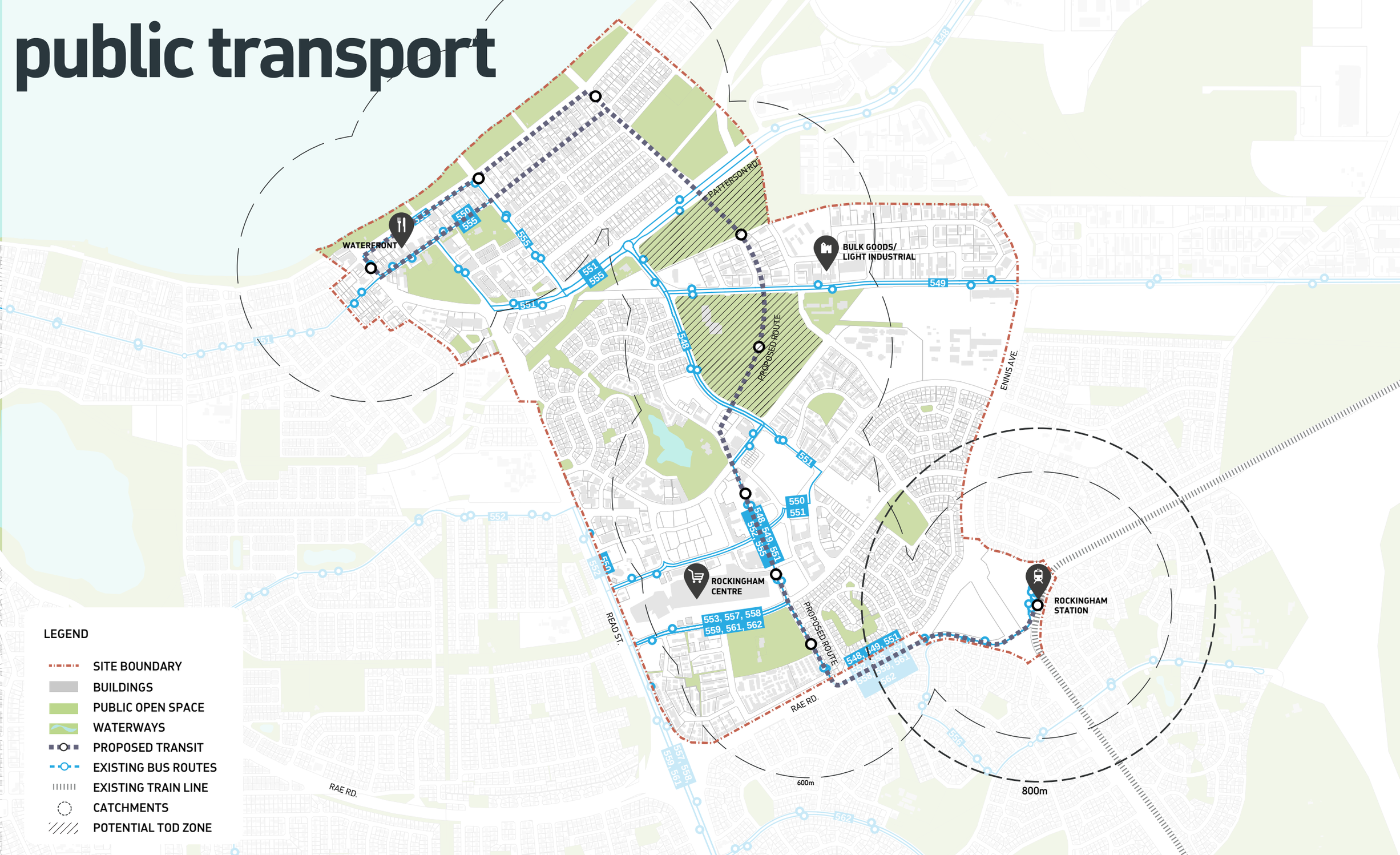




LEGEND

- SITE BOUNDARY
- FORMAL LANDSCAPED PARKS
- SPORTS AND PLAYING FIELDS
- NATURAL RESERVES/REMNANT VEGETATION
- 1 PUBLIC REALM NODES
  1. ROCKINGHAM BEACH PLAZA
  2. RAILWAY TERRACE
  3. SECONDARY MAIN STREET (KENT STREET)
  4. CIVIC PLAZA
  5. SYREN STREET
- 6AHD SPOT LEVELS
- PUBLIC FILTERED VIEWS
- DIRECT VIEWS
- POTENTIAL TOD ZONE

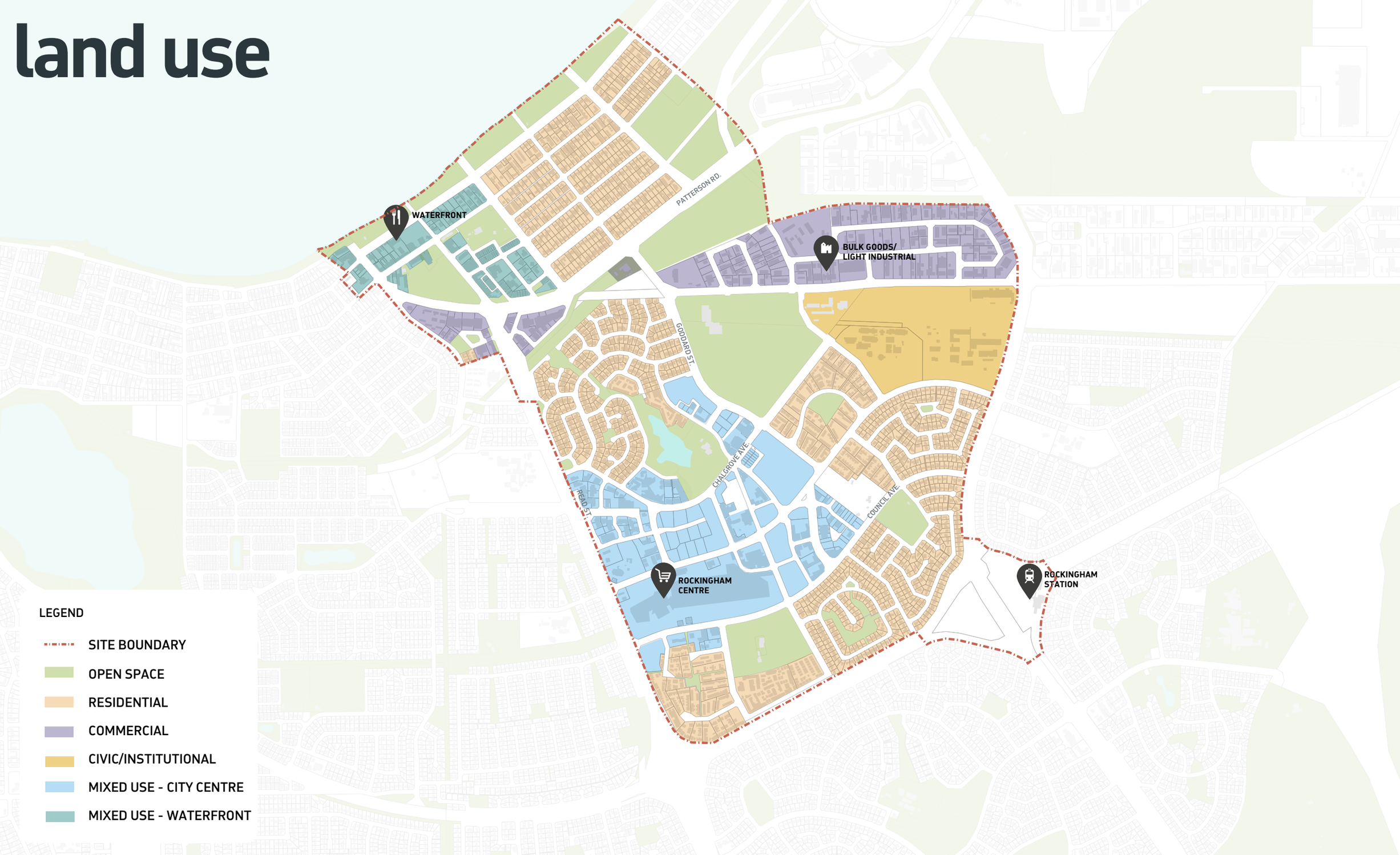
public transport



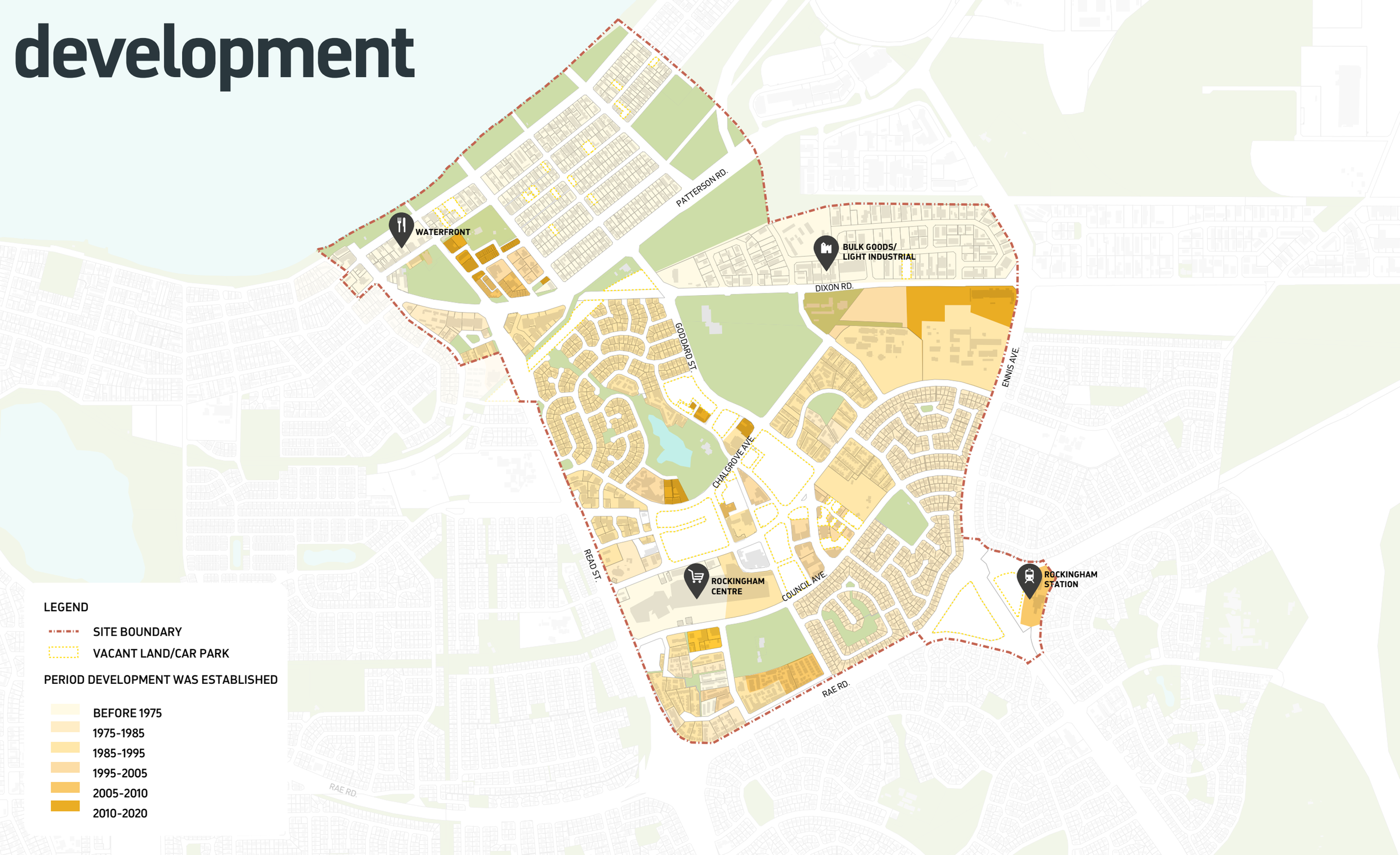
vehicles


WATERFRONT
PATTERSON RD.
BULK GOODS/
LIGHT INDUSTRIAL
DIXON RD.
GODDARD ST.
ENNIS AVE.
CHALGROVE AVE.
ROCKINGHAM
CENTRE
COUNCIL AVE.
ROCKINGHAM
STATION
READ ST.
RAE RD.
RAE RD.
LEGEND
SITE BOUNDARY
BUILDING
PRIMARY DISTRIBUTOR
SECONDARY ROUTE
PUBLIC CAR PARKING
PRIVATE CAR PARKING
POTENTIAL TOD ZONE

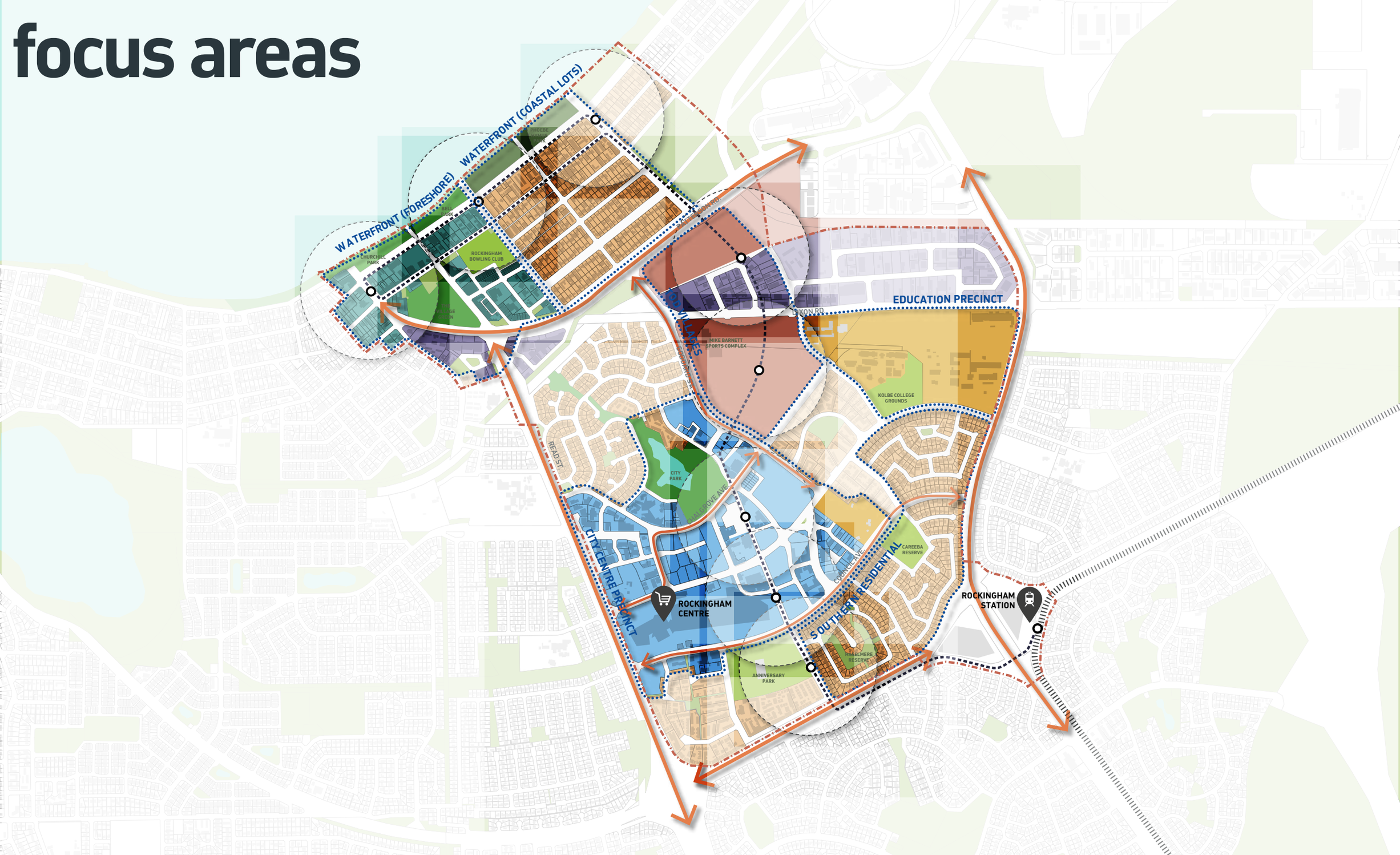
land use


WATERFRONT
PATTERSON RD.
BULK GOODS/
LIGHT INDUSTRIAL
GODDARD ST.
CHALGROVE AVE.
READ ST.
COUNCIL AVE.
ROCKINGHAM
CENTRE
ROCKINGHAM
STATION
LEGEND
SITE BOUNDARY
OPEN SPACE
RESIDENTIAL
COMMERCIAL
CIVIC/INSTITUTIONAL
MIXED USE - CITY CENTRE
MIXED USE - WATERFRONT

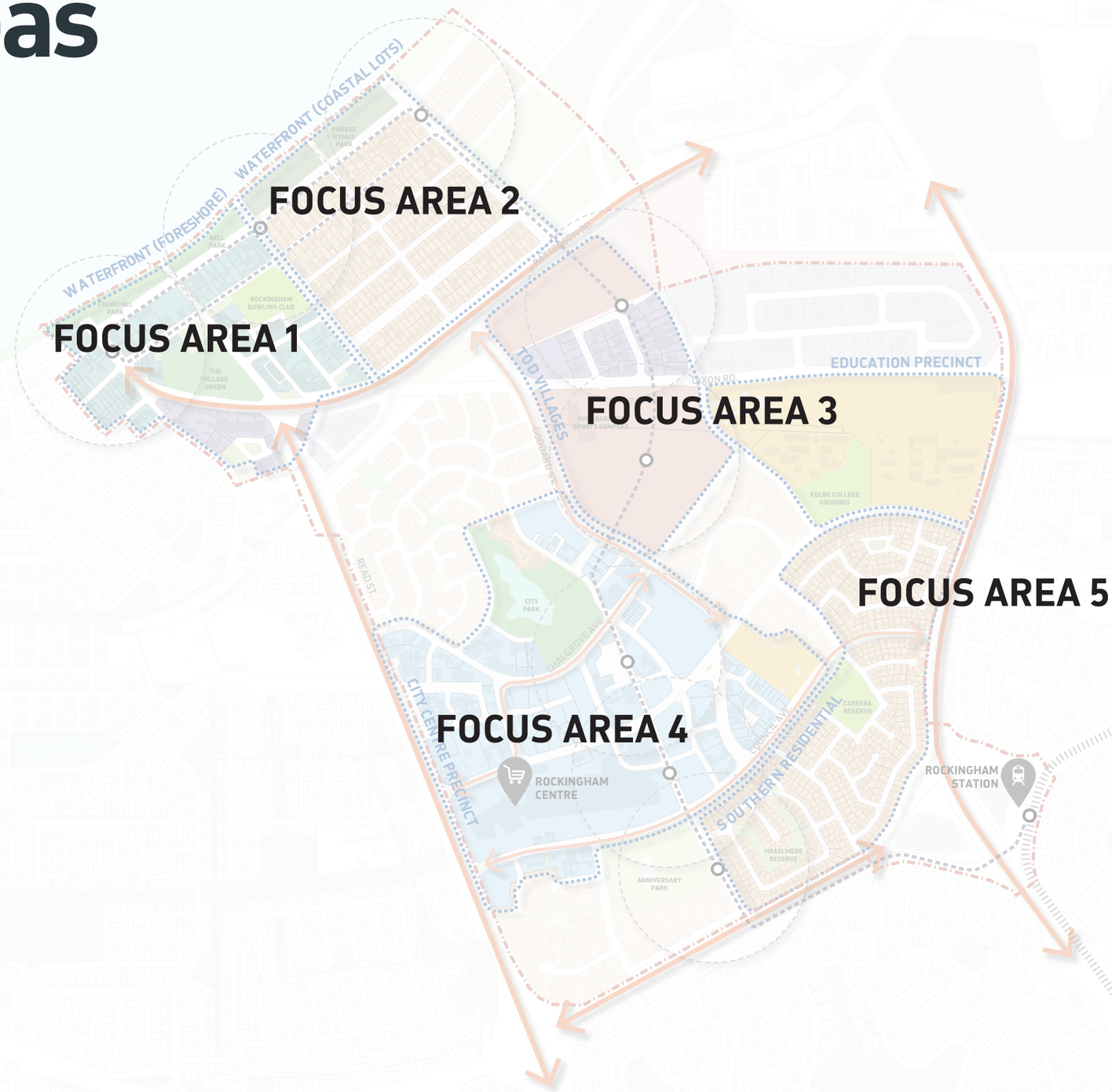
development



focus areas


WATERFRONT (FORESHORE)
WATERFRONT (COASTAL LOTS)
CHURCHILL PARK
ROCKINGHAM BOWLING CLUB
EDUCATION PRECINCT
DIXON RD
MIKE BARNETT SPORTS COMPLEX
KOLBE COLLEGE GROUNDS
CITY PARK
READ ST
HILL GROVE AVE
CITY CENTRE PRECINCT
ROCKINGHAM CENTRE
CAREEBA RESERVE
SOUTHERN RESIDENTIAL
ROCKINGHAM STATION
ANNIVERSARY PARK

focus areas


WATERFRONT (COASTAL LOTS)
WATERFRONT (FORESHORE)
FOCUS AREA 2
FOCUS AREA 1
FOCUS AREA 3
FOCUS AREA 4
FOCUS AREA 5
TOD VILLAGES
EDUCATION PRECINCT
CITY CENTRE PRECINCT
SOUTHERN RESIDENTIAL
ROCKINGHAM CENTRE
ROCKINGHAM STATION
PHOEBE HYMUS PARK
BELL PARK
CHURCHILL PARK
ROCKINGHAM BOWLING CLUB
THE VILLAGE GREEN
DIXON RD
KOLBE COLLEGE GROUNDS
READ ST
CHALGROVE AVE
CITY PARK
COUNCIL AVE
CAREEBA RESERVE
HASELMERE RESERVE
ANNIVERSARY PARK

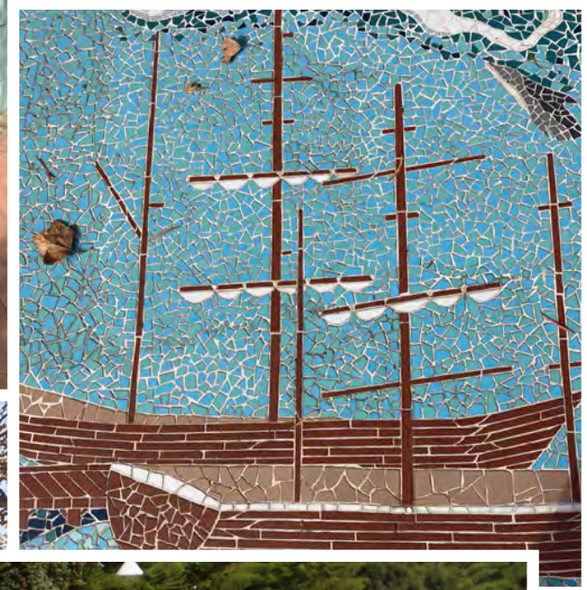
focus area discussion 1

character

what does urban character mean?

+ Character incorporates many aspects of built and public life:
  - Activities that take place;
  - How people get to and through places;
  - The stories people remember;
  - How we explain a place; and
  - The physical form of buildings (e.g. materials), streets and landscape.
+ **It's about the things that make Rockingham unique.**



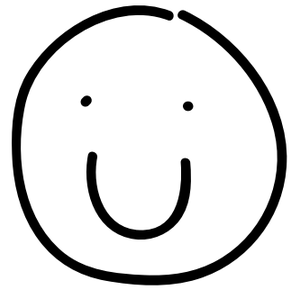




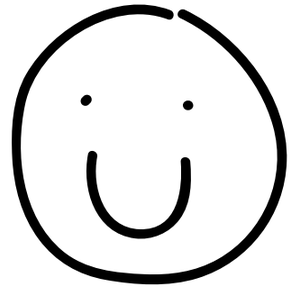


why is it important as a place changes?

- We know that cities change and evolve over time. That's true of Rockingham!
- Through the Precinct Structure Plan we can highlight the characteristics and qualities that make a place.
- If we identify them now then we can then think about how that should apply to development standards in an area.

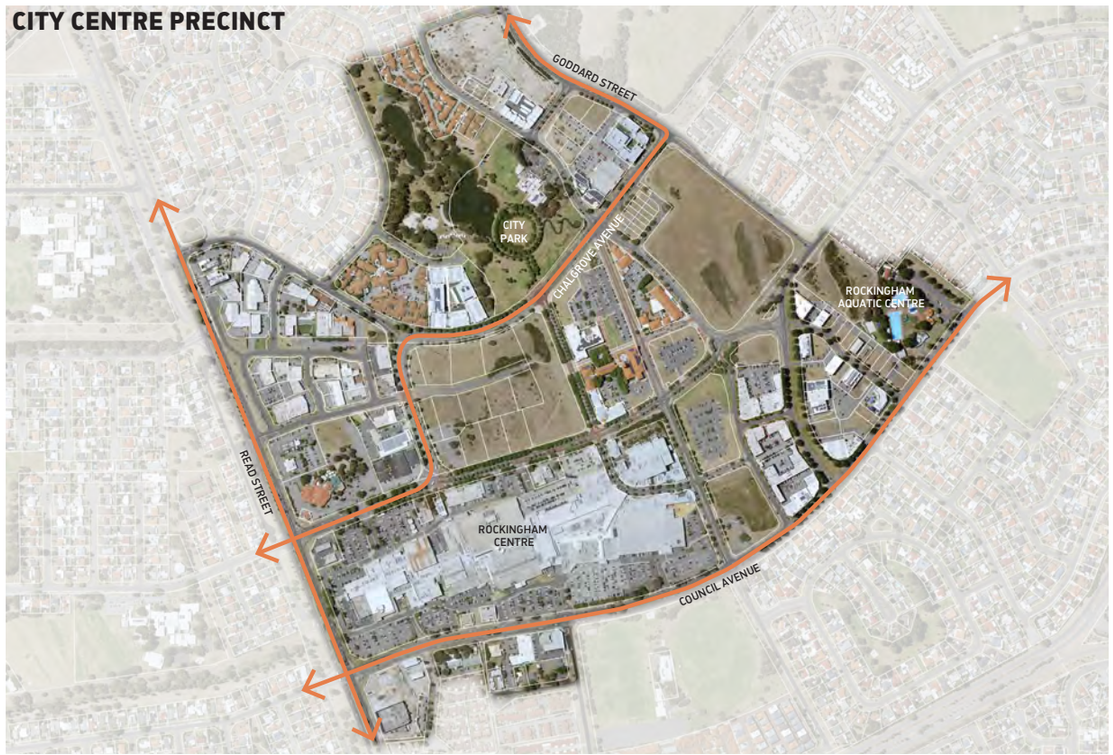


I notice the large garden spaces between the streets and the houses, they add to the green feel of the place.



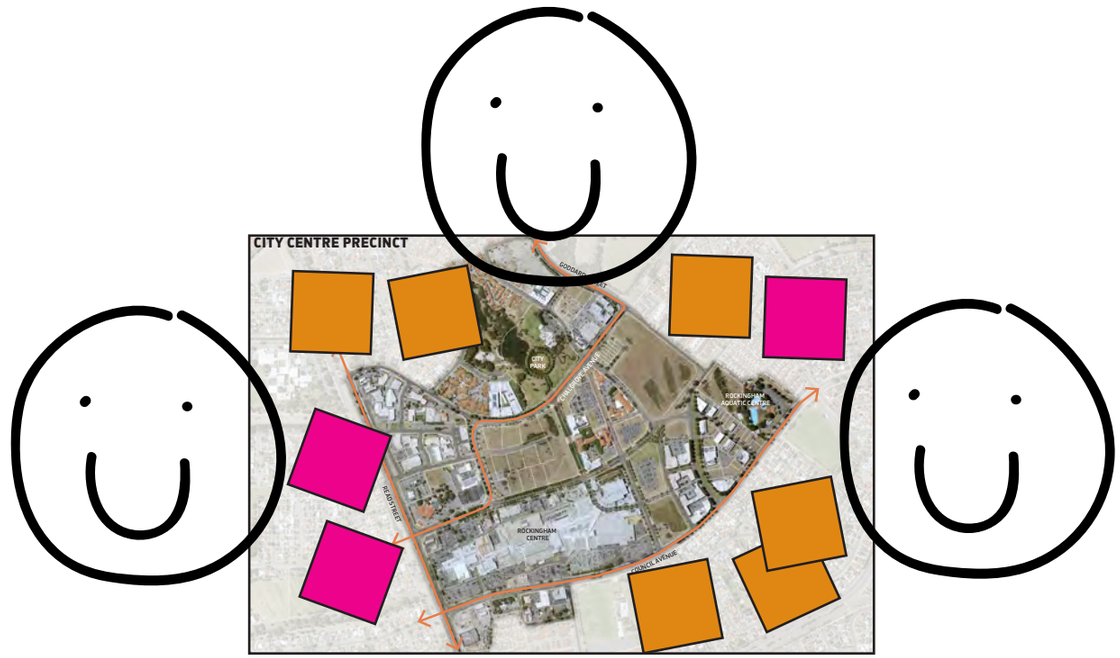
The car parks and wide traffic lanes are what I think about when I arrive into Rockingham.

how do you define local character?



The aerial plan for each focus area is for comments and post it notes.

We want to know how you define the character of each area, what you like and what you'd like to see less of.



The photo board is provided as a 'prompter'.

Orange notes = characteristics that we like

Pink notes = characteristics we'd like to see less of

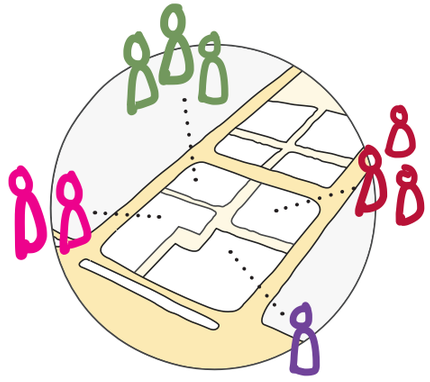
character discussion

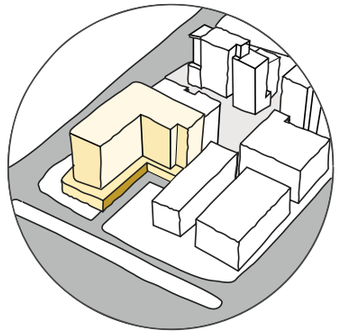
your table facilitator will guide you

focus area discussion 2

built form and land use

built form and land use





LAND USE

+ Land uses are the types of activities that happen on a site or in a building. Some examples are:
  - Residential places for living
  - Commercial places for office work
  - Retail places to buy goods, food and services
+ Land use type, proportion, mix and location should will change over time to respond to community needs.

BUILT FORM

+ Buildings are different sizes, shapes and orientations. It depends on what land uses they have inside and where they are placed.
+ Rockingham's 2010 plan supported building types with more people living and working will help local businesses and public transport.
+ The planning framework has settings that explain what heights, setbacks and other characteristics are supported in each area.

built form and land use

+ Precinct name
+ Future intent
+ Key questions we'd like to ask of you today
+ Level of change anticipated

CITY CENTRE

The City Centre will continue to be the primary location for employment with an expanded shopping centre merging with mixed-use main street developments, civic buildings and major public spaces.

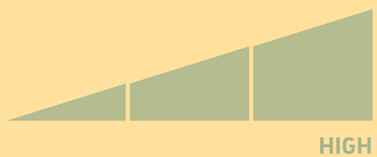
Provision will be made for higher density offices and residential apartments over street level retail and commercial tenancies.

KEY QUESTIONS:

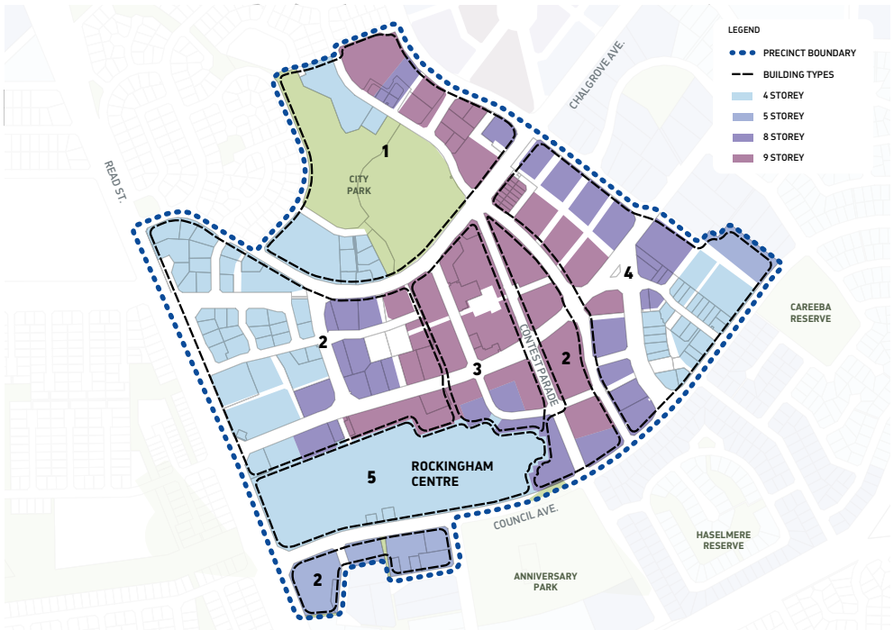
+ Of the permitted building types, which ones do you want to see more of?
+ Based on the existing permitted building height map, are there any other areas where more height would be suitable?
+ How do you use and access the commercial area east of Contest Road? Do you have any suggestions that could improve your experience here?
+ What features/uses/amenities would attract you to live in this precinct?
+ Do you have any suggestions that could improve your experience at the shopping centre precinct?
+ What character qualities do you value that should be maintained as the place changes?

LEVEL OF CHANGE ANTICIPATED

From today's environment



PERMITTED BUILDING HEIGHTS AND TYPES





Diagrams and photos are indicative to assist with workshop activities only. They may not reflect accurate heights / setbacks in the existing planning framework.

EXAMPLES OF EXISTING DEVELOPMENT IN THE AREA



built form and land use

- Map illustrating building heights and types that are currently permitted in the existing 2010 plan
- Illustrative examples of common building types that are permitted.
- Numbers correspond with plan to show typical locations.

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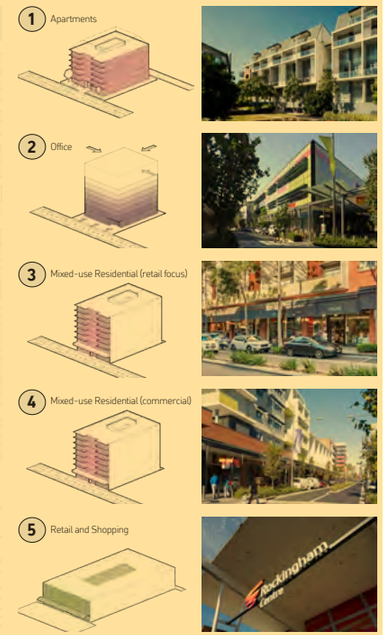
PERMITTED BUILDING HEIGHTS AND TYPES





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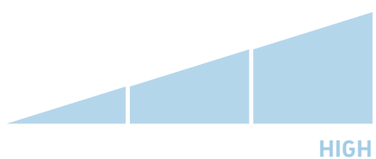

EXAMPLES OF EXISTING DEVELOPMENT IN THE AREA



built form and land use

+ Photos of existing buildings and streets in each focus area.

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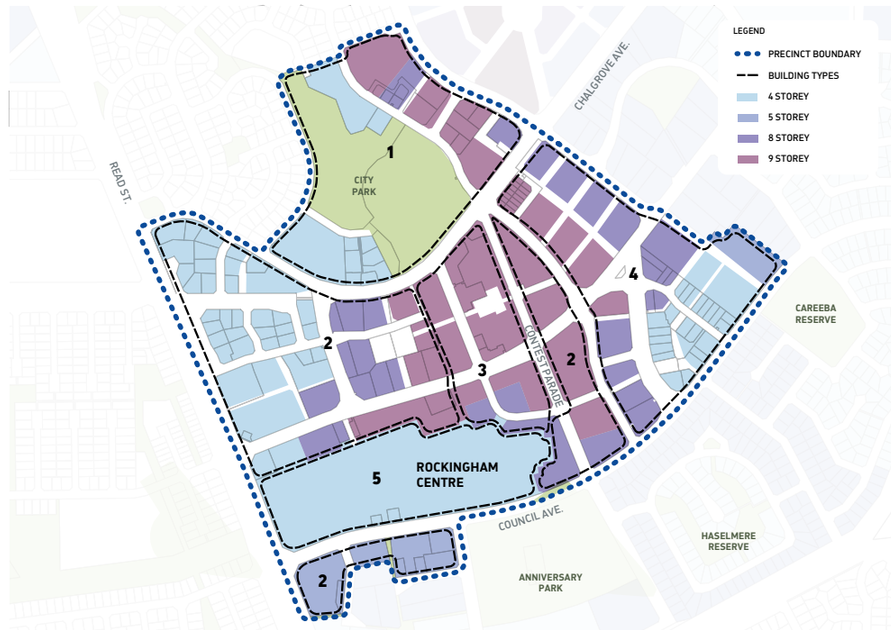
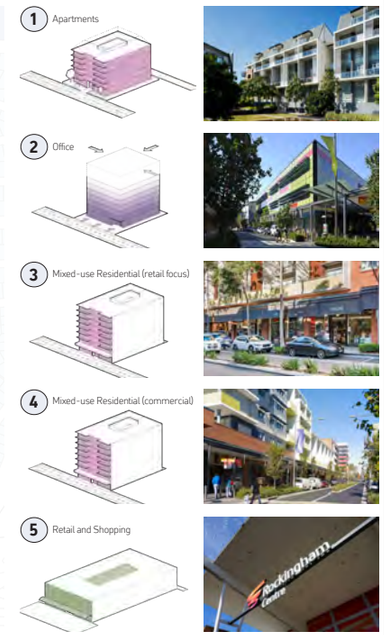
PERMITTED BUILDING HEIGHTS AND TYPES





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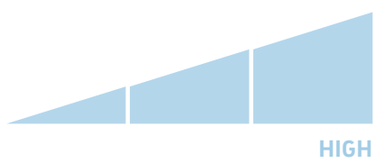

EXAMPLES OF EXISTING DEVELOPMENT IN THE AREA



built form and land use discussion

your table facilitator will guide you

what’s next....

next steps

- **June - July 2021**
  Business workshop and key stakeholder meetings.
- **August 2021**
  Concept Design.
- **October - December 2021**
  Draft Precinct Structure Plan Report.
- **January 2022**
  Council Endorsement
- **February 2022**
  Public Advertising

together let’s enable communities to flourish.

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www.hamessharley.com.au

APPENDIX B

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
Waterfront (Foreshore) Precinct	Nice area on foreshore - cafe etcetera	Fast cars in the foreshore
	More alfresco dining areas within the primary hospitality area	No crosswalk over Patterson Road to village green - unsafe
	The foreshore is beautiful - what about: - a sculpture - art walk - extend the playground - parkour, etc	Bus route close from Wanliss and Railway Terrace
	Safe water play for kids	RHam hotel site? development parking
	Affordable housing	Too much car traffic around the foreshore. Need more one way streets and more parking.
	Lots of free entertainment	Unused commercial properties, eg vacant petrol station on Parkin Street
	More entertainment, hospitality, leisure places in Rockingam Waterfront Precinct	Traffic to Garden Island, new road trucks, traffic 4am daily Rae Road through
	Keep Rockingham unique by not following what everyone else is doing, i.e. No high risk Gold Coast look	Speed bumps on Val Street along the Esplanade to Fisher, as they work at Hymus to Esplanade
	Taller and more buildings.	Old buildings on Railway Terrace and other rundown buildings
	More medium and high density in the area at the expense of the old commercial and retail structures	Crosswalk park to cafe dangerous - warning signs
	Love all our coastal views and access to them	Less concrete
	1. Build a marina 2. more trees	Marina to go ahead, build the marina
	Stop boxy housing on very little land	Shut down between Railway Tce and Wanliss
	Slow traffic speed.	More artwork
	More quirky shops along Kent Street to increase usage of precinct one street back	More connection with history and Aboriginal culture.
	Rooftop bar on foreshore	Volleyball beach sporting competitions and activities on the sand

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
Waterfront (Foreshore) Precinct continued...	Love the atmosphere of the foreshore, especially the open street trading	More land - space, i.e. Room to move around Apartment buildings - more green
	A seaside atmosphere	Any access to public places I.e. Markets / park With well lit crosswalks at night too
	Love the village green. Need more angle parking and slower traffic	Traffic along the beach road is noisy and dangerous. We need these areas for people not cars.
	More trees - native trees	Stop vehicles in Rockingham beach Road area
	More nature play	Less cars within Rockingham Beach Road area
	More native plants	No safe crossing at Thorpe Street to village green
	More trees more shade	Don't want high density apartments too close to the foreshore
	Art sculpture	Parking on the foreshore is limited, looks bad, in many places, and is not good re signage
	Modern visionary design	Lack of parking detracts me from visiting compared to pre development parking
	The tram for visitors to Rockingham	
	Redevelopment of the foreshore	
	Sustainable waste options	
	I like the village green concept, and one that left as is. If more vehicle parking is required to service the foreshore turn the existing parking area where markets are held into a multi-storey reasonably priced parking centre, rather than taking up valuable open space.	

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
Waterfront (Coastal) Precinct	Develop a cycle path network around Rockingham. Read Street is a death zone!!	Need to link paths, all the way to silos
	Develop an area for the cyclists to safely race/ride	More development between R.B. Road and beach
	Outdoor Velodrome criterium circuit Fitness/ Healthy People = less stress on a healthy system	Low rate of development
	Less concrete	Not enough sub-developable housing lots to allow people to afford to stay in their seaside lots
	Sustainable waste options	Family and children facilities for older kids • Skate park • Parkour • Nature scape • Botanical gardens • Splashpads
	Bike paths	Support for wildlife - Flora and fauna support - Plant for birds - Plant for food + habitat
	Superb beach	Mixed Residential + Shops (commercial)
	Rooftop bars	Environmentally considerate builds
	Fresh air	Green spaces • Beautify areas! • Carbon offset • Vertical gardens • Beautiful designs (art color shapes) • Botanical/bush tucker trails
	Wildlife corridors Support quendas - seals - penguins	
	More good street landscaping and walkways for pedestrians	
	More trees (small)	
	Include elders (noongar) re history	
	Art sculpture	
	Modern visionary design	
	Greenery, especially near beach front	

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
Waterfront (Coastal) Precinct	Good local people	
	Native planting Low water use	
	Nature play options	
	More public open space with multipurpose amenities for different audience segments	
	All future builds should be interspersed with nature: • Carbon offsets • Wildlife corridors • Native parks and gardens • Food forests • Play grounds for wide range of ages!	
City Centre Precinct	City Park • Graded exercise options • Picturesque • Potential for better flora and fauna and playgrounds	The big fences around the oval (Hefburn) not good
	Aquatic Centre - update and expansion • Elderly • Splash pool • Young • Playground • Parkour • Families • Skate park	Around the shops needs art, shade, color, brightening, beautifying
	Intersperse all future development with green space 1:1 • Carbon offset • Lunch spots • Wildlife habitats • Beautifying	Less shops, more entertainment hospitality and leisure venues
	More medium and higher density development, including affordable housing options	Flat build out areas - more multi story makes for more open space
	native trees, bushes, flowers - bush tucker trail?	Lack of waterfront transport (tram)
	Make more of great landscaping design like around City Park	City Park playground update was not an improvement
	Streets around shops	Nature scape potential

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
City Centre Precinct continued...	City Park - more trees	Less concrete - update old look
	The parks - better access but	Chalgrove Avenue less power poles
	Local character is welcoming	More native planting please
	Should have more flowers around restaurants	City Park, outdated playspaces lack of undercover and BBQ facilities
	A good balance of accesses around the coast	Syren street traffic pedestrianise the road in full close section
	City Park - cleanliness lake	More native planting please
	Like how already set out. Oval is well kept	Less spaces encouraging anti social behavior
	More seating around oval	Unnecessary traffic light - island or stop sign instead
	Cycle paths around oval	Aquatic Center, dated, lack of brand
	Bikes + prams	Parking is congested and in the future better suited to multi storey car parks with built in walkways between and well placed, small gardens
	Syren Street > Entertainment Leisure Precinct	
	More connection with our history and Aboriginal culture	
	Playgrounds Botanical gardens Skate park Parkour Adventure playgrounds!	
	Recycle - binlining	
	Wave pool Parkour Skate park	
	Rham Aquatic Centre - great place	
	Bike paths	
	Pool + activity areas are great	
	Wildlife corridors	
	Aquatic Centre great open place - would like to see it expanded	

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
Southern Residential Precinct	All future builds should be interspersed with nature 1:1 - native flora and fauna, community gardens, exercise, food, nature, carbon offset	Traffic light does not allow enough time to cross road
	Like the current state of residential living i.e. not apartments	No light rail above or below ground down Kitson Street
	Quiet area	Keep education area in Dixon road
	Good open space in Haselmere Reserve	More native trees, not deciduous
	More native trees on verges and in general are needed	Too much road noise
	Bike paths	Not enough native trees
	Location to shopping centre and train station	
	Wildlife corridors	
	Nature play for wide age range - parkour - skate park	
	Community food garden	

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
Education and TOD Villages Precincts	Trees - natives	Isolated feeling when out and about, not well lit, not well populated
	Consult elders re heritage	Green space around Mike Barnett needs facilities for attending youth + families - playgrounds, parks
	Green belt buffer from industry	Insufficient greenery, more street trees needed to combat asphalt heat island effect
	Green corridors place for wildlife	Shopping precinct Light industrial area is desolate and unattractive
	Bike paths	Space underutilised
	Place for youth to meet and play	Isolated feeling when out and about, not well lit, not well populated
	Nice green space - bike bitumen, could be expanded & play roads/ signs/obstacles for kids - dog parks etc	
	All future builds should be interspersed with nature 1:1: • Parks/gardens • Wildlife habitats • Playgrounds > 15 years • Park or two • Skatepark • Lunch/picnic spots • Carbon offset	
	Like this green space (Mike Barnetts Sport Complex park)	
	This space needs to be utilised (Mike Barnetts Sport Complex park)	
	Could be an extension of original complex - sport ovals to return	
	We love trees more trees	

APPENDIX B: COMMUNITY WORKSHOP ACTIVITY 1 NOTES

PRECINCT	CHARACTERISTICS WE LIKE	CHARACTERISTICS WE'D LIKE TO SEE LESS OF
	Near education hub - • playgrounds - • nature escapes - • lunch spots - • community + family facilities	Frequency of transport to move people around education precinct
	Accommodation to be integrated into the landscape, attract students for economic and education benefits	
	Artfully considered education and accommodation spaces	
	Education area all together Economic value is huge	
	Retain education hub	
	Wildlife corridor	
	Wildlife corridors to be extended using Australian native plantings	
	Bike paths	

APPENDIX C

APPENDIX C: COMMUNITY WORKSHOP ACTIVITY 2 NOTES

WATERFRONT (FORESHORE) PRECINCT	
QUESTION	**RESPONSE**
1. Of the permitted building types, which ones do we want to see more of?	Mixed use residential. No. 2. Must be a clause that no clothing can be hung on balconies that are open to public (walking) view inc. Back (greenery) area to each building
2. Based on the existing permitted building height map, are there any other areas where more height would be suitable?	No other areas higher than what is on the present map Do not want to spoil our foreshore
3. What features of the buildings in this area do you like/not like when you are on the street? Do you have any suggestions that would improve your experience from the street?	Private garden area for residents & retail. Retail & shop fronts - shade (weather protection) Less concrete at front of buildings - more features Lots of parking for visitors under high rises - birds etc
4. How do you move between Kent Street and the Foreshore? Do you have any suggestions that could improve your experience here?	Well lit walkway including security (CCTV) Cameras between each building Wide enough to cater for people to sit or relax (park benchs, room for prams & children to play)
5. What character qualities do you value that should be maintained as the place changes?	Lots of greenery so no concrete city of apartments Buildings should be built so people living above retail, cafe, shops - noise levels Must be done to allow a musician to play ??? at reasonable time - Many people enjoy this type of atmosphere People friendly open area - "mall" between Railway Tce & Flinders - seating similar to end of Railway
Other Notes	Community facilities - Art + sculpture walk Info on local *special* fauna Space for performance
	Recycling hub - recepticles etc but also community engagement - bikes that power lights , or play equipment

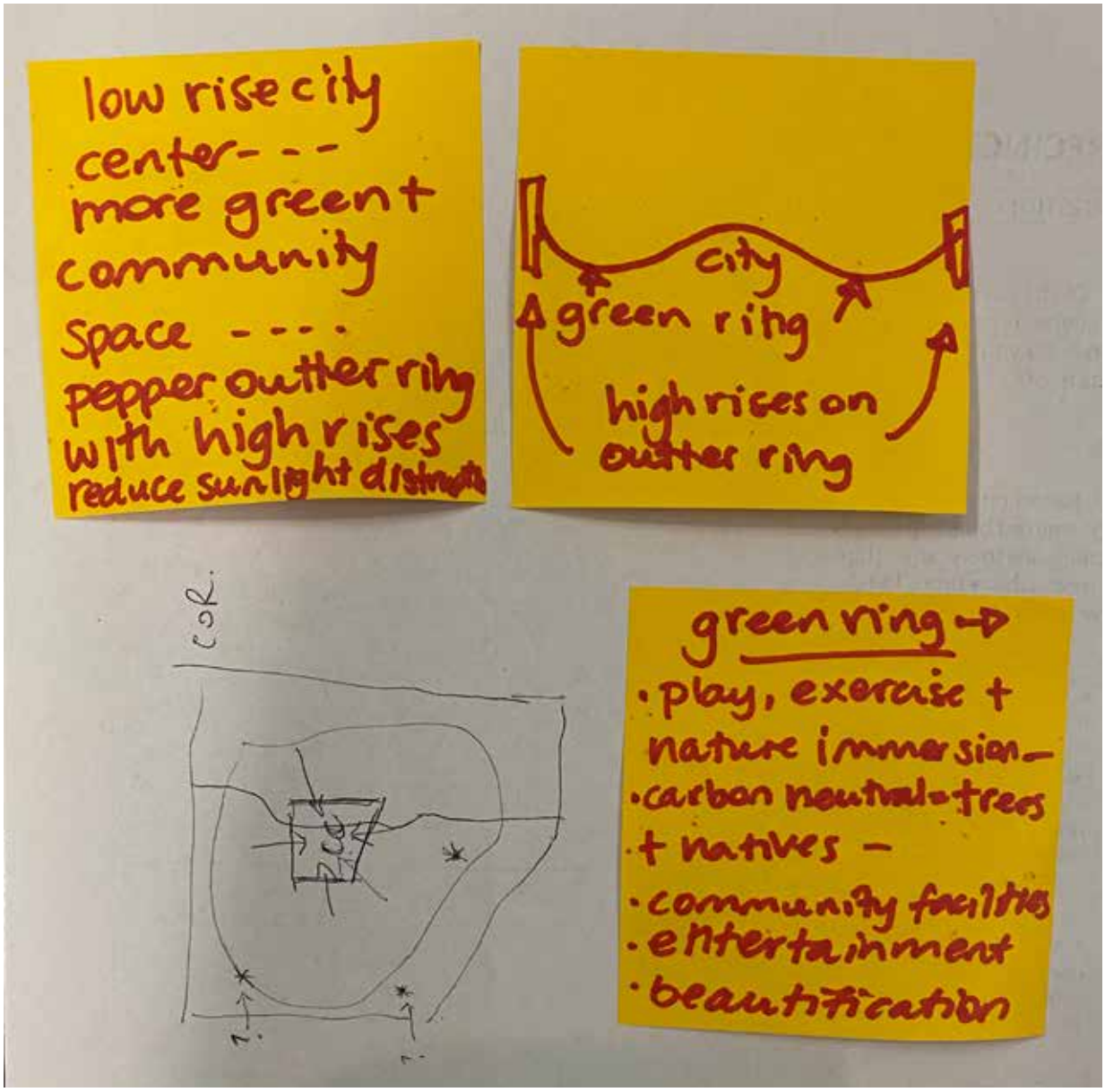
APPENDIX C: COMMUNITY WORKSHOP ACTIVITY 2 NOTES

WATERFRONT (COASTAL LOTS) PRECINCT	
QUESTION	**RESPONSE**
1. Of the permitted building types, which ones do we want to see more of?	More of the high rise with destination cafes, restaurants at front Pheobe Hymus Park developed Multi storey back into single dwelling lots
2. Based on the existing permitted building height map, are there any other areas where more height would be suitable?	The beach front
3. There is currently a 1,500m2 minimum lot size required to redevelop lots in this area to encourage consolidated development that allows for a mix of residential typologies and uses. Do you think it's achieving its goal? If not, why not?	1500m2 is not feasible for development
4. What character qualities do you value that should be maintained as the place changes?	Family Environmental considerations

APPENDIX C: COMMUNITY WORKSHOP ACTIVITY 2 NOTES

CITY CENTRE PRECINCT	
QUESTION	**RESPONSE**
1. Of the permitted building types, which ones do we want to see more of?	Don't want to see too many on the periphery Shape and design of buildings to relate to existing landscape Coastal relationship
2. Based on the existing permitted building height map, are there any other areas where more height would be suitable?	Sunlight is a very important consideration Alternative density model of higher buildings in a ring around the city centre would be worth considering
3. How do you user and access the commercial area east of Contest Road? Do you have any suggestions that would improve your experience from the street?	It's too sterile. We need more life/ community/ color/ art/ native flora + fauna + beautiful designs Gardens and green space Promote residential development to improve safety
4. What features/uses/ amenities would attract you to live in this precinct?	More green space and community opportunities Workers need rest by respite Vertical garden Exercise and play opportunities • Nature playground • Skatepark • Sports and community Facilities • Food gardens. • Parkour parks
5. Do you have any suggestions that could improve your experience at the shopping centre precinct?	Closer parking in hidden multi-storey buildings Passive surveillance instead of CCTV
6. What character qualities do you value that should be maintained as the place changes?	We need to stop the concrete There should be gardens and benefits where people can communication to support mental and physical health 1:1 to carbon offset / green spaces Introducing native flora Reliance on traditional fire methods

CITY CENTRE PRECINCT	
QUESTION	**RESPONSE**
Other notes	Low rise city centre More green + community space Pepper outer ring with high rises reduces sunlight disruption Green ring: • Play, exercise + nature immersion • Carbon neutral = trees + natives • Community facilities • Entertainment • Beautification



APPENDIX C: COMMUNITY WORKSHOP ACTIVITY 2 NOTES

SOUTHERN RESIDENTIAL PRECINCT	
QUESTION	**RESPONSE**
1. Of the permitted building types, which ones do we want to see more of?	None; single or two storey only in area 1 & area 2
2. Based on the existing permitted building height map, are there any other areas where more height would be suitable?	No
3. There is currently a 1,200m2 minimum lot size required to redevelop lots in this area to encourage consolidated development that allows for a mix of residential typologies and uses. Do you think it's achieving its goal? If not, why not?	No, average size of block is 600m2. Would take 2 or more rate payers/owners to sell to develop 1200m2, a lot of rental properties may sell as owners don't live in area No, commercial use on ground level if 5 storeys No guarantee that dwellings would be put to full use i.e. not occupied
4. What character qualities do you value that should be maintained as the place changes?	Quiet, peaceful May form urban 'ghetto' would need way more infrastructure like CCTV, underground power etc

APPENDIX C: COMMUNITY WORKSHOP ACTIVITY 2 NOTES

EDUCATION & TOD VILLAGES PRECINCT	
QUESTION	**RESPONSE**
1. Two new transit stops are proposed between Goddard Street and Patterson Road that would enable this area to transition to more urban uses. Of the permitted building types, which ones do we want to see more of?	Transit absolutely necessary around education + sporting precinct 5 -> 8 story + 3 story complexes
2. What features/uses/ amenities would attract you to live in this precinct?	Wildlife corridors (sensitive development) Sporting Precinct Bike Path Network - transport links around Rockingham + out of the precinct - Inter generational multi use/multi level buildings Entertainment, restaurants, bars (small), green space, public open space, retail, cafes
3. Based on the existing permitted building height map, are there any other areas where more height would be suitable?	Possible development of 5 to 8 stories between the uni tafe and Kolbe; Lower density everywhere else High density has the potential to become ghettos
4. Based on the existing permitted building types map, are there any areas where other building types may be suitable?	More commercial/offic/entertainment space - eco tourism potential/ Green buildings - Green roof spaces Solar passive development
5. What character qualities do you value that should be maintained as the place changes?	Existing green spaces Sporting complex - oval Value the buildings coexisting with green spaces not conflicting
Other Notes	Public open space Cafe, bars, offices, retail 18 stories BAD No 15 storeys - open to 5 + 8 storey Multi-level mixed use What about parkour park • Skate park • Nature playground • Botanical garden • Community food gardens • Bush tucker trails *At location 1 on the spatial plan, the group marked a transit stop*

APPENDIX D

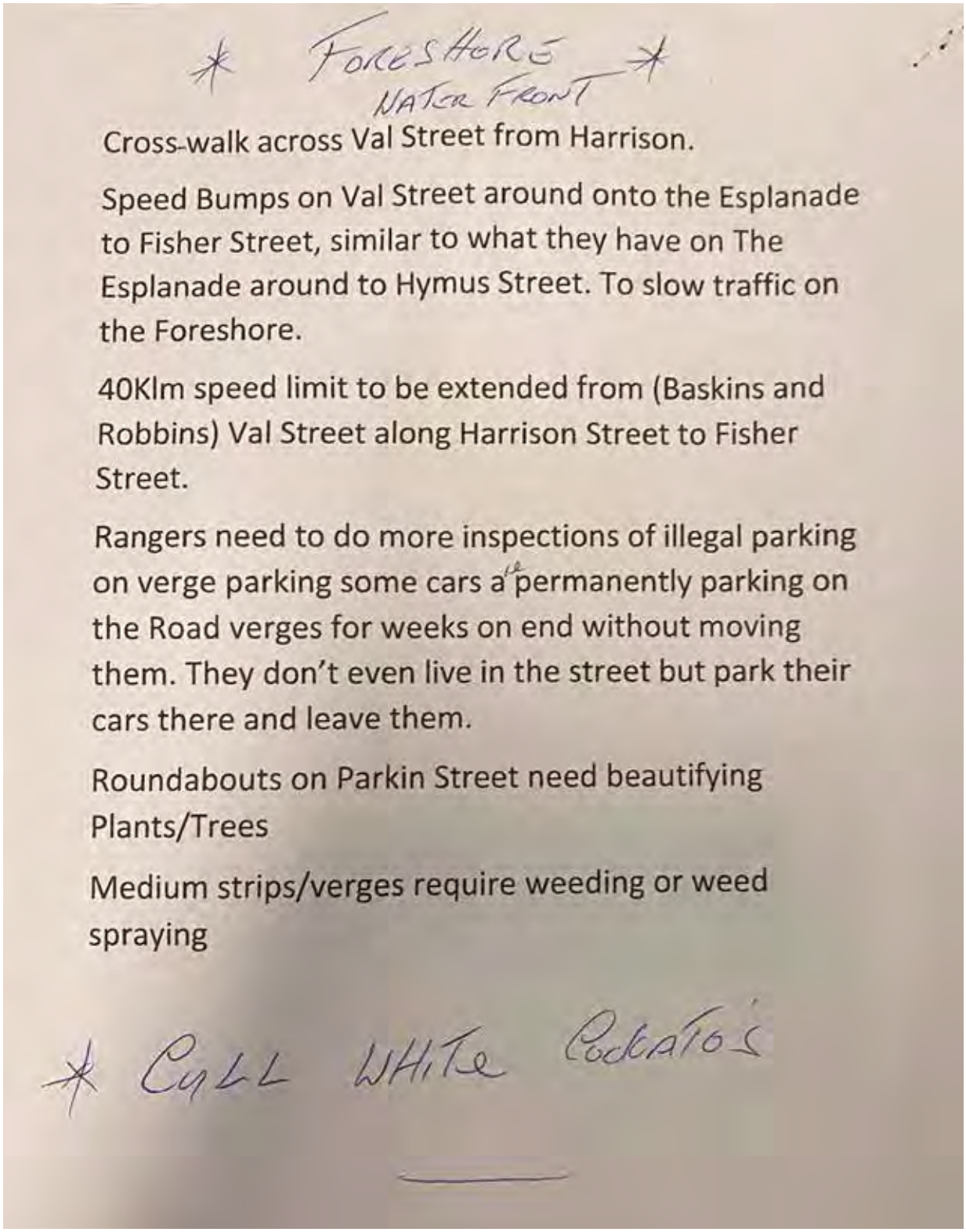
APPENDIX D: COMMUNITY WORKSHOP OTHER NOTES AND COMMENTS

COMMENTS
Upgrade C/ak [crosswalk] In Kent St Railway [undecipherable] Lead look 17th Century
Please build spaces that build and enhance our community. We need places that connect us to place
Our ideas be taken into account
Movement for people to walk safely in the area day or night and ensure the noise above retail shops/cafes is taken into the policy of each building
Rockingham is yet to realise its potential, it needs to attract more residents, we have unique opportunity to create liveable, engaged & active community
Whole area - make sure there is variety in structure + design, but make it harmonise
More buskers
What is the timeframe of developing the Southern Residential zone?

A workshop attendee also advised the project team that they would like to poll other workshop attendees on whether the foreshore from Railway Terrace to Flinders Lane should be closed to vehicles.

Five people voted agree (to close) and two voted disagree (shouldn't be closed).

Another workshop attendee provided a written document as shown below.



* FORESHORE *
WATER FRONT

Cross-walk across Val Street from Harrison.

Speed Bumps on Val Street around onto the Esplanade to Fisher Street, similar to what they have on The Esplanade around to Hymus Street. To slow traffic on the Foreshore.

40Klm speed limit to be extended from (Baskins and Robbins) Val Street along Harrison Street to Fisher Street.

Rangers need to do more inspections of illegal parking on verge parking some cars are permanently parking on the Road verges for weeks on end without moving them. They don't even live in the street but park their cars there and leave them.

Roundabouts on Parkin Street need beautifying Plants/Trees

Medium strips/verges require weeding or weed spraying

* CALL WHITE Cockatoos

APPENDIX E

APPENDIX E: BUSINESS WORKSHOP PRESENTATION MATERIALS



rockingham strategic centre

BUSINESS WORKSHOP

28 July 2021



welcome and thank you for coming...

city of Rockingham

Hames Sharley

S+U SHAPE URBAN

our team

City of Rockingham

+ Bob Jeans – Director Planning and Development Services
+ Peter Ricci – Manager Major Planning Projects
+ Sharon Peacock – Projects Research Officer

Consultant team

+ Naden Scarfone - Strategic Planning
+ Anna Kelderman - Engagement
+ Rachel Doohan - Engagement

we’re here to help

every question is a good question

we want to hear from you about what is important

housekeeping

we have some tips about how to get the most out of todays meeting....

+ our team will help you through this and give you all the information you need
+ we will be taking photos - let me know if you do not want us to use photos of you in our reporting
+ mobile phones are fine, but perhaps move away from the table if you are chatting
+ bathrooms are outside the doors at the rear of the room
+ in case of emergency we will meet outside on the grass near the entrance to the building
+ tea/coffee/biscuits are provided - please take advantage of this to keep your energy up for the discussion!
+ be COVID safe - try and keep 1.5m away from others, use the hand sanitiser at the back of the room, hold on to your pen until you leave and please make sure you practice good hygiene if sneezing

what are we talking about today?

workshop purpose

why?

- Rockingham Strategic Regional Centre - Centre Plan prepared in 2009 / 2010.
- Centre Plan has provided framework for land use change and development.
- It was bold for its time, promoting different development types.
- Review now required.



cities change, so does planning



1985 -->



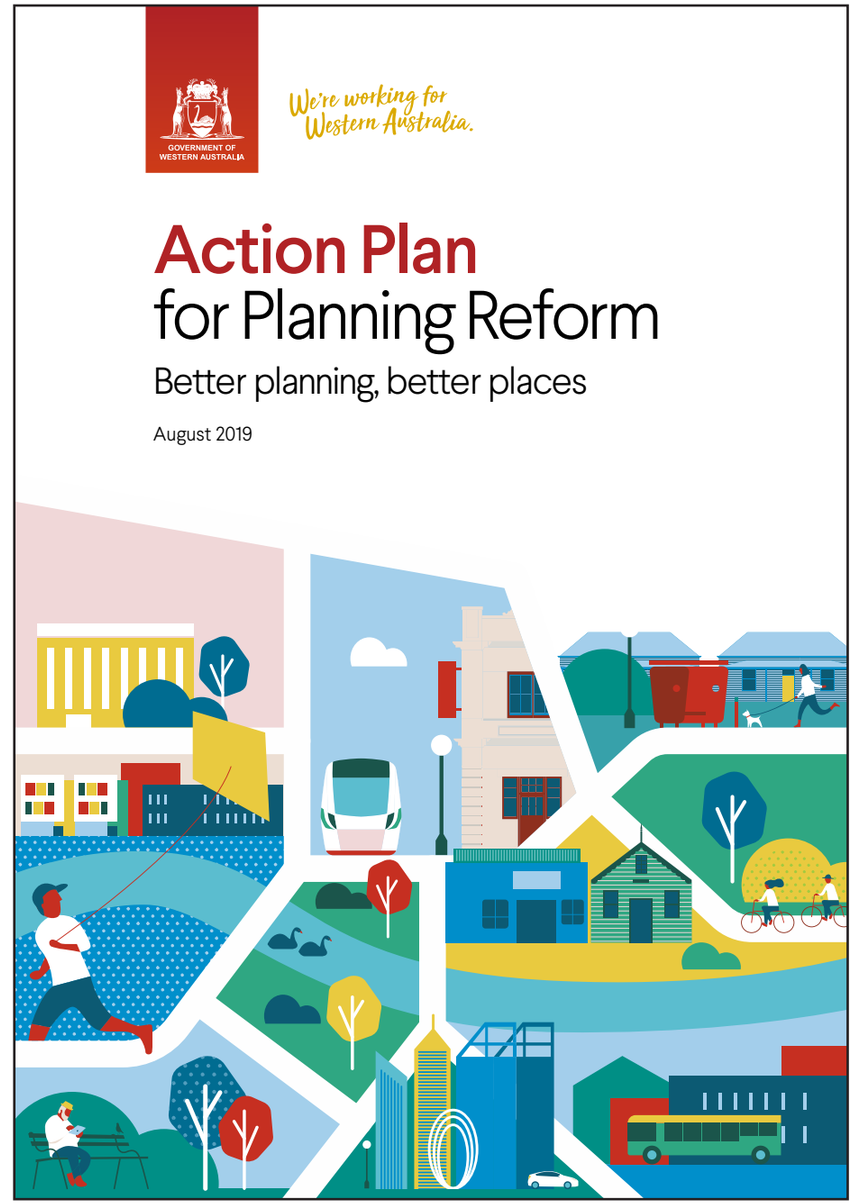
2015 -->

2045?

the need for a review

PLANNING REFORM

+ The State Government has identified three goals for planning reform:
  - Planning creates great places for people
  - Planning is easier to understand and navigate
  - **Planning systems are consistent and efficient**.
+ To achieve greater consistency and efficiency ten initiatives have been identified:
  - **Structure and precinct planning tools are fit-for-purpose**
+ Review of important state design policies is also happening.



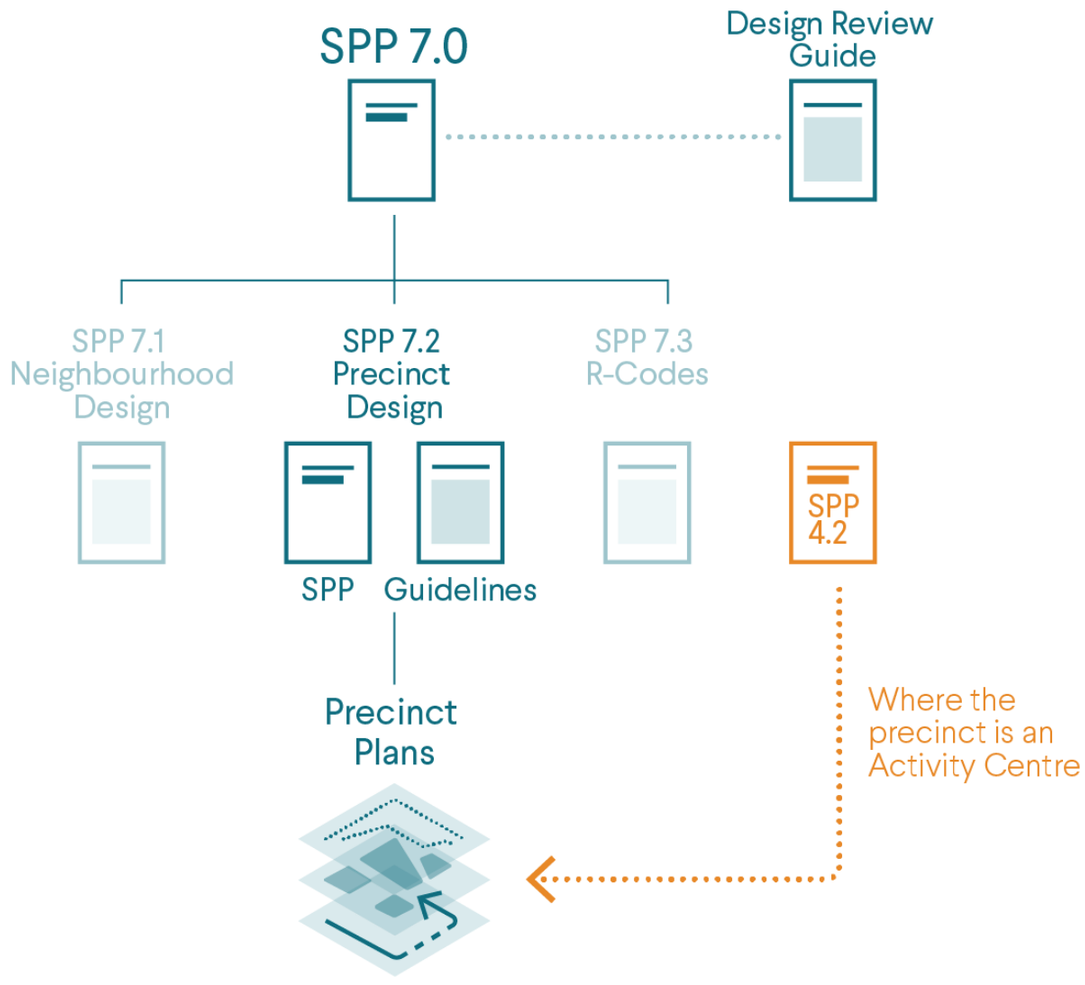
the need for a review

STATE POLICY 4.2 - ACTIVITY CENTRES

+ Policy began in 2010. It is being updated.
+ Sets out how centres are distributed, and coordinated across Perth and Peel.
+ Rockingham is one of ten Strategic Centres identified in the policy.
+ Draft has been prepared to simplify/link to SPP 7.2.

STATE POLICY 7.2 - PRECINCT DESIGN

+ Policy began operating in December 2020.
+ Planning for the Rockingham SC **must be in accordance** with this framework.
+ Requires **'Precinct Structure Plan'. Which is then approved by the State Government.**



what is a precinct structure plan?

- A planning document that **guides future subdivision and development.**
- It is prepared and approved under the provisions of a Local Planning Scheme.
- It bring together all the elements that make a centre:
  - Land use;
  - Density and development;
  - Access arrangements
  - Infrastructure;
  - Environmental assets; and
  - Community facilities



what does the existing centre plan include?

overview of the existing plan

centre plan vision (2010)

For a **modern, distinctly coastal centre** offering a **wide range of mixed uses** including retail, commercial, office, civic, residential, education and recreation within an **accessible and highly inter-connected, urban–scaled townscape**, comprising a major activity centre and related urban villages based on **'main street' principles**.



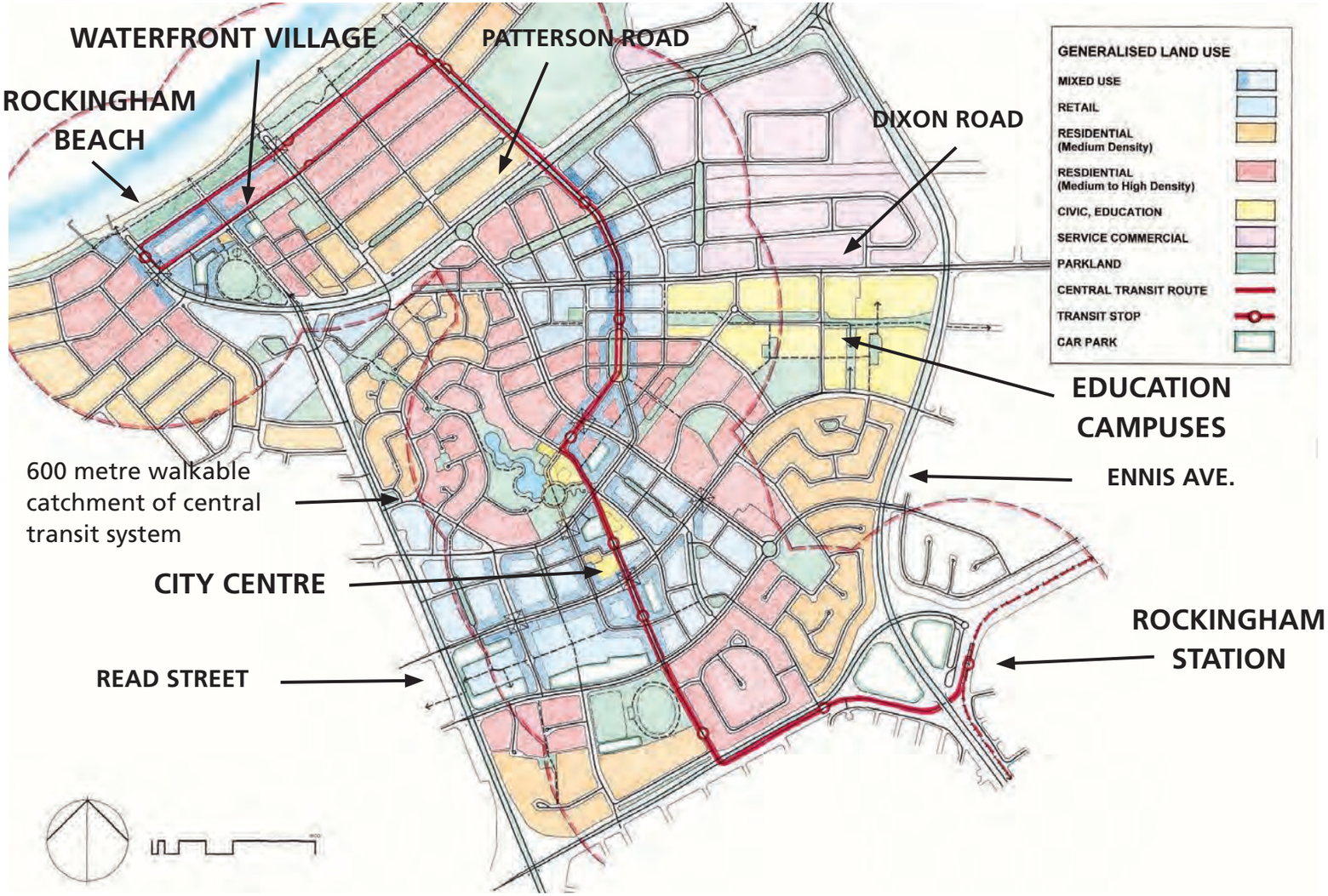




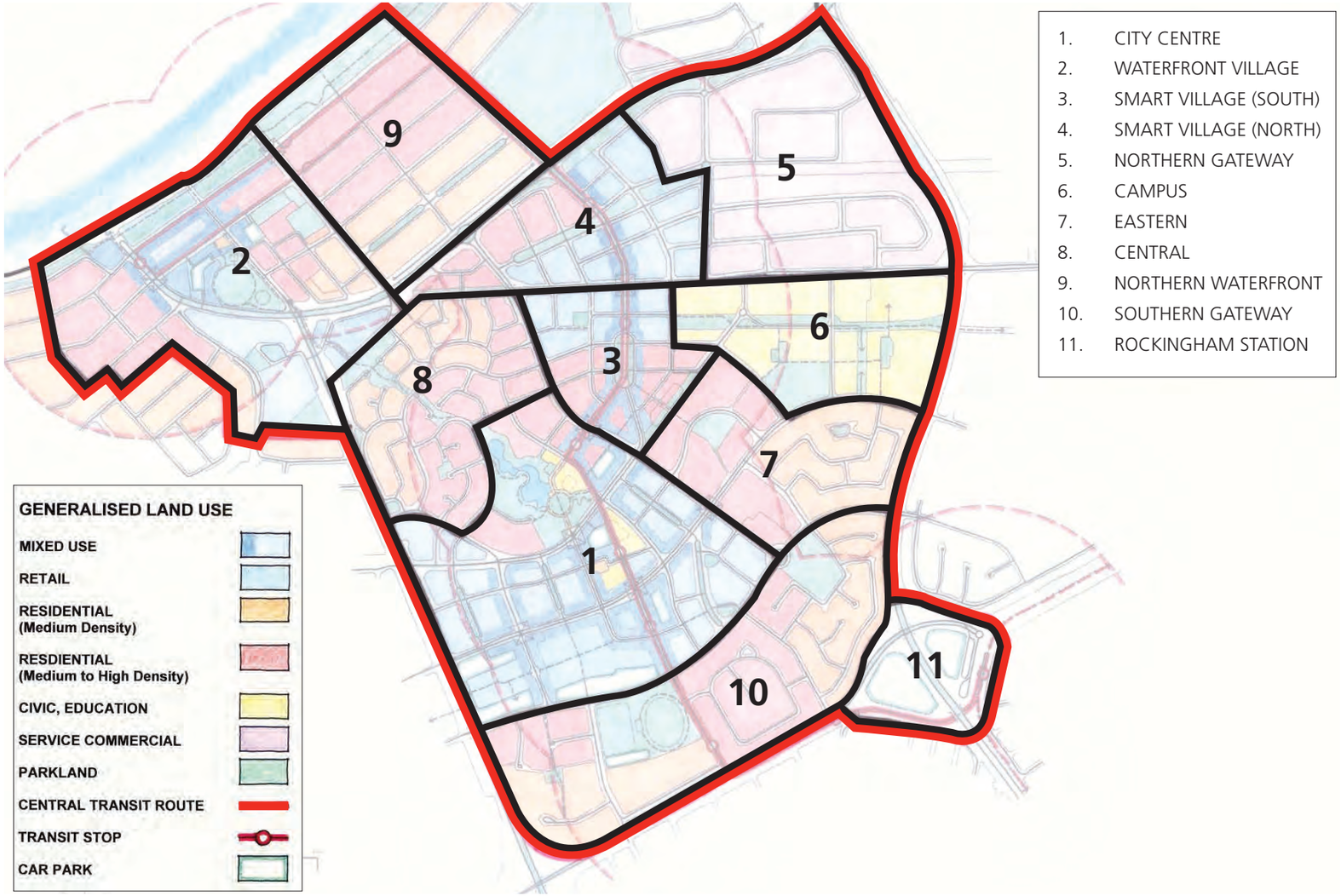
centre plan principles (2010)

- **Medium to high density development** based on **activated, "Main Street"** principles.
- A configuration of generally **contiguous street front buildings** and a **mix of uses** that generate high levels of pedestrian activity.
- A **street–based transit system**, with closely spaced stops.
- A **permeable network of streets, laneways, arcades and public spaces** that provide **high quality linkages**, particularly for pedestrians, to Centre activities from transit stops, street and off-street car parking and from the surrounding walkable catchment.
- An **identifiable City Centre hub** to provide major CBD functions.
- **Connected village precincts** between the City Centre and Rockingham Beach **along the route of the transit system**.
- The new village precincts will make provision for **mixed and consolidated education (university), technology, commercial and medium to high density residential development**, based on sustainable planning principles and design criteria.

centre plan concept from (2010)



centre plan sectors (2010)



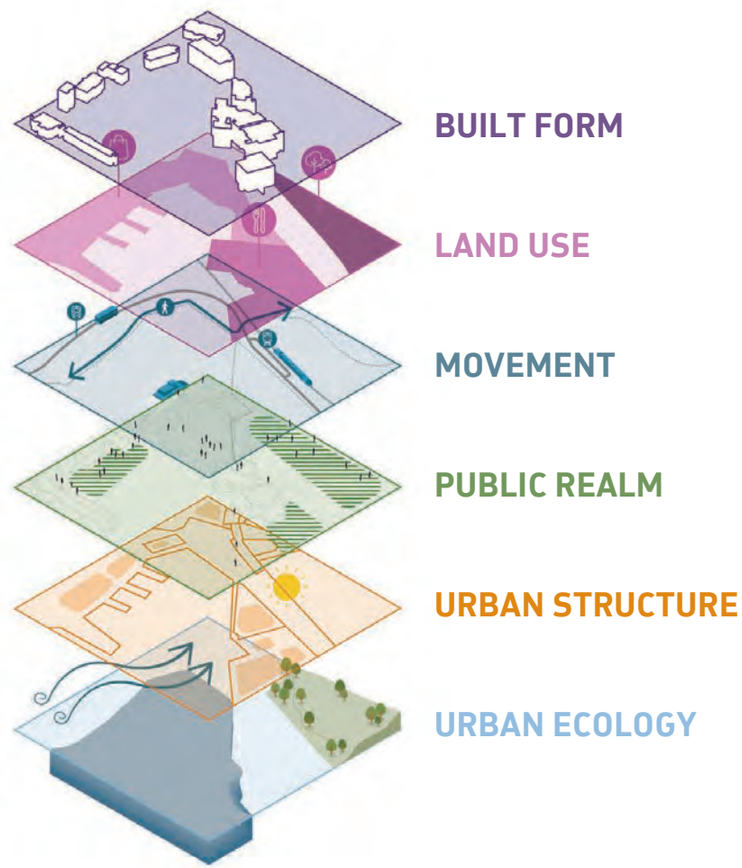
1. CITY CENTRE
2. WATERFRONT VILLAGE
3. SMART VILLAGE (SOUTH)
4. SMART VILLAGE (NORTH)
5. NORTHERN GATEWAY
6. CAMPUS
7. EASTERN
8. CENTRAL
9. NORTHERN WATERFRONT
10. SOUTHERN GATEWAY
11. ROCKINGHAM STATION

+ Each sector includes a 'Sector Policy'
+ Provides detailed guidance on land use and built form.

what needs updating (State expectations)

- We've worked with the State Government to understand what most needs updating, and what matches their expectations.
- Some of these updates are more procedural, other elements need more community input.

DESIGN ELEMENT	AMOUNT OF UPDATE NEEDED		
	MINIMAL	MODERATE	HIGH
Built Form		✓	
Land Use	✓		
Movement	✓		
Public Realm		✓	
Urban Structure	✓		
Urban Ecology			✓



what's unlikely to change from the 2010 plan

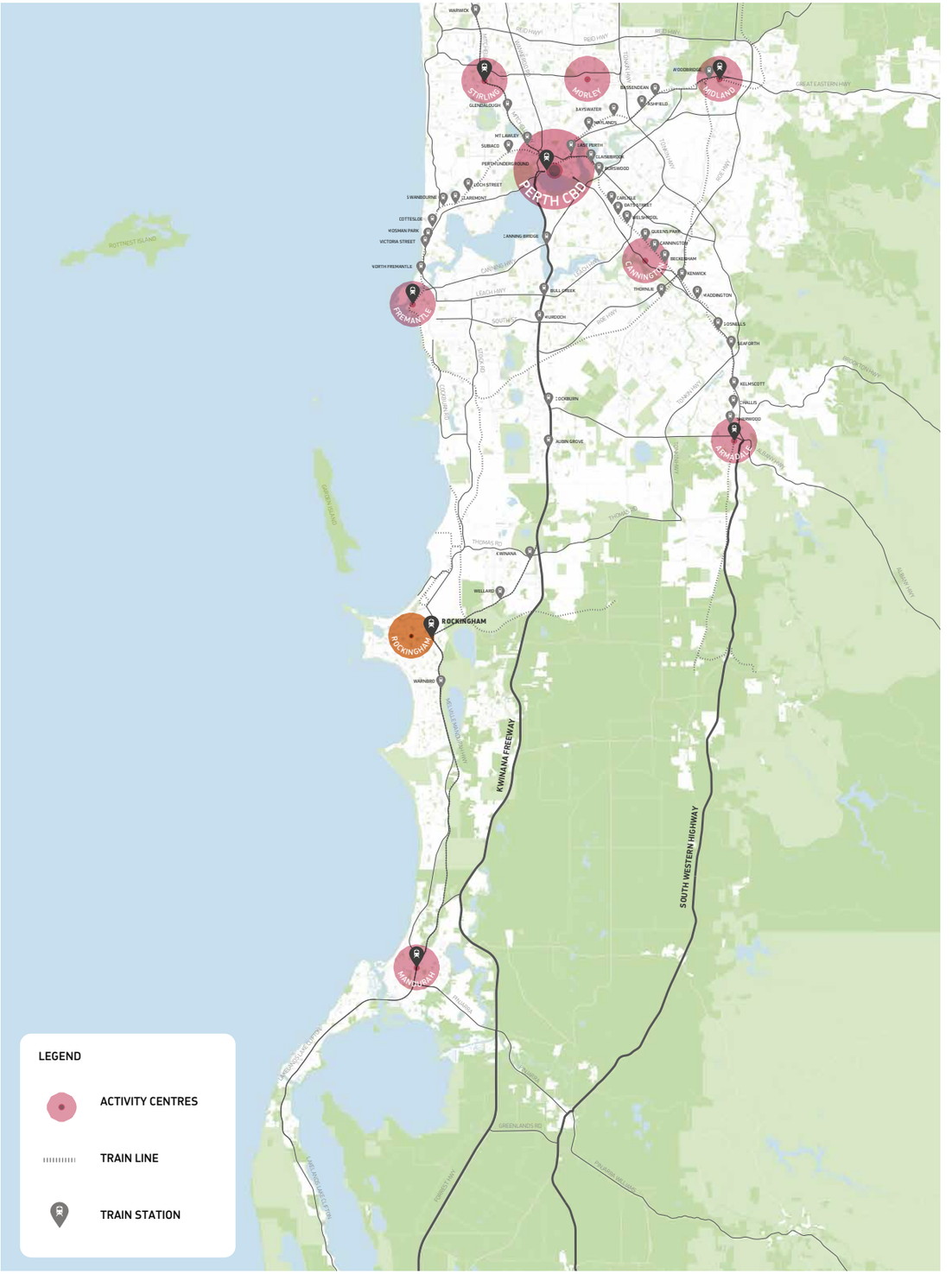
+ As the city continues to grow there are certain things that the State expects of this updated plan.
+ Rockingham Strategic Centre is still expected to be major employment, entertainment and residential hub.
  - This means the heights and densities may be adjusted or calibrated, but should generally stay.
+ Structuring Rockingham around a future Rockingham City Centre Transit System is expected.
  - This includes development around future stations.

what have we found so far?

response to context

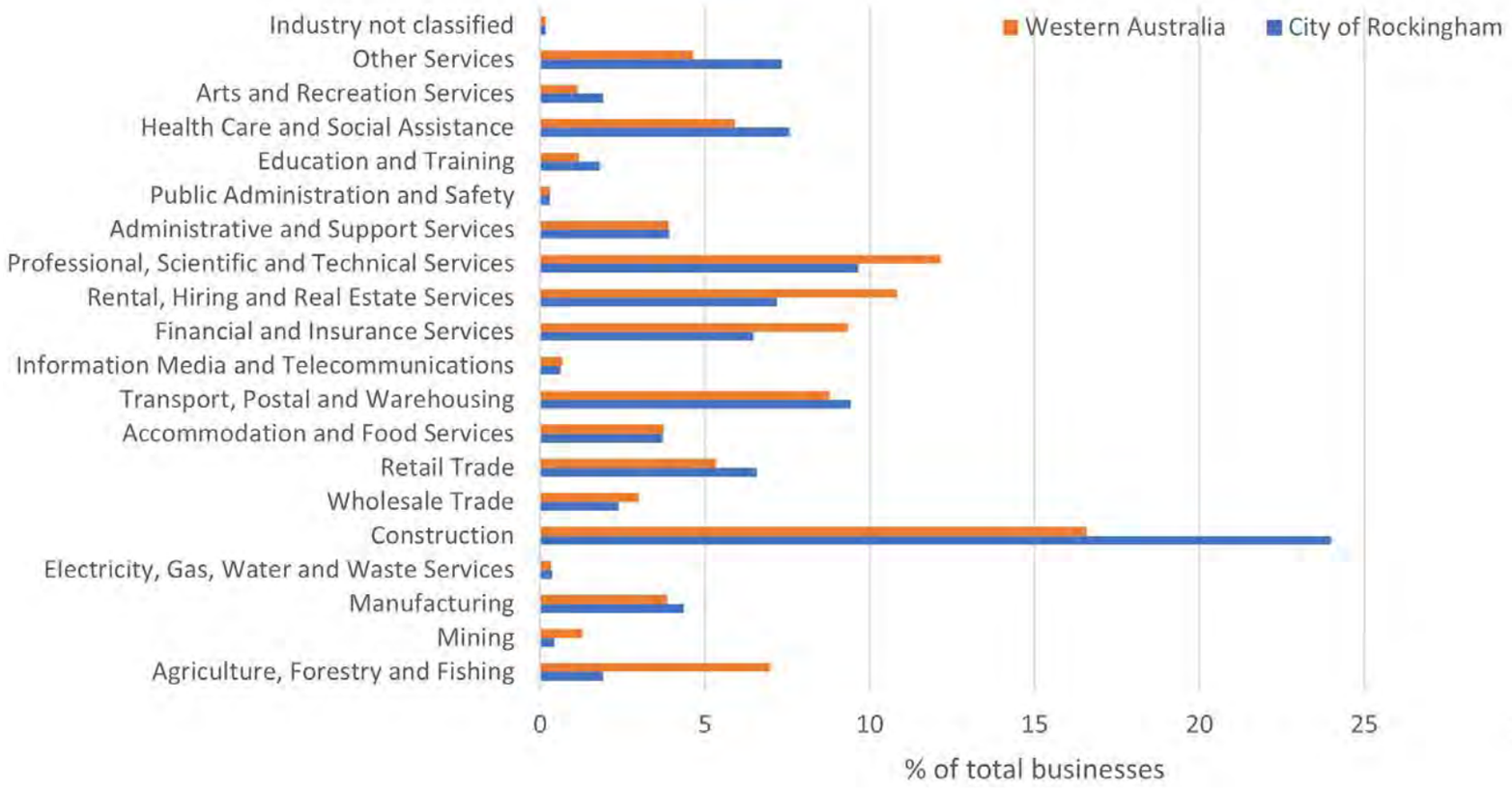
regional context

+ Rockingham is one of ten Strategic Centres across the Perth Metropolitan Area.
  - Main regional activity centres.
  - Multi-purpose centres that provide a diversity of uses - full range of economic and community services necessary for their catchments.
  - Expected to service substantial populations and provide a diversity of housing and employment.
+ Rockingham is the primary centre between Fremantle and Mandurah.
+ Services a broad catchment which includes Rockingham / Kwinana LGAs and parts of Mandurah and Cockburn LGAs.

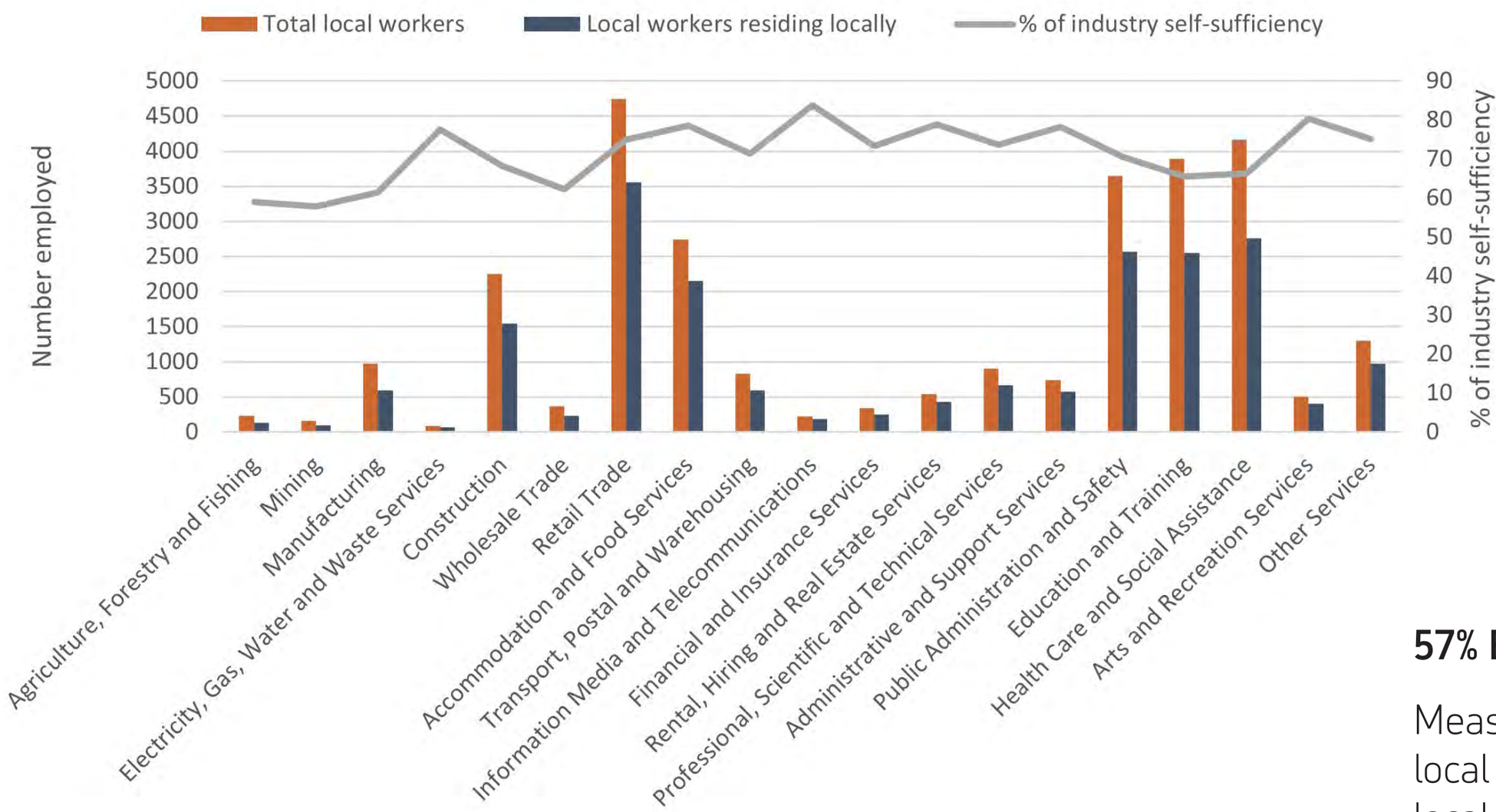


business growth

- Review of the 2020 Australian Business Register found that the number of businesses in Rockingham has increased from 5,435 (June 2018) to 5,937 (December 2020).
- If this trend continues, there is a chance for additional economic output and employment opportunities within the area.
- Construction is the biggest industry sector, followed by professional, scientific and technical services, and transport, postal and warehousing.



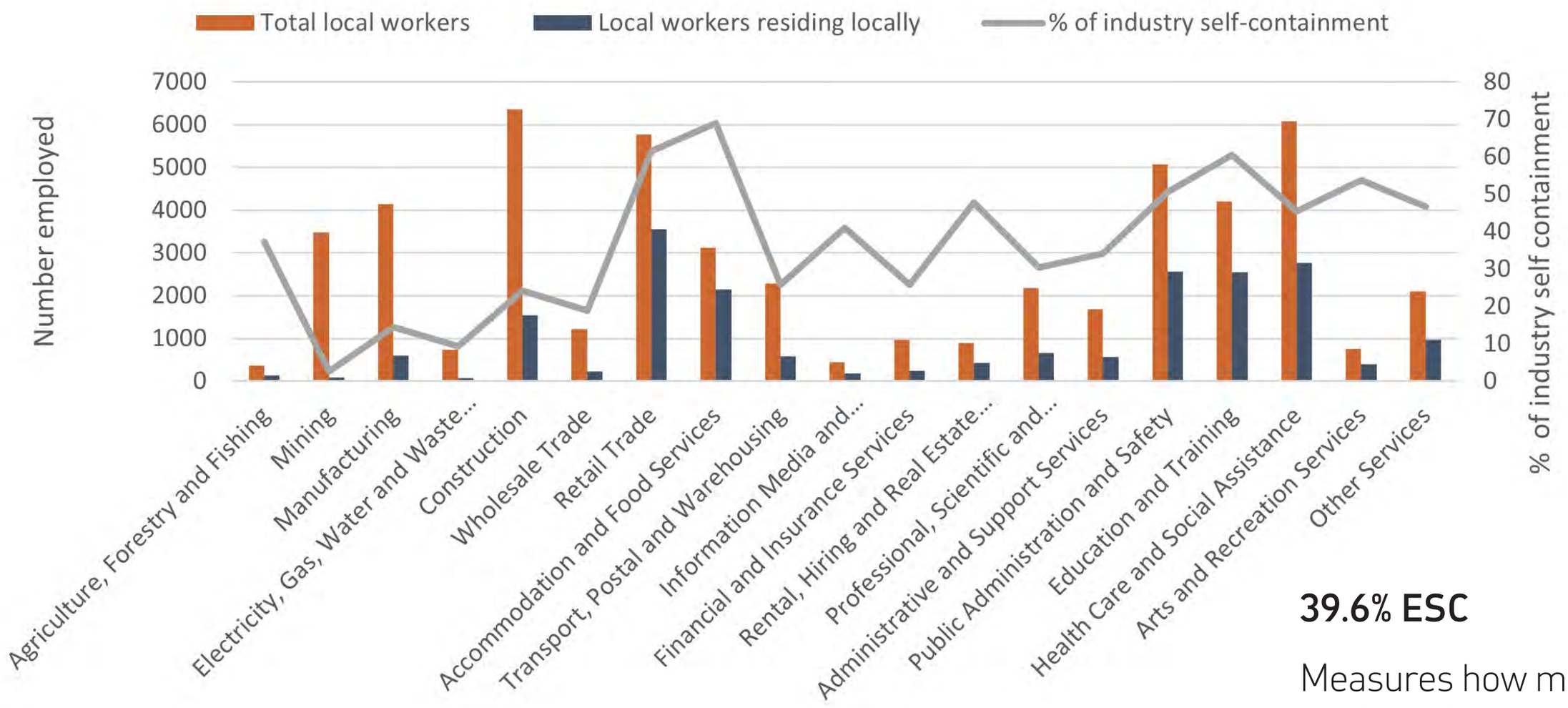
employment self sufficiency



57% ESS

Measures how many local jobs are filled by local residents.

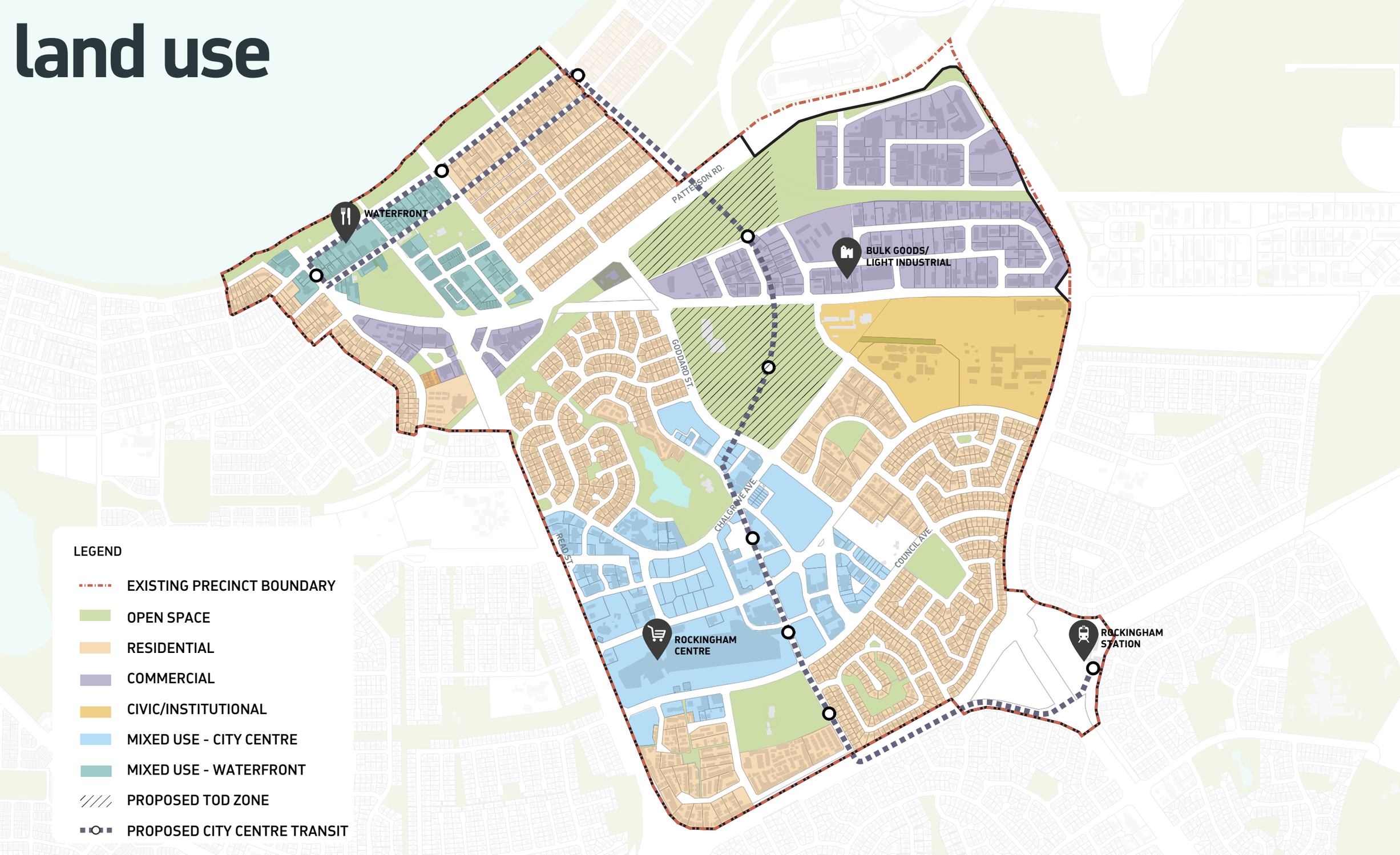
employment self containment



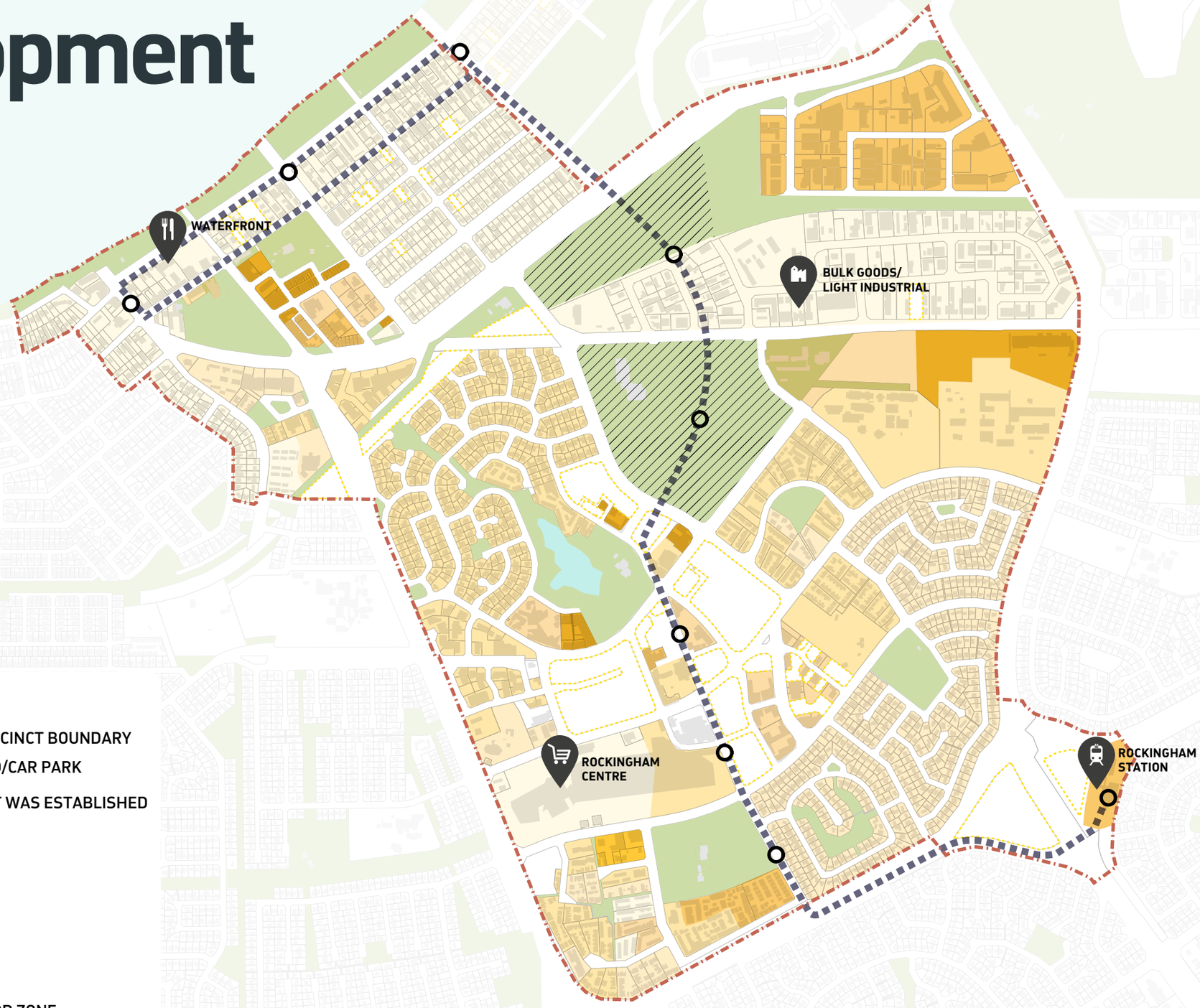
39.6% ESC

Measures how many local residents can work locally.

land use


WATERFRONT
PATTERSON RD.
BULK GOODS/
LIGHT INDUSTRIAL
GODDARD ST.
CHALGROVE AVE.
READ ST.
COUNCIL AVE.
ROCKINGHAM
CENTRE
ROCKINGHAM
STATION
LEGEND
EXISTING PRECINCT BOUNDARY
OPEN SPACE
RESIDENTIAL
COMMERCIAL
CIVIC/INSTITUTIONAL
MIXED USE - CITY CENTRE
MIXED USE - WATERFRONT
PROPOSED TOD ZONE
PROPOSED CITY CENTRE TRANSIT

development



LEGEND

EXISTING PRECINCT BOUNDARY

VACANT LAND/CAR PARK

PERIOD DEVELOPMENT WAS ESTABLISHED

BEFORE 1975

1975-1985

1985-1995

1995-2005

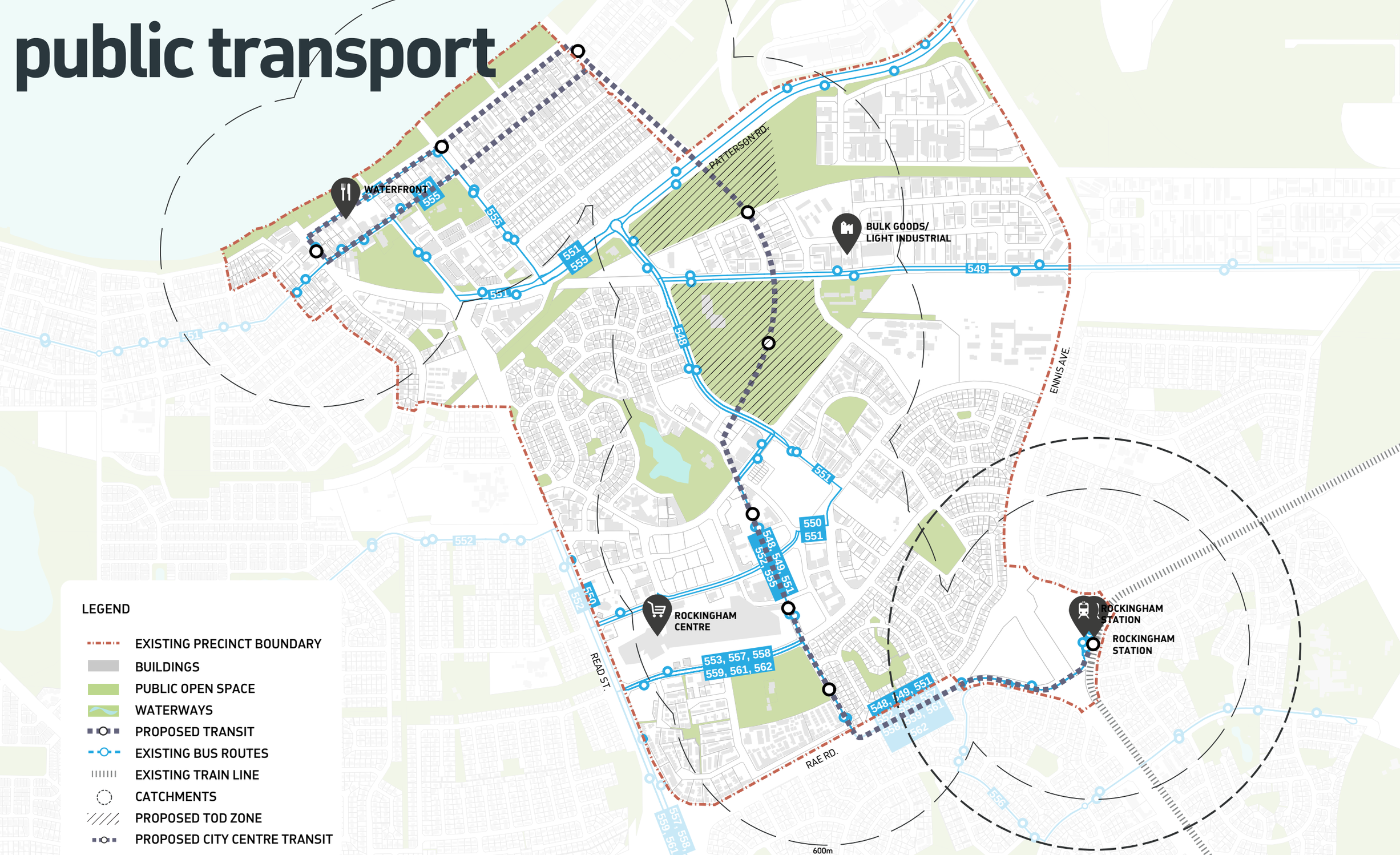
2005-2010

2010-2020

PROPOSED TOD ZONE

PROPOSED CITY CENTRE TRANSIT

public transport



LEGEND

- EXISTING PRECINCT BOUNDARY
- BUILDINGS
- PUBLIC OPEN SPACE
- WATERWAYS
- PROPOSED TRANSIT
- EXISTING BUS ROUTES
- EXISTING TRAIN LINE
- CATCHMENTS
- PROPOSED TOD ZONE
- PROPOSED CITY CENTRE TRANSIT

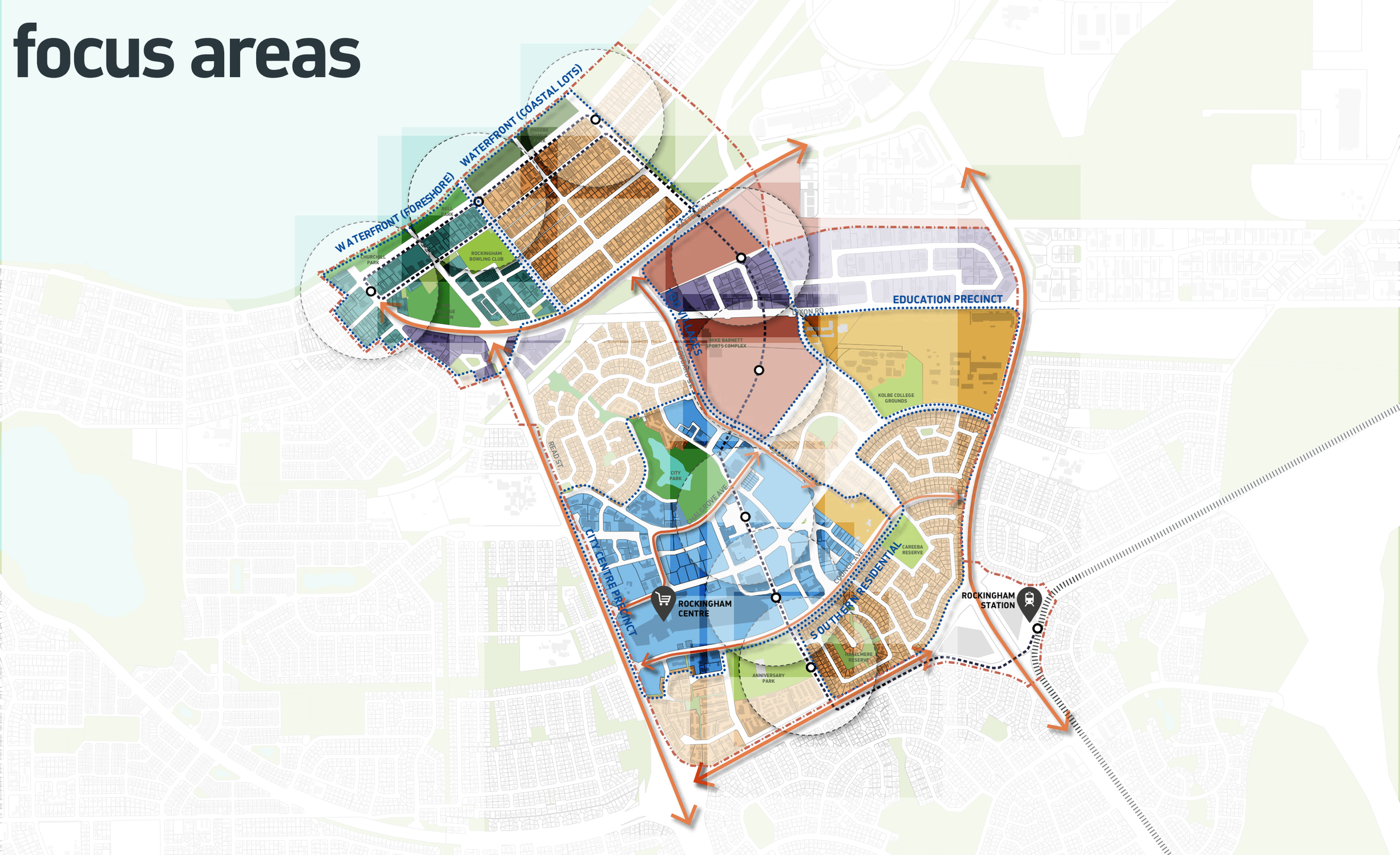
vehicles



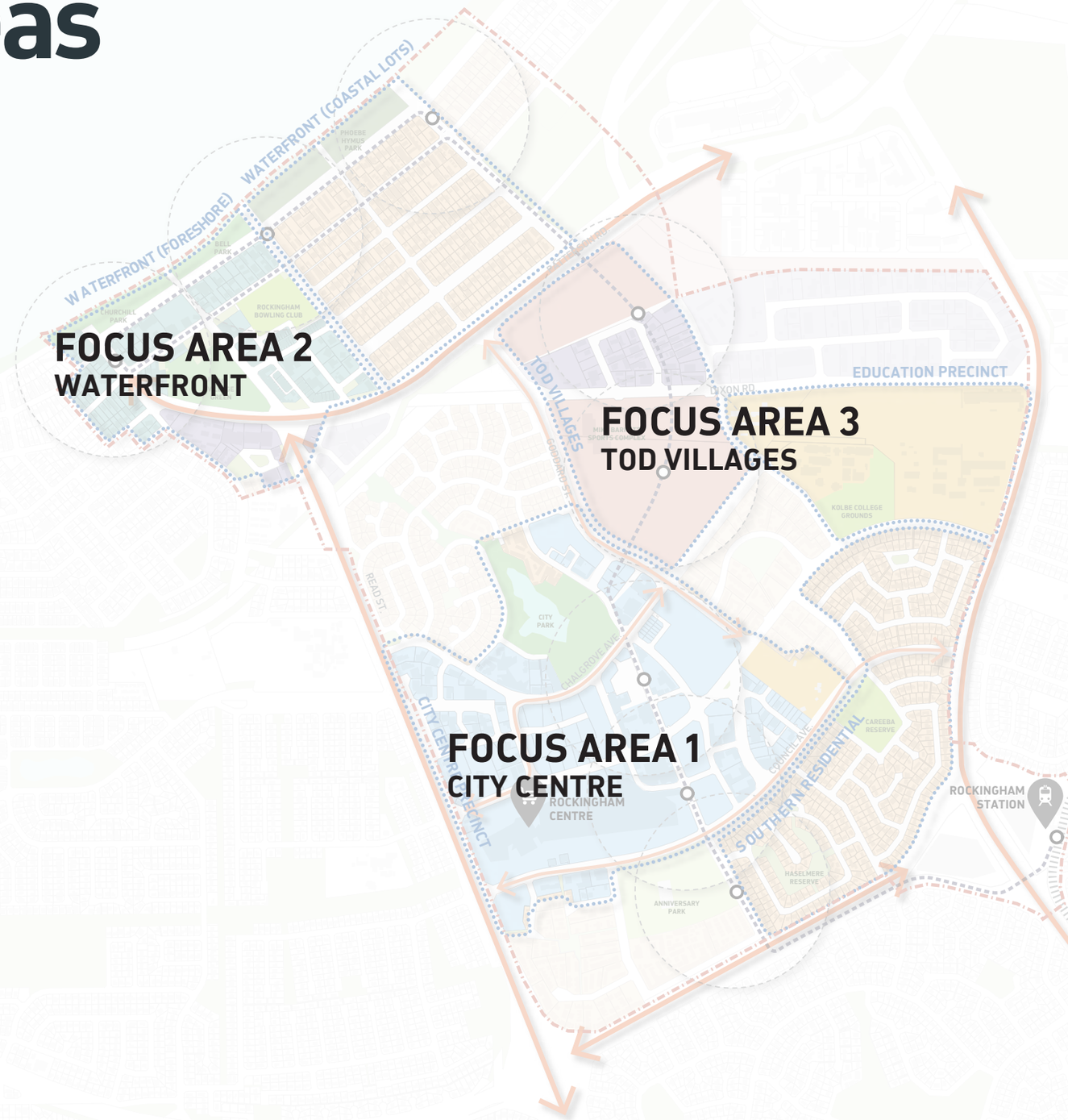
LEGEND

- EXISTING PRECINCT BOUNDARY
- BUILDING
- PRIMARY DISTRIBUTOR
- SECONDARY ROUTE
- PUBLIC CAR PARKING
- PRIVATE CAR PARKING
- PROPOSED TOD ZONE
- PROPOSED CITY CENTRE TRANSIT

focus areas


WATERFRONT (FORESHORE)
WATERFRONT (COASTAL LOTS)
CHURCHILL PARK
ROCKINGHAM BOWLING CLUB
EDUCATION PRECINCT
DIXON RD
MIKE BARNETT SPORTS COMPLEX
KOLBE COLLEGE GROUNDS
CITY PARK
READ ST
HILL GROVE AVE
CITY CENTRE PRECINCT
ROCKINGHAM CENTRE
CAREEBA RESERVE
SOUTHERN RESIDENTIAL
ROCKINGHAM STATION
ANNIVERSARY PARK

focus areas



WATERFRONT (COASTAL LOTS)
WATERFRONT (FORESHORE)
FOCUS AREA 2
WATERFRONT
TOD VILLAGES
FOCUS AREA 3
TOD VILLAGES
EDUCATION PRECINCT
FOCUS AREA 1
CITY CENTRE
CITY CENTRE PRECINCT
ROCKINGHAM CENTRE
SOUTHERN RESIDENTIAL
ROCKINGHAM STATION

focus area discussion 1
doing business in Rockingham

what can the precinct plan influence?

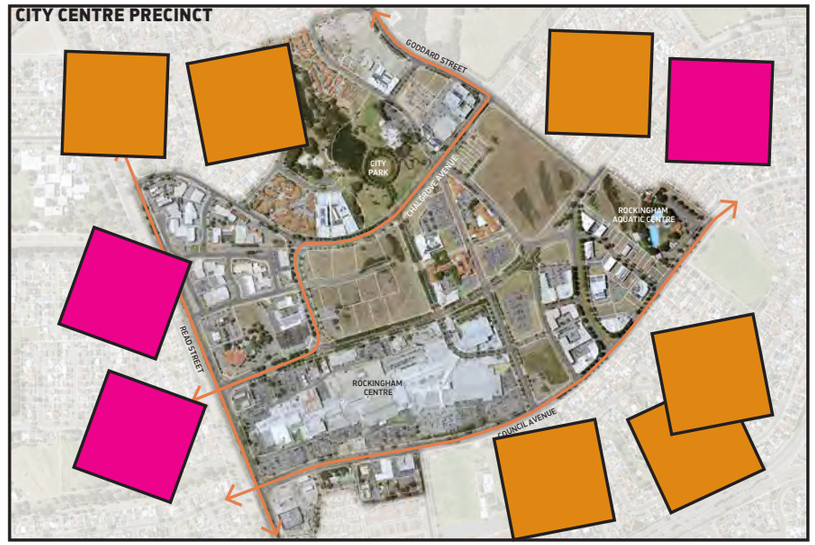
- The PSP will incorporates many aspects that can influence business operations / establishment of new businesses:
  - Primary controls (e.g. building heights and setbacks);
  - Land use and zoning;
  - Urban design outcomes (e.g. street activation, safety, landscape requirements);
  - Future public transport access;
  - Parking management and ratios.
- It does not deal with other Council functions such as rates, public open space maintenance, local laws.

why is it important as a place changes?

- We know that cities change and evolve over time. That's true of Rockingham!
- Through the Precinct Structure Plan we can highlight the elements of the existing framework that work well / do not work well.
- If we identify them now then we can then think about how that should apply to development standards in an area.

what is your experience in doing business?





The aerial plan for each focus area is for comments and post it notes.

We want to know your experiences, to better understand the opportunities and challenges.

The photo board is provided as a ‘prompter’.

Orange notes = business opportunities

Pink notes = business barries or challenges

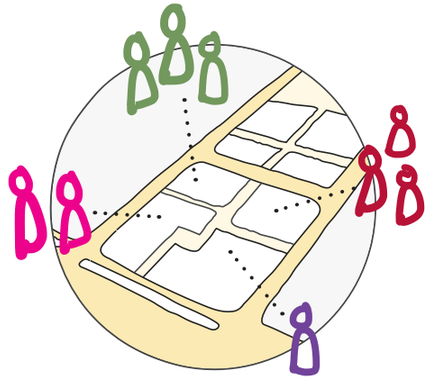
general discussion

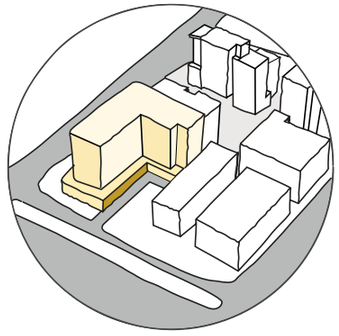
your table facilitator will guide you

focus area discussion 2

built form and land use

built form and land use





LAND USE

+ Land uses are the types of activities that happen on a site or in a building. Some examples are:
  - Residential places for living
  - Commercial places for office work
  - Retail places to buy goods, food and services
+ Land use type, proportion, mix and location should will change over time to respond to community needs.

BUILT FORM

+ Buildings are different sizes, shapes and orientations. It depends on what land uses they have inside and where they are placed.
+ Rockingham's 2010 plan supported building types with more people living and working will help local businesses and public transport.
+ The planning framework has settings that explain what heights, setbacks and other characteristics are supported in each area.

built form and land use

+ Precinct name
+ Future intent
+ Preferred land uses (existing Centre Plan)

CITY CENTRE

The City Centre will continue to be the primary location for employment with an expanded shopping centre merging with mixed-use main street developments, civic buildings and major public spaces.

Provision will be made for higher density offices and residential apartments over street level retail and commercial tenancies.

PREFERRED LAND USES:

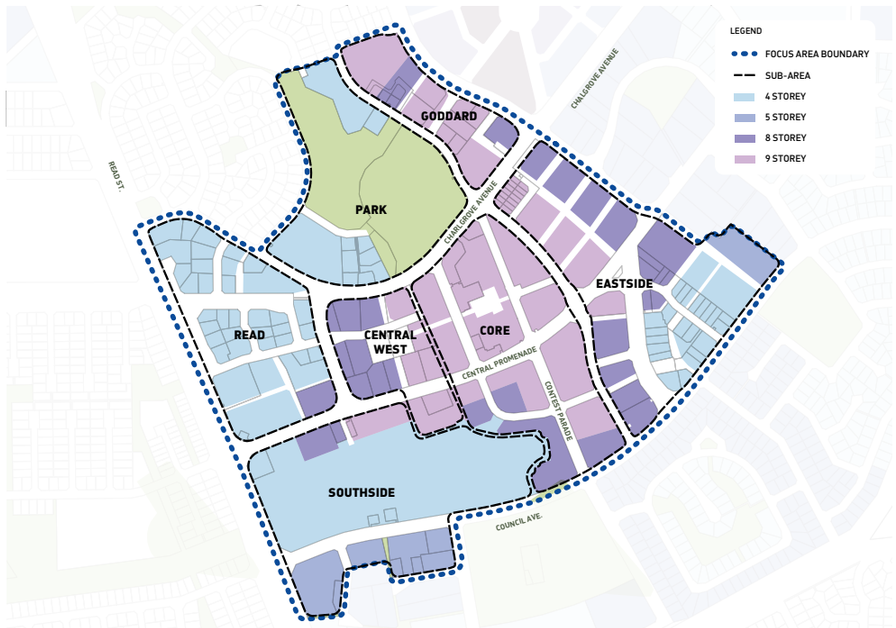
Core
+ office and commercial
+ residential (first floor and above)
+ serviced accommodation
+ civic and community
+ eating and drinking places
+ arts and entertainment
+ showrooms

Central West / Eastside / Goddard / Read
+ office and commercial
+ residential
+ professional consulting rooms
+ showrooms
+ serviced accommodation
+ eating and drinking places
+ retail
+ education

Southside
+ retail
+ office and commercial
+ professional consulting rooms
+ showrooms
+ entertainment and leisure.

Park
+ leisure
+ civic and community
+ residential, office, education

PERMITTED BUILDING HEIGHTS AND TYPES





Diagrams and photos are indicative to assist with workshop activities only. They may not reflect accurate heights / setbacks in the existing planning framework.

EXAMPLES OF EXISTING DEVELOPMENT IN THE AREA



built form and land use

+ Map illustrating building heights and types that are currently permitted in the existing 2010 plan
+ Illustrative examples of common building types that are permitted.

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+ showrooms
+ entertainment and leisure.

Park
+ leisure
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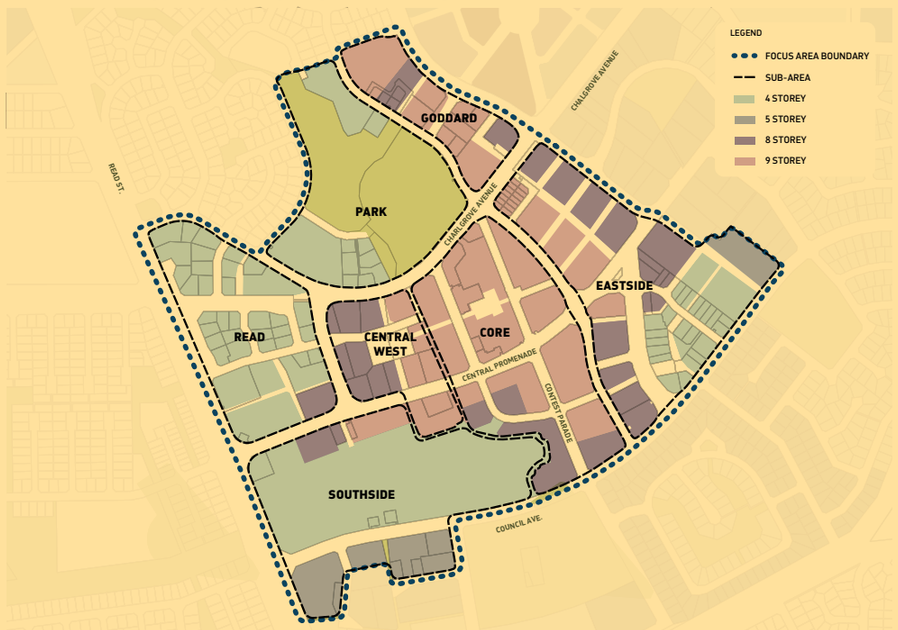
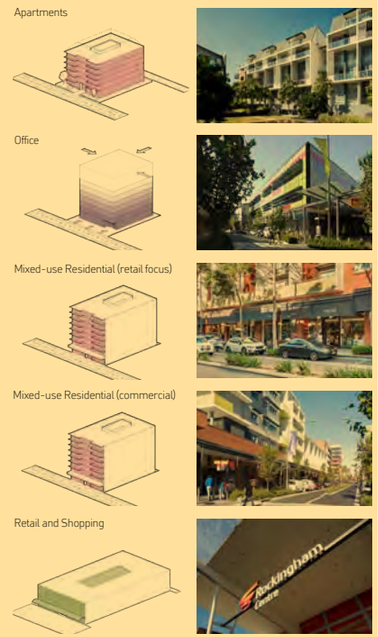
+ residential, office, education

PERMITTED BUILDING HEIGHTS AND TYPES





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EXAMPLES OF EXISTING DEVELOPMENT IN THE AREA



built form and land use

+ Photos of existing buildings and streets in each focus area.

CITY CENTRE

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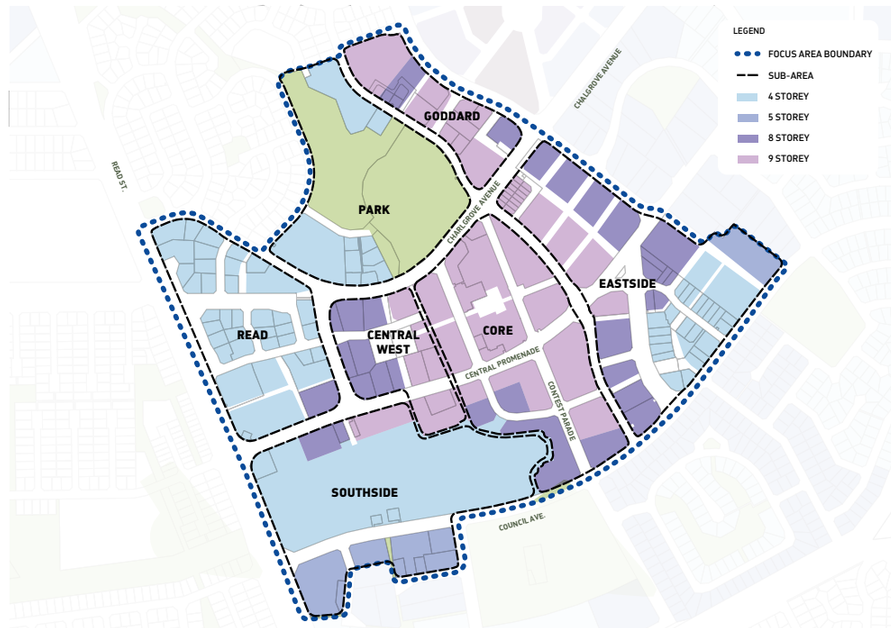
PERMITTED BUILDING HEIGHTS AND TYPES



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EXAMPLES OF EXISTING DEVELOPMENT IN THE AREA



built form and land use discussion

your table facilitator will guide you

what’s next....

next steps

+ **July 2021**
  Stakeholder engagement finalised.

+ **August 2021**
  Concept Design.

+ **October - December 2021**
  Draft Precinct Structure Plan Report.

+ **January 2022**
  Council Endorsement

+ **February 2022**
  Public Advertising

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APPENDIX F

APPENDIX F: BUSINESS WORKSHOP - ACTIVITY 1 NOTES

APPENDIX F: BUSINESS WORKSHOP - ACTIVITY 1 NOTES

OPPORTUNTIES	Arts and assoc crafts create jobs
Government area workforce	rooftop bar outdoor
One of 4 or 5 regional centres is Rockingham. No Gov Dept - why?	Market place for the city centre 'shopping precinct'
More provision for verge planting to beautify streets	International training academy for education
Environment sympathetic to water environment	working with Murdoch Uni to develop tertiary programs at Uni site. It is derelic.
Large areas that could be developed. e.g. crn Wanlis and Kent St Crn Railway Tce Parkin St Opp for s/market, shopping, servo, offices	from the graphs we are bringing many educators in to area. With growth of population we need more schools nad diverse educational opportunities for families.
Providing more footpaths in the waterfront precinct around the "crown" land portion to bowling club	mixed use in green space e.g. small community gardens in public open space e.g. small triangle on Attwood Way.
Free CAT-like service	arts activities for the public
shuttle bus between beach and station (free)	Not for profit playgroups in COR facilities with storage space
City centre bussiness[sic] shoping [sic]	venue for holding conference
Reduce red tape and regulation.	**CONSTRAINTS/BARRIERS**
Better parking areas on the waterfront	parking requirements
Increase residential on the foreshore	Parking
more high rise on the foreshore quality	Office space
activation of foreshore reserve concerts etc.	Ugly entry (crn Railway Tce and Parkin St)
uniformity in building design	lack of commute b/ween WF and City ctr.
active uses on foreshore	parking linkage pedestrian cat bus
Increase retail on the foreshore	
Move [name removed] on to allow for youth and innovation like Freo and Mandurah.	Planning dept practices does not align to this workshop or City's ideas of development.
Pop up retail lane way construction walk cycle ways public accessability	When working with COR planning dept it is very much about blocking development. Planning dept only says what you can't do and does not provide support and transparency.
utilise outdoor venues areas	Land use flexibility
Gateway to the ocean	flexibility on land use

APPENDIX G

APPENDIX G: BUSINESS WORKSHOP - ACTIVITY 2 NOTES

APPENDIX G: BUSINESS WORKSHOP - ACTIVITY 2 NOTES

QUESTION	RESPONSE - WATERFRONT (FORESHORE)
Are there any existing planning rules (specifically land use and built form) that have impacted your ability to grow and change your business?	• Insufficient office space • Insufficient parking
	• Building height • Parking (major). Public parking station • Leisure and creative activities to entertain
	Flexibility in short-term usage of public/private open space (carparks) for alternative purposes (pop-up food market/stall)
Are there any desired planning rules (specifically land use and built form) that you would suggest that would enable greater or more rapid growth of your business?	• Larger setbacks • More alfresco • More parking • One way traffic • Development of multiuse office and residential
	• Parking • Transport tram: city centre/station
	Streamline/robust system for applications to activate foreshore reserve and roads for temporary events and alternative retail.
If you were to identify one challenge associated with doing business in the RSC (related to the planning system), what would it be?	• Speed up planning approvals • Lack of parking
	• High quality housing apartment • Shopping - entertainment • Support entrepreneurs - new innovation idea • Flexible governing regulations
	The static planning framework that doesn't facilitate innovation and rapid changes to business models.
Can you identify any opportunities that would encourage others to do business in Rockingham rather than somewhere else?	• Improvement in the planning Dept. • Parking office space • Laneway construction pedestrian access/zones and shelter
	• Environment • Upgrade outdated old building • Modernise
	Amplification and increased visibility of the uniqueness of the foreshore precinct e.g. block party/festivals/street closure.
Map comments	• Major council parking station (near Kent and Wanliss Streets) • Enlarge Rockingham art centre • Expansion of Garry Holland as a theatre • [undecipherable] craft/art centre at craft shop • Cultural centre added to museum

APPENDIX G: BUSINESS WORKSHOP - ACTIVITY 2 NOTES

QUESTION	RESPONSE - EDUCATION/TOD
Are there any existing planning rules (specifically land use and built form) that have impacted your ability to grow and change your business?	Murdoch Uni have pulled all resources fro this facility. COR to work with them to develop the Education Precinct. MU used to do education training but now COR are having to bring teachers from outside area to our region. COR needs to facilitate the development of an international teacher training facility.
	Utilise Murdoch University. Use for Art and Creative opportunities.
Are there any desired planning rules (specifically land use and built form) that you would suggest that would enable greater or more rapid growth of your business?	COR being more active with training facilities to establish a truly viable education precinct.
	• Transport system needs to be streamline. • Cycling network • Tram
If you were to identify one challenge associated with doing business in the RSC (related to the planning system), what would it be?	Allocate a dedicated COR staff member to focus on an educational precinct plan. COR needs to drive this initiative.
Can you identify any opportunities that would encourage others to do business in Rockingham rather than somewhere else?	Really beef up the asthenic of the education precinct. Around Notre Dame in Freo people want to hang out. The TAFE and Uni is really ugly. Can the green space between become a garden, area even though it has facilities below ground.
Map comments	Utilize [sic] space - with reference to land between Murdoch and TAFE
	Between these three facilities it is “baron waste land” - with reference to photos of TAFE, Murdoch and Kolbe College

APPENDIX H

APPENDIX H: SURVEY

APPENDIX H: SURVEY

Rockingham SMC Planning Framework Review
Community Survey

Waterfront (Foreshore) Precinct Survey – Focus Area 1

1. In the **Waterfront (Foreshore)** Precinct, do you think the current building height limits are appropriate?
   - Yes, the maximum heights shown on the map are appropriate
   - No, the maximum heights shown on the map should be increased
     - Specify where.

2. For new buildings and development in the **Waterfront (Foreshore)** Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.
   - Landscaping – vegetation, trees, plantings etc.
   - Space around buildings
   - Features that reduce the amount of concrete
   - Weather protection – shade, awnings etc.
   - On site car parking
   - Sustainable waste options
   - Modern iconic design
   - Artwork

3. In the **Waterfront (Foreshore)** Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.
   - Apartment (residential focus)
   - Mixed use residential (ground floor commercial/retail with residential above)
   - Main street retail
   - Terrace housing
   - I do not want to see more, the existing building types shown on the plan are appropriate.
   - Other

4. In the **Waterfront (Foreshore)** Precinct, what type of activities would you like to see more of? Please tick those that you agree with and list any we missed.
   - Hospitality venues
   - Al fresco opportunities
   - Entertainment venues
   - Shops
   - Cultural facilities
   - Community and arts facilities
   - Marina
   - Other

5. When you move around the **Waterfront (Foreshore)** Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.
   - Security such as CCTV

- More lighting
- Wide paths that allow movement, but also allow people to sit
- Improved pedestrian crossings
- Reduced car movement along Rockingham Beach Road
- One way traffic on Rockingham Beach Road
- Reduced vehicle speeds
- More parking
- Other

6. In the **Waterfront (Foreshore)** Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.
   - Greenery – trees, plantings, vegetation etc.
   - Connection with local history and culture
   - Recreation facilities – play spaces, nature play, water park etc
   - Artwork
   - Coastal views
   - Other

7. Do you have/wish to start a business within this precinct?
   - Yes
     - Are there any design elements in the existing planning framework limiting your ability to do business in Rockingham?
     - Are there any opportunities you have identified that would improve your ability to do business in Rockingham?
   - No

8. Is there anything else you would like to tell us about the **Waterfront (Foreshore)** Precinct?

Waterfront (Coastal Lots) Precinct Survey – Focus Area 2

1. In the **Waterfront (Coastal Lots)** Precinct, do you think the current building height limits are appropriate?
   - Yes, the maximum heights shown on the map are appropriate
   - No, the maximum heights shown on the map should be increased
     - Specify where.

2. In the **Waterfront (Coastal Lots)** Precinct, a lot must be at least 1,500m^2 in order to develop the site. Do you think this requirement is appropriate?
   - Yes, a minimum lot size of 1,500m^2 is appropriate
   - No, development should be able to happen on lots less than 1,500m^2
     - If so, what size?
   - No, lots should be larger than 1,500m^2 in order to develop the site
     - If so, what size?
   - There should be no minimum lot size for development

APPENDIX H: SURVEY

3. For new buildings and development in the **Waterfront (Coastal Lots)** Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.
   - Greenery and trees
   - Features that reduce the amount of concrete
   - Environmentally considerate buildings
   - Sustainable waste options
   - Artwork
   - Modern iconic design
   - Other

4. In the **Waterfront (Coastal Lots)** Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.
   - Terrace housing
   - Apartment (residential focus)
   - Mixed use (ground floor commercial/retail with residential above)
   - I do not want to see more, the existing building types shown on the plan are appropriate.
   - Other

5. When you move around the **Waterfront (Coastal Lots)** Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.
   - Cycle paths
   - Paths linking to other areas
   - Reducing number of beach access points
   - One way traffic on Rockingham Beach Road and Kent Street
   - Other

6. In the **Waterfront (Coastal Lots))** Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.
   - Greenery - green spaces, native plantings, wildlife support, trees, botanical gardens etc.
   - Play spaces
   - Cycle facilities
   - Removal of overhead powerlines
   - Improved landscaping and walkways
   - Connection with local history and culture
   - Beach and open air
   - Family friendly atmosphere
   - Other

7. Is there anything else you would like to tell us about the **Waterfront (Coastal Lots)** Precinct?

APPENDIX H: SURVEY

Education/ Transit Oriented Development (TOD) Precinct Survey – Focus Area 3

1. In the **Education/ TOD** Precinct, do you think the current building height limits are appropriate?
   - Yes, the maximum heights shown on the map are appropriate
   - No, the maximum heights shown on the map should be increased
     - Specify where.

2. In the **Education/ TOD** Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.
   - Campus
   - Residential
   - Office
   - Apartment
   - I do not want to see more, the existing building types shown on the plan are appropriate.
   - Other

3. In the **Education/ TOD** Precinct, what type of activities would you like to see more of? Please tick those that you agree with and list any we missed.
   - Commercial uses
   - Office space
   - Entertainment space
   - Eco tourism
   - Restaurants
   - Bars (small)
   - Retail
   - Cafes
   - Sporting facilities
   - Places for youth
   - Other

4. When you move around the **Education/ TOD** Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.
   - More lighting
   - Bike path network
   - Other

5. In the **Education/ TOD** Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.
   - Greenery - native vegetation, botanical gardens, wildlife corridors, industry green buffers, nature around future development etc
   - Facilities for families and youth around Mike Barnett
   - Connection with local history and culture
   - Sporting facilities
   - Other

APPENDIX H: SURVEY

6. Do you have/wish to start a business within this precinct?
   - Yes
     - Are there any design elements in the existing planning framework limiting your ability to do business in Rockingham?
     - Are there any opportunities you have identified that would improve your ability to do business in Rockingham?
   - No

7. Is there anything else you would like to tell us about the **Education/ TOD** Precinct?

City Centre Precinct Survey – Focus Area 4

1. In the **City Centre** Precinct, do you think the current building height limits are appropriate?
   - Yes, the maximum heights shown on the map are appropriate
   - No, the maximum heights shown on the map should be increased
     - Specify where.

2. For new buildings and development in the **City Centre** Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.
   - Landscaping
   - Relationship to the coast
   - Features that reduce the amount of concrete
   - Green space between buildings
   - Designs that reduce areas that encourage antisocial behaviour
   - Art and colour
   - Shade
   - Other

3. In the **City Centre** Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.
   - Apartment (residential focus)
   - Office
   - Main street retail
   - Mixed use residential (ground floor commercial/retail with residential above)
   - Large format retail
   - Medium and high density development (affordable housing options)
   - I do not want to see more, the existing building types shown on the plan are appropriate.
   - Other

4. In the **City Centre** Precinct, what type of activities would you like to see more of? Please tick those that you agree with and list any we missed.

APPENDIX H: SURVEY

- Entertainment venues
- Hospitality venues
- Leisure venues
- Sport facilities
- Community facilities
- Opportunities to support mental and physical health
- Other

5. When you move around the City Centre Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.
   - Pedestrianising Syren Street
   - Removing unnecessary traffic signals
   - Multi-storey car park to reduce parking congestion
   - Waterfront transport (tram)
   - Cycle paths around oval
   - Connections between pool, sporting fields and beach
   - Other

6. In the City Centre Precinct, what features would improve the experience at the shopping centre precinct? Please tick those that you agree with and list any we missed.
   - Closer parking in hidden multi-storey buildings
   - Passive surveillance instead of CCTV
   - Other

7. In the City Centre Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.
   - Greenery – landscaping, green spaces, native vegetation, wildlife corridors, trees, botanical gardens etc.
   - Play and exercise spaces
   - Reduced number of power poles on Chalgrove Avenue
   - Connection with local history and culture
   - Welcoming local character
   - More seating around oval
   - Art and colour
   - Shade
   - Other

8. Do you have/wish to start a business within this precinct?
   - Yes
     - Are there any design elements in the existing planning framework limiting your ability to do business in Rockingham?
     - Are there any opportunities you have identified that would improve your ability to do business in Rockingham?
   - No

9. Is there anything else you would like to tell us about the City Centre Precinct?

APPENDIX H: SURVEY

Southern Residential Precinct Survey – Focus Area 5

1. In the **Southern Residential** Precinct, do you think the current building height limits are appropriate?
   - Yes, the maximum heights shown on the map are appropriate
   - No, the maximum heights shown on the map should be increased
     - Specify where.

2. In the **Southern Residential** Precinct, a lot must be at least 1,200m^2 in order to develop the site. Do you think this requirement is appropriate?
   - Yes, a minimum lot size of 1,200m^2 is appropriate
   - No, development should be able to happen on lots less than 1,200m^2
     - If so, what size?
   - No, lots should be larger than 1,200m^2 in order to develop the site
     - If so, what size?
   - There should be no minimum lot size for development

3. In the **Southern Residential** Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.
   - Single houses
   - Terrace housing
   - Apartment (residential focus)
   - I do not want to see more, the existing building types shown on the plan are appropriate.
   - Other

4. When you move around the **Southern Residential** Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.
   - Lengthen pedestrian phase of traffic lights
   - Reduce road noise
   - Other

5. In the **Southern Residential** Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.
   - Quiet, peaceful atmosphere
   - CCTV
   - Underground power
   - Native vegetation
   - Nature around future development
   - More native vegetation
   - Play spaces
   - Community food garden
   - Wildlife corridors
   - Other
6. Is there anything else you would like to tell us about the **Southern Residential** Precinct?

APPENDIX I

APPENDIX I: SURVEY COMMENTS

APPENDIX I: SURVEY COMMENTS

WATERFRONT (FORESHORE) COMMENTS

2. For new buildings and development in the Waterfront (Foreshore) Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.

- The area is prone to damage by wind during storms. Make buildings wind prepared and resistant. No loose items e.g. awnings etc. Very well attached roofs etc. Orientation of buildings is also crucial to withstand damaging winds. DECREASE building heights allowed for this section, since there is no option in Q1 to say that one wants a decrease in building heights.
- Some easier and safer access to the Kent st and Waterfront area. ie one way streets or pedestrian ways

3. In the Waterfront (Foreshore) Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.

- Art hub precinct on Kent st to give visitors more activities and interest

5.When you move around the Waterfront (Foreshore) Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.

- improve intersection of Kent St and Flinders Lane. Very hard to see if a vehicle is coming. Make Kent St one way traffic, the opposite to R Beach Rd. Stop sign on Flinders Lane does not work. Use lights or make a roundabout (large, not too small).
- pub, nightclub for over 40's,marina, more restaurants, cafes, bands, music

6. In the Waterfront (Foreshore) Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed.

- A jetty for swimmers at the end of RAILWAY TERRACE. In L form or like a square (see Busselton swimmers jetty, square) with a safety net for sharks, jelly fish etc. Large in size, up to where the pontoons normally are placed. Not for fishing but just for swimming purposes with a very safe swimming are in the middle of this jetty. Encourage swimming. At one end, you could have a hire place for water activities, such as pedal boats for the water etc.
- do more to bring in our be beachside alive, markets, music, yoga,pubs, green areas, selective shops, live music...but first of all, move the trouble, and get more parking, there needs to be better parking, if you want highrise, build a multistory carpark, then the visitors will come, at the moment they avoid it as they cant get parked, and move on the unnecessary beggars off the streets, this is a well known business in perth, and still they wont move them on, homeless make lots of money on the streets
- Art and Cultural Activities. Create vitality and interest a buzz

8.Is there anything else you would like to tell us about the Waterfront (Foreshore) Precinct?

- There is an extreme need now for parking as staff, deliveries and clientele are frustrated with the lack of close parking. This is and will impact business as it has done elsewhere, such as the Fremantle retail/commercial areas. An improved CAT type bus system may help. More alfresco areas via wider sidewalks, possibly one way traffic along rockingham beach road to facilitate easier pedestrian movements and allowing for much more angle car parking

APPENDIX I: SURVEY COMMENTS

- Be mindful of present residential single use home owners who wish to see their properties. I know more than one owner in this area and I believe they have many restrictions as to what can be done in this precinct. This adversely affects their capacity to sell and many of these need to sell and downsize because of the owner's age.
- give us parking and promote a marina, the rest will follow, look at hillaries
- Already Kent st has the Rockingham Art Centre (Small but great spot) , the Gary Holland Community Centre (limited is fictionality [sic] but potential), the Museum (iconic building but needs updating) and the Arts and Craft Centre. A creative hub of activities that could be expanded to be an exciting Arts and Cultural Hub. Expand and update theses existing structures, adding a cultural centre to the Museum/Craft zone. A Multipurpose Performing Art Theatre that can open up and back in to the Village Green allowing for big community performances. The add Artist studios and an expanded exhibition space to the Rockingham Art Centre and you have a vibrant Art hub that adds value and increases the draw to the Waterfront

WATERFRONT (COASTAL LOTS) COMMENTS

3. For new buildings and development in the Waterfront (Coastal Lots) Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed

- waterwise gardens with native flora. Screens so that surrounding housing is not affected by people in higher buildings looking into the gardens etc of single houses etc. Privacy. Create adequate parking solutions for these developments and driveways in and out of the lot.
- people love the sit and view our coastline, not enough spaces that let us do that, a marina would be perfect

4. In the Waterfront (Coastal Lots) Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed

- a oceanic type bar looking over our ocean, live music, not more residential

5. When you move around the Waterfront (Coastal Lots) Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed. Please tick those that you agree with and list any we missed.

- bring it alive, live music, concerts, bars, pool area in the ocean, street food, local crafts, twilight markets, cycle paths

6. In the Waterfront (Coastal Lots) Precinct, what qualities and characteristics of the area and public spaces would you like to see more of? Please tick those that you agree with and list any we missed

- clean it up, there is always an eye sore, a feeling of we are just not good enough, develop the land better, not fill it with high rise buildings,

APPENDIX I: SURVEY COMMENTS

EDUCATION/TOD COMMENTS

7. Is there anything else you would like to tell us about the Education/ TOD Precinct?

- Reduce vacant lots, less vacant lots... Less empty buildings.

CITY CENTRE COMMENTS

2. For new buildings and development in the City Centre Precinct, what features would you like to see more of? Please tick those that you agree with and list any we missed.

- Reduce number of vacant or empty lots.

3. In the City Centre Precinct, what type of building would you like to see more of? Please tick those that you agree with and list any we missed.

- Affordable social housing for seniors and especially for single women (seniors), like a development that is only for elderly ladies. THERE IS NOT ENOUGH SOCIAL HOUSING OWNED BY THE CITY IN ROCKINGHAM. Other shires have more social housing owned by the Shire, e.g. Melville, Cannington etc.

5. When you move around the City Centre Precinct, what elements would improve your experience? Please tick those that you agree with and list any we missed.

- The pool on Council Ave needs modernising and linking to other existing facilities. Create a second AquaJetty on Council Ave but with different facilities. It is not used in winter so the whole pool is underused. It needs to be changed to allow for use all year round. Make it attractive. Looks very old.

6. In the City Centre Precinct, what features would improve the experience at the shopping centre precinct? Please tick those that you agree with and list any we missed.

- More parking with easy access to main roads around it.
- Clear Signage to different precincts, safe easy access to outdoor undercover green areas with Art to encourage it as a place to meet

9. Is there anything else you would like to tell us about the City Centre Precinct?

- Shopping Centre management need to look after their trees in the carparks. Need more soil and soil protection. Roots are exposed, people put trolleys on them. Not enough irrigation. Roots need protection. How will they grow and give shade if they are so neglected. Need urgent attention: now. All trees in the carparks around and in the shopping centre.
- Connect the shopping precinct to quality dinner areas and shire building Needs a focus hub area to attract people

APPENDIX I: SURVEY COMMENTS

SOUTHERN RESIDENTIAL COMMENTS

6. Is there anything else you would like to tell us about the Southern Residential Precinct?

- MainRoads needs to urgently lengthen the lane on Ennis Ave which turns into Council Rd, coming from the south. The lane to peel off into Council Rd is not long enough. It needs to be started at Rae Rd and continue til Council Ave. COUNCIL RD: this road is still way too busy despite your development of Rae Rd. Too many cars use Council Ave or Council Rd which connects Ennis Ave with the main R Shopping Centre. Whereas Rae Rd is underutilised and people are penalised for doing more than 70km/h on a near empty 2 lane road. You need to find a solution for Council Ave which is also overutilised because of Kolbe school traffic and people going to the shopping centre plus all traffic from Hillman and those travelling north or south on Ennis Ave.

APPENDIX J

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

FOCUS AREA	COMMENTS
City Centre	Can we connect the Pool, sporting fields the beach? Can we think 'Rockingham, the lifestyle city' where all recreation facilities are connected.
	Please keep this as a cul-de-sac .
	Really would like to see the pools kept and upgraded.
	Why is this a dust bowl for more then 10 years?
Waterfront (Coastal lots)	Can we have the marina here please, many local boat users and families would benefit as well as local business' . Look at Mandurah, plenty of money being spent down there and it looks great btw.
	Not enough trees. Look at what South Perth (east applecross foreshore) is doing to stop vandals destroy trees. Please plant native salt tolerate trees such as the Rottnest island trees or Tuarts like in Bell park.
	Please NONSENSE (in response to previous comment), ALL entrances are key for everyones' convenience.
	Stop wasting money replacing playgrounds that are in good condition (Victoria st one) with similar plastic ones what's the point and it's not environmentally friendly. Why not design a lovely well thought out nature playground and replace one of the older playgrounds like the one near the toilet that has rubber matting falling apart and a million years old.
	The rubber path is great. Can these be added to other high traffic areas?
	Well! why not? What is wrong with making it easy for the public to access the beach?
	When are the powerlines going to be put underground? It was said 10 years ago this was going to happen.
	Why are these paths here? Can all foot traffic be channelled to key entrances.
	Why is this an unofficial boat launch area?
	With the every increasing number of people accessing the foreshore and Kent St activities. For community safety and road safety I think Rockingham Beach Rd and Kent St need to be one way, between Patterson St and Wanilis St . One going east and the other west. Too many pedestrians cross these roads and too many cars not sure where they are going and looking for parking.
	Why is this a pathway.

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

FOCUS AREA	COMMENTS
Education/ TOD	Can we have more shade trees for spectators etc. Think about mid sun angles etc.
	Can we please create a high quality shared pathway through this bushland to facilitate convenient access for pedestrians and bicycle usage through this nice piece of bush reserve.
	Can we please retain these trees
	I am interested to know what happens to the hugely popular netball courts and hence association? I can't see plans for this in the Village precinct plans. Participating in netball and basketball is extremely Important for many Rockingham locals and surrounding suburbs. It is vital for children's health and well being.
	Let's Think Big for this area. Surely Council's concept of a series of high rise building including one of 20 storeys can not be allowed to happen. Love to see Botanical Gardens established
	This area needs to be left to allow for any future expansion of Mike Barnett Sporting Complex. It's already at capacity for Basketball and Netball and only getting busier. Extra court space needs to be considered for the growth of our population and the growth of sports.
	What will become of this open space? Currently used by the school community, dog walkers, walkers, extra parking, access to Kolbe school. This area could assist in reducing the congestion issues , reduce noise on Dowling St & Simpson Ave from the kolbe school.
	With an increasing population it is short sighted to not leave enough recreation space for future users. With basketball and netball associations reaching capacity currently at Mike Barnett Sport Complex, ideally located in Rockingham would if better planned have the capacity to grown. This is one pocket area of the plan that as part of the review needs to be changed. This is important recreational space and loved by our community
	Would rather see this space utilised as sporting fields and additional court space for Mike Barnett. Its a very busy complex and only getting busier. This could be a regional facility for Basketball and Netball.
Waterfront (Foreshore)	As a local artist, we are in desperate need of a local building to run our community art meetings as well as a spacious art gallery for our exhibitions. Studio 4 at Gary Holland Centre is not coping with the amount of artists attending. Thank you for listening to our opinions, this will mean a huge difference to our growing art groups.
	Can parking be underground at the foreshore, allowing for all existing eyesore concrete slabs like this to become natural recreational public open spaces?! Possibly we can make this specific dirty concrete place into a small water park, protected from the wind and with back-door access to some little eateries, the bakery etc...

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

FOCUS AREA	COMMENTS
Waterfront (Foreshore)	Definately KEEP all old trees and ensure a long-term plan for sustainable natural shade. Our green grassed foreshore is used and loved by so many
	From head height up, the whole strip looks outdated and old. All the faded signs and half painted buildings. Needs a touch up.
	Gary Holland Community Centre although originally gazetted to have a Performing Art area and dance area is more of a commercial centre. As Kent street is quickly becoming the ART centre for Rockingham with the Art Centre, Museum, Craft Group and Rockingham Regional Art group all situated on the street. Also being the location for Symphony Orchestra performances, Art Awards and linking to the Castaways and other foreshore activities. How about connecting these activities to an ART HUB.
	How about upgrading the Museum and adding a long overdue Cultural Centre. Create pride in where we have come from and the history of Rockingham. I believe the COR owns the area behind gazetted for parking. Make underground parking or add a two story structure to accommodate both. Make Kent street the Art and Cultural Hub for Rockingham. The Craft group behind the museum could be incorporated in the upgrade.
	Lower the speed limit to 20, ban noisy bikes and cars, make this a one-way street. There is no need for speed along this foreshore. This will give the council the opportunity to improve parking, widen space for pedestrians and make the street and landscape more people-friendly.
	Make one way traffic Make one side for better parking and the other side a wider footpath. Keep the trees
	More parking is a must. Less high risers we don't need them keep Rockingham foreshore family friendly. High density apartments and commercial areas is not what locals want people come to Rockingham to escape the city don't bring the city to us. What happened to our water playground?
	Please, can the council please deal with this ugly eyesore of a carpark.
	Need better laydown and wash off facilities for divers. Diving needs to be included in the recreation plan.
	Requires a foot path for pedestrians crossing from Rockingham Beach Road and Harrison Street across to Val Street intersection.
	That comment about 20km/hr speed limit and turn it into a oneway street to improve the pedestrian and alfresco experience along the caffe/restaurant strip of Rockingham Beach Road, is like taken straight out of my comment letter to the City 14/11/2020 in response to "Proposed Alfresco Dining Policy & Guidelines". I am encouraged by the thought that I am not alone in suggesting this.

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

FOCUS AREA	COMMENTS
Waterfront (Foreshore)	Rockingham desperately needs a creative hub for Art, culture and other activities. We are being left out again, you are building a performing arts centre at Baldivis School, we need one on the foreshore, Rockingham is being left behind yet again, we need a modern well equipped centre big enough for all the Arts. Rockingham needs a Performing Arts Centre on or near the waterfront.! You've had a plan for years, update and build!!!
	The Gary Holland Community Centre looks out over the Village Green which make a wonder backdrop but is underutilized. Perth Symphony Orchestra come down annually and at great expense a stage, lighting etc are erected over 3-4days. The Village Green is a wonderful arena and very well attended by an enormous number of the community. Why not extend the Gary Holland to allow a staging that can be utilized for indoor and outdoor events? Multipurpose Performing arena.
	The Rockingham Art Centre although about to undergo some upgrades also needs to be extended as Art needs and community interest in the Arts increases. This Art Centre is very active with booking 2 years in advance. It is already overwelmed with community need for access to Art and as a platform to outreach Art to the community. This little Art Centre creates activity and vibrancy to Kent st and the foreshore area. Connecting to the art events happening on the Foreshore. Extend the gallery out.
	The visionary pictures shared with the community on Facebook are hopefully not reflective of the actual plans, as they show Rockingham as a suburbia concrete jungle, which is most certainly not the reason why most of us enjoy living in Rockingham. Please ensure our vision and plans maintain focused on our slightly rural community feel, our beaches and green. If we would want to live in the city we would have moved to Perth, if we'd like to live in suburbia we would also have been in here.
	These big trees are the most magnificent part of Rockingham Beach. Does the city have a clear Policy in place for their preservation?
	This area always looks dirty
	Too much high rise Please preserve foreshore quiet family friendly vibe
	What happened to our water park that the govt gave us $5mil towards
	What is happening with this heap of junk petrol station? It is a disgrace and blight the main connection between city and our most beautiful tourist attraction, Rockingham Beach.
	What is the plan to deal with the build up of sand in the park? In some places the grass in greater then 0.5m high then the path...
	When is the marina happening?
	Why are there not trees in spaces like this?

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

FOCUS AREA	COMMENTS
Waterfront (Foreshore)	Why do we not have anything to encourage fitness and fun? Why not add some vollyball nets and a spotlight for night time?
	YES! What is happening with this eyesore corner property, previously a petrol station, why is it allowed to forever fester in a state of disrepair? Perhaps it should serve as a warning to the City Council to be extremely careful with approving new petrol station proposals, like the Liberty service station proposal for the corner of Day and Dixon Road. Once a petrol station, always contaminated and extremely difficult to sell and redevelop.
Outside five main focus areas	Anniversary Park is the epicentre of our community football league. I believe the club rooms and facilities need upgrading. After visiting north Mandurah FC for football I was impressed with the facilities they have for their team and visitors. Some of the responsibility falls on the RAMS footy club I am guessing but being our main sporting facility I think it deserves some tlc.
	Connection between Meadows estate and Patterson St (roundabout with Wanliss St) is non-existent. Perhaps consider a foot or bike path connection, or even a road connecting Walleroo Place to the roundabout.
	Bike way Can we please have a safe bike route that has loops - beach front from grain terminal to penguin island - internally to sports fields to Read street - connection to grain terminal and penguin island.
	The idea of amalgamation has good intention in order to bring at least 3 blocks together to satisfy the > 2150 m2 requirement for development. But unfortunately it doesn't work given the fact that people living there doesn't have the money for development. And developer will only buy in if rate of return is attractive, hence the last 5 years there's no progress. Please change to R80 or even R40 for Houston St, at least there were some development past number 42....
	The speed limit should be reduced to 40 kilometers
	Needs to be path/bike way link to Lake Richmond.
	Happy to retain R40 zoning for Houston St
	Fish muck is making a mess of this jetty. And there is always lines and hooks left lying around. It is about time, that fishing and the amount of people using the jetty becomes incompatible.
	I would like to see high rise buildings having green spaces for example green walled gardens to soften the structures. Keeping all trees, parks and gas areas for families Make the waterfront have architectural features/environmental Make the Shire stand out.

APPENDIX J: ONLINE MAPPING TOOL COMMENTS

FOCUS AREA	COMMENTS
Outside five main focus areas	Can we please have this opened up for development .
	Can we please stop encroaching on this wonderful bushland. Can we stop the creation of new paths. Look at paths in Point Peron or Kalgoorlie Karlkurla Bushland Park.
	* light rail/tram from the train station to the foreshore * connect the train to the Rockingham shopping centre or move it so it is all within the same vicinity *shopping centre on foreshore * open up the Safety Bay/Waikiki/Warnbro foreshore to commercial land not just residential * Resorts on Penguin Island and Garden Island but done in an ecologically sustainable way *not just apartments but restaurants/cafes/bistros/hotels Kind Regards



FIGURE 6: SOCIAL PINPOINT MAPPING - COMMUNITY COMMENTS

APPENDIX K

APPENDIX K: OTHER COMMENTS

APPENDIX K: OTHER COMMENTS

A comunity member who was unable to attend the workshops provided the following comments:

I am concerned about checking out the options that were proposed for a Performance Theatre for the Arts, which included options of extended art rooms around Gary Holland and whilst keeping the Village Green? Other proposals seemed to suggest the Old Murdoch University Building on Dixon Road, though not sure that is still part of the ideas I saw. Nevertheless I would like to express support for the growing arts cultures to be given consideration in Rockingham for this idea as Arts play a much bigger role than seems to be recognised in maintaining healthy adults and children as they develop their artistic journey, Currently workshops are run regularly and well supported but more gallery space, perhaps an artist in residence gallery area or two, as well as other art rooms should not be ruled out. A performing arts theatre to the other side of Gary Holland, away from the parking area, would be one way to extend or forward from the back room at the bottom of Gary Holland? This would enable existing facilities to still fit well.

I couldn't attend on 28th July unfortunately, but didn't want to not register support for this idea. I believe members of the RRA have suggested a few good ideas and this certainly needs to be kept on the books for future planning.




ROCKINGHAM
RATION CENTRE

Rockingham Beach Height Study





V3. November 2017

mackay urban**design**

Contents

General Introduction

1. Discussion paper 1 – Building height in the landscape context
- 1.1 Introduction
- 1.2 The landscape characteristics of the Rockingham Beach context
- 1.3 Relationships between buildings and landscape
- 1.4 The social and economic role of coastal activity centres
- 1.5 Examples of tall buildings in a coastal landscape context
- 1.6 The social context of Western Australia and public perceptions
- 1.7 Visual impact of development in the Rockingham Beach precinct
- 1.8 Summary and conclusions

2. Discussion paper 2 – Building height in the local urban context
- 2.1 Introduction
- 2.2 The role of building height in shaping the built form
- 2.3 The benefits of building height
- 2.4 The impacts of building height
- 2.5 The economics of development and building height
- 2.6 Principles for managing the height of built form outcomes
- 2.7 Summary and conclusions

3. Discussion paper 3 – Urban design guidance for managing taller and more intensive built forms
- 3.1 Introduction
- 3.2 Collective built form
- 3.3 Individual built form
- 3.4 Streetscape interfaces
- 3.5 Land uses and occupant amenity
- 3.6 Vehicle parking and access
- 3.7 Service infrastructure
- 3.8 Landscape
- 3.9 Architecture and character
- 3.10 Environment
- 3.11 Summary and conclusions

4. Existing conditions
- 4.1 Precinct description
- 4.2 Likelihood of development
- 4.3 Existing development controls

5. Scenario Development
- 5.1 Scenario 2a
- 5.2 Scenario 2b
- 5.3 Scenario 3
- 5.4 Scenario evaluation

6. Preferred Scenario (Scenario 2A)
- 6.1 Description
- 6.2 Rationale
- 6.3 Principles
- 6.4 Development controls

7. General Summary and Conclusion

Appendix A
Discussion Paper 1: Visual analysis images

Appendix B
Scenario 2B

Appendix C
Scenario 3

GENERAL INTRODUCTION

The City of Rockingham engaged Mackay Urbandesign to undertake a Building Height Study, with the aim of helping to determine an appropriate scale of development for the precinct, and to review the Policy guidelines to manage the height and massing of buildings that may be constructed on land along Rockingham Beach Road and Kent Street within the Waterfront Village Sector.

The study considered the appropriateness of taller buildings in the urban environment in relation to a range of factors that include:

- The broader landscape context.
- Strategic planning objectives such as the relationship to desired urban consolidation and the sustainability agenda.
- Local townscape and environmental impacts such as streetscape character, building overshadowing and overlooking.
- Community sentiment and community benefit.
- Development economics, and economic impact.

For the purpose of the study, the Rockingham Beach precinct is defined by Rockingham Beach Road, Patterson Road, Kent Street and Wanliss Street. The precinct is illustrated in ***Figure 1: Study area*** below.



Figure 1: Study area

The study area is effectively what was the original Rockingham town centre prior to the development of the new Rockingham city centre further inland.

The methodology for the study consisted broadly of two parts. The first part of the study includes the preparation of three papers that provide background on the above considerations. The second part of the study involved the modelling of a series of built form scenarios for the precinct to explore the impact of development at various intensities and scale of development.

The scenarios consisted of:

- Scenario 1, being the current 'business as usual' development controls for the precinct, to establish a base line for the comparison of the subsequent scenarios.

- Scenario 2A and 2B, being a combination of traditional urban building forms and towers on podiums, with Scenario 2A being developed to a greater height and intensity.

- Scenario 3, being development at the highest conceivable intensity for the precinct.

Following a series of workshops with City of Rockingham planning officers, Scenario 2A was considered to be the most appropriate of the development scenarios presented for the precinct, and is referred to as the 'preferred scenario' in the report.

1. DISCUSSION PAPER 1 – BUILDING HEIGHT IN THE LANDSCAPE CONTEXT

1.1 Introduction

This is the first of the three discussion papers and, as a starting point, explores the relationship between development and its landscape context, particularly the context of a coastal environment and, specifically, the coastal context of Rockingham.

1.2 The landscape characteristics of the Rockingham Beach context

Rockingham Beach is located at the southern end of Cockburn Sound with a north-western beach aspect. The characteristics of the broader Rockingham Beach landscape context are:

- A relatively low and flat topography consistent with the Swan Coastal Plain.
- Suburban development of varying intensities and residential density to the west, south and east of the Rockingham Beach area, with varying degrees of tree cover in parks, streets and gardens.
- Industrial and port infrastructure to the northeast of the Rockingham Beach area
- The waters of Cockburn Sound to the west with the Garden Island navel base to the west.
- A significant road causeway structure to the west that leads from Point Perron to Garden Island.
- Point Perron – a largely undeveloped headland with modest elevation to the northwest, although it is partially obscured from Rockingham Beach by the causeway.

The characteristics of the local Rockingham Beach landscape context are:

- A well-landscaped foreshore area used extensively for passive recreational activity.
- A sheltered sandy beach with a north-western aspect.
- Significant planting of tall Norfolk Island trees in the foreshore area.
- Two jetties to the west of the precinct that afford public views from over the water.
- A ‘main street’ element along the western portion of Kent Street to the south of the precinct.
- Areas of parkland and sporting infrastructure (tennis and bowling clubs) further to the south across Kent Street.
- Commercial and residential development that varies from one to nine storeys (including several buildings of eight storeys or more within the precinct).

There are some significant areas of natural environment with high landscape values in the Point Perron Reserve and around Lake Richmond to the west, and on Garden Island. In the case of Point Perron, the areas of high landscape value face largely westwards towards the ocean. In the case of Lake Richmond, the landscape values are already compromised by the surrounding residential development, and Garden Island is not publicly accessible.

In summary, the overall landscape characteristic of the Rockingham Beach precinct is developed rather than natural, with a mix of suburban, commercial, urban, industrial and port infrastructure uses; in other words, it would be unreasonable to describe it as a natural environment. Therefore, it is reasonable to conclude that any additional development in the Rockingham Beach precinct needs to be considered in the context of a significantly modified landscape.

1.3 Relationships between buildings and landscape

The relationships between buildings and landscape are highly varied depending on the building and the setting.

In a rural setting, individual buildings or clusters of buildings become minor elements of the landscape – in some cases, they blend seamlessly into the landscape by virtue of their size, colour and material, in other cases they contrast significantly to announce their presence in a broad landscape; in either case, the built elements are always subservient to the landscape.

In a suburban setting, buildings and landscape become more or less equal elements of the landscape. It is often difficult to say whether suburbia is landscaped environment populated by buildings or a built environment with generous landscaping.

The suburban landscape is also typified by the extent of its coverage and high degree of consistency of its scale. Whist there may be localised pockets of individuality, the suburban environment is predominantly homogeneous and for visitors to a suburban area, there is little in the way of landmarks to navigate or distinguish location.

In an urban setting, the built form predominates and the role of the landscape becomes either that of the surrounding frame that defines the extent of a city, or it provides local decoration, shade and visual relief.

In an urban environment, the architecture of buildings, whether by virtue of their size of architectural detail, provides clues for navigation and creates a sense of place. In an urban environment, the scale of buildings also provides a clue as to the function and hierarchy of different places. Typically, in the modern world, buildings are larger in CBDs, activity centres and other places of public importance and can be readily discerned from their surrounding and predominantly residential suburbs.

If GPS were the sole means of navigating around a city then, arguably, building height would not be an issue. However, there is more to a city than a street network, and building height literally adds another dimension to a city and describes which places are more publicly important than others.

In the context of Rockingham, the Rockingham Beach precinct is one of the most important destinations in the region. It is the principal coastal destination between Fremantle and Mandurah; a place with a long-standing tradition as a place of relaxation and pleasure and of socialising with other people. In other words, it is a place where the regional community comes together. For that reason, it deserves a built form that clearly announces its function and location.

1.4 The social and economic role of coastal activity centres

Coastal activity centres are important public places that provide a range of social and economic benefits and opportunities. Far more than only a place to sit on the beach, a coastal activity centre is:

- A destination for meeting friends and family and for visitors.
- An access point to the beach for people who don't have a car (on the assumption that most major coastal activity centres are served also by public transport).
- An attractive place for visitors from other places to stay and enjoy a coastal and eco experience that is not otherwise available to them by virtue of geography or climate.
- A 'hot spot' for food and beverages that provides diversity of choice.
- A source of employment in the tourism and hospitality industry.
- A place with a range of opportunities for passive recreation.
- A place with a range of active recreation opportunities (in the case of Rockingham Beach this includes sailing, tennis, bowls, swimming, walking, windsurfing, paddle-boarding etc.).
- A place that provides an opportunity to escape the monotony and day-to-day life of suburbia, and be somewhere different and do something different.
- A place that is pleasantly cooler than the inland suburban areas of the Swan coastal plain in summer.
- A place that offers a diversity of activities for family members of all ages in one place.
- A place to live or retire with the potential for a sea view from the balcony of an apartment and a coffee shop on the ground floor.
- A lock-and-leave lifestyle for people with extensive travel commitments.
- A place than meets the needs of younger generations and immigrants whose experience overseas has led to an expectation of a typical Australian 'beach experience', however with one that offers more that only the beach.

1.5 Examples of tall buildings in a coastal landscape context

There are many examples of tall buildings in the context of coastal landscapes throughout Australia. For example:

Cairns: A highly desirable tropical destination in Far North Queensland where a growing collection of apartments, mixed-use buildings and hotels, some up to 16 storeys in height, frame the foreshore area in the vicinity of the Boardwalk and the Cairns Lagoon and which together form the social epicentre of the region. The majority of the taller buildings are located on the Esplanade, which, like Rockingham Beach Road, is separated from the ocean by a modest foreshore reserve.



Cairns

Manly Beach: One of the two main beachside centres in the Sydney metropolitan area (the other being Bondi Beach). Manly Beach is a very popular and complementary destination to Sydney's central and riverside centres, with a majority of visitors originating from within the Sydney metropolitan area and visiting as day-trippers. At Manly, mixed-use and apartment buildings rise up to 14 storeys sporadically along the length of North and South Steyne, which is separated from the beach by a modest foreshore planted with Norfolk Island Pines.



Manly Beach

St Kilda/Port Melbourne: The principal beachside playground of the Melbourne metropolitan area, the St Kilda/Port Melbourne coastal strip is characterised by intensive urban activity at the St Kilda end and a more relaxed residential character at the Port Melbourne end of the strip.

Building heights vary considerably from two to 16 storeys, however, the grouping of the taller buildings close to the St Kilda town centre and the Beacon Cove development in Port Melbourne provide a clear indication of where the activity is in the centres.



Port Melbourne

Glenelg: In the same way as Manly and St Kilda are for Sydney and Melbourne, Glenelg functions as a principal coastal destination for Adelaide. Glenelg has developed considerably in recent years and is recognisable from a considerable distance in the surrounding area with a cluster of buildings up to 13 storeys rising from a suburban coastal landscape that is every bit as flat as that of Rockingham.

As with all of the previous examples, Glenelg offers a wide range of recreational activities, food and beverage outlets, a choice of accommodation in hotels, apartments and houses and the place is well-served by public transport.



Glenelg

Gold Coast: No discussion on urban coastal development in Australia would be complete without mention of Queensland's Gold Coast. With buildings up to 80 storeys in height, the Gold Coast is often cited as an example of what not to do by people

opposed to coastal development (and in many of those cases, by people who have never been there). The Gold Coast has its drawbacks: the lack of a meaningful foreshore and numerous buildings that cast shadows on the beach in the afternoon (neither of which are issues for Rockingham Beach), and a glitzy style of commercialism that is beyond the taste of more conservative people.

However, it should be noted that the Gold Coast has been very successful. Since the 1950's it has grown from virtually nowhere into Australia's sixth largest city. Of particular note is that the Gold Coast and its hinterland has a population roughly equivalent to the population projected in *Perth and Peel @ 3.5m for the Southern Metropolitan and Peel region*. Given the limited capacity for coastal development in Fremantle and other places between Rockingham and Scarborough, Rockingham Beach and Mandurah will, between them, need to serve a catchment greater than the Gold Coast - such a task will require extensive development.



Gold Coast

Internationally, many of the world's most famous beaches are not isolated 'getting away from it all places' but they are in a distinctly urban context. For example: South Beach in Miami; Copacabana Beach in Rio de Janeiro; the beaches of Nice and Cannes in the south of France; and Venice Beach in Los Angeles. In all cases, the beach is backed with an urban strip that meets the needs of a large regional catchment, and in many cases, the beach is framed with buildings of considerable height.



Copacabana Beach

In the Perth context, the coastal centres are significantly less developed than in most other Australian cities. Whilst Fremantle remains the principal, most central and coastal destination in the Perth metropolitan area, its capacity is heavily restricted by heritage considerations. To the north, Scarborough is emerging as an important coastal centre, whilst in the southern part of the Perth and Peel region, Rockingham and Mandurah are the principal coastal centres and will continue to be so.

Given the anticipated population growth of the Perth and Peel regions and the limited opportunities for coastal development, it is evident that the coastal centres such as Scarborough, Rockingham and Mandurah will need to work hard to perform their roles as regional coastal destinations.

1.6 The social context of Western Australia and public perceptions

There is a long-standing community view that life in Western Australia is characterised by 'getting away from it all', and that the beach is the ultimate 'getting away from it all' by virtue of being at the very edge of the continent.

There is merit in preserving the 'getting away from it all' experience in the cases of beaches that provide that experience. Given that WA has over 20,700km of coastline; that should be reasonably easy to achieve.

Whilst the dream of a spot on a secluded beach remains strong in some older people who were raised in a less populous and more isolated WA, the aspirations of the younger generation, a growing and increasingly active older generation, visitors and immigrants from overseas have been influenced by experience of overseas resort towns, the 'coffee culture', and a greater desire for entertainment, nightlife, food, drinks and social interaction. In short, things are changing and, as a result, there is a need to accommodate WA's social diversity and provide a greater range of coastal urban and ecological experiences.

As identified in Section 2 above, Rockingham Beach is far from being a wilderness environment and the experience of the beach is influenced by surrounding urban and suburban development, industry and port infrastructure, including an extensive road causeway. As such, it is appropriate to recognise that Rockingham Beach cannot offer the 'getting away from it all' experience and should, therefore, focus on offering an alternative for those people who are looking for an urban coastal experience – a 'beach with a diversity of benefits'.

1.7 Visual impact of development in the Rockingham Beach precinct

The long-standing view of many older people in the community that beaches are places to 'get away from it all', commonly manifests itself in an opposition to coastal development, particularly if it is of a scale and height that increases the visual prominence of the built environment (and, thus, dilutes or negates the perception of wilderness), or results in more people using the beach (and diluting the experience of 'getting away from other people.

Given that such opposition is commonly founded on broad matters of principle rather than an evaluation of the actual visual impact of development, it is worthwhile exploring the visual impact of redevelopment of the Rockingham Beach precinct at various scales of development.

The following visual analysis is based on a series of popular locations along the Rockingham coastline and estimates the overall building mass of a collection of buildings resulting from widespread redevelopment of the Rockingham Beach precinct.

The visual analysis investigates two scenarios:

Scenario A: Development at a scale and form consistent with the current planning framework and recently constructed development, with a notional height of up to eight storeys.

Scenario B: Development at a height up to 16 storeys in a form based on a combination of towers up to 16 storeys and conventional 8-storey urban buildings.

The images of the above scenarios are based on a series of photographs taken at various locations along the Rockingham coast, which are identified on the accompanying maps. The photographs are taken at a depth of field equivalent to the human eye, but it should be noted that the images cover a much smaller field of vision than the human eye.

The series of images are included in Appendix A.

From the images, it is clearly apparent that from most of the locations, including the ones from relatively close to the Rockingham Beach precinct, the extent of visible development is a small proportion of the image (and a much smaller proportion of the human field of vision). This is in part due to the fact that the precinct is elongated and lies parallel to the coast, thus, presenting its shortest side to the view along the coast.

The visual impact was not considered from the beach directly in front of the Rockingham Beach precinct because:

a) the development would be directly behind the viewer when looking out to sea from the beach and only in peripheral vision looking along the coast; and
b) the development would be largely obscured by the extensive coverage of tall Norfolk Island Pines within the foreshore area.

1.8 Summary and conclusions

From the above discussion, the following observations are of particular note:

- The coastal landscape of the surrounding area is not a natural wilderness but is heavily modified with man-made structures.

- Rockingham Beach is an existing urban coastal centre that already has 7 developments of eight storeys or more and it serves a large regional catchment.

- Urban coastal centres provide for a broad range of social and economic opportunities for a diverse range of people.

- There are a limited number of places where an urban coastal experience can be provided along the coastline of the Perth and Peel region.

- Whilst there is some opposition, as a matter of principle, to intensive coastal development amongst some of the community, there is a growing proportion of the community that values a more social and diverse urban coastal experience over a ‘getting away from it all' experience.

- There are numerous examples around Australia of successful and popular urban coastal centres, many of which have buildings up to 13 to 16 storeys in height (or up to 80 storeys in the case of the Gold Coast).

- Publicly important urban centres benefit from being taller than their surrounding predominantly residential suburban areas so they can be readily identified from afar.

- Given the limited extent of the Rockingham Beach precinct and its parallel alignment with the coast, the visual impact of further development within the precinct will be limited in regard to visual amenity along the coastline.

The above observations suggest that there is a growing need for more intensive urban coastal centres in the Perth and Peel region and that Rockingham Beach is well placed to function as one of the principal urban coastal centres.

Given the relatively small footprint of the Rockingham Beach precinct, and the fact that it is constrained to the north by Cockburn Sound and to the south by existing parkland and sporting facilities, there is a strong argument for development to go upwards. The other alternative is for the precinct to grow outwards into the suburban areas immediately along the coast to the east and west, which likely may be more unpalatable to the communities that live there.

The implications of a taller built form on the urban environment within the Rockingham Beach precinct will be explored in ***Discussion Paper 2: Building height in the local urban context.***

2. DISCUSSION PAPER 2 – BUILDING HEIGHT IN THE LOCAL URBAN CONTEXT

2.1 Introduction

This is the second of the three discussion papers and explores a range of considerations in regard to built form and, in particular, considerations related to building height and where to put it and in what form.

2.2 The role of building height in shaping the built form

Building height can play an important role in 'shaping' the overall form of an urban centre or precinct and make it more legible or 'understandable'. There are a number of considerations in 'shaping', or giving a three-dimensional form, to an urban area. These include:

Intensity of built form at the centre: From the perspective of giving shape to an urban area, there is a general understanding that the development in cities increases in intensity in centres or other publicly important places, and that greater intensity of development and activity generally translates to greater building height.

Stepping down at the edge: There is an also a general understanding that areas of a city, such as centres, have a finite extent and that at the edges of a high-rise precinct, the built form needs to step down and transition towards the lower scale of the surrounding area. Failure to so do inevitably results in dissatisfaction in the local community as residents and landowners in small buildings with limited development rights, find themselves living adjacent to, and in the shadow of, tall buildings where the neighbouring landowners made significant financial gain from the higher development rights conferred upon them.



Example of greater height in a centre and buildings stepping down to meet the suburbs

The footprint of the precinct: The two-dimensional footprint of a taller and more intensive urban precinct is driven by the function of the precinct. In the case of a transit-orientated precinct, the defining driver of the precinct's footprint is likely to be walking distance to a railway station or other significant element of transport infrastructure, where development is at its most intense within a 400m walk of the point of transit access, and may extend in a less intensive form for up to 800m from the point of access to transit. If there are no significant constraints to development, the overall footprint of the precinct is likely to be roughly circular or, more specifically, a jagged diamond shape.

In the case of a beachside coastal centre, the footprint of an intensive precinct with taller buildings is likely to be linear in its form and run parallel to the coast as a response to maximising the number of people living close to, and having views of, the beach and the ocean.

Likewise, an activity centre based on a traditional main street is also likely to result in an elongated precinct as it stretches along the length of the main street. However, a precinct based on a main street is likely to be wider than a beach-based precinct as development occurs on both sides of the main street whereas development only occurs on the landside of the beach. It is for this reason that beachside precincts tend to be longer to compensate for their single-sided nature.

European or New World? More intensive urban development comes in two main forms, which can be described as 'European' or 'New World'. European style describes the traditional perimeter block and courtyard forms of development that can be found in most European cities. Perimeter block development generally follows the street pattern and consists of buildings that are built side-to-side, effectively forming a single large block surrounded by streets on all sides. The centre of the block commonly consists of a courtyard or a series of courtyards. Building heights generally range from five to eight storeys in height. Above that, perimeter blocks appear bulky given that the width and length is equivalent to an entire street block.



Examples of 'European' built form

New World style of built form generally consists of taller and more slender towers, which may stand alone in a landscaped setting on a site or the tower will be located on top of a low-level podium. Tower heights vary considerably depending on the place, the demand for floorspace, and the flexibility of planning controls. Typically, towers might range anywhere from eight storeys to 80 storeys or more. In the case of podium and tower combinations, the podium is most likely to contain ground level commercial land uses, car-parking decks, or a combination of both.



Example of 'New world' built form

In places where there are onerous height limits and a healthy demand for floorspace, a European style of built form is best able to deliver the desired development yield, however this may be potentially at the expense of occupant amenity such as access to views.

Where height limits are less onerous, and particular in a place that offers desirable views, developers will tend to gravitate to a New World style of built form because a slender tower form offers more opportunities for views and has a highly repetitive floor plate that can be more efficient to design and construct.

Planner's Vernacular: A common approach in places that lack the confidence found in well-established cities is what could be termed 'Planner's Vernacular'. This approach is often found in places where the community is struggling to come to terms with the transition from the relative comfort of a low-intensity and low scale suburban area to a higher intensity, larger scale urban area. Planner's Vernacular is a building form that has a greater use of setbacks to step taller buildings back from the street and from other adjacent buildings. A typical Planner's Vernacular building limits the height of the building adjacent to a street to something akin to the height of existing buildings. In Subiaco, for example, the limit is two storeys with any additional storeys being set further back and sometimes in a tiered formation.



Example of 'Planner's vernacular' built form

Whilst Planner's Vernacular delivers a more politically acceptable solution to assuage public concern about taller buildings, it can result in awkward and poorly proportioned buildings with limited visual attraction.

In planning an intensive urban precinct, such as a centre, a transit-orientated precinct or a coastal centre, all of the above needs to be taken into consideration.

2.3 The benefits of building height

Taller buildings can deliver a range of benefits, including:

- The potential to retain more of a development site as open space or landscaping.
- The potential for more floorspace to enable a larger residential population in activity centres, which may otherwise be devoid of people after normal business hours.
- More opportunity for views and in the case of apartment buildings, views from multiple rooms of an apartment.
- Greater opportunity for cross-ventilation of apartments and north-facing apartments, whereby a slender tower naturally has a high proportion of corner apartments that allow for cross-ventilation. Furthermore, through careful placement of the lift and stair core, south-facing apartments can be minimised and north-facing apartments can be maximised, subject to other site constraints.
- Greater degree of privacy for the building's occupants, where in the case of a tower, people look out to the distance rather than into a communal courtyard space.

- More opportunity for architectural expression, where architects can exploit the tower shape and its visibility from a distance to create a strong sculptural shape, or the verticality of the building can be designed in a well-proportioned manner with a clear base, middle and top.

- Greater access to sunlight at street level. It may sound counter intuitive to say that taller buildings offer the potential for more sunlight, however a series of slender towers with significant distance between them would allow more low-angle winter sunlight to reach the street level than a continuous run of bulkier buildings of up to eight storeys in height.

- More opportunity for views for other people. Again, it may sound counter intuitive to say that taller buildings offer greater potential for views for other people, however for the same reason as above, slender towers with gaps between them create view corridors that would not be available with a continuous run of bulkier buildings up to eight storeys in height.

- Something to look at in the distance. For example, properties with a view to the city towers of the Perth CBD commonly command a significant price premium over those that don't.

- Greater legibility in the suburban landscape. As mentioned in Discussion Paper 1, a cluster of taller buildings associated with an activity centre or other publicly significant destination acts as a beacon in the broader landscape, helping people to find the centre of activity.

2.4 The impacts of building height

Whilst taller buildings can provide a range of benefits, they can also create a range of negative impacts, including:

- Greater degrees of overlooking of other properties as a result of higher viewing angles that enable looking down into rooms and spaces, and as a result of less-obstructed viewing points.

- Greater degrees of overshadowing of streets or adjacent properties where taller buildings are wide or contiguous with each other.

- The redirection and funnelling of wind down the positive-pressure side of a tall building towards pedestrians on the street below.

- The placement of residents at higher levels where wind flows are higher and less obstructed than at ground level, including a corresponding 'suction' effect on balconies and windows on the negative-pressure side of a tall building.

- The longer reach of shadows, although the further parts of a tower's shadow moves more quickly the taller the building is and the lower the sun angle.

- Visual intrusion into streets and other spaces that have an intimate landscape character and that provide a sense of sanctuary from the urban environment.

- A reduced sense of containment and enclosure of streets and other urban spaces such plazas.

- Fewer opportunities to conceal services and other visually unappealing building elements, particularly at ground level, because towers are seen 'in the round' from the surrounding area.



Example of poor ground floor interface

- The potential to result in large areas of exposed blank walls.

- Fewer opportunities to 'sleeve' above-ground car parking with other uses in the case of taller and more slender buildings because of their smaller footprint.

- Greater vehicle movement resulting from potentially higher resident or worker populations in taller buildings.

- Greater costs associated with more elaborate fire safety measures and more expensive forms of construction and site supervision.

In summary, there are numerous benefits and drawbacks associated with building height and there is no conclusive argument to say that taller buildings are absolutely better than smaller buildings.

The reality is that the height of any proposed development needs to be considered in its unique context, taking into account the overall form of the precinct in which it is located; considering the opportunities that the location affords; and addressing any negative impacts that might arise.

2.5 The economics of development and building height

In addition to the broader planning intent for the precinct in which a development site may be located, and consideration of the potential benefits and impacts arising from the site's location, the economics of development also need to be taken into account.

The economics of development have a significant bearing on building heights. The following point provide general rules of thumb on construction costs for residential buildings:

- Single storey development is by far the cheapest form of construction; however, it is very inefficient in regard to land use. Single-storey makes sense in a price-sensitive market where land values are low, which is why many of the suburban areas in the Perth metropolitan area have been developed at a single storey.

- The per-square-metre rate of double-storey houses is between 1.3 and 2 times the cost of single storey construction and makes sense for single dwelling lots where land values are somewhat higher than the norm (for example, a more desirable suburb or street or a place with a view), or for apartments in places with lower land values where additional dwelling yield (achieved through additional height) is not required to offset land costs.

- Three-storey buildings are a cost-effective means of providing apartments in that the construction techniques are similar to the widely used techniques for single housing, which is the bread-and-butter product for Perth's building industry. At three storeys, car parking can be provided usually at ground level thereby avoiding the expense associated with basement or decked car parks.

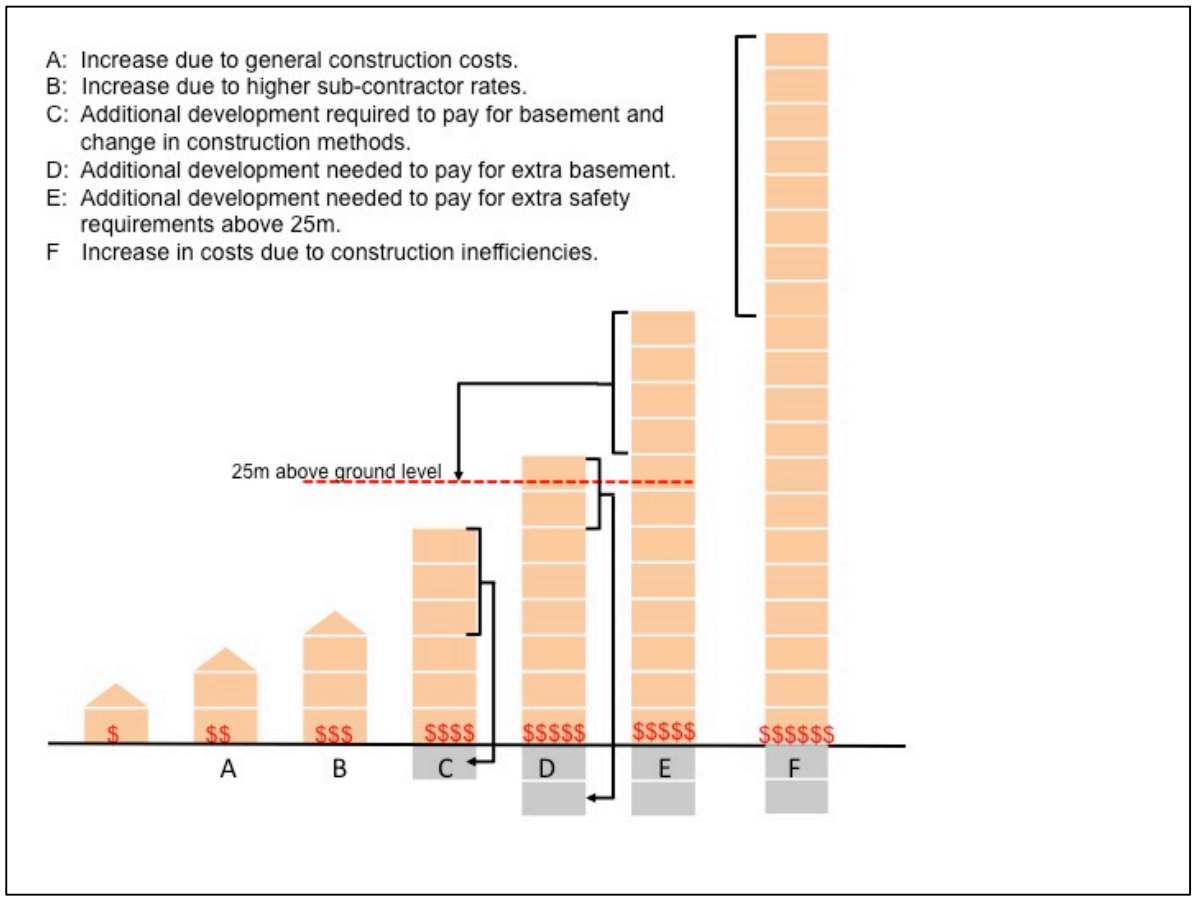
- Four-storey apartments lead to the first significant jump in construction costs, because at this point a lift is required for vertical circulation.

- At five storeys, there is commonly a significant increase in construction costs, because this tends to be the threshold where the construction technique moves from simple load-bearing construction to a framed structural system. At five storeys, either a basement car park is required, or a first-floor parking deck in addition to ground level car parking.

- The next major increase in construction costs occurs at between eight to ten storeys when apartment buildings no longer meet the 'BCA 25m height rule', which requires more onerous and costly fire safety measures when the top floor is more than 25m above ground level. At around this height, apartment buildings will generally require an additional level of car parking which further adds to the cost. In most cases, development will need to extend to between 12 and 16 storeys in height to cover the additional cost.

- Beyond 16 storeys, the construction cost gradually rises as the logistics of construction become more complicated – materials need to be lifted further up the building, which takes time, and it becomes costlier to supervise workers when they are spread over numerous floors.

- The construction cost of taller buildings also increases every time there is a need for an additional level of parking as the number of apartments and occupants increases, and when there is a need to add an additional lift shaft.



Summary of factors that influence building cost

In addition to building height, development economics is also influenced by other built form considerations, including:

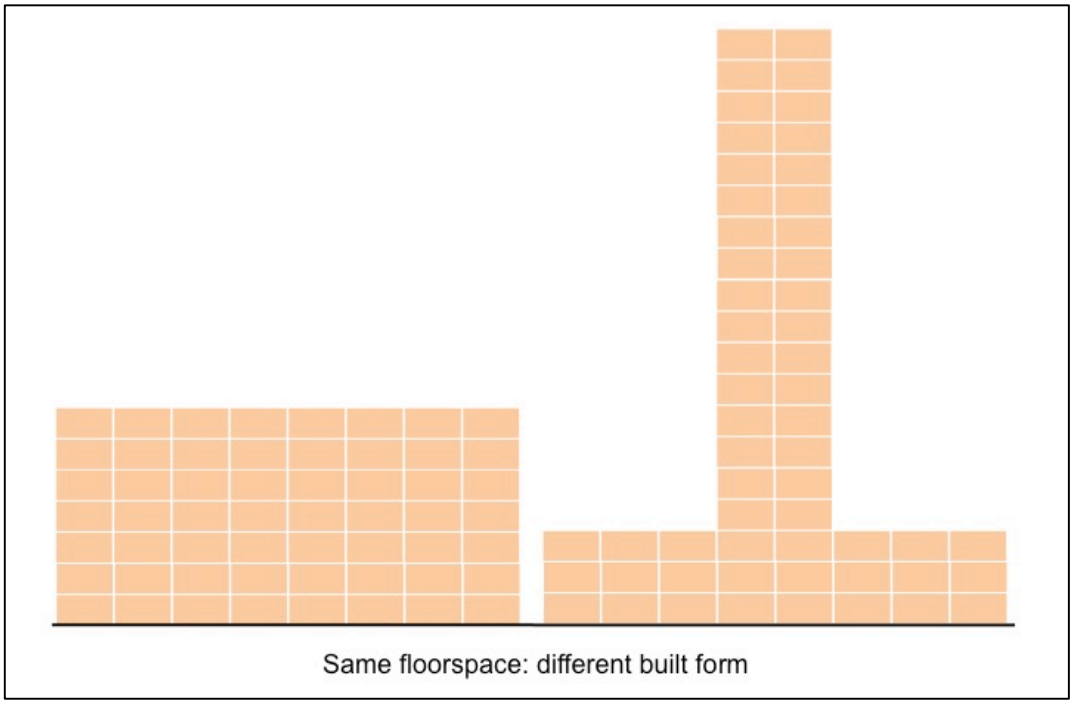
The size and shape of a development site: As a rule, the larger the site, the more efficiently it can be developed because car parking can be more easily accommodated and because less of the site is taken up by setbacks. Likewise, a regular and rectangular site will be more efficient to develop than an irregular-shaped site, and a squarer site will be more efficient to develop than a long thin site.

Site frontage: A site with two or more street frontages will generally result in a more efficient apartment development outcome than a similar-sized site with a single street frontage, because the street affords the opportunity to include windows without having to accommodate setbacks for privacy - this rule of thumb doesn't apply to single-storey buildings.

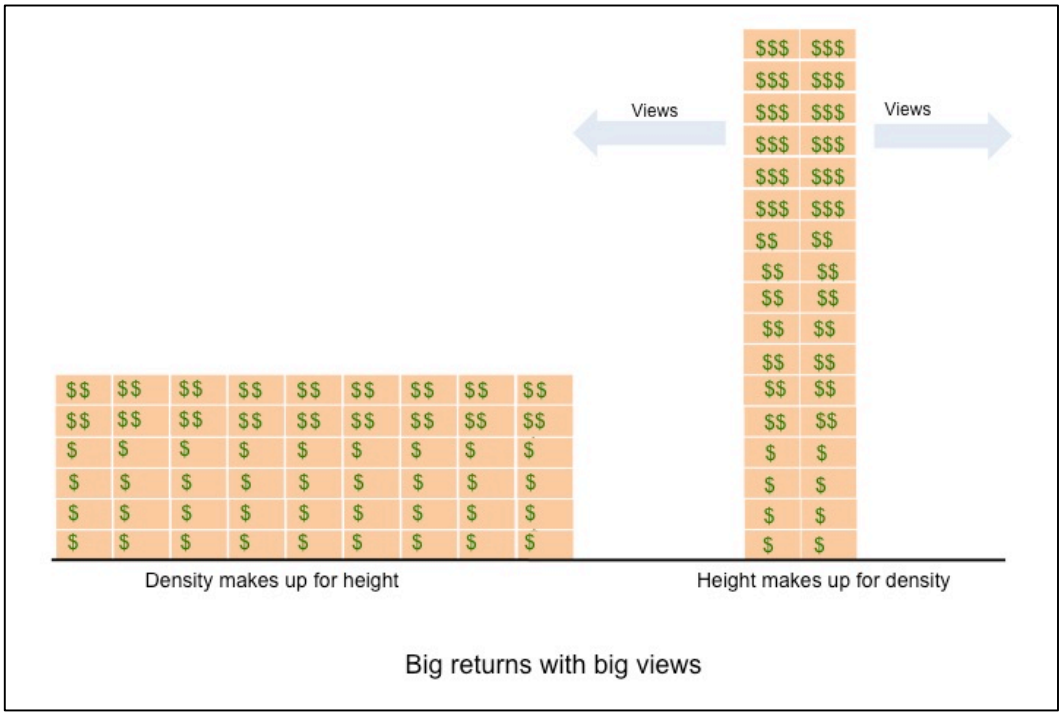
Building typology: Whilst tall 'New World' style towers have cost constraints, as discussed previously, 'European' style building forms also have inherent cost implications. For example, when the footprint of an apartment building expands, it will reach a point where additional stairwells are required, at a cost, to meet fire safety regulations.

Furthermore, if long corridors are to be avoided from a design perspective, then the alternative in a 'European' style building is to construct multiple lift and stairwells, which also comes at a considerable cost.

It should also be noted that a 'New World' built form will not necessarily deliver a greater density despite the additional height.

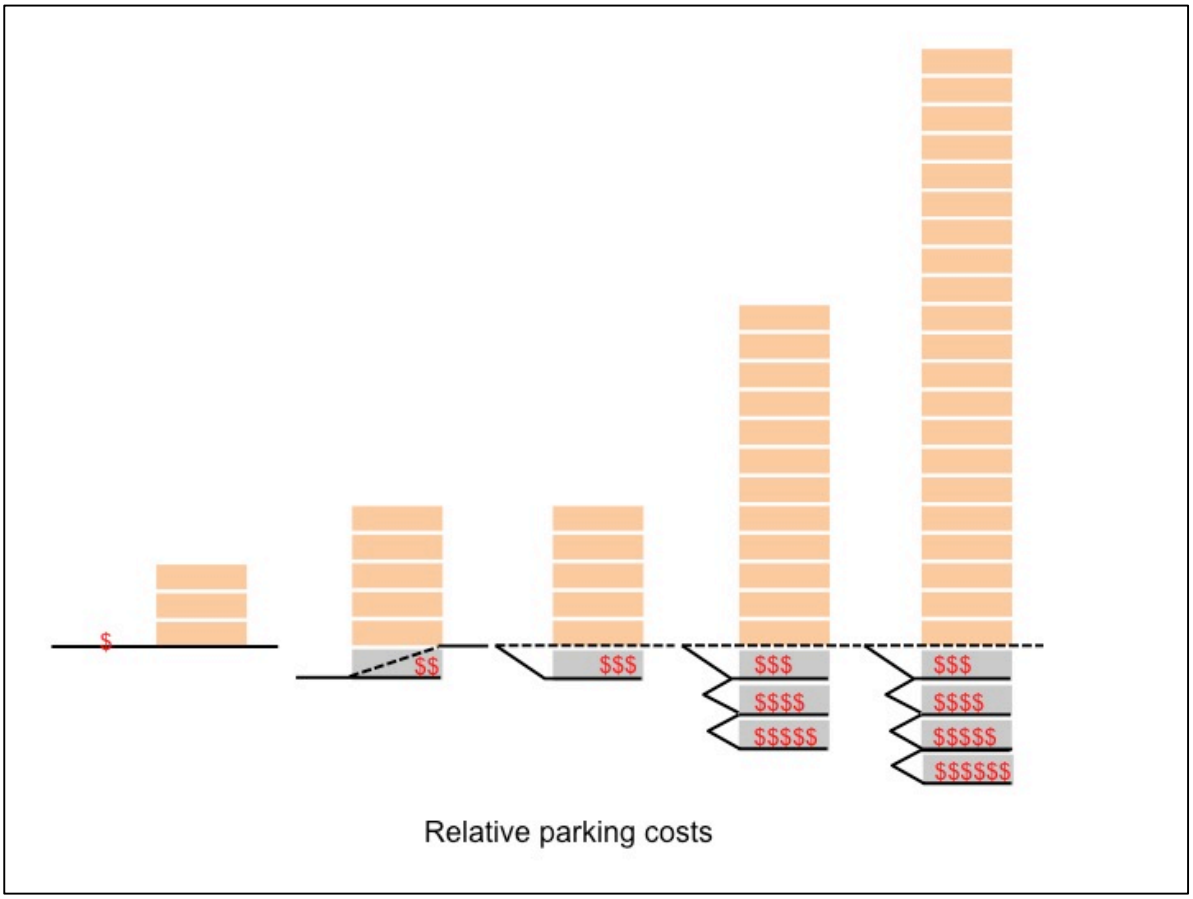


'European' and 'New World' built form comparison 1



'European and 'New World' built form comparison 2

However, where there are views available, the 'New World' built form has the potential to achieve higher values in sales to outweigh additional cost.



More basement = more cost

Extent of basements: Basements are expensive, and the deeper they are, the more expensive they become. In addition to the construction cost, full depth basements require the additional and on-going expense of mechanical ventilation.

Land use mix: Buildings with different uses in them can also introduce additional costs. For example, in the case of a mixed-use building, the commercial and residential components are likely to require separate entry lobbies, car-parking areas, and bin stores. Likewise, buildings with residential and short-stay apartments are likely to require similar separation between the permanent and short stay components.

In summary, development economics is a complicated interaction of numerous considerations, many of which relate to building height. From a planning perspective, it is important to understand the implications of development economics as there is a risk in setting development controls that don't allow sufficient floorspace (either though plot ratio, height or both) to adequately cover construction costs. Likewise, there is a risk that planning controls may be set a threshold that cannot be viably achieved (for example, ten storeys) or a threshold that is overly ambitious, and sites may then not achieve their full development potential.

2.6 Principles for managing the height of built form outcomes

From all of the above, it is possible to draw out some basic planning and design principles in regard to building height. These principles include:

- Establish an overall built form shape, and footprint, for an intensive urban precinct that is derived from the function and role of the precinct.
- Use building height to establish legibility in the broader landscape and signify where intensive urban precincts, such as centres of activity and other major destinations, are located.
- Use building height to accentuate the primacy of a centre's core.
- Step building heights down at the edges of an intensive urban precinct to meet the interface with less intensive development.
- Match built form typologies that are appropriate to the location and function of the precinct.
- Identify the economic context for development and either match development controls to the likely scale of development or provide sufficient flexibility to enable viable development.
- Identify existing, or future, viewing opportunities through the precinct and establish view corridors with open areas or low-rise buildings between taller buildings to maintain views if required.
- Manage building heights to maintain a reasonable degree of winter solar access to active streets and other public spaces.
- Consider a built form that 'maintains a pedestrian scale at street level' where there is community anxiety about the impact of taller buildings.
- Consider the use of additional building height as a trade-off for the delivery of publicly accessible open space or quality landscape at ground level.
- Utilise a built form that reduces adverse wind impacts from taller buildings.
- Manage building heights to avoid extensive overshadowing of active public spaces and existing dwellings and their outdoor areas for long periods of time.
- Establish a built edge to streets and public space that is high enough and contiguous enough to provide a sense of containment and enclosure without being over-bearing.
- Introduce architectural elements that sculpt taller building and provide visual interest.

- Break up the scale of taller buildings in a manner that is well proportioned, articulate and visually pleasing, with a clear base, middle and top.

- Avoid the establishment of large areas of exposed blank walls.

The above principles provide a foundation for design guidance on managing the built form of taller buildings. The third discussion paper will build upon these principles and combine them with widely acknowledged urban design principles for urban buildings generally; this approach will help to establish a 'planning and design brief'' for the preparation of development scenarios for the Rockingham Beach precinct.

2.7 Summary and conclusions

In summary, building height is a complex issue with numerous benefits and drawbacks – too complex to reduce into a simple argument about whether 'x' number of storeys is too high.

The appropriateness of building height needs to be considered firstly in the context of the place in which a development is located, both in regard to the nature of the place it is in and where it is within that place.

Building height also needs to be considered in regard to what the most appropriate built form typologies might be for a place – whether tall slender towers that offer views or a more modest perimeter block that provides a sense of enclosure. In addition, the most appropriate built form and height may also be a function of development economics.

In providing a pathway through the complexity of the issues surrounding the appropriateness of building heights, it is possible to identify a suite of principles that provide guidance on managing the built form of taller buildings.

These guiding principles can then be combined with widely acknowledged urban design principles for urban buildings generally to create a comprehensive planning and design brief for development in intensive urban precincts such as activity centres and primary coastal centres, such as Rockingham Beach. This will be explored in greater detail in ***Discussion Paper 3: Urban design guidance for managing taller and more intensive development.***

3. DISCUSSION PAPER 3 – URBAN DESIGN GUIDANCE FOR MANAGING TALLER AND MORE INTENSIVE BUILT FORMS

3.1 Introduction

This is the third of the three discussion papers and explores what detailed urban design guidance should be applied to the Rockingham Beach precinct, particularly in the event that the City of Rockingham decides to enable the development of taller and more intensive development within the precinct.

There is already a range of urban design objectives and provisions within the City of Rockingham's local planning framework contained within *Development Policy Plan No.3.2.5 - Waterfront Village Sector* provides an overview of planning and urban design considerations, whilst the *Foreshore Precinct Plan* provides an additional level of guidance.

The area of design guidance is also changing rapidly in WA, with the recent release of the draft Design WA documents including *Apartment Design (Volume Two of State Planning Policy No. 7.3 Residential Design Codes Guidance for multiple-dwelling and mixed-use developments)*, which provides very detailed guidance on the planning and design of apartment and mixed-use buildings.

The intention of this discussion paper is to highlight a range of considerations, that can then be used to evaluate which elements of the existing local planning framework should be retained and where further detail should be included in any update of the policy framework. It also may be that, given a high degree of concurrence between the elements of this discussion paper and Design WA, the final form of Design WA also can be referenced in any updated local planning policy as a 'belt and braces' approach for achieving satisfactory design quality.

The principles of design guidance in this discussion paper are organised under a series of headings for clarity. These are:

- The overall shape, extent and function of the collective built form of the precinct.
- The site planning and built form of individual buildings.
- Appropriate building interfaces with adjacent streetscapes.
- Appropriate land uses and the provision of a high standard of internal and external occupant amenity.
- Vehicle access and parking.
- The location of services infrastructure for buildings.
- Landscape.
- Architecture and character.
- Environmental responsibility and resource conservation.

It should be noted that whilst the theme of the three discussion papers has been building height, a good urban design outcome cannot be achieved by simply focussing on height, and that the principles need to cover a range of other considerations in relation to the built form.

3.2 Collective built form



Principle: Development in the precinct should be coordinated to form a legible and distinctive built form composition.
Reason: If the Rockingham Beach precinct is to be an identifiable place of character, it cannot be composed of a random collection of buildings and spaces of disparate appearances and no common architectural language. Therefore, the use of precinct planning and design guidance is essential.

Principle: The collective built form should step down at the edge of the precinct.
Reason: The focus of development should be within the core of the precinct, allowing the edges of the precinct to transition towards the planned height of the surrounding areas.

Principle: Buildings should be a minimum of five storeys.
Reason: The precinct is one of the metropolitan areas most significant regional coastal destinations and the scale of the built form should reflect that significance. Low-scaled development would be an under-utilisation of high value land in an activity centre, Furthermore, low-scaled development will be difficult to redevelop if it is strata-titled.

Principle: Development within the precinct should seek to optimise density rather than simply maximising density.
Reason: The pursuit of dwelling yield alone does not create good places. The quantity of dwellings achievable needs to be balanced against the quality of amenity that the dwellings provide for residents, and the amenity of the public realm at street level.

Principle: The collective built form should contribute, wherever possible, to increased pedestrian permeability.
Reason: The main destinations in the precinct are the Kent Street main street and the foreshore, however there is currently limited pedestrian connectivity between them.

Principle: The pedestrian movement network within the precinct should be legible and connect the main pedestrian destinations.
Reason: Successful places tend to be easily mind-mapped by residents and visitors and the most legible places offer direct routes.

Principle: The collective built form should avoid contiguous buildings of more than eight storeys in height.
Reason: Above eight storeys, a long contiguous wall of buildings becomes visually oppressive and will diminish public amenity of the foreshore, and reduce the potential for intensive development of land immediately inland of the wall of buildings by compromising the potential for views.

Principle: The collective built form should be structured and coordinated to create or define identifiable public places.
Reason: Successful and appealing places are more than a collection of individual development sites along streets, no matter how good the streetscape is. Successful and appealing places are largely characterised by well-defined places where people want to be.

Principle: The collective built form should maximise the number of dwellings (or short stay accommodation units) that have a view to the foreshore and ocean.
Reason: The foreshore and beach are the most significant landscape features of the precinct's location, and development that maximises views will maximise value, amenity and desirability.

Principle: The collective built form should establish a clear and direct relationship with the foreshore.
Reason: The foreshore and beach are the most significant landscape features of the precinct's surrounds and are the principal pedestrian destinations in the surrounding adjacent area.

3.3 Individual built form





Principle: Buildings should be designed to avoid extensive overshadowing of public spaces or other residential dwellings for prolonged periods of the day.
Reason: Whilst shadow is an inevitable consequence of urban-scaled development, extensive and prolonged shadow diminishes the amenity of public spaces and other dwellings. Particular consideration needs to be given to the quality and amenity of al-fresco areas, parks, plazas and outdoor living areas.

Principle: Street corners should be expressed with a distinctive architectural element or treatment.
Reason: Corners are important places where people make directional decisions when they orientate themselves through an urban area. Distinctive corners act as recognisable landmarks.

Principle: Buildings on street corners shall treat each street as a primary street front and present a consistent quality of architectural treatment.
Reason: Unlike suburban areas, there are no primary or secondary streets in an urban area, all the streets are important.

Principle: Buildings shall incorporate architectural treatments to break up their perceived bulk.
Reason: Modulation of the built form, horizontal banding, changes in material, colour or pattern assist in articulating and moderating building bulk and also provide visual interest.

Principle: Tall 'tower' buildings should be treated as sculptural elements.
Reason: Tall buildings are more likely to be seen from a distance, where fine architectural details cannot be seen. As such, treating the built form as a sculptural element enables it to provide visual interest from a distance.

Principles: Buildings should be designed to maintain reasonable privacy for residents
Reason: Because taller buildings have fewer visual obstructions (such as trees and fences) between them, visual privacy becomes a more pressing issue and requires separation distances between opposing habitable rooms that will limit detailed visibility from room to room.

Principle: Vehicle entrances should be integrated into the design of a building and recessed to reduce their visual impact on the street.
Reason: Vehicle entrances are generally unattractive and offer views into the less-appealing and utilitarian areas of a building. Integrating and recessing vehicle entrances reduces their visual impact.

3.4 Streetscape interfaces





Principle: Development should optimise the opportunities by people for passive surveillance from dwellings of the adjacent public realm.
Reason: The more that passive surveillance by people is possible, the safer pedestrians are likely to feel in the streets and other public spaces.

Principle: Buildings should have their primary access from a well-designed street, park, plaza or pedestrian right-of-way, rather than a laneway.
Reason: Residents deserve a proper and clearly identifiable address. A primary access from a laneway for vehicle access and servicing, with no footpath or landscape, is unacceptable.

Principle: Pedestrian movement should be prioritised over car movement wherever possible.
Reason: If a place is designed for people, then people will use it. If a place is designed for cars, then the cars will dominate it. This is particularly relevant for potential pedestrian/vehicle conflict points such as driveway crossovers, and encourages the use of formal pedestrian crossings across streets.

Principle: Buildings should be built to the street boundary for the majority of the frontage
Reason: The quality of streetscape and sense of enclosure in an urban area is dependant on the largely contiguous nature of the building frontage. Gaps in the streetscape are like missing teeth in a smile.

Principle: Ground-floor commercial uses with a street frontage should provide shade and shelter to the adjacent footpath
Reason: The fundamental benefit of a commercial street interface is the engagement between pedestrians and the building. The provision of shade and shelter encourages pedestrians to walk close to the frontage and to experience the public realm in comfort.

Principle: Commercial ground floor uses should have their main pedestrian access from the adjacent street.
Reason: There is little benefit to the streetscape if a commercial tenancy is accessed from an internal mall or a car park.

Principle: Buildings should establish a human-scaled experience at street level.
Reason: Pedestrian movement is paramount in an urban area, and creating an environment with a human scale encourages pedestrians to use it. Whilst 'human scale' is commonly interpreted as setting back upper levels, it can be more effectively achieved by paying attention to the scale of openings, the use of fine-grained and textured, materials, the horizontal layering, or 'ordering' of a building, and the provision of canopies, arcades and awnings that restrict views upwards adjacent to tall buildings.

3.5 Land uses and occupant amenity



Principle: The land use mix of new development should include commercial uses, such as food and beverage or retail at ground level to increase the range of local services.
Reason: In an urban activity centre and tourist destination, the ability to walk to local services is an essential requirement that also can significantly reduce car use, which is an important consideration in areas of high residential density.

Principle: Residential uses should be restricted to upper levels at the street interface.
Reason: Ground floor apartments deliver poor residential amenity in a busy urban street unless there is an integrated home-office with large areas of commercial style glazing.

Principle: Where there are no available views to the foreshore, the ocean, streets, parks or other public places, landscaped areas should be provided for visual amenity for residents.
Reason: The precinct requires a consistently high quality of development that is commensurate with the intent of the precinct being one of Perth's principal coastal destinations. Without an appealing outlook, the value of development internal to the sites will diminish the ability to deliver an appropriately high standard of development.

Principle: Development should seek to achieve a resort-style of living with generous outdoor areas.
Reason: The precinct is a highly desirable location and emblematic of WA's relaxed coastal lifestyle. As such, opportunities for outdoor living should be generous and create a place where residents can feel as if they are on a permanent holiday.

Principle: Development should incorporate sheltered outdoor areas to provide relief from strong sea breezes.
Reason: The coastal environment experiences strong winds at all times of the year. For residents, sheltered spaces become an essential retreat from the wind.

Principle: All habitable rooms (bedrooms, living rooms etc.) shall have access to natural ventilation and daylight.
Reason: Access to light and ventilation is environmentally responsible and an essential element to the quality of life of most people. A development should seek to maximise natural ventilation and access to daylight for access corridors to apartments and, where possible, to bathrooms.

3.6 Vehicle Parking and access





Principle: The number of vehicle crossovers should be minimised.
Reason: Every crossover is a potential pedestrian-vehicle conflict point; furthermore, excessive vehicle crossovers tend to diminish the quality of a streetscape.

Principle: The width of vehicle crossover should be minimised.
Reason: Vehicle crossovers are pedestrian/vehicle conflict points and wider crossovers increases the time that pedestrians are exposed to risk.

Principle: Garages, carports and off-street car parks should be located away from streets and other public places (other than service laneways) and should be screened from public view.
Reason: Car parking infrastructure is largely unappealing and diminishes the quality of an adjacent streetscape or other public space. Car parking also precludes opportunities for passive surveillance by people in buildings and engagement between buildings and the public realm.

Principle: On-street parking should be retained or accommodated wherever possible.
Reason: On-street parking is the most efficient and most publicly accessible form of car parking possible. On street parking also provides 'friction' that reduces ambient traffic speeds.

Principle: Existing on-street and foreshore car parking should not contribute to resident car parking.
Reason: The existing car parking within the public domain is public parking for the benefit of all visitors to the Rockingham Beach precinct.

3.7 Service infrastructure



Principle: Mechanical equipment and associated ducting should be screened from views from the street and located so as not to cause nuisance to adjoining properties.
Reason: Mechanical equipment is a visual blight and the source of a significant number of neighbour complaints in regard to noise.

Principle: Service elements such as hydrant boosters, electrical transformers, and pump rooms if required, shall be integrated into the architectural design in a manner that minimises their impact on the adjacent streetscape.

Reason: For larger and taller developments, elements such as hydrant boosters, electrical transformers, and pump rooms can take up a disproportionate amount of street frontage, along with car park entrances and waste collection.

Principle: Air-conditioning plant should be located, wherever possible, in an undercroft, on the roof or within a dedicated plant area on each floor level.
Reason: Air conditioning units are unsightly and when located on a balcony, can severely compromise the enjoyment of the balcony.

Principle: Bin areas should be located to avoid noise and smell nuisance to residents, and be located conveniently for removal and collection.
Reason: In larger and taller developments the nuisance associated with waste storage and collection is exacerbated because of the amount of waste as well as the nature and frequency of collection.

3.8 Landscape



Principle: Landscape planting should be native coastal vegetation or other water-wise and salt-tolerant vegetation
Reason: Coastal vegetation is naturally more tolerant of the ocean-side environment and contributes to the sense of place.

Principle: The use of upper-level landscape, such as roof gardens with deep soil zones for trees and balcony planters is encouraged.
Reason: There is no reason why gardens should be at ground level only, as upper level gardens enable residents to enjoy the amenity along with offering a high degree of privacy and access to views.

Principle: Existing street tree should be retained wherever possible.
Reason: Existing trees are publicly-owned assets that contribute to a sense of place and help to provide a visual foil to adjacent development.

Principle: Street trees should be planted at frequent intervals to maintain continuity of canopy cover at maturity.

Reason: Street trees contribute to pedestrian amenity (in regard to shade and shelter), establish a sense of place, and help to provide an attractive visual foil to adjacent development.

3.9 Architecture and character



Principle: Buildings should be designed to provide a recognisable response to the coastal location.
Reason: There is a community expectation that buildings on the coast should look like coastal buildings. As such, they should be expected to draw inspiration from traditional coastal forms, materials and other maritime references.

Principle: Buildings should exhibit a common design character that is defined through detailed design guidelines.
Reason: Developments with a recognisable 'sense of place' usually exhibit a strong commonality of building and open space elements, materials and colours, architectural details and landscape, with subtle variations only giving each building its unique identity.

Principle: Buildings should be designed to endure a harsh maritime climate.
Reason: The coastal climate can be harsh with strong winds, driving rain, high levels of UV and salty air, all of which can degrade construction materials if poorly selected. Buildings, therefore, should be durable, finished and detailed appropriately with a view to minimising maintenance and avoiding water ingress.

3.10 Environment



Principle: Buildings should be designed to enable cross ventilation to most dwellings.
Reason: The advantage of a coastal location is the ability to utilise the sea breeze for natural cooling in hot summer months and reduce the extent of energy expended on artificial ventilation and temperature control.

Principle: Buildings should be designed to maximise beneficial solar access and avoid detrimental solar access.
Reason: Glazing with a northerly aspect enables passive solar heating in cooler winter months, thus reducing the extent of energy expended on artificial heating, whilst western summer sun needs to be restricted.

Principle: The number of apartments with only a south-facing aspect should be minimised.
Reason: South facing apartments have limited access to the benefits of winter solar gain and are more expensive to heat in winter.

Principle: Roofs and wall surfaces with significant exposure to summer sun should be predominantly light in colour.
Reason: Light colours reduce solar absorption and energy use associated with cooling.

Principle: PV cells and other energy-efficiency measures shall be integrated wherever possible.
Reason: A reduction in household energy consumption is a global concern and new large strata-titled developments are an opportunity to achieve reductions for a large number of households in an efficient manner.

3.11 Summary and conclusions

If the City of Rockingham reviews its local planning policy framework for the Rockingham Beach precinct, whether it is to enable buildings of greater height or simply to update the current provisions to provide a more holistic set of guidelines for high quality architecture and urban design, then there is a range of considerations that need to be taken into account.

These considerations are summarised as a suite of planning and design principles that also form the basis of more specific design controls.

The planning and design considerations cover issues such as:

- The overall shape, extent and function of the collective built form of the precinct.
- The site planning and built form of individual buildings.
- Appropriate building interfaces with the adjacent streetscapes.
- Appropriate land uses and the provision of a high standard of occupant amenity.
- Vehicle access and parking.
- The location of service infrastructure for buildings.
- Landscape.
- Architecture and character.
- Environmental responsibility and resource conservation.

It should be noted that not all of the considerations relate directly to building height, because a focus on building height alone will not provide a satisfactory built outcome.

The principles identified provide a good foundation for further investigation into the development capacity of the Rockingham Beach precinct. It is important that any analysis of the potential built form is not undertaken in isolation of the many ingredients that make great urban places.

4. EXISTING CONDITION

4.1 Precinct description

For the purpose of the study, the Rockingham Beach precinct is defined by Rockingham Beach Road, Patterson Road, Kent Street and Wanliss Street. The precinct is illustrated in ***Figure 1: Study area*** below.



Figure 1: Study area

The precinct is characterised by a range of building forms of different ages, that range from one to nine storeys in height. Some lots are vacant or significantly underutilised, whilst others have been developed in recent years to a scale that makes it very unlikely that they will be redeveloped in foreseeable future.

The lots facing Rockingham Beach Road have an ocean outlook that favours them from a developer's and apartment purchaser's perspective, whilst all of the streets have the conditions required to support ground floor commercial activity.

The precinct also has deep lots that have the capacity to accommodate the car-parking required to support more intensive redevelopment. There is also a Right-of-Way network in the western part of the precinct that provides access deep in to the precinct.

Whilst the precinct lends itself readily to delivering a functional ground level for mixed-use development, the major planning and urban design challenge is in the delivery of apartment buildings that include the higher density accommodation to support the precinct whilst working with the existing buildings and in building forms that provide high levels of amenity for both residents in their apartments and for the public in the surrounding streets and open spaces.

4.2 Likelihood of development

The following diagrams provide an indication of the likelihood of development for properties within the Rockingham Beach precinct based on a wide range of considerations such as the age, intensity, condition and tenure of the existing building stock, existing uses, lot size and length of street frontage and access to ocean views.



Where a lot has been defined with a low or no likelihood of development, the existing built form has been retained and integrated into the scenario modelling.



4.3 Existing development controls

The existing development controls contained within the current planning policy framework were modelled in 3D to illustrate the development potential at present. As with all of the modelled scenarios, the model illustrates the allowable building envelope. The reality is that the actual achievable built form would have a lesser bulk than what is modelled.



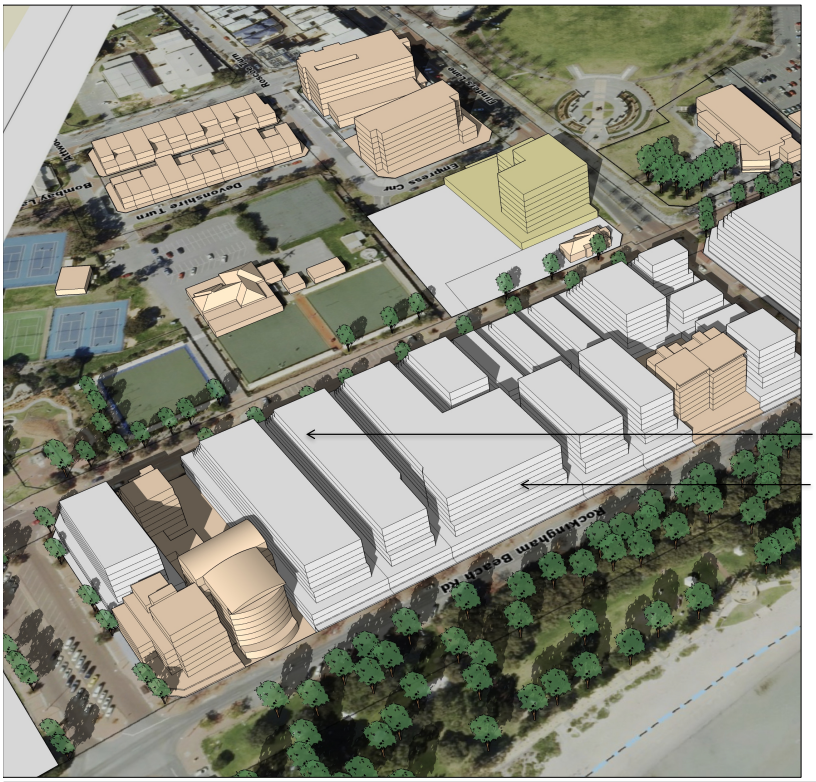


View from the West



View from the East

Observations on the existing development controls



No constraint on building depth may result in poor occupant amenity in the centre of the block.

Middle setback for the 4th/5th level is difficult to design and construct.

View from the North



Envelope for the Hotel site is overly flexible and provides little certainty of built form or amenity for residents in the centre of the block.

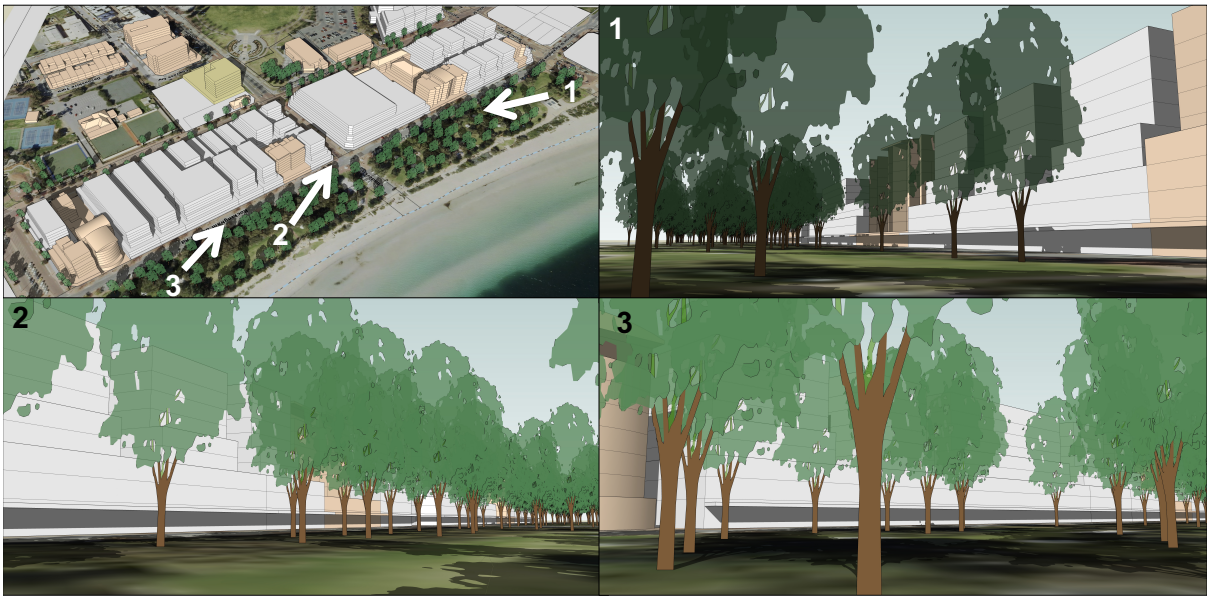
Typically 9-storey buildings with a 3-storey street front podium.

Ziggurat forms are expensive and impractical to design and construct – therefore, envelopes are inefficient.

Shadows fall well short of the opposite footpath on Kent Street – therefore, greater capacity for building height.

View from the South

Visual impact from the foreshore



Visual impact from the civic centre



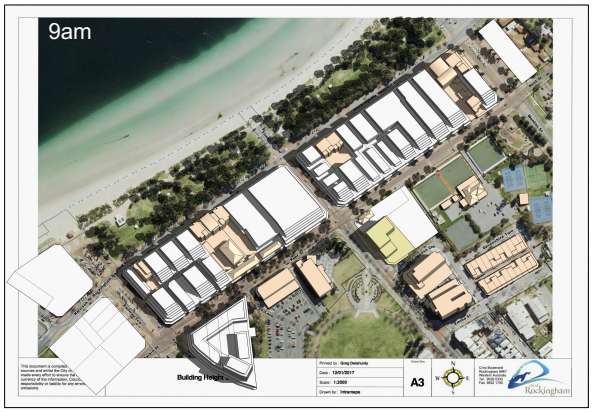
Midwinter shadows (21st June)

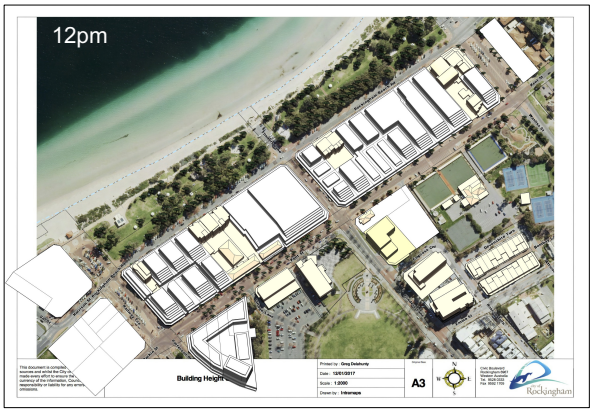


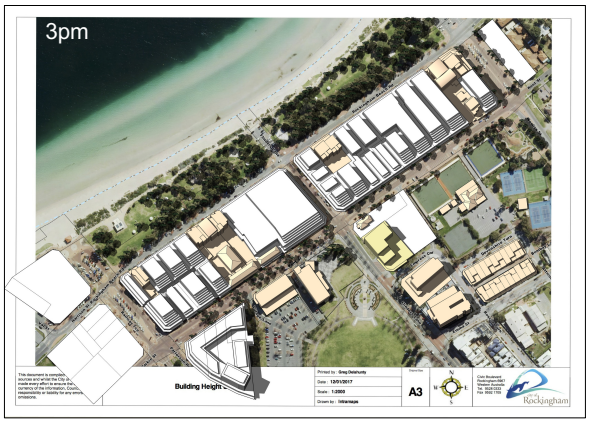




Midsummer shadows (21st December)







5. SCENARIO DEVELOPMENT

In addition to modelling the existing policy provisions for the precinct (Scenario 1) a number of other built form scenarios were modelled to gauge the potential development yield and the potential impact of each of the scenarios on the surrounding area. The development scenarios that were modelled were:

5.1 Scenario 2a: Tower/European combination – moderate intensity

In Scenario 2a, the precinct was envisaged with a built form that is characterised by buildings along Rockingham Beach Road with a 'New World' 'tower on podium' form (refer to Discussion Paper 2) that consists of a podium of up to 3 storeys that could be built to the site boundaries, which in all likelihood would accommodate commercial activities, car parking, and some residential units. Above the podium the buildings would take the form of towers, which would be set back from the site boundaries to enable light, views and ventilation for the likely residential uses in the tower.

Along Kent Street, the built form was envisaged as a more 'European' built form (refer to Discussion Paper 2) with building that are built from side boundary to side boundary up to a general height of five storeys, with a further 2 attic storeys set back, in the manner of buildings in European cities.

The maximum heights of buildings in the precinct were largely determined by a desire to avoid overshadowing of any non-podium building or the southern side of Kent Street at 12pm mid-winter. A cap of 12 storeys was also placed on all buildings except where additional height could be granted to encourage community benefit, such as pedestrian connections through a site from Kent Street to Rockingham Beach Road.

The net effect of the controls was an overall built form with a relatively high degree of modulation that was subtle enough to look as if the existing taller buildings were part of the planning intent.

Having been determined as the preferred outcome, Scenario 2a is described in greater detail in Section 6 of this report.

Scenario 2a views



View from the West



View from the East

5.2 Scenario 2b: Tower/European combination – greater intensity

Scenario 2b was, in many respects, similar to Scenario 2a in that the precinct was also envisaged with a built form that is characterised by buildings along Rockingham Beach Road with a 'New World' 'tower on podium' form (refer to Discussion Paper 2) that consists of a podium of up to 3 storeys that could be built to the site boundaries, which in all likelihood would accommodate commercial activities, car parking, and some residential units. Above the podium the buildings would take the form of towers, which would be set back from the site boundaries to enable light, views and ventilation for the likely residential uses in the tower.

As with Scenario 1, Along Kent Street, the built form was envisaged as a more 'European' built form (refer to Discussion Paper 2) with building that are built from side boundary to side boundary up to a general height of five storeys, with a further 2 attic storeys set back, in the manner of buildings in European cities.

The main point of difference to Scenario 2a was that, in addition to maximum heights being largely determined by a desire to avoid overshadowing of any non-podium building or the southern side of Kent Street at 12pm mid-winter, a cap of 16 storeys was placed on all buildings except for the Hotel site where additional height was deemed appropriate to encourage the development of a high-quality hotel.

The net effect of the controls in Scenario 2b was an overall built form that could potentially have relatively little and with buildings height that were double that of the existing taller buildings in the precinct.

Scenario 2b views



View from the West



View from the East

Scenario 3: High-intensity tower development

Scenario 3 was developed to investigate the maximum development potential of the precinct without overshadowing of any of the buildings or footpath on the southern side of Kent Street at 12pm mid-winter.

In this Scenario, all of the buildings to both Rockingham Beach Road and Kent Street were envisaged as a built form characterised by buildings with a 'New World' 'tower on podium' form (refer to Discussion Paper 2) that consists of a podium of between 3 to 5 storeys that could be built to the site boundaries, which in all likelihood would accommodate commercial activities, car parking, and some residential units. Above the podium the buildings would take the form of towers set back from the site boundaries to enable light, views and ventilation for the likely residential uses in the tower.

The net effect of the controls in Scenario 2a was an overall built form that was substantially higher than the existing taller buildings, with heights generally up to 25 storeys along Rockingham Beach Road and up to 9 storeys along Kent street, albeit with the upper 6 storeys set well back from the street.

Scenario 3 views

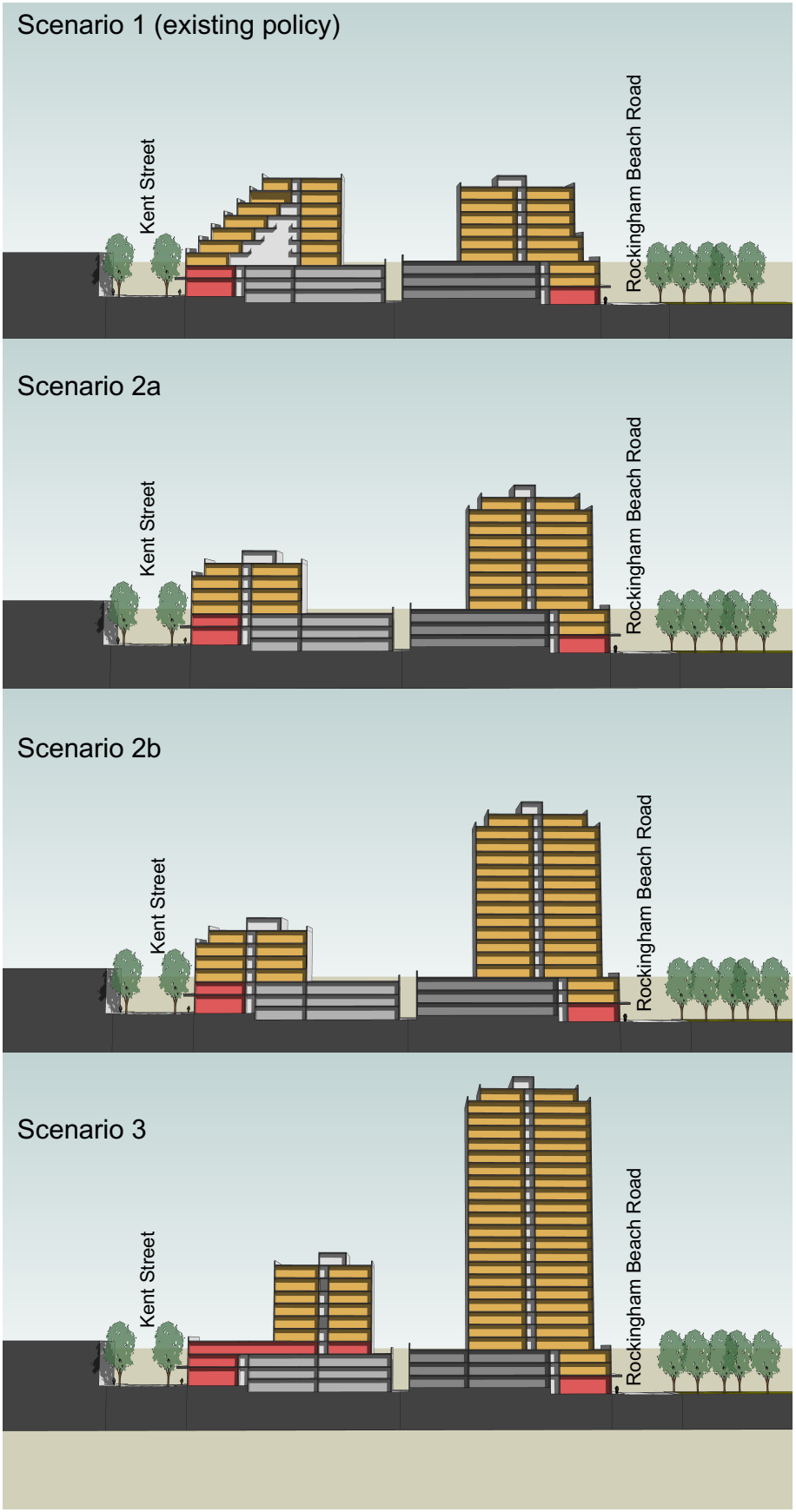


View from the West



View from the East

The three scenarios are illustrated in section in the following diagram along with the current policy provisions to demonstrate the relative heights and setbacks of each scenario. The cross-section is a typical cross section taken through the precinct between Kent Street and Rockingham Beach Road.


Scenario 1 (existing policy)
Kent Street
Rockingham Beach Road
Scenario 2a
Kent Street
Rockingham Beach Road
Scenario 2b
Kent Street
Rockingham Beach Road
Scenario 3
Kent Street
Rockingham Beach Road

Scenario evaluation

The modelling of each of the development scenarios was evaluated through discussion with the City of Rockingham planning officers through a workshop process.

The evaluation of the development scenarios reached the following conclusions:

- Scenario 2b and 3 were both considered as excessive and would result in a visual disconnect between the scale of the existing towers and new towers.
- Because the development potential was maximised, Scenario 3 lacked incentives to encourage community benefits by awarding height bonuses.
- Both Scenario 2b and 3 were considered to have an overly high degree of consistency to the building envelopes that could result in a lack of visual interest and 'shape' to the precinct.
- The intensity of development in Scenario 3 raised concerns about the cumulative impact on the movement network within and around the precinct.
- Whilst there was some concern about whether there was sufficient development potential in Scenario 2a to encourage timely redevelopment, Scenario 2a offered the greatest potential to offer incentives to encourage community benefits by awarding height or plot ratio bonuses.
- The scale of potential new buildings in Scenario 2a was not considered excessively different to the scale of existing taller buildings within the precinct and, as such, the existing taller buildings were likely to look as if they were part of the planning intent.

6. PREFERRED SCENARIO (SCENARIO 2A)

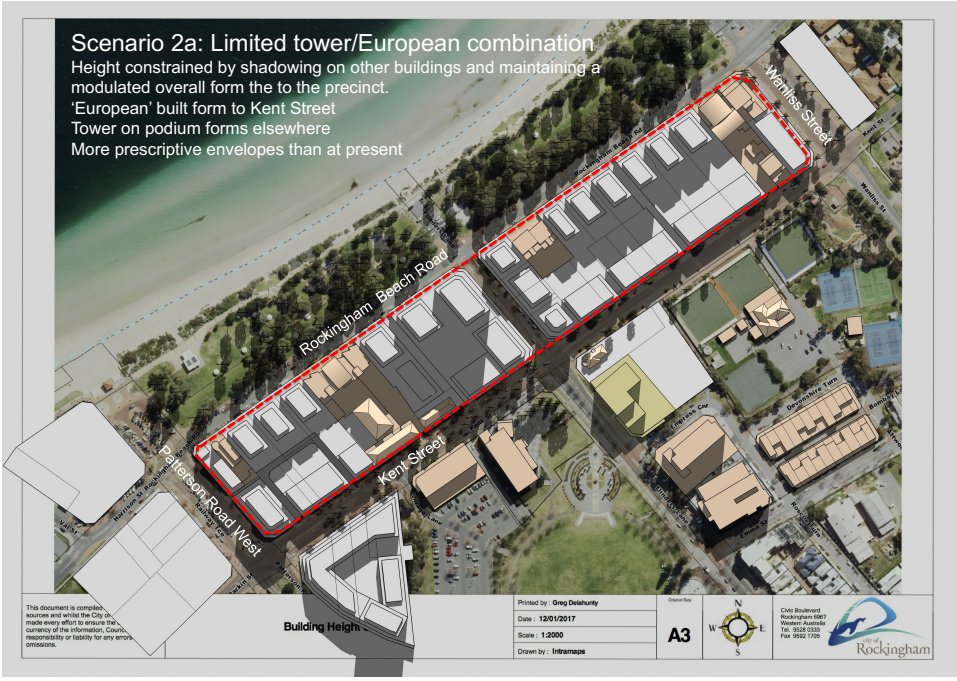
6.1 Description

The preferred scenario (Scenario 2A) seeks to maintain a well-modulated overall form to the precinct that enables greater height for key lots along Rockingham Beach Road, whilst incorporating the existing taller buildings into the overall built form composition.

The heights of the new buildings are constrained by limiting the overshadowing on buildings on other lots and on the southern footpath of Kent Street.

This scenario envisages a more 'European' built form to Kent Street with mid-rise buildings rather than towers on podiums that are the preferred building typology for the lots along Rockingham Beach Road.

To achieve the desired outcome, the planning framework will require more prescriptive building envelopes than at present.





View from the West



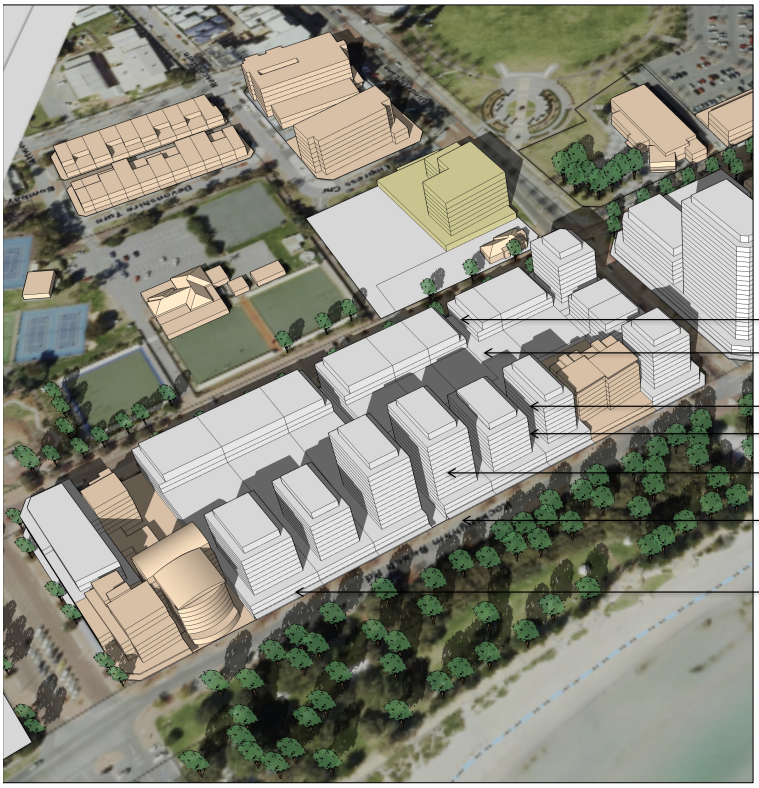
View from the East



View from the North



View from the South

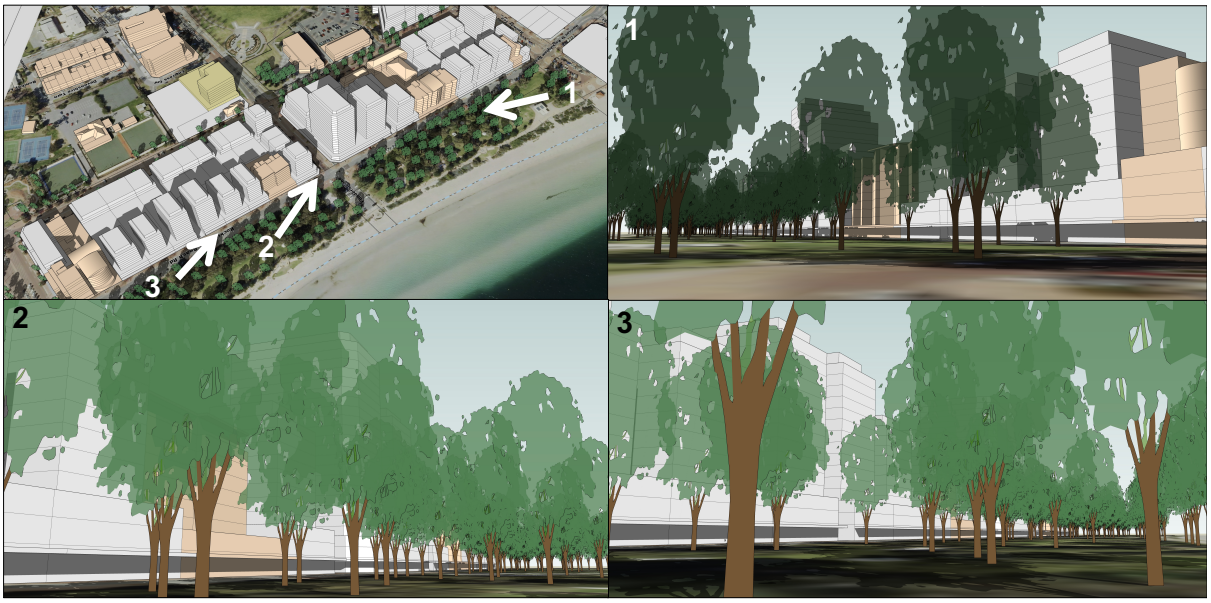


View from the North

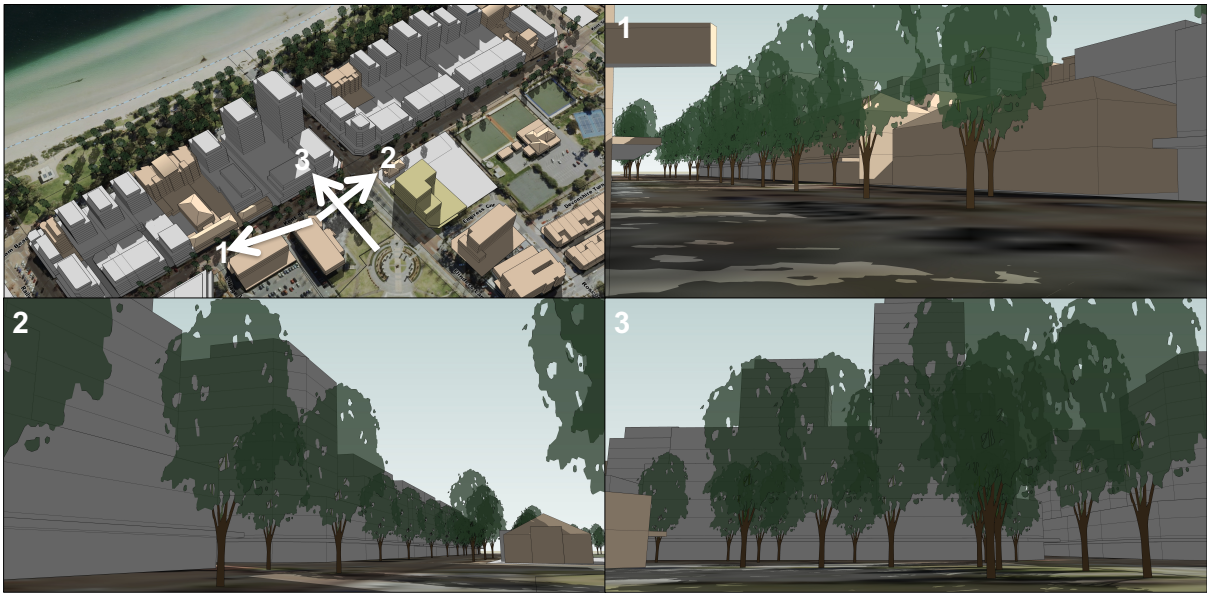


View from the South

Visual impact from the foreshore



Visual impact from the civic centre



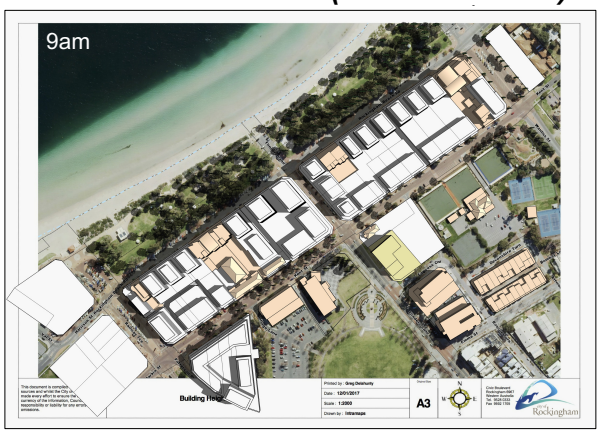
Midwinter shadows (21st June)

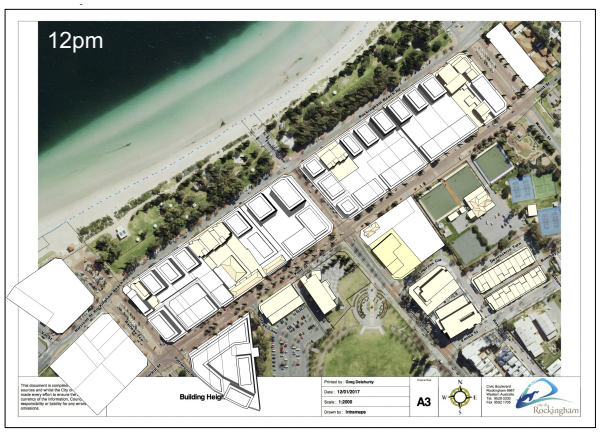






Midsummer shadows (21st December)







6.2 Rationale

The rationale for the preferred scenario includes the following reasoning:

- Given the slow rate of redevelopment and changing development economics over the last decade, the existing development controls are clearly not delivering the desired outcome for a revitalised and vibrant Rockingham Beach precinct, with very little development having occurred within the precinct over the last 10 years. It is, therefore, arguable that there needs to be greater incentive to encourage redevelopment through the use of planning controls that enable development viability and building forms that are more efficient to design and construct.

- The existing taller buildings are long-term fixtures of the urban environment and must be considered as elements in the overall built form composition. As such, if the general height of development is overly large, the existing towers will look out of place and read as gaps in the overall streetscape and shape of the precinct. The preferred scenario maintains the height of development, generally, to no more than a 33% increase in the current permissible height.

- Large underutilised sites, such as the Hotel site, are vital potential catalysts to the overall revitalisation of the precinct and their redevelopment should be encouraged through development controls that deliver a high level of feasibility to offset the inherently high risk associated with larger developments.

  It is noted that the current policy supports the development of a major hotel(s) to the precinct to reinforce Rockingham's role as a regional destination. Specifically, the current policy envisages a Hotel with a minimum of 160 rooms, being a 4-star full service internationally or nationally branded hotel, with a bar and bistro, restaurant, room service, meeting and conference facilities, a function room with a minimum capacity of 300 guests, and Leisure facilities e.g. pool, gym, spa, steam room sauna.

  It is also noted that in practice, the economics of such a development would be under-pinned with the provision of residential apartments either above the hotel floors or in a separate tower(s).

  In the context of the preferred built form for the precinct, a development of this scale could be reasonable expected to accommodate the support functions in three podium levels, with 160 hotel rooms requiring 12 floors with 14 rooms per floor assuming a typical gross floor area for a tower of 700sqm. This would require a minimum building height of 15 storeys for the hotel component with either additional floors for residential apartments or a separate residential tower(s).

  There are currently two sites within the precinct that have the capacity to support a development incorporating a 160-bed hotel, and the preferred scenario recognises that by providing additional development potential on these sites for such a development to be enabled.

- Providing too many overly generous development controls is counter-productive in that it may result in community discontent and deliver development opportunities that are so large that they become too expensive and risky to develop in anything other than a booming market. Furthermore, if development controls are excessive, it reduces the potential for the planning framework to include incentives for developers to include community benefits that they are not otherwise obliged to.

- A variety of building heights will create a more pleasing urban composition than highly repetitive building forms.

- The contexts of Rockingham Beach Road and Kent Street are very different and demand different built from responses. Rockingham Beach Road has a superb ocean outlook and a well-vegetated foreshore that suits tower forms that provide views without resulting in an excessive visual presence, whereas Kent Street is a more intimate environment with limited outlook that demands a more traditional relationship between buildings and the street.

- Kent Street is the main street of Rockingham Beach and the amenity of the main street needs to be protected from overshadowing from excessively tall buildings.

- Greater pedestrian connectivity between Rockingham Beach Road and Kent Street is essential to establish an integrated urban precinct and assist in the viability of local businesses. The larger development sites are the best opportunities to secure additional pedestrian connections through the redevelopment process, and through the use of development bonuses, in the form of increased height and/or plot ratio controls, to specific sites.

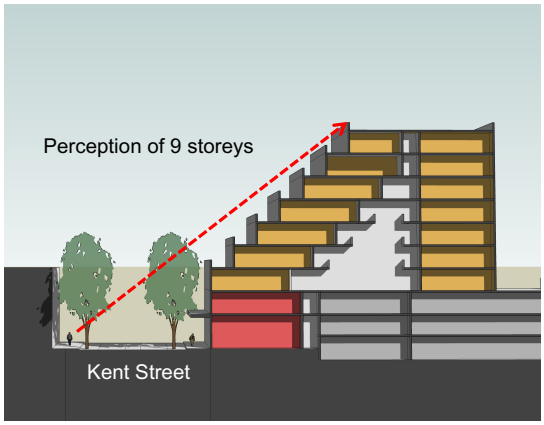
  As such, the preferred scenario identifies four locations where a mid-block pedestrian connection is considered as desirable. Two of those sites are those that would readily support a hotel development so any height incentives for provision of a pedestrian connection have been contained within the height incentives for encouraging a hotel development. As for the remaining two locations, the policy should enable some flexibility to either incentivise the provision of pedestrian connections through either reasonable height or plot-ratio bonuses provided that the broader objectives of the precinct are met.

- The current upper floor setbacks result in a ‘ziggurat’ building envelope that is inefficient and makes apartment layouts difficult to plan, and should be rationalised to create building envelopes that are more buildable and useable.

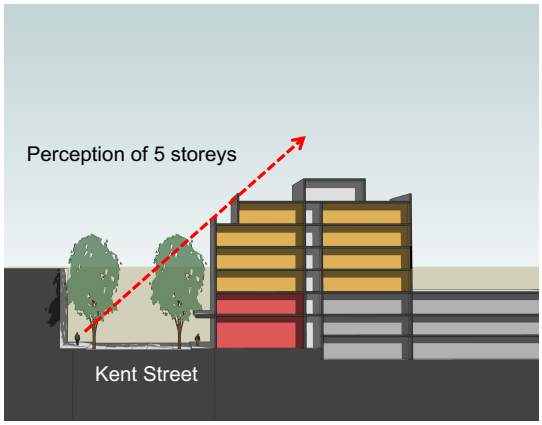
  The ‘ziggurat’ building envelopes form part of the current suite of policy provisions for the precinct, with the intent of maintaining a ‘human scale’ of development at the street level. Whilst such an approach certainly limits the height of the building interface with the street, it does so at the cost of buildability and the sense of spatial containment to the street, and in the context of best-practice urban design globally, is an example of overkill in regard to development control.

In reality, the exceptionally appealing streetscapes of European cities are not the result of planning policy that forces buildings to set back in a ziggurat form. Most European cities have a street interface of between 3 and 7 storeys before utilising setbacks from the street, and as a consequence deliver streets that are well-defined and architecture that is visually interesting.

In the context of Kent Street, enabling a building to street interface of 5 storeys with additional storeys set back would create a European-scaled street with the uppermost 2 floors barely visible from the street below, and with no difference in overshadowing to either the near or far footpaths of the street.



Existing policy – impractical building envelope, all 9 storeys seen from the street and limited containment of the street space.



Preferred scenario – practical building envelope, only 5 storeys seen from the street and good containment of the street space. Note: similar sight line to the top of the building.

Furthermore, through the use of good urban design principles such as providing canopies over footpaths and creating a high degree of visual interest at ground level, pedestrians' eyes are not drawn upwards to the upper levels of buildings.

In the context of Rockingham Beach Road, the heights of the podiums have been capped at 3 storeys as a counterpoint to the allowance of greater height in the towers, and to emphasise the difference between the tower and podium elements.

6.3 Principles

The rationale for the proposed built form of the preferred scenario, and the proposed development controls suggested below, are based on the principles previously outlined in Discussion Paper 3.

6.4 Development controls

To encourage the desired built form, the local planning framework should be reviewed to provide the following guidance:

Preferred built form

For lots with a frontage to Kent Street, the preferred built form is for 'European' urban buildings that are built to side boundaries, with the uppermost storey set back by a minimum of 3m to reduce their visual presence and create a transition between the street wall and the skyline. The lots with a frontage to Kent Street should have a prescribed Building Zone for the first 25m from the street boundary beyond where development is limited to three storeys.

For all other locations, and especially the lots along Rockingham Beach Road, the preferred built form is a 'Tower and Podium'. Towers should either have the uppermost storey set back by a minimum of 3m or incorporate a unique and identifiable top to the tower component to create a transition between the tower wall and the skyline.

The use of Local Development Plans should be considered for key sites or sites with unique attributes that require a particular built form outcome.

Total building height

The maximum height limits for each lot generally should be based on avoiding shadows cast at 12pm on the 21st June on the footpath of the opposite side of an adjacent street, or on living areas in the prescribed building zone for the lots on the northern side of Kent Street.

However, development storeys along Rockingham Beach Road also should have additional height controls for specific lots to vary building heights and encourage a modulated overall building form. These varied height controls apply to Lot 75 (9 storeys). Lot 99 (18-24 storeys) and Lot 267 (16 storeys).

Indicatively, overall building heights would range from 12 to 24 storeys along Rockingham Beach Road (typically 12 storeys) and from 6 to 8 storeys along Kent Street, other than for the lots with a second frontage to Railway Terrace, which range from 9-12 storeys.

Maximum podium and street wall height

The maximum street wall height for Kent Street should be five storeys to maintain a comfortable 'European' scale to buildings.

Elsewhere, where a 'Tower and Podium' built form is envisaged, the maximum podium height should generally be three storeys. However, this could be increase to four storeys along Wanliss Street and Railway Terrace to establish a transition to the five-storey street wall along Kent Street. Additionally, there is capacity to allow an

additional storey in height to podiums within 20m of street corners to provide legibility and emphasis to the street corners.

Setbacks for 'Tower and Podium' buildings
The front setback for the podium levels should be a mandatory nil, except where a setback is provided for architectural articulation, an entry forecourt or al-fresco dining.

The front setback for floor levels above the podium should be a minimum of 3m.

Podium side setbacks should be a mandatory nil for the first 20m back from the front boundary, with nil setback permissible for the remainder of the side boundaries, to create a cohesive streetscape and optimise the use of the lower floor levels, such as for commercial uses and car parking.

Tower side setbacks could be a minimum of 4m if major openings are orientated away from the side boundary. Where major openings or balconies, are orientated towards the side boundary, the setbacks should be 6m.

Towers on the same lot should be separated by a minimum of 12m separation on the same lot to provide the same level of privacy as 2 x 6m boundary setbacks, and to enable some views from within the lot to the ocean.

Setbacks for Kent Street lots
The front setback for the first five levels (other than the uppermost storey) should be a mandatory nil, except where a setback is provided for architectural articulation, an entry forecourt or al-fresco dining.

The front setback to the uppermost floor should be 3m, or 6m if above the sixth level.

Side setbacks to Kent Street buildings should be a mandatory nil for the first 25m back from the front boundary, with nil permissible for the remainder of the side boundaries for the first five levels. The sixth level and any other floors above should have a 3m side setback where adjacent to a street or laneway, but may be built to the side boundary where there is an adjacent lot.

All buildings to Kent Street should setback the uppermost floor from the side boundary by 3m from the floor below.

All lots addressing Kent Street should have a prescribed building envelope with a maximum depth of 25m for floors above the first three levels to ensure that upper level apartment floors are constructed to address the street and to relate to the overshadowing rationale that determines the height of buildings along Rockingham Beach Road.

Lot 75 on the corner of Rockingham Beach Road and Railway Terrace is a unique condition insofar as it is a corner lot and immediately adjacent to a tall building that was constructed without apparent consideration of the development potential of the corner lots. As such, specific development controls should be developed to ensure that any development creates a good urban design without unduly compromising the amenity of the adjacent existing building.

In this context, it is suggested that development be limited to a maximum of 9 storeys, but with a 4-storey podium, consistent with the adjacent existing building. Furthermore, the tower component should be set back by 20m from Rockingham Beach Road.

Pedestrian connectivity

The policy framework should include the requirement for public pedestrian connections with a minimum width of 8m between Rockingham Beach Road and Kent Street for a number of locations within the precinct. The preferred locations for the pedestrian connections are on Lot 889, Lot 99, Lot 101 and Lot 267 and illustrated in the following diagram:

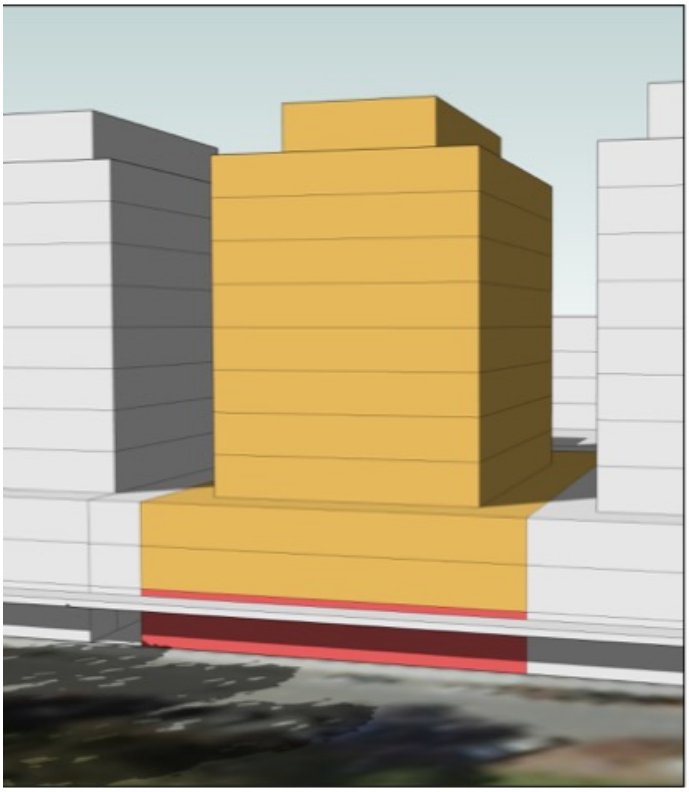


Street interface

The existing policy provisions to ensure a good urban design outcome at street level, such as active frontage, sufficient glazing to shopfronts and the provision of canopy cover, are largely adequate, however, there is some scope to further tighten the controls. Alternatively, the introduction of *Design WA* by the Stata Government would also further tighten controls in regard to how buildings contribute to the quality of the streetscape.

Indicative yield

The following diagram illustrates the building envelope defined by the above policy provisions for a typical lot along Rockingham Beach Road, with a brief assessment of the potential development yield if the building envelope were maximised.



Typical site

Notional site area: 1,285sqm

Typical height: 12 storeys

Notional PR residential floorspace: 3,902sqm

Notional Plot Ratio: 3.04

Notional residential yield: 46 du

Planning statistics for a typical site on Rockingham Beach Road

7. GENERAL SUMMARY AND CONCLUSION

In conclusion, the Rockingham Beach precinct was previously identified as a significant coastal node for the Perth Metropolitan Area, and a planning framework was established many years ago to enable a greater intensity of development.

Some development has occurred, albeit sporadically, and predominantly along Rockingham Beach Road. The current built environment has a somewhat 'gap tooth' and unfinished feel to it. Meanwhile, development economics and levels of risk in the development process have changed and the likelihood of the missing pieces being constructed has diminished.

However, the Rockingham Beach precinct could be given greater incentives for redevelopment, the most significant being greater height limits. Before the City of Rockingham decides whether to change the planning framework to provide more generous development controls, the two questions that need to be answered are:

1. Are taller buildings appropriate in the context of the surrounding landscape?

2. And, is a more intensive beachside centre appropriate in the regional context?

The answers from the first two discussion papers is clearly 'yes'. In which case, the next two questions are:

3. What are the planning and urban design principles to inform the greater intensification of the precinct?

4. And, what form of development is the most appropriate?

Question 3. is answered by the third discussion paper. Question 4. has been explored through a series of 3D modelling scenarios that investigated the overall built form for the precinct.

Through consideration of the various modelled scenarios, a preferred scenario selected that provided for:

- A modest increase in the development potential for the majority of the lots along Rockingham Beach Road.

- A more significant increase for larger sites that can act as the catalysts for the greater revitalisation of the precinct.

- A variety of maximum building heights to create a well-modulated overall built form.

- Greater pedestrian connectivity between Rockingham Beach Road and Kent Street.

- A more traditional 'European' scale of building for Kent Street.

- A rationalisation of upper floor setbacks that are better suited to efficient and logical apartment floor plans.

- The retention of winter sun to the southern footpath along Kent Street.

- Tower building forms and locations that optimise access to views and minimise overshadowing of other apartments to the south.

The preferred scenario is believed to be the optimal outcome for the precinct; the scenario is one that carefully balances the benefits and outcomes of more intensive development and that could form the basis for a review of the current planning policy framework.

Malcolm Mackay
Mackay Urbandesign

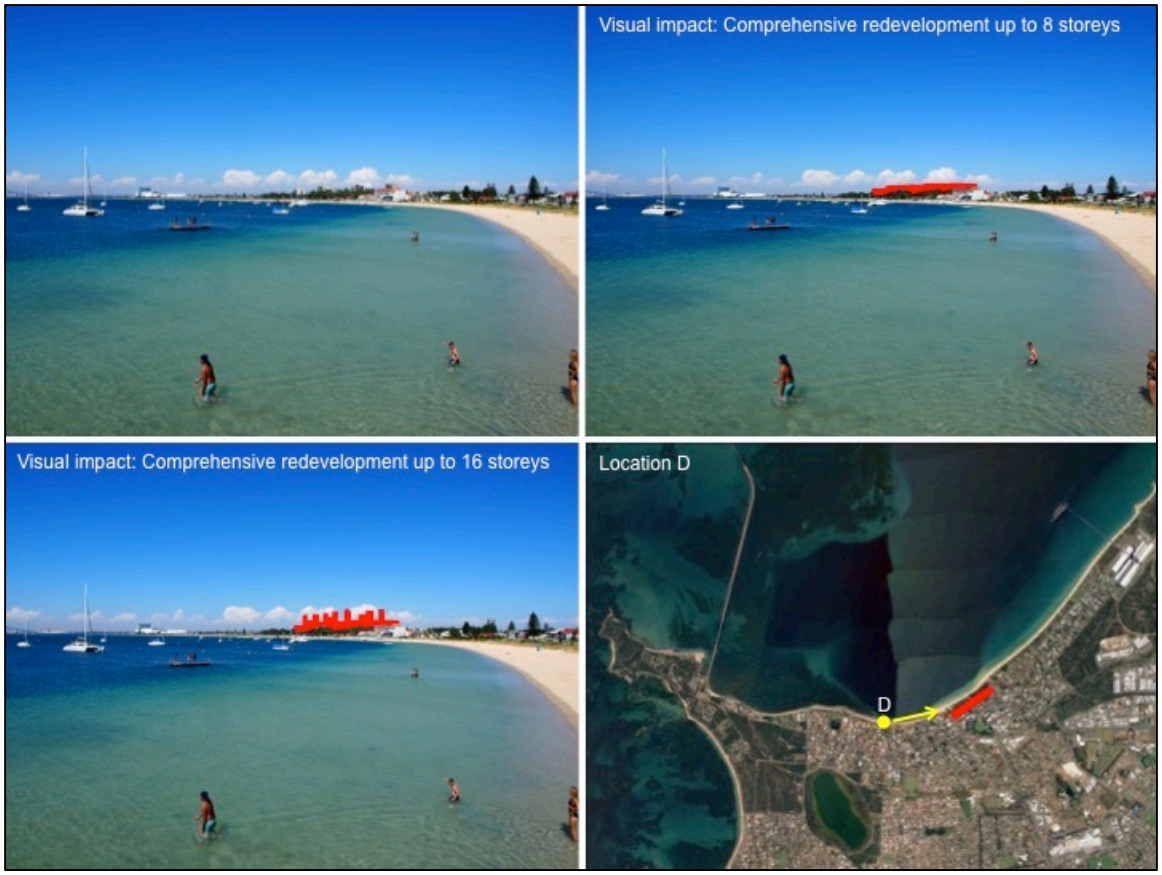
November 2017

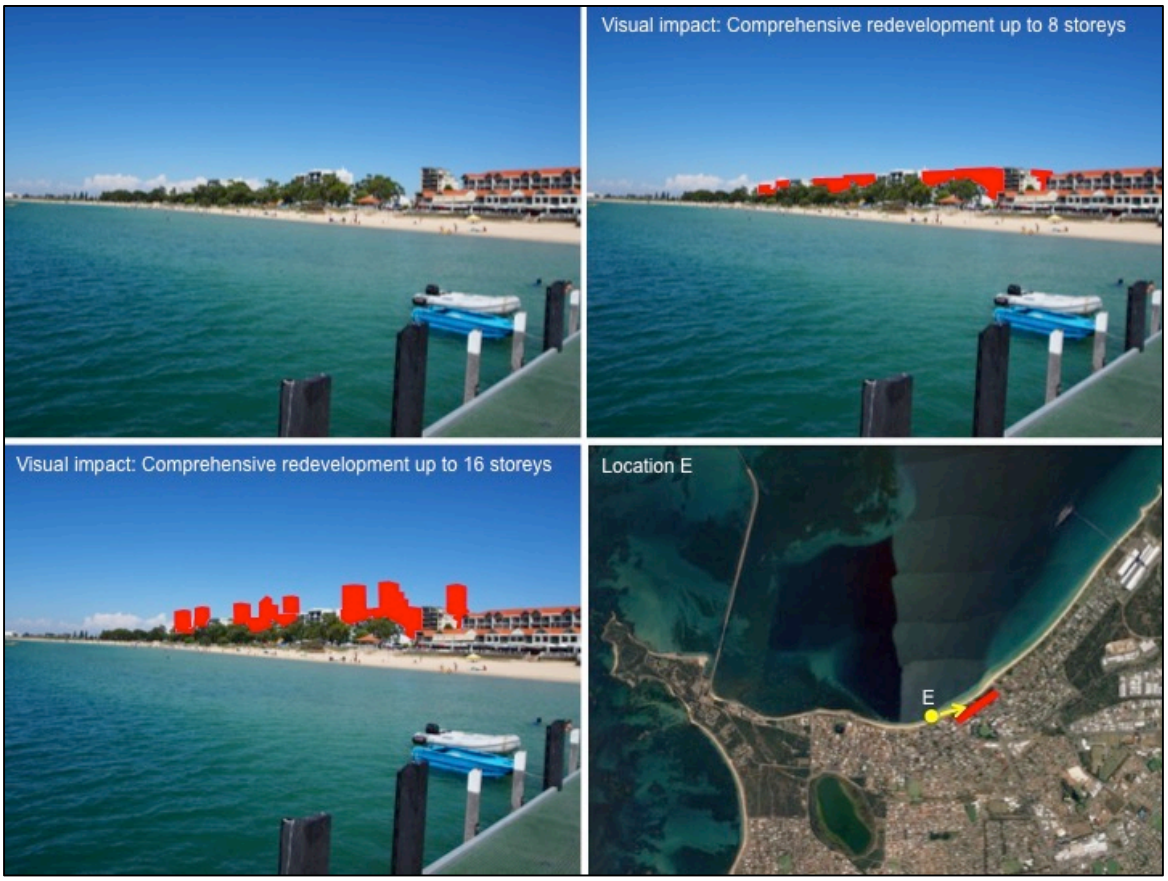
APPENDIX A: Visual analysis images

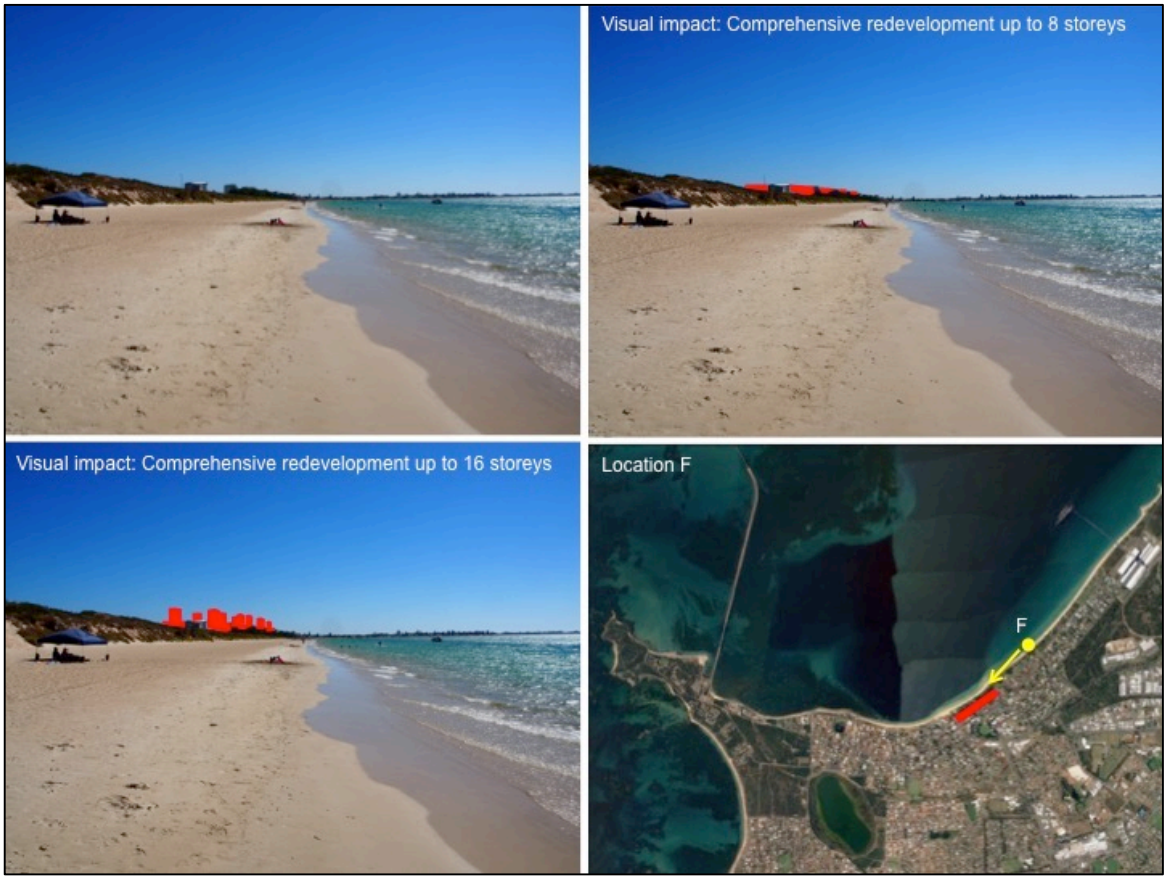


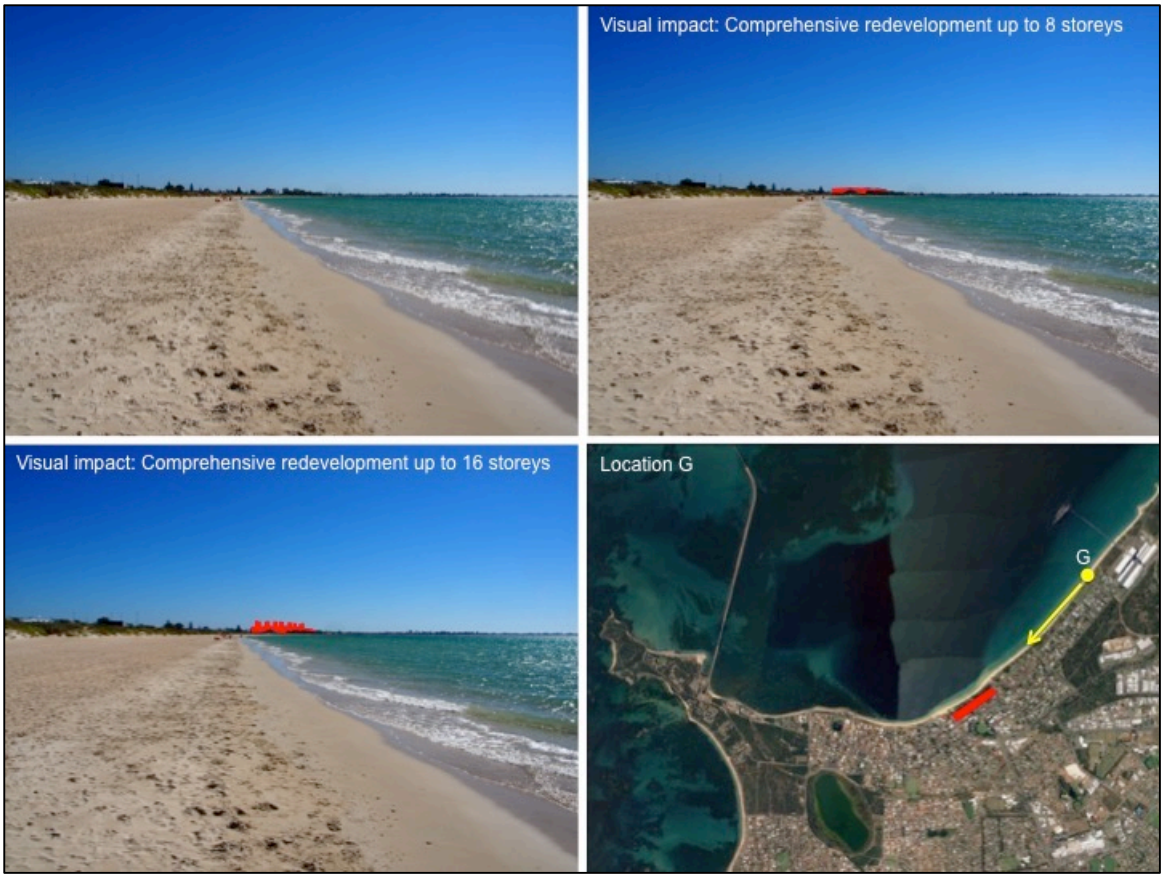



Visual impact: Comprehensive redevelopment up to 8 storeys
Visual impact: Comprehensive redevelopment up to 16 storeys
Location C
C


Visual impact: Comprehensive redevelopment up to 8 storeys
Visual impact: Comprehensive redevelopment up to 16 storeys
Location D
D


Visual impact: Comprehensive redevelopment up to 8 storeys
Visual impact: Comprehensive redevelopment up to 16 storeys
Location E
E


Visual impact: Comprehensive redevelopment up to 8 storeys
Visual impact: Comprehensive redevelopment up to 16 storeys
Location F
F


Visual impact: Comprehensive redevelopment up to 8 storeys
Visual impact: Comprehensive redevelopment up to 16 storeys
Location G
G

APPENDIX B: SCENARIO 2B

Scenario 2b: Tower/European combination – greater intensity

Height constrained only by shadowing on other buildings
'European' built form to Kent Street
Tower on podium forms elsewhere
More prescriptive envelopes than at present

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b: Summary of assumed built form controls

- Preferred built form: 'European' form built to side boundaries along Kent Street. Tower over Podium for all other locations.
- Total building height: Specified limits for each lot generally based on extent of shadow cast on the footpath of the opposite side of an adjacent street at 12pm 21/6, or on living areas in the prescribed building zone for the lots on the north side of Kent Street. Ranges from 11-24 storeys along Rockingham Beach Road (typically 16 storeys) and 6-8 storeys along Kent Street.
- Maximum podium and street wall height: 4 storeys to Wanliss Street and Railway Terrace, and 3 storeys to all other streets, with additional storey within 20m of street corners.
- Maximum street wall height for Kent Street: 5 storeys.
- Podium side setbacks: 0m minimum.
- Upper floor setback to Kent Street buildings: 0m minimum.
- Front setback above podium: 3m minimum
- Front setback to uppermost floor: 6m minimum (or 3m behind the floor below).
- Tower side setbacks: 4m minimum.
- Tower separation on the same lot: 12m minimum.
- Prescribed building depth: Max depth of 25m above podium for lot frontages on the northern side of Kent Street:

Other:
- Unique controls for Lot ### on the corner of Rockingham Beach Road and Railway Terrace.
- Requirement for pedestrian connection between Rockingham Beach Road and Kent Street for Lot ### and Hotel site.

Street interface: Active frontage/ glazing/ canopy cover, etc. largely as per existing policy framework.

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b



View from the North

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b



View from the South

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b



View from the West



View from the East

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b

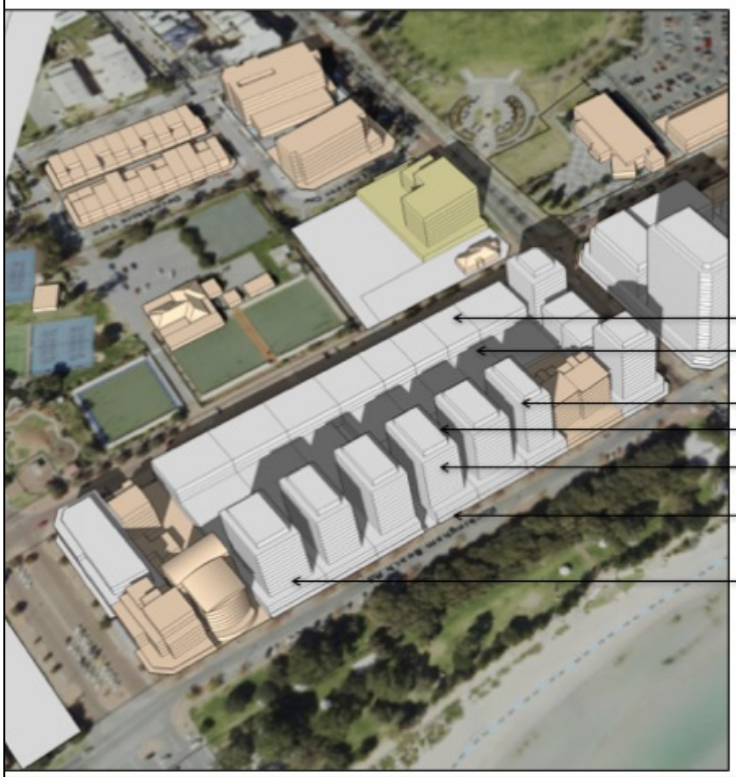
Comments



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b

Comments



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b: Visual impact on the foreshore



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b: Visual impact on the civic centre



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b: Midsummer shadows (21st December)



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 2b: Planning stats for a typical site on Rockingham Beach Road



Typical site

Notional site area: 1,285sqm

Typical height: 16 storeys

Notional PR residential floorspace: 5,582sqm

Notional Plot Ratio: 4.34

Notional residential yield: 66 du

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

APPENDIX C: SCENARIO 3

Scenario 3: High-intensity tower development (not supported)
Height constrained by shadowing across Kent Street
Tower on podium forms generally
More prescriptive envelopes than at present

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3: Summary of built form controls

- Preferred built form: Tower over Podium.
- Total building height: Limits for each lot generally based on extent of shadow cast on the footpath on the south side Kent Street. Ranges from 24-30 storeys along Rockingham Beach Road (typically 27 storeys) and 9-12 storeys along Kent Street.
- Maximum podium and street wall height: 5 storeys.
- Podium side setbacks: 0m minimum.
- Front setback above podium: 3m minimum
- Front setback to uppermost floor: 6m minimum (or 3m behind the floor below).
- Tower side setbacks: 4m minimum.
- Tower separation on the same lot: 12m minimum.

Other:
- Unique controls for Lot ### on the corner of Rockingham Beach Road and Railway Terrace.
- Requirement for pedestrian connection between Rockingham Beach Road and Kent Street for Lot ### and Hotel site.

Street interface: Active frontage/ glazing/ canopy cover, etc. largely as per existing policy framework.

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3



View from the North

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3



View from the South

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3



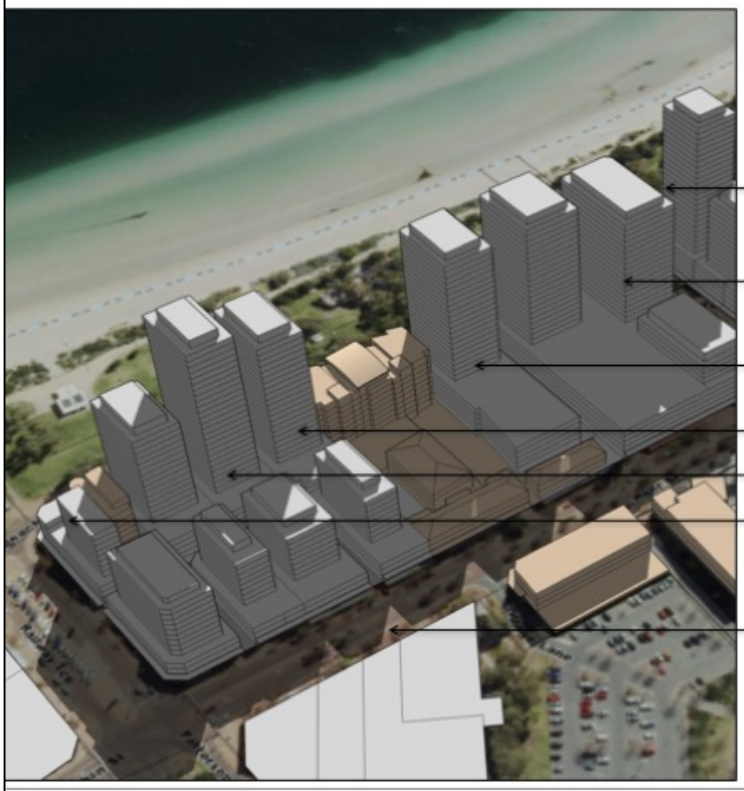
View from the West



View from the East

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3
Comments



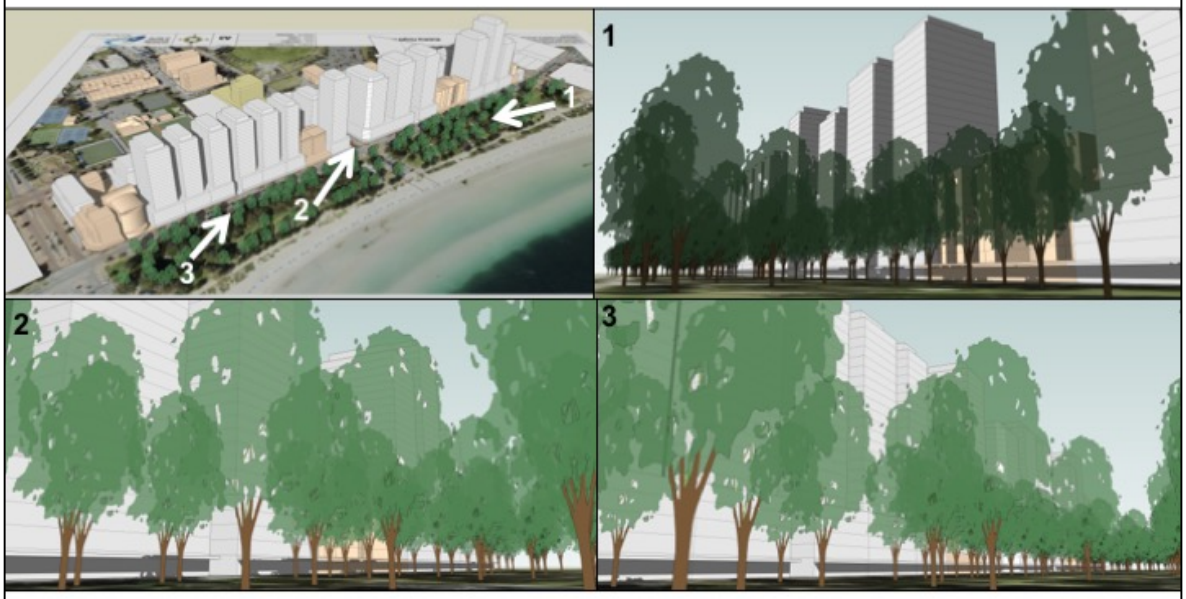
Rockingham Beach Height Study: V.2. April 2017 **mackay** urban**design**

Scenario 3
Comments



Rockingham Beach Height Study: V.2. April 2017 **mackay** urban**design**

Scenario 3: Visual impact on the foreshore



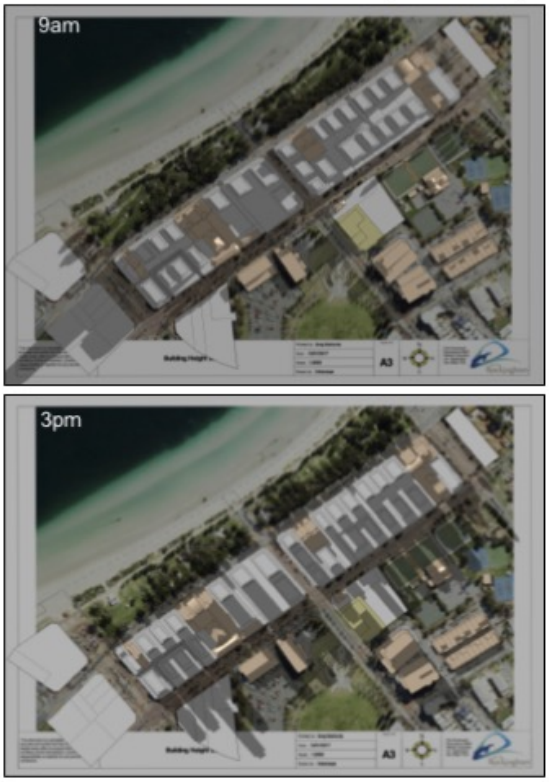
Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3: Visual impact on the civic centre



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3: Midwinter shadows (21st June)



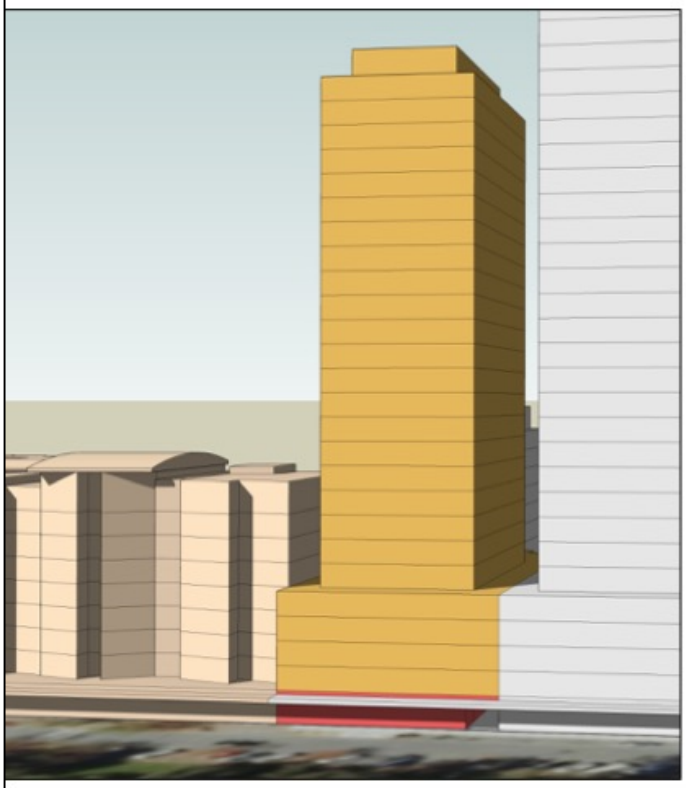
Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3: Midsummer shadows (21st December)



Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

Scenario 3: Planning stats for a typical site on Rockingham Beach Road



Typical site

Notional site area: 1,285sqm

Typical height: 27 storeys

Notional PR residential floorspace: 9,650sqm

Notional Plot Ratio: 7.5

Notional residential yield: 113 du

Rockingham Beach Height Study: V.2. April 2017 mackay urbandesign

pracsys.

City of Rockingham

Local Commercial Strategy Review:

Preparation of Needs Assessment

March 2022

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Disclaimer

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CONTENTS

1 Executive Summary 6

1.1 Major Activity Centres Gap Analysis 6

1.2 Precinct Gap Analysis 8

1.3 Employment Targets 14

1.4 Implementation Advice 16

2 Introduction 17

2.1 Report Structure 17

2.2 Rockingham Activity Centre Context 18

3 Strategic Context 22

3.1 State Planning Framework 22

3.2 City of Rockingham Local Planning Framework 26

4 Floorspace Drivers 30

4.1 Demographic Profile 30

4.2 Socio-economic Profile 32

4.3 Employment Profile 33

4.4 Trends Analysis 34

4.5 Businesses Profile 37

4.6 Property Market Profile 39

4.7 Floorspace Drivers Summary 41

5 Current Gap Analysis 42

5.1 Current Activity Centre Hierarchy 42

5.2 Provision of Centres 43

5.3 Floorspace Gap Analysis 48

5.4 Gap Analysis Summary 50

6 Floorspace and Employment Projections 51

6.1 Retail Floorspace Projections 52

6.2 Non-Retail Floorspace Projections 57

6.3 Employment Targets 58
6.4 Scenario Assessment 65
6.5 Floorspace and Employment Projection Summary 66
7 Activity Centre Hierarchy 68
7.1 Potential Activity Centre Hierarchy Changes 68
7.2 Precinct 1 – Rockingham Centre Catchment 69
7.3 Precinct 2 – Warnbro District Centre Catchment 73
7.4 Precinct 3 – Secret Harbour District Centre Catchment 75
7.5 Precinct 4 – Baldivis District Centre Catchment 77
8 Implementation 80
8.1 Current State Planning Framework 80
8.2 Integrating Needs Assessment Findings 81
8.3 Supporting Centre Development 83
8.4 The City's Role 87
8.5 Karnup DSP 89
8.6 Implementation Summary 92
9 Conclusion 94
10 Appendix 1: Modelling Information 96
10.1 Gravity Modelling Methodology 96
10.2 Floorspace Supply Used in Analysis 101
10.3 Floorspace Productivity 109
10.4 PLUC Definitions 109
11 Appendix 2: Floorspace Gaps by Activity Centre 111
11.1 Precinct 1 111
11.2 Precinct 2 112
11.3 Precinct 3 113
11.4 Precinct 4 113
12 Appendix 3: Floorspace Profile 115
12.1 Total Commercial Supply 115

12.2 Commercial Floorspace 117
12.3 Retail Floorspace 120
12.4 Vacant Floorspace 121
12.5 Strategic Centre Benchmarking 123
12.6 Benchmark Gap Analysis 135
12.7 Future Gap Analysis 158
13 Appendix 4: Property Market Profile 162

1 EXECUTIVE SUMMARY

This Needs Assessment provides the City of Rockingham with guidance on the supportable level of retail and non-retail floorspace that should be located at its activity centres going forward until 2041. It should be noted that the figures for the Strategic Metropolitan Centre are for ultimate development and outline future trajectory for floorspace demand. This will guide the City in planning its activity centres and assist it in determining the most appropriate way to meet its Employment Self Sufficiency (ESS) target.

The supportable level of retail floorspace that can be located at centres has been estimated by using retail gravity modelling and benchmarked floorspace productivity estimates. This methodology ensures future floorspace estimates are supportable and will not impact the vitality of activity centres.

The supportable level of non-retail floorspace has been estimated using floorspace per person provision ratio analysis. This methodology identifies areas that are considered suitable benchmarks for the City and growing non-retail floor space to match the provision of floorspace per person by the type of non-retail floorspace.

This analysis has been undertaken for two population scenarios:

- A 'low growth' scenario based on WA Tomorrow (referred to as 'WA Tomorrow' in figures and tables) census forecasts that can account for projected population growth within the full 25km Strategic Centre catchment; and
- A 'high growth' forecast scenario (referred to as 'City of Rockingham' in figures and tables) based forecast.id population projections accounting for Structure Plan and subdivision approval data supplementing census data and considering the capacity of the adopted Local Planning Framework to support higher density development throughout the City.

1.1 Major Activity Centres Gap Analysis

The City has one strategic centre and three developed district centres. These centres support a significant number of residents within the City and the analysis has projected significant expansions in retail and non-retail floorspace for these centres in both population scenarios (Figure 1 and Figure 2).

Figure 1. Major Activity Centres Floorspace Increases – High Growth City of Rockingham Projections

City of Rockingham Population Projections						
Year	Current Floorspace (2021)			Additional Floorspace by 2036		
Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Rockingham	63,978	7,526	128,912	34,834	7,722	171,799
Rockingham Beach	13,848	306	35,661	4,334	265	14,152
Rockingham Strategic Centre	**77,826**	**7,832**	**164,573**	**39,168**	**7,987**	**185,950**
Warnbro	21,029	685	2,079	1,534	136	1,383
Secret Harbour	15,000	-	3,531	11,782	-	3,726
Baldivis	29,435	16,795	13,411	7,037	8,032	12,629

Source: Pracsys 2021

Note: Shop Retail = Convenience/Comparison Retail, Other Retail = Bulky Goods Retail, Non-Retail Floorspace = (Entertainment, Health, Office, Service Commercial, Storage, Manufacturing). Detailed Floorspace definitions are provided in Appendix 1, Section 10.4, PLUC Definitions

Note: Rockingham Strategic Centre = Rockingham + Rockingham Beach

Figure 2. Major Activity Centres Floorspace Increases – Low Growth WA Tomorrow Projections

WA Tomorrow Population Projections						
Year	Current Floorspace (2021)			Additional Floorspace by 2036		
Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Rockingham	63,978	7,526	128,912	6,212	4,441	136,615
Rockingham Beach	13,848	306	35,661	-	144	10,282
Rockingham Strategic Centre	**77,826**	**7,832**	**164,573**	**6,212**	**4,585**	**146,896**
Warnbro	21,029	685	2,079	442	109	1,269
Secret Harbour	15,000	-	3,531	6,527	-	2,755
Baldivis	29,435	16,795	13,411	2,519	6,332	10,713

Source: Pracsys 2021

Note: Shop Retail = Convenience/Comparison Retail, Other Retail = Bulky Goods Retail, Non-Retail Floorspace = (Entertainment, Health, Office, Service Commercial, Storage, Manufacturing). Detailed Floorspace definitions are provided in Appendix 1, Section 10.4, PLUC Definitions

Note: Rockingham Strategic Centre = Rockingham + Rockingham Beach

These centres will accommodate a significant amount of the overall increase in retail and non-retail floorspace and the City should closely monitor their performance to ensure other activity centres are not negatively impacting the ongoing health of these centres. It is paramount that the City assesses the health of the activity centre hierarchy and individual centres when approving centre expansions or new centres going forward. This analysis provides an estimate of supportable floorspace, however, discrete factors that cannot be modelled (centre management, tenant performance, etc) for centres are likely to impact these results. The implementation recommendations will support the City in assessing development applications and maintaining the Activity Centre Hierarchy (See Section 8.4, The City's Role).

1.2 Precinct Gap Analysis

The analysis has assessed four of the five precincts within the City of Rockingham. Precinct 5 – Karnup, has been excluded from this report due to the early stage of planning. Advice for integration of the District Structure Plan for Karnup into the Needs Assessment at an appropriate time has been provided. The viable increase in retail and non-retail floorspace and the associated employment by precinct is shown in Figure 3.

Figure 3. Viable Retail and Non-Retail Floorspace and Employment Increases in 2036 by Precinct

Precinct 1				
Floorspace Type	**Shop Retail**		**Other Retail + Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	48,308	1,862	227,366	4,477
WA Tomorrow	8,327	330	175,298	3,433
Precinct 2				
Floorspace Type	**Shop Retail**		**Other Retail + Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	4,659	189	23,638	501
WA Tomorrow	1,990	95	20,627	433
Precinct 3				
Floorspace Type	**Shop Retail**		**Other Retail + Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	21,442	799	10,497	279
WA Tomorrow	12,336	535	8,090	203
Precinct 4				
Floorspace Type	**Shop Retail**		**Other Retail + Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	29,350	1,230	53,116	1,521
WA Tomorrow	13,603	902	40,828	1,176

Source: Pracsys 2021

Note: Shop Retail = Convenience/Comparison Retail, Other Retail = Bulky Goods Retail, Non-Retail Floorspace = (Entertainment, Health, Office, Service Commercial, Storage, Manufacturing). Detailed Floorspace definitions are provided in Appendix 1, Section 10.4, PLUC Definitions

Viability has been determined based on the required Shop Retail floorspace productivity to ensure projected floorspace increases were supportable considering the size and location of centres and the expected performance by centre type. The result should contribute to a health activity centre hierarchy that attracts and retains tenants and addresses community needs for access to goods, services and employment (Figure 4).

Figure 4. Required Floorspace to productivity Ratio by Activity Centre Type

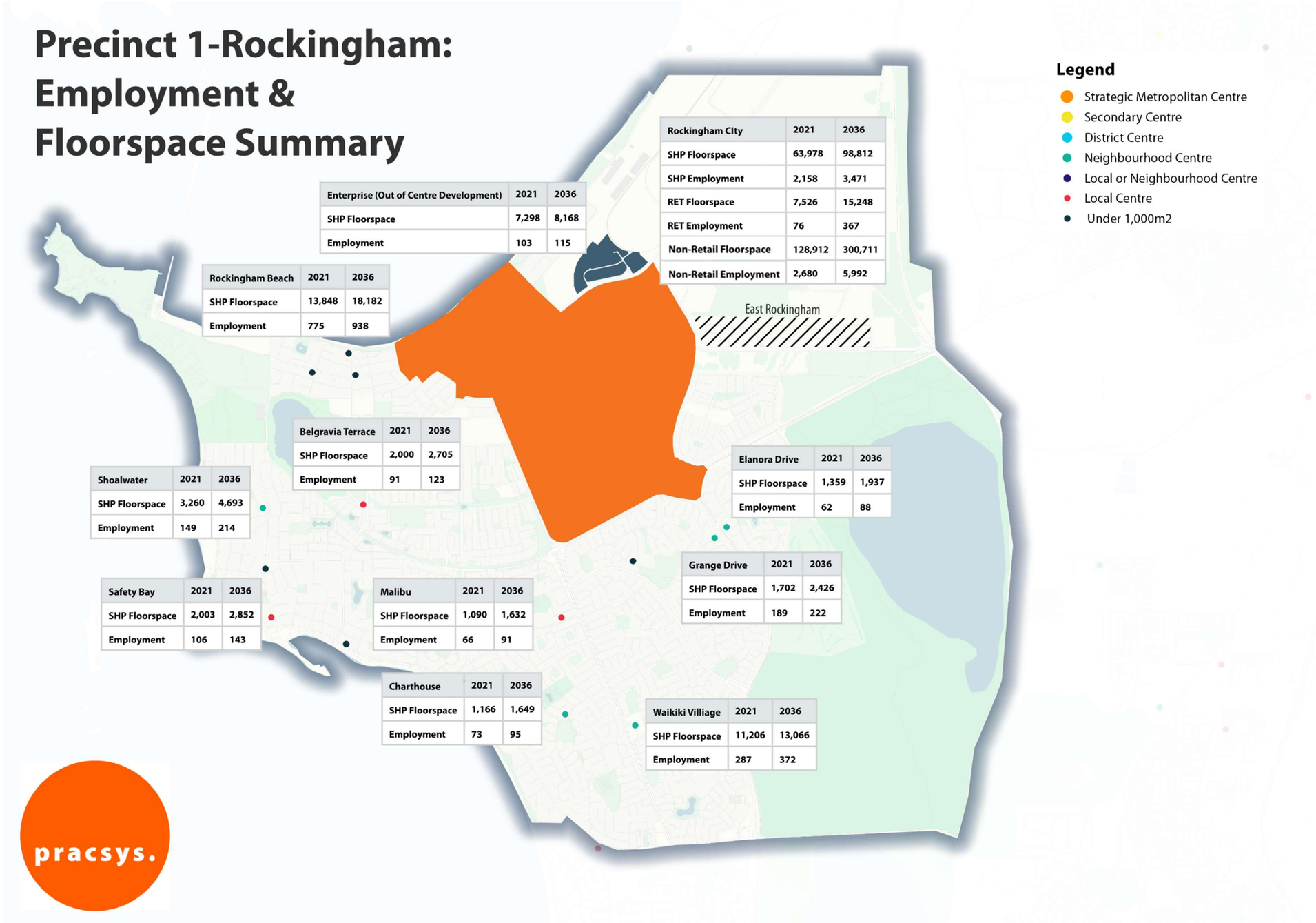
Centre Type	Required Floorspace Productivity
Strategic Metropolitan Centre (COR Scenario)	$6,997 per m^2
Strategic Metropolitan Centre (WAT Scenario)	$6,433 per m^2
District Centre	$8,300 per m^2
Neighbourhood Centre	$8,100 per m^2
Local Centre	$8,100 per m^2
Other Retail Centre	$6,500 per m^2

Source: Pracsys 2021

Note: The required floorspace productivity ratio by Centre Type has been estimated by assessing the productivity of other centres using the Property Council of Australia's Shopping Centre Directory and through wider research looking at shopping centre turnover.

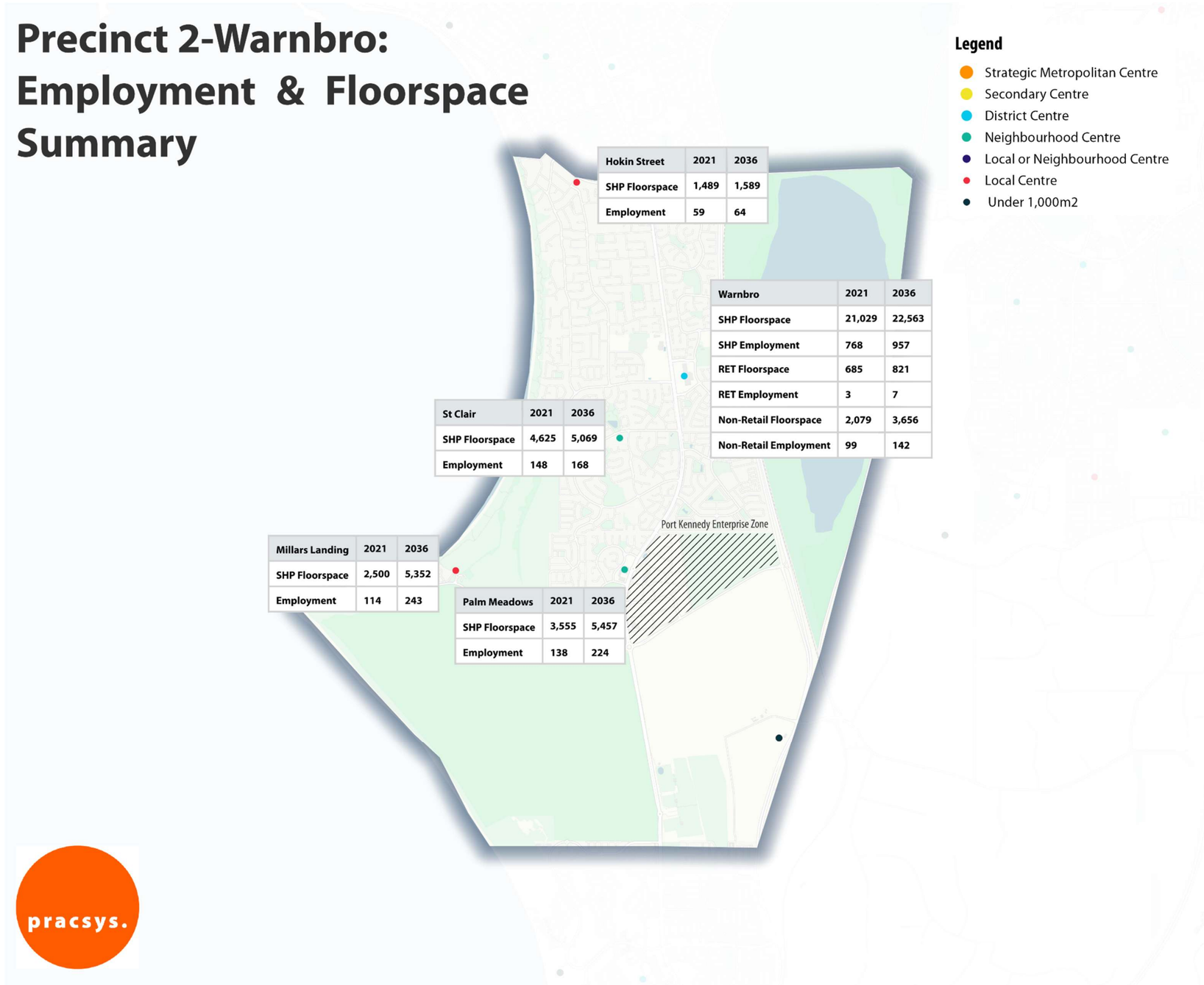
The maps for these precincts are shown in Figure 5, Figure 6, Figure 7 and Figure 8.

Figure 5. Precinct 1 Activity Centre Map



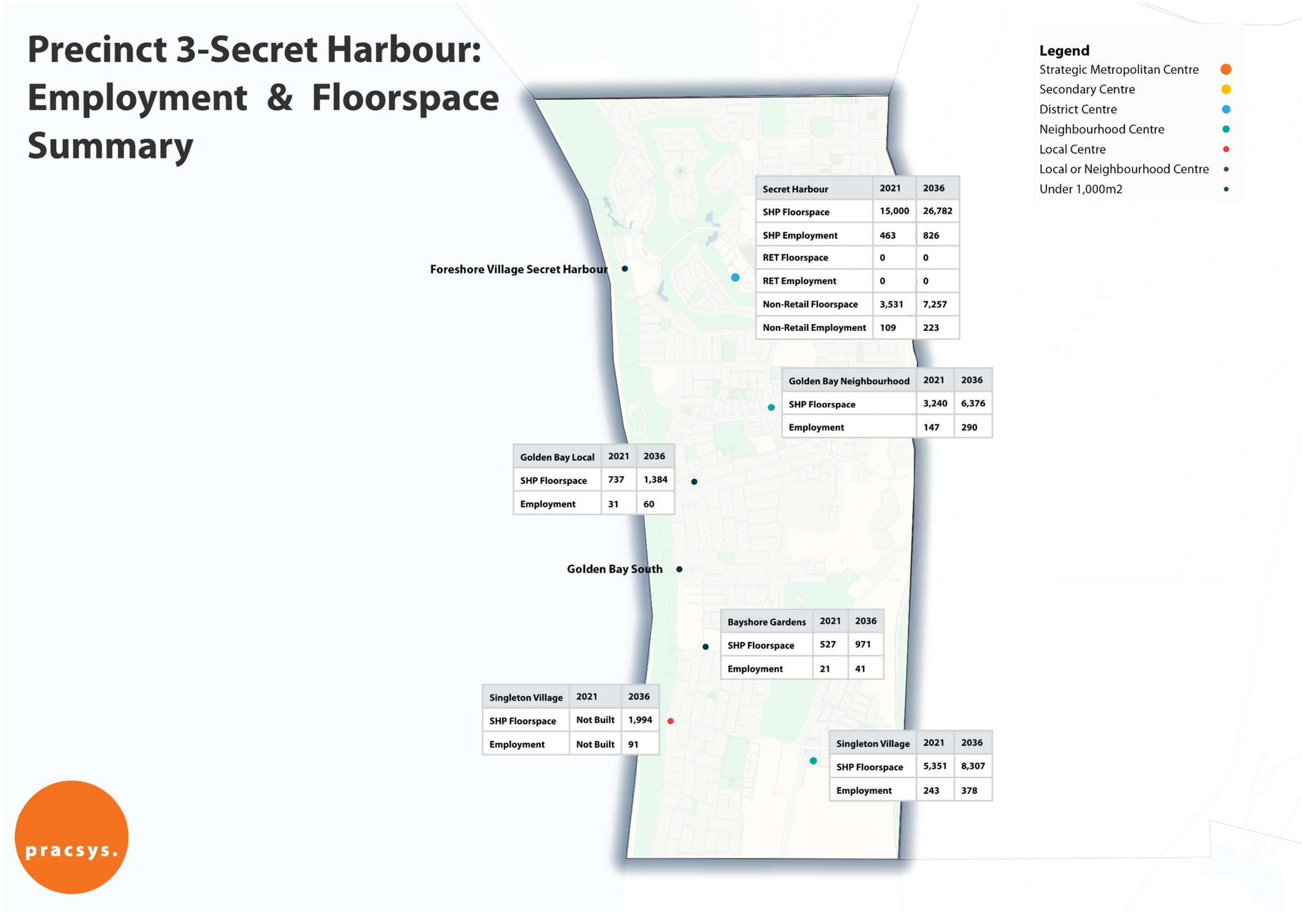
Pracsys 2021

Figure 6. Precinct 2 Activity Centre Map



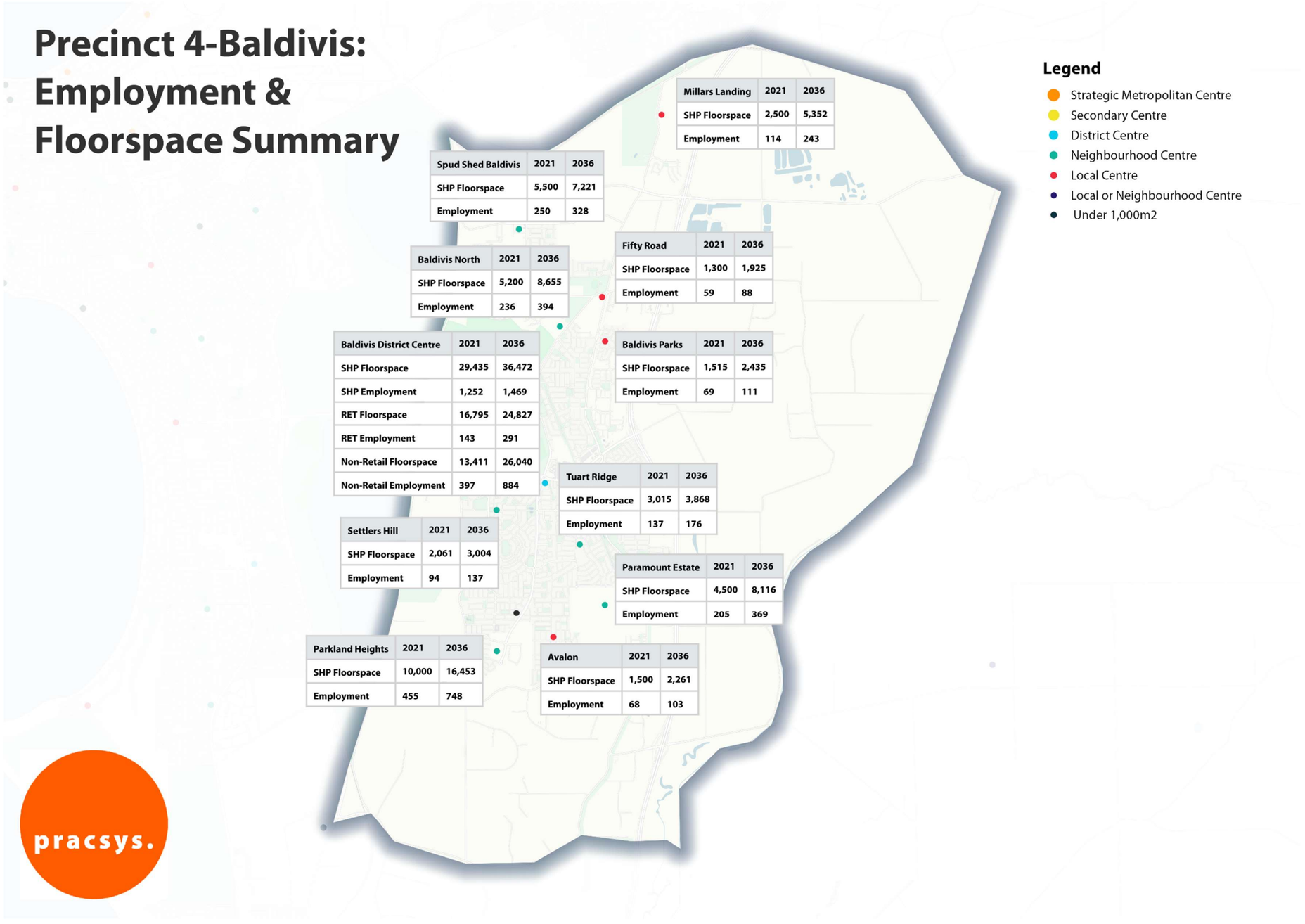
Pracsys 2021

Figure 7. Precinct 3 Activity Centre Map



Pracsys 2021

Figure 8. Precinct 4 Activity Centre Map



Pracsys 2021

1.3 Employment Targets

The South Metropolitan Peel Sub-Regional Planning Framework provides Employment Self-Sufficiency (ESS) targets for the region. ESS represents the jobs available in a sub-region compared to the labour force of the sub-region. An ESS of 100% means that a sub-region has an equal number of jobs and labour force. The assessment has estimated the employment supportable at the City's Activity Centres based on population growth. The 2020 Rockingham Employment Study considered the potential employment requirements of the City with projections based on population growth and other development opportunities.

Employment estimates from the Rockingham Employment Study for non-activity centre employment have been combined with activity centre estimates to approximate the additional employment required to achieve an ESS target of 74%. The additional employment will need to be in strategic in nature and suitable to the RSMC and other employment lands such as industrial areas. The estimated gap in employment without considering future employment land (not activity centre based) and catalyst projects in the RSMC amounts to between 31,000 and 40,000 (**Figure 9**).

Figure 9. Employment Gap Without Future Employment Land

Employment Category	WAT Employment	CoR Employment
Employment Target 2041 (74% ESS)	70,833	88,292
Needs Assessment 2041 - RSMC	10,697	14,252
Needs Assessment 2041 – Other Centres	13,139	15,442
Jobs Rest of City	15,572	18,984
Gap to Target ESS	31,425	39,614

Source: Syme Marmion & Co 2020, Pracsys 2021

The Employment Study identified North-East Baldivis, Karnup (Core) and Karnup (South) as Future Employment Land. Employment in the Study was projected to 2050 and has been estimated at 2041 for the purpose of understanding implications for the Needs Assessment. These employment estimates have been used to refine the gap estimate for both scenarios (**Figure 10**).

Figure 10. Employment Gap with Future Employment Land

Employment Area	WAT (jobs)	CoR (jobs)
Gap to Target ESS	31,425	39,614
Future Employment Land	22,897	22,897
Additional RSCM Employment (based on Employment Study)	2,101	5,055
Remaining Gap	6,428	11,662

Source: Syme Marmion & Co 2020, Pracsys 2021

It is estimated that the employment gap to reach a target ESS of 74% would require an additional 2,100 to 5,100 jobs in the RSMC and 6,400 and 11,700 jobs on other employment lands. These results reflect the

importance of the RSMC in providing employment opportunities to meet Sub-regional employment targets. The Southern Metropolitan Peel Framework currently provides a target of only 12,290 jobs in the RSMC. Under the CoR scenario the RSMC will need at least 14,252 jobs to meet the goods and services needs of the surrounding population, with a total of 19,307 jobs by 2041 to contribute to an ESS of 74%. The findings of the Rockingham Employment Study and our analysis indicate that regional ESS targets would not be achievable unless a greater concentration of employment is planned for in the RSMC. This additional employment would be in line with its role as a Strategic Metropolitan Centre.

The Employment Study defines a number of employment activities in line with the Strategic Metropolitan Centre roll of the RSMC that could be targeted to achieve greater employment levels. These include:

- Primary regional institutions including a full-service university, major health campus with teaching capabilities, State government administration, and high-level arts and entertainment
- Business services for nearby industrial areas, the naval base and Westport
- Tourist activities including business travel and visitation for the surrounding area

Out of centre development will be driven by strategic employment opportunities, particularly associated with the WTC and Westport; and population-driven light industrial services for the wider sub-region.

It is estimated that the RSMC would need an additional 126,000m^2 to 273,000 m^2 in commercial floorspace to support the additional employment estimates (**Figure 11**).

Figure 11. Additional Floorspace Estimates to Meet ESS Target

Floorspace Uses	WAT Floorspace (m^2)	CoR Floorspace (m^2)
RSMC		
Education	45,600	91,200
Accommodation	48,200	96,800
Office	32,317	85,098
Other Employment Land		
Light Industrial	732,990	1,329,878

Source: Pracsys 2021, DPLH 2016

An additional 733,000m^2 to 1,330,000m^2 in light Industrial floorspace uses would be required on other employment lands. More Detailed analysis is provided in Section 6.3, Employment Targets.

1.4 Implementation Advice

The Needs Assessment provides the evidence-base for planning the City's Activity Centres. It will be integrated into the City's Local Planning Framework through:

- The Local Commercial Strategy (LCS)
- The Rockingham Strategic Metropolitan Centre Local Planning Framework (RSMCLPF)

The Needs Assessment establishes the floorspace supply of retail and non-retail uses in Activity Centres required to support identified population demand. The analysis has used population projections from WA Tomorrow and forecast.id to develop the estimates. The years associated with the projections are less important than the quantum of population itself. It is recommended that for planning purposes the Local Commercial and Activity Centre Strategy (LCACS) and RSMCLPF adopt a 'stage gate' interpretation of the results to guide decision making.

In creating an attractive business environment within the City's activity centres, the role of the City is to act as a central regulator, coordinator and facilitator, working to understand the challenges facing local businesses including; linking businesses with appropriate resources, advocating on behalf of local businesses, and supporting specific projects where appropriate. The levers available to the City can be described under the following hierarchy:



CONTROL

e.g. Establishing local policy and regulation, directing internal resources, utilisation of local government-controlled land and assets, implementing programs and events, and supporting projects with seed funding

INFLUENCE



e.g. Facilitating the strengthening of networks that encourage the sharing of knowledge and investment opportunities, and supporting communication with State and Federal governments regarding the influence of wider policy, projects or funding decisions

MONITOR



e.g. Tracking economic performance indicators and collecting feedback from businesses regarding current issues or opportunities which relies on communication channels with industry and the broader community

Using these levers, the City can actively attract and retain businesses through an understanding of the role, strengths and weaknesses of different centres and employment lands, and how they relate to a business's locational preference drivers and hence its operational productivity. These considerations differ depending on the nature of a business, with population/consumption-oriented businesses having different needs to those that operate business-to-business or are export-driven.

2 INTRODUCTION

This Needs Assessment report has been prepared for the City of Rockingham to inform the City's upcoming Local Planning Strategy (LPS); interim review of its Local Commercial and Activity Centre Strategy (LCACS) prepared in advance of the LPS; and, the Local Planning Framework for the Rockingham Strategic Metropolitan Centre.

The City is experiencing consistently high levels of population growth with an average annual growth rate of approximately 2.8% over the past decade, 57% faster than the Greater Perth average of 1.79%. The City's population is projected to grow at an average annual rate of 2.2% between 2021 and 2046, an increase of approximately 71%. The projected growth in population will create significant additional demand for retail and non-retail floorspace uses that will need to be delivered across the activity centre hierarchy.

This report addresses the elements identified in the Draft SPP4.2 Implementation Guidelines for Needs Assessments, including:

- Review of drivers of demand for retail and non-retail floorspace
- Assessment of relevant local and state planning documents
- Identification of appropriate study area
- Assessment of all retail and non-retail floorspace within the Study area
- Projection of future demand using gravity modelling and floorspace provision analysis; and
- Development of multiple future floorspace scenarios

Additionally, this Needs Assessment has been prepared to address the specific objectives the City has with regards to inputs for the LCACS review and the review of the local planning framework for the RSMC.

It should be noted that Karnup has been excluded from this report pending the preparation of the Karnup District Structure Plan. This Needs Assessment does not specify key considerations and advice for the integration of the District Structure Plan into the Needs Assessment when it is prepared.

2.1 Report Structure

Section 1 provides an overview of the report and summarises the key findings.

Section 3 provides a strategic review of relevant planning frameworks that have been used to guide analysis.

Section 4 provides an overview of the drivers underpinning floorspace demand including a demographic profile, socio-economic profile, trends analysis, businesses profile and property market profile.

Section 5 details the gap analysis for the City of Rockingham in its current state.

Section 6 provides floorspace recommendations for retail and non-retail floorspace over 5-year intervals in the City of Rockingham. This has been done for a number of scenarios.

Section 7 details the future Activity Centre Hierarchy developed for the five precincts in the City of Rockingham that have been defined in the current Local Commercial Strategy.

Section 8 provide implementation advice for the City of Rockingham in regard to this report.

Section 9 concludes the report.

Sections 10 to 13 are the appendices, providing analysis and results not included in the body of this Needs Assessment.

2.2 Rockingham Activity Centre Context

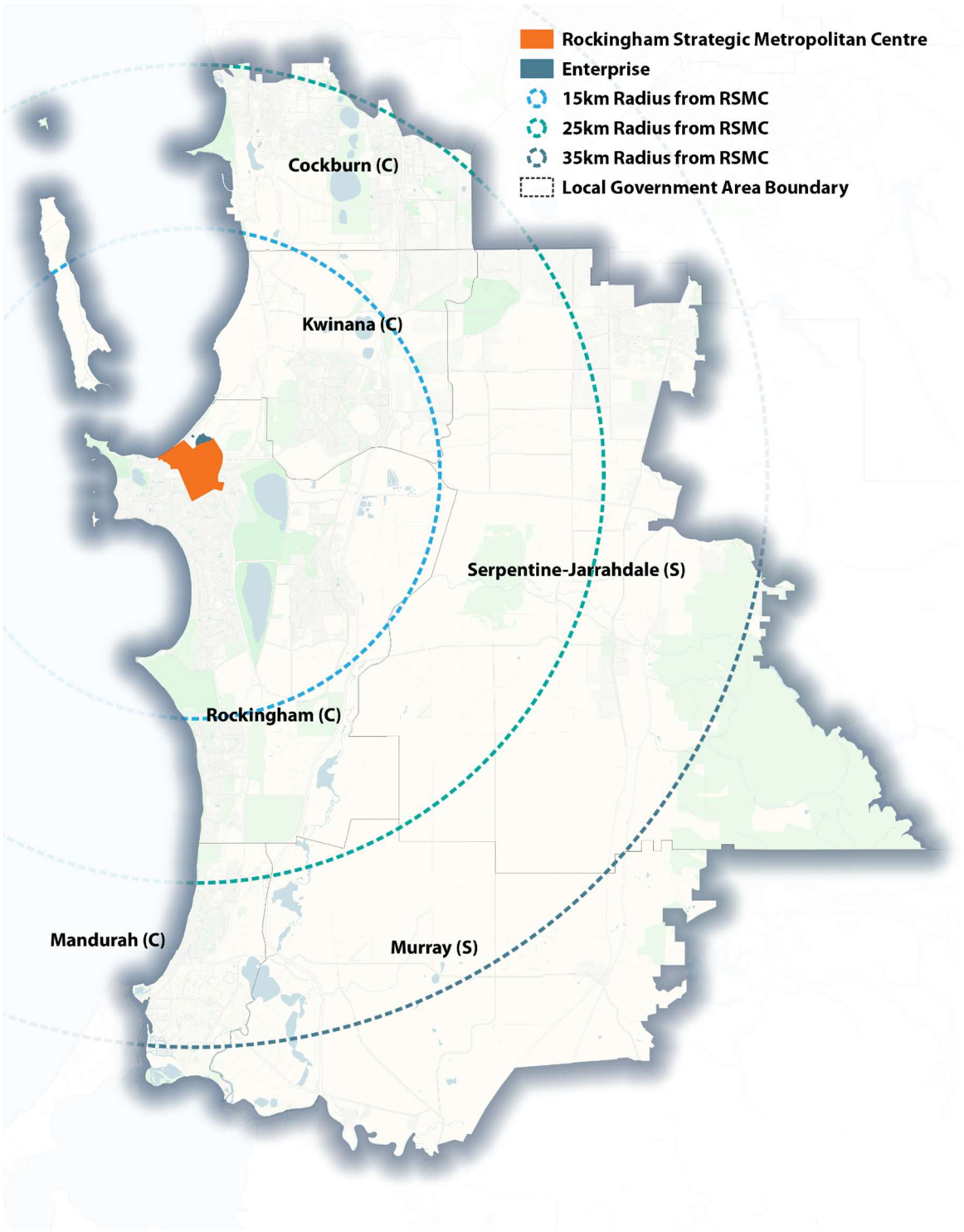
The Analysis Catchment used to guide this Needs Assessment has been defined in relation to the Rockingham Strategic Metropolitan Centre (RSMC).

The Analysis Catchment has been constructed based on the following rationale:

- **Quantum and Composition of RSMC Offering**: The large amount of retail floorspace provided within the RSMC attracts expenditure from a wide catchment. This is reflected in the Strategic Metropolitan Centre status of the Centre. Additionally, the highly diverse commercial floorspace offering of the RSMC means that users can satisfy a larger number of different shopping needs concurrently. This acts to further broaden the Centre's catchment.
- **Proximity to Local Government Areas with Limited Retail Offerings:** A portion of the Shire of Serpentine-Jarrahdale and the Shire of Murray has been included in the Analysis Catchment, as residents of these areas will likely utilise centres within the City of Rockingham due to the lack of higher-order centres provided within these Shires.
- **Retail Utilisation Patterns**: A number of the City of Rockingham's southern coastal suburbs, such as Secret Harbour, Singleton and Golden Bay, access services within the City of Mandurah in place of the City of Rockingham. The localities of Mundijong and Byford to the east/north-east have been included in the Analysis Catchment based on the fact that residents of these areas enjoy access to the Rockingham Strategic Metropolitan Centre via Mundijong Road. This will likely see them utilise centres within the City of Rockingham as well as/in addition to the Armadale Strategic Metropolitan Centre.
- **Natural Barriers**: The inclusion of the City of Mandurah in the Analysis Catchment has been truncated by the natural southern boundary of the Peel Inlet / Murray River. The inclusion of the Shire of Serpentine-Jarrahdale in the Analysis Catchment has been truncated by natural barriers and the frontier of urban development to the east. The inclusion of the Shire of Murray in the Analysis Catchment has been truncated by the natural southern boundary of the Peel Inlet / Murray River and the eastern frontier of urban development.

The resulting Analysis Catchment includes the entirety of the City of Rockingham and the City of Kwinana, as well as a portion of the City of Cockburn, the City of Mandurah, the Shire of Serpentine-Jarrahdale and the Shire of Murray (Figure 12).

Figure 12. Analysis Catchment for the Rockingham Local Commercial Strategy Needs Assessment



Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

This Analysis Catchment has been used to determine the demand for and supply of retail centres affecting the review of the City of Rockingham's LCACS. To ensure the analysis accurately estimates the retail demand in

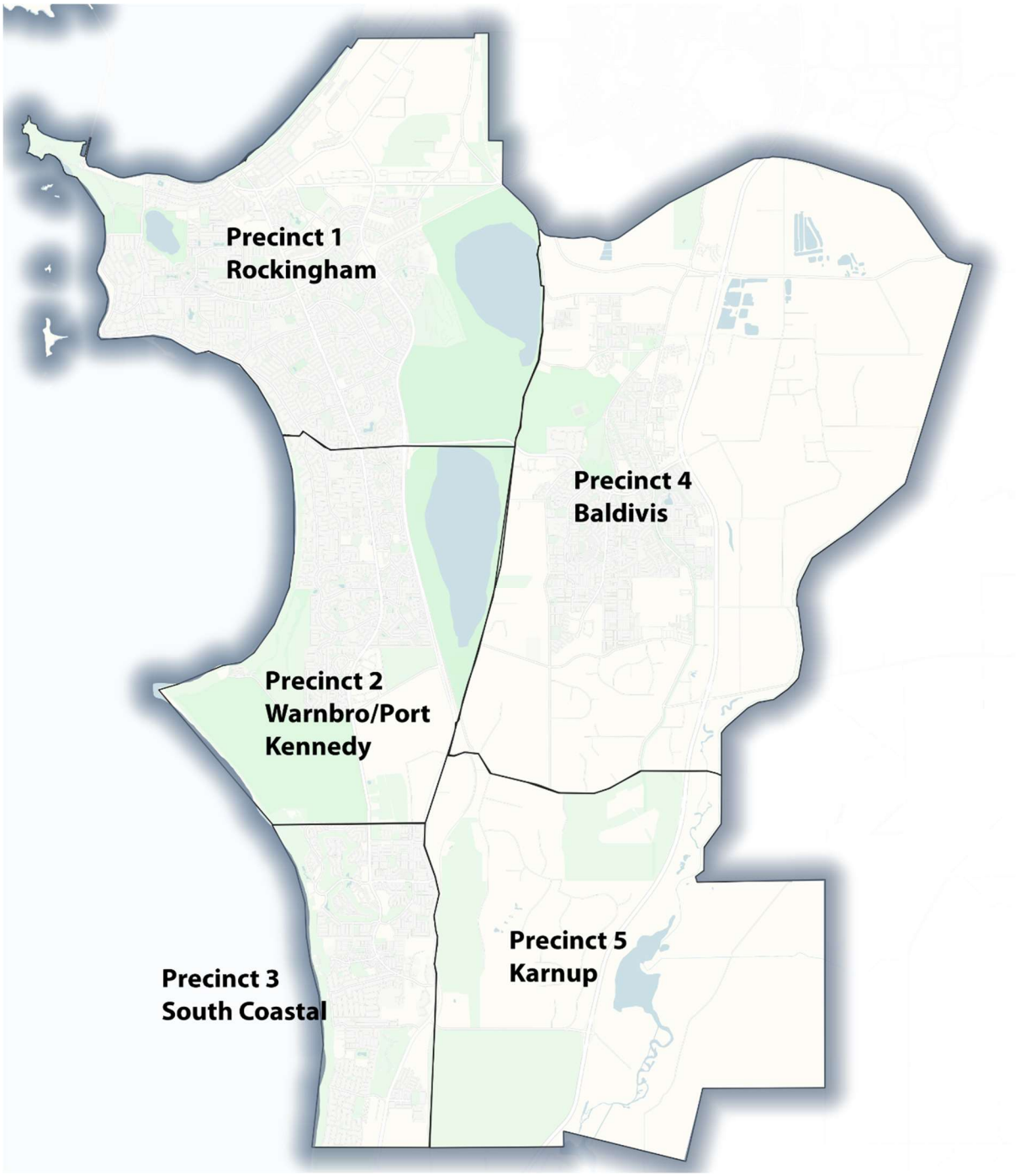
this Analysis Catchment, the net worker migration within the Analysis Catchment and the expected number of international visitors has also been incorporated into the demand profile.

The Analysis Catchment currently contains a total of approximately 350,000 residents and 146,000 households. The Analysis Catchment exhibits a net worker migration of approximately -27,000; 27,000 more workers leave the area than enter it for employment (see Section 6.1 for more detail).[1] An annual estimate of 24,000 international visitors[2] staying 23 days per trip have also been included in the demand side of the Analysis Catchment, conservatively based on the number of international visitors to the City of Rockingham (see Section 6.1 for more detail).[3,4]

The City's activity centre hierarchy is broken down into five Precincts that have been used to report analysis findings. These are the same Precincts as the previous Local Commercial Strategy as there was no evidence identified that indicated the boundaries needed amending. These precincts are shown in Figure 13.

[1] ABS Census, 2016, https://www.abs.gov.au/websitedbs/censushome.nsf/home/tablebuilder
[2] Tourism WA, 2021, https://www.tra.gov.au/
[3] Forecast ID, 2021, https://economy.id.com.au/rockingham/tourism-visitors-nights
[4] For the purpose of the analysis, the number of international visitors has been conservatively assumed to remain constant over time.

Figure 13. Precincts within the City of Rockingham



Source: City of Rockingham 2013, Pracsys 2021

3 STRATEGIC CONTEXT

This section provides a review of the relevant strategic documents used to shape the analysis. It should be noted that this review will be expanded in the final report, when precinct sections are developed and the analysis assesses the appropriate design of activity centres and the activity centre hierarchy needed to support the population.

3.1 State Planning Framework

State Planning Policy 4.2 (Draft)

The Draft State Planning Policy (SPP) 4.2 provides a detailed overview of activity centre types and their appropriate hierarchy. It defines activity centres as multi-functional community focal points that vary in size and function. These activity centres should be serviced by transport networks with a focus on integrating pedestrian access and walkability. Activity centres should also include a range of land uses, including:

- Commercial uses
- Retail uses
- Food and hospitality use
- Higher density housing
- Entertainment uses
- Tourism Uses
- Civic/community uses
- Higher education uses, and
- Medical services

This planning policy is used to inform the development of planning instruments such as Local Commercial Strategies and has three specific policy objectives:

- Provide a hierarchy and network of activity centres that meet community needs and provide social, economic and environmental benefits to all Western Australians
- Enables the distribution of a broad range of goods, services and activities
- Ensure consistency and rigour in the planning and development of activity centres

To ensure a proposal meets these objectives and is approved under the SPP 4.2, it should:

- Support the overall precinct design objectives
- Deliver net community benefit and not result in a loss of community service to residents
- Provide an impact test for major developments
- Ensure the activity centre network meets different levels of community need and enables employment, goods and services to be accessed efficiently and equitably by the community

- Ensure the primacy of active centres is reinforced, and out-of-centre development that undermines the hierarchy of activity centres is discouraged
- Ensure new activity centres or the expansion and consolidation of existing activity centres does not unreasonably undermine existing centres

Draft SPP 4.2 provides implementation guidelines to support the development of planning documents and development applications. The guidelines identify two supporting documents:

- Needs Assessments to supporting strategies, structure plans and major developments
- Impact Tests to support major developments

There are specific criteria that identify when these documents are required. These will be specified as Precinct specific findings are developed.

The analysis undertaken for the Rockingham Local Commercial Strategy Review will be in line with the Draft SPP 4.2.

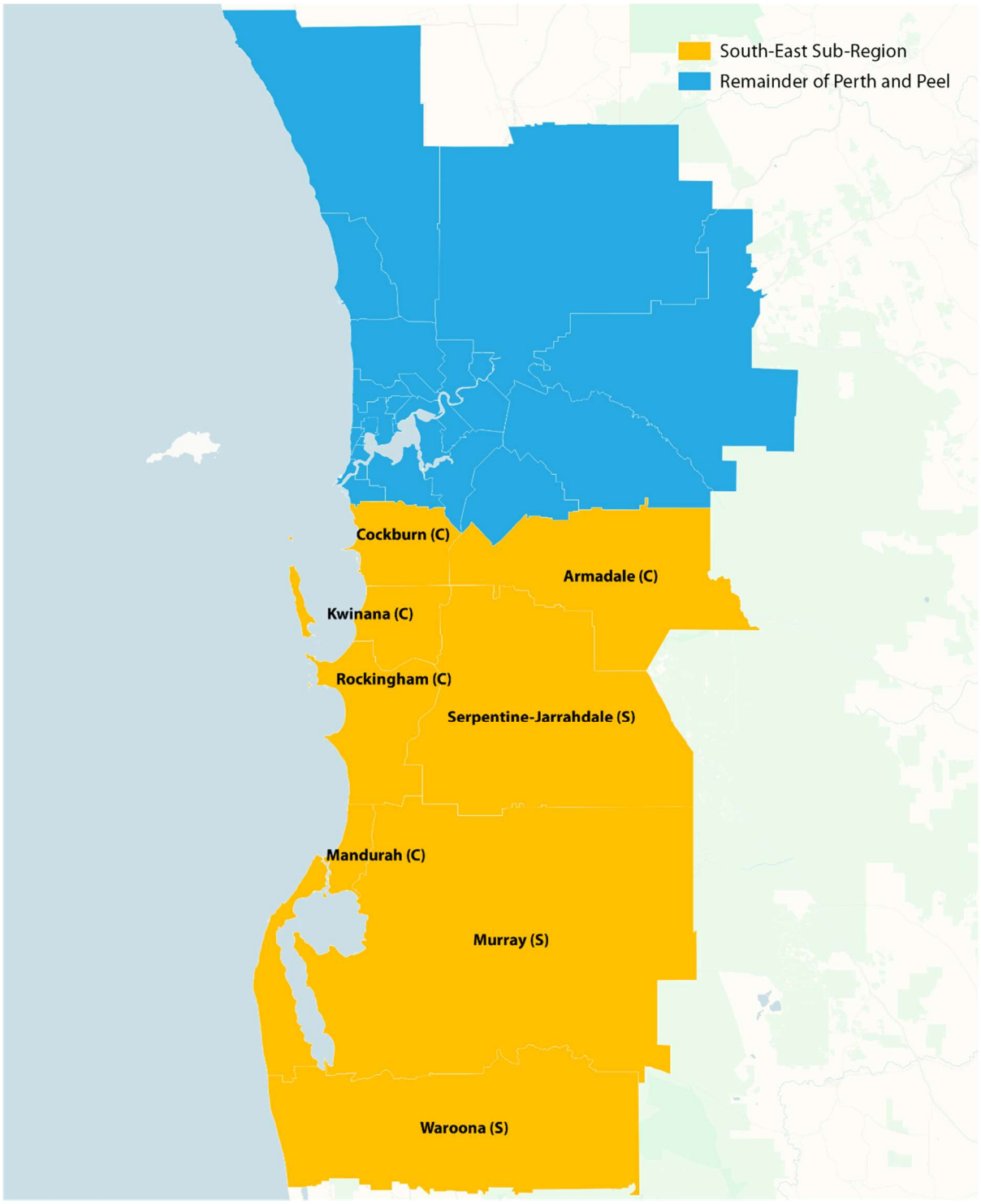
South Metropolitan Sub-Regional Planning Framework

The South Metropolitan Sub-Regional Planning Framework is a part of the Perth and Peel @3.5 million suites of land use planning and infrastructure frameworks. The South Metropolitan Peel Sub-Region covers an area of almost 5,000 km^2 and comprises the cities of Armadale, Cockburn, Gosnells, Kwinana, Mandurah and Rockingham, as well as the Shire of Murray, Serpentine-Jarrahdale and Waroona (Figure 14).

This framework has a number of strategic directions and priorities, including:

- Reducing the reliance on jobs outside of the South Metropolitan Sub Region as the sub-region has a considerable reliance on jobs in other locations, especially within the CBD, the Central sub-region and outside of the Perth metropolitan area with fly-in-fly-out jobs in the north-west of the State. This reliance is particularly evident in the south-eastern sector, which currently has an employment self-sufficiency of 45 per cent (2011), as well as the Peel sector
- Increasing Employment self-sufficiency levels in the South Metropolitan Peel sub-region are projected to increase from 65 percent to 83 percent in the south-western sector (Cities of Cockburn, Kwinana, Rockingham)
- Increasing employment at the Rockingham Strategic Metropolitan Centre that is identified to provide 5,500 additional jobs from 6,790 in 2011 to 12,290 by 2050
- Increase employment within the South-Western sector with 25,810 jobs within activity centres and 95,280 jobs outside of centres
- Increase manufacturing and agricultural sectors as well as **knowledge-based employment** that should be strategically located at activity and specialised centres
- Collaborate across government and with the private sector is to facilitate economic development and improved self-sufficiency within the sub-region, particularly to attract strategic economic and employment land uses into the sub-region and maximise the use of existing infrastructure

Figure 14. South Metropolitan Sub-Region



Source: DPLH 2018, Pracsys 2021

This framework sets out proposals to:

- Achieve a more consolidated urban form

- Facilitate increasing the number of people living close to where they work with the identification of suitable sites for employment within the sub-region
- Maximise the use of and add value to existing infrastructure, including transport, community/social and service infrastructure
- Promote employment nodes including activity centres, specialised centres, industrial areas, industrial expansion areas and industrial investigation areas
- Protect employment land from uses inconsistent with the employment objective by planning for ultimate development with limtier interim uses
- Protect strategic industries and land classified for this purpose, together with their buffers, from the encroachment of non-strategic and/or incompatible land uses
- Improve employment self-sufficiency to reach identified targets

The City of Rockingham has been identified as a key area for housing growth due to its strategic centre and proximity to the coast. This housing growth will need significant infrastructure to support residents going forward. Rockingham is the principal centre of the south-western sector. It has a large and increasingly urban catchment. Population-driven growth will support increased retail activity and the activity centre will be the focus of office and commercial development for much of the area. The ability to attract development and investment has been constrained by the need for better connectivity between the heavy rail system and city centre. Transit corridors connecting the city centre with the surrounding urban catchment are proposed.

Additionally specialised centres focus on regionally-significant economic or institutional activities that attract substantial numbers of people. These activities will be centred on key uses and include complementary activities. The clustering of complementary activities can deliver additional economic benefits. In addition to the existing specialised activity centre at Jandakot Airport, focusing on aviation and logistic services, a new centre is proposed at Karnup. Karnup (East) is a strategic opportunity to identify a site for longer-term public uses that is centrally located in the urban system between Rockingham–Kwinana and Mandurah–Pinjarra. It is located adjacent to a rail and/or transit station and also accessible via transit corridors. A Karnup specialised activity node could provide for a range of regional public facilities which may include education, health and other future ancillary uses.

The planning framework provides context and guidance to support:

- Determination of an appropriate activity centre hierarchy
- Distribution of infrastructure throughout the City of Rockingham's centres
- Estimating employment and floorspace requirements to meet employment self-sufficiency targets

3.2 City of Rockingham Local Planning Framework

City of Rockingham Planning Policy No.3.1.2 – Local Commercial Strategy

The City of Rockingham Planning Policy No.3.1.2 – Local Commercial Strategy provides a detailed review of the existing City of Rockingham Retail Structure Plan that was updated to 1996. The purpose of this strategy is to:

- Establish the objectives, principles and key strategies for retailing and commercial development in Rockingham
- Apply the strategic planning policies set out in the State Government's Metropolitan Centres Policy Statement (2000)
- Provide a context for the review of the City of Rockingham Town Planning Scheme No.2 in respect of provisions for retail and commercial development
- Guide private sector investment and the City's capital works expenditure
- Provide Council with a sound basis for decision making on development applications, rezoning proposals and the provision and location of future Council services and facilities
- Identify centres and commercial locations requiring particular action, for example, where new ideas such as Community Design Codes may change the urban form of existing structure plans or for the restoration and improvement of established centres

This planning policy sets out the activity centre hierarchy for the City of Rockingham and splits the City of Rockingham into five distinct precincts, these precincts are:

- Rockingham
- Warnbro/Port Kennedy
- South Coastal
- Baldivis
- Karnup

Each of these precincts has been designated an activity centre hierarchy and provides recommendations for the appropriate floorspace of floorspace at activity centres going forward.

The work being undertaken for this Local Commercial Strategy review will build on the current Local Commercial Strategy, providing up to date and detailed insights on the appropriate provision of retail and non-retail floorspace within the City of Rockingham needed to support its growing population over time. The work undertaken will be in alignment with Draft SPP 4.2. The current LCS 3.1.2 maintains a significant amount of language from the Metropolitan Centres Policy (2000), some of which may not align with outcomes established in Draft SPP4.2. In particular, language referring to floorspace caps would be seen as inconsistent with the Draft SPP 4.2. Precinct specific sections will include language based on the Draft SPP4.2 and further guidance can be provided to ensure the final update to the LCS 3.1.2 is consistent with the current State Planning Framework.

Employment Planning Strategy

The Employment Planning Strategy undertaken by Syme, Marmion & Co assessed the current state of employment in the City of Rockingham and assessed potential employment scenarios going forward until 2050.

Currently, the City of Rockingham has a relatively high level of unemployment compared to the Greater Perth region and has a particular issue with youth unemployment. This issue is likely to be exacerbated if current trends continue, with employment opportunities in the City of Rockingham growing slower than the population. Employment opportunities in the City of Rockingham are specialised in construction and defence, reflective of the expansion in residential dwellings currently happening and due to Garden Island. To increase the current level of Employment Self-Sufficiency (ESS) in the City of Rockingham, additional strategic employment opportunities need to be generated over time.

Syme, Marmion & Co have identified a number of major employment centres that are likely to be the sites for employment growth over the next 30 years, these include:

- Rockingham City Centre
- East Rockingham Industrial Area
- Port Kennedy Industrial Area
- HMAS Stirling (Defence)
- North East Baldivis Industrial Area
- Karnup Industrial Area
- Baldivis – Kerosene Lane

The City is forecast to have high population growth, but currently only limited planning for commensurate employment growth. This being said it has a number of major advantages for employment growth:

- A major defence establishment at Garden Island
- An internationally competitive heavy industry zone at the Rockingham / Kwinana Industrial complex
- An internationally competitive naval and maritime industries construction, maintenance and services complex at Henderson in the Western Trade Coast
- A City Centre designated as the primary activity centre for a very large region, connected to regional transport systems and with an attractive ocean-front location for part of it

Despite these significant strengths, there are a number of weaknesses, including:

- Current employment-generating land is under threat from competing non-industrial uses
- The City's current planning framework for its Strategic Metropolitan Centre identifies the need to allocate more land for employment generating purposes

Based on differing scenarios for employment and population growth between now and 2050, Syme, Marmion & Co have estimated the likely ESS level in the City of Rockingham for 2050 (Figure 15).

Figure 15. Employment Self-Sufficiency Scenarios in the City of Rockingham

Scenario	1	2	3	4	5	6
Population Growth	Low	Low	Medium	Medium	High	High
Employment Growth	Low	Medium	Low	Medium	Medium	High
Town Centre Population	26,030	26,030	32,321	32,321	48,580	48,580
Jobs: Town Centre	11,193	13,693	13,898	19,307	25,262	34,422
Jobs: Rest of City	30,721	33,221	34,426	39,926	38,980	43,480
Total Jobs - Base	**41,914**	**46,914**	**48,324**	**59,233**	**64,241**	**77,901**
Additions						
North East Baldivis	8,300	8,300	8,300	8,300	8,300	8,300
Karnup (Core)	12,500	12,500	12,500	12,500	12,500	12,500
Karnup (South)	12,400	12,400	12,400	12,400	12,400	12,400
Employment Self-Sufficiency (Jobs / Workers Ratio)						
Base	0.45	0.50	0.44	0.53	0.49	0.59
With North East Baldivis	0.53	0.59	0.52	0.61	0.55	0.66
Plus Karnup (Core)	0.67	0.72	0.63	0.72	0.65	0.75
Plus Karnup (South)	0.80	0.85	0.75	0.84	0.74	0.85

Source: Syme, Marmion & Co 2020

This analysis has identified the City of Rockingham will have a relatively low level of ESS unless additional employment opportunities in industrial areas are capitalised on going forward. Additionally, Syme, Marmion & Co's report has identified that it is critical that every opportunity to increase the amount of diversity of economic activity in the Rockingham City Centre is taken.

Our analysis will use the findings of this report to estimate the appropriate provision of floorspace by type in activity centres required to help meet certain levels of ESS.

City of Rockingham Economic Development Strategy

The City of Rockingham's Economic Development Strategy 2020-2025 aims to provides strategic economic development priorities for Rockingham. This strategy reflects the Council's ongoing commitment to addressing the needs of the local business community, attracting new and diverse investment and delivering increased economic and social benefits to their community.

This Community Plan Strategy has been prepared to address Aspiration 1 – Actively Pursue Tourism and Economic Development as specified by the City's Strategic Community Plan 2019-2029, which identified actively pursuing tourism and economic development as an aspiration for the City of Rockingham. To pursue this aspiration, a number of potential actions have been identified, including:

- Promote the City as the premier metropolitan coastal tourism destination
- Attract local and international investment to the City to contribute to the local economy

- Develop and implement effective marketing approaches to promote the City as a destination of choice for the local community, visitors, investors and businesses
- Seek to host iconic community events and attractions that will entice residents and visitors throughout the year
- Lobby local, state and federal stakeholders to establish infrastructure and development opportunities for the City
- Support business development initiatives throughout the City; and
- Identify and attract conferences and high-profile businesses and sporting events to the City to develop its profile as a destination of choice for event organisers

These actions are required to support a number of key findings identified by the City that will provide direction on what needs to be considered going forward, including:

- The heavy reliance on the retail sector
- The importance of the defence sector
- Continued high population growth will negatively impact the City's ability to sustain its currently low level of ESS, which adds to higher unemployment levels, especially youth, with the population in Rockingham getting younger
- Inequitable infrastructure funding from Federal and State Government compared with other similar communities
- A lack of employment generating zoned land, which in turn restricts the City's ability to diversify industries and attract businesses to the area
- A lack of high-quality office space and business accommodation
- Lack of short-stay accommodation in the Waterfront Tourism Precinct and Cape Peron; and
- Underutilised tourism assets with particular emphasis on Point Peron, which offers a wide variety of opportunities for the development of formal infrastructure and amenity to support visitors to the area

The EDS, in combination with the Syme, Marmion & Co Employment Planning Strategy has identified that key avenues for employment growth in defence, tourism, general and heavy industrial, the City Centre, Westport, aged care, retirement living and local hospitality (restaurants, cafes and bars).

The findings from the EDS document will assist this report in identifying the types of land uses that should be focused on at activity centres to assist the City in catalysing economic growth.

4 FLOORSPACE DRIVERS

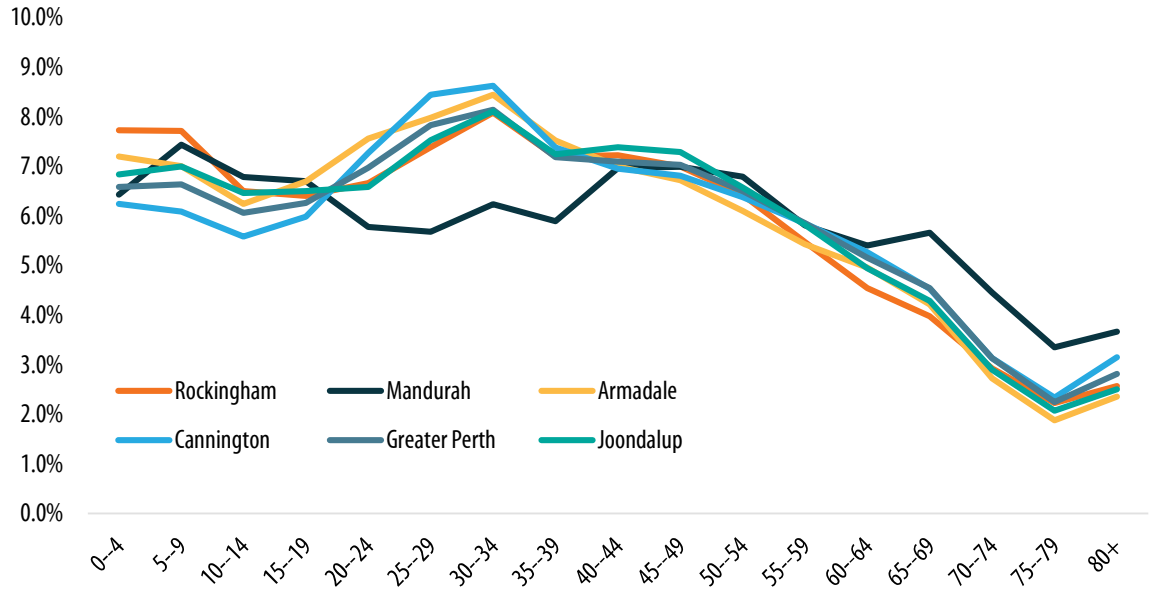
This section details the demand profile for the City's activity centre hierarchy based on population, employment and business trends. The trends have been compared to benchmark catchments for the Mandurah, Armadale, Cannington and Joondalup strategic metropolitan centres, as well as the Greater Perth region. A 25km radius (roughly aligned to the Analysis Catchment) was set as the study area for all benchmark centres to support comparability. The benchmark catchments have been used for comparison as they will support the floorspace gap analysis.

4.1 Demographic Profile

Age Profile

The demographic analysis indicates the Analysis Catchment has a high proportion of young families, with the City having a high proportion of persons aged 0-9 and 20-40 compared to the benchmarked areas (Figure 16).

Figure 16. Age Profile of RSMC Analysis Catchment and Selected Benchmarks



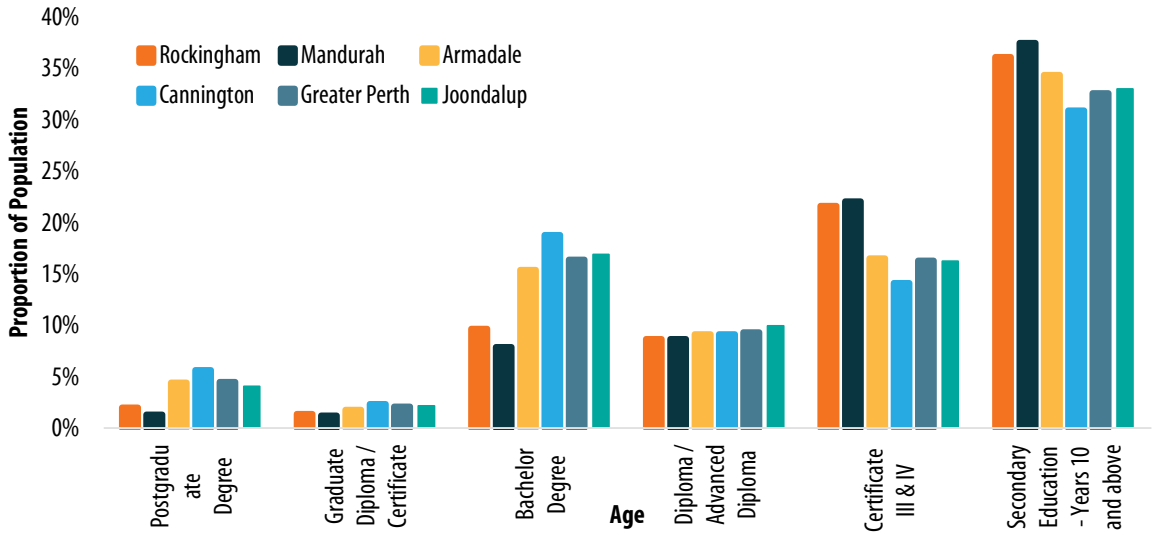
Source: ABS Census 2016, Pracsys 2021

This population breakdown indicates the City of Rockingham may need to target the retail needs of young families when designing and planning activity centres. This could include providing suitable amenities such as playgrounds within viewing distance of cafes and restaurants. Additionally, the significant expected increase in dwellings for the City of Rockingham will further attract young families and activity centres designed around new dwellings should specifically target this demographic.

Education profile

There is a relatively high proportion of persons with Certificate III & IV as their highest level of educational attainment (Figure 17). This indicates that a large portion of residents work in trades, with many likely supporting the construction industry due to the high rates of residential growth. Notwithstanding, there are opportunities for wholesale and retail uses that support tradespersons and skilled professionals.

Figure 17. Education Profile

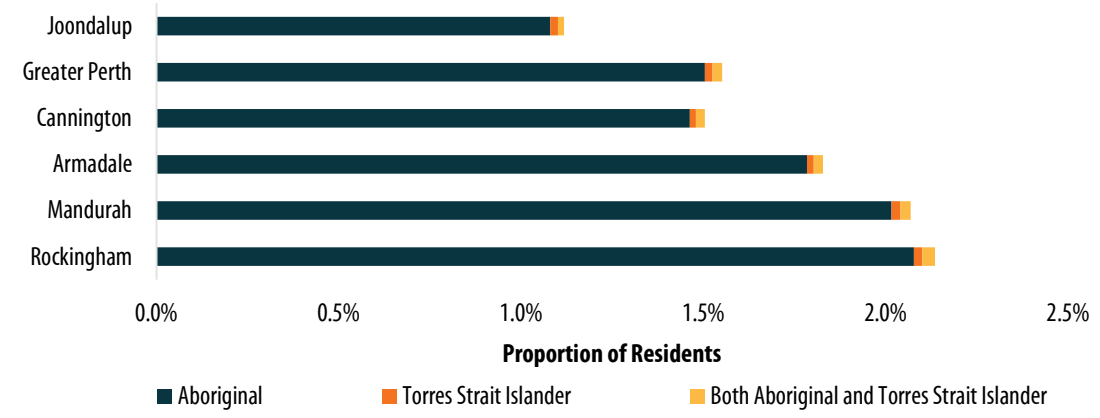


Source: ABS Census 2016, Pracsys 2021

Diversity Profile

The analysis shows that the Analysis Catchment has a slightly higher concentration of Indigenous persons than the Greater Perth region, however, it is not significantly higher and is unlikely to impact the preferred retail offerings of the overall demographic in the Analysis Catchment (Figure 18).

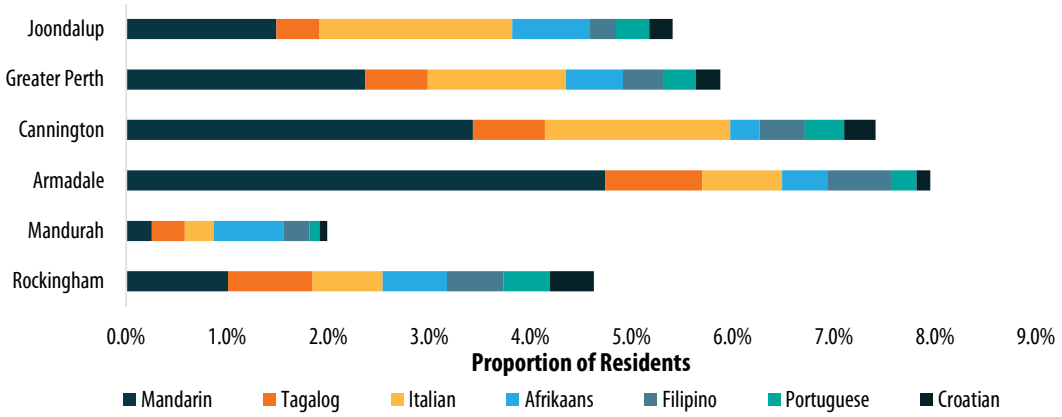
Figure 18. Aboriginal and Torres Strait Islander Profile



Source: ABS Census 2016, Pracsys 2021

The level of diversity in the Analysis Catchment was assessed based on the proportion of residents who speak a language other than English at home. The Analysis Catchment has a relatively low proportion of persons who speak a language other than English at home compared to the Greater Perth area (Figure 19).

Figure 19. Language Spoken at Home Profile



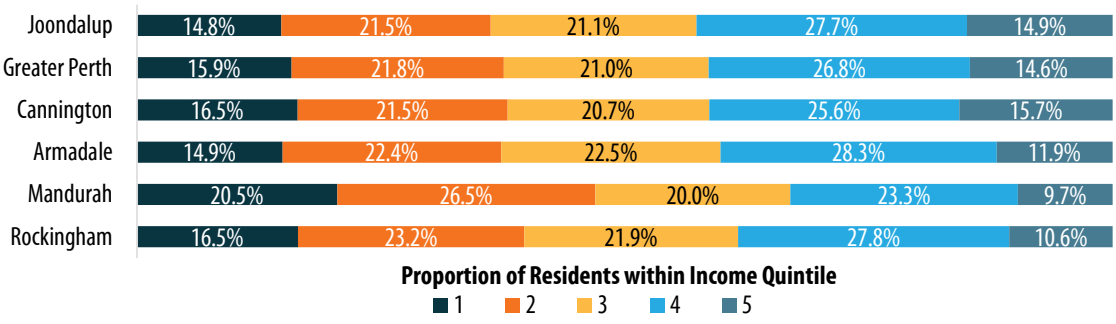
Source: ABS Census 2016, Pracsys 2021

Despite the relatively low level of diversity within the Analysis Catchment, ensuring a diverse retail offering is recommended as the high growth in dwellings for the area will likely encourage increased diversity over time.

4.2 Socio-economic Profile

The Analysis Catchment has a lower proportion of high-income earners than the Greater Perth area, with only 9.8% of households within the top income quintile compared to 12.7% for Greater Perth (Figure 20). A lower proportion of persons within the highest income quintile indicates that residents are likely to spend a greater portion of their income on convenience retail and accordingly, will spend less on comparison items. There could be a shift in income levels as Westport develops and attracts more strategic and knowledge-intensive employment to the sub-region.

Figure 20. Household Income Profile



Source: ABS Census 2016, Pracsys 2021

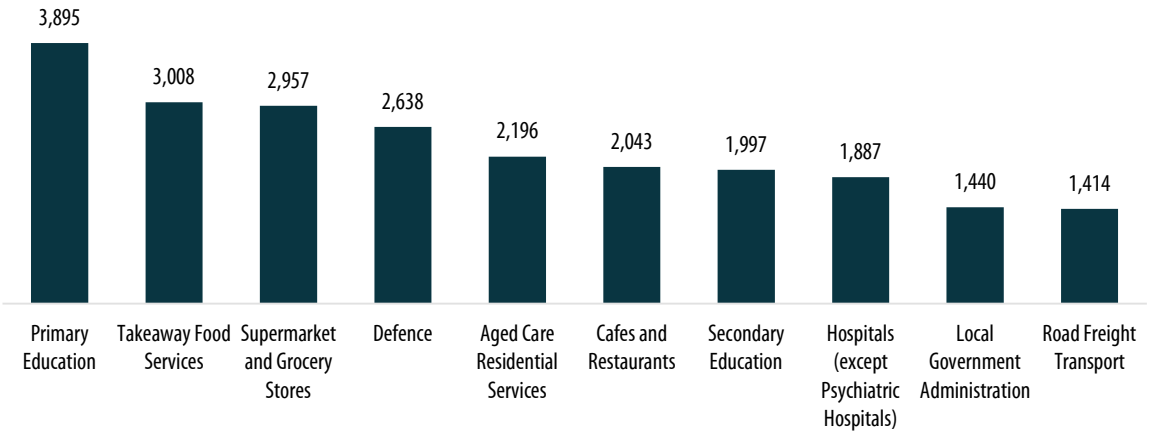
Note: Income quintiles for households are as follows; 1 = $1 - $33,799, 2 = $33,800 - $64,999, 3 = $65,000 - $103,999, 4 = $104,000 - $181,999, 5 = $182,000+

4.3 Employment Profile

The top employing industries at the Australian and New Zealand Standard Industry Classification (ANZSIC) Level 4 include Primary Education, Defence and Supermarket and Grocery Stores (Figure 21). Eight of the top ten industries are population-driven and will be expected to grow in line with the population.

Demand for employment in Secondary Education is expected to grow proportionately faster than the population as children age throughout the analysis catchment, similarly, demand for Aged Care services are expected to grow as the population ages. Defence and Road Freight Transport are strategic industries that will grow based on factors other than changes in population in the Analysis Catchment. Relevant drivers for these industries are increased federal defence spending and the development of Westport at the Western Trade Coast industrial area.

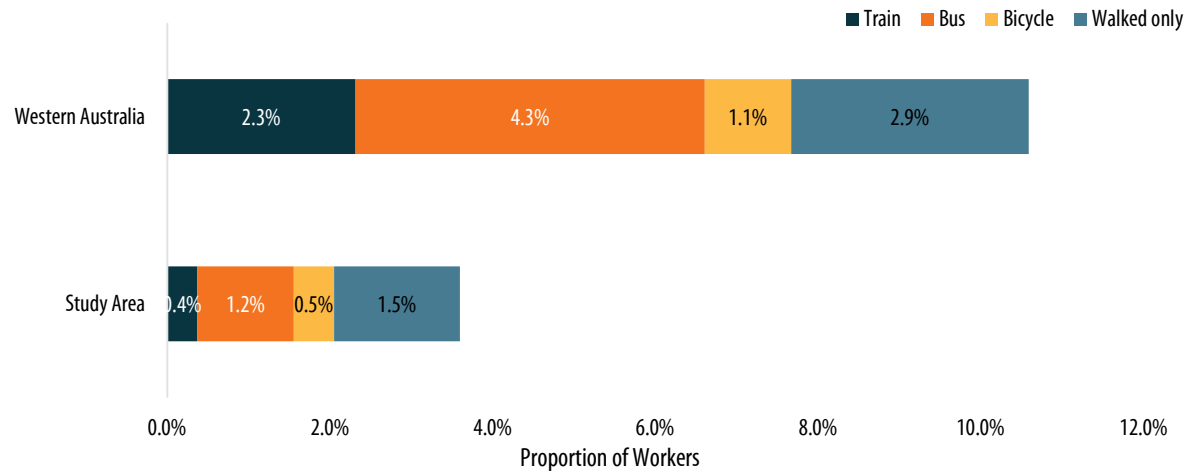
Figure 21. Top Employing Industries within the Analysis Catchment



Source: ABS Census 2016, Pracsys 2021

Employees within the Analysis Catchment have been found to use a much smaller proportion of public transport than persons in Western Australia, potentially indicating that there are insufficient transport links to key employment centres within the Analysis Catchment (Figure 22).

Figure 22. Mode of Travel to Work Profile within the Analysis Catchment



Source: ABS Census 2016, Pracsys 2021

4.4 Trends Analysis

The City should encourage development within its activity centres in line with current retail trends to maximise expenditure and overall demand. This being said, the City's main goal should be to addressed the policy outcomes specified in the SPP 4.2, ensuring the establishment of a hierarchy of activity centres that promotes, employment, equitable access of goods and services and primacy of activity centres.

The identified trends highlight the fast-changing nature of retail that businesses need to adapt to. It is key to ensure that planning for activity centres allows for flexibility in uses and floorspace areas. The following trends are worth considering as activation and development opportunities arise. [5]

Trend	Description	Drivers
Conscious Retail	Conscious retail is increasingly keeping customers loyal to a brand /distributor.	Many consumers have made a lifestyle choice to have a smaller global footprint, support brands that provide better conditions for factory workers in developing countries, or support local products. Consumers are often willing to pay a premium for these products.
Data Retail	'Big Data' is being used to continually monitor and respond to changing consumer desires, shortening the product cycle.	Collecting and analysing data on retail sales is being used to inform all parts of the retail sale process, from supply chain to understanding customer satisfaction with their purchase. Retailers who don't use data to inform their decisions are much less likely to understand their customer's preferences or forecast demand and may find it difficult to remain competitive with those who do.

[5] http://www.smartcompany.com.au/industries/retail/top-five-retail-trends-watch-2017/; https://www.rangeme.com/blog/6-trends-that-will-reinvent-retail-in-2017/; https://www.appearhere.co.uk/inspire/blog/the-retail-trends-with-staying-power; http://digitalmainstreet.ca/retail-trends-10-experts-share-their-predictions-for-2017/; https://www.vendhq.com/au/university/retail-trends-and-predictions-2017; https://www.digitalpulse.pwc.com.au/retail-trends-2017-paul-zahra/; https://www.forbes.com/sites/bernardmarr/2015/11/10/big-data-a-game-changer-in-the-retail-sector/#63dc4fbd9f37

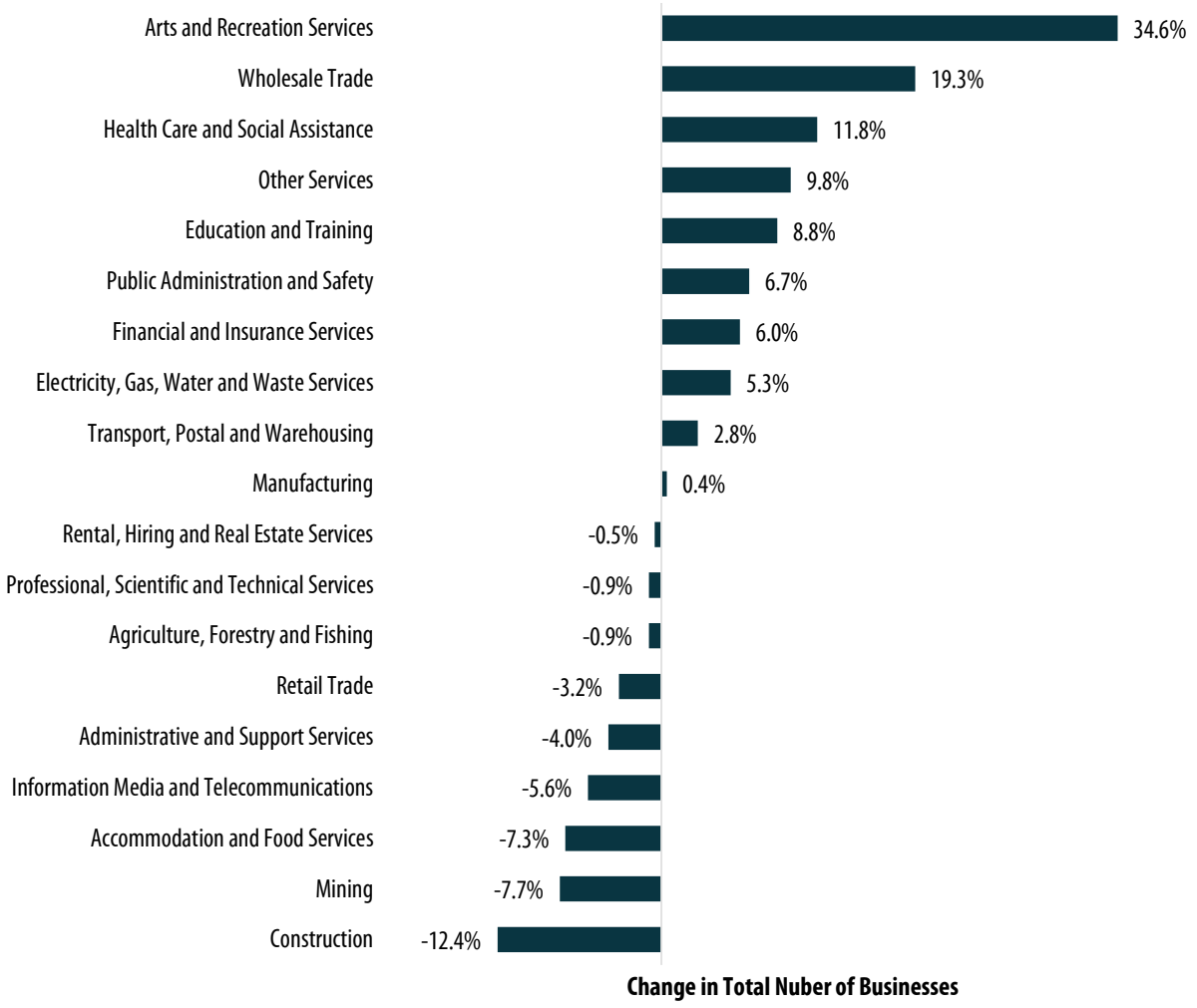
Trend	Description	Drivers
International Retail	The last few years have seen an influx of international brands penetrating the Australian market.	An untapped Australian market and Australian's demanding goods they can see online but cannot purchase locally. Additionally, the ability to geoblock products and charge higher prices in the Australian market has driven demand.
Omnichannel Retail	Digital marketing has been used to keep customers loyal to a brand/distributor.	The emergence of digital marketing across a range of devices, platforms and applications have provided multiple channels for retailers to market their products. Physical stores need an online presence to be competitive, as a consumer may shop using both means at different times.
Mobile Devices	Accessing retail via mobile devices and integrating mobile devices.	Mobile devices are providing unprecedented 24/7 access to retail offerings.
Subscription retail	Subscription retail allows retailers to encourage increased loyalty and connection to their brand.	Retailers need a business model that 'locks in' customers to increase the threshold of switching brand
Fast Retail	Business models comprised of virtual stores accessible from anywhere with fast distribution networks.	Technology has enabled customers to decide when, how and where to go. Consumers are no longer beholden to opening times or physical geography, consumer desires rather than retailers are driving consumption.
Retailtainment	Entertainment as an integral part of the retail experience.	The popularity of online retail channels has resulted in physical retailers needing to provide a retail experience or social experience as a point of difference. Millennials integrate retail and entertainment as a single social experience.
Small Retail	Speciality shops and smaller floorplates are becoming more popular.	Smaller stores with more curated selections, and specialty shops with niche products and more knowledgeable staff are predicted to be more competitive than larger stores where products can be harder to find.
Personal Retail	Consumers are increasingly desiring products that can be personalised.	Consumers are going shopping with a strong idea of what they want, rather than shopping to see what is available and fits their needs. They want to find a product that reflects their personal brand, and is tailored to their needs rather than generic and mass-produced.
Ethical Consumerism	Consumers are considering the ethical and environmental impact of their purchases; where the product was produced and if it reflects their values.	This has been driven by a range of factors such as COVID-19, social media raising awareness around working conditions and environmental impact, news, Oxfam and other organisations that rate brands.
Ecommerce	The rise of online shopping coincides with a rise in e-commerce. Online shopping provides the ability of consumers to stay home and e-commerce has revolutionised who can be a retailer.	This has been driven by fast-paced lives, the rise of social media, more people starting online businesses. Online shopping is what customers are doing and ecommerce is what businesses are doing. This also means in-store shopping has to be enticing or convenient enough to attract consumers.
Buying Local	Supporting local businesses and individuals	Consumers are becoming increasingly willing to purchase from small businesses and locally. This has been exacerbated by COVID-19, with small businesses struggling and a lack of imported goods.

Trend	Description	Drivers
Open Air Shopping Experiences	People are starting to prefer outdoor malls rather than enclosed malls.	People wanting to be in nature, prefer to walk between shops outside rather than in a shopping centre, however, the trade area pull is larger for indoors than outdoors
Circular Fashion	More consumers are turning to be a part of a circular economy model in which they consume and give away items in a more sustainable manner.	This has been driven by second-hand ecommerce like Etsy, people both buying and selling as individuals or small 'brands' and the growth of the sharing economy.
Authenticity	Customers are increasingly wanting to feel a personal connection with brands and are becoming more aware of manipulative advertisements.	Increased availability of information is making consumers more aware of marketing tactics. This is making consumers more inclined to purchase from brands/retailers they feel are authentic.

4.5 Businesses Profile

ABS Business Entries & Exits data indicates that the total number of businesses in the City of Rockingham has declined slightly between 2018-2020 (latest available data), down from 5,564 in 2018 to 5,497 in 2020. It should be noted, however, that the construction industry has experienced a significant decline, down from 1,505 in 2018 to 1,318 in 2020. Excluding this industry, business growth has been relatively strong in the City of Rockingham between 2018-2020 (Figure 23).

Figure 23. Change in Total Number of Businesses by Industry, 2018-2020



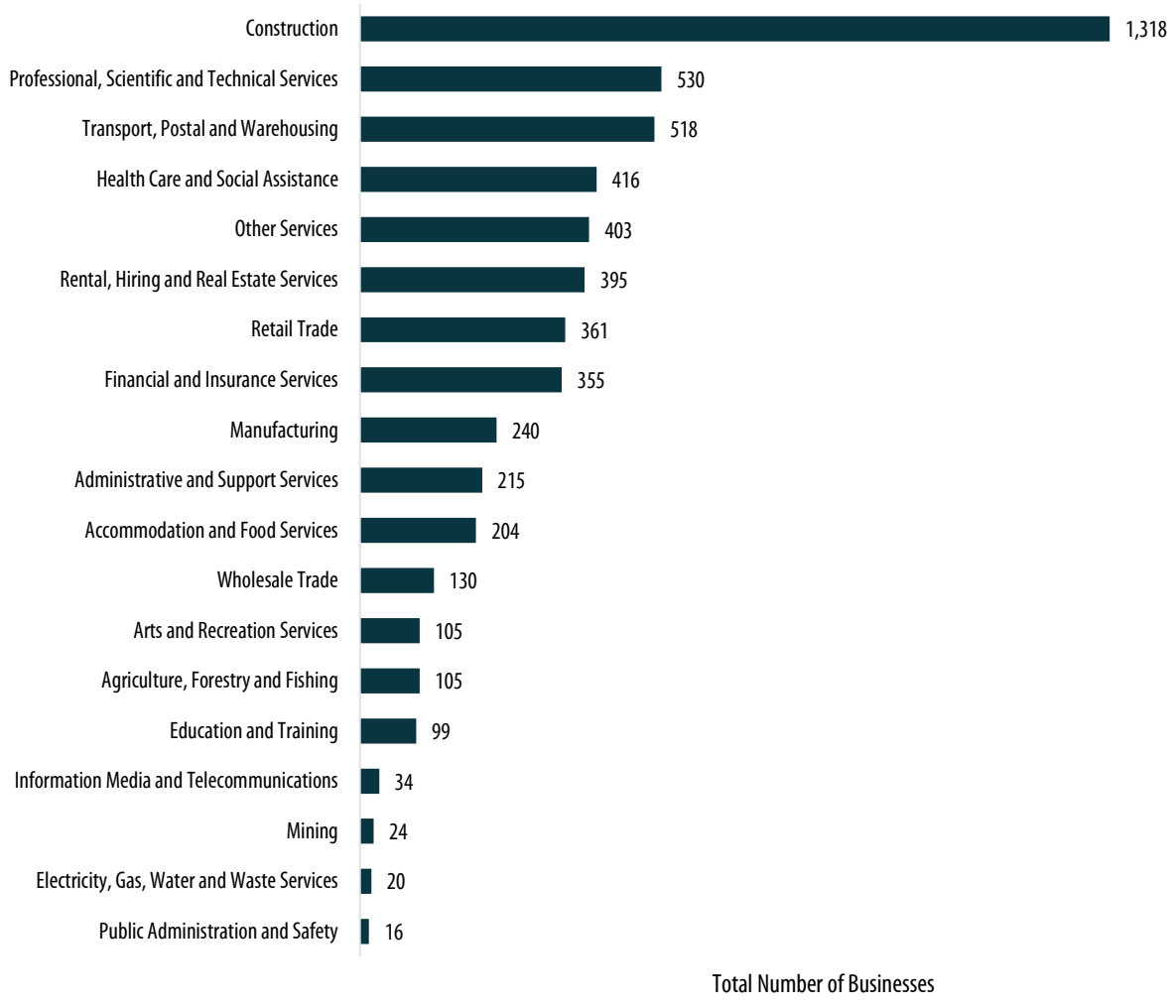
Source: ABS 2020, Pracsys 2021

High growth in Arts and Recreation, Health and Education related businesses align with the high levels of population growth and would be expected to continue, although not at the same rate. Declines in Retail, Accommodation and Food Services are seen as temporary, and it is expected there will be business growth to support continued population growth. These businesses will develop predominantly in activity centres.

Businesses related to Westport such as those in Transport, Postal and Warehousing, and Professional, Scientific and Technical Services are expected to grow as the Westport transition occurs.

The City is forecasting significant dwellings growth over time and may attract construction businesses to grow to support this development. Employment land (i.e. light industrial land) could develop to offer services and products that directly support the significant number of construction businesses, particularly with continued residential dwelling development (Figure 24).

Figure 24. Total Number of Businesses by Industry in the City of Rockingham



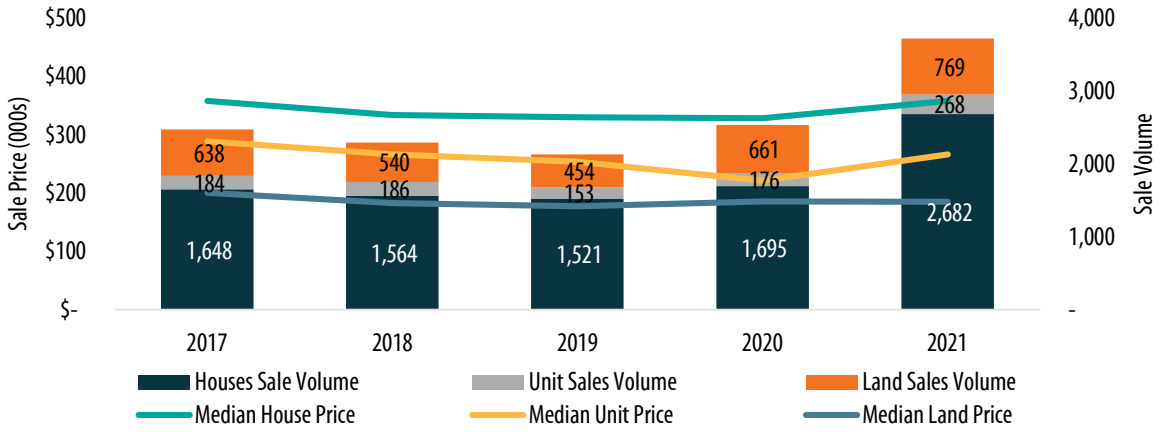
Source: ABS 2020, Pracsys 2020

4.6 Property Market Profile

The analysis has assessed the current residential property market profile in the City of Rockingham. This includes an assessment of sale prices, sales volumes, rental prices, rental volume and rental yield at the suburb level (see Section 13). It should be noted that complete sales data was not available for all suburbs and rental yield was calculated using the average house sale price and average rental return from houses.

Sales Analysis

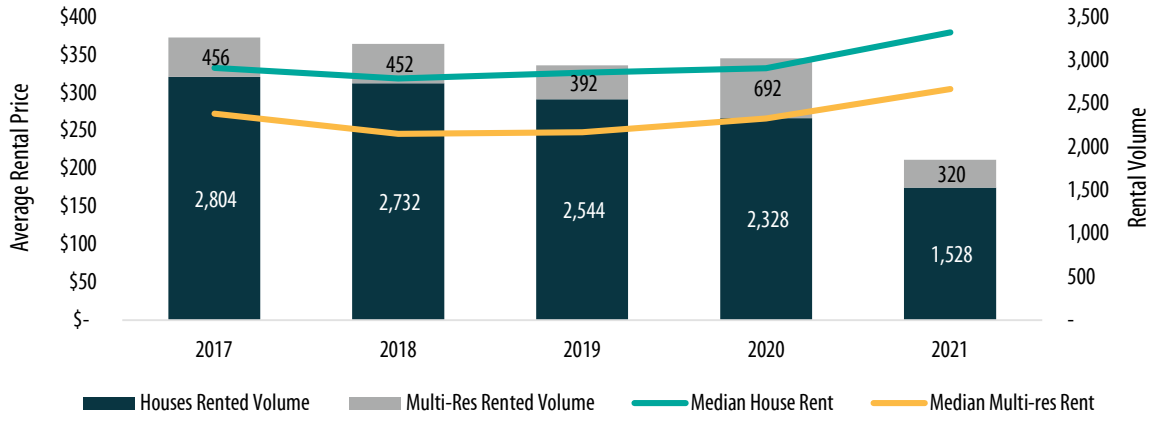
Figure 25. City of Rockingham Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

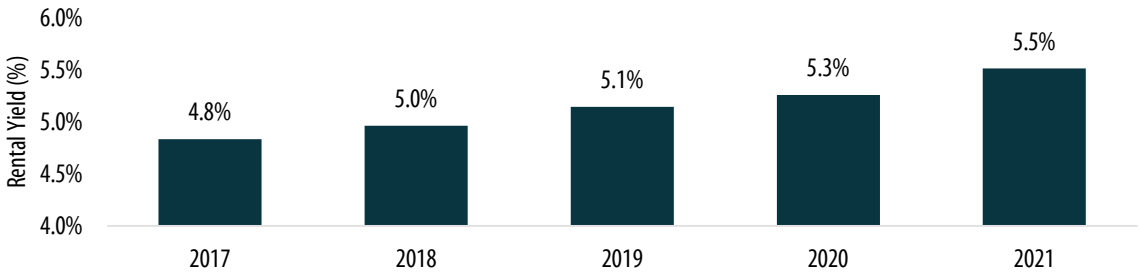
Rental Analysis

Figure 26. City of Rockingham Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 27. City of Rockingham Rental Yield for Houses



Source: REIWA 2021, Pracsys 2021

The assessment of the residential property market in the City has identified that it is experiencing increased property demand. Between 2017 and 2021;

- Total houses purchased have increased by 63%
- House prices have remained constant
- Total units purchased have increased by 46%
- The median unit price declined by approximately $23,000[6]
- Total land purchased it up by 21%
- Land prices have declined by approximately $15,000[7]

Encouragingly, despite the significant increase in greenfield development and the number of properties being constructed, prices have only fallen slightly and demand has increased sharply. It should be noted that this increase is considered significant, as data for 2021 is only a portion of the full year.

For rental properties in 2021, compared to 2017:

- 46% fewer houses have been rented
- The average rental price for houses has increased by approximately $50 per week
- 30% fewer multi-residential properties have been rented
- The average rental price for multi-residential properties has increased by approximately $30 per week

It should be noted that these decreases are not considered significant, due to the data for 2021 only being a portion of the full year and rental restrictions associated with COVID being in place until March 2021. This being said, the number of houses rented in 2020 was down by approximately 17% compared to 2017 and the number of multi-residential properties being rented increased by approximately 250.

The relatively consistent house prices and the increase in rental prices have increased the rental yield of properties in the City, with the rental yield increasing from 4.8% in 2017 to 5.5% in 2021. Increased rental yield is an encouraging sign for investors and reflects the increased demand for properties in the City. It could raise questions of affordability however, and housing affordability should be considered when preparing the LPS.

[6] This could reflect smaller or more affordable apartments becoming available
[7] This could reflect the wider trend for smaller lots being sold

4.7 Floorspace Drivers Summary

This section considers some of the key drivers of floorspace. A summary of findings, includes:

- Age demographics indicate the City of Rockingham may need to target the retail needs of young families when designing and planning activity centres. This could include providing suitable amenities such as playgrounds within viewing distance of cafes and restaurants. Additionally, the significant expected increase in dwellings for the City of Rockingham will further attract young families and activity centres designed around new dwellings should specifically target this demographic
- There are opportunities for wholesale and retail uses that support tradespersons and skilled professionals. These are relevant to Other Retail centres
- A lower proportion of persons within the highest income quintile indicates that residents are likely to spend a greater portion of their income on convenience retail and accordingly, will spend less on comparison items. There could be a shift in income levels as Westport develops and attracts more strategic and knowledge-intensive employment to the sub-region. Private industry will likely adapt to changing purchasing behaviour and there could therefore be changes in floorspace requirements
- High growth in Arts and Recreation, Health and Education related businesses align with the high levels of population growth and would be expected to continue, although not at the same rate.
- Declines in Retail, Accommodation and Food Services are seen as temporary, and it is expected there will be business growth to support continued population growth. These businesses will develop predominantly in activity centres.
- Businesses related to Westport such as those in Transport, Postal and Warehousing, and Professional, Scientific and Technical Services are expected to grow as the Westport transition occurs. These businesses should develop in strategic industrial areas and the RSMC.
- The City is forecasting significant dwellings growth over time and may attract construction businesses to support this development. Employment land (i.e. light industrial land) could develop to offer services and products that directly support the significant number of construction businesses, particularly with continued residential dwelling development
- The relatively consistent house prices and the increase in rental prices have increased the rental yield of properties in the City, with the rental yield increasing from 4.8% in 2017 to 5.5% in 2021. Increased rental yield is an encouraging sign for investors and reflects the increased demand for properties in the City. It could raise questions of affordability however, and housing affordability should be considered when preparing the LPS.

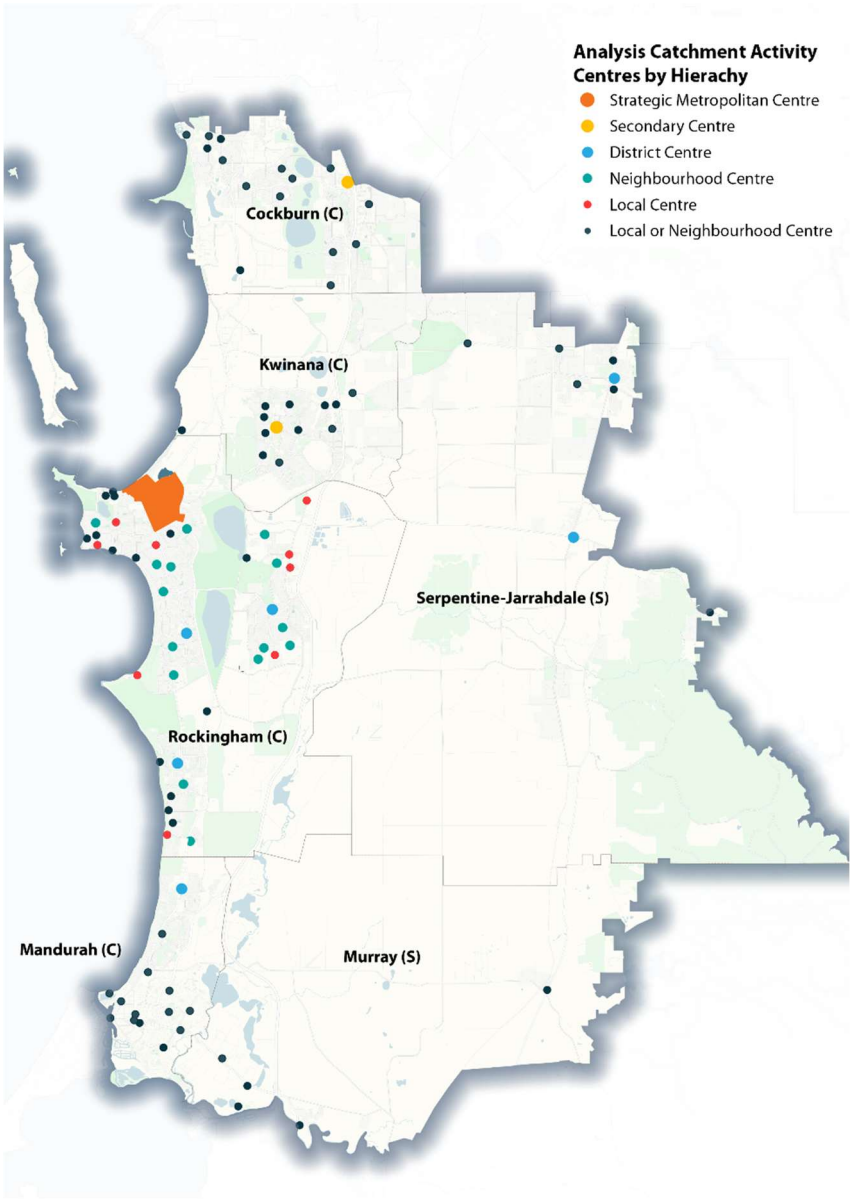
5 CURRENT GAP ANALYSIS

The current gap analysis was developed through consideration of both access to centres and the quantum of floorspace provided. This allowed for consideration of where new centres may be required and the additional floorspace that could be supported based on the City's population.

5.1 Current Activity Centre Hierarchy

The Analysis Catchment's current and future supply profile is mapped with based on centre type (Figure 28).

Figure 28. Analysis Catchment Activity Centres by Hierarchy



Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

Note: Centres were listed as 'Local or Neighbourhood Centre' if they were outside the City of Rockingham or their established position in the activity centre hierarchy was unclear.

Activity centres in the Analysis Catchment provide a total of approximately 1,200,000 m^2 of commercial floorspace (Figure 29).

Figure 29. Commercial Floorspace in the Analysis Catchment

Area	Shop/Retail	Other Retail	Non-Retail
City of Rockingham Centres	207,000	85,000	235,000
Centres Outside of City[8]	295,000	78,000	297,000

Source: DPLH 2016

Note: Shop Retail = Convenience/Comparison Retail, Other Retail = Bulky Goods Retail, Non-Retail Floorspace = (Entertainment, Health, Office, Service Commercial, Storage, Manufacturing). Detailed Floorspace definitions are provided in Appendix 1, Section 10.4, PLUC Definitions

The City's current supply of floorspace has been summarised by precinct with a detailed centre floorspace supply table provided in Section 12 (Figure 30). Precincts are based on previous classification in planning frameworks.

Figure 30. Commercial Floorspace by Precinct

Area	Shop/Retail	Other Retail	Non-Retail
Precinct 1 – Rockingham	112,000	48,000	175,000
Precinct 2 – Warnbro	31,000	18,000	12,000
Precinct 3 – Secret Harbour	23,000	0	10,000
Precinct 4 – Baldivis	41,000	18,000	37,000

Source: DPLH 2016

Note: Shop Retail = Convenience/Comparison Retail, Other Retail = Bulky Goods Retail, Non-Retail Floorspace = (Entertainment, Health, Office, Service Commercial, Storage, Manufacturing). Detailed Floorspace definitions are provided in Appendix 1, Section 10.4, PLUC Definitions

This current supply of floorspace in the Analysis Catchment has been assessed using service ratio modelling and retail gravity modelling (see Section 10) to determine the gaps in floorspace provision for the City's activity centre hierarchy.

5.2 Provision of Centres

The provision of centres was assessed to identify any potential gaps in the activity centre hierarchy. Distance to access centres from where residents live was used to assess the provision of centres. A number of iterations were undertaken to assess the provision of centres:

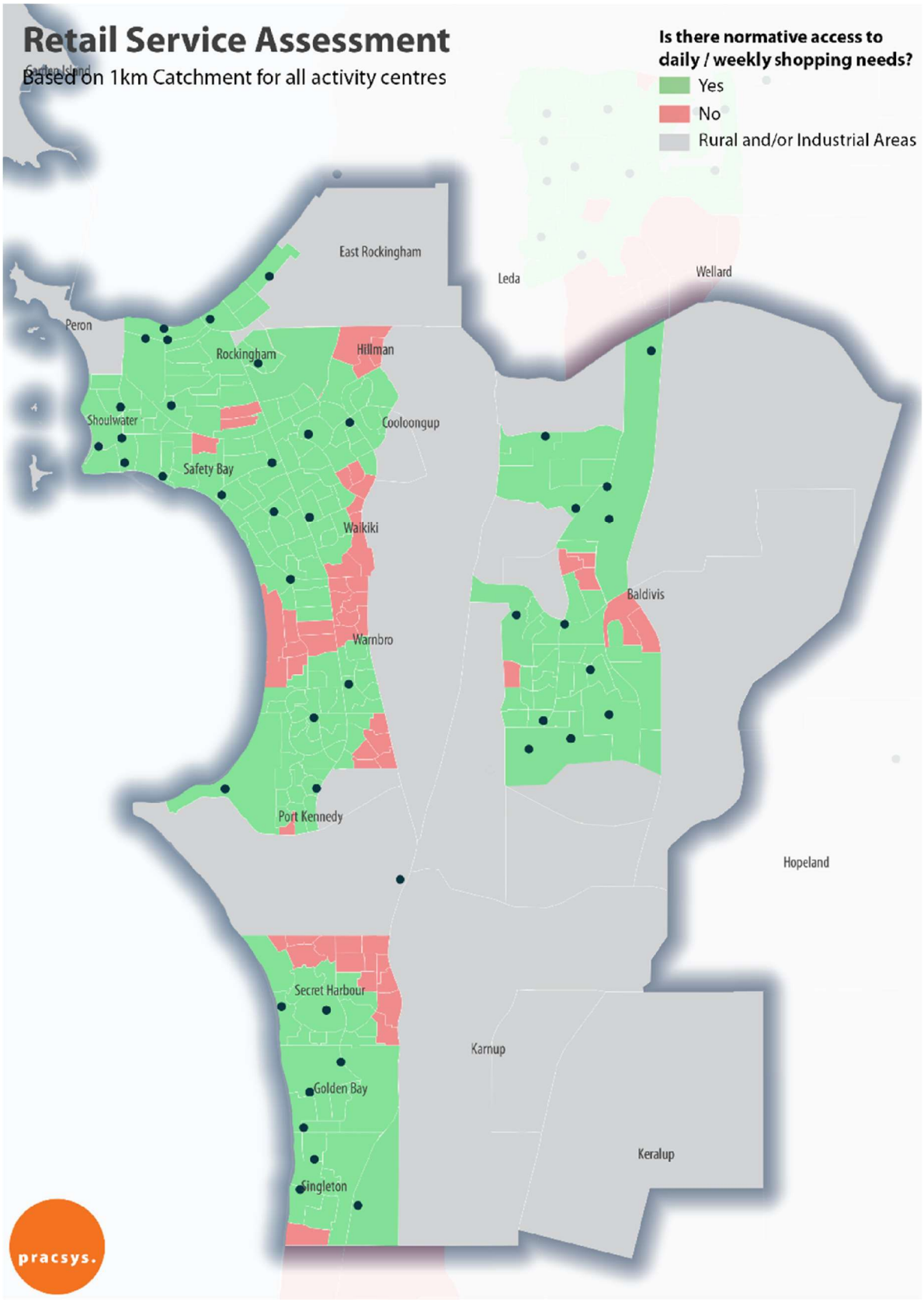
- Minimum Access: The spatial area has overall access to at least one centre and can therefore access a minimum standard of retail service. This was measured based on approximate catchment boundaries (i.e. 10km for a district centre)

[8] These activity centres sit within the entirety of the City of Kwinana and portions of the City of Cockburn, the City of Mandurah and the Shire of Serpentine-Jarrahdale.

- Daily/Weekly Access: The spatial area has overall access to at least one Neighbourhood or Local centre (or larger) and can therefore access an activity centre that provides for daily / weekly shopping needs. This was assessed based on a 1km radius around all centres
- Walkable Access: The spatial area has walkable access to at least one centre (this was assessed at 200m to 800m walkable catchments

It was decided that 1km was a reasonable distance to assess provision given the suburban nature of Rockingham. This means that any ABS SA1 spatial areas that were more than 1km from an activity centre would be identified as having an underprovision. (Figure 31).

Figure 31. Access to Centres Providing for Daily / Weekly Shopping Needs in the City of Rockingham



Source: DPLH & WAPC State Planning Policy 4.2 2020, Pracsys 2021

Within the City, an estimated 35,000 residents do not currently enjoy normatively adequate walkable access to an activity centre providing for their daily/weekly shopping needs, with this number set to grow to 60,000 by 2041 (Figure 32).

Figure 32. Persons Without Normatively Adequate Access to Daily / Weekly Shopping Needs

Area	2021	2026	2031	2036	2041
City of Rockingham	35,000	40,000	45,000	52,000	60,000
Analysis Catchment	108,000	127,000	146,000	169,000	196,000

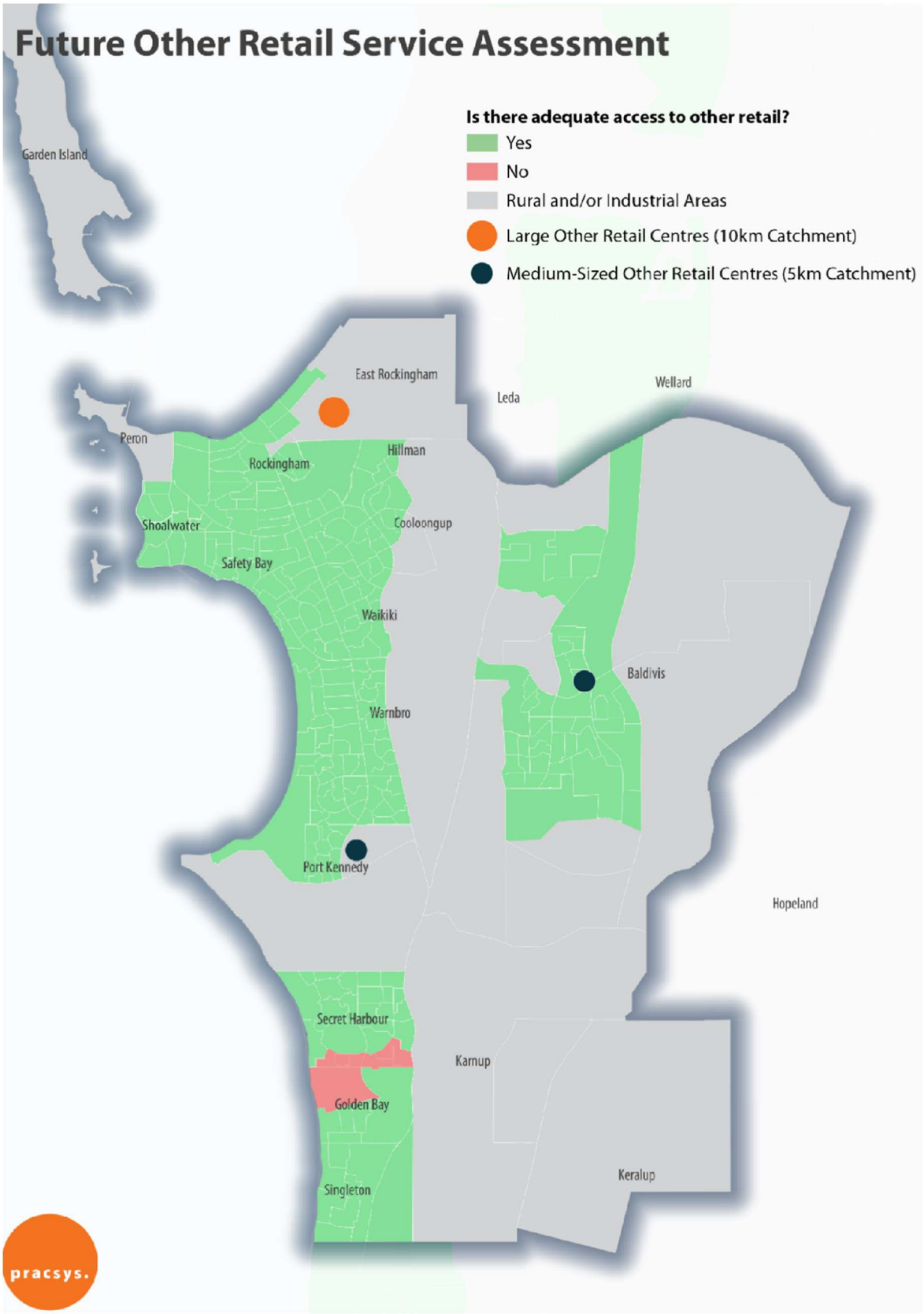
Source: ABS 2016, WA Tomorrow 2018, DPLH & WAPC State Planning Policy 4.2 2020, City of Rockingham 2021, Pracsys 2021

Other Retail Centres

Other retail (bulky goods) centres were assessed based on adequate driveable distance. For Other Retail centres, the analysis has assumed that large centres are accessible if they are within 10km and medium centres are accessible if they are within 5km. Based on this, the analysis shows that the majority of the City of Rockingham has adequate access to an Other retail centre, with a potential gap in the Secret Harbour area (Precinct 3) (Figure 33).

To be considered a 'large' Other Retail centre, it must be a significant employment node and provide bulky goods shopping needs for both residents and businesses. 'Medium' sized Other Retail centres are smaller in size primarily provide bulky goods retailing for residents in the proximate area. The City currently has one large Other Retail centre, located along Dixon Road and Patterson Road and two medium sized Other Retail Centres, located in Baldivis and Port Kennedy.

Figure 33. Access to Other Retail Activity Centres within the City of Rockingham



Source: DPLH & WAPC State Planning Policy 4.2 2020, Pracsys 2022

5.3 Floorspace Gap Analysis

The provision of floorspace across the City's activity centres was compared to the identified benchmarks to determine and quantify current gaps by PLUC floorspace use. Detailed floorspace gaps were also identified at a Western Australian Land Use Category (WASLUC) level; these gaps should provide an indication of uses that could be targeted (see Section 12). Gaps were quantified using the following methods:

Shop/Retail and Other Retail Gaps

The gap in Shop/Retail and Other Retail floorspace was assessed by estimating expenditure at each activity centre through gravity modelling. This expenditure was then divided by the required floorspace to productivity ratio for activity centres to ensure adequate retention of tenants (Figure 34).

Figure 34. Required Floorspace to productivity Ratio by Activity Centre Type

Centre Type	Required Floorspace Productivity
Strategic Metropolitan Centre (Upper Limit)	$6,997 per m^2
Strategic Metropolitan Centre (Lower Limit)	$6,433 per m^2
District Centre	$8,300 per m^2
Neighbourhood Centre	$8,100 per m^2
Local Centre	$8,100 per m^2
Other Retail Centre	$6,500 per m^2

Source: Pracsys 2021

Note: The required floorspace productivity ratio by Centre Type has been estimated by assessing the productivity of other centres using the Property Council of Australia's Shopping Centre Directory and through wider research looking at shopping centre turnover.

Based on this, the level of supportable floorspace at each activity centre was calculated. This was compared to the current provision of floorspace at each centre to identify centres that could be expanded. Using this methodology, the current gap in Shop Retail (SHP) and Other Retail (RET) by Precinct has been estimated (Figure 35).

Figure 35. Current Shop Retail and Other Retail Floorspace Gap by Precinct

Precinct	SHP	RET	Total
Precinct 1 – Rockingham	11,736	3,765	**15,500**
Precinct 2 – Warnbro	4,200	2,402	**6,602**
Precinct 3 – Secret Harbour	2,942	-	**2,942**
Precinct 4 - Baldivis	7,770	214	**7,984**
Total	**26,647**	**6,380**	**33,027**

Source: Pracsys 2021

Note: Figures are based on the City of Rockingham Population Projection Scenario. This scenario assumes higher floorspace productivity for Strategic Activity Centres than the WA Tomorrow Projections.

More detailed information showing the identified gap by activity centre for the City of Rockingham and WA Tomorrow Population Projections are detailed in Section 11.

Non-Retail Gaps

Non-Retail Floorspace gaps were calculated by identifying a suitable floorspace per person ratio by PLUC code based on a number of benchmarked areas. The areas used as benchmarks were 25km catchments from the Mandurah, Armadale and Joondalup Strategic Activity Centres. Based on these benchmarks, the following provision ratios were identified (Figure 36) for Entertainment (ENT), Health/Welfare/Community (HEL), Manufacturing (MAN), Office (OFF), Service (SER) and Storage (STO).

Figure 36. Provision Ratio Benchmarks for Non-Retail Analysis

	PLUC Code					
Spatial Area	**ENT**	**HEL**	**MAN**	**OFF**	**SER**	**STO**
RSMC Study Area	**0.30**	**0.42**	**0.02**	**0.43**	**0.06**	**0.17**
Mandurah Catchment	0.23	0.12	0.06*	0.34	0.07*	0.16*
Armadale Catchment	0.31*	0.23	0.08*	0.49*	0.16*	0.23*
Joondalup Catchment	0.35*	0.57*	0.06*	0.57*	0.17*	0.32*
Analysis Benchmark	**0.33**	**0.57**	**0.07**	**0.54**	**0.15**	**0.26**
Floorspace Provision Gap	**-0.03**	**-0.15**	**-0.05**	**-0.11**	**-0.09**	**-0.09**

Source: DPLH 2017, Pracsys 2021

Note: Figures with an Asterix were used to calculate the Analysis Benchmark. Analysis Benchmarks are weighted averages.

The identified Floorspace Provision Gap was then multiplied by the population in the City at each time interval assessed to determine the current gap in Non-Retail Floorspace. The floorspace gap by PLUC Code and Precinct is shown in Figure 37.

Figure 37. Current Non-Retail Floorspace Gaps by PLUC Code and Precinct

Year	ENT	HEL	MAN	OFF	SER	STO	Total
Precinct 1	7,070	46,084	6,175	16,415	8,141	4,090	**87,976**
Precinct 2	792	288	457	1,170	1,665	1,316	**5,687**
Precinct 3	82	644	116	698	-	1,846	**3,386**
Precinct 4	2,001	494	893	3,937	3,383	7,955	**18,663**
Total	**9,944**	**47,510**	**7,641**	**22,221**	**13,189**	**15,207**	**115,712**

Source: DPLH 2017, Pracsys 2021

It should be noted that the majority of the Health floorspace gap has been assigned to Precinct 1 - Rockingham. This is due to the Joondalup Strategic Centre being utilised as the Health floorspace benchmark. Accordingly, the analysis assumes that the majority of additional health floorspace would be placed in proximity to the Rockingham Strategic Metropolitan Centre.

These floorspace gaps have been distributed to activity centres based on the activity centres current share of floorspace by PLUC Code in the City (i.e. if the Rockingham Strategic Metropolitan Centre has 25% of the total

Entertainment floorspace in the City, it will be allocated 25% of the overall gap in Entertainment floorspace). More detailed information showing the identified gap by activity centre for the City of Rockingham and WA Tomorrow Population Projections are detailed in Section 11.

5.4 Gap Analysis Summary

The Gap Analysis considered both access to centres and gaps in the provision of floorspace. The key findings include:

- Using a 1km walkable catchment from all centres, an estimated 35,000 residents do not currently enjoy normatively adequate walkable access to an activity centre providing for their daily/weekly shopping needs, with this number set to grow to 60,000 by 2041
- The analysis shows that the majority of the City of Rockingham has adequate access to an Other retail centre, with a potential gap in the Secret Harbour area (Precinct 3)
- An assessment of detailed floorspace uses identified gaps in retail and non-retail uses (for detailed floorspace gaps see Section 11).
    - The retail gaps indicate that there are certain specific uses that could improve the diversity in the City's centres. The quantum of retail floorspace gaps has been further assessed through gravity modelling, see Section 6
    - There is a total non-retail floorspace gap of 115,712m^2 based on benchmark analysis

6 FLOORSPACE AND EMPLOYMENT PROJECTIONS

Floorspace projections for Shop/Retail and Other Retail floorspace was assessed by estimating expenditure at each activity centre through gravity modelling. Population projections provided by the City of Rockingham and from WA Tomorrow were then used to project retail demand going forward. This expenditure was then divided by the required floorspace to productivity ratio for activity centres to ensure adequate retention of tenants (Figure 34). Using this methodology, the level of supportable Shop Retail and Other Retail floorspace was estimated in 5-year intervals until 2041, which is the ultimate development scenario for the City Centre.

Floorspace projections for Non-Retail floorspace were estimated by using floorspace per person provision ratio analysis (Figure 36). The identified benchmarked ratios were then used to estimate the floorspace gap based on population projections provided by the City of Rockingham and from WA Tomorrow. The total identified gap in the City was then distributed to activity centres based on each centres share of floorspace by PLUC Code. The estimated change in the activity centres relative provision of Shop/Retail floorspace going forward compared to other centres in the City of Rockingham. For example, if the Rockingham Strategic Metropolitan Centre has 25% of the total Entertainment floorspace in Rockingham, it will be allocated 25% of the overall gap in Entertainment floorspace. However, if the Rockingham Strategic Metropolitan Centre's supply of Shop/Retail floorspace doubled by 2041 and all other centres floorspaces were unchanged, the Rockingham Strategic Centre would be allocated 50% of the gap in Entertainment floorspace in 2041.

The population projections provided by the City are shown in Figure 38 and population projections based on WA Tomorrow projections are shown in Figure 39.[9]

Figure 38. Population Projection based on City of Rockingham Projections

Area	2016	2021	2026	2031	2036	2041
Rockingham Strategic Metropolitan Centre Study Area	237,721	275,899	323,651	371,975	430,349	501,057
Rockingham LGA Population	125,069	142,002	163,062	185,190	212,302	245,632

Source: City of Rockingham 2021, WA Tomorrow 2016, Pracsys 2021

Figure 39. Population Projection based on WA Tomorrow Projections

Area	2016	2021	2026	2031	2036	2041
Rockingham Strategic Metropolitan Centre Study Area	237,721	275,899	314,534	353,017	398,544	452,485
Rockingham LGA Population	125,069	142,002	153,946	166,233	180,497	197,060

Source: WA Tomorrow 2016, Pracsys 2021

Floorspace projections have been developed based on population projections for the Analysis Catchment with specific density targets for the City's Centres.

[9] Forecast.id forecast projections were not used as they were not available for all areas in the catchment. WA Tomorrow may also be preferable for planning purposes as the projections are for the whole of WA, meaning growth in one Local Government accounts for growth in surrounding Local Governments.

6.1 Retail Floorspace Projections

The analysis has assessed residents, workers and international visitors to model the demand over time for convenience and comparison retail in the Analysis Catchment between 2021 and 2041.

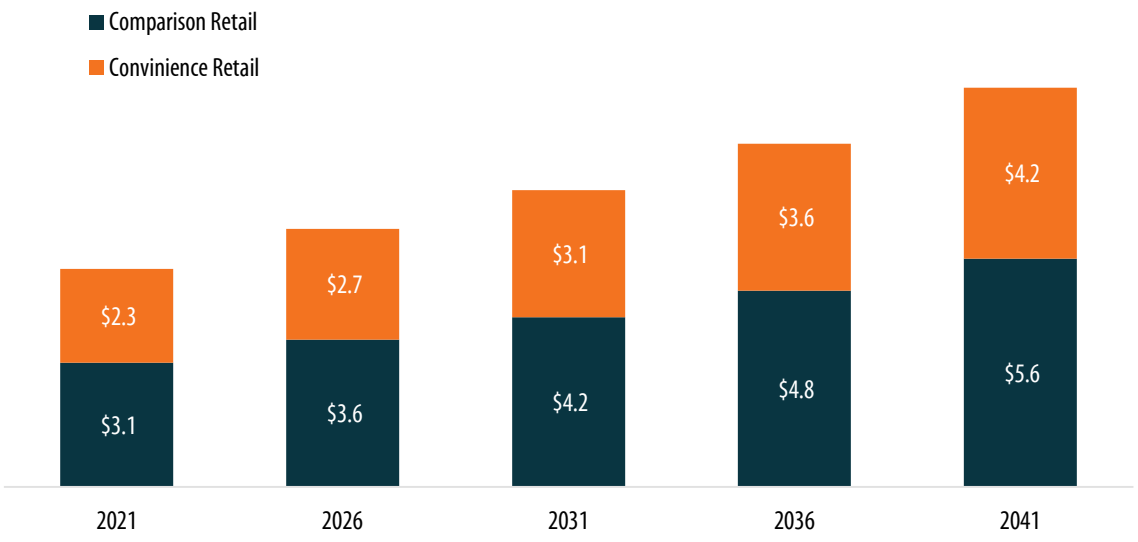
Residential demand

To assess the resident retail demand within the Analysis Catchment the analysis has combined WA Tomorrow projections with expected dwelling increases provided by the City of Rockingham.

The City of Rockingham data provided was specifically for expected dwellings proximate to activity centres and in some instances does not reflect the likely increase in the wider area. To counter this issue, the analysis has used the highest estimate for each spatial area.

Using this methodology, the analysis estimates a total retail demand from residents within the Analysis Catchment of $5.4 billion, increasing to $9.9 billion in 2041. This has been compared to just the WA Tomorrow projections to provide a conservative and aspirational level of expected retail demand (Figure 40).

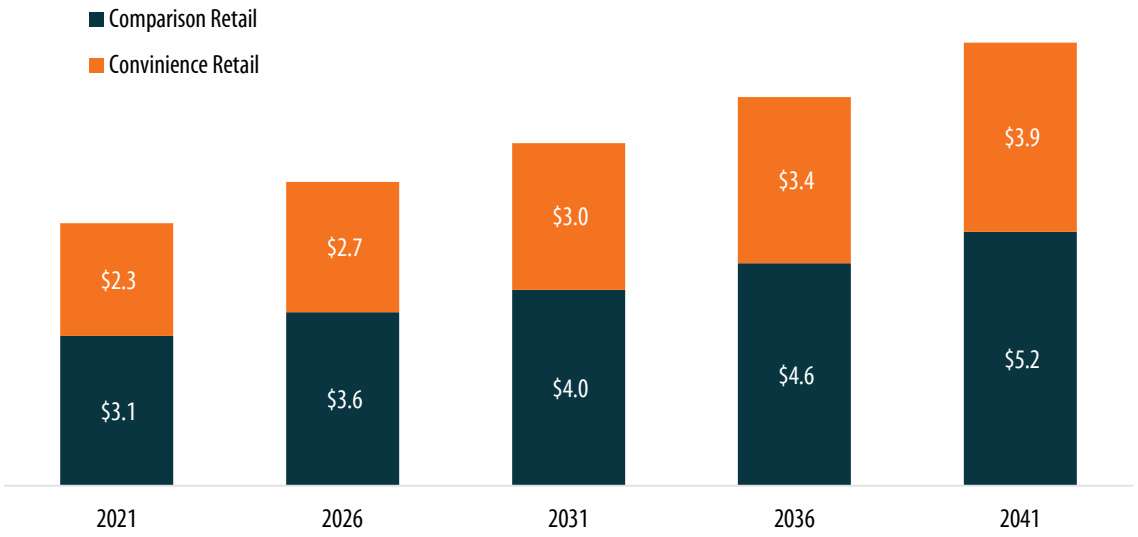
Figure 40. Total Resident Retail Demand with City of Rockingham Projections ($ billions)



Source: WA Tomorrow 2016, City of Rockingham 2021, Pracsys 2021

In total, using the City of Rockingham targets for dwelling growth, the analysis estimates that there will be an additional $0.8 billion in retail expenditure compared to WA Tomorrow projections in 2041 (Figure 41).

Figure 41. Total Resident Retail Demand with WA Tomorrow Projections ($ billions)



Source: WA Tomorrow 2016, City of Rockingham 2021, Pracsys 2021

These projections demonstrate a significant increase in retail goods demand over the next 20 years, indicating there is the potential for significant growth in retail floorspace in the Analysis Catchment. This projected growth in retail goods demand will require the provision of additional floorspace within new and established activity centres.

Visitor and Worker Retail Demand

The analysis has estimated the amount of retail demand that will be derived from visitors and workers over the next twenty years.

International Visitor Demand

Using data provided by the City of Rockingham, it is estimated there is an average of approximately 24,000 international visitors per year. Forecast ID estimates that these visitors on average stay for 22.7 days and Tourism WA estimates they spend $62 per day on their trip in total.[10][11] Of this $62, the analysis estimates approximately $37 is retail expenditure. This results in a per-day visitor spend of $8.50 on comparison retail and $28.76 on convenience expenditure by assessing the breakdown of visitor expenditure from Tourism WA.[12] In total, this results in $4.6 million expenditure on comparison items and $15.5 million on convenience items from international visitors per year.

[10] Forecast ID, 2021, https://economy.id.com.au/rockingham/tourism-visitors-nights
[11] Tourism WA, 2020, https://www.tourism.wa.gov.au/Publications%20Library/Markets%20and%20research/2019/Ad-hoc/LGA%20Factsheets/LGA%20Visitor%20Factsheet%202019%20-%20City%20of%20Rockingham.pdf
[12] Tourism WA, 2021, https://www.tra.gov.au/data-and-research/reports/national-visitor-survey-results-march-2021/national-visitor-survey-results-march-2021

Worker Demand

The analysis has estimated the net flow of expenditure from workers in the Analysis Catchment by subtracting the expenditure from residents in the Analysis Catchment who work outside the Analysis Catchment from persons who live outside of the Analysis Catchment but work within the Analysis Catchment.

$$Net\ Worker\ Flow$$

$$=$$

$$(Residents\ who\ work\ outside\ of\ catchment)$$

$$-$$

$$(Workers\ in\ catchment\ who\ do\ not\ reside\ in\ catchment)$$

The analysis has assumed the portion of residents who work outside of the Analysis Catchment remains constant as the population grows, resulting in retail expenditure leakage from workers increasing with the population.

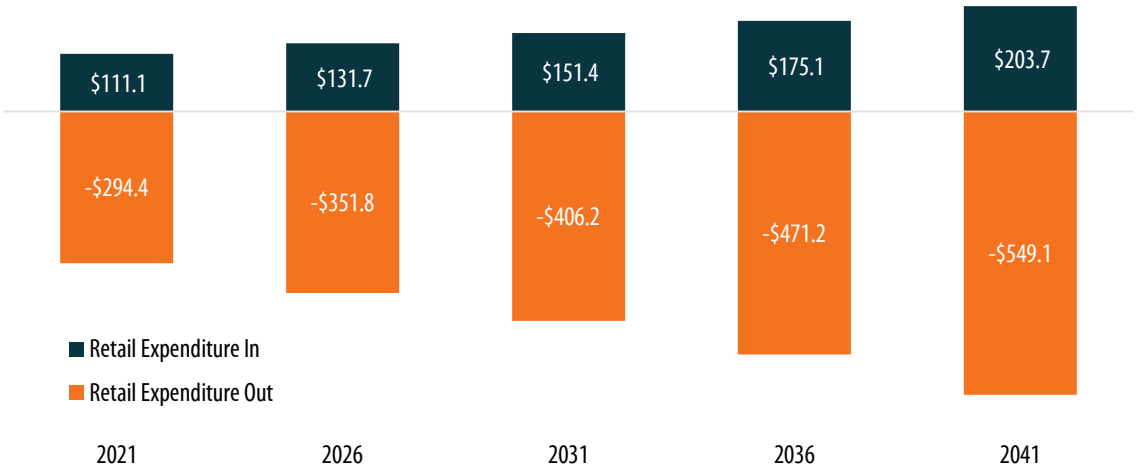
For persons who live outside of the Analysis Catchment but work within the Analysis Catchment, the analysis assumes that the number of people doing so will expand proportionally with Analysis Catchment residential population growth.

This reflects the fact that the total number of workers in the Analysis Catchment economy is likely to grow in line with the floorspace demands of the residential population. In total, there are an estimated 43,000 workers who live in the Analysis Catchment but work outside of it and 16,000 workers who live outside of the Analysis Catchment but work inside of it.[13] For workers, research indicates that the average worker spends $142 per week on Shop/Retail during work hours. [14]

In total, this results in an estimated inflow of $111.1 million in retail expenditure and an outflow of $294.4 million per year in the Analysis Catchment in 2021. This inflow is expected to grow over time to $203.7 million by 2041, with worker expenditure outflow estimated to increase to $549.1 million (Figure 42).

[13] ABS Census, 2016, https://www.abs.gov.au/websitedbs/censushome.nsf/home/tablebuilder
[14] International Council of Shopping Centers, 2012, http://www.southfieldcitycentre.com/wp-content/uploads/2012/06/Office-Worker-Retail-Spending-in-a-Digital-Age.pdf

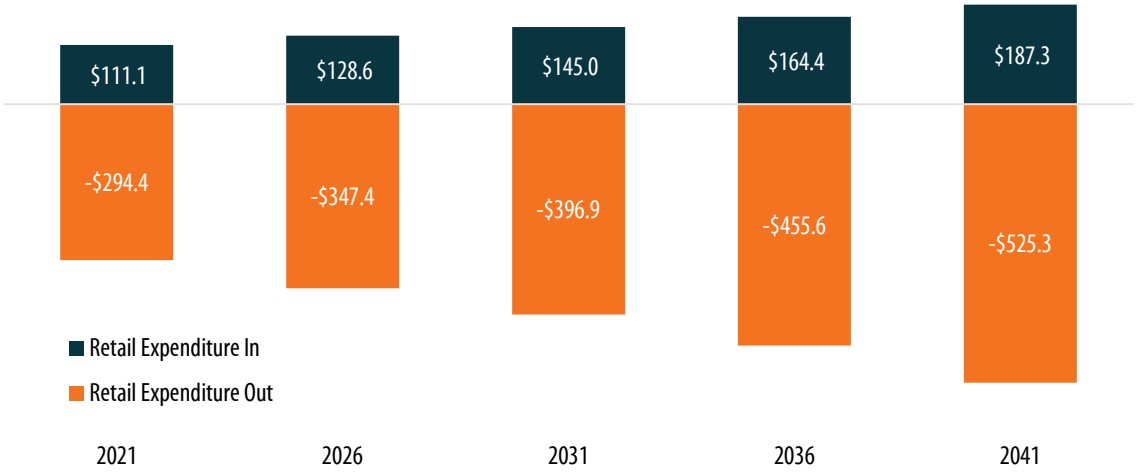
Figure 42. Worker Expenditure Flow with City of Rockingham Projections Over Time ($ millions)



Source: WA Tomorrow 2016, City of Rockingham 2021, Pracsys 2021

Using conservative population estimates from WA Tomorrow, this outflow is estimated to be $525.3 million in 2041 (Figure 43).

Figure 43. Worker Expenditure Flow with WA Tomorrow Projections Over Time ($ millions)

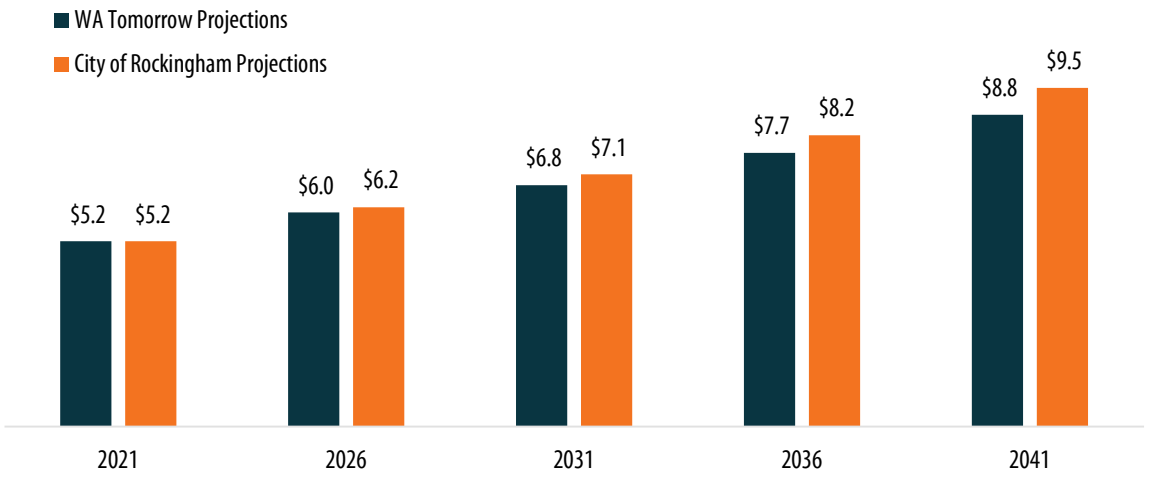


Source: WA Tomorrow 2016, City of Rockingham 2021, Pracsys 2021

Spatial-Longitudinal Demand Projections

In total, the analysis estimates retail expenditure within the Analysis Catchment to be $5.2 billion in 2021, with this expenditure growing to $9.5 billion in 2041 using City of Rockingham dwelling projections or $8.8 billion using WA Tomorrow population projections (Figure 44).

Figure 44. Total Retail Expenditure in the Analysis Catchment Over Time



Source: WA Tomorrow 2016, City of Rockingham 2021, Pracsys 2021

Section 10.1, Figure 80, Figure 81, Figure 82 and Figure 83 illustrate how household retail demand is expected to change spatially over time at the SA1 level as the Analysis Catchment's population expands and densifies.

The current and future household demand for retail within the Analysis Catchment has been mapped at detailed spatial areas through the use of the Pracsys Retail Gravity Model.

Based on this analysis, the total supportable increase in Shop Retail and Other Retail floorspace over time has been estimated (Figure 45).

Figure 45. Total Supportable Increase in Shop Retail and Other Retail Floorspace Over Time

City of Rockingham Population Projections Scenario				
Year	**Shop Retail**	**Other Retail**	**Total**	**Estimated Population**
2021	20,889	6,380	27,270	142,002
2026	26,954	18,634	45,588	163,062
2031	58,976	33,720	92,696	185,190
2036	102,759	52,051	154,810	212,302
2041	157,438	74,398	231,836	245,632
WA Tomorrow Population Projections Scenario				
Year	**Shop Retail**	**Other Retail**	**Total**	**Estimated Population**
2021	26,647	6,380	33,027	142,002
2026	20,628	14,602	35,231	153,946
2031	36,692	25,352	62,044	166,233
2036	58,759	38,022	96,780	180,497
2041	84,844	52,975	137,819	197,060

Source: Pracsys 2021

It should be noted that in 2026 a number of future centres are included in the modelling and accordingly, the supportable increase in the WA Tomorrow Population Projections supportable Shop Retail floorspace decreases from 2021 – 2026. These future centres are not part of the increases stated.

The City of Rockingham can viably increase floorspace by the amounts stated in Figure 45 under the premise that the population estimates detailed in Figure 38 and Figure 39 are met within the City of Rockingham and wider study area. If the City does not meet a particular population target, the level of additional supportable Shop Retail and Other Retail floorspace can be estimated based on the population target that is closest to reality (i.e. if the City of Rockingham has only 185,000 residents in 2041, which was the target for 2031, the 2031 increase in Shop Retail and Other Retail floorspace is applicable).

6.2 Non-Retail Floorspace Projections

As detailed in Section 5.3, the level of supportable Non-Retail floorspace has been estimated based on floorspace provision per person ratio analysis and a number of benchmarked areas. Using this methodology, the analysis demonstrates that the City of Rockingham can significantly increase Non-Retail floorspace in both the City of Rockingham Population Projection and the WA Tomorrow Population Projection scenarios (Figure 46).

Figure 46. Total Supportable Increase in Non-Retail Floorspace Over Time

City of Rockingham Population Projections Scenario								
Year	ENT	HEL	MAN	OFF	SER	STO	Total	Estimated Population
2021	9,944	47,510	7,641	22,221	13,189	15,207	115,712	142,002
2026	16,997	63,321	9,092	33,493	16,347	20,674	159,923	163,062
2031	24,407	79,663	10,617	45,337	19,665	26,418	206,106	185,190
2036	33,486	99,563	12,485	59,847	23,730	33,456	262,566	212,302
2041	44,647	123,873	14,781	77,687	28,728	42,108	331,824	245,632
WA Tomorrow Population projections Scenario								
Year	ENT	HEL	MAN	OFF	SER	STO	Total	Estimated Population
2021	9,944	47,510	7,641	22,221	13,189	15,207	115,712	142,002
2026	13,944	59,505	8,464	28,614	14,980	18,307	143,814	153,946
2031	18,058	71,728	9,310	35,190	16,822	21,497	172,607	166,233
2036	22,835	86,250	10,293	42,825	18,961	25,200	206,365	180,497
2041	28,382	103,534	11,434	51,690	21,445	29,499	245,984	197,060

Source: Pracsys 2021

Note: ENT = Entertainment/Recreation/Cultural, HEL = Health/Welfare/Community Services, MAN = Manufacturing/Processing/Fabrication, OFF = Office/Business, SER = Service Industrial, STO = Storage/Distribution

The City of Rockingham can viably increase floorspace by the amounts stated in Figure 46 under the premise that the population estimates detailed in Figure 38 and Figure 39 are met within the City of Rockingham and

wider study area. If the City does not meet a particular population target, the level of additional supportable Non-Retail floorspace can be estimated based on the population target that is closest to reality.

6.3 Employment Targets

The South Metropolitan Peel Sub-Regional Planning Framework provides Employment Self-Sufficiency (ESS) targets for the region. ESS represents the jobs available in a sub-region compared to the labour force of the sub-region. An ESS of 100% means that a sub-region has an equal number of jobs and labour force. The assessment has estimated the employment supportable at the City's Activity Centres based on population growth. This section considers the additional employment requirements to achieve a targeted ESS in the City.

The broader South Metropolitan Peel ESS target for 2050 is 74%. By 2050, the target for the south west sector (the Cities of Cockburn, Kwinana and Rockingham) are to provide for a total of 195,115 jobs, which is an additional 121.090 or 108% increase from 2011 figures Based on the anticipated population for the South west sector of 478,120, the ESS target is 83% by 2050.

The City's ESS was approximately 50% in 2016, indicating the City provided jobs for half of its total labour force. There is a requirement for significant employment growth in order for the City to reach the identified ESS targets. Strategic employment opportunities associated with the RSMC and development of Westport will be key in supporting this employment growth. The 2020 Rockingham Employment Study considered the potential employment requirements of the City with projections based on population growth and other development opportunities.

Employment estimates from the Rockingham Employment Study for non-activity centre employment have been combined with activity centre estimates to approximate the additional employment required to achieve an ESS target of 74%.

The Employment Study identified three population growth scenarios:

- Low: estimated total City population of 214,000 in 2050
- Medium: estimated total City population of 248,000 in 2050
- High: estimated total City population of 298,000 in 2050

Population growth from the Employment Study was aligned with population growth estimates from the WA Tomorrow (WAT) and City of Rockingham (COR) scenarios in the Needs Assessment to identify suitable comparisons **(**Figure 47).

Figure 47. Needs Assessment Alignment to Employment Study Scenarios

Scenario	Employment Area	Employment Study Equivalent	Reasoning
WAT	RSMC	Low Population / Medium Employment	The Low population growth scenario reaches a population of approximately 200,000 in 2041 which aligns with the WA Tomorrow projections (See Figure 3.4, Page 33 of the Employment Study). The Medium Employment scenario reflects slightly higher than population

Scenario	Employment Area	Employment Study Equivalent	Reasoning
			growth employment in the RSMC providing an understanding of the additional employment that the RSMC could support.
WAT	Other Employment Land	Low Population Growth/Low Employment Scenario adjusted to 2041 population	The Low population growth scenario reaches a population of approximately 200,000 in 2041 which aligns with the WA Tomorrow projections (See Figure 3.4, Page 33 of the Employment Study). The Low employment scenario is based on population growth only which aligns with the Needs Assessment assumptions outside of the RSMC.
CoR	RSMC	Medium Population / Medium Employment	The medium population growth scenario in the Employment Study results in a population of approximately 250,000 which aligns with the CoR estimate of 248,000. The Medium Employment scenario reflects slightly higher than population growth employment in the RSMC providing an understanding of the additional employment that the RSMC could support.
CoR	Other Employment Land	Medium Population Growth / Low Employment	The medium population growth scenario in the Employment Study results in a population of approximately 250,000 which aligns with the CoR estimate of 248,000. The Low employment scenario is based on population growth only which aligns with the Needs Assessment assumptions outside of the RSMC.

Source: Syme Marmion & Co 2020, Pracsys 2021

This alignment was used to estimate the total employment (at activity centres and on other employment lands) that could be expected outside of the RSMC based on population growth. It is also used to estimate the additional employment that could be supported at the RSMC based on potential catalytic projects, above that calculated in the Needs Assessment (Figure 48).

Figure 48. Relevant Employment Study Estimates

Scenario	Employment Area	Employment Study Estimate
WAT	Jobs RSMC	12,797
	Jobs Rest of City	28,711
COR	Jobs RSMC	19,307
	Jobs Rest of City	34,426

Source: Syme Marmion & Co 2020, Pracsys 2021

The estimated gap in employment without considering future employment land and catalyst projects in the RSMC amounts to between 31,000m^2 and 40,000m^2 (Figure 49).

Figure 49. Employment Gap Without Future Employment Land

Employment Category	WAT Employment	CoR Employment
Employment Target 2041 (74% ESS)	70,833	88,292
Needs Assessment 2041 - RSMC	10,697	14,252
Needs Assessment 2041 – Other Centres	13,139	15,442
Jobs Rest of City	15,572	18,984

Employment Category	WAT Employment	CoR Employment
Gap to Target ESS	31,425	39,614

Source: Syme Marmion & Co 2020, Pracsys 2021

The Employment Study identified North-East Baldivis, Karnup (Core) and Karnup (South) as future employment areas.[15] Employment was projected to 2050 and has been estimated at 2041 for the purpose of understanding implications for the Needs Assessment (Figure 50).

Figure 50. Employment Study - Future Employment Land Estimates

Future Employment Land	Employment Adjusted to 2041 (jobs)
North East Baldivis	5,724
Karnup (Core)	8,621
Karnup (South)	8,552

Source: Syme Marmion & Co 2020, Pracsys 2021

These employment estimates have been used to refine the gap estimate for both scenarios (Figure 51).

Figure 51. Employment Gap with Future Employment Land

Employment Area	WAT (jobs)	CoR (jobs)
Gap to Target ESS	31,425	39,614
Future Employment Land	22,897	22,897
Additional RSCM Employment (based on Employment Study)	2,101	5,055
Remaining Gap	6,428	11,662

Source: Syme Marmion & Co 2020, Pracsys 2021

It is estimated that the employment gap to reach a target ESS of 74% would require an additional 2,100 to 5,100 jobs in the RSMC and 6,400 and 11,700 jobs on other employment lands. These results reflect the importance of the RSMC in providing employment opportunities to meet Sub-regional employment targets. The Southern Metropolitan Peel Framework currently provides a target of only 12,290 jobs in the RSMC. Under the CoR scenario the RSMC will need at least 14,252 jobs to meet the goods and services needs of the surrounding population, without further contributing to ESS targets. The findings of the Rockingham Employment Study and our analysis indicate that regional ESS targets are not likely to be achieved without a greater concentration of employment in the RSMC.

Employment Drivers to Achieve Additional RSMC Employment

The additional employment at the RSMC would need to come from catalytic projects that support strategic employment opportunities. The Employment Study defines employment activities in line with the Strategic

[15] Considerations to support the development of the Karnup DSP are provided in Section 8.5, Karnup DSP.

Metropolitan Centre roll of the RSMC that could be targeted to achieve greater employment levels. These include:[16]

- Primary regional institutions including a full-service university, major health campus with teaching capabilities, State government administration, and high-level arts and entertainment
- Business services for nearby industrial areas, the naval base and defence industries, and Westport
- Tourist activities including business travel and visitation for the surrounding area

The significant population relying on the RSMC as their primary Strategic Metropolitan Centre would benefit from having access to higher-order services such as a university, reducing their need to travel significant distances to access the services elsewhere in the Metropolitan area. It would also facilitate access to residents of surrounding areas that have lower socio-economic status and may be limited in their ability to access services elsewhere.

Westport and Western Trade Coast

The announcement of Westport at the WTC is a significant opportunity for development at the RSMC, which is the closest higher order centre. The Employment Study identified a significant proportion of office floorspace currently at the WTC. Strategic port-related uses will create significant demand for land as Westport develops and will likely lead to a transition of uses in the WTC. The uses that are most likely to transfer are those that are population-related and/or do not need to be located on strategic industrial land. The RSMC is ideally located near the WTC to attract office related uses.

Employment Drivers to Achieve Remaining Out of Centre Employment

Out of centre development will be driven by strategic employment opportunities, particularly associated with defence, the WTC and Westport; and population-driven light industrial services for the wider sub-region. The City has a range of current and potential future employment land to accommodate this development including the strategic East Rockingham industrial area and future potential industrial areas such as North East Baldivis and potential employment land in Karnup.

The strategic East Rockingham area should see significant land demand as Westport develops. These uses are likely to be heavy industrial in nature and land-intensive. The Employment Study indicates this land could support an additional 5,900 jobs. Another strategic industrial opportunity identified in the Employment Study is HMAS Stirling, which is identified as having the potential to expand to 7,000 jobs in the medium term.

Light industrial uses are driven by population growth. Latitude 32 is a major industrial land holding with approximately 1,400ha of developable land. Much of the Latitude 32 industrial area has been planned as light industrial; however, the introduction of Westport is likely to increase the need for strategic industrial land to support heavy industrial uses at Latitude 32. This means that light industrial land uses for the wider sub-region will need to locate in other suitable locations. The future employment land (i.e. North East Baldivis and Karnup)

[16] More detailed drivers and opportunities for employment growth are provided in the Rockingham Employment Study 2020

identified in the Employment Study are suitable to accommodating these light industrial uses, particularly given their location adjacent to the Kwinana Freeway.[17] The Employment Study indicated that Future Employment Land could support a total of almost 23,000 jobs in the long term.

Employment Distribution Within the RSMC

The RSMC is made up of eleven individual sectors that provide a mix of employment and non-commercial opportunities. Certain sections are more suited to meeting the needs of different users such as residents, visitors and workers. The following table summarises the types of employment that should be targeted by sector (Figure 52).

Figure 52. Employment Activities Aligned with RSMC Sectors

Sector	Employment Opportunity
City Centre	Office based employment – Private (i.e. regional offices for businesses in the WTC) Office based employment – Public (i.e. State Administration) Shop Retail uses catering to the wider RSMC catchment Entertainment uses catering to the wider RSMC precinct (i.e. small bars, clubs, etc.) Shop Retail uses catering to high-density development within the RSMC Health and community services catering to high-density development within the RSMC
Waterfront and North Waterfront	Accommodation (i.e. short stay, hotels, etc.) Tourism uses (i.e. Shop Retail, Entertainment and Recreation activities aimed at tourists) Cultural and creative uses catering to the wider RSMs catchment and tourists (i.e. theatre, spaces for buskers, etc.) Entertainment uses catering to the wider RSMC catchment and tourists (i.e. small bars, clubs, etc.) Shop Retail uses catering to high-density development within the sector Non-Retail uses catering to high-density development within the sector Some office floorspace – less of a priority than for the City Centre but the location may attract interest from larger organisations
Smart Village and Campus	Tertiary education services for the wider RSMC catchment Creative employment linked to education Health services that may benefit from proximity to tertiary education facilities Shop Retail uses catering to residents, workers and visitors to the sector Secondary education services for some of the City of Rockingham population

[17] The Karnup DSP will investigate the scale and suitability of commercial uses over the Karnup area. See Section 8.5, Karnup DSP for recommendations to support the DSP.

Sector	Employment Opportunity
	Recreation services for some of the City of Rockingham population
Eastern	Shop Retail uses catering to residential development within the sector Limited non-retail uses (i.e. similar provision to a local centre) (i.e. office, recreation and health) catering to residential development within the sector
Southern Gateway and Rockingham Station	Limited shop Retail uses (i.e. similar provision to a local centre) catering to residential development within the sector
Leeuwin	Shop Retail uses catering to residential development within the sector Uses or clear pathway that connects the City Centre to the waterfront sectors

Source: Pracsys 2022

This table does not summarise all employment activities that will locate in these areas. For instance, regional recreation facilities will likely need to be either expanded or provided to cater for the additional population in the RSMC, however, they might not be provided for within the centre. The proposed opportunities will need to be considered within the context of the draft RSMC Planning Framework with some uses potentially constrained or prioritised in different sectors.

Additional Floorspace Requirements

Additional floorspace will be necessary to support the employment required to meet an ESS target of 74%. High-level floorspace estimates have been developed using benchmarks and assumptions. Floorspace related to the RSMC has been modelled based on additional Education, Accommodation and Office floorspace (health was not modelled as the Needs Assessment already incorporated a higher benchmark for health floorspace uses) (Figure 53). Other employment land was modelled using an aggregate benchmark for light industrial uses (Figure 54).

Figure 53. Benchmarks for Additional RSMC Employment

Benchmark	Assumption	Measure	Note
Employment			
Future ECU Perth City	Education	WAT: 600 COR: 1,200	50% of benchmark achieved in WAT
Bunbury CBD	Accommodation	WAT: 154 COR: 309	50% of benchmark achieved in WAT
It is assumed that office employment will be the difference required to achieve the additional required employment.		WAT: 1,347 COR: 3,546	N/A
Floorspace to Employment Ratio			
Murdoch	Education	76m^2 per employee	This was in between estimates for UWA and Curtin

Benchmark	Assumption	Measure	Note
Average Industrial Total	Office	24m^2 per employee	Slightly higher than the average for commercial floorspace (20m^2). Representative of office for business services related to WTC and Westport
Scarborough	Accommodation	313m^2 per employee	Centre with predominantly commercial accommodation related Residential floorspace

Source: DPLH 2016, WA State Government 2021

Figure 54. Benchmarks for Additional Out of Centre Employment

Benchmark	Assumption	Measure	Note
Bibra Lake Industrial Area	Light Industrial Uses	135m^2 per employee	The average of these was used to estimate additional floorspace requirements
Malaga Industrial Area	Light Industrial Uses	92m^2 per employee	

Source: DPLH 2016

Applying these benchmarks, it is estimated that the RSMC would need an additional 126,000m^2 to 273,000 m^2 in commercial floorspace to support the additional employment estimates (Figure 55).

Figure 55. Additional Floorspace Estimates to Meet ESS Target

Floorspace Uses	WAT Floorspace (m^2)	CoR Floorspace (m^2)
RSMC		
Education	45,600	91,200
Accommodation	48,200	96,800
Office	32,317	85,098
Other Employment Land		
Light Industrial	732,990	1,329,878

Source: Pracsys 2021, DPLH 2016

An additional 733,000m^2 to 1,330,000m^2 in light Industrial floorspace uses would be required on other employment lands. This floorspace represents a subcomponent of the employment identified in the Employment Study and identified future employment land should be able to accommodate the required development. Should additional employment lands need to be identified in the long term, some key economic considerations include:

- Proximity to relevant customer (i.e. population – light industry, businesses – heavy industry)
- Appropriate road and/or freight access
- Compatible uses (i.e. heavy industry uses are not compatible with residential development)
- Access to necessary infrastructure (i.e. special waste disposal requirements, etc.)
- Land constraints (if site works will be too expensive, commercial uses may not be viable)

Private industry will likely indicate appropriate locations for additional employment land through development applications. Appropriate analysis and planning should be commissioned by the City when the current provision of future employment land is approaching full capacity.

6.4 Scenario Assessment

Based on the floorspace and employment projections the analysis has estimated the level of floorspace and employment that will be supportable at each precinct in the City of Rockingham (Figure 56).

Figure 56. Supportable Additional Employment and Floorspace by Precinct and Scenario in 2041

Precinct 1				
Floorspace Type	**Shop Retail + Other Retail**		**Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	122,615	2,921	248,239	5,776
WA Tomorrow	40,237	444	183,384	4,141
Additional Floorspace on Future Employment Land and in Precinct 1 to Meet ESS Target				
Floorspace Type	**Light Industrial**		**Education/Accommodation/Office**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham: Additional to meet ESS Target	1,329,878	11,662	273,106	5,055
WA Tomorrow: Additional to meet ESS Target	732,990	6,428	126,165	2,101
Precinct 2				
Floorspace Type	**Shop Retail + Other Retail**		**Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	21,851	264	14,458	614
WA Tomorrow	16,402	130	12,391	534
Precinct 3				
Floorspace Type	**Shop Retail + Other Retail**		**Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	30,105	1,114	13,965	357
WA Tomorrow	16,624	714	9,891	249
Precinct 4				
Floorspace Type	**Shop Retail + Other Retail**		**Non-Retail**	
Population Projection Scenario	**Floorspace**	**Employment**	**Floorspace**	**Employment**
City of Rockingham	57,265	1,813	55,161	1,966
WA Tomorrow	30,618	1,289	40,318	1,467

Source: Pracsys 2021

A more detailed breakdown of this analysis by year and activity centre is provided in Section 7.

6.5 Floorspace and Employment Projection Summary

The floorspace and employment projections provide an understanding of the floorspace required to support population demand for goods and services. They also estimate the additional employment and floorspace required for the City to achieve an ESS of 74%. Key findings from the section include:

- There is an estimated total retail demand from residents within the Analysis Catchment of $5.4 billion, increasing to $9.9 billion in 2041
- There is an estimated $20 million in retail expenditure from international visitors per year
- Through worker movements into and out of the Analysis Catchment, there is an estimated inflow of $111.1 million in retail expenditure and an outflow of $294.4 million per year in the Analysis Catchment in 2021. This inflow is expected to grow over time to $203.7 million by 2041, with worker expenditure outflow estimated to increase to $549.1 million. The expenditure outflow would be reduced if an ESS of 74% was achieved
- Total additional retail floorspace in the City is estimated to be between 138,000m^2 and 232,000m^2
- Total additional non-retail floorspace in the City is estimated to be between 246,000m^2 and 333,000m^2
- It is estimated that the employment gap to reach a target ESS of 74% would require an additional 2,100 to 5,100 jobs in the RSMC and 6,400 and 11,700 jobs on other employment lands. These results reflect the importance of the RSMC in providing employment opportunities to meet Sub-regional employment targets. The Southern Metropolitan Peel Framework currently provides a target of only 12,290 jobs in the RSMC. Under the CoR scenario the RSMC will need at least 14,252 jobs to meet the goods and services needs of the surrounding population, without further contributing to ESS targets. The findings of the Rockingham Employment Study and our analysis indicate that regional ESS targets are not likely to be achieved without a greater concentration of employment in the RSMC.
- The significant population relying on the RSMC as their primary Strategic Metropolitan Centre would benefit from having access to higher-order services such as a university, reducing their need to travel significant distances to access the services elsewhere in the Metropolitan area. It would also facilitate access to residents of surrounding areas that have lower socio-economic status and may be limited in their ability to access services elsewhere.
- The strategic East Rockingham area should see significant land demand as Westport develops. These uses are likely to be heavy industrial in nature and land intensive. The Employment Study indicates this land could support an additional 5,900 jobs. Another strategic industrial opportunity identified in the Employment Study is HMAS Stirling, which is identified as having the potential to expand to 7,000 jobs in the medium term.
- The Employment Study indicated that Future Employment Land could support a total of almost 23,000 jobs in the long term.

- it is estimated that the RSMC would need an additional 126,000m^2 to 273,000 m^2 in commercial floorspace to support the additional employment estimates to achieve an ESS of 74%
- An additional 733,000m^2 to 1,330,000m^2 in light Industrial floorspace uses would be required on other employment lands to achieve an ESS of 74%
- Should additional employment lands need to be identified in the long term, some key economic considerations include:
    - Proximity to relevant customer (i.e. population – light industry, businesses – heavy industry)
    - Appropriate road and/or freight access
    - Compatible uses (i.e. heavy industry uses are not compatible with residential development)
    - Access to necessary infrastructure (i.e. special waste disposal requirements, etc.)
    - Land constraints (if site works will be too expensive, commercial

7 ACTIVITY CENTRE HIERARCHY

The Activity Centre Hierarchy for the City of Rockingham has been developed based on the City of Rockingham population projections and the modelling detailed above. This hierarchy has been split by precinct.

This section provides estimates for the level of supportable floorspace at each activity centre going forward until 2041. It should be noted that the level of supportable floorspace is dependent on population and the City of Rockingham should increase the provision of floorspace at activity centre when certain thresholds of population within a precinct are achieved. The population levels used to guide this analysis are shown in Figure 57.

Figure 57. Population by Precinct Over Time

Precinct	2021	2026	2031	2036	2041
Precinct 1 – Rockingham	46,491	54,021	61,387	71,139	84,042
Precinct 2 – Warnbro	23,996	24,039	24,202	24,377	24,562
Precinct 3 – Secret Harbour	23,186	28,600	34,717	42,143	51,159
Precinct 4 - Baldivis	46,324	54,063	62,194	71,548	82,308

Source: City of Rockingham 2021, Pracsys 2021

Additionally, if centres are not able to grow, their estimated supportable increase in floorspace should be distributed throughout other centres in their precinct. Further recommendations regarding implementation of the Needs Assessment are included in Section 8, Implementation.

7.1 Potential Activity Centre Hierarchy Changes

There are a number of centres that could potentially change centre classification based on projected growth (Figure 58). These changes have been assessed and recommendations provided.

Figure 58. Activity Centre Hierarchy Assessment

Centre and Current Classification	Floorspace change to 2036 (m^2)	Comment
Baldivis Town Centre District Centre	+7,000m^2 Shop Retail +8,032m^2 Other Retail +12,629m^2 Non-Retail	The analysis does not account for activity centres (including a potential district centre) being developed in Karnup. These future centres will likely support some goods and service needs of population growth in South Baldivis, reducing the pressure on the BTC to transition into a Secondary Centre. It is recommended that no change to classification be considered at this point. Analysis for the Karnup DSP should include the BTC and consider the need for a change in future.
Parkland Heights Neighbourhood Centre	+6,500m^2 Shop Retail +5,000m^2 Non-Retail	The analysis does not account for activity centres (including a potential district centre) being developed in Karnup. These future centres will likely support some goods and

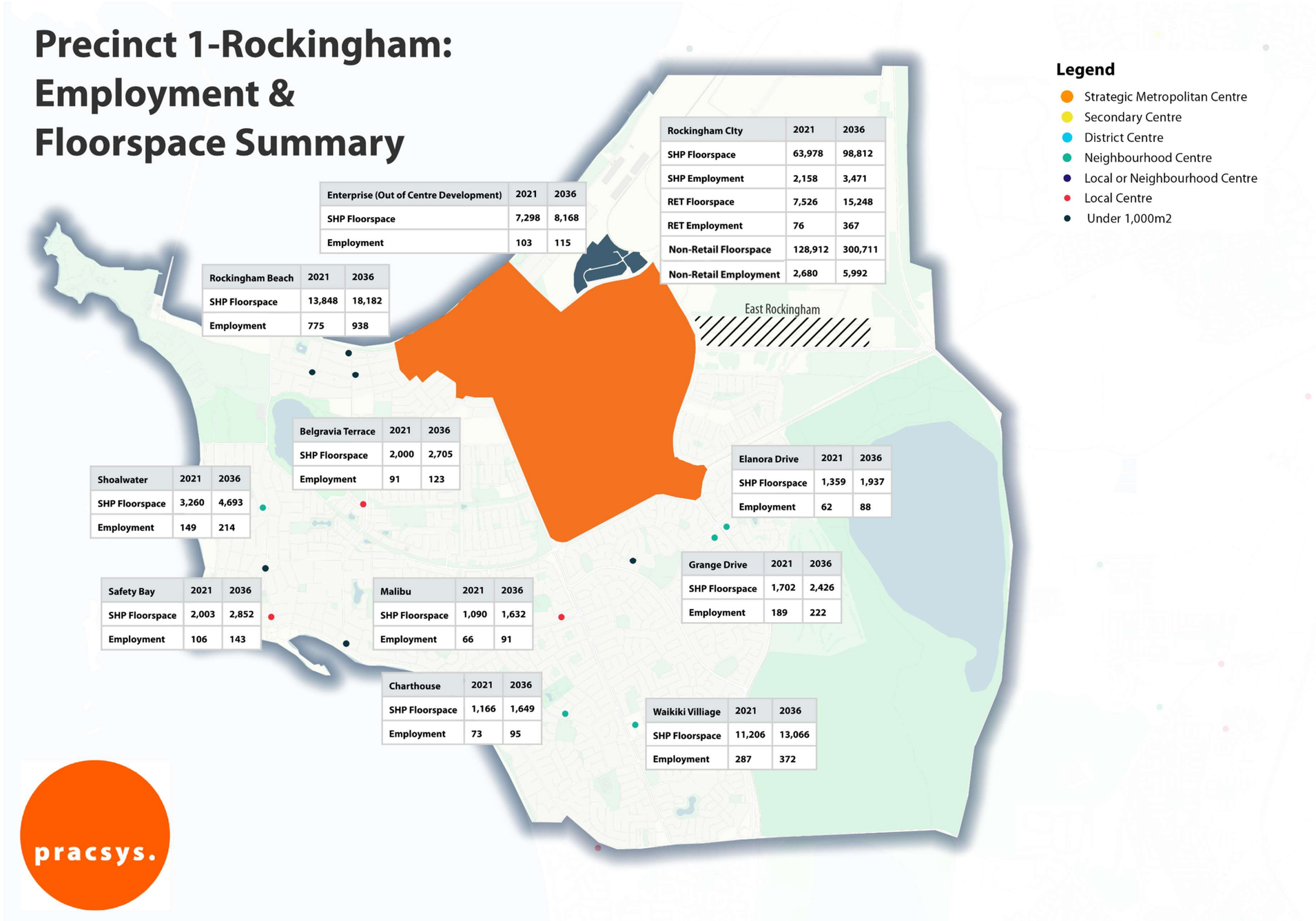
Centre and Current Classification	Floorspace change to 2036 (m^2)	Comment
		service needs of population growth in South Baldivis, reducing the pressure on Parkland Heights to transition into a District Centre. It is recommended that no change to classification be considered at this point. Analysis for the Karnup DSP should include Parkland Heights and consider the need for a change in future.
Local Centres – Most notably Millars Landing	A number of local centres could expand beyond the notional Shop Retail provision of 1,500m^2 for a local centre. Millars Landing is expanding from 2,500m^2 to over 5,000m^2 Shop Retail floorspace.	SPP4.2 (2010) identified local centres as supporting up to 1,500m^2 Shop Retail floorspace. This is not intended to be a cap as can be seen by a number of local centres within the City's current activity centre hierarchy that contain greater than 1,500m^2 Shop Retail floorspace. Where the role of the centre does not change it is recommended that the classification of Local Centre can remain. The Millars Landing centre appears to be the only Local Centre who's role could change. Its Shop Retail floorspace will almost double and would likely include the provision of additional supermarket or department store floorspace to support any additional specialty retail. This type of change would expand the catchment of the centre with a selection of goods and services that could cater more for the weekly shopping requirements of the surrounding population. While this expansion may be justified, it is recommended that any proposed expansions should clearly identify the need for a change in centre classification and be assessed against the criteria provided in Section 8, Implementation.

Source: Pracsys 2022

7.2 Precinct 1 – Rockingham Centre Catchment

Precinct 1 is the most significant precinct in the City of Rockingham due to it containing the Rockingham Strategic Metropolitan Centre, Rockingham District Hospital, the Enterprise Service Commercial precinct and East Rockingham Industrial Area. The Rockingham Strategic Metropolitan Centre is expected to grow significantly over time and will accommodate an additional 14,000 dwellings by 2041. Due to this, significant employment and floorspace increases have been attributed to this precinct. It should be noted that significant employment and floorspace are attributed to the Centre's function in the hierarchy as a Strategic Centre for the sub-region.

Figure 59. Precinct 1 Activity Centre Map



Pracsys 2021

Figure 60. Precinct 1 Activity Centres - Supportable Additional Floorspace (Not Cumulative)

		Estimated Floorspace			2021 (Additional)			2026 (Additional)			2031 (Additional)			2036 (Additional)			2041 (Additional)		
Centre Type	**Centre Name**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**
Service Commercial	Enterprise	7,298	17,368	2,787	-	1,704	1,027	-	5,596	1,354	-	9,219	1,599	870	13,679	2,011	2,430	19,189	2,617
Strategic Metropolitan Centre	Rockingham	63,978	7,526	128,912	1,764	1,801	77,846	8,402	3,679	105,508	19,665	5,463	135,299	34,834	7,722	171,799	54,546	10,591	217,278
Strategic Metropolitan Centre	Rockingham Beach	13,848	306	35,661	-	33	5,621	-	107	7,789	1,345	177	10,348	4,334	265	14,152	8,220	377	18,980
Neighbourhood Centre	Charthouse	1,166	-	-	395	-	-	346	-	-	403	-	-	483	-	-	583	-	-
Neighbourhood Centre	Elanora Drive	1,359	-	-	333	-	-	289	-	-	410	-	-	578	-	-	787	-	-
Neighbourhood Centre	Grange Drive	1,702	-	1,394	417	-	381	362	-	647	513	-	846	724	-	1,063	986	-	1,306
Neighbourhood Centre	Shoalwater	3,260	219	1,254	322	34	334	486	73	551	887	110	752	1,433	159	984	2,146	221	1,263
Neighbourhood Centre	Waikiki Village	11,206	330	1,310	1,542	82	421	1,138	97	602	1,437	110	722	1,860	127	835	2,389	148	945
Local Centre	Arcadia Drive	382	218	274	94	85	241	-	136	295	-	188	336	-	248	372	18	319	422
Local Centre	Belgravia Terrace	2,000	-	913	-	-	348	110	-	480	362	-	632	705	-	816	1,157	-	1,045
Local Centre	Bell Street	98,611	-	489	68	-	147	106	-	232	204	-	315	336	-	415	507	-	538
Local Centre	Bent Street	570	-	-	50	-	-	51	-	-	90	-	-	145	-	-	216	-	-
Local Centre	Fisher street	200	-	-	12	-	-	23	-	-	54	-	-	97	-	-	152	-	-
Local Centre	Malibu	1,090	-	912	337	-	158	336	-	328	423	-	446	542	-	570	695	-	705
Local Centre	McLarty Street	482	-	-	50	-	-	42	-	-	79	-	-	130	-	-	195	-	-
Local Centre	Parkin Street	246	-	130	36	-	13	53	-	32	96	-	51	154	-	73	230	-	101
Local Centre	Safety Bay	2,033	-	961	442	-	785	412	-	1,094	583	-	1,277	819	-	1,478	1,123	-	1,709
Local Centre	Safety Bay Road	548	-	192	116	-	310	119	-	429	175	-	500	253	-	581	353	-	678
Local Centre	Soyara Place	70	-	150	1	-	278	1	-	337	5	-	403	11	-	479	19	-	568
Local Centre	Waikiki Hotel	-	138	40	-	26	65	-	38	73	-	50	79	-	65	83	-	84	86
Other Retail Centre	East Rockingham	-	22,049	-	-	-	-	-	1,289	-	-	4,916	-	-	9,392	-	-	14,934	-
	Total	**112,049**	**48,154**	**175,378**	**5,978**	**3,765**	**87,976**	**12,277**	**11,013**	**119,750**	**26,732**	**20,233**	**153,606**	**48,308**	**31,657**	**195,709**	**76,752**	**45,863**	**248,239**

Pracsys 2021

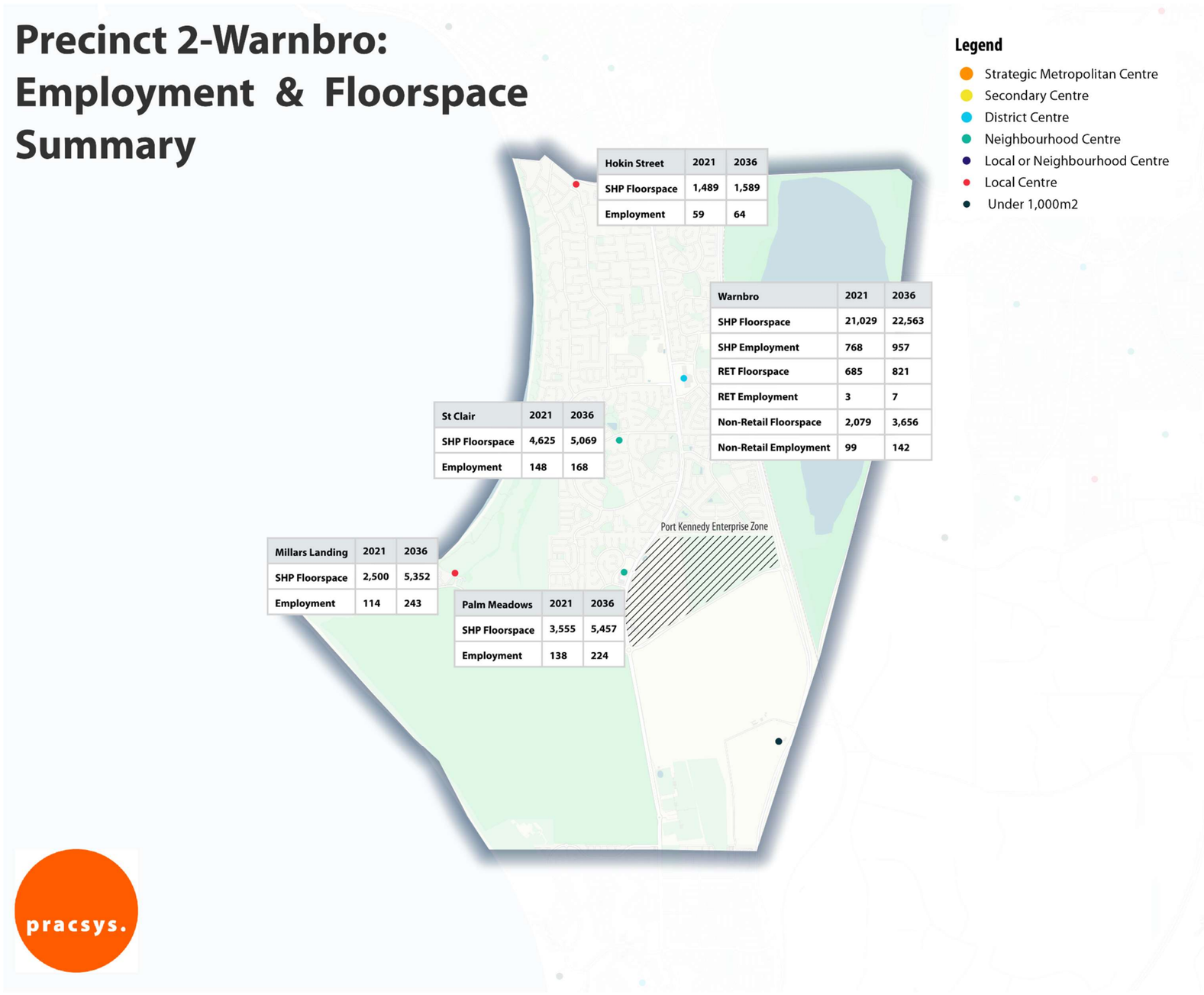
Figure 61. Precinct 1 Activity Centres - Supportable Total Floorspace

		Estimated Floorspace			2021			2026			2031			2036			2041		
Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Neighbourhood Centre	Enterprise	7,298	17,368	2,787	7,298	19,072	3,814	7,298	22,964	4,141	7,298	26,587	4,386	8,168	31,047	4,798	9,728	36,557	5,404
Strategic Metropolitan Centre	Rockingham	63,978	7,526	128,912	65,742	9,327	206,758	72,380	11,205	234,420	83,643	12,989	264,211	98,812	15,248	300,711	118,524	18,117	346,190
Strategic Metropolitan Centre	Rockingham Beach	13,848	306	35,661	13,848	339	41,282	13,848	413	43,450	15,193	483	46,009	18,182	571	49,813	22,068	683	54,641
Neighbourhood Centre	Charthouse	1,166	-	-	1,561	-	-	1,512	-	-	1,569	-	-	1,649	-	-	1,749	-	-
Neighbourhood Centre	Elanora Drive	1,359	-	-	1,692	-	-	1,648	-	-	1,769	-	-	1,937	-	-	2,146	-	-
Neighbourhood Centre	Grange Drive	1,702	-	1,394	2,119	-	1,775	2,064	-	2,041	2,215	-	2,240	2,426	-	2,457	2,688	-	2,700
Neighbourhood Centre	Shoalwater	3,260	219	1,254	3,582	253	1,588	3,746	292	1,805	4,147	329	2,006	4,693	378	2,238	5,406	440	2,517
Neighbourhood Centre	Waikiki Village	11,206	330	1,310	12,748	412	1,731	12,344	427	1,912	12,643	440	2,032	13,066	457	2,145	13,595	478	2,255
Local Centre	Arcadia Drive	382	218	274	476	303	515	382	354	569	382	406	610	382	467	645	400	537	696
Local Centre	Belgravia Terrace	2,000	-	913	2,000	-	1,261	2,110	-	1,392	2,362	-	1,545	2,705	-	1,729	3,157	-	1,957
Local Centre	Bell Street	611	-	489	679	-	636	717	-	721	815	-	804	947	-	904	1,118	-	1,027
Local Centre	Bent Street	570	-	-	620	-	-	621	-	-	660	-	-	715	-	-	786	-	-
Local Centre	Fisher street	200	-	-	212	-	-	223	-	-	254	-	-	297	-	-	352	-	-
Local Centre	Malibu	1,090	-	912	1,427	-	1,070	1,426	-	1,240	1,513	-	1,358	1,632	-	1,482	1,785	-	1,617
Local Centre	McLarty Street	482	-	-	532	-	-	524	-	-	561	-	-	612	-	-	677	-	-
Local Centre	Parkin Street	246	-	130	282	-	143	299	-	162	342	-	181	400	-	203	476	-	231
Local Centre	Safety Bay	2,033	-	961	2,475	-	1,746	2,445	-	2,055	2,616	-	2,238	2,852	-	2,439	3,156	-	2,670
Local Centre	Safety Bay Road	548	-	192	664	-	502	667	-	621	723	-	692	801	-	773	901	-	870
Local Centre	Soyara Place	70	-	150	71	-	428	71	-	487	75	-	553	81	-	629	89	-	718
Local Centre	Waikiki Hotel	-	138	40	-	164	105	-	176	113	-	188	119	-	203	123	-	222	126
Other Retail Centre	East Rockingham	-	22,049	-	-	22,049	-	-	23,338	-	-	26,965	-	-	31,441	-	-	36,983	-
	Total	**112,049**	**48,154**	**175,378**	**118,027**	**51,919**	**263,354**	**124,326**	**59,167**	**295,129**	**138,780**	**68,387**	**328,985**	**160,356**	**79,812**	**371,087**	**188,801**	**94,017**	**423,618**

In total, the Rockingham Strategic Centre is estimated to be able to support 140,000m^2 of Shop Retail, 18,000m^2 of Other Retail and 400,000m^2 of Non-Retail floorspace in 2041.

7.3 Precinct 2 – Warnbro District Centre Catchment

Figure 62. Precinct 2 Activity Centre Map



Pracsys 2021

Figure 63. Precinct 2 Activity Centres - Supportable Additional Floorspace (Not Cumulative)

		Estimated Floorspace			2021 (Additional)			2026 (Additional)			2031 (Additional)			2036 (Additional)			2041 (Additional)		
Centre Type	**Centre Name**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**
District Centre	Warnbro	21,029	685	2,079	1,912	28	743	-	60	1,081	673	95	1,186	1,534	136	1,383	2,547	186	1,577
Neighbourhood Centre	Palm Meadows	3,555	-	6,280	1,653	-	2,345	1,170	-	4,229	1,500	-	5,442	1,902	-	6,715	2,373	-	8,087
Neighbourhood Centre	St Clair	4,625	-	560	512	-	529	84	-	615	245	-	687	444	-	753	674	-	816
Local Centre	Hokin Street	1,489	460	2,762	122	102	1,809	50	116	2,288	69	130	2,619	100	146	2,909	138	168	3,185
Local Centre	Kennedy Bay	1,500	-	684	Not Built	Not Built	Not Built	350	-	421	497	-	535	680	-	658	897	-	793
Other Retail Centre	Port Kennedy Enterprise Park	-	17,139	-	-	2,272	-	-	4,907	-	-	7,655	-	-	10,938	-	-	14,868	-
	Total	**32,198**	**18,284**	**12,365**	**4,200**	**2,402**	**5,426**	**1,654**	**5,083**	**8,634**	**2,985**	**7,879**	**10,469**	**4,659**	**11,221**	**12,418**	**6,629**	**15,221**	**14,458**

Pracsys 2021

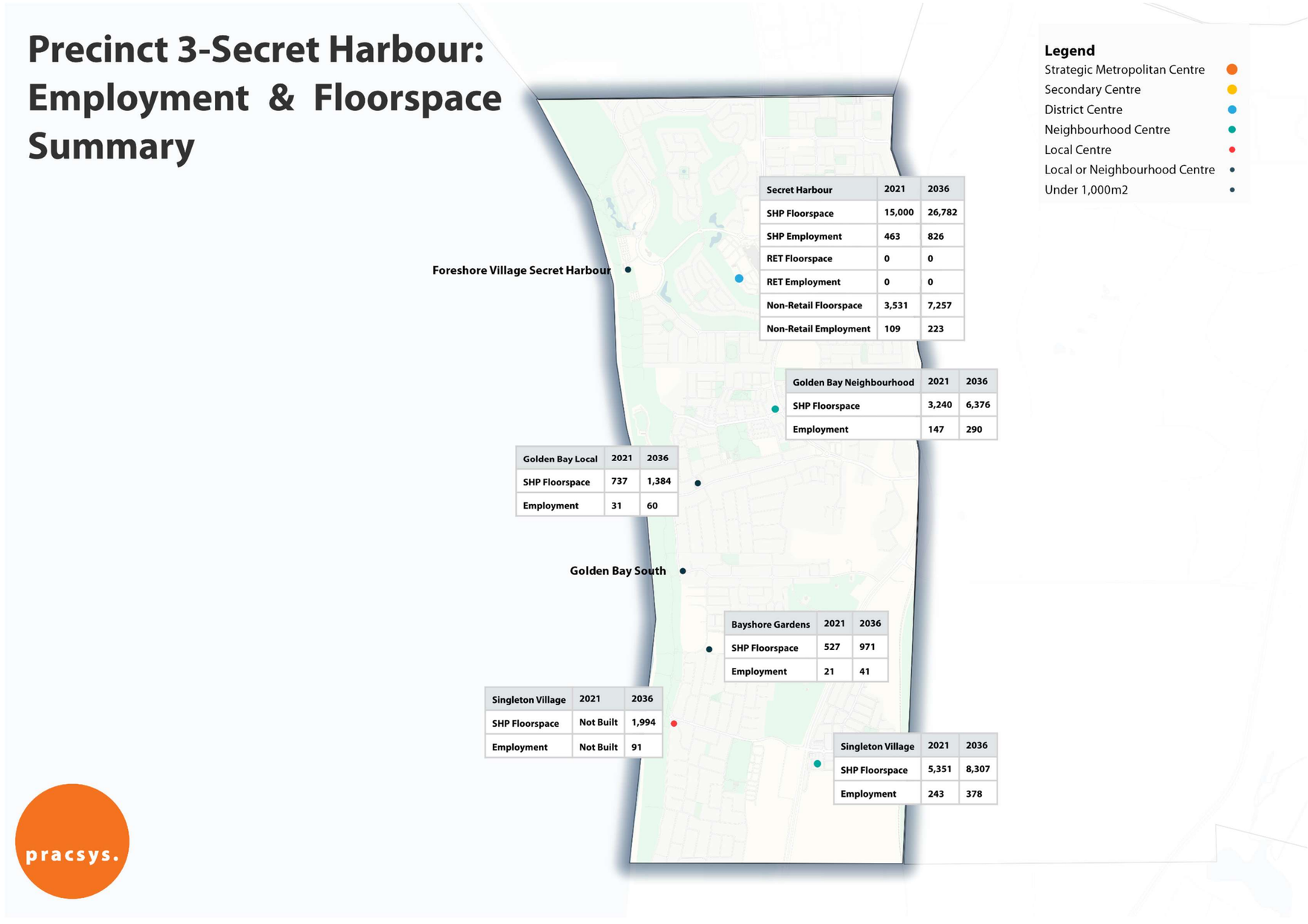
Figure 64. Precinct 2 Activity Centres - Supportable Total Floorspace

		Estimated Floorspace			2021			2026			2031			2036			2041		
Centre Type	**Centre Name**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**
District Centre	Warnbro	21,029	685	2,079	22,941	713	2,822	21,029	745	3,160	21,702	780	3,265	22,563	821	3,462	23,576	871	3,656
Neighbourhood Centre	Palm Meadows	3,555	-	6,280	5,208	-	8,625	4,725	-	10,509	5,055	-	11,722	5,457	-	12,995	5,928	-	14,367
Neighbourhood Centre	St Clair	4,625	-	560	5,137	-	1,089	4,709	-	1,175	4,870	-	1,247	5,069	-	1,313	5,299	-	1,376
Local Centre	Hokin Street	1,489	460	2,762	1,611	562	4,571	1,539	576	5,050	1,558	590	5,381	1,589	606	5,671	1,627	628	5,947
Local Centre	Kennedy Bay	1,500	-	684	Not Built	Not Built	Not Built	1,850	-	1,105	1,997	-	1,219	2,180	-	1,342	2,397	-	1,477
Other Retail Centre	Port Kennedy Enterprise Park	-	17,139	-	-	2,272	-	-	22,046	-	-	24,794	-	-	28,077	-	-	32,007	-
	Total	**64,396**	**50,482**	**44,563**	**36,398**	**34,600**	**37,624**	**33,852**	**23,367**	**21,000**	**35,183**	**26,163**	**22,834**	**36,857**	**29,505**	**24,783**	**38,827**	**33,505**	**26,823**

Pracsys 2021

7.4 Precinct 3 – Secret Harbour District Centre Catchment

Figure 65. Precinct 3 Activity Centre Map



Pracsys 2021

Figure 66. Precinct 3 Activity Centres - Supportable Additional Floorspace (Not Cumulative)

		Estimated Floorspace			2021 (Additional)			2026 (Additional)			2031 (Additional)			2036 (Additional)			2041 (Additional)		
Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Secret Harbour	15,000	-	3,531	2,300	-	994	3,388	-	1,769	7,177	-	2,643	11,782	-	3,726	17,366	-	5,059
Neighbourhood Centre	Bayshore Gardens	527	-	559	95	-	168	144	-	288	280	-	413	444	-	564	643	-	746
Neighbourhood Centre	Golden Bay Neighbourhood	3,240	-	1,478	Not Built	Not Built	Not Built	1,155	-	999	2,050	-	1,416	3,136	-	1,924	4,452	-	2,545
Neighbourhood Centre	Singleton Village	5,351	-	-	-	-	-	493	-	-	1,607	-	-	2,956	-	-	4,582	-	-
Local Centre	Foreshore Village Secret Harbour	330	-	400	70	-	41	86	-	102	171	-	170	274	-	252	399	-	353
Local Centre	Golden Bay Local	737	-	707	189	-	212	213	-	369	409	-	531	647	-	727	935	-	964
Local Centre	Golden Bay South	307	-	-	10	-	-	30	-	-	99	-	-	182	-	-	283	-	-
Local Centre	Mandurah Road	150	-	3,160	-	-	1,233	-	-	1,674	1	-	2,030	26	-	2,704	55	-	3,506
Local Centre	Singleton	Not Built	Not Built	Not Built	Not Built	Not Built	Not Built	1,397	-	774	1,667	-	903	1,994	-	1,058	2,390	-	1,247
	Total	**25,642**	**-**	**9,836**	**2,663**	**-**	**2,647**	**6,907**	**-**	**5,975**	**13,461**	**-**	**8,106**	**21,442**	**-**	**10,954**	**31,105**	**-**	**14,422**

Pracsys 2021

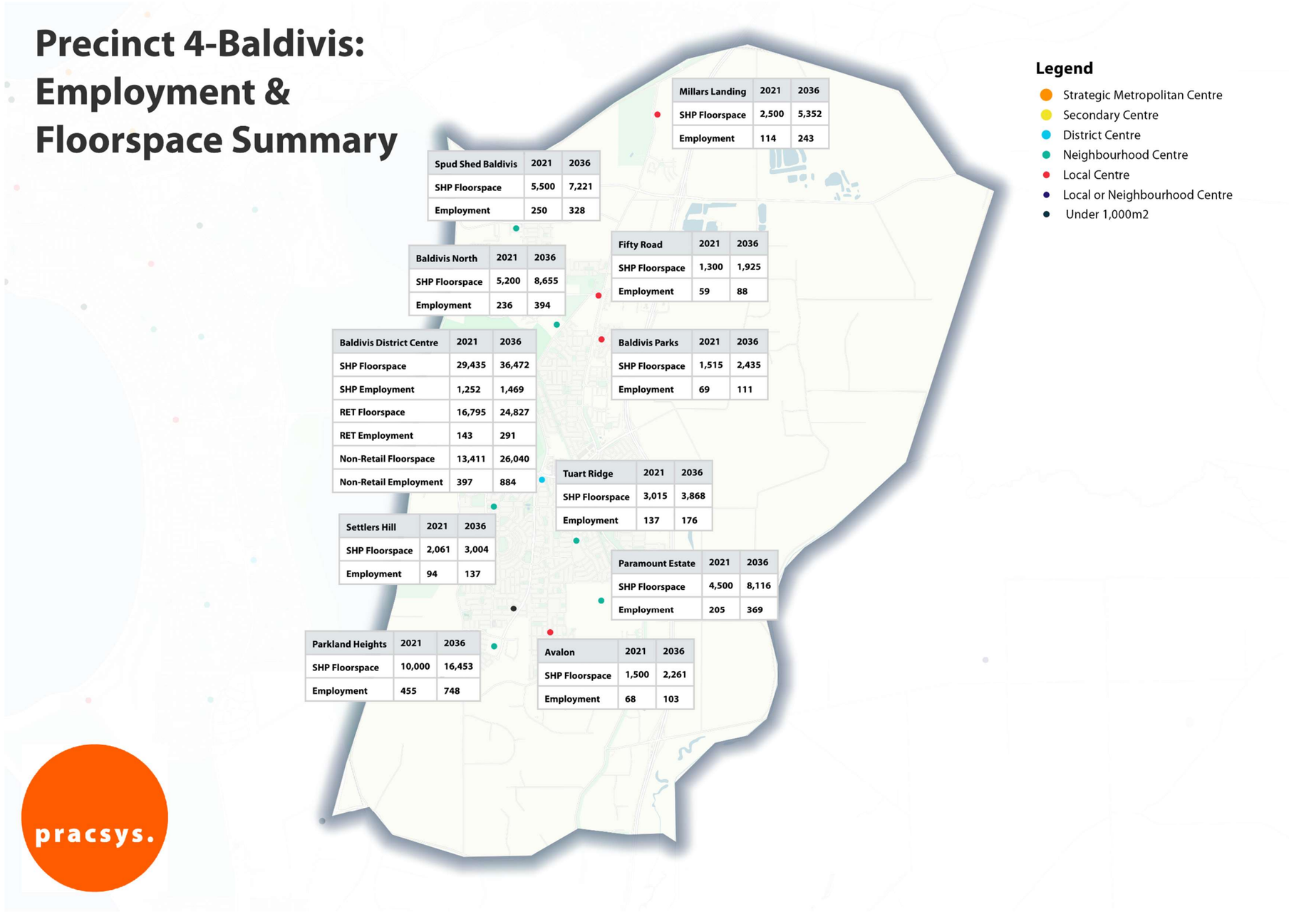
Figure 67. Precinct 3 Activity Centres - Supportable Total Floorspace

		Estimated Floorspace			2021			2026			2031			2036			2041		
Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Secret Harbour	15,000	-	3,531	17,300	-	4,525	18,388	-	5,300	22,177	-	6,175	26,782	-	7,257	32,366	-	8,591
Neighbourhood Centre	Bayshore Gardens	527	-	559	622	-	727	671	-	847	807	-	972	971	-	1,123	1,170	-	1,305
Neighbourhood Centre	Golden Bay Neighbourhood	3,240	-	1,478	Not Built	Not Built	Not Built	4,395	-	2,478	5,290	-	2,895	6,376	-	3,402	7,692	-	4,024
Neighbourhood Centre	Singleton Village	5,351	-	-	5,351	-	-	5,844	-	-	6,958	-	-	8,307	-	-	9,933	-	-
Local Centre	Foreshore Village Secret Harbour	330	-	400	400	-	441	416	-	502	501	-	570	604	-	652	729	-	753
Local Centre	Golden Bay Local	737	-	707	926	-	919	950	-	1,076	1,146	-	1,238	1,384	-	1,434	1,672	-	1,671
Local Centre	Golden Bay South	307	-	-	317	-	-	337	-	-	406	-	-	489	-	-	590	-	-
Local Centre	Mandurah Road	150	-	3,160	150	-	4,393	150	-	4,834	151	-	5,190	176	-	5,864	205	-	6,666
Local Centre	Singleton	Not Built	Not Built	Not Built	Not Built	Not Built	Not Built	1,397	-	774	1,667	-	903	1,994	-	1,058	2,390	-	1,247
	Total	**25,642**	**-**	**10,292**	**28,305**	**-**	**12,483**	**32,549**	**-**	**15,811**	**39,103**	**-**	**17,942**	**47,084**	**-**	**20,790**	**56,747**	**-**	**24,258**

Source: Pracsys 2021

7.5 Precinct 4 – Baldivis District Centre Catchment

Figure 68. Precinct 4 Activity Centre Map



Pracsys 2021

Figure 69. Precinct 4 Activity Centres - Supportable Additional Floorspace (Not Cumulative)

		Estimated Floorspace			2021 (Additional)			2026 (Additional)			2031 (Additional)			2036 (Additional)			2041 (Additional)		
Centre Type	**Centre Name**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**	**SHP Floorspace**	**RET Floorspace**	**Non-Retail Floorspace**
District Centre	Baldivis	29,435	16,795	13,411	3,179	-	6,134	-	2,036	7,860	2,317	4,811	9,866	7,037	8,032	12,629	12,474	11,773	15,779
Neighbourhood Centre	Baldivis North	5,200	-	2,373	Not Built	Not Built	Not Built	1,551	-	1,535	2,351	-	2,022	3,455	-	2,611	4,741	-	3,289
Neighbourhood Centre	Paramount Estate	4,500	-	2,053	Not Built	Not Built	Not Built	1,706	-	1,411	2,583	-	1,896	3,616	-	2,448	4,808	-	3,080
Neighbourhood Centre	Parkland Heights	10,000	-	4,563	Not Built	Not Built	Not Built	2,605	-	2,866	4,375	-	3,849	6,453	-	4,963	8,851	-	6,237
Neighbourhood Centre	Settlers Hills	2,061	1,179	7,384	1,914	84	6,494	232	294	8,855	560	511	11,532	943	762	14,610	1,385	1,054	18,176
Neighbourhood Centre	Spud Shed	5,500	-	2,510	1,447	-	958	197	-	1,295	786	-	1,683	1,721	-	2,178	2,828	-	2,755
Neighbourhood Centre	Tuart Ridge	3,015	-	1,376	859	-	525	-	-	686	349	-	901	853	-	1,167	1,432	-	1,472
Local Centre	Avalon	1,500	-	684	Not Built	Not Built	Not Built	236	-	395	477	-	529	761	-	682	1,088	-	856
Local Centre	Baldivis parks	1,515	-	691	Not Built	Not Built	Not Built	371	-	429	605	-	568	920	-	735	1,285	-	926
Local Centre	Fifty Road	1,300	-	593	Not Built	Not Built	Not Built	209	-	343	377	-	449	625	-	581	916	-	733
Local Centre	Lakeside Caravan Park	360	-	-	228	-	-	10	-	-	57	-	-	114	-	-	179	-	-
Local Centre	Millars Landing	2,500	-	1,141	Not Built	Not Built	Not Built	Not Built	Not Built	Not Built	1,962	-	575	2,852	-	771	3,935	-	1,213
Local Centre	The Ridge	583	333	418	143	129	368	-	207	451	-	287	513	-	379	567	27	487	644
	Total	**67,469**	**18,307**	**37,197**	**7,770**	**214**	**14,480**	**7,116**	**2,537**	**26,126**	**16,799**	**5,609**	**34,382**	**29,350**	**9,173**	**43,943**	**43,951**	**13,314**	**55,161**

Pracsys 2021

Figure 70. Precinct 4 Activity Centres - Supportable Total Floorspace

		Estimated Floorspace			2,21			2026			2031			2036			2041		
Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Baldivis	29,435	16,795	13,411	32,614	16,795	19,545	29,435	18,831	21,271	31,752	21,606	23,277	36,472	24,827	26,040	41,909	28,568	29,190
Neighbourhood Centre	Baldivis North	5,200	-	2,373	Not Built	Not Built	Not Built	6,751	-	3,908	7,551	-	4,394	8,655	-	4,984	9,941	-	5,662
Neighbourhood Centre	Paramount Estate	4,500	-	2,053	Not Built	Not Built	Not Built	6,206	-	3,465	7,083	-	3,950	8,116	-	4,502	9,308	-	5,133
Neighbourhood Centre	Parkland Heights	10,000	-	4,563	Not Built	Not Built	Not Built	12,605	-	7,430	14,375	-	8,412	16,453	-	9,526	18,851	-	10,800
Neighbourhood Centre	Settlers Hills	2,061	1,179	7,384	3,975	2,145	8,556	2,293	1,473	16,239	2,621	1,690	18,916	3,004	1,941	21,994	3,446	2,233	25,560
Neighbourhood Centre	Spud Shed	5,500	-	2,510	6,947	5,500	6,458	5,697	-	3,805	6,286	-	4,193	7,221	-	4,688	8,328	-	5,265
Neighbourhood Centre	Tuart Ridge	3,015	-	1,376	3,874	3,015	3,540	3,015	-	2,061	3,364	-	2,276	3,868	-	2,543	4,447	-	2,847
Local Centre	Avalon	1,500	-	684	Not Built	Not Built	Not Built	1,736	-	1,079	1,977	-	1,214	2,261	-	1,366	2,588	-	1,541
Local Centre	Baldivis parks	1,515	-	691	Not Built	Not Built	Not Built	1,886	-	1,120	2,120	-	1,259	2,435	-	1,426	2,800	-	1,618
Local Centre	Fifty Road	1,300	-	593	Not Built	Not Built	Not Built	1,509	-	936	1,677	-	1,042	1,925	-	1,174	2,216	-	1,327
Local Centre	Lakeside Caravan Park	360	-	-	588	360	360	370	-	-	417	-	-	474	-	-	539	-	-
Local Centre	Millars Landing	2,500	-	1,141	Not Built	Not Built	Not Built	Not Built	Not Built	Not Built	4,462	-	1,716	5,352	-	1,912	6,435	-	2,354
Local Centre	The Ridge	583	333	418	726	712	950	583	790	1,033	583	620	931	583	713	985	610	820	1,062
	Total	**67,469**	**18,307**	**37,197**	**75,239**	**67,683**	**81,949**	**74,585**	**70,006**	**93,595**	**84,268**	**23,916**	**71,579**	**96,819**	**27,481**	**81,140**	**111,420**	**31,621**	**92,358**

Source: Pracsys 2021

8 IMPLEMENTATION

8.1 Current State Planning Framework

The Needs Assessment has been developed based on the Draft SPP4.2 (2020). The City's current local planning framework retains language from the Metropolitan Centres Policy (2000) that is inconsistent with the current planning policy. It is recommended that all references to the previous policy be removed with the following notes:

- The previous LCS included a discussion of retail floorspace caps/limits. The current planning policy does not support the use of caps as it can lead to under-provision of floorspace, for instance, if higher than expected population growth occurs. The effect of the previous caps can be seen by the significant expansion of retail centres that occurred when SPP4.2 (2010) was implemented. It is recommended that floorspace amounts allocated to centres in the Needs Assessment be used as a target to support the population benchmarks listed in Figure 38 and Figure 39. Developments that may exceed these amounts should be assessed on a case-by-case basis with evidence provided by applicants required to demonstrate the need for goods and services and consideration of the impact on the activity centre hierarchy
- The Draft SPP4.2 provides guidelines that can be implemented into the local planning framework to support decision making. This includes defining when tools such as a Needs Assessment or Impact Test are required and recommended methodology inclusions. Needs Assessments and Impact Tests are tools that can be required by the City at a development application level to support decision making. They are currently included in the LCS but the triggers for when they are used and how they are developed should be updated to align with Draft SPP4.2 requirements. It is recommended that retail gravity modelling be identified as a preferred method given it was used in the Needs Assessment (it is not recommended to make retail gravity modelling compulsory)
- The Draft SPP4.2 defines different levels of impact to guide the assessment of proposed developments. As a general rule, significant impacts are over 10% and are grounds to consider rejecting a potential expansion or new development depending on the broader level of community benefit. It is recommended that language from the Draft SPP4.2 regarding significant impacts be adopted in the local planning framework to ensure any evidence provided to support a development uses standardised language and metrics. For moderate impacts (5%-9.9%) the City should assess the health of surrounding centres and assess if a proposed developments impact is likely to reduce trading levels below a supportable level for proximate centres.

These considerations have been applied through the following sections, where relevant, to support recommendations for integration of the findings from this report with the City's Local Planning Framework.

8.2 Integrating Needs Assessment Findings

The Needs Assessment provides the evidence-base for planning the City's Activity Centres. It will be integrated into the City's Local Planning Framework through:

- The Local Commercial and Activity Centre Strategy (LCACS)
- Local Planning Strategy (LPS - to be prepared in 2022/23 incorporating LCACS findings)
- The Rockingham Strategic Metropolitan Centre Local Planning Framework (RSMCLPF)

The Needs Assessment establishes the floorspace supply of retail and non-retail uses in Activity Centres required to support identified population demand. The analysis has used population projections from WA Tomorrow to develop the estimates. The years associated with the projections are less important than the quantum of population themselves. It is recommended that for planning purposes the LCACS and RSMCLPF adopt a 'stage gate' interpretation of the results to guide decision making.

A number of considerations have been developed to support the integration of the Needs Assessment with these planning documents and to maximise viability and resilience of activity centres across the hierarchy:

- The floorspace projections in this analysis provide guidance for the City to understand the potential quantum of floorspace that may be demanded at a certain time point. Reaching a certain population or year does not automatically mean a centre should expand. The City can take into account this analysis and will need to consider other factors affecting the activity centre hierarchy at the time of receiving an application (i.e. future developments that may not be in this analysis, changing floorspace per population requirements, etc.) in order to assess whether additional floorspace is required in future
- The floorspace projections (by centre), population projections (by precinct) and dwelling density targets (for relevant centres) in the reported years (i.e. 2026, 2031, 2036, 2041) should be used to monitor the provision of uses across the activity centre network. When a population level is reached in a precinct and/or target density is reached at a centre, this is an indication that further floorspace can be considered if private interest arises; even if this occurs prior to the year identified in the Needs Assessment. Interest from private industry can be an indicator of current or future potential demand and should be considered as part of the overall decision-making process. This being said, private interest may undermine the activity centre hierarchy and appropriate measures should be used to ensure development applicants have demonstrated an actual need for additional goods or services (see following dot points). If a population level does not occur by an identified year, the population level should be the guiding factor for potential development and not the year
- The Needs Assessment provides floorspace quantum estimates for individual centres. These should not be treated as strict floorspace caps but as targeted supportable floorspace with some flexibility for small under or over provisions (the under or over provision should be based on identified need at the time, see dot points below for the evidence needed to support new/expanded centres)

- With regards to the City's planning of activity centres, new local centres should be considered in areas where the normative daily/weekly shopping needs of the population (access to a centre within a 1km radius) are not being met (see Section 5.2, Figure 31) **and** there is sufficient demand to support a centre (to be demonstrated by a development applicant – see dot points below). Where new residential developments occur (e.g. Karnup), the City should ensure that planning of new centres addresses the normative daily/weekly shopping needs of residents through an appropriate distribution of high and lower order centres
- Potential changes to activity centre classifications in the Baldivis area (Precinct 4) should be dependent on the findings of the Karnup DSP. The Karnup DSP should consider current and planned centres in Precinct 4 to ensure that overall development supports a viable and vibrant activity centre hierarchy. For further detail regarding potential changes to activity centre classifications, see Section 7.1
- The City should consider a number of factors when assessing the potential for a **large expansion of a current centre** (see Draft SPP4.2, Table 2: Major activity centre use floorspace thresholds) or for a **proposed new centre**. There should be robust evidence that:
    - There is a need (i.e. high population growth within the centre's catchment)
    - There is alignment with Draft SPP4.2 objectives (i.e. walkable catchment, public transport access, etc.)
    - The development would not affect the viability of the activity centre hierarchy
    - The proposed uses are viable (i.e. if a supermarket is proposed the applicant's evidence must demonstrate there is sufficient demand for that offering). Where the demand for uses can be demonstrated, there should be flexibility to allow for a variety of uses across all centre types to enable operators to meet specific and potentially changing needs of consumers
    - There are wider community benefits such as improved service, increased employment, reduced travel times, etc.
- A current centre in a fully developed area should not be allowed to justify an expansion on the basis that another centre has not expanded to the level identified in the Needs Assessment at a given timepoint. This may be reconsidered in developing areas where another centre is constrained and there has been population growth within the catchment (robust evidence should be required as per the previous dot point)
- New centres may be allowed to incorporate additional floorspace where a current centre cannot expand due to land or other constraints, with some caveats:
    - The new centre should be in a location that provides suitable access to residents of the current centre's catchment
    - The new centre needs to demonstrate the same robust evidence as above

These considerations should allow the City the flexibility to decide when development is appropriate and ensure that development benefits the community without unduly impacting the surrounding activity centre hierarchy.

Considerations have also been developed for service commercial and light industrial developments:[18]

- Shop Retail uses should only be allowed in service commercial and light industrial areas where an applicant can be shown they are providing for demand from local workers and visitors to businesses in the commercial centre
- Service commercial and light industrial uses should be focussed in identified employment centres (see Section 5.2, Figure 32) or in future employment areas (i.e. Nort East Baldivis and Karnup)
- There is the opportunity to consider provision of bulky goods retail uses near Secret Harbour (see Section 5.2, Figure 32)
- The following elements should be used to assess any proposed developments for these uses in new locations:
    - Is there sufficient space for the use in a current employment centre

    If there is not, then does the proposed location have the following attributes:
    - Proximity to relevant consumer/customer (i.e. population – light industry, businesses – heavy industry)
    - Appropriate road and/or freight access
    - Compatible surrounding uses (i.e. heavy industry uses are not compatible with residential development)
    - Access to necessary infrastructure (i.e. special waste disposal requirements, etc.)
    - Land constraints (if site works will be too expensive, commercial uses may not be viable)
- The type of uses allowed in service commercial and light industrial areas should be flexible as these areas span both business to consumer and business to business supply chains. The primary goal for the City in planning these areas should be to minimise the encroachment of uses that are most appropriate for Activity Centres (i.e. Shop Retail) unless supporting the employee and visitor populations.

8.3 Supporting Centre Development

It is assumed the City will facilitate employment growth through an understanding of the key drivers that attract businesses to the City's centres. Any strategy to reimagine the function, scale or use of the centres should respond to the 'felt needs' of the user groups it caters for, including:

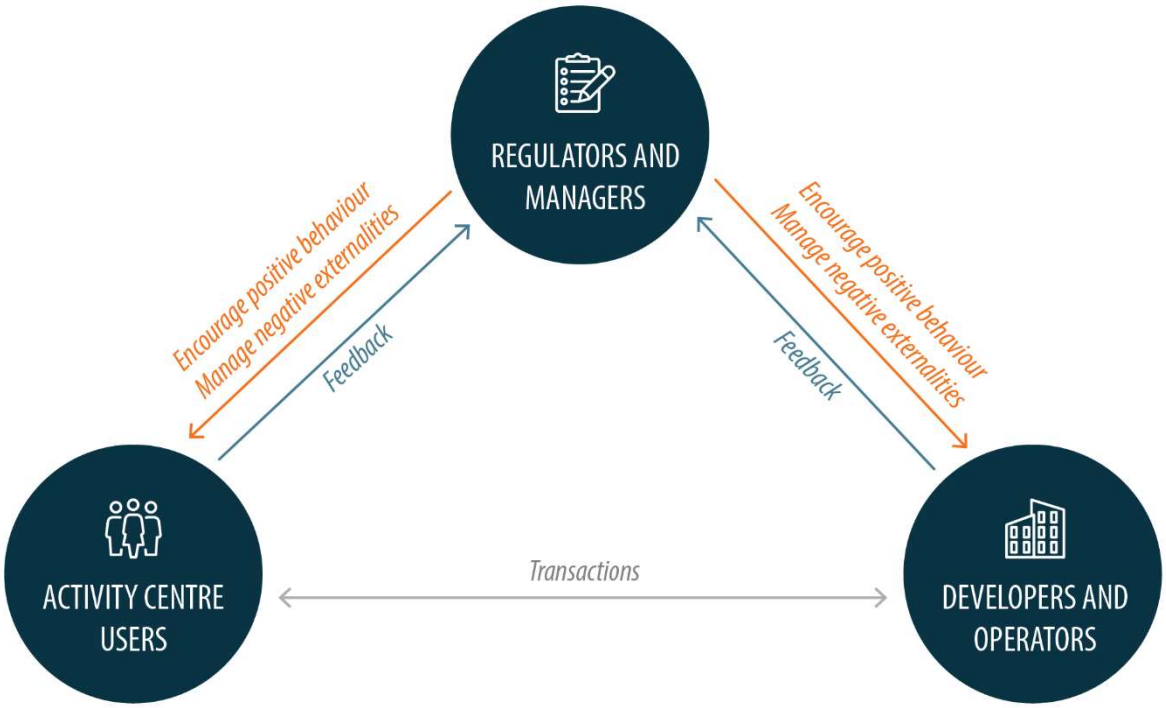
- Activity centre users
- Enterprise developers/operators (and the workers)

[18] Please note these considerations are for population driven centres only and do not apply to strategic industrial land such as the Rockingham Industrial Area in the Western Trade Coast.

- Regulators/managers

Decisions are made to benefit one or more of the user groups in the context of an overarching strategic vision.

Figure 71. User group interactions



Understanding the drivers of user behaviour is required to achieve vibrant and viable activity centres across the City's activity centre hierarchy. Regulators and managers (e.g. State and Local government and other authorities) can generally only encourage or influence certain behaviours, rather than control them. Ultimately the market and centre users will decide what activity is viable for the centres, with regulators and managers able to exert influence toward the desired approach. It is therefore paramount that the planning for the City's activity centre hierarchy aligns with desired outcomes of users and employment providers.

There are a number of key drivers for population-driven industries that need to be considered when planning for activity centres (Figure 72 and Figure 73).

Figure 72. Example demand drivers for population-driven businesses

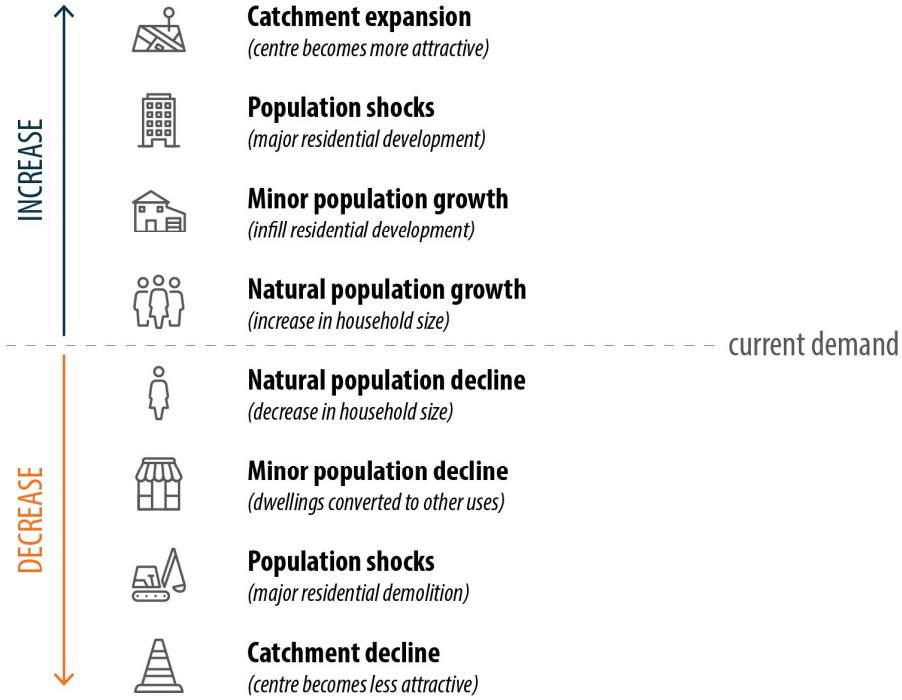
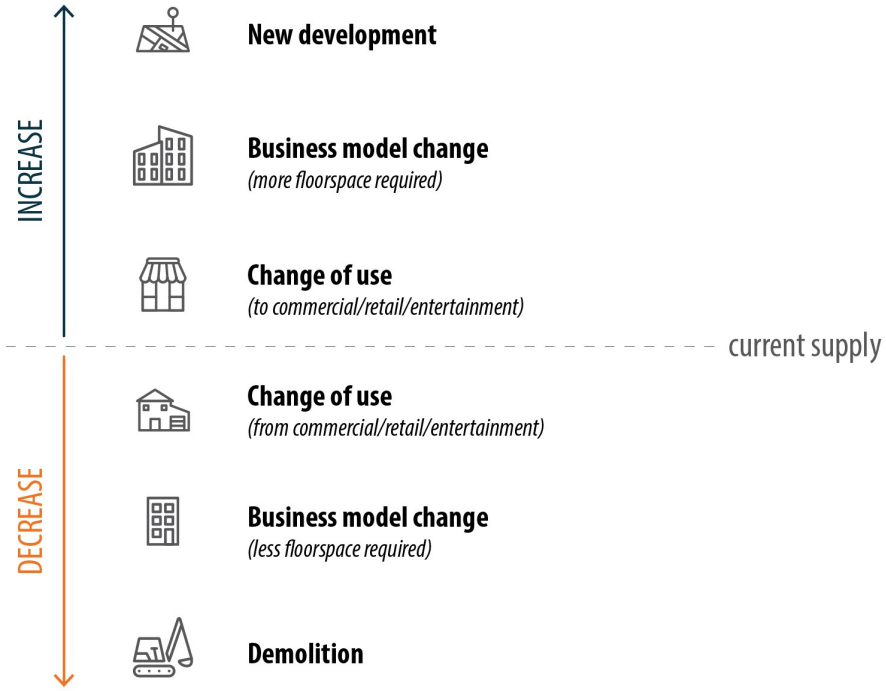


Figure 73. Example supply drivers for population-driven businesses



A change in any of the above characteristics will promote a change in floorspace and interest from the market for redevelopment. For example, on the demand side, an increase in the level of density surrounding the centre increases the effective userbase and proportion of expenditure that is likely to be directed and

captured by the centre, this will provoke a competitive response from developers in which investment will be made to capture this extra expenditure pool.

Similarly, a change in the urban fabric (on the supply side) that makes the centre more attractive will increase the catchment of the centre. This could, for example, be improved streetscaping or connectivity, activation and event strategies within the centre or improved connection to the local tourism areas. This will provoke a similar competitive response from developers wishing to take advantage of the extra expenditure pool.

Strategic Employment

When considering strategic employment, the relevant industries are largely exogenous to changes in these drivers and principally rely on the comparative advantages of an area (i.e. resources, location) and individual decisions of businesses. Changes in strategic employment can be affected through promoting the unique advantages of the area to businesses, encouraging business collaboration and other business-friendly policies. Typical considerations include travel time to the CBD or major employment centres such as the WTC (to access clients), travel time to work for employees and the cost of the premises. The City's Employment Study (2020) and Economic Development Strategy provide the foundation for economic development that is not population-driven, opportunities include:[19]

- Primary regional institutions including a full-service university, major health campus with teaching capabilities, State government administration, and high-level arts and entertainment
- Business services for nearby industrial areas, the naval base and defence industries, and Westport
- Tourist activities including business travel and visitation for the surrounding area
- Defence, heavy industry and port related uses

The primary locations that can accommodate strategic employment with the City are the RSMC and Rockingham Industrial Area. The role of the City in encouraging uses is considered in Section 8.4.

[19] A summary of the drivers for strategic employment is provided in Section 6.3, Employment Targets; detailed drivers are provided in the Rockingham Employment Study 2020.

8.4 The City's Role

In creating an attractive business environment within the City's activity centres, the role of the City is to act as a central regulator, coordinator and facilitator, working to understand the challenges facing local businesses including; linking businesses with appropriate resources, advocating on behalf of local businesses, and supporting specific projects where appropriate. The levers available to the City can be described under the following hierarchy:



CONTROL

e.g. Establishing local policy and regulation, directing internal resources, utilisation of local government-controlled land and assets, implementing programs and events, and supporting projects with seed funding

INFLUENCE



e.g. Facilitating the strengthening of networks that encourage the sharing of knowledge and investment opportunities, and supporting communication with State and Federal governments regarding the influence of wider policy, projects or funding decisions



MONITOR

e.g. Tracking economic performance indicators and collecting feedback from businesses regarding current issues or opportunities which relies on communication channels with industry and the broader community

Using these levers, the City can actively attract and retain businesses through an understanding of the role, strengths and weaknesses of different centres and employment lands, and how they relate to a business's locational preference drivers and hence its operational productivity. These considerations differ depending on the nature of a business, with population/consumption-oriented businesses having different needs to those that operate business-to-business or are export-driven. The City can effect these levers through the Local Planning and Economic Development Frameworks.

The City's activity centres are almost solely population-driven with the RSMC being an exception due to its significant role in providing access to goods, services and employment for the wider Study Area. The levers available to the City can be considered in terms of centre and employment land type (Figure 74).

Figure 74. Role of City in Supporting Development by Centre and Employment Type

Lever	Centre Type	Application
Control	RSMC	The City can control the population-driven uses (i.e. shop/retail) available in the RSMC through planning and policy measures. It is recommended that these uses be allowed flexibility to develop based on private industry interest in the RSMC particularly with the significant potential population increase in the CoR scenario. The City has less control over the attraction of strategic uses in the centre and needs to develop a planning approach that incentivises

Lever	Centre Type	Application
		investment (i.e. allows for flexibility with regards to development considerations such as height and mix of appropriate uses).
	Other Activity Centres (i.e. district, neighbourhood, etc.)	The City's has greater control of development at its smaller order centres and can use evidence-based decision making (see Section 8.2) to ensure the centres are capable of meeting the needs of the current and future population while also maintaining a viable activity centre hierarchy. The Needs Assessment provides the evidence base with which the City and commercial stakeholders can understand markers for additional floorspace requirements. It is recommended that the floorspace estimates in this report be used as targets and not floorspace caps/limits due to the evolving nature of industries (particularly retail) and the changing nature of consumer demand.
	Heavy Industrial Land	The City has limited ability to control the development of strategic industries at heavy industrial areas such as the East Rockingham Industrial Area; these should be allowed to develop based on industry demand. The main control the City should apply to these areas is to ensure that strategic industrial land is not taken up by less strategic, light industrial uses. This is particularly the case for any developable land in East Rockingham that may be suitable to support uses related to Westport and the wider WTC area.
	Light Industrial Land	The City should look to control the uptake of Shop Retail uses in light industrial areas. These areas generally provide cheaper land and high levels of parking but do not support activated centres, the use of public transport and walkability. Bulky Goods Retail (Other Retail) can be suited to these areas; however, it should not be allowed to develop to a point that it constrains the development of light industrial uses (i.e. uses that require warehousing, large storage, large truck access, separation from residential developments, etc.). The Employment Study highlights the protection of light industrial employment land such as North East Baldivis and potentially Karnup for employment uses with appropriate planning controls.
Influence	RSMC	The City has an important role in influencing development in the RSMC, particularly for catalyst projects and more strategic uses. The Employment Study identifies a number of potential strategies for supporting the development of the RSMC including collaboration at a regional level, advocacy and communication with key stakeholders.
	Other Activity Centres (i.e. district, neighbourhood, etc.)	Other centres should not require much influence to develop. They are driven by population growth that creates private developer interest. Should the City in the future wish to change the role of a centre it may need to use influencing tactics such as communication and advocacy.
	Heavy Industrial Land	The Employment Strategy identifies dialogue, collaboration and advocacy as key roles for the City in influencing development in areas such as the Naval Base and East Rockingham Industrial Area.
	Light Industrial Land	These land uses are similar in nature to those in activity centres, with population growth being the primary driver. There is an unlikely need for the City to influence the uptake of these areas.

Lever	Centre Type	Application
Monitor	RSMC	Ongoing monitoring should be undertaken to ensure that the activity centres and employment land in the City are meeting desired objectives. The Needs Assessment provides the evidence base for monitoring the change in floorspace across the Activity Centre hierarchy with an understanding of population levels at different time points that may indicate the need for additional floorspace. The City's Employment Study and Economic Development Strategy should be used to monitor industry development, particularly for catalyst projects (i.e. a university) and strategic uses, based on economic development objectives. The City should ensure that it communicates with key stakeholders to understand the needs of businesses associated with Westport and the support that it can offer (i.e. information, planning/policy incentives, etc.) to facilitate business growth.
	Other Activity Centres (i.e. district, neighbourhood, etc.)	
	Heavy Industrial Land	
	Light Industrial Land	

8.5 Karnup DSP

The analysis undertaken for the Needs Assessment has not included the potential population and activity centre development at Karnup in Precinct 5. A District Structure Plan (DSP) is going to be developed for Karnup and will identify the potential dwelling and employment land yield for the area.

Recommendations to Support Preparation of the DSP

The development of the Karnup DSP will be guided by the State Planning Framework, with the following policies most relevant to retail and economic considerations:

- State Planning Policy 7.2 Precinct Design
- Draft State Planning Policy 4.2 Activity Centres

These policies require certain analyses to be undertaken to support precinct planning and are interlinked. SPP 7.2 requires land use analysis to support precinct design considerations. Specifically, it recommends an **Economic, Retail and Employment Strategy** (ERE Strategy) be developed as a technical document to support a precinct plan. ERE Strategies incorporate economic analysis including identification of priority industries and economic development considerations; and, floorspace analysis to understand current and future gaps in floorspace provision. The policy indicates that a precinct plan which includes an activity centre defined in Draft SPP4.2 must also address the requirements of that policy.

The Implementation Guidelines of Draft SPP4.2 identify the requirement of a Needs Assessment to support precinct planning. Where the potential development would occur outside of a currently defined activity centre and includes greater than 500m^2 Shop/Retail floorspace, there may be a requirement for an Impact

Test. The Draft SPP4.2 provides guidance for both Needs Assessments and Impact Tests; these guidelines will need to be adhered to when developing the analysis for the DSP. The DSP findings should be incorporated into the next review of the Needs Assessment / Local Commercial Strategy and allow for refined estimates of future floorspace demand across the activity centre hierarchy.

Key considerations for the ERE Strategy to support the Karnup DSP have been developed based on an understanding of SPP7.2 and SPP4.2 requirements and the documentation/analysis that has already been developed to support the City's policies and strategies (Figure 75).

Figure 75. Recommendations to Support DSP Development

Strategy Component	Recommendation
Catchment Development	Modelling, particularly for retail floorspace, should be undertaken using a catchment size relevant to the potential size of the activity centre(s) (i.e. a large district centre would likely require a catchment that encompasses all of the City of Rockingham and some areas outside the City). There may need to be iterations between the potential developable size and the size supportable based on population demand.
Strategic Context	Consider the development of the precinct against strategic objectives in the State planning framework and local planning framework, ensuring it aligns. The Strategic Context should also consider economic development policy at both a State (i.e. Diversify WA) and Local (i.e. Rockingham Economic Development Strategy) level.
Population and Economic Analysis	Socio-economic, employment and industry analysis should be undertaken to understand the drivers, opportunities and constraints for different industries and floorspace in the catchment. Should the DSP be developed before Census 2021 data becomes available, the Needs Assessment, Rockingham Employment Study and Economic Development Strategy would likely have the most up to date analysis. Should Census 2021 data be available, the analysis should be revised based on the identified catchment.
Land Use Analysis	Should new Department of Planning, Lands and Heritage Land Use and Employment Survey data be available when undertaking the Karnup DSP, it should be used to identify the current gap in uses relevant to the Karnup DSP. The current gap for the precinct should be relatively limited due to the low-density nature of the area. The current gap in floorspace identified in the Needs Assessment for other centres would likely be sufficient for undertaking the DSP, although it should be updated based on new LUES data when the Needs Assessment / Local Commercial Strategy is reviewed. The focus of the Karnup DSP analysis relating to activity centre uses should be on the floorspace requirements of the future population that could be accommodated in the DSP area and the potential size of the activity centre(s) included. Retail gravity modelling is recommended due to its objective nature with floorspace provision ratio modelling used for non-retail uses. The number and distribution of future activity centres should be developed based on the final distribution of dwellings and meeting objectives identified in Draft SPP4.2 such as walkable catchments and access to public transport. The size of the centres should be based primarily on retail modelling as it is the main attractor for activity centres. This should support centre size(s) that is(are) viable and do not have a significant impact on current centres (levels of impact are defined in the Draft SPP4.2 Implementation Guidelines). Industry analysis for other employment lands (such as employment land for light industrial uses) should follow from analysis in the Employment Study which discusses potentially developable land and indicates that this land should be protected for

Strategy Component	Recommendation
	employment uses to ensure capacity for future development. The size of land allocated for employment in this context should be based on supporting employment targets.
Scenario Analysis	Scenarios should be developed as per Draft SPP4.2 to identify a possible range of outcomes and how they affect: • Demand for floorspace uses from the DSP's population yield • Impact on floorspace sizes and viability of other centres • Contribution to employment targets • Contribution to strategic objectives (i.e. community, economic development, etc.)
Recommendations	The ERE Strategy should clearly state the role of proposed activity centre(s) in providing access to goods, services and employment; and, how the centre(s) integrate into the activity centre hierarchy. It should also define the role of other employment lands (i.e. light industrial areas in achieving economic development objectives) and should draw from the Employment Study and Economic Development Strategy to identify relevant implementation actions that apply to the DSP area. Draft SPP7.2 identifies ongoing evaluation and monitoring as part of the planning process. From a retail and economic perspective, this would include aligning the DSP with specific outcomes that can be measured over time (i.e. employment, population, number of businesses, diversity of businesses, education services, etc.) to ensure the implementation of the DSP delivers the desired benefits for the community.

Integration with the Needs Assessment / LCS Review

The findings of the DSP will need to be integrated with the Needs Assessment and LCS Review to refine medium to long term floorspace considerations for the activity centre hierarchy. The DSP should be developed before any potential changes to activity centre classifications in Precinct 4 are considered.[20] Development related to the DSP is not likely to take place in the short term, therefore it is expected that the Needs Assessment estimates for activity centre floorspace distribution will hold for 2026 and potentially 2031. It is recommended that the findings of the DSP be incorporated into the Needs Assessment / LCS Review at the time they are next updated/reviewed; it is assumed that such documents would be updated every five years or so.

The key elements that will need integration include:

- Activity centres and floorspace quantum by retail and non-retail uses
- Dwelling projections and locations
- Estimated timing of population development
- Estimated timing of commercial floorspace development

Depending on the quantum of population growth, the distribution of this population, and the size and role of the potential activity centre(s) in Karnup, there may be a shift in the quantum of floorspace supportable in surrounding centres. Centres in Precinct 3 (Secret Harbour) and Precinct 4 (Baldivis) are most likely to be affected. In particular the higher-order centres: Secret Harbour and Baldivis Town Centre.

[20] For further detail regarding potential changes to Activity Centre classifications, see Section 7.1

Reductions in long-term floorspace at these centres due to the development of activity centres in Precinct 5 should be considered based on the community benefit achieved. For instance, Baldivis Town Centre is the largest centre along the freeway would attract greater expenditure from high population growth in South Baldivis. Where the population is closer to a potential future centre in Karnup it may be desirable for their expenditure to be captured at that activity centre should it both not have a significant negative impact on the developed Baldivis Town Centre and reduce the distance residents need to drive to access goods and services by a sufficient amount.

Considerations such as these will need to be assessed upon review of the Needs Assessment / LCS to revise the floorspace distribution of the activity centre hierarchy so that centres are viable and achieve the highest and best outcome for the community.

8.6 Implementation Summary

The Needs Assessment will support the development and implementation of the City's LCACS, LPF and RSMCLPF. Key implementation points include:

- The Needs Assessment has been developed based on the Draft SPP4.2 (2020). The City's current local planning framework retains language from the Metropolitan Centres Policy (2000) that is inconsistent with the current planning policy. It is recommended that all references to the previous policy be removed and aligned to the Draft SPP4.2
- The Needs Assessment establishes the floorspace supply of retail and non-retail uses in Activity Centres required to support identified population demand. The analysis has used population projections from WA Tomorrow to develop the estimates. The years associated with the projections are less important than the quantum of population themselves. It is recommended that for planning purposes the LCACS and RSMCLPF adopt a 'stage gate' interpretation of the results to guide decision making
- An evidence-based approach to activity centre development is recommended. This approach is aligned with Draft SPP4.2 and provides the City with the flexibility to assess applications on a case by case basis to ensure the viability and vibrancy of the activity centre hierarchy is maintained
- The role of the City is to act as a central regulator, coordinator and facilitator, working to understand the challenges facing local businesses to support sustainable activity centre development
- The City has three levers that it can effect through the Local Planning and Economic Development Frameworks, these include Control (i.e. planning regulations), Influence (i.e. advocacy), and Monitor (i.e. measurable outcomes to inform progress towards desired future)
- The City's activity centres are almost solely population-driven with the RSMC being an exception due to its significant role in providing access to goods, services and employment for the wider Study Area
- An **Economic, Retail and Employment Strategy** (ERE Strategy) is recommended to be developed as a technical document to support the Karnup DSP

- The Draft SPP4.2 provides guidance for both Needs Assessments and Impact Tests; these guidelines will need to be adhered to when developing the analysis for the DSP. The DSP findings should be incorporated into the next review of the Needs Assessment / Local Commercial Strategy and allow for refined estimates of future floorspace demand across the activity centre hierarchy
- The DSP should be developed before any potential changes to activity centre classifications in Precinct 4 are considered[21]

[21] For further detail regarding potential changes to Activity Centre classifications, see Section 7.1

9 CONCLUSION

This Needs Assessment provides the City of Rockingham with guidance on the supportable level of retail and non-retail floorspace that should be located at its activity centres going forward until 2041. It should be noted that the figures for the Strategic Metropolitan Centre are for ultimate development and outline future trajectory for floorspace demand. This will guide the City in planning its activity centres and assist it in determining the most appropriate way to meet its Employment Self Sufficiency (ESS) target.

The supportable level of retail floorspace that can be located at centres has been estimated with consideration of floorspace drivers and by using retail gravity modelling and benchmarked floorspace productivity estimates. This methodology ensures future floorspace estimates are supportable and will not impact the vitality of activity centres.

The supportable level of non-retail floorspace has been estimated using floorspace per person provision ratio analysis. This methodology identifies areas that are considered suitable benchmarks for the City and growing non-retail floor space to match the provision of floorspace per person by the type of non-retail floorspace.

This analysis has been undertaken for two population scenarios:

- A 'low growth' scenario based on WA Tomorrow (referred to as 'WA Tomorrow' in figures and tables) census forecasts that can account for projected population growth within the full 25km Strategic Centre catchment; and
- A 'high growth' forecast scenario (referred to as 'City of Rockingham' in figures and tables) based forecast.id population projections accounting for Structure Plan and subdivision approval data supplementing census data and considering the capacity of the adopted Local Planning Framework to support higher density development throughout the City.

The Needs Assessment provides floorspace projections linked to population projections for each of the City's Precincts[22] at five-year intervals (see Section 7). It is recommended the City adopt a 'stage gate' interpretation of the results to guide decision making. An evidence-based approach is recommended for assessing future developments to ensure the viability and vibrancy of the activity centre hierarchy are maintained (see Section 8.2). Potential changes to activity centre classifications have been identified, particularly in Precinct 4 (see Section 7.1). It is recommended that the Karnup DSP be undertaken prior to any re-classification of centres in Precinct 4 (see Section 8.5). The Karnup DSP should be informed by an Economic, Retail and Employment Strategy with findings integrated into the Needs Assessment and LCACS upon their next review.

Employment Self-Sufficiency (ESS) targets are assessed to understand the strategic employment required to achieve an ESS of 74% in the City (see Section 6.3).[23] It is estimated that the employment gap to reach a target ESS of 74% would require an additional 2,100 to 5,100 jobs in the RSMC and 6,400 and 11,700 jobs on other

[22] Precincts 1 through 4, Precinct 5 (Karnup) has been excluded as a District Structure Plan is to be undertaken to inform the development potential of Karnup
[23] The Southern Metropolitan Peel average ESS target is 74%

employment lands. These results reflect the importance of the RSMC in providing employment opportunities to meet Sub-regional employment targets. The Southern Metropolitan Peel Framework currently provides a target of only 12,290 jobs in the RSMC. Under the CoR scenario the RSMC will need at least 14,252 jobs to meet the goods and services needs of the surrounding population, without further contributing to ESS targets. The findings of the Rockingham Employment Study and our analysis indicate that regional ESS targets are not likely to be achieved without a greater concentration of employment in the RSMC.

The implementation role of the City is to act as a central regulator, coordinator and facilitator, working to understand the challenges facing local businesses to support sustainable activity centre development. The City has three levers that it can effect through the Local Planning and Economic Development Frameworks, these include Control (i.e. planning regulations), Influence (i.e. advocacy), and Monitor (i.e. measurable outcomes to inform progress towards desired future). The City will predominantly need to use the Control lever to ensure activity centre development contributes to a viable activity centre hierarchy. The influence lever will be key to attracting strategic employment to the RSMC with some elements of control providing capacity for the relevant uses (i.e. allowing for office development in the RSMCLPF). Monitoring will be key to ensuring the City's overarching planning and economic development objectives are being achieved. Detailed directions for the City's role in implementation are provided in Section 8.4

10 APPENDIX 1: MODELLING INFORMATION

10.1 Gravity Modelling Methodology

Gravity models allow for the measurement of spatial interaction as a function of distance to determine the probability of a given customer shopping at a centre and provide an approximation of trade area and sales potential for development. This modelling technique uses the distance between a household and each centre, and a measure of 'attractiveness' to define the probability model. The 'attractiveness' of a centre has been defined by total floorspace and the distance has been calculated by measuring straight-line distances between each centre and population. The gravity model probability formula is shown in Figure 76.

Figure 76. Gravity Model Probability Formula

$$P_{ij} = \frac{\frac{A_{jk}^{a}}{D_{ij}^{ß}}}{\sum_{j=1}^{m} \frac{A_{jk}^{a}}{D_{ij}^{ß}}}$$

P_{ij}	=	Probability of customer living/working in statistical area i shopping at complex j.
A_i	=	Area of floorspace in centre, j in square metres, according to the type of supply, k.
D_{ij}	=	Distance between statistical area of households, i and complex j.
a	=	Area exponent
ß	=	Distance exponent
k	=	Type of supply or expenditure, either Convenience or Comparison
i	=	Statistical area (i=1,...,n)
j	=	Complexes (j=1,...,m)

Source: Carter, C (1993) 'Assumptions Underlying the Retail Gravity Model', *Appraisal Journal,* Vol 61, No 4, pp510; Pracsys (2020)

Figure 77. Gravity Model Demand Formula

$$D_{kj} = \sum_{i=1}^{n} (P_{ij} * E_i)$$

D_{kj} = Demand for retail category k, at centre j.

E_i = Expenditure pool of statistical area i.

Source: Carter, C (1993) 'Assumptions Underlying the Retail Gravity Model', *Appraisal Journal,* Vol 61, No 4, pp510; Pracsys (2020)

Figure 77 shows that the demand for retail category k[24], at centre j, is equal to the sum of the probabilities of customers living in statistical areas i to n, multiplied by the expenditure pool of statistical area i. In other words, the demand for retail is a function of the probability of customers from a particular statistical area attending the centre multiplied by the expenditure pool of that statistical area. The expenditure pool is derived through the population multiplied by its income distribution.

In its core form gravity modelling provides a clearer, reproducible outcome that can be easily assessed. However, it does not consider local factors, including:

- The comparative value proposition of centres (e.g. the presence of an 'anchor' attractor that draws significant market share);
- The brand preference of users; or
- The efficiency of transport networks, as well as geographical barriers (e.g. in some cases it may be easier for customers to access a centre that lies physically further away).

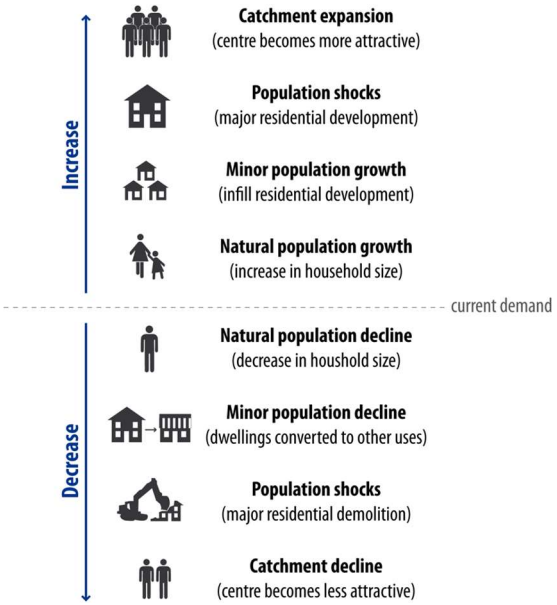
Drivers of Retail Floorspace Supply and Demand

Demand changes can result in increased or decreased expenditure. The potential causes of demand changes are shown in Figure 78. These largely show that an increasing population increases demand, and vice versa. There are significant amounts of commercial floorspace, especially office floorspace, flagged for the central sub-region of Perth and beyond. There will also be significant numbers of new dwellings provided across Perth. This increase in residents has the potential to boost demand for goods and services in the area.

Demand can also increase from rising incomes, or wealth, because people have more disposable income to spend on retail. Demand can also be increased by reducing leakage. Leakage for retail is largely caused by online retail, as well as travelling.

[24] Retail categories are determined by their PLUC code and whether they are convenience or comparison goods. Convenience goods are day-to-day items such as groceries, pharmaceuticals and fast food. Comparison goods are items where consumers are willing to travel further distances, and are bought less frequently such as clothing, furniture, electronics, or other household items.

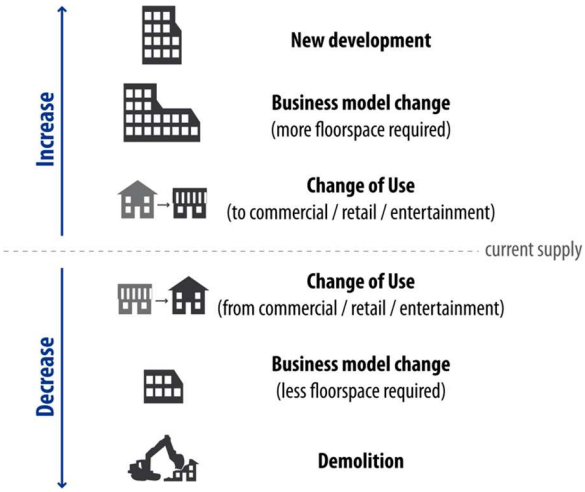
Figure 78. Drivers of Retail Floorspace Demand



Source: Pracsys 2020

Supply changes can result in increased or decreased retail floorspace. The potential causes of supply changes are shown in Figure 79.

Figure 79. Drivers of Retail Floorspace Supply



Source: Pracsys 2020

Spatial Retail Demand Projections

The estimated retail demand for the WA Tomorrow and City of Rockingham Population projection scenarios are shown in Figure 80, Figure 81, Figure 82 and Figure 83.

Figure 80. Future Retail Demand from WA Tomorrow Population Projections (2021)

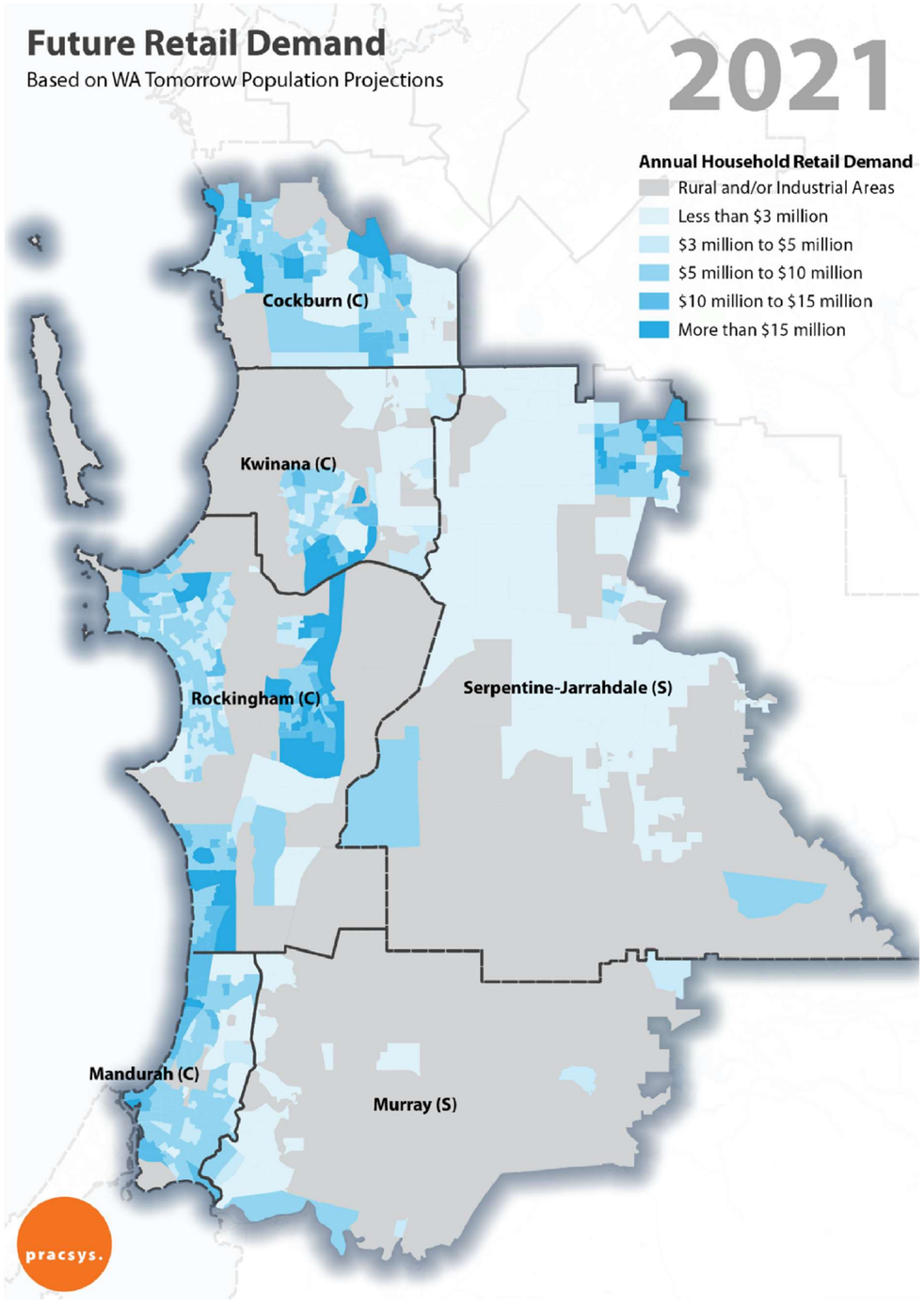


Figure 81. Future Retail Demand from WA Tomorrow Population Projections (2041)

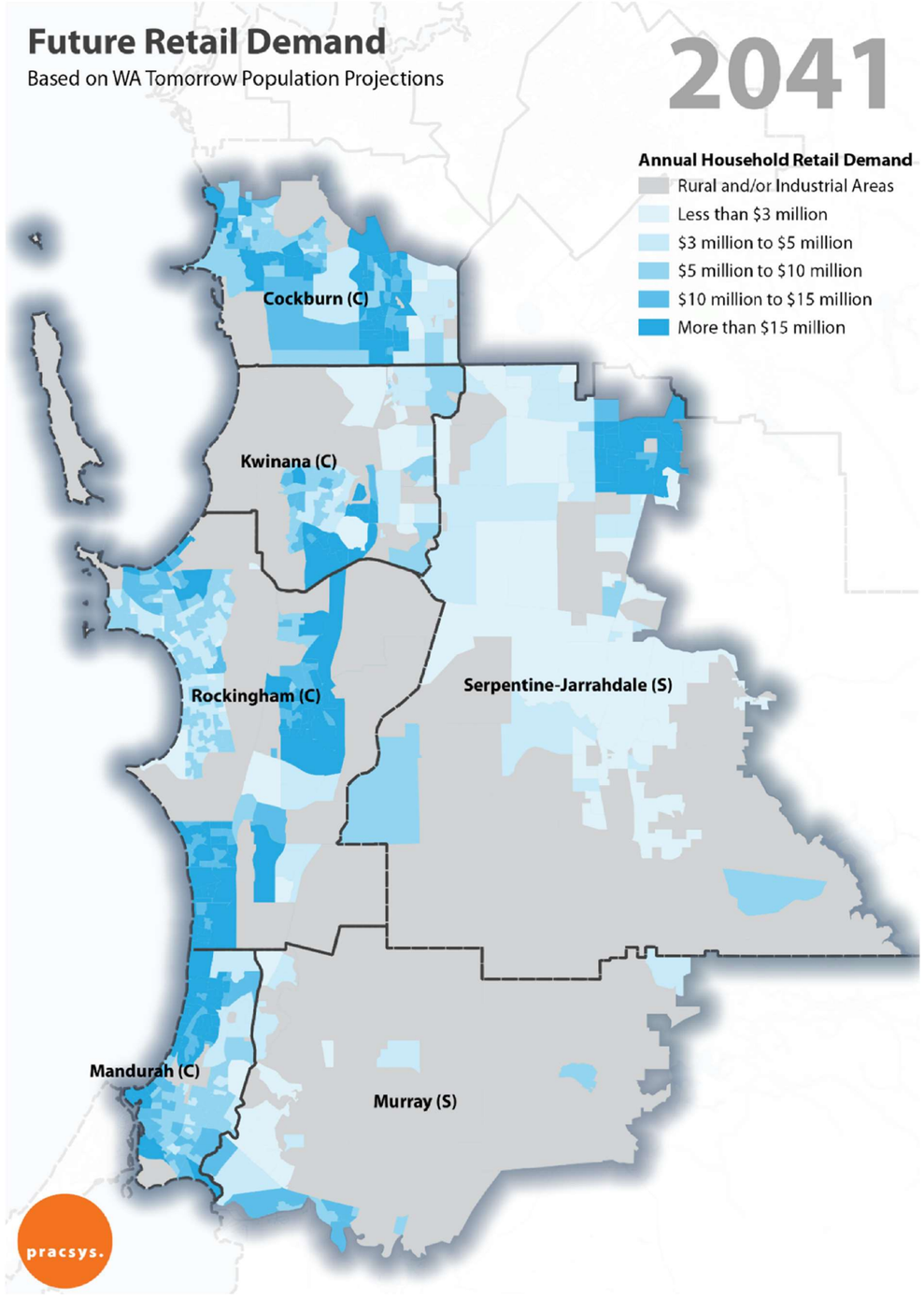


Figure 82. Future Retail Demand from City of Rockingham Population Projections (2021)

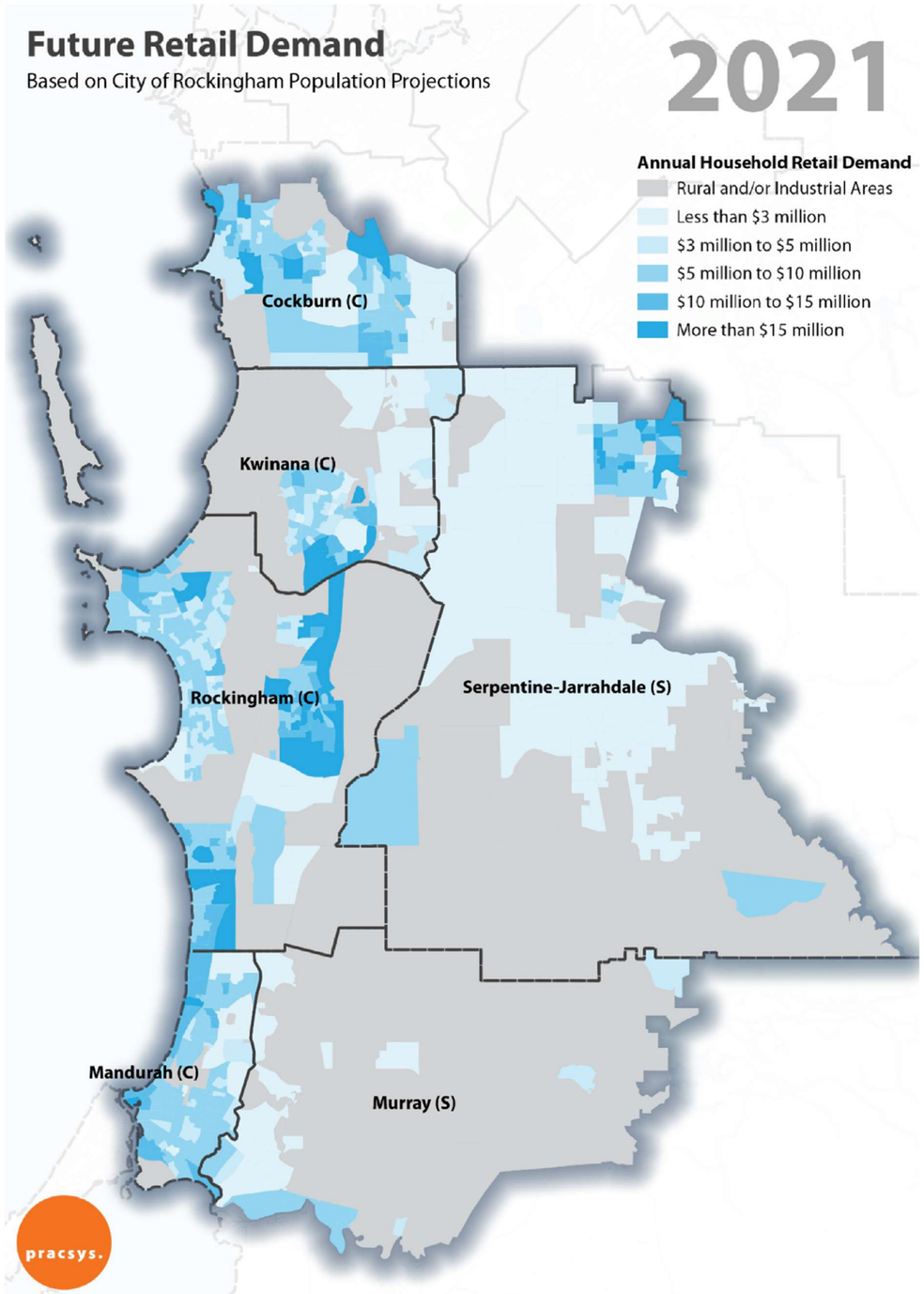
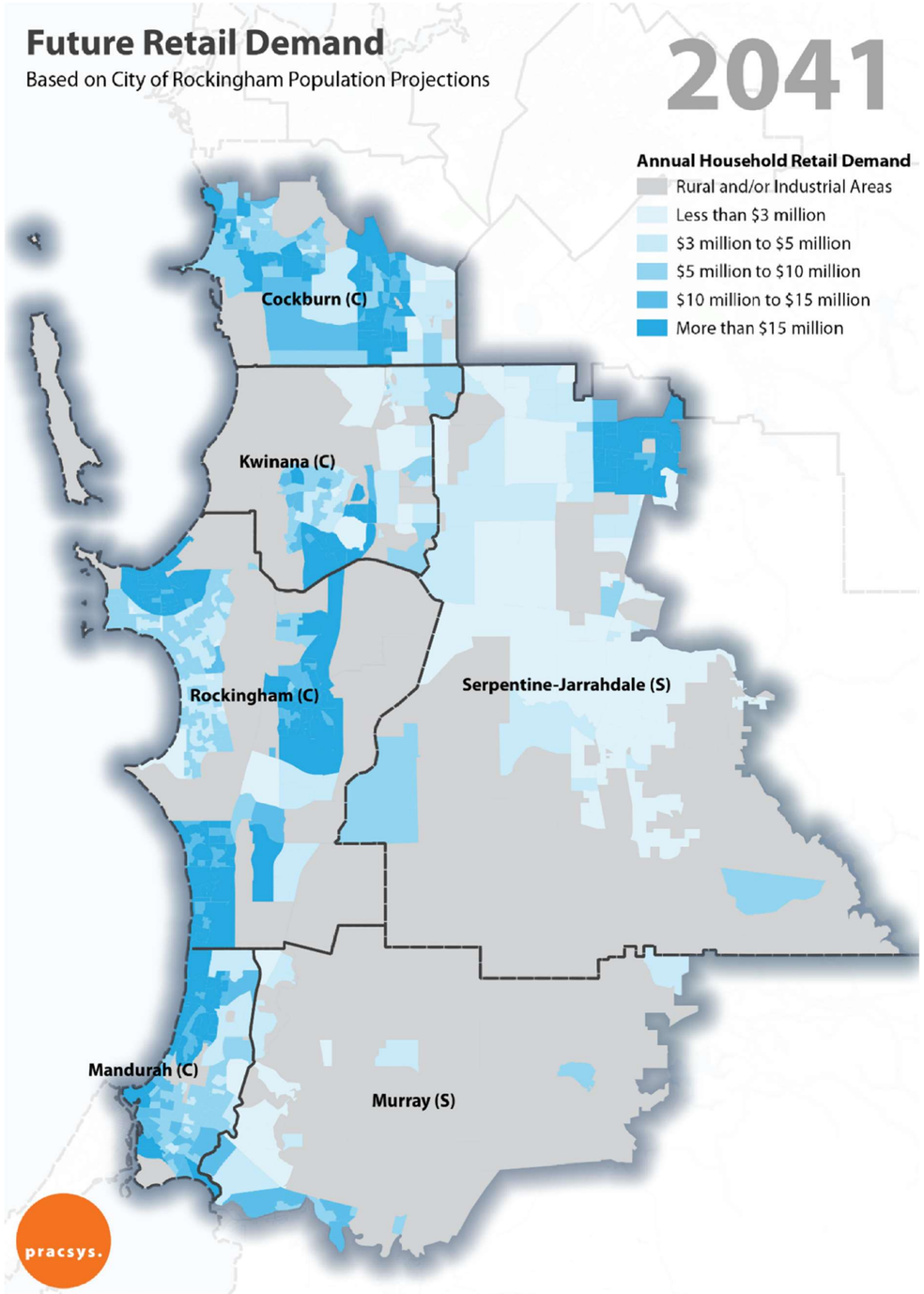


Figure 83. Future Retail Demand from City of Rockingham Population Projections (2041)



10.2 Floorspace Supply Used in Analysis

Current Supply – City of Rockingham

The City of Rockingham has a significant number of activity centres, with a total of approximately 240,000m^2 of retail floorspace (Figure 84).

Figure 84. Activity Centres Within the City of Rockingham by Hierarchy

LUES Activity Centre Name	Activity Centre Name Used in Report	Total SHP Floorspace (m2)	Total RET Floorspace (m2)	Activity Centre Hierarchy
ENTERPRISE	Enterprise	7,298	17,368	Strategic Metropolitan Centre
ROCKINGHAM BEACH	Rockingham Beach	13,848	306	
ROCKINGHAM CITY	Rockingham	63,978	7,526	
BALDIVIS TOWN CENTRE	Baldivis	29,435	16,795	District Centre
SECRET HARBOUR GOLF LINKS	Secret Harbour	15,000		District Centre
WARNBRO AVE	Warnbro	21,029	685	District Centre
BAYSHORE GARDEN	Bayshore Gardens	527		Neighbourhood Centre
CHARTHOUSE WAIKIKI	Charthouse	1,166		Neighbourhood Centre
COOLOONGUP	Grange Drive	1,702		Neighbourhood Centre
COOLOONGUP	Elanora Drive	1,359		Neighbourhood Centre
ISOLATED SERVICE STATIONS	Singleton Village	5,351		Neighbourhood Centre
Not Listed	Spud Shed	5,500		Neighbourhood Centre
Not Listed	Tuart Ridge	3,015		Neighbourhood Centre
PORT KENNEDY	Palm Meadows	3,555		Neighbourhood Centre
READ ROAD	Waikiki Village	11,206	330	Neighbourhood Centre
ROCKINGHAM ISOLATED USES	Settlers Hills	2,061	1,179	Neighbourhood Centre
SHOALWATER	Shoalwater	3,260	219	Neighbourhood Centre
ST CLAIR	St Clair	4,625		Neighbourhood Centre
BELL	Bell Street	611		Local Centre
BALDIVIS	Lakeside Caravan Park	360		Local Centre
BAYSIDE	Safety Bay	2,033		Local Centre
BENT STREET	Bent Street	570		Local Centre
DAMPIER DRIVE	Golden Bay Local	737		Local Centre
FISHER	Fisher street	200		Local Centre
FORESHORE VILLAGE	Foreshore Village Secret Harbour	330		Local Centre
GOLDEN BAY	Golden Bay South	307		Local Centre
MALIBU	Malibu	1,090		Local Centre
MANDURAH ROAD	Mandurah Road	150		Local Centre
McLARTY	McLarty Street	482		Local Centre
Not Listed	Belgravia Terrace	2,000		Local Centre
PARKIN STREET	Parkin Street	246		Local Centre
SAFETY BAY ROAD	Safety Bay Road	548		Local Centre
SINGLETON	Singleton	1,000		Local Centre

LUES Activity Centre Name	Activity Centre Name Used in Report	Total SHP Floorspace (m2)	Total RET Floorspace (m2)	Activity Centre Hierarchy
SORAYA PLACE	Soyara Place	70		Local Centre
ROCKINGHAM ISOLATED USES	The Ridge	583	333	Local Centre
ROCKINGHAM ISOLATED USES	Arcadia Drive	382	218	Local Centre
WAIKIKI	Waikiki Hotel	-	138	Local Centre
WARNBRO	Hokin Street	1,489	460	Local Centre
Total		**207,103**	**45,557**	

Note: Enterprise, Rockingham and Rockingham Beach make up the Rockingham Strategic Metropolitan Centre.

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

These activity centres are used in the Retail Gravity Modelling to estimate current demand for retail in the City of Rockingham from the wider Analysis Catchment. SHP and RET floorspace have been modelled separately. Future activity centres are also included in gravity modelling after their expected completion date.

Future Supply – City of Rockingham

The City of Rockingham has planned the development of a number of activity centres to support its growing population. In total, there is approximately 31,000m^2 of additional retail floorspace planned for the City of Rockingham (Figure 85).

Figure 85. Future Activity Centres within The City of Rockingham by Hierarchy

LUES Activity Centre Name	Activity Centre Name Used in Report	Total Retail Floorspace (m^2)	Activity Centre Hierarchy
Not Listed	Baldivis North	5,200	Neighbourhood Centre
Not Listed	Golden Bay Neighbourhood	3,240	Neighbourhood Centre
Not Listed	Paramount Estate	4,500	Neighbourhood Centre
Not Listed	Parkland Heights	10,000	Neighbourhood Centre
Not Listed	Avalon	1,500	Local Centre
Not Listed	Baldivis parks	1,515	Local Centre
Not Listed	Fifty Road	1,300	Local Centre
Not Listed	Kennedy Bay	1,500	Local Centre
Not Listed	Millars Landing	2,500	Local Centre
Total		**31,255**	

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

Note* A District Centre and Specialised Centre in Karnup is also planned, however, this analysis does not assess Karnup and has excluded these activity centres from the analysis

Floorspace from these yet to be developed activity centres will be included in the Retail Gravity Modelling after their expected date of completion. Additionally, if the analysis identifies the potential to expand or develop additional centres to what is currently planned, these centres will also be included in the analysis.

Floorspace Diversity – City of Rockingham

The floorspace diversity of activity centres within the City of Rockingham has been calculated and compared to the hierarchy level-specific benchmark diversity ratios contained in State Planning Policy 4.2 (**Figure 86**).

Figure 86. Floorspace Diversity Performance of City of Rockingham Activity Centres

Activity Centre	Level in SPP Hierarchy	Shop/Retail Floorspace	Other Non-Residential Land Uses	Diversity Ratio	SPP Benchmark Ratio	Diversity Result
Rockingham	Strategic Metropolitan Centre	63,978	134,013	0.48	1	More Diverse than SPP 4.2 Guideline
Rockingham Beach	Strategic Metropolitan Centre	13,848	19,680	0.70	1	More Diverse than SPP 4.2 Guideline
Enterprise	Strategic Metropolitan Centre	7,298	20,155	0.36	1	More Diverse than SPP 4.2 Guideline
Baldivis	District Centre	29,435	17,206	1.71	2	More Diverse than SPP 4.2 Guideline
Warnbro	District Centre	21,029	2,764	7.61	2	Less Diverse than SPP 4.2 Guideline
Secret Harbour	District Centre	15,000	3,531[25]	15.35	2	Less Diverse than SPP 4.2 Guideline
Waikiki Village	Neighbourhood Centre	6,635	1,310	5.06	Not Applicable	Not Applicable
St Clair	Neighbourhood Centre	4,625	560	8.26	Not Applicable	Not Applicable
Settlers Hills	Neighbourhood Centre	3,602	7,022	0.51	Not Applicable	Not Applicable
The Ridge	Neighbourhood Centre	3,602	7,022	0.51	Not Applicable	Not Applicable
Arcadia Drive	Neighbourhood Centre	3,602	7,022	0.51	Not Applicable	Not Applicable
Palm Meadows	Neighbourhood Centre	3,555	6,280	0.57	Not Applicable	Not Applicable
Shoalwater	Neighbourhood Centre	3,260	1,473	2.21	Not Applicable	Not Applicable
Grange Drive	Neighbourhood Centre	1,702	1,394	1.22	Not Applicable	Not Applicable
Elanora Drive	Neighbourhood Centre	1,702	1,394	1.22	Not Applicable	Not Applicable
Charthouse	Neighbourhood Centre	1,166	0	Not Applicable	Not Applicable	Not Applicable
Singleton Village	Neighbourhood Centre	800	4,551	0.18	Not Applicable	Not Applicable
Bayshore Gardens	Neighbourhood Centre	527	559	0.94	Not Applicable	Not Applicable
Lakeside Caravan Park	Local Centre	2,081	1,991	1.05	Not Applicable	Not Applicable
Safety Bay	Local Centre	2,033	961	2.12	Not Applicable	Not Applicable
Hokin Street	Local Centre	1,489	3,222	0.46	Not Applicable	Not Applicable
Malibu	Local Centre	1,090	912	1.20	Not Applicable	Not Applicable
Golden Bay Local	Local Centre	737	707	1.04	Not Applicable	Not Applicable

[25] Actual not available, estimated based on provision in similar centre types

Activity Centre	Level in SPP Hierarchy	Shop/Retail Floorspace	Other Non-Residential Land Uses	Diversity Ratio	SPP Benchmark Ratio	Diversity Result
Bell Street	Local Centre	611	489	1.25	Not Applicable	Not Applicable
Bent Street	Local Centre	570	0	Not Applicable	Not Applicable	Not Applicable
Safety Bay Road	Local Centre	548	192	2.85	Not Applicable	Not Applicable
Foreshore Village Secret Harbour	Local Centre	330	400	0.83	Not Applicable	Not Applicable
Golden Bay South	Local Centre	307	0	Not Applicable	Not Applicable	Not Applicable
Parkin Street	Local Centre	246	130	1.89	Not Applicable	Not Applicable
Fisher street	Local Centre	200	0	Not Applicable	Not Applicable	Not Applicable
Soyara Place	Local Centre	70	150	0.47	Not Applicable	Not Applicable
Mandurah Road	Local Centre	0	3,310	No Shop/Retail	Not Applicable	Not Applicable
McLarty Street	Local Centre	0	482	No Shop/Retail	Not Applicable	Not Applicable
Waikiki Hotel	Local Centre	0	178	No Shop/Retail	Not Applicable	Not Applicable

Note: Enterprise, Rockingham and Rockingham Beach make up the Rockingham Strategic Metropolitan Centre.

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

The Analysis Catchment used in the analysis extends beyond the City of Rockingham and accordingly, a number of current and planned activity centres that are outside of the City are included in the supply profile for the Analysis Catchment.

Current Supply – Outside the City of Rockingham

There is currently a total of 352,000m^2 of retail floorspace within the Analysis Catchment from outside the City of Rockingham (Figure 87). These activity centres sit within the entirety of the City of Kwinana and portions of the City of Cockburn, the City of Mandurah and the Shire of Serpentine-Jarrahdale.

Figure 87. Other Activity Centres within the Analysis Catchment by Local Government Area

LUES Activity Centre Name	Activity Centre Name Used in Report	Total Retail Floorspace (m^2)	Activity Centre Hierarchy
City of Cockburn			
GATEWAY	Cockburn Central	55,200	Secondary Centre
ATWELL	Stargate Shopping Centre - Atwell	1,443	Local or Neighbourhood Centre
CCC SPEARWOOD ET AL	Beeliar Village	9,015	Local or Neighbourhood Centre
COCKBURN LIQUOR	Cockburn Liquor	465	Local or Neighbourhood Centre
HAMILTON ROAD	Coogee Shopping Centre	755	Local or Neighbourhood Centre
JANDAKOT NORTH	Jandakot North	1,646	Local or Neighbourhood Centre
LYON ROAD	Harvest Lakes Shopping Centre	3,628	Local or Neighbourhood Centre
SPEARWOOD ROAD	Stargate Shopping Centre - Spearwood	3,089	Local or Neighbourhood Centre
THE GRANGE	Beeliar Shopping Centre	2,064	Local or Neighbourhood Centre
WATTLEUP	Wattelup Shopping Centre	180	Local or Neighbourhood Centre
YANGEBUP	Swallow Dr	1,539	Local or Neighbourhood Centre
YANGEBUP SHOPPING	Yangebup Rd/Dunraven Dr	1,041	Local or Neighbourhood Centre
Not Listed	The Park Hive	2,913	Local or Neighbourhood Centre
Not Listed	Port Coogee Village Shopping Centre	5,500	Local or Neighbourhood Centre
Total		**88,478**	
City of Kwinana			
KWINANA CENTRE	Kwinana Town Centre	32,922	Secondary Centre
CALISTA AVENUE	Calista Avenue	153	Local or Neighbourhood Centre
CASUARINA	Casuarina	1,515	Local or Neighbourhood Centre
LEDA	Stargate Shopping Centre - Leda	1,028	Local or Neighbourhood Centre
ORELIA	Orelia Shopping Centre	354	Local or Neighbourhood Centre
PACE ROAD	Pace Road	627	Local or Neighbourhood Centre
PARMELIA	Parmelia Ave / Sutherland Parade	521	Local or Neighbourhood Centre
SUMMERTON	Summerton	394	Local or Neighbourhood Centre
THOMAS RD/HOLDEN CL	Thomas Rd/Holden Cl	350	Local or Neighbourhood Centre
Not Listed	Kwinana Beach Road Thirsty Camel	600	Local or Neighbourhood Centre
Not Listed	Wellard Square	6,500	Local or Neighbourhood Centre
Total		**44,964**	
City of Mandurah			
MANDURAH FORUM	Mandurah Forum	52,072	Strategic Metropolitan Centre

LUES Activity Centre Name	Activity Centre Name Used in Report	Total Retail Floorspace (m^2)	Activity Centre Hierarchy
Not Listed	Lakelands Shopping Centre	21,170	District Centre
MEADOW SPRINGS	Meadow Springs Shopping Centre	8,585	Local or Neighbourhood Centre
NORTH MANDURAH	North Mandurah	45,455	Local or Neighbourhood Centre
MARINA	Mandurah Marina	5,710	Local or Neighbourhood Centre
SANDS	Mandurah Beach	2,700	Local or Neighbourhood Centre
MISSISSIPPI	Greenfields Shopping Centre	1,506	Local or Neighbourhood Centre
LAKES	Mandurah Hospital	1,565	Local or Neighbourhood Centre
AQUATIC CENTRE	Mandurah Aquatic Centre	310	Local or Neighbourhood Centre
DUDLEY PARK	Dudley Park	200	Local or Neighbourhood Centre
MANDURAH CENTRAL	Mandurah Central	24,329	Local or Neighbourhood Centre
MANDURAH EAST	Mandurah East	7,010	Local or Neighbourhood Centre
BIRD CAMERON	Bird Cameron	8,058	Local or Neighbourhood Centre
Not Listed	ALDI Mandurah	1,350	Local or Neighbourhood Centre
Not Listed	Mandurah Greenfields Shopping Centre	4,950	Local or Neighbourhood Centre
Total		**184,970**	
Shire of Murray			
NTH DANDALUP	Nth Dandalup	430	Local or Neighbourhood Centre
BARRAGUP	Barragup	2,732	Local or Neighbourhood Centre
CALTEX YUNDERUP	Caltex Yunderup	480	Local or Neighbourhood Centre
NORTH YUNDERUP ROAD	North Yunderup Road	340	Local or Neighbourhood Centre
RAVENSWOOD	Ravenswood Caravan Park	555	Local or Neighbourhood Centre
Total		**4,537**	
Shire of Serpentine Jarrahdale			
BYFORD	Byford Village Shopping Centre	19,497	District Centre
MUNDIJONG	Mundijong Shopping Centre	1,445	District Centre
SERPENTINE	Serpentine	1,130	Local or Neighbourhood Centre
GEORGE RD	George Rd	395	Local or Neighbourhood Centre
ATKINS STREET	Atkins Street	62	Local or Neighbourhood Centre
Not Listed	Thomas Rd/Kardan Blvd	1,350	Local or Neighbourhood Centre
Not Listed	South Western Highway/Nettleton Road	2,500	Local or Neighbourhood Centre
Not Listed	Lakeside Shopping Centre	2,700	Local or Neighbourhood Centre
Total		**20,097**	

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

Future Supply – Outside the City of Rockingham

There is a total of 121,500m^2 of future retail floorspace within the Analysis Catchment from outside the City of Rockingham, with the vast majority of this floorspace coming from the Cockburn Central expansion (Figure 88). These activity centres sit within the entirety of the City of Kwinana and portions of the City of Cockburn, the City of Mandurah and the Shire of Serpentine-Jarrahdale. It should be noted that for LGAs where only portions of the LGA are included in the Analysis Catchment, only activity centres planned for the portion in the Analysis Catchment are included.

Figure 88. Future Other Activity Centres within the Analysis Catchment by Local Government Area

LUES Activity Centre Name	Activity Centre Name Used in Report	Total Retail Floorspace (m^2)	Activity Centre Hierarchy
City of Cockburn			
GATEWAY	Cockburn Central	Expansion of 90,000	Secondary Centre
Not Listed	Entrance Road Activity Centre	TBD - Assumed 1,500	Local Centre
Not Listed	Hammond Road Local Centre	TBD - Assumed 8,100	Local Centre
Total		**TBD - Assumed 99,600**	
City of Kwinana			
Not Listed	Wandi District Centre	16,000	District Centre
Not Listed	Bertram Neighbourhood Centre	900	Local Centre
Total		**16,900**	
Shire of Serpentine-Jarrahdale			
Not Listed	Thomas Road	TBD - Assumed 5,000	Neighbourhood Centre

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

Note: It has been assumed that future centres identified as local centres will have approximately 1,500m^2 of retail floorspace and future centres identified as neighbourhood centres will have approximately 5,000m^2 of retail floorspace.

Activity Centre Hierarchy

Activity centres under SPP 4.2 are defined under the activity centre hierarchy, which splits activity centres into seven distinct groups:

- Capital City
- Primary Centres
- Strategic Metropolitan Centres
- Secondary Centres
- District Centres
- Neighbourhood Centres
- Local Centres

Each of these centre types has a specific purpose and is considered complementary to the other groups in the hierarchy. The typical characteristics of each activity centre type are described in Figure 89. It should be noted that the City of Rockingham does not have any centres that come under 'Capital City' or 'Primary Centres' and accordingly, these centre types are not included in Figure 89.

Figure 89. Activity Centre Characteristics

Typical Characteristics	Strategic Metropolitan Centres	Secondary Centres	District Centres	Neighbourhood Centres	Local Centres
Main Role/Function	Strategic metropolitan centres are the main regional activity centres. They are multipurpose centres that provide a diversity of uses. These centres provide the full range of economic and community services necessary for the communities in their catchments.	Secondary centres share similar characteristics with strategic metropolitan centres but serve smaller catchments and offer a more limited range of services, facilities and employment opportunities. They perform an important role in the city's economy, and provide essential services to their catchments.	District centres have a greater focus on servicing the daily and weekly needs of residents. Their relatively smaller scale catchment enables them to have a greater local community focus and provide services, facilities and job opportunities that reflect the particular needs of their catchments.	Neighbourhood centres provide for daily and weekly household shopping needs, community facilities and a small range of other convenience services.	Local centres provide for some daily and weekly convenience shopping needs.
Transport connectivity and accessibility	Important focus for passenger rail and high frequency bus networks.	Important focus for passenger rail and high frequency bus networks.	Focal point for bus network.	Stopping/transfer point for bus network.	Stopping/transfer point for bus network.
Typical retail types	• Department stores • Discount department stores • Supermarkets • Full range of specialty shops	• Department stores • Discount department stores • Supermarkets • Specialty shops	• Discount department stores • Supermarkets • Convenience goods • Small scale comparison shopping • Personal services • Some specialty shops	• Supermarkets • Personal services • Convenience shops	• Convenience shops • Take away food
Typical Office development	• Major offices • State government agencies	• Major offices • Professional and service businesses	• District level office development • Local professional services	• Local professional services	• None
Walkable Catchment	800 metres	800 metres	400 metres	200 metres	200 metres

Source: Department of Planning, Lands and Heritage, 2010, Pracsys 202

10.3 Floorspace Productivity

The floorspace productivity rates required to ensure reasonable retention rates by shop type are shown in **Figure 90**.

Figure 90. Required Floorspace Productivity for Business Retention

Retail Category	Productivity ($/m^2)
Take-Home Food	$ 10,000
Take-Home Liquor	$ 9,000
Dine Out Food	$ 6,500
Clothing/Footwear	$ 5,000
Convenience Retail	$ 7,000
Bulky Goods Retail	$ 5,500

Source: Colliers 2017

10.4 PLUC Definitions

Planning Land Use Category (PLUC) Code		Description
PRI	Primary-Rural	Land use activities which usually involve the use of large areas of land, including mining, agriculture, fishing and nature conservation. The function of many of these activities is to make use of, or extract from, the land in its natural state. Since such activities are the first step in the production process, they are quite distinct from the other categories.
MAN	Manufacturing/Processing/Fabrication	This category includes land use activities involving the manufacture, processing and fabrication of all general goods. Both the scale and associated environmental impact of these activities separate them from other land use categories.
STO	Storage/Distribution	Any land use activity which involves the storage, warehousing or wholesaling of goods usually conducted from large structures, or involving large bulk goods, but does not include activities that attract the general retail trade activities.
SER	Service Industry	This category includes service industries offering a range of services. The scale and environmental impact of such activities require their separation from other land uses. These services include film processing, cleaning, motor vehicle and other repair services, and other servicing activities, including some construction activities.
SHP	Shop/Retail	Any activity which involves the sale of goods from a shop located separate to, and/or in, a shopping centre other than those included in Other Retail.

Planning Land Use Category (PLUC) Code		Description
RET	Other Retail	Many of these activities are not normally accommodated in a shopping centre. By virtue of their scale and special nature the goods of these activities separate them from the Shop/Retail category (for example car sales yard or carpet showroom).
OFF	Office/Business	Administrative, clerical, professional and medical offices are activities which do not necessarily require the land area/floor space or exposure of other land uses. Although offices require building and parking facilities, these needs are quite distinct from those of commercial uses and service industries.
HEL	Health/Welfare/Community Services	Government, government-subsidised and non-government activities that provide the community with a specific service, including hospitals, schools, personal services and religious activities.
ENT	Entertainment/Recreation/Cultural	Activities which provide entertainment, recreation and culture for the community and which occur in buildings and/or on land, such as passive and active sports venues, museums, amusements and gambling services.
RES	Residential	Includes all types of residential land use ranging from single housing to nursing homes for the aged, residential hotels, motels, other holiday housing, institutions and religious housing.
UTE	Utilities/Communications	All forms of local, state, national and international communication, transportation and other utilities (for example, electricity, gas, water, sewerage, roads, parking and other transport or communications related activities) covering the public and private sectors.
VFA	Vacant Floor Area	This category accounts for vacant floor areas of buildings, including both non-residential and residential.
VLA	Vacant Land Area	Includes land that has not been improved by development and remains unused.

11 APPENDIX 2: FLOORSPACE GAPS BY ACTIVITY CENTRE

11.1 Precinct 1

City of Rockingham Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Strategic Metropolitan Centre	Enterprise	-	1,704	1,027
Strategic Metropolitan Centre	Rockingham	1,764	1,801	77,846
Strategic Metropolitan Centre	Rockingham Beach	-	33	5,621
Neighbourhood Centre	Charthouse	395	-	-
Neighbourhood Centre	Elanora Drive	333	-	-
Neighbourhood Centre	Grange Drive	417	-	381
Neighbourhood Centre	Shoalwater	322	34	334
Neighbourhood Centre	Waikiki Village	1,542	82	421
Local Centre	Arcadia Drive	94	85	241
Local Centre	Belgravia Terrace	-	-	348
Local Centre	Bell Street	68	-	147
Local Centre	Bent Street	50	-	-
Local Centre	Fisher street	12	-	-
Local Centre	Malibu	337	-	158
Local Centre	McLarty Street	50	-	-
Local Centre	Parkin Street	36	-	13
Local Centre	Safety Bay	442	-	785
Local Centre	Safety Bay Road	116	-	310
Local Centre	Soyara Place	1	-	278
Local Centre	Waikiki Hotel	-	26	65
Other Retail Centre	East Rockingham	-	-	-
	Total	**5,978**	**3,765**	**87,976**

WA Tomorrow Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Strategic Metropolitan Centre	Enterprise	-	1,704	1,024
Strategic Metropolitan Centre	Rockingham	4,513	1,801	77,664
Strategic Metropolitan Centre	Rockingham Beach	-	33	5,588
Neighbourhood Centre	Charthouse	237	-	-
Neighbourhood Centre	Elanora Drive	200	-	-
Neighbourhood Centre	Grange Drive	250	-	380
Neighbourhood Centre	Shoalwater	193	34	333

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Neighbourhood Centre	Waikiki Village	925	82	419
Local Centre	Arcadia Drive	56	85	239
Local Centre	Belgravia Terrace	-	-	345
Local Centre	Bell Street	41	-	146
Local Centre	Bent Street	30	-	-
Local Centre	Fisher street	7	-	-
Local Centre	Malibu	202	-	157
Local Centre	McLarty Street	30	-	-
Local Centre	Parkin Street	21	-	13
Local Centre	Safety Bay	265	-	779
Local Centre	Safety Bay Road	70	-	310
Local Centre	Soyara Place	0	-	275
Local Centre	Waikiki Hotel	-	26	65
Other Retail Centre	East Rockingham	-	-	-
	Total	**7,041**	**3,765**	**87,737**

11.2 Precinct 2

City of Rockingham Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Warnbro	1,912	28	743
Neighbourhood Centre	Palm Meadows	1,653	-	2,345
Neighbourhood Centre	St Clair	512	-	529
Local Centre	Hokin Street	122	102	1,809
Local Centre	Kennedy Bay	Not Built	Not Built	Not Built
Other Retail Centre	Port Kennedy Enterprise Park	-	2,272	-
	Total	**4,200**	**2,402**	**5,426**

WA Tomorrow Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Warnbro	1,147	28	741
Neighbourhood Centre	Palm Meadows	992	-	2,327
Neighbourhood Centre	St Clair	307	-	524
Local Centre	Hokin Street	73	102	1,806
Local Centre	Kennedy Bay	Not Built	Not Built	Not Built
Other Retail Centre	Port Kennedy Enterprise Park	-	2,272	-
	Total	**2,520**	**2,402**	**5,398**

11.3 Precinct 3

City of Rockingham Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Secret Harbour	2,300	-	994
Neighbourhood Centre	Bayshore Gardens	95	-	168
Neighbourhood Centre	Golden Bay Neighbourhood	Not Built	Not Built	Not Built
Neighbourhood Centre	Singleton Village	-	-	-
Local Centre	Foreshore Village Secret Harbour	70	-	41
Local Centre	Golden Bay Local	189	-	212
Local Centre	Golden Bay South	10	-	-
Local Centre	Mandurah Road	-	-	1,233
Local Centre	Singleton	278	-	174
	Total	**2,942**	**-**	**2,821**

WA Tomorrow Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Secret Harbour	1,380	-	984
Neighbourhood Centre	Bayshore Gardens	57	-	167
Neighbourhood Centre	Golden Bay Neighbourhood	Not Built	Not Built	Not Built
Neighbourhood Centre	Singleton Village	-	-	-
Local Centre	Foreshore Village Secret Harbour	42	-	41
Local Centre	Golden Bay Local	113	-	211
Local Centre	Golden Bay South	6	-	-
Local Centre	Mandurah Road	-	-	1,221
Local Centre	Singleton	167	-	173
	Total	**1,765**	**-**	**2,797**

11.4 Precinct 4

City of Rockingham Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Baldivis	3,179	-	6,134
Neighbourhood Centre	Baldivis North	Not Built	Not Built	Not Built
Neighbourhood Centre	Paramount Estate	Not Built	Not Built	Not Built
Neighbourhood Centre	Parkland Heights	Not Built	Not Built	Not Built
Neighbourhood Centre	Settlers Hills	1,914	84	6,494
Neighbourhood Centre	Spud Shed	1,447	-	958
Neighbourhood Centre	Tuart Ridge	859	-	525
Local Centre	Avalon	Not Built	Not Built	Not Built
Local Centre	Baldivis parks	Not Built	Not Built	Not Built

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
Local Centre	Fifty Road	Not Built	Not Built	Not Built
Local Centre	Lakeside Caravan Park	228	-	-
Local Centre	Millars Landing	Not Built	Not Built	Not Built
Local Centre	The Ridge	143	129	368
	Total	**7,770**	**214**	**14,480**

WA Tomorrow Population Projections Floorspace Gap in 2021

Centre Type	Centre Name	SHP Floorspace	RET Floorspace	Non-Retail Floorspace
District Centre	Baldivis	1,907	-	6,109
Neighbourhood Centre	Baldivis North	Not Built	Not Built	Not Built
Neighbourhood Centre	Paramount Estate	Not Built	Not Built	Not Built
Neighbourhood Centre	Parkland Heights	Not Built	Not Built	Not Built
Neighbourhood Centre	Settlers Hills	1,149	84	6,438
Neighbourhood Centre	Spud Shed	868	-	950
Neighbourhood Centre	Tuart Ridge	515	-	521
Local Centre	Avalon	Not Built	Not Built	Not Built
Local Centre	Baldivis parks	Not Built	Not Built	Not Built
Local Centre	Fifty Road	Not Built	Not Built	Not Built
Local Centre	Lakeside Caravan Park	137	-	-
Local Centre	Millars Landing	Not Built	Not Built	Not Built
Local Centre	The Ridge	86	129	364
	Total	**4,662**	**214**	**14,382**

12 APPENDIX 3: FLOORSPACE PROFILE

12.1 Total Commercial Supply

Figure 91. Activity Centres Within the City of Rockingham by Hierarchy

LUES Activity Centre Name	Activity Centre Name Used in Report	Total SHP Floorspace (m2)	Total RET Floorspace (m2)	Activity Centre Hierarchy
ENTERPRISE	Enterprise	7,298	17,368	Strategic Metropolitan Centre
ROCKINGHAM BEACH	Rockingham Beach	13,848	306	
ROCKINGHAM CITY	Rockingham	63,978	7,526	
BALDIVIS TOWN CENTRE	Baldivis	29,435	16,795	District Centre
SECRET HARBOUR GOLF LINKS	Secret Harbour	15,000		District Centre
WARNBRO AVE	Warnbro	21,029	685	District Centre
BAYSHORE GARDEN	Bayshore Gardens	527	-	Neighbourhood Centre
CHARTHOUSE WAIKIKI	Charthouse	1,166	-	Neighbourhood Centre
COOLOONGUP	Grange Drive	1,702	-	Neighbourhood Centre
COOLOONGUP	Elanora Drive	1,359	-	Neighbourhood Centre
ISOLATED SERVICE STATIONS	Singleton Village	5,351	-	Neighbourhood Centre
Not Listed	Spud Shed	5,500	-	Neighbourhood Centre
Not Listed	Tuart Ridge	3,015	-	Neighbourhood Centre
PORT KENNEDY	Palm Meadows	3,555	-	Neighbourhood Centre
READ ROAD	Waikiki Village	11,206	330	Neighbourhood Centre
ROCKINGHAM ISOLATED USES	Settlers Hills	2,061	1,179	Neighbourhood Centre
SHOALWATER	Shoalwater	3,260	219	Neighbourhood Centre
ST CLAIR	St Clair	4,625	-	Neighbourhood Centre
BELL	Bell Street	611	-	Local Centre
BALDIVIS	Lakeside Caravan Park	360	-	Local Centre
BAYSIDE	Safety Bay	2,033	-	Local Centre
BENT STREET	Bent Street	570	-	Local Centre
DAMPIER DRIVE	Golden Bay Local	737	-	Local Centre
FISHER	Fisher street	200	-	Local Centre
FORESHORE VILLAGE	Foreshore Village Secret Harbour	330	-	Local Centre
GOLDEN BAY	Golden Bay South	307	-	Local Centre
MALIBU	Malibu	1,090	-	Local Centre
MANDURAH ROAD	Mandurah Road	150	-	Local Centre
McLARTY	McLarty Street	482	-	Local Centre
Not Listed	Belgravia Terrace	2,000	-	Local Centre
PARKIN STREET	Parkin Street	246	-	Local Centre
SAFETY BAY ROAD	Safety Bay Road	548	-	Local Centre
SINGLETON	Singleton	1,000	-	Local Centre

LUES Activity Centre Name	Activity Centre Name Used in Report	Total SHP Floorspace (m2)	Total RET Floorspace (m2)	Activity Centre Hierarchy
SORAYA PLACE	Soyara Place	70	-	Local Centre
ROCKINGHAM ISOLATED USES	The Ridge	583	333	Local Centre
ROCKINGHAM ISOLATED USES	Arcadia Drive	382	218	Local Centre
WAIKIKI	Waikiki Hotel	-	138	Local Centre
WARNBRO	Hokin Street	1,489	460	Local Centre
Total		**207,103**	**45,557**	

Note: Enterprise, Rockingham and Rockingham Beach make up the Rockingham Strategic Metropolitan Centre.

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

These activity centres are used in the Retail Gravity Modelling to estimate current demand for retail in the City of Rockingham from the wider Analysis Catchment. SHP and RET floorspace have been modelled separately. Future activity centres are also included in gravity modelling after their expected completion date.

The City of Rockingham has planned the development of a number of activity centres to support its growing population. In total, there is approximately 31,000m^2 of additional Shop/Retail floorspace planned for the City of Rockingham (Figure 92).[26]

Figure 92. Future Activity Centres within The City of Rockingham by Hierarchy

LUES Activity Centre Name	Activity Centre Name Used in Report	Total Retail Floorspace (m^2)	Activity Centre Hierarchy
Not Listed	Baldivis North	5,200	Neighbourhood Centre
Not Listed	Golden Bay Neighbourhood	3,240	Neighbourhood Centre
Not Listed	Paramount Estate	4,500	Neighbourhood Centre
Not Listed	Parkland Heights	10,000	Neighbourhood Centre
Not Listed	Avalon	1,500	Local Centre
Not Listed	Baldivis parks	1,515	Local Centre
Not Listed	Fifty Road	1,300	Local Centre
Not Listed	Kennedy Bay	1,500	Local Centre
Not Listed	Millars Landing	2,500	Local Centre
Total		**31,255**	

Source: DPLH 2016, City of Rockingham 2021, Pracsys 2021

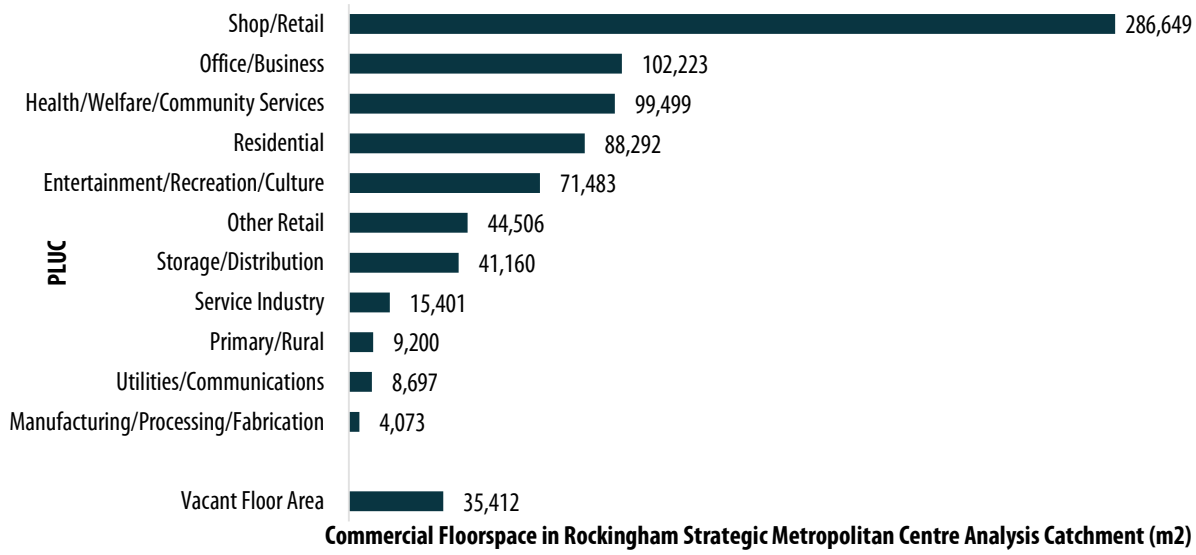
Note* A District Centre and Specialised Centre in Karnup is also planned, however, this analysis does not assess Karnup and has excluded these activity centres from the analysis.

Floorspace from these yet to be developed activity centres will be included in the Retail Gravity Modelling after their expected date of completion. Additionally, if the analysis identifies potential to expand or develop additional centres to what is currently planned, these centres will also be included in the analysis.

[26] Only Shop/Retail figures were available for planned centres. Estimates of Non-Retail provision were developed based on current provision by centre type and included into modelling of future non-retail floorspace.

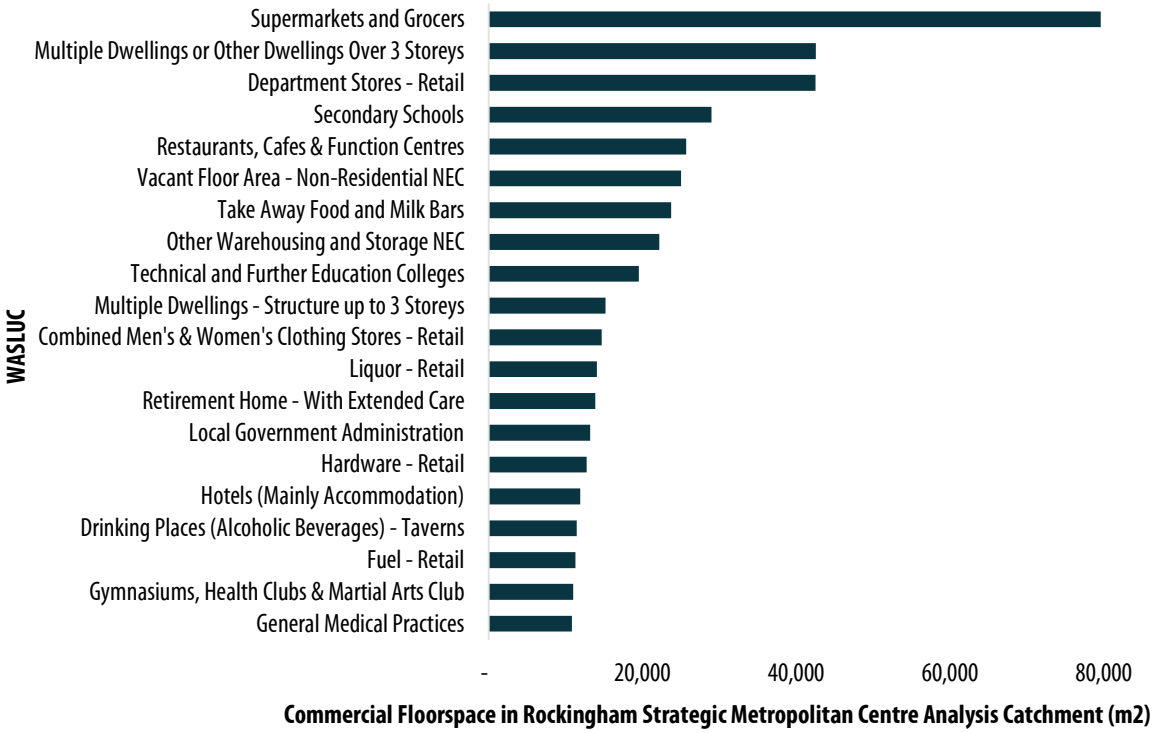
12.2 Commercial Floorspace

Figure 93. Commercial Floorspace in the Rockingham Strategic Metropolitan Centre (RSMC) 25km Catchment by PLUC



Source: DPLH 2016, Pracsys 2021

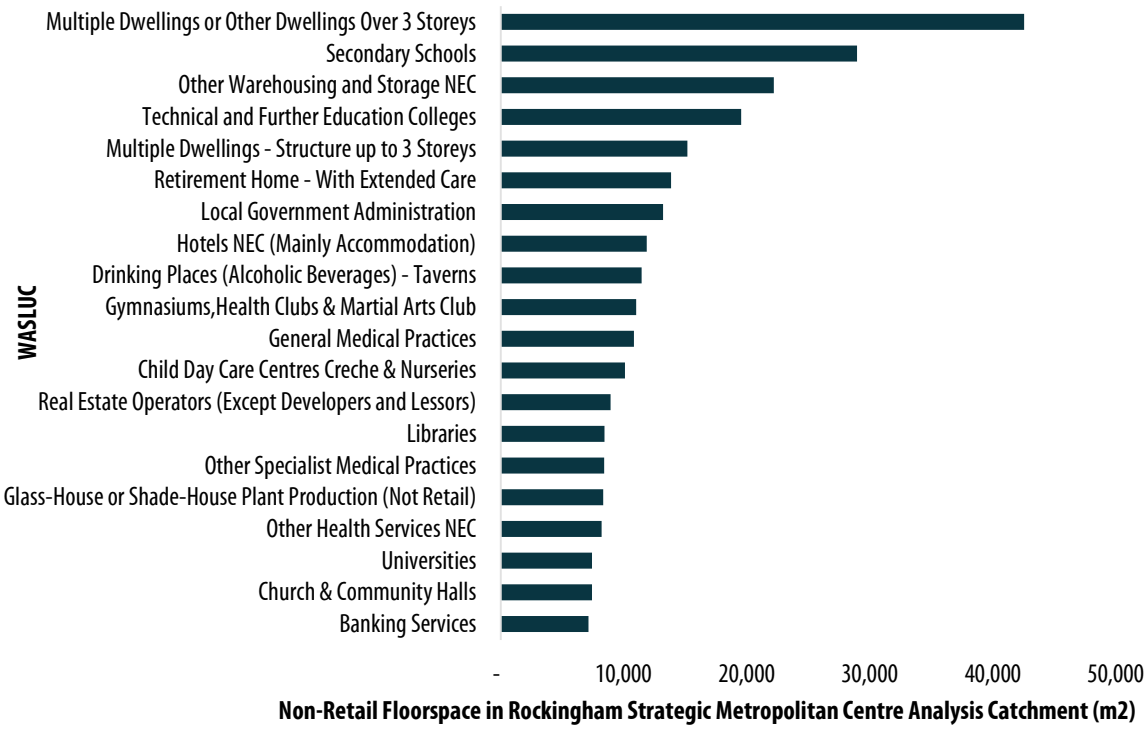
Figure 94. Commercial Floorspace in the RSMC 25km Catchment by WASLUC



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

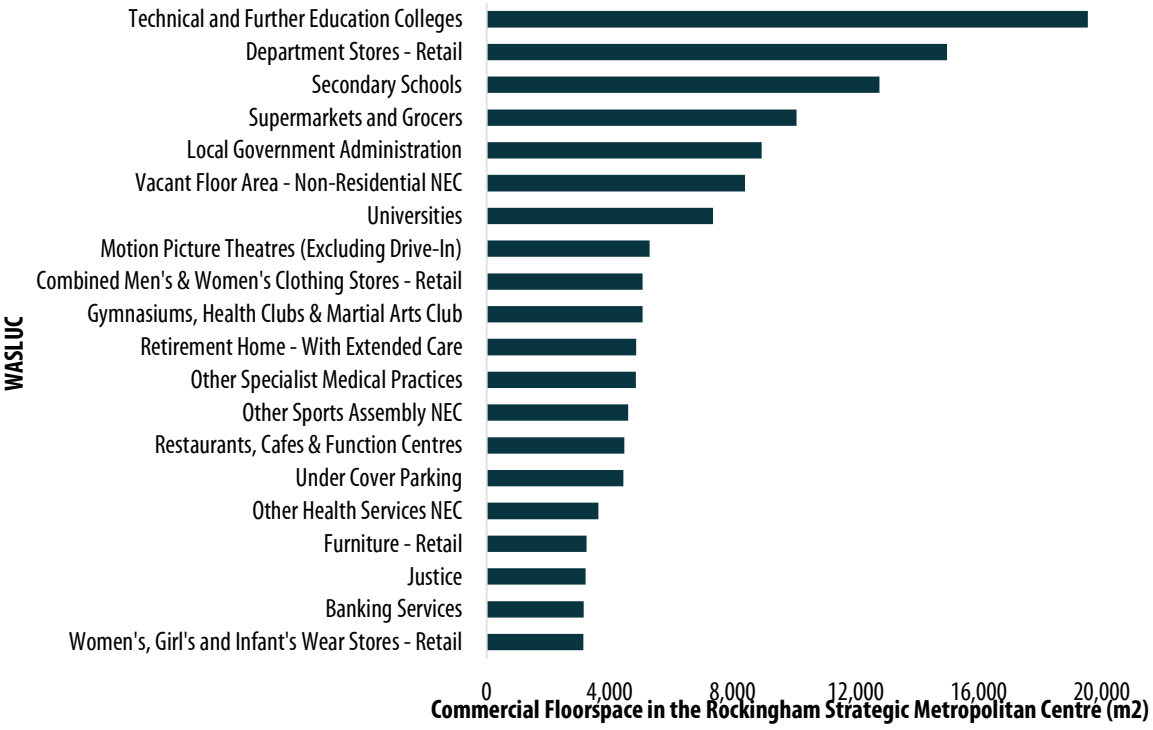
Figure 95. Non-Retail Floorspace in the RSMC 25km Catchment by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

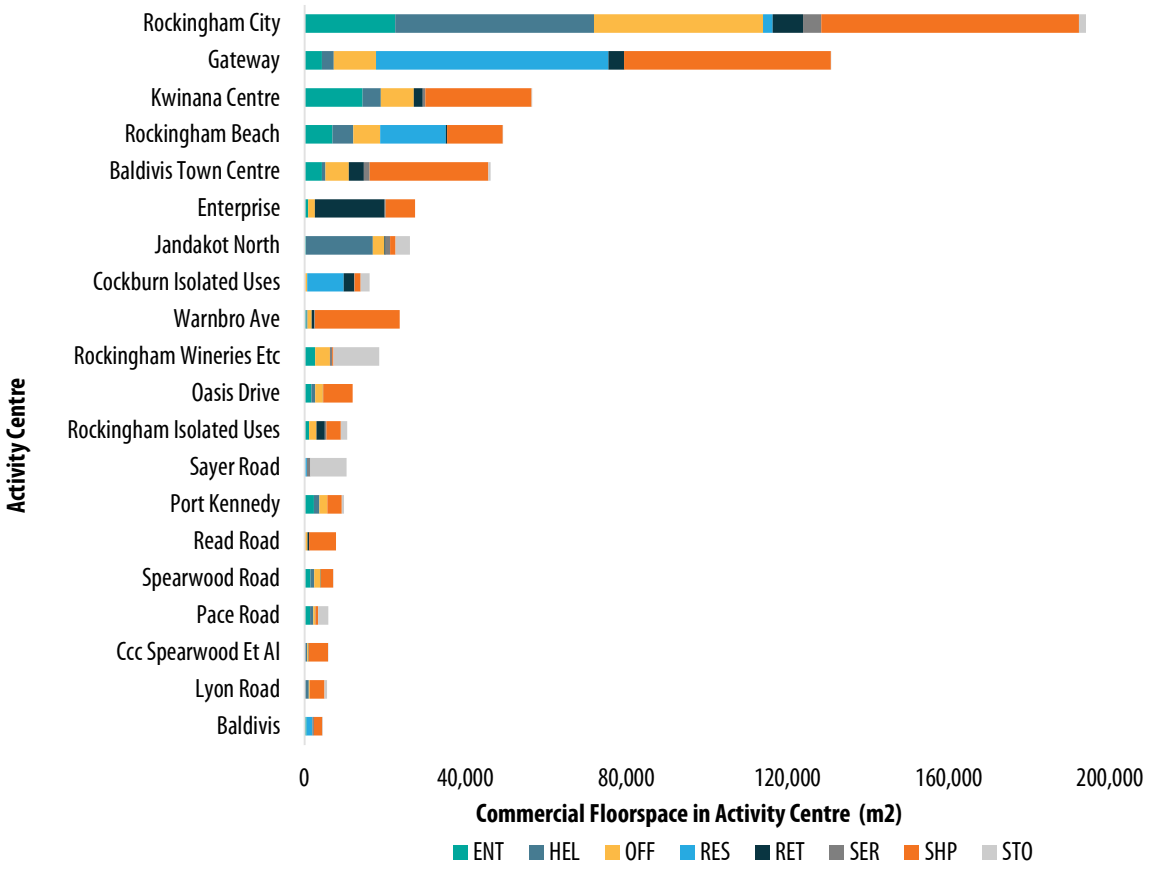
Figure 96. Commercial Floorspace in the RSMC by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 97. Commercial Floorspace in RSMC 25km Catchment Activity Centres by PLUC

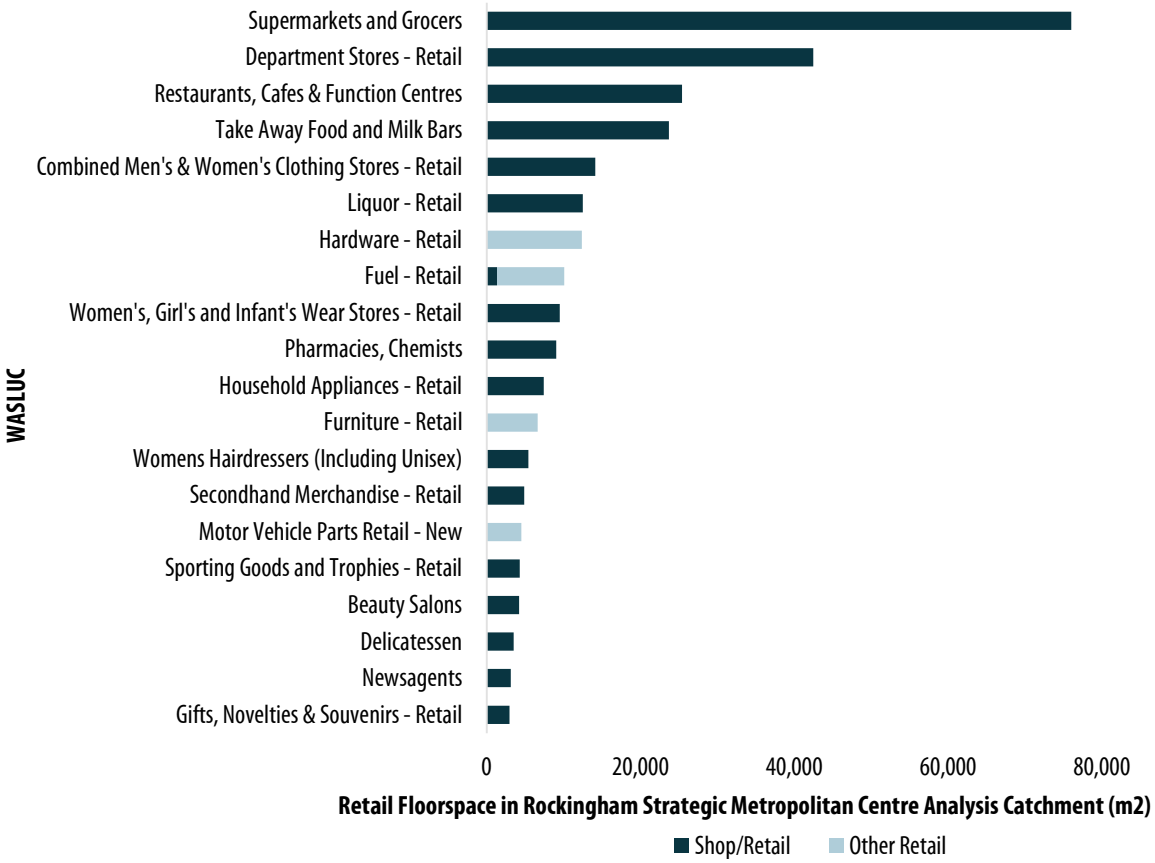


Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

12.3 Retail Floorspace

Figure 98. Retail Floorspace in the RSMC 25km Catchment by WASLUC



Note: Only top floorspaces illustrated.

Source: DPLH 2016, Pracsys 2021

Retail Floorspace Diversity

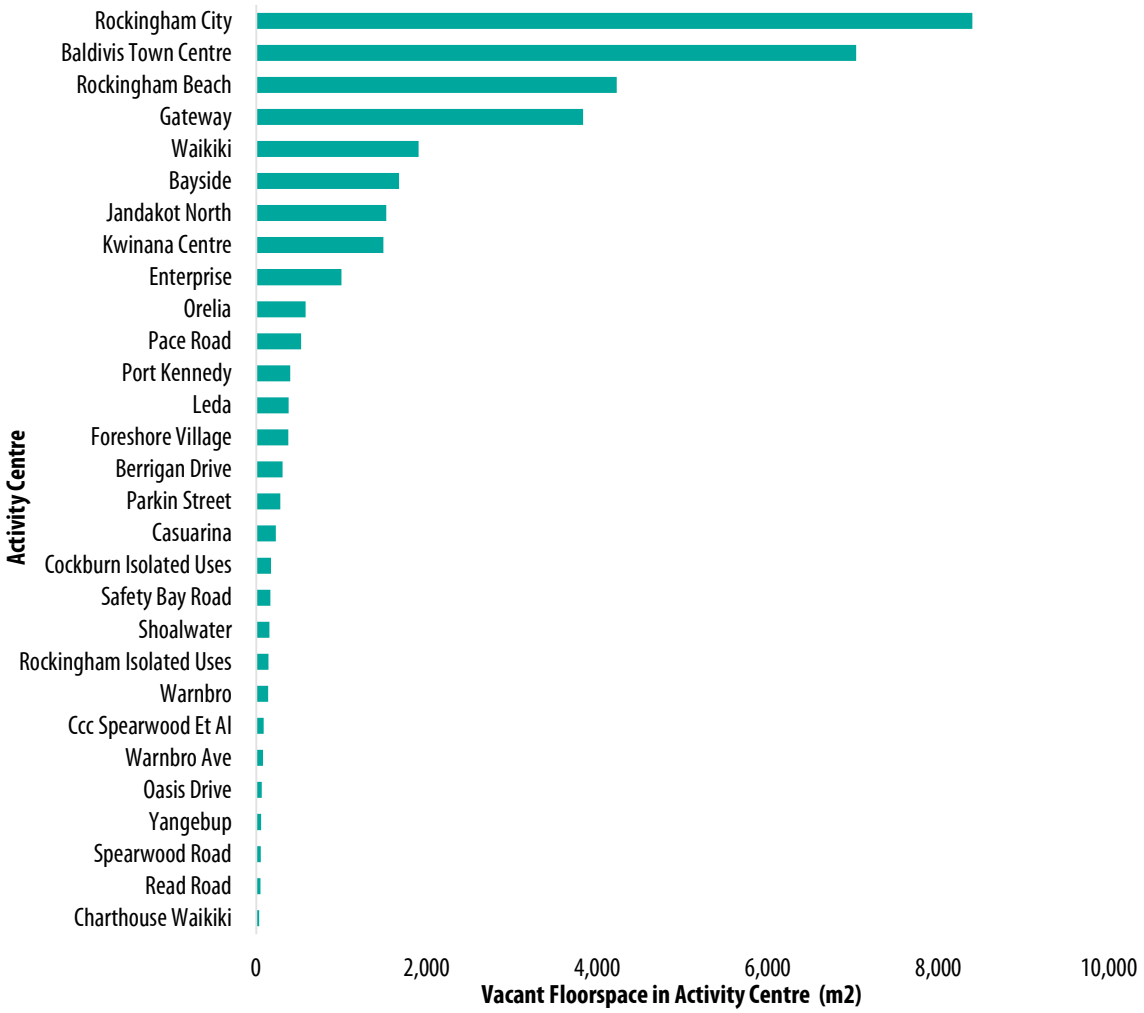
Figure 99. Floorspace Diversity Ratio in the RSMC 25km Catchment

	RSMC	RSMC 25km Catchment
Shop/Retail Floorspace	63,978	286,649
Other Non-Residential Land Uses	134,013	396,242
Diversity Ratio	0.48 : 1	0.72 : 1
State Planning Policy Benchmark Ratio	1 : 1	1 : 1
Diversity Variance	-0.52 : 1	-0.28 : 1

Source: DPLH 2016, Pracsys 2021

12.4 Vacant Floorspace

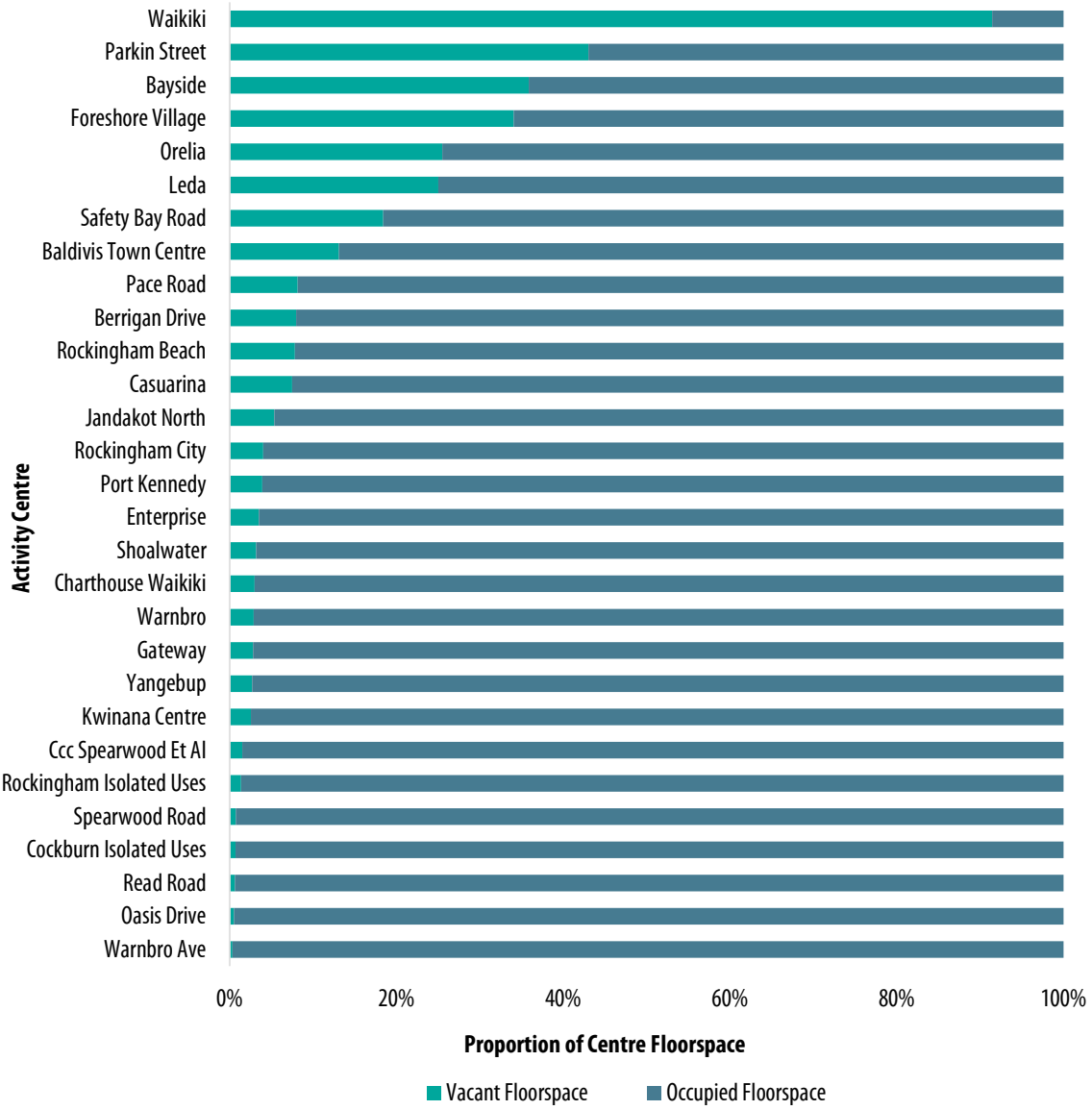
Figure 100. Vacant Floorspace in RSMC 25km Catchment Activity Centres (m^2)



Note: Only those centres with Vacant Floor Area are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 101. Vacant Floorspace in the RSMC 25km Catchment Activity Centres (Proportion)



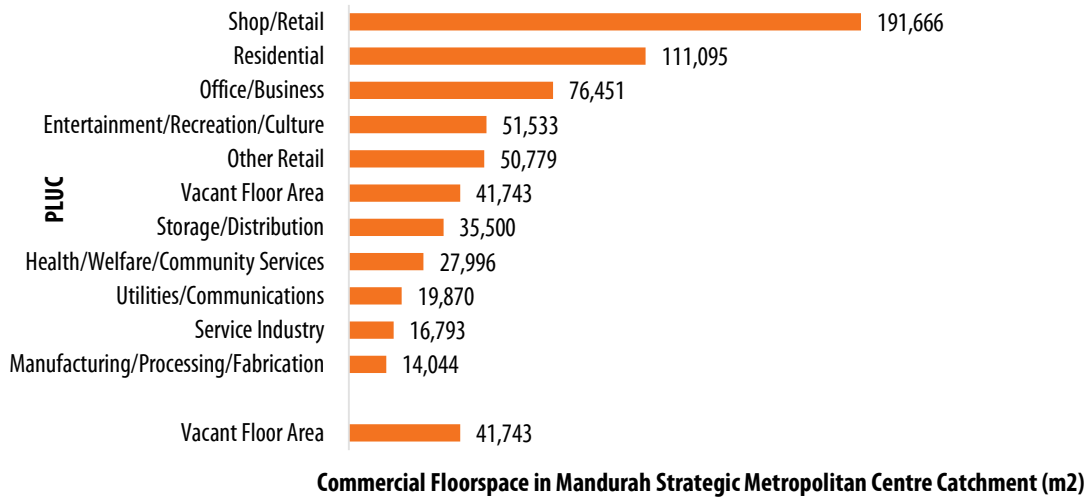
Note: Only those centres with Vacant Floor Area are illustrated.

Source: DPLH 2016, Pracsys 2021

12.5 Strategic Centre Benchmarking

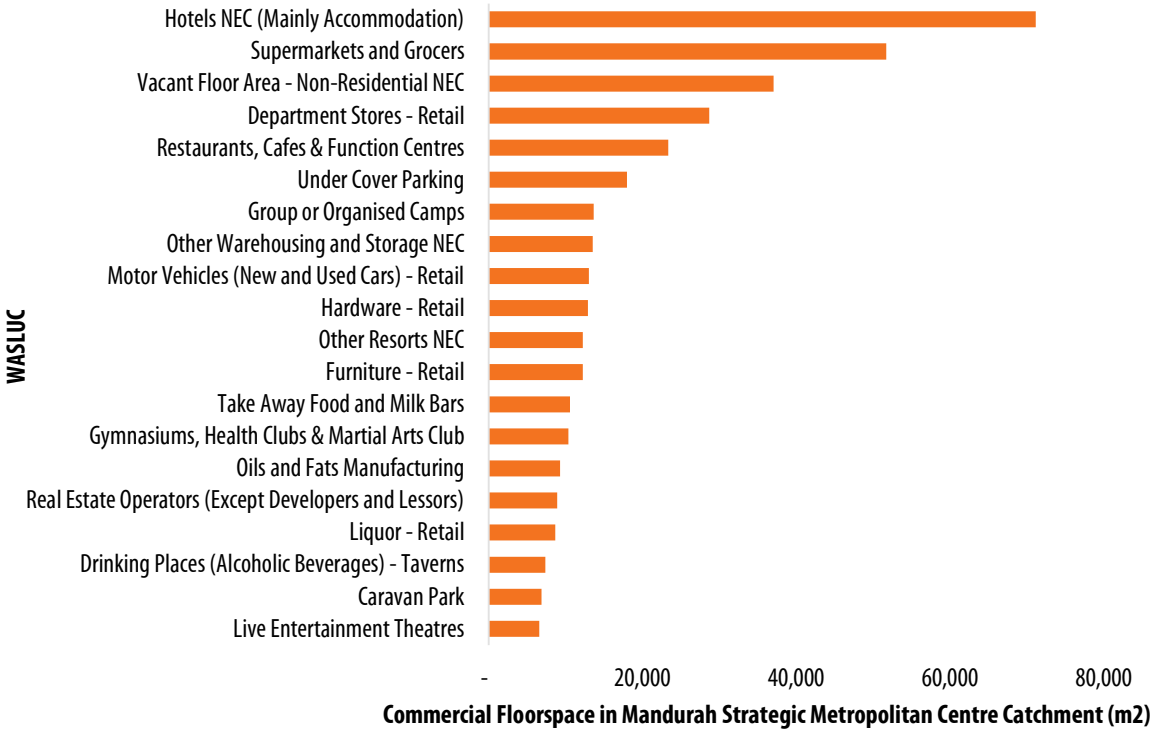
Mandurah Strategic Metropolitan Centre

Figure 102. Commercial Floorspace in Mandurah Strategic Metropolitan Centre Catchment by PLUC



Source: DPLH 2016, Pracsys 2021

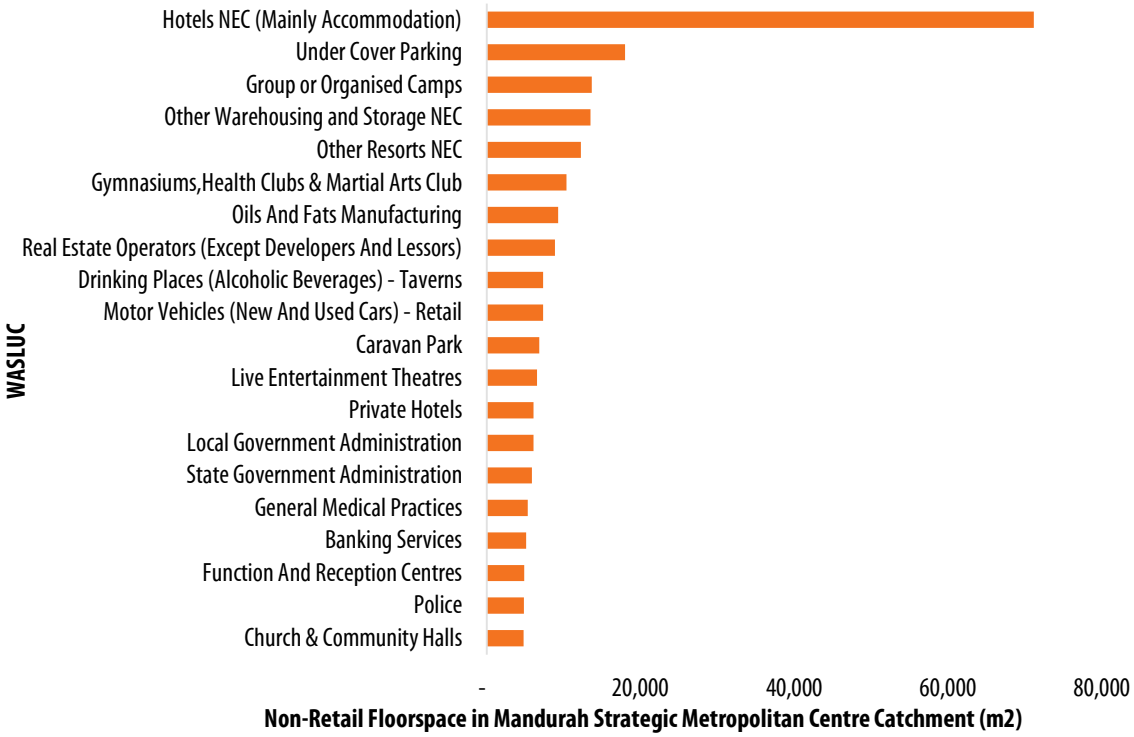
Figure 103. Commercial Floorspace in Mandurah Strategic Metropolitan Centre Catchment by WASLUC



Note: Only top floorspaces are illustrated.

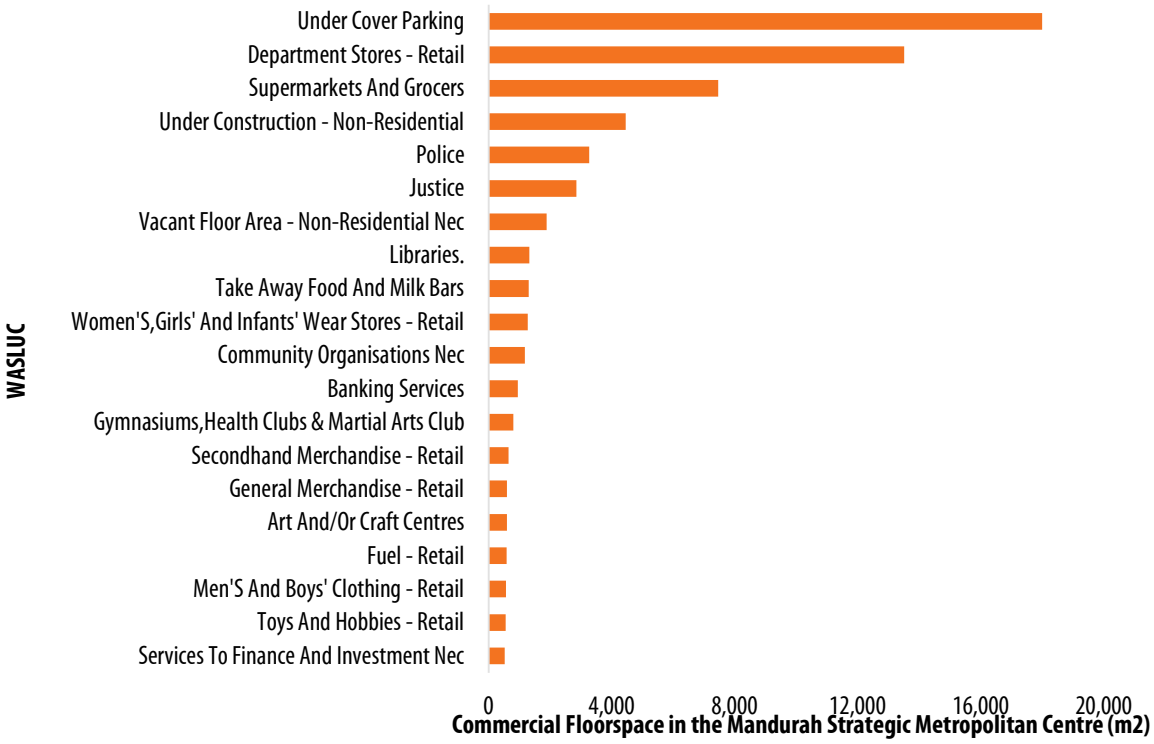
Source: DPLH 2016, Pracsys 2021

Figure 104. Non-Retail Floorspace in Mandurah Strategic Metropolitan Centre Catchment by WASLUC



Note: Only top floorspaces are illustrated.
Source: DPLH 2016, Pracsys 2021

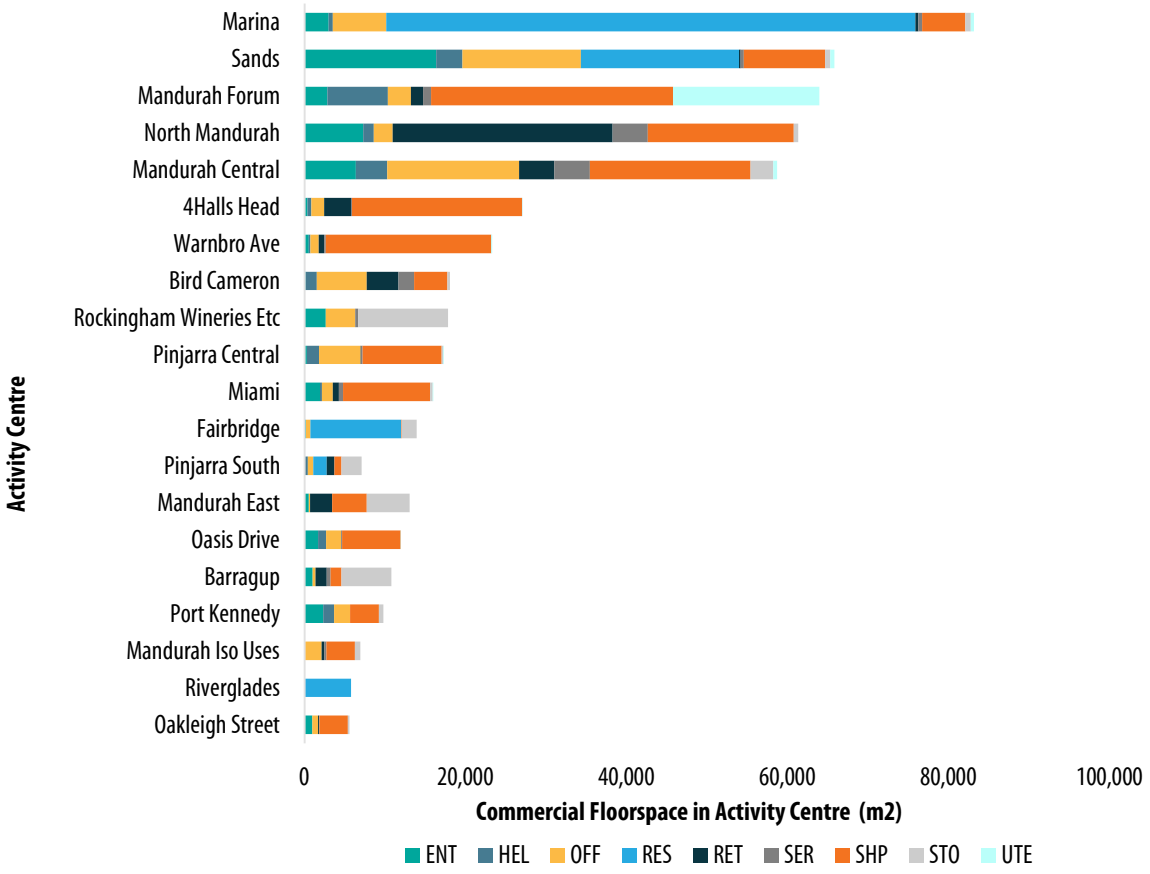
Figure 105. Commercial Floorspace in the Mandurah Strategic Metropolitan Centre by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

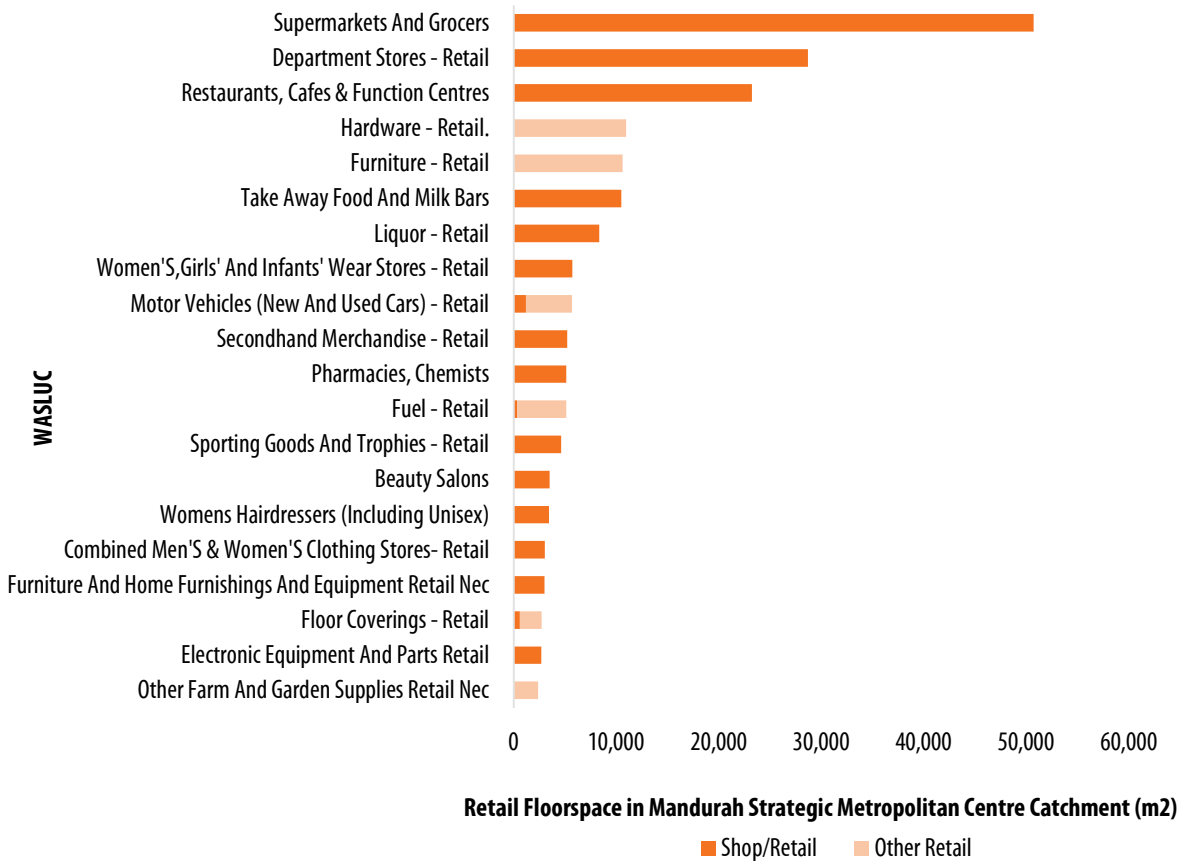
Figure 106. Commercial Floorspace in Mandurah Catchment Activity Centres by PLUC



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 107. Retail Floorspace in Mandurah Strategic Metropolitan Centre Catchment by WASLUC

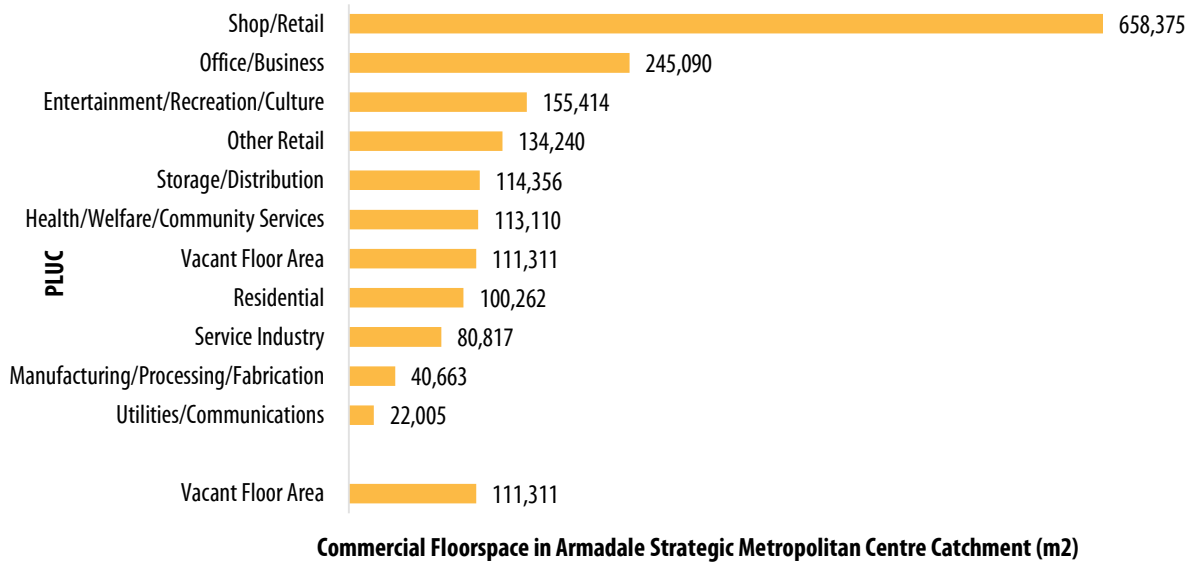


Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

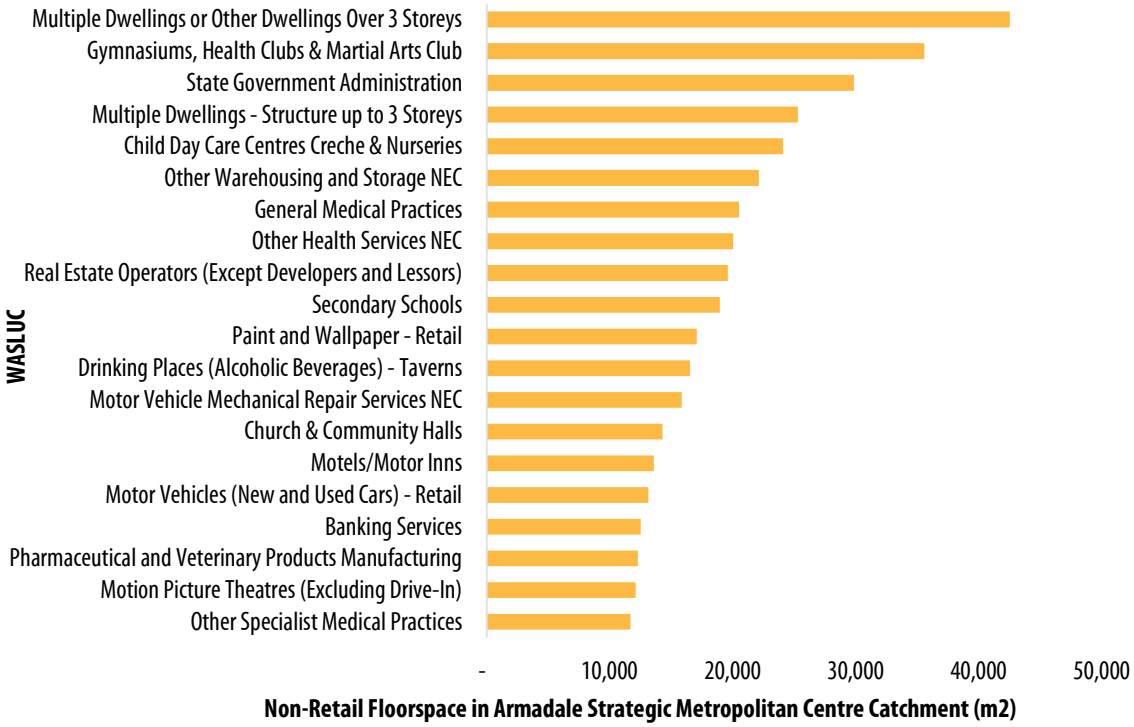
Armadale Strategic Metropolitan Centre

Figure 108. Commercial Floorspace in Armadale Strategic Metropolitan Centre Catchment by PLUC



Source: DPLH 2016, Pracsys 2021

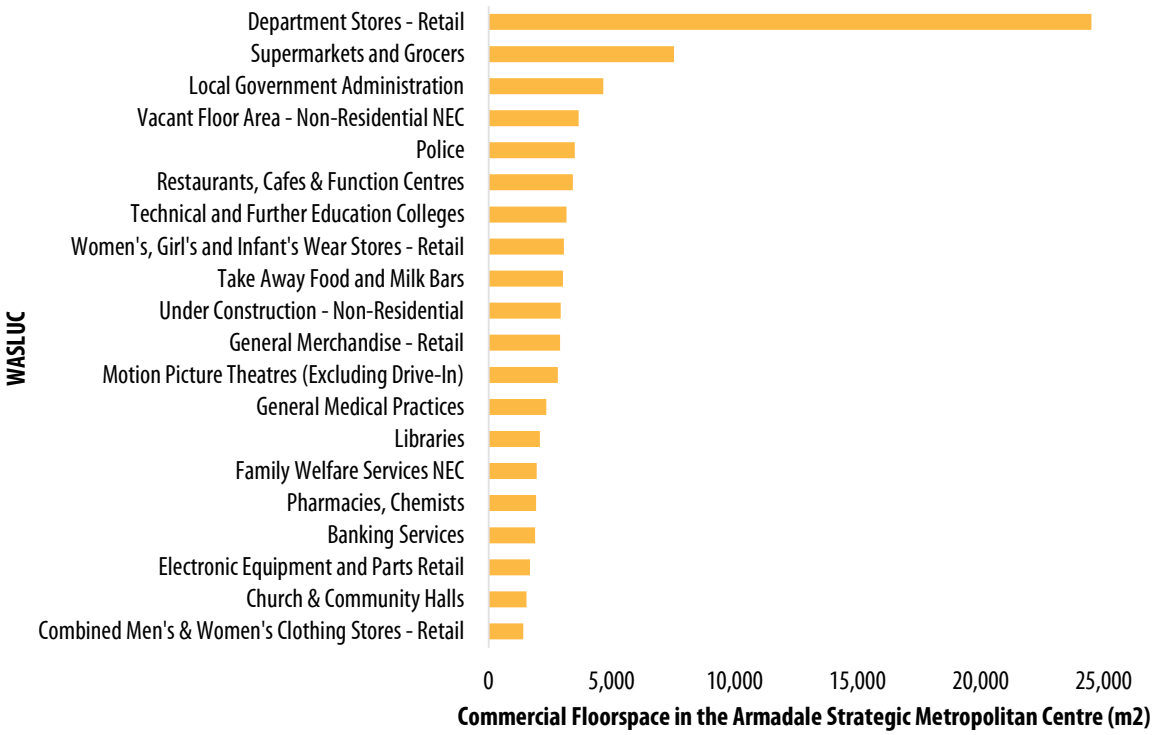
Figure 109. Non-Retail Floorspace in Armadale Strategic Metropolitan Centre Catchment by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

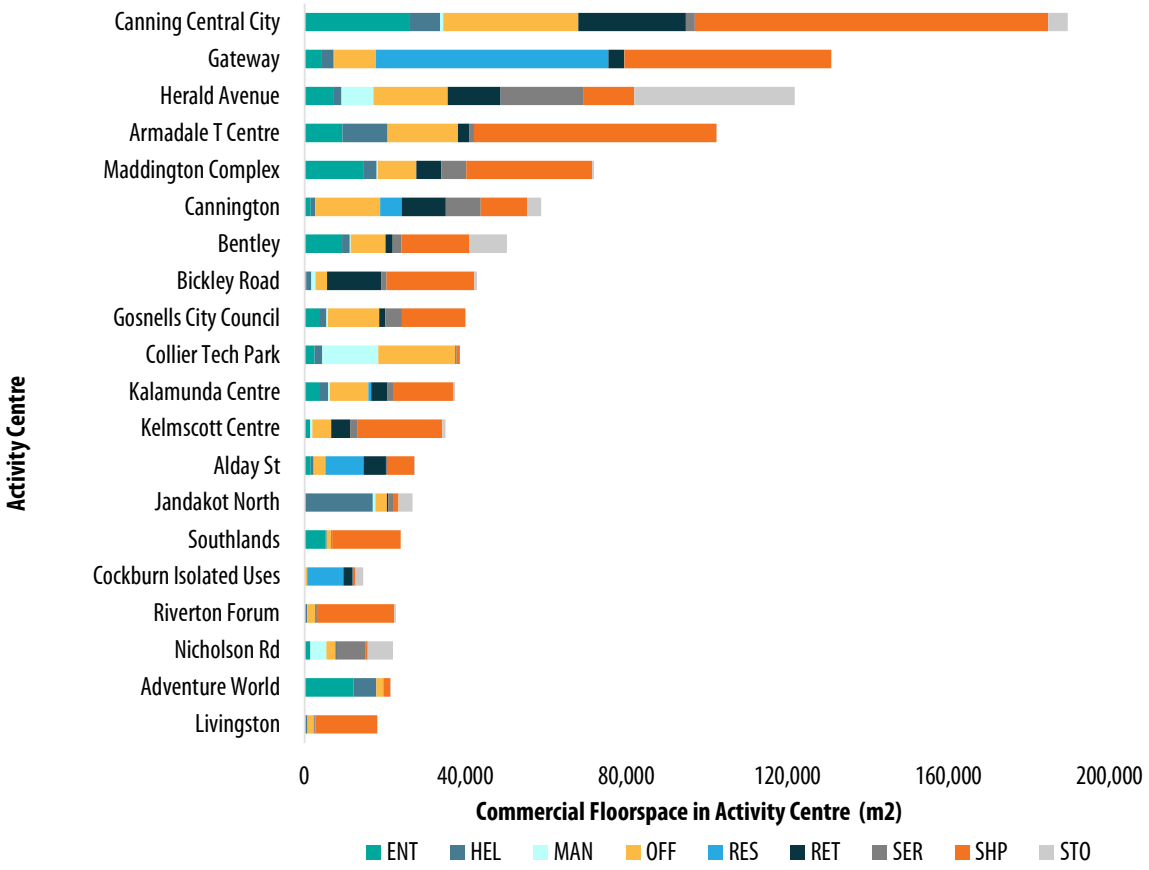
Figure 110. Commercial Floorspace in the Armadale Strategic Metropolitan Centre by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

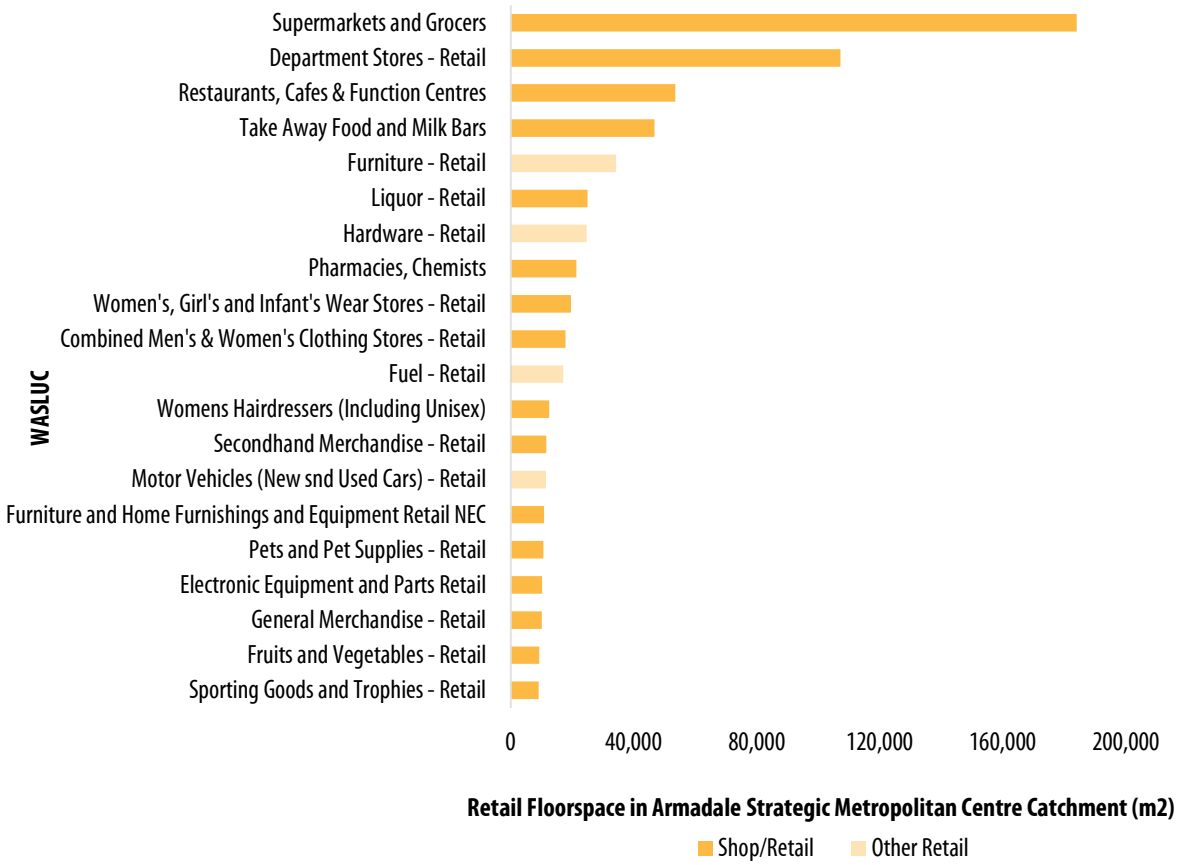
Figure 111. Commercial Floorspace in Armadale Catchment Activity Centres by PLUC



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 112. Retail Floorspace in Armadale Strategic Metropolitan Centre Catchment by WASLUC

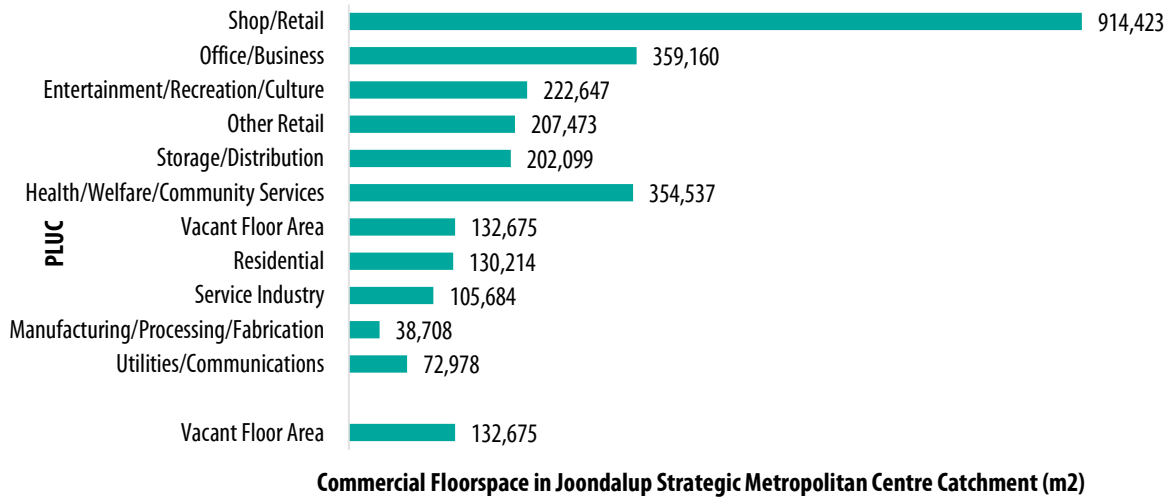


Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

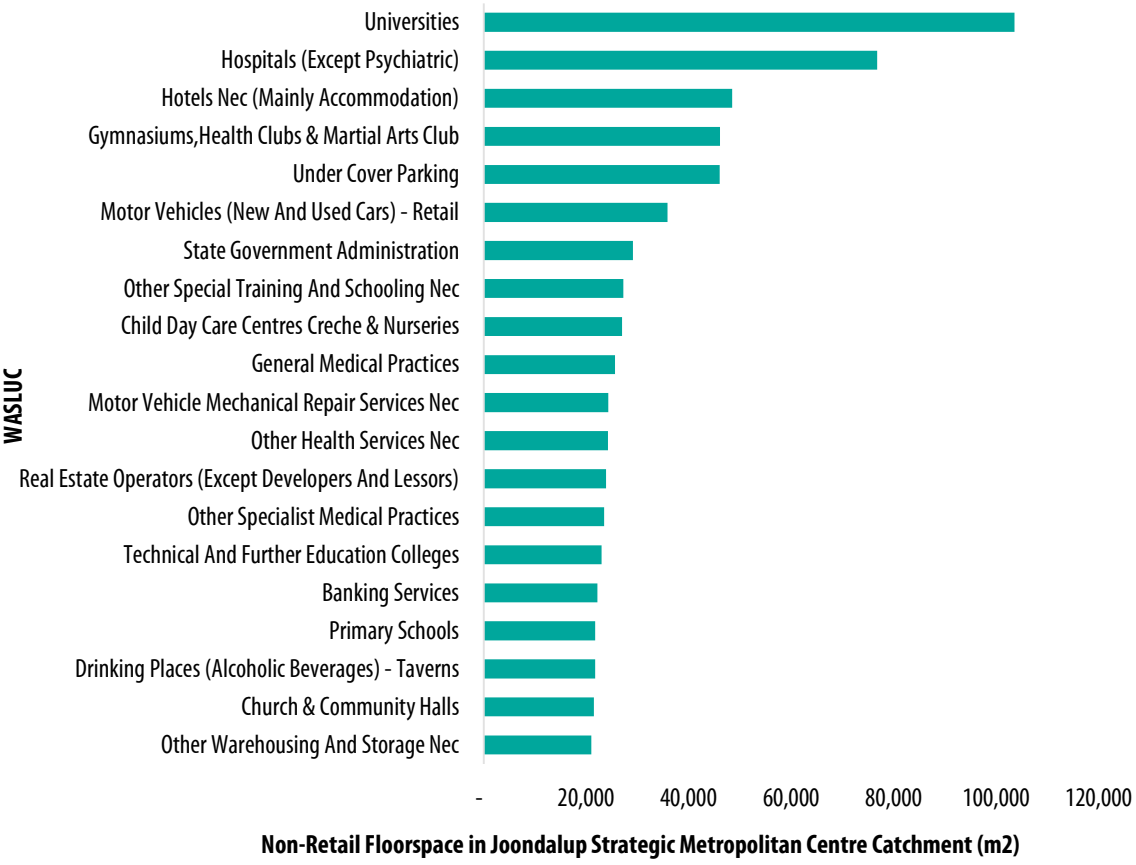
Joondalup Strategic Metropolitan Centre

Figure 113. Commercial Floorspace in Joondalup Strategic Metropolitan Centre Catchment by PLUC



Source: DPLH 2016, Pracsys 2021

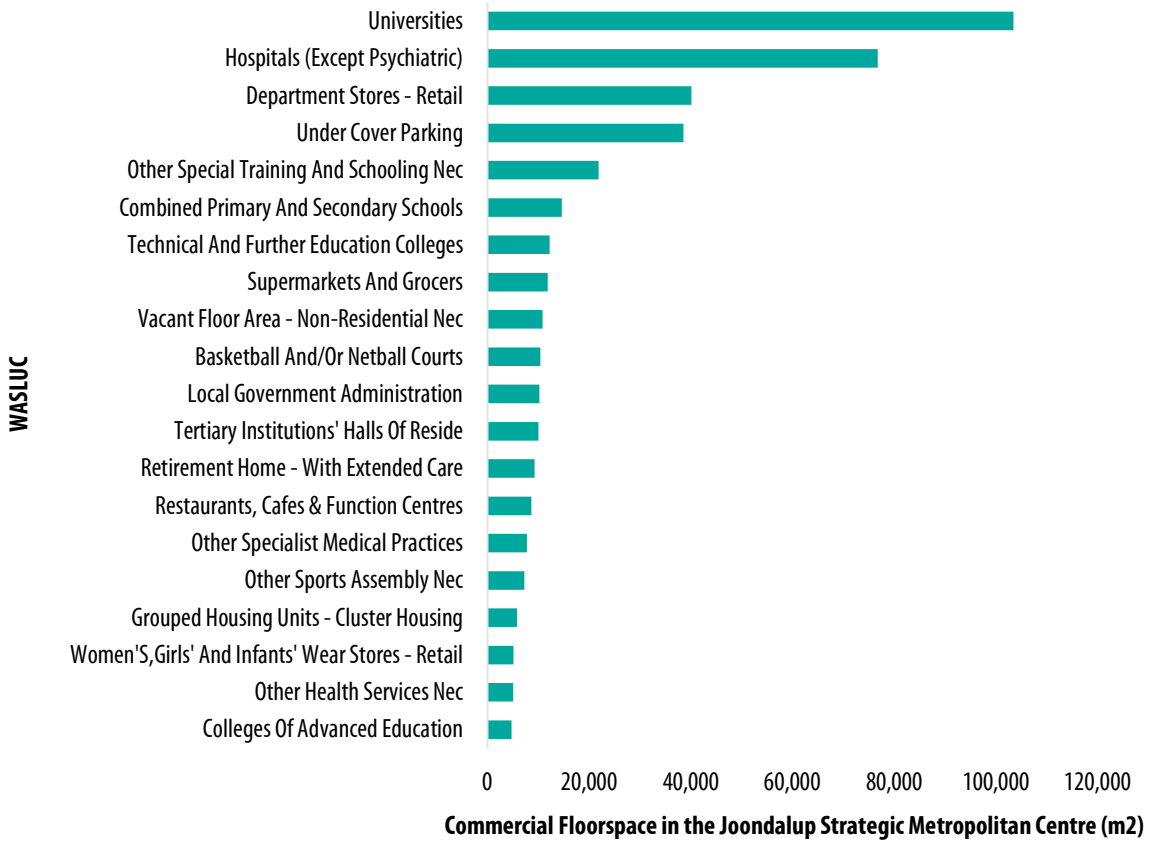
Figure 114. Non-Retail Floorspace in Joondalup Strategic Metropolitan Centre Catchment by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

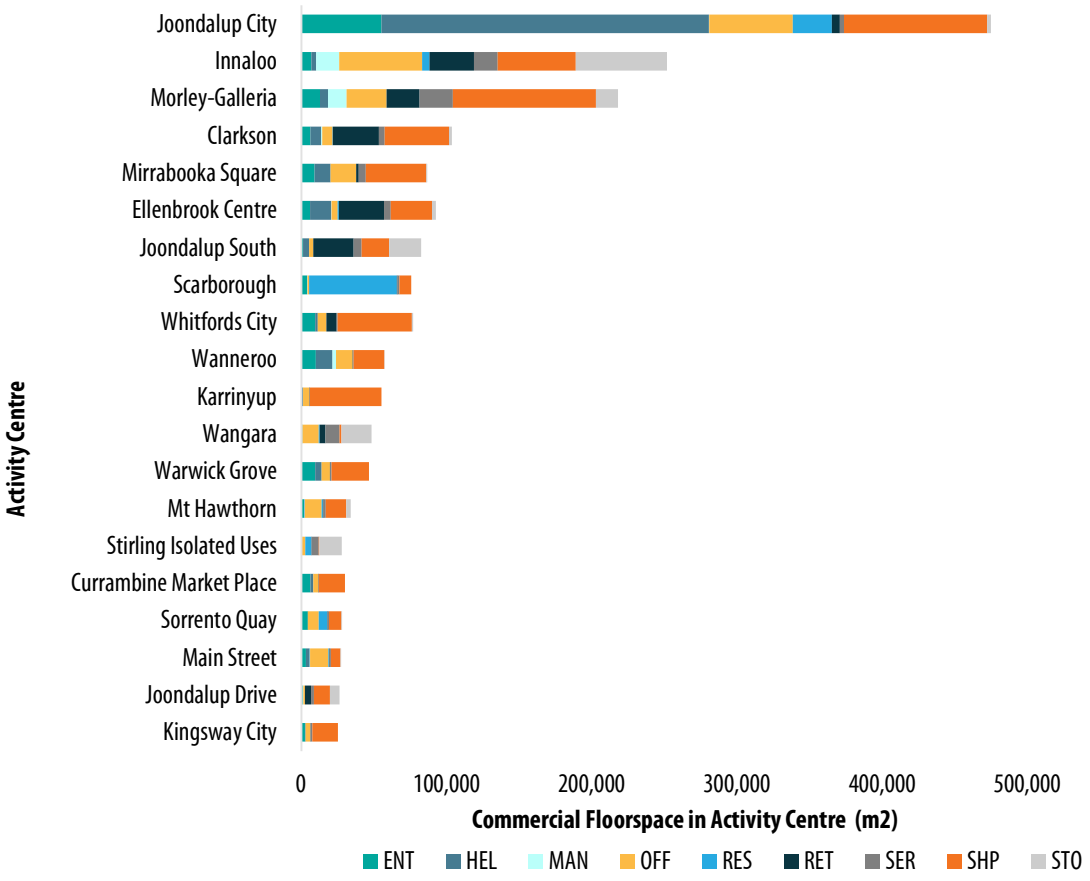
Figure 115. Commercial Floorspace in the Joondalup Strategic Metropolitan Centre by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

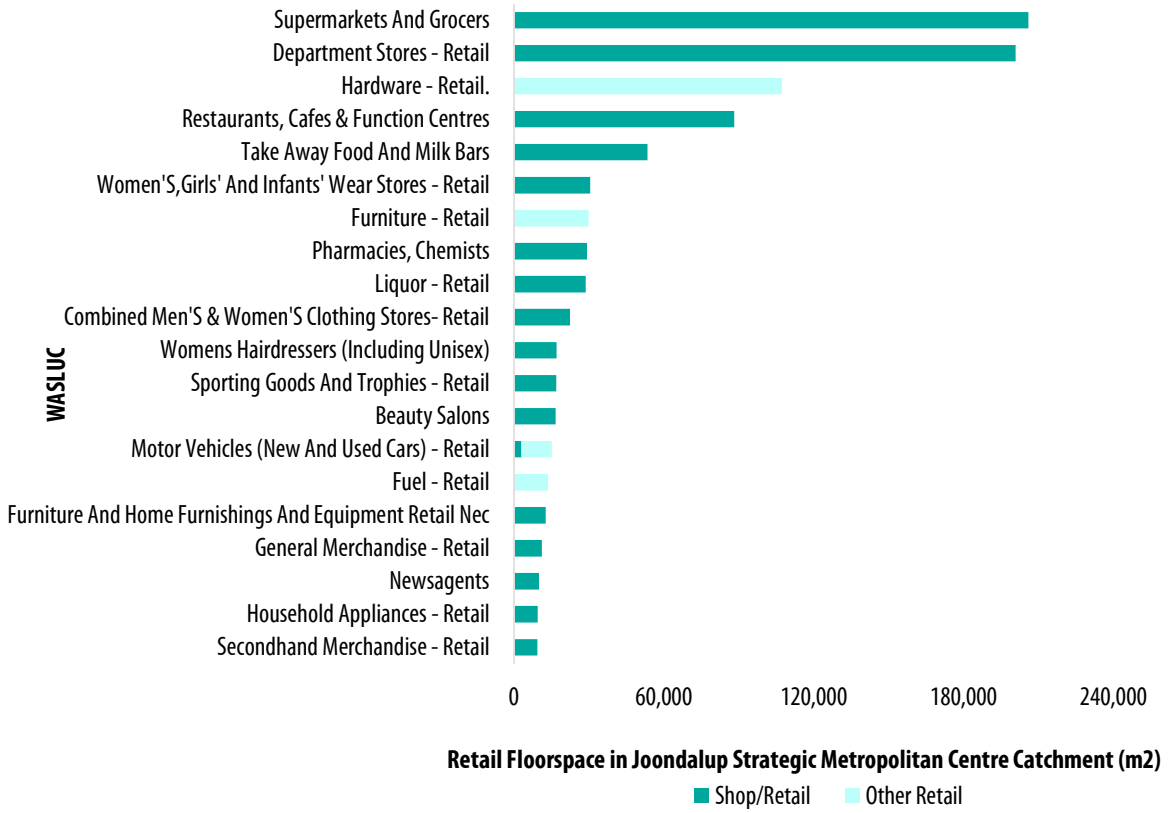
Figure 116. Commercial Floorspace in Joondalup Catchment Activity Centres by PLUC



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 117. Retail Floorspace in Joondalup Strategic Metropolitan Centre Catchment by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

12.6 Benchmark Gap Analysis

The following analysis used population to floorspace ratios to compare the Analysis Catchment to the benchmark catchments and identify gaps in floorspace. The total gaps by PLUC category were constrained based on the benchmark level of population to floorspace to identify gaps that represent a supportable floorspace increase.

Figure 118. Commercial Floorspace in RSMC and Benchmarks by PLUC

PLUC	RSMC 25km Catchment	Mandurah Catchment	Armadale/Cannington Catchment	Joondalup Catchment
Other Retail	44,506	50,779	134,240	207,473
Shop/Retail	286,649	191,666	658,375	914,423
Total Retail	**331,155**	**242,445**	**792,615**	**1,121,896**
Entertainment/Recreation/Culture	71,483	51,533	155,414	222,647
Health/Welfare/Community Services	99,499	27,996	113,110	354,537
Manufacturing/Processing/Fabrication	4,073	14,044	40,663	38,708
Office/Business	102,223	76,451	245,090	359,160
Primary/Rural	9,200	0	9,200	2,600
Residential	88,292	111,095	100,262	130,214
Service Industry	15,401	16,793	80,817	105,684
Storage/Distribution	41,160	35,500	114,356	202,099
Utilities/Communications	8,697	19,870	22,005	72,978
Vacant Floor Area	35,412	41,743	111,311	132,675
Total Non-Retail	**440,028**	**353,282**	**880,917**	**1,488,627**
Total Commercial	**771,183**	**595,727**	**1,673,532**	**2,610,523**

Source: DPLH 2016, Pracsys 2021

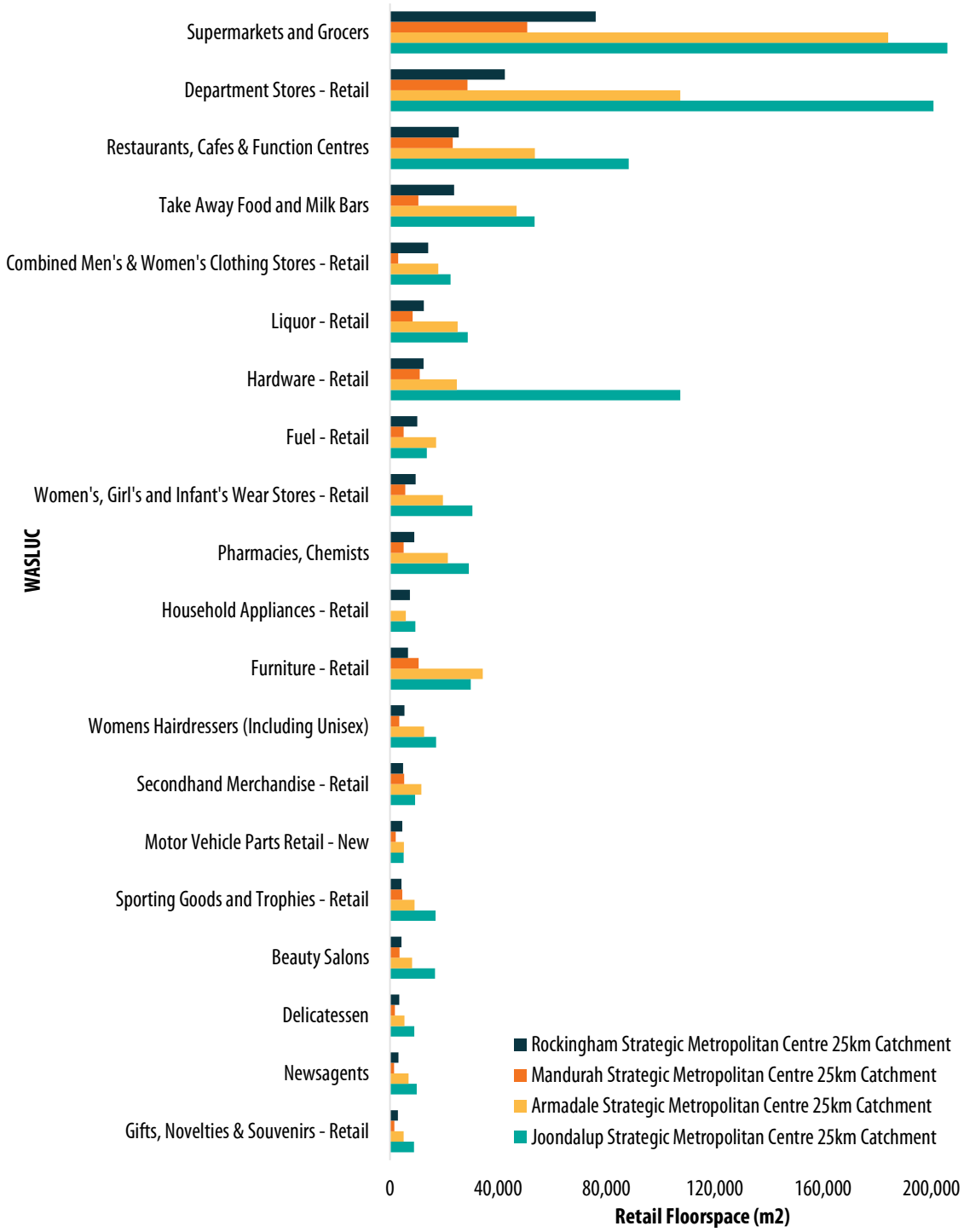
Figure 119. Commercial Floorspace Provision Ratios in RSMC and Benchmarks by PLUC

PLUC	RSMC 25km Catchment	Mandurah Catchment	Armadale/Cannington Catchment	Joondalup Catchment
Other Retail	0.19	0.22	0.27	0.33
Shop/Retail	1.21	0.84	1.31	1.46
Total Retail	**1.39**	**1.07**	**1.58**	**1.79**
Entertainment/Recreation/Culture	0.30	0.23	0.31	0.35
Health/Welfare/Community Services	0.42	0.12	0.23	0.57
Manufacturing/Processing/Fabrication	0.02	0.06	0.08	0.06
Office/Business	0.43	0.34	0.49	0.57
Primary/Rural	0.04	0.00	0.02	0.00
Residential	0.37	0.49	0.20	0.21
Service Industry	0.06	0.07	0.16	0.17
Storage/Distribution	0.17	0.16	0.23	0.32
Utilities/Communications	0.04	0.09	0.04	0.12
Vacant Floor Area	0.15	0.18	0.22	0.21
Total Non-Retail	**1.85**	**1.56**	**1.76**	**2.37**
Total Commercial	**3.24**	**2.63**	**3.34**	**4.16**

Source: DPLH 2016, Pracsys 2021

The following tables provide the total gap amount per WASLUC where a gap was identified. The total floorspace gap for the City's centres has been developed using a mix of the identified benchmarks and a maximum level of floorspace provision based on benchmarks (i.e. the total amount of additional floorspace was not allowed to exceed the floorspace to population ratio of the benchmarks). Gaps identified at the specific WASLUC level should not be interpreted as target amounts of floorspace for that use as the gaps are unconstrained. The identified WASLUC gaps should be interpreted as potential opportunity uses and their uptake should be considered based on private sector interest (i.e. if a development proposes to include a use that is identified as a WASLUC gap it may indicate potential community benefit/viability).

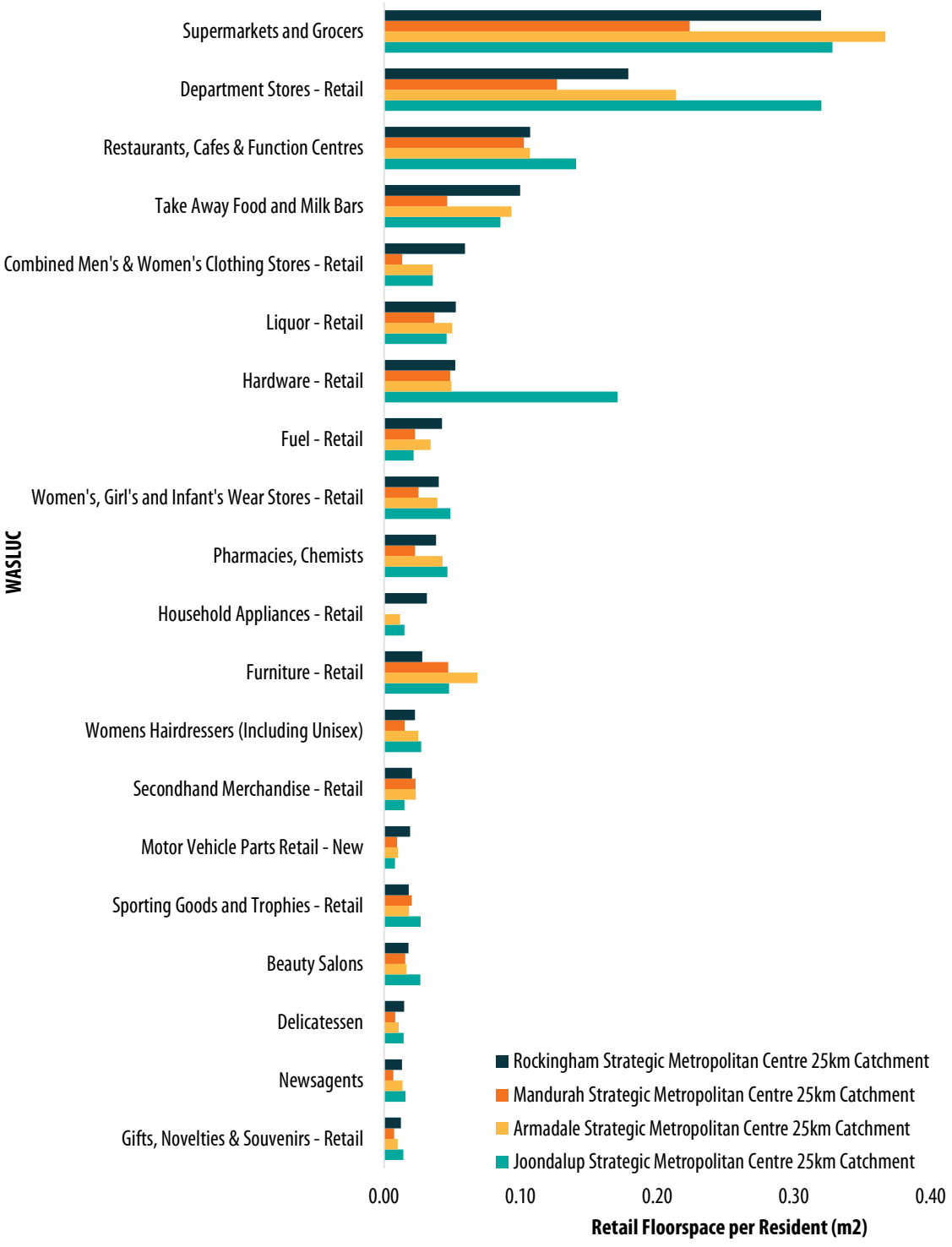
Figure 120. Retail Floorspace in RSMC Catchment and Benchmarks by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 121. Retail Floorspace Provision Ratios in RSMC and Benchmarks by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 122. Retail Floorspace Gaps in RMSC 25km Catchment to Mandurah Benchmark by WASLUC

WASLUC	Gap to Mandurah Provision Rate
Furniture - Retail	4,516
Furniture and Home Furnishings and Equipment Retail NEC	1,414
Marine Craft and Accessories - Retail	1,414
Stationers	1,142
Manchester Goods and Soft Furnishings - Retail	688
Second-hand Merchandise - Retail	602
Sporting Goods and Trophies - Retail	551
Kitchenware - Retail	469
Paint and Wallpaper - Retail	439
Men's Hairdressers	385
Bicycles - Retail	301
Nurseries - Retail	269
Electronic Equipment and Parts Retail	265
Business and Computing Equipment	192
Tyres, Batteries & Accessories-Retail	158
Craft and Art Supplies - Retail	129
Other Retail Trade NEC	120
Music And Musical Instruments - Retail	111
Other Farm and Garden Supplies Retail NEC	110
Plumbing, Heating & Refrigeration Equipment - Retail	46
Floor Coverings - Retail	38
Florists - Retail	5

Source: DPLH 2016, Pracsys 2021

Figure 123. Retail Floorspace Gaps in RMSC 25km Catchment to Armadale Benchmark by WASLUC

WASLUC	Gap to Armadale Provision Rate
Supermarkets and Grocers	11,193
Furniture - Retail	9,628
Department Stores - Retail	8,338
Pets and Pet Supplies - Retail	3,643
Furniture and Home Furnishings and Equipment Retail NEC	3,403
Fruits and Vegetables - Retail	3,051
Tyres, Batteries & Accessories-Retail	2,554
Other Retail Trade NEC	2,317
Electronic Equipment and Parts Retail	2,265
Nurseries - Retail	1,983
General Merchandise - Retail	1,891
Pharmacies, Chemists	1,108
Manchester Goods and Soft Furnishings - Retail	1,006
Meats - Retail	839
Paint and Wallpaper - Retail	693
Second-hand Merchandise - Retail	645
Craft and Art Supplies - Retail	635
Toys and Hobbies - Retail	573
Women's Hairdressers (Including Unisex)	558
Floor Coverings - Retail	487
Sports Store - Clothing/Equipment Etc	415
Plumbing, Heating & Refrigeration Equipment - Retail	399
Florists - Retail	368
Stationers	133
Adult Products - Retail	124
Health Foods	124
Other Retail Food Trade NEC	118
Newsagents	101
Bread and Cake Stores	82
Men's Hairdressers	69
Sporting Goods and Trophies - Retail	41
Footwear Repair Services	32
Fabric Shop and Dressmaking Accessories Retail	24

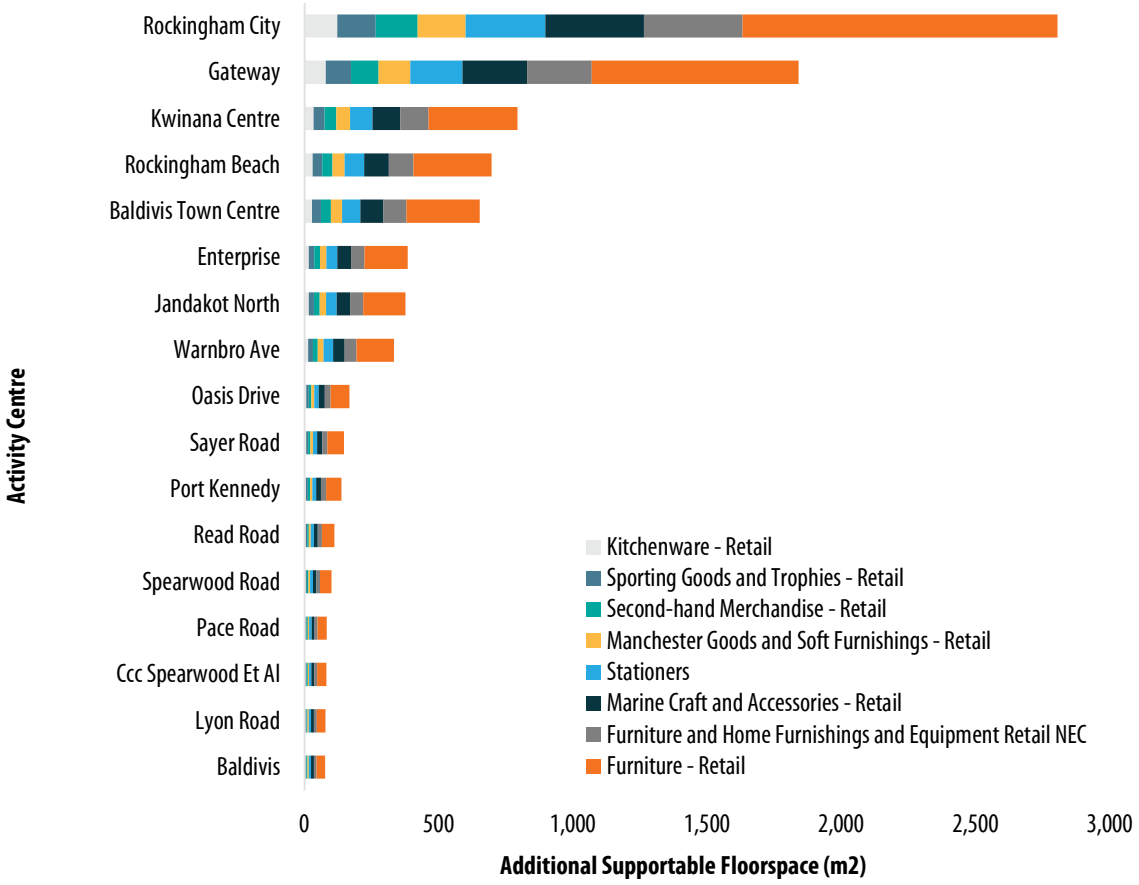
Source: DPLH 2016, Pracsys 2021

Figure 124. Retail Floorspace Gaps in RMSC 25km Catchment to Joondalup Benchmark by WASLUC

WASLUC	Gap to Joondalup Provision Rate
Department Stores - Retail	33,574
Hardware - Retail	28,223
Restaurants, Cafes & Function Centres	8,007
Furniture - Retail	4,688
Furniture And Home Furnishings And Equipment Retail NEC	3,050
Sporting Goods and Trophies - Retail	2,089
Beauty Salons	2,078
Women's, Girl's and Infant's Wear Stores - Retail	2,038
Nurseries - Retail	2,007
Fabric Shop And Dressmaking Accessories Retail	1,991
Pharmacies, Chemists	1,988
Supermarkets and Grocers	1,986
Pets And Pet Supplies - Retail	1,982
Fruits And Vegetables - Retail	1,976
General Merchandise - Retail	1,330
Other Retail Trade NEC	1,251
Bread And Cake Stores	1,163
Sports Store - Clothing/Equipment Etc	1,109
Business And Computing Equipment	1,056
Women's Hairdressers (Including Unisex)	1,052
Marine Craft And Accessories - Retail	942
Electronic Equipment And Parts Retail	925
Tyres, Batteries & Accessories-Retail	877
Plumbing, Heating & Refrigeration Equipment - Retail	779
Men's And Boys' Clothing - Retail	743
Meats - Retail.	669
Watchmakers And Jewellers - Retail	640
Newsagents	610
Booksellers	550
Manchester Goods And Soft Furnishings - Retail	522
Stationers	496
Fish And Seafoods - Retail	471
Footwear - Retail	468
Motion Picture Distribution And Services	452
Gifts, Novelties & Souvenirs - Retail	408
Accessories Retail NEC	406
Paint And Wallpaper - Retail	351
Kitchenware - Retail	327
Florists - Retail	291
Craft And Art Supplies - Retail	281
Men's Hairdressers	223
Weight Reducing Salons	189
Other Retail Food Trade NEC	132
Toys And Hobbies - Retail	97
Boat, Caravan & Trailer Hire	82
Footwear Repair Services	6

Source: DPLH 2016, Pracsys 2021

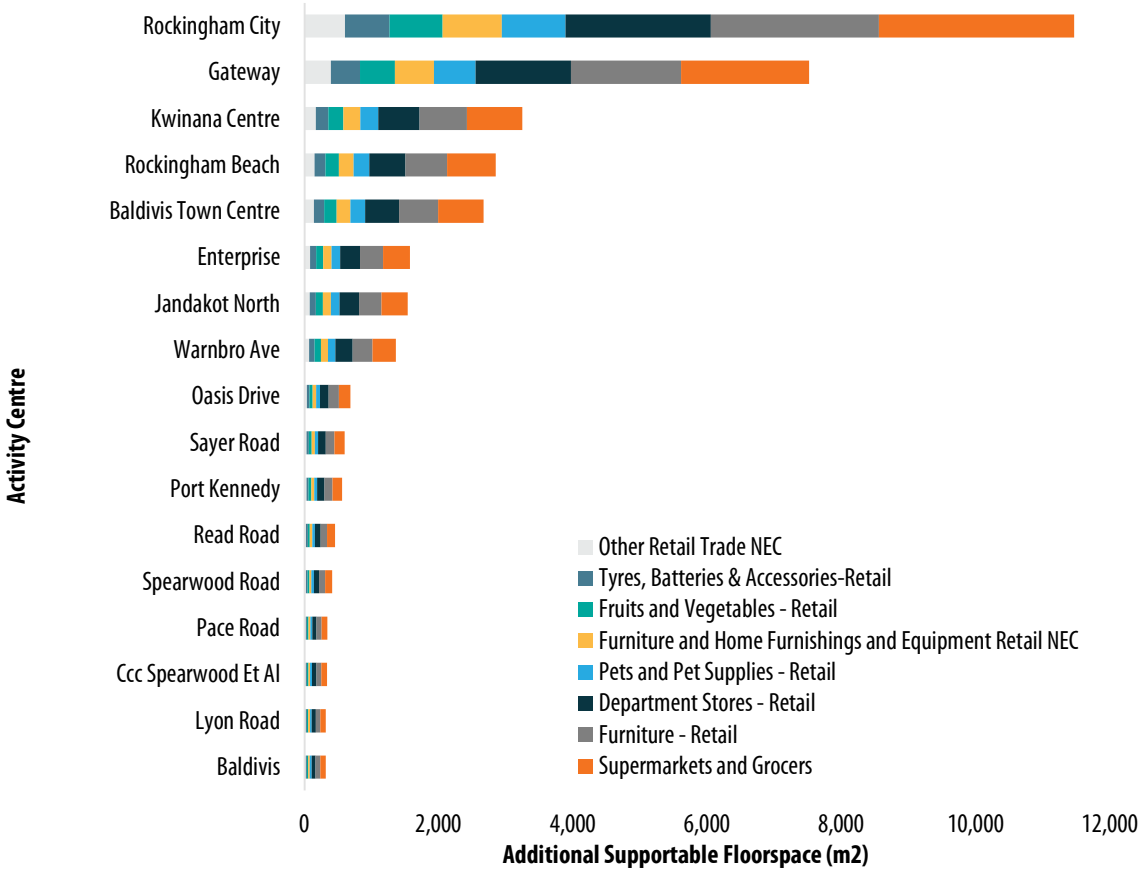
Figure 125. Retail Gaps to Mandurah Benchmark Supportable by RSMC 25km Catchment Activity Centres



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

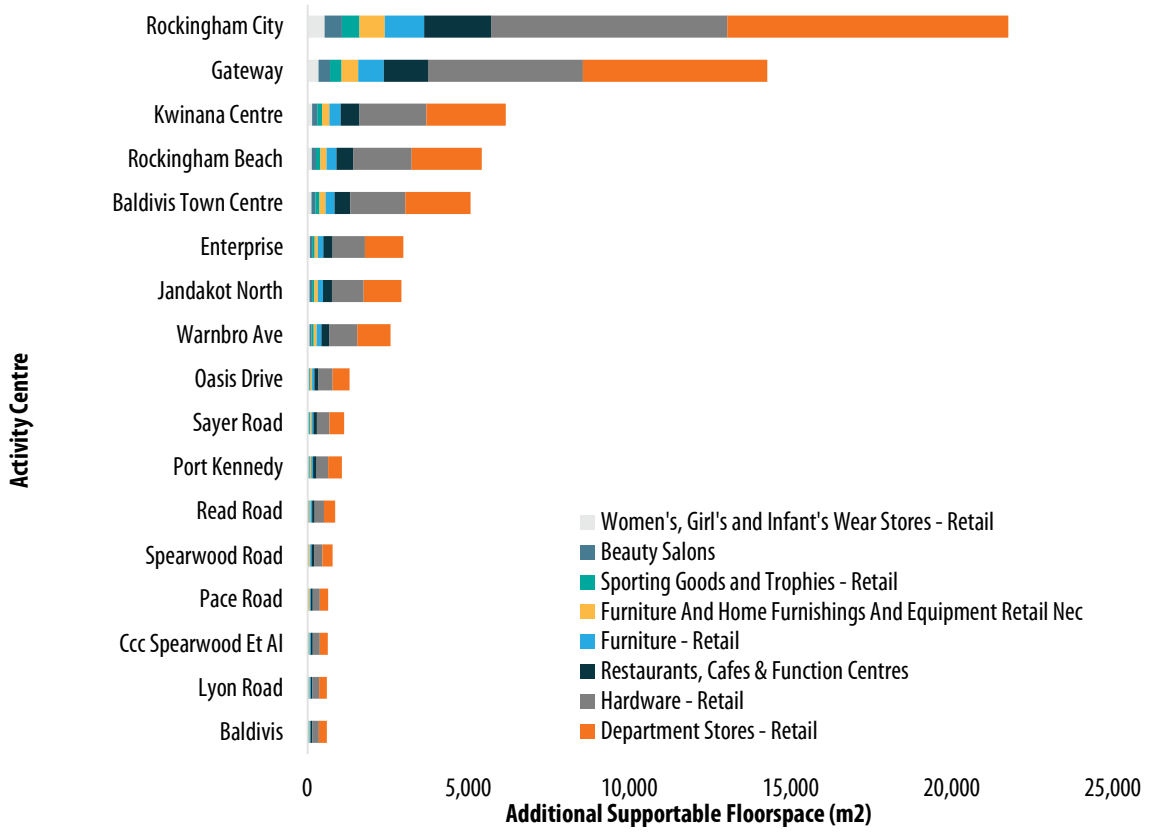
Figure 126. Retail Gaps to Armadale Benchmark Supportable by RSMC 25km Catchment Activity Centres



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

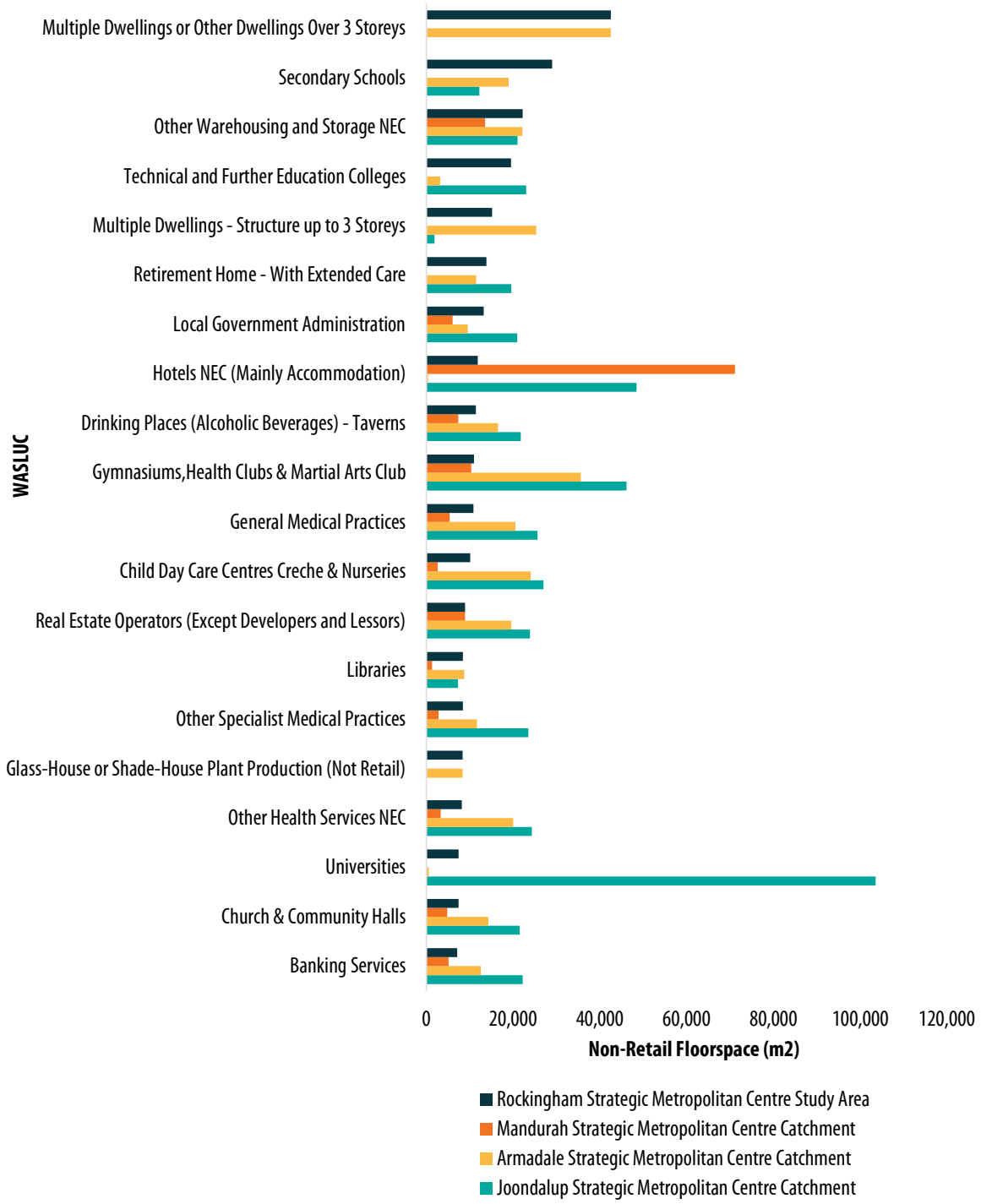
Figure 127. Retail Gaps to Joondalup Benchmark Supportable by RSMC 25km Catchment Activity Centres



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

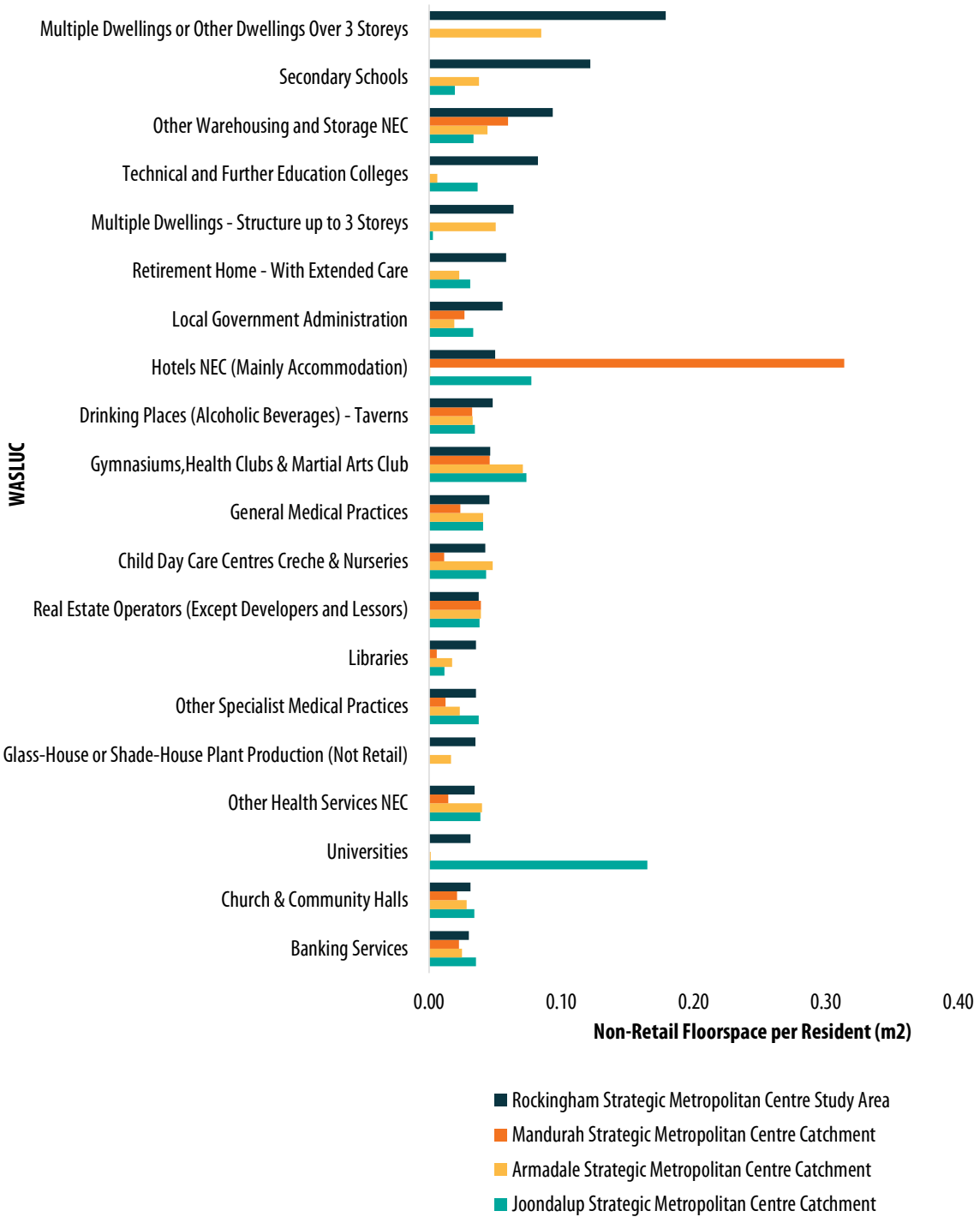
Figure 128. Non-Retail Floorspace in RSMC and Benchmarks by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 129. Non-Retail Floorspace Provision Ratios in RSMC and Benchmarks by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 130. Non-Retail Floorspace Gaps in RMSC 25km Catchment to Mandurah Benchmark by WASLUC

WASLUC	Gap to Mandurah Provision Rate
Hotels NEC (Mainly Accommodation)	62,686
Under Cover Parking	14,126
Live Entertainment Theatres	6,385
Private Hotels	5,792
Police	3,574
Other Transient Lodgings NEC	2,586
State Government Administration	2,407
Other Professional Services NEC	2,084
Welfare and Charitable Services NEC	2,054
Plumbing, Heating & Air Conditioning Services	1,965
Art Galleries	1,957
Motor Vehicle Repairs NEC	1,866
Hardware - Retail	1,702
Services to Finance and Investment NEC	1,457
Community Organisations NEC	1,119
Furniture - Retail	1,077
Travel Arranging Services	874
Yachting Clubs	850
Electrical Services	816
Advertising Services	707
Pet Services	660
Building Materials - Retail	574
Tyres, Batteries & Accessories- Retail	556
Function and Reception Centres	535
Art and/or Craft Centres	514
Accounting, Auditing & Book-Keeping Services	470
Insurance Agents, Brokers & Services	440
Other Repair Services NEC	416
Real Estate Operators (Except Developers and Lessors)	396
Other Retail Food Trade NEC	364
Other Cultural, Entertainment & Recreational Activities NEC	348
Publishing	339
Printing	299
Other Special Training and Schooling NEC	293
Business and Management Consulting Services	281
Legal Services	229
Wood Products Manufacturing NEC	178
Sand, Gravel & Soil Quarrying	170
Primary Schools	163
Churches, Synagogues & Temples	155
Precision Engineered Products Manufacturing	135
Retirement Home - No Extended Care	132

Source: DPLH 2016, Pracsys 2021

Figure 131. Non-Retail Floorspace Gaps in RMSC 25km Catchment to Armadale Benchmark by WASLUC

WASLUC	Gap to Armadale Provision Rate
State Government Administration	10,377
Gymnasiums, Health Clubs & Martial Arts Club	5,862
Other Special Training And Schooling NEC	3,936
Motor Vehicle Mechanical Repair Services NEC	3,381
Motor Vehicle Repairs NEC	2,952
Accounting, Auditing & Book-Keeping Services	2,526
Police	2,355
Hardware - Retail	2,118
Electrical Services	1,869
Primary Schools	1,852
Motor Vehicle Detailing	1,517
Telecommunication Facilities Operation	1,468
Other Professional Services NEC	1,435
Community Organisations NEC	1,395
Child Day Care Centres Creche & Nurseries	1,308
Other Health Services NEC	1,304
Community Health Centres (Medical)	1,253
Motels/Motor Inns	1,101
Business And Management Consulting Services	1,082
Welfare And Charitable Services NEC	1,075
Engineering Services	1,038
Furniture - Retail	1,014
Basketball And/or Netball Courts	995
Clothing - Wholesale/Warehousing	833
Printing	725
Building Materials -Retail	706
Water Well Drilling, Irrigation & Reticulation Services	631
Other Laboratory Services	600
Travel Arranging Services	552
Family Welfare Services NEC	550
Cheese Manufacturing	543
Services To Finance And Investment NEC	505
Postal Service Operation NEC	488
Computer Support Services	482
Funeral And Crematory Services	464
Optometry And Optical Dispensing	460
Motion Picture Theatres (Excluding Drive-In)	449
Single House	440
Gambling Services (Except Lotteries)	422
Wine And Brandy Manufacturing	395
Psychology Practices	389
Real Estate Operators (Except Developers and Lessors)	363

Source: DPLH 2016, Pracsys 2021

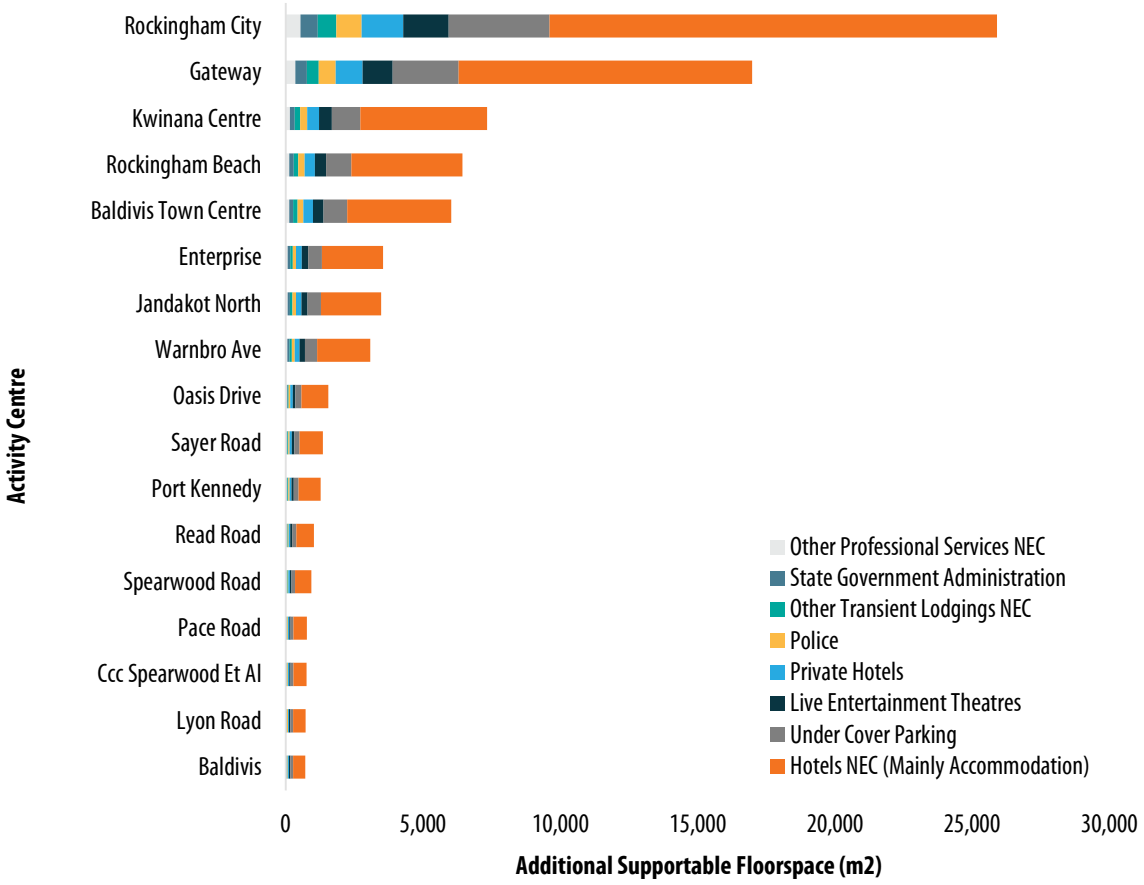
Figure 132. Non-Retail Floorspace Gaps in RMSC 25km Catchment to Joondalup Benchmark by WASLUC

WASLUC	Gap to Joondalup Provision Rate
Universities	31,803
Under Cover Parking	12,726
Other Special Training And Schooling NEC	9,609
State Government Administration	7,270
Hotels NEC (Mainly Accommodation)	6,479
Gymnasiums, Health Clubs & Martial Arts Club	6,471
Primary Schools	6,467
Building Materials -Retail	6,154
Motor Vehicle Mechanical Repair Services NEC	5,089
Basketball And/or Netball Courts	3,940
Furniture - Retail	3,814
Community Health Centres (Medical)	3,502
Accounting, Auditing & Book-Keeping Services	3,213
Other Business Services NEC	3,064
Engineering Services	2,911
Other Entertainment Assembly NEC	2,598
Other Professional Services NEC	2,571
Motels/Motor Inns	2,500
Holiday And Club Resorts	2,199
Grouped Housing Units - Town Houses	2,138
Outdoor Storage NEC	2,080
Dental Practices	1,911
Police	1,794
Plumbing, Heating & Air Conditioning Services	1,794
Welfare And Charitable Services NEC	1,784
Nurseries - Retail	1,710
Hardware - Retail.	1,611
Churches, Synagogues & Temples	1,500
Motor Vehicle Detailing	1,358
Banking Services	1,261
Other Retail Trade NEC	1,122
Business And Management Consulting Services	1,013
Other Health Services NEC	1,009
Insurance Agents, Brokers & Services	972
Other Sports Assembly NEC	971
Physically And Mentally Handicapped Welfare Services NEC	930
Postal Service Operation NEC	928
Optometry And Optical Dispensing	912
Motor Vehicle Repairs NEC	896
Tennis Courts (Outdoor)	879
Retirement Home - No Extended Care	859
Advertising Services	828

WASLUC	Gap to Joondalup Provision Rate
Grouped Housing Units - Villa Units	824
Laundering, Dry-Cleaning & Dyeing Services	816
Electrical Services	728
Church & Community Halls	727
Travel Arranging Services	645
Psychology Practices	608
Funeral And Crematory Services	603
Services To Finance And Investment NEC	592
Communication NEC	557
Other Specialist Medical Practices	510
Community Organisations NEC	506
Detective And Protective Services	471
Cleaning Services NEC	465
Other Personal Services NEC	451
Supermarkets And Grocers	445
Colleges Of Advanced Education	444
Lawn Mower Repair Service	428
Computer Support Services	418
Bread Manufacturing	415
Architectural Services	393
Settlement Agents	390
Gardening Services	389
Parliamentary Office	387
Other Wholesale Trade With Associated Warehousing NEC	341
Gambling Services (Except Lotteries)	336
Art And Music Schools	331
Meats - Retail.	330
Motion Picture Theatres (Excluding Drive-In)	320
Legal Services	318
Iron And Steel Basic Products Mfg	280
Other Cultural, Entertainment & Recreational Activities NEC	268
Printing Trade Service NEC	251
Other Laboratory Services	210
Federal Government Administration	180
Publishing	151
Marketing Services	144
Precision Engineered Products Mfg	140
Tyres, Batteries & Accessories-Retail	131
Real Estate Operators (Except Developers and Lessors)	117
Child Day Care Centres Creche & Nurseries	111
Printing	109

Source: DPLH 2016, Pracsys 2021

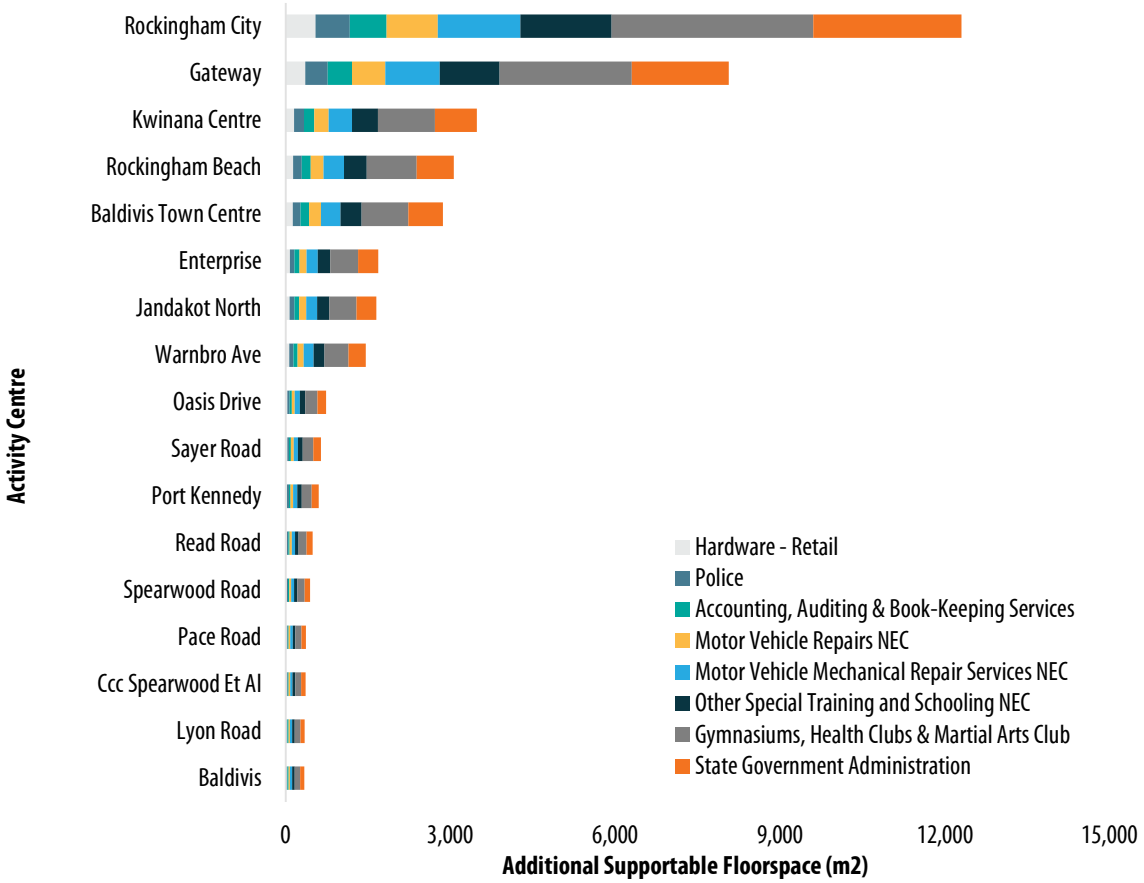
Figure 133. Non-Retail Gaps to Mandurah Benchmark Supportable by RSMC 25km Catchment Activity Centres



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

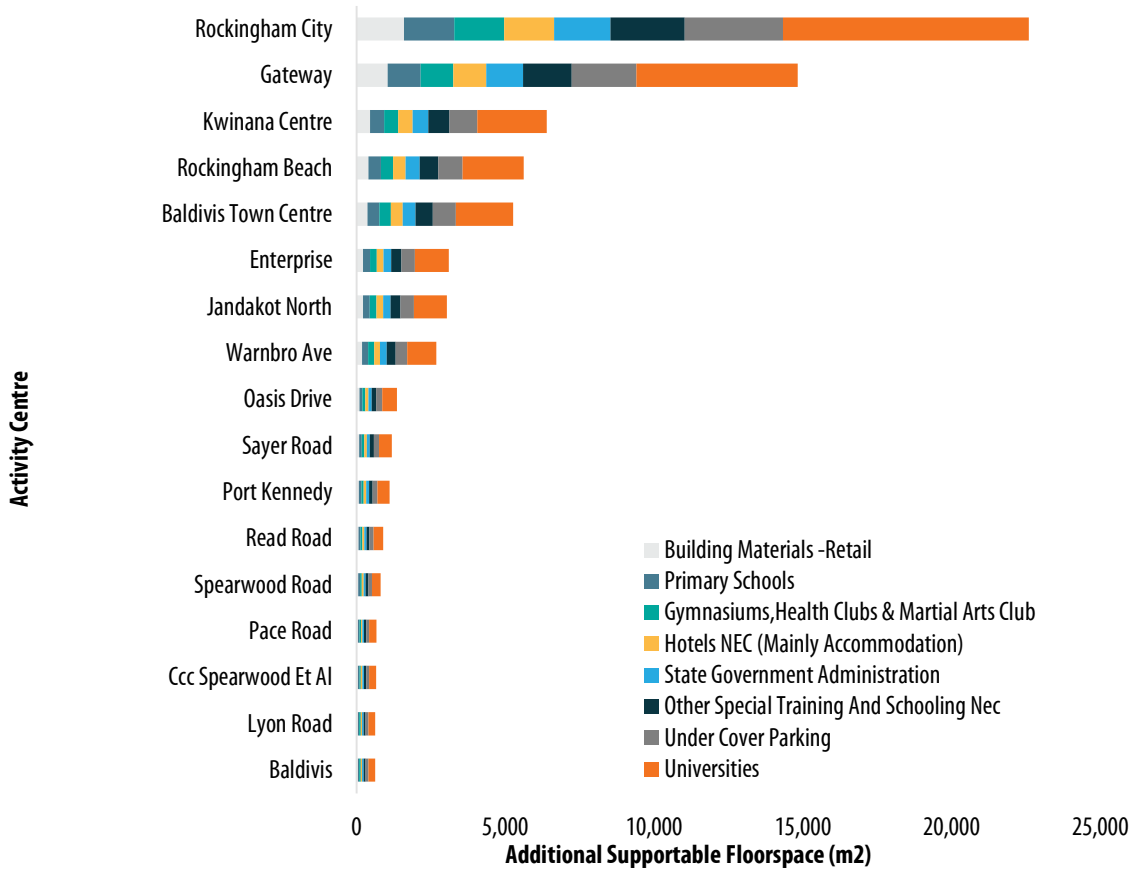
Figure 134. Non-Retail Gaps to Armadale Benchmark Supportable by RSMC 25km Catchment Activity Centres



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

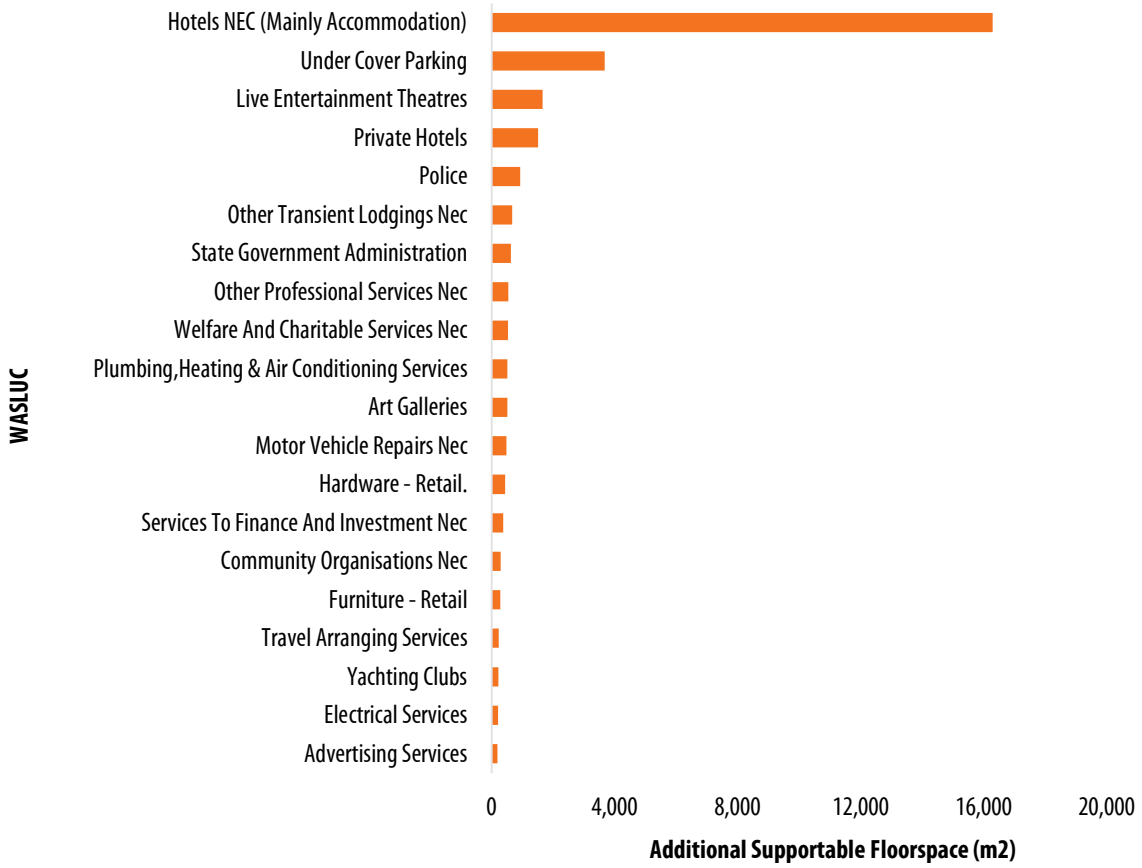
Figure 135. Non-Retail Gaps to Joondalup Benchmark Supportable by RSMC 25km Catchment Activity Centres



Note: Only top floorspaces and centres are illustrated.

Source: DPLH 2016, Pracsys 2021

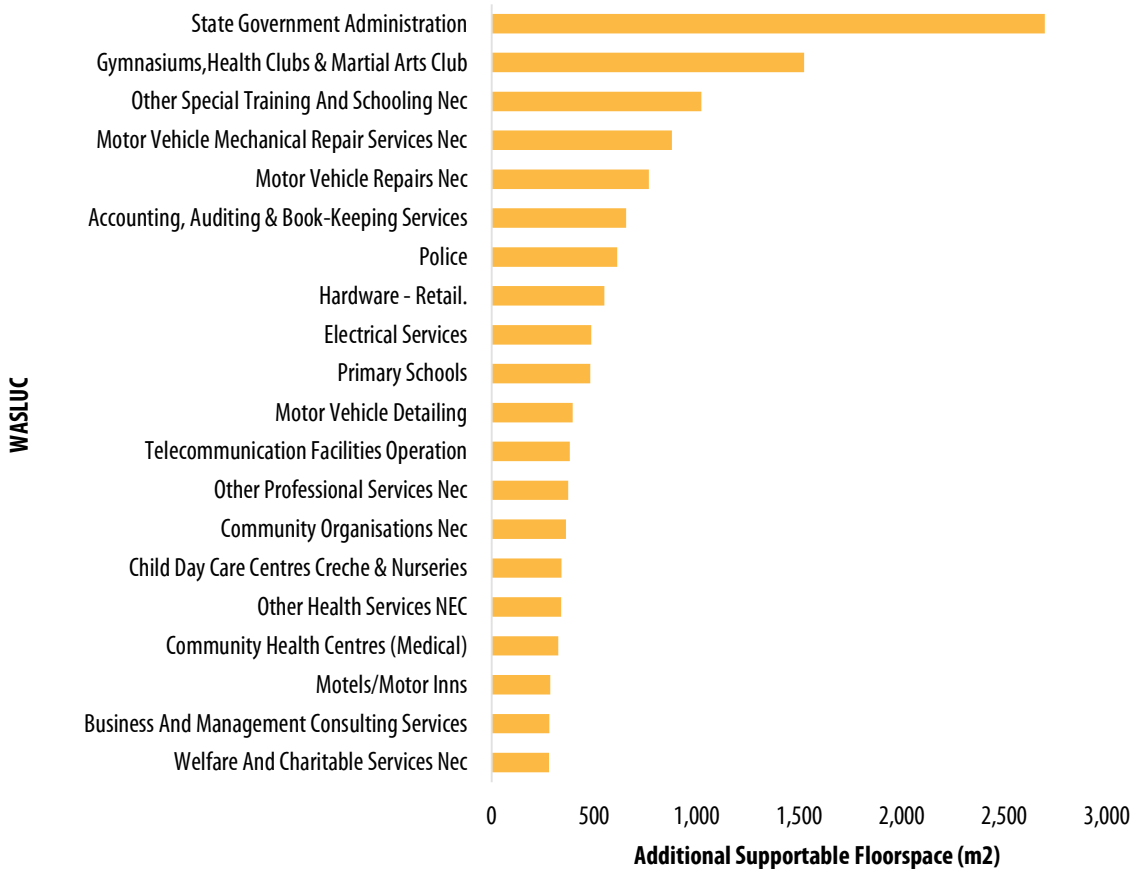
Figure 136. Non-Retail Floorspace Gaps to Mandurah Benchmark Supportable at RSMC by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

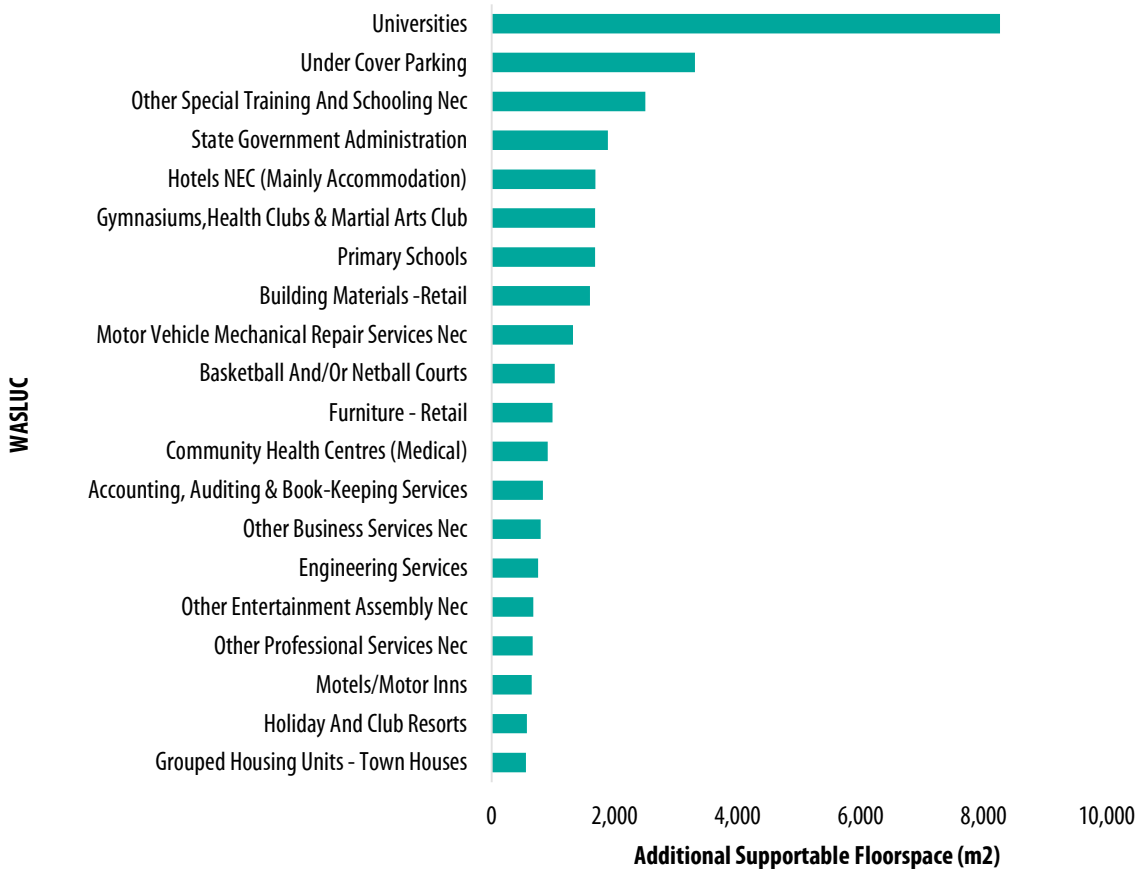
Figure 137. Non-Retail Floorspace Gaps to Armadale Benchmark Supportable at RSMC by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Figure 138. Non-Retail Floorspace Gaps to Joondalup Benchmark Supportable at RSMC by WASLUC



Note: Only top floorspaces are illustrated.

Source: DPLH 2016, Pracsys 2021

Accommodation Floorspace

Figure 139. Per Resident Provision of Accommodation Floorspace by Benchmark

WASLUC	RSMC 25km Catchment	Mandurah Catchment	Armadale Catchment	Joondalup Catchment
Motels/Motor Inns	0.022	0.014	0.027	0.033
Hotels NEC (Mainly Accommodation)	0.050	0.314	0.001	0.077
Private Hotels	0.003	0.027	0.000	0.000
Holiday and Club Resorts	0.002	0.000	0.000	0.011

Source: DPLH 2016, Pracsys 2021

Figure 140. Accommodation Floorspace Gaps by Benchmark

WASLUC	RSMC 25km Catchment	Mandurah Catchment	Armadale Catchment	Joondalup Catchment
Motels/Motor Inns	n/a	-1,987	1,101	2,500
Hotels NEC (Mainly Accommodation)	n/a	62,686	-11,705	6,479
Private Hotels	n/a	5,792	-486	-600
Holiday and Club Resorts	n/a	-430	-430	2,199

Source: DPLH 2016, Pracsys 2021

Figure 141. Visitor Nights and Accommodation Floorspace, City of Rockingham versus Benchmarks

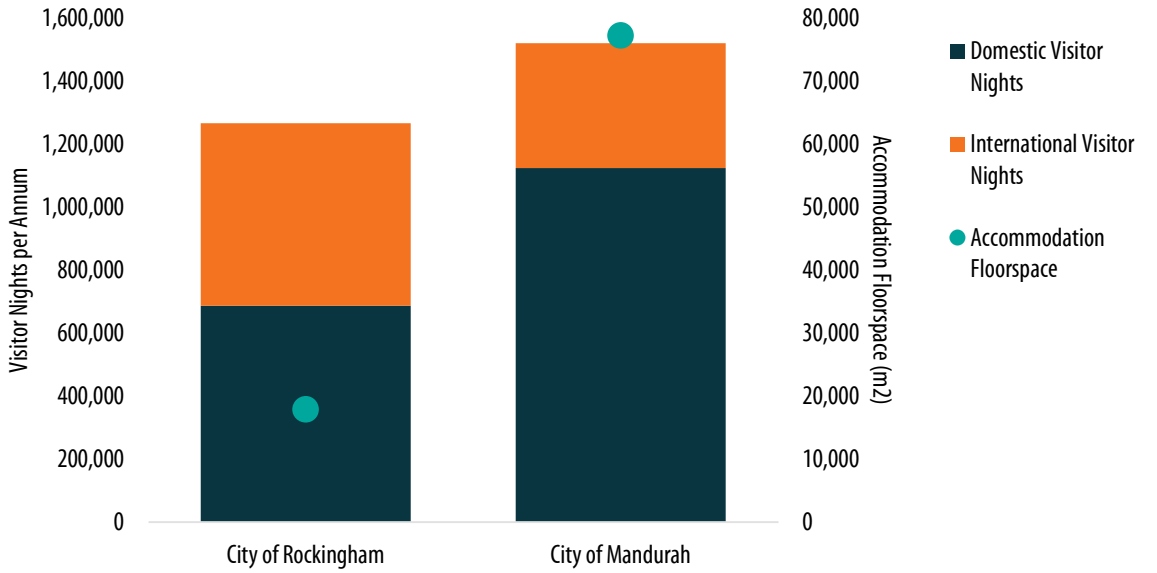
Local Government Area	Domestic Visitor Nights per Annum	International Visitor Nights per Annum	Total Visitor Nights per Annum	Short-Stay Accommodation Floorspace	Total Visitor Nights per Accommodation Floorspace (m2)
City of Rockingham	686,163	579,301	1,265,464	17,833	71
City of Mandurah	1,123,294	395,549	1,518,843	77,162	20
City of Armadale	298,695	572,828	871,523	6,410	136
City of Joondalup	333,028	786,625	1,119,653	4,941	227

Note: As floorspace information is based on data collected by the Department of Planning, Lands and Heritage in 2016, 2016/17 visitor nights data has been utilised to ensure comparison between visitation demand and accommodation supply is accurate.

Source: DPLH 2016, Tourism Research Australia 2021, Pracsys 2021

The analysis has identified a gap in the provision of accommodation floorspace by compared the City of Rockingham to the City of Mandurah. Rockingham attracts approximately 83% of the visitation that Mandurah attracts, however Rockingham only provides 23% of Mandurah's total accommodation floorspace. Further analysis will quantify a relevant accommodation floorspace target for Rockingham and distribute it to appropriate centres (Figure 142).

Figure 142. Visitor Nights and Accommodation Floorspace, City of Rockingham and City of Mandurah



Note: As floorspace information is based on data collected by the Department of Planning, Lands and Heritage in 2016, 2016/17 visitor nights data has been utilised to ensure comparison between visitation demand and accommodation supply is accurate.

Source: DPLH 2016, Tourism Research Australia 2021, Pracsys 2021

12.7 Future Gap Analysis

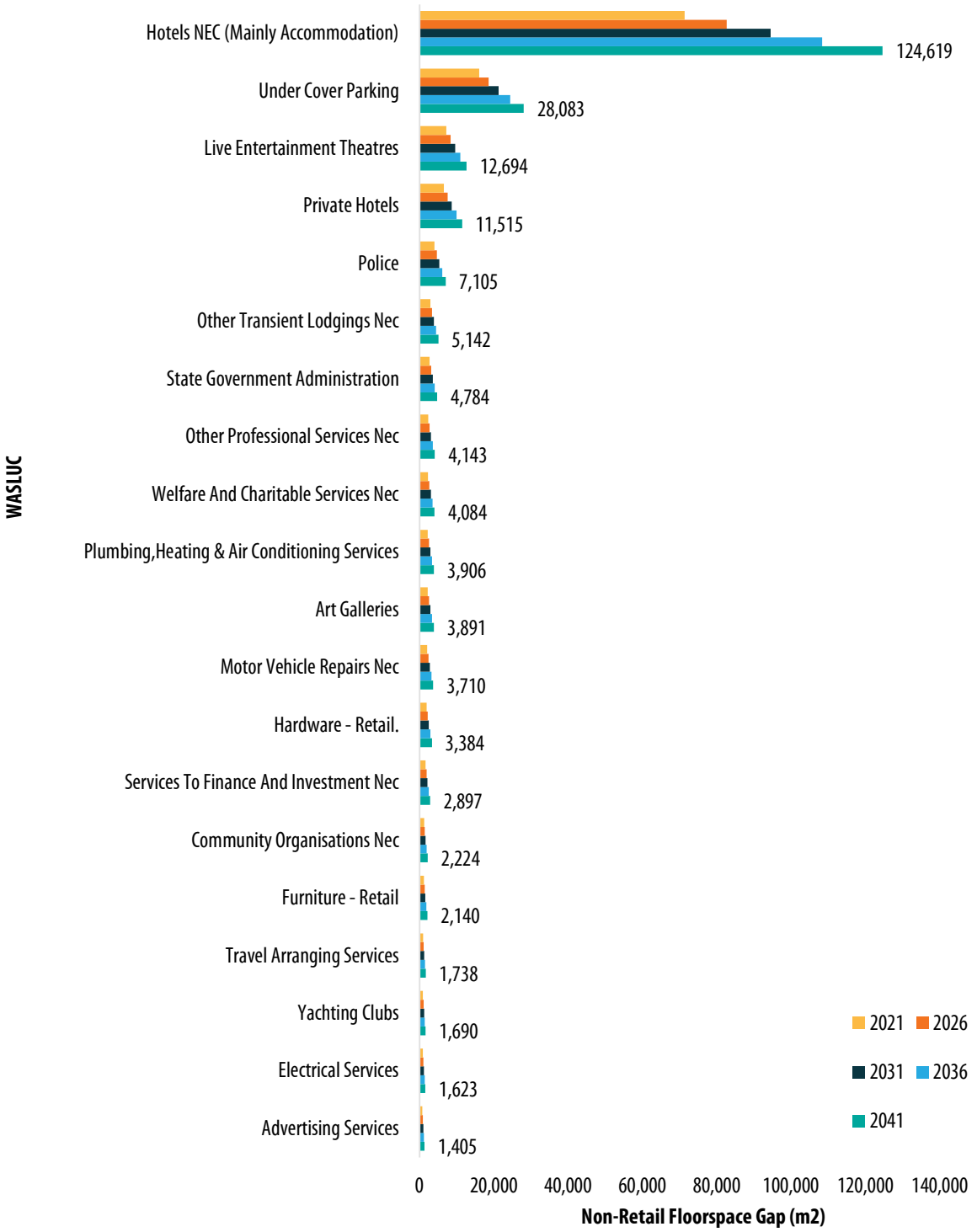
Figure 143. Projected Future Residential Population in Strategic Activity Centre Catchments

Spatial Area	2016	2021	2026	2031	2036	2041
Rockingham Strategic Metropolitan Centre 25kmCatchment	237,721	277,300	336,708	396,362	469,836	561,069
Mandurah Strategic Metropolitan Centre Catchment	226,853	258,384	299,130	342,037	392,209	450,978
Armadale Strategic Metropolitan Centre Catchment	501,544	544,363	605,376	663,864	731,985	811,480
Joondalup Strategic Metropolitan Centre Catchment	627,426	662,202	722,025	786,794	869,496	976,538

Source: WA Tomorrow 2015, Pracsys 2021

The following graphs summarise the gaps in non-retail floorspace by benchmark comparison. The total non-retail floorspace gap for the City's centres has been developed using a mix of the identified benchmarks (see Draft Activity Centre Hierarchy (Floorspace only) 2.0 2021.10.19) and a maximum level of floorspace provision (i.e. the total amount of additional floorspace was not allowed to exceed the floorspace to population ratio of the benchmarks).

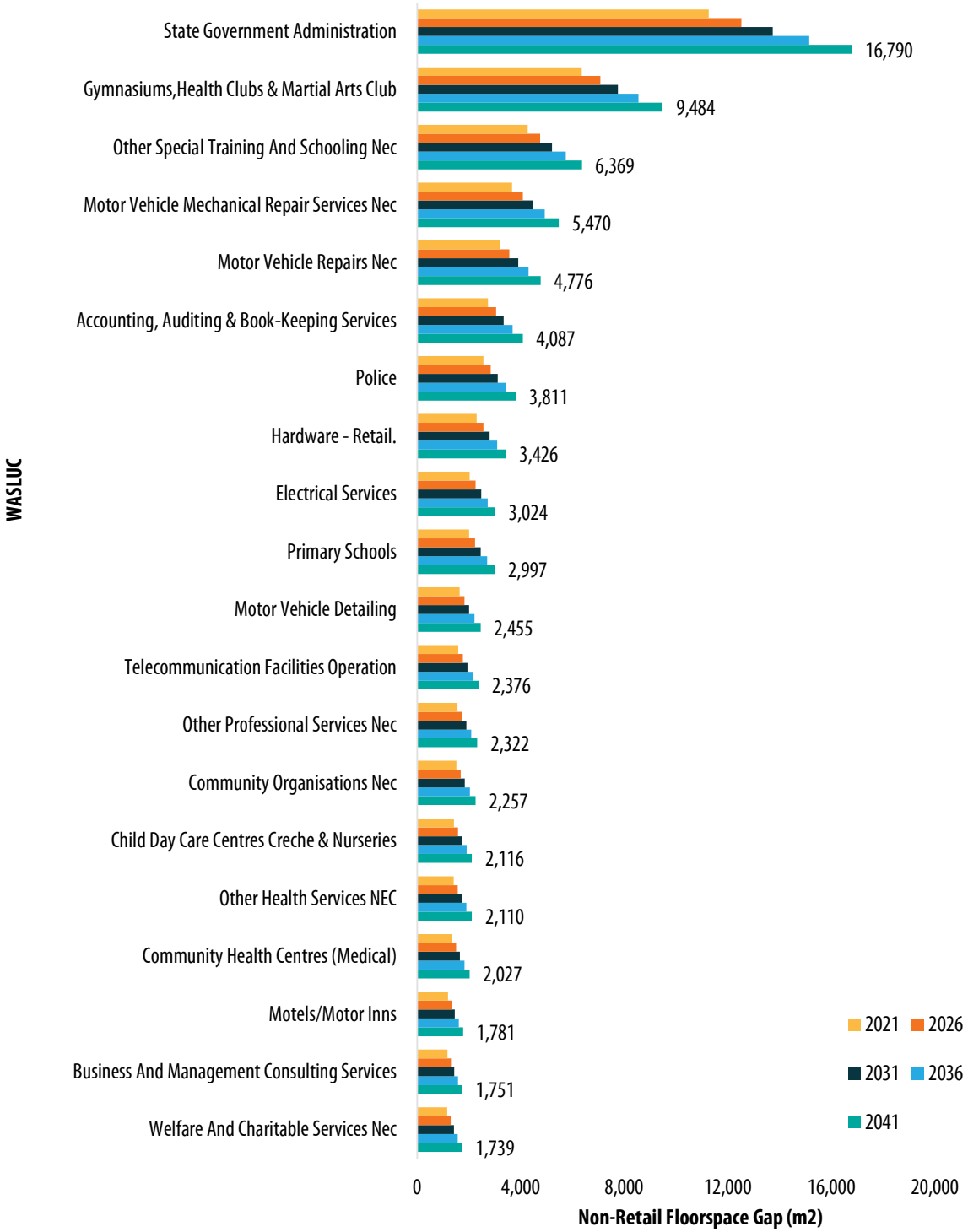
Figure 144. Future Non-Retail Floorspace Gaps to Mandurah Benchmark in RSMC 25km Catchment by WASLUC



Note: Only top floorspaces are illustrated. 2041 gap value shown as data label.

Source: WA Tomorrow 2016, DPLH 2016, City of Rockingham 2021, Pracsys 2021

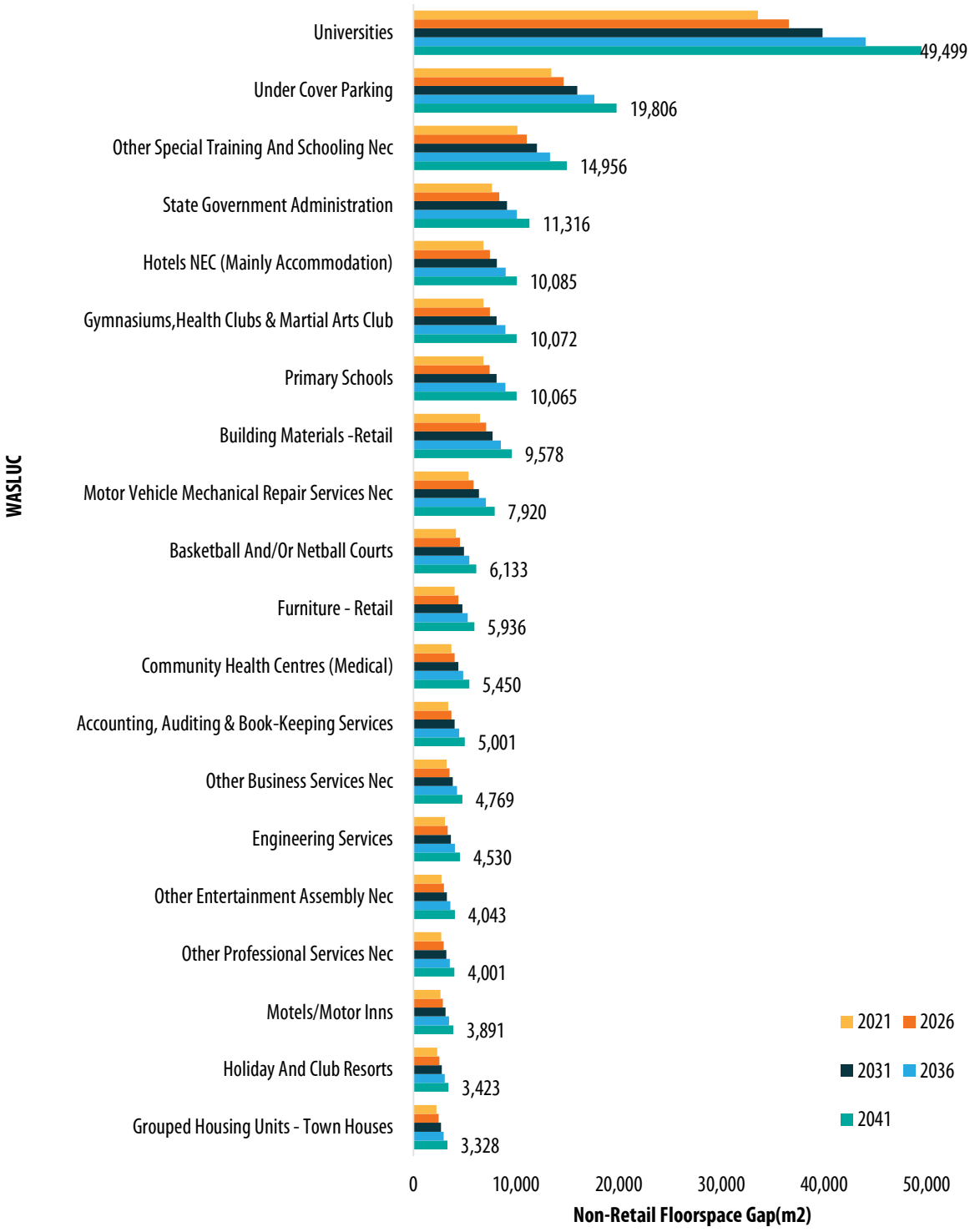
Figure 145. Future Non-Retail Floorspace Gaps to Cannington/Armadale Benchmark in RSMC 25km Catchment by WASLUC



Note: Only top floorspaces are illustrated. 2041 gap value shown as data label.

Source: WA Tomorrow 2016, DPLH 2016, City of Rockingham 2021, Pracsys 2021

Figure 146. Future Non-Retail Floorspace Gaps to Joondalup Benchmark in RSMC 25km Catchment by WASLUC



Note: Only top floorspaces are illustrated. 2041 gap value shown as data label.

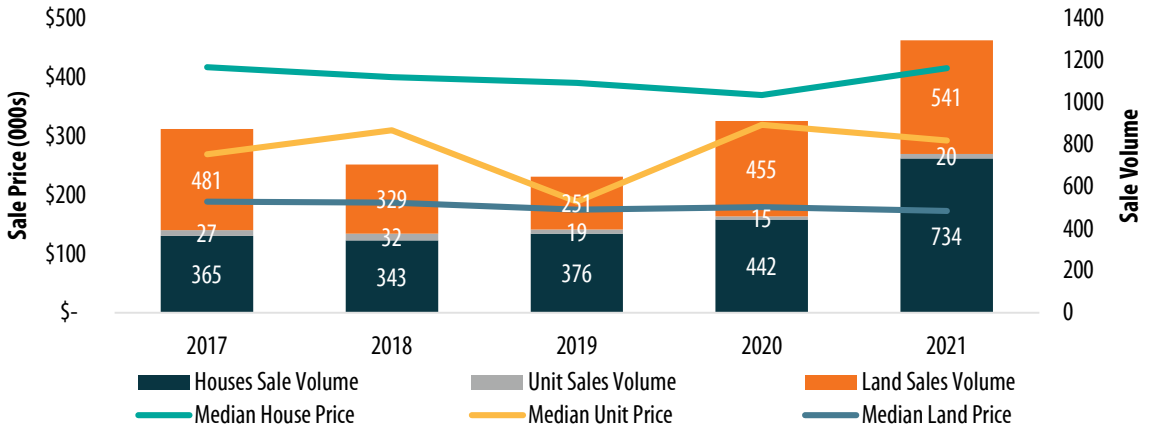
Source: WA Tomorrow 2016, DPLH 2016, City of Rockingham 2021, Pracsys 2021

13 APPENDIX 4: PROPERTY MARKET PROFILE

Suburb of Baldivis

Sales Analysis

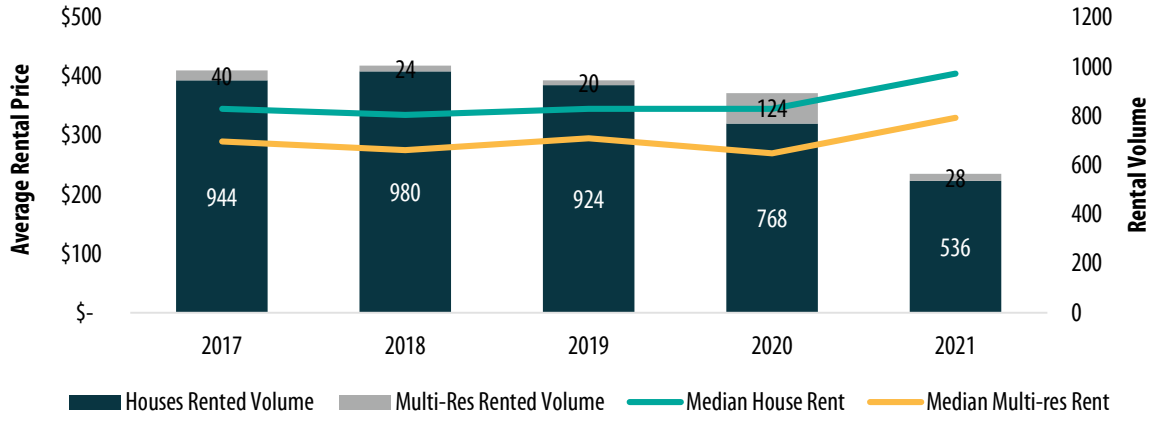
Figure 147. Suburb of Baldivis Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

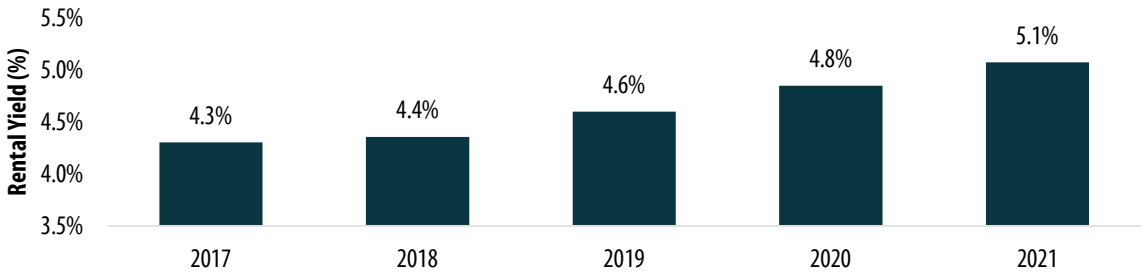
Rental Analysis

Figure 148. Suburb of Baldivis Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 149. Suburb of Baldivis Rental Yield for Houses

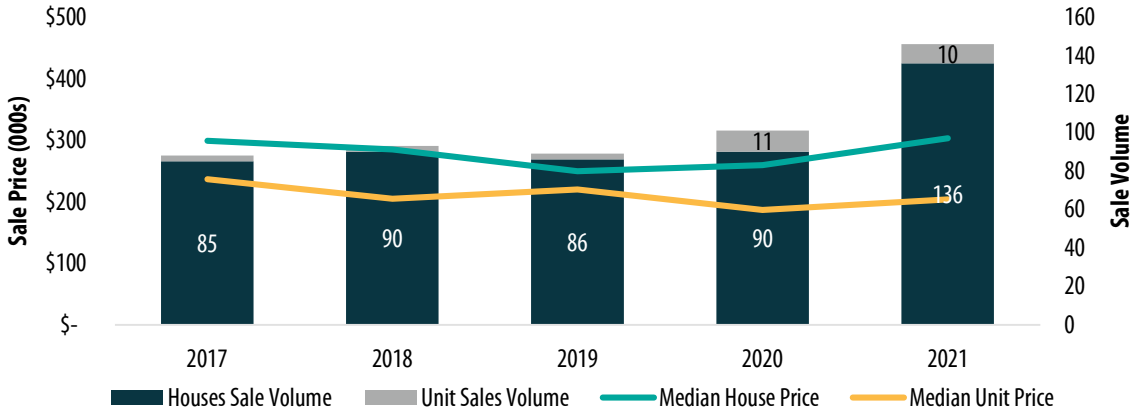


Source: REIWA 2021, Pracsys 2021

Suburb of Cooloongup

Sales Analysis

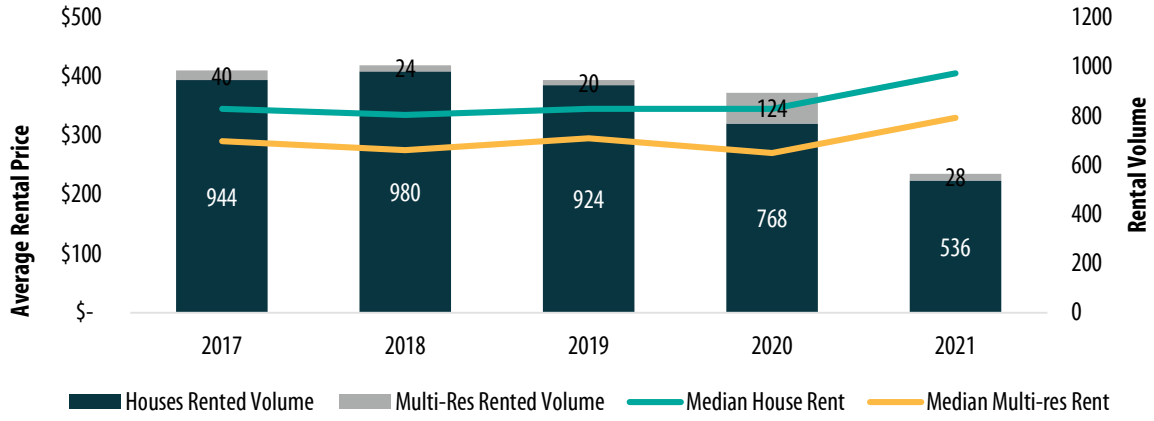
Figure 150. Suburb of Cooloongup Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

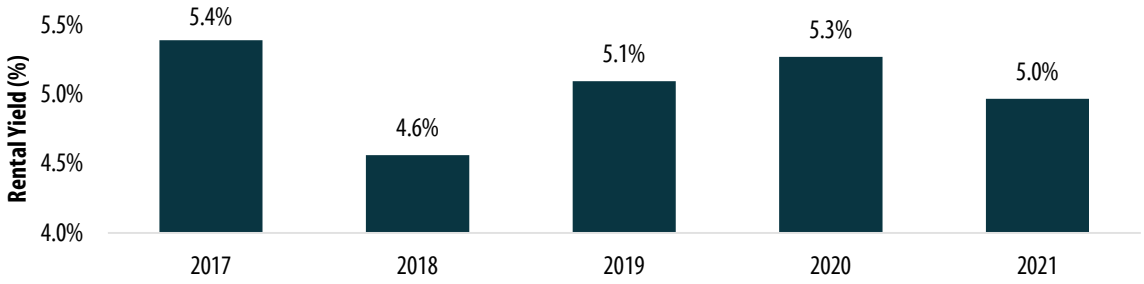
Rental Analysis

Figure 151. Suburb of Cooloongup Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 152. Suburb of Cooloongup Rental Yield for Houses

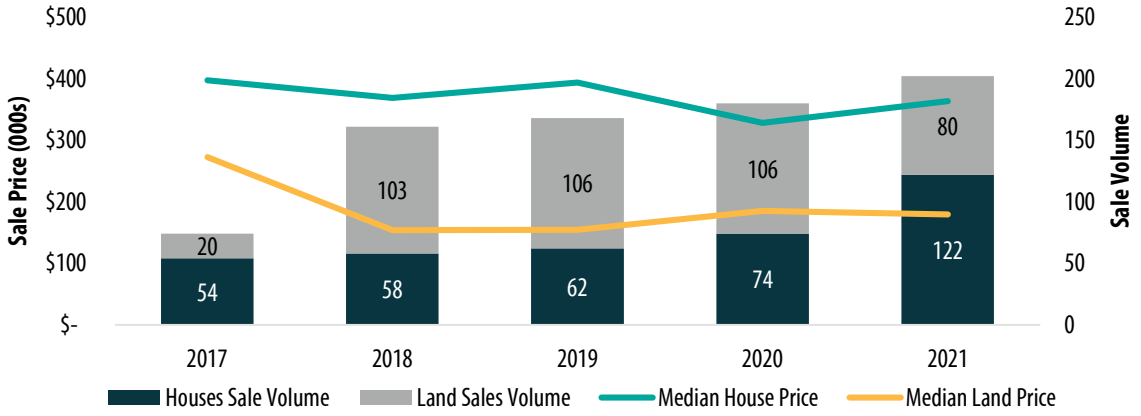


Source: REIWA 2021, Pracsys 2021

Suburb of Golden Bay

Sales Analysis

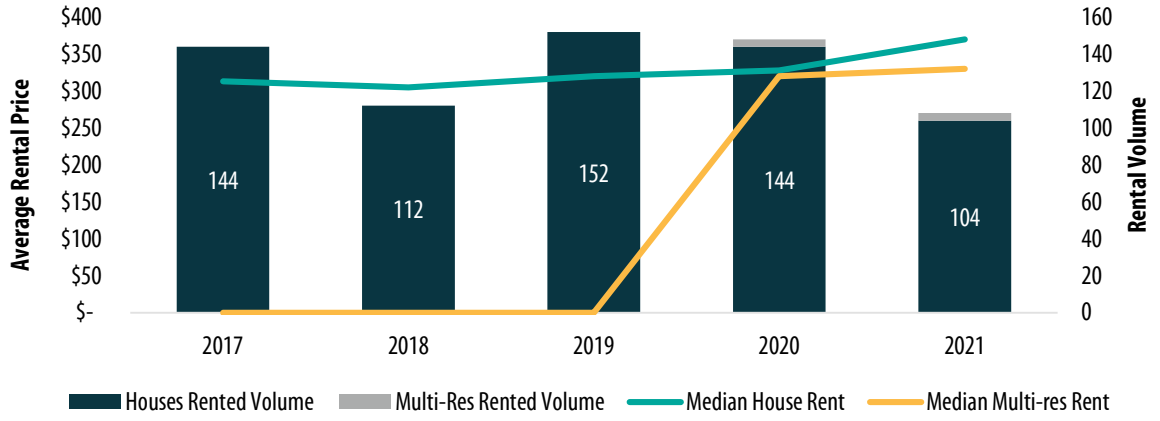
Figure 153. Suburb of Golden Bay Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

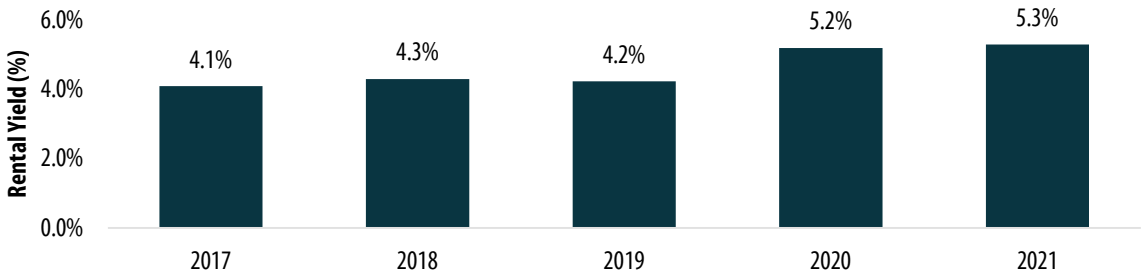
Rental Analysis

Figure 154. Suburb of Golden Bay Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 155. Suburb of Golden Bay Rental Yield for Houses

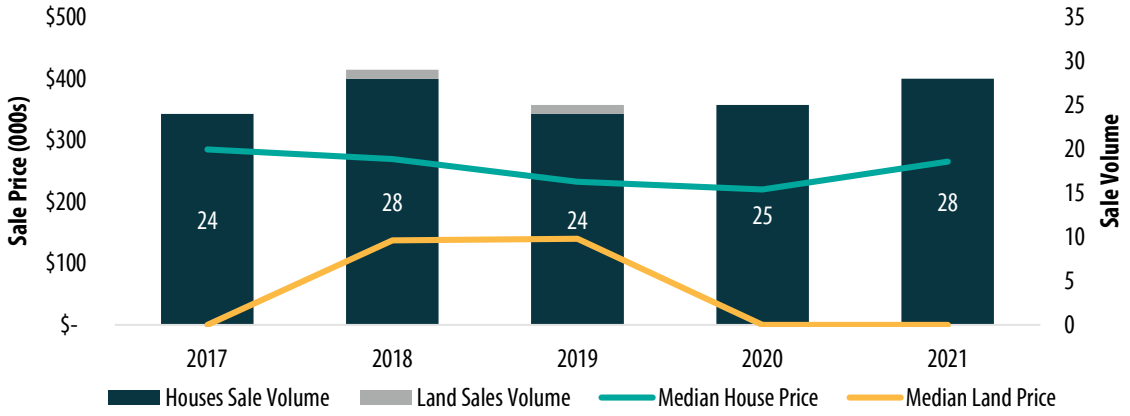


Source: REIWA 2021, Pracsys 2021

Suburb of Hillman

Sales Analysis

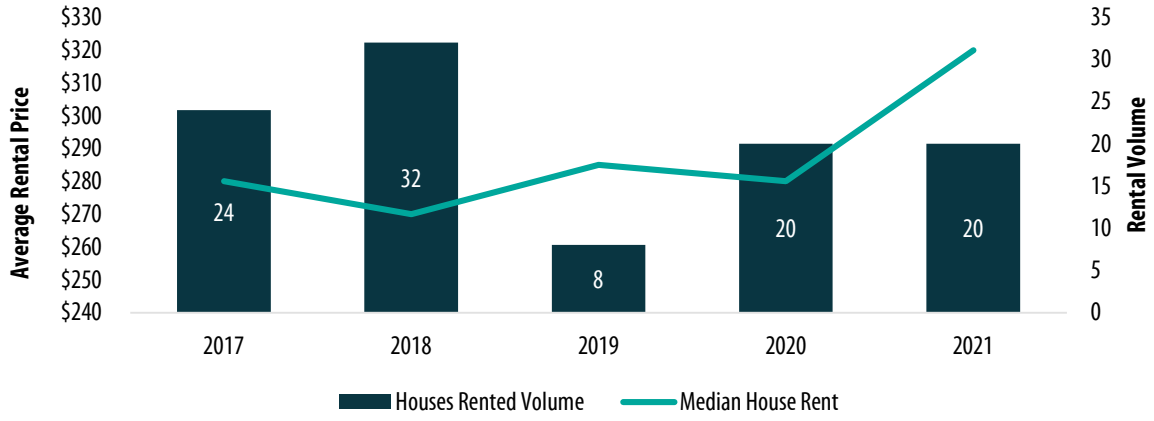
Figure 156. Suburb of Hillman Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

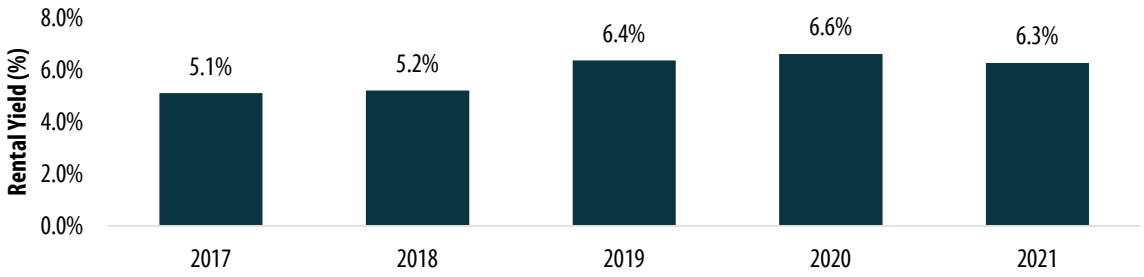
Rental Analysis

Figure 157. Suburb of Hillman Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 158. Suburb of Hillman Rental Yield for Houses

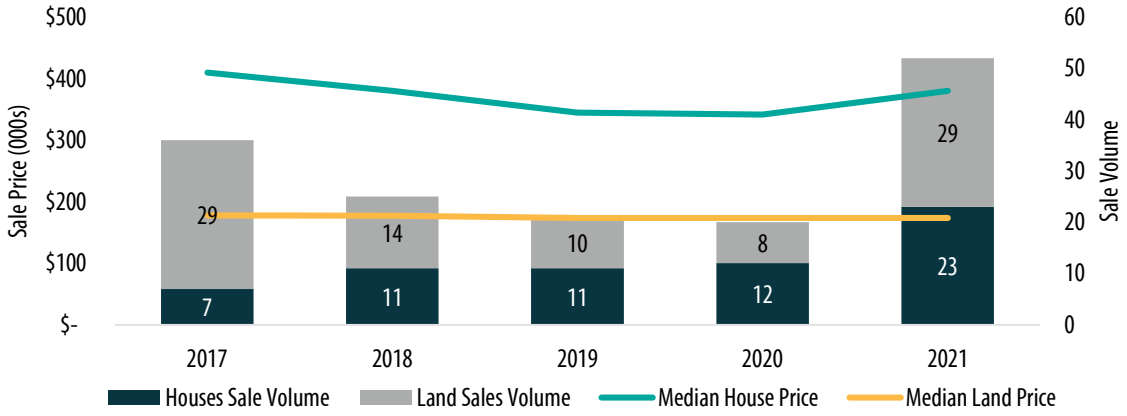


Source: REIWA 2021, Pracsys 2021

Suburb of Karnup

Sales Analysis

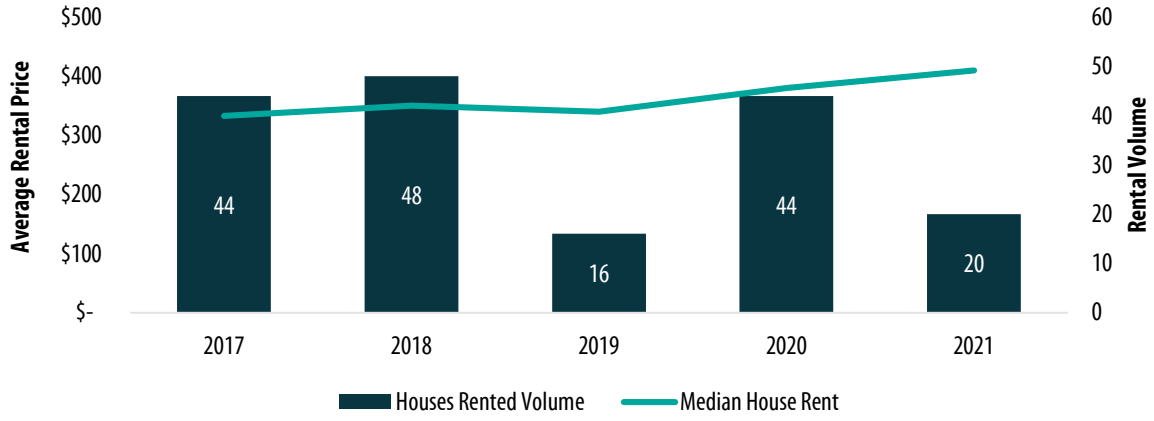
Figure 159. Suburb of Karnup Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

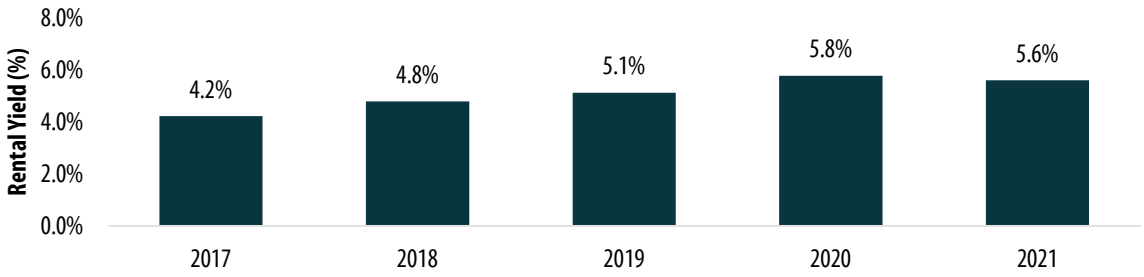
Rental Analysis

Figure 160. Suburb of Karnup Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 161. Suburb of Karnup Rental Yield for Houses

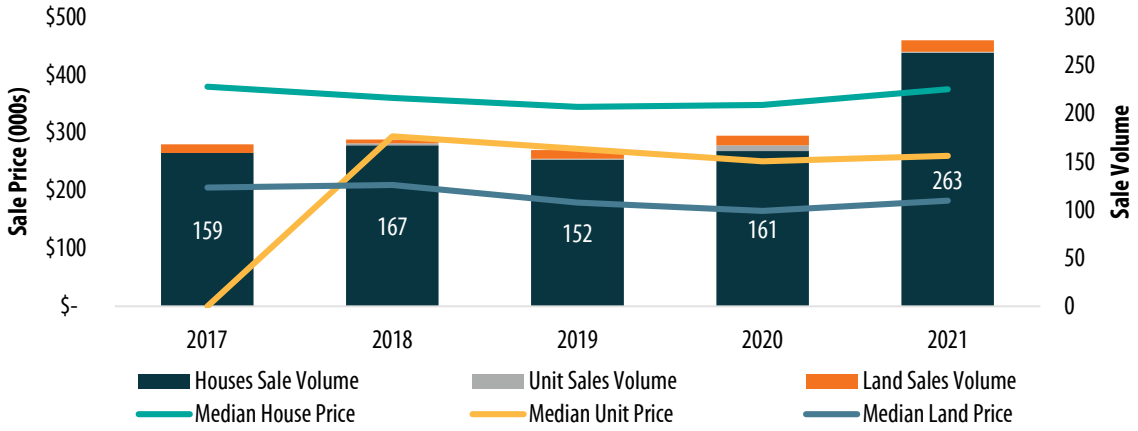


Source: REIWA 2021, Pracsys 2021

Suburb of Port Kennedy

Sales Analysis

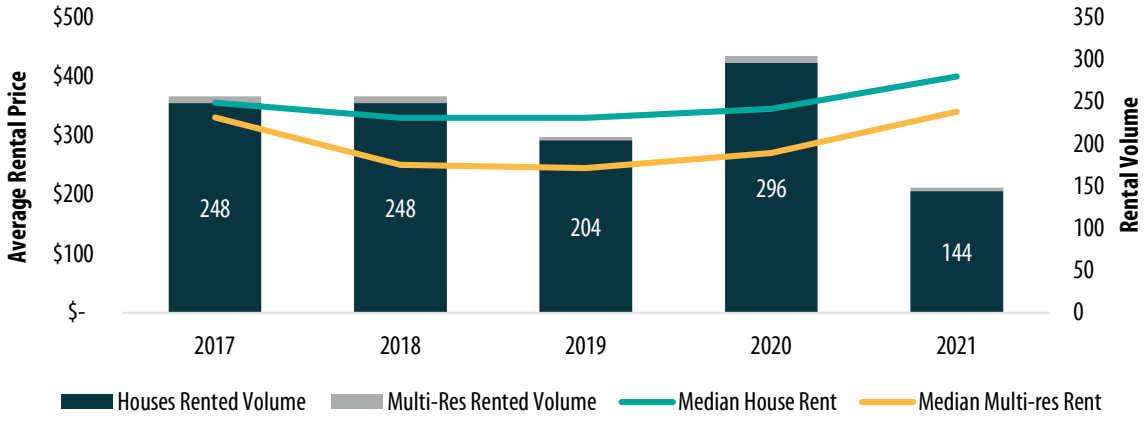
Figure 162. Suburb of Port Kennedy Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

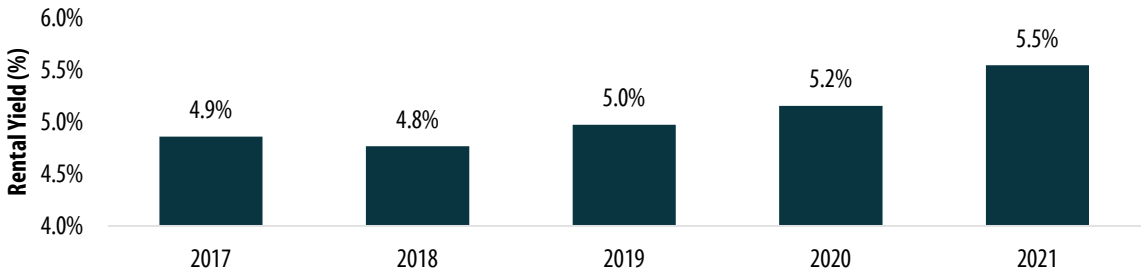
Rental Analysis

Figure 163. Suburb of Port Kennedy Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 164. Suburb of Port Kennedy Rental Yield for Houses

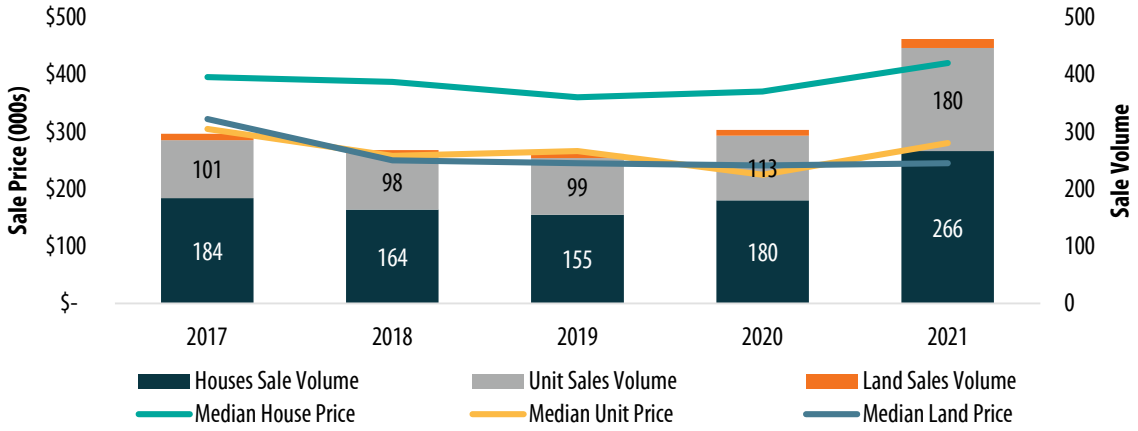


Source: REIWA 2021, Pracsys 2021

Suburb of Rockingham

Sales Analysis

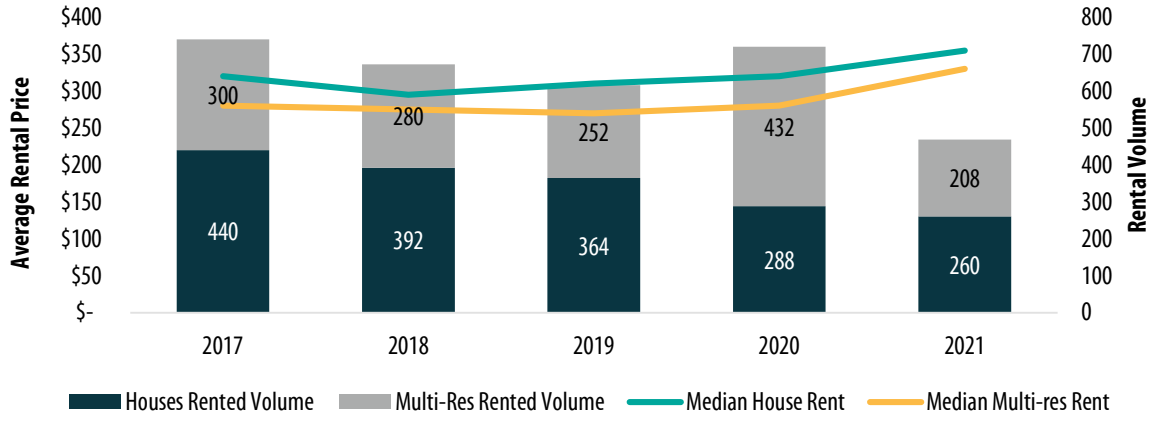
Figure 165. Suburb of Rockingham Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

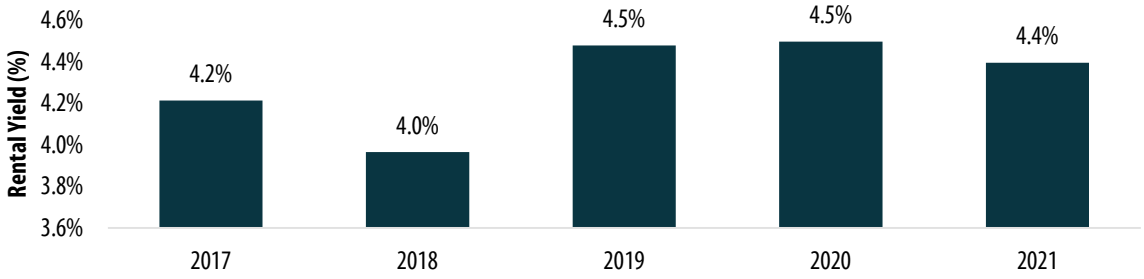
Rental Analysis

Figure 166. Suburb of Rockingham Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 167. Suburb of Rockingham Rental Yield for Houses

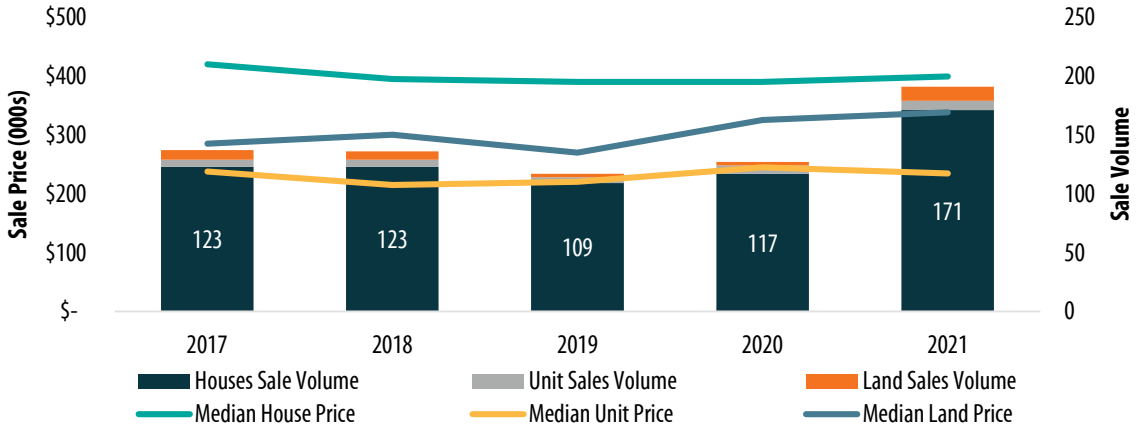


Source: REIWA 2021, Pracsys 2021

Suburb of Safety Bay

Sales Analysis

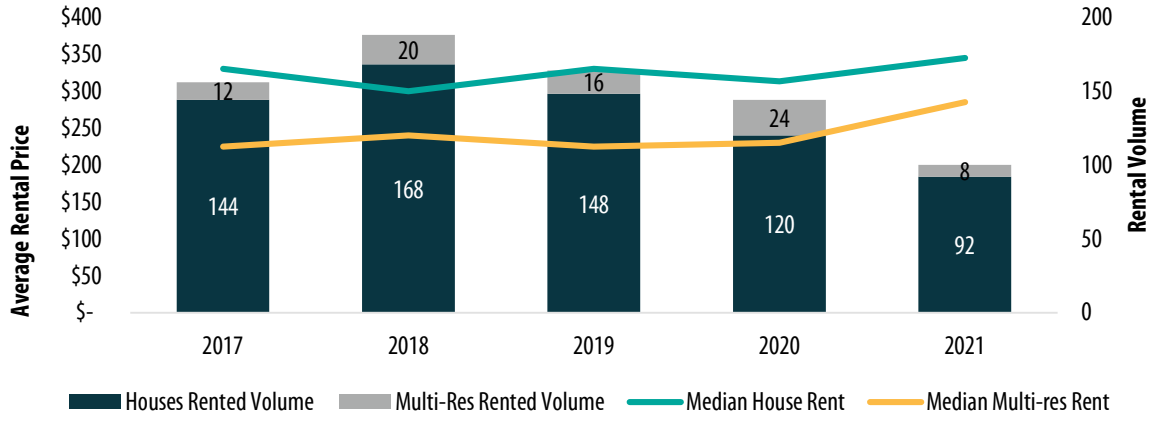
Figure 168. Suburb of Safety Bay Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

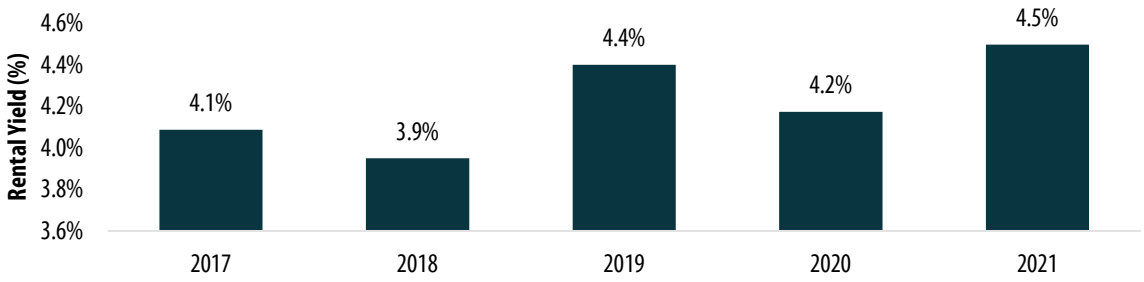
Rental Analysis

Figure 169. Suburb of Safety Bay Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 170. Suburb of Safety Bay Rental Yield for Houses

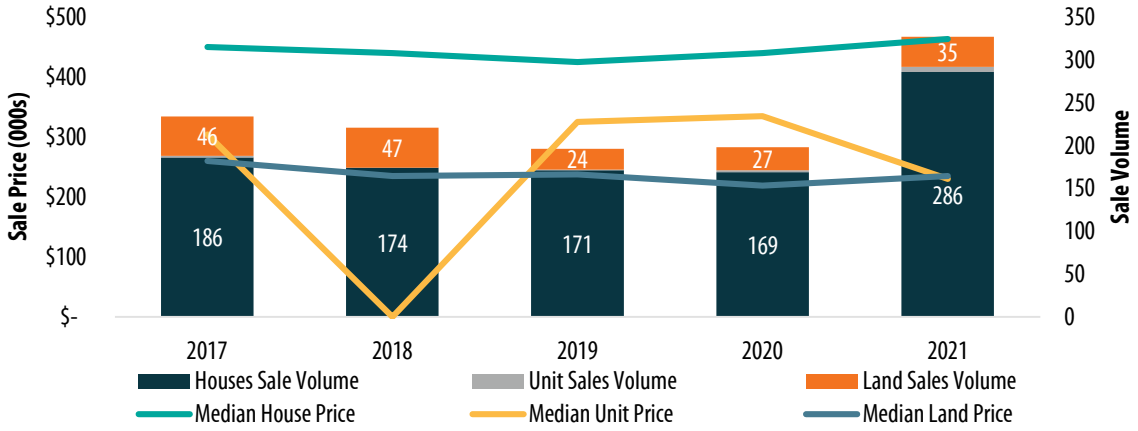


Source: REIWA 2021, Pracsys 2021

Suburb of Secret Harbour

Sales Analysis

Figure 171. Suburb of Secret Harbour Residential Sales Prices and Volumes

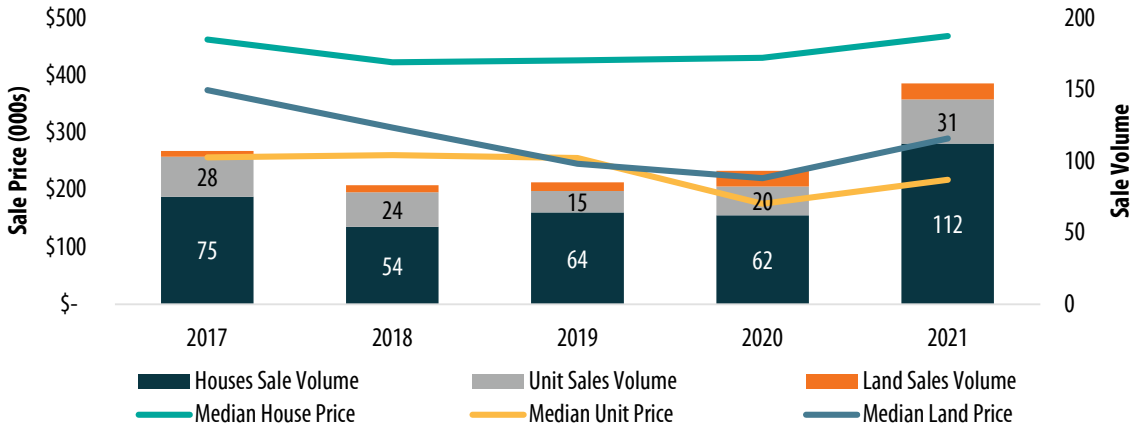


Source: REIWA 2021, Pracsys 2021

Suburb of Shoalwater

Sales Analysis

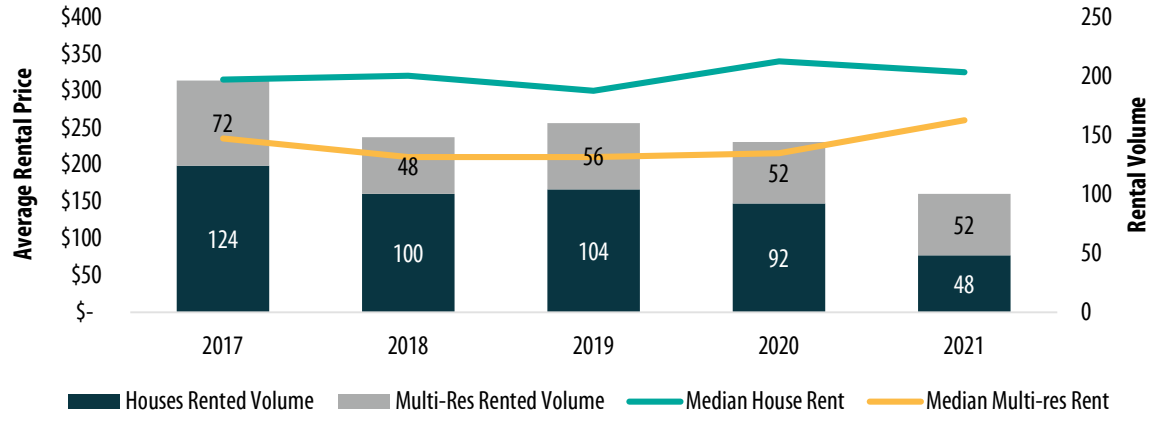
Figure 172. Suburb of Shoalwater Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

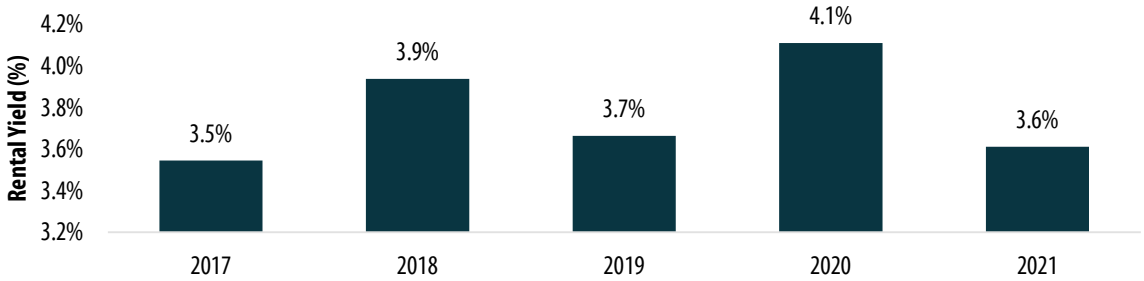
Rental Analysis

Figure 173. Suburb of Shoalwater Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 174. Suburb of Shoalwater Rental Yield for Houses

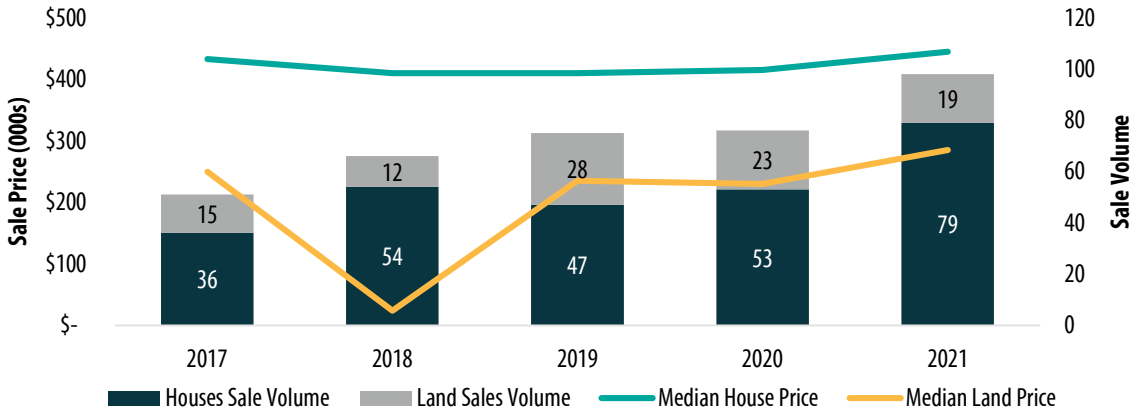


Source: REIWA 2021, Pracsys 2021

Suburb of Singleton

Sales Analysis

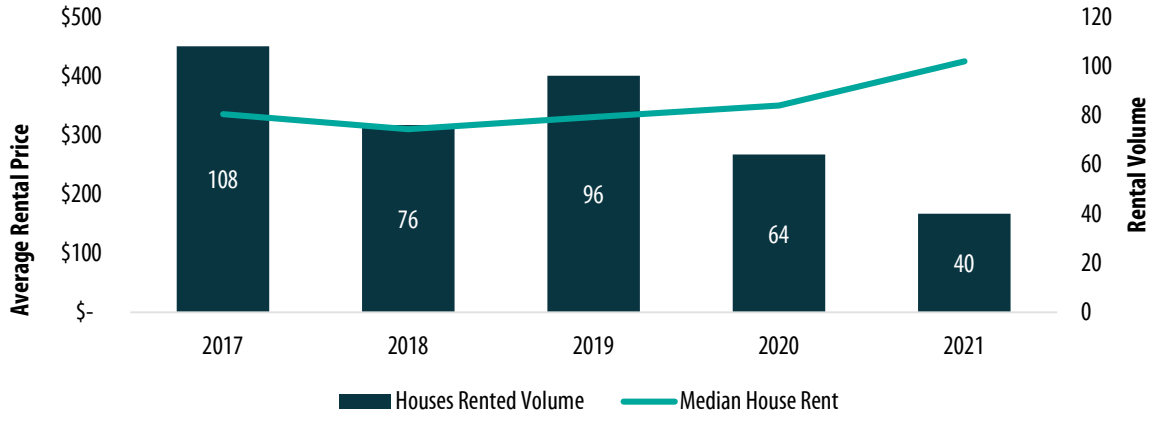
Figure 175. Suburb of Singleton Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

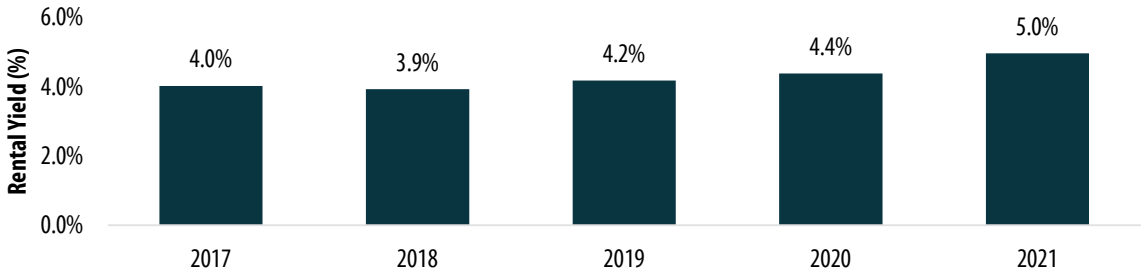
Rental Analysis

Figure 176. Suburb of Singleton Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 177. Suburb of Singleton Rental Yield for Houses

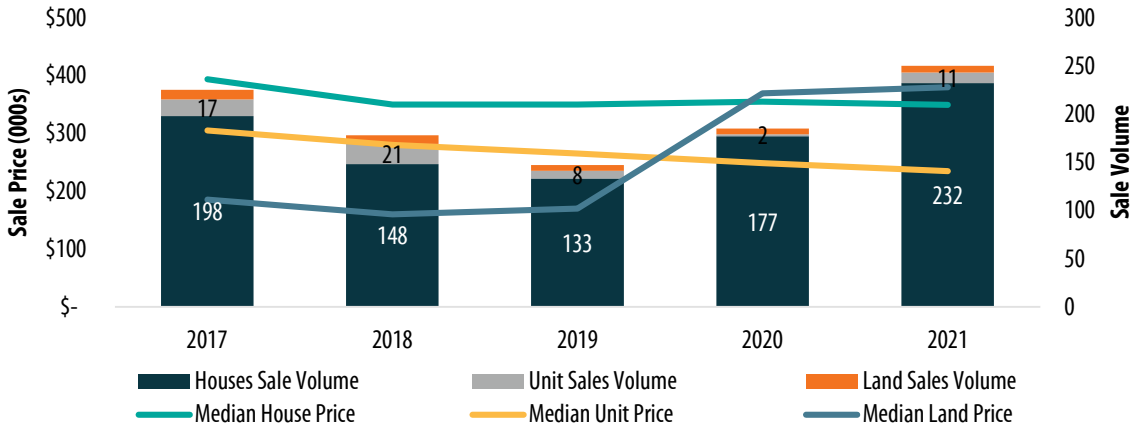


Source: REIWA 2021, Pracsys 2021

Suburb of Waikiki

Sales Analysis

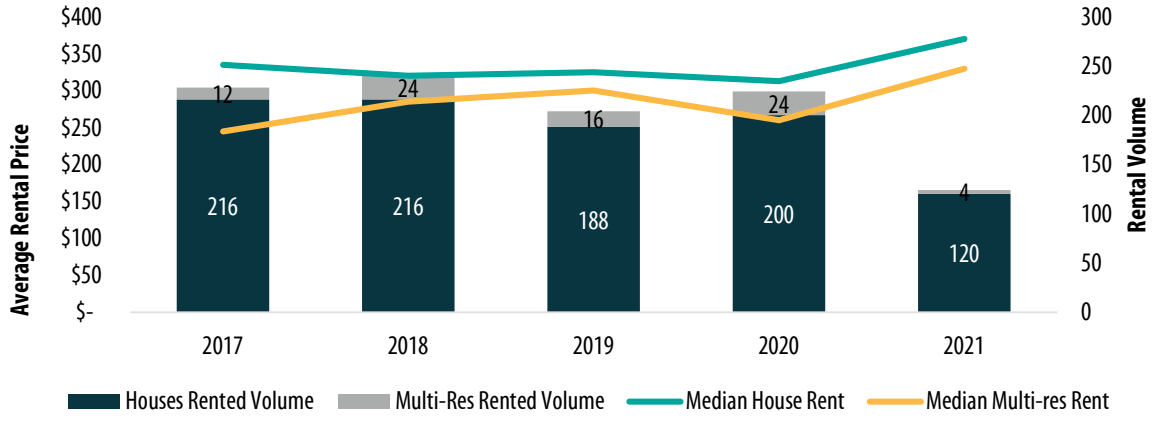
Figure 178. Suburb of Waikiki Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

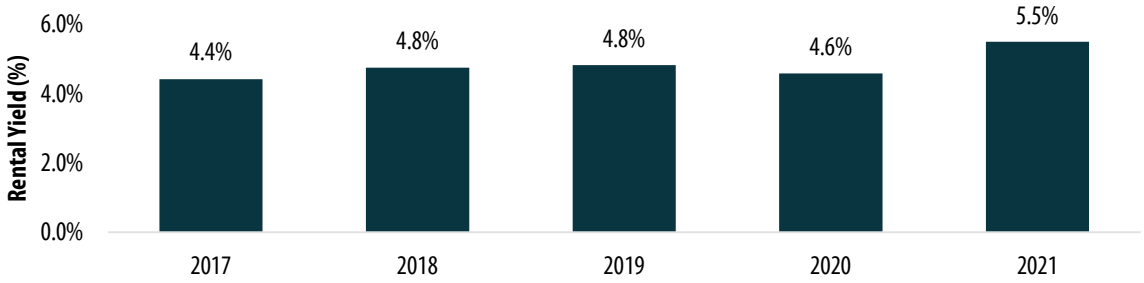
Rental Analysis

Figure 179. Suburb of Waikiki Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 180. Suburb of Waikiki Rental Yield for Houses

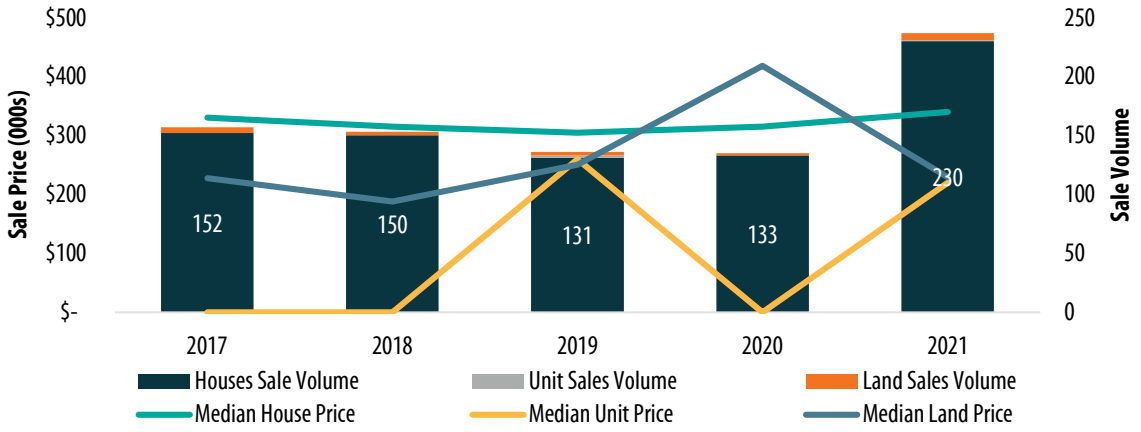


Source: REIWA 2021, Pracsys 2021

Suburb of Warnbro

Sales Analysis

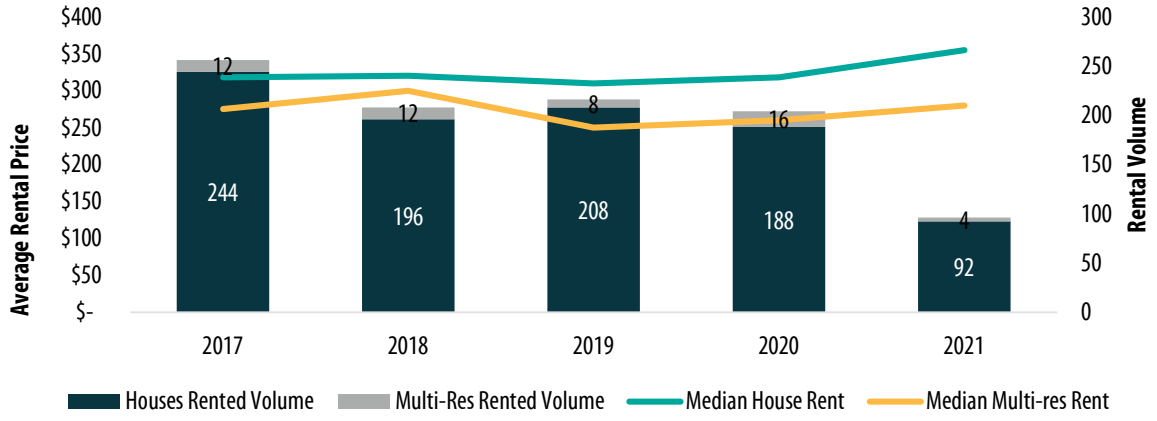
Figure 181. Suburb of Warnbro Residential Sales Prices and Volumes



Source: REIWA 2021, Pracsys 2021

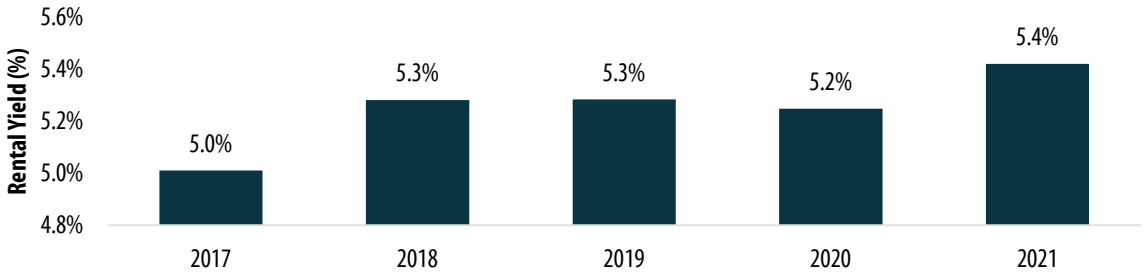
Rental Analysis

Figure 182. Suburb of Warnbro Residential Rental Prices and Volumes



Source: REIWA 2021, Pracsys 2021

Figure 183. Suburb of Warnbro Rental Yield for Houses



Source: REIWA 2021, Pracsys 2021

CHRMAP

2019

COASTAL HAZARD RISK MANAGEMENT AND ADAPTATION PLAN

city of Rockingham

where the coast comes to life

Frequently Asked Questions

What is a CHRMAP?

A Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) is a strategic planning document that informs the community and decisions makers about potential coastal hazards, the consequences and necessary actions.

The CHRMAP is required under the State Planning Policy 2.6 State Coastal Planning (SPP 2.6) and aims to provide long term direction, while giving context to planning decisions in the short term.

Please refer to Section 1 to learn about the CHRMAP objectives and Section 3 for more information on why the CHRMAP is required.

Why release a draft CHRMAP?

The purpose of the draft CHRMAP is to provide an opportunity for the community to view and provide input on the document and its proposed recommendations. All actions in the draft CHRMAP are only proposals at this stage for consideration by the community and Council.

Once all community comments have been received, the draft CHRAMP will be updated to incorporate feedback and reported back to Council.

What are coastal hazards?

The two main coastal processes that are considered hazards are erosion and inundation. The CHRMAP identifies areas that could potentially be impacted by these hazards over the next 100 years, relative to storm events and projected sea level rise. Please refer to Section 4 for more information.

How can I tell if my property is in a coastal hazard area?

To determine if your property may be vulnerable to erosion, please refer to Section 5.

To determine if your property may be vulnerable to inundation, please refer to Section 6.

What are the options for adapting to coastal hazards?

The State Coastal Policy identifies four options for adapting to coastal hazards:

- Avoid
- Retreat
- Accommodate
- Protect

Please refer to Section 7.2 to learn more about these options and the pros and cons for each.

How does this affect me?

Coastal vulnerability will affect different people in different ways depending on where they live and how they access, use and enjoy the coastline. Please refer to the table for more information.

I am a…	
Private property owner in a coastal hazard area	If a planning or development application is submitted for a lot located in a coastal hazard area then the State Coastal Policy requires a notification to be placed on the certificate of title as a condition of approval, identifying that the lot may be vulnerable to coastal hazards. This will also be communicated in any Land Enquiry requested from the City.
User of the City's coastline	Some areas of the City's coastline may become vulnerable over the next 100 years. This includes beaches, access ways, footpaths, carparks, toilets, roads and public open space areas. Section 9.7 provides a summary of the short term management actions to be undertaken by 2030. These actions are largely focused 'behind the scenes' to better prepare the City for future coastal hazards and are not expected to impact the way in which you currently use and enjoy the coastline. Long term, adaptation strategies such as protection or managed retreat may be required if and when coastal hazards are realised, as explained in Section 8. In areas identified for future protection (Section 8.2), structures such as seawalls may be constructed in the future. This means that the natural sandy beach will eventually be lost in these locations, but existing infrastructure will be protected. In areas identified for future managed retreat (Section 8.2), existing infrastructure may gradually be permanently removed or relocated if coastal hazards cause damage during storm events. The natural sandy beach and dunes will be retained in these areas.
A lessee or user of one the City's coastal buildings	If you lease or use a City building that is located in a coastal hazard area, it may be impacted within the 100 year planning timeframe. Please refer to Section 9.3.2 for short and long term measures relating to land and facilities leased by the City.

Who is responsible if my property is affected? Will the state or local government protect my property?

There is no legal obligation on the State or Local Governments to either protect public and private assets within coastal hazard areas, or to compensate for any losses incurred due to coastal hazards.

SPP 2.6 requires that local governments prepare a CHRMAP to identify coastal hazard areas, outline potential adaptation pathways and share this information with the community.

What changes can I expect to see in the short term?

It is unlikely that you will see any major adaptation works along the City's coastline before 2030. In the short term, proposed actions will be primarily 'behind the scenes' with a focus on establishing;

- A long term coastal monitoring program, to ensure the City has accurate and timely data to track coastal hazard impacts and inform future decision making;
- A coastal adaptation fund, to ensure the City is well placed to implement best practice coastal adaptation works if and when they are required; and
- Measures for education and engagement, to ensure the community is well informed and property owners are aware of any potential coastal hazard risks that may affect them.

Please refer to Section 9 for more information on the short term actions to 2030.

What will the City be doing in the long term?

Long term, adaptation strategies such as protection or managed retreat may be required if and when coastal hazards are realised. This is further explained in Section 8, with priority areas identified for protection or managed retreat shown in Section 8.2.

Who will pay for adaptation?

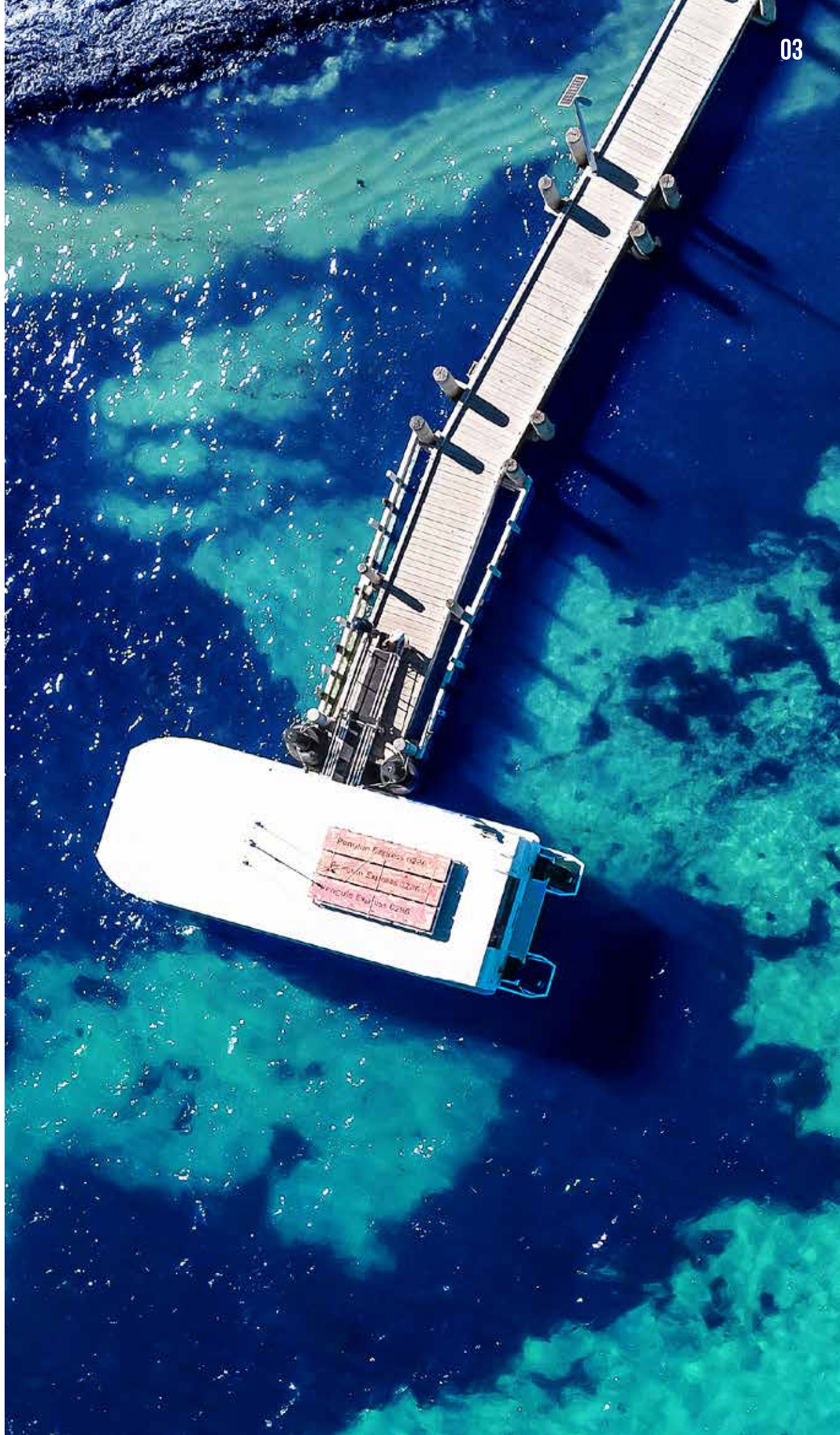
Currently, both the state and federal governments do not propose any funding to assist local governments in paying for coastal adaptation. Knowing that any type of coastal adaptation will be expensive, it is recommended that the City establish a dedicated fund for Coastal Adaptation to ensure the City is well placed to undertake works as necessary, when the time comes. This is further explained in Section 9.2.

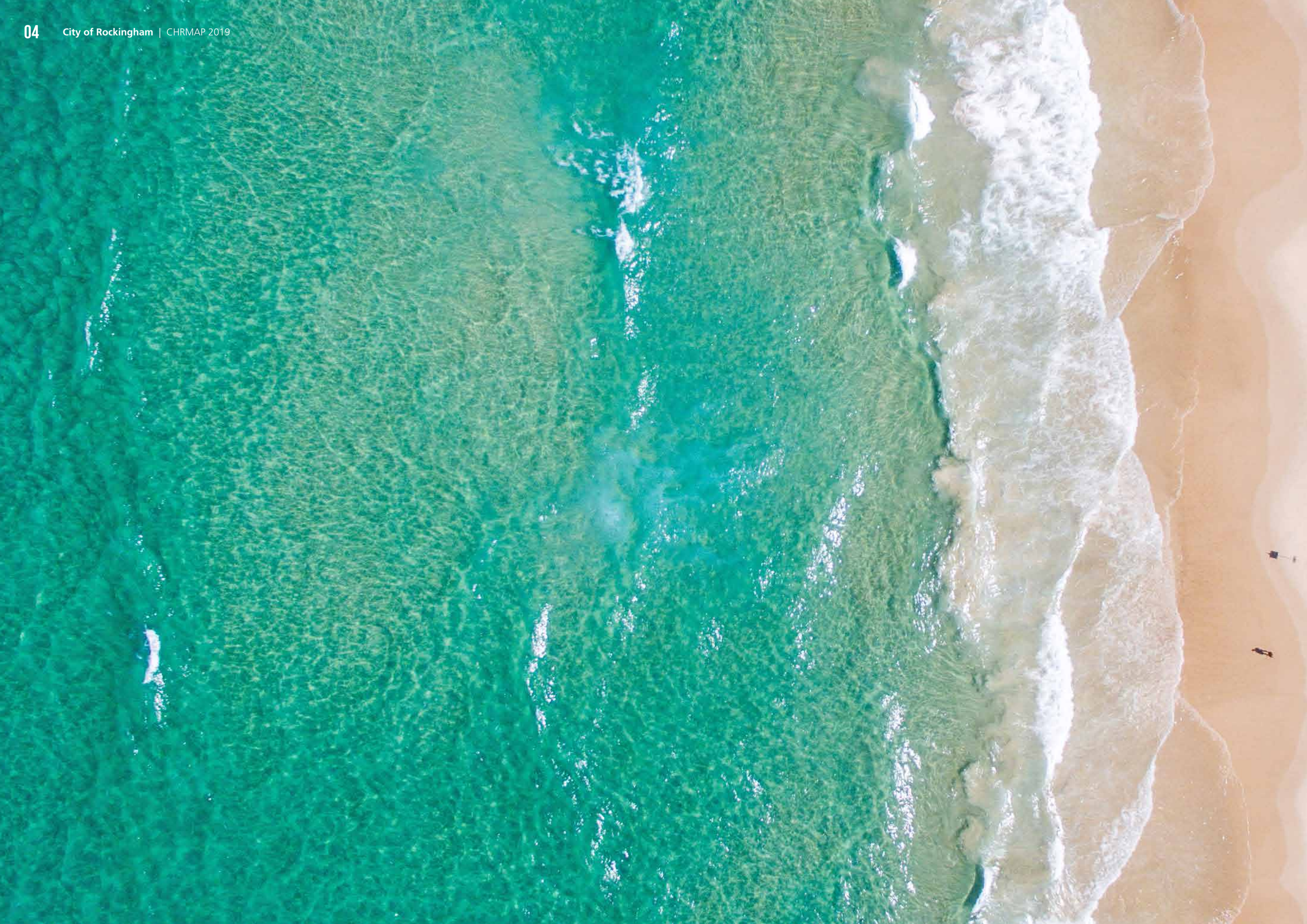
Will it affect my insurance?

The impact on insurance premiums when a lot is identified as potentially vulnerable to coastal hazards is unclear. Insurance premiums are determined by insurance providers not the City.

Will it affect my property values?

Property values are determined by the property market. As there are numerous factors affecting property values, the potential impact of identifying that a lot may be vulnerable to coastal hazards over the next 100 years is not readily ascertained or predicted.





Contents

1. Introduction 7
- 1.1 Vision 8
- 1.2 Purpose 8
- 1.3 Objectives 8
- 1.4 Study area 9
- 1.5 Assets and values 9

2. Existing environment 10
- 2.1 Climate 10
- 2.2 Geology and landform 10
- 2.3 Hydrology 10
- 2.4 Coastal processes 11

3. Why does the City need a CHRMAP? 13
- 3.1 Community and stakeholder engagement 14

4. What are coastal hazards and how are they estimated? 17
- 4.1 Coastal hazard modelling 17
- 4.2 How are risks assessed? 18
- 4.3 What could be impacted? 19

5. Which areas of the City could be impacted by erosion? 21

6. Which areas of the City could be impacted by inundation? 35

7. What are the management options and considerations for coastal hazards? 57
- 7.1 Key concepts 57
- 7.2 Adaptation hierarchy 58
- 7.3 Triggers 61

8. Long term recommendations (beyond 2030) 62
- 8.1 Priority areas for protection and/or retreat 63
- 8.2 Priority areas for long term protection and managed retreat 64

9. Short term recommendations (before 2030) 69
- 9.1 Summary of short term recommendations 69

10. Implementation table 79

11. References 81

Appendices 82





1 Introduction

The City of Rockingham has over 37 km of coastline. The adjacent land, known as the coastal zone, supports a variety of recreation, conservation, residential and commercial land uses. The coastal zone is highly valued by the community and underpins the City's identity, prosperity and lifestyle. The City's coastal zone is already subject to the impacts of coastal hazards, such as erosion and inundation, and it is expected that the vulnerability of these areas may increase in the future due to the predicted effects of climate change and sea level rise.

This Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) provides a long term view of the potential future coastal hazards for the City, and highlights pathways to adapt to the changing future oceanic and coastal conditions. The CHRMAP aims to ensure the City is well placed to deal with impacts to the coastal zone, if and when those hazards arise.

The CHRMAP process is designed to be ongoing, with regular updates associated with the emergence and collection of new information. Development of the City's CHRMAP has followed the requirements of Western Australian State Planning Policy No. 2.6: State Coastal Planning Policy (SPP2.6) and supporting guideline documents. A summary of the planning context, from a state level to local level, can be viewed in Appendix B.

A coastal hazard assessment was undertaken to determine potential extents of coastal erosion and inundation hazards over future planning timeframes to 2110. A risk and vulnerability assessment was then applied according to different sectors, with results highlighting the most vulnerable assets and areas along the City's coastline, for which a more detailed investigation of adaptation options was undertaken.

Based on the work undertaken to date, this CHRMAP provides a series of recommended actions for implementation before 2030, as well as potential long term adaptation pathways for consideration by current and future generations.

The CHRMAP acknowledges the challenges associated with managing risks in a dynamic coastal environment, together with the need to balance environmental, social and economic values to ensure the long term sustainable use and management of the City's unique coastline.

1.1 Vision

The CHRMAP aims to deliver the following aspiration contained in the City's Strategic Community Plan 2019-2029:

Aspiration 3
Plan for Future Generations

Strategic Objective:
Climate change adaptation

Acknowledge and understand the impacts of climate change, and identify actions to mitigate and adapt to those impacts.

1.2 Purpose

The purpose of the CHRMAP is to provide a framework for adapting to coastal hazards over the next 100 years, while prioritising adaptation management actions over the next 10 years.

1.3 Objectives

The CHRMAP is driven by the following overarching objectives:

- Ensure that development and the location of coastal facilities takes into account coastal processes, landform stability, coastal hazards, climate change and biophysical criteria;
- Guide the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities;
- Provide for public coastal foreshore reserves on the coast and ensure access to them; and
- Protect, conserve and enhance coastal zone values, particularly in areas of landscape, biodiversity and ecosystem integrity, indigenous and cultural significance.

Note: there is no legal obligation on the State or Local Governments to either protect public and private assets within the coastal hazard zone, or to compensate for any losses incurred due to coastal hazards.



1.4 Study area

The entire City of Rockingham coastline is included in the CHRMAP, from the City of Kwinana boundary in the north, to the City of Mandurah boundary in the south. The study area encompasses sediment cells in adjoining coastal areas to ensure effective consideration of coastal processes. The area has been divided into the following sectors for the purpose of defining detail at an appropriate scale for assessment and management:

- **Sector 1:** Municipal Boundary (North) to Wanliss Street
- **Sector 2A:** Wanliss Street to Garden Island Causeway
- **Sector 2B:** Garden Island Causeway to Boundary Road
- **Sector 3:** Boundary Road to Shelton Street
- **Sector 4A:** Shelton Street to Bayeux Avenue
- **Sector 4B:** Bayeux Avenue to Becher Point
- **Sector 5:** Becher Point to Turtles Bend
- **Sector 6:** Turtles Bend to Municipal Boundary (South)

The CHRMAP includes all areas of the coastline, not only those under management by the City, to ensure future adaptation pathways are considered in a holistic context. The relevant stakeholders, including Water Corporation, Department of Biodiversity Conservation and Attractions, and the Department of Defence, have been consulted through development of this CHRMAP.

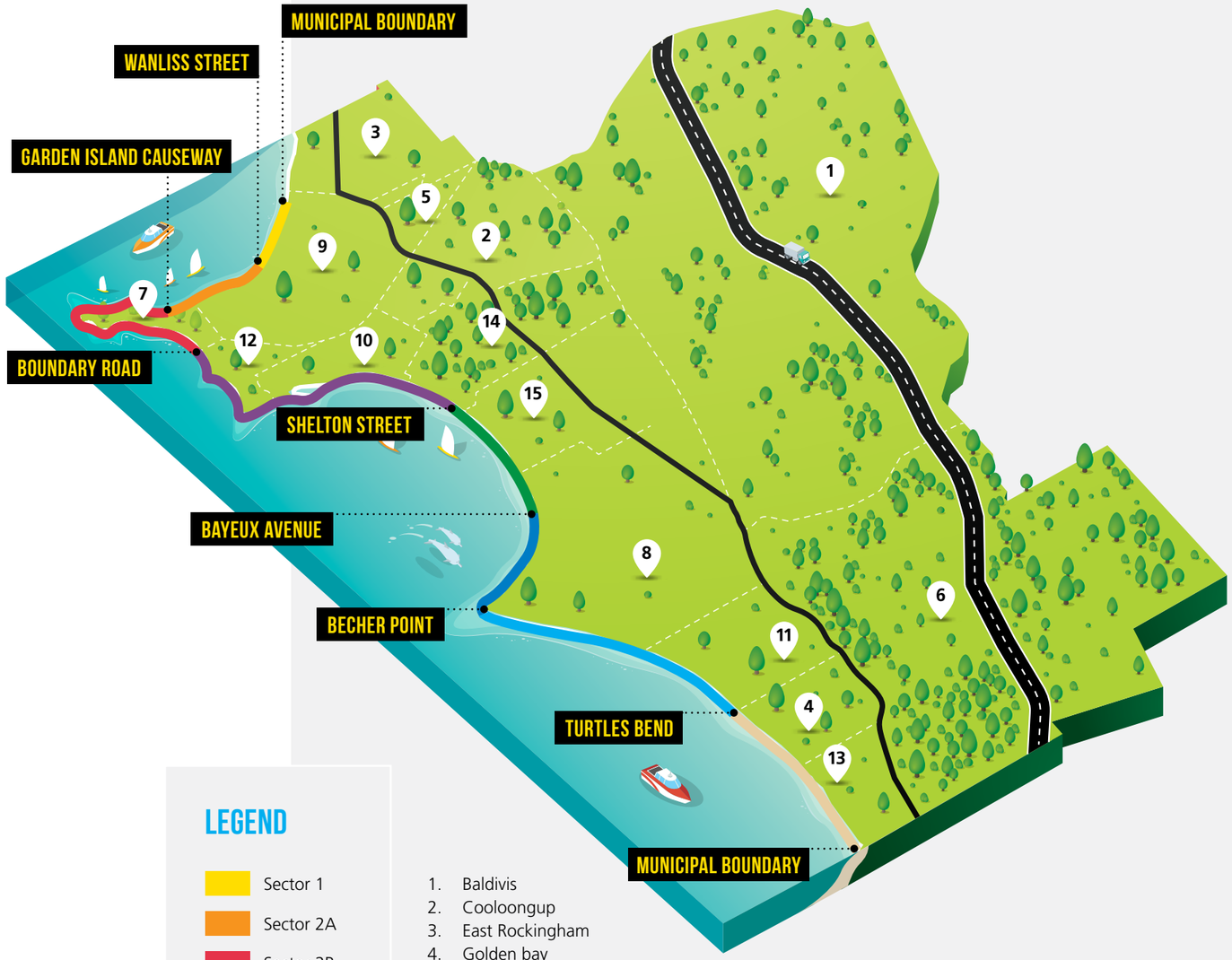
1.5 Assets and values

For the purpose of the CHRMAP, assets are defined as:

- natural features such as beaches and natural vegetation;
- buildings and other structures (houses and commercial buildings);
- infrastructure relating to drainage, water and sewerage;
- roads, paths and walkways; and
- coastal structures, such as jetties, boat ramps, seawalls and groynes.

As defined in the Australian Standard for Climate change adaptation for settlements and infrastructure – A risk based approach (AS 5334-2013), an asset's value can be tangible or intangible, financial or non-financial. Examples of non-tangible assets include ecological function and coastal views.

The value of an asset also includes consideration of risks and liabilities, and can be positive or negative at different stages of the asset's life. Values in the context of the CHRMAP further encompass the economic, social (including heritage) and environmental values of the coastal area.



LEGEND

- Sector 1
- Sector 2A
- Sector 2B
- Sector 3
- Sector 4A
- Sector 4B
- Sector 5
- Sector6

1. Baldivis
2. Cooloongup
3. East Rockingham
4. Golden bay
5. Hillman
6. Karnup
7. Point Peron
8. Port Kennedy
9. Rockingham
10. Safety Bay
11. Secret Harbour
12. Shoalwater
13. Singeton
14. Waikiki
15. Warnbro



Existing environment

2.1 Climate

The south west of Western Australia has a Mediterranean climate with hot, dry summers and cool, wet winters. Mean daily maximum temperatures vary from 30˚C in summer and 18˚C in winter. The mean annual rainfall is approximately 730 mm, with most falling from May through to October.

2.2 Geology and landform

The City is situated on the Swan Coastal Plain bioregion, which is a long coastal strip that extends from Dunsborough in the south to Gingin in the north.

The area is dominated by the Quindalup dune system, which is a relatively recent landform characterised by a series of low sand dunes made up of marine sands and Aeolian (windblown) soils. The Quindalup dunes are underlain by the Safety Bay sand formation which comprises calcareous soils derived from Tamala limestone (Semeniuk 1989).

For the majority of the Swan Coastal Plain, the Quindalup dune system occurs as a thin stretch adjacent to the ocean; however within the City, the dunes form a wide plain known as the Rockingham – Becher Plain (Semeniuk 1989). This plain consists of a series of multiple, parallel, linear sandridges that are stranded former beach ridges, providing an important example of Holocene sedimentation and stratigraphic evolution.

The City's coastal environment has site elevations ranging from 0 m to 20 m Australian Height Datum (AHD), with higher dunes generally found in the Point Peron area (up to 10 m), Waikiki (up to 20 m), Warnbro (up to 15 m), Port Kennedy (up to 15 m), and Secret Harbour (up to 12 m).

2.3 Hydrology

No natural drainage lines or wetland areas occur within the foreshore. However, the Becher Point Wetlands, an internationally significant Ramsar site, is located in close proximity. Lake Richmond also occurs in proximity to the coast, supporting two endangered Threatened Ecological Communities.

Groundwater in the region comprises unconfined, semi-confined and confined aquifers that exist as separate layered systems. The aquifers, in order of increasing depth, include:

- The Superficial and Rockingham Sand Aquifers (unconfined)
- The Leederville Aquifer (semi-confined to confined)
- The Yarragadee Aquifer (confined)

2.4 Coastal processes

The geomorphological complexity of the City's coastline supports significant biological diversity and a range of recreational opportunities, encompassing highly unique stretches of coastline within the Cockburn Sound, Warnbro Sound and Shoalwater Islands Marine Park. Situated along the coast is a chain of islands, offshore ridges and depressions, which extend from Garden Island in the north to Long Point in the south, providing protection from swell and limiting offshore sediment feeds, resulting in low energy beaches. Conversely, the beaches south of Long Point are high energy as they are not protected by offshore geomorphology and are therefore exposed to significantly more swell.

A detailed understanding of coastal processes which effectively considers past, present and predicted future shoreline change is critical to effective coastal planning and management.

At varying intensities and magnitudes, the interaction of the following key coastal processes impact on coastal landforms and shoreline movement.

2.4.1 Wind

The nature of local seas, particularly in sheltered areas like Warnbro and Cockburn Sounds, are significantly influenced by the speed, direction and duration of wind. In the summer months, winds are characterised by a dominant sea breeze, with strong south to south-westerlies which can result in significant longshore movement of sediment.

Sea breezes are generated because land heats up faster than the ocean, resulting in a significant difference between land and sea temperatures in summer, particularly in the afternoon when solar radiation is at its maximum.

During the day, air over the land becomes warm and rises, resulting in an area of low pressure. This air then moves out toward the ocean where the temperature is lower. As the air cools it sinks, resulting in an area of high pressure over the water. The air then moves from the high pressure area over the ocean to the low pressure area over land and it is this movement which is known as the sea breeze. The strength of a sea breeze is therefore dependent on the difference in land and sea temperature.

In winter, north-westerly winds dominate due to the movement of low pressure systems. While strong, these winds generally result in less sediment movement than the summer winds as the duration is shorter and the sand is usually wet.

Ultimately, the winds which have the most significant impact on nearshore coastal processes are those with extreme speed and these can occur in both summer and winter (WAPC, 2008).

2.4.2 Tides

Tides are caused by the gravitational pull of the sun and moon on the earth. When the sun and moon are aligned, the tidal bulge is large and this is known as a spring tide. When the sun and moon are perpendicular, the tidal bulge is small and this is known as a neap tide.

The tidal environment in Rockingham is known as microtidal, with a range of less than 2 m between high and low tides. Tides in the region are predominantly diurnal in form, with one high and low tide each day, although semidiurnal components do occur during certain lunar phases resulting in two high and two low tides per day.

There are a range of other tidal cycles which also influence sea level due to the orbit of the moon, including the 18.6 year nodal cycle and 8.8 year cycle of lunar perigee.

2.4.3 Waves

In the south west of Western Australia, swell is primarily generated by large storm systems over the Indian Ocean or Southern Ocean. The direction of swell varies seasonally, from south/southwest in summer to west/south-west in winter. Within the City, the coastal areas south of Becher Point are exposed to the most wave energy.

North of Becher Point, the swell refracts around the series of islands, offshore ridges and depressions which extend north to Garden Island. This refraction results in varying energy zones and levels of sediment deposition.

2.4.4 Currents

The marine ecology in Western Australia is predominantly driven by the Leeuwin Current, which travels south along the continental shelf transporting warm water from the north. Closer to shore, localised currents caused by winds and tides are responsible for the longshore transport of sediment and are therefore a key consideration for coastal planning.

These currents can result in a range of erosion or accretion impacts along the shore. The level of these impacts is dependent on a number of factors, including high and low energy zones in the water column and interaction with other coastal processes.

2.4.5 Sea level

While tides cause small, predictable changes in sea level, storm surge can also result in short term sea level rises associated with strong winds and barometric pressure changes. In particular, strong winds generate high steep waves which erode higher sections of beach which are not typically vulnerable. The level of beach impact can be substantial, particularly if storm events occur during high tide. Overall, the impact on beach profile is dependent on the magnitude, intensity and duration of the associated storm system.

As previously mentioned, the beaches of the Warnbro and Cockburn Sounds are largely protected from offshore wave energy by a chain of islands and offshore reef and therefore an increase in sea level could enable the transfer of more wave energy over the reef and into the nearshore environment.

This wave energy can have a significant impact on the coast particularly when combined with strong winds as result of storm surge or sea breeze, further illustrating the potential consequence of interaction between coastal processes.

When looking at sea level, it is important to consider other tidal cycles. For example, the next high point in the nodal cycle (18.6 years) will occur in 2025. If storm events occur around that time, it is possible that they may result in more damage as the sea levels will be higher. Conversely, a severe storm may cause less damage if it were to occur at the low point of that cycle as sea levels will be lower.



3 Why does the City need a CHRMAP?

Globally, mean sea level has risen since the 19th century and is predicted to continue to rise, at an increasing rate, through the 21st century bringing changes to the Western Australian (WA) coastline over the coming decades.

Changes to mean sea level over the past century have been observed for the coastline adjacent to the Perth Metropolitan Area. Under State Planning Policy 2.6, the City is required to consider a projected sea level rise of 0.9m over the next 100 years.

For low lying sandy coastlines such as the City's, increases in local mean sea level generally result in shoreline recession, with the rule of thumb being that a 1 cm rise in sea level will result in the shoreline moving 1 m further inland (Figure 1). As such, the projected 0.9m rise in sea level could have significant impacts on the City's coastal zone in the future.

Long term projected increases in mean sea level have the potential to exacerbate existing coastal processes, particularly when coupled with a predicted increase in storm frequency and severity. As such, all levels of government are putting measures in place to ensure that communities understand the risks to values and assets on the coast, with a plan to adapt over time.

While the scientific community has established that human-induced climate change is occurring, uncertainty remains about the magnitude and extent of the impacts from these changes. Despite the uncertainty, early consideration of coastal hazards and the adaptation and management of appropriate planning responses is important to ensure economic, environmental and social objectives are achieved.

National and international coastal planning practices are increasingly adopting a risk management approach to deal with the potential adverse impacts of coastal hazards. This ensures that coastal hazards are appropriately factored into decision-making processes for sustainable land use and development in the coastal zone.

Given our coastline is already subject to the impacts of coastal hazards (Figure 2), it is critical that the City has a plan in place irrespective of whether the projected sea level rise of 0.9m is realised.

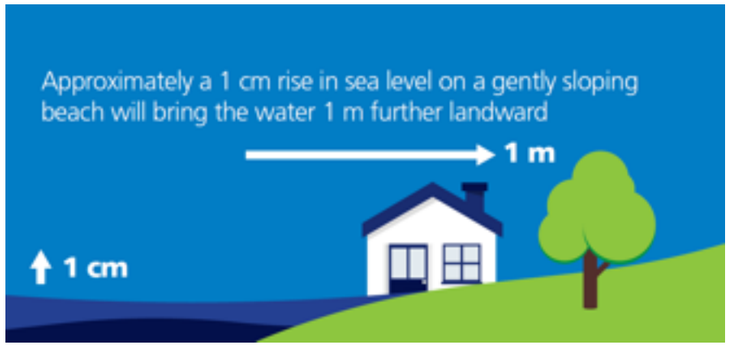


Figure 1 Generalised impact of sea level rise on low lying sandy coastlines (CoastAdapt, 2017)

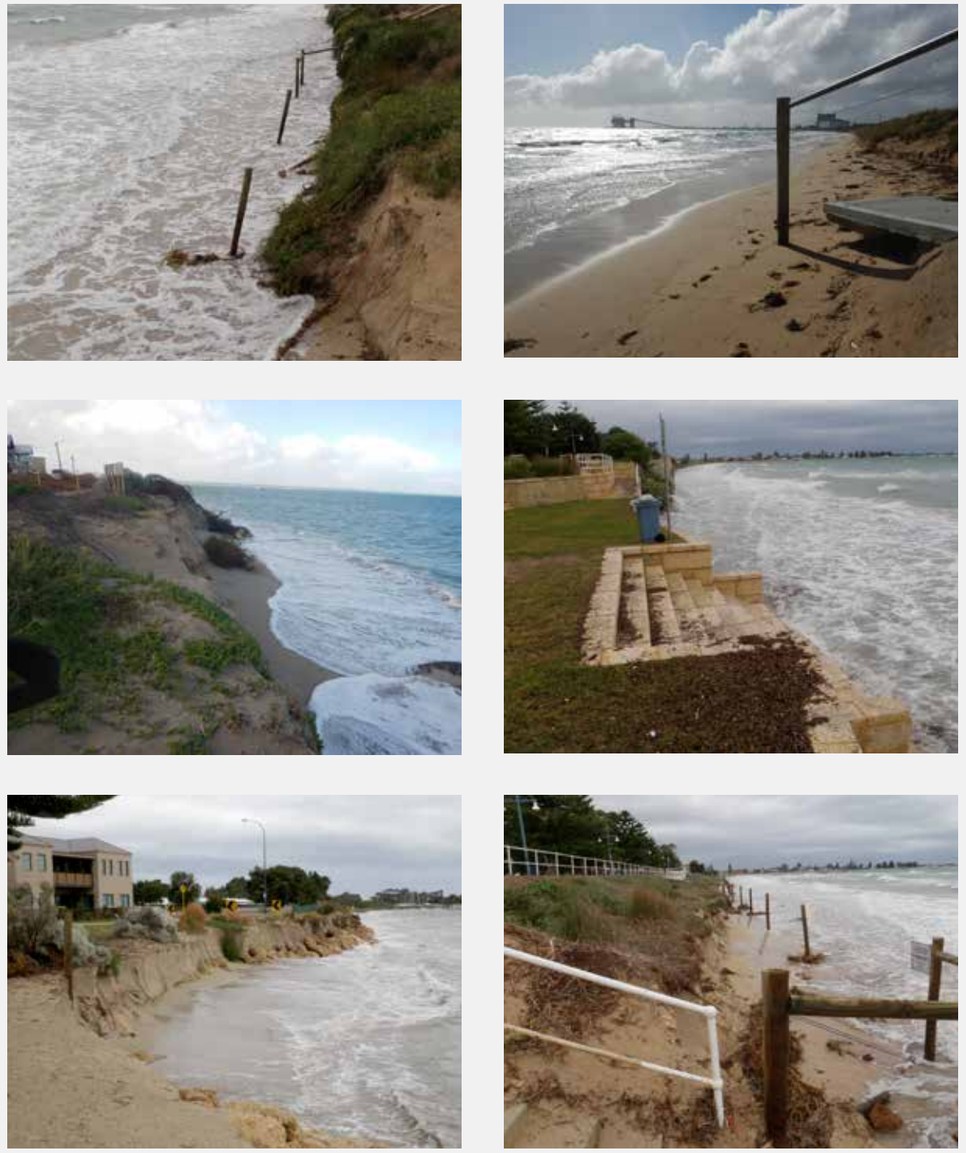


Figure 2 Impacts of coastal hazards already experienced in the City

3.1 Community and stakeholder engagement

Community input is the cornerstone of an effective CHRMAP process, in order to understand how the community uses and values the coast, and how it should be managed in the future.

Historical uses of the City's coastline



Rockingham Jetty



Late 1800's



Late 1800's



Palm Beach Jetty





Community consultation has underpinned the development of this CHRMAP, being undertaken at key milestones as shown below.

CHRMAP Part 1
Hazard assessment

↓

Community Coastal Values Survey

↓

CHRMAP Part 2
Risk assessment and potential adaptation options

↓

Public Information Sessions and Adaption Workshops

↓

CHRMAP Part 3
Draft Adaption Plan

↓

Draft Adaptation Plan released for public comment

↓

CHRMAP Part 4
Final Adaptation Plan

3.1.1 Community Coastal Values Survey

Community consultation for the City's CHRMAP began in August 2017, with a Community Coastal Values Survey to better understand how our community uses and values the coast.

A link to the survey was available for the public to access via the City's Facebook page and website. The survey was also mailed out to a random selection of 5,000 homes, with a reasonably even distribution across suburbs.

Both methods of surveying were utilised for the consultation to gauge an accurate cross section of the City's demographic, not only those who were online. A total of 1,040 responses were received.

Furthermore, 743 community members requested their names be placed on a stakeholder register to be notified of future events relating to the CHRMAP project.

The results were centred on aspects such as demographics, proximity to the coast, favoured coastal attributes, the average amount of time per visit, the benefits of beach visits, modes of transport, boat ramps, priority aspects to protect and recommendations for improvement.

Together these elements highlight the varying character of beaches along the City's coastline and provide direction in planning for the future use and management of these areas, with the key findings being:

- 66% of respondents with homes within 1 km of the beach noted that living close to the beach was extremely important to them
- Rockingham Beach was the most frequently visited beach among respondents, with many residents travelling over 10 km to visit this beach.
- Residents tend to prefer beaches that are close to home, have an attractive natural setting and are easy to access. Other important deciding factors include environmental qualities (such as clear water and vegetated dunes), facilities (such as BBQs, toilets, seating and playgrounds), being able to access sandy beach, parks and grassed areas, being close to cafes and restaurants, and being able to enjoy shaded areas.
- The natural setting and environmental qualities (clear water/vegetated dunes) were the most significant drawcard for those choosing to visit Shoalwater Bay, whereas the facilities, grassed areas and proximity to cafes and restaurants was the biggest drawcard for those visiting Rockingham Beach.
- Most respondents visit their preferred beach at least once a week.
- Overall, walking, running or exercise was the most popular activity at the beach.
- In terms of the benefits to lifestyle, health and wellbeing, visiting the beach is perceived as most important for mental and emotional health as well as physical fitness.
- Approximately half of respondents feel that erosion is the same as it has always been. This perception is most common among those who frequently visit Mangles Bay, Waikiki and East Rockingham Horse Beach. Around 37% of respondents feel that erosion of beaches is getting worse. Erosion is a greater concern for Golden Bay and Shoalwater Bay beach users. 12% of respondents feel that erosion is not as bad as it used to be.
- Residents feel it is most important to protect the environmental qualities of local beaches, such as preserving water quality and dune vegetation. This perception is strongest among those who most frequently visit Golden Bay, Port Kennedy and Singleton beaches.
- The second highest priority is protecting sandy areas of the beach. This is more important for users of Golden Bay, Warnbro, Waikiki and East Rockingham Horse Beach.

3.1.2 Coastal Adaptation Workshop and Information Evening

In August 2018, following completion of the coastal hazard modelling and risk assessment, the City commenced the second phase of community consultation with an Information Evening and Coastal Adaptation Workshop.

Emails and letters were sent to all 743 community members on the project stakeholder register with an invitation to attend the walk-in Information Evening and/or the two hour Coastal Adaptation Workshop. These events were also advertised with notices in the local newspaper and in libraries, as well as online through RockPort (the City's online portal), the City's website and social media.

Thirteen people attended the Information Evening and 30 people attended the Coastal Adaptation Workshop.

The workshop centred around a presentation on potential coastal hazards, adaptation options and costs. In the context of this information, 30 residents participated in a number of activities and engaged in valuable discussion. Key questions for discussion at the workshop included:

- Generally speaking, would you favour 'protect' or 'managed retreat', and why?
- If you could only keep three stretches of sandy beach (each 600 m long) which would they be?
- If you could only install three seawalls (each 600 m long) which areas of the coastline would you choose and why?
- Who do you think should pay to manage coastal hazards in the future?
- Do you think residents on the coast should pay more than those who live inland? Or should all residents pay equally?
- Hypothetically, how much would you be willing to pay to manage coastal hazards on top of your rates? i.e. $20, $50, $100
- Do you think it is reasonable to start putting money in a cash reserve now? Why?

The various responses and feedback provided in response to these question are detailed in Appendix D. A report summarising discussions from the Coastal Adaptation Workshop was circulated to attendees after the event to ensure all views had been appropriately captured. In view of this, feedback received on the workshop and the Summary Report was generally positive.

The responses received, together with ephemeral feedback obtained from the workshop, greatly assisted in development of this CHRMAP and the identification of priority areas for long term protection and/or managed retreat.

3.1.3 External stakeholders

The City engaged with the following government and external stakeholders in preparation of this CHRMAP and will continue to liaise with the relevant agencies as required, to ensure coastal hazard management and planning is coordinated within the municipality and across the region.

- Department of Biodiversity, Conservation and Attractions
- Department of Defence
- Department of Transport
- Department of Planning, Lands and Heritage
- Water Corporation
- Peron Naturaliste Partnership
- Various local governments on the Swan Coastal Plain



4 What are coastal hazards and how are they estimated?

4.1 Coastal hazard modelling

Coastal hazards are modelled as per the parameters outlined in SPP 2.6, which stipulates allowances for storm events, historic shoreline movements and future sea level rise. Hazards were assessed relative to projected sea level rise for the planning timeframes of 2017, 2030, 2070 and 2110.

Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.

A **100 year** ARI storm event has a 1% chance of occurring in any given year.

A **50 year** ARI storm event has a 2% chance of occurring in any given year.

All CHRMAP maps were prepared by certified engineers. This section provides a summary of the methods used, however, the detailed technical methodology can be viewed in the CHRMAP Technical Assessment Report (Cardno 2018).

4.1.1 Erosion

Erosion is when sediment is transported away by waves, wind and currents, reducing the size of sandy beach.



Figure 3 Example of erosion at Hymus Street, Rockingham

Coastal erosion hazards have been estimated using an allowance for the current risk of storm erosion based on a 100-year average recurrence interval storm event (S1 erosion), an allowance for future erosion based on historic shoreline movement trends (S2 erosion), an allowance for erosion associated with future sea level rise (S3 erosion) and an additional factor of uncertainty. These components were combined to derive coastal erosion hazard extents at each of the planning timeframes.

Existing coastal protection structures were not factored into the modelling for coastal erosion for the various planning timeframes. Rather, the presence, condition and design life of existing coastal protection structures was considered as part of the risk assessment.

4.1.2 Inundation

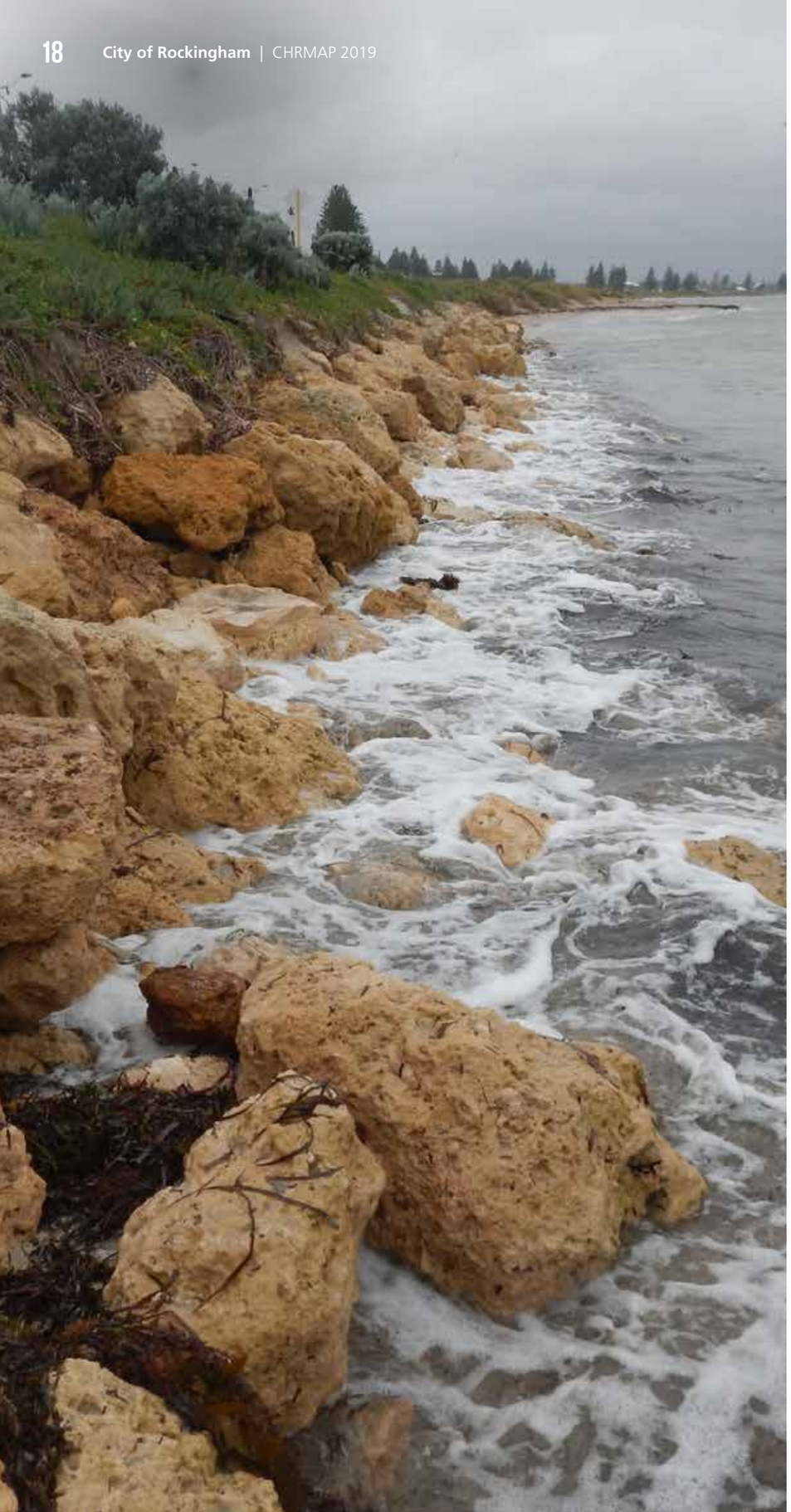
Inundation is the temporary flooding of a portion of land with ocean water, particularly during storm events or high tides.

SPP 2.6 requires coastal inundation hazards to be estimated for a 500-year ARI water level for each of the planning timeframes. This assessment involved the estimation of coastal inundation water levels based on a combination of estimated ARI water levels from tide gauge measurements, an estimate of wave setup along the City's coastline and an allowance for predicted sea level rise over the 100-year planning timeframe.

Further to this, inundation was also estimated for a 1, 10, 50 and 100 year ARI, to provide an indication of potential inundation risks for more storm events with a greater likelihood of occurring, together with the depth and duration of inundation. Although not required under SPP 2.6, this was done to better understand potential impacts and inform risk based decision making. For example, the community may tolerate the risk associated with a 500 year ARI event, but do not tolerate the risk associated with more frequent 1 year or 10 year ARI events.



Figure 4 Example of inundation in Florida, USA



4.1.3 Groundwater rise

It is generally accepted that sea level rise will cause groundwater levels adjacent to the coast to also increase. This can have a number of impacts including:

- Seawater intrusion (migration inland of the freshwater/saline water interface);
- Increased salinity in groundwater dependent ecosystems (such as Lake Richmond);
- Impacts on drainage infrastructure; and
- Contamination of production bores.

A macro-scale estimate of the potential rise in groundwater due to sea level rise to 2110 was completed and mapped. This was undertaken using the Department of Water and Environmental Regulation's maximum groundwater level contours. The projected sea level rise of 0.9m was then added to the groundwater levels to provide an estimate of groundwater elevations in 2110.

4.1.4 Stormwater drainage assessment

An assessment of the City's stormwater drainage infrastructure, which may be impacted by coastal erosion and inundation, was completed based on the estimated inundation and erosion hazard areas. This included physical surveying of pits and pipes estimated to be affected by 2070, based on a typical 50 year asset replacement lifespan of drainage infrastructure.

4.2 How are the risks assessed?

To provide a transparent and logical basis for determining adaptation planning priorities, a risk assessment was undertaken based on the Australian Standard Guideline Climate change adaptation for settlements and infrastructure – A risk based approach (AS5334-2013), and the CHRMAP guidelines (WAPC, 2019).

Risk was assessed in relation to the:

- Likelihood of a hazard occurring
- Consequence if it were to occur
- Capacity for the assets to adapt and cope with the impacts of coastal hazards

Likelihood was assigned using the results of the coastal hazard assessment. Consequence ratings were informed by estimated economic values and additional values determined through community consultation.

Risk is considered to be the combination of likelihood and consequence, with consideration of adaptive capacity determining an asset's overall vulnerability in the face of coastal hazards.

Vulnerability has a specific meaning in the context of risk-based approaches to climate change adaptations, in accordance with the Australian Standard (AS 5334-2013) and SPP2.6, which defines vulnerability as:

"the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. Systems that are highly exposed, sensitive and less able to adapt are vulnerable"

Values in the context of the CHRMAP further encompass the economic, social (including heritage) and environmental values of the coastal area.

A detailed explanation of the methods and criteria used in the risk assessment can be viewed in the CHRMAP Technical Assessment Report.

4.2.1 Existing coastal protection structures

The risk assessment assumes that existing coastal protection structures (i.e. buried sea walls), will not perform a function beyond their design life. These structures typically have a 50 year design life and there is no guarantee that they will be repaired or reinstated in the future. Further, SPP2.6 has a preference against the construction of new coastal protection structures and retrofit of existing structures. For the purpose of estimating worst case scenario coastal hazards, it is assumed that no other adaptation intervention will occur.

4.3 What could be impacted?

COLLECTIVELY, THE TOTAL VALUE OF ASSETS POTENTIALLY IMPACTED BY COASTAL HAZARDS, BOTH EROSION AND INUNDATION, TO 2110 IS OVER $1.9 BILLION AND INCLUDES:

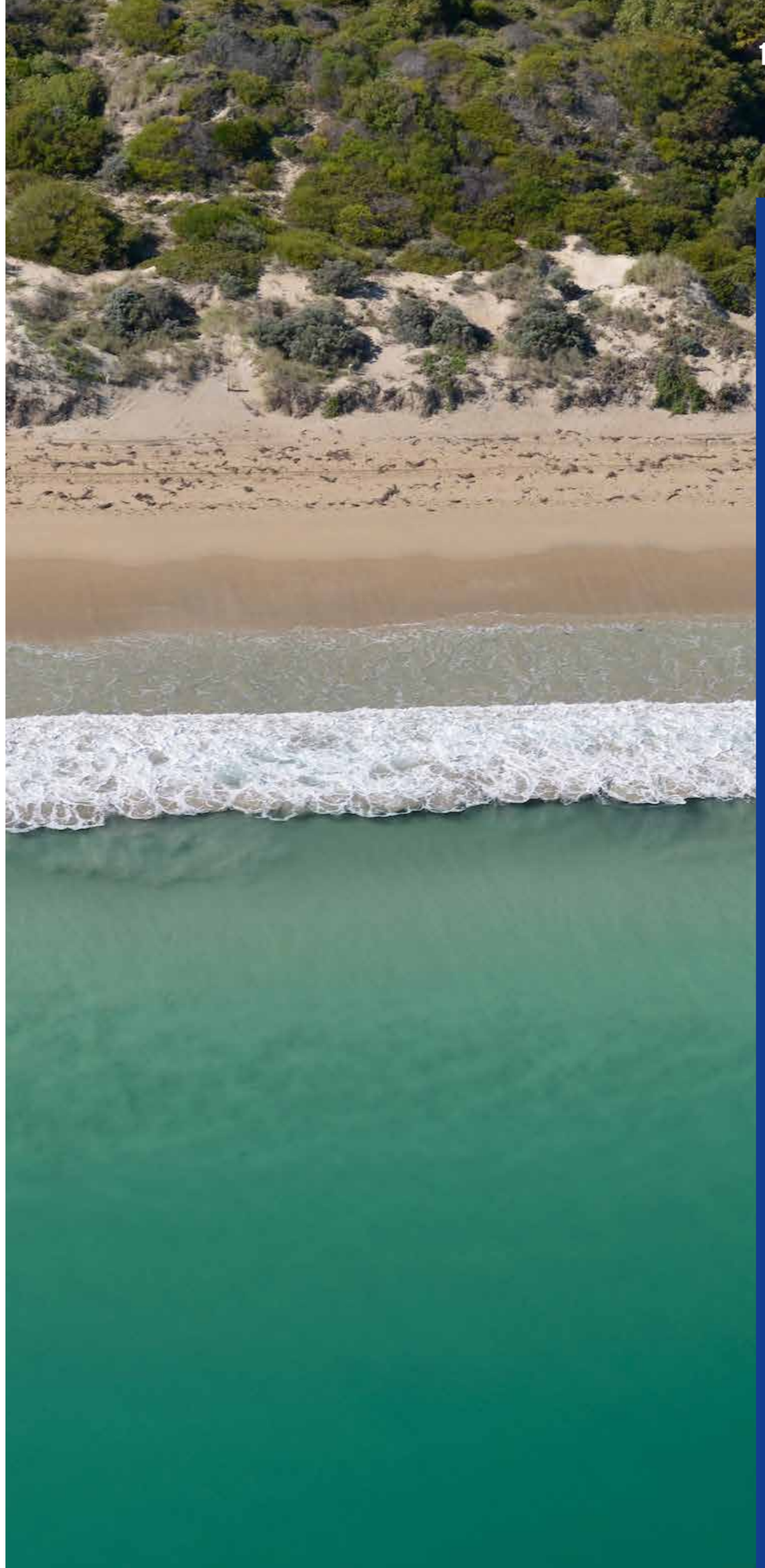
- residential properties: 847 potentially at risk from erosion, 4,591 potentially at risk from inundation
- coastal dune vegetation
- usable sandy beaches
- parks
- carparks
- dual use paths
- roads
- stormwater pits
- stormwater pipes
- underground storage
- drainage channels
- lakes (including Lake Richmond)
- groundwater bores
- commercial areas
- boat launching facilities
- jetty abutments

The impacts from coastal erosion are typically much more damaging than the impacts of inundation. For example, if a carpark is temporarily inundated with salt water during a storm event, the water will subside and may not result in structural damage. If a carpark is eroded during a storm event it is likely to require significant repair or complete replacement. As such, the potential impacts of erosion and inundation have been considered separately.

In terms of risk, coastal erosion hazards generally lead to the highest vulnerability in the short-term, due to their greater capacity to damage assets. The risk of coastal inundation, however, increases substantially over future planning timeframes and extends across large areas of low-lying land along the City's coastline.

In viewing the erosion and inundation hazard maps, it is important to note that these are based on a suite of assumptions and have varying degrees of uncertainty, which may influence the likelihood of the predicted extent of erosion or inundation occurring at each planning horizon.

SPP 2.6 requires revision of the CHRMAP every 10 years (or sooner if required), including an update of hazard estimates using the most up to date information, the findings of specialist investigations undertaken, changes to projected sea level rise, climate change effects and any changes to the use of the foreshore.





5 Which areas of the City could be impacted by erosion?

Erosion is when sediment is transported away by waves, wind and currents, reducing the size of sandy beach.

- The total value of assets potentially impacted by erosion to 2110 is estimated to be around $530 million.
- While there are coastal erosion risks along the length of the City's coastline, the following areas have significant hazards:
  - almost the entire shorelines of Sectors 1, 2, 3 and 4 (East Rockingham around to Port Kennedy); and
  - the existing residential area adjacent to the Port Kennedy Boat Ramp (Sector 4).

A detailed list of assets vulnerable within each sector is presented alongside each Sector Hazard Map.

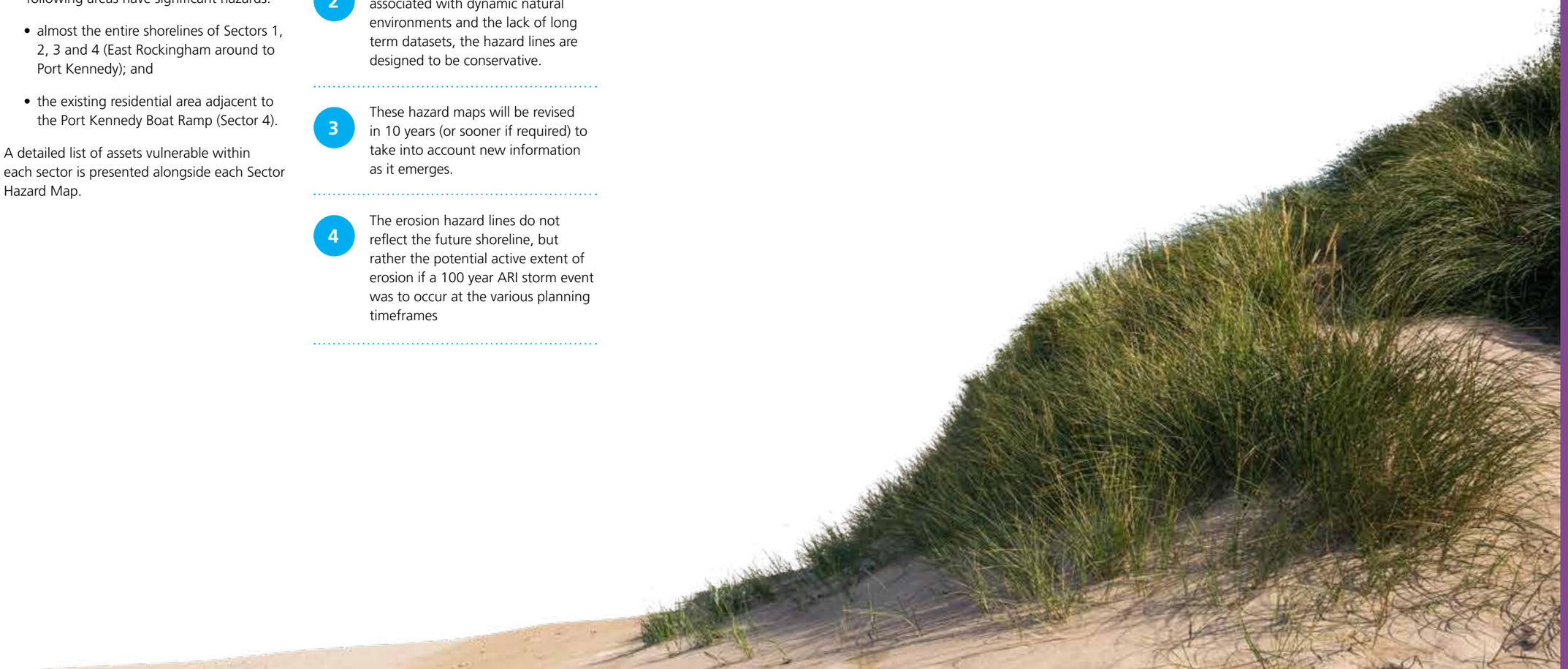
In viewing these maps, keep in mind that:

1. The erosion hazard lines are based on a suite of assumptions and have varying degrees of uncertainty, which may influence the likelihood of these impacts being realised at each planning horizon.

2. To account for the uncertainty associated with dynamic natural environments and the lack of long term datasets, the hazard lines are designed to be conservative.

3. These hazard maps will be revised in 10 years (or sooner if required) to take into account new information as it emerges.

4. The erosion hazard lines do not reflect the future shoreline, but rather the potential active extent of erosion if a 100 year ARI storm event was to occur at the various planning timeframes



5.1 Sector 1 Municipal Boundary (North) to Wanliss Street

Existing coastal structures	Year
Two offshore breakwaters	2007

Vulnerability of assets to erosion

Sector 1		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	CBH Kwinana Grain Terminal	●	●	●	●
3	Coastal dune/vegetation	●	●	●	●
4	Dual use paths	●	●	●	●
5	Emerald Park Carpark	●	●	●	●
6	Governor Reserve Carpark	●	●	●	●
7	Naval Memorial Park	●	●	●	●
8	Naval Memorial Park Carpark	●	●	●	●
9	Phoebe Hymus Carpark	●	●	●	●
10	Pipes	●	●	●	●
11	Pits	●	●	●	●
12	Residential properties (102)	●	●	●	●
13	Road (Rockingham Beach Rd)	●	●	●	●
14	Rockingham Foreshore Park	●	●	●	●
15	Rockingham Rd Conservation Reserve Carpark	●	●	●	●

● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $37 MILLION.



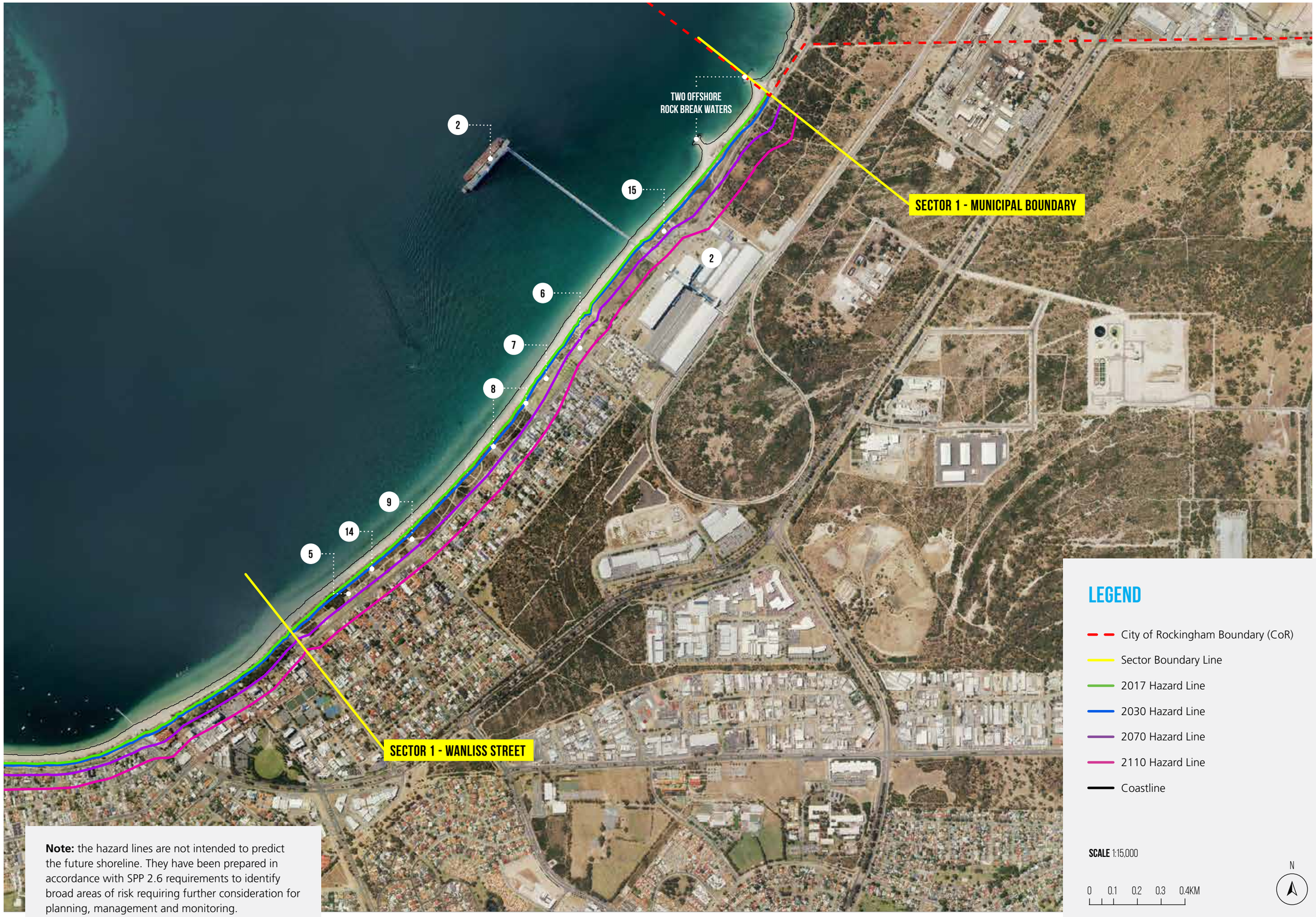












Note: the hazard lines are not intended to predict the future shoreline. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- City of Rockingham Boundary (CoR)
- Sector Boundary Line
- 2017 Hazard Line
- 2030 Hazard Line
- 2070 Hazard Line
- 2110 Hazard Line
- Coastline

SCALE 1:15,000

0 0.1 0.2 0.3 0.4KM

N

5.2 Sector 2A Wanliss Street to Garden Island Causeway; and Sector 2B Garden Island Causeway to Boundary Road

Timeline of coastal protection structures:

1944 Original Palm Beach Jetty

Late 1950s Original Val Street Jetty

1971 Garden Island Causeway

1973 200 m groyne to west of Garden Island Causeway

1986 65 m long 90° groyne extension to west of Garden Island Causeway

1987 Informal rock seawall west of camp school

1990 Spur added to groyne west of Garden Island Causeway for sand trap

2002 Palm Beach West Boat Ramp

2002 Hymus St Timber Groyne

2004 Rockingham Foreshore - GSC Seawall

2007 Val St Jetty extended 40 m

2009 Palm Beach Jetty

2010 Palm Beach East Boat Ramp

2013 GSC Groyne at Point Peron Camp School

2014 Val St Jetty 0-80 m reconstructed

2014 Palm Beach Boat Ramp rock armour modified

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $234 MILLION.





Vulnerability of assets to erosion

Sector 2		2017	2030	2070	2110
Vulnerability					
1	Alfred Hines Seaside Home	Low	Low	High	Very High
2	Beach	High	Very High	Very High	Very High
3	Bell Park	Low	Medium	Very High	Very High
4	Bell Park Carpark	High	Very High	Very High	Very High
5	Boat Ramps (Catalpa Park)	Low	Low	High	Very High
6	Bores	Low	Low	Low	Medium
7	Catalpa Park	Low	Very High	Very High	Very High
8	Catalpa Park Carpark	Low	Low	High	High
9	Churchill Park	Low	Low	Medium	Very High
10	Coastal/dune vegetation	Low	Medium	Very High	Very High
11	Commercial area (Railway Tce)	Low	Low	Low	Medium
12	Commercial area (Rockingham Beach Rd)	Low	Medium	Very High	Very High
13	Department of Defence Land	Low	Medium	Very High	Very High
14	DoBCA Managed Land	Medium	High	Very High	Very High
15	Dual use paths	Low	High	Very High	Very High
16	Flinders Lane Carpark	Low	Low	Low	Medium
17	Jetty abutments (Val St and Fisher St)	Medium	High	Very High	Very High
18	L&S Recreation Centre	Low	Low	Low	Medium
19	Mangles Bay Fishing Club	Low	Medium	Very High	Very High
20	Maritime Union of Australia Holiday Camp	Low	Medium	Very High	Very High
21	Pipes	Low	Low	Low	Medium
22	Pits	High	Very High	Very High	Very High
23	Point Peron Boating Facility	Low	Medium	High	Very High
24	Point Peron Boating Facility Carpark	Low	Low	Low	High
25	Point Peron Camp School	Low	Medium	Very High	Very High
26	Point Peron Dive Site Carpark	Medium	High	Very High	Very High
27	Point Peron Foreshore Carpark (Central)	Low	Medium	Very High	Very High
28	Point Peron Foreshore Carpark (NE)	Low	Medium	High	Very High
29	Point Peron Foreshore Carpark (SW)	Low	Low	Low	Medium
30	Point Peron Wastewater Treatment Plant	Low	Low	Low	High
31	Railway Terrace Carpark	Low	Low	Low	Very High
32	Residential properties (157)	Low	Low	High	Very High
33	Roads	Low	High	Very High	Very High
34	Rockingham Beach Road Parking	Medium	Medium	High	Very High
35	Rockingham Naval Club	Low	Medium	Very High	Very High
36	Rockingham Recreation Centre (Memorial Dr)	Low	Low	Medium	High
37	Rotary Park	Low	Low	Low	Very High
38	Samuel Street Carpark	Low	Low	Medium	Very High
39	The Cruising Yacht Club	Low	Low	High	Very High
40	The Cruising Yacht Club Carpark	Low	Low	High	High
41	Underground Storage	Medium	High	Very High	Very High

Low Medium High Very High



Note: the hazard lines are not intended to predict the future shoreline. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

5.3 Sector 3 Boundary Road to Shelton Street

2003 South Mersey Point Rock Seawall (200 m long)

2004 Bent Street Boat Ramp

2010 Waikiki Rock Seawall

2015 Bent Street Boat Ramp rock armour modified

Vulnerability of assets to erosion

Sector 3		2017	2030	2070	2110
Vulnerability					
1	Beach	Low	Medium	Very High	Very High
2	Coastal/dune vegetation	Low	Low	High	High
3	Residential properties (520)	Low	Low	Low	Medium
4	Roads	Medium	Medium	Very High	Very High
5	Shoalwater Foreshore Park	Low	Medium	Very High	Very High
6	Lions Park	Low	Low	High	Very High
7	Mersey Point / Rockingham Wild Encounters	Medium	High	Very High	Very High
8	Safety Bay Foreshore Park	Low	Medium	Very High	Very High
9	Noel France Reserve (park)	Medium	High	High	Very High
10	BP Petrol Station	Low	Low	High	High
11	Safety Bay Yacht Club	Low	Low	Medium	High
12	Commercial area (Bent St)	Low	Low	Very High	Very High
13	Waikiki Foreshore Park	Low	Low	High	High
14	Shoalwater Foreshore Carpark	Low	Low	Low	Low
15	Lions Park Carpark	Low	High	Very High	Very High
16	Mersey Point Carpark	Medium	High	Very High	Very High
17	Safety Bay Foreshore Carparks (7 total)	Low	Low	Very High	Very High
18	Waikiki Foreshore Carparks (5 total)	Medium	Medium	High	Very High
19	Dual use paths	Low	Medium	Very High	Very High
20	Pipes	Medium	Medium	Very High	Very High
21	Pits	Low	Medium	Very High	Very High
22	Bores	Low	Low	Medium	Medium

Low Medium High Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $193 MILLION.



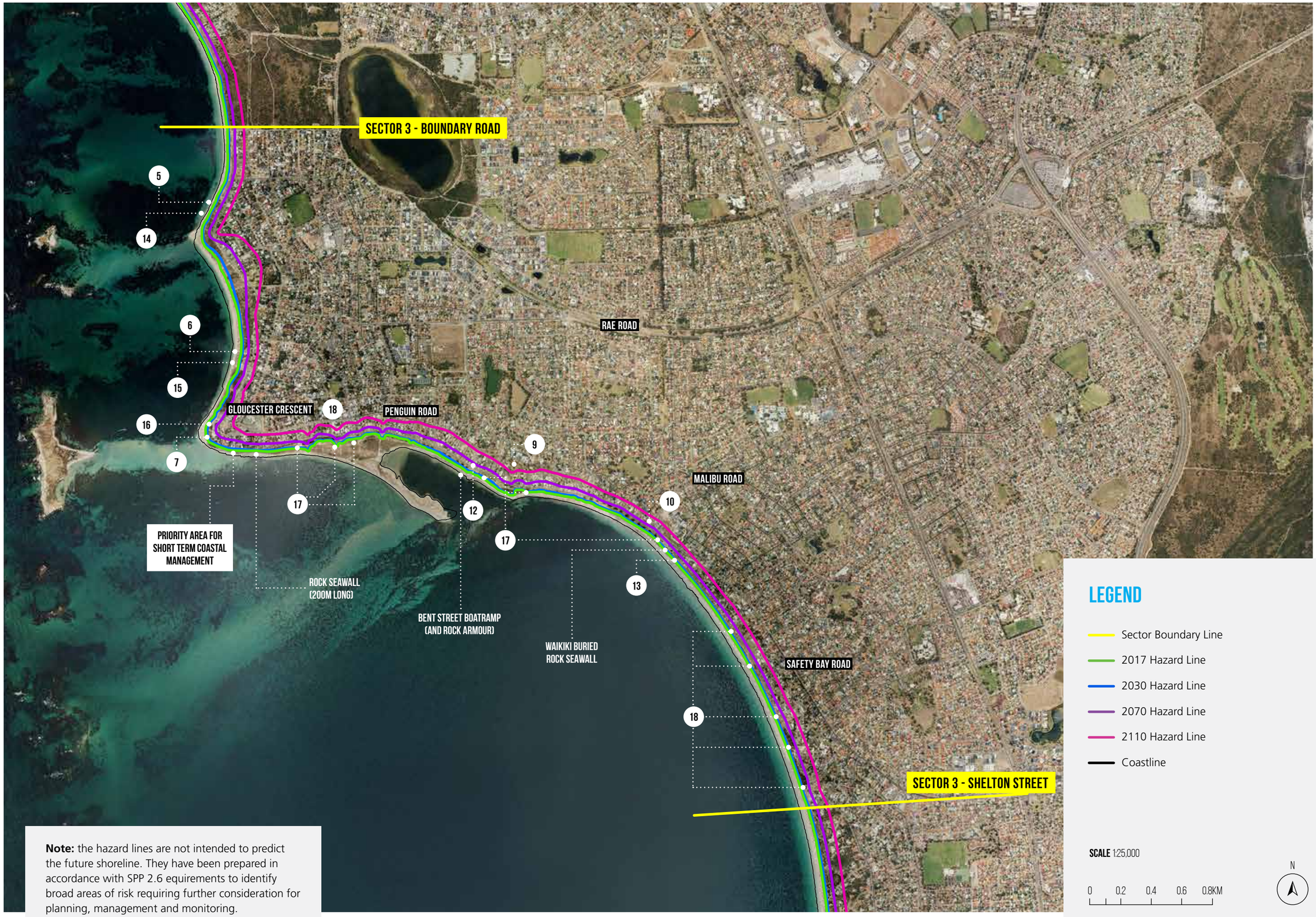












LEGEND

- Sector Boundary Line
- 2017 Hazard Line
- 2030 Hazard Line
- 2070 Hazard Line
- 2110 Hazard Line
- Coastline

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

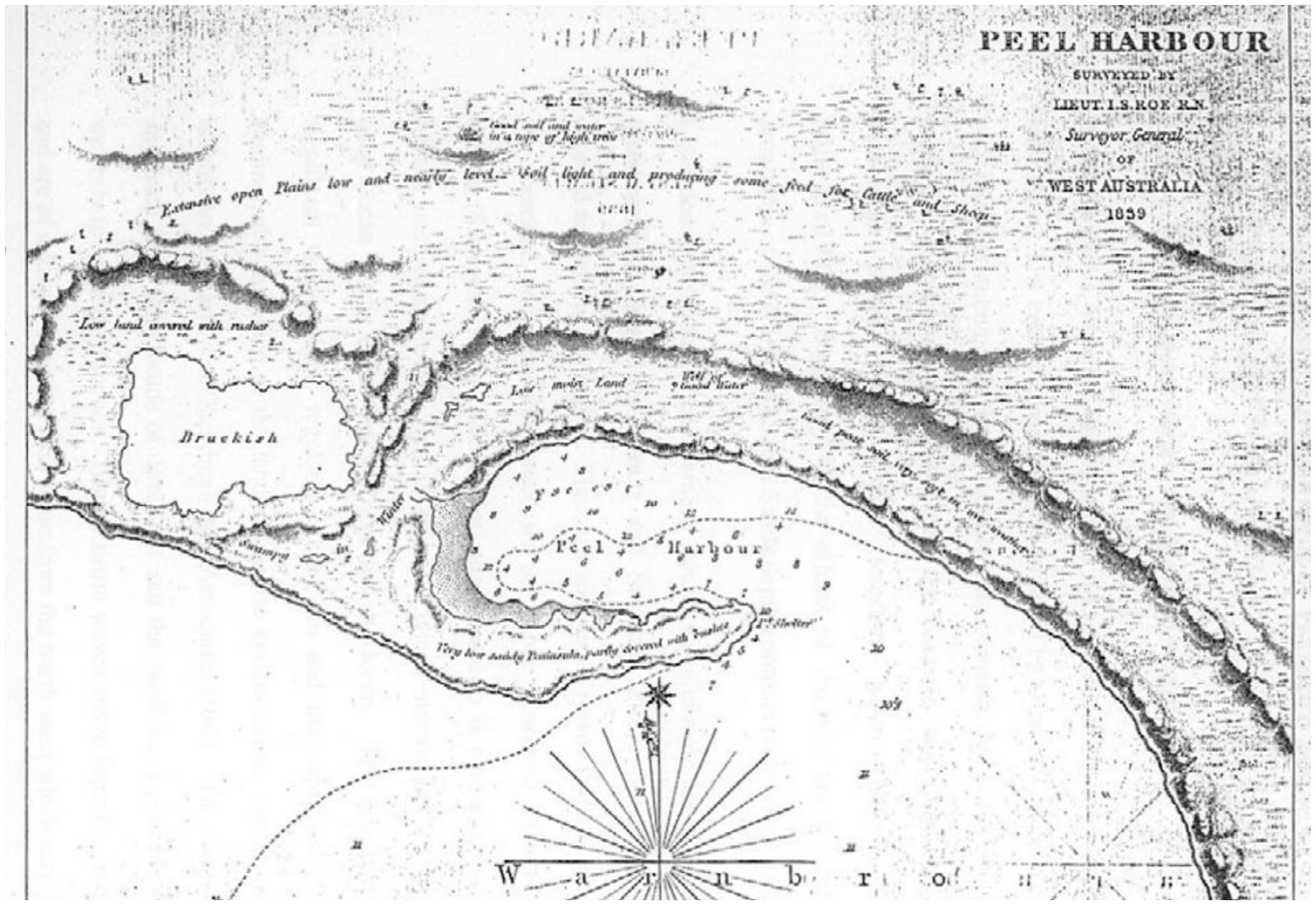
Note: the hazard lines are not intended to predict the future shoreline. They have been prepared in accordance with SPP 2.6 equirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

Tern Island History

Tern Island is a prominent feature of the City's coastal landscape. Historical surveys of the Warnbro Sound highlight the dynamic nature of sediment transport in the region.

When John Septimus Roe surveyed the area in 1839, he highlighted the Tern Island spit similar to its configuration today and labelled it Peel Harbour.

Currently, it is estimated that Tern Island is accreting by up to 10,000m³ per year, however, given the dynamic nature of this feature, the coastal hazard modelling takes a conservative approach and assumes that the bank will not offer any future protection to landward assets.



Survey of Peel Harbour by John Septimus Roe in 1839. (Image source: Hollings 2004).



Tern Island 1953



Tern Island 2015



Safety Bay Yacht Club 1950



Safety Bay Yacht Club 1950

5.4 Sector 4A Shelton Street to Bayeux Avenue
Sector 4B Bayeux Avenue to Becher Point

Existing coastal structures	Year
Port Kennedy Boat Ramp	2010

Vulnerability of assets to erosion

Sector 4					
		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Coastal/dune vegetation	●	●	●	●
3	Port Kennedy Foreshore Recreation Area (park)	●	●	●	●
4	Port Kennedy Scientific Park	●	●	●	●
5	Residential - north (98 properties, in whole sector)	●	●	●	●
6	Roads	●	●	●	●
7	Residential - Port Kennedy (98 properties, in whole sector)	●	●	●	●
8	St Malo Cove Carpark	●	●	●	●
9	La Seyne Crescent Carpark	●	●	●	●
10	St Ives Cove Carpark	●	●	●	●
11	Capella Pass Carpark	●	●	●	●
12	Cote D'Azur Gardens Carpark	●	●	●	●
13	Bayeux Avenue Carpark	●	●	●	●
14	Port Kennedy Foreshore Carpark	●	●	●	●
15	Port Kennedy boat ramp	●	●	●	●
16	Dual use paths	●	●	●	●
17	Pipes	●	●	●	●
18	Pits	●	●	●	●

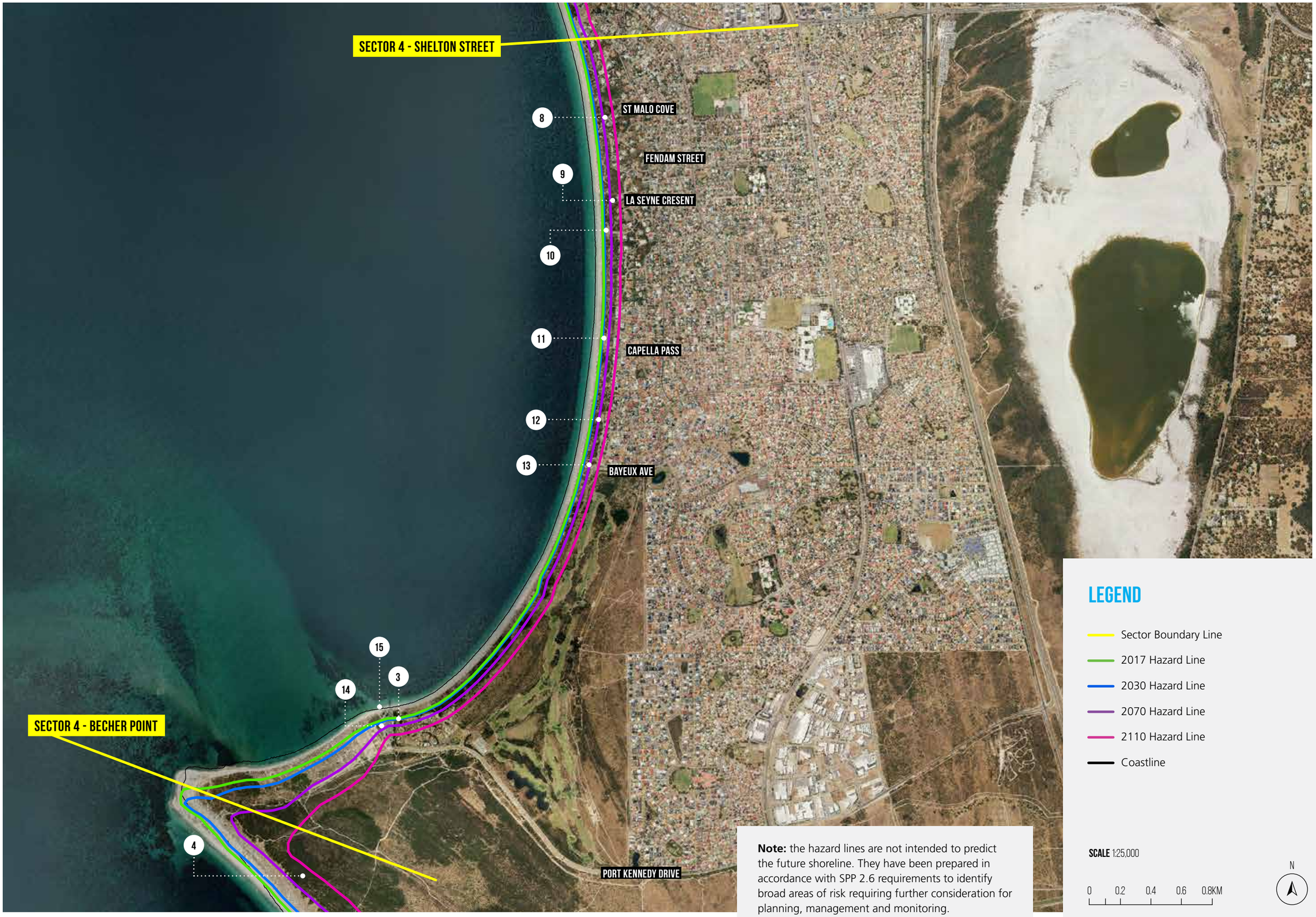
● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $59 MILLION







LEGEND

- Sector Boundary Line
- 2017 Hazard Line
- 2030 Hazard Line
- 2070 Hazard Line
- 2110 Hazard Line
- Coastline

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

Note: the hazard lines are not intended to predict the future shoreline. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

5.5 Sectors 5 Secret Harbour Foreshore Park to Turtles Bend

Vulnerability of assets to erosion

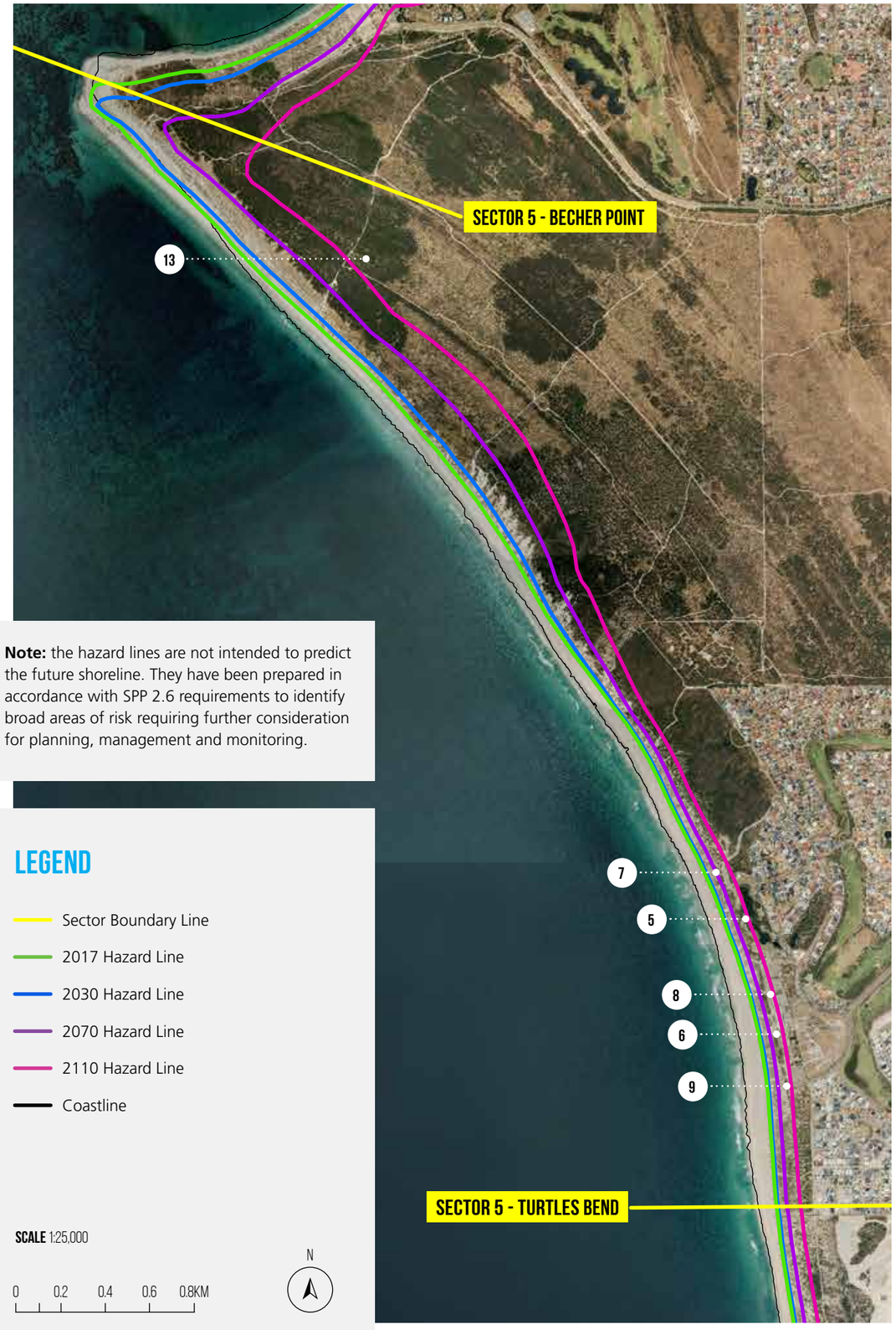
Sector 5					
		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Coastal/dune vegetation	●	●	●	●
3	Port Kennedy Scientific Park	●	●	●	●
4	Road (Siracusa Ct)	●	●	●	●
5	Lagoon Park	●	●	●	●
6	Secret Harbour Surf Lifesaving Club	●	●	●	●
7	Secret Harbour Beach Carpark (Siracusa St)	●	●	●	●
8	Secret Harbour Beach Carpark (Albenga Pl)	●	●	●	●
9	Secret Harbour Beach Carpark (Palisades Bvd)	●	●	●	●
10	Pedestrian pathway	●	●	●	●
11	Pipes	●	●	●	●
12	Pits	●	●	●	●

● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $6 MILLION







Note: the hazard lines are not intended to predict the future shoreline. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- 2017 Hazard Line
- 2030 Hazard Line
- 2070 Hazard Line
- 2110 Hazard Line
- Coastline

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

5.5 Sector 6 Turtles Bend to Municipal Boundary (South)

Vulnerability of assets to erosion

Sector 5		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Coastal/dune vegetation	●	●	●	●
3	Singleton Foreshore Park	●	●	●	●
4	Pipes	●	●	●	●
5	Pits	●	●	●	●

● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $52,000











Note: the hazard lines are not intended to predict the future shoreline. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- City of Rockingham Boundary (CoR)
- Sector Boundary Line
- 2017 Hazard Line
- 2030 Hazard Line
- 2070 Hazard Line
- 2110 Hazard Line
- Coastline

SCALE 1:20,000

0 0.15 0.3 0.45 0.6KM

N



6

Which areas of the City could be impacted by inundation?

Inundation is the temporary flooding of a portion of land with ocean water, particularly during storm events or high tides.

- The total value of assets potentially impacted by inundation to 2110 is estimated to be around $1.3 billion. However, it is uncertain how damaging this inundation would be to these assets.
- While there are coastal inundation risks along the length of the City's coastline, the following areas have significant hazards:
  - the low-lying southern coastline of Cockburn Sound between approximately Wanliss Street and Cape Peron (Sectors 1 and 2);
  - the low-lying, west and south-facing sections of both Shoalwater and Safety Bay (Sector 3);
  - the low-lying areas of Safety Bay, Shoalwater, Peron and Rockingham between areas 1 and 2 above (Sectors 1, 2 and 3); and
  - the low-lying areas around Becher Point in Port Kennedy (Sectors 4 and 5).

A detailed list of assets vulnerable within each sector is presented alongside each Sector Hazard Map.

The impact of sea level rise and inundation on drainage infrastructure has also be assessed. These figures are presented in Appendix A.

Figures showing the depth and duration of inundation in 2110 have been included in this section. The complete suite of depth and duration maps for all timeframes in all sectors can be viewed in the CHRMAP Technical Assessment Report.

In viewing these maps, keep in mind that:

1. The inundation extents are based on a suite of assumptions and have varying degrees of uncertainty, which may influence the likelihood of these impacts being realised at each planning horizon.
2. To account for the uncertainty associated with dynamic natural environments and the lack of long term datasets, the extents shown are designed to be conservative for the purpose of future planning.
3. These hazard maps will be revised in 10 years (or sooner if required) to take into account new information as it emerges.
4. The depth and duration maps are based on a 500 year ARI as per SPP 2.6, which is a very significant storm event with a statistical chance of recurring once per 500 years or a 0.2% chance of occurring in any given year.
5. The duration of inundation maps are an indicative estimate presented for information only and are not comparable to a flooding and drainage study as they do not include consideration of drainage, rainfall or stormwater flow.

6.1 Sector 1 Municipal Boundary (North) to Wanliss Street

Vulnerability of assets to erosion

Sector 4					
		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Coastal/dune vegetation	●	●	●	●
3	Pipes	●	●	●	●
4	Rockingham Beach Rd	●	●	●	●
5	Rockingham Foreshore Park	●	●	●	●

● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS $84,494

Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.

A **100 year** ARI storm event has a 1% chance of occurring in any given year.

A **50 year** ARI storm event has a 2% chance of occurring in any given year.

A 1 in **10 year** storm event has a 10% chance of occurring in any given year.

A 1 in **1 year** storm event has a 99% chance of occurring in any given year.



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- City of Rockingham Boundary (CoR)
- Sector Boundary Line
- Coastline

INUNDATION EXTENT

- 1yr ARI
- 10yr ARI
- 50yr ARI
- 100yr ARI
- 500yr ARI

SCALE 1:15,000

0 0.1 0.2 0.3 0.4KM

N

INUNDATION 2110 HAZARD MAP



SECTOR 1 DEPTH OF COASTAL INUNDATION 2110 – 500 YEAR ARI



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

DURATION OF INUNDATION (HOURS)

- 0 - 20
- 20 -40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120

SCALE 1:15,000

0 0.1 0.2 0.3 0.4KM

N

SECTOR 1 DURATION OF COASTAL INUNDATION 2110 - 500 YEAR ARI

6.2 Sector 2A Wanliss Street to Garden Island Causeway
Sector 2B Garden Island Causeway to Boundary Road

Vulnerability of assets to inundation

Sector 4					
		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Alfred Hines Seaside Home	●	●	●	●
3	Bell Park Carpark	●	●	●	●
4	Boat Ramps (Catalpa Park)	●	●	●	●
5	Bores	●	●	●	●
6	Catalpa Park Carpark	●	●	●	●
7	Coastal/dune vegetation	●	●	●	●
8	Department of Defence Land	●	●	●	●
9	DoBCA Managed Land	●	●	●	●
10	Dual use path	●	●	●	●
11	Jetty abutments (Val St and Fisher St)	●	●	●	●
12	Mangles Bay Fishing Club	●	●	●	●
13	Parks & Recreation areas	●	●	●	●
14	Pipes	●	●	●	●
15	Pits	●	●	●	●
16	Point Peron Boating Facility Carpark	●	●	●	●
17	Point Peron Camp School	●	●	●	●
18	Point Peron Wastewater Treatment Plant	●	●	●	●
19	Residential properties (985)	●	●	●	●
20	Roads	●	●	●	●
21	Rockingham Beach Primary	●	●	●	●
22	Rockingham Naval Club	●	●	●	●
23	Samuel St Carpark	●	●	●	●
24	Star of the Sea Catholic Primary School	●	●	●	●
25	Underground Storage	●	●	●	●

● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $405 MILLION

Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.

A **100 year** ARI storm event has a 1% chance of occurring in any given year.

A **50 year** ARI storm event has a 2% chance of occurring in any given year.

A 1 in **10 year** storm event has a 10% chance of occurring in any given year.

A 1 in **1 year** storm event has a 99% chance of occurring in any given year.

Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- City of Rockingham Boundary (CoR)
- Sector Boundary Line
- Coastline

INUNDATION EXTENT

- 1yr ARI
- 10yr ARI
- 50yr ARI
- 100yr ARI
- 500yr ARI

SCALE 1:15,000

0 0.1 0.2 0.3 0.4KM

N

2017 INUNDATION HAZARD MAP



2030 INUNDATION HAZARD MAP



2070 INUNDATION HAZARD MAP



2110 INUNDATION HAZARD MAP





Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

WATER DEPTH (M)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

SCALE 1:15,000

0 0.1 0.2 0.3 0.4KM

N

SECTOR 2 DEPTH OF COASTAL INUNDATION 2110 – 500 YEAR ARI



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

DURATION OF INUNDATION (HOURS)

- 0 - 20
- 20 -40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120

SCALE 1:15,000

0 0.1 0.2 0.3 0.4KM

N

SECTOR 2 DURATION OF COASTAL INUNDATION 2110 - 500 YEAR ARI

6.3 Sector 3 Boundary Road to Shelton Street

Vulnerability of assets to inundation

Sector 4		2017	2030	2070	2110
Vulnerability					
1	Beach	Medium	Medium	High	Very High
2	Bores	Low	Low	Low	Medium
3	Coastal/dune vegetation	Low	Low	Medium	Medium
4	Dual use paths	Low	Low	High	Very High
5	Mersey Point Carpark	High	High	Very High	Very High
6	Parks and Recreational areas	Low	Low	Medium	Medium
7	Pipes	Low	Low	Low	Medium
8	Pits	Low	Low	Medium	Medium
9	Residential properties (3,578)	Low	Low	Medium	Medium
10	Roads	Low	Medium	High	High
11	Mersey Point / Rockingham Wild Encounters	Medium	Medium	High	Very High
12	Safety Bay Foreshore Carparks (6 total)	Low	Medium	High	Very High
13	Safety Bay Primary School	Low	Medium	High	Very High
14	Safety Bay Tennis Club	Low	Low	Low	Medium
15	Safety Bay Yacht Club	Medium	Medium	Medium	High

Low Medium High Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $969 MILLION

Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.

A **100 year** ARI storm event has a 1% chance of occurring in any given year.

A **50 year** ARI storm event has a 2% chance of occurring in any given year.

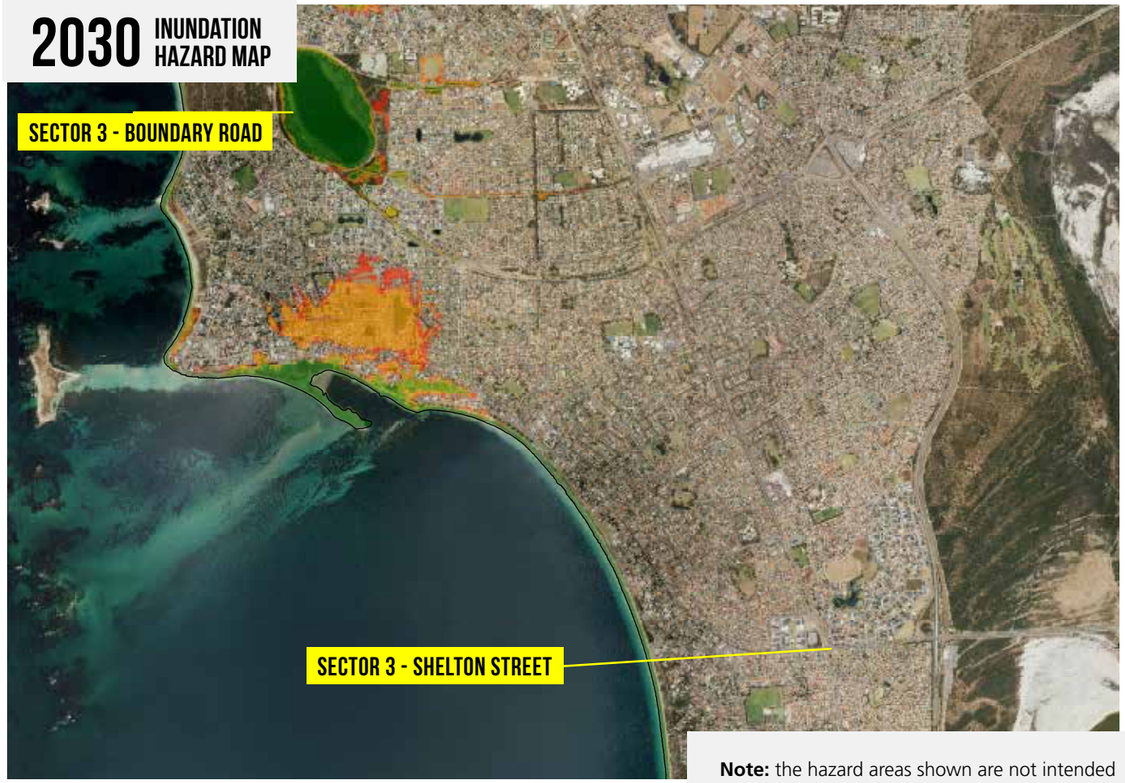
A 1 in **10 year** storm event has a 10% chance of occurring in any given year.

A 1 in **1 year** storm event has a 99% chance of occurring in any given year.

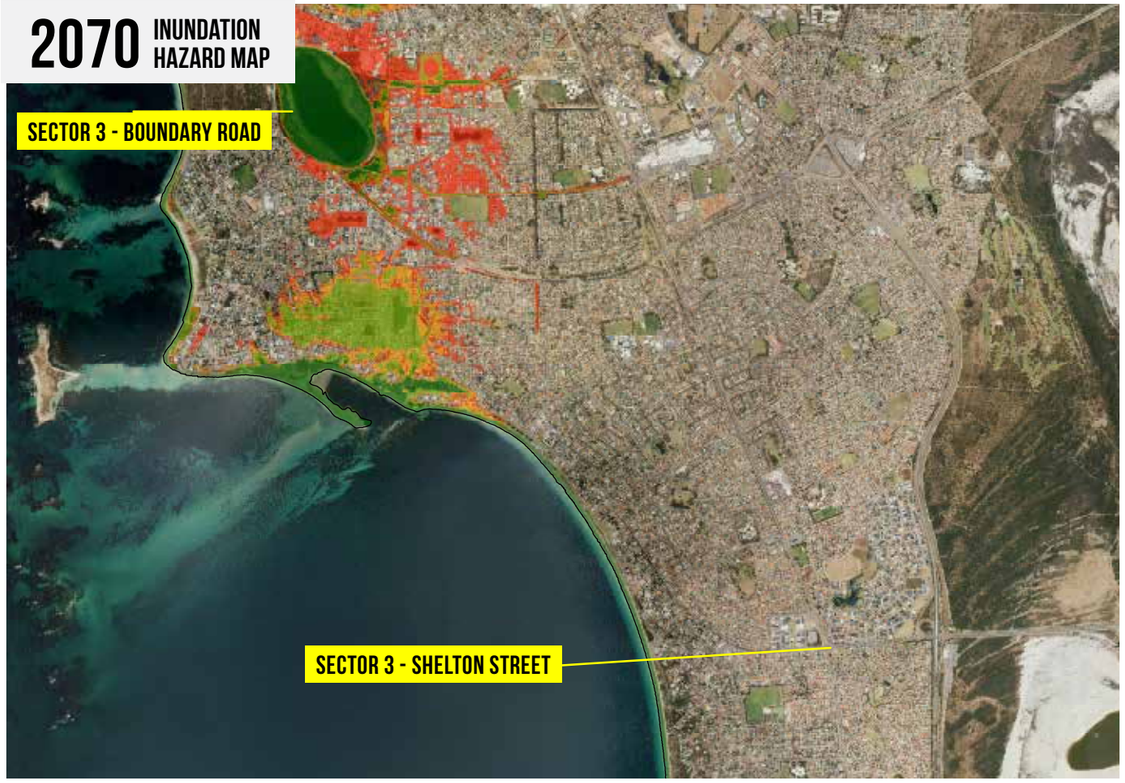
2017 INUNDATION HAZARD MAP



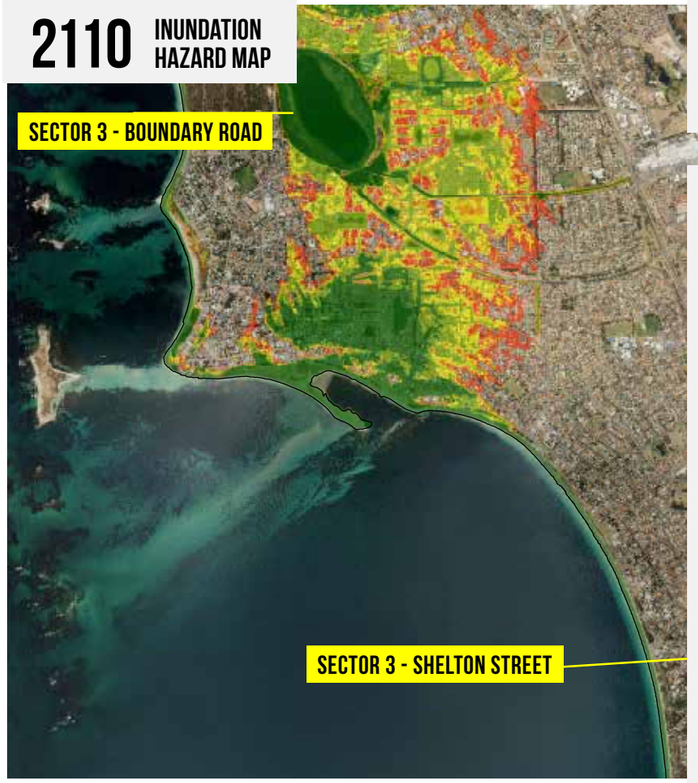
2030 INUNDATION HAZARD MAP



2070 INUNDATION HAZARD MAP



2110 INUNDATION HAZARD MAP



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

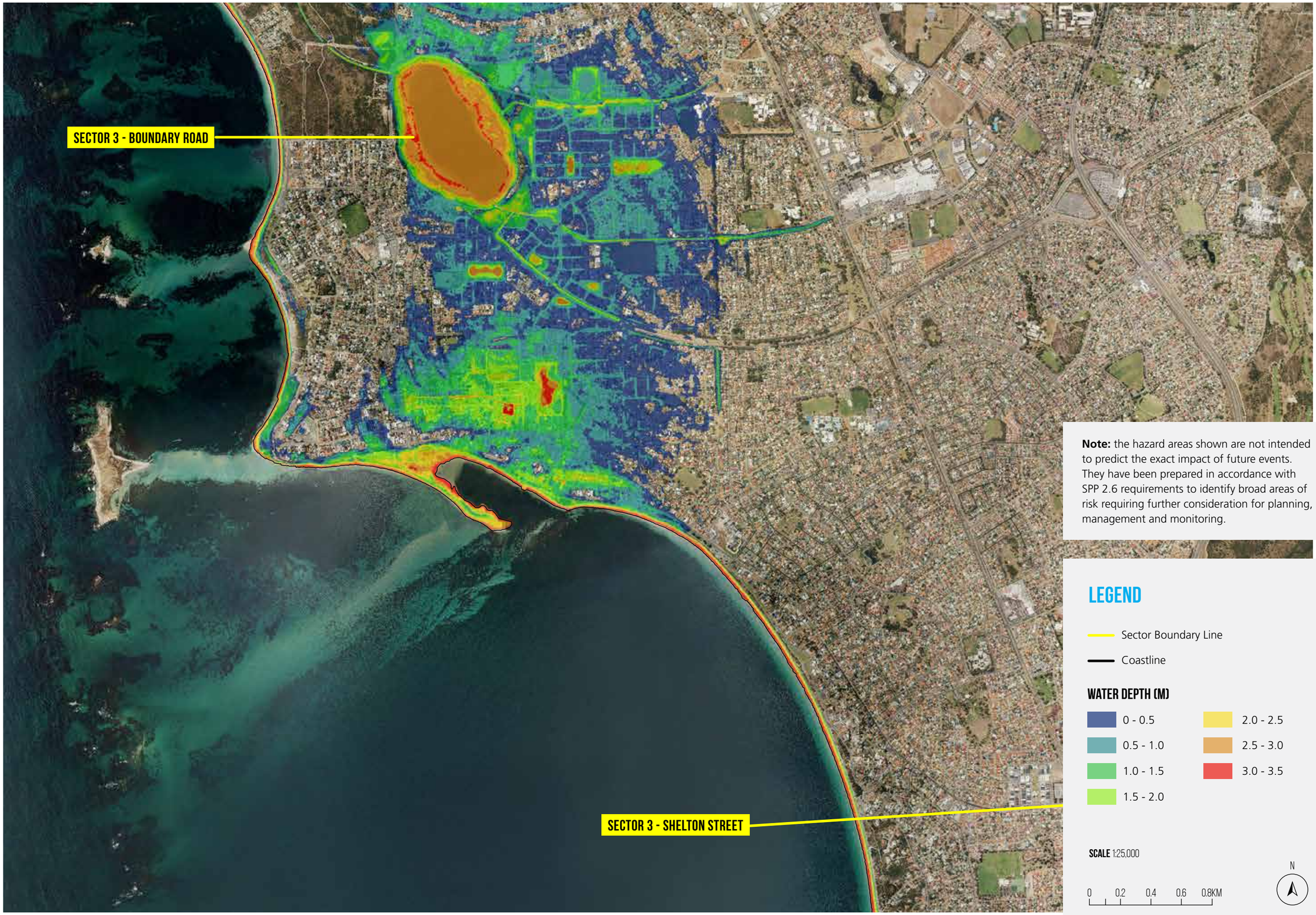
INUNDATION EXTENT

- 1yr ARI
- 10yr ARI
- 50yr ARI
- 100yr ARI
- 500yr ARI

SCALE 1:25,000

0 0.1 0.2 0.3 0.8KM

N



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

WATER DEPTH (M)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

SECTOR 3 DEPTH OF COASTAL INUNDATION 2110 – 500 YEAR ARI



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

DURATION OF INUNDATION (HOURS)

0 - 20	60 - 80
20 -40	80 - 100
40 - 60	100 - 120

SCALE 1:25,000

N

0 0.2 0.4 0.6 0.8KM

SECTOR 3 DURATION OF COASTAL INUNDATION 2110 - 500 YEAR ARI

6.4 Sector 4A Shelton Street to Bayeux Avenue
Sector 4B Bayeux Avenue to Becher Point

Vulnerability of assets to inundation

Sector 4					
		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Dual use paths	●	●	●	●
3	Parks and Recreation areas	●	●	●	●
4	Pipes	●	●	●	●
5	Pits	●	●	●	●
6	Port Kennedy Foreshore Carpark	●	●	●	●
7	Port Kennedy Scientific Park	●	●	●	●
8	Residential properties (28)	●	●	●	●
9	Roads	●	●	●	●
10	The Links Kennedy Bay Golf Course	●	●	●	●

● Low ● Medium ● High ● Very High

ESTIMATED TOTAL VALUE OF ASSETS AT RISK BY 2110 IS OVER $9 MILLION

Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.

A **100 year** ARI storm event has a 1% chance of occurring in any given year.

A **50 year** ARI storm event has a 2% chance of occurring in any given year.

A 1 in **10 year** storm event has a 10% chance of occurring in any given year.

A 1 in **1 year** storm event has a 99% chance of occurring in any given year.



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

INUNDATION EXTENT

- 1yr ARI
- 10yr ARI
- 50yr ARI
- 100yr ARI
- 500yr ARI

SCALE 1:25,000

0 0.1 0.2 0.3 0.8KM

N

SECTOR 4 2110 INUNDATION HAZARD MAP



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

WATER DEPTH (M)

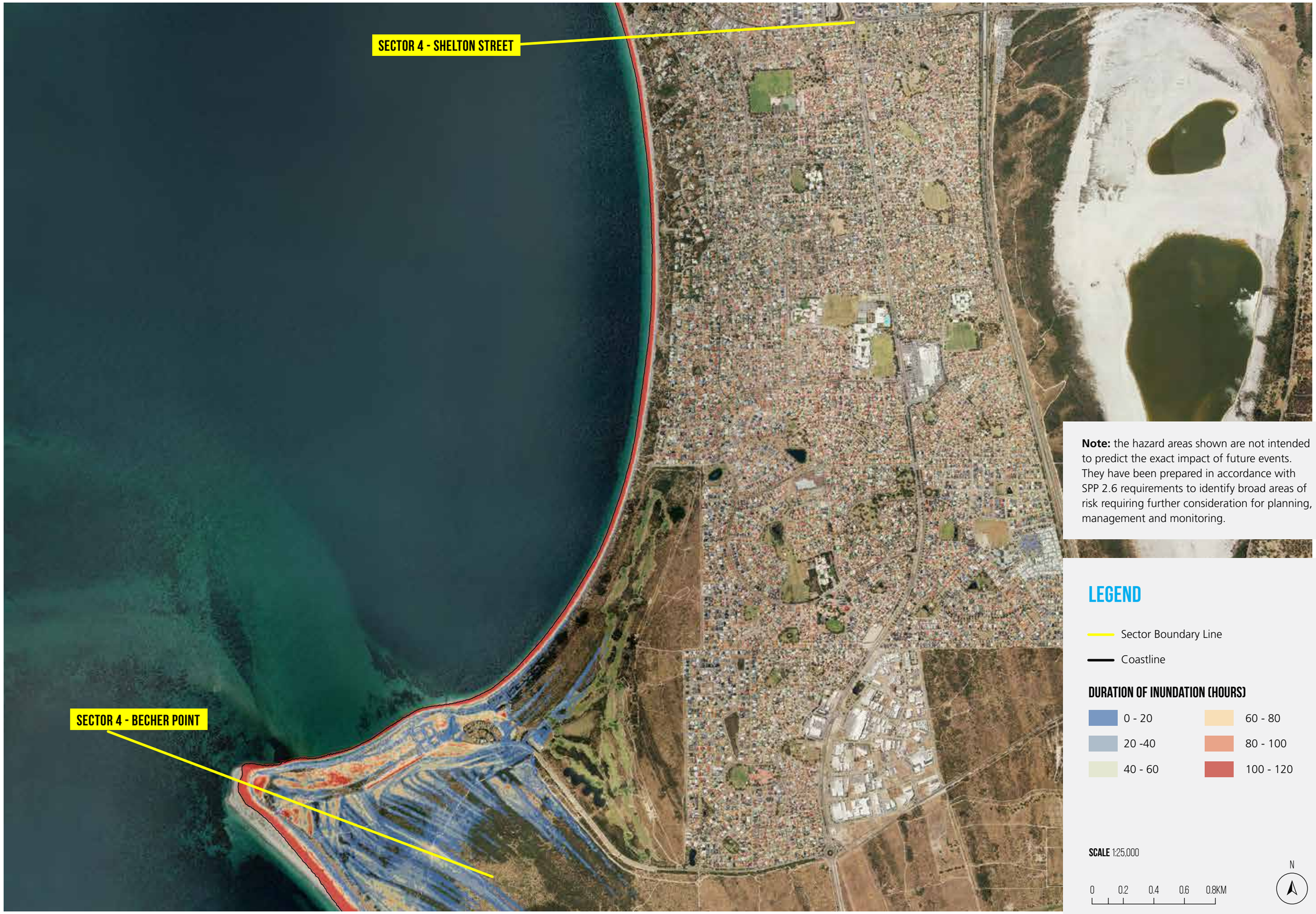
- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

SECTOR 4 DEPTH OF COASTAL INUNDATION 2110 – 500 YEAR ARI



SECTOR 4 DURATION OF COASTAL INUNDATION 2110 - 500 YEAR ARI

Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

DURATION OF INUNDATION (HOURS)

- 0 - 20
- 20 -40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

6.5 Sector 5 Secret Harbour Foreshore Park to Turtles Bend

Vulnerability of assets to inundation

Sector 4					
		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Coastal/dune vegetation	●	●	●	●
3	Port Kennedy Scientific Park	●	●	●	●

● Low ● Medium ● High ● Very High

As no built assets are at risk of inundation by 2110, a monetary value has not been assigned for Sectors 5. Acknowledging the important social and environmental values of these assets, it is recommended that further work be undertaken as an outcome of this CHRMAP to better quantify these intrinsic values and inform future risk assessments.

Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

500 A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.

100 A **100 year** ARI storm event has a 1% chance of occurring in any given year.

50 A **50 year** ARI storm event has a 2% chance of occurring in any given year.

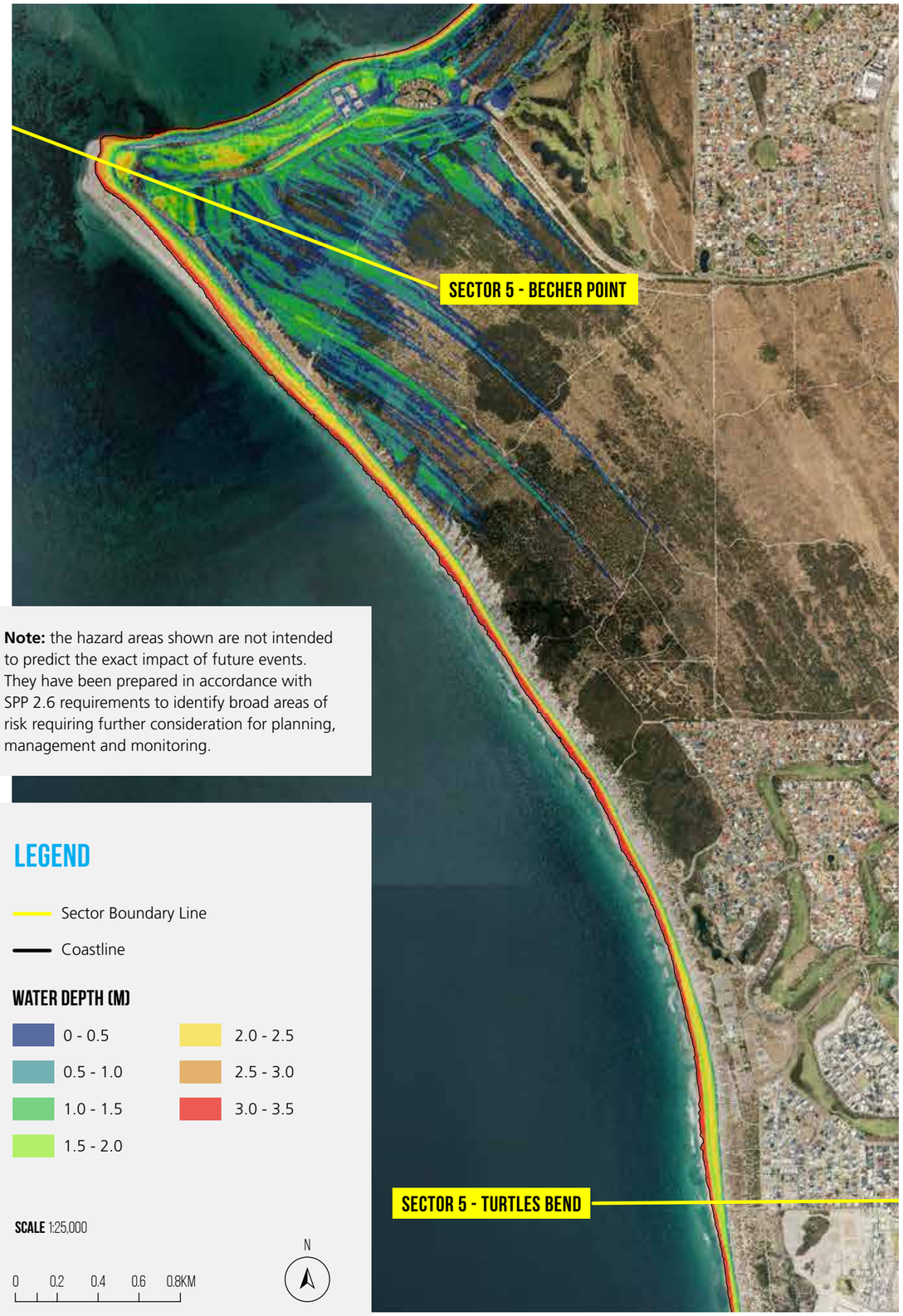
10 A 1 in **10 year** storm event has a 10% chance of occurring in any given year.

1 A 1 in **1 year** storm event has a 99% chance of occurring in any given year.



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

SECTOR 5 INUNDATION 2110 HAZARD MAP



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- Sector Boundary Line
- Coastline

WATER DEPTH (M)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

SECTOR 5 DEPTH OF COASTAL INUNDATION 2110 – 500 YEAR ARI



LEGEND

- Sector Boundary Line
- Coastline

DURATION OF INUNDATION (HOURS)

- 0 - 20
- 20 -40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120

SCALE 1:25,000

0 0.2 0.4 0.6 0.8KM

N

SECTOR 5 DURATION OF COASTAL INUNDATION 2110 – 500 YEAR ARI

6.5 Sector 6: Turtles Bend to Municipal Boundary (South)

Vulnerability of assets to inundation

Sector 4		2017	2030	2070	2110
Vulnerability					
1	Beach	●	●	●	●
2	Coastal/dune vegetation	●	●	●	●

● Low ● Medium ● High ● Very High

As no built assets are at risk of inundation by 2110, a monetary value has not been assigned for Sectors 6. Acknowledging the important social and environmental values of these assets, it is recommended that further work be undertaken as an outcome of this CHRMAP to better quantify these intrinsic values and inform future risk assessments.

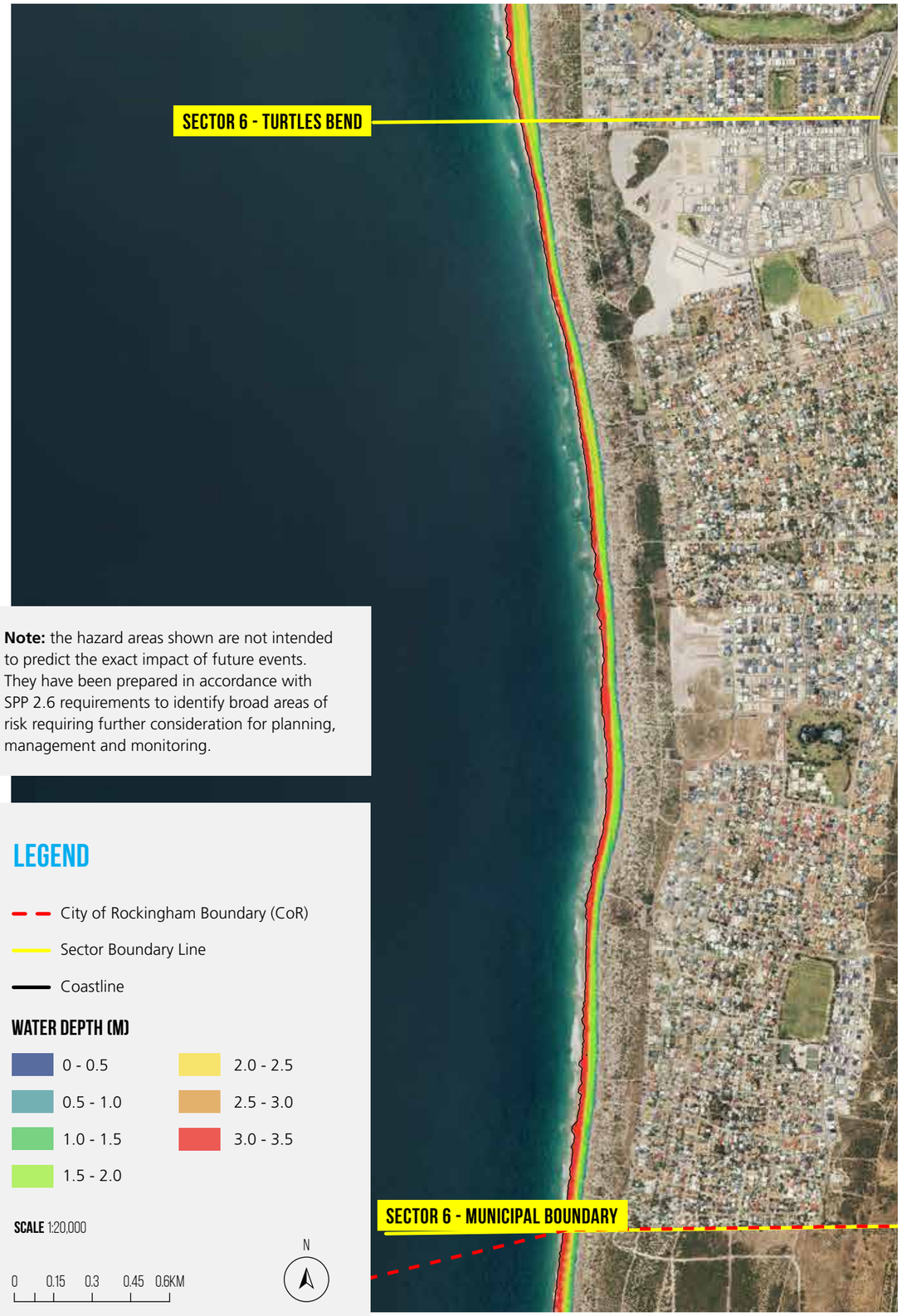
Storm events are characterised based on an average recurrence interval (ARI). The recurrence interval is a statistical probability of that event occurring, so:

- A **500 year** ARI storm event has a 0.2% chance of occurring in any given year.
- A **100 year** ARI storm event has a 1% chance of occurring in any given year.
- A **50 year** ARI storm event has a 2% chance of occurring in any given year.
- A 1 in **10 year** storm event has a 10% chance of occurring in any given year.
- A 1 in **1 year** storm event has a 99% chance of occurring in any given year.



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

SECTOR 6 INUNDATION 2110 HAZARD MAP



Note: the hazard areas shown are not intended to predict the exact impact of future events. They have been prepared in accordance with SPP 2.6 requirements to identify broad areas of risk requiring further consideration for planning, management and monitoring.

LEGEND

- City of Rockingham Boundary (CoR)
- Sector Boundary Line
- Coastline

WATER DEPTH (M)

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

SCALE 1:20,000

0 0.15 0.3 0.45 0.6KM

N

SECTOR 6 DEPTH OF COASTAL INUNDATION 2110 – 500 YEAR ARI



LEGEND

- City of Rockingham Boundary (CoR)
- Sector Boundary Line
- Coastline

DURATION OF INUNDATION (HOURS)

- 0 - 20
- 20 -40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120

SCALE 1:20,000

0 0.15 0.3 0.45 0.6KM

N

SECTOR 6 DURATION OF COASTAL INUNDATION 2110 – 500 YEAR ARI

7 What are the management options and considerations for coastal hazards?

7.1 Key concepts

7.1.1 Equity

Equity is a concept central to the purpose of the CHRMAP process. Australia's coastline is highly valued by the community as a public asset, with stakeholders ranging from individual property owners in coastal areas, to all levels of government, ratepayers, taxpayers in general and users both from within and outside of jurisdictional boundaries.

Responsibility for coastal planning lies with both State and Local Governments, and with a need to ensure decision making considers equity in terms of:

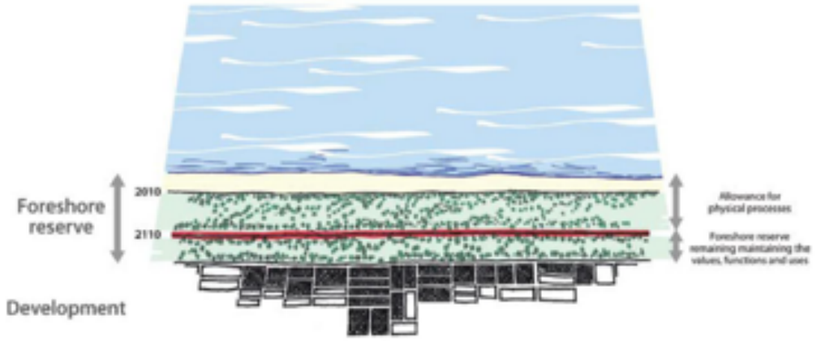
- Access - if the foreshore reserve erodes to the point where private houses directly front the beach, then this would restrict public access to those areas of beach. The coast and coastal foreshore reserves are public assets which should not, now or in the future, become the exclusive domain of private landholders by virtue of the erosion or other coastal processes.
- Enjoyment – if a seawall is installed, then a fisherman may still be able to enjoy the coastal environment by fishing from the rocks, however, the loss of the sandy beach would impact on enjoyment of the coastal environment by someone who wants to walk along the sandy beach and appreciate the natural dunes.
- Beneficiaries - coastal protection structures, such as groynes, may create beneficiaries (those who are protected from hazards) but potentially disadvantage others. For example, protection structures may exacerbate erosion adjacent to the structure, and limit sediment availability for maintaining beaches some distance from the protected area. Protection structures can also result in significant impacts to coastal ecosystems, well beyond the local area in which the structures are installed (Gittman et al., 2016).
- Intergenerational equity – in planning for a 100 year timeframe, how will the decisions made now affect future generations? Continuing to develop the coast without planning for hazards has potential to result in further issues and expense for future generations. Similarly, protecting existing assets now may be delaying proper management of the issue to future generations, and may not be considered economically responsible from a long term perspective.

In light of the above, it is critical that planning and management is as transparent and equitable as possible.

7.1.2 Coastal Foreshore Reservation

The coastal foreshore provides beach access, public space for recreation and conservation, is a tourist attraction and provides habitat for native flora and fauna. Importantly, it can also provide a buffer to protect built assets, such as buildings and infrastructure, from coastal hazards.

SPP2.6 Schedule One provides guidance for calculating the component of the coastal foreshore reserve required to allow for coastal processes. This should ensure that, at the end of the planning timeframe, a coastal foreshore reserve is still present for recreation and/or conservation and is not exposed to the adverse impacts of erosion and inundation. It is behind this reserve that additional development can be considered. This concept is shown in the figure below, as development is set back from the coast allowing a sufficient foreshore reserve for future generations.



Notwithstanding, Schedule One also contains Clause 7 – Variations, which outlines specific instances where certain types of development may be considered appropriate within a coastal foreshore reserve, regardless of the allowance for physical coastal processes.

In Secret Harbour, Golden Bay and Singleton, the foreshore reserve is of a sufficient width to ensure that private property and key public infrastructure is not impacted by coastal hazards over the next 100 years.

Conversely, from East Rockingham to Port Kennedy, the foreshore reserve is not of sufficient width to ensure that the values, functions and equitable use of the coast can continue to be provided as is over the next 100 years without management intervention.

7.1.3 Rights and Responsibilities

There is no law requiring any level of government to provide protection of private property from natural hazards, nor compensation when land is lost to the sea. There are, however, several laws that allow the intervention of governments to enforce eviction if private property becomes uninhabitable, or removal of property if it constitutes a public risk. In the event of coastal erosion causing a property to "fall into the sea", and the land to disappear below the high water mark, the loss is to be borne by the property owner.

The current situation in WA determines that property titles remain, even if the land is lost to coastal processes, and this can mean that public access to foreshore areas is lost in the event that erosion encroaches on private property.

Nonetheless, the CHRMAP process ultimately intends to minimise risks and maximise beneficial use of the coast from an economic, social and environmental perspective. For more information on rights and responsibilities, refer to the State Government's WA Coastal Zone Strategy (2017).

7.2 Hierarchy

SPP 2.6 provides the following hierarchy for consideration of risk management and adaptation options:





Avoid
Identify future 'no build areas' and use planning tools to prevent new development in areas at risk now or in the future.



Retreat
Withdraw, relocate or abandon assets that are at risk; ecosystems are allowed to retreat landward as sea levels rise.



Accommodate
Continue to use land in developed areas and accommodate risk through raised floor levels, raised roads, etc.



Protect
Use hard structures (e.g. sea walls) or soft solutions (e.g. dunes and vegetation) to protect land from the sea.

7.2.1 AVOID

Avoid any further residential or commercial development within areas identified as vulnerable to the impacts of coastal hazards.

Avoid is seen as the preferred strategy but is generally only applicable to undeveloped coastal land and areas of the coast where intensification of development in hazardous areas might be proposed. This option is underpinned by the implementation of planning controls which should prevent inappropriate use of land in areas identified as potentially at risk from coastal hazards.

Pros

- Ensures that property and infrastructure will not require costly management in the future

Cons

- Not an option for much of the City's coastline, where development already exists in vulnerable areas.

7.2.2 MANAGED RETREAT

This option aims to remove assets from the risk of coastal hazards. This would be a significant undertaking and could potentially involve acquisition of vulnerable private property and the removal and relocation of public infrastructure in order to increase the width of the coastal foreshore reserve.

Although it may involve significant expenditure during implementation, this is generally considered the responsible approach for future communities in the long-term.

Managed retreat is identified as the preferred adaptation pathway under SPP 2.6. The Coastal Hazard Risk Management and Adaptation Plan Guidelines (WAPC 2019) outline mechanisms for actioning the transfer of land from private ownership to the public realm under this approach.

Although the State Government recommends managed retreat, it does not propose to fund it. While there is no obligation at any level of Government to compensate landholders for the impacts of coastal hazards and sea level rise, there is a responsibility to act in the best interests of the community.

This option can be facilitated in a number of ways, such as:

- leaving assets unprotected and repairing or removing them only when they are impacted (i.e. minor park infrastructure)
- removing or relocating assets before they are impacted (i.e. larger assets and infrastructure, including commercial/private property and roads).

- not acting to retreat until certain triggers have been reached (i.e. shoreline recedes to a defined point).
- pre-emptive planning controls, as described in Section 9.3 (i.e. application of a Special Control Area of vulnerable areas)
- reserving land to expand existing foreshore reserves; including acquisition of land either voluntary or compulsory

It is important to note that without acquisition of private property to expand the foreshore reserve, a managed retreat may result in a loss of public access to foreshore areas and a loss of amenity as houses become uninhabitable.

The estimated cost of managed retreat to 2100, based on the value of assets potentially impacted and the cost of demolition, is $530 million.

Pros

- Removing assets from hazardous areas eliminates the need to fund expensive ongoing protection, making it the economically responsible approach over the long term
- It ensures public access and maintenance of a sandy beach and dunes for the broader community long term
- There is no obligation at any level of Government to protect private property from coastal hazards. It is also unlikely that these properties would be insured against damage caused by coastal hazards.
- From an intergenerational equity perspective, failing to retreat when needed could be seen to disadvantage future generations, who would effectively be paying to rectify land mismanagement attributable to previous generations.

Cons

- Well defined trigger levels based on long term datasets are critical to ensure that management responses are appropriate and timely. For example, an arbitrary trigger might be that managed retreat will be implemented once more than 40 m of beach is lost. However, if 80 m of beach was lost in one storm, it would not allow time to implement a contingency response.
- There is currently no funding proposed by the State or Federal governments to assist with the costs of managed retreat, making it prohibitively expensive for local government to fund.
- With the progressive removal of significant infrastructure such as roads, there is a need to maintain safe public access to private property.
- The managed retreat option leads to considerable equity implications. The option is considered fair to the broader community, whose ability to access and use the beach and foreshore is maintained. Those owning residential properties that will be removed will be seen to lose out through the strategy if mechanisms for adequate compensation are not put in place.
- A managed retreat strategy would result in the blighting of existing residential areas over a period of time while homes and infrastructure are removed
- There will be management costs associated with rehabilitating expanded foreshore reserves.

7.2.3 ACCOMMODATE

Accommodate options aim to re-design existing infrastructure to mitigate potential impacts as they occur, and allow for land use of a low risk (for example temporary) nature. This option is rarely applicable to areas at risk of coastal erosion but is suitable to some areas prone to coastal inundation, where assets can be elevated above flooding to maintain land use in an otherwise hazardous area.

The ability for substantial, built assets to be redesigned to accommodate coastal erosion hazards is generally limited.

Emergency response plans and controls are also considered as a measure to accommodate hazards. This involves the implementation of plans for assets and areas that are at risk of coastal hazards, with procedures in place for before, during and after the events for safety. This would identify roles and responsibilities, and measures such as signage and barriers to prevent access.

Pros

- Relatively simple to implement for areas prone to inundation through planning controls i.e. requiring new developments to have minimum finished floor levels

Cons

- Is not effective for areas impacted by erosion
- Retrofitting existing structures to accommodate inundation would be challenging and costly
- Where substantial inundation levels are expected, the accommodate option may adversely impact on the character and amenity of the area.

7.2.4 PROTECTION

7.2.4.1 Soft protection

Dune management – involves development of ongoing program for revegetation and rehabilitation of the dune system, including wind break fencing.

Beach renourishment – involves placing sand on the beach or dunes following erosion to create an additional buffer for future storm events. Large scale beach renourishment can provide additional protection for 18 months to 5 years, before the shoreline recedes to its original position. The option can be used as an interim measure or on an ongoing basis, but should not be viewed as a permanent solution to protect against sea level rise.

To keep the shoreline in its current position to 2030, approximately 200,000m^3 of sand would be required for renourishment at an estimated cost of over $7 million. Further, only 10,000m^3 is currently excavated from the Point Peron sand trap annually and the availability of other beach sand sources to meet future demand is uncertain. As such, this temporary form of coastal management is not a feasible long term option.

Pros

- Relatively minor up front cost compared to other management options
- Does not require significant infrastructure
- Can delay the need for hard protection structures or managed retreat.

Cons

- Only offers interim temporary protection, not a feasible long term option.
- Significant ongoing cost
- The availability of suitable clean beach sand to meet future demand is uncertain



Groyne, South Beach, Fremantle



Breakwaters, East Rockingham



Seawall, Mersey Point

7.2.4.2 Hard protection

This option involves the construction of engineered revetments to protect landward assets from the impacts of coastal hazards.

It should be noted that no protection option is considered permanent, and all have associated expense to implement, maintain and remove.

This expense and the inability of protection options to permanently mitigate the risks associated with coastal hazards are the primary reasons why these options are considered the least favourable in the adaptation hierarchy.

Hard protection options also have the potential to divert coastal erosion hazards elsewhere, increasing risk for adjacent areas or assets and potentially creating liability for those responsible for the structures.

The feasibility of a number of protection measures (pictured) was investigated based on an assessment of local coastal dynamics, including the wave climate and sediment transport. The results are summarised below:

Possible protection	Feasibility
Seawall	Most feasible
Groynes	Not recommended
Offshore breakwaters	Not recommended

A selection of concepts for the purpose of illustrating these protection options can be seen in Appendix C. Based on the feasibility assessment, it was determined that seawalls were likely to be to most appropriate hard protection for the City's coastline, particularly as seawalls can be provide protection against both erosion and inundation.

Seawalls are hard structures built in front of assets along the coast, acting as a last line of defence against coastal erosion and inundation. Seawalls are very effective, however, they can increase the rate of erosion in front of the seawall due to wave refraction, resulting in complete loss of the sandy beach in front of the wall.

The potential to degrade beach amenity is likely to lower the acceptability of a seawall to the broader community, unless they perform the dual function of protecting broader areas from intermittent coastal inundation. Therefore, seawalls are not considered to be an option for areas that are only at risk from coastal erosion.

The estimated cost of constructing a seawall to protect areas vulnerable to erosion and inundation from Wanliss Street to the Causeway and from Boundary Road to Warnbro Beach Road is shown in the table below.

Note: In addition to the $31.71 million needed to protect key assets, there will be significant maintenance and asset replacement costs beyond the 50 year design life of the seawall. This does not include the cost of ongoing sand renourishment required to maintain some form of usable beach for public amenity in front of the wall.

Given that such volume of sand is unlikely to be available for this purpose in perpetuity, it is important to consider the social, commercial and environmental cost of eventually losing all usable beach in Rockingham, Shoalwater and Safety Bay.

Total length of seawall (m)	Seawall cost	Maintenance cost to 2070	Allowance for structural design	Total cost
3900	$23m	$ 8.5m	$210k	$31.71m

Pros

- Provides interim protections against coastal hazards for the assets and private properties behind the seawall from coastal hazards

Cons

- Hard protection structures generally divert erosion issues elsewhere, such as to beaches either side of, and directly in front of, a seawall.
- They can have significant impact on coastal ecosystems.
- They require a significant up front capital cost and will require long term maintenance.
- Will result in complete loss of the beach (see picture).
- The beach may be reinstated through renourishment, however, this is not feasible in the long term due to cost and limited sand availability relative to increasing demand.
- Protects homes directly impacted by coastal hazards, however, the loss of beach amenity impacts on the broader community.

7.3 Triggers

An effective managed retreat strategy is dependent on well-defined triggers to commence actioning the transfer of private land to the public realm. In this regard, the CHRMAP Guidelines (WAPC 2019) provide the following guidance:

Managed retreat allows development to remain and be safely used until the coastal hazard risk becomes unacceptable. Initiation of the process to remove at risk development can be controlled by triggers such as:

1. Trigger 1. Where the most landward part of the Horizontal Shoreline Datum (HSD) is within 40 metres of the most seaward point of a development or structure.
2. Trigger 2. Where a public road is no longer available or able to provide legal access to the property.
3. Trigger 3. When water, sewerage or electricity to the lot is no longer available as they have been removed/ decommissioned by the relevant authority due to coastal hazards.

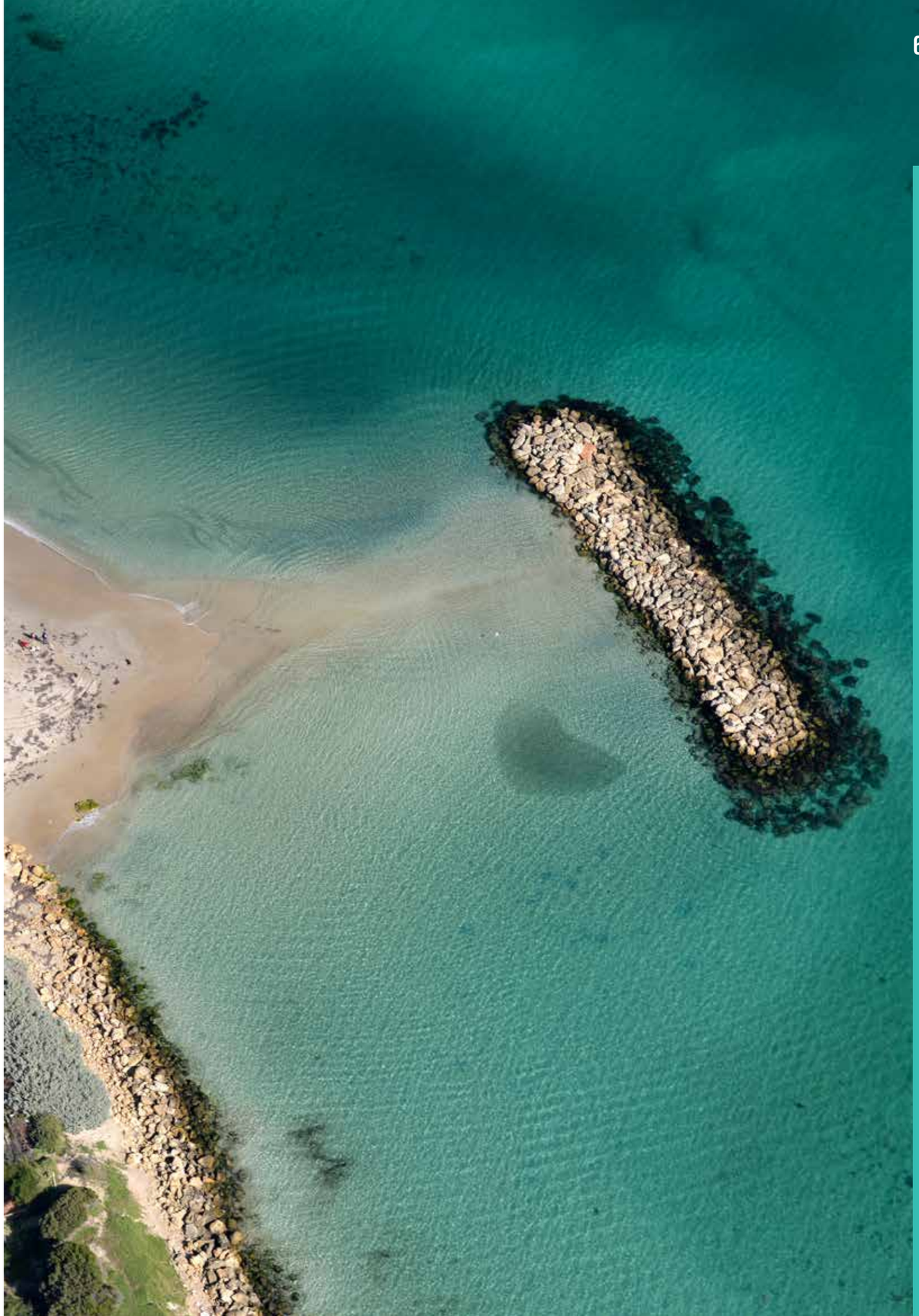
The CHRMAP Guidelines state that Trigger 1 can be varied where modelling has been undertaken in accordance with SPP2.6, to determine a suitable distance. As this modelling has been undertaken as part of the CHRMAP, the nominal 40 metre distance has been replaced with the calculated distance for this trigger (known as S1). This distance is site specific and varies along the City's coastline due to coastal exposure, shoreline profile and sediment size. These site specific S1 trigger values can be seen in the CHRMAP Technical Assessment Report.

For the purpose of guiding management pathways in this CHRMAP, various additional triggers have also been defined. These look at additional drivers for management actions, including social and economic drivers. The triggers also relate to the implementation of management responses other than managed retreat, such as the implementation of interim protection where this can be demonstrated to be appropriate.

Recommendations

Given the CHRMAP is required to consider a 100 year planning timeframe, all recommendations are presented as:

- short term - requiring action before 2030; or
- long term - potential pathways are identified now, with decision points occurring beyond 2030.



8 Long term adaptation pathways beyond 2030

A range of options for addressing the challenges of coastal erosion and its effects on the coastal zone over the next century have been outlined. While it is natural that the community would prefer to protect and preserve the current features of the coastal zone, the reality is that unless some new and innovative protection methods are developed, the costs of maintaining current features will likely become prohibitively expensive at some point in the future, given current sea level rise projections. The interim nature of protection options needs to be recognised across the community, and the adaption options developed and solutions optimised for social, environmental and economic (affordability) drivers.

The CHRMAP Guidelines (WAPC, 2019) suggest the process for implementing future managed retreat should include compensation under provisions in the *Land Administration Act 1997*. In reality, this is unlikely to be financially feasible in the immediate to short term, unless the State or Commonwealth governments provide the majority of funding to acquire property.

It is important to note that while eventually managed retreat is recommended in some areas, future implementation will need further investigation of the implications for both government and private stakeholders.

Through further detailed economic and feasibility assessment, it is likely that the implementation of interim protection measures in certain areas will be confirmed as providing overall benefit to the City.

Interim protection would also delay the expensive implementation of managed retreat and allow decision points for long term adaptation pathways to be well in the future relative to the best available information and coastal hazard realities at the time.

The CHRMAP process is designed to be ongoing, with regular updates associated with the emergence and collection of new information, such as new legislation, climatic changes, or any new information that becomes available and that significantly modifies the understanding of coastal hazards.

8.1 Potential adaptation pathways, triggers and actions

Coastal hazards and their associated risks manifest over long time scales, generally not requiring implementation of costly response(s) until such time as a significant level of change has occurred. The adaptation pathway(s) approach enables for the establishment of a decision making strategy that is made up of a sequence of decision-points over time, preventing a decision maker from being locked into a particular management and adaptation option (and associated actions), which may not be appropriate for dealing with the long-term problem.

The intent is for decision making to be responsive to changing circumstances over time, in that while not all decisions can be made today, they can be planned, prioritised and prepared for.

This approach is useful for dealing with uncertainty, ensuring that decisions made and associated actions undertaken today do not prevent alternative courses of action being chosen in the future consistent with the SPP 2.6 hierarchy and stakeholder and community values.

The key advantages of the pathways approach are:

1. It buys time to plan and reduces the pressure of making decisions now.
2. It reduces uncertainty by using events - not time - as decision points
3. Its flexibility enables the plan to reflect local circumstances
4. It keeps options open until there is more information, funding or support for options
5. It allows for learning along the adaptation journey.

Ultimately, decisions on adaptation pathways will be made by future communities and Councils.

Table 1 Summary of proposed adaptation pathways, triggers and possible actions.

What is the pathway?	What are the triggers?	Recommended actions
Avoid residential or commercial development in areas identified for managed retreat, unless there is an overwhelming planning justification.	Where undeveloped land is identified as lying within the hazard extents.	• Implement planning controls to avoid inappropriate development of the land • Continue to update hazard extent mapping as required relative to new information .
Managed retreat of minor public or drainage infrastructure where possible/appropriate.	When an asset is damaged, destroyed or becomes unsafe due to coastal hazards.	• Minor public and drainage infrastructure will be; i) repaired to extend short term life and function, but left unprotected; or ii) removed and relocated to a less vulnerable area.
Accommodate the risk of coastal hazards by implementing an Emergency Response Plan.	When the shoreline (HSD) is within the S1 distance refer to CHRMAP Technical Assessment Report for specific S1 values of most seaward asset.	• Remove major infrastructure (roads, carparks), residential and commercial buildings, and transfer land to public realm; • Provide interim protection for major infrastructure (roads, carparks), residential and commercial buildings; • Prepare response plans for minor infrastructure that could be impacted.
Investigate and implement planning controls for managed retreat.	Where residential or commercial property lies seaward of the 100 year coastal hazard erosion line.	• Include all affected land in a Special Control Area and ensure the hazard information is incorporated in structure planning • Provide notification of potential hazards on certificates of title where possible or by direct contact with landowners.
Short term (to 2030) Undertake interim soft protection.	Where: the beach and coastal foreshore reserve is significantly diminished with respect to its original state and function; or the shoreline (HSD) is within the S1 distance (see CHRMAP Technical Assessment) of most seaward asset.	• Dune care to enhance a natural form of protection • Sand renourishment where required.
Long term (beyond 2030) Managed retreat in areas when triggers are reached	Where: the shoreline (HSD) is within the S1 distance of most seaward asset; a public road is no longer available or able to provide legal access to a property; water, sewerage or electricity to a lot is no longer available as they have been removed/decommissioned by the relevant authority due to coastal hazards; an asset is damaged, destroyed or becomes unsafe due to coastal erosion; or the overall community and stakeholders are no longer supportive of a specific coastal management technique or approach.	• Remove major infrastructure, buildings, acquire land and transfer to the public realm through MRS amendment • Ensure mechanisms for compensation of landowners • Realign public roads.
Long term (beyond 2030) Implement long term hard protection in key areas when triggers are reached.	Where: the shoreline (HSD) is within the S1 distance of most seaward asset; the overall community and stakeholders are no longer supportive of a specific coastal management technique or approach; a specific coastal management technique (i.e. soft protection) is forecast to no longer be economically or physically feasible within 10 years; or the beach and coastal foreshore reserve is significantly diminished with respect to its original state and function.	Construct hard protection structures based on detailed analysis of feasible options (i.e. groynes, seawalls, breakwaters).

Refer to the CHRMAP Technical Assessment Report for a detailed explanation of adaptation and management options, pathways and triggers relative to each sector.



8.2 Priority areas for long term protection and managed retreat

PRIORITY AREAS FOR LONG TERM PROTECTION

How were they selected?

- Where both erosion and inundation impacts were present, meaning a large proportion of residents would benefit from costly protection.
- Areas of key community attraction and commercial activity.
- Significant infrastructure without clear alternative locations to perform the required function (i.e. Safety Bay Road).

What does this mean?

- Hard protection structures such as groynes, seawalls or breakwaters may be constructed in these locations to protect against erosion and inundation hazards.
- Increased development density may be permitted in areas vulnerable to coastal hazards where long term protection is identified and there is an overwhelming planning justification
- New development in these areas may be required to contribute to the ongoing maintenance of the seawall.

Things to note:

- If hard structures are installed to protect landward assets, this will significantly impact the amenity in the beach in these areas long term.
- The type and suitability of structures to be installed will require further modelling and detailed analysis.
- The City will not be constructing protection until triggers are reached, likely beyond 2030 or even 2070.
- The need for protection in these areas will be revised relative to new information when the CHRMAP is reviewed in 10 years.





Example of Groynes (UK)



Example of Breakwater (UK)



Seawalls

PRIORITY AREAS FOR MANAGED RETREAT

How were they selected?

- Where only erosion impacts were present, with proportionately fewer residents benefiting from costly protection.
- Recognising the importance of maintaining natural beach environments along considerable portions of the coast, reflective of the community's values.

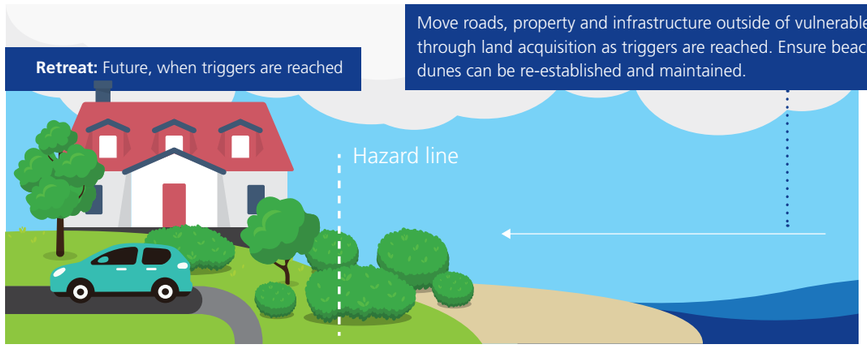
What does this mean?

- All landward assets (private property, roads, public infrastructure) vulnerable to coastal hazards in these areas will eventually be retreated through land acquisition to ensure a foreshore reserve is retained for community use and future generations.
- Increased development density may not be permitted in areas vulnerable to coastal hazards where potential long term managed retreat is identified.
- New development might be considered where time limited approvals or other planning controls are in place.

Things to note:

- The sandy beach, dunes and natural foreshore reserve will be preserved in these areas.
- Managed retreat will not be implemented until absolutely necessary, when certain triggers are reached likely beyond 2070.
- The City would not acquire private property for transfer to the public realm unless there was sufficient funding for compensation, with contributions from the state and federal government.
- The need for managed retreat in these areas will be revised relative to new information when the CHRMAP is reviewed in years.







Dunes and sandy beach are retained





8.2 Long term pathways – Summary by Sector

8.2.1 Sector 1 Municipal Boundary (North) to Wanliss Street

The assets in the sector are not predicted to be highly vulnerable in the short term. When affected by coastal hazards and no longer safe or serviceable, minor infrastructure should be removed and relocated or replaced (if necessary) in a less vulnerable area.

Significant public infrastructure and residential and commercial property is likely to be highly vulnerable at some stage across the future planning timeframes, hence there may be overall benefit in using an interim protection measure for the sector, to delay the timing of this managed retreat.

Such a protection measure should maintain the amenity of the coastal foreshore reserve and be funded under the beneficiary pays principle. Managed retreat is likely to be triggered when Rockingham Beach Road requires removal due to intolerable risk or to maintain a suitable foreshore reserve, which isn't expected beyond 2070. This would also trigger the removal of the first row of houses along Rockingham Beach Road, due to loss of legal access, although the houses aren't expected to be impacted until 2100. This is reflected in the erosion hazard maps in Section 5. As reflected in section 6, inundation is not a concern in this sector.

The maintenance and enhancement of the beach and dune system, through dune care, sand management and beach nourishment, should be considered in the sector as these assets provide a valuable, natural protective function.

Acknowledging the strategic economic importance of CBH Kwinana Grain Terminal to the State, this infrastructure has been identified as a priority area for long term protection, subject to this protection being funded by CBH Group or the State.

8.2.2 Sector 2A: Wanliss Street to Garden Island Causeway

Significant public infrastructure and residential and commercial property is predicted to be highly vulnerable in the short term, requiring interim protection. Palm Beach and the area near Hymus Street are identified as potentially vulnerable in the short term and are therefore hotspots for a detailed options assessment of protection structures before 2030.

Long term protection is likely to be triggered when Esplanade and/or Rockingham Beach Road is subject to intolerable risk as the interim protection is no longer sufficient. Long term protection is identified in this sector, as opposed to managed retreat, given:

- the importance of the commercial area at Railway Terrace to the community
- the social value of Bell and Churchill Parks to the community
- the dual function of addressing coastal erosion and inundation hazards in this area, protecting a significant portion of private and public assets.

There is likely to be overall benefit in using an interim protection measure for the sector, particularly if it also mitigates coastal inundation hazards, which are predicted to increase risk levels significantly over future planning timeframes.

Any protection measure should maintain the amenity of the coastal foreshore reserve, including key recreation areas such as parks, and be funded under the beneficiary pays principle. Further investigation is required to determine how best to prepare for and accommodate risk for Lake Richmond, which is predicted to be affected by sea level rise and other climate change impacts across the planning timeframes.

It is possible that the existing flap valves on the Rockingham Main Drain (Water Corporation), which currently offer protection to the hydrologic regime of Lake Richmond, may lessen the extent of inundation around and upstream of the lake in the medium term. In the long term, however, sea level rise and coastal process changes may mean the current flap valves become ineffective and new management measures would be required. The need to review the operation of this drain in the future has been acknowledged by Water Corporation through development of this CHRMAP.

8.2.3 Sector 2B: Garden Island Causeway to Boundary Road

Some assets in the sector have been assessed as highly vulnerable in the short term, which could require a significant change in the management approach for the area. The management pathway for the sector should look to avoid further permanent development in the coastal foreshore reserve.

When affected by coastal hazards and no longer safe or serviceable, minor infrastructure should be removed and relocated (or replaced if necessary) to a less vulnerable area.

Due to the low concentration of vulnerable assets in the sector along Cape Peron and their lower economic value compared to other key vulnerable assets in the City, a managed retreat approach would be applicable for all built assets in this sector. It is noted, however, that potentially vulnerable land uses and responsible authorities in this sector include:

- Point Peron Reserve and leased land, Department of Biodiversity, Conservation and Attractions
- Point Peron Waste Water Treatment Plan (WWTP), Water Corporation
- Garden Island Causeway abutment, Department of Defence
- Point Peron boat ramp, City of Rockingham

Long term, it is expected that the Department of Defence will apportion funding as required for protection and upgrade of the Garden Island Causeway to ensure access to HMAS Stirling is not impacted.

Water Corporation has advised that the infrastructure potentially affected on its land in this sector includes some drainage infrastructure, local reticulation networks for water and wastewater services, at least one pump station, the Point Peron wastewater treatment plant and the Sepia Depression Ocean Outlet Line (SDOOL) and associated infrastructure. Generally, significant impacts on identified infrastructure are not expected until after 2030.

Water Corporation's most critical potentially impacted assets are the Point Peron WWTP and the SDOOL. While Water Corporation currently plans to decommission Point Peron sometime around 2030, there is a long term intention to retain and expand infrastructure on that site in order to increase the capacity of the SDOOL. As part its future planning for the site, the Water Corporation will consider the need to protect and secure essential infrastructure in the long term, taking into account the results of the City's CHRMAP.

The boat ramp in this sector is not likely to be vulnerable in the short term and this will be monitored as recommended for all boat ramps. Long term, when this infrastructure is due for replacement, it would be designed and constructed to allow for coastal hazards as required.



8.2.4 Sector 3: Boundary Road to Shelton Street
The assets in the sector have been assessed as highly vulnerable in the short term, which could require a significant change in the management approach for the area.

The southern side of Mersey Point has been identified as a hotspot for further detailed assessment of interim protection options in the short term, before 2030. Any protection measure should maintain the amenity of the coastal foreshore reserve and be funded under the beneficiary pays principle. In the short term, maintenance and enhancement of the beach and dune system, through dune care, sand management and beach nourishment, should be applied in the sector as required.

The areas from the southern side of Mersey Point around to Donald Drive are identified as priority for long term protection, as opposed to managed retreat, given:

- the dual function of addressing coastal erosion and inundation hazards in this area, protecting a significant portion of private and public assets.

It is noted, however, that the construction of protection structures in this sector will require approval from the Department of Biodiversity, Conservation and Attractions, given its location within the Shoalwater Islands Marine Park.

Managed retreat in the remainder of this sector is likely to be triggered when Arcadia Drive or Warnbro Beach Road requires removal due to intolerable risk or to maintain a suitable foreshore reserve. This would require the removal of the first row of houses along these roads due to loss of legal access, but only when the risk of coastal hazards in these areas becomes intolerable and certain trigger levels are reached. Given Shoalwater Foreshore is very well valued by the community for its natural attributes, the importance of retaining these values through managed retreat is considered paramount. If long term protection via a seawall was identified in this location, community members would no longer be able to walk along the sandy beach of Shoalwater Bay in the future.

8.2.5 Sector 4A: Shelton Street to Bayeux Avenue
The assets in the sector are not predicted to be highly vulnerable until later in the century.

When affected by coastal hazards and no longer safe or serviceable, minor infrastructure should be removed and relocated or replaced (if necessary) to a less vulnerable area. In the short term, maintenance and enhancement of the beach and dune system, through dune care, sand management and beach nourishment, should be considered in the sector as required.

Public infrastructure and residential and commercial property may be highly vulnerable at some stage across the future planning timeframes, requiring managed retreat from the area. There may be overall benefit in using an interim protection measure in some parts of the sector, to delay the timing of this managed retreat. Such a protection measure should maintain the amenity of the coastal foreshore reserve.

Given this area is very well valued by the community for its natural attributes such as the Warnbro dunes, the importance of retaining these values through an eventual managed retreat pathway is considered paramount.

8.2.6 Sector 4B: Bayeux Avenue to Becher Point
The assets in the sector are not predicted to be highly vulnerable in the short term. The management pathway for the sector should look to avoid further permanent development in the coastal foreshore reserve.

When affected by coastal hazards and no longer safe or serviceable, minor infrastructure should be removed and relocated or replaced (if necessary) to a less vulnerable area.

Major built infrastructure, including residential property at Port Kennedy is likely to be highly vulnerable at some stage across the future planning timeframes. There may be overall benefit in using a seawall to provide interim protection for built assets, to delay the timing of long term protection or eventual managed retreat. Such a protection measure should maintain the amenity of the coastal foreshore reserve.

In relation to the future Kennedy Bay development, the proposed Town Centre area has also been identified as a priority for long term protection (i.e. with a seawall), provided it is funded by the developer or the State.

The boat ramp in this sector is not likely to be vulnerable in the short term and this will be monitored as recommended for all boat ramps. Long term, when this infrastructure is due for replacement, it would be designed and constructed to allow for coastal hazards as required.

8.2.7 Sector 5 Secret Harbour Foreshore Park to Turtles Bend;
Some assets in the sector are predicted to be highly vulnerable in the second half of the century.

When affected by coastal hazards and no longer safe or serviceable, minor infrastructure should be removed and relocated or replaced (if necessary) to a less vulnerable area.

Public infrastructure such as carparks and the Secret Harbour Surf Life Saving Club may be highly vulnerable at some stage across the future planning timeframes, requiring managed retreat from the area, however, it is likely that this would occur beyond 2070 by which time the infrastructure will be due for replacement.

The maintenance and enhancement of the beach and dune system, through dune care and sand management, should be considered in the sector. These assets provide a valuable, natural protective function.

8.2.8 Sector 6 Turtles Bend to Municipal Boundary (South)
There are very few built assets predicted to become vulnerable before 2110.

When affected by coastal hazards and no longer safe or serviceable, minor infrastructure should be removed and relocated or replaced (if necessary) to a less vulnerable area.

The maintenance and enhancement of the beach and dune system, through dune care and sand management, should be considered in the sector. These assets provide a valuable, natural protective function.



9 Short term actions to 2030

9.1 Building Understanding

Action1. Engage the community to present the results of this CHRMAP and collect their feedback on the acceptability of adaptation options and pathways.

Critical to the CHRMAP process is ongoing community engagement. The City will ensure the results of the CHRMAP are well communicated to ensure transparency, educate the community on coastal processes and the hazards associated with sea level rise, and seek their feedback on the acceptability of the range of adaptation measures presented.

9.2 Funding

Action 2. A detailed economic assessment should be undertaken to establish the economic value/contribution of natural assets in key vulnerable areas.

This assessment should look at the range of direct and indirect economic benefits provided by beaches and the coastal foreshore reserve (including parks). The assessment should focus on Sectors 2 and 3, where the highest vulnerability is present in the short term. The assessment should incorporate:

- estimates of beach visitation and surveys of beach visitors to assist in estimating tourism, external and local visitor value;
- an assessment of the effect of proximity to the beach on property values as well as the identification of any links between beach quality (beach width, useability etc.) and local property value;
- assessment of the beach's contribution to local business revenue, for example by assessing seasonal trends in turnover;
- assessment of the economic value of the environmental functions of the beach and foreshore; and
- identification of existing beneficiaries and the level to which they benefit from the natural assets.

A critical information gap existing at present, that is required to inform a proper cost-benefit analysis of future adaptation options, is an estimate of the economic value/productivity of beaches and other natural assets. This input is required to establish a 'base case' for economic analysis, against which costs and benefits can be assessed. This will be required to inform detailed options assessments, such as those recommended in Section 5.4. It will also be important to inform the next CHRMAP review.

Action 3: Investigate and establish a fund for Coastal Hazard Management and Adaptation and allocate funding sources.

The estimated long term management cost by 2100 will ultimately vary depending on the triggers reached and where the City chooses to protect and/or retreat. Regardless, the cost is likely to be considerably greater than the City's current expenditure on coastal management.

The City will continue to advocate for part funding from the Federal and State Governments, however, must also establish funding arrangements to ensure the City is well placed in the future to make the most appropriate decisions for the community and stakeholders, when the time comes.

As such, the City will establish a fund for management of coastal hazards. Funding may need to be directed towards a combination of interim protection, to hold the shoreline in place, or compensation for affected landholders to implement managed retreat and allow the shoreline to recede.

Levels of funding required should be informed by economic values presented in this CHRMAP and more detailed economic analyses performed through the proposed detailed options assessments.

There is a range of potential revenue raising mechanisms which could be used to establish a Coastal Adaptation and Management cash reserve, such as applying:

- a percentage increase to all rates (i.e. additional 1% per year), acknowledging that the coastline is a public asset to the whole community, not only those who live in close proximity to the coast.
- a specified area rate to apportion funding contributions, aligning them with the level of benefit that certain rate payers will receive as a result of management.
- A differential area rate based on TPS2 zoning and land use
- the requirement for developer contributions. Such contributions would be required where a development is set to benefit from its proximity to the coast and, therefore, the management of the coast in the area.
- a user pays principle, collecting revenue from paid parking at the foreshore and boat ramps. Sourcing funding in this way would need to be carefully approached, given that the intent of the CHRMAP is to ensure the beach and coastal foreshore reserve is a public asset that should be available to all members of the community.

Further investigations are required prior to collecting revenue specifically for a Coastal Hazard Management and Adaptation fund. An associated policy framework would also be required to guide future allocation of this funding.

For now, it is proposed that modest annual inputs be allocated into a cash reserve for coastal adaptation through existing budgeting processes, relative to other priorities.

Identification of targeted revenue raising mechanisms, preparation of a Coastal Adaptation Costing Plan to inform potential rate increases and investigation of a DCP for protection areas would then await the next CHRMAP review (10 years), so that these items can take into account:

- The proposed coastal monitoring dataset;

- Revised IPCC sea level rise projections;

- Revised SPP 2.6; and

- More informed adaptation cost estimates.

Following revision of the hazard lines with the next CHRMAP review, a Coastal Adaptation Costing Plan document could operate in a similar manner to the Community Infrastructure Plan, providing a robust foundation for collection of funding specifically for a Coastal Hazard Management and Adaptation fund.

Future advocacy for State and Federal Government funding should aim to be specific, with the cost of proposed actions well justified in response to triggers, community values and comprehensive coastal planning.

9.3 Land use planning

Western Australia's preference for addressing coastal hazards by way of a State Planning Policy is a less stringent framework than the legislative approach by other states. It requires that local authorities have due regard to the policy when preparing or modifying schemes and assessing development proposals.

The following planning instruments are generally consistent with those outlined in CHRMAP Guidelines (WAPC, 2019) and have varying applicability in the context of the City.

Structure Planning
In areas where development or redevelopment of coastal land is proposed, all local structure plans should properly incorporate the requirements of the City's CHRMAP, to account for coastal hazard risks and ensure an appropriate coastal foreshore reserve is included. This instrument will have limited effect in the context of the City, given much of the land identified as vulnerable is already developed.

Special Control Areas (SCA)
To ensure discretion over any further development proposed in coastal hazard areas and to identify areas likely to require eventual managed retreat. The SCA would be based on the coastal hazard mapping (a SCA for inundation and a SCA for erosion) in this CHRMAP and be reflected in TPS2, as required by the P&D Regulations, Schedule 1, Part 5. The SCA would require planning approval for normally exempt development to ensure coastal hazards are considered in the decision making process and enable the application of notifications on titles.

It is noted that some forms of development cannot be controlled by a SCA, such as works carried out by the State Government under the Public Works Act 1902. Inbuilt flexibility would be required to permit certain public infrastructure on land prone to coastal processes, where deemed necessary and appropriate.

The City should liaise with the State regarding such development, to ensure it is not incongruous with the long term pathway set out for the area.

Local Planning Policy (LPP)
IA LPP would be linked to the SCA under TPS2 and provide guidance for applicants and decision-makers in relation to assessment procedures and development standards on land prone to coastal hazards. The LPP could outline coastal adaptation options from the CHRMAP, include 'as-of-right' criteria and performance-based criteria for achieving compliance with TPS2 provisions, refer to design guidelines where applicable and establish procedures to manage risk when approving development in coastal hazards areas.

Scheme Amendment
An amendment to TPS2 would be required to reference the SCA, Local Planning Policy and associated hazard mapping, to identify the permissibility of uses on land subject to coastal hazards and to permit temporary approvals (time limited) where appropriate.

Design Guidelines
Design Guidelines would be referenced in the LPP and might specify appropriate design responses for individual development proposals (e.g. relocatable dwellings, prescribed setbacks, finished floor levels) and outline preferred options in an 'as-of-right' approval arrangement in compliance with the accompanying Local Planning Policy.

Notifications on Title
Require the provision of a Section 70A notification on the Title as a condition of any planning approval to alert prospective purchasers of the potential coastal hazard impacts on the lot, as required by SPP2.6. These notifications can only be applied where triggered by a Subdivision or Development Application.

Time Limited Planning Consent Conditions
To allow, where appropriate, the temporary use of land in hazard areas until hazards materialise, while ensuring that the City maintains a level of discretion over development in these areas. Time limits on development approvals could be set using coastal hazard mapping projections. If the approval expires before hazards materialise, the proponent may apply for an extension to the approval. If hazards materialise before the time limit expires, the City would consider requiring the demolition or removal of compromised structures under relevant legislative provisions.

Event-based triggers can also be used, but are not preferred due to the inherent uncertainty around defining coastal hazard events in the coastal environment and the ability to respond in a timely manner.

Where development is proposed behind a protected coastline, the lifecycle of the protection mechanism should determine the time limit permitted on planning consents. Maintenance and capital costs of any protection should be funded by the beneficiaries of the protection.

Development applications for subdivision and zoning
Beyond existing scheme allowances, application for further subdivision should not be permitted within coastal hazard areas, except where a strategy for long term protection is adopted in key locations. If a long term strategy for protection is in place then further development can be supported, provided developer contribution requirements or specialised area rates are in place to enable collection of funds for the construction, maintenance and upkeep of the seawall in the future.

Other instruments
There are a range of other instruments, including 'transferable development rights', 'leaseback of land', 'land swaps' and 'rolling easements'. These instruments remain conceptual in the WA planning context and are not provided for under the State's planning framework at present. These concepts require more research to determine how they would be practically implemented, but may be considered by the City in future.

9.3.1 Planning recommendations

In light of the above, instruments available to address coastal hazards have been considered by the CHRMAP and the following actions are recommended.

> Action 4: Existing and proposed structure plans should be reviewed to ensure they adhere to SPP2.6 and account for the risks identified in this CHRMAP.

All structure planning should account for the hazards identified in this CHRMAP and the requirements of SPP2.6. The primary mechanism for achieving this through structure planning will be the allocation of a suitable portion of land as coastal foreshore reserve. This foreshore reserve should be of adequate width to account for the 2110 coastal erosion hazard line, and also ensure a functional foreshore area will remain should this hazard extent be realised in the future.

> Action 5: TPS2 should be amended to incorporate SPP2.6 and include vulnerable areas as Special Control Areas (SCA).

It is recommended that TPS2 be amended to directly reference SPP2.6. Wording and placement of this reference is specified in the CHRMAP Guidelines (WAPC 2019). It is also recommended that TPS2 be amended to incorporate areas lying within the 2110 coastal erosion and inundation extents as SCAs. Two SCA's will be required, as different controls will be required in areas prone to erosion, compared to areas prone to inundation. The SCA for erosion is likely to exhibit a greater level of control and should, therefore, prevail in areas of both erosion and inundation hazard. The SCA classification should be used to facilitate land use changes and ensure development control over the identified areas. The nature of the SCA would be distinct for areas at risk of erosion, compared to those at risk from inundation. They should function as follows:

- The SCA for coastal erosion should be based on the 2110 hazard extent, plus an additional allowance for future foreshore amenity;
- The SCA for coastal erosion should establish the intent to eventually retreat from the identified area, where this is identified as the priority long term pathway;
- Both SCA's should require that all development in the area requires approval, allowing the City to control development and ensure it aligns with the long-term pathways for the area;
- SCA's should not extend over areas zoned such that development is already prohibited, such as Parks and Recreation Reserve.

> Action 6: Landholders that may be affected by coastal hazards by 2110 should be notified directly and by the application of notification on Certificates of Title where possible.

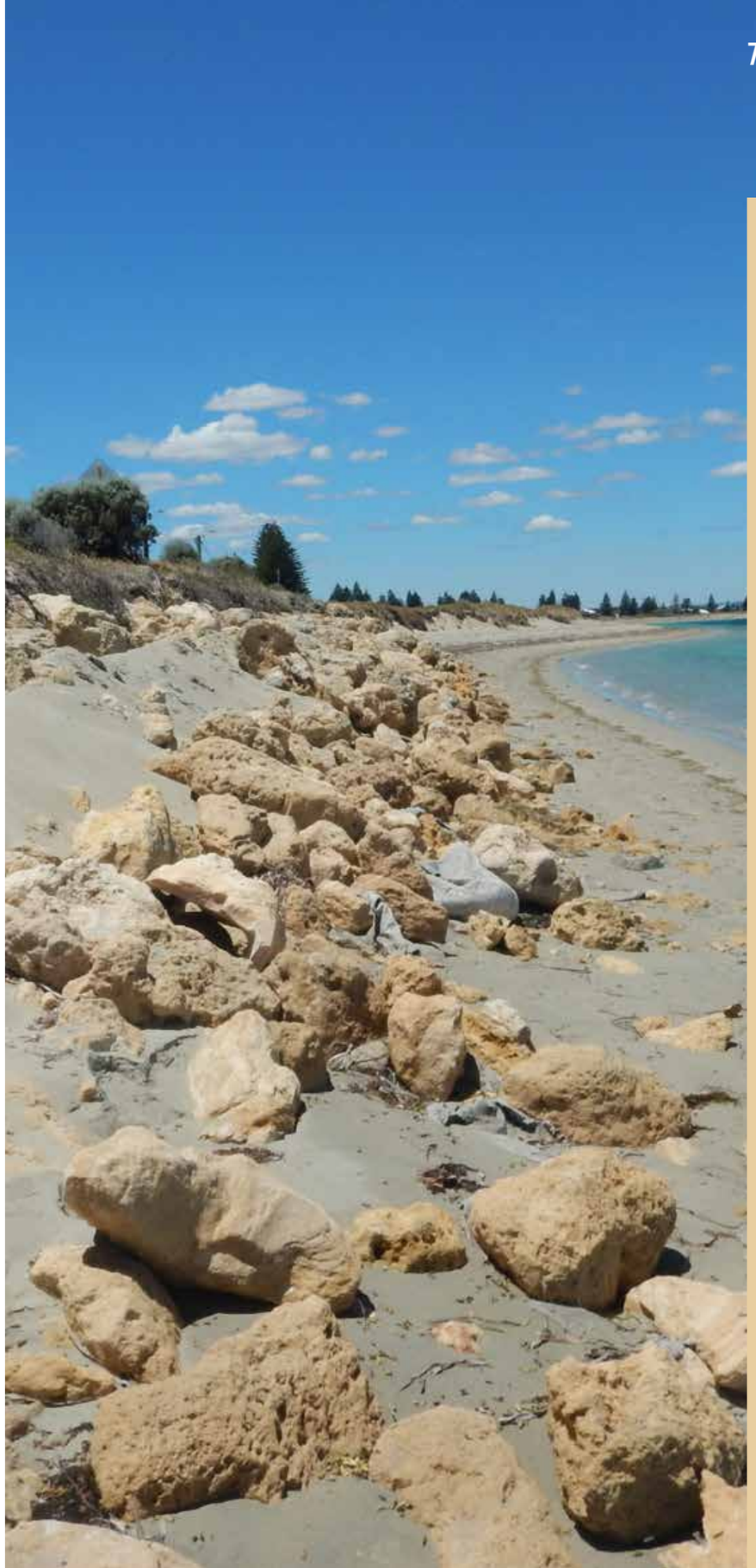
It is important that the City notify the community and potentially affected landholders and stakeholders of the results of the CHRMAP and the extents of potential coastal hazards. The City will notify owners of land situated within the mapped 100 year erosion and inundation extents directly, via mail or email. There are also mechanisms to apply notification of the potential hazards to Certificates of Title and these should be implemented where possible.

9.3.2 Leases

Where the City leases facilities on land vulnerable to coastal hazards short term measures would include:

- notifying all affected leasees of potential coastal hazards
- reviewing the suitability of lease arrangements relative to the CHRMAP at such time that new leases are applied for or existing leases are due for renewal
- if leases are in an area identified for protection or with hazards not likely to be realised until 2070, then renewing for a term up to 20 years may be appropriate
- if leases are in an area likely to be vulnerable in the short term, consider not leasing, or leasing with a reduced term or event-limited arrangement.

The suitably of leases in the future would need to be investigated relative to the findings of future CHRMAPs and long term adaptation pathways selected.



9.4 Managing Short Term Hotspots

9.4.1 Ongoing protection

Action 7: Initiate/continue targeted beach nourishment in vulnerable areas.

In the short term, beach nourishment should continue to be employed to manage coastal erosion hazards along the City's coastline. With predicted sea level rise, the volume of sand required is likely to increase and it will be important to allocate nourishment effort as effectively as possible. Nourishment activities are often reactive and are in response to threats to individual assets or isolated areas. While this may seem necessary, it could be an inappropriate allocation of resources.

The City will review past nourishment activities and plan future activities in light of the results of hazard modelling undertaken as part of the CHRMAP. Nourishment should target areas with the highest overall vulnerability and also consider where the most value can be added through the activity, such as by improving beach amenity at popular beaches. Areas where nourishment should be considered/continued include:

- along Rockingham Beach between Catalpa Park and The Cruising Yacht Club due to the vulnerability of landward assets, the potential for event-based erosion and the opportunity to improve beach amenity;
- to the north of Shoalwater Foreshore Park due to the vulnerability of landward assets, the potential for event-based erosion and the opportunity to improve beach amenity;
- along the southern side of Mersey Point due to the vulnerability of landward assets;
- to the west of Safety Bay Foreshore Park due to the vulnerability of landward assets, the potential for event-based erosion and the opportunity to improve beach amenity; and
- in front of vulnerable infrastructure (predominantly carparks) due to the vulnerability of landward assets, the potential for event-based erosion and the opportunity to improve beach amenity.

Effective beach nourishment programs should consider the various components that increase success and the longevity of protection. These include:

- selecting the appropriate location for placement;
- using the most effective placement volume, footprint and profile;
- selecting appropriate sand in terms of grain size and colour; and
- timing nourishment for greatest effect.

Specific criteria for when and where nourishment should be placed can be developed and refined through data collected during ongoing shoreline monitoring (R11), as well as through other specialist investigations including sediment transport analysis (R13), detailed management options assessments (R8, R9) and even community engagement (R1) and economic assessment (R2) - to identify where nourishment would be most beneficial from a social perspective.

9.4.2 Sector 3 Vulnerability

Action 8: Undertake a detailed options assessment for management of coastal vulnerability in Sector 3 with a particular focus on ongoing erosion issues at Mersey Point.

The City will undertake a detailed options assessment of potential mitigation measures for vulnerable areas in Sector 3. The study should consider the implementation of managed retreat, groynes, offshore breakwaters, seawall(s) and nourishment, in isolation or as a combination. The detailed assessment should consider the methodology outlined in Coastal Management - Local Coastal Hazard Assessment (Department of Transport 2018).
Mersey Point is currently experiencing erosion issues and this should be an area of priority for the treatment options. A detailed options assessment should include the following:

- detailed engineering feasibility of coastal protection structures;
- sediment transport modelling to estimate the future changes to the shoreline, with the installation of structures or without management; and
- detailed costings of the management options and a detailed cost-benefit analysis, assessing the full lifecycle of each prospective option and determining the value of natural assets involved.

Interim protection should still aim to achieve as natural looking and feeling beaches as possible, reflective of the community value placed on these attributes.

It should be noted that to properly assess and implement major management options, R13 will require implementation. Ideally R1 would also be undertaken to inform the assessment, if possible.

9.4.3 Sector 2A Vulnerability

Action 9: Undertake a detailed options assessment for management of coastal vulnerability in Sector 2A, with a focus on the area near Hymus Street.

The City will undertake a detailed options assessment of potential mitigation measures for vulnerable areas in Sector 2A. The study should consider the implementation of managed retreat, groynes, offshore breakwaters, seawall(s) and nourishment, in isolation or as a combination. The assessment should consider the methodology outlined in Coastal Management - Local Coastal Hazard Assessment (Department of Transport 2018). A detailed options assessment should include the following:

- detailed engineering feasibility of coastal protection structures;
- sediment transport modelling to estimate the future changes to the shoreline, with the installation of structures or without management; and
- detailed costings of the management options and a detailed cost-benefit analysis, assessing the full lifecycle of each prospective option and determining the value of natural assets involved.

Interim protection should still aim to achieve as natural looking and feeling beaches as possible, reflective of the community value placed on these attributes.

It should be noted that to properly assess and implement major management options, R13 will require implementation. Ideally R1 would also be undertaken to inform the assessment, if possible.

9.4.4 Emergency Hazard Response

Action 10: Update the existing asset inventory to identify vulnerable assets and prepare an emergency/ damage response plan to respond to potential coastal impacts.

The City will use the hazard extents derived through the CHRMAP, specifically those for the present day and 2030 planning timeframes, to create an inventory of assets that could be impacted, further to the existing asset database on Intramaps.

With the identification of vulnerable assets, the possible result of impacts shall be assessed and any potential risks to public safety identified (flooding, unsafe/unstable infrastructure etc.). The City will develop a plan to respond to hazardous events, and the asset damage and scenarios that could be associated with them. This plan might involve the rapid installation of signage and access prevention, the timely removal of damaged assets and response plans for emergency situations.

9.5 Monitoring and further investigation

Monitoring and further investigation is recommended with respect to the CHRMAP process and has been defined to better inform future iterations of the City's CHRMAP. Further investigation that will refine estimated risk levels and inform management beyond the CHRMAP process has also been recommended.

9.5.1 Long-term coastal monitoring (S2, S3)



Action 11: Initiate a long term coastal monitoring program, incorporating ad hoc storm and metocean monitoring, and coastal asset condition assessments.

Long term estimates of recession are typically derived using historic high resolution aerial imagery. This provides a useful indication of how the shoreline has moved in the past. Due to the difficulties in defining shoreline positions from aerial imagery, it is common practice to use the vegetation line as an indicator of shoreline movement. Whilst this is a useful analysis to estimate historic long term trends, it is emphasised that the vegetation line does not necessarily move at the same rate as the shoreline.

This is further complicated in the assumption that the shoreline will erode due to rising sea levels. Noting that sea levels have risen in the past, the sea level rise component (S3) of historic erosion is typically (conservatively) assumed to be negligible. Moving forward, sea level rise is predicted to accelerate, so any future updates to the CHRMAP process may need to split historic erosion rates into an underlying erosion rate and a rate due to sea level rise.

To inform future revisions of the CHRMAP and to identify the current position of the HSD, the City will implement regular monitoring, in addition to analysis of collected aerial imagery. The City already undertakes coastal monitoring through the Peron Naturaliste Partnership.

The existing program will be assessed alongside the recommendations in this report, to achieve efficiencies, improvements and collaboration where possible, and avoid unnecessary repetition of monitoring activities. In view of this CHRMAP, the monitoring program should include:

- regular analysis of aerial images, vegetation lines, and creation of GIS layers to describe them. i.e. digital tracing of vegetation lines and shorelines (at least in key vulnerable areas) in a GIS format, to allow analysis and comparison over time;
- 6 monthly beach profile monitoring at set transect locations, spaced at 50 to 100 metre intervals, depending on the change in orientation of the shoreline (i.e. long straight beaches can have surveys wider apart). The surveying should prioritise areas with the highest vulnerability at present. Ideally, all of Sector's 1, 2 and 3 should have surveying commence as soon as possible, to ensure the longest dataset possible is available to inform future management. These should be timed to occur in the intervals between the Perth seasonal summer and winter (approximately April and October/November, respectively);
- nearshore bathymetric surveys on an annual basis (or 6 monthly in association with beach profiles if feasible);
- sediment sampling at beach profile locations (6 monthly). Ideally, samples would be analysed for particle size distribution by a laboratory. Lab analysis can be expensive and other options are available, such as analysing with sediment sizing cards, and/or the collection and storage of sediment samples for future analysis if/when required;
- installation of remote imagery cameras - As well as providing ongoing information on the state of beaches, cameras also capture a range of other data, including storm effects, beach visitation, coastal inundation extents and seasonal variations that could be missed by beach profile surveys;
- storm monitoring and metocean data collection as described below (Section 9.5.2);
- regular analysis of collected data (every 2-5 years as required) alongside wind data collected by the Bureau of Meteorology, and water level and wave data collected by the DoT.

The City shall engage a specialist coastal monitoring consultant to review and formalise the monitoring program for the entire coastline. This would include development of a monitoring manual, which also includes instruction around storm monitoring.

9.5.2 Storm and metocean monitoring (S1)

The collection of data around storm events will be valuable in refining estimates of how vulnerable beaches within the City are to storm-based erosion. The collected data can be used to validate the modelled erosion extents. These extents are critical to adaptation planning because they are used as a trigger distance to initiate a change in the management pathway, such as a shift to managed retreat.

As such, the City will seek to incorporate ad hoc storm monitoring in key vulnerable areas into the recommended long-term coastal monitoring program. The key components of the program would be shoreline profiling and sediment sampling, targeting vulnerable sections of coastline before and after storm events. Sampling should target the most severe storm events, or those with the greatest potential to lead to shoreline impact.

Predicting the duration and intensity of forecast storms is difficult and, furthermore, predicting their ability to impact the shoreline is impossible. Notwithstanding this, there are several key factors that should be assessed when selecting a storm to monitor. These are as follows:

- Predicted wave height, period and direction (forecast of these is available at websites such as Seabreeze and Willy Weather). Higher wave height and longer wave period means higher wave energy and greater ability to erode the coastline. A wave direction that is less obstructed by offshore island and reefs is also preferred;
- Predicted tide / water level (available at the websites above or from the Bureau of Meteorology website). Water level is highly important in a storm's ability to impact the coastline. Storms should be chosen where the peak of the storm is predicted to occur at high tide, ideally during spring tides; and
- Predicted storm duration. Generally, storms with a longer duration will have higher impact on the coast. Longer duration also means there is the potential for storm peak(s) to occur during elevated water levels.

Once a storm has been selected for measurement, data should be collected as close to the start and finish of storm conditions as practicable.

Profiling is critical for assessing changes in the shoreline and estimating changes in volume of sand on the beach. It is important to note that the shoreline is constantly changing and profiling provides a 'snapshot' in time of the beach cross section. The dynamic nature of the shoreline means it is important to profile as close to before and after a storm as possible, to avoid detecting changes that might be associated with other processes. Profiling protocols for storm monitoring should be consistent with those outlined in 5.5.1, and the same profile locations as the overall monitoring program should be used where possible.

Sediment sampling is important to assess the change in composition of beach sand, associated with storm impact. Generally smaller grain sizes are taken away more easily, leaving large sand particles after a storm event. Sediment data will be useful for informing renourishment and shoreline protection activities, where the characteristics of imported sand are critical. Sediment sampling protocols for storm monitoring should be consistent with those outlined in Section 5.5.1, and the same sample locations as the overall monitoring program should be used where possible.

Ideally, metocean data such as water level, wave and current conditions should also be measured during storm monitoring. This data can help define the nature of the sampled storm event, including its severity and duration. This type of data collection is relatively expensive and would be difficult to implement alongside each storm sampling exercise. Targeted metocean data collection campaigns (during the winter period for example) should, however, be incorporated into the City's coastal monitoring program where feasible. Metocean data has significant value and provides information for a range of applications. These include: validating wave and hydrodynamic modelling, informing sediment transport analysis and modelling, informing detailed management options assessments and informing the design of coastal structures.



9.5.3 Existing Coastal Infrastructure - Condition Assessment

Some built assets necessarily reside within coastal hazard areas because of their purpose. These assets include boat ramps, jetties, groynes, seawalls, breakwaters and associated access infrastructure, like carparks and access ways. An example is the Point Peron Boat Ramp and associated parking and access. Such assets are generally designed to be sufficiently strong to withstand coastal hazards in their own right, or accompanied by protection against coastal hazards.

As mean sea level has already been rising and climate change is expected to bring further changes to water levels and storm intensity, it is possible that existing coastal assets have been under-designed for present and/or future coastal conditions. Assets like boat ramps, protection structures and access ways can also lose functionality as conditions change and the shoreline is altered. This is always a challenge when placing fixed infrastructure at a dynamic shoreline.

As unprecedented changes and coastal conditions are predicted to occur, more regular condition assessment of coastal infrastructure shall be undertaken by the City. For significant infrastructure, assessments should be carried out by an experienced coastal or maritime structural engineer. Formal inspection frequency should be approximately every 5 to 10 years, but this should be flexible based on the outcomes of previous assessments and observations from informal assessments. There should also be the capacity to inspect infrastructure after major storm events, to identify any critical damage.

9.5.4 Water level/ inundation (S4)

Action 12: Undertake a local water level and sea level rise analysis.

A key component of this CHRMAP involved analysis of water level records to estimate peak water levels during extreme events. Due to the length and reliability of the data set, the tide record from Fremantle Fishing Boat Harbour was analysed to define design water levels for various ARI events. Water level can change considerably with location (even when nearby). To better inform risk levels prior to the next CHRMAP revision, the City will undertake a local assessment of water levels, adjacent to its coastline. The assessment should include:

- collection of water level data (during storm events if possible) for analysis/comparison through the deployment of instrumentation at a selected offshore location. A specialist consultant would be required to carry out this data collection;
- an analysis of water level records (including historical) at nearby locations, including Fremantle, Mangles Bay and Mandurah, to establish relationships between the datasets and identify historical sea level rise trends specific to Rockingham; and
- visual inspections (or remote imagery capture) of inundation extents during storm activity, to assess against modelled hazard extents.

9.6 Further Investigation

Action 13: Undertake a detailed sediment transport analysis to establish a detailed sediment budget for the City focusing on Sectors 2 and 3.

9.6.1 Sediment Transport Analysis

Coastal erosion hazards, as estimated through the CHRMAP process, are based on a number of simplified assumptions. One of the key assumptions made in defining hazard extents is that the historical rate of shoreline recession will continue at the same rate into the future. In reality, the rate of recession is governed by a number of factors including wave conditions, bathymetry, availability and size of sediment and the orientation of the shoreline.

This CHRMAP assessment has identified a number of assets which are potentially at risk of erosion hazards now, or in the future. To further qualify the risk levels, a detailed sediment transport analysis shall be undertaken to quantify expected erosion and accretion rates in the future. Key outcomes of the study should include:

- development of a (or multiple) validated numerical sediment transport and shoreline response model(s) of the Rockingham shoreline;
- quantification of gross and net transport rates along the Rockingham foreshore under current and future climatic conditions;
- further quantification and refinement of future erosion hazards to be incorporated into the next CHRMAP revision; and
- assessment and further development of any proposed shoreline protection options (such as groynes, breakwaters, seawalls, nourishment programs etc.), and their impacts on the shoreline.

The CHRMAP process has identified that the most vulnerable sections of coastline lie within Sectors 2 and 3, therefore the sediment transport assessment should focus on these areas.

9.6.2 Nourishment Sand Source Investigation

Action 14: Undertake an investigation to identify suitable sediment sources and determine available volumes for use in ongoing beach nourishment.

The preferred management scheme for vulnerable areas in the short term is to continue the City's beach nourishment activities. This management technique provides temporary protection, generally improves beach amenity and maintains a flexible adaptation pathway for the future. As sea levels rise, the volume of sand needing to be added to the beach will increase. In anticipation of the increased nourishment volumes, beyond the volume available at the Point Peron sand trap, it is prudent that the City identifies suitable sediment sources for use in the future. This could include identification of sources such as:

- stripping sand from the City's beaches where accretion is occurring or in areas not considered to be vulnerable;
- investigation of the existing sand trap, and investigating ways to increase the trapping efficiency of this operation;
- sourcing sand from developments close to the coast where excavation in good quality sand (for example basement excavation) is proposed; and
- identification of nearshore sand sources that could be sourced using dredging operations.

9.6.3 Geophysical Investigations

Geophysical investigations can be useful in identifying the depth of erodible material below the ground surface. Noting that managed retreat is a potential adaptation option in the future, geophysical investigations may be more beneficial prior to major built infrastructure being removed. The geophysical investigation could inform the managed retreat decision, ensuring assets are not removed unnecessarily.

Geophysical investigation generally involves transect and point measurements to identify layers and hardness of material below the surface. For this purpose, they would be used to identify if there is a continuous, alongshore rock barrier located below the ground surface (e.g. within a sand dune), that has sufficient strength and height to prevent coastal hazards impacting assets on its landward side. Such investigations are carried out by geologists using specialised equipment.

Given the generally low lying nature of the City's coastal areas and the general lack of exposed hard rock in these areas, a geophysical investigation is not expected to add significant value to future revisions of the CHRMAP.

9.6.4 Stormwater and Drainage Asset Management and Maintenance Program

Action 15: Update the City's Asset Management Plan and Drainage Maintenance Program to reflect adaptive measures selected by the City and develop a priority matrix to ensure assets nearer to the foreshore area are performing as expected.

Asset Management

When drainage assets become due for upgrade or renewal the City will need to consider the adaptation options proposed for each section of coastline, be it long term protection or managed retreat. These options, along with critical failure mode analysis, need to be considered when developing and determining renewal and upgrade intervention levels and their subsequent treatments. This information will need to be included in drainage asset deterioration modelling to ensure future funding requirements are factored into the Infrastructure Asset Management Plan and the City's 10 Year Business Plan.

Subsequently, the adaptation options will inform drainage asset levels of service; and determine maintenance strategies and programs.

Drainage Maintenance Program

It will be important that maintenance is proactive as opposed to reactive. A proactive maintenance regime could substantially prolong the useful life of the stormwater and drainage assets, and improve performance.

It is suggested that a priority matrix be developed that assesses maintenance of assets nearer to the foreshore areas in line with the potential impacts of erosion and inundation. This is to ensure that the assets in these vulnerable locations are performing as expected and are not hindered by blockages or other obstructions.

Operational and maintenance activities may be targeted to mitigate critical asset failure and maintain agreed service levels. These activities may include increased inspection frequency and higher maintenance intervention levels.

Identification of critical stormwater assets and their failure modes will be necessary to minimise risk and inform the City's asset management plan. For example, critical stormwater assets are likely to include:

- drainage structures under main roads;
- drainage structures under roads with no nearby alternative routes;
- drainage structures near schools, aged care and childcare facilities;
- drainage structures protecting emergency services sites; and
- flood mitigation structures protecting residential land.

Any reported drainage or flooding issues should be reviewed and assessed to identify if the issues are related to coastal processes or hazards.

Through the implementation of updates to stormwater and drainage information on the City's mapping system (Intramaps), assets noted as critical can be identified and linked to a specific maintenance regime, to address known issues. This will help develop maintenance planning for predicted sea level rise and increased inundation. Maintenance regimes will need to be reviewed and a gap analysis performed to ensure that maintenance planning will address future adaptation pathways identified by the City.

9.6.5 Stormwater Modelling

Action 16: Stormwater and drainage system be reviewed for functional capacity should issues be reported.

As the City has over 40 drainage outlets discharging to the ocean, understanding the capacity of the drainage network will provide an indication of which catchments will be prone to failure due to coastal processes.

Up to 2030, should drainage assets be identified as underperforming, the drainage system should be reviewed for functional capacity and retrofication works undertaken to ensure performance is maintained.

Beyond 2030, the City shall seek to undertake direct rainfall modelling of the coastal area. This assessment will provide the City with an understanding of the areas most prone to inundation due to rainfall. This modelling should be used to determine the impact of elevated water levels on the efficiency of the drainage network as part of the adaption measures assessment.

Direct rainfall modelling applies an excess rainfall volume directly to a hydraulic model, thereby considering both flow capacity and volumetric storage. This is particularly important in considering drainage networks that flow to tidal boundaries, as exist in the City, as the capacity of the outlet can be constrained under high tidal levels, due to sea level rise or ocean inundation events, leading to the ponding of water in flood storage areas. These areas include low lying areas behind dunes and local depression storages that would normally flow under low tide conditions via the underground drainage network.

As part of the direct rainfall modelling, consideration should be given to include a joint-probability analysis of both coastal events and pluvial flooding along the entire coast line.

9.6.6 Lake Richmond

Action 17: Continue to undertake environmental surveys and monitor TDS levels for Lake Richmond.

The City currently undertakes environmental surveys and water quality monitoring to collect baseline information on the health of Lake Richmond. This shall be continued to ensure future adaptive measures will preserve the important economic, environmental and social values of the lake.

Once substantial baseline data is collected (i.e. five years), trigger values and contingency measures should be derived. Should trigger values be exceeded the identified contingency measures shall be implemented. It is suggested trigger values are based on increases in Total Dissolved Solids (TDS) levels, an indication of salinity, based on a review of the ability of flora, fauna and microbialite communities to adapt to changes in salinity.

9.6.7 CHRMAP Revision

Action 18: Undertake a full revision of the City's hazard extents and CHRMAP identifying and incorporating relevant new information.

As noted in the CHRMAP guidelines, the CHRMAP should be a living document and undergo regular revisions and monitoring.

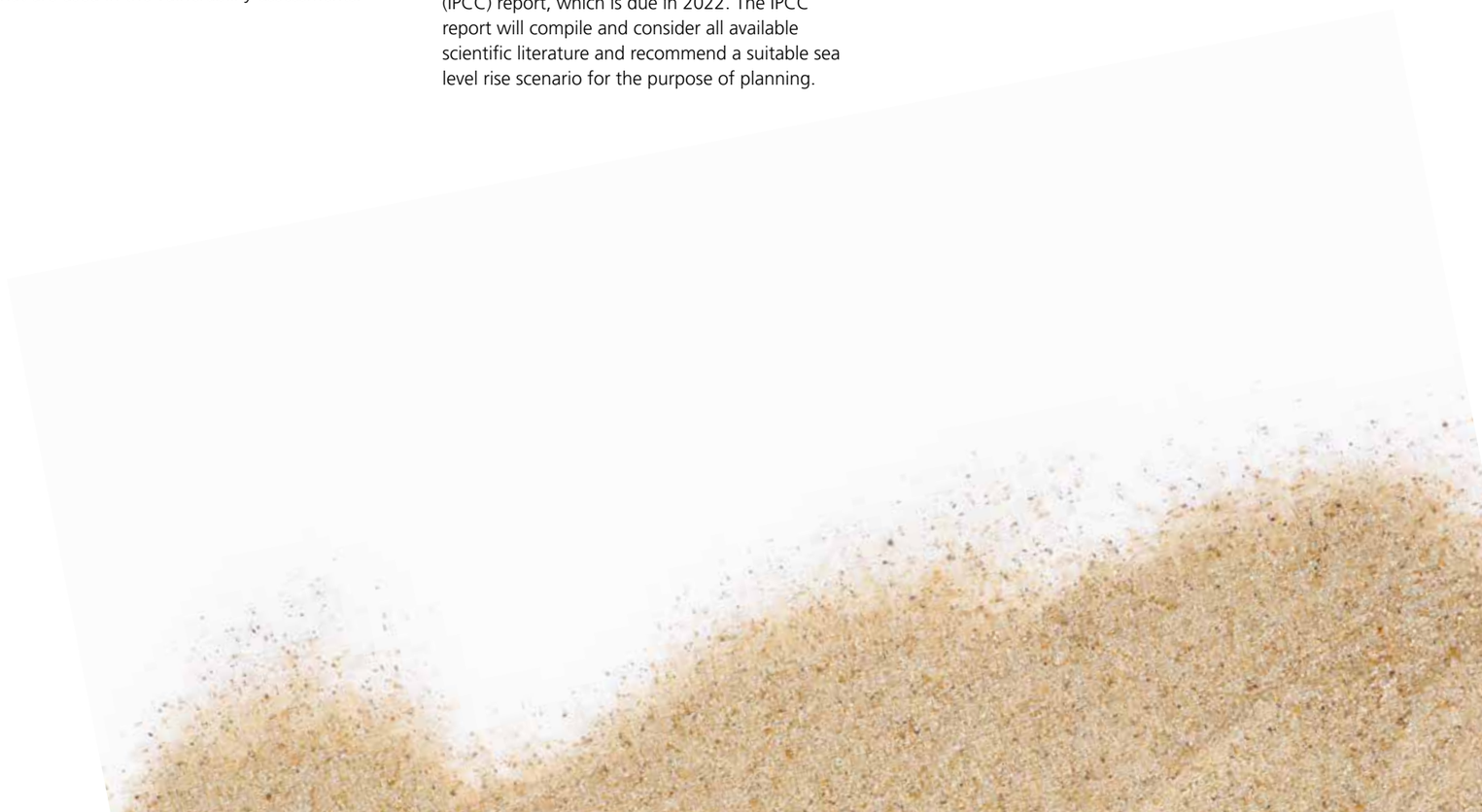
"…risks arising from coastal hazards rarely remain static, especially as our understanding of coastal processes is improving and given the long timeframes associated with some types of coastal processes and types of land use and development in the coastal zone. It is also impacted by uncertainty on the degree of future climate change (i.e. what the future global greenhouse emissions will be), and climate change projections that are used in the vulnerability assessments.

Monitoring and reviewing the CHRMAP ensure the management and adaptation to reduce risks, their likelihood and consequences and the risk priorities, remain the most suitable and effective, and timing and cost appropriate. Where possible principles of adaptive management should be applied which involves small, flexible, incremental changes based on regular monitoring and revision of plans based on the best information available at the time."

The key changes to any future revisions of the CHRMAP should include an update of hazard estimates using more recent information, the findings of specialist investigations undertaken, changes to projected sea level rise, climate change effects and any changes to the use of the foreshore.

The CHRMAP will be reviewed in 10 years or when SPP 2.6 is reviewed, whichever comes first.

SPP 2.6 is proposed to be revised following the next Intergovernmental Panel on Climate Change (IPCC) report, which is due in 2022. The IPCC report will compile and consider all available scientific literature and recommend a suitable sea level rise scenario for the purpose of planning.



9.7 Summary of short term recommendations (to 2030)

The recommended short term actions discussed in the previous section are collated and summarised in the table below. These actions generally focus on actions that will or may require implementation prior to 2030. Recommendations for management actions beyond 2030 will be better informed by investigations undertaken and information collected over the next decade, which will be highlighted in the next review of the CHRMAP.

	Action		Action
1	Engage the community to present the results of this CHRMAP and collect their feedback on the acceptability of adaptation options and pathways.	10	Update the existing asset inventory to identify vulnerable assets and prepare an emergency/damage response plan to respond to potential coastal impacts.
2	A detailed economic assessment should be undertaken to establish the economic value/contribution of natural assets in key vulnerable areas.	11	Initiate a long-term coastal monitoring program, incorporating ad hoc storm and metocean monitoring, and coastal asset condition assessments.
3	Investigate and establish a fund for ongoing coastal adaptation and management, and allocate funding sources.	12	Undertake a local water level and sea level rise analysis.
4	Existing and proposed structure plans should be reviewed to ensure they adhere to SPP2.6 and account for the risks identified in this CHRMAP.	13	Undertake a detailed sediment transport analysis to establish a detailed sediment budget for the City, focusing on Sectors 2 and 3.
5	TPS2 should be amended to incorporate SPP2.6 and include vulnerable areas as SCAs.	14	Undertake an investigation to identify suitable sediment sources and determine available volumes for use in ongoing beach nourishment.
6	Landholders that may be affected by coastal hazards by 2110 should be notified directly and by the application of notification on Certificates of Title, where possible.	15	Update the City's Asset Management Plan and Drainage Maintenance Program to reflect adaptive measures selected by the City and develop a priority matrix to ensure assets nearer to the foreshore area are performing as expected.
7	Initiate/continue targeted beach nourishment in vulnerable areas.	16	Stormwater and drainage system be reviewed for functional capacity should issues be reported.
8	Undertake a detailed options assessment for management of coastal vulnerability in Sector 3, with a particular focus on ongoing erosion issues at Mersey Point.	17	Continue to undertake environmental surveys and monitor TDS levels for Lake Richmond.
9	Undertake a detailed options assessment for management of coastal vulnerability in Sector 2A, with a focus on Hymus Street.	18	Undertake a full revision of the City's hazard extents and CHRMAP, identifying and incorporating relevant new information.



10 Short Term Implementation Plan to 2030

This table describes actions recommended for implementation by 2030, their estimated costs, responsible divisions and suggestions for timing. It is noted that the costs in the table are estimates only, and the relevant teams should undertake a more detailed cost estimate at such time the action is due to be budgeted for and implemented.

Component	Responsible	Annual cost estimate	Total cost estimate (to 2030)	Timing
Planning				
Review existing Structure Plans	SPE	O	O	2019/20
Amend TPS2	SP	O	O	2019/20
Directly notify affected landholders	SP	O	O	2019/20
Apply notification to title for new Development and Subdivision Approvals, as per SPP 2.6 requirements	SP	O	TBD	From 2019
Monitoring				
Shoreline monitoring manual	SPE	$25,000	$25,000	From 2019
Ongoing aerial imagery analysis	SPE	$5,000	$60,000	From 2019
Ongoing shoreline monitoring	SPE	$40,000	$480,000	From 2019
Storm monitoring	SPE	$15,000	$180,000	From 2019
Coastal asset condition assessments	ES	$15,000	$180,000	From 2020
Metocean data collection	SPE	$25,000	$300,000	From 2019
	Sub-total		**$1,225,000**	
Implementation/ Management				
CHRMAP community engagement	SPE	-	$25,000	2019
Ongoing community engagement	SPE	$10,000	$60,000	From 2019
Undertake detailed investigations and establish a coastal adaptation fund	FS	-	-	2019/20
Ongoing beach nourishment	ES	$250,000	$3,000,000	From 2019
Coastal asset inventory update	AS	-	$10,000	2020/21
Asset management plan update	AS	-	$15,000	2020/21
Drainage Maintenance Program update	ES	-	-	From 2019
Hazard response preparation	CS	-	$15,000	2019/20
Management at Mersey Point	ES	-	$500,000	2020-2025
	Sub-total		**$3,625,000**	
Special Investigations				
Detailed economic assessment	SPE	-	$150,000	By 2025
Detailed options assessment for Sector 3	ES	-	$100,000	By 2020
Detailed options assessment for Sector 2	ES	-	$100,000	By 2025
Water level/sea level rise analysis	SPE	-	$50,000	By 2030
Detailed sediment transport investigation	ES	-	$120,000	By 2020
Nourishment sand source investigation	ES	-	$20,000	By 2025
Stormwater and drainage system review	ES	-	$100,000	By 2030
Hazard line and CHRMAP revision	SPE	-	$150,000	By 2030
	Sub-total		**$790,000**	
	Grand Total		**$5,640,000**	

LEGEND

ES: Engineering Services

SP: Statutory Planning

SPE: Strategic Planning and Environment

AS: Asset Services

CS: Community Safety



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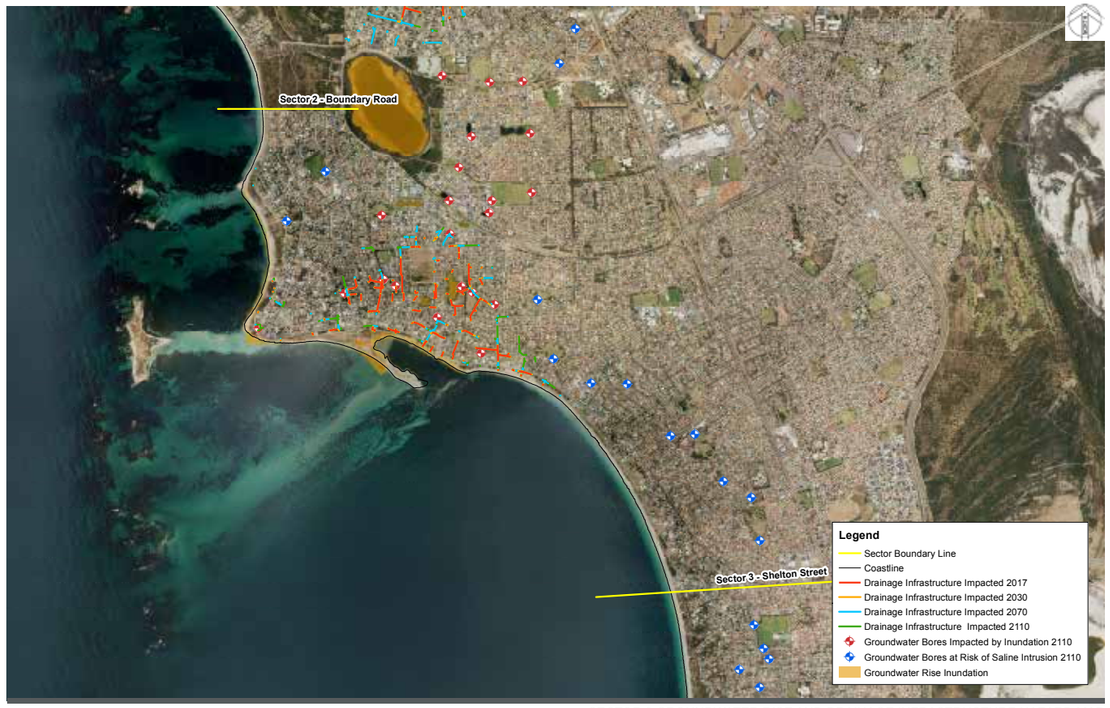
Appendix A Groundwater Rise Assessment



SECTOR 1 GROUNDWATER RISE AND DRAINAGE INFRASTRUCTURE HAZARD MAP



SECTOR 2 GROUNDWATER RISE AND DRAINAGE INFRASTRUCTURE HAZARD MAP



SECTOR 3 GROUNDWATER RISE AND DRAINAGE INFRASTRUCTURE HAZARD MAP



SECTOR 4 GROUNDWATER RISE AND DRAINAGE INFRASTRUCTURE HAZARD MAP

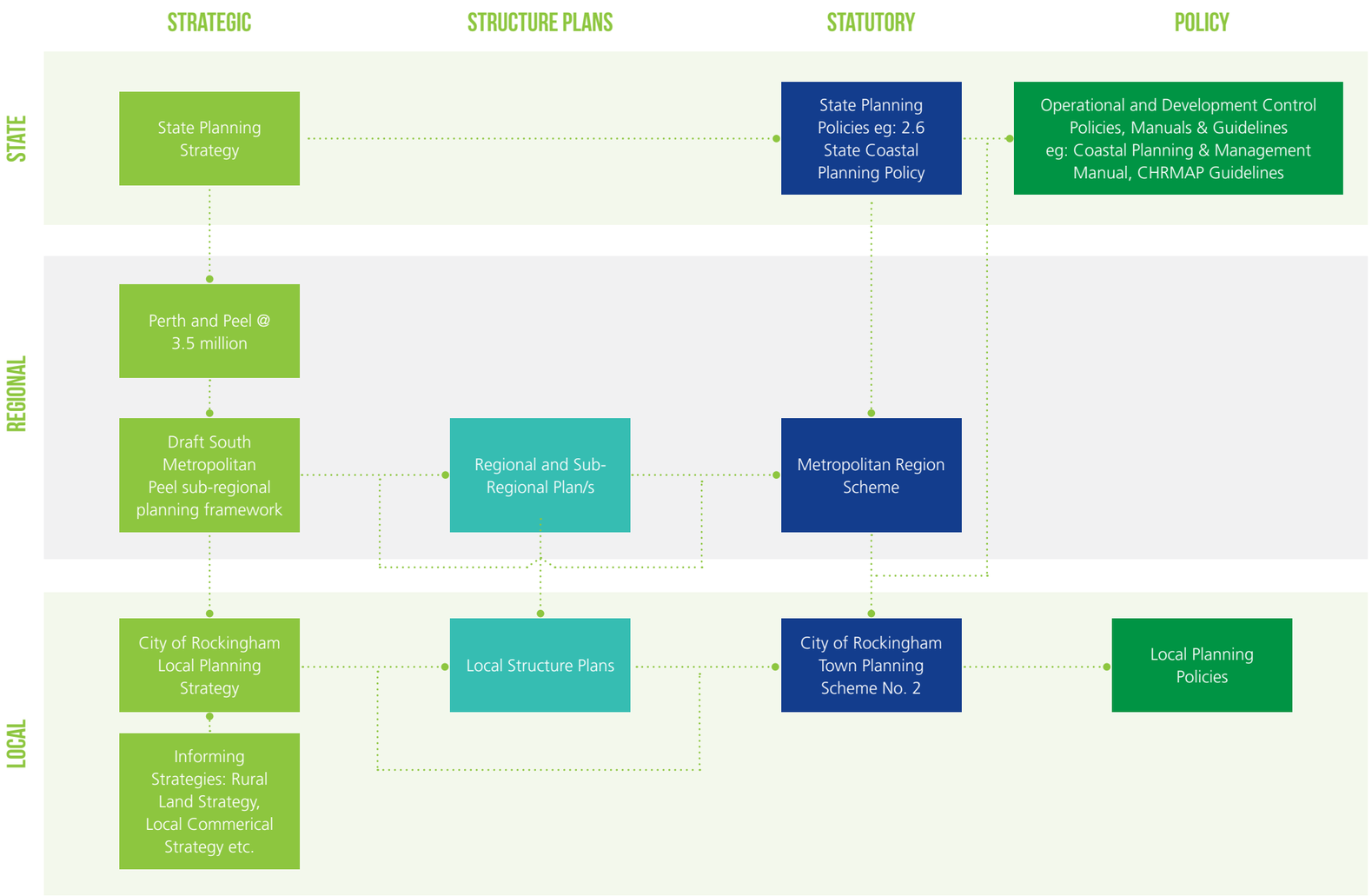


SECTOR 5 GROUNDWATER RISE AND DRAINAGE INFRASTRUCTURE HAZARD MAP



SECTOR 6 GROUNDWATER RISE AND DRAINAGE INFRASTRUCTURE HAZARD MAP

Appendix B Planning Context



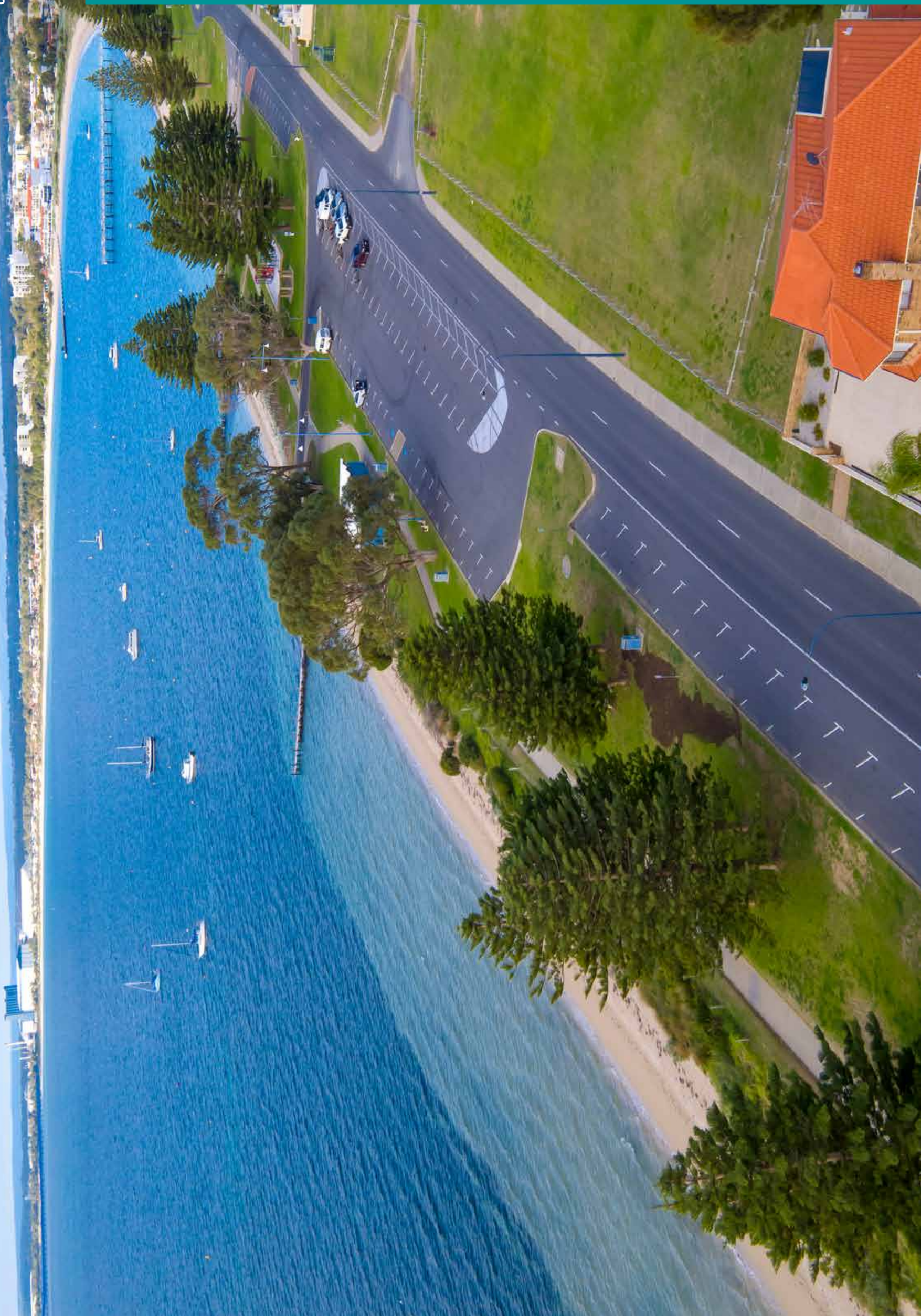
Statutory Planning Framework
This figure summarises the relevant planning framework. The key statutory planning document for the City is Town Planning Scheme No. 2 (TPS2). This applies zones and reserves to land within the City and outlines the permissibility of land uses, the requirements for development and the processes for seeking approval for proposed development. TPS2 was gazetted on 19 November 2004.

TPS2 was amended in September 2017, to be consistent with the Planning and Development (Local Planning Scheme) Regulations 2015 (the P&D Regulations, DoPLH, 2017a). Through the review of TPS2, the City identified any aspects of the document that were inconsistent with the intent of regional and state strategies, policies, and statutory requirements, including SPP2.6.

The general objectives of TPS2 are to:

- Optimise the provision of services and facilities for the community;
- Establish the preferred use of land well in advance of development;
- Ensure the coordinated provision of adequate land for development;
- Conserve and enhance features of cultural, historical, environmental and natural significance; and
- Reconcile community needs and aspirations with appropriate land use and development.

State Planning Policies provide the highest level of planning policy control and guidance in Western Australia and are prepared under Part 3 of the *Planning and Development Act 2005* (DoPLH, 2017b). SPP2.6 is an environmental sector policy consistent with the higher order SPP 2 Environmental and Natural Resources Policy.

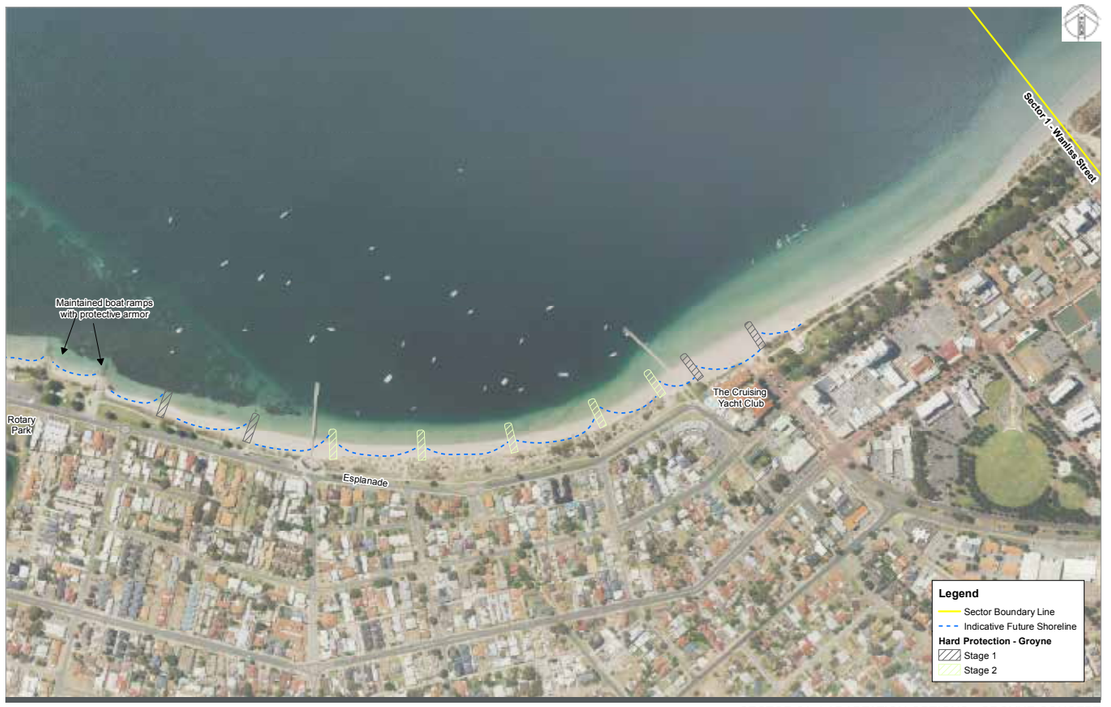


Appendix C Hard Protection Adaptation Options - Feasibility Assessment Concept Designs





SECTOR 2A-1 ADAPTATION OPTIONS - BREAKWATER CONCEPT



SECTOR 2A-1 ADAPTATION OPTIONS - GROYNE CONCEPT



SECTOR 2A-1 ADAPTATION OPTIONS MAP - SEAWALL CONCEPT



SECTOR 3A-2 ADAPTATION OPTIONS - GROYNE CONCEPT



SECTOR 3A-2 ADAPTATION OPTIONS - SEAWALL CONCEPT



SECTOR 3B-1 ADAPTATION OPTIONS - BREAKWATER CONCEPT



SECTOR 3B-1 ADAPTATION OPTIONS - GROYNE CONCEPT



SECTOR 3B-1 ADAPTATION OPTIONS - SEAWALL CONCEPT



SECTOR 4B-1 ADAPTATION OPTIONS - BREAKWATER CONCEPT



SECTOR 2A-1 ADAPTATION OPTIONS - BREAKWATER CONCEPT



SECTOR 4B-1 ADAPTATION OPTIONS - SEAWALL CONCEPT

Appendix D - Community Adaptation Workshop Summary

Background
The intent of the Community Adaptation Workshop was to inform dvelopment of the CHRMAP, which will outline key directions for coastal adaptation over a 100 year planning timeframe, in addition to prioritising management works over the next 10 years.

The workshop was held at the Gary Holland Community Centre on Wednesday 15 August 2018, from 5-7 pm. The workshop centred around a presentation on potential coastal hazards, adaptation options and costs. In the context of this information, 30 residents participated in a number of activities and engaged in valuable discussion.

Activity One

Group	Participant suburbs	What is your favourite and/or most visited beach?	Name three things you value most about that beach?
1	• Shoalwater	• Shoalwater • The Pond • Rockingham Foreshore	• Water sports - kayaking, kitesurfing, diving • Nature and wildlife • Absence of pollution • Cafes
2	• Shoalwater • Safety Bay	• Shoalwater • Safety Bay • The Pond	• Clean and calm water • Visiting the islands • Exercising on the water • The naturally maintained sand dunes • Dog beach • Easy access, boat ramp • Swimming, kayaking, diving
3	• Shoalwater • Warnbro • Rockingham	• Point Peron • Warnbro Dog Beach • Shoalwater • Palm Beach	• Clean quality of water • Clean sandy beaches • Dunes in Warnbro • The islands
4	• Rockingham • Baldivis • Shoalwater	• Rockingham Foreshore • Palm Beach • Shoalwater Bay • Safety Bay	• Parkland – family friendly, grass, trees, gazebos • Pollution free - clean water and sand • Easy access for boating
5	• Warnbro • Golden Bay • Port Kennedy • Safety Bay	• Warnbro • Rockingham Foreshore • Secret Harbour • Safety Bay	• Dog beach • Dunes and native vegetation • Quality of water and clean beaches • Safe for swimming • Family friendly, grassed picnic areas • Native vegetation
6	• Rockingham	• Point Peron • Rockingham Beach • Palm Beach	• Calm, clean water • North facing beach • Boat ramps, jetties • Restaurants, cafes • Coastal views

Activity Two

1. Generally speaking, would you favour protect or managed retreat, and why?

Group responses:
Likely favour protect at first, and then if this becomes no longer possible, managed retreat. Don't necessarily know enough about it to decide for sure.
Favour protection short term, with a view to carefully consider managed retreat long term. This would provide more time to manage as carefully as possible, due to level of unknowing. Perhaps it could be based on 'priority zones' for protection.
Combination of both, depending on the value of an area to the whole community. It is important to protect homes, but managed retreat will minimise costs long term.
Combination of both. Protection in some areas where there is high economic value or more vulnerable property, but managed retreat in other areas. Who pays for protection long term?
Important that the dunes are conserved and protected, with appropriate fencing, planting and signage.
Managed retreat. Protection is an ongoing expense with little net benefit in the long term. It allows for a buffer to be provided for the area.
Depends on personal circumstances. Property owners will favour protect, amenity users will favour managed retreat. The suspicion with managed retreat is woefully inadequate compensation for property owners. If there was more certainty around compensation, then managed retreat may be looked more favourably upon.
Protect, as our residence is on the front esplanade.

2. If you could only keep three stretches of sandy beach (each 600 m long) which would they be?



A VARIETY OF SANDY BEACHES WERE SELECTED AND DID NOT NECESSARILY FAVOUR THOSE NEAREST TO THEM. FOR EXAMPLE, RESIDENTS FROM WARNBRO AND PORT KENNEDY SELECTED ROCKINGHAM BEACH AND POINT PERON, RESIDENTS FROM ROCKINGHAM SELECTED SHOALWATER BAY, AND A BALDIVIS RESIDENT SELECTED THE POND.

3. If you could only install three seawalls (each 600 m long) which areas of the coastline would you choose and why?



SELECTIONS GENERALLY ALIGNED WITH THOSE AREAS MORE VULNERABLE TO COASTAL HAZARDS. THERE WERE SOME AREAS IDENTIFIED FOR SEAWALLS, CONTRARY TO THOSE SAME AREAS BEING SELECTED FOR RETENTION OF THE NATURAL SANDY BEACH IN THE PREVIOUS ACTIVITY. HOWEVER, KEY DIFFERENCES CAN BE NOTED, INCLUDING MERSEY POINT BEING STRONGLY FAVOURED FOR PROTECTION, WITH ROCKINGHAM BEACH AND POINT PERON ALSO FAVOURED. BY COMPARISON, PALM BEACH, SHOALWATER BAY AND THE POND ALL RANKED HIGHER FOR RETENTION OF A SANDY BEACH AS OPPOSED A CONSTRUCTED SEAWALL COASTLINE. SOME RESIDENTS ALSO NOTED THE IMPORTANCE OF PROTECTING BOATING INFRASTRUCTURE WITH HIGH COMMUNITY VALUE, SUCH AS BENT STREET BOAT RAMP, WHILE STILL MAINTAINING SANDY BEACHES EITHER SIDE.

Activity Three

1. Who do you think should pay to manage coastal hazards in the future?

Group responses:
Everyone
Federal, state and local governments; climate polluters; a carbon tax; tax on any other related externalities; Tony Abbott
Climate change is a global issue, all tiers of government have a role to play
All levels of government have some responsibility, but particularly state and local governments. In responding to coastal hazards it's important to work with neighbouring Councils to ensure continuity.
All levels of government, but local government in particular.
It is a whole community and state responsibility, but all three levels of government should contribute
It's a shared responsibility, all should contribute

2. Do you think residents on the coast should pay more than those who live inland? Or should all residents pay equally?

Group responses:
Everyone who drives, walks, swims and fishes in the area. We all fund parks, libraries, community centres and playing fields, but may never use them. This is just another thing that all of our rates should go towards managing.
Community should generally all pay, so long as public access remains to everyone can use it.
All should contribute through rates, which means that people on the coast will pay proportionately more anyway as their property values (GRV) are generally higher.
Everyone should pay the same
Everyone uses and enjoys the beach, so everyone should pay. Could also have a user pays component, where visitors coming to the area contribute to coastal management through parking fees.
Everyone should pay equally, people move houses over time too.
Waterfront properties already pay higher rates based on land value. Everyone should pay as everyone uses the beach and local facilities. Perhaps if certain properties are going to be particularly impacted that they pay proportionally more.

3. Hypothetically, how much would you be willing to pay to manage coastal hazards on top of your rates? i.e. $20, $50, $100

Group responses:
$50
$20 - $100, or what is required
$100 or whatever is required based on best estimates. Not an open cheque book.
$50 - $100
Unsure, depends what is necessary
A sliding scale based on CPI, not a set amount forever. It should be a small amount continually collected over time.
$100

4. Do you think it is reasonable to start putting money in a cash reserve now? Why?

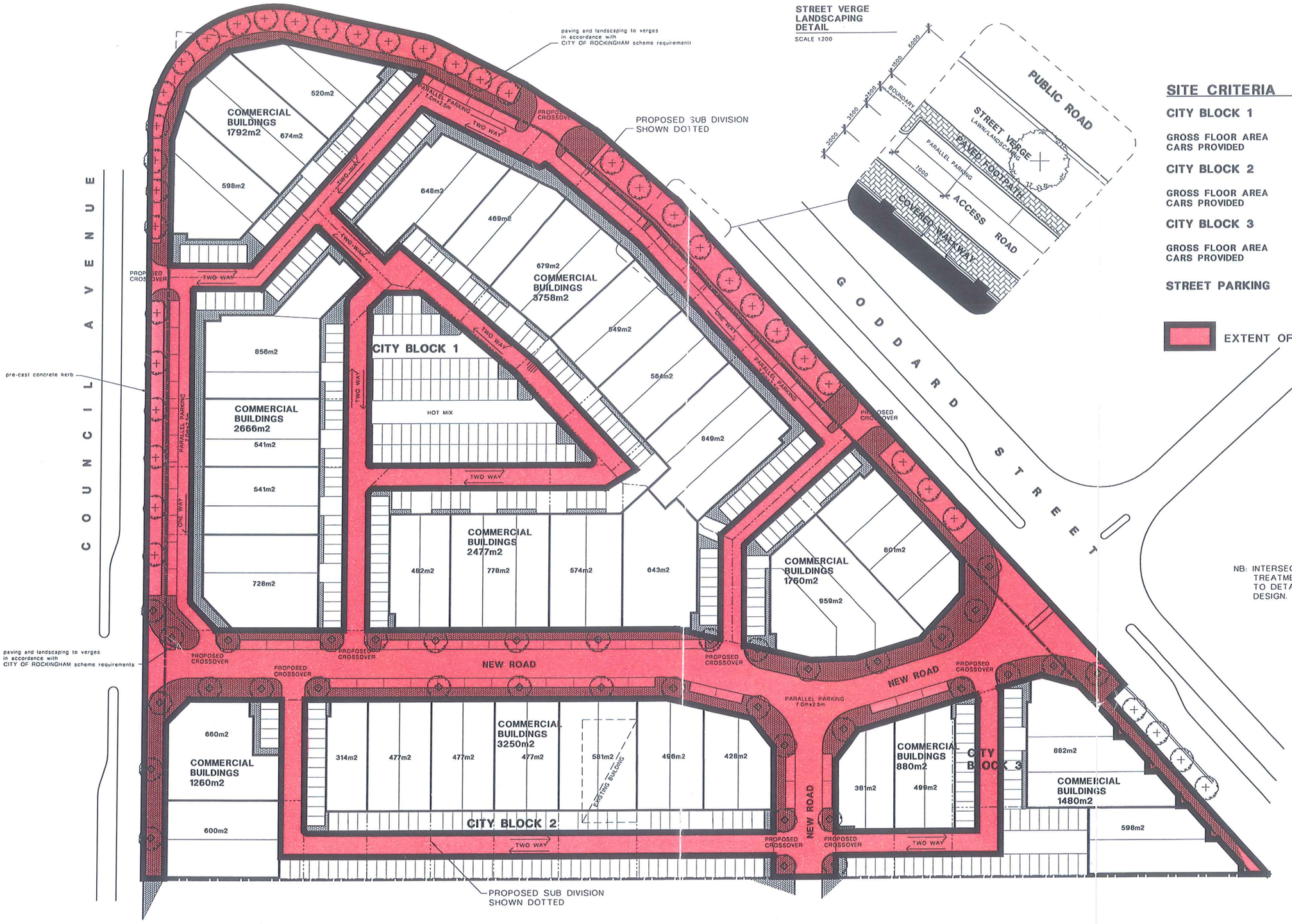
Group responses:
A sovereign wealth fund is always good
Yes, because it is better to act sooner and accrue interest
Yes, we don't want intergenerational inequity (whereby future generations are left paying more). Need to consider funding whole of life costs for asset management.
Yes, also important to protect the natural dunes now.
Yes, coastal management is not getting any cheaper. A cash reserve needs to be dedicated to coastal management and not redirected to other causes.
Yes, small amounts put away over time ensure sensible decisions can be made in times of need.
Yes, we need to plan ahead. There is going to be an impact, we just don't know when and how bad.

* With respect to questions 3 and 4, a scenario was discussed whereby a 1% rate increase could be applied to all residents for a set period of time (i.e. 10 years) to establish a cash reserve for coastal hazards, which could then accrue interest over time.

In response, comments from the group expressed:

- The importance of establishing a cash reserve sooner rather than later to appropriately respond to coastal hazards when they occur.
- General support for a rate increase to establish a cash reserve, with 1% considered relatively acceptable (i.e. ~$20, depending on the property).
- That if a rate increase is applied, it would be better to continue collecting relatively small amounts indefinitely and not cease after a set term, acknowledging that management of coastal hazards is ongoing.
- The need for utmost certainty around the security of a cash reserve to only be used for future management of coastal hazards, and not for any other purpose.





SITE CRITERIA

CITY BLOCK 1

GROSS FLOOR AREA	12 453m2	
CARS PROVIDED	275 CARS	(1 CAR/45m2)

CITY BLOCK 2

GROSS FLOOR AREA	4 510m2	
CARS PROVIDED	95 CARS	(1 CAR/47m2)

CITY BLOCK 3

GROSS FLOOR AREA	2 360m2	
CARS PROVIDED	57 CARS	(1 CAR/41m2)

STREET PARKING 32 ADDITIONAL CARS

EXTENT OF SUBDIVISIONAL WORKS

NB: INTERSECTION DESIGN AND TREATMENTS ARE SUBJECT TO DETAILED ENGINEERING DESIGN.

SITE PLAN

SCALE 1:500

PLOT DATE : 22th May 1996

REV.	DATE	REMARKS	REV.	DATE	REMARKS
A	26.3.96	General Revisions	E		
B	15.5.96	Buildings moved to road reserve	F		
C	22.5.96	Street parking and landscaping added	G		
D			H		

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BUILDING DESIGNERS ASSOCIATION OF W.A. INC.

INTEGRATED DEVELOPMENT GUIDE PLAN

ON Cnr. COUNCIL AVENUE and GODDARD STREET, ROCKINGHAM
FOR : SAVOY ESTATES PTY. LTD.

BSD CONSULTANTS
CONSULTING ENGINEERS TOWN PLANNERS PROJECT MANAGERS
BSD Centre 2 Bagot Road P.O. Box 1000 Subiaco Western Australia 6008 Telephone (08) 273 3000 Facsimile (08) 388 2071

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Western Australia
Tel 09 381 8511
Fax 09 388 1339

date FEB 1996	PROJECT No 5487
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checked	



Figure 19 *- Landscape Master Plan*